

**HENRY FORD AND HIS RESEARCHERS -
HISTORY OF THEIR WORK WITH SOYBEANS,
SOYFOODS AND CHEMURGY (1928-2011):
EXTENSIVELY ANNOTATED
BIBLIOGRAPHY AND SOURCEBOOK**

SOYINFO CENTER

**HENRY FORD AND HIS RESEARCHERS -
HISTORY OF THEIR WORK WITH SOYBEANS,
SOYFOODS AND CHEMURGY (1928-2011):**

**EXTENSIVELY ANNOTATED
BIBLIOGRAPHY AND SOURCEBOOK**

Compiled

by

William Shurtleff & Akiko Aoyagi



2011

Copyright (c) 2011 by William Shurtleff & Akiko Aoyagi

All rights reserved. No part of this work may be reproduced or copied in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems - except for use in reviews, without written permission from the publisher.

Published by: Soyinfo Center
P.O. Box 234
Lafayette, CA 94549-0234 USA
Phone: 925-283-2991 Fax: 925-283-9091
www.soyinfocenter.com info@soyinfocenter.com

ISBN 978-1-928914-36-5 (Henry Ford)

Printed 16 June 2011

Price: Available on the Web free of charge

Search engine keywords:

Henry Ford and soybeans
Soybeans and Henry Ford
Biography of Henry Ford
Biography of Robert Boyer
Chronology of Henry Ford
Chronology of Robert Boyer
Timeline of Henry Ford
Timeline of Robert Boyer

Contents

	Page
Dedication and Acknowledgments.....	6
Introduction and Brief Chronology, by William Shurtleff	7
About This Book	10
Abbreviations Used in This Book	11
How to Make the Best Use of This Digital Book - Search It!	12
Full-Page Graphics: Maps and Graphs Related to Henry Ford	14
History of Henry Ford's Work with Soy: 926 References in Chronological Order	19
Contains 48 photographs and illustrations	
Subject/Geographical Index by Record Numbers	389
Last Page of Index	437

DEDICATION AND ACKNOWLEDGMENTS

This book is dedicated to Henry Ford, Robert Boyer, Frank Calvert, William Atkinson, Edsel Ruddiman, Bob Smith, Holton W. “Rex” Diamond, and Jan Willemse - pioneers all

Part of the enjoyment of writing a book lies in meeting people from around the world who share a common interest, and in learning from them what is often the knowledge or skills acquired during a lifetime of devoted research or practice. We wish to give deepest thanks...

Of the many libraries and librarians who have been of great help to our research over the years, several stand out:

University of California at Berkeley: John Creaser, Lois Farrell, Norma Kobzina, Ingrid Radkey.

Northern Regional Library Facility (NRLF), Richmond, California: Martha Lucero, Jutta Wiemhoff, Scott Miller, Virginia Moon, Kay Loughman.

Stanford University: Molly Molloy, who has been of special help on Slavic-language documents.

National Agricultural Library: Susan Chapman, Carol Ditzler, John Forbes, Winnifred Gelenter, Henry Gilbert, Kim Hicks, Patricia Krug, Veronica Lefebvre, Julie Mangin, Ellen Mann, Josephine McDowell, Wayne Olson, Mike Thompson, Tanner Wray.

Library of Congress: Ronald Jackson, Ronald Roache.

Lane Medical Library at Stanford University.

Contra Costa County Central Library and Lafayette Library: Carole Barksdale, Kristen Wick, Barbara Furgason, Sherry Cartmill, Linda Barbero.

Harvard University’s Five Botanical Libraries (especially Arnold Arboretum Library): Jill Gelmers Thomas.

French translation: Martine Liguori of Lafayette, California, for ongoing, generous, and outstanding help since the early 1980s.

Japanese translation and maps: Akiko Aoyagi Shurtleff.

Loma Linda University, Del E. Webb Memorial Library (Seventh-day Adventist): Janice Little, Trish Chapman.

We would also like to thank our co-workers and friends at Soyinfo Center who, since 1984, have played a major role in collecting the documents, building the library, and producing the SoyaScan database from which this book is printed:

Irene Yen, Tony Jenkins, Sarah Chang, Laurie Wilmore, Alice Whealey, Simon Beaven, Elinor McCoy, Patricia McKelvey, Claire Wickens, Ron Perry, Walter Lin, Dana Scott, Jeremy Longinotti, John Edelen, Alex Lerman, Lydia Lam, Gretchen Muller, Joyce Mao, Luna Oxenberg, Joelle Bouchard, Justine Lam, Joey Shurtleff, Justin Hildebrandt, Michelle Chun, Olga Kochan, Loren Clive, Marina Li, Rowyn McDonald, Casey Brodsky, Hannah Woodman, Elizabeth Hawkins, Molly Howland, Jacqueline Tao.

Special thanks to Tom and Linda Wolfe of Berwyn Park, Maryland.

■ For outstanding help on this Henry Ford book we thank: Ford R. Bryan, Robert A. Boyer, Jan Willemse, Robert A. Smith, Francis E. Calvert, William T. Atkinson, Florence Barbier Diamond, Dave Crippen, Austin W. Curtis, Jr., Robert E. Rich, Sr., Mark A. Greene, Leo Landis, David L. Lewis, The Henry Ford Archives, Charles Butke, Alice Cerniglia, David Duggan, John Ferrell, Richard B. Folsom, Jeff Gain, Clem Glotzhober, Elmer Hamel, Warren Hartman, Dr. George Harding, Richard S. Leiss, Sr., Ron McDermott, Edwin W. Meyer, Bruce Parsons, Steve Pedersen, Dave Perkins, Ron Roller, Catherine Ruddiman, Mrs. Robert Smith, Chuck Stewart, David Whitehouse, Harvey Whitehouse, Fred Wilson, David E. Wright.

■ Finally our deepest thanks to Tony Cooper of San Ramon, California, who has kept our computers up and running since Sept. 1983. Without Tony, this series of books on the Web would not have been possible.

This book, no doubt and alas, has its share of errors. These, of course, are solely the responsibility of William Shurtleff.

■ This bibliography and sourcebook was written with the hope that someone will write a detailed and well-documented history of this subject.

INTRODUCTION

Brief chronology of the Work of Henry Ford and His Researchers with Soybeans and Soyfoods

1927 Jan. – Wheeler McMillen, publisher of the popular magazine *Farm & Fireside*, writes an article titled “Wanted: Machines to Eat Up Our Crop Surplus,” which is widely credited with having started what soon became the farm chemurgic movement.

1928 early – McMillen discusses his ideas on new industrial uses for farm products, and new crops, with Henry Ford, who quickly became very interested in the idea of putting chemistry and allied sciences to work for agriculture (*Chambersburg Opinion* 15 Dec. 1931; McMillen 1962; David L. Lewis 1976).

1928 early – Ford’s Model T automobile is replaced by the model A, “which some auto historians and old-car enthusiasts believe was – pound for pounds, dollar for dollar – the best car ever built” (David L. Lewis 1976).

1928 – Dr. Edsel Ruddiman, formerly dean of the School of Pharmacy at Vanderbilt University, working in his laboratory at the Ford Motor Co., starts research on food uses of soybeans, and soon develops soymilk, made from whole soybeans (Chubbuck 1937). Ruddiman is the man who got Henry Ford interested in soyfoods.

1928 July 30 – Henry Ford’s 65th birthday. The year 1928 is a big one, with major transitions and new interests.

1928 Sept. 27 – Thomas Edison comes to Greenfield Village, in Dearborn, Michigan, to dedicate The Edison Institute. Henry Ford has reassembled and restored Edison’s Menlo Park (New Jersey) “invention factory” there (Geoffrey Upward 1979).

1928 late – Ford wanted to set up an experimental agricultural chemical factory to determine what useful products could be obtained from plants. He had a one-quarter size model of his mammoth wood distillation plant at Iron Mountain, Michigan, constructed at Iron Mountain and moved to Greenfield Village in late 1928 (see 1930 photo). At about that time Ford asked Robert Boyer if he would like to supervise this model experimental chemical laboratory / plant. Boyer, who had had little formal training in chemistry, accepted – and began a serious study of the subject. From 1929 to 1933 he studied chemistry at the “Edison Institute of Technology.” From 1927 to 1929 Boyer had attended the Henry Ford Trade School (Ford R. Bryan 1993; Boyer 1975).

1929 – Henry Ford and Thomas Edison establish the Edison Institute of Technology in Dearborn as “a school for inventors.” The chemical plant is part of the Edison Institute.

1929 – Ford begins experiments at Dearborn to discover a farm crop that will have both food value and possibilities for industrial use. He dumps off truckloads of tomatoes, potatoes, onions, soybeans, etc. at the chemical laboratory (Nevins & Hill 1957, Vol. 2).

1929 May 10 – An article in the *New York Times*, titled “Ford wants diet taught by the clergy” holds that right food will cut illness and crime” (p. 29). He was extremely interested in the relationship between diet, health and longevity. Ford’s mentor, Thomas Edison, held similar views. If people ate properly, there would much better health and fewer hospitals and jails. Ford did not smoke or drink alcohol. He was a strong prohibitionist, and he waged many a public crusade against these evils. He banned smoking in his plants and discouraged drinking. Throughout his life, Henry Ford was full of energy, lean as a split rail fence, and good physical condition – indeed the picture of health (Didzun 1959; Simonds 1938; Nevins and Hill 1963).

1929 Oct. – The great stock market crash heralds the beginning of the Great Depression, which lasts until 1942. Thus, most of Ford’s work with soybeans and chemurgy was done during the Great Depression. Ford soon came to believe that the soybean could play a major role in lifting America out of the Great Depression (Wik 1962).

1931 Aug. – An unpublished typescript titled “Current jobs at the Chemical Plant” states that there are two jobs for processing various fruits and vegetables and finding uses for their parts. One of these foods is “Soy Beans.”

1931 Dec. – Ford tells his young researchers at the chemical plant to stop researching other crops and to focus on the soybean, which is “rich in versatile oil, high in protein content, and with a residual fiber amenable to many uses” (New Outlook 1934; David L. Lewis 1976).

1931 Dec. 15 – An article titled “Henry Ford’s mysterious new hobby” in the periodical *Public Opinion* (Chambersburg, Pennsylvania) states that he is putting his new ideas on industrial utilization of farm crops into action by buying over 3,000 acres of Michigan farm land. This concept will soon be called “chemurgy.”

1931 – Land planted to soybeans by Ford near Dearborn amounts to about 500 acres (*Ford News*. 1933. March, p. 49-51).

1932 – Soybean acreage planted by Ford near Dearborn has increased to 8,200 acres (*Ford News*. 1933. March, p. 49-51).

1932 Dec. 2 – An article titled “Ford to paint cars with Michigan soy bean oil” is the first to mention soy bean oil in connection with Ford (*Detroit Evening News*).

1932 and 1933 – Ford plants 300 soybean varieties on some 8,000 acres of his farms in Michigan. He also urges Michigan farmers to plant soybeans with the assurance that the Ford Motor Co. would provide a market for them (David L. Lewis 1976).

1933 March – An article in *Ford News*, titled “Experimenting with the soy bean,” contains the following quotation by Henry Ford: “For a long time now I have believed that industry and agriculture are natural partners and that they should begin to recognize and practise their partnership. Each of them is suffering from ailments which the other can cure. Agriculture needs a wider and steadier market; industrial workers need more and steadier jobs. Can each be made to supply what the other needs? I think so. The link between is Chemistry.”

1933 Dec. – *Fortune* magazine writes that “Mr. Ford is now as much interested in the soya bean as he is in the V-8” (p. 134).

1933 – Ford’s experiments with soybeans cost \$1.25 million this year. The leading discoveries are that soybean oil made an excellent enamel for painting automobiles and for binding casting molds, and that soybean protein can be molded to shape and used in manufacturing small plastic car parts (David L. Lewis 1972).

1933 – Greenfield Village officially opens in Dearborn, Michigan. It was one of Ford’s two major interests during the 1930s outside of automobile manufacturing; the other was the cultivation and processing of soybeans. “He felt the crop had a great dietary importance, could aid the farmer, and had a definite place in his own business” (Nevins & Hill 1963, Vol. 3). During the 1930s, anyone visiting Greenfield village came away with a knowledge of soybeans and soyfoods.

1933-34 – The first successful soybean crop in England (about 20 acres) is grown in Boreham, Essex, using seeds supplied by J.L. North on the 2,000 acre Fordson Estate that Henry Ford had acquired in 1932. North, late curator of the Botanical Gardens at Regent’s Park, worked to develop new soybean varieties that were suited to local conditions (*Times* {London} 17 Sept. 1934).

1934 summer – Ford’s soybean exhibits at the “Century of Progress” World’s Fair in Chicago make nationwide

headlines and attract more than a million visitors. Ford brought in an entire barn from his childhood home (built by his father in 1863), planted a plot of soybeans around it, put up a sign “The Industrialized American Barn” over the door, and set up inside it an elaborate display featuring one of his small farm-scale solvent extraction plants and a soyfoods kitchen. Soy protein was molded into plastic parts and soy oil, extracted on the spot, was used to fuel a diesel engine, which ran a generator that produced all the electricity for the display. A glass model of the basic Ford extractor was the first in the Western world to use hexane as a solvent. Large seeded, vegetable-type soybeans were deep fried and served like salted peanuts to visitors, providing most with their first taste of soybeans. Moreover, a press luncheon, featuring 14 soy-based dishes developed by Edsel Ruddiman, was served to 30 wary reporters; it included “Celery stuffed with soybean cheese” [tofu], and “Cocoa with soymilk;” and ended with ice cream made from soymilk; no meat was served (*Christian Science Monitor* 18 Aug. 1934).

1934 – Ford is now deeply interested in developing a “synthetic milk” from the soybean. He calls the cow the crudest machine in the world. He soon builds a demonstration soymilk plant in Greenfield village; it produced several hundred gallons of soymilk daily. The beverage was most popular among Ford’s Filipino employees; a little banana oil was added to improve the flavor. Henry Ford loved soymilk. He kept a bottle in his refrigerator and gave his recipe away to friends. He liked it best sweetened with a little maple syrup. Ford’s interest in soymilk is best viewed against his lifelong and unusually strong interest in diet and health (Simonds 1938; Nevins and Hill

1934 Aug. – *The Farm Chemurgic: Farmward the Star of Destiny Lights Our Way*, by William J. Hale, is published. This is the earliest document seen that contains the word “chemurgy” or the word “chemurgical,” for Hale coined these words (see p. ii).

1935 April – An article in *Oil and Soap* titled “The method of soybean oil extraction as developed at the Edison Institute of Technology” discusses the small scale extractor that can be housed in a barn on any farm – to give the farmer a new source of income. Aviation gasoline and hexane can be successfully used as solvents.

1935 May 7-8 – The National Farm Chemurgic Council organizes the first Dearborn Conference of Agriculture, Industry and Science, at Dearborn, Michigan. Hosted by Henry Ford, it is attended by about 300 leaders of industry to explore ways of using agricultural crops in non-food industrial products. A paper by R.H. McCarroll of the Ford Motor Co. discusses soybeans extensively, and is the earliest

document seen that talks about both chemurgy and soybeans. The proceedings (256 pages) are soon published.

1935 – A complete and huge (400 feet long) soybean processing plant is established at the Rouge. This year “a bushel of soybeans went into the paint, horn button, gear-shift knob, inside window riser knobs, accelerator pedal, and timing gears of every Ford car...” (David L. Lewis 1972).

1935 – More than 1 million gallons of paints are used in enamel paints for Ford cars. Another 540,000 gallons are made into shock absorbers, and 200,000 gallons are used in the foundry as a sand binder in the manufacture of cores. It took 76,000 acres of soybeans to yield all this oil; 12,000 of these were grown by Ford. (McCarroll 1935; Lougee 1936).

1936 Oct. 12 – *Time* magazine calls Henry Ford “The number 1 U.S. soybean man” and “A bean’s best friend.”

1938 May – A new synthetic fiber, made from soybean protein, is exhibited for the first time by Robert A. Boyer, researcher at the Ford Motor Co. before meetings of the Fourth Annual Conference of the Farm Chemurgic Council in Omaha, Nebraska. The new synthetic fiber is destined for use in automobile upholstery as an extender for wool (*Science News Letter*, May 7, p. 302; *New York Times* 19 May 1939, p. 19; *Ford News*, Feb. 1942, p. 39, 52).

1938 – Two smaller, decentralized soybean processing plants are established at Saline and Milan, Michigan, for the extraction of oil and the manufacture of small plastic items for Ford cars – such as horn buttons, distributor housings, lever knobs, and switch handles (Nevins & Hill 1963, Vol. 3).

1938 – A booklet titled *Recipes for Soy Bean Foods* (19 pages) is published by the Edison Institute in Dearborn, Michigan. Recipes include tofu, green soy beans, roasted soy beans, and soy bean milk.

1939 Dec. 14 – “Ford has done more to promote the soybean industry in the United States than perhaps any one person in the nation” (*Kalamazoo Gazette*, Michigan).

1940 – Henry Ford, who has worked closely with the American Soybean Association (ASA), hosts the annual ASA convention in Dearborn. It turns out to be a turning point in ASA history.

1940 Nov. – A famous photo shows Henry Ford, dressed in coat and hat, swinging an ax (for the press) at the plastic trunk lid of this car. It appeared, with accompanying wire service stories, in most U.S. newspapers.

1941 Jan. – Robert A. Boyer, age 31, head of one of the Ford Motor Co. research laboratories and developer of the plastic automobile body, is named as one of “The Ten Outstanding Young Men of 1940” by the U.S. Junior Chamber of Commerce (*Detroit News*, Jan. 11, p. 3).

1941 Aug. 13 – Ford unveils his handmade car with complete plastic body at the climax of Dearborn’s annual community festival. It is widely called Ford’s “plastic car.” This happened at a time when Americans were just becoming conscious of plastic and aware of the metal shortage developing during World War II. The event generated tremendous publicity and stirred the imagination of editorial writers nationwide as had few other Ford-related events for years (Lewis 1972).

1941 Aug. 22 – “When history is written and the achievements of Henry Ford are chronicled, the Soy Bean victory will stand out as his foremost contribution to mankind” (*Detroit Legal Courier*).

1941 Dec. 7 – Japanese airplanes attack Pearl Harbor, Oahu, Hawaiian Islands. The next day President Roosevelt, in his “day of infamy” speech declares war on Japan. Ford is soon asked to convert all of his assembly lines to making American bombers and other vehicles needed for the war. His interest in soybeans is put on hold.

1942 – After the start of World War II, Ford gives his soymilk recipe and process to other who want to try to develop it into commercial products. Ford employee Robert A. Smith built a private soy dairy in Dearborn. Robert Rich of Rich Products (Buffalo, New York) transformed the soymilk into Whip Topping and a line of related products. Herbert Marshall Taylor started Delsoy, which also made a soy whipped cream.

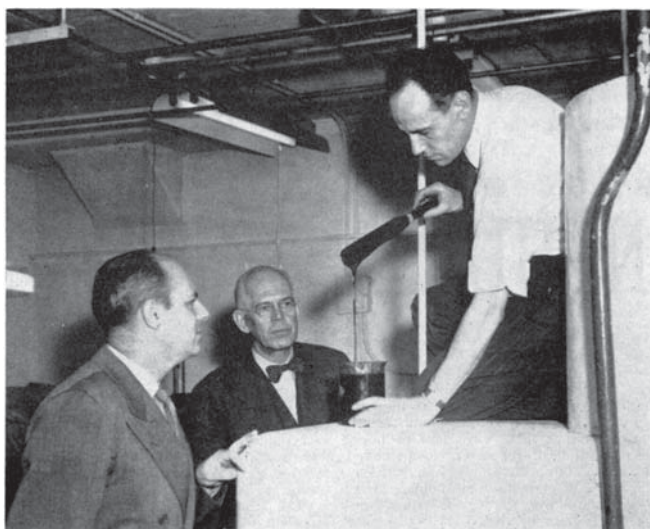
1943 Nov. – Ford sells his process and machinery for making soy fiber and soybean fabric to The Drackett Company of Cincinnati, Ohio.

1947 April 7 – Henry Ford dies at age 85 at his home in Dearborn, Michigan. He was and remains an American folk hero and a major soybean pioneer.

1954 June 29 – Robert Boyer is issued a landmark patent (U.S. Patent 2,682,466) for spinning soy protein fibers and using them to simulate muscle fiber in meat alternatives. This process will later be used to make a new type meat alternatives, especially by Worthington Foods.

1963 – “Through his experimentation and the publicity he gave it, Henry Ford made a substantial contribution to the increased utilization of the soybean. His work in this field,

which started when he was in his late sixties and carried forward until he was eighty years of age, is perhaps the outstanding achievement of his declining years. Of all Ford's accomplishments, it is possible that none pleased him more than in helping to prove that there was magic in the beanstalk" (Nevins and Hill, 1963).



ABOUT THIS BOOK

This is the most comprehensive book ever published about the history of the work of Henry Ford and his researchers with soybeans, soyfoods and chemurgy. It has been compiled, one record at a time over a period of 35 years, in an attempt to document the history of soy in this region. It is also the single most current and useful source of information on this subject.

This is one of more than 100 books compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyinfo Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features detailed information on:

- 51 different document types, both published and unpublished.
- 748 published documents - extensively annotated bibliography. Every known publication on the subject in every language.
- 142 original Soyinfo Center interviews and overviews never before published.
- 126 unpublished archival documents
- 22 commercial soy products.

Thus, it is a powerful tool for understanding the development of this subject from its earliest beginnings to the present.

Each bibliographic record in this book contains (in addition to the typical author, date, title, volume and pages information) the author's address, number of references cited, original title of all non-English language publications together with an English translation of the title, month and issue of publication, and the first author's first name (if given). For most books, we state if it is illustrated, whether or not it has an index, and the height in centimeters.

For commercial soy products (CSP), each record includes (if possible) the product name, date of introduction, manufacturer's name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as advertisements, articles, patents, etc.) are also given.

A complete subject/geographical index is also included.

ABBREVIATIONS USED IN THIS BOOK

A&M = Agricultural and Mechanical
 Agric. = Agricultural or Agriculture
 Agric. Exp. Station = Agricultural Experiment Station
 ARS = Agricultural Research Service
 ASA = American Soybean Association
 Assoc. = Association, Associate
 Asst. = Assistant
 Aug. = August
 Ave. = Avenue
 Blvd. = Boulevard
 bu = bushel(s)
 ca. = about (circa)
 cc = cubic centimeter(s)
 Chap. = Chapter
 cm = centimeter(s)
 Co. = company
 Corp. = Corporation
 Dec. = December
 Dep. or Dept. = Department
 Depts. = Departments
 Div. = Division
 Dr. = Drive
 E. = East
 ed. = edition or editor
 e.g. = for example
 Exp. = Experiment
 Feb. = February
 fl oz = fluid ounce(s)
 ft = foot or feet
 gm = gram(s)
 ha = hectare(s)
 i.e. = in other words
 Inc. = Incorporated
 incl. = including
 Illust. = Illustrated or Illustration(s)
 Inst. = Institute
 J. = Journal
 J. of the American Oil Chemists' Soc. = Journal of the American Oil Chemists' Society
 Jan. = January
 kg = kilogram(s)
 km = kilometer(s)
 Lab. = Laboratory
 Labs. = Laboratories
 lb = pound(s)
 Ltd. = Limited
 mcg = microgram(s)
 mg = milligram(s)
 ml = milliliter(s)

mm = millimeter(s)
 N. = North
 No. = number or North
 Nov. = November
 Oct. = October
 oz = ounce(s)
 p. = page(s)
 photo(s) = photograph(s)
 P.O. Box = Post Office Box
 Prof. = Professor
 psi = pounds per square inch
 R&D = Research and Development
 Rd. = Road
 Rev. = Revised
 RPM = revolutions per minute
 S. = South
 SANA = Soyfoods Association of North America
 Sept. = September
 St. = Street
 tonnes = metric tons
 trans. = translator(s)
 Univ. = University
 USB = United Soybean Board
 USDA = United States Department of Agriculture
 Vol. = volume
 V.P. = Vice President
 vs. = versus
 W. = West
 °C = degrees Celsius (Centigrade)
 °F = degrees Fahrenheit
 > = greater than, more than
 < = less than

HOW TO MAKE THE BEST USE OF THIS DIGITAL BOOK

Most Important Thing: The **KEY** to using this book is to **SEARCH IT** using Adobe Acrobat Reader: For those few who do not have it, Google: **Acrobat Reader** - then select the **free** download for your type of computer. Then...

On the toolbar at the top of every page, on the far right end is a rectangular white box with the word “Find” in it.

Click the down-pointing arrow to the right of that box to get a menu.

Click “Open Full Acrobat Search.”

On the left side of your screen a “Search” box will open up.

When asked: “What word or phrase would you like to search for?” type that word or phrase in the box. For example: Soymilk or Ford Foundation. No need to use quotation marks. Then click “Search.”

At “Results” click any line that interests you.

For those using a Mac without Acrobat Reader: Safari is often the default browser. Click “Edit” in the toolbar at top. In the dropdown click “Find,” then click “Find...” again. A search bar will open across top of screen with a search box at right. In this box type a word or phrase you would like to search, such as China or Rockefeller Foundation. Click “Done” then scroll through the various matches in the book.

Chronological Order: The publications and products in this book are listed with the earliest first and the most recent last. Within each year, references are sorted alphabetically by author. If you are interested in only current information, start reading at the back, just before the indexes.

A Reference Book: Like an encyclopedia or any other reference book, this work is meant to be searched first - to find exactly the information you are looking for - and then to be read.

How to Use the Index: A subject and country index is located at the back of this book. It will help you to go directly to the specific information that interests you. Browse through it briefly to familiarize yourself with its contents and format.

Each record in the book has been assigned a sequential number, starting with 1 for the first/earliest reference. It is this number, not the page number, to which the indexes refer. A publication will typically be listed in each index in more than one place, and major documents may have 30-40

subject index entries. Thus a publication about the nutritional value of tofu and soymilk in India would be indexed under at least four headings in the subject and country index: Nutrition, Tofu, Soymilk, and Asia, South: India.

Note the extensive use of cross references to help you: e.g. “Bean curd. See Tofu.”

Countries and States/Provinces: Every record contains a country keyword. Most USA and Canadian records also contain a state or province keyword, indexed at “U.S. States” or “Canadian Provinces and Territories” respectively. All countries are indexed under their region or continent. Thus for Egypt, look under Africa: Egypt, and not under Egypt. For Brazil, see the entry at Latin America, South America: Brazil. For India, see Asia, South: India. For Australia see Oceania: Australia.

Most Important Documents: Look in the Index under “Important Documents -.”

Organizations: Many of the larger, more innovative, or pioneering soy-related companies appear in the subject index – companies like ADM / Archer Daniels Midland Co., AGP, Cargill, DuPont, Kikkoman, Monsanto, Tofutti, etc. Worldwide, we index many major soybean crushers, tofu makers, soymilk and soymilk equipment manufacturers, soyfoods companies with various products, Seventh-day Adventist food companies, soy protein makers (including pioneers), soy sauce manufacturers, soy ice cream, tempeh, soynut, soy flour companies, etc.

Other key organizations include Society for Acclimatization (from 1855 in France), American Soybean Association, National Oilseed/Soybean Processors Association, Research & Development Centers (Peoria, Cornell), Meals for Millions Foundation, and International Soybean Programs (INTSOY, AVRDC, IITA, International Inst. of Agriculture, and United Nations). Pioneer soy protein companies include Borden, Drackett, Glidden, Griffith Labs., Gunther, Laucks, Protein Technologies International, and Rich Products.

Soyfoods: Look under the most common name: Tofu, Miso, Soymilk, Soy Ice Cream, Soy Cheese, Soy Yogurt, Soy Flour, Green Vegetable Soybeans, or Whole Dry Soybeans. But note: Soy Proteins: Isolates, Soy Proteins: Textured Products, etc.

Industrial (Non-Food) Uses of Soybeans: Look under “Industrial Uses ...” for more than 17 subject headings.

Pioneers - Individuals: Laszlo Berczeller, Henry Ford, Friedrich Haberlandt, A.A. Horvath, Englebert Kaempfer, Mildred Lager, William Morse, etc. Soy-Related Movements: Soyfoods Movement, Vegetarianism, Health and Dietary Reform Movements (esp. 1830-1930s), Health Foods Movement (1920s-1960s), Animal Welfare/ Rights. These are indexed under the person's last name or movement name.

Nutrition: All subjects related to soybean nutrition (protein quality, minerals, antinutritional factors, etc.) are indexed under Nutrition, in one or more of 14 subcategories.

Soybean Production: All subjects related to growing, marketing, and trading soybeans are indexed under Soybean Production, e.g., Soybean Production: Nitrogen Fixation, or Soybean Production: Plant Protection, or Soybean Production: Variety Development.

Other Special Index Headings: Browsing through the subject index will show you many more interesting subject headings, such as Industry and Market Statistics, Information (incl. computers, databases, libraries), Standards, Bibliographies (works containing more than 50 references), and History (soy-related).

Commercial Soy Products (CSP): See p. 10.

SoyaScan Notes: This is a term we have created exclusively for use with this database. A SoyaScan Notes Interview contains all the important material in short interviews conducted and transcribed by William Shurtleff. This material has not been published in any other source. Longer interviews are designated as such, and listed as unpublished manuscripts. A transcript of each can be ordered from Soyinfo Center Library. A SoyaScan Notes Summary is a summary by William Shurtleff of existing information on one subject.

"Note:" When this term is used in a record's summary, it indicates that the information which follows it has been added by the producer of this database.

Asterisks at End of Individual References.

1. An asterisk (*) at the end of a record means that Soyinfo Center does not own that document. Lack of an asterisk means that Soyinfo Center owns all or part of the document.

2. An asterisk after eng (eng*) means that Soyinfo Center has done a partial or complete translation into English of that document.

3. An asterisk in a listing of the number of references [23* ref] means that most of these references are **not** about soybeans or soyfoods.

Documents Owned by Soyinfo Center. Lack of an * at the

end of a reference indicates that the Soyinfo Center Library owns all or part of that document. We own roughly three fourths of the documents listed. Photocopies of hard-to-find documents or those without copyright protection can be ordered for a fee. Please contact us for details.

Document Types: The SoyaScan database contains 130+ different types of documents, both published (books, journal articles, patents, annual reports, theses, catalogs, news releases, videos, etc.) and unpublished (interviews, unpublished manuscripts, letters, summaries, etc.).

Customized Database Searches: This book was printed from SoyaScan, a large computerized database produced by the Soyinfo Center. Customized/personalized reports are "The Perfect Book," containing exactly the information you need on any subject you can define, and they are now just a phone call away. For example: Current statistics on tofu and soymilk production and sales in England, France, and Germany. Or soybean varietal development and genetic research in Third World countries before 1970. Or details on all tofu cheesecakes and dressings ever made. You name it, we've got it. For fast results, call us now!

BIBLIO: The software program used to produce this book and the SoyaScan database, and to computerize the Soyinfo Center Library is named BIBLIO. Based on Advanced Revelation, it was developed by Soyinfo Center, Tony Cooper and John Ladd.

History of Soybeans and Soyfoods: Many of our digital books have a corresponding chapter in our forthcoming scholarly work titled History of Soybeans and Soyfoods (4 volumes). Manuscript chapters from that book are now available, free of charge, on our website, www.soyinfocenter.com.

About the Soyinfo Center. An overview of our publications, computerized databases, services, and history is given on our website.

Soyinfo Center

P.O. Box 234,

Lafayette, CA 94549 USA

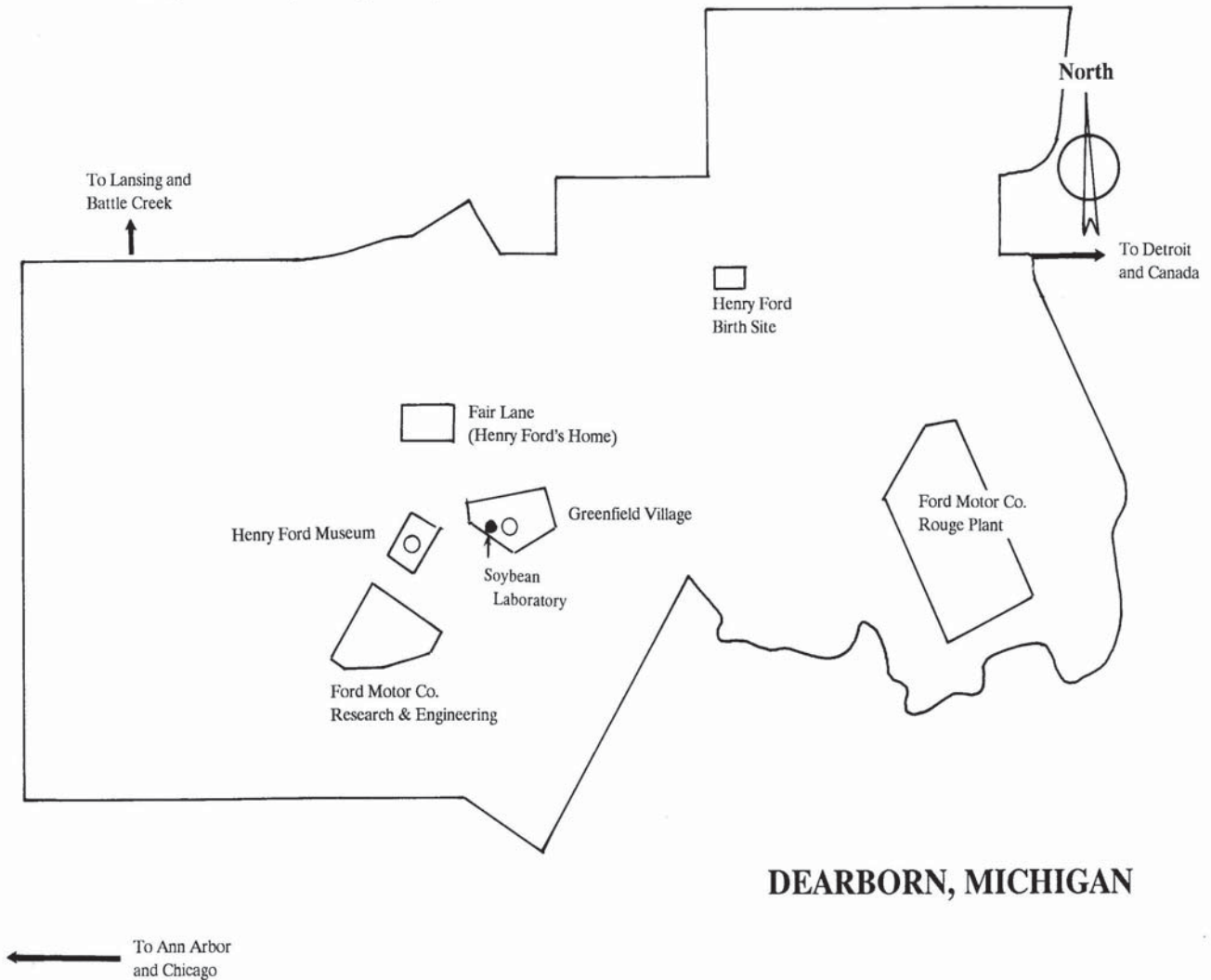
Phone: 925-283-2991

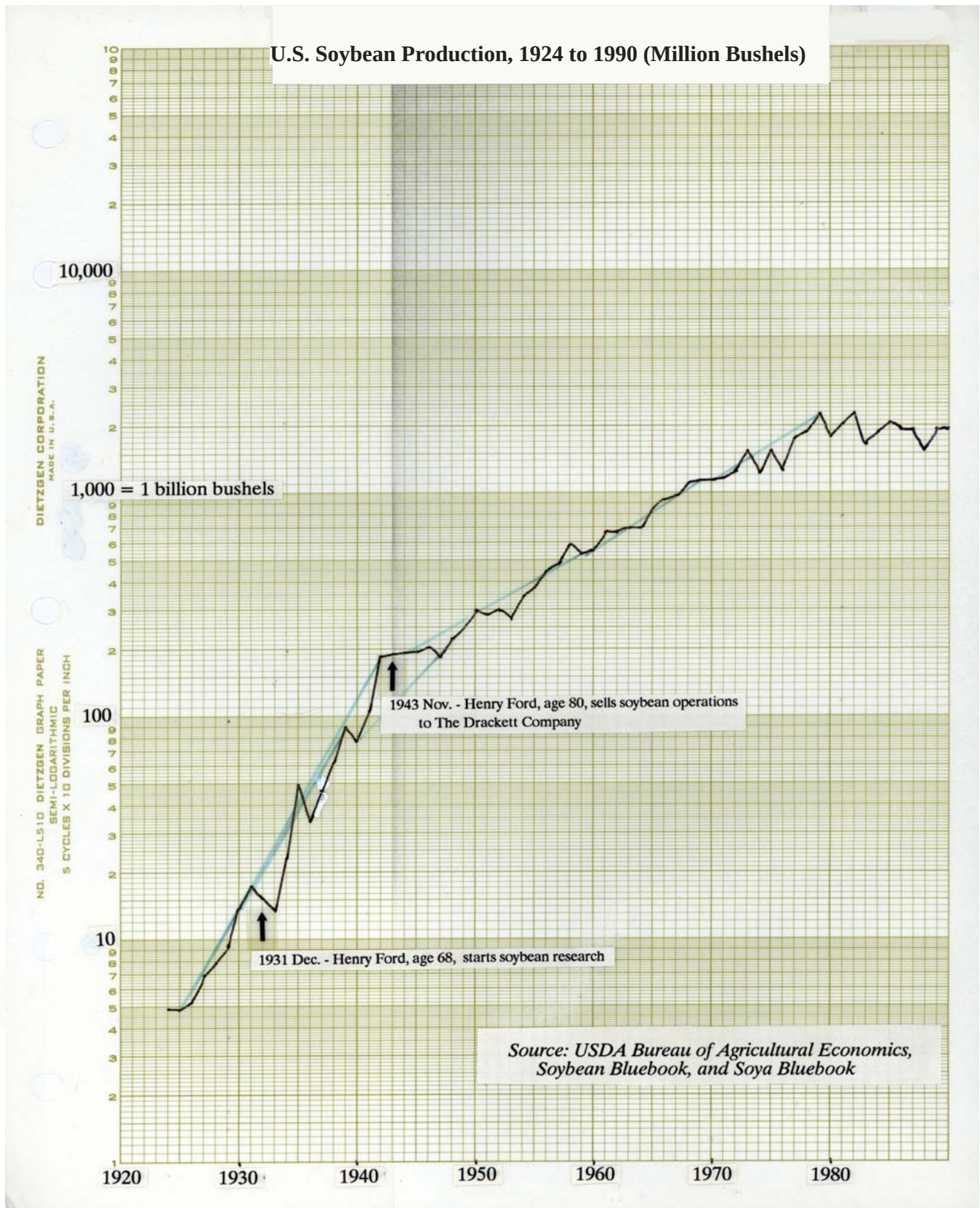
Fax: 925-283-9091

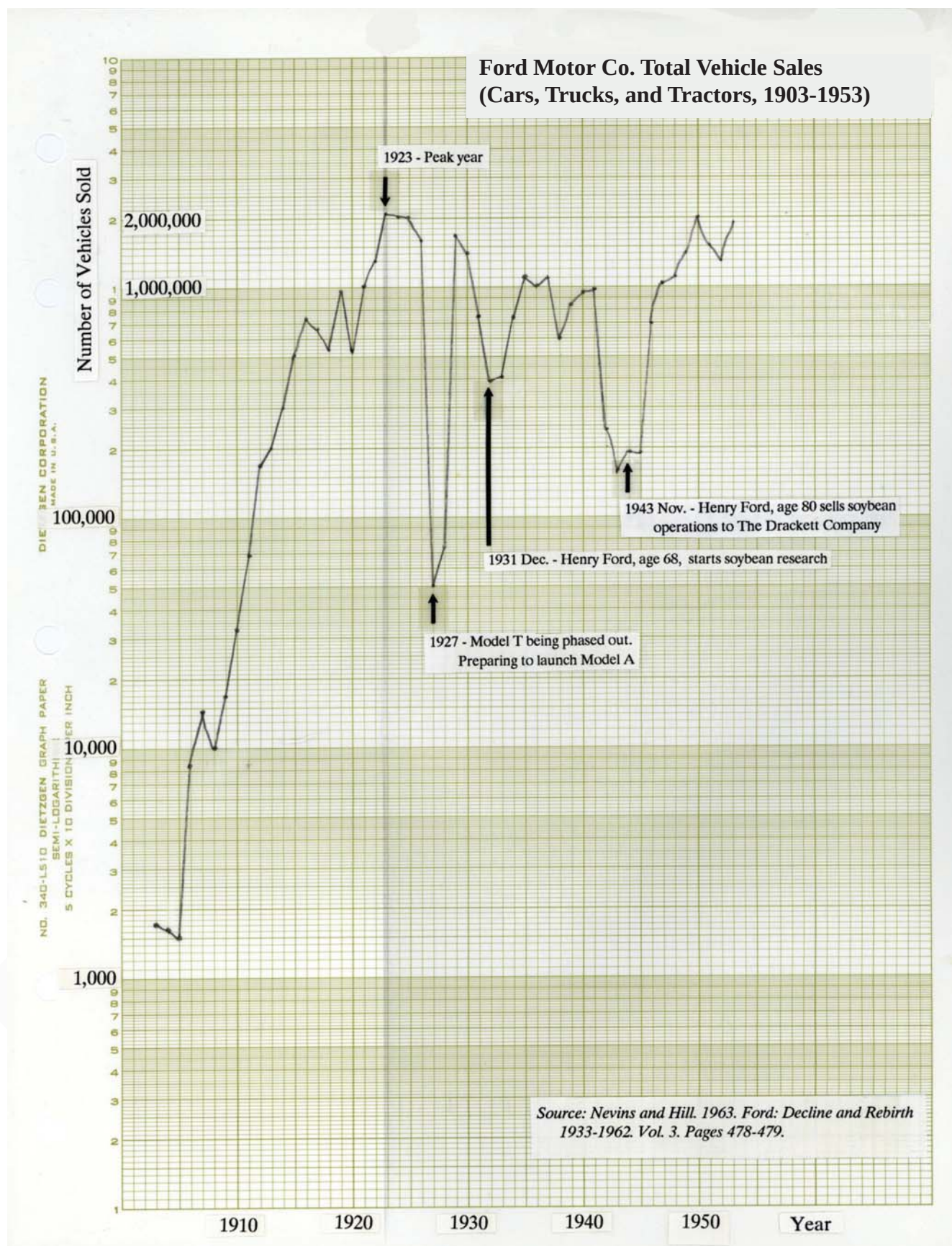
www.soyinfocenter.com



Map of Dearborn, Michigan - Key Ford Motor Co. Sites







SOYINFO CENTER

HENRY FORD AND HIS RESEARCHERS - WORK WITH SOY AND CHEMURGY

1. Portrait photograph of Henry Ford. 1904.

• **Summary:** This is the first official Ford Motor Company portrait. It was taken by A.G. McMichael whose studio was at 212 Woodward Avenue in Detroit, Michigan. (Ford Archives No. 0.4165.66).

2. *SoyaScan Notes*. 1916. Chronology of Procter & Gamble and Buckeye's work with soybeans. 8 July 1993. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** 1901–Procter & Gamble (P&G) establishes and incorporates the Buckeye Cotton Oil Co. They leased an oil mill and put it under the Buckeye Cotton Oil Company name. The buckeye is the official Ohio state tree. During its early years, Buckeye crushed cottonseeds.

1911–P&G introduces Crisco shortening—a revolutionary new product. “The name Crisco was derived from the words CRYStalized Cottonseed Oil. P&G needed the oil for Crisco, Ivory Soap, and other products. Then they had to find a market for all the cotton linters (the fuzz of short fibers) stuck to the cottonseeds. So P&G started selling cotton linters (cellulose) to many different companies.

1916–By this year P&G was using soybean oil in soap.

1929–Buckeye Cotton Oil Co. purchases a mill at Louisville, Kentucky, and in the spring of 1931 Buckeye crushes Procter & Gamble's first soybeans, using expellers, at this mill in Louisville.

1935 Oct.–Buckeye starts crushing soybeans at the Binghampton mill in Memphis, Tennessee.

1939–P&G orders a solvent extraction unit for processing soybeans from Hansa-Muehle in Germany. But it was sitting at the docks in Hamburg, Germany, when World War II broke out in 1939. Because of the blockade it never left Germany. So P&G went to the French Oil Mill Machinery Company in Piqua, Ohio, to have a similar unit designed and built to Buckeye's specifications.

1941 Feb.–Buckeye finally begins processing soybeans at Louisville, Kentucky, using solvent extraction, after a year's experimental work. Then during World War II, when the cotton crop declined, there was still enough demand for cellulose, that P&G bought large acreages of southern wood pine to use for its pulp. But since Buckeye's primary job was crushing oilseeds, P&G decided to have Buckeye switch from crushing cottonseeds to crushing soybeans, primarily to supply Procter & Gamble with soybean oil for food products such as Crisco.

1946–P&G introduces Tide, the most successful of its new line of detergents. Research on detergents increases.

1948–Buckeye starts solvent extraction of soybeans at

New Madrid, Missouri.

1949 Sept.–Buckeye is crushing soybeans at Raleigh, North Carolina. During the 1950s the company continued studying cleaning compounds and detergents.

1946-47–Procter & Gamble starts using industrial-grade soy protein isolate, made at their Louisville plant, in the wall cleaner named Spic and Span. Spic and Span was launched in the 1930s by the Spic and Span Co. of Saginaw, Michigan. It was operated by two ladies who developed the recipe (which contained glue) in their kitchen and patented the process. P&G bought the company in 1945, right after World War II. At that time the front panel of the box read: “The perfect cleaner for all painted and varnished surfaces. No rinsing. No wiping. P&G introduced a new, improved formula in about 1950–”Cleans extra fast yet extra kind to hands”–but no ingredients were listed on the box. In the fall of 1946, Procter & Gamble needed a raw material to use in the new formula of Spic and Span. It was found that a protein product that could be made from soybeans at Louisville would supply this demand. As a result, a unit for making industrial-grade isolated soy protein was erected at the Louisville mill. This adequately took care of Procter & Gamble needs. “After a few years, the Spic and Span formula was changed again so there was less need for this protein product and it was necessary to develop outside markets where it was used largely as a substitute for casein in the paper trade.”

1952–1953. Two technical bulletins dated from these two years state that this isolated soy protein is now named Buckeye Protein. It is used for paper coatings, sizings, fire-fighting foam, adhesives, water-dispersible paints, etc.

1958 July.–The name Buckeye Cellulose Corp. starts to be used in place of the previous Buckeye Cotton Oil Co. in connection with P&G's soybean processing activities.

1958 Dec. 10–Ralston Purina Co. finalizes the purchase of mills (located in Louisville, Kentucky; New Madrid, Missouri; Memphis, Tennessee; and Raleigh, North Carolina) from P&G/Buckeye. Ralston Purina wanted to expand its mixed feed operations. By 1958 the increasing importance of soybean meal for animal feed has made it desirable for soybean crushers to enter the mixed animal feed business. That was not Buckeye's or P&G's kind of business, so it became sound business policy P&G to buy soybean oil on the open market and to dispose of the facilities for crushing soybean seeds.

Note 1. In Oct. 1962 Ralston Purina produced its first commercial edible isolated soy proteins (under the Edi-Pro brand) in this Louisville plant using technology largely developed by Frank Calvert and Robert Boyer when they

worked as researchers for Henry Ford. By 1976 Ralston Purina was the world's leading manufacturer of edible isolated soy proteins—and this plant, purchased from Buckeye/P&G, was their flagship plant in America. 1955 Sept.—Buckeye is crushing soybeans at Little Rock, Arkansas; Wilson, Arkansas; and Greenwood, Mississippi.

1958.—Buckeye is crushing soybeans at Memphis, Tennessee (Hollywood mill) and Augusta, Georgia.

1978 Sept.—Buckeye Cellulose Corporation is still a member of the National Soybean Processors Association; it crushes soybeans in its mills at Little Rock, Arkansas; Augusta, Georgia; and Memphis, Tennessee (Hollywood mill at 1355 Lynnfield Road).

1992—P&G sells the Buckeye Cotton Oil Co., dividing it into several parts. Several of the cellulose processing operations (P&G Cellulose) are sold to Weyerhaeuser, and Bob Cannon, a retired P&G executive who used to run Buckeye, sets up a group that buys the Memphis operation. Bob, who lives in Memphis, has been with Buckeye for about 30 years.

The company's files in Memphis (Phone: 901-320-8100) are probably much more complete on soybean operations than those in Cincinnati. Another good person to contact would be Walter L. Lingle, Jr., who was president of Buckeye in 1958 at the time it sold 4 mills to Ralston Purina. He lives in Cincinnati and has a "perfect memory" (Office phone: 513-621-4525). He set a lot of P&G's international operations.

Note 2. This information was compiled with great help from Ed Rider (Corporate Archivist) and Diane L. Brown (Archivist), Procter & Gamble Co., P.O. Box 599, Cincinnati, Ohio 45201-0599.

3. Forrest, Wilbur. 1921. Ford breaks silence; Denies seeking loan. New policy aims to shift industry to country towns; Horse and cow will disappear, he says; Science to furnish milk and beef. *New York Tribune*. Feb. 9. p. 1, 4.

• **Summary:** In this exclusive interview, Ford broke the silence of nearly a year and talked freely of general affairs. Last year Ford sold 1,250,000 cars. There is unemployment worldwide and the company has been closed for a while to sell off excess stocks. The Ford Motor Co. wants to move a large part of its manufacturing away from cities, which "have come to be unnatural. They cause unnatural unrest in men's minds." Ford wants to make major use of the water power of small streams throughout the country for making car and tractor parts. Farmers can work at these rural industries when they are not farming.

Ford predicts that horses will be replaced by automobiles and tractors. The horse is a "twelve hundred-pound 'hay motor' of one horse power." The milk and meat from cows will be replaced by man-made products. Ford notes: "It is a simple matter to take the same cereals that the cows eat and make them into a milk which is superior to the natural article and much cleaner. The cow is the crudest machine in the world. Our laboratories have already demonstrated that

cow's milk can be done away with and the concentration of the elements of milk can be manufactured into scientific food by machines far cleaner than cows and not subject to tuberculosis." [Note: This article was written 10 years before Ford discovered soybeans and soymilk!]

But what about the beef that the cow also provides? "Meat is not essential. A scientific food, such as I have described, will not only take the place of milk, but meat."

A nice photo shows Henry Ford, with an insightful character sketch.

4. *St. Louis Globe-Democrat (Missouri)*. 1921. Amazing food uses for the lowly peanut. April 3. p. 3. Sunday magazine section.

• **Summary:** The subtitle reads: "At a recent session of the Ways and Means Committee of the House of Representatives, Geo. W. Carver, a professor of the Tuskegee Institute, astounded both the members and spectators with visible proof that he can manufacture one hundred and forty-five different foods and useful articles, including milk and cream, from peanuts. This milk not only looks like cow's milk, but even tastes better and purer."

"My very latest work in investigation is in reference to the production of peanut milk. Like Mr. Ford I believe that the cow is the crudest milk machine in the world and may easily be abolished for the synthetic cow, which gives clean, sweet and wholesome peanut milk.

"In the milk, the cream rises exactly the same way as in cow's milk. In many ways peanut milk is even better than cow's milk, for no chemicals are used—nothing but pure water. The milk produced from the peanut is a vegetable milk, uncontaminated with harmful bacteria.

"The peanut milk I have developed looks like cow's milk and is, if anything, more nourishing and more pleasant to the palate. It consists of a perfect emulsion of oils, fats, proteids, and carbohydrates. If you did not know one was cow's milk and the other peanut milk, the eye would never detect the difference. Peanut milk can be used for cooking just the same as cow's milk, while the rich cream may be used on fruit, in coffee, and for breakfast cereals.

"Of course, you want to know how many peanuts it will take to make a pint of milk. Here is a 3½ ounce glass. When filled with shelled peanuts it will make a pint of very, very rich milk, that is, milk that is many times richer than cow's milk, about what they call cream in most city dairies.

"Here is a bottle of synthetic buttermilk made from peanuts. In this buttermilk, the whey rises exactly as it does in the cow's milk, and tastes very much like real fresh buttermilk. What's more, it is very nutritious, having a mild, pleasing acid taste.

"Here is a bottle of full peanut cream. It can be used in coffee, chocolate, cereals, fruit, and in other ways, the same as cow's product.

"Here is some peanut milk made especially for ice cream.

Not long since I made a quart, gave it to a neighbor, and invited myself over to help eat it. It is not modest to say so, but I am honest when I say it was the finest I had ever tasted.

"Here is an evaporated synthetic milk, much on the order of the regular commercial evaporated cow's milk, and acting when used in the same way. An interesting thing about this and the other peanut milks is that you can use nay acid with them, and they don't curdle as cow's milk does.

"The cow is a portable milk manufacturer who grinds her food, moistens it, heats it to a proper temperature and then filters it, and the result is milk,' continued the chemist. 'A machine or the simple utensils used here, under the direction of a man, can do the same thing that the cow does. It is the same food or the elements of the same food as cow's milk and contains all the vitamins and nutritive quantities now that it has been proved that most excellent milk can be made from peanuts. The skill and ability of the human being can perfect a machine far more economical and infinitely more convenient for milk making than the cow. Man can do more than the cow. He can produce a synthetic milk at his own convenience and protect its quality and purity. He can make milk which lacks the animal taint and the danger of disease germs.

"It takes the cow twenty-four hours to make milk. I can make from peanuts better, cleaner and more healthful milk in five minutes. The cow simply takes out of the food she eats what is soluble. Which is the cleaner process, that of grinding, moistening, heating and filtering in a machine or pan, or passing cereals, vegetables or the vegetable matter a cow eats through her stomach?"

Dr. Carver then demonstrated how to make peanut coffee. For the best flavor, the peanuts must be roasted, allowed to cool, then roasted again; only then does it develop the coffee flavor. An illustrations shows Carver turning the crank on a hand mill whose hopper is filled with peanuts. Out of it come boxes and bottles of many common products, such as dyes, sauce, coffee, breakfast food, cheese, cream, milk, oil, face cream, and flavorings.

5. Ford Motor Company. 1923. Fordson (Ad). *Progressive Farmer (Mississippi Valley Edition)* 38(51):Rear cover. Dec. 22.

• **Summary:** This full-page ad on the rear cover shows a farmer using the take-off drive from his Fordson tractor to grind corn. The ad's subtitle reads: "To put the farmer on a par with the city manufacturer. To put his produce factory—for that is what a farm is—on an efficient production basis."

6. *SoyaScan Notes*. 1923. Early history of soybean crushing, including solvent extraction, in the USA (Overview). Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** The first documented crushing of soybeans in the USA to obtain oil and meal took place in 1911 (probably not in 1910 as some accounts say) at Seattle, Washington.

The soybeans were imported from Manchuria by the Albers Brothers Milling Co. and sold to Herman Meyer, who operated a small hydraulic press in Seattle. His establishment was later named Pacific Oil Mills.

The second U.S. crusher, and the first to crush American-grown soybeans, was the Elizabeth City Oil and Fertilizer Co. in Elizabeth City, North Carolina; ordinarily a cottonseed crusher, they began crushing soybeans on 15 Dec. 1915. At that time, North Carolina was America's leading soybean producing state. By 1916 seven cottonseed mills in North Carolina were crushing soybeans.

Soybeans grown in the Corn Belt were first crushed for oil and meal in 1919 (probably not in 1917 or 1918 as one account says) by the Chicago Heights Oil Manufacturing Co. in Chicago Heights, Illinois (located just south of Chicago). The plant, operated by George Brett and I. Clark Bradley, primarily crushed linseed for oil, but it also crushed soybeans, corn germ and mustard seed. For the first few years the soybeans were crushed using screw presses (expellers) which were generally used for crushing corn germs, but by 1922 they were using hydraulic presses. In Aug. 1923 the company went out of business for lack of soybeans. In 1924 Funk Bros. Seed Co. of Bloomington, Illinois, bought the Chicago Heights plant (Eisenschiml 1929, *American Paint Journal*. March 18. p. 22-30; *Soybean Digest*, Sept. 1944, p. 18-19 and May 1945, p. 15).

The A.E. Staley Manufacturing Co. in Decatur, Illinois, first began crushing soybeans on 30 Sept. 1922. Staley was the first company to construct a plant solely for the purpose of crushing soybeans, the first to crush only soybeans in a U.S. plant, and the first to crush only domestically-grown soybeans in a U.S. plant. Staley was also the only one of the early U.S. soybean crushers that survived under the same ownership for more than several years. Although Staley operated at a loss from 1922 to 1924 due to a shortage of soybeans, in 1925 an upswing began and from that year until 1957 Staley was America's leading soybean crusher (Forrestal 1982, p. 60-66).

In Aug. 1923 the Piatt County Cooperative Soy Bean Company (soon renamed the Monticello Co-operative Soybean Products Co.) in Monticello, Illinois became the first company in the U.S. to process soybeans using solvent extraction. The plant was scheduled to open for business on 5 Sept. 1923. They used a batch extraction process with benzol as a solvent. The plant was shut down in about 1924-26 (*Orange Judd Farmer*. 1923. July 15, p. 375; *Journal of the American Oil Chemists' Society*. 1977. March. p. 202A).

The first continuous solvent extraction of soybeans was done by the Eastern Cotton Oil Co. in Norfolk, Virginia, starting in 1924, and using a Bollmann extractor imported from Germany. The plant closed in 1925, being unprofitable (W.H. Goss. 1941. *Chemical and Metallurgical Engineering*. April. p. 80; *Journal of the American Oil Chemists' Society*. 1977. March. p. 202A). As early as 1926 the William O.

Goodrich Company (acquired by the Archer-Daniels-Midland Co. [ADM] in 1928) had been experimenting with solvent extraction of soybean and other vegetable seeds using a Scott batch extraction system.

In 1933 Robert Boyer and coworkers at the Ford Motor Company developed the Ford Extractor using hexane as a solvent. By 1934 it processed 6 tons of soybeans a day using a screw inside of a metal tube. It was probably the first to use hexane as a solvent. They had a working extractor in Ford's Industrialized Barn at the 1934 World's Fair in Chicago.

ADM and The Glidden Co. initiated large-scale solvent extraction of soybeans in the USA in 1934. ADM purchased from Germany a 150-ton-per day capacity Hildebrandt continuous-flow, counter-current (U-tube) hexane solvent extractor. It began operation in March 1934 on Blackhawk Street in Chicago. It was America's first successful continuous solvent extractor; at the time it was also America's largest and most modern soybean crushing system, and the first to use hexane as a solvent with soybeans. The Glidden Co. purchased an identical solvent extraction plant from Germany and also installed it in Chicago. It began operation in about Nov. 1934. In 1937 Central Soya purchased from Germany an even larger continuous solvent unit, a 275-ton-per-day capacity Hansa Muehle extractor, which began operation in November 1937 at Decatur, Indiana.

7. *Proceedings of the American Soybean Association*. 1925-1930, 1935-1940. Serial/periodical. American Soybean Assoc. Annual.

• **Summary:** Volume 1, covering the years 1920 to the fall of 1928, was published in late 1928. Volume 2, covering 1928-29, was published in 1930. Vol. 3, covering 1930, was published in 1931. 1931-34 were never published. The American Soybean Association (ASA) held annual meetings each year, starting in Sept. 1920. Proceedings of the first through 11th annual meetings were published once a year, starting in 1928. Most early issues were compiled and edited by William Morse of the USDA. Volume 1 contained no advertising; the costs of editing, printing and distribution were apparently borne by the USDA. Subsequent volumes each contained some advertising, which partially offset the publication costs.

The 11th annual meeting was held in Sept. 1930, early in the Great Depression. Then no proceedings were published for the next four years (1931-1934). Publication resumed with the proceedings of the 15th annual meeting in 1935. The last published proceedings were those for the 20th annual meeting held at the Dearborn Inn, Dearborn, Michigan, on 18-20 Aug. 1940, at the invitation of the Ford Motor Co. *Soybean Digest* began publication in Nov. 1940 as a monthly magazine, the official organ of the ASA. From then on, it published news of and selected papers presented at the annual meetings. So these proceedings can be considered the forerunner of *Soybean Digest*.

Note 1. This is the earliest document seen (Oct. 2007) that uses the term "American Soybean Association."

Note 2. This is the earliest periodical published by the American Soybean Association.

8. Ford Motor Co. 1925. A profit from every season: Fordson. *Country Gentleman* 90(35):54. Sept.

• **Summary:** A Fordson tractor costs \$495 F.O.B. Detroit—Fenders and pulley extra. The Fordson can be used after the typical farming season ends, in the Fall and Winter, to produce additional farm income. "On the corn husker, the silo filler, feed grinder, wood saw, hay baler, and other belt machines the Fordson's ready power can add much to the year's profits."

Three illustrations show: (1) The Fordson tractor power takeoff used for husking corn. (2) The Fordson pulling a plow. (3) A man loading crates onto the back of a flat-bed Ford truck. Address: Detroit, Michigan.

9. Hale, William J. 1926. Farming must become a chemical industry: Development of co-products will solve present agricultural crisis. *Dearborn Independent (Michigan)*. Oct. 2. p. 4-5, 24-26.

• **Summary:** William J. Hale, in his 1939 book *Farmward March: Chemurgy Takes Command*, notes (p. 43) that this article "met with rejection on the part of a half-dozen or more magazine editors before Mr. William J. Cameron, of the Ford Motor Company, then editor of the *Dearborn Independent*, could telegraph the author of his hearty acceptance of the article for early publication."

The article describes a new way of using agricultural products by organic chemistry, of organizing individual farms around "agricenters" run by experts, and of growing new crops with new uses. "Of greatest interest in the last few years is the development of the soy bean industry. This bean is distinctly rich in nitrogen. Soy bean oil is used for making lard and butter substitutes, for soaps and for edible oil. It is also used in the making of water-proofing materials, enamels, varnishes, and printing inks. The oil cake is an excellent stock food and finds use further in the manufacture of a flour for man's consumption and for special food for invalids and infants."

David E. Wright, in his article on the Farm Chemurgic Movement and the USDA (*Agricultural History*. 1993. Winter. p. 40) states: "It is possible to date Chemurgy's public beginnings rather precisely to two publications that appeared in October 1926." This is the first of the two publications mentioned. Wright notes: "In his article Hale explained how to yoke agriculture to the chemical industry and listed the kinds of new products that would result. Since he was then serving as Chair of Chemistry and Chemical Technology Division of the National Research Council, his ideas received a fairly broad and sympathetic hearing, although they failed to stimulate concerted action either at the USDA or in the

chemical industry.”

Prof. Wright further states that Hale’s 1926 article “did not immediately fire the imagination of the nation’s editors. It was, as Hale put it dryly, ‘rejected by all of the leading magazines of the country.’ Finally Hale sent the manuscript to William J. Cameron, editor of Henry Ford’s *Dearborn Independent*, where it was accepted (“Waste not, want not: The Michigan roots of the Farm Chemurgic Movement.” 1989. *Michigan History*. Sept/Oct. p. 32-38).

Note 1. This is the earliest document seen (June 2011) that clearly discusses what later came to be called chemurgy.

Note 2. This is the earliest document seen (June 2011) that discusses chemurgy in connection with soy. The word “soy bean” is mentioned, but the word “chemurgy” is not.

Note 3. This is the earliest document seen (June 2011) connecting Henry Ford (who owned the *Dearborn Independent* newspaper) with what was later called chemurgy.

Note 4. Dearborn, is a city in Wayne County, southeastern Michigan, 10 miles west of Detroit. Address: Chairman, Div. of Chemistry and Chemical Technology, National Research Council.

10. Hirsch, Fred S. ed. 1928. Health Center newslets (Ad). *Los Angeles Times*. Feb. 26. p. K27.

• **Summary:** “When Henry Ford heard that Albert D. Lasker, former chairman of the U.S. Shipping Board, had given \$1,000,000 to the University of Chicago” [Illinois] to be used for finding why so many men die just after age 50, Ford sent him the *Life of Luigi Cornaro*. Cornaro lived in Venice, Italy, a long time ago [1467-1566]. “For 40 years he lived ‘foolishly,’ and then was given up to die by his doctors. Whereupon he regulated his diet and put off dying till he was 105. The action of Ford’s was a clever way of saying ‘Why spend a million to find out something that has long been known?’”

On the last line of this long column, by itself, is written “– [Advertisement].”

Note: This is the 4th issue of the “Newslets” in which Paul Bragg is not mentioned. Address: D.N.S., Managing Director, Health Center, 1000 West Seventh St. [Los Angeles].

11. *New York Times*. 1929. Ford wants diet taught by the clergy: Holds right food will cut illness and crime. May 10. p. 29. [1 ref]

• **Summary:** “Some day people will learn how to eat, and there will be no more hospitals, is the declaration of Henry Ford in calling upon the clergy of America to make right eating part of their religious teaching. Mr. Ford’s views on eating are published in an interview in the June issue of *The Red Book Magazine*, and are declared to be his first comments on his experiments on foods...”

“Mr. Ford asserts that most crimes and wrongful actions are ‘the result of wrong mixtures in the stomach.’ Illness will vanish and crime diminish, Mr. Ford thinks, when people apply a knowledge of right food combinations in their daily

life... ‘What greater mission can the clergy have than the elimination of sickness, jails and prisons?’...”

“Part of the lesson toward physical fitness was the elimination of meat on Friday. The clergy developed that. Let it go ahead and finish the job’...”

“Senator Royal S. Copeland, a physician, in the same article endorses Ford’s views, but would take the teaching of right eating into the schools rather than the churches.”

12. Osterberger, C.L. 1929. Producing corn and soybeans with mechanical power. *Agricultural Engineering* 10(6):201-02. June.

• **Summary:** “The object of the study was to determine the practicability and economy of tractors and tractor equipment in producing corn and soybeans on the alluvial or bottom lands of Louisiana...” “The equipment used was a Farmall tractor with two-row lister, cultivator and planter, and a Fordson-Moline two-row cultivator and a complete Fordson-Kelley two-row outfit. Note: *Webster’s Dictionary* (1985) defines lister, a word first used in 1887, as “a double moldboard plow [that throws a ridge of earth both ways], often equipped with a subsoiling attachment and used mainly where rainfall is limited.” Also called a “middlebreaker, middle-burster, middlebuster, or middlesplitter.”

A table (p. 202) compares the power and labor hours and costs for producing the crops in 1928 at the Louisiana Experiment Station. The operations comparing a tractor with a man are: Disking (fall), plowing (flat), disking (spring), bedding, reversing rows, harrowing, planting, replanting, and cultivating. Those done only by a man are: Thinning, plowing drains, shovelling drains, plowing ditch bank, harvesting, miscellaneous.

“It was possible for one negro to handle the plowing, disking, bedding and cultivating of this 60-acre field. This acreage normally would require three men and six mules as a minimum and four men and eight mules as a maximum where 6-foot rows are used. This is worthy of note because of the increasing cost and scarcity of farm labor.”

Photos show: (1) A two-row cultivator (like a tractor with huge, wide metal wheels) in the first cultivation of corn and soybeans; (2) The same machine doing a later cultivation in the same field. The negro operator handled 60 acres for a wage of \$2.00 a day. Address: Agricultural Engineer, Louisiana State Univ.

13. *New York Times*. 1930. Ford adopts diet to extend his life: Declares man should be in service at 85 and live to 100 years. Upholds prohibition law. Advocates full production by farmers and letting chemist take care of surplus. March 5. p. 7.

• **Summary:** “Fort Myers, Florida—Henry Ford at 66 years of age sees no reason why man should not increase his expectancy of life to 100 years and be of ‘service’ to himself and mankind from the age of 15 to 85 years. His rules for

longevity are work, an active mind and exercise and a single combination diet...

"For five years Mr. Ford has directed experiments with foods in a dietetic laboratory at Dearborn in an effort to simplify the eating problem... Mr. Ford's theory is based on eating only one type of food at a meal. He says, eat only fruit for breakfast, protein for lunch and starch for dinner..."

"He also said that he believes in natural methods of healing and operates a modern hospital on those methods. He said it is possible to cure many distressing ailments by proper eating and the right combination of foods..."

"He drinks no tea or coffee and the boys in his schools do without them."

"He advocated full production of all crops by farmers and said the scientist and chemist will take care of the surplus, pointing out that new uses have been discovered for corn and cotton." He does not believe that politicians can bring relief to farmers.

Note: This is the earliest document seen (June 2011) in which Henry Ford expresses his interest in and views on chemurgy, the industrial utilization of farm crops. However, the word "chemurgy" is not mentioned.

14. *New York Times*. 1930. Ford by-products worth \$19,000,000. March 23. p. X:11.

• **Summary:** Henry Ford had a deep interest in conservation of resources—both renewable and non-renewable. "In the Ford plants nothing is thrown away. After the raw materials—and even the smoke—have served their purposes in the production of automobiles, they are made to yield vast quantities of still other raw materials, which are either employed in the plants or sold in the market." Soy is not mentioned.

15. Photographs of the Chemical Laboratory (later called the Soybean Laboratory) at Ford's Greenfield Village, Dearborn, Michigan. 1930.

• **Summary:** All inside steel and brick structures and distillation apparatus are visible (see next page) because the outside of the building has not yet been erected. The experimental chemical factory was a one-quarter size model of Ford's mammoth wood distillation plant at Iron Mountain in northern Michigan.

A second photo shows the opposite side of the structure, with a large metal tank, mounted horizontally on the slab floor, at the front right.

The model was constructed at Iron Mountain and moved to Greenfield Village in late 1928 (negative number: unknown; Accession EI 1929).

Note: This is the earliest photo seen (June 2011) related to the Ford Motor Company's work with soybeans. The date on this photo makes it seem unlikely that Ford started soybean experiments prior to 1930—not including the small-scale food experiments conducted by Dr. Edsel Ruddiman starting in

1928.

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

16. Photographs of the outside of the Chemical Laboratory at Henry Ford's Greenfield Village. 1930.

• **Summary:** It is a tall, wooden 2-story building with an attic above the third floor (used for pouring material into a hopper) and a large, attractive greenhouse attached to one side.

Research at this laboratory under Robert Boyer revealed the adaptability of the soybean to a multitude of uses (0-6212, 0-6213, or A-6749).

View of the opposite side of the building (0-6209). The Chemical Laboratory (Analytical Lab) and the sawmill (to its right) shot from a distance on 25 April 1931 (188-3802).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

17. Ford Motor Co. 1930. Ford Farm and soybean growing and processing (Motion picture). Dearborn, Michigan. 368 ft., silent, black-and-white, 35 mm. No captions. *

• **Summary:** Shows: Henry Ford in soybean field looking at soybeans. Ford walking across street toward Ford Homestead. Samuel Crowther. Ford talking with man in a soybean field. Close-up of soybeans in palm of hand. Hand reaching into bag, drawing out soybeans. Close-up of hand. Display of parts made from soybeans. View of soybean plant.

Note: The date given for this film seems too early. It is probably 1934-36. Address: Dearborn, Michigan.

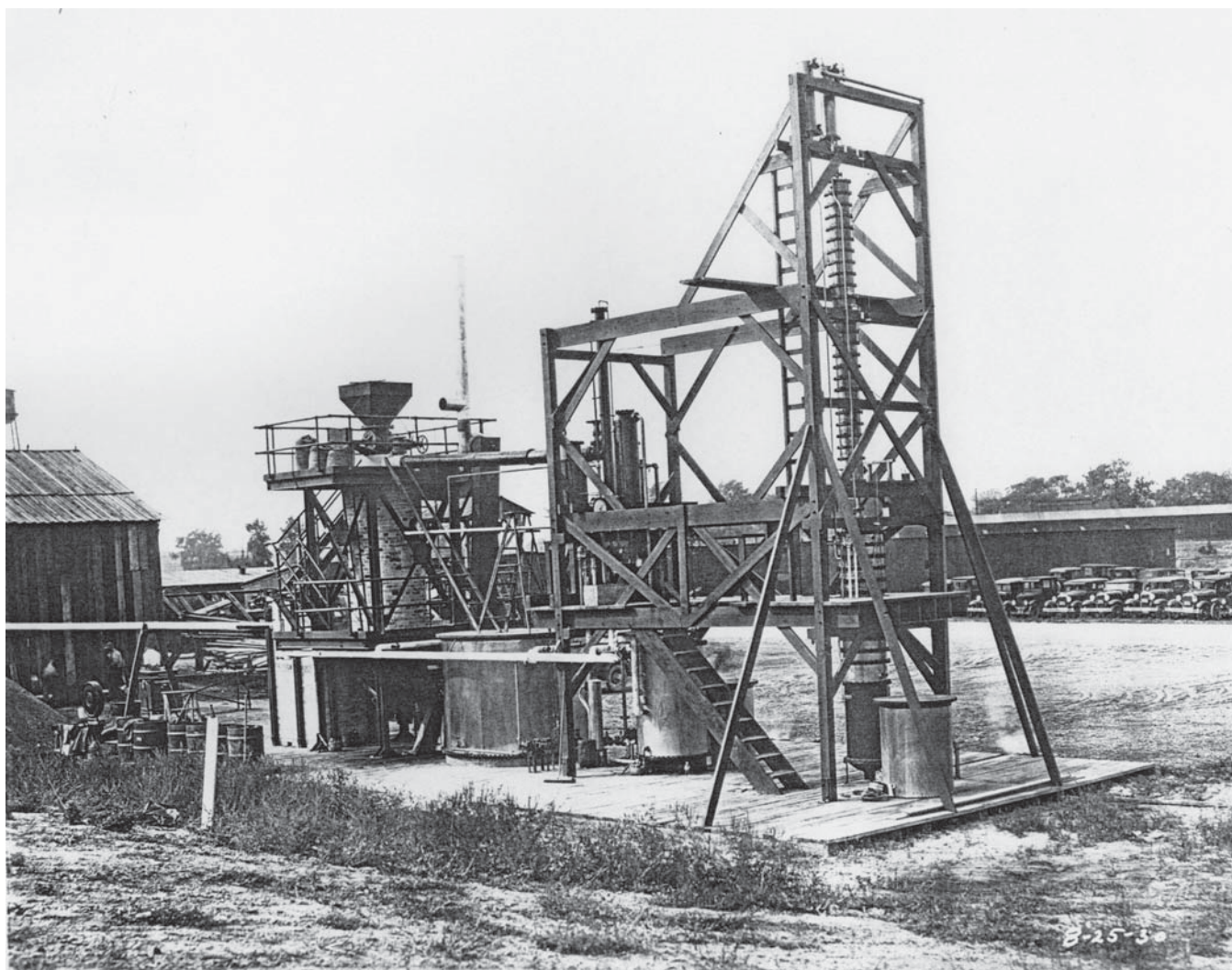
18. Wood plant. 1930? Dearborn, Michigan: Ford Motor Co. 1 p. Undated. Unpublished typescript.

• **Summary:** "Near the saw mill a modern note has been added to the village. A building has been erected over a distilling plant which takes the sawdust waste from the mill and utilizes it in manufacturing by-products, principally Acetic and Alcohol."

"Students of Chemical Engineering of the Edison Institute who operate the plant under the guidance of trained engineers and chemists are learning not only the technology of the process but the value of by-product manufacture in the operation of modern industry."

Note: At the top of the document the words "Circa 1930. Author unknown" have been written in, probably by an archivist. At the bottom of the document, the following was written in, apparently by another person: "Wood plant became chemical (soybean) laboratory. Circular (Loranger) saw mill was near it at time above was written (r.p. 11/16/78). Circular sawmill, also known as Loranger sawmill, currently Stony Creek Sawmill." Address: Dearborn, Michigan.

19. Baker, E.J., Jr. 1931. A quarter century of tractor development. *Agricultural Engineering* 12(6):206-07. June.





• **Summary:** Baker, the sagacious and self-appointed chronicler of the farm implement industry, noted this 25 year period could be divided into four periods: (1) Engine development on the traction engine gear. (2) Frame and transmission development with enclosure of parts. (3) Redesigning for straight line assembly. (4) Development of general purpose models with their associated equipment.

To find the genesis of the farm tractor, one must go back to 1892, when Van Duzen Gas and Gasoline Engine Company of Cincinnati, Ohio, built an internal combustion engine to be mounted on a traction engine gear; it was ordered by John H. Froelich, an Iowa thresherman. The machine ran well and threshed thousands of bushels of grain. Its success led Mr. Froelich and others to organize a company to produce similar machines.

Baker observed that the Fordson and its competitors, the McCormick-Deering 10-20 and 15-30 were "designed as much for low-cost production as for proper functioning." His analysis penetrated to the heart of the Fordson generation of tractors. They were designed to be cheap and useful, and they generally succeeded more at the former than at the latter. Cheapness was their strength, but it also led to their downfall. Address: Assoc. editor, "The Farm Implement News."

20. Current jobs at the Chemical Plant. 1931. Dearborn, Michigan: Ford Motor Co. 1 p. Summer. Unpublished typescript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** Twelve projects are described, including: "2. Processing of Fruits and Vegetables and uses for various parts of: Lettuce, Tomatoes, Plums, Watermelons, Soy Beans, Sunflowers, Cantaloupes and Potatoes, etc."

Note: This is the earliest document seen (June 2011) concerning the Ford Motor Co. and soybeans. At the top of the document the words "Greenfield Village" and "Summer 1931" have been written in, probably by an archivist. Address: Dearborn, Michigan.

21. *Public Opinion (Chambersburg, Pennsylvania)*. 1931. Henry Ford's mysterious new hobby. Dec. 15. p. 6. Reprinted from Every Week Magazine.

• **Summary:** Henry Ford, now age 68 and called "the richest man in the world," is putting his new ideas on industrial utilization of farm crops into action by buying over 3,000 acres of Michigan farm land. "The latest and perhaps the greatest of all the hobbies of Henry Ford is now being worked out in Macon Township, Lenawee County, Michigan, 45 miles from Dearborn. Here one of the world's richest men, king of the most stupendous industrial organization in the world, is endeavoring to prove to the farmers of the country that their methods have been wrong and their markets inadequate."

"Now he has acquired several thousand acres of land in an ancient agricultural settlement in the northeast corner of Lenawee County, and he has begun the work of

experimentation that he thinks will revolutionize the business of raising crops. Mr. Ford believes the solution of much of the present dilemma of the farmer lies in the matter of providing new uses for farm products. Too large a share of the farmer's output has been used for food and little or none of it is used for industrial purposes."

"He thinks he might be able to raise crops that will furnish the raw material for automobiles and perhaps for a multiplicity of other industrial products."

"Farming," said Mr. Ford one day, "ought to be run more like industry."

"Now it seems to me that the farmer ought to work closely with the manufacturer. The two ought to use the same methods and ought to help each other. They should work together much better than they do."

Note: This is the earliest article seen that describes Henry Ford's work with industrial utilization of farm crops—a concept soon to be called "chemurgy." Soybeans are not mentioned.

22. Radford, Floyd. 1932. Re: Crops for 1932 planting. Letter to Henry Ford, Jan. 11. 1 p.

• **Summary:** This 1-page form begins: "Mr. Henry Ford:— Please check the crops you are interested in for 1932 planting." An alphabetical, 2-column table gives the common names of 38 crops (including "Beans—Soy"), with a column for the number of acres to plant after each crop. The names of 7 farms are listed in a second table. These farms have the following acreage: Macon 4,163, Belleville 3,242, Joe B 2,068, Dearborn 1,900 acres, Harrison 1,200 acres, Cherry Hill 1,425 acres, Nankin 33 acres. For four of the farms, the total acreage, acres deductible, and balance to plant in acres is given.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

23. Boyer, R.A. 1932. [Summary of the development and progress at the Chemical Plant of the Edison Institute (Dearborn, Michigan) during the past year]. 5 p. Undated. Unpublished manuscript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 23, Henry-Ford Office-General, Box 2.

• **Summary:** "The following report is a summary of the development and progress which has taken place at the Chemical Plant of the Edison Institute during the past year... A great many of these things are not known outside the laboratory and the beginning of the new year [i.e. probably January 1932] is an appropriate time to report them."

During its first year, the Chemical Plant of the Edison Institute focused on developing a well-equipped laboratory and organizing an efficient group of personnel (often called "boys"). "Early last year Mr. Ford told us that we would spend over a year in getting organized, and although very few of us realized it then, the many months in the interim have proved

the truth of his statement.”

The group is working “on the problem of finding industrial uses for farm crops.” During the entire spring, summer, and fall they worked for one week each on different crops such as wheat, corn, and carrots. They ran over 30 farm crops through a large retort using destructive distillation. “We found from all that preliminary work that the soybean was outstanding in its commercial possibilities. Its high oil and protein content are especially important. It can be grown easily requiring little fertilizer, it even improves the ground, and it is a very good source of food. Last December [1931], therefore, Mr. Ford told us to concentrate on the soybean and develop it. We now have a chance to use all the knowledge and experience gained in the last year and are hitting the problem hard. We hope to be able to use the beans grown this summer by erecting a plant for producing some commercial object such as an insulating object for the car and thus having a starting point for showing what can be done towards industrializing farm products...”

“To make our industrial farms complete, power is necessary. Of course water power is the cheapest source, but power in the form of a fuel such as gas is very convenient also. We have worked on the problem of turning the waste cellulose on a farm such as the stalks and leaves of the crops into a fuel gas. The cheapest way of doing this is by fermentation or by really letting nature do it.”

Note: This is the second earliest document seen (March 2001) that discusses Henry Ford’s work with soybeans. He decided to focus on soybeans in Dec. 1931 after a long series of experiments. At that time Ford, born on 30 July 1863, was 68 years old. His company had built its 20 millionth Ford in 1931 and his son, Edsel B. Ford, had been president of the company since Jan. 1919. Ford R. Bryan notes in his biography of Robert Boyer in *Henry’s Lieutenants* (1993): “Design of the V-8 Ford in 1931 seems to have been Ford’s final great interest in automobile mechanics. His Edison Institute Schools, Greenfield Village, and soybean research now largely occupied his time. In 1932 he began to plant hundreds of acres of soybeans on his Dearborn farm lands and began procuring thousands more acres in Southeastern Michigan.” Address: Edison Inst., Dearborn, Michigan.

24. *Detroit News*. 1932. Ford planning agriculture. April 26. p. 1.

• **Summary:** “After a surprise call at the White House, Henry Ford said today he had advocated to President Hoover a plan of combining farming and industry under which factory workers could have \$500 a year by raising part of their own foodstuffs... Ford intimated that the idea he had been experimenting with on his Dearborn farm, with Ford factory hands, was to have men working in the plants spend part of their time in small scale scientific farming.”

25. *Toledo Times (Ohio)*. 1932. Auto with garden to be next

thing out, [Will] Rogers says. April 30.

• **Summary:** Hollywood, California—“The other day Mr. Henry Ford visited Mr. Hoover [President of the USA], and told him that what the country needed was a ‘new eight’ [8-cylinder car; V-8] and a new garden. Most people got no room for a garden so what Mr. Ford will do is put out a car with a garden in it. Then you hoe as you go.” Address: Ohio.

26. Two photographs of Edsel Ruddiman’s laboratory at Henry Ford’s Greenfield Village. July 22. 1932.

• **Summary:** The outside (188-7257) looks like a typical 1-story home.

The inside (188-7256) looks like a chemist’s laboratory.

27. Borth, Christy. 1932. “I have never worked so hard at anything”—Henry Ford: Modern Jack the Giant Killer hopes he has run the ogre of hunger to Earth in his experimental farm where he grows soy beans. *Detroit Free Press*. Aug. 21.

28. *New York Times*. 1932. Ford sits up in bed, talks of new car... But he will not tell more than that soy bean makes paint for it—Not selling stock. Dec. 2. p. 23.

• **Summary:** Detroit, Michigan, Dec. 1. Henry Ford, age 69, is in the hospital recovering from an “operation last Saturday for the removal of his appendix and a strangulated hernia.” He said that “the paint on next year’s Ford cars would be made from oil developed from soy beans raised near Detroit this year.”

29. Zeamer, W.G. 1932. Ford to paint cars with Michigan soy bean oil: Magnate sets new industry afoot here. *Detroit Evening Times*. Dec. 2.

• **Summary:** Henry Ford, still in the hospital but making an excellent recovery from his operation a week ago for a strangulated hernia, “said he was going to paint his new cars with a product from his own farms—soy bean oil. This lets out a secret and explains the acres upon acres of soy beans which Ford has been growing. It also bespeaks for Michigan a new place in the sun. Michigan is already the motor capital and bean capital of the world. With bean oil in competition with linseed oil, Ford and Michigan challenge the world dominance of the Argentine. Argentine is the chief producer of flax from which linseed oil—the universal paint base—is made.”

“There was only the briefest reference to development of soy bean oil as an industrially useful paint base. ‘We raised enough beans last year to paint all the new cars, and we’re going to make a lot of cars,’ Ford said.”

Note: This is the earliest document seen (June 2011) that mentions paint made from soybean oil in connection with Henry Ford.

30. *Madison Survey (Madison, Tennessee)*. 1932. The food factory. Dec. 7. p. 179-80.

• **Summary:** “For many years, as one of the campus industries at Madison, a health food factory has been operated. It has furnished foods for the college cafeteria, for the sanitarium diet kitchen, and for the Nashville Vegetarian Cafeteria, and has sold much to the outside trade. Recently more than usual interest is being shown in health foods. Quotations from a few letters written by those representing and those using our food in other places will be of interest to many of the Survey readers.”

Popular products include Vigorost, Soy Cheese [tofu], Soybean Dixie Fruit Crackers, and Soy Bread.

Dr. E.A. Ruddiman, in charge of Soy Bean Research at the Henry Ford Laboratory in Dearborn, Michigan, wrote that he took home the samples of Vigorost and Soy Cheese and enjoyed them very much; his wife made some croquettes from the Soy Cheese.

Dr. A.A. Horvath of the Bureau of Mines in Pittsburgh, Pennsylvania, ordered 12 small cans of soy cheese. “Dr. Horvath is an expert on the soy bean and our correspondence with him is most interesting.

“Dr. Harvey Holmes of the Severance Chemical Laboratory, Oberlin College, writes: ‘I am very anxious to try the “tofu” (soy cheese) and learn the various ways of serving it. I would like to obtain a sample of the Soybean Dixie Fruit Crackers.’”

31. *Los Angeles Times*. 1932. New motor-car oil. Dec. 12. p. A4.

• **Summary:** “Henry Ford announces inauguration of another automobile plant. It is the soy bean, oil from which will be used in the paint that is to decorate next year’s models.”

32. Ford Motor Co. 1932. Henry Ford and Robert Boyer, soy bean processing (Motion picture). Dearborn, Michigan. 364 ft., silent, black-and-white. 35 mm. No captions. *

• **Summary:** Shows: Views of River Rouge Plant. Men in coveralls painting rear of car with spray guns (using soy oil-based paint). Henry Ford and Robert Boyer talking inside the plant. Boyer explaining soybean processing to Henry Ford. Henry Ford and Robert Boyer talking in soybean field. Address: Dearborn, Michigan.

33. Radford, Floyd. 1932? Re: Planting soy beans on Ford farms. Letters to Ford employees involved with planting soybeans. 5 p. Undated.

• **Summary:** We will treat these 5 documents as one entry, since some are unsigned and all are undated. They were probably written in about 1932. (1) Crop trials. Seventeen plants are listed alphabetically in a table, with the same information given for each that is given for soy beans: No. of acres 1931: 200. Variety selected: Manchu. Average seed required per acre: ½ bu. [30 lb] to 35 lbs. When to plant: May 15-30. How to plant: 1-3 inches deep, every 18-20 inches, in rows 30-36 inches apart. Proper soil: Loam worked well.

Harvest date (approximate): 105 days, Sept. 1st. Average yield per acre: 16 bushels, 1 ton hay. Pounds per bushel: 60.

(2) “Soy Bean. Seed should be ordered now for orchard & farm. We have 3,000 bu. seed on hand. This will plant 4,500 acres of the 10,000 available land: Macon 2,000 acres, Cherry Hill 1,000, Belleville 2,500, Dearborn 2000, Joe 1,000. Also Tecumseh and Harrison.”

(3) Soy beans. Seed on hand will plant 5,000 acres. But 8,000 acres are available. Macon 2,000; Dearborn 1,500; Cherry Hill 1,000; Belleville 2,500; Joe 1,000. “To plant this amount of acres it will be necessary to purchase 2,200 bu. of additional seed at \$0.50 per bu. = \$1,100. Is this O.K.—Can we order seed?”

(4) “Note: Have just received a report from Michigan State Agricultural College that they have had much better results in the last two years all over the state with Manchu Soy bean than with the Early Brown which they previously recommended. Floyd.”

(5) Departmental communication. Soy beans. 19,568 lbs of oil sold for \$0.56 per lb = \$1,095.81. 55 tons of cake worth \$26.00 per ton = \$1,430.00. Total worth: \$2,525.81. Less cost of pressing 2,372 bu @ \$0.3984 per bu = \$945.03. Net: \$1,580.76 or \$0.666 per bushel of soybeans. [Note: 148 acres yielding 16 bu/acre would produce about 2,372 bushels of soybeans].

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

34. Horvath, A.A. 1933. The soy-bean industry in the United States. *J. of Chemical Education* 10(1):5-12. Jan. [19 ref]

• **Summary:** This is an excellent overview. Contents: Introduction: Soybean acreage in the USA in 1917 (50,000 acres) and 1931 (3,497,000 acres), production in bushels of seed for the top 22 states in 1931. Oil milling: Solvent or new process, hydraulic or old process, expeller method, the pioneering work of North Carolina (1916), Chicago Heights Oil Manufacturing Co. (1920), A.E. Staley Mfg. Co. (1922; starting with one expeller. Today capacity is over 1 million bushels/year), the Blish Milling Co. of Seymour and Crotersville, Indiana (1923; they crushed 317,000 pounds of soy beans in the 1927-28 season), current U.S. production of soy bean oil (13.5 million lb in 1930, up from 11 million lb in 1929), the problem of disposing of soy-bean oil meal. Soy bean oil for food. Lecithin. Bleaching properties (J.R. Short Milling Co. and Wytase). Soy beans for food: Use in China, Prof. L. Berczeller and soya flour, the Soyex Co. of Nutley, New Jersey. Glue: I.F. Laucks of Seattle, Washington (Research began in 1923 but the year “1926 proved to be the turning point in the life history of soy-bean glue”).

“The maintenance of the soy-bean milling industry at a high level of production is dependent upon the consumption of soy-bean oil meal. And heretofore, according to W.H. Eastman [president of the National Soy-bean Oil Manufacturers Association], this consumption has been

disappointingly small, despite the fact that the meal has no superior as a protein concentrate.” The American livestock feeder “has not come to realize the value of the meal, nor to utilize its qualities to the same extent as the Danish farmer. In the year 1930 something over 100,000 tons of the meal were manufactured in this country [USA] from our domestic beans. Yet the little country of Denmark is consuming considerably more than we produce in the United States, while our milling industry is forced to store a good share of its production, unable to dispose of it... The demand for soy-bean cake is the limiting factor for the industry.”

“Soybean oil has certain properties which make it more valuable to the paint and varnish industries than it would be as a mere diluent for linseed oil. For instance, it is particularly well adapted for grinding pastes... Soybean oil further has the property of mitigating the after-yellowing of a white paint or enamel, and in this respect it is without a peer. The trade would pay a considerable premium over the price of linseed oil to obtain soy-bean oil for this purpose.”

“It is estimated that 75 per cent. of the soy-bean oil consumed in the United States is being used by paint and varnish industries and in the manufacture of linoleum, oilcloth, and artificial leather. Lesser quantities are utilized in printer’s ink and soap.”

Lecithin: “Up to the present time all the soy-bean lecithin used in this country [USA] is being imported from Germany and Denmark. The commercial product is a dark brown paste or heavy viscous liquid, containing about 60 to 70 per cent. of lecithin, the remainder being pure soya oil, cocoanut oil, etc... The margarine industry absorbs a considerable amount of this lipid, as its incorporation overcomes many of the differences between butter and its substitute—e.g., it binds the water and prevents spitting when frying. Lecithin is of great interest in the chocolate and cocoa industry...” Discusses many applications of lecithin but does not give statistics concerning imports or domestic consumption / utilization.

“A new era dawned in the possibilities of the soy bean for food with the discovery in 1923 by Prof. L. Berczeller of the University of Vienna of a special process which eliminated the beany flavor from the soy bean and produced a nutty-tasting soy-bean flour capable of being stored for years without marked deterioration. Its principle consists in the subjection of the beans to the action of saturated steam for a short period of time, followed by vacuum distillation. It is to the credit of the Soyex Company that this process was brought over to the United States with the establishment in 1930 of a plant in Nutley, New Jersey. A high standard for soy-bean flour was established.”

Soy-bean exhibit at the Chicago World’s Fair: “The soy-bean industry of the United States will be adequately represented at the 1933 ‘Century of Progress’ exposition in Chicago in the Agricultural Division under the title ‘Century Soy-bean Exhibit.’ On July 9, 1931, an organization meeting of representatives of the soy-bean industries was held in

Chicago, where a committee was elected for the sections: producing, marketing, and utilization, the latter section being subdivided into human utilization, livestock utilization, the arts, paints and oils, and milling. The ‘Century Soy-bean Exhibit’ is an excellent opportunity for the domestic soy-bean industries to display their products and it is undoubtedly going to stimulate further developments.

“Conclusions: As Henry Ford recently said, ‘The dinner table of the world is not a sufficient outlet for the farmer’s products; there must be found a wider market if agriculture is to be all that it is competent to become. And where is that market to be found if not in industry?... For several years we have been running large crops of everything from sunflowers to soy beans through our chemical laboratory, in an effort to find an annual market for the farmer’s produce. There can be no doubt that the soy bean is one of the most promising of all agricultural plants for an almost unlimited variety of industrial uses, and that it is going to play an outstanding role in the future economic life of this country.’”

Photos show: (1) A hydraulic process [press] mill (William O. Goodrich Co., Milwaukee, Wisconsin [subsidiary of ADM]). (2) Equipment for soy-bean oil refining process (A.E. Staley Mfg. Co., Decatur, Illinois). (3) Steam aspirator for producing high vacuum for deodorizing vegetable oils (Staley). (4) Soy-bean flour mill (Soyex Company, Inc., Nutley, New Jersey). (5) Baking Laboratory (Soyex; which may contain a photo of Dr. Fearn). (6) Plant making soy-bean adhesives (I.F. Laucks, Inc., Seattle, Washington). (7) Tank for adhesives (as high as the chin of a man standing next to it; Laucks).

Diagram: “Exploitation of the soy bean, according to the processes of Hansa Muehle G.m.b.H., Hamburg, Germany. Those derivatives representing products ready for sale are marked by circles.” The process uses solvent extraction. On the oil side: There is a “distillation” step before the crude oil, which is refined to make edible oil. Crude lecithin is refined to make finished lecithin. On the meal side: First step is removal of solvent and drying of meal. Then cooling by air to give finished meal. It undergoes grinding, milling and sifting to give grits, hull meal, and edible flour.

Note 1. A footnote on the first page states that Horvath is a “Special Associate Member of the National Soy-bean Oil Manufacturers Association. (P.O. Box 331, Oakland Station).”

Note 2. Talk with Bob at the Map Room of the University of Chicago. 1997. March 25. Oakland Station is probably in Chicago, Illinois. A railway map from the 1930s and a gazetteer from the 1920s show it to be a mail stop on the Illinois Central line at 39th Street. This is 39 blocks south of The Loop, right along Lake Michigan, south of the center of Chicago.

Note 3. This is the earliest document seen (Dec. 2001) concerning soy lecithin industry and market information (all soy lecithin used in this country [USA] is being imported from Germany and Denmark). Address: Pittsburgh,

Pennsylvania.

35. *Ford News (Dearborn, Michigan)*.1933. An interview on decentralization of industry. 13:26. Feb. [3 ref]

• **Summary:** “Two interviews with Mr. Henry Ford at Dearborn, Michigan, were obtained by Mr. Harold N. Denny of The New York *Times* staff and published in the newspaper February 1 and 5.” This articles contains excerpts from those 2 articles plus excerpts from interviews with the United Press and Associated Press services.

The Ford Motor Co. now has 7 village industries in operation along the River Rouge. They make parts such as valves or screws. “In the production system toward which he is working, parts for his cars will be built in thousands of rural communities, situated where there is power...

“Mr. Ford repeated his conviction that much of an automobile could be ‘grown on a farm, that much of it could be made from by-products of agriculture and that great new sources of income awaited the farmer.’ He had an assistant bring to his desk a steering wheel, a distributor box and other Ford parts made from products of soy beans grown near Detroit.”

36. Zlatarov, Asen. 1933. Henri Ford i kulturata na soiata [Henry Ford and soyfoods]. *Priroda i Nauka (Nature and Science, Bulgaria)* 3(5-6):86. Jan/Feb. [Bul]*

• **Summary:** Discusses soybean production (on 10,000 acres near Detroit, Michigan) and laboratory research. Address: Bulgaria.

37. *Madison Survey (Madison, Tennessee)*.1933. Soybean on exhibition at World's Fair. March 22. p. 39-40.

• **Summary:** “According to Sherman R. Duffy, the soybean will be the only vegetable crop having an exhibit all to itself at the Century of Progress Exposition, and will occupy 6,000 square feet of space in the Agricultural Building.” The soybean is known to urban dwellers only as the “material from which chop suey sauce is made... In the soybean exhibit will be soybean flour, diabetic foods, infant foods, macaroni, breakfast foods, and a vegetable milk which is being used in a variety ways in the manufacture of foods and confections.”

38. *Ford News (Dearborn, Michigan)*.1933. Experimenting with the soy bean. 13:49-51. March.

• **Summary:** “During the first year [1931] the land planted in soy beans near Dearborn amounted to about five hundred acres. During 1932 it was increased to 8,200 [acres], all of which were devoted exclusively to this product [crop].

“The crops produced here do not compete with any market crops, since the greater part has been put through the distillation plant of the Ford chemical laboratory and much of the soy bean oil is being used in the paint shop at the Highland Park plant of the Ford Motor Company.”

“Experiments undertaken with the soy bean have

developed a product [later called soy plastics] that can be moulded to shape and used in manufacturing small parts of the Ford car. A synthetic resinous product produced from the oil is being used as a body for paint. It is expected that this will result in a more durable and beautiful finish when experiments are complete. More than 150 different tests have been made to find uses for the bean product.”

Research by others, worldwide, has shown that soybean oil can be and has been used in manufacturing processes. “Glycerine, explosives, enamels, varnish, waterproof goods, linoleum, paints, soaps and printing inks have been made with it. The residue after the removal of the oil is fabricated into cellulose, rubber substitute and countless other substances useful in manufacturing.”

A brief history of the soybean, a native of Eastern Asia, is given. “The soy bean in its cultivated form was first introduced into the United States in 1804 when seamen brought seeds which were planted in Pennsylvania.”

“There are more than three thousands kinds [varieties] of soy bean. The object of the technicians is to discover the species most suitable to the various uses to which the product is put. Soil has much to do with variety of product. It has been found that a poor soil makes for a higher oil content, and a rich soil produces a bean rich in protein. A continuous process for extracting oil from the bean has been developed at Dearborn. By its means the solvent used in extracting the oil may be used again and again, cheapening the resultant product.”

Two sidebars on the first page of this article contain quotations from statements by Henry Ford: “For a long time now I have believed that industry and agriculture are natural partners and that they should begin to recognize and practise their partnership. Each of them is suffering from ailments which the other can cure. Agriculture needs a wider and steadier market; industrial workers need more and steadier jobs. Can each be made to supply what the other needs? I think so.

“The link between is Chemistry. In the vicinity of Dearborn we are farming twenty thousand acres for everything from sunflowers to soy beans. We pass the crops through our laboratory to learn how they may be used in the manufacture of motor cars and thus provide an industrial market for the farmers’ products.”

Ford hoped to conserve non-renewable resources and prevent deforestation. “I foresee the time when industry shall no longer denude the forests which require generations to mature, nor use up the mines which are ages in the making, but shall draw its raw material largely from the annual produce of the fields. The dinner table of the world is not sufficient outlet for the farmer’s products; there must be found a wider market if agriculture is to be all that it is competent to become. And where is that market to be found if not in industry?

“I am convinced that we shall be able to get out of yearly

crops most of the basic materials which we now get from forest and mine. That is to say, we shall grow annually many if not most of the substances needed in manufacturing. When that day comes, and it is surely on the way, the farmer will not lack a market and the worker will not lack a job. More people will live in the country. The present unnatural condition will be naturally balanced again. Our foundations will be once more securely laid in the land."

Contains 12 photos, including: (1) A soybean plant (hanging upside down) grown at Cherry Hill, near Dearborn, bearing 300 pods. (2) A jar labeled "Manchu soy bean, Michigan grown, Ford Farms-1931." (3) A student in the Edison Institute experimenting with soy bean oil in a chemistry laboratory. (4) Several rows of soybeans labeled "C-132 Manchu Frost-Pan Control." (5) An Edison Institute student using an ingenious hand-pushed cultivator to cultivate a tract of soy bean plants shown in (4) above. (6) A jar of "soy bean oil meal." (7) A huge field of soy beans in Macon, Michigan. (8) Four tractor-driven combines harvesting a large, experimental plot of soy beans at Dearborn. (8) Whole soybean plants being fed into a miniature thresher from the left. (9) Soybean seeds coming out on the right.

Note 1. This is the earliest document seen (June 2011) published by the Ford Motor Co. concerning its cultivation and varietal testing of soybeans. Note 2. It is not clear who planted or owned the 500 acres of soybeans grown near Dearborn in 1931. It was probably Ford because of the clue given on the label of the jar noted above; however the soybeans would have had to be planted in the spring of 1931 and Ford had not decided to focus on soybeans until Dec. 1931. Moreover, in May 1935 R.H. McCarroll, a chemist at the Ford Motor Co. in Dearborn, stated at the First Dearborn Conference of Agriculture, Industry, and Science: "Our large scale work on these beans started in 1932 with the planting of 8,000 acres. About 300 varieties have now been tried on our experimental farm."

Note 3. This is the earliest document seen (June 2011) concerning Henry Ford's work with plastics that contained soy protein. These plastics were typically made by incorporating soybean flour in phenol formaldehyde plastic.

Note 4. This is the earliest document seen (June 2011) concerning the use of soy oil to make a synthetic resin—for use as body for automotive paint/enamel.

Note 5. This is the earliest document seen (June 2011) stating that paints made with soybean oil were being used on Ford cars.

39. *Ford News (Dearborn, Michigan)*. 1933. Industrial farming. 13:60. March.

• **Summary:** Below an illustration of a farmer in his field, with a factory in the background, is this quote from Henry Ford: "I see the time soon coming when the farmer will not only raise raw materials for industry but will do the initial

processing on his farm. He will stand on both his feet—one foot on the soil for his livelihood, and the other foot in industry for the cash he needs. He will have a double security. Agriculture suffers from a lack of market for its product, industry suffers from a lack of employment for its surplus men. Bringing them together heals the ailments of both. That is my conviction and that is what I am working for."

Note: This is the second earliest document seen (June 2011) related to Henry Ford and chemurgy—though it does not mention the latter term.

40. *New York Times*. 1933. Sales drive starts soon: Ford's soy-bean tests. April 9. Section 8. p. 7.

• **Summary:** "Experiments with the soy bean are being given increasing attention at the Ford plant in Dearborn, according to reports. The automobile manufacturer started growing this product several years ago, devoting about 500 acres to the original planting; last year the acreage grew to 8,200... To date, according to *Ford News*, house organ of the company, more than 150 tests have been made to find the most advantageous means of using the soy bean."

It is said that the Chinese have grown the soy bean for more than 5,000 years, "the Emperor Shen Nung having mentioned it in the Ben Tsao Gen Mu [Bencao Gangmu] (the ancient *Materia Medica*), compiled in 2838 B.C."

41. Ryerson, Knowles A. 1933. History and significance of the foreign plant introduction work of the United States Department of Agriculture. *Agricultural History* 7(3):110-28. July. See p. 126-27. [7 ref]

• **Summary:** Contents: Introduction. Introduction activities important in colonial period. Early federal period. Influence of Henry L. Ellsworth. Pre-Civil War period. Civil War years. Post-war period. Influence of William Saunders. Influence of Secretary James Wilson (incl. David Fairchild, Bureau of Plant Industry). Turn of the century. Organization of activities. Influence of plant breeding. Some additional present day problems. A few significant results (incl. Frank Meyer, development of the soybean industry, human foods made from soybeans, Henry Ford's work with soybeans).

"The development of the soybean industry has been one of the most spectacular phases of recent agricultural development in this country... Through new introductions from the Orient, made by Department explorers, and selections from these new strains by Federal and State investigators, the acreage has increased from less than fifty thousand in 1907 to nearly four million in 1932. Of the twenty varieties now commercially grown in the United States, all but three are introductions of the division of foreign plant introduction. In 1921 there was no soy oil produced in this country; in 1932 there were thirty-nine million pounds. In 1928 there was no export of soybeans; in 1932 there were two million bushels. In 1932 the value of the soybean crop was estimated as follows: thirteen

million bushels of seeds, \$9,000,000; two million tons of hay, \$22,500,000; grazing, \$4,000,000; cover crops, \$500,000; total, \$36,000,000.

"Factories for the preparation of human foods from soybeans are appearing and many preparations are on the market. Many oil mills have already been established. The uses of the oil are many, including the manufacture of paint, linoleum, and insulating material. Henry Ford has established a laboratory for soybean experiments and produced eighteen thousand tons of soybeans in 1932. His laboratory has already devised steering wheels, knobs, distributor shells, insulators, and other parts from the seeds. It reports the oil as more satisfactory than linseed and 25 per cent cheaper in connection with auto-body making. The soybean has already become an integral part of the agriculture of many states" (p. 126-27).

Mr. Ryerson "has been principal horticulturist in charge of the Div. of Foreign Plant Introduction, Bureau of Plant Industry, USDA, since 1928. He is a graduate of the Univ. of California (B.S., 1916; M.S., 1924) and has received the Chevalier du Merite Agricole, from France. Ryerson was horticulturist at the agricultural experiment station of the Service Technique, Port au Prince, Haiti, during 1925-27, and for the Joint Palestine Survey during May-November, 1927." Address: In Charge, Div. of Foreign Plant Introduction, Bureau of Plant Industry, USDA.

42. Wartenweiler, Marion J. 1933. The bean in ancient and modern times. *Good Health (Battle Creek, Michigan)* 68(7):20-21, 26. July.

• **Summary:** Beans were not widely consumed in Egypt. Herodotus wrote that the priests regarded beans as unclean. Pythagoras, "although a vegetarian, forbade his disciples to eat beans. Borrowing the superstition from the Egyptians, he believed that they stupefied [dulled] the mind."

Today there is a noticeable increase in the use of soybean flour in the United States and in Europe. "It has a strong and characteristic, although quite delicious flavor. Moreover, only recently Henry Ford has announced that the paint on his next model Ford will be compounded with oil developed from the soybeans raised on the Ford farms."

43. Chase, Herbert. 1933. Plastic molding at the Ford plant. *Automotive Industries* 69:390-92. Sept. 30.

• **Summary:** "A Ford Eight [having an 8-cylinder ignition system] required two pounds of phenolic molded parts, chiefly in the ignition system, but horn buttons, hand throttle parts, and gear-shift knobs are also made by this process." A detailed technical description is given of how these plastic parts are manufactured from preforms. Photos show the parts and the molding presses at Ford's River Rouge plant.

Note: This is the earliest article seen concerning Ford's use of phenolic molded parts. Although soy is not mentioned in the article, by April 1936, soybean meal (protein) was

being mixed with phenol and a part of the total quantity of formaldehyde required to form the plastic compound. Address: M.E.

44. Van Vlissingen, Arthur, Jr. 1933. Automobiles and soybeans: An interview with Henry Ford. *Rotarian (The)* 43:6-8, 58-59. Sept.

• **Summary:** Utilization of the soybean in the automobile industry is discussed. Mr. Ford is quoted as saying: "Anything that can be grown for industry's raw materials will bring new revenue to agriculture, will help to raise prices of old-line, conventional crops. It will thus add doubly to the purchasing power of the farmers, and so will directly increase industry activity and employment."

"Soybeans have been grown in this country for years, chiefly to be pressed into oil for soaps and paints, and oil cake for cattle feed. Many farmers raise them for dairy silage. But they have been unimportant as a source of industrial raw material and they have cut no really large figure in American agriculture.

"Our chemists began to study soybeans from many different angles. For one thing, they discovered that soybean oil is quite as effective for mixing with sand to make foundry cores as is linseed oil. So far, we have used a good many thousand gallons in this way..."

"Research on the meal left after extracting the oil suggested that it might be incorporated in what are known as molding compounds, the resinous materials which are molded and pressed into such small parts as the button you press when you sound the horn, the ball on top of the gear-shift lever, and so on. This residual meal proved excellent for the purpose..."

"The most startling development in the soybean saga at Ford's has to do with making a new body finish [paint] from the oil. The laboratories worked out a process for producing from the oil a synthetic resin which can be made into an enamel superior to lacquer in every respect, from original gloss to its complete resistance to deterioration. It costs less by the gallon, uses less gallons to the job, saves tremendously on labor. To match its qualities the chemists are working on a better finish for fenders, using the soybean resin as a coating and soybean oil as a carrier of the pigment.

"One entire class of cars was last winter scheduled to carry this finish. The only reason why Ford did not shift over on his entire line was that he had not as yet enough oil-crushing capacity to do it.

"Last summer, said Mr. Ford, 'we had almost ten thousand acres of land under cultivation, most of it in soybeans. The yield is approximately fifteen bushels to the acre. Last year's planting is equivalent to about 7 million pounds of soybean oil. About fifteen pounds of oil are needed for finishing one of our cars. Think what this means as a new outlet for farm products when the new enamel becomes standard for the industry, as it probably will!'"

A large photo shows Henry Ford hunkering down to inspect a patch of soybeans; his left hand is touching the plants and his right hand holds his straw hat. A smaller photo shows two pairs of horses pulling a cultivating rig in a field of soybeans.

45. *Ford News (Dearborn, Michigan)*. 1933. Crowds visit Ford Exposition. Nov. p. 203-04.

• **Summary:** The Ford Exposition of Progress in Detroit showed the role science and industry have played in the manufacture of motor cars since their birth. During the last ten days of August and into November, approximately 1.2 million people viewed the exhibition. It was so successful that it will be presented in New York City starting Dec. 9.

"In addition to the Ford Motor Co., more than 175 industries, some of them among the greatest in the industrial world, participated in the exposition."

In one section of the huge exhibition space stood a replica of the historic brick workshop on Bagley Avenue where Mr. Ford built his first motor car back in 1893. A large photo (p. 203) shows the entrance to the Exposition and convention hall in Detroit. Photos (p. 204) show: (1) "The soy bean exhibit demonstrated how experimental industries are being developed to aid the farmer." (2) The Fordson tractor—old and recent models. (3) Many historic Ford automobiles that were on display, down to the present Ford V-8.

46. *Fortune*. 1933. Henry Ford doesn't care... 8(6):62-69, 121-22, 125, 126, 128, 131-34. Dec.

• **Summary:** "... what Chevrolet does. The Ford Motor Co. loses \$20,000,000 this year, the whispers that Ford is through grow louder. But Mr. Ford is building his best car in thirty years. And competition—deficits—whispers—are only incidents in his great commercial history."

The article describes a typical day in Henry Ford's life in 1933—which was heavily weighted in favor of non-automotive activities, primarily his outside activities or "hobbies." A photo shows Henry Ford meeting with his top executives (including Charles Sorensen and Edsel Ford) at a round lunch table in the maple-paneled corner room. They meet here daily. "After the meetings are over the executives travel back to the Rouge plant—four miles away—and Mr. Ford stays in the Engineering Laboratory where he makes his personal headquarters."

Page 65 states: "As for soya beans—of which Mr. Ford has 7,400 acres with a 1933 yield of 100,000 bushels—these testify to Mr. Ford's interest in the theory of industrial uses of farm products. The population cannot eat as much as the farmer can grow, so why not find some method of using the surplus in industry? Thus Mr. Ford makes the [plastic] button of the Ford horn out of soya beans, uses soya-bean oil in mixing his paint and in oiling casting molds. There is a bushel of soya beans in every Ford car. Last year Mr. Ford spent \$726,000 on his farming experiment, spent another \$451,000 in the first

ten months of 1933. The uses found for the soya bean as yet hardly justify the investment in them but the vision is broad. Meanwhile he supplies employment and income to many a soya-bean raiser.

"Another tie-up between agriculture and industry is seen in the so-called farm factories, of which the Ford headlight plant, located at Flat Rock, Michigan, is a good example. Having constructed the largest automobile plant in the world at the River Rouge, Mr. Ford now feels that he has learned all centralization can teach. The next step is decentralization. He wants to make as many parts as he can in small factories, whose workmen will live nearby, each tilling his little plot of soil."

"But though Mr. Ford is still connected with soya beans and farm factories, he has completely lost interest in several enterprises which were at one time close to his heart. He no longer makes tractors—International Harvester made that experiment too expensive. He has sold (to Penroad Corp.) his Detroit, Toledo & Ironton Railroad. And his airplane factory lies idle."

Page 134 states: "Mr. Ford is now as much interested in the soya bean as he is in the V-8. The difference is that he may forget the soya bean tomorrow but the automobile will always be with him."

47. Photograph of automotive products made from soybean plastic at Ford's Chemical Laboratory are displayed at New York. 1933.

• **Summary:** Over the expo is a sign that reads "Edison Institute of Technology." Robert Boyer and Frank Calvert are among the four men shown.

48. Ford Motor Co. 1934. Re: Ford Exposition of Progress in Detroit and New York a great success (New release). Dearborn, Michigan. 1 p. Jan. 5.

• **Summary:** "Evidence of an awakening interest by the American public in automobiles is graphically portrayed in the report by the Ford Motor Company that approximately 3,500,000 persons—the greatest attendance for any similar event in American history—visited the Ford Exposition of Progress during its showing in New York and Detroit.

"In New York the Exposition brought a total attendance of 2,298,023 and it was necessary to extend the showing for one week to handle crowds that thronged the Port Authority of Commerce Building at the rate of over 100,000 a day." More than 1,200,000 persons attended the Exposition in Detroit.

"Scores of costly exhibits portrayed vividly to the vast throng of Exposition visitors how farms, factories and mines in all parts of the United States and in many foreign countries contributed to the manufacture of the motor car. The display pictured for the first time the vast ramifications of the motor industry, and showed how, by demands upon hundreds of other manufacturers, as well as chemists, metallurgists, other scientists and engineers, the manufacture of automobiles

reached out of the automobile plant into practically every section of the country, drawing materials and equipment and furnishing employment to thousands. The whole panorama of industries which have grown up around the automobile industry, and which have become an integral part of it, was portrayed.

"Henry Ford was a frequent visitor to the Exposition, both in New York and Detroit." Thousands of school children also attended.

Note 1. A soy bean exhibit in both Expositions demonstrated how new industries are being developed to aid the farmer. Note 2. The Ford Trade School and Edison Institute of Technology (Robert Boyer's group) had a display on the second floor of the Port of New York Authority's Island Terminal No. 1 on 12 Nov. 1933. An illustration shows the floor plan.

49. Mullin, Earl. 1934. Ford will push his farm ideas in fair exhibit: To show growing and use of soy beans. *Chicago Daily Tribune*. April 4. p. 14.

• **Summary:** In a large exhibit at A Century of Progress exhibition in Chicago, Illinois, Henry Ford will grown soy beans and show how to extract their oil using simple machinery than will fit into an average barn. "The exhibit will be situated next to the Ford building at the Fair, and is getting more attention from the manufacturer than his main exhibit." He is "going to show how any farmer may begin the industrialization of his farm."

"Ford uses the [soy] beans in his own manufacturing plant, a half bushel of beans going into each car. The oil is used in the paint and enamel, and the residue [oil free meal] forms panels, buttons, and gearshift knobs."

50. *New York Times*. 1934. Ford Chicago show to grow soybeans: Auto maker's exhibit at Fair will include simple system of extracting oil. Planned to aid farmers. April 4. p. 12.

• **Summary:** Henry Ford plans to plant an acre of soy beans at the Chicago World's Fair. He says the residue from the oil extraction process may be used as food for humans or animals, or it may be pressed for manufacturing. "Parts of the Ford car, such as the horn button and the gearshift knob, are pressed out of soy beans..."

51. Ford Motor Co. 1934. Only car under \$2500 with a V-8 engine: New Ford V-8 (Ad). *Chicago Daily Tribune*. May 27. p. 19.

• **Summary:** A sidebar across the bottom of this full page ad states: "See the Ford exhibit at the Century of Progress." An illustration shows the Ford building at the fair is 900 feet long, equivalent in height to a ten-story building, and bathed in rainbow light from 9,000 concealed floodlights. See "the new industrial uses for soy-beans, one of the world's oldest crops."

52. *Ford News (Dearborn, Michigan)*. 1934. Industry and agriculture hand in hand at the World's Fair. 14(5):83-84. May.

• **Summary:** Ford set up an "industrialized American barn" adjacent to the main Ford exposition building using what would today be called "appropriate technology." "In this barn will be operated soy bean processing machinery with which Mr. Ford has been experimenting for several years. A patch of soy beans will be planted near by. 'The processing plant will be of the simplest sort, Mr Ford explained. 'Many farmers could build one like it out of odds and ends. It will be steam operated and have a capacity of one-third of a ton of soy beans every eight hours. One man could run it. A single farmer or a group of farmers might own it, according to the acreage planted in the beans. We decided on soy beans because they seem at this time to offer the greatest number of uses and markets... Today such parts of the Ford car as the horn button and the gear shift knob are pressed out of soy beans."

"At Chicago [Illinois] we will show a machine for molding the soy bean residue after the oil is extracted. It will be in actual operation so that farmers may see how simple the whole process is and how readily it could be adapted for farm use."

"All Ford cars are now finished in an enamel [paint] in which soy bean oil is used extensively. There are about a half-bushel of soy beans used in the manufacture of every Ford car, it is estimated."

53. Elliott, H.G. 1934. Soya bean trials, 1933-34. *J. of the Department of Agriculture of Western Australia* 11:327. June.

• **Summary:** "The soya beans which were obtained through the courtesy of the Ford Motor Company of Australia were the subject of experiments at various centres to determine their possibility as a summer growing legume..." The soybeans were to be used as a protein-rich fodder. A table gives the results of the trials for the season 1933-34 in 4 locations in Western Australia: Margaret River, Muresk, Denmark, and Munja Station. The soybeans generally failed even though all seeds were inoculated with the "Soya bean bacteria" just prior to planting. "It is believed that this crop is quite unsuitable in Western Australia, with the exception perhaps of some of the irrigated areas." Cow peas do better as a summer legume. Address: Agricultural Adviser, Dairy Branch.

54. *Ford News (Dearborn, Michigan)*. 1934. Ford Exposition gates open. 14(6):103-05. June.

• **Summary:** The Ford Exposition Building, the largest single building in the 1934 World's Fair (titled A Century of Progress, in Chicago, Illinois), is expected to tell the Ford story to more than 25 million people before the fair closes. The Ford exhibit covers 11 acres on the shores of Lake Michigan. There are five exhibits as part of the great white rotunda. One of these is "Mr. Ford's soy bean exhibit,

an effort to show the farmers of America how to improve their income by growing and processing for industry one of the world's most ancient crops. Today all the enamel used in the painting of Ford cars—and enamel is used exclusively instead of lacquer—has a soy bean oil base. The horn button, the gearshift knob, the ornamental doodabs [sic, doo-dads] on the door handles, are made of soy bean meal, an excellent plastic. A half-bushel of soy beans is in every Ford, a fact that is significant of the wider uses Mr. Ford sees ahead for this homely legume.

"The little old barn on the Ford homestead at Dearborn, built in 1863, the year of Mr. Ford's own birth, has been dismantled, marked board by board and shingle by shingle, shipped to Chicago, and rebuilt; it now stands just in the rear of Mr. Ford's own shop, surrounded by a soy bean patch. In the barn is the machinery Ford engineers have developed for the processing of the beans—machinery which Mr. Ford says any farmer might profitably adapt to his own use."

55. *Ford News (Dearborn, Michigan)*. 1934. Economic liberation for the farmer. 14(6):108-09. June.

• **Summary:** A photo shows a barn, from the Ford homestead at Dearborn, in which visitors to the Ford Exposition at the World's Fair in Chicago, Illinois, will be shown how soybeans can be processed by farmers to make oil and meal on a small scale. The old wooden barn, which once "stood across the road from the house in which Henry Ford was born, may symbolize a revolutionary idea—for countless thousands of farmers who visit it today at A Century of Progress are getting from it their first lesson in *industrialized farming*." They will see farm crops transformed into industrial raw materials. The "old barn stands just back of the south end of the Ford Exhibition Building. Close by is an acre from which a lusty crop of soy beans is rising—a reflection of the 10,000 acre soy bean plantation in Lenawee County, Michigan, with which Mr. Ford has been experimenting for several years."

Mr. Ford believes that industry and agriculture are natural partners. He has "been experimenting with soy beans because at this time they seem to offer the greatest number of uses and markets... Already such parts of the Ford car as the horn button and the gearshift knob are pressed out of soy beans."

56. *Automobile Topics (New York)*. 1934. Ford pushes soy beans. Aug. 4.

• **Summary:** "More data regarding Henry Ford's experiments with the soy bean are recorded in 'The Triumph of an Idea'. This new book deals with some of Ford's more recent activities and was published this week. It is recounted that in every one of the 1934 Fords, a half bushel of soy beans is used. The new enamel [paint] is made largely from the oil of the beans, and it is stated that the durability of the finish is so improved that only water is recommended as a polish. Ford is also using soy bean oil for lubricating machinery."

57. *Detroit Free Press*. 1934. Ford advises state farmers: Use of soy beans in industry tested. Aug. 12.

• **Summary:** In a letter Ford wrote to Fred W. Green, former Governor of Ionia, Michigan, he encouraged farmers to turn their attention to the cultivation of soy beans. Mr. Green is interested in the possible use of soy bean by-products in the manufacture of furniture in his plant in Ionia. "'The best possible working plan for any man in our civilization is to have one foot on the soil and the other in industry,' Ford's letter to Green pointed out. To familiarize farmers with some of the uses to which by-products of soy beans are being utilized industrially in his laboratories, Ford is preparing an extensive exhibit for the Ionia Free Fair."

"The oil is the most valuable part of the soy bean... The most startling development in the soy bean experiment at Ford's has to do with making a new body finish [paint] from the oil. The laboratories have worked out a process for producing from the oil a synthetic resin which can be made into an enamel."

58. Christian Science Monitor Bureau. 1934. Chicago finds that soy bean, made up into savory dishes, rivals noted Boston article. *Chicago News*. Aug. 18.

• **Summary:** For the text of this article, see the *Christian Science Monitor* of 18 Aug. 1934.

59. *Christian Science Monitor*. 1934. Chicago finds that soy bean, made up into savory dishes, rivals noted Boston article. 26(223):1. Aug. 18. Central edition.

• **Summary:** This article was written after Henry Ford's gala soybean banquet at the Chicago World's Fair. "Chicago. Aug. 18—Please pass the soy bean salad. Oh won't you have some soy bean soup?" "This soy bean cake is delicious, but after the soy bean croquettes, soy bean apple pie and soy bean coffee you know, one isn't really hungry."

"Remarks like these were heard here last night at a dinner in which the humble soy bean made its social debut. The hosts were the Ford exposition staff who have been exhibiting growing soy beans at the World's Fair all summer and who thought it about time to prove their claims about soy beans being excellent food for people."

"As the dinner advanced some 30 guests who had arrived in a state of anxious expectation, not at all sure they were going to be able to eat their way through the five courses, relaxed and began to enjoy themselves. The soy bean appetizers, which included celery stalks stuffed with soy-bean cheese [tofu], set the pace for an excellent dinner in which every dish and drink was made wholly or in part of the little legume."

"No meat was served and it was not missed. The dish which took the place of the usual roast was soy bean croquettes. The hosts had obligingly furnished the guests with typewritten receipts of the foods they were eating so they were able to find out just how the croquettes were made..."

The man who was responsible for the menu, as well as for most of the recipes, was here to face the guests. He is Dr. A. E. Ruddimer [sic, Dr. E.A. Ruddiman], now chief chemist for the Ford Motor Company, but as one time desk-mate of Mr. Henry Ford's in a little country school in Michigan...

"Soy-bean meals are really only a side line for Dr. Ruddimer [Ruddiman]. He has been greatly interested in perfecting the salted soy bean and in developing synthetic milk from the legume, but the important part of his work, in Mr. Ford's scheme of things, he says, is the discovery of industrial uses for the bean.

"The Ford Company now makes 20 automobile parts and all of its car body enamel out of soy beans. Fortunately none of the parts or enamel got mixed up in the meal last night, which Dr. Ruddimen [sic, Ruddiman] had cooked in Dearborn with the aid of the Ford cafeteria staff to whom he gave much credit. It was brought here ready to serve in automobiles."

Note 1. This exact article was also published in the *Chicago News* on the same day. Note 2. No mention is made of Jan Willemse. Address: Special to the Christian Science Monitor Bureau, Boston, Massachusetts.

60. *St. Louis Globe-Democrat (Missouri)*. 1934. Too much beans. Aug. 21.

• **Summary:** "It is to be feared that Henry Ford, in developing new uses for farm products, is doing a grave injustice to the City of Boston. The Ford Company makes 20 automobile parts and all of its car-body enamel out of soy beans, and now the Ford staff at the Chicago Exposition is trying to prove that soy beans are excellent food for people..."

"As a demonstration of the versatility of the soy bean, the dinner was an unqualified success. But it is a terrible blow to the Boston baked bean..."

"But is Boston the only place that has reason to be alarmed? Admitting that a bean which can take the place of meat, cheese, coffee and dessert might be a great asset if the nation's supply of grain and live stock were further reduced by drouth and crop limitation, what would happen if production of these commodities were normal and soy-bean dinners were served in every household? Brazil's coffee industry would collapse. The hog and cattle market would be demoralized. To prevent disaster to the farmers, the AAA [Agricultural Adjustment Administration (USDA)] would have to concentrate on limitation of soy-bean acreage. There would be no demand for cheese. And if the automobile manufacturer succeeded in developing synthetic milk from soy beans, as he is trying to do, the dairy industry would be in even greater peril.

"Mr. Ford should hesitate before he goes on with his efforts to find new uses for farm products."

Note: This is the earliest document seen (March 2006) that mentions USDA's Agricultural Adjustment Administration—the first major piece of New Deal

agricultural legislation.

61. *Chicago Herald and Examiner*. 1934. Soy beans good any way! Aug. 24. p. 11.

• **Summary:** A photo shows 3 men seated in chairs eating from plates. The caption reads: "Testimony—These gentlemen dining in the executive lounge of the Ford exhibit at the [Chicago] world's fair seem to be delighted with their soy bean dinner. They are left to right: Dr. A.E. [sic, E.A.] Ruddiman, Ford Motor Company food chemist who developed the soy bean recipes. C.V. Gregory, editor of *Prairie Farmer*, and Fred Black, manager of the Ford exhibit. The dinner consisted of soy bean croquettes, buttered green soya beans, pineapple ring with soy bean cheese [tofu] and dressing, and soy bean bread buttered with soy bean relish."

Note the statement that Dr. Ruddiman developed the soy bean recipes; no mention is made of them having been developed by Jan Willemse, as he later claimed.

62. Ford Motor Co. 1934. Menu of dinner served at Ford Exhibit, Century of Progress, August 17, 1934. Dearborn, Michigan. 1 p.

• **Summary:** "Tomato juice seasoned with soy bean sauce. Salted soy beans. Celery stuffed with soy bean cheese. Puree of soy bean. Soy bean cracker. Soy bean croquettes with tomato sauce. Buttered green soy beans. Pineapple ring with soy bean cheese [tofu] and soy bean dressing. Soy bean bread with soy bean relish. Soy bean biscuit [sic, biscuit] with soy bean butter. Apple pie (soy bean crust). Cocoa with soy bean milk. Soy bean coffee. Assorted soy bean cookies. Soy bean cakes. Assorted soy bean candy."

Note 1. No mention is made of soy ice cream being served at this meal in Aug. 1934. Yet shortly thereafter, and definitely by Aug. 1935 soy ice cream for dessert was served at similar meals in the pine-panelled dining room in the Ford Engineering Laboratory (Strother 1961).

Note 2. A 1936 recipe book published by the Edison Institute describes how to make "Soy bean butter: Mix hydrogenated soy oil with salt, coloring matter and diacetyl to color and taste." Thus this product is similar to today's soy margarine.

Note 3. This is the earliest menu seen on which soyfoods appear prominently. Address: Dearborn, Michigan.

63. Hale, William J. 1934. *The farm chemurgic: Farmward the star of destiny lights our way*. Boston, Massachusetts: The Stratford Co. 201 p. Oct. No index. 19 cm.

• **Summary:** This is the earliest document seen (June 2011) that contains the word "chemurgy" (pronounced KEM-ur-jee), or the word "chemurgical"—for Hale coined these terms on page ii, where he states that *chemurgy* is derived from the Greek terms for chemistry (the black art of Egypt) plus work (*ergon*). Thus chemurgy "is that science concerned in the working with and for chemical compounds. The farm is the

great chemurgical plant...” This is also the earliest document seen (June 2011) with “chemurgic” (pronounced kuh-MUR-jik) in the title.

The book, which became the manifesto for an independent chemurgic movement and organization (the Farm Chemurgic Council, formed in May 1935), begins with a history of the rise of the industrial revolution. It began with the mechanical revolution. “By the opening of the 19th century a mighty revolution had come upon western Europe. The direct cause of this upheaval was the invention of the steam engine by James Watt in 1769 [in England]. As precursors to this invention we note the rapid strides in metallurgy...” Soon machines were pumping water from mines and replacing hand labor in the textile mills of England. In 1804 the locomotive was invented by Trevithick, but it was not translated into a steam-powered train on tracks until 1825 by Stephenson. The steamboat of Fulton, however came into the picture as early as 1807 and the first crossing of the Atlantic was accomplished by the S.S. ‘Savannah’ as early as 1819. Thus the mechanical revolution had struck” in England. The great coal beds in the British Isles contributed greatly to its progress. “The mechanical revolution brought man up to a new and higher plane of living. The great contribution of this revolution to mankind was the inauguration of our Industrial Era. This dates from 1856 with the invention of the Bessemer furnace for the production of steel. From that day on mass production and the introduction of replaceable units in manufacture have dominated all industry.”

The chemical revolution, which started in 1850s, began with the manufacture of synthetic dyes such as mauve (from aniline), alizarin, and synthetic indigo. Earlier progress had been blocked by the “lack of a visual conception of the structure of the simplest types of organic chemical compounds. At last in 1865 Kekulé put forth his concept of the structural arrangement of the carbon atoms in the benzene ring. This was the key that unlocked the door to a room of transcendent beauty in color and splendor.”

“The introduction of synthetic silk-like fibre for natural fibre constituted the second great conquest by the organic chemist. As early as 1889 in France we may record the first successful attempts in this direction by Count Hilaire de Chardonnet. In 1905 Cross and Bevan in England introduced the viscose type of artificial silk, commonly called rayon. By 1910 at Markus Hook, New Jersey, our commercial production of viscose silk was under way. By 1926 our plants were producing 60,000,000 pounds of the world’s then 200,000,000 pound output of artificial silk. In 1931 we produced 144,000,000 pounds of the world’s 480,000,000 pound output. In 1933 we manufactured 208,000,000 pounds of artificial silk made up of 76 per cent viscose silk, 17 per cent acetate silk and 7 per cent other types. The world’s total output in 1933 was 650,000,000 pounds. The basis of silk-like fibre is alpha-cellulose.”

Next came the production of synthetic plastics. By 1910 a small plant in New York was making Bakelite, a resin capable of being molded to the desired form under heat. Synthetic plastics began to replace amber, bone, and horn.

The most important date in the early chemical revolution is 1913, the year that Haber-Bosch plant at Oppau, Germany, began production of synthetic ammonia from hydrogen and atmospheric nitrogen at the rate of about 7,000 tons annually. This small plant [which produced explosives and fertilizer] made World War I possible. Without it and its enlargements there would have been no World War in 1914. By 1928 Germany’s production of fixed nitrogen exceeded 400,000 tons per year which amount contains more fixed nitrogen than is to be found in the total annual export of sodium nitrate from Chile... The Haber-Bosch process gives man unlimited command of explosives and fertilizer. Through it the naturally occurring nitrogenous fertilizers are rendered entirely superfluous. This process opened up the air to chemical exploitation.

So the first four major products of the chemical revolution were dyes, artificial fiber, synthetic plastics, and synthetic ammonia. The first stage in the chemical revolution was World War I (1914-1918); the Germans led the world in chemical technology. The second stage was the period of recuperation (1919-23). The third stage was the period of phantom prosperity (1924-28). The fourth stage was the Great Depression (1929-32).

Note: Although Henry Ford’s work with chemurgy, and with plant-based synthetic fibers and plastics is not mentioned in this book (which was published before Ford’s major work began), the book nevertheless gives a good understanding of the background for Ford’s work. Address: Midland, Michigan. Research Consultant, The Dow Chemical Co.

64. Horvath, A.A. 1934. The way to prosperity for the soybean grower. Paper presented at the Annual Meeting of the American Soybean Association in Fayetteville, Arkansas, on Aug. 24, 1934. 3 p.

• **Summary:** With soybeans selling for only \$1.00 per bushel last winter, it is evident that “the growing of soybeans is not a paying proposition. The reason for such a situation lies primarily in the fact that the oil milling industry mainly removes as oil only one-seventh of the weight of the soybeans and markets the remaining six-sevenths in the form of meal, both products being in competition with vegetable oils and meals of other origin, of which cotton-seed oil and meal are in reality but by-products of the cotton industry.

“It is evident that in order to bring about an increase in the price for the millions of bushels of soybeans crushed as well as to create a demand for additional millions of bushels, it is necessary to convert the soybeans into products of higher market value than the original soybean oil and meal, and in this respect the soybean is an exceptionally promising

material. The diversity of industrial uses to which its several derivatives are already put is little short of amazing. As yet, however, we are only beginning to suspect the extent of the potentialities which further scientific research may here discover and which commercial development may transform into actualities."

One of the most promising products is "edible soya flour," which is sold wholesale for 6 to 9 cents per pound. A large market for this product can be readily provided by the Federal Emergency Relief Administration as well as the state and local relief organizations who have the responsible task of providing for the millions of needy and unemployed and their families. To quote the *Washington Sunday Star* of last December 24th:

"When Mr. Wallace (Our present Secretary of Agriculture) was a student at Ames State Agricultural School of Iowa he was making a study of the soybean, and not feeling satisfied with the laboratory experiments, he went on a diet of soy beans for several weeks, recording his own reactions and physical response to the food, with the result that at the end of the time he felt satisfied that the beans were an ample diet and also that he could live on 15 cents a week."

The author then discusses numerous industrial uses of the soybean, as in paint, varnish, linoleum, and soap.

"Soybean oil is quite as effective for mixing with sand to make foundry cores as linseed oil, and the Ford Motor Company has used many thousands of gallons of it for this purpose. The laboratories of the Ford Motor Company have also worked out a process for producing from the oil a resin which can be made into an enamel. Exhaustive tests seem to prove this enamel [paint] superior to lacquer in every respect, from the original gloss to its complete resistance to deterioration. It costs less per gallon and saves tremendously on labor. To match its qualities the chemists are working on a better finish for fenders, employing soybean resin as a coating and soybean oil as a carrier of pigment. One entire class of cars was scheduled to carry this finish.

"The soybean is remarkable for possessing another substance, closely related to the oil, namely the phospholipoid Lecithin, whose only other commercial source of supply is the egg yolk. In a general way lecithin seems to act on fats as a protective colloid, and it tends to prevent the separation of fractional constituents. In Europe the margarine industry absorbs a considerable amount of this lipoid (in Germany up to 500,000 pounds of soya lecithin a year). Lecithin is also being used in the baking and confectionary trades and as an antioxidant for shortening. Soya lecithin has recently found application in the textile industry as a very useful lubricant for both cotton and wool and in the finishing of artificial silk. Soybean lecithin is also a suitable ingredient in making emulsions for greasing chrome leather. Recently it was found that by using soybean lecithin one is able to obtain rubber in powder form by simply milling them together."

Note: Chrome leather is chrome-tanned leather used

largely in the manufacture of shoe uppers.

"Up to the present time all the soybean lecithin used in this country was being imported from Germany and Denmark since the domestic soya lecithin remains in the soybean oil cake (or meal) after most of the oil has been removed by pressure, and as such goes to feed our farm stock. The establishment of a lecithin extraction plant in the United States would provide an additional income of over one dollar per bushel of soybeans."

Finally the author encourages the American Soybean Association to establish a "National Soybean Research Institute."

"Today there is also an urgent need for a 'Soybean Journal' since all the information and material available is at present either completely lost or scattered in fragments in hundreds of publications under various titles.

"It seems highly desirable to promote the establishment of numerous rural industries which could handle the industrial utilization of the soybean in a highly efficient way. They could be owned by individuals as well as by cooperative or other farm organizations." Address: Agric. Exp. Station, Newark, Delaware.

65. *Times (London)*. 1934. Soya beans: An experiment in Essex. Harvesting a crop. Sept. 17. p. 16, cols. 2-3 (photo), 18, col. 4 (article).

• **Summary:** "From our special correspondent—For the first time in the history of British farming, a substantial crop of acclimatized soya beans has been successfully grown and brought to maturity in this country. The scene of this experiment is Fordson Estate, Boreham, near Chelmsford belonging to Mr. Henry Ford and comprising some 2,000 acres. Here about 20 acres of soya bean plant are now being harvested.

"This is the outcome of a previous trial planting with a type of soy bean seeds supplied by Mr. J.L. North, late curator of the Botanical Gardens, Regent's Park... There have been previous experiments in this country in growing soya beans but they were on a smaller scale and not entirely successful. Many attempts on the same lines were also made in Germany with like result. In each case failure was largely due to adverse climatic conditions. At present the principle source of supply to Great Britain is Manchuria, which sends considerable quantities of the soybean here and elsewhere, annually."

The soya beans on the Fordson Estate were planted last May. Four varieties were planted. It was thought that the English summer was neither long enough nor warm enough and the spring and autumn frost would kill the young soy beans. Varieties of soy bean seeds were obtained from America and planted on the estate but they did not mature. At the same time Mr. North who had long been experimenting with soybeans seeds supplied a type of his own collection and it was from these that the present crop had been obtained. [Note that North simply supplied the

seed; he didn't grow it.] A larger quantity may be cultivated next year. The rest of the estate is used to grow wheat, garden produce and fruit. A photo (p. 16) shows a man standing in a very large experimental field of soya beans grown this summer on the Fordson Estate at Boreham, Essex.

Note 1. This is the earliest article seen concerning Henry Ford's testing of soybean varieties in England. Note 2. Boreham, which is about 35 miles northeast of central London, is located at 51°45.4' north latitude.

66. *Chemical Trade Journal and Chemical Engineer* (London). 1934. A British soya-bean crop. 95(2,470):201. Sept. 21.

• **Summary:** In England this year [1934] a crop of 20 acres of soybeans is being harvested on Mr. Henry Ford's 2,000-acre estate at Boreham near Chelmsford. This is the largest successful soybean experiment that has been made in England and promises a very satisfactory yield. It is reported that soya bean oil is used at Ford's works in the United States to make a plastic of secret composition.

Note: Soya bean protein, not oil, is used by Ford to make plastics in the USA.

67. **Product Name:** Soy Bean Oil, and Soy Bean Oil Meal.

Manufacturer's Name: Ford Motor Co.

Manufacturer's Address: Dearborn, Michigan.

Date of Introduction: 1934. September.

Ingredients: Soybeans.

New Product–Documentation: *New Outlook*. 1934. "The schoolmaster of Dearborn." 164:56, 59, 61-63. Sept. "An unpainted weatherbeaten barn of wood sits in Mr. Ford's backyard at Chicago [Illinois] in striking contrast with his huge exposition building in its modernistic dress. The little wooden structure bears a homely board sign: 'Barn from the farm of William Ford, father of Henry Ford. Built 1863. Brought here to demonstrate the possibility of a closer relationship between agriculture and industry...' Mr. Ford explains the presence of the barn this way.... 'Our experiments to date have shown that from soybeans grown in our own farms we can extract oil, which we use in the enamel on our cars. From the residue, after the oil is taken out, we have found we can make steering wheels, timing gears and other parts. The old barn shows how it can be done with machinery which most any farmer can rig up at home from odds and ends. It proves beyond dispute that materials that can be used in making cars can be grown on farms, thus saving our mines and forests...'"

Sweinhart, James. 1934. *The industrialized American barn: A glimpse of the farm of the future*. Dearborn, Michigan: Ford Motor Co. 18 p. Ford's purpose "in exhibiting his 'industrialized barn' is to show the millions of American farmers attending the Exposition how simply the initial process of manufacturing soybean products can be done right on the farm, at home... There are many barns in the

United States, now standing abandoned, that could easily be converted into factories such as is shown at the Exposition. The machinery is simple and easily installed. It can be obtained almost anywhere, at small cost." The extractor is "filled with a solvent, which is generally a high-test gasoline or naphtha." When the machinery is in operation there are about 100 gallons of solvent in the system, flowing continuously in a closed circuit. There is very small fire hazard. The only items that have to be purchased, aside from the few pipe fittings and other accessories needed, are the crushing rolls.

Sweeney, O.R.; Arnold, Lionel K. 1935. "Processing the soybean." 2nd ed. *Iowa State College, Engineering Extension Service, Bulletin* No. 103. 59 p. See p. 55.

68. *New Outlook*. 1934. The schoolmaster of Dearborn. 164:56, 59, 61-63. Sept.

• **Summary:** A detailed report on the author's visit to the many vast Ford Motor Co. exhibits at the 1934 Chicago World's Fair and the lessons it has to teach. In 1893 Henry Ford built his first automobile. "Fifteen years ago Henry Ford said that the history of our public school textbooks is 'the bunk.' [Note: "History is more or less bunk," said Ford on 25 May 1916 in an interview with Charles Wheeler for the *Chicago Tribune*]. He has long displayed an impatience bordering on contempt for the methods of our popular educational system.

"Therefore it become a matter of moment when, as the largest individual exhibitor at the 1934 World's Fair, Mr. Ford assumes the role of schoolmaster in history and does so on a scale so vast that his pupils number millions and include even the wife of the President of the United States. Mr. Ford went into the World's Fair avowedly to educate."

On the lofty circular walls of the Ford Concourse are many aphorisms, below which no signature appears and for which none is needed—such as "If we had more justice, there would be less need of charity." Flanking these are "photomurals of an astounding size and technical perfection... In all eighteen quotations from Mr. Ford's writings are presented. They emphasize the inter-dependence of farm and shop and his creed of low prices and high wages—"The farm and the shop each needs what the other produces"; "High wages and best materials, the only road to low prices"; "With one foot on the land and one in industry America is safe."

In the Century Room he portrays the history of mechanical development from 1830 to date. Soybeans play an important part in the Ford Exposition. "One may hear instructive lectures in Mr. Ford's big white building on... the cultivation of soy beans."

"An unpainted weatherbeaten barn of wood sits in Mr. Ford's backyard at Chicago in striking contrast with his huge exposition building in its modernistic dress. The little wooden structure bears a homely board sign: 'Barn from the farm of William Ford, father of Henry Ford. Built 1863.

Brought here to demonstrate the possibility of a closer relationship between agriculture and industry.’

“As a young man Henry Ford pitched hay in this barn... Mr. Ford explains the presence of the barn this way.... ‘Our experiments to date have shown that from soybeans grown in our own farms we can extract oil, which we use in the enamel on our cars. From the residue, after the oil is taken out, we have found we can make steering wheels, timing gears and other parts. The old barn shows how it can be done with machinery which most any farmer can rig up at home from odds and ends. It proves beyond dispute that materials that can be used in making cars can be grown on farms, thus saving our mines and forests...’

“Ford’s first experiments to bring the farm and industry closer together were made in a laboratory in connection with the Edison Institute, at Dearborn, in 1930...

“It was not until December, 1931, after a long series of experiments with the soybean that Mr. Ford and his chemists felt they, at last, were approaching solution of the problem of finding a basic farm material from which the ordinary farmer could develop a commercially profitable product.

“Centuries of use of the soybean by man have proven three facts: 1–Cultivation of the plant builds up the soil by bringing nitrogen to it, rather than deteriorating the soil as many crops do; 2–The soybean can be used as a highly nutritious food by man and beast; and, 3–It contains oil and other products which are coming to have a commercial and industrial value.

“There is no need, as Mr. Ford sees it, to exhaust the mines and forests if the material required can be grown on the farm; and, in addition, the growing of the material on the farm will give to the farmer, when markets are developed, another source of cash.”

69. *Oil and Soap*. 1934. The world’s fair and the Oil and Soap Chemists. 11(9):194-95. Sept.

• **Summary:** “In the scientific exhibits of the World’s Fair of 1934 the soy bean, as a source of basic materials, is occupying a prominent place because of the bean’s variety of economic appeals. Three exhibits in which soy beans are shown as an oil source susceptible of great development are those of the Ford Motor Company, the University of Illinois and the Sherwin-Williams Company. In the latter soy bean oil appears as a paint base with some limitations.

“Dealing with the soy bean as an agricultural product the University of Illinois exhibit in the Food and Agricultural Building shows the possibilities of this plant as a profitable crop. In the past year, 4,350,000 bushels were produced in the state...

“The University exhibit includes samples of jars of various grades of soy oil which may be used in hard and liquid soaps. There are also exhibits of varieties of soy beans and of soy bean flours and bakery goods made from them.

“Henry Ford has been a consistent advocate of soy beans

as a farm crop as part of his program for the industrialized farm, in which the farmer will have a variety of ways of turning his crop into money. In the Ford exhibit at the Fair the Ford ‘Industrialized Barn’ is surrounded on two sides by plots in which soy beans are growing as demonstration of the vigor and productiveness of the plants.

“The barn is the original Ford homestead barn built in 1863 near what is now the city of Dearborn, Michigan. The building was taken up and transported to the Fair, partly for its sentimental interest and partly as a demonstration of how a farmer may transpose his old home barn into an industrial unit. A soy bean processing plant is built around the interior of the barn, the engine being outside.

“Units of the oil extractor are of simple design and made chiefly of standard piping and sheet metal that any mechanic could put together. The crushing rolls and a few accessories are the only parts that need be purchased.

“Oil extraction operation in this plant is by solvent. The beans are taken from storage in dry sheds, tempered to 12 per cent moisture content, then gravity fed to a series of five rolls between which they are progressively reduced to flakes of minimum thinness. The flaked beans are then passed by conveyor through a counter current of solvent, gasoline being used in the exhibit. The gasoline is distilled out of the solvent-oil solution and re-used. Flakes come through the process reduced to 2 per cent oil. The solvent is steamed out of the flakes, they are dried and ready for further conversion into food or industrial products. A paper concerning soy bean oil extraction is scheduled for the morning of Oct. 11 of the A.O.C.S. [American Oil Chemists’ Society] meeting.

“A soy food exhibit in the Ford barn shows soy flours, cheese, milk, butter, sprouts, salad dressing and various bakery goods. Dinners have been served at the Ford exhibit at which a number of guests have sat down to meals of which the entire menu was contrived from soy beans in various disguises. Plastic uses of the soy bean also are shown. Light switch assemblies are molded in a demonstration operation. Gear shift knobs and other small parts are exhibited. The entire exhibit is a forceful educational effort in which Henry Ford’s campaign to urge the raising of crops that will provide the farmer winter employment as manufacturer is centered on the soy bean.”

A photo at the bottom of p. 195 bears the caption: “This crude barn, originally built 71 years ago on the farm of Henry Ford’s father at Dearborn demonstrates to the World’s Fair visitors what has been called ‘Henry Ford’s solution to the Farm Problem.’”

70. Sweinhart, James. 1934. The industrialized American barn: A glimpse of the farm of the future. Dearborn, Michigan: Ford Motor Co. 18 p. Undated.

• **Summary:** The “industrialized American barn” nestles in the shadow of the great Ford Exhibition Building at the Century of Progress Exposition in Chicago. Ford’s first

experiments to bring the farm and industry together were made in a laboratory in connection with the Edison Institute, at Dearborn, in 1930. It was not until December, 1931, that, after a long series of experiments with the soybean, Ford and his chemists felt they were approaching a solution to the problem of finding a basic farm material from which the farmer could develop a commercially profitable product.

Ford's "interest in and cultivation of the soybean as a part of his efforts to bring prosperity to the American farmer will undoubtedly prove a great stimulus to the growth of the soybean... Last year Mr. Ford had more than 7,400 acres* planted in soybeans, on his huge farms in Lenawee County, Michigan, yielding approximately 100,000 bushels. During 1932 and 1933 he expended approximately \$1,225,000 on his soybean experiments and his work along this line is continuing today and represents one of his closest personal interests." Ford's purpose "in exhibiting his 'industrialized barn' is to show the millions of American farmers attending the Exposition how simply the initial process of manufacturing soybean products can be done right on the farm, at home... There are many barns in the United States, now standing abandoned, that could easily be converted into factories such as is shown at the Exposition.

"The machinery is simple and easily installed. It can be obtained almost anywhere, at small cost. Much of it is standard piping... The rollers flatten the beans into thin flakes and they then pass into the extractor." A pipe is fixed at a 10-degree angle to the floor and "filled with a solvent, which is generally a high-test gasoline or naphtha." "When the machinery is in operation there are about 100 gallons of solvent in the system, flowing continuously in a closed circuit." There is very small fire hazard. The only items that have to be purchased, aside from the few pipe fittings and other accessories needed, are the crushing rolls.

Photos show: (1) An exterior view of the barn with smokestack, the words "Ford Industrial Barn" written in large letters over the door. (2) Henry Ford hunkering down to inspect a patch of soybeans; his left hand is touching the plants and his right hand holds his straw hat. (3) Two round gear shift knobs made of soy bean plastic. (4) A field with a "bumper crop" of soy beans. (5) The "interior of the industrialized barn at the Ford Exposition." (6) The "Soybean Experimental Station at Greenfield Village" (fields of soybeans are growing in front of the Chemical Laboratory). (7) The light switch assembly, horn button, and coil case, each made of soy bean plastic.

Concerning the history of the soybean, p. 7 states: "How far back man began to cultivate the [soy bean] plant no one knows—one authority estimates 25,000 years. Certainly it was cultivated and highly valued as a food as a food in China and Japan for centuries before written records were kept. One of the earliest instances of its being mentioned is in a Chinese remedy book, or materia medica, written by the Emperor Shen Nung in 2838 years before Christ... It was a

New England clipper ship, back from trading along the China coast, that, in 1804, first brought soybean plants to the United States..."

Note 1. This is the earliest document seen (Sept. 2003) which estimates that the soybean was first cultivated 25,000 years ago.

Note 2. This is the earliest document seen (June 2003) that uses the term "clipper ship" in connection with the introduction of the soybeans to the United States.

Note 3. * This undated booklet may have been first published as early as 1933, since (1) in 1932 Ford planted 8,200 acres of soybeans, and (2) he was thinking along these lines with his Ford Exposition of Progress in Detroit and New York in 1933, where he was showing how agricultural raw materials were transformed into auto parts. It was definitely published by 1934, since it was widely distributed at the Ford Exposition of the Chicago World's Fair which opened in the summer of 1934 and which featured the Industrialized American barn which was viewed by millions of attendees. Address: Michigan.

71. McKown, Dallas. 1934. Saga of the soy: When scientists and farmers get together, even beans can join the wonders of the world. *Country Home*. Oct. p. 10-11, 32-36.

• **Summary:** From December 1933 until December 1939 Dr. A.A. Horvath was employed at the Agricultural Experiment Station of the School of Agriculture, University of Delaware, in Newark, New Jersey. There he was head of the chemistry department. This article, in which a friendly soybean farmer tells the author how Dr. Horvath arrived in town to begin his work at the experiment station, gives a good sense of Dr. Horvath's dedication to the soybean.

"He came to town last fall to take over his new job at the station. Soon as he'd rented a house and washed up he went down to the business men's clubs and asked if they wanted a speech on soy beans. Don't know if they did or not but he gave the speech anyhow. And at the luncheon where he talked he fed 'em rolls and doughnuts made from soy-bean flour."

"Next he went down to see Mrs. Fader, who runs the bakery in town. Talked her into making up some soy-bean bread. Told her where to order her flour, and when it came he went down with a recipe and a pair of good strong arms and helped her mix the first batch of dough."

"Trouble was, nobody in town had ever heard of soy-bean flour bread, although all us farmers around here have been growing the crop for years. So he had to be Mrs. Fader's salesman and spread the word around. He was pretty good. She sold her first dozen loaves in a couple of days. Saw her the other afternoon and she says before closing up time Saturday nights she's sold over a hundred loaves in the week, right there in that little town."

"Next he pestered the grocery store into stocking up on soy-bean salad oil and cooking oil. He talked the arm off our hardware man and got him to put some soy-bean oil paint on

his shelves. Won't quit, I guess, until every store in town sells soy beans in one form or another."

Dr. Horvath told the author directly: "In China 15 years ago I went soy-bean a hundred per cent." He explained that the enamel [paint] on his black Ford car was made of soy bean oil. The horn button and the gear-shift knob were made from soy-bean meal [plastic]. And the castings in his car were poured into molds of sand mixed with soy bean oil. The author adds: "My head started to go around. This made alchemy appear pale and weak."

Dr. Horvath continues: "It's a good thing for American farmers that Henry Ford is interested in the soy bean. He grows 10,000 acres a year and does most of the research here on the industrial uses of the oil and meal. He has a theory, you know, that a good share of a finished automobile can come off the farm. He has one laboratory where chemists are working with nothing but soy beans."

"In Peking the Chinese Government has a great central laboratory where they research the soy. The Soviets have a research institute for the same purpose in Moscow. But we have none in the United States."

72. Cameron, W.J. 1935. *Farms and motors*. Dearborn, Michigan: Ford Motor Co. 4 p. Feb. 24. 18 cm.

• **Summary:** This is the text of a radio talk given on the Ford Sunday Evening hour on 24 Feb. 1935, number 21 of the 1935-36 Series broadcast over the Nation-Wide Network of the Columbia Broadcasting System from Orchestra Hall, Detroit. It describes basic chemurgic concepts (though neither the terms "chemurgy" nor "chemurgic" are used) and the work of the Ford Motor Co. to realize their objectives and meet its goal of making 1 million cars this year. There is a new tie-up between factory and farm. "We paint Ford cars with soy beans." Address: Ford Motor Co., Dearborn, Michigan.

73. MacConkey, C.A. 1935. *Soybeans*. Ottawa, Canada: Div. of Research Information, National Research Council, Ottawa. 93 p. March. 28 cm. [152 ref]

• **Summary:** A very important and interesting book. In 1932 the first two sections of this report were prepared; in 1934 the third section was added in order to bring it up to date. Contents: Summary of Part I. Summary of Part II. Summary of Part III. Part I (p. 14): Cultivation, utilization and trade. Introduction. Cultivation: Varieties, differences, maturity, hardness, color of bean, climate, soil, seeding, harvesting. Production of oil and cake. Applications: Introduction, the plant (forage, hay, pasturage, silage, soilage, straw, soil improvement and fertilizer), the bean (grain, flour, soy sauce, bean curd [tofu], vegetable beans, other uses), the cake (cattle feed, flour, fertilizer, other uses), the oil (general, the soap industry, the paint and varnish industry, the food industry). The soybean industry in the United States: Importance of the crop, history and development (incl. Henry Ford who is said

to have 10,000 acres under cultivation), standards (classes of soybeans), production of oil and cake, consumption of soybean oil, export trade in soybeans. Statistics of world trade: Beans (production, exports, imports [statistics, pre-war average {1909-13} + 1926-1931 for Germany, Japan, Denmark, UK and British Empire countries, Dutch East Indies, Sweden, Italy, Formosa, and Holland], consumption [net imports], prices), oil (production, exports, imports, consumption, prices), cake (production, exports and imports). Statistics of the German oil seed industry: Oil seeds in Germany [by far the world's largest soybean importing country and largest European producer of soybean oil] (imports and exports), vegetable oils (production, consumption and value), oil cake and meal (production, imports, exports, consumption and relative values), soybean experiment stations in Germany.

Part II (p. 56): Development in Canada. The difference between growing soybeans for forage and for seed. Present status of soybean cultivation in Canada. The future for soybeans on the Prairies. Extent of Canadian Experimentation. Varieties suitable for Canada. The climates of Manchuria and Canada. Planning the development of soybeans in Canada. Consumption of vegetable oils in Canada by industries. Consumption of oil cakes in Canada. Firms engaged in the soybean industry in Canada. Casein in Canada.

Part III (p. 69): Survey of the Literature, 1931-34. Cultivation. Green manure. Breeding. Germination of seeds. Diseases and parasites. Soil. Manufacture of oil cake. Composition of the soybean. Properties and composition of soybean oil. Feedstuffs. Edible products. Detection in food (e.g. detection of soybeans in wheat flour, pasta, meat products, etc.). Inedible products. Economics. Table (p. 79-80)—Imports of soy products into Canada: Soy sauces (1931-1933), edible peanut and soyabean oil, peanut and soyabean oil for the manufacture of soap and peanut oil for canning fish, soybeans, soyabean cake and soyabean meal for use exclusively in the manufacture of cattle food and of fertilizers. References (102). Other references (Nos. 103-117). References not consulted (35).

The section titled "Development in Canada" (p. 56-62) states: "Soybeans are at present being grown for seed on a commercial scale in southern Ontario, chiefly in Kent and Essex Counties [the Niagara Peninsula]. Prior to 1931 the acreage under soybeans was about 1000 or 1500. The efforts of persons interested in establishing oil mills increased this to about 5000 in 1931 and to 6000 or 7000 in 1932. The average yield of seed has been about 23 bushels per acre, which is quite equal to yields in the U.S., while another variety, the A.K., has yielded at the rate of nearly 40 bushels per acre during a six-year test at Harrow, Ontario."

"T.B. Macaulay, President of the Sun Life Assurance Company of Canada has been experimenting for a number of years on the growing of soybeans in the hopes of being able

to make the western farmer more free from his dependence on wheat, and believes that he is near to discovering suitable varieties...

"A statement appearing in the *Montreal Financial Times* (Nov. 18, 1932) reports that a number of varieties introduced from Urbana [Illinois] and tried in various parts of Alberta made an excellent growth of forage...

"The work being carried out at T.B. Macaulay's experiment farm at Hudson Heights, Quebec, is particularly worthy of mention. Here the testing of varieties has been in progress for 8 years. Mr. Macaulay's method of approaching the problem consists in obtaining samples of hitherto untried varieties from the most northerly regions where soybeans grow and the earliest varieties from Asia and elsewhere... Mr. Macaulay has a new variety which he calls Toyanaga. It matures 5 days to a week earlier than the variety called Manchou, which is being grown to a small extent in southern Ontario."

"Varieties suitable for Canada: Besides O.A.C. 211 which is the one outstanding variety that has shown itself suitable for cultivation in Canada albeit only in southern Ontario, a number of other varieties have been tried and experimented with such as Mandarin, Manchou, Wisconsin Black, Quebec 92, Quebec 537, Early Yellow, Early Brown, and Manitoba Brown, but none of these have been very satisfactory."

Table 29 (p. 60) gives a summary of current (1932) Canadian experiments with soybeans: Ontario Agricultural College (Guelph), grown for 39 years (i.e. since 1893), tested 125 varieties. Dominion Experimental Farms (Ottawa and Harrow, Ontario), 9 years, 100 varieties. Macdonald College (Quebec), 20 years, 16 varieties. Manitoba Agricultural College (Winnipeg), 10 years, 12 varieties. University of Alberta, Edmonton, 3 years, 7 varieties. Brooks (Canadian Pacific Railway Irrigation Experimental Station, Alberta), unknown number of years and varieties. Pointe Platin (Quebec, by J. deLothinière [deLothiniere]), unknown number of years and varieties. Hudson Heights (Quebec, by T.B. Macaulay), 8 years, 100 varieties. University of Saskatchewan, 10 years, 25 varieties.

Page 65 lists "Firms Engaged in the Soybean Industry in Canada." The Soy Bean Oil and Meal Co-operative Company of Canada, Ltd., Chatham, Ontario; Canadian Soyabeans Ltd., Milton, Ontario; The Vitone Co., Hamilton, Ontario; Dominion Soya Industries, 355, Place Royale, Montreal, Quebec.

Note 1. This is the earliest document seen (Jan. 2010) that mentions Dominion Soya Industry, Ltd. (Montreal, Quebec, Canada) in connection with soybeans.

Table 33 (p. 67) gives "Consumption of oilseed cake and meal in Canada" for the calendar years 1926 to 1931. Figures (taken from *Trade in Canada*) are given for cottonseed, linseed, palm nut, soya and total. Consumption of soya cake and meal (in tons) were: 200 in 1926 (0.6% of total); 680 in 1927; 560 in 1928; 1,560 in 1929 (5.0% of the total); 1,190 in

1930; and 2,500 in 1931. The value in dollars rose from \$8,000 in 1926 to about \$50,000 in 1931. Apparently all of this soyabean cake and meal was imported.

Note 2. This is the earliest English-language document seen (Dec. 2005) that uses the term "soyabean meal" to refer to ground, defatted soybeans. Address: Div. of Research Information, National Research Council, Canada.

74. Horvath, A.A. 1935. Continuous extractors for soybean oil. *Oil, Paint, and Drug Reporter* 127:33, 51. April 22.

• **Summary:** The three basic types of continuous extractors are the Bollman [Bollmann] system, the Boehm system, and the Ford system. A detailed description and diagram of each system is given, with all main parts labeled. Address: Newark, Delaware.

75. Shoenfield, Allen. 1935. 500 called to Dearborn for Ford's conference. Means of realizing new era to be talked over; Speakers engaged for May 7-8 sessions at Dearborn Inn. *Detroit News*. April 28. p. 1.

• **Summary:** "Regarded by leaders of industry, agricultural experts, and political economists as the most significant conference of its kind ever projected, the meeting planned for the Dearborn Inn, Dearborn [Michigan], May 7 and 8 to consider the utilization of farm wastes and farm by-products in industry may mark the beginning of a wholly new era in chemical research.

"The conference, sponsored by Henry Ford, will summon to Dearborn more than 500 persons of recognized inventive and administrative genius to concentrate on a practical program of interrelating agriculture, industry and science.

Ford's long cherished dream of literally growing from the soil the raw materials for clothing, furniture, houses, automobiles and machinery of all kinds is not thought to be close to realization; but it is believed economic conditions have warranted the attempt to industrialize the American barn.

The keynote of the conference is found in Ford's statement that: "I believe that industry and agriculture are natural partners. Agriculture suffers from lack of a market for its products. Industry suffers from a lack of employment for its surplus men. Bringing them together heals the ailments of both.

"I see the time coming when the farmer not only will raise raw materials for industry but will do the initial processing on his farm. He will stand on both his feet—one foot on the soil for his livelihood; the other in industry for the cash he needs. Thus he will have a double security. That is what I am working for!"

"The conference is considered portentous in that it is scheduled to take place on the 300th anniversary of the founding of the chemical industries in America." A detailed list of topics and speakers is given.

David L. Lewis (1976, p. 486) states: "The Dearborn Inn,

one of the nation's first airport hotels, retains the charm that has made it a pleasant hostelry ever since it was opened by Henry Ford in 1931."

76. *Bureau Farmer (Illinois Agricultural Association Section)*. 1935. Paint company [Glidden] erects new soy oil plant. 10(8):8. April.

• **Summary:** The article describes the growing interest in soybeans, the erection of a new \$650,000 plant for processing soybeans by the Glidden Company in Chicago, and the value of soybean oil in paint.

"While Henry Ford has long preached the advisability of using soy oil in paints and enamels and lacquers, it remained for the federal and state experimental agencies and the Farm Bureau in Illinois to pioneer the use of paint containing soy oil. Long ago, it was found that soy oil turns yellow less rapidly than other oils used in paints, such as linseed oil, and that it holds its original color longer."

Note: This is the earliest English-language document seen (Sept. 2006) with the term "soy oil" in the title.

77. Joyce, H. 1935. The method of soybean oil extraction as developed at the Edison Institute of Technology. *Oil and Soap* 12(4):68-70. April.

• **Summary:** "The Edison Institute of Technology was founded in 1929, by Mr. Ford in honor of Thomas A. Edison. The purpose of the Institute is to train students along the lines that Edison pursued in his work and to give them an opportunity to study farm products for industrial possibilities.

"In Mr. Ford's Early American Village, in Dearborn, the Edison Institute has its research laboratory which is large enough for semiplant production..."

"... it was found that the meal could be utilized in the manufacture of plastic material and the oil in making enamels for the car. The meal, to be satisfactory for use, in the plastic, however, had to have an oil content of 2% or lower. We decided to develop an extractor because the previous methods of extraction did not remove the oil to this extent with sufficient speed and economy..."

"We wanted to build an extractor suitable for our needs and one that the farmer could afford to buy and operate."

"Aviation gasoline, light petroleum naphtha and Hexane can be successfully used [as solvents] because of a satisfactory boiling range and specific gravity."

"Our present solvent is aviation gasoline with a boiling point of 116°... This extractor was in the Industrialized Barn at 'A Century of Progress' at the opening of the Fair. The barn was displayed to show a closer relationship between agriculture and industry..." A detailed description of the extractor is given.

Note: This is the earliest document seen (May 2011) that mentions "Hexane" in connection with soybeans—as a potential solvent for extraction. However Robert Boyer, in

his 1985 *Reminiscences*, states that experiments with soybean oil extraction using hexane solvent started in 1933. That year, at the Ford Exposition of Progress in New York City, Ford had a glass model of this extractor that used hexane solvent. Address: Edison Inst., Dearborn, Michigan.

78. *Prairie Farmer*. 1935. Crops into cars. May 23. *

79. Bowdidge, Elizabeth. 1935. The soya bean: Its history, cultivation (in England), and uses. London: Oxford University Press. xii + 83 p. Foreword by Sir John T. Davies (Director, Ford Motor Co., Ltd.). Illust. 20 cm.

• **Summary:** Contents: 1. Introduction. 2. The soya bean in the East: Europe, United States, Canada. 3. Description of the plant: Results of experiments in England, the 1934 experiment in Essex, yields from the four varieties, description of the four varieties, composition of English and other varieties. 4. Culture of the soya bean: Soil requirements, inoculation of the seed, preparation of soil, rates of seeding, sowing seed, cultivation, fertilizers, harvesting the crop, threshing, storage, yields in various countries, soya bean prices. 5. Soya bean hay: Feeding values, time of cutting, soya straw, soya in the mixed crop (in mixed cropping plans with sorghum, maize, etc.). 6. Soya beans for soil improvement. 7. By-products of the soya bean: Oil and its uses, notes on experiments in breeding for oil, methods of extraction, soya cake and meal, results of comparative feeding tests. 8. Food products of the soya bean.

This book describes the successful introduction and cultivation of soybeans in England. The Foreword notes (p. v): "In past years no sustained effort has been made to grow the plant on a large scale in England. The Royal Agricultural Society devoted several years to experiment at Woburn, but in 1914 they reported that the plant was quite unsuitable for growth in this country as it required more warmth than could be obtained here. The British Board of Agriculture reported in 1916 that 'the Japanese and Manchurian varieties hitherto tested cannot be relied upon to produce seed in this country.'"

In the Preface (p. ix) Ms. Bowdidge acknowledges: "That very able and unique work *The Soybean*, by Messrs. Piper and Morse, has been my principal source of information."

"Efforts to introduce the [soy] bean to English agriculture were begun in 1909 and given up in 1914, and except for the work of Mr. J.L. North nothing further has been done" (p. 9).

The section titled "Results of experiments in England" (p. 15-17) states: "One of the first attempts to acclimatize the soya bean in England began in 1914 at the Royal Botanic Gardens, Regents Park, when it was shown by Mr. North that certain varieties could be 'advanced' sufficiently to produce a mature crop towards the end of September. Many years devoted to careful selection of seed from the varieties in his collection had resulted in several early strains. In 1928, a hybrid was received from Canada which, on passing the experimental stage, was planted out on a number of small

plots in various parts of the country. It proved to be a very reliable cropper and matured earlier than any of the sixty varieties previously under test. Planted in the first week in May it was harvested at the beginning of September, and reports of good results came from Middlesex, Essex, Berkshire, Oxfordshire, and Hampshire.

"The largest experimental test ever conducted in this country took place in 1933 at Boreham, Essex, when forty-seven different varieties of the soya bean originating from North America, Canada, Manchuria, and Japan were grown under observation. The selection included four varieties which had been acclimatized by Mr. North. Mr. North was engaged to supervise operations, and 50 lb. of his special seeds was purchased. The results obtained were most interesting."

"There is no doubt at all that the four varieties acclimatized by Mr. North were a great success; two reached maturity on September 1st and two on September 6th. In many cases plants bearing between 300 and 400 seeds were harvested."

"It has been found by Mr. North in the course of more than twenty years' study of the subject, mainly with foreign beans grown in various parts of the country, that no variety of soya bean has any chance of success in England unless it matures in less than 100 days in America. Varieties requiring this length of time in America need nearly a month more in this country and, owing to our colder spring weather, no advantage is gained by earlier sowing. Mr. North's seeds require 124 to 127 days to reach maturity in England but, if grown in America, they would only require 85 to 90 days."

The section on "The 1934 Experiment in Essex" (p. 17-23) notes: "The result of the 1933 experiment was so encouraging that it was determined that a further attempt should be made in 1934 to ascertain whether it would be possible to grow the plant profitably as a field crop and, with this in view, a field of nearly 20 acres was specially prepared for the acclimatized seeds from the 1933 crop."

Joseph Bramah, an English engineer, invented the hydraulic press in 1796, leading to a "great advance in the oil-extraction industry." All "old methods in the western world immediately gave place to the new appliance." More recently the method of solvent extraction has been developed; it is now used throughout the world and removes nearly all the oil from the seeds (p. 69).

"There is plenty of evidence as to the efficiency of soya meal in live-stock feeding, yet it does not appear to be used in this country as widely as its feeding value merits. The prejudice formed when it was first introduced in England as dairy food seems still to exist. It was thought at that time that the use of the meal might affect the taste of milk and butter; but, although this was disproved later, England remains a small user" (p. 72).

Food products of the soya bean (p. 80-83): "It is unfortunate that the inherent conservatism of English

people to anything new has been the cause of past failures to popularize soya bean food products for consumption in this country. The bean contains iron, magnesium, calcium, and other mineral salts; phosphorus in the form of lecithin makes it valuable in cases of nervous disorders..."

"Soya 'sprouts,' which have been grown and used for centuries in the East, have recently been introduced as a green vegetable. The beans gathered before ripe and prepared in the same manner as green peas are a very satisfactory vegetable and the dried beans, if soaked for forty-eight hours, may be cooked like haricot or butter beans and make a most delicious and nutritious vegetable dish."

There is no doubt that soybean products are gradually becoming established in Western countries. We sometimes eat soybeans without knowing it. "The bean, when properly prepared by roasting, makes an excellent cereal beverage which looks, smells, and tastes like coffee; a sauce, appropriately seasoned with spices, is the so-called 'Worcester Sauce,' and soya soups made from the bean taste like beef extract. During the late war, when Germany found herself on the verge of starvation, glutamic acid, produced from the soya bean, was used in German hospitals to form the basis of beef-tea, and it is said that the ground bean also was used at that time for the making of bread. Soya bread, made from properly prepared flour, is obtainable in England and is stated to be of high nutritive value" (p. 81).

Soya flour has long been used in foods for diabetic persons requiring a low starch diet. "The flour contains more protein and fat, and less carbohydrates than ordinary cereal flours, and a certain variety manufactured in England is stated by the proprietors to contain 42 per cent. protein and 20 per cent. fat, having good keeping qualities, 0.13 per cent lecithin phosphoric acid and the vitamins A, B, D, and E. There are many food products on the London market under the names that conceal their soya bean origin. Just before the late war [World War I] an enterprising English firm was making great strides with soya products. Vegetable butter, biscuits, cocoa, milk chocolates and other confectionery, cream, cakes, bread, &c., proved quite a success until a war-time embargo placed upon the importation of soya beans put a stop to the business; the organizers eventually went to America! (p. 82).

The author concludes (p. 83): "The soya bean is by far the most valuable of all known beans and our farmers ought to make a serious effort to grow it. It has already been shown that the acclimatized bean will grow in this country, and if crops can be raised profitably and on a commercial basis, a service will be rendered both to the farmer himself and to the country."

Excellent photos show (see p. xiii): (1) A typical example of the soya bean plant grown at Boreham, County of Essex, in 1933. (2) The soya bean plant in full maturity. (3) Bags of English acclimatized soya beans harvested on Fordson Estates, Boreham, Essex, in 1933. Left to right: Brown 'C'

yellow 'J', black 'O', and green 'Jap'. (4) A sturdy specimen of the 'Jap' soya bean plant grown at Boreham, Essex in 1934. (5) The 'J' variety. (6) The 'O' variety (for hay) at the seed stage. (7) Aerial view of the soya bean field as it appeared on 29 Aug. 1934. (8) Soya beans inoculated the previous day being fed into the horse-drawn drill prior to sowing. (9) A man seated on an ordinary horse-drawn grain-drill, planting soya beans in rows wide enough to enable cultivation later on. (10) Six men stooping in a field, planting small quantities of different varieties of soya beans by hand in 30-inch rows. (11) A man walking beside a horse pulling a cylindrical roller, which helps to give the seeds a better growth and even stand. (12) Harvesting soya beans with a reaper and binder pulled by a tractor. (13) Threshing soya beans in 1934 with a mechanical 'Ruston' Thresher; many beans were split. (14) Loading sacks of soya beans onto an open-bed truck for conveyance to storage barns. (15) The first English rick of soya hay, grown in 1933. (16) Baled and trussed soya bean straw being ricked; a man is shouldering a bale atop the rick with a ladder propped against one side. (17) Heated cakes of crushed soya beans ready for hydraulic pressing at Erith Oil Mills, Ltd. (18) Soya bean cakes, after leaving the press, are passed through a paring machine where the edges are trimmed at Erith Oil Mills. Address: England.

80. Product Name: Soybean Oil, Soybean Oil Meal, Dominion Soya Powder (Soybean Flour for Industrial Uses).
Manufacturer's Name: Dominion Soya Industries.
Manufacturer's Address: 355, Place Royale, Montreal, Quebec, Canada.

Date of Introduction: 1935. May.

Ingredients: Soybeans.

How Stored: Shelf stable.

New Product–Documentation: C.A. MacConkey. 1935. Soybeans. Ottawa, Ontario, Canada: National Research Council. p. 65. "Firms Engaged in the Soybean Industry in Canada." Dominion Soya Industries, 355, Place Royale, Montreal.

Note 1. This company was incorporated as Dominion Soya Industry Ltd. in Oct. 1935.

F. Dimmock. 1936. "Division of Forage Plants: A report on the present status of the soybean industry, particularly in western Ontario." In: National Research Council of Canada. 1936. Proceedings of the Second Conference on Soybeans. Ottawa, Canada. Appendix "B." p. B-2. "As the centre of soybean production [in Canada] is located in western Ontario, it is only natural that the mills for utilizing the crop should be located there also. The one exception is the plant of the Dominion Soya Industries, 2049 Harvard Avenue, Montreal, Quebec."

Note 2. The company apparently moved to Harvard Avenue from 355 Place Royale, or maybe the plant was in one place and the offices in another. "The plant of the Dominion Soya Industries, Montreal, P.Q. [Quebec], commenced

operations in the spring of 1935. This mill uses the solvent process and has a single unit extractor built by the Ford Motor Company. Besides oil and meal, soybean flour is also produced... This plant is now operating and has a capacity of about 100 to 150 bushels of beans a day."

D.L. Calkin. 1936. "Report by Dr. Whitby of interview with Mr. Calkin." In: National Research Council of Canada. 1936. Proceedings of the Third Conference on Soybeans. Ottawa, Canada. Appendix "B." p. B-1. This company, now named "Dominion Soya Products Company," originally intended to put in a German plant for the extraction of oil but ultimately decided to put in an inexpensive solvent extraction plant developed by the Ford Motor Co. Aviation gasoline is used as the solvent, but it is not entirely satisfactory, since it leaves an odor in the finished product.

Note 3. This is the earliest known commercial soy product made in Quebec province, Canada.

81. Ford Motor Company. 1935. We paint Ford cars with soy beans (Ad). *Ford News (Dearborn, Michigan)* 15(5):Rear cover. May.

• **Summary:** "The farmer's service has been extended. Once his main job was to keep the nation's dinner table supplied. Now he also supplies materials for industry.

"The farmer helps to build Ford cars and trucks, and the Ford Motor Company helps to make farming more efficient and convenient. We help each other and that helps the country.

"The enamel developed by Ford chemists for finishing our cars gets one of its principal ingredients from the farmer's fields. That is why we say 'We paint Ford cars with soy beans.'

"To make a million V-8's this year, we must use the labor and products of thousands of farmers. The harvest of hundreds of thousands of acres will go into the production of the Ford car."

From the fields, Ford will use 69 million lb of cotton, 500,000 bushels of corn, 2.4 million lb of linseed oil, 2.5 million gallons of molasses from sugar cane. From the pastures Ford will use 3.2 million pounds of wool from 800,000 sheep, 1.5 million square feet of leather from 30,000 cattle, lard from 20,000 hogs, and 350,000 lb of mohair from 87,500 goats.

Note 1. The quantity of soybeans used is not given. Note 2. This ad also appeared in *The Country Home* (May 1935, p. 29).

82. McCarroll, R.H. 1935. Increasing the use of agricultural products in the automotive industry. In: Farm Chemurgic Council, ed. 1935. Proceedings of the First Dearborn Conference of Agriculture, Industry, and Science. Dearborn, Michigan: FCC. 256 p. See p. 57-66.

• **Summary:** This speech was presented at the above-mentioned Conference held on 7-8 May 1935 at Dearborn, Michigan. It describes the use of soybeans in the Ford plant,

and its importance to the farming industry. A discussion follows the presentation. "Perhaps there is no better way of introducing this discussion than to quote a brief statement made by Mr. Ford recently. 'I foresee the time when industry shall no longer denude the forests which require generations to mature, nor use up the mines which were ages in making, but shall draw its raw material largely from the annual produce of the fields... I am convinced that we shall be able to get out of yearly crops most of the basic materials which we now get from forest and mine.'

Now while this is a long-range view of a rather ambitious program, we have already made a very definite start toward fulfilling it. There are two distinct aspects to this problem of helping the agricultural districts. The first deals with a greater use of farm products in industry, which we shall discuss from the automotive point of view. The second, with the decentralization of industry or the taking of industry out to the farm or the rural community. As to the latter, we now have twenty small plants in rural districts: seven of these near Dearborn employ 2,400 part-time farmers."

The Ford Motor Co. was already a good customer of the farmer. The company's "million-car program for 1935 will call for the cotton from 433,000 acres, the wool from more than 800,000 sheep, the hair from 87,500 goats, 11,200 acres of corn, 12,500 acres of sugar cane, and 61,500 acres of soy beans—to mention only a few of the products...

"How far back man began to cultivate the soy bean plant no one knows... One of the earliest instances of its being mentioned is in a Chinese remedy book, or materia medica, written by the Emperor Shen Nung in 2838 B.C. It was a New England clipper ship, back from trading along the China coast, that in 1804 first brought the plant to the United States..." Note: This brief ancient history is taken from J. Sweinhart. 1934? "The Industrialized American Barn."

"Our large scale work on these beans started in 1932 with the planting of 8,000 acres. About 300 varieties have now been tried on our experimental farm. The quantity of beans we have raised has been sufficient for only a small percentage of our requirements. It has, however, supplied the needs for our experimental processing.

"It was realized at the start that the first and greatest need was a simple processing unit that would satisfactorily and efficiently separate the oil from the beans. Requirements laid down for this unit were: 1. Adaptability to farm community operation. 2. Low first cost. 3. Simplicity of operation. 4. A continuous process (not a batch operation). 5. Low operating cost.

"To-day at the Edison Institute in Greenfield Village you had the opportunity of seeing a six-ton experimental oil extraction unit in operation. This unit in the village will process 1,200 tons or 40,000 bushels of beans in 200 days, or the production from about 2,000 acres. A unit of about this size will lend itself well to farm community operation. The processing cost has been about 15 cents a bushel... Briefly,

the process consists of removing the oil contained in the soy beans by means of a solvent. The solvent used is similar to aviation gasoline, which is recovered from the oil and meal by distillation and used over again... There are two main products from a unit such as this. First, the oil, and second, the meal... The oil is of good color and uniform quality. It is used in enamel for painting cars, both in the production of the glycerine used in making the glyptol resin and as the oil modifier of the finished enamel... We estimate that about 825,000 gallons will be used for this purpose this year, assuming that only one-half the glycerine comes from soy bean oil. And if one-half the glycerine used in our shock absorbers is from soy bean oil, this use also will consume 540,000 gallons... Our foundry is now another large user. There this oil is used as a core sand dry bond. That is, it becomes the bond after the core is baked. This use will amount to about 200,000 gallons this year... It may interest you to know that our building at the Chicago Exposition last year was painted entirely with paint containing soy bean oil as the only drying oil.

"Now to consider the uses of the meal. Because it contained almost 50 per cent. proteins, making it somewhat similar to animal horn and milk casein, the Edison Institute started experimenting with its use for moulded products. Some of the results of this work you see on this display board. Here you see such parts as: The Horn Button, Gear Shift Lever Ball, Light Switch Handle, Distributor Base, Distributor Cover, Window Trim Strips and other moulded products. Close inspection of these samples will show the many colors and the pleasing effects that may be obtained.

"The production of moulding plastic from this meal is based on the ability of the proteins to react with formaldehyde to produce a thermoplastic resin...

"Let us illustrate what this means to the farmer by considering how just one of these parts, such as this window reveal or trim strip, will affect him. 144,000 bushels of beans per year, or the product of 7,200 acres, will be required."

Harvey J. Sconce of Chicago, Illinois, recalls (p. 62) how, in March 1930 at the home of Thomas Alva Edison (the American inventor, lived 1847-1931) in Florida, he met with Henry Ford and discussed possible industrial uses of soy beans. In April 1930, "Illinois soy beans, grown on my farm, were shipped to Mr. Ford. In 1932, there was quite a heavy shipment, and that was the year that they made the first heavy demonstration here. Mr. Ford asked me at that time if it had ever been used as paint. My home in 1930 was painted with soy bean oils, made by Gene Funk [of Bloomington, Illinois] right here in front of me." In 1930 Sconce grew 1,300 acres of soy beans in Illinois.

Note: This is the earliest document seen (June 2011) showing that Henry Ford was interested in soy beans as early as April 1930, and that he obtained possession of soybeans that year from an Illinois farmer. Address: Chemist, Ford Motor Co., Dearborn, Michigan.

83. National Farm Chemurgic Council. ed. 1935. Proceedings of the Dearborn Conference of Agriculture, Industry, and Science. Dearborn, Michigan: FCC; New York: The Chemical Foundation, Inc. 256 p. Held 7-8 May 1935 at Dearborn, Michigan.

• **Summary:** The purpose of this conference, convened in the midst of the Great Depression and attended by about 300 leaders of industry, was to explore ways of using agricultural crops in non-food industrial products such as automobiles or chemicals, and ways that farmers could process more of their own crops using industrial equipment. Mr. Carl B. Fritsche and the members of the conference issued a "Declaration of Dependence upon the Soil and of the Right of Self-Maintenance," which discussed the concept of chemurgy (see p. 33). A paper titled "Increasing the use of agricultural products in the automotive industry," by R.H. McCarroll of the Ford Motor Company, discusses soybeans extensively.

The host of the conference was Henry Ford. Francis P. Garvan, president of the Chemical Foundation in New York City, was elected permanent chairman of the Conference, and Mr. Carl B. Fritsche of Grosse Pointe, Michigan, was elected permanent secretary. Mr. Wheeler McMillen of New York City, editor of *The Country Home*, was chairman of a number of sessions, broadcast radio programs by himself and other key speakers during the conference from the Dearborn Inn. Note 1. This is the earliest "Conference Proceedings" seen that discusses soybeans.

Note 2. This is the earliest document seen (Sept. 2001) which specifically talks about both chemurgy and soybeans. Address: Dearborn, Michigan.

84. Borth, Christy. 1935. Henry Ford, economist: Beans, Britain, and an experiment in national independence. *Detroit Free Press*. June 2.

• **Summary:** "William Bushnell Stout, the automotive and aviation engineer, once said: 'Posterity will honor Henry Ford less as an industrialist than as the foremost economist of his time... Henry Ford stands almost alone in the understanding of the economics of plenty, which in the past quarter of a century have smashed into obsolescence all the academic theories based on the belief that permanent want must prevail.'" The author pursues this idea on discussing Ford's work with soybeans and with Mr. J.L. North at Boreham, England as described in a new book by Elizabeth Bowdidge titled "The Soya Bean," which Oxford University Press has just published.

85. *Chemical and Metallurgical Engineering*. 1935. Ford uses soya bean in plastics. 42(6):313. June.

• **Summary:** Quotes a statement sanctioned by the Ford Motor Co. on the utilization of soybean meal in the Ford plant to make molded plastic products. The soya bean is known to be one source of furfural. Furfural can be

combined with phenol to produce a moldable plastic. "The production of molding plastics from this [soybean] meal is based on the ability of protein to react with formaldehyde to produce a thermoplastic resin."

86. Kennedy, L.W. 1935. The soybean... A new American. *Purdue Agriculturist (Indiana)* 29(9):83, 86. June.

• **Summary:** "This article was written with the aid of material taken from an undergraduate thesis submitted by E.A. Johnson, '34 [class of 1934]. Products of the soybean are rapidly becoming more important to agriculture and various manufacturing industries of the nation." Soybean oil meal is an important livestock feed for cattle, hogs, sheep, and poultry. It is also "used extensively in the making of glue, water paints, fertilizer, celluloid substitutes, [plastic] gear shift knobs, etc. Breakfast food, diabetic food, infant food, macaroni, crackers, bean curd, soy sauce, vegetable casein, and meat substitute are popular in the list of foods made from soybean oil meal. The meal possesses a nut-like flavor and lends itself well to be used as human food."

Crude soy bean oil is dark brown in color and has a "beany" odor. It is largely refined to make special oils for use as paints, varnishes, glycerine, enamel, the waterproofing of cloth, fabrics, papers, and sandpapers, the making of oilcloth, shade cloth, rubber substitutes, printers ink, lubricants, hard and soft soaps, insecticides, foundry core oil, and lighting fuels. The food products, salads, edible oils, and lard and butter substitutes are also prepared by a commercial process from soybean oil. In 1930 about 6,000,000 pounds of soybean oil, or one-sixth of the domestic crop, were used in the preparation of edible products.

Note: This is the earliest document seen (Sept. 2001) concerning the use of soybean oil in insecticides or other crop-protecting chemicals (pesticides).

"A new auto body finish from soybean oil is the result of experiments made by the Ford Motor Company of Detroit, Michigan."

Also discusses "the vegetable soybean" which can serve as a supplement to the garden pea or lima bean. "In China vegetable soybeans have long been used as a delicacy on the table. They may be used green, or canned, or made into salads."

"Dried soybeans serve as a good substitute for coffee and peanuts when properly roasted and prepared. The dried beans are also used in preparing soy sauce, boiled beans, baked beans, breakfast food, soaps, and vegetable milk. From the vegetable milk, meat substitutes, infant food, confections, cheese, and fresh, dried, condensed, and fermented bean curd is prepared. Soybean milk has not received serious consideration in this country, but it has been successfully used as a food for growing infants in China." Address: Class of 1936.

87. *Prairie Farmer*. 1935. Your business and ours: Farm

Chemurgic Council. 107(14):12. July 6.

• **Summary:** "The Farm Chemurgic Council was formed in Chicago [Illinois], June 17, by a committee of 15 appointed for that purpose at the recent conference at Dearborn, Michigan, of agriculture and industry. The purpose of the newly-organized council is to promote the use of farm products as raw materials in industry. "Chemurgie" means chemistry at work, and the idea is to put chemistry at work to devise new uses for farm products.

"Frances [sic, Francis] P. Garvan, president of the Chemical Foundation, was elected president of the Farm Chemurgic Council. Other officers are as follows: Wheeler McMillen, editor Country Home, first vice-pres."

"The council will be financed for the first year by the Chemical Foundation. The Chemical Foundation was set up by President Wilson at the close of the World War to have custody of the German chemical patents which we took over when war was declared. Its revenue comes from royalties on these patents. It has financed a great deal of important chemical research.

"One of the first steps to be taken by the Farm Chemurgic Council is to encourage greater use of soybean oil paint in order to help make a market for the large crop of beans which is in prospect this year."

88. *Detroit News*. 1935. Soy beans in the bleachers. July 12. p. 18, col. 2. Editorial.

• **Summary:** At the recent Dearborn conference on "new uses for farm products, the soy bean was a candidate for every service to man," from food to automobile paint. "Toasted soy beans, salted and packaged, are on sale in Chicago taverns."

89. *Literary Digest*. 1935. From salad-oil to paint: With the aid of chemists, a new farm product, the humble soybean, is making good in industry and helping agriculture. 120(4):17. July 27.

• **Summary:** The Farm Chemurgic Council, a new organization formed recently at Dearborn, Michigan, to promote the use of farm products in industry, recently reported events of significance to farmers, chemists, and consumers. "The 1935 soy-bean crop will be several million bushels larger than that for 1934 (approximately 17,800,000 bushels)."

"New products developed: Principally owing to the interest of Henry Ford, chemists have developed entire new families of products from this versatile bean. Varnish, enamels, oilcloth and linoleum, molded plastic products such as horn buttons, handles, box-covers, window-trim strips, parts of electrical switches, and other electrical equipment, are coming from the soy-bean fields. Chemists have learned how to turn soy-beans into printer's ink, glycerin, celluloid, waterproof glue, soap and rubber substitutes. The list grows longer daily.

"Soy-soup to salad oil: In the field of human and animal

foods, lists which are admittedly incomplete name more than sixty-five different products, ranging from soy-soup to salad oil. A lard substitute is being made by hydrogenating soy-bean oil (a process similar to that used in making gasoline from brown coal in Germany). There is a soy-bean ice-cream, and a special soy-bean food for diabetics."

A photo shows huge quantities of sacked soy-beans awaiting shipment in Manchukuo.

90. McCarroll, R.H. 1935. Increasing the use of agricultural products in the automotive industry. *Ford News (Dearborn, Michigan)* 15(7):125-26. July.

• **Summary:** This is the condensed version of a speech that was first published in the *Proceedings of the First Dearborn Conference of Agriculture, Industry, and Science* (p. 57-65), held on 7-8 May 1935 at Dearborn, Michigan, and sponsored by the Farm Chemurgic Council. The original speech is very important, in that it explains how Henry Ford first got involved with and obtained soybeans in March and April 1930.

Photos taken at the "Ford experimental farms" show: Soy beans being threshed. Manchu soy beans grown in Michigan. Harvested soy beans coming out of a combine. 6-7 people working in an experimental soybean field. A display board containing plastic car parts made from moulded soy bean meal. A full soy bean pod, and an opened pod showing the 3 soy beans inside. A student at the Edison Institute experimenting with soy bean oil. Address: Chemist, Ford Motor Co., Dearborn, Michigan.

91. Burlison, W.L. 1935. Utilization of soybean oil with special reference to paint. *Proceedings of the American Soybean Association* p. 12-15, 17. 15th annual meeting. Held 21-22 Aug. 1935 at Evansville and 23 Aug. at Lafayette, Indiana. [12 ref]

• **Summary:** "The need in 1920 was for more legumes in the rotation; more home-grown, high-protein feeds in the feed bin; and substitutes in the rotation for red clover and oats. For these purposes the soybean was then promising. This early promise has been more than fulfilled."

"No phase in the utilization of soybeans has been more striking than the perfection of methods for using the oil in paints and varnishes... It was just five years ago, in [August] 1930, that the Experiment Station launched this project. Today, it is estimated that in Illinois, one out of every ten farmers has one or more buildings painted with 'Soybean Oil Paint.'"

Describes the Station's experiments, then quotes four authorities on the value and quality of paints containing soybean oil. For example, Adrian D. Joyce, a leading paint manufacturer and president of The Glidden Company, in correspondence of 10 July 1935, stated: "I am glad to tell you that as a result of our experimental work and long experience, we have found that by carefully refining and treating soybean

oil we can make an oil which is very desirable for use in paints and enamels. This oil is not only flexible, but it also dries properly and retains its elasticity when combined with special driers. One of the fine characteristics of this oil is the fact that it is non-yellowing.

"I am of the opinion that soybean oil can be still further employed and that progressive manufacturers will soon realize the tremendous opportunities there are for the use of soybean oil in a long list of products."

There are also positive quotations from W.H. Gerke of The Sargent-Gerke Co., C.D. Holley of The Sherman-Williams Co., and W.G. Dickinson. Burlison continues: "All of you, of course, are already familiar with what the Ford Motor Company is doing in the development of industrial uses for the soybean. The Ford Company plans to increase the amount of soybean oil used in enamel for motor cars."

A table, titled "Crude soybean oil statistics. 1000 lbs." gives figures for 1914 to 1935 for: Factory production in the U.S. (increased from 751 in 1922 to 35,366 in 1934). Net imports. Stocks as of Dec. 31. And total apparent disappearance. Address: Agric. Exp. Station, Univ. of Illinois.

92. *Industrie Chimique (L)*.1935. Emploi de l'huile et des tourteaux de soja aux usines Ford [The use of soybean oil and meal in Ford factories]. No. 259. Aug. (Paris). [Fre]*

93. Bruner, Raymond A. 1935. Hormones yield secret of dwarfs and giants: Smaller or larger human beings may some day be produced through laboratory methods being perfected at present time. *Washington Post*. Sept. 8. p. B12.

• **Summary:** Miss Bossy Cow has a new rival: the soybean. The soybean has captured the imagination of chemists "to such an extent that it may in the future revolutionize not only agriculture, but many branches of industry." American soybean areas is increasing by over a million acres a year, mainly because it is "one of the most efficient chemical laboratories for transforming materials of the atmosphere and soil into foods and raw materials for industry."

"The soybean is one of the oldest crops grown by man. In a Chinese materia medica, 'Ben Tsao Gang Mu,' Emperor Shen-Nung, 4,800 years ago told about this important plant." "The plant was introduced into the United States in 1804." But only during the past 15 years have Americans realized how important a crop it could be.

The Glidden Co. of Cleveland, Ohio, is probably doing more things with the soybean than any other firm. Tells the story of how Glidden bought a soybean solvent extraction plant from Germany and started to crush soybeans. Glidden also began to obtain lecithin from soybeans. The Ford Motor Co. is making soybean enamel and plastics for its automobiles.

94. *Times (London)*.1935. Soya beans. Sept. 30. p. 22, col. 1.

• **Summary:** "Many attempts have been made to grow soya

beans in England but with little success until Mr. F.L. North, curator of the Royal Botanical Society of London, succeeded in acclimatizing the soya bean by careful selection and patient research. His varieties were grown at Boreham in 1933 and 1934 and, at the suggestion of Fordson Estates Ltd. 250 farmers in all parts of the country have grown trial plots of soybeans this season."

95. *Chicago Daily Tribune*.1935. The city: Blast. Oct. 13. p. B9.

• **Summary:** "The manufacture from soy beans of salad oil, shortening, paint, varnish, cattle feed, flour, and such surprising things as automobile horn buttons is a new industry developed chiefly by the Ford Motor Car company and the Glidden company, which had a plant at 1845 North Laramie avenue." It was a year old, five stories high, half a block long, and, including new equipment was worth \$500,000.

It had been closed for five weeks, but last Monday it was opened again and about 40 persons went to work. At 11:40 a.m. the entire building was demolished by a terrific explosion.

96. *Detroit News*.1935. Ford opens economic path to link farm with factory: Soy bean products furnish a new field. Company expects to draw on agriculture for crops used in new method of manufacture at Rouge plant. Oct. 13. Section 1. p. 4, col. 1.

• **Summary:** "Almost as if by the magic of seven-league boots, the Ford Motor Co... is now preparing to use soy beans produced on about 50,000 acres in 1936." Almost a decade ago, Henry Ford announced his belief that a stronger basis of American life could be built by linking more closely the processes of centralized industry and rural farming.

97. *Time*.1935. Bean blast: Science. Oct. 21. p. 34.

• **Summary:** The Glidden Company's soybean processing plant in Chicago, occupying almost a block and once a bootleg brewery, now lies in smoking ruins. Eleven people were killed and 45 injured in the explosion. It seems that dust rather than hexane solvent caused the explosion. Soybeans are crushed into flakes then "treated with a hydrocarbon solvent such as hexane or benzene." A jury of scientists "found that two 4,000-gal. tanks of hexane had not exploded." "Soy beans were prized in China 5,000 years ago, were first brought to the U.S. in 1804 by a Yankee clipper." Note 1. This is the earliest document seen (June 2003) that uses the term "Yankee clipper" [ship] in connection with the introduction of the soybean to the United States. The term is next repeated in 1942 by Edward Dies.

"Most famed U.S. soy-bean user is Henry Ford, devout believer in manufacturing as an outlet for agricultural products. In 20 small, scattered factories, Ford has been making a hard, easily cleaned enamel from the bean oil, and from the bean meal, such molded plastic parts as horn

buttons, gear lever caps, dash panels and distributor covers. This year Ford will use the crop from 61,500 soy-bean acres.”

Note 2. This is the earliest document seen (Dec. 2002) that mentions “hexane” being used commercially as a solvent for soybeans. It was being used by The Glidden Co.

Note 3. This is the earliest article on soy seen (Aug. 2002) in *Time* magazine.

Note 3. This is the earliest document seen (Aug. 2005) concerning an explosion at a soybean crushing / processing plant. Note 5. Talk with Joe Givens, manager of Dawson Mills for 28 years. 2005. June 1. Joe, and most people he knows, believe that it was hexane solvent, not dust, that caused this explosion.

98. *Hartford Courant (Connecticut)*. 1935. Soybeans in America. Oct. 22. p. 12.

• **Summary:** From the Des Moines Register: Soybean acreage is rapidly increasing in the USA for several reasons: (1) The most apparent is that millions of acres of land growing major crops are being removed from production. (2) In crop rotations, soybeans are becoming a popular substitute for oats. (3) Soybeans are increasingly finding industrial uses such as in the manufacture of glue, varnish, soap, automobile parts, etc. “Witness, for example, the recent interest in soybeans demonstrated by Henry Ford and the Farm Chemurgic Council.”

Indeed the crop is growing so fast that at the August meeting of the American Soybean Association in Indiana, growers “were talking about a ‘control’ program and demanding a higher tariff on Manchurian soybean meal—Asia being the plant’s original home.”

“... soybeans are unquestionably here to stay as a minor crop in this midwestern area.”

99. *Automotive Industries*. 1935. Ford soy bean requirement 1,000,000 bushels yearly for million car output. 73(17):541. Oct. 26.

• **Summary:** “The soy bean production of 50,000 acres will be required by the Ford Motor Co. in 1936 for parts and materials derived from this product of the soil. Ford has about 12,000 acres in soy beans and expected to depend on outside sources for the balance of requirements... Henry Ford’s experiments in the use of the soy bean in automobile manufacture cost him more than \$1,000,000 up to Sept. 1, 1934.”

100. Stegman, Henry M. 1935. Wide usefulness of the soy bean. *Good Health (Battle Creek, Michigan)* 70(10):315. Oct. [1 ref]

• **Summary:** “The advantages of the soy bean are so manifold and manifest that its cultivation is sure to spread. In the United States the demand for it grows steadily... After twenty years of experimentation it has been acclimatized in England. Henry Ford now grows it there on his two thousand

acre farm in Essex, as well as in Michigan.” Many food and industrial uses of the soy bean are given.

101. *Christian Science Monitor*. 1935. Vermont ready to launch soybean culture tests: Fifty one-acre plots are set aside for experiments which are hoped to result in bringing state not only ample forage for cattle but new industries developed from bean’s various by-products. Dec. 31. p. 5.

• **Summary:** Joseph Winterbotham and Earle R. Conant are president and secretary of the Vermont Soy Bean Association, which will sponsor and supervise the soy bean experiments next summer.

“Oil from soy beans is today a well known article of commerce. This oil is considered by many superior to any other vegetable oil.” Some paint manufacturers are already using soybean oil. Foundries could use soy bean oil as a cohesive agent and antirust agent in castings.

The soy bean is on a westward march. “As early as 2800 B.C. the soy bean was bartered in Chinese markets.” By 1804 it had reached the United States.

“Henry Ford and his remarkable experiments together with the Japanese struggle for Manchukuo [Manchuria] and the domination of the important soy bean, made this legume internationally known.”

During the first 6 months of this year, a national retail nut company tried selling roasted soy beans as a delicacy.

Photos show: (1) “Soy beans on the vine.” (2) Joseph Winterbotham. (3) E.R. Conant. An outline map of the Midwest and New England shows a cow (symbolic of Vermont’s dairy industry), with a very long neck like a giraffe, reaching from Vermont to faraway Iowa for its feed. Address: Staff correspondent, *Christian Science Monitor*.

102. Ford Motor Co. 1935. Farm of the future (Motion picture). Dearborn, Michigan. *

• **Summary:** In 1935 the Ford Motor Co. produced and distributed this sound-slide film which illustrated Henry Ford’s views on the importance of chemurgy.

103. Ford Motor Co. 1935. The Ford year. Part 4 (Motion picture). Dearborn, Michigan. 854 ft., silent, black-and-white. 35 mm. No captions. See 200FC-1124 for sound track. *

• **Summary:** Shows: Two workers in small shop making sand molds (probably with soy oil binder). R.H. McCarroll lecturing about automobile parts. Worker checking machine in soybean processing plant. Address: Dearborn, Michigan.

104. Sweeney, O.R.; Arnold, Lionel K. 1935. Processing the soybean. 2nd ed. *Iowa State College, Engineering Extension Service, Bulletin* No. 103. 59 p. 28 cm. (Ames, Iowa). First published in 1929. Official publication, Vol. 34, No. 14. 4 Sept. 1935. [42 ref]

• **Summary:** This is a revised version of the original 1929 bulletin. Contents: 1. The soybean and the farm problem:

Characteristics of the soybean, uses of the soybean, soybeans in Iowa, the soybean and the nitrogen problem, the soybean and the protein problem, the soybean and the vegetable oil problem. 2. Methods of producing soybean oil: The hydraulic press method, the Anderson Expeller method, the solvent extraction system (stationary, large-scale Soxhlet type, rotary, continuous [Hansa Company, Ford Motor Co.], extraction solvents incl. trichloroethylene). 3. Plant design. 4. Production costs: Operating costs, calculation of costs. "The authors have endeavored to present the philosophy of small plants located close to the grower of the beans who would also be the buyer of the meal at a price not loaded by high freight costs. The farmer would thus retain on the farm the protein portion of the bean with its high feed and fertilizer values."

Page 39 notes: "A continuous process said to be suitable for a small scale plant is being experimented with by the Ford Motor Company. In this process the flaked beans are fed into the bottom of a pipe set at a 10 degree angle and fitted with a screw conveyor. The flaked beans are moved through the pipe against the solvent, which flows in at about halfway between the upper and lower end. The upper end of the pipe forms a steaming chamber where the solvent is vaporized off. A similar process has been patented by Flumerfelt."

Photos show: (1) Experimental hydraulic press. (2) An Anderson Expeller.

Table 31, titled "U.S. soybean oil mills" (p. 55), lists 22 establishments that "are, or have been, processing soybeans for the production of soybean oil: Archer-Daniels-Midland Co., Minneapolis, Minnesota. The Chicago Heights Oil Co., Chicago Heights, Illinois. The East St. Louis Cotton Oil Co., East St. Louis, Illinois. The Eastern Cotton Oil Co., Elizabeth City, North Carolina. The Elizabeth City Oil and Fertilizer Co., Elizabeth City, North Carolina. Falk and Co., Carnegie, Pennsylvania. W.F. Fancourt and Co., Philadelphia, Pennsylvania. Ford Motor Co., Detroit, Michigan. Funk Bros. Seed Co., Bloomington, Illinois. Wm. O. Goodrich Co., Milwaukee, Wisconsin [subsidiary of ADM]. W.R. Grau and Co., New York, New York. The Havens Oil Co., Washington, New Jersey. National Oil Products Co., Harrison, New Jersey. The New Bern Cotton Oil and Fertilizer Mills, New Bern, North Carolina. The Peru Products Co., Peru, Indiana. Wm. H. Scheil, Inc., New York, New York. Soybean Products Co., Cedar Rapids, Iowa. Spencer Kellogg and Sons, Inc., Des Moines, Iowa. The A.E. Staley Co., Decatur, Illinois. Standard Soybean Processing Co., Centerville, Iowa. Welch, Holme and Clark, Inc., New York, New York. The Winterville Cotton Oil Co., Winterville, North Carolina." Address: Iowa State College, Ames, Iowa.

105. *East Arkansas Record (Helena, Arkansas)*. 1936. Soybeans are adapted to all kinds of uses. More than 75 commercial uses for soybeans, says writer in *Cotton and Cotton Oil Press*. 5(138):1, 4. Jan. 28. Soybean section.

• **Summary:** Orville Adams, writing in a recent issue of the *Cotton and Cotton Oil Press*, also discussed Henry Ford's conference in Dearborn, Michigan, last summer and the attention given the soybean there. Many long quotations are given.

106. Sconce, Harvey J. 1936. The soy bean conquers industrial America. *Illinois J. of Commerce* 18(1):16-17, 26, 28, 30, 32. Jan. *

• **Summary:** Traces the history of the soybean, and discusses harvesting methods, extraction processes, industrial and food products derived from the beans, the utilization of the bean in the Ford plant, its invasion of the cotton lands, and its adaptability to Tennessee and Canada.

"This is the greatest conquest of territory by a plant in history. Ten years more and it will have revolutionized the industrial manufacturing of America. The soy bean had to come to the United States to get its chance, and it made good."

Note: The author supplied Henry Ford with his first soy beans. Address: Chicago, Illinois.

107. *Good Health (Battle Creek, Michigan)*. 1936. Increasing use of the soy bean. 71(2):50-51. Feb.

• **Summary:** "Henry Ford has aided in the development of the soy bean industry, having urged the planting as a new opportunity for farmers.

"Manchukuo still produces the world's largest crop of soy beans. The culture of this bean is spreading as people come to know its value for food and many other purposes. Various attempts have been made to grow them in England, Germany, and other parts of Europe with poor success. But the *London Times* records the harvesting of twenty acres of soy beans on the Fordson estate, near Chelmsford [England]. Here Henry Ford has a farm of about two or three thousand acres. His direct interest is due to the fact that he uses this product in his automobile industry.

"Four years ago Dr. Kellogg discovered that milk made from the soy bean made a remarkable culture medium for protective bacteria or so-called 'friendly germs.' In soy milk more than twice the number of these germs can be made to grow than in cow's milk. Remarkable results have been obtained in cases of intestinal disorders through the use of this milk. The Canadian quintuplets are protected against bowel trouble by the constant use of soy acidophilus milk."

108. Finney, Burnham. 1936. Car parts of plastic. Molded materials grow in favor with makers—Ford's soya beans. *New York Times*. March 22. Section 12. p. 6.

• **Summary:** "Ford soya bean plastics heretofore have been made on a semi-production scale, the quantity approximating 1,000 pounds a day, or about 7 per cent of the amount needed to mold 5,000 sets of twenty-five small parts regularly used in Ford's production. Expanded facilities will greatly increase

output at the Rouge plant of plastic materials... While the molding compound is more expensive per pound than steel, the saving in weight and the few operations necessary to fabricate a finished part actually result in a less costly completed product. Aside from the fact that they are cheaper to make than steel parts, plastic products show no wear, do not become chipped or scratched and are not subject to corrosion...

"To supply Ford with enough soya products for 1,000,000 cars a year it is estimated that 50,000 acres a year must be planted in soya beans. Such acreage would provide about 825,000 gallons of oil for enamel, 540,000 gallons for shock absorber fluid and 200,000 gallons for foundry core oil."

Address: Detroit.

109. Cameron, W.J. 1936. Henry Ford. Dearborn, Michigan: Ford Motor Co. 4 p. March 29. 18 cm.

• **Summary:** This is the text of a radio talk given on the Ford Sunday Evening hour on 29 March 1936, number 27 of the 1935-36 Series broadcast over the Nation-Wide Network of the Columbia Broadcasting System from Masonic Temple, Detroit.

It gives a brief and colorful biography of Henry Ford, who is now age 73. Ford was born in Civil War days on a Michigan farm, left motherless at age 13, began working for a living in Detroit at age 16, paid his room rent by repairing watches at night. Got married [to Clara Bryant on 11 April 1888 in Greenfield], set up his own sawmill, himself sawing the lumber for his first home.

"At 28, engineer for the Edison Illuminating Company of Detroit, where single-handed he installed the 8-hour-day for his helpers. Working nights on a horseless carriage, greatly encouraged by Thomas A. Edison; running his first little car around Detroit to the consternation of horses and the amusement of men; and—typical of his engineer's conscience—waiting seven years after his first car ran before he would sell one. So he came to his 40th year and began to make automobiles..."

"He ran the price of a Ford car *down* from \$2000 in 1906 to \$360 in 1916. He ran production *up* from six cars a day to 9,000. From \$2 a day, he ran wages *up* to a \$7-a-day minimum. In 1915, his volume reaching 300,000 cars, he returned \$50 to each purchaser and cut the price. Always trying the untried, he inspired Edgar Guest's famous poem—'He started to sing as he tackled the thing / That couldn't be done, and he did it.'"

"Outside of business, preserves American folk music and dances; rescues the old landmarks—Longfellow's Wayside Inn, 'Mary's Little Lamb' schoolhouse; courthouse where Lincoln began to practice law; the laboratories where Edison wrought his wonders; McGuffey readers. Establishes schools and trade schools. Builds great American museum and historical village, as an institute of technology for young Americans." Address: Ford Motor Co., Dearborn, Michigan.

110. McCarroll, Hudson. 1936. Address of Hudson McCarroll, Chief chemist of Ford Motor Company, at Illinois farmers grain dealers convention, Chicago. *Farmers' Elevator Guide* 31(4):3-5. April 5. Also published as "Increasing the Use of Agricultural Products in Industry," Ford News. April 1936, p. 65-66, 75.

• **Summary:** The work done at the Ford plant at Dearborn, Michigan, in utilizing the soybean in the automobile industry, and the process followed, are described in the talk delivered before the Farmers' National Grain Dealers Association, of Illinois, at La Salle Hotel in Chicago.

"During 1935 the Ford Motor Company paid out for farm products more than \$27,000,000. As an example, this means that our million-car program for 1935 called for the cotton from 556,000 acres... and 61,500 acres of soy beans—to mention only a few of the products."

"Several years ago, Mr. Henry Ford set aside about 200 acres at Dearborn, Michigan, for an educational project which he named the Edison Institute after his friend Thomas Alva Edison. The institute includes a museum, the early American Village of Greenfield and a research organization.

"In 1930 Mr. Ford decided that increasing the use of agricultural products in our industry should be one of the main problems of the Edison Institute, and should receive attention from those in the Ford Motor Company interested in research.

"Since that time there have been constantly employed in excess of 20 men on this research work, besides the farmers necessary to raise the crops under consideration.

"Probably in excess of \$2,500,000 has been expended. This work is one of Mr. Ford's closest personal interests, and whatever has been accomplished has been under his personal direction.

"Mr. Ford selected the soy bean for our initial large scale work as an example of what may be done, although it should not be thought that this is the only farm product on which we have worked."

"Our large-scale work on the beans started in 1932 with the planting of 8,000 acres. About 300 varieties have now been tried on our experimental farm... At the Edison Institute in Greenfield Village you may see a six-ton experimental soy bean oil extraction unit in operation five days each week. This unit in the village will process 1,200 tons or 40,000 bushels, of beans in 200 days, this being the production from 2,000 acres. A unit of this size will lend itself well to farm community operation. Processing cost has been about 15 cents a bushel..."

This oil extractor operates much like an ordinary coffee percolator. The solvent is fed into the percolator near the upper end. The oil and solvent flow off through a filter and into a still, where the oil is freed from solvent...

"Assuming that half the glycerine used in car enamels comes from soy bean oil, we estimate that about a million gallons were used for this purpose in 1935. And if one-half

the glycerine used in our shock absorbers is from soy bean oil, this use consumed 540,000 gallons.

"Our foundry is another large user... This process consumed about 200,000 gallons last year." Address: Chief Chemist, Ford Motor Co., Michigan.

111. Holmes, Marie. 1936. Cooking chat: Parts of motor car and baby foods made from soy bean. *Toronto Daily Star (Canada)*. April 16. p. 34.

• **Summary:** A long article, with recipes, focusing on the rise of the soy bean in Canada's public awareness.

"What's all this talk about soy beans? Why are they bursting into headlines, causing heated debates in the House of Commons and revolutionizing the food and industrial world?"

"When a product whose name is foreign to most of us becomes the subject of much discussion publicly or privately, we are anxious to know why."

"A small bean, known for thousands of years by the Chinese, is about to become the culture plant of the future. This ancient food with new importance is the soy bean."

The story of the soy bean is a romantic one, for its origin dates back thousands of years to Manchuria and Mongolia [sic], where it is still largely grown today. Henry Ford is discovering new uses for it in the automobile industry. It is used [in the form of fermented soymilk] in the scientific formulas fed to the Dionne quintuplets. As many as 595 products are now made from the soy bean. Several of the 500 varieties of soy beans are now grown in Ontario, and are of high quality.

The soy bean is a rich source of oil, from which many industrial products have been developed, such as soaps, paints, varnishes, printers' ink, linoleum, and artificial leather. This oil is also rich in lecithin, which can be added to dye baths and to finishing solutions for artificial silks and for cotton. Soy bean glue is used to make furniture and plywood from pine trees.

The soy bean is also an excellent source of food, feed, and ammunition. "Dr. A.A. Horvath, probably the greatest chemical authority on the subject of the soy bean says: 'As an economical source of valuable and wholesome dietary elements it probably has no peer.'"

Pediatricians have found "soy milk" beneficial for feeding infants when mother's milk is not available. Roasted soybeans [soynuts] can be used as a peanut substitute. Flour made from the soy bean can replace part of the wheat flour in cakes, puddings, and breads, and because of its high protein and low starch content, is suited for diabetic and reducing diets. Soy bean cereals are now on the market.

"The hardy Mongolians, giants of strength and stature, have, through the ages, been nourished by the soy bean, the growing of which is the greatest industry of Mongolia [sic, Manchuria]."

The soy bean is widely used in Chinese cookery, in forms

such as the famous soy sauce. And the soy bean is a rich source of high quality, low cost protein (and minerals)—rivaling that in milk, meat, fish and eggs.

Recipes: Vegetable casserole (with "1 cup soy bean cereal"). Raisin soy muffins (with "1 cup soy bean cereal"). Chocolate soy cake (with "½ cup soy flour"). Health pudding (with "2 tablespoons soy bean cereal"). Soy bean cookies (with "2 cup soy bean cereal").

A large photo, titled "Manufacture of new foods," shows a man (wearing a white lab coat) pouring a ladle of soy beans into the hopper of a mechanical mill.

A small portrait photo shows Marie Holmes.

112. Chase, Herbert. 1936. More plastic parts with soya beans playing an important role to the tune of 1000 lb. daily at the River Rouge Ford plant. Metal parts in Ford line supplanted by molded plastics. *Automotive Industries* 74(16):560-64. April 18.

• **Summary:** The Ford Motor Company has opened a new plant for manufacturing and molding plastics, including soybean plastics. "Ford is beginning to substitute plastics for other types of material in a much larger way than has ever been done before in the automotive field and probably in any class of manufacturing. It seems likely that the new program for using plastics will have a far-reaching effect..."

"Heretofore, the consumption of plastics in the older Ford molding plant, which continues in operation, approximated 15,000 lb. a day... and has included up to 1000 lb. a day of the new soya-bean plastic which is an exclusive development of the Ford company."

"It is well known, of course, that Henry Ford is greatly interested in a closer tie-up between the farmers of the country and manufacturing industry... In the soya bean, Mr. Ford has found one means of accomplishing this. Some 12,000 acres of Ford land have been planted with soya beans, and to supply enough soya products for building a million cars annually another 38,000 acres planted in these beans, it is estimated, will be required. It is understood that Mr. Ford would like to see the latter come from other farms than his own.

"The chief product of the soya bean used in Ford car manufacture is oil, of which, for one million cars, 825,000 gallons are needed for paint (enamel), 540,000 gal. for shock-absorber fluid, and 200,000 gal. for foundry core oil."

Photos show six types of equipment. Address: M.E.

113. *Newsweek*. 1936. Raiding a treasure store of the vegetable kingdom. 7:38. April 25.

• **Summary:** "Today some 20 concerns manufacture soya food products." Chemists have found some 300 uses for the soybean, ranging from hay to hairpins. The most striking use is the perfection of methods for using the oil in paints and varnishes. Manufacturers found that proper amounts of soybean oil will prevent white paint and enamel from turning

yellow.

Henry Ford was one of the first to see possibilities in the oil as a paint base. He became involved with the soybean in 1931. His technicians soon discovered other useful qualities in the versatile legume. Ford became the largest soya grower in the world. In 1935 Ford built a \$5,000,000 mill at his River Rouge plant to process crops for industrial purposes—for which oil must first be extracted from the bean.

The soybean has grown into an industrial giant at Dearborn. In 1935 it provided paint for 1,000,000 Ford cars, 540,000 gallons of the oil went into glycerine for shock absorbers, and 200,000 were required for dry bond for core sand in the foundries.

Ford worked other miracles with the soybean meal cake. "Plastic manufacture converts it into all sorts of automotive gadgets—steering wheels, gear-shift knobs, light-switch handles, dashboard panels, soap, distributor covers, and window-trim strips... This year the Ford Company will use the produce of approximately 60,000 acres."

Note 1. This is the second earliest document seen that uses the word "miracles" (or "miracle" or "miraculous") in connection with soybeans.

Note 2. This is the earliest article on soy seen (Aug. 2002) in *Newsweek* magazine.

114. J.G.C. 1936. The soya bean: Remarkable progress in cultivation. *Manchester Guardian (England)*. April 27. p. 6.

• **Summary:** The soya bean is a major crop in Asia; about 25% of the area of Manchuria is used for growing it. The Japanese, like the Chinese, eat "soya bean foods" in their daily diet.

In 1910 in the United States, 2,000 acres of soybeans were grown; by 1920 the acreage had grown to 950,000 and today it is about 5,000,000. In 1931 the U.S. began to export soybeans to Europe.

In Soviet Russia, similar advances in the cultivation and utilization of soya beans have occurred recently.

Mr. Henry Ford has cultivated soya beans at Detroit, Michigan. During the past few years he had begun their full-scale cultivation in England, on the Fordson Estates near Chelmsford.

A list of the many industrial and food uses of soya beans is given.

An interesting account of the Fordson experiments appears in the book *The Soya Bean*, by Elizabeth Bowdidge.

Mr. J.L. North, former curator of the Royal Botanical Society of London, during 20 years of breeding experiments in Regent's Park and elsewhere, has developed four soya bean varieties capable of maturing in England's climate. The Fordson Estates obtained these seeds and Mr. North's advice. In 1933 they did experimental plantings of about 50 soybean varieties collected from various parts of the world. In 1934 they planted about 20 acres of the most promising varieties.

Westerners obtain most of their fat and oil from meat, milk, eggs and bread. But these foods are relatively expensive,

and many [especially in 1936 in the midst of the Great Depression] cannot afford them. The people of north China, who consume very little dairy products or meat, obtain an inexpensive, balanced diet from soya beans. Moreover, Chinese make a soya milk from soya beans. Although it is unpalatable to Western tastes, more refined processes can produce a palatable soya milk with good nutritional value.

Conclusion: "The soya bean provides a remarkably efficient method of providing supplies of food and raw materials."

115. Lougee, E.F. 1936. Industry and the soy bean. *Modern Plastics* 13(8):13-15, 54-57. April.

• **Summary:** An account of the "experimental development of soy bean plastics by the Ford Motor Co. The information was obtained by personal interviews with Ford executives both in the Engineering Laboratory at Dearborn and in the River Rouge molding division of the company." The article quotes Mr. Ford's theory of making partners of industry and agriculture, since the one needs employment for its surplus men, and the other lacks a market for its product. This has resulted in the starting of a large plastic plant to utilize agricultural products such as the soybean. "The general plan is to produce a simple processing unit which will satisfactorily separate the oil from the beans. This unit is to be available to farmers in rural communities who can raise beans in the summer and process them in the winter."

Soy bean plastics made by Ford do not follow the conventional methods employed by other manufacturers of phenolic plastics. The soy meal is mixed with phenol and a part of the total quantity of formaldehyde required, and a suitable accelerator, in a steam jacketed mixer where it reacts for 15 or 20 minutes. The filler (wood flour) is added, together with clay and stearic acid to promote smooth molding.

Large scale work on soy beans began in 1931 [sic, 1932] when the Ford Motor Co. planted 8,000 acres. "Last year this was increased to 12,000. About 300 varieties have been tried on this experimental farm... A six-ton experimental unit has been in operation has been in operation at Greenfield Village for more than a year. It will process 1200 tons or 40,000 bushels of beans in about 200 days."

"More than one million gallons of soy bean oil were used last year in enamel for Ford cars. Another 540,000 gallons were made into glycerin and used in shock absorbers for the same cars. The oil is used, too, in the foundry as a core sand dry bond—at the rate of some 200,000 gallons a year. To supply this demand, the soy beans from more than 64,000 acres were required in addition to those raised on the 12,000 acre experiment farm. "The production of molded plastics from this meal is based on the ability of proteins to react with formaldehyde to produce a thermoplastic resin."

116. McCarroll, R. Hudson. 1936. Increasing the use of

agricultural products in industry. *Ford News (Dearborn, Michigan)* 16(4):65-66, 75. April.

• **Summary:** Largely duplicates the author's article in *Farmer's Elevator Guide*, 5 April 1936, p. 3-5. It is based on a talk he delivered before the Farmers' National Grain Dealers Association, in Chicago, Illinois, at the La Salle Hotel. Address: Chief Chemist, Ford Motor Co., Michigan.

117. Russell, John. 1936. The culture of the soya bean in England. *J. of the Ministry of Agriculture (Great Britain)* 43(1):24-30. April. [4 ref]

• **Summary:** Cultivation of maize and the soya bean in England began at a relatively late date. "Much important work on selection and hybridization of these crops has been done by Professor W. Southworth, formerly of the Manitoba Agricultural College [in Canada], and now of the Rothamsted Experimental Station." Some 30 years ago [about 1906-10] Professor [James] Hendrick tried to grow the soya bean at "Aberdeen [Scotland], using Manchurian seed; in the greenhouse a few plants grew and even flowered, but they never produced seed, while in the open the seeds hardly germinated.

"Further south, at Kingston and Kegworth in the Midlands, Mr. Golding obtained better results with Japanese seed, and indeed he used the plant for some of his pioneering investigations on nitrogen fixation by leguminous plants, working with a culture supplied by Hiltner, then of Munich [Germany]. Although it was useful for laboratory investigations the crop held out little promise to the practical farmer. Similar negative results were obtained by Sir Rowland Biffen at Cambridge. A summary of these tests was given in this Journal in April, 1912 (p.33). A little later in the summer of 1912 and 1913, soya bean was tried at the Woburn experimental farm, but although the seed germinated satisfactorily and the plant grew, as in Mr. Golding's experiments, only a few pools were produced, and it was clear that the varieties tested were useless to this country. Still further south, in the old Royal Botanic Society's Gardens, Regent's Park, Mr. J. L. North, the Curator, was more successful than any of his predecessors: he began in 1914 and within a few years was growing a number of varieties and found some that ripened seed ready for harvesting in September. A brown variety seemed so promising that by 1929 it was taken up for further trial by the National Institute of Agricultural Botany and by Messrs. Sutton and Sons. Meanwhile Mr. North received other varieties from Professor McRostie, of Ontario [Canada], and these were included in his trials-but they all failed.

"This brown variety had been obtained by Professor Southworth about 1916 at the Manitoba Agricultural College, and was fully tested and ready for distribution by 1922. It was a selection from Ogemaw, a hybrid between an early black and a dwarf brown variety produced by E.E. Evans at West Branch, Michigan, in the opening years of the

present century. Like all hybrids, it is variable, and Professor Southworth's selection differed in such important respects from the parent material that it was issued as a distinct variety under the name Manitoba Brown. This was sent to Mr. North and grown by him: he described it in the *Quarterly Summary* of the Royal Botanic Gardens, for April, 1929, as having 'in the course of seven years' trials here proved to be not only the most reliable cropper, but the earliest of any of the sixty varieties of soya tested by me for growth in this country for the last fourteen years.' Although Mr. North gives no estimate of yields he quotes Messrs. Chivers' estimate of 12 to 15 cwt. [1 cwt = hundredweight = 112 pounds] of grain per acre, and soya beans sold at that time at £13 per ton. Mr. North states also that the soya bean has been grown successfully in the Home Counties, Oxfordshire, Hampshire and the Channel Islands, but gives no figures of yields in any of these places. The National Institute of Agricultural Botany grew it in 1924, 1925, and 1926 from Mr. North's seed, and each year had a fair crop of seeds: in 1928 large plots were grown and the yield was estimated at 900 lb. per acre without inoculation and 1,150 lb. per acre with inoculation. The results seemed so promising that half an acre was sown in 1929, but the plants ripened irregularly and produced little seed. The trial was then discontinued."

Mr. North continued his trials and "was fortunate in enlisting the sympathy of Mr. Henry Ford, who in 1932 had purchased some 2,000 acres of agricultural land at Boreham in Essex and proceeded to sow some Michigan varieties of soya bean. These failed, but in the meantime Mr. Ford discovered Mr. North, who furnished him with the above variety and three others, and these have been grown since 1933... Meanwhile in 1932 Professor Southworth, the originator of the most successful of these varieties, had retired from the Manitoba Agricultural College and joined the Rothamsted Staff. He started growing his best selection at the Woburn Experimental Farm... Professor Southworth himself has been growing the crop both at Rothamsted and at Woburn since 1934." Cultures for inoculating soya beans are obtainable from Messrs. Allen and Hanbury, 3 Colts Lane, Bethnal Green, London, E.2.

Note 1. This is the earliest document seen stating that the soya bean was grown at Rothamsted, the world's first agricultural experiment station, established in 1843.

Note 2. This document contains the earliest date seen for soybeans in Scotland, or the cultivation of soybeans in Scotland (About 1906-1910). The source of these soybeans is unknown (One of two documents).

Note 3. This is the 2nd earliest document seen (March 2010) concerning soybeans in the Channel Islands, or the cultivation of soybeans in the Channel Islands. This document contains the 2nd earliest date seen for soybeans in the Channel Islands, or the cultivation of soybeans in the Channel Islands (April 1936). The source of these soybeans was Mr. North. Address: Sir, D.Sc., F.R.S., Director,

Rothamsted Experimental Station [England].

118. Smith, Robert A. 1936. Soy bean seed production in Michigan. *Edison Institute of Technology, Bulletin (Dearborn, Michigan)* No. 10. 17 p. April.

• **Summary:** Contents: Introduction. Climatic requirements. Soil requirements. Soil preparation. Selection of varieties (Manchu, Illini, Ito San, Dunfield, Mandarin, and Greenfield have been tested for 4 consecutive years–1932-1935; Greenfield gave the best average yield, 25.3 bu/acre). Inoculation. Time of planting. Rate of seeding. Depth of seeding. Methods of planting. Cultivation. Harvesting: Combine, binder, mower. Threshing. Storage of soy beans. Industrial products made from soy beans (in the laboratories of the Edison Institute).

Industrial products can be made from either oil, meal, or stalks, as follows: “Soy bean oil: Enamels used on Ford bodies, house paints, varnishes, linoleum and oil cloth, printers ink, glycerin, fatty acids, soap, foundry sand cores, vegetable shortening, oleomargarine. Oil-free soy meal: Molded parts (horn buttons, gear shift knobs, distributor parts, light switch assembly, timing gears), glues and adhesives, water paints, core bonds, plywood glues. Soy bean stalks: Fibers–pressed boards, furfural.” Note: This is the earliest document seen (June 2011) that mentions Ford’s work using soy bean protein in water-based paints.

“Soy beans were not grown extensively in Michigan as a seed crop until the last few years, when the Ford Motor Company became interested in their commercial possibilities and began growing them on a large scale. As a result considerable interest has been shown concerning their value as a Michigan crop and the methods to be used in their culture.”

119. Taylor, Robert L. 1936. How soybeans help build Fords. *Chemical and Metallurgical Engineering* 43(4):172-76. April.

• **Summary:** The Ford Motor Company, probably more than any other organization or individual, caused the soybean to become associated chiefly with paint and plastics in the public mind, although other uses have always been more important. “The problem which led to the soybean development at the Ford Motor Co. was first presented by Mr. Ford to a small group of his officials in 1930... The oil extractor is simply a piece of 12-in. steel pipe, 30 ft. in length, and set at an angle of 10 degrees. Operation is countercurrent... At the present time, the solvent used is hexane.” The Ford development was based on the addition of soybean flour and wood flour to phenol formaldehyde plastics, which material was used in such items on the Ford motor car as gear shift knobs, horn buttons, window frames, distributor caps, etc.

Note: Although this use of soybean flour was not successful and was eventually abandoned, the publicity given to it attracted public attention to the possibilities of soybeans

in plastics.

A diagram and several photos show the small-scale Ford oil extractor. The use of lecithin as an antioxidant in rubber is being investigated experimentally.

What are the main uses of soybeans in the manufacture of Ford cars in terms of bushels and acres of soybeans used? 1. Soybean oil for enamel: 270,000 bushels or 16,875 acres. 2. Soybean oil for foundry sand cores: 193,920 bushels or 12,120 acres. 3. Oil-free soybean meal for window frames: 74,074 bushels or 4,560 acres. Other small uses for meal: Distributor caps 7,200 bushels, distributor bars 7,000 bushels, coil plate 3,100 bushels, coil cap 2,333 bushels, light switch 1,800 bushels, gear shift knob 1,460 bushels, large horn button 487 bushels.

“With the production of one million automobiles annually, the Ford company will require for all purposes more than 450,000 bushels or 28,000 acres of soybeans each year. At the present time, the company owns only 12,000 acres.”

A flow sheet shows the process for making soybean molding compound at Ford’s River Rouge Plant: The main ingredients are wood flour 396.6 lb, solvent-extracted soybean meal 330 lb, formaldehyde 250 lb, phenol 250 lb, pigments 75 lb, alcohol 33 lb, lime 26.3 lb, hexamethylene tetramine 26.3 lb, etc. Address: Editor, The Michigan Technic, Ann Arbor.

120. *Times (London)*. 1936. Future of the soya bean: Not an economic crop. May 4. p. 20, col. 3.

• **Summary:** “Briefly, the growing of the crop as a seed crop [in Britain] is not an economic proposition under existing conditions, although the prospect of an oil seed industry being ultimately established cannot be ruled out. The possibility of growing the crop for hay or for ploughing in as green manure is worth consideration.”

“Certain names are worthy of record for the work being done in bringing the soya bean to public notice and in investigating its economic possibilities on a field scale. Mr. J.L. North, when curator of the old Royal Botanic Society’s gardens, Regent’s Park, was trying, over 20 years ago, to secure varieties which ripened early enough for harvesting under English conditions. In spite of discouragements he persevered and eventually found a brown variety which offered promise. Messrs. Sutton, of Reading, made efforts to introduce this variety into farming and carried out patient work for several years. Four years ago Mr. Henry Ford visualised the possibilities of the crop and was responsible for the starting of the large-scale experiments at Boreham, where critical field tests have been in progress for the last three years, and from which, seed has been widely distributed. The four varieties grown at Boreham included at least two of Mr. North’s selection. At about this time Professor Southworth, who was originally responsible, when working at the Manitoba Agricultural College, Canada, for the production

of the brown variety, subsequently found by Mr. North to be a likely possibility in this country, had joined the staff of the Rothamsted Experimental Station, and was investigating the soya bean at the station's Experimental Farm at Woburn.

"The general results of these various investigations are summed up by Sir John Russel, the director of Rothamsted, in an article which appears in the Journal of the Ministry of Agriculture. The Fordson Estates, Limited, have also prepared a leaflet for free distribution which deals with the widespread investigations which they have successfully carried through.

"On the economic side the position is that under favourable conditions, such as obtained in 1934, a yield of about half a ton [of seed] from each acre may be expected in the South of England from a variety such as the brown bean 'C',..." This "would bring in, at present prices, a return of about £3 to £5 an acre and the value of the straw. This compares unfavourably with the return from field beans or peas,..."

121. *Agricultor Venezolano (El) (Ministerio de Agricultura y Cria, Caracas)*. 1936. El cultivo de la "soya" [The cultivation the soybean]. 1(1):24. May. [1 ref. Spa]

• **Summary:** A short paragraph at the top of the article states: We have translated the monthly bulletin of the Royal Bank of Canada [actually The Royal Bank of Canada Monthly Letter, April 1936] which discusses the extraordinary importance acquired recently by the soybean, an agricultural product whose cultivation is being tested in Venezuela. The intensification of this crop in our country can come to signify a new and important source of national wealth.

The article begins: "To many people, the soybean has an oriental flavour; they know it as the basic ingredient in some of the most famous English meat sauces [Worcestershire, etc.] and have heard that it is an important Manchurian export. Against this background it is something of a surprise to learn from the *Wall Street Journal* of February 17, 1936, that in the previous year it had become, from the viewpoint of cash return to the farmers, the fourth most important cereal crop in the United States. The crop of 1934 was about 50 per cent larger than that of 1933 and the crop of 1935 was doubled that of 1934."

The many uses of the soybean are discussed, including soybean flour (with and without the original oil content of the seed), soybean milk, butter, cheese [tofu], and coffee. Among industrial uses, in 1934, 10 million lb of soybean oil were used by the paint industry in the USA. "In varnish and lacquers soybean oil is the principal base. The Ford car is finished with a soybean lacquer and the Ford Company is erecting a \$5,000,000 plant in Detroit [Michigan] to make soybean products. In soaps, glues, linoleums and rubber substitutes, the ingredients of the soybean have come to be of predominant importance."

122. Dimmock, F. 1936. Division of Forage Plants: A report on the present status of the soybean industry, particularly in

western Ontario. In: National Research Council of Canada. 1936. Proceedings of the Second Conference on Soybeans. Ottawa, Canada. 18 p. See Appendix B, p. B1-B6. Held on 4 May 1936 in the National Research Building, Ottawa, Ontario, Canada. [4 ref]

• **Summary:** An excellent insight into early soybean crushing operations in Canada. "During the year 1935 it has been estimated that approximately 10,000 acres were devoted to soybeans in Canada. This acreage was located almost entirely in western Ontario where the comparatively long, warm season provides excellent conditions for the production of this crop.

"Of the 10,000 acres it is unlikely that more than half of 5,000 acres was harvested for seed. At an average of 20 bushels per acre this would mean a total seed production of about 100,000 bushels. Possibly 50 percent of this quantity will be used for feed and to supply seed for the present season's crop, leaving approximately 50,000 bushels of beans available for disposal for commercial purposes..."

"As the centre of soybean production is located in western Ontario, it is only natural that the mills for utilizing the crop should be located there also. The one exception is the plant of the Dominion Soya Industries, 2049 Harvard Avenue, Montreal, Quebec.

"During the fall of 1929 the first oil mill for processing soybeans was established at Milton, Ontario, under the name of the Milton Oil Refineries, Limited. This mill got off to a poor start, and for various reasons such as poor management, poor machinery, and probably poor financing, has never operated with any degree of success. It has changed hands several times but is not operating at present. It uses the hydraulic press method of extraction.

"The next effort to start a mill was made at Chatham, Ontario, in 1932 by a farmer's co-operative under the name of the Soybean Oil and Meal Co-operative Co. of Canada, Limited. Farmers secured membership in the company by the purchase of a share valued at \$50 and this gave the purchaser prior rights to sell beans to the company. The number of members was said to have reached from 700 to 800 farmers. Under an agreement with the Archer-Daniels-Midland Company, Milwaukee, Wisconsin, (one of the largest millers of soybeans in the United States), this company installed the machinery and provided a manager, Mr. B.E. Biles, to run the mill. In return for these services the Archer-Daniels-Midland Company was to receive 5 cents for every bushel of beans milled. The mill was of the Anderson expeller type and had a total capacity of about 20 tons of beans a day (24 hours). Unfortunately during the first year of operation the prices of soybean oil and meal dropped to their lowest point, and as a result the price paid for beans was only about 50 cents per bushel. The mill operated at intervals for a few months, but crushed only 22,000 bushels of beans. The first year's results were disappointing to the company and the growers alike.

"In 1933 the price of soybean products rose considerably

(meal from \$21 to \$36.50 per ton) but while the mill handled something over 50,000 bushels of beans the price paid the farmer averaged only 65 to 70 cents per bushel. This continued low price had a very discouraging effect upon the growers and while they continued to produce soybeans they preferred to use them for feeding to livestock rather than sell them to the mill. Much difficulty was encountered in purchasing beans for the mill from the 1934 crop—farmers were beginning to appreciate the value of soybeans for feeding purposes. The price offered, 70 to 75 cents per bushel, brought in very few beans. The final blow came when Mr. Biles, the manager, disappeared with about \$7,000 of the company's funds. The plant is now idle and did not open for the 1935 crop.

"The plant of the Dominion Soya Industries, Montreal, P.Q. [Quebec], commenced operations in the spring of 1935. This mill uses the solvent process and has a single unit extractor built by the Ford Motor Company. Besides oil and meal, soybean flour is also produced... This plant is now operating and has a capacity of about 100 to 150 bushels of beans a day. Only about 25 percent of the beans processed during the past year have been of Canadian origin, the remainder having been imported from the United States.

"A new mill was established in Stratford, Ontario, during the late fall of 1935 under the name of Soya Mills Limited. Mr. T.D. Bell, Toronto, is the president of this company and Mr. H.P. Trickey, vice-president and plant manager. An entirely new and up-to-date mill of the hydraulic press type was brought from England and installed so as to be ready to handle the 1935 crop. About 30,000 bushels of Ontario beans were bought and paid for at 95 cents per bushel f.o.b. Stratford. Additional beans were purchased in the United States. The beans were stored in the plant elevators and the plant commenced operating at about the beginning of January 1936. After the mill had run for some time and several thousand bags of meal had been produced, analysis showed that the press was incapable of extracting the oil below 10 to 11 percent. The feed companies demanded that the meal not carry more than 5 percent of oil. This unfortunate experience has given the company a serious setback. Orders are on hand for every pound of oil and meal that can be produced—oil at 7 to 8 cents per pound and meal at \$30.00 per ton by carlots, at the mill—and not a single pound has been sold due to the unsatisfactory nature of the product. Mr. Bell, the president, was interviewed in Toronto and stated that in all probability the present mill would have to be taken out and returned to England and the regular type of mill (as recommended in the first place by the manufacturers) installed in its place. It is the intention of the company to go right ahead as the management has every confidence of ultimate success.

"At Belle River, Ontario, an entirely new mill is now in the course of construction. Mr. James Edgar, of Edgar Sugar House, Detroit, Michigan, is building this plant under the

name of the Edgar Soya Products, Limited. The intention is to produce oil, meal and flour. The mill is to consist of two Ford solvent extractors manufactured by the Ford Motor Company... This company intends to contract with growers for acreage. Although no attempt has been made to canvas the farmers contracts for more than 400 acres have already been secured. It is expected that this mill will have no difficulty in obtaining sufficient acreage to provide for its requirements."

"The Dominion Linseed Oil Company plant at Baden, Ontario... is operating a press of the expeller type at this point and is said to have been processing soybeans for 4 to 5 years" [i.e. since about 1931 or 1932]. "Mr. Livingstone, president of the Dominion Linseed Company, was interviewed in Toronto and states that in addition to soybean oil and meal his company is producing soybean flour at its plant in Owen Sound. This flour has been made by a special process and retains the entire oil content of the bean. It is of excellent quality, having been thoroughly tested at the University of Illinois in comparison with other soybean flours of United States origin and declared as equal or better than most of them for cooking purposes. This company is prepared to produce in addition a low oil content flour and plans to do so in the near future. The company is having considerable difficulty in marketing its soybean flour. Mr. Livingston claims that the large wheat milling companies control the bakeries and are strongly opposed to an additional flour being placed on the market, especially when there is any possibility of such flour being used in bread-making. He also claims that before he can definitely establish the value of this flour, both from the standpoint of nutrition and use, it will be necessary to show results that have been obtained in baking tests conducted by an impartial authority, such as the Dominion Department of Agriculture..."

"The Christie Brown Company, biscuit manufacturers, Toronto, have been large buyers of soybean flour and have expressed a preference for the Dominion Linseed Oil Company's product over soybean flours which have been previously imported. The price of 6 cents per pound is considerably lower than 9 cents per pound, which was formerly paid for the imported flours."

Tables on page B-5 show that the amount and value of soybeans, soybean oil, and soybean cake or meal imported to Canada have increased dramatically during the past 2 years. For example, during the one year from 1 April 1934 to 31 March 1935 some 4,325 bu of soybeans worth \$7,822 were imported. 64% of these soybeans were subject to a tariff totaling \$2,488.80. Yet during the 10 months from 1 April 1935 to 31 Jan. 1936 some 12,416 bu of soybeans worth \$13,918 were imported. Only 19% of these soybeans were subject to a tariff totaling \$2,242.74. "The imports of the last 10 months period represent the product of about 10,000 acres which might easily have been produced in Canada."

Note: This is the earliest document seen (Jan. 2005) that gives

soybean production statistics for Canada. Address: Div. of Forage Plants, Dominion Experimental Farms.

123. Farm Chemurgic Council. ed. 1936. *Proceedings of the Second Dearborn Conference of Agriculture, Industry, and Science*. Dearborn, Michigan: Farm Chemurgic Council; New York: The Chemical Foundation, Inc. 409 p. Held 12-14 May 1936 at Dearborn, Michigan.

• **Summary:** The conference is sponsored by the Farm Chemurgic Council and The Chemical Foundation, Inc. to "Advance the industrial use of American farm products through applied science." Mr. Wheeler McMillan, Permanent Chairman. Mr. Victor H. Schoffelmayer, Permanent Secretary. Contents: Introductory. 1. Council luncheon. 2. General opening session. 3. Symposium on new things. 4. Power alcohol. 5. Starches and sugars. 6. Plastics. 7. Cellulose. 8. Farm chemurgic banquet. 9. Soy bean. 10. Insecticides and fertilizers. 11. Closing general session. 12. Business session. 13. Appendix.

The Soy bean is the only crop discussed as such. Chapter IX (p. 243-67) contains the six papers presented: 1. Soy beans as a farm crop, by Mr. E.D. Funk; 2. The processing of soy beans, by Mr. Clark Bradley; 3. The rôle of soy bean oil in paint formulation, by Mr. E.E. Ware; 4. Soy bean proteins, by Mr. W.J. O'Brien; 5. Soy bean chemistry, by Dr. H.R. Kraybill; and 6. Mixing soy bean oil and tung oil, by Mr. F. Taggart. A discussion followed, moderated by Dr. C.C. Concannon.

Of the many exhibits, the application of vegetable oils in the manufacture of paints and the manufacture of molded plastics from farm grown materials were given most attention. Both of these projects were demonstrated in 5 different displays. Exhibitors included: Ford Motor Company, I.F. Laucks, Inc. and O'Brien Varnish Company.

Soy bean oil for tractors (p. 360): "If he [the farmer] can extract soy bean oil and run tractors on soy bean oil, he does not have to ship the soy beans to market and pay the freight, and let the industrialist extract the oil... he can run his Diesel tractor on the oil, and be ahead of the game all around." Also encourages farmers or groups of farmers to do the initial steps of processing their own soybeans to make industrial products. Note 1. This is the earliest document seen (April 2007) that mentions the use of soybean oil as a specifically "diesel" fuel. Many earlier documents on this general subject referred to its use as "artificial petroleum."

The casein plastics have increased their consumption during the depression. Their total now reaches 4 million pounds. They are used mostly in buttons and costume jewelry. "Of the soya bean plastics little can yet be definitely said as to prices or possibilities. Their characteristics are naturally similar to the casein materials and like them, they are comparatively expensive." Noted from the Chemurgic point of view is that the Ford plant output is said to be 300,000 pounds a year; 100,000 pounds of which represent soy bean material.

Financial report. Disbursements for the first year of the Council's activities ending April 30, 1936 (including organization expense of the First Dearborn Conference): Total Dearborn office—\$55,093.39. Total New York office (including printing and distribution of 40,000 copies of *Proceedings of First Dearborn Conference*)—\$44,567.41. Total for the year—\$99,660.80. All financial support was supplied by the Chemical Foundation, Inc.

Conference attendance: 1000 attend second conference; 35,000 attend nationwide meetings. Geographically, public meetings have included every section of the country. "The actual number of meetings organized specifically to further the Council's activities or at which the Council's program was presented, was in excess of 100, and the combined total attendance is estimated in round numbers at about 35,000."

The Soy Bean Committee (p. 391, 396-97). The meeting was called to order by Edward J. Dies, Executive Secretary of the National Soy Bean Processing Association [sic, National Soybean Processors Assoc. (NSPA)], Board of Trade Building, Chicago. Members present included E.D. Funk, Burlison, and Kraybill. Those present by invitation included Dr. J.W. Hayward of Archer Daniels Midland Co. (Milwaukee, Wisconsin), E.E. Roquemore of Allied Mills (Chicago, Illinois), E.F. Johnson and Lamar Kishlar of Ralston-Purina Co. (St. Louis, Missouri). Other members listed as being on the committee were Dr. A.A. Horvath, Chemist, Agric. Exp. Station, University of Delaware, Newark, Delaware. And Dr. Henry A. Gardner, Director, National Paint, Varnish & Lacquer Association, 2201 New York Avenue, N.W., Washington, DC. Mr. Adrian Joyce, President. The Glidden Company, 1963 Union Trust Building, Cleveland, Ohio. Note 2. This is the earliest document seen (Oct. 2005) showing that Dr J.W. Hayward is now working for Archer Daniels Midland Co.; an expert on soybean meal, he was formerly at the Univ. of Wisconsin.

"A sub-committee composed of Messrs. I.C. Bradley, president of the National Soy Bean Processors Association, Ware and Burlison, charged with certain work, found that the particular activity would now be carried on by the newly organized Soy Bean Laboratory at Urbana, which under the direction of the Federal government, will coordinate its work with that of the Experiment Stations of twelve cooperating states. Dr. Kraybill then sketched in broad outline aims and purposes of the new Laboratory and indicated potential benefits to all interests from grower to consumer."

"On motion of Mr. Bradley the resignation of Mr. H.G. Atwood as Chairman of the Committee was accepted and Edward J. Dies, Executive Secretary of the National Soy Bean Processing Association, was elected as Chairman" (p. 396-97).

Photos show: (1) General view of the exhibition hall from the entrance. (2) Mr. Francis P. Garvan, father of the Farm Chemurgic Council and President of The Chemical Foundation. (3) Dr. Charles M.A. Stine, Mr. Williams

Haynes, Mr. Howard E. Coffin.

Note 3. This is the earliest document seen (May 2008) that mentions Edward J. Dies in connection with the National Soybean Processors Association. Note the unusual spelling of the name of the Association of which he is executive secretary. Address: Dearborn, Michigan; New York.

124. Jenkins, G.F. 1936. The First Dearborn Conference—A resume and its significance. In: Farm Chemurgic Council, ed. 1936. Proceedings of the Second Dearborn Conference of Agriculture, Industry, and Science. Dearborn, Michigan. 409 p. See p. 381-85.

• **Summary:** The Farm Chemurgic Council and its movement to create new national wealth from products of the soil, grew out of The First Dearborn Conference. “Leading American farmers, manufacturers and scientists, meeting in Henry Ford’s Dearborn Inn on May 7th and 8th, 1935, were called together to discuss the ‘chemical revolution.’ The Conference was unique in the annals of industrial development. It sought to bring together 3 great forces, agriculture, industry and science—to weld them into a single tremendous force. Nothing like it had ever been attempted before.” Mr. Carl B. Fritzsche organized the memorable gathering, “In the name of high adventure.” He later became managing director of the Farm Chemurgic Council. The program was undertaken with the faith and expectation that such cooperation would: 1. Result in gradual absorption of much of the domestic farm surplus by domestic industry; 2. Put idle acres to work profitably. 3. Increase the purchasing power of the American farmer on a stable and more permanent basis.

“Henry Ford had begun work on a \$5,000,000 plastics plant, a division of his vast industrial ‘empire,’ in which he is to convert soy beans into paints, varnishes, automobile parts. Ford envisions the day when automobile bodies may be made of soy bean meal or perhaps in combination with some other product of the soil that now goes to waste. His chief chemist, R.H. McCarroll, addressed the Conference on the ‘Increasing Use of Agricultural Products in the Automobile Industry.’”

Henry Ford’s homely philosophy fits in so admirably with the Farm Chemurgic Council’s long-time program, it is again emphasized: “I believe that industry and agriculture are natural partners. Agriculture suffers from lack of a market for its products. Industry suffers from a lack of employment for its surplus men. Bringing them together heals the ailments of both. I see the time coming when the farmer not only will raise raw materials for industry, but will do the initial processing on his farm. He will stand on both his feet—one foot on the soil for his livelihood; the other in industry for the cash he needs. Thus he will have a double security. That is what I am working for.” Address: Assoc. Editor, The Detroit Saturday Night.

125. National Research Council of Canada. 1936. Proceedings of the Second Conference on Soybeans. Ottawa, Canada. 18

p. Held on 4 May 1936 in the National Research Building, Ottawa, Ontario, Canada. Confidential.

• **Summary:** Contents: Minutes. Appendixes: A. Memorandum on soybeans: Varieties, introduction, selection, breeding, variety testing and other experimental work—of the Division of Forage Plants, Central Experimental Farm, Ottawa, by L.E. Kirk (A1-5).

B. A report on the present status of the soybean industry, particularly in western Ontario, by F. Dimmock (B1-6).

C. The soybean (The Royal Bank of Canada, Monthly Letter, April 1936) (C1-2).

In addition to the people present at the first conference on April 29, the following were also present: Dr. L.E. Kirk, Mr. C.H. Robinson, and Dr. J.M. Swaine.

The following subjects were discussed: Dr. Kirk talked about the potential for growing soybeans in Manitoba, Saskatchewan (and the central and northern parts of the other prairie provinces), Nova Scotia, Quebec, the Maritimes, Guelph (where O.A.C. had developed and popularized a new variety named Goldsoy), and the area around Medicine Hat (in southeast Alberta). “Southern Ontario was the only suitable place in Canada for the industrial growth of soybeans. There was no future for soybeans in Summerland [BC], which had other feed crops. The British Columbia coast, he said, was too wet.” Work on soybeans had once been conducted at Macdonald College [Quebec], but had been discontinued. During the last 7 years, the average soybean yield in Canada had been about 25 bushels/acre (range 18 to 30 bu/acre). Dr. Kirk reported that soybeans grown in Ottawa [in northeastern Ontario] had shown consistently higher oil content than those grown at Harrow [at the southwestern tip of Ontario], while the latter had a consistently higher protein content.

“Mr. Robinson stated that fairly complete analyses of the O.A.C. and Mandarin varieties over a period of two years were available and that a chemical study of the oil content of soybeans had been made, but that no report on this had been prepared yet.”

Concerning the use of soybean flour to extend wheat flour in foods (such as baked goods): “Dr. Kirk pointed out that a good deal of soybean flour was already being used and that its use was likely to increase...” Dr. Whitby referred to Henry Ford’s plant for making plastics from soybeans and the research on industrial utilization being carried out at Urbana, Illinois [by the U.S. Regional Soybean Laboratory]; “industrial outlets looked as though they would be very important.” “Dr. Kirk mentioned the recent application of soybeans in the manufacture of ice cream, chocolates, sausages and peanut products.” Use of soybeans in feeding animals. Dr. Hopkins was appointed to attend the Second Dearborn Conference of Agriculture, Industry and Science, soon to be held in Michigan; one session was scheduled to be devoted to soybeans. The National Research Council might consider investigations on industrial development

of soybeans, being careful not to duplicate the work of Dr. Swaine at the Experimental Farm. The meeting lasted 1 hour and 40 minutes. It was agreed that all discussions and research would be treated as confidential.

See separate entries for each of the 3 Appendixes.
Address: Ottawa, Ontario, Canada.

126. The Royal Bank of Canada Monthly Letter, April 1936. 1936. In: National Research Council of Canada. 1936. Proceedings of the Second Conference on Soybeans. Ottawa, Canada. 18 p. See Appendix C, p. C1-C2. Held on 4 May 1936 in the National Research Building, Ottawa, Ontario, Canada. [1 ref]

• **Summary:** An overview of the rapid growth of soybeans in the United States, and their potential as a crop in Canada. "To many people, the soybean has an oriental flavour; they know it as the basic ingredient in some of the most famous English meat sauces [Worcestershire, etc.] and have heard that it is an important Manchurian export. Against this background it is something of a surprise to learn from the *Wall Street Journal* of February 17, 1936, that in the previous year it had become, from the viewpoint of cash return to the farmers, the fourth most important cereal crop in the United States. The crop of 1934 was about 50 per cent larger than that of 1933 and the crop of 1935 was doubled that of 1934."

The many uses of the soybean are discussed, including soybean flour (with and without the original oil content of the seed), soybean milk, butter, cheese [tofu], and coffee. Among industrial uses, in 1934, 10 million lb of soybean oil were used by the paint industry in the USA. "In varnish and lacquers soybean oil is the principal base. The Ford car is finished with a soybean lacquer and the Ford Company is erecting a \$5,000,000 plant in Detroit [Michigan] to make soybean products. In soaps, glues, linoleums and rubber substitutes, the ingredients of the soybean have come to be of predominant importance."

127. Heilman, Paul. 1936. Re: Cultivation of soybeans in Cuba. Letter to Agricultural Experiment Station (*Estacion Experimental Agronomica*) at Santiago de las Vegas, Cuba, June 16. 1 p. [Spa]*

• **Summary:** Mr. Heliman of the Ford Motor Company in Havana is very interested in cultivating soybeans in Cuba and would like to see a field of soybeans. Address: Ford Motor Co., Havana, Cuba.

128. Calkin, D.L. 1936. Report by Dr. Whitby of interview with Mr. D.L. Calkin of the Dominion Soya Products Company, Montreal. In: National Research Council of Canada. 1936. Proceedings of the Third Conference on Soybeans. Ottawa, Canada. 34 p. See Appendix B, p. B1-B10. Held on 30 June 1936 in the National Research Building, Ottawa, Ontario, Canada. [2 ref]

• **Summary:** Note: In several subsequent interviews in

this report, the company name is given as Dominion Soya Industries Limited. Based on a phone conversation of 24 April 1936. Dominion Soya Products Co. uses an inexpensive solvent extraction plant developed by the Ford Motor Co. Aviation gasoline is used as the solvent, but it is not entirely satisfactory, since it leaves an odor in the finished product. Most of the plants processing soya beans in Canada are apparently using solvent extraction. Exceptions are (1) Soya Mills Co. (Mr. Tricky) [sic, Trickey; at Stratford, Ontario], using English-built oil expeller equipment, and (2) Dominion Linseed Oil Company, making whole-oil flour.

Soybean oil: The chief outlets for soya bean oil are to the paint manufacturers and the packers (including Canada Packers), which use it for the production of shortening, or of a refined, bland salad or cooking oil. "It is understood that the Ford Motor Company is now using soya bean oil exclusively for its car enamels."

Soybean flour: The Ford Motor Co., in co-operation with the Bakelite Co., has developed a successful plastic from soya bean meal. Soya bean flour is being used in England for making sausages; it is claimed to have the advantage of holding the meat juices and of acting as an antioxidant (preventing rancidity). Dr. Rabinovitch of Montreal is in favor of using soy "flour in sausages, especially in the low-grade type known as 'hot dogs.' Dr. Rabinovitch on his trip to the north last summer took considerable quantities of soya bean flour and oil for use of the Eskimo. Canada Packers think well of its use in sausages... Brown of Bradley Foulds in England used soya flour for finishing light textiles with good results, but found that in the case of heavy goods and finishes the flour tends to produce a slimy feel on the goods. Experiments on the use of soya flour in water paints were made by the Sherwin-Williams Co., Montreal. The objection was raised, however, that the solutions stank. In experiments in England in this connection the chief point stressed was the difficulty of getting the flour into solution... Experiments are in progress in Canada on the use of soya flour in the manufacture of explosives, presumably after nitration. Soya bean flour used as a glue in the manufacture of plywood from soft wood has the advantage of being more waterproof than any other glue known. On account of this property it was used for all walls and floors exposed to the weather at the Century of Progress Exhibition in Chicago [Illinois]. Soya bean glue is being made in Canada by the Hercules Glue Company and a small quantity by the Bulldog Grip Cement Co."

"Mr. Calkin's experience with Ontario beans has been that they have often been contaminated with shells, small stones, clay, etc. Furthermore, U.S. beans could be bought for 90¢–\$1.00 a bushel at a time when \$1.50 was being asked for Ontario Beans.

"The Co-operative Soya Bean plant in Ontario (at Milton) in which the Archer Daniels Midland Company is also interested is not now apparently operating. It appears that the

secretary of the Co-operative decamped with the funds.”

Also describes (p. B5-10) several experiments conducted by J.B. Phillips, MSc, PhD (July 1933 in Montreal) on “beating experiments with sulphite pulp and soya flour” using Dominion Soya Powder as a filler and size for paper. And “Utilization of Dominion Soya in coatings for papers.” Address: Dominion Soya Products Company, Montreal, Quebec, Canada.

129. Calkin, D.L. 1936. Report by Mr. F.C. Green of interviews with Mr. D.L. Calkin on April 23 and 24, 1936. In: National Research Council of Canada. 1936. Proceedings of the Third Conference on Soybeans. Ottawa, Canada. 34 p. See Appendix C, p. C1-C2. Held on 30 June 1936 in the National Research Building, Ottawa, Ontario, Canada.

• **Summary:** Dominion Soya Industries Ltd. [called Dominion Soya Products Co. in another interview in this document] operates a Ford-type solvent extraction plant with a capacity of 2½ tons of soybean per day. The solvent is high test or aviation gas. The company originally imported soya flour from Germany.

“Soya flour with wheat flour: One company in the West failed to market a health bread containing about 10% or more of Soya flour. Moirs in Halifax [Nova Scotia] are attempting to sell a 10% bread, but this sells at 10 cents and they find it difficult to compete with ordinary loaves selling at 6 cents.

“Using about 2% soya flour is a different matter. While there is added cost, this is overcome by ability of soya flour to carry extra moisture through oven and 4% water (or twice weight of soya flour may be added). These loaves do not stale as rapidly. Some bakers are quite won over to this use of the flour—others are not impressed. In cakes, the use of soya flour may cut down eggs required, but this is of greater interest to commercial bakers than to housewives. Recipes would require some modification with probable larger amounts of liquids and baking powder.

“Mr. Calkin did not believe that much sale could be found for packaged flour until there was greater common knowledge of its uses and value. Eatons in Montreal sell some at 65 cents per lb. in their special diet section. Some uses for flour are in bread, cakes, pancakes, muffins, soup and sauce thickening, etc.” Address: Dominion Soya Industries Ltd., 2049 Harvard Ave., Montreal, Quebec, Canada.

130. Dies, Edward Jerome. 1936. Soy, the Midwest’s miracle bean. *Commerce* 33(5):27-28. June.

• **Summary:** The editorial introduction begins: “The sensation of agriculture as far as the industrial and chemical worlds are concerned is the soybean. In 1935 the crop was 39,000,000 bushels, double the crop of 1934... Henry Ford helped make the soybean a fascinating feature of his World’s Fair exhibit of 1934. It was an important unit in his industrialized farm scheme.”

The article begins: “A brilliant new star has appeared in

the agricultural skies. It is the versatile and resourceful little soybean. Hoary with age in the orient, its recent dizzy rise in America has caused the farm world to blink in wonderment.

“Where it is going, what other magic it will perform, is anybody’s guess. But the indisputable fact is that it has already written a new and colorful chapter in agricultural history, and has sent dollars jingling into the pockets of an ever-growing number of farmers.”

Discusses the increasing soybean acreage, establishment of the soybean research laboratory at the University of Illinois, food and industrial uses for the bean, growth of the industry in the United States, “I.C. Bradley, Taylorville, Illinois, president and the National Soybean Processors association,” and the need for tariff protection. “A step of first importance was the recent decision to launch a regional research laboratory at the college of agriculture, University of Illinois, to be headed by the able Dr. O.E. May of the United States bureau of chemistry and soils... The work will be coordinated with that of the experiment stations of 12 cooperative states.” Plastics are manufactured from the soybean cake. It is being converted into: steering wheels, gear shift lever balls, horn buttons, light switch handles, distributor bases, distributor covers, window trim strips, dash board panels, timing gears, and electrical insulations. It has been said that “the motor car of the future may be ‘grown on the farm.’”

In 1934 it is reported that the paint industry used 10,451,000 pounds of soybean oil and the linoleum industry used 2,843,000 pounds.

“Tariff protection needed: To protect industry, Congress must take action soon to curb the inflow of competing products. It is claimed that last year we imported 2 billion pounds of foreign fats and oils or oil equivalent, in oil bearing seeds and nuts.” A table (p. 28) shows imports to the USA of nine edible vegetable oils and tallow for the years 1934 and 1935. The vegetable oils are corn, palm kernel, palm, peanut, perilla, soybean, rapeseed, sesame, and cottonseed. In 1935 the top three imported in the largest amounts were palm oil (159.8 million lb), tallow (98.5 million), and cottonseed oil (62.5 million). Soybean oil had the smallest amount imported (5.2 million lb).

The article concludes: “Whatever the outcome, one salient fact remains: The little miracle bean from Manchuria is destined to write its story boldly across the pages of American agricultural history.”

Note 1. This is the earliest publication seen (Nov. 2004) by Edward Jerome Dies concerning soybeans. Never known for understatement, the colorful Mr. Dies was a staff correspondent of the Associated Press and a magazine writer before launching his Chicago public relations bureau. In 1936 his agency was engaged by the National Soybean Processors Association. Soon he became president of the expanding trade group, and continued in office until 1945. A vigorous promoter of soybeans, he was also author of the important

book *Gold from the Soil* (1942, 1943).

Note 2. This is the earliest document seen (May 2008) that mentions the “National Soybean Processors association” (or “Association”).

Note 3. This is the earliest document seen (July 2007) that refers to the soybean as the “miracle bean.” It is also the earliest document seen (July 2007) with the word “miracle” in the title in connection with the soybean.

Note 4. This is the earliest document seen (Aug. 2002) that contains the term “Hoary with age” with the respect to the antiquity of the soybean.

131. Hopkins, C.Y. 1936. Report on Dearborn Conference of Agriculture, Industry & Science, Detroit, May 12-14, 1936. In: National Research Council of Canada. 1936. Proceedings of the Third Conference on Soybeans. Ottawa, Canada. 34 p. See Appendix D, p. D1-D4. Held on 30 June 1936 in the National Research Building, Ottawa, Ontario, Canada.

• **Summary:** In this Report (No. C35-368) the author gives his general impressions of the conference (which hindsight shows to be quite inaccurate or short-sighted), summarizes papers that were presented, and describes in detail his visit to the Soybean Extraction Plant at the Edison Institute in Greenfield Village [Dearborn, Michigan]. Address: National Research Laboratories, Div. of Chemistry, Canada.

132. Breedlove, L.B. 1936. Soy bean—The magic plant: Industrial uses already manifold with more in prospect. Article XIV. *Chicago J. of Commerce and La Salle Street Journal*. July 2. p. 14.

• **Summary:** Contents: Introduction (Early history of plastics, celluloid, Dr. Hyatt, and Dr. Baekeland). 1,500 plastic materials now used. Soya protein suitable in synthesis. Soya bean products used by Ford. Ford’s new soy bean plastics plant. Soy bean oil in the foundry.

“Nearly 100 years ago Dr. Hyatt, searching for a substitute for the ivory from elephants’ tusks used in billiard balls for which a large prize was offered as the shortage was then acute, after the date for the prize had passed, discovered the world’s first plastic material—called celluloid—composed of cellulose (from plants) and camphor. The price of the natural camphor, only obtainable from the island of Formosa [Taiwan], was for decades high enough to limit the commercial uses of celluloid. It was not until the year 1934 that synthetic camphor was produced, a development which would have greatly lowered the price of celluloid.

“In 1912, Dr. Baekeland found the secret of synthesis and produced a resinous material by the action of phenol (carbolic acid) and formaldehyde in the presence of a catalyst. This new material of high electric resisting properties and mechanical strength, which could be moulded easily and quickly, was supplied by the plastic industry, born just in the nick of time, for use in the electrical equipment necessary in all the machines used on land or water or in the air in

military operations, at a speed so superior to the output of other materials that one general said ‘the more the plastics the shorter will be any war.’”

“The production of moulding plastics from soya bean meal is based on the ability of the protein to react with formaldehyde to produce a thermoplastic resin. Many such resins have been produced from soy bean meal. [But] many of these products made from soy bean meal exhibit the same crazy crosspatch of shade and color as did the original plastics of twenty years ago.

“Production of some of the finer types of plastics involves the separation of protein from the soluble carbohydrates. Several phases of this separation remain to be worked out before such types of plastics can be put to their commercial use.

“Soy bean products used by Ford: During the recent years the Ford Motor Company has used increasingly larger quantities of resins of this type in the molding of many small parts as buttons, light switches, ignition system parts, floor boards, battery covers and window frames. These products show strength, moisture resistance and dielectric properties comparable to the phenol-formaldehyde resins which they are replacing.”

“Ford’s new soy bean plastics plant: After six years of research on soy bean resin, the Ford company commenced, last August, the construction of a moulding plant, 86,000 feet of floor space, which is expected to cost around \$5,000,000.

“The patent situation in reference to soy bean plastics is somewhat confused due to basic patents held by some of the larger chemical companies.”

“Soy bean oil in the foundry: Whenever a hollow casting of metal is made, a core is used to form the hollow space in the casting. The core, usually a mixture of fine sand and a drying oil molded to shape and baked, must be strong enough to withstand the action of the hot metal as it is poured into the mold and, when the metal has cooled, be sufficiently pulverized that it may be removed through some small hole in the casting.

“Extensive test have proven that soy bean oil meets all requirements for a core binder equally as well as does linseed oil and, in one requirement, namely, wetting quality, soy bean oil is superior to linseed. The wetting quality of soy bean oil is such that it is not necessary to add kerosene or water to aid the distribution of the binder through the core. Soy bean oil is now used almost exclusively in many of the largest foundries in this country.

“A recent application has been the dipping of new castings in a vat of soy bean oil before outside storage. The oil forms a film over the casting and fills pores so that the castings remain clean and bright even after six months’ storage in outside weather.”

Table I shows “Soy beans used in the manufacture of Ford car.” In making one million Ford cars, a total of 4.362 million lb of “soy bean oil-free meal,” equivalent to 97,454 bushels or

6,101 acres, are used in descending order of amount used as follows: in the window frames (3,333,333 lb = 76.4% of the total meal used = 74,074 bushels = 4,500 acres), distributor cap—2 pieces (320,000 lb), distributor bar end—2 pieces (300),000 lb, coil plate (140,000 lb), light switch (80,000 lb), gear shift knob (66,666 lb), and horn button—large (22,200 lb). In making the same one million Ford cars, a total of 618,600 lb of “soy bean oil,” equivalent to 463,920 bushels or 28,995 acres, are used as follows: in the enamel paint (360,000 gallons = 270,000 bushels of soybeans = 16,875 acres), and foundry sand cores (258,600 gallons). Address: Staff member, Chicago Journal of Commerce.

133. Breedlove, L.B. 1936. Soy bean—The magic plant: Industrial uses already manifold with more in prospect. Article XV. *Chicago J. of Commerce and La Salle Street Journal*. July 7. p. 11.

• **Summary:** Introduction: Casein and soy bean glues. Lecithin from new plants. Use in ice cream and soup tablets (as well as linoleum, printing inks, and lubricating oils). Industrial forms using soy beans. New laboratory to study uses (regional laboratory in Illinois).

Casein is widely used to make glue. The casein (about 18% by weight) is used with borax water and glycerine in a state of hydrophilic solution to form the highly cohesive jellies called glues.

“The fir and plywood industry of the Pacific coast now uses extensively glue made with soy bean casein. Over half of the box shook plywood industry-cut boxes made for assembly at the shipper’s plant—in the southern and eastern part of this country recently has adopted soy bean glue in preference to other glues. Tests by chemists of the plywood industry have proven that glue made from soy bean oil will not dissolve in water. The total consumption of soy bean glue for various uses in the wood working industries of this country is nearly 1,500 tons per month.

“Lecithin from new plants: Lecithin is used to give chocolate candy a gloss. Gumdrops manufacturers put in a drop of this substance to prevent hardening in storage. Cotton textile plants produce a soft, supple finish to their goods by the use of lecithin. Tanneries want their chrome leather to take up plenty of grease and lecithin has been found to be the best agent to increase the absorption.

“During the last decade mills for commercial extraction of lecithin from soy beans were successfully operated in Germany and Denmark, and, according to Rewald, over one million pounds are used annually in the German margarine industry. For a number of years soy bean lecithin was imported into the United States in competition with the lecithin extracted from eggs, but recently two mills were constructed in this country to supply the domestic demand. Lecithin is used in margarine to secure a better distribution of the fat.

“A solid made by vulcanization of soy bean oil with

sulphur, known as factice, a compounding ingredient for the rubber manufacturer, was introduced last year... This brown compounder is used to increase the aging, curing, strength and wear resisting qualities of automobile tires and other heavy rubber products,...

The following is a partial list of firms which buy soy beans and make industrial [non-food, non-feed] products from them: Archer-Daniels-Midland Company, Milwaukee, Wisconsin makes refined oils and kindred products. Armstrong Cork Company, Lancaster, Pennsylvania makes cork coverings and linoleum. Armstrong Paint and Varnish Works, Chicago, Illinois makes soaps and paints. The Blanton Companies, St. Louis, Missouri makes soaps. Davies-Young Soap Company, Dayton, Ohio makes soaps. Detroit Graphite Company, Detroit, Michigan makes soy bean oil varnish. E.I. duPont de Nemours and Company, Wilmington, Delaware makes paints, Duco finishes, plastics. Ford Motor Company, Dearborn, Michigan makes plastic automobile parts. Fischer’s Surfa-Saver, Inc., Cincinnati, Ohio makes soft soap. Funk Brothers Seed Company, Bloomington, Illinois makes oil meal feeds. The Glidden Company, Chicago, Illinois makes paints, varnishes, lacquers. I.F. Laucks, Inc., Seattle, Washington, and Portsmouth, Virginia makes glues. Paintcraft Company, Galesburg, Illinois makes paint. Peterson Core Oil and Manufacturing Company, Chicago, Illinois makes core oils. Procter and Gamble, Cincinnati, Ohio makes soaps. Purina Mills, St. Louis, Missouri, makes oil meal feeds. Sherwin-Williams Company, Chicago, Illinois makes paints, varnishes, lacquers. A.E. Staley Manufacturing Company, Decatur, Illinois makes refined oils and kindred products. Stamford Rubber Company, Stamford, Connecticut makes rubber compounders. Woolsey Paint and Color Company, Jersey City, New Jersey makes paints and varnishes.

The Bankhead-Jones Act of 29 June 1935 authorizes the USDA to establish several specialized laboratories in the major agricultural regions of this country. The department last month designated the College of Agriculture of the University of Illinois as the regional government research laboratory to serve the 12 north central states. The 3 objectives of the laboratory are discussed. “It is expected that twenty research men will soon be at work in the 6,000 square feet of space that the new laboratory will occupy.” Address: Staff member, Chicago Journal of Commerce.

134. Breedlove, L.B. 1936. Soy bean—The magic plant: Location of processing mills; plant explosion hazard. Article XVII. *Chicago J. of Commerce and La Salle Street Journal*. July 11. p. 12.

• **Summary:** Contents: Introduction. Manufacturers of mill equipment: Expellers, hydraulic presses, continuous solvent extraction equipment, general mill equipment. The explosion hazard.

A large map, titled “Location of soy bean processing

[crushing] plants,” at the top of the page shows the eastern half of the United States and all of the major soybean growing and processing states. It shows plants that have processed soy beans within the last 6 months. A triangle symbolizes a small-capacity plant, and circle a medium-capacity plant, and a square a large capacity plant. “These plants are of the expeller, hydraulic, and solvent extraction types. Most of the large plants are equipped with solvent extraction and expeller machinery; the medium sized plants seldom have solvent extraction apparatus in conjunction with expeller equipment; and the small plants generally have only expeller equipment. The greatest number of plants are in Illinois, Indiana, and Iowa, and down the Mississippi River.

Manufacturers of continuous solvent extraction equipment are: (1) J.P. Devine Manufacturing Company, Mount Vernon, Illinois. (2) C.O. Bartlett and Snow Company, Cleveland, Ohio. (3) Edison Institute (Ford Motor Company), Dearborn, Michigan. (4) Wurster and Sanger, Inc. Chicago.

“The Explosion Hazard: Within the last few months disastrous explosions in two soy bean plants of different types—one a large commercial mill having a daily capacity in Chicago and the other one a small rural community mill at Momence, Illinois—have occurred. Both plants were practically destroyed and many persons lost their lives.” In each case, hexane solvent caused the explosion. Address: Staff member, Chicago Journal of Commerce.

135. Grodzinski, Paul. 1936. Kunstharzpressstoffe im Kraftwagenbau [Pressed artificial resin objects in automobile construction]. *Kunststoffe* 26(7):141-44. July. (Chem. Abst. 30:7119). [1 ref. Ger]

• **Summary:** Soybean plastics are used at Henry Ford’s River Rouge plant to build automobile parts and bodies. The formula (in kilograms) for these soybean plastics consists of the following: wood meal or sawdust 180.00, defatted soybean meal 150.00, formaldehyde 113.50, phenol 113.50, colorings 54.00, alcohol 15.00, ammonia (gas) 11.95, limestone (chalk) 11.95, water 5.62, stearic acid 5.62, and zinc stearate 1.86. Address: Dipl. Ing.

136. Horvath, A.A. 1936. The soybean points the way to agricultural recovery. *Scientific Monthly* 43:63-69. July.

• **Summary:** “The soybean is a vivid example of a crop with an amazing diversity of industrial uses... In 1934 soybean oil constituted 11.6 per cent. of the world’s production of vegetable oils. The United States production of soybean oil for the same year amounted to 1.6 per cent. of the total U.S. production of vegetable oils...”

“When hydrolysed by acids or enzymes, soybean protein is converted into soy sauce, which is used for bouillon extract preparations and has been for decades as the base of Worcestershire sauce.”

Soybean protein “is capable of taking the place of casein (which is much more expensive and is being imported to

the U.S.) in a large number of industries, such as sizing for paper, glue (waterproof) and plastics, all of which are already in existence in our country. At the 1933-34 International Exposition in Chicago [Illinois] all exterior walls and sub-floors of the Hall of Science were constructed of plywood panels glued with soybean glue. To-day soybean meal is used by the Ford Motor Company for the manufacture of horn buttons, gear shift lever balls, light switch handles, distributor bases, distributor cover and window trim strips... With the completion of a new \$5,000,000 River Rouge plant for soybean plastics, the use of soybean meal will extend to making dashboards and probably also automobile bodies.”

Soybean meal can also be used for making floor coverings, for hardening and strengthening steel and iron, in water paints, as an emulsifier for asphalt in roads, and as an emulsifier for mineral oils for dormant sprays. Soya lecithin also has many applications. One million pounds of soya phosphatides are used annually in the margarine industry in Germany. It can be used for making and softening leather and for milling rubber to a powder.

In 1934 the main commercial uses of soybean oil were (in million pounds): Paint and varnish 10.4. Linoleum and oilcloth 2.8. Compounds and vegetable shortenings 2.7. Soap 1.35. Printing ink 0.059.

During the last decade “whole soya flour” has steadily gained in popularity. It “contains over 2 per cent. of phosphatides, nearly all the known vitamins, and an ash of high alkalinity.” Address: M.D., Chemist, Agric. Exp. Station, Newark, Delaware.

137. *Business Week*. 1936. Soybean sits pretty: Becomes so important that Chicago Board of Trade may establish futures trading. Aug. 8. p. 21-22.

• **Summary:** “The soybean is advancing so rapidly in importance among American Farm products that the Chicago Board of Trade is considering the establishment of soybean futures trading.” Note: Soybeans were soon admitted by the CBOT. The first transaction, in October 1936, was for 5,000 bushels at \$1.20.

“Prime mover in the industrial development of soybeans has been Henry Ford and the Farm Chemurgic Council, which he sponsors. Not only has he found a multitude of uses for soybean products in the Ford car, but he has been instrumental in increasing use of it for human consumption. Latest figures show use of 560,000 bu. of soybeans in the production of a million Ford cars (more than ½ bu. per car).”

The soybean is used in certain soaps, and it is a fairly good drying oil for use in paints (11,000,000 lb in paints last year) and varnishes, with an iodine value of about 136 compared with 185 for linseed oil. “The oil is used in lard substitutes, margarin [margarine] and cooking oils, bakery goods—to mention but a few of a growing list. The familiar soya sauce for chop suey is an ancient product of the plant.”

“Factors responsible for the sharp increase in 1935

acreage to 2,691,000 from 1,511,000 in 1934 included the AAA [Agricultural Adjustment Administration (USDA)] restrictions on production of other grains and the growing realization by farmers that soybeans are valuable as a source of nitrogen for land and suitable for rotating purposes." The competition of soybean oil with tung oil is discussed.

138. Associated Press (AP). 1936. A vegetable wonder. *Advertiser (Montgomery, Alabama)*. Sept. 8.

• **Summary:** "The soy bean is an immigrant from China... In Detroit, Mr. Ford is building a \$5,000,000 plant to make soy bean products. He finishes all his cars with soy bean lacquer [paint].

"The soy bean is also being canned for human consumption. So versatile is this remarkable vegetable that there is soy bean milk, butter, cheese, coffee, breakfast foods, and macaroni on the market. It is remarkable because of a complete absence of starch and a high protein content. In soy bean flour the protein runs from 37 to 40 per cent, and has a high nutrition value."

Note: A cartoon on the same page tells the life story of George Washington Carver. "George worked his way through college. He extracted an oil from peanuts which has been used in treating infantile paralysis. Now, Dr. George Washington Carver, whose parents were slaves, is a great scientist—one of the few Americans to become a member of the Royal Society of Arts, London."

139. Tedford, Claude C. 1936. George Washington Carver's exhibit creates attention at Texas Centennial Fair. *Black Dispatch (Oklahoma City, Oklahoma)*. Sept. 26.

• **Summary:** "Dallas, Texas, Sept. 24.—(ANP)—No exhibit at the Hall of Negro Life has greater national significance than the exposition of the Tuskegee Research and Experiment Station work under the direction of George W. Carver and his assistant A.W. Curtis, Jr....

"The main feature of the experiment work presented here is work done on the sweet potato and the peanut."

The next section is titled "Potato and Peanut Versus the Soy Bean." It discusses the Ford Motor Co. exposition at the Centennial Fair, and the prominent place given to the soy beans. "The Ford Motor Company has elevated the lowly soy bean to a higher place of usefulness." The many ways in which the soy beans ends up in Ford cars is discussed. "Dr. Carver's work has clearly shown that his potato products and his peanut experiments can be extended into just the same manner as the soy bean has been exploited."

Note: This is the earliest document seen in which both Carver and Ford are discussed in the same article.

140. Barnard, H.E. 1936. Soybeans and the Farm Chemurgic Council. *Proceedings of the American Soybean Association* p. 8-14. 16th annual meeting. Held 14-16 Sept. in Iowa.

• **Summary:** The Farm Chemurgic Council emerged as a

new organization from the Dearborn meeting. It was created with the definite purpose of advancing the industrial use of farm products through applied science. The name of this new organization translates simply as "chemistry at work for the farm."

Today every country is striving towards self-containment for their food supply. Ten years ago 10,520 tons of soybeans were crushed for the production of oil cake and meal. In 1935, 272,745 tons were crushed—more than 25 times the volume in 1925. "A report issued the last of January by the Bureau of the Census showed that 49 mills were listed as soybean crushers for the last quarter of 1935... These figures compare with 19 active mills crushing 60,183 tons of beans and producing 16,779,450 pounds of oil and 49,254 tons of cake during the same quarter in 1934; 12 active mills, 26,876 tons, crushed, and 7,609,999 pounds of oil and 21,615 tons of cake in 1933; 12 active mills, 36,341 tons crushed, and 10,154,983 pounds of oil and 30,154 tons of cake in 1932."

"Fifteen years ago when the soybean was grown largely as a forage crop, the need was for more legumes in the rotation; more homegrown, high protein feeds in the feed bin; and substitutes in the rotation for red clover and oats... soybean has advanced beyond a substitute crop and has become the 'wonder' bean.

"Indeed so important to industry is this 'wonder' bean that a major section of the Second Dearborn Conference of Agriculture, Industry and Science was devoted entirely to a discussion of the soybean crop... At the present time most of the oil used by paint manufacturers is largely imported as linseed oil from the Argentine, tung oil from China, perilla oil from Manchuria and Japan. But 4% of the oil used by the paint industry is soybean oil."

Soybean oil was reported at the conference to not only hold its own but showed outstanding performance in certain lines. In automobile baking and air-drying synthetics soybean oil "gives a depth of color, a freedom from 'orange' peel and 'silk,' and a permanent elasticity not possible with other oils... It also exhibits humidity and grease resistance and permanency of color not possible with linseed, perilla or tung oils."

In 1932 the Glidden Company undertook the isolation of protein from soybeans. "At that time it was found that the ordinary type of soybean meal such as the expeller or hydraulic meals, which were then available in the U.S., was not suitable for obtaining a protein which would have the proper characteristics of color, purity, adhesion, and viscosity.

"The protein in the soybean meal is very sensitive to temperature, so modifications had to be made in the process to extract at as low a temperature as possible."

When the Farm Chemurgic Council was organizing an important Western Conference at Fresno, California, they were told by lumber manufacturers in Seattle that the plywood industry in the Northwest was using large quantities of soybean glues, one company alone reporting that its

plywood output used the proteins from more than 60,000 acres of soybeans.

“Figures just obtained from the Ford Motor Company show that during the past year the company used in various ways the soy beans grown on more than 75,000 acres. The oil found use in the enamels for painting cars, more than a million gallons of it. More than half a million more gallons were made into glycerine and used in shock absorbers and 200,000 gallons went to the foundries for use as a binder for core sand. The meal is combined in a chemical reaction with phenol and formaldehyde into a moulding compound, not as a filler but as an actual part of the plastic which we see in our cars as gearshift knobs, horn buttons, electrical switch assemblies and distributor cases... What will the development of these new plastic products require of soybean grower?... There is a potential requirement of some 5 to 10 million bushels of soybeans annually... The experimental soybean extraction unit which has operated at Greenfield Village for more than a year has been enlarged and developed into commercial units which are now in full operation. The experimental unit... will handle in 200 days some 40,000 bushels or the production of 2,000 acres at a processing cost of about 15 cents a bushel. A unit of this size may well lend itself to farm community operation and so carry forward the Farm Chemurgic Council's belief that one practical form of farm relief lies in the partial processing of farm crops close to the source of raw material.” Address: PhD, Director of Research, Farm Chemurgic Council, Dearborn, Michigan.

141. Burlison, W.L. 1936. The soybean. A plant immigrant makes good. *Illinois Agricultural Experiment Station, Circular No. 461*. 15 p. Sept. First printed in *Industrial and Engineering Chemistry*. 1936. 28(7):772-77. July. [24 ref]
• Summary: A shorter version of this article, with the same title and author but a somewhat different format, was published two months earlier in *Industrial and Engineering Chemistry* 28(7):772-77. July.

Contents: Introduction and brief history. Description of the soybean. Soybean culture. Industrial uses. Disposition of the domestic crop. Products derived from soybeans: Food, feed, and industrial products. Imports. Chemical composition: Soybeans, soybean oil, soybean oil meal. Methods of processing soybeans: Expeller, hydraulic-press, solvent extraction. Industrial use of soybean oil. Use of soybean oil in the paint industry. Soybean oil as a core binder. Other uses for soybean oil: Lecithin, sulphonated oil. Plastic industry uses soybean oil meal. Glue from soybean oil meal. Soybean oil meal for fertilizers. Further investigation needed.

The section titled “Products derived from soybeans” (p. 6-7) gives is an extensive list of commercial food, feed, and industrial products derived from soybeans. This list is almost identical to that published two months earlier. Address: Chief in Crop Production.

142. Associated Press (AP). 1936. Farmer-industry partnership gains so fast Ford can ‘hardly keep up’ with his project. *New York Times*. Oct. 4. Section 2. p. 1.

• Summary: This partnership “is a story of accomplishment centering about the soy bean, which has found a place in industry...” Mr Ford has developed a soybean processing [solvent extraction] unit “which he believes could be bought or built by groups of farmers at a cost of from \$3,000 to \$4,000.”

143. *Automotive Industries*. 1936. Field to factory. 75:470. Oct. 10. *

• Summary: “Farms of the Future,” a sound-slide production, was shown by the Ford Motor Co. at Chicago World's Fair. It includes a discussion of Henry Ford's work with soybeans.

144. *Time*. 1936. “Little honorable plant.” Oct. 12. p. 76, 78, 80. [1 ref]

• Summary: “Last year ‘the little honorable plant’ put \$35,000,000 into the pockets of U.S. farmers, outranking in value rye and barley. Soybean trading had grown so active that the [Chicago] Board of Trade could no longer overlook it as a potential source of commissions. First futures transaction in soybeans in the Pit this week was 5,000 bu. sold by Archer-Daniels-Midland Co. to Bartlett-Frazier Co. at \$1.20 per bu...”

“A Yankee shipmaster brought the first soybeans to the U.S. in 1804... Yet no more than 500,000 acres were planted to soybean in the U.S. in any one year until 1917.”

“In the U.S. some 600,000 farmers grow soybeans in 27 states.” Illinois produced more than half the total U.S. crop last year.

“Food. Soybeans are ideal for diabetics because they contain little sugar, no starch. They do, however, contain more than three times the protein of wheat or eggs, more than twice that of lean meat. Soybean vitamins are A, B-1, B-2, D, E. For vegetarians and diabetics, the bean is converted into cheese, soup, butter, salad oil, macaroni, breakfast food milk (from grinding the beans in water). To bakers soybeans mean a new bread which is expected to break sales records. Last year vegetable shortenings and other lard substitutes required no less than 52,450,000 lb. of soybean oil, compared to a 1934 consumption of 2,735,000 lb.”

“Factory. Each ton of soybeans yields 30 gallons of oil and 1,600 lb of meal. Industry takes the oil and the meal, uses one or both to make glue, paints, combs, candles, radios, buttons, axle grease, paper size, explosives, linoleum, oilcloth, printer's ink, billiard balls, rubber substitutes, cigaret holders, Christmas tree ornaments. Last year U.S. manufacturers consumed 91,166,000 lb. of soybean oil, of which 2,550,000 lb. went into soaps, 4,800,00 lb. into linoleum and oilcloth, 13,000,000 lb. into paints and varnishes.”

“Ford & Future... The number 1 U.S. soybean man is Henry Ford. His reason: ‘If we want the farmer to be our customer, we must find a way to be his customer.’ Henry

Ford began investigating the beans in 1930, spent more than \$1,000,000 in the next few years growing them, finding out how they could be used. Few months ago the River Rouge works got a \$5,000,000 addition in the shape of a soybean processing plant. Into Ford cars at present go the product of some 60,000 acres of soybeans. The oil goes into glycerine for shock-absorbers, enamel for body finishes [paints], binder for foundry cores. The meal, turned into plastics, rolls off the assembly line as horn buttons, gearshift knobs, window-trims, distributor cases.

"Said Mr. Ford few months ago: 'You will see the time when a good many automobile parts will be grown.'"

A portrait photo shows Henry Ford with the caption, "Motormaker Ford. A bean's best friend."

Note: This is the earliest document seen that mentions the "assembly line" in connection with Henry Ford. Mass production was pioneered on the Ford moving assembly line in April 1913 at the Highland Park plant—and with it began the rise of the consumer economy.

145. Loskowske, Corinne. 1936. Canning green soy beans. *Herald (Edison Inst., Dearborn, Michigan)* 3(20):1, 3. Oct. 30.

• **Summary:** Contains a detailed description of every step in the process, from cutting and shelling to canning of Manchu soybeans. "Canning green soy beans is a new process. It is believed that this is the first time it has been tried; that is, commercially. Two years ago a few were taken to Owosso, where they were threshed and canned; last year the production was 500 cans. They were put on the market and they sold very well; therefore, this year 1,000 cases were canned in Dearborn.

"The beans are cut with a binder and hauled to the place where they are to be threshed. The machine used for this called a viner. It is the kind of machine that is used to thresh lima beans and peas. There is a hexagonal cylinder, made up of screens, in the viner. It revolves in one direction. The stalk of the beans are passed into this. Inside the cylinder is a shaft with paddles on it. It revolves in the opposite direction at a higher speed. These paddles beat the beans out of their pods.

"Soy beans are harder to get out of their pods than peas or lima beans, because they are fastened to a membrane which is attached to the pod; therefore, it takes longer for them to be beaten loose. After the beans are beaten out of their pods, they fall on a moving canvas. They roll off this canvas into bushel baskets. The straw passes out and is stacked in a pile. It will be used for feed for cattle or some of it may be used for fertilizer.

"The beans are then taken to the fanning mill, where they are cleaned by passing on to another machine—a washer. They go down a chute with a riffle-board over which is a stream of running water. The purpose of this board is to catch the stones and dirt. This gets rid of all the substances heavier than water. A screw type of conveyor catches the things lighter than water and conveys them to an overflow by which

they are carried away from the beans.

"The beans are next put through a spray washer which has a revolving cylinder on which the beans are carried. As they pass along this cylinder cold water is sprayed on them. Then they pass up a goose-neck elevator, which conveys them to the blancher."

A photo shows a "machine used for extracting oil from ripe soy beans. This is the first of its kind used in the oil-extraction process. The apparatus is located in Greenfield village."

Note 3. This is the earliest document seen (Aug. 2001) that describes machinery or equipment for picking / harvesting and shelling green soybeans.

146. Stegman, Henry M. 1936. Hope for the farmer in the soy bean. *Good Health (Battle Creek, Michigan)* 71(10):297. Oct. [1 ref]

• **Summary:** "The soy bean promises to prove a great boon to the farmer in this country and to create numerous new industries which will relieve unemployment... It might also develop into one of our most valuable foodstuffs." Details are given on the extensive use of soybean protein and soybean oil in cars made by the Ford Motor Company. This is a summary of an article titled "The soybean points the way to agricultural recovery," by Dr. A.A. Horvath (*Scientific Monthly*, July, p. 63-69).

147. Aikman, Duncan. 1936. China's sacred bean lends us its magic. *New York Times Magazine*. Nov. 1. Section 8. p. 7, 20.

• **Summary:** Begins with a history of the soybean in East Asia, Europe, and America. In China "the soybean recognized as the vegetable that gave strength to millions whose meatless days lasted for centuries. Nursing mothers thrive on it, farm animals grew sleek and strong when soybeans were mixed in their diet; men and women, ill of a long list of wasting, degenerative and digestive ailments, grew better and often recovered entirely when they ate soybean concoctions plentifully. As far back as 2838 B.C. the Emperor Shen-Nung, an all-round pundit of China's ancient sciences, listed 300 ways in which soy products were good for human ailments.

"But food and medical uses were only a part of the story. The rich bean oils were good for lighting homes, for waterproofing the fabrics of the mandarin's pre-rubber raincoat, for letting the light through the paper and cloth fabrics that served the Chinese for windows."

During the past 20 years power-age technicians have discovered close to 1,000 uses for soybeans in industry alone. In its new phase in the 1930s it "seems the entering wedge for a vast and thriving market for American farm products in American industry.

"If we (industrialists) want the farmer to be our customer,' Henry Ford said several years ago, 'we must find a way to become his customer.' The bean which has solved

five millenniums of famine and farm-profits problems for China, today in Mr. Ford's own opinion is supplying a more diversified exchange commodity between farm and factory than any other plant in the vegetable kingdom."

The more progressive farm economists are beginning to speak of the "soybean revolution." But it was really World War I which gave the "little honorable plant" its first chance to prove itself in America by helping to fill oil shortages.

"The pioneer laboratory work with plastics during World War I and down into the early 1920s gave Mr. Ford the idea that the soybean was the answer to the automobile manufacturer's demand for a cheap farm-grown product that could be used practically anywhere in the motor car's anatomy except the engine and the driving shaft. It was an idea which led to the appointment of a vast soybean research staff in the Ford factories--and last year to the building of a \$5,000,000 soybean processing plant at the River Rouge establishment."

Photos show: (1) Farmers cultivating soybeans in Manchuria. (2) A man waist-deep in soybeans in a storage vat filling them into a sack by hand with a wooden box. (3) Coolies walking across and gang-plank carrying sacks of soybeans onto a ship for export. (4) A large machine grinding soybeans to a fine meal or flour. (5) Dolls made of soybean plastic. (6) A combine harvesting soybeans. (7) Two men standing among rows of soybeans in a field. (8) Using a machine to make soybean hay. (9) Close-up of a soybean plant showing pods, leaves and a hand.

148. O'Brien, W.J. 1936. Soya bean proteins. *Oil and Colour Trades Journal (London)* 90(1987):1434-36, 1442. Nov. 13.

• **Summary:** This paper was read in May 1936 at the Second Dearborn Conference in Michigan, which see. Address: [Vice-President, The Glidden Co., Cleveland, Ohio].

149. *Tropical Life (England)*. 1936. Soya beans in the limelight: Very much so just now. 32(371):110-11. Oct/Nov.

• **Summary:** "In 1935, according to the *Wall Street Journal*, the United States turned out 100,000,000 lb. of all kinds of plastics... Chemical plastics differ from each other not only in materials used but in their inherent qualities. Nitro-cellulose and cellulose acetate are what is known as thermo-plastic materials, that is, they soften under heat and may be reshaped. Phenol-formaldehyde plastics are what is known as thermo-setting since they are formed under heat and either in moulds or dies. After they have been formed, they cannot be affected by heat at ordinary temperatures. Phenol-formaldehyde plastics fall into two classes: moulded products are made from moulding powder plus a filler (wood flour) which are stamped out into the desired shape from dies; cast phenol resins are made by pouring the mixture of chemicals into forms to solidify in the form of sheets, bars and tubes, which are then fabricated into the finished product."

150. Mead, W. Carroll. 1936. Staley's beans (Letter to the editor). *Time*. Dec. 7. p. 8. Letters to the editor. [1 ref]

• **Summary:** The writer, with reference to an article in the Oct. 12 issue, believes that A.E. Staley, not Henry Ford, should be considered the No. 1 U.S. soybean man. "I think the fact that Illinois accounted for 21,834,000 bu. of the total U.S. production of 39,637,000 bu. in 1935 can be largely attributed to Mr. Staley's pioneer work in educating the farmers of his own State in the production of soybeans and it is also interesting to note that Mr. Staley built the first soybean plant in the U.S. in 1922, which provided a commercial market for the farmers of Illinois."

She adds that as far back as 1916, Mr. Staley sent men to China to study the cultivation of soybeans, so that the relevant practices might be applied to the USA. She doubts that Mr. Ford knew anything about soybeans until long after Mr. Staley had done the pioneering work.

Note: In Oct. 1922 A.E. Staley Mfg Co. (Decatur, Illinois) and the Chicago Heights Oil Co. (Chicago Heights, Illinois) started the first two soybean crushing plants in Illinois. However at least 11 soybean crushing plants had been operated in other parts of the USA before this date. Although Mr. Staley did important work in commercializing soybeans in Illinois, he was conspicuously absent in 1928-29 from the very important pioneering work of the Peoria Plan in Illinois. Henry Ford first began his work with soybeans in 1930, long after Staley, but by 1936 many more Americans associated soybeans with Henry Ford than with A.E. Staley--in large part because of Ford's unrivalled publicity machine. Address: Baltimore, Maryland.

151. Hill, Edwin C. 1936. Hill praises Henry Ford's soy beans. *Detroit Times*. Dec. 21.

• **Summary:** "Henry Ford is a great exploiter of the soy bean. Out near Dearborn he has 65,000 acres cultivated to a particular variety, called the 'Illini.' The fruit of these 65,000 acres goes into the millions of automobiles which are run off the assembly lines at River Rouge. The rich, lustrous paints of the sleek bodies have their basis in bean oil. The knobs of the gear shifts, the horn buttons and the scores of other parts of the body which are made of plastics, trace their origins back to the soy bean farm near Dearborn."

"The truth is that one must cultivate a taste for soy beans just as one does for olives and certain kinds of cheese. To the westerner, soy bean milk has a horrible taste, yet Manchurian babies cry for it, not at it, and thrive very well on it."

152. Slawson, H.H. 1936. Baby's milk from beans: Glowing news story of the soybean that staggers imagination. *Hoard's Dairyman* 81(24):631, 649. Dec. 25.

• **Summary:** "To the average Chinese in that cowless country, the taste of cow's milk is said to be 'well nigh intolerable.' The big news for the dairyman, however, lies in the fact that soybean milk is now being produced in this country on a

commercial basis. And there is further news in the fact that soybean flour is being promoted as a substitute for milk in the making of bread, pastries, and other foods, which recipes have heretofore called for milk. And there is yet further news in the third fact that soybean casein, made from soybean milk, is being employed as a substitute for casein obtained from cow's milk and used by the paint, paper, textile, and adhesives industries."

"One Tsinan [soy] milk factory had a daily output of 250 bottles and patrons could get one bottle delivered daily for \$1 (Mex.) per month." No soymilk brand names are given.

The Chinese make a cheese, called tofu, by coagulating the soymilk. "To this product the rich poetic fancy of the Oriental has given the classic name 'Li chi,' or 'the morning prayer,' which suggests the early morning hours devoted to its manufacture... The importance of this cheese in the Chinese diet can be inferred from the oft-repeated saying that soybean cheese is 'the poor man's meat,' just as the soybean milk is 'the poor man's milk.'"

Soybean casein is now competing with cow's milk casein. "How far the invasion has proceeded can be inferred from statistics furnished by a Detroit [Michigan] automobile manufacturer [Henry Ford]. In 1936 he used the entire output of over 61,500 acres of soybeans for use in his cars, including paints and such plastic parts as gears, distributor terminal plates, and other accessories. For the plastic frame of the rear window alone 144,000 bushels of soybeans were required. All of the plastic parts might possibly have been made from milk."

153. *Annual Report for the Minister for Agriculture (Irish Free State / Ireland)*. 1936. Seed propagation division. 5:71-74. For 1935-36.

• **Summary:** The subsection titled "Soya Beans" (p. 74) states: "Experimental sowings of four varieties of Soya Beans—Green Jap, Brown C, Yellow J, and Black O, were made at eight centres in 1935. The seed, portion of which was inoculated, was sown about the 1st of May in rows approximately 3 feet apart. All four varieties germinated evenly and quickly, and grew freely throughout the summer. Two of the varieties, Green Jap and Brown C, ripened in reasonably good season. The other two varieties, however, were very slow in maturing."

Note 1. We read in 1939 that the seed of these "four varieties, acclimatised in England, was obtained through the courtesy of Fordson Estates Ltd., London."

Note 2. This is the 2nd earliest document seen (Dec. 2009) concerning the cultivation of soya beans in Ireland (the Irish Republic).

154. **Product Name:** Soybean Oil, Soybean Oil Meal, Soybean Flour.

Manufacturer's Name: Edgar Soya Products, Limited.

Manufacturer's Address: Belle River, ONT, Canada.

Date of Introduction: 1936.

Ingredients: Soybeans.

How Stored: Shelf stable.

New Product—Documentation: F. Dimmock. 1936.

"Division of Forage Plants: A report on the present status of the soybean industry, particularly in western Ontario." In: National Research Council of Canada. 1936. Proceedings of the Second Conference on Soybeans. Ottawa, Canada. Appendix "B." p. B-3. "At Belle River, Ontario, an entirely new mill is now in the course of construction. Mr. James Edgar, of Edgar Sugar House, Detroit, Michigan, is building this plant under the name of the Edgar Soya Products, Limited. The intention is to produce oil, meal and flour. The mill is to consist of two Ford solvent extractors manufactured by the Ford Motor Company... This company intends to contract with growers for acreage. The contract, a copy of which was secured and is attached herewith, calls for a minimum price of 80 cents per bushel of beans, on the farm. Although no attempt has been made to canvas the farmers, contracts for more than 400 acres have already been secured. It is expected that this mill will have no difficulty in obtaining sufficient acreage to provide for its requirements."

155. Ford Motor Co. 1936. Ford process of extracting soy bean oil (Motion picture). Dearborn, Michigan: Ford Motion Picture Laboratories (Producer and Distributor). 695 ft., silent, black-and-white. 35 mm. Captions. *

• **Summary:** Shows: "The new soy bean oil extracting plant built in the summer of 1936 and located in the heart of the River Rouge Plant of the Ford Motor Co... 4 separate extraction units operate 24 hours a day." A newly developed simple, small-sized flaker that does not use rolls. The actual extraction takes place in the "percolation tube." "The flakes are conveyed upward by a screw through the inclined pipe, meeting the solvent flowing downward. This is counter-current extraction, the most efficient type for a process of this kind." The solvent is separated from the oil in a newly designed still. Ford radiator cores cool the solvent back to liquid form. Henry Ford and Robert Boyer examine soy beans from a sack, and oil from in beakers. Address: Dearborn, Michigan.

156. Ford Motor Co. 1936. Soy bean processing (Motion picture). Dearborn, Michigan. 998 ft., silent, black-and-white. 35 mm. No captions. *

• **Summary:** Shows: Henry Ford and Robert Boyer in Laboratory, then with another man next to a machine, then in a soybean field. River Rouge Plant. Two workers wearing face masks spraying a car body. Mr. Boyer and Henry Ford in soybean processing plant. Henry Ford taking handful of beans from sack, wiping hands, talking to Boyer. View of soybean processing plant on grounds of River Rouge Plant. Henry Ford watching worker take molded part from machine. Henry Ford and R. Boyer examining plastic part.

Machinery in operation in soybean processing plant. View of plant. A hand holding soybean flakes. Glass soybean oil extractor with liquid bubbling inside. Worker beside machine. Henry Ford and Boyer watching worker operate mold press. Worker checking machinery. A hand adjusting valves. Address: Dearborn, Michigan.

157. Fordson Estates Ltd. 1936. English acclimatized soya beans. Boreham House, Boreham, Essex, England. 4 p. [2 ref]

• **Summary:** Fordson Estates in Boreham, Essex, England, began to grow soya beans in 1932. The first attempt was a failure since the varieties matured too late, but a second attempt in 1933 met with more success, as 47 different varieties from Manchuria, Japan, Canada, and North America were tested. Among these varieties were four that had been acclimatized by Mr. J.L. North, late Curator of the Royal Botanic Gardens, Regent's Park. The only plants to reach full maturity in September were Mr. North's four varieties. Many of the foreign varieties, though not suitable for seed production, could be grown quite satisfactorily for hay which is cut about 4-6 weeks before the seed stage is reached. In 1934, a successful attempt was made to grow soya beans for seed on a field scale; the acclimatized seem of the 1933 crop was used. The plants were sown during the first week in May and harvested during the first 2 weeks in September. A illustrated article appeared in the *Times* of London on 29 Aug. 1934 showing the field at maturity. "This was the first time in agricultural history that soya beans had been grown as a field crop in Great Britain. The seeds were judged to be as good as any grown in other parts of the world... The successful harvesting of the 1934 crop was followed by an enormous demand for English seed from all parts of the United Kingdom, Europe and the Colonies. Most of the seed was sold for trial purposes in different localities and, in 1935, soya beans were grown in practically every county in England." There follows a description of available seed varieties, recommended cultural practices, and references to several books on the subject.

Note: Much of the information in this booklet first appeared in Elizabeth Bowdidge's *The Soya Bean* (1935). At the end of page 3 is a statement: "Soya Foods, Ltd., Rickmansworth, Herts, have arranged to buy available supplies of soya beans grown in England and the Empire at market prices, if in dry and sound condition. Supplies not exceeding 1,000 pounds may be sent freight paid without notification." On the last page is a price list for four varieties of soya beans that have been acclimatized to England by Mr. North. Named Green "Jap," Yellow "J," Black "O," and Brown "C," they are sold in weights of 75 lb. or less. Prepaid orders are to be sent to Fordson Estates Limited, Boreham House, Boreham, Essex.

158. Gray, George Douglas. 1936. All about the soya bean: In agriculture, industry and commerce. London: John Bale, Sons

& Danielsson Ltd. ix + 144 p. Introduction by James L. North. Late curator, Royal Botanic Gardens, Regent's Park, London. Index. 28 cm. [19 ref]

• **Summary:** A comprehensive, early work on the soybean. Gray was a Scotch physician. Contents: 1. Introducing the soya bean. 2. The soya bean plant and its cultivation. 3. The soya bean as food: Dietetics, immature green beans, mature dried beans, soya bean coffee, soya bean chocolate, soya bean sprouts, soya bean milk, soya bean flour (incl. Berczeller flour, Soyvita bread made by Messrs. Wm. Beattie, Ltd., Glasgow), bean curd [tofu], soy (also called soya bean sauce, Chinese bean sauce, or shoyu), miso, fermented bean curd (p. 66-67). 4. Soya bean oil. 5. Soya bean trade. 6. The soya bean in agriculture.

Addenda: Soya bean products in the USA. Dieting and recipes. Statistics. India. Bibliography.

In the chapter on "Soya bean oil" we read (p. 75): "In England, the bean oil trade is carried on by the following firms:—The British Oil and Cake Mills Ltd., the ordinary shares of which are held by Lever Bros., Ltd., so that they are a branch of Unilever, Ltd.

"The Hull Oil Manufacturing Co., Ltd., Hull, now merged in the foregoing concern.

"The Premier Oil Extracting Mills, Ltd., Hull.

"Messrs. Wray Sanderson & Co., Hull.

"The Medina Refinery Ltd., Deptford, London.

"Messrs. J. Bibby & Sons Ltd., Liverpool.

"The Erith Oil Works Ltd., Erith" [Kent].

The first addendum, titled "Soybean products exhibited by the American Soybean Association" (at Washington, DC, p. 120-24) lists the following companies and each of the soy products that they manufacture: American Lecithin Corp. (Atlanta, Georgia), Archer-Daniels-Midland Co. (Milwaukee, Wisconsin), Armstrong Paint and Varnish Works (Chicago, Illinois), Battle Creek [Food] Factory (Battle Creek, Michigan), The Blanton Co. (St. Louis, Missouri), Cereo Co. (Tappan, New York), The Davies-Young Soap Co. (Dayton, Ohio), Detroit Graphite Co. (Detroit, Michigan), Eastern Health Food Stores Association (Washington, DC), Funk Brothers Seed Company (Bloomington, Illinois), Harshaw Essential Foods, Inc. (Cleveland, Ohio), Keystone Macaroni Mfg. Co. (Lebanon, Pennsylvania), Kloss, Jethro (Takoma Park, Maryland: Fresh [soybean] milk. Pumpkin pie [soybean milk and soybean flour]. Soybean cheese. Soybean bread [20% soybean flour]. Soybean buns. Soybean sprouts. Soybean cake), Laucks, I.F., Inc. (Bloomington, Illinois—home office, Seattle, Washington), Madison Food Company (Madison, Tennessee; Vigorost, Cheese [Tofu], Soybeans canned with Tomato, Soybeans canned plain, Dixie Fruit Crackers), Mead Johnson and Co. (Evansville, Indiana; Makes Sobee [Infant Formula]), Oriental Show-You Co. (Columbia City, Indiana), Paintcraft Co. (Galesburg, Illinois), Prince Macaroni Mfg. Co. (Boston, Massachusetts), Purina Mills (St. Louis, Missouri; makes Cresol disinfectant,

Purina turkey and growing fattening chow, Purina lay chow, Purina egg chowder, Purina breeder egg chowder, Purina fitting chow, Purina rabbit chow, Purina chick Growena chow, Purina 34% cow chow, Purina chowder, Purina bulky cow chow, Purina 24% cow chow, Purina pig and hog chow, Protена all mash starting and growing food), Shellabarger Grain Products Company (Decatur, Illinois), Soyex Company, Inc. (Nutley, New Jersey), Staley Sales Corporation (Decatur, Illinois), The Stamford Rubber Supply Company (Stamford, Connecticut), Dr. Roy Monier, President, Board of Managers, State Hospitals (Jefferson City, Missouri), United Drug Company (Boston, Massachusetts), Vi-tone Company (Hamilton, Canada), Woolsey Paint and Color Co., C.A. (Jersey City, New Jersey), Bureau of Chemistry and Soils, Department of Agriculture (Washington, D.C.). Page 120 adds: "The exhibit also contained some 200 soybean products, mostly foods, brought from the Orient by Mr. W.J. Morse, Senior Agronomist, Department of Agriculture, Washington, DC, U.S.A." Note: Morse and P.H. Dorsett were in East Asia from 1929 to 1931, when they collected many samples of soybeans and soyfoods.

In the second addendum, recipes, the author notes that soy flour is widely used in diabetic diets. Two leading firms who make soy flour in England and who also incorporate it in various products are: Soya Foods, Ltd., Rickmansworth, Herts, and Dietetic Foods Ltd. 124 Victoria St., London, S.W. 1. "The former specialize in Soyolk which is flour prepared on the principles laid down by Professor Berczeller; it is a mealy powder, fatty to the touch. The latter firm are the sole distributors in Great Britain of the well-known 'Heudebert' Dietetic Food products, a French concern which makes different kinds of diabetic breads." The following recipes are then given; * = Calls for Soyolk soy flour: Soybeans, southern style. Soybean salad. Roasted soybeans [like dry-roasted peanuts]. Soybean croquettes. Soybean soufflé. Stuffing for baked fish*. White sponge pudding*. Shortbread*. Madeira cake*. Soya soup à la Reine (uses Heudebert soya flour). Soya chocolate (with soya flour). Soya vegetable soup (with soya flour). Soya bean sprout salad.

Note: This is the earliest English-language document seen (Feb. 2000) that uses the term "soya bean sprouts" to refer to these sprouts. Address: M.D. (Scotch physician) England. Late medical officer to H.B.M. Legation, Peking, China. Lieut.-Colonel, Retired.

159. North, James L. 1936. Introductory chapter. In: G.D. Gray. 1936. All About the Soya Bean: In Agriculture, Industry and Commerce. London: John Bale, Sons & Danielsson Ltd. 144 p. See p. 1-9.

• **Summary:** This is the story of early attempts by Dr. North and others to grow soybeans in England. "In 1913 chance put in my hands thirteen small seeds of a variety of soya bean said to have come from North China in 1910 and to have ripened pods in Germany for two successive years. Sown by

me the following May the plants grew to a height of 1½ feet and ripened seed in October. This took place at the Gardens of the Royal Botanic Society, of which I was then Curator. I was aware that of the many attempts to grow soya which had taken place in this country, all had failed, also that no others were being attempted, since it was the considered opinion of the Ministry of Agriculture and the Royal Agricultural Society that the soya bean was quite unsuited for growth here, as it required heat that would ripen maize.

"The podded beans were brought to the notice of Professor Bottomley, of King's College, and Professor Greenish, of the Pharmaceutical Society, and both considered the matter to be important. They pointed out that this country possessed no oil plant and was importing soya from Manchuria to the extent of half a million tons per annum... They advised me to increase my stock as rapidly as I could.

"The result of the first year's crop was four hundred seeds from the original thirteen seeds; the second year four thousand and the third twelve thousand. In 1917 it became a question of finding space to grow them and it was decided to have part grown by a firm of market growers at Uxbridge, Middlesex and the rest on a farm at Manningtree, Essex, belonging to Mr. C.P. Ogilvie. Both were failures." The first crop failed because the land had been too heavily manured and the seeds were sown too far apart. The second crop, sown in the middle of a field of wheat, had been eaten by rabbits. Rabbits are still a major pest for soya beans.

Since little was known about the soya bean, Mr. North tried to gain experience by sending seeds to the Chelsea Botanic Gardens, the Horticultural Society at Wisley, the Cambridge Botanic Gardens, Messrs. Sutton and Sons, Reading, and to a friend in Hampshire. But the reports received were not encouraging. "That same year I got in touch with the United States Department of Agriculture at Washington [DC], I received from it not only soya bulletins and seeds of a number of American soya varieties for trial in England, but the promise of further assistance. I owe a very great debt of gratitude to that department and to Dr. W.J. Morse, its agronomist and soybean expert, the man who, more than any other, has made the United States the soya bean centre of the world and now a growing competitor with Manchuria as world exporter.

"The results of 1917 were better than those of the previous year and in 1918 I had sufficient seed of my one variety to plant half an acre on land lent by Mr. Clark at Virginia Water. These were sown in company with 12 American varieties, half being inoculated with a nodule culture supplied by Professor Bottomley."

Following some poor years, 1921, a drought year, was the best year to date. "Accounts of my success appeared in the Press and I wrote an article which came out in the *Illustrated London News* in October. As a result many applications for seed reached me and I sent samples to over one hundred places, among others to Professor Southworth of Manitoba

College, Winnipeg [Canada]. He found my variety better than anything he had had there, both for fodder and seed, but not early enough in seasons with early frost. In return he sent me seed of a brown variety 'Manitoba Brown,' a selection from a well-known American variety 'Ogemaw.'"

1922 was a wet year and at his plot and not one person to whom North had sent seed reported success. On his own plot at Chiswick, where he had twenty varieties under test, only one, "Manitoba Brown," succeeded.

"In 1923 appeared Messrs. Piper and Morse's encyclopædic work, 'The Soybean,' in America; it solved a good many of my problems and I determined to follow American practice in future. From it I learned that two-thirds of the American crop was consumed as fodder upon the farm; that every variety had a fixed time ranging from 80 to 160 days for maturing; that in industry the chief value of the bean rested upon its oil content; and that the plant possessed what is now called 'local limitations,' meaning that a variety that grew well in one place could not be depended upon at another and that in American agricultural practice it was usual to test two or more varieties before growing it as a crop. This last was particularly interesting to me because it explained the erratic behaviour of some of my varieties when sent to other places.

"Convinced by the failure of my 1922 trials that soya was not yet ready to put forward as a crop plant, I extended my search to new sorts and with the help of friends abroad obtained many varieties from China, Manchuria, Japan, South Africa and India." North then began to specialize in short season varieties. "My friend Dr. Morse approved the plan and from then onward sent me only varieties which in America took less than one hundred days to mature... Using Manitoba Brown Soya as a standard I was able to select several varieties as early or even earlier than it." In 1930 Messrs. Sutton and Sons of Reading [seedsmen] decided to put the variety Brown C in their catalogue.

"In 1931, Mr. A.F. Secrett, a Twickenham market grower, offered the use of a piece of land at Brentford, Middlesex; it enabled me to grow on a larger scale than had been possible previously. In September the same year a photograph of the crop appeared in the *Evening News*. By chance it was seen by Sir John Davis, a Director of the Ford Motor Co. and manager of the Ford Estate at Boreham, Essex, who at the request of Henry Ford had tried to grow soya with American seed and had failed. At his request I agreed to supply acclimatized seed and to superintend its growing. All my four varieties of soya were used and under field conditions the crop was a success. From 2 acres the first year it was increased to 12 acres in 1934 and to 20 in 1935, the last two crops being grown without assistance. The Boreham trials were visited by farmers from every part of the United Kingdom and visitors from America pronounced the crops to be as good as any grown in that country. The seed was distributed in 1935 and that year saw it being grown in quantity in some hundreds of places

throughout the British Isles."

A photo facing page 1 shows Mr. J.L. North standing in a field with soya bean plants which he has grown. Address: 60, Grove Park Terrace, Chiswick, London, W.4, Engalnd. Late curator, Royal Botanic Gardens, Regent's Park, London.

160. *New York Times*. 1937. Soy bean in debut as major product: Versatile little legume now a \$30,000,000 farm item indispensable to industry. Vital to auto makers. Its oil almost standard in paints—it is also gaining as food ingredient. Jan. 3. Section 3. p. 8.

• **Summary:** "Until 1921 the chief product of the soy bean—soy bean oil—was utilized mostly in lard compounds and to a lesser extent in paints and varnishes. Lard compounders consumed about 1,500,000 pounds of soy bean oil in 1914; by 1920 the total had multiplied more than 20 times to 30,000,000 pounds.

"Today automobiles, refrigerators, &c., acquired their fast color qualities solely by the use of soy bean oil compound. More than 10,000,000 pounds of soy bean oil were used last year in the manufacture of paints and varnishes in the United States...

"The other product of soy beans—soy bean cake—plays a major role in the all important industry of plastics... Switch buttons, light switches, distributor caps and containers, ignition system parts, dashboard panels, silent timing gears, window panels, battery covers, horn buttons, gear shift knobs, &c., are some of the multiple uses. One leading automobile manufacturer [Ford Motor Co.] has recently constructed a \$5,000,000 soy bean processing plant."

161. Aikman, Duncan. 1937. The magic bean. *Nature's Path* (New York City). Jan. p. 9, 21.

• **Summary:** This is a reprint of an article by the author published under the title "China's sacred bean lends us its magic" in the *New York Times Magazine* (1 Nov. 1936, p. 7, 20).

162. *Revista de Agricultura (Cuba)*. 1937. La pequena planta honorable [Little honorable plant]. 20(2):67-69. Feb. [1 ref. Spa]

• **Summary:** This is a translation by Prof. Miquel A. Valdiva of the *Time* magazine article of 12 Oct. 1936. Discusses the value of the soybean crop to the United States, the increasing acreage planted in soybeans, their uses as food, and in the factory, and the utilization of the beans in the Ford Motor Co. plant. Address: Chicago, Illinois, USA.

163. *Food Industries*. 1937. Keeping right on soy beans. 9(3):119. March.

• **Summary:** What is the best way to utilize soybeans in the United States?—a very important question addressed by this interesting editorial. "There is considerable danger that over enthusiastic friends of the soy bean may attempt to develop

the new industry into directions that are unwise and may retard its development. Properly exploited, the soy bean should add to our national welfare; but improperly exploited the soy bean may go into disfavor. It has not yet won its way to the point where Americans will recognize its possible misuse, despite the propaganda of the Farm Chemurgic Council at Dearborn, Michigan.

"Oriental foods such as soy bean milk and cheese are not very palatable, we are advised, and are more expensive than cows' milk and cheese. Until there is a shortage of cows' milk it is unwise to create fears of new competition and the consequent antagonism of the dairy crowd.

"Another possible weak spot lies in the marketing of inferior tasting soy bean products, yet putting them over by a sales talk on nutritive values. Any food that earns a permanent place on the American dinner table does so because it tastes good—not because it ought to be eaten.

"Again: emphasizing the value of soy beans as a food for diabetics lays stress on one of its lesser values. To most of us, diabetic foods seem like foods that have been deprived of all pleasure and zest in eating. Butter, green vegetables and poultry are good foods for diabetics, but a big sales drive on that angle alone will not build volume business.

"And finally, it is a mistake to give the public the notion that soya flour and soy bean products are luxury foods by demanding prices that are out of reach of the masses. Soy beans are almost as cheap as corn and are usually cheaper than wheat. Soya products belong in the grocery store—not exclusively in the so-called health store."

164. Chubbuck, Dorothy. 1937. The many wonders of the soy bean. *Herald (Edison Inst., Dearborn, Michigan)* 4(7):1, 3. April 30.

• **Summary:** Describes the work of the Ford Motor Co. with soy beans. "Let us now see how the soy bean was first introduced to the Ford Motor Company and Greenfield Village. In the chemical plant in the Village, a group of young men were experimenting with several different vegetables—carrots, beets, cabbage, etc.—to discover which of the vegetables was the most complete food. Among these vegetables was the soy bean, which proved to be the most promising. About 1928 Dr. Ruddiman started experimenting with the soy bean; however, it was not until about 1930 that the young men in the chemical plant began work on it.

"The number of acres planted with soy beans has increased greatly. In 1917 about 50,000 acres were planted in the United States; in 1935 over a million and a half acres were sowed. Evidently people are beginning to realize the value of the soy bean." Michigan ranks seventh in amount of soy beans grown...

"Soy beans even play a part in the production of Ford cars. Every car that comes off the assembly line at the Rouge Plant will require several pounds of soy bean plastics for horn buttons, electrical apparatus, window frames, and many other

parts. The use of the soy bean in the factory draws closer together the link between agriculture and manufacturing... Soy bean plastics are used not only in the factory but also in the hospital for table tops and coverings for either curved or flat apparatus. Soy bean plastics give a modern as well as a serviceable appearance to the hospital."

Photos show: (1) The author interviewing "Dr. E.A. Ruddiman, director of the food laboratory, concerning the many uses of the soy bean. On the table are biscuits, waffles, cake, cheese, soy butter, sandwich spread, soy sprouts, milk, and canned beans—all made from or containing soy bean products." (2) The author and Dr. Ruddiman in a laboratory by distillation tubes.

Note: This journal is "Published by Students of the Edison Institute." This article contains the earliest date seen (1928) for the Ford Motor Company's involvement with soybeans.

165. Kellogg, John Harvey. 1937. Re: Battle Creek Sanitarium, Battle Creek Food Company, and soy beans. Letter to Mr. E.C. Liebold, c/o Mr. Henry Ford, Dearborn, Michigan, May 10. 2 p. Typed, without signature (carbon copy).

• **Summary:** On 3 April 1937 Dr. Kellogg sent a Western Union telegram to Henry Ford requesting a brief interview. On May 5, E.G. Liebold, General Secretary to Henry Ford, wrote Kellogg (on "Henry Ford" letterhead, with signature) saying he regretted that Mr. Ford was away but that if Dr. Kellogg planned to come to Detroit, Liebold would be "be very glad to discuss the matter with you and submit it to Mr. Ford later on when he might be available."

Dr. Kellogg replied with this letter: "The bankers are making a very determined effort to get control of the Battle Creek Sanitarium... I will not surrender control or submit to any change of ideals or principles of the Sanitarium... I have begun at the bottom twice and can do it again if necessary, but Mr. Ford has shown so much interest in the food reform and race betterment work I am carrying on, I am anxious to have his advice before making a final decision if he is willing to give me a few moments.

"An attempt is being made by large financial interests to get possession of my food company [the Battle Creek Food Company].

"Incidentally, I might mention that I have made some discoveries in relation to the soy bean which I am sure Mr. Ford would like to know about. This relates to a preparation [soy acidophilus milk] by which I have been able to save the lives of the [Dionne] quintuplets, and I have also found it the most successful means yet discovered for combatting old age processes."

On May 12 Liebold replies that Mr. Ford has been away almost continuously for the past two weeks. Dr. Kellogg writes again on May 15 (see separate letter).

166. Kellogg, John Harvey. 1937. Re: Soy acidophilus milk. Letter to Mr. E.C. Liebold, c/o Mr. Henry Ford, Dearborn,

Michigan, May 15. 2 p. Typed, without signature (carbon copy).

• **Summary:** "I know Mr. Ford must be very busy just now because of the labor agitation as well as the usual press of business, and as it will not be convenient for him to see me, I will postpone my visit to some future time. The information I wanted to give him about the soy bean is pretty well covered in a paper which I am sending herewith which sometime he may be glad to hear about.

"I find this Soy Acidophilus Milk extremely useful because of its rejuvenating effects. I am in my 86th year and am as hard at work as ever.

"If Mr. Ford wishes to try the Soy Acidophilus Milk, I shall be glad to order a case sent to him. We send three cases to the quintuplets every week. It keeps them free from bowel trouble which, because of the liver Dr. Dafoe insists on giving them, comes back as soon as they stop the use of the Soy Acidophilus Milk... It cured them of bowel trouble when they were four months old and they have been taking it ever since in gradually increasing quantities. They began with a teaspoonful at each feeding. Each one is now taking a pint a day."

167. Carver, George Washington. 1937. What chemurgy means to my people. In: Farm Chemurgic Council, ed. 1937. Proceedings of the Third Dearborn Conference of Agriculture, Industry, and Science, Dearborn, Michigan: FCC. 182 p. See p. 38-42.



• **Summary:** "Strange as it seems, less than a century ago the soy bean was regarded as a sort of curiosity in many parts of the United States. I can well remember as a boy* one of our leading seed houses cataloging it in glowing colors and selling small packages of seed (at a high price) as the wonder coffee berry. What Chemurgy has done with this bean under the direction of Mr. Ford is truly amazing, and the end is not yet. More things will be made.

"About the same time the peanut's chief value was to feed hogs and to become a general nuisance by cluttering up (with shells) the benches and surroundings at theaters, baseball parks, etc. Now it is considered one of our major crops."

A nice photo titled "Two Modern Pioneers" shows Henry Ford and G.W. Carver shaking hands, as they exchange greetings at the Third Dearborn Conference on chemurgy, held in Dearborn, Michigan.

* Note 1. Carver was born in 1864 or 1865; the exact date is unknown. He grew up in southwestern Missouri. So his boyhood recollection was probably from about the 1870s, shortly after the Civil War.

Note 2. This is the earliest document seen (June 2011) with the word "chemurgy" in the title. Address: Dr., Tuskegee Inst., Tuskegee, Alabama.

168. Farm Chemurgic Council. ed. 1937. Proceedings of the Third Dearborn Conference of Agriculture, Industry, and Science. Dearborn, Michigan: FCC; New York: The Chemical Foundation, Inc. 182. p. Held May 1937 at Dearborn, Michigan. Also published as Farm Chemurgic Council Journal, Vol. 1, No. 1. Sept. 17, 1937, by Farm Chemurgic Council, Inc.

• **Summary:** Includes a report from the "Soy Bean Committee" and a report on "Soy Bean Products submitted to the Committee" which gives statistics regarding utilization of the commercial soybeans and the production capacity of processing plants. Address: Dearborn, Michigan; New York.

169. Chibnall, Albert Charles; Bailey, Kenneth; Astbury, William Thomas. 1937. Improvements in or relating to the production of artificial filaments, threads, films, and the like. *British Patent Specification* 467,704. June 22. 6 p. 5,797. 2 p. Applications filed 22 and 24 Oct. 1935 and 28 July 1936. 193. Complete specification left, 22 Oct. 1936. Specification accepted 22 June 1937.

• **Summary:** In the application of 22 Oct. 1935 the protein filaments are made from 43.5 gm of urea and 8 gm of edestin (the protein from hemp). The protein is denatured, then dissolved in a solvent. "The solution is forced through a capillary orifice into a large bulk of cold water. A silky filament is obtained... [which has] many of the properties of natural silk and wool.

In the final specification of 22 Oct. 1936, page 4 states: "Any vegetable globular protein capable of degeneration and/or denaturation may be employed in the present invention. The strongest filaments, threads and the like will be obtained if during the process of manufacture the change through degenerate to denatured protein is made as complete as possible, so that when stretched, the filaments, threads and the like show a typical β -keratin structure on X-ray analysis (cf. Astbury, Dickinson and Bailey. 1935. *Biochemical Journal*. Vol. 29, pages 2351-2360). We have obtained the most consistently good results from vegetable proteins of the globulin class e.g. ground-nut globulin, edestin, soya bean globulin and castor-bean globulin..."

In example 1 (p. 5), the main ingredients are 35 parts of air-dried ground-nut seed globulin, 25 parts of crystalline

urea, 5 parts of crystalline thiourea, and 1 part of sorbitol. "For spinning the filaments or fibres the ripened solution is transferred to a spinneret immersed in a bath containing the following solution:..."

Note 1. This work was done in England before similar work at the Ford Motor Co. in the USA.

Note 2. This is the earliest document seen (March 2009) that uses the word "spinneret" (or "spinnerets") in connection with spinning plant protein fibers. It is also the earliest document seen (Aug. 2000) that contains the word "thiourea," which is a bitter crystalline compound, analogous to urea with the oxygen replaced by sulfur; it resembles urea in chemical properties.

Moncrieff (1950, p. 182) notes that in 1935 Professors Astbury and Chibnall did pioneering work on the development of Ardil, a vegetable protein fiber made from ground-nuts [peanuts]. They communicated their findings to I.C.I. Ltd., and in 1938 the first filaments were spun at I.C.I.'s Ardeer factory in Scotland.

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term "artificial filaments" (or "filament") to refer to spun soy protein fiber used like a textile fiber. Address: 1-2. Imperial College of Science & Technology, South Kensington, London S.W. 7, England; 3. 189, Kirkstall lane, Leeds, Yorkshire, England.

170. Photograph of Henry Ford and Robert Boyer, July 30. 1937.

• **Summary:** Boyer (to the left) is holding the driveshaft of a large wooden model, while Ford (to the right) is pointing his right finger at the apparatus. (188-21323).

171. Photograph of Henry Ford and Robert Boyer talking in front of two cars. July 30. 1937.

• **Summary:** Robert Boyer is at the left (in white shirt and necktie) and Henry Ford is at the right (in suit with head slightly bowed, holding a rolled paper in his right hand) (188-21321).

Note: One caption incorrectly gives the date as 1934.

172. Photograph of Henry Ford discussing soybean work with Robert Boyer in the Chemical Laboratory on Ford's birthday, July 30. 1937.

• **Summary:** Ford is seated on a stool by a laboratory bench reading, and Boyer has one elbow on the bench behind him. (No. P.188.21320). (See next page).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

173. *Revista de Agricultura (Cuba)*. 1937. El valor alimenticio e industrial del frijol soya [The food and industrial value of the soybean]. 20(7):30-36. July. Adapted from a publication by the New Jersey Agricultural Experiment Station. [Spa]

• **Summary:** Contents: Introduction. Soybean oil and its constituents. Soybean phosphatides. Whole soy flour. Commercial enzymes. Conclusions.

A table shows the composition of the soybean (in terms of the three constituents of most value to industry): Oil 20%, phosphatides 2%, protein 40%. The Ford Motor Co. is now using soya oil extensively.

174. Shoenfield, Allen. 1937. Soy Bean Special displays magic plant's myriad uses. *Detroit News*. Oct. 5. p. 15, col. 3.

• **Summary:** "What his magic lamp was to Aladdin, the soy bean plant promises to become for American agriculture and industry.

"This was graphically illustrated Monday when the Pennsylvania Railroad's 'Soy Bean Special' was halted at the Rouge plant of the Ford Motor Co. in the course of its tour of the East and Middlewest." The car contains, for the first time, a complete exhibit of the soy bean from planting the seed to the appearance of the oil and "pressed residue" [meal, cake] in hundreds of commercial forms. The car remained at the Union Station in Detroit this morning.

In 1878 the soy bean was introduced to the USA by a New Jersey experimenter [by G.H. Cook and James Neilson of Rutgers Scientific School]. Carl B. Fritsche, managing director of the National Farm Chemurgic Council (headquartered in Dearborn) predicted that the cash value of the U.S. soy bean crop would equal that of the corn crop within one generation.

Describes how soy beans are used in America.

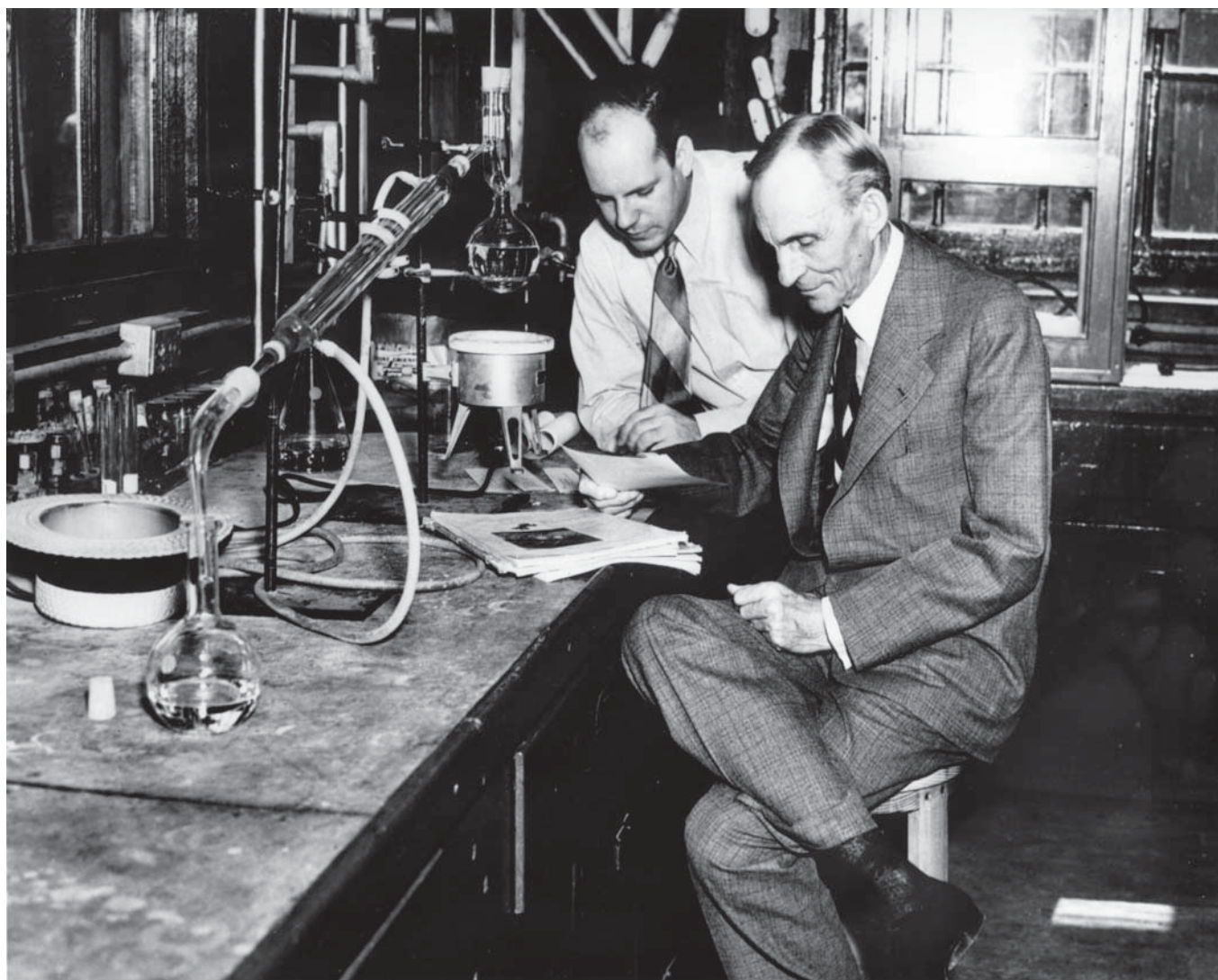
175. *Bean-Bag (The) (Lansing, Michigan)*. 1937. What his magic lamp was to Aladdin, the soy bean plant promises to become... 20(5):21. Oct.

• **Summary:** "... for American agriculture and industry. This was graphically illustrated, recently in Detroit, when the Pennsylvania railroad's 'Soy Bean Special' was halted at the Rouge plant of the Ford Motor company in the course of its tour of the East and Middlewest. The car, intended to present for the first time a complete exhibit of the soy bean from the planting of the seed to the appearance of the oil and pressed residue in hundreds of commercial forms, remained at the Union station."

176. *Nature's Path to Health (Melbourne, Australia)*. 1937. Nutrition: Bernard Shaw, Gandhi, Henry Ford advocate soy beans and vegetarianism. Nov/Dec. p. 13-14.

• **Summary:** "In a recent visit to this country, Bernard Shaw was observed drinking a glass of milk. When questioned why he used milk, since he opposed exploitation of cows, Shaw replied that it was not cow's milk he used, but Soybean Milk. Bernard Shaw has been a vegetarian for a long time and has lately become interested in the Soybean.

"Gandhi becomes a champion of soybean—Abandoning his famous goat-milk, Gandhi, who is also a vegetarian,



has become an advocate of soybean milk. Gandhi is a great believer in the soya bean. He thinks that soya milk will eventually replace the dairy product." A long article about the soya bean published in a recent issue of *Harijan* is quoted.

"Ford predicts vegetarian world. Dearborn, Michigan—Henry Ford, billionaire, automobile maker, has visioned a future world without ham sandwiches, juicy steaks, and chicken dinners, but with a worthy substitute produced by science from grains and vegetables... Ford is now 73 and is in excellent health."

"In a recent interview with newspaper men, Ford predicted: 'The farm animal will go, but the farm will become larger. The horse is dying out through the increased use of machines. The cow is losing its economic importance through the great advances in chemistry. The farmer of the future will grow vegetable foods instead of livestock.'

"According to Dr. Kellogg, a vegetarian diet is not new to Mr. Ford. For many years he has been practically a vegetarian. He owes to a vegetarian diet the health and vigor necessary to conduct successfully the gigantic industries his remarkable genius has created.

"Henry Ford, looking into the future, sees that the use of meat will have to be abandoned for economic reasons." Address: Australia.

177. Torri, A.J. 1937. Can country elevators process soybeans? *Grain & Feed Journals Consolidated* 78:190.

• **Summary:** Three systems for processing soybeans are in common use in the USA: The generally used expeller system, the hydraulic system, and the solvent system. The latter is in use by some large processors and is "the subject of extensive experiments by the Edison Institute at Dearborn, Michigan, as a method suitable for development into small processing plants located in communities where soybeans are grown, and where the meal can be fed." Details of the Edison Institute's research are given. There is a brief discussion of industrial uses of soybeans, such as the oil in paints. Address: Seatonville, Illinois.

178. Ford Motor Co. 1937. Soy bean processing machinery (Motion picture). Dearborn, Michigan. 80 ft., silent, black-and-white. 35 mm. No captions. *

• **Summary:** Shows: Henry Ford and Robert Boyer sitting in chairs, watching machine in operation, talking, cars in background. Ford and Boyer examining soybean flakes from machine. Pattern maker rearranging wooden pattern of machine at Henry Ford's suggestion. Ford, Boyer, and pattern maker looking at wooden pattern, talking. Address: Dearborn, Michigan.

179. Ford Motor Co. 1937. Ford advertising stills (Film strip). Dearborn, Michigan. 639 ft., silent, black-and-white. 35 mm. No captions. *

• **Summary:** These single frame advertising stills, including

some from 1935 and 1937, show: Ford plan to fight Depression through soy bean production. Oil extraction methods from primitive to modern. Food products, livestock feed, and plastics from soy beans. Address: Dearborn, Michigan.

180. Kale, F.S. 1937. Soya bean: Its value in dietetics, cultivation and uses. With 300 recipes. 2nd ed. Baroda State, India: Baroda State Press. xxx + 375 p. Illust. (35 leaves of plates, described in a separate record). Index. 22 cm. 2nd ed. 1937. [66 ref]

• **Summary:** Contents: 1. Deficiencies in the Indian diet and soya bean as a means to rectify them. 2. History of the origin and growth of soya bean: Derivation of the word soya bean, origin of soya bean, literature, primitive man and soya bean, name of the plant, home of soya bean and its expansion, varieties of soya bean, the culture of soya bean is very remote (It "has been the chief article of diet in China for over 7,000 years."), reference of soya bean in old Chinese records, how and when soya bean became known to Europeans, soya bean in England (from 1890; J.L. North and Henry Ford), soya bean in France (from 1739), soya bean in Italy, soya bean in other countries of Europe, soya bean in United States of America, India and soya bean.

3. The use of soya bean: Importance of soya bean, dietetic importance, industrial importance, agricultural importance (Russia, Mussolini in Italy), medical importance, soya bean is alkalising in its effect ("Soya bean milk as well as its flour is used in foods for invalids and infants, like Nestlé's food"), longevity and soya bean.

4. World trade in soya bean: Imports to Europe, production of soya bean in Manchuria (58% in North Manchuria), exports from Manchuria, oil and cake industry in Manchuria, soya bean production in Japan, in America, in Africa, in Australia, in Europe, in Java, in India, in other British possessions, estimate of world production of the soya bean, the desirability of the expansion of soya bean cultivation, imports and exports of soybeans, soya bean oil, and soya cake—1913-1927: Denmark, Holland, United States, Great Britain, Japan, France, Russia, China, Germany, Norway, Korea. Source: International Institute of Agriculture, Bureau of Statistics, 1921, p. 420-21. A table (p. 38) shows statistics for world production of soybeans "as estimated by the leading firm of London soya bean dealers" for various years from 1923 to 1929. This includes individual statistics each year for China [incl. Manchuria], Japan, and USA. The world totals in tons are: 3,095,000 (for 1923-25). 3,397,000 (for 1926). 4,325,000 (for 1927). 6,000,000 (for 1928), and 6,570,000 (for 1929; incl. China 5,250,000; Japan 550,000; USA 250,000; Java & Dutch East Indies 120,000; Other Asiatic countries & Africa 400,000).

5. Botany of the soya bean plant. 6. Classification of soya bean. 7. Cultivation of soya bean. 8. Diseases and pests of soya bean. 9. Cultivation of soya bean in India. 10. The

constituents of soya bean. 11. Soya bean milk. 12. Soya bean flour. 13. Industrial uses of soya bean. 14. Enriching soil by addition of nitrogen and use of soya bean as fodder. 15. Food requirement of the human body. 16. European and American soya bean recipes. 17. Diabetic dishes, Mahatma Gandhi's experiments at Magan Wadi and opinion of scientists on soya bean. 18. Chinese and Japanese soya bean dishes: Toffu [tofu] or soya bean curd: Digestibility, utilization, toffu khan, toffu nao, tze toffu (fried bean curd), chien chang toffu (thousand folds), hsiang khan, kori toffu (frozen toffu), preservation of toffu. Natto. Tokio natto and Kyoto natto etc. Hamanan natto [Hamanatto]. Yuba. Misso [miso]. Soya sauce. Soya bean confectionery. Roasted beans (Chinese).

19. Indian soya bean dishes: Hindustani dishes, Moglai dishes, Gujarati dishes, Maharashtrian dishes, Bengali dishes, Goa dishes, Tanjore dishes. Appendixes. 1. Acreage of soya bean in Manchuria during the last 5 years. 2. Total figures of export during last 5 years. 3. Bibliography. 4. Some opinions about the first edition of this book.

The preface begins (p. iii): "This little book is written in response to innumerable inquiries I have had from time to time after the inauguration of the plantation ceremony of Soya Beans at the State Agricultural Experimental Station by H.H. the Maharaja Gaekwar of Baroda in November 1933.

"A few months after this a food exhibition was held in Baroda where many Soya Bean dishes—Indian, European and Chinese—were exhibited. The leading papers and journals all over the country spoke in very glowing terms about the Soya Bean dishes that were exhibited... Later on at the request of Messrs. Mitsui Bussan Kaisha Ltd., a leading Japanese Firm in Bombay, a Soya Bean Exhibition and Restaurant were run in the Japanese village at the H.O.H. fete. So keen was the interest and enthusiasm evinced by the cosmopolitan public of Bombay that seats in the restaurant had to be reserved in advance. The presence of H.E. the Governor and Lady Brabourne and many Indian princes was an additional evidence of the ever growing popularity of the tasty Soya Bean dishes served there.

"At the closing of the H.O.H. fete many prominent people of Bombay requested me to continue the restaurant at a convenient place in the city, and asked me to open soya-bean milk centres for the children of the poor who could not afford to buy cow's milk. Many were ready to finance any scheme that I would propose, but unfortunately my time was not my own as I had to attend to my duties in the State and could not take advantage of their generous offer.

"The Departments of Agriculture of the various provinces of India as well as many Indian States asked me to supply them with literature regarding the cultivation and the uses of this most useful bean. The Department of Commerce and Industry of the Government of Bombay inquired if I could furnish them with information about the machinery for the extraction of Soya-bean milk. Letters of inquiries from private individuals kept pouring in daily from all parts of

India. All this has induced me to undertake the preparation and the publication of this book...

"From the number of experiments carried on in the Baroda territories and outside it, I feel sure that the Indian soil is most suitable for the cultivation of soya bean...

"The leading thought of the day in India is, 'Village uplift' and 'Rural reconstruction'.

"Baroda, 7th January 1936, F.S.K. (p. iv)

"Preface to the Second Edition: I feel grateful to the public for having given such a hearty reception to the first edition of my book. It is running into a second edition within a year...

"Now, Soya Bean Bakeries and Restaurants have been started in the city of Bombay and in many other towns in India, and Soya Bean products are exhibited in almost all the exhibitions...

"I feel highly thankful to His Highness the Maharaja of Baroda who gave me an opportunity last year of visiting Russia, where I have seen that seven to ten per cent. of Soya Bean flour was being added to the wheat flour in order to enhance the nutritive value of the bread. The Soya Research Institute at Moscow is making researches into the nutritive, industrial and economical values of Soya Bean. I have seen there the actual working of the Soya-bean milk extracting plant. They make casein out of Soya-bean milk. Soya-bean cream is sold in the market.

"I visited the dietetic clinics in England, France, Germany, Austria and other European countries, where doctors prescribe Soya Bean bread for diabetic patients. In Russia, rickets and consumption are treated by Soyolk extracted out of Soya Bean...

"France is growing Soya Bean on côlt de jura [sic, Côte d'Azur, on the Mediterranean?]. In England, through the efforts of Mr. J.L. North, Soya Bean is realised as a field crop for the last two years.

"Paris, 3rd April 1937. F.S.K. (p. ix)." Address: Food Survey Officer, Baroda State, India.

181. *Oil, Paint and Drug Reporter*. 1938. McMillen heads Farm Chemurgic: Agricultural editor succeeds late F.P. Garvan—W.H. Dow represents chemical industry. 133(1):3, 41. Jan. 3.

• **Summary:** "Wheeler McMillen, editorial director of *The Country Home* and a noted agricultural authority, has been elected to succeed the late Francis P. Garvan as president of the National Farm Chemurgic Council. As an advocate since 1936 of the council's purpose to seek increased industrial utilization of American farm crops, Mr. McMillen is regarded as a pioneer of the chemurgic program."

Willard H. Dow, president of the Dow Chemical Co. of Midland, Michigan, has been elected vice-president of the Council. Mr. McMillen said that "The sole objective of the National Farm Chemurgic Council is to enlarge the income of farmers." The council maintains a permanent office in Dearborn, Michigan, with Carl B. Fritzsche as managing director and Dr. H.E. Barnard as technical director. A portrait

photo shows Wheeler McMillen.

182. *Science*. 1938. Soybean plastic. 87(2246):Supplement p. 8, 10. Jan. 14.

• **Summary:** "Soybean protein plastic is understood to be used in the manufacture of the steering wheel, horn button and other such parts of Ford cars."

"In addition to development undertaken by Ford and other manufacturers, the Federal Government, through the Bureau of Chemistry and Soils of the Department of Agriculture, established early last year a soybean industrial research laboratory at Urbana, Illinois, in cooperation with twelve North Central states. Here some 30 chemists and other staff members are developing and improving industrial uses of soybeans. The Farm Chemurgic Council has been urging the industrial and other use of soybeans for several years as a part of its program to obtain the use of more American-grown agricultural products in industry.

"It is estimated that some 50 factories are turning out various industrial soybean products. Soybeans are used in making such articles as paint, enamel, varnish, glue, printing ink, rubber substitutes, linoleum, insecticides, glycerin, flour, soy sauce, breakfast food, candies, roasted beans with nutlike flavor, livestock feeds, as well as plastics."

183. *Christian Science Monitor*. 1938. Husks into fenders. Jan. 17. p. 18.

• **Summary:** Henry Ford is increasingly enthusiastic about chemurgy. The other day he announced "that his experiments with the utilization of farm by-products, such as wheat and soy bean chaff and corn husks, were approaching the stage where a considerable portion of an automobile could be 'grown on the farm.'"

Likewise, Ford engineers are almost ready with a low-cost tractor.

It is a fact that "soy bean products already are being used in finishes applied to many Ford cars and in the manufacture of such parts as steering wheel rims and interior trim."

Note: Soybean oil is being used to make enamel finishes, and soybean protein is being converted to plastics that are shaped into steering wheel rims and interior trim.

184. *Time*. 1938. Old gentleman in Detroit. 31(3):53-54. Jan. 17.

• **Summary:** "Last week Ford Motor Co. announced that 1937 had been its second best year since 1930, with a total world production of 1,314,639 units. In another respect, however—public relations—1937 was perhaps the worst year in Ford history. Once universally regarded as a model employer, in 1937 Henry Ford saw himself and his company held up to hatred in a suddenly labor-conscious nation. Only a fortnight ago came an adverse ruling on his labor policies by the National Labor Relations Board" [NLRB]. In response, Ford turned on his charm and "extremely canny

sense of diplomacy." "Calling in reporters, the crotchety, 74-year-old tycoon outdid himself in genial interviews. First he delivered himself about the State of the Nation..." Then he led a group of reporters on a tour of his plant. He opined that the most prosperous era in U.S. history is just around the corner because industry is opening up a whole new field for agricultural by-products. Picking up a curved sheet of a composition which he said was made from soybeans, the angular old man jumped enthusiastically up & down on it, exclaimed triumphantly: 'If that was steel it would have caved in.' Almost entire cars, said Henry Ford, will soon be made of such things as soybeans."

185. *Detroit Free Press*. 1938. Who does Henry Ford think he is? Iffy the dopester rises to remark. Jan. 19. p. 1, 3; Jan. 20. p. 3.; Jan. 21. p. 3. Jan. 23. p. 3. Jan. 24. p. 3.

• **Summary:** These humorous articles effectively defend Henry Ford from his critics in labor unions (John L. Lewis), big government (Roosevelt), Wall Street, and big banks (J.P. Morgan). Address: Michigan.

186. *Science News Letter*. 1938. Plastic made of soybean offers use for farm products. 33:71. Jan. 29.

• **Summary:** "Henry Ford's greatest love among the 'chemurgic' products—agricultural products used industrially—that he sees aiding economic progress is known to be soybean protein plastic. Already this synthetic material is understood to be used in manufacture of the steering wheel, horn button and other such parts of the Ford cars."

"It is estimated that some 50 factories are turning out various industrial products using soybean products."

187. *Newbury News (Massachusetts)*. 1938. Plastic cars. Jan. 17. *

188. Sharpless, George R. 1938. A new goiter-producing diet for the rat. *Proceedings of the Society for Experimental Biology and Medicine* 38(1):166-68. Feb. Issue No. 268. [5 ref]

• **Summary:** Rats "readily developed goiter when fed the following diet: soy bean flour (unprocessed [raw]) 75.0 parts, dried yeast 3.0 parts, butter fat 5.0 parts, sodium chloride 1.0 part, calcium carbonate 0.5 part, sucrose 15.5 parts, and viosterol 15 drops per kilo of food.

"Rats weighing 50-70 gm. were used in the study. More than 150 were fed the diet over a period of 2 years. Enlarged glands were obtained consistently. After 4 weeks on the diet, the glands of many animals were enlarged to 5 times normal size but there were wide individual variations."

In this study, the observations made by McCarrison in 1933 on goiter produced by soy beans were not confirmed.

In summary: "In 4 to 8 weeks, a diet containing 75% raw soy flour induces in the thyroid of young rats an enlargement of 3 to 5 times normal. The enlargement is accompanied by hyperplasia and loss of colloid. Although the diet contains

more iodine than would be expected, additional iodine will completely prevent the enlargement." Address: Henry Ford Hospital, Detroit, Michigan.

189. *Farm Chemurgic Journal*. 1938. Francis P. Garvan (1875-1937) [Obituary]. 1(2):9. March.

• **Summary:** "Francis P. Garvan, President of Farm Chemurgic Council, President of the Chemical Foundation, and statesman extraordinary of the United States, is dead..."

"Until his broad comprehension envisioned its far-reaching potentialities, the concept of enriching America by increasing the industrial uses of farm-grown materials was little more than an idea. Advocated enthusiastically enough by its few proponents, the idea had no organized form..."

"Immediately he offered the resources and prestige of the Chemical Foundation to forward the movement. Preparations were made at once for the first Conference of Agriculture, Industry and Science at Dearborn, Michigan, in May of 1935. Under his guidance a program was shaped which brought together a group of exceptional distinction. For more than 2 years the Foundation financed the work entirely..."

"Personally few men were ever more delightful to know than was Francis P. Garvan. In possession of great wealth, his human qualities were in nowise different than had circumstances been otherwise. His human sympathies were tremendous both for people in the mass and for individuals..."

"His backing fully launched the Chemurgic movement, with its new hope for agriculture and for the nation. His aggressive and far-seeing leadership lives in inspiration to those who carry on."

190. *Industrial and Engineering Chemistry, News Edition*. 1938. Artificial fiber from soybean cake [Ryohei Inouye receives Fuji prize for 1937]. 16(8):232. April 20.

• **Summary:** On March 5, Ryohei Inouye received the Fuji prize award from the Physical and Chemical Study Council of Kyoto Imperial University for his discovery of a process by which it is economically possible to produce artificial fiber from the proteins of soybean cake. The council believes this is an outstanding contribution to the development of Japan's chemical industry in 1937. These researches were stimulated by the Italian process of producing fibers from casein and by researches in Germany which aim to produce textile fiber from fish protein. A company has been formed to undertake the production of the fiber from soybean cake and hopes to be producing 20 to 30 tons/day by autumn.

Note 1. On 8 Sept. 1937 Toshiiji Kajita and Ryohei Inoue of Japan applied for a U.S. patent titled "Process for manufacturing artificial fiber from protein contained in soya bean." This patent (No. 2,192,194) was issued on 5 March 1940 and assigned to Showa Sangyo K.K. of Yokohama. On 5 March 1938 Ryohei Inouye of Japan received the Fuji prize for artificial fiber made from soybean proteins. At the same

time, Robert Boyer of the Ford Motor Co. in Dearborn, Michigan, must have been researching and developing an identical product, which he first exhibited in May 1938. Yet it would seem that Inouye (and Kajita) of Japan should be given the credit for invention of the product. But was Inouye's product ever sold commercially?

Note 2. This is the earliest English-language document seen (Dec. 2004) that uses the term "artificial fiber" to refer to spun soy protein fiber used like a textile fiber.

191. Shoenfield, Allen. 1938. Soy beans help light way in chemurgic recovery path. *Detroit News*. April 26. p. 9, col. 3.

• **Summary:** A summary of presentations related to soy beans at the 4th annual conference of the Farm Chemurgic Council, held in Omaha, Nebraska. Soy beans and fuel alcohol (agrol) are seen as a kind of two-horse team that will help farmers out of the depression. The main speaker was Robert A. Boyer of the Ford Motor Co. Address: U of M. Bureau.

192. National Farm Chemurgic Council, Inc. 1938. Official program-Fourth Annual Chemurgic Conference of Agriculture, Industry and Science. New York, New York. 8 p. 18 cm.

• **Summary:** On the cover: The conference will be held at the "Hotel Fontenele, Omaha, Nebraska. April 25, 26, 27, 1938. Purpose: To advance the industrial use of American farm products through applied science."

"Tuesday, April 26. 9:15 A.M. Soybean section: Planning a soybean agenda for next year. Presiding: Edward J. Dies, Chairman, Soybean Committee. 'Soybean oil,' H.R. Kraybill (Purdue Univ., West Lafayette, Indiana), Lamar Kishlar (Ralston Purina Co., St. Louis, Missouri), E.E. Ware (Sherwin-Williams Co., Cleveland, Ohio). 'Soybean oilmeal,' J.W. Hayward (Archer-Daniels-Midland Co., Minneapolis, Minnesota), E.S. Dyas (Iowa State College, Ames, Iowa). 'Solving problems of southern soybean growers,' C.O. Eddy (State Experiment Station, Baton Rouge, Louisiana), Jacob Hartz (Stuttgart, Arkansas), Walter Godchaux (New Orleans, Louisiana).

"General soybean section. Presiding: Eugene D. Funk, Bloomington, Illinois. 'Work of the U.S. Regional Soybean Industrial Laboratory,' O.E. May, Director, U.S. Regional Soybean Industrial Laboratory, Urbana, Illinois. 'Value of recent developments in soybean oil to technical trades,' M.F. Taggart, (O'Brien Varnish Co., South Bend, Indiana). 'The story of soybean glue,' Hugh F. Armstrong, (I.F. Laucks, Inc., Portsmouth, Virginia). 'Past and future prospects for utilization of soybean products,' E.F. Johnson, (President, National Soybean Processors Association). Address: R.A. Boyer (Ford Motor Co., Dearborn, Michigan). General discussion.

The conference also included four luncheons, an agrol session (agricultural alcohol), a chemurgic banquet, a closing general section, an open form near the end, with Wheeler

McMillen (President, National Farm Chemurgic Council) presiding. Address: 654 Madison Ave., New York, N.Y.

193. Nippon Kari Kogyo K.K. 1938. [Textile fibers made from soybean protein]. *French Patent* 827,992. May 6. [Fre]*

• **Summary:** The fibers are made by a process similar to that for making Lanital, a wool-like fiber made from casein. Note: This process for making soy protein fiber was patented (in two patents) by this Japanese company before it was “invented” by Robert Boyer at the Ford Motor Co.

194. *Science News Letter*. 1938. New fiber made from soybean protein to be used in autos: Ford factories already have half-a-dozen good jobs for Chinese legume's products; Good mixer with tung oil. 33:302. May 7.

• **Summary:** “A new synthetic fiber, made from the protein material of soybeans, was exhibited for the first time by Dr. R.A. Boyer of the research department of the Ford Motor Company before the meetings of the Fourth Annual Conference of the Farm Chemurgic Council, at Omaha [Nebraska in April 1938; Proceedings were never published]. The new fiber, destined for use in automobile upholstery, was developed as an outgrowth of work by Italian chemists in making a synthetic wool from milk casein.” In 1937 some 400,000 pounds of soybean meal were used in the manufacture of parts for motor cars, probably largely as a filler. “The enamel on Ford cars contains 35 per cent soybean oil and 300,000 gallons of this oil were needed in 1937. The foundry uses some 250,000 gallons yearly in its operations. Soybean meal, from which the oil has been extracted, is widely used in the plastic molding compounds from which are made steering wheels and other parts of motor cars. Last year 400,000 pounds of soybean meal were used in this way. Soybean meal is also being used in the foundry of the steel mill, where large-sized cores in the molds are made of this material. A million pounds of this core binder, containing a large proportion of soybean meal, was used by the Ford plants last year. Soybean meal finds additional use as an impregnating agent for gaskets. A water-soluble paint, using soybean oil as the carrying agent for paint pigment, has been developed and is being employed in the Ford factories.”

Note 1. This is the earliest document seen concerning the Ford Motor Company's work with soy protein fiber. Notice however that on 8 Sept. 1937 Toshiji Kajita and Ryohei Inoue of Japan applied for a U.S. patent titled “Process for manufacturing artificial fiber from protein contained in soya bean.” This patent (No. 2,192,194) was issued on 5 March 1940 and assigned to Showa Sangyo K.K. of Yokohama. On 5 March 1938 Ryohei Inoue of Japan received the Fuji prize for his earlier discovery of soy protein fiber. His research was stimulated by the Italian process of producing fibers from casein and by researches in Germany which aim to produce textile fiber from fish protein.

Note 2. This is the earliest English-language document

seen (Dec. 2004) that uses the term “synthetic fiber” to refer to spun soy protein fiber used like a textile fiber.

195. Nippon Kari Kogyo K.K. 1938. [Textile fibers made from soybean protein]. *French Patent* 828,075. May 10. [Fre]*

• **Summary:** The fibers are made by a process similar to that for making Lanital, a wool-like fiber made from casein.

196. Rockwell, F.F. 1938. Round about the garden [Henry Ford's soybeans]. *New York Times*. July 3. Section 2. p. 8.

• **Summary:** As the author approached Henry Ford's Greenfield Village at Dearborn, Michigan he saw the “salutiferous and succulent soy bean sprouting in every vacant strip of ground.” Ford is credited with the statement that from the soy bean he expects to be able to make “every part of a motor car except the chassis and the engine.”

197. Davis, Watson. 1938. Henry Ford and soybeans. *Health (Mountain View, California)* 5(7):16. July.

• **Summary:** “Henry Ford's greatest love among the ‘chemurgic’ products (agricultural products used industrially) that he sees aiding economic progress is known to be soybean protein plastic.” Address: Director, Science Service.

198. *Chicago Herald Examiner*. 1938. Ford opens new soy bean plant. Aug. 7. *

199. *Newsweek*. 1938. Henry Ford, 75: Machine age just begun, he tells Detroit banquet. 12:11-12. Aug. 8.

• **Summary:** Henry Ford has always shied away from public tributes, and been serious and self-effacing. And so he was on July 30, his 75th birthday, “when all Michigan paid him homage as the man who lifted America out of the horse-and-buggy era and transformed an agricultural state into the motor capital of the world.”

Following a day of parades throughout Michigan, in which thousands of citizens participated, a special banquet was held in Detroit on Saturday night. Some “1,600 persons who had paid \$5 a plate—many of them rival auto makers—cheered the name of the lean, sharp-eyed industrialist who has an unshakeable faith on the onward march of America and of American initiative.” Neither selfish financiers nor misguided administrators in Washington, DC, can stop it, he said. Then there was a pageant at the Fair Grounds.

“All in all, it was largely just another day to Henry Ford except for two things—a pair of neckties, one worn about his neck and the other carried in his pocket. They were not marvels for looks, nor was there any personal vanity concerned. But to the motor magnate they were symbols of a new advance: each contained 50 per cent material spun from the fiber of the soy bean, that Asiatic legume which Ford has already transformed into plastics, finishes [auto body paints] and other automobile material.”

200. *Science News Letter*. 1938. Fiber and cloth made from soybean protein [in Japan]. 34:105. Aug. 13.

• **Summary:** A Japanese company is preparing to start production in the fall of 1938 on a small commercial scale of another new synthetic fiber, produced this time by chemical means from the soybean. The company plans to manufacture fibers and cloth at the rate of 20 to 30 tons a day. The process for converting soybean protein into fiber was developed by Ryohei Inouye, who was recently awarded the Fujii prize of the Physical and Chemical Study Council of Kyoto Imperial University, one of Japan's "big six" universities.

The drive to produce the new material as soon as possible was inspired by German success in making a fiber that contains 50% fish albumin and 50% cellulose, and by an Italian process which makes yarn out of casein.

201. *Bean-Bag (The) (Lansing, Michigan)*. 1938. Henry Ford opens soybean factory. 21(2-3):14. July/Aug.

• **Summary:** "Henry Ford's demonstration soy bean factory at Saline, Michigan, is open for operation. One of the plant's two buildings is the historic Schuyler grist mill, now transformed into a cleaning and storage plant. Oil is extracted in the other building.

"More than 700 farmers within a 200 mile radius of the plant are growing soy beans."

202. Boyer, R.A. 1938. How soybeans help make Fords. *Proceedings of the American Soybean Association* p. 6-9. 18th annual meeting. Held 12-14 Sept. at Wooster and Columbus, Ohio.

• **Summary:** This paper was presented at Wooster or Columbus, Ohio, on Sept. 12-14, 1938. "Eight years ago out in Greenfield Village in Dearborn, Mr. Henry Ford built a laboratory. It was not an ordinary laboratory because it did not contain the ordinary apparatus usually found in a laboratory. Instead there was a large retort, so large that it was capable of treating one ton of raw materials at a time. Day and night for one year, tons of corn, wheat, potatoes, oats, carrots, etc. were fed into this retort, disintegrated by heat, and the by-products separated for chemical examination.

"This was the first attempt made by Mr. Ford to put into action something he had had in mind for a long time, namely, 'Finding Industrial Uses for Farm Crops' or in Mr. Ford's words, 'To Learn How to Grow an Automobile.' It was done in a typical Ford manner. Instead of highly trained men he chose for this work, young men from his Trade School who had demonstrated an interest in science but who were not yet handicapped by too much book knowledge about things that could *not* be done. The scale on which the work was done was also typical of Mr. Ford. He built the retort large necessitating that the work be done with tons rather than grams of materials. The idea was that if anything unusual did happen it would be on a scale so large that it could not escape notice.

"After examining the results of the first years work we

came to the conclusion that a crop, to be successful as a raw material for industry, should have substantial quantities of oil, protein and carbohydrate. With this theory established it was easy for us to pick out the soybean as the crop on which to concentrate our experiments because of its outstanding ability in meeting all these requirements."

"This year [1938]... we have planted on Ford Farms over 12,000 acres of soybeans. That will not be enough for our requirements, however, so we have encouraged farmers to grow beans for us by loaning them seed in the spring to be returned at harvest time together with the rest of their crop which we buy at market price. This spring we gave out 46,000 bushels of seed which should return us at harvest time, estimating conservatively, a half million bushels of soybeans."

Boyer's group developed a small-scale solvent extraction unit that used a "special gasoline solvent." "It was our belief that this operation should be done as close to the source of the beans as possible... so we have kept it simple and as cheap as possible and have made it suitable and practical for installation in a farm community. A month ago at Saline, Michigan we put into operation one of these solvent oil extraction units. This is the first rural installation we have made and it is a good example of how the farm and factory can be brought together. This plant is located on Michigan Avenue..."

"Last year in our experimental oil extraction plant located at Rouge, we processed a total of 12,000,000 pounds of beans or the crop from about 10,000 acres. We obtained 250,000 gallons of oil from this operation which amounted to less than half of our requirements. We have two large uses for soy oil. The enamel with which all Ford cars are painted contains approximately 35% soybean oil. In 1937 the total consumption in this manner was 300,000 gallons. The other large use of soybean oil is in the foundry, used in the manufacture of cores. The oil is used as a binder for the sand. In times of high production half a tank car of oil is consumed every day. In 1937, 600,000 gallons of oil were used. It takes 30,000 acres or 46 square miles to produce this amount..."

"After the meal has been freed from the oil it is used on production in three different ways; the first and most spectacular use is that of the plastics. The Ford Motor Company uses 2½ million pounds of the plastic compound in a year and last year we produced about half of this amount ourselves. About one-third of this molding compound consists of soybean meal, so that we consumed about half a million pounds of meal in this manner last year... We use a large amount of soybean meal in the foundry in much the same manner as we use the oil..."

"A binder for this sand consisting mainly of soybean meal is used here. The consumption in this manner approaches a million pounds yearly."

The development of which Boyer's group is most proud is the spinning of a synthetic protein fiber from soybeans. The first synthetic cellulose fiber was rayon and in 1936 Lanital, a

synthetic protein fiber made from milk protein (casein) was developed in Italy. "Although Lanital is a synthetic protein fiber, it is still dependent on an animal source, cows milk, for its raw material. When Lanital was announced it was natural for us to undertake the same thing using the protein from soybeans. We were not successful in producing a fibre until a few months ago and it was not until the other day that a skein of soybean fibre was produced. I am glad to be able to display today for the first time in a skein form a fibre made from soybean protein. Although it is still very much in the experimental stage, the fibre exhibits the same tendency as wool and mohair [goat's hair] in its tendency to resist creasing.

"In order to give you an idea of what the comparative costs will be between wool and soybean fibre, it takes 2 acres of grazing land to support one sheep a year. The average wool yield from one sheep is eight pounds. On the other hand two acres of land will produce 400 pounds of soybean protein.

"We realize that we have a great deal of hard work ahead of us yet before we attain our goal of 'growing a Ford car.' We feel, however, that we have made substantial progress." Address: Ford Motor Company [Dearborn, Michigan].

203. Esselen, Gustavus J.; Scott, Walter M. 1938. Modified plastics 1918-1938. *Chemical Industries* 43(3):258-59, 261-63, 265-67. Sept. [29 ref]

• **Summary:** "The public has become plastic conscious within the last few years and many writers have made the statement that we are now entering upon an Age of Plastics."

"Bitumen or pitch holds the undoubted distinction of being the oldest known plastic. Students of our early civilizations have discovered that bitumen was used as a plastic many years before Christ in ancient Babylon."

"Casein as a plastic material dates to 1897, when 2 Germans, W. Krische and A. Spitteler, working at first independently and then together upon the problem of waterproofing casein coatings, discovered the casein-formaldehyde reaction. A patent was granted in Oct. 1897 and attention was then given to the production of plastic casein in the form of masses, rather than as protective coatings. The process was soon acquired by the Galalith [Galalith] Company, and commercial development [of Galalith] was started in Germany."

"Estimates of the output of casein plastics in various countries of the world for selected years from 1913-1935, inclusive are given in Table V." The leading producers of casein plastics in 1935 (in million lb) were thought to be France (7.7), Germany (4.5), England (3.7-4.5), Japan (1.5), and Italy (1.3). World production in 1930 was about 22 million lb.

"The protein material from soybeans is analogous in its properties to casein and to zein. Soybean meal, from which the oil has been extracted, can be used as the basis for plastic molding material. If plasticized with 5% or more of water

it behaves in a similar manner to casein, but it is necessary to modify the casein procedure somewhat and the product is not as good... It appears that the best plastic material is obtained by removing all moisture and plasticizing the soybean protein with some anhydrous organic agent.

"Plastics from soybean meal or protein have not yet been marketed on any large scale in this country. However, it has been stated (*Science News Letter* 33, 302, 1938) that in 1937, 400,000 lb of soybean meal were used in the manufacture of parts for motor cars, probably largely as filler." Address: Consultants, Boston, Massachusetts.

204. *Ford News (Dearborn, Michigan)*. 1938. A new farm market. Sept. p. 195.

• **Summary:** Discusses the Ford village industry at Saline, Michigan, 31 miles west of Dearborn. "There in the historic Schuyler gristmill, which has stood unused since the demise of most countryside industry shortly after the turn of the century, activity was recommenced on the completion of its reconstruction by Henry Ford as his eleventh village industry."

"The old gristmill, deteriorating on the banks of the Saline River two years ago, today serves as a soybean cleaning and storage plant. A new frame structure, in architectural conformity with the mill, houses soy bean flaking and oil extraction equipment. Banked by shrubbery and tall trees, the Ford dam and glistening white mill buildings stand in sharp contrast on broad rolling lawns."

"The Saline Mill is the center of interest for farmers within a 200-mile radius. On 700 farms within this area in Michigan, Indiana and Ohio, soy beans are being grown on 15,624 acres from seed furnished by the Ford Motor Company. In addition, the company has 5,898 more acres seeded under contract. The total yield of soy beans for the season is expected to be 312,480 bushels.

"The historic old mill in its new, park-like setting already has become a mecca for the farmers in southern Michigan. It promises to become a show place for Ford soy bean operations, and will acquaint the public in general with this new and expanding market which industry is offering agriculture... Present equipment at Saline will permit the processing of more than 140,000 bushels of soy beans a year. A second Ford plant under construction at the village of Milan, another little Michigan town some 15 miles away, is expected to equal this capacity and thus double the Ford consumption of soy beans."

"The two extracting units in the Saline extraction plant were moved from the Rouge Plant, a real step in the industrial decentralization."

"Like most Ford Village Industries, the Saline Mill is powered by the stream it borders. Water from the lake formed by the near-by Ford dam with a twenty-one-foot head, is brought by a mill race to a new water wheel. The generator, rated at 208 volts, alternating current, produces

eighty-eight and one-half horsepower; two coal-fired fifty-horsepower boilers operating at 150 pounds pressure provide necessary steam for soy bean processing and heating the buildings. The generators and boilers are located in the original mill.”

Contains 6 photos, including: (1) The refurbished gristmill complex buildings. (2) The electrical generator powered by the stream bordering the plant. (3) The interior of the solvent extraction plant, focusing on the solvent extractor. (4) Part of the Ford automobile door handle being made from soybean plastics. (5) Henry Ford, squatting down, with a straw hat in his right hand, inspecting soybean plants on his experimental farm. (6) Harvesting soybeans in a field using a mechanical harvester.

Note: This is the earliest document seen concerning soybeans in connection with Saline, Michigan.

205. George, S.E. 1938. New industries: The versatile soya bean. *Nature's Path to Health* (Melbourne, Australia). Oct. 1. p. 17, 38.

• **Summary:** Discusses utilization of soya beans throughout the world to make soya bean oil and meal, industrial products (glycerine, paints, soaps, linoleum, rubber substitute, printing inks, explosives, etc.), bean-milk, bean-curd or tofu, salted bean-curd (resembles Roquefort cheese), coffee substitutes (sold today in America and Europe), soya bean flour, and beef-like extracts for use in soups (“one of the most famous European brands of soup-cubes has a soya-bean base”). “Sacks of [soya] beans make excellent substitutes for sandbags [in wartime], as was proved in the recent Manchurian struggle. Buddhists in China use bean-curd [probably yuba], shaped in molds, to make many products that resemble animal products: fish with sauces, a whole chicken swimming in a golden chicken soup. A number of other products made from soya beans are listed. Discusses the work of the Ford Motor Co. with growing and using soybeans in England and the USA.

A cartoon shows a figure of “The Versatile Soya Bean” smiling and dancing with hands on hips.

Note 1. This is the earliest document seen (April 2003) that mentions a meat alternative which is described as an alternative to fish or seafood.

Note 2. This is the earliest English-language document seen (Feb. 2004) that uses the term “bean-curd” (with a space in front of the word “bean”) to refer to tofu. Address: Australia.

206. Black, M.A.; Woodcock, J.W. 1938. Soya beans in New Zealand. Question of economic value examined. *New Zealand J. of Agriculture* 57(4):293-95. Oct. 20.

• **Summary:** “Both from a commercial and an agricultural point of view the growing of soya beans is not an economic proposition in this country.” The article attempts to answer 3 questions: 1. For what purposes are soya beans grown in

other countries? 2. For what purposes might they be grown in New Zealand? 3. What is the experience of growing soya beans in New Zealand? Concerning the latter, it is reasonably certain that, outside the maize-growing areas, satisfactory yields cannot be relied upon. Temperature is clearly the controlling factor. In Palmerston North in 1935-36 the average yield of the 6 best varieties was 35.1 bushels. The next year the average temperature dropped about 4 degrees and the yield dropped to 9.2 bushels of very low-grade seed.

For the past 3 seasons the Fields Division of the Department of Agriculture and the Agronomy Division of Plant Research Bureau have collaborated in 15 field trials with soya beans. The locations of the trials and descriptions of the plots are given. Two to three trials were conducted each year. In 1935-36 the best yields came from Early Yellow (45 bushels/acre) and OAC (42 bu/a); in 1936-37 from Henry Ford (20.9) and Manchu (Ottawa; 20.8); in 1937-38 from Early Yellow (41.2) and Mandarin (40.4 bu/acre). Address: 1. Crop Ecologist, Plant Research Bureau; 2. Crop Experimentalist, Dep. of Agriculture.

207. *Chemical Age* (London). 1938. “Lanital” manufacture. Use of soya bean casein in Japan and Manchukuo. 39:320. Oct. 22.

• **Summary:** The German Press reported that an agreement has been concluded between the Snia Viscosa of Italy and a Japanese industrial group under which the latter acquires the right to manufacture “Lanital” in Japan and Manchukuo. It has been proved that casein from the soya bean is a good substitute for milk casein in Lanital manufacture. Ferretti, the discoverer of Lanital, and part owners of the patent rights, has been experimenting with soya bean casein with successful results. The Lanital industry in Italy is also widening the Lanital patent basis to include soya casein.

208. Berg, D.J. v.d.; Toit, F.M. du. 1938. The soybean: Its production and industrial use. *Farming in South Africa* 13(151):391-93. Oct.

• **Summary:** Part I, by Berg, is titled “Soybean production in South Africa.” It discusses adaptation, uses of soybeans as a fodder crop, for industrial purposes, and for human consumption, cultural practices, and soybeans in diversified farming systems. Concerning use in human foods, the author notes: “But it is in the meal, after the oil is extracted, that its greatest value lies. The meal contains nearly 43 per cent. of protein, an ingredient so often absent from the diet of a very large proportion of South Africa’s population. The value that this meal, judiciously mixed with maize meal, would have in the feeding of the working classes and the native population of South Africa cannot be overemphasized.”

Part II, by Toit, is titled “The importance of the soybean in industry.” Fig. 2 (photo) shows ten soybean food products, including soybean flour (Soyolk, 7 lb), Worcestershire sauce (Lea and Perrins), soybean biscuits, soybean cocoa, soybean chocolate (Eden Chocolat au Soja), soft soap,

laundry soap, invalid and diabetic food, soybean meal, and compressed soybean cake for stock feed. With the exception of the chocolate and cocoa which originated in France, all of these products were made in England. Fig. 3. shows auto parts made of soybean protein and oil made at the Ford River Rouge plant. "One firm in this country is treating and milling soybeans and preparing a meal which is becoming increasingly popular as a source of protein in the rations of mine natives. This firm is to-day forced to import a large proportion of its requirements owing to the low production of soybeans in the Union." Address: 1. Research Officer and Superintendent, Summer Cereal Station, Kroonstad; 2. Field Husbandry Section, Div. of Plant Industry.

209. Dring, George. 1938. A plastics review. *J. of the Society of Chemical Industry-Chemistry & Industry* 57(50):1159-61. Dec. 10. [3 ref]

• **Summary:** "The world-wide publicity which has been given to the work of Ford on soya bean plastics has not yet given us a complete moulded motor-car which has been prophesied, but the day when such a thing might come about is drawing nearer..." Address: M.A., B.Sc., F.I.C., Development manager, Bakelite, Ltd..

210. Boyer, R.A. 1938. Industrial utilization of soybeans. *Farm Chemurgic Journal* 1(3):26-29. Dec.

• **Summary:** Contents: Introduction. Improved crops. Rural factories (at Saline and Milan, Michigan). Soybean plastics. Soybeans and steel. Finding new uses. Upholstery from beans. Continued research. "It has been much more difficult for us to develop uses for the meal than for the oil, and the fact that there is approximately four times as much meal by weight does not make the problem any easier."

"Mr. Ford's well known policy of industrial utilization of farm crops includes not only producing raw materials on the farm but processing them as close to their source as is practical." Last year, within a radius of 25 miles from Saline, Michigan, more than 20,000 acres of soybeans were grown. Of this total, over 12,000 acres were grown by individual farmers; the remainder was grown on Ford farms. These soybeans filled about 50% of the requirements of Ford's processing plant.

"In order to process these beans somewhere near their source, the Ford Motor Company has for several years been experimenting with small solvent extraction units." Two years ago four of these solvent extractors were installed at Ford's Rouge plant in order to test the commercial aspects of these small units. The test was kept in continuous operation until the start of 1938. "During 1937 a total of 12,000,000 pounds of soybeans was processed, yielding over 250,000 gallons of oil and 10,000,000 pounds of meal.

"Rural factories: This plant operated so satisfactorily throughout the year that it was decided to separate it into two complete plants consisting of two units each, and to

move them to rural locations which had been prepared at Saline and Milan, Michigan. The installation at Saline is now completed and will be the first complete rural demonstration of Mr. Ford's ideas for connecting the farm and factory.

"The oil produced last year was largely consumed in two ways. The enamel with which Ford cars have been painted since 1934 contains 35 per cent soybean oil. During 1937 the total consumption in this manner of soybean oil was 300,000 gallons.

"Glycerine, which is another ingredient in this enamel, is obtained from vegetable oils... If we assume that half of the glycerine came from soybean oil, it would mean that an additional 270,000 gallons of soybean oil was required. The foundry is a large user of soybean oil, using in times of peak production 3,000 gallons per day. The total for the year was 250,000 gallons. We produce less than one-half our total requirements for all these uses, making it necessary to purchase an additional 620,000 gallons.

"Soybean plastics: Soybean oil extracted meal is used on a production scale in three ways. The first and most spectacular use is that of the plastics. The Ford Motor Company uses over two and a half million pounds of thermo-setting molding compound a year. Last year we produced approximately one-half of this amount or one and one-fourth million pounds of soybean molding compound. Roughly, one-third of this molding compound consists of soybean meal, so that 400,000 pounds of soybean meal was consumed in this manner... The foundry also uses a large amount of soybean meal... Last year one million pounds of core binder was consumed in our foundry.

"Soybeans and steel: During 1936 another use was developed for large quantities of soybean meal in our steel mill. In producing steel ingots, a removable top is placed on each ingot mold which is lined with sand and must be relined after each use. A formula similar to the foundry core binder is used here, and, as a result, our steel mill consumed over three-quarters of a million pounds of soybean meal last year."

"Two years ago it was announced in Italy that a process had been perfected for making synthetic wool from milk casein. To men engaged in soybean research that announcement immediately suggested the possibility of producing a similar substance from soybean protein. Our laboratory undertook this project, knowing that it was a difficult one. For 18 months we worked without any signs of success, and it was not until a few months ago that we were able to produce a fiber from this protein. Our objective is to produce an upholstery material for automobiles."

"Inasmuch as we are entirely dependent on outside sources for the glycerine in our enamel, the production of stearic acid by the hydrogenation of soybean oil with glycerine obtained as a by-product fits in very well with the Ford program."

Note: This issue contains the partial Proceedings of the 4th Annual Chemurgic Conference. Address: Ford Motor

Co., Dearborn, Michigan.

211. Balzli, Hans. 1938. *Kleine Soja-Fibel. Geschichte, Anbau und Verwertung einer einzigartigen Nutzpflanze* [A little soybean primer. History, culture, and utilization of a unique useful plant]. Zurich and Leipzig: Albert Mueller Verlag. 88 p. Index. 16 cm. [26 ref. Ger]

• **Summary:** Contents: Foreword. Economic questions. Botanical. Historical. Chemical composition of the soybean seed. Utilization in East Asia: Koji, miso, shoyu, soymilk, yuba, tofu (*Sojakäese*, like Quark), soy oil and press-cake. Utilization in Europe and America: As fertilizer and feed, as food (soy flour, roasted soybeans, soy coffee, green vegetable soybeans (*den jungen Sojakern... wie junge grüne Erbse*), soy sprouts), and industrial products (incl. “soybean steel,” an invention of Henry Ford). Medicinal significance. Cultivation and yield. Epilogue. Bibliography. Author-subject index.

In the chapter on History (p. 24), the author notes: “The poet Johann Heinrich Voss (lived 1751-1826) once said: ‘Young Calcuttans... with your sharp soy sauce from Jakarta (*Junge Kalkuten... mit scharfer batavischer Soja*).’ Then he adds to that the observation: ‘Soy sauce (*Soja*) is a powerful sauce, which is prepared from soybeans (*Sojafasele*), *Dolichos Soja*, which originate in the East Indies and are subject to fermentation, together with brine and spice.’”

Balzli continues on page 25: “The *Deutsche Woerterbuch der Naturgeschichte* (German Dictionary of Natural History) contained in the *Allgemeinen Polyglotten-Lexikon der Naturgeschichte* (General Multilingual Encyclopedia of Natural History) by Philipp Andreas Nemnich (1793) contains the entry: ‘*Sojablume. Dolichos soja.*’ (*Soya flower. Dolichos soja.*)”

“In the world-famous work *Geist der Kochkunst* (Spirit of the Culinary Art), the art historian C.F. von Rumohr (lived 1785-1843) also mentions soya in the second edition (1832, p. 155) and conjectures that the *Garum* sauce of the Romans was an imitation of the East Indian sauce (*Sulze*) made from soybeans (*Soja*).”

Page 29 reports that “During the war of 1870 (*des siebziger Kriege*), in which Bismarck of Germany defeated Napoleon III of France) the German head artillery man, O. Wehrman, saw in the botanical garden of Montigny-les-Metz a plant that was unknown to him. It was the soybean. He took 4-5 seeds with him and planted them in early 1872 on his property / estate near Meissen (in Sachsen/Saxony, near Dresden in today’s Germany). He harvested 80 to 100 seeds, with which he continued his investigations successfully for some years” [Note: Haberlandt (1878, p. 5) tells this same story].

On page 57 the author uses the term “*Sojaspeisen*” to refer to soyfoods. Address: Switzerland.

212. Ford Motor Co. 1938. *Harvest of the years* (Motion picture). Dearborn, Michigan. 832 ft., silent, black-and-white, 35 mm. No captions. See 200FC-4032 for master print with

sound track. *

• **Summary:** Shows: Worker operating machine as small [plastic] parts drop from molds. Worker shoveling soy beans into basket. Worker removing small parts from molding machine. Revolving drum washing small molded parts. Address: Dearborn, Michigan.

213. Horvath, A.A. 1938. *The soybean industry*. New York, NY: The Chemical Publishing Co. of New York, Inc. vi + 221 p. Index. 22 cm. 2nd ed., 1939. 221 p. [70 ref]

• **Summary:** Contents: Introduction. 1. Edible whole soybean flour. 2. Pressure oil milling. 3. Oil milling (Anderson Expeller, French mechanical screw press). 4. Press oil (changes in specific gravity, changes in viscosity, changes in color, changes in acidity, changes in saponification value, changes in the refractive properties of the soybean oil, changes of the unsaponifiable matter content, changes of the iodine value). 5. Press meal (hydraulic press or expeller). 6. Solvent extractions (introduction, extraction solvents, the use of low boiling hydrocarbons, extraction machinery, batch or continuous extraction machinery, conveyor (Bollmann) system, screw (Ford) system, drum and press (Fauth) system, column {Extractol [Bonotto]} system). 7. Safety in solvent extraction and in flour milling (explosibility tests of soybean products, preliminary conclusions from explosibility tests of soybean products, recommendations for explosion prevention). 8. Efficiency of solvents and their effect on oil quality (extraction with ethyl alcohol). 9. Experimental (laboratory) extraction of phosphatides. 10. Commercial extraction of phosphatides (ethyl alcohol, azeotropic mixtures of organic solvents). 11. Soybean oil (hot-pressed oil). 12. Refining of soybean oil (refining crude soybean oil by sodium hydroxide, washing and drying, bleaching, deodorizing, keeping qualities and uses). 13. Blown, sulfonated and hydrogenated oil (livestock fly spray, sulfonation, hydrogenation). 14. Technical uses of soybean oil, core oil [foundry cores] and cutting fluid (paint, drying time and hardness, today’s standing synthetic resins, fatty acid and distillation, soap, waterproofing cement, codling moth control, factis, artificial petroleum from soybean oil). 15. Phosphatides (lecithins) and their uses (general properties, cephalin, commercial soybean phosphatides, bleaching, stabilizing emulsions, hydrophylic “sols” of soybean lecithin, commercial phosphatides to which aqueous solutions of sodium hydroxide or sodium peroxide have been added, sulphonated phosphatides, hydrolecithin, hydrocephalin, uses of commercial phosphatides (“lecithin”)). 16. Soybean protein (general properties). 17. Industrial protein (preliminary “washing,” extraction and precipitation, properties of industrial protein). 18. Plastics (Ford plastics). 19. Adhesive and sizing materials (artificial wool). 20. Solvent extraction meal. Bibliography. Useful books.

The Foreword by H. Bennett notes that “Dr. Horvath was graduated from the University of Kazan. After a period as

instructor in chemistry at the Vladivostock [Vladivostok] Institute of Technology he went to China and Manchuria to study the soybean at first hand. For over eight years he followed and studied this bean in such important centers as Harbin, Dairen, Tientsin and Peking. In Tientsin he was associated as chemist for a concern processing oils and fats. In Peking he was in charge of soybean research at the Peking Union Medical College (Rockefeller Foundation). During his stay in China he wrote many articles on soybean food products. These articles were collected and issued by the Chinese Bureau of Economic Information in book form. In 1927 his booklet 'The Soybean for Food and Feed' was published by the Manchurian Research Society. In 1930 the Chinese Government printed his study of 'The Soybean Oil of China and Its Manifold Uses.'

"In 1927 Dr. Horvath joined the research staff of the Rockefeller Institute at Princeton, New Jersey. In 1930 he served as research chemist at the U.S. Bureau of Mines Experiment Station at Pittsburgh [Pennsylvania]. In 1933 he came to the Delaware Experiment Station at Newark, Delaware, as head of the Chemistry Department, where he is continuing his investigations on the soybean and its practical applications."

Industrial uses of soy oil (p. 97-111) include in paint, in the modification of synthetic resins of the glyptal and phenol formaldehyde types, for free fatty acids, in soap, waterproofing cement, lead arsenate-soybean oil mixtures as a spreader and sticking agent in an insecticide for codling moth control, in factis (a rubber substitute), and for artificial petroleum.

Concerning industrial (non-food) uses of lecithin, pages 134-40 give details on its use as an anti-oxidant for gasoline to prevent gum formation, in soaps and cosmetics, paints, leather tanning, as a wetting and softening agent for textiles, especially rayon ("Lecithin effects more even and thorough dyeing, greater brilliancy of coloration, flexibility, and softer feel."), in hard rubber compositions (to facilitate mixing, accelerate vulcanization, and act as a softener), in plastics such as phonograph records and linoleum cement (a small amount reduces the need for softening agents), as an emulsifying agent for asphalt and tar emulsions, as a dispersing agent in insecticides, in creosote to improve the viscosity and surface tension, and in electroplating to give finer, denser, and more uniform coatings.

Concerning the Column (Extractol {Bonotto}) system (p. 56-58). The soybeans are "weighed, cleaned, cracked and flaked, then conveyed to the extraction department. A feeder supplies the flakes to the extraction column at the proper rate. A bed of flakes above the upper plate of the column acts as a filter to remove fines from the miscella. Solvent enters the base of the column and ascends countercurrently to the flakes..." Note: Allis-Chalmers and Anderson extractors are modifications of the Bonotto apparatus. Address: Chemist, Delaware Agric. Exp. Station, Newark, Delaware.

214. Horvath, A.A. 1938. Ford plastics (Document part). In: A.A. Horvath. 1938. The Soybean Industry. New York, NY: The Chemical Publishing Co. of New York, Inc. vi + 221 p. See p. 179-82. [1 ref]

• **Summary:** "Present practice calls for the addition of a certain amount of phenol, giving a composition of phenolic and protein-formaldehyde product which is both waterproof and durable. Although isolation and purification of the protein give a higher grade plastic, the added expense has not been justified in view of the present satisfactory results obtained by using the whole meal (Footnote: "From beans extracted by hexane"). Since phenol is a good solvent for soybean meal this method makes available both the protein for the formaldehyde reaction and the carbohydrates for filler, thus cutting the cost to a figure considerable below that of a straight phenolic plastic. Wood flour is used as an additional filler."

The formula is: Wood flour 396.6 lb, soybean meal (extracted) 330 lb, formaldehyde 250 lb, phenol 250 lb, pigments 75 lb, alcohol 33 lb, lime 26.3 lb, ammonia 26.3 lb, hexamethylene tetramine 26.3 lb, water 12.4 lb, stearic acid 4.1 lb, zinc stearate 4.1 lb.

"Ford's welding is being done in part of the huge glass works at his River Rouge plant. In the main building are housed the mixing equipment and molding machines capable of turning out 100 tons of plastic per day in the form of distributor parts, gear shift lever knobs, light switches, horn buttons, coil parts, and window frames. The total outlay represents a construction and equipment cost of approximately \$4,000,000." The process for making the plastic is then described in detail.

"The cost of soybean plastic is greater than steel per pound, but the finishing of steel brings the final cost of many steel parts in excess of that for the finished product fabricated from the soybean material." Address: Chemist, Delaware Agric. Exp. Station, Newark, Delaware.

215. Simonds, William Adams. 1938. Henry Ford and Greenfield Village. New York, NY: Frederick A. Stokes Co. xiv + 268 p. Illust. No index. 20 cm.

• **Summary:** In chapter 9, titled "Industry and Agriculture," Henry Ford's work with soybeans is discussed on pages 230-35. Ford developed plastics using soybeans. "The cost of one pound of soybean molding material has as yet proved higher than that of a pound of steel, but the polishing and finishing of the steel makes the cost of its finished part somewhat greater than that of the finished plastic. When a molded plastic part replaces one of steel, weight is decreased with consequent reduction in gasoline consumption.

"Two years before experiments with the soybean in its relation to industry were commenced, the bean was the subject of another definite line of research in the food and diet laboratory maintained by the Company in the rear of the

Engineering Laboratory directed by Mr. Ford's old seatmate, Dr. Edsel Ruddiman... Many will doubtless recall the howl of laughter that went up when Mr. Ford informed a reporter one day of his belief that synthetic milk could be produced. Nevertheless, milk has been produced from the soybean in the Ford laboratories and elsewhere. It is even better than cows' milk for certain infants' cases, where skin afflictions make use of the latter undesirable...

"When Dr. Victor Heiser, author of 'An American Doctor's Odyssey,' visited Greenfield Village he told me of the wide use of soybean milk among the Filipinos, and how the addition of a little oil of banana had made it much more palatable..."

"With this milk soybean cheese, similar to cottage cheese except in flavor, may be made. While somewhat insipid in taste, the cheese proves very useful when mixed in salads, sandwich spreads, croquettes with a food having a strong flavor. The whole bean has many food uses, among them soups, baked beans, salads, and canning. As the flavor of the soya is slightly stronger than that of the ordinary bean, onions and tomatoes are often used to cover it. The process of canning the green soybean was first demonstrated under Dr. Ruddiman's direction. Production of soybeans in 1935 totaled 590 cans; and in 1936 it reached 1,000."

Defatted soybean flour "finds a ready market among visitors at the Village. It is used in many common baked goods such as bread, rolls, muffins, biscuits, cakes, cookies, and so on... Another product that has proved popular with visitors is the salted soya, put up in small packages like nuts. In preparing these, the bean is soaked in water for a time, then roasted in hot soya oil. The salt is added to taste." Lecithin can be used to make a "chocolate sauce and coating for soybean candies, with which the Ford men have done much experimenting.

"As a practical demonstration of the possibilities of the soybean in a variety of foods, a dinner was served one August evening in 1934 at the Ford exhibit in the Chicago Century of Progress Fair. Every dish on the menu was comprised, in part at least, of the legume. Following was the list [of 15 dishes served].

"Tomato juice seasoned with soybean sauce. Salted soybeans. Celery stuffed with soybean cheese. Purée of soybean. Soybean crackers. Soybean croquettes with tomato sauce. Buttered green soybeans. Pineapple ring with soybean cheese [tofu] and soybean dressing. Soybean bread with soybean butter. Apple pie (soybean crust). Cocoa with soybean milk. Soybean coffee. Assorted soybean cookies. Soybean cakes. Assorted soybean candy."

Note 1. The listing and spelling of the items in this menu differs slightly from the original menu of 17 Aug. 1934.

Note 2. No mention is made of soy ice cream being served at this meal in Aug. 1934. Yet shortly thereafter, and definitely by Aug. 1935 soy ice cream for dessert was served at similar meals in the pine-panelled dining room in the Ford

Engineering Laboratory (Strother 1961).

Chapter 10, titled "Little Factories," discusses Ford's rural industries, including the mills at Saline, Tecumseh, Milan, and Ypsilanti. At Tecumseh, in the heart of soybean country, the Hayden Mills, after its restoration, "was used for cleaning and sacking soybeans for seed, preparing them for distribution to neighboring farmers in the spring." At "the village of Saline where the Chicago pike crosses the Saline River a few miles north of the soybean farms..." the old Shuyler mill and its dam were restored. "The fall of 1936 also found workmen busy at the town of Milan east of the soybean area..."

An excellent panoramic view of and guide to Greenfield Village are shown inside the front cover and on the facing page. #11 is a "soybean extraction plant."

Note 3. This is the earliest English-language document seen (June 2011) that uses the term "Salted soybeans" to refer to soynuts. Address: Dearborn, Michigan.

216. Edison Institute. 1938? Recipes for soy bean foods. Dearborn, Michigan: Edison Institute. 19 p. Undated.

• **Summary:** This undated booklet begins with 1½ pages of nutritional information about soy beans and recipes containing them. "Fresh green soy beans contain about 10% of protein compared with 7% in green lima beans or green peas. The varieties Willomi and Rokusun "are preferred because they do not have such a strong taste." Many of the 58 recipes are based on soy flour, e.g. soy-bran bread, steamed soy bean bread, cinnamon buns, muffins, waffles, lady fingers, apple sauce cake, soy bean "paste," doughnuts, etc. A number of others use cooked whole soybeans (soy loaf, chile con carne [chili], baked beans, salad) or ground soy beans (soup). More unique recipes include: Soy loaf (with "soy cheese" [tofu], p. 9). Cheese croquettes (with soy bean cheese and soy milk, p. 9). Green soy beans (p. 10). Scalloped green soy beans. Omelette (with tofu, p. 10). Salad (with tofu, p. 11). Salad soy bean sprouts (p. 11). Sandwich spread (with "soy nut butter," p. 12). Honey soy bean icebox cookies (with soy bean butter or Crisco [shortening], p. 14). Brittle cookies (with soy bean flour and roasted soy beans, p. 14). Coconut balls (with roasted soy beans, p. 15). Soy bean custard (with soy bean milk, p. 18). Candy-milk chocolate clusters (with freshly roasted soy beans, p. 18). Candy-roast soy brittle (with fresh roasted soy beans, p. 18).

The last page (p. 19) gives basic recipes for: Cooked soy beans. Green soy beans. Soy bean milk. Soy bean cheese [tofu], coagulated with dilute acetic acid or vinegar; salt to taste. Roasted soy beans. Soy bean nut butter. Soy bean butter.

"Roasted soy beans: Soak beans in water 3 or 5 hours. Drain off water and roast beans for 9 to 11 minutes in deep, purified soy oil or Wesson oil heated to about 325°F. Drain and sprinkle with powdered salt."

"Soy bean nut butter: Grind about 2½ cups of roasted soy beans and mix with about 2 tbs. of purified soy oil or salad

oil.

Soy bean butter: Mix hydrogenated soy oil with salt, coloring matter and diacetyl to color and taste.

Note 1. Robert Boyer stated in an interview in the 1980s that this booklet was published in the mid-1930s, and the recipes were developed mostly by Dr. Edsel Ruddiman. However mention of the varieties Willomi and Rokusun makes it more likely that this booklet was published after mid-1938.

Note 2. This is the earliest English-language document seen (Nov. 2009) that uses the term “soy nut butter” or the term “soy bean nut butter” to refer to soynut butter. Address: Dearborn, Michigan.

217. Four molded black plastic parts used Ford automobiles (Memorabilia). 1938? River Rouge, Michigan. Undated.

• **Summary:** These four round parts, made from soy-based plastic, were sent to Soyinfo Center by Tatiana Horvath on in May 2010. Their diameters range from 3.5 inches to 2 inches. Two are hollow like a cup and have what appear to be three short legs on the bottom (convex part). It is not clear what each part was used for.

Tatiana does not know when or how or why Dr. Horvath got these plastic parts. But she remembers Dr. Horvath talked about Ford, and he *always* drove a Ford car—as did Tatiana. Address: River Rouge, Michigan.

218. Muhs, Edward J. 1938? The Chemical Foundation, Incorporated. Undated. Unpublished manuscript. 28 cm.

• **Summary:** This unpublished manuscript is located in the Francis P. Garvan Collection #6090, Box 43, Folder #6, American Heritage Center (University of Wyoming), Laramie, Wyoming. The author, Edward J. Muhs, was the foundation's internal historian. See especially Chap. 18, “Contributions in the Agricultural Field.”

Talk with Carol Bowers, American Heritage Center Reference Librarian. 1999. April 9. The folder containing the typescript which appears to be a rough draft typescript of the history of the Chemical Foundation is missing everything prior to chapter 15. Thus, there is no title page, author, or date, and the pages (roughly 200 pages remain) are not sequentially numbered; each chapter starts again with page 1. The remaining chapters have the following titles: 18. Contributions in the agricultural field (29 p.): Contents: Farm Chemurgic Council and eleven of its publications (1930-36), Henry Ford, the Dearborn Conferences. Cellulose: Boyce Thompson Institute for Plant Research (Yonkers, New York). Massachusetts Institute of Technology. Hemp. Newsprint from Southern Pine (Dr. Hertzy, Lufkin). Nitrates: Fixed nitrogen research laboratory (Chile had a monopoly on its natural nitrates from 1831 to 1914; the German chemical industry produced nitrates for fertilizer and explosives synthetically from atmospheric nitrogen). Prof. J. Enrique Zanetti. Power alcohol (Iowa State University, Dr.

Christensen, Atchison Agrol Co.). Soil science. Soy beans (The Soysein Process Corporation was organized to produce a casein substitute from soybeans for use in the coating of paper. The project failed because the product turned out to be unsatisfactory). Sweet potato starch. Tung oil (All U.S. imports came from China).

19. Contributions to industrial research and dyeing. 20. Contributions to sewage research. 21. Contributions to miscellaneous research. 22. Combatting foreign competition.

23. Francis P. Garvan—A biography (9 p.). “... Francis P. Garvan was the guiding spirit in all of the activities of the Foundation. Mr. Garvan was born at East Hartford, Connecticut, on June 13, 1875. He graduated from Yale University in 1897 with a Bachelor of Arts degree, and in 1899 received his LL.B. degree from New York Law School. In 1900 he was appointed assistant district attorney of the City of New York, which position he held for ten years. He distinguished himself as a brilliant investigator of crime and a prosecutor of criminals.

“In 1910 he returned to private practice as a member of the firm of Garvan & Armstrong and later of the firm of Osborne, Lambe & Garvan. In addition to general legal practice, he devoted his time to the administration of philanthropic organizations, and a study of social problems as related to government.

“During the first World War he was appointed chief of the U.S. Bureau of Investigation on November 12, 1917 and also manager of the New York office of the Alien Property Custodian. On March 4, 1919 he was appointed Alien Property Custodian which office he held until March 10, 1921. On April 13, 1920 he was appointed Assistant Attorney General of the United States. He was elected president of The Chemical Foundation on March 8, 1919 which post he held until his death on November 7, 1937.

“On June 9, 1910 he was married to Mabel Brady and they had seven children. One of the children Patricia, died at the age of seven from rheumatic fever. The best of medical advice was obtained for her but there was no cure available. Thereupon, Mr. and Mrs. Garvan dedicated themselves and their wealth to the support of chemical and medical research as a memorial to their daughter. Mr. and Mrs. Garvan personally gave large grants for such research. As is apparent from the previous chapters in this book, a great part of the Foundation's income was spent for medical research because it affects everyone.

“From the previous part of this book, also, it is evident that Mr. Garvan was the driving force behind the effort of promote scientific research and create an independent chemical industry in this country. He had vision, tenacity and untiring energy, and was able to secure the wholehearted cooperation of scientific leaders and organizations in a common effort toward the advancement of research in all scientific fields.”

“When Mr. Garvan died on November 7, 1937, lengthy

and praiseworthy obituaries and editorials were printed in many newspapers and magazines. Nationally-known persons wrote tributes in his memory, and resolutions of sympathy and appreciation of his works were adopted by many organizations." These included: *New York Times* (editorial, Nov. 9), *Wall Street Journal* (Nov. 9), Home Market Club, Newsdom (Nov. 13), Textile Colorist (Dec.), and Chemical Industries (Dec.). The later article said: "... He was the first American to sense the enormous importance of chemistry in modern civilization and to comprehend that a domestic supply of all chemicals is vital alike to prosperity in peace and security in war."

The last page in Chap. 23 is the last page in the folder. There is no back matter (bibliography, index, etc.). Talk with David Wright of Michigan State University. 1999. April 14. He went through the Garvan papers in Wyoming in about 1986 when they were housed in a Quonset hut. He saw the above chapters in this history, which he inferred, through other documents he had, were written by Muhs in about 1938. Muhs worked in the same office as Garvan and was the corporate historian. Address: The Chemical Foundation.

219. Brother, George H. 1939. Plastic materials from farm products. *Industrial and Engineering Chemistry* 31(2):145-148. Feb. [3 ref]

• **Summary:** Contents: Introduction. Definition of plastics. Wood and cellulose. Zein. Soybeans. Economics.

A widely used molding compound has a phenol-formaldehyde base to which is added both wood flour and soybean meal. The soybean meal serves as more than just a filler; its protein plays a key role in the plastic. The company developing this product [Ford Motor Co.] has increased its use of soybean meal in the product from 4,000 lb in 1934 to 311,750 lb in 1937. This same company has done extensive work on the development of a textile fiber, similar to lanital, from soybean protein. There are "probably few farm materials which are chemically as favorably constituted for plastics development as the soybean." Address: U.S. Regional Soybean Industrial Products Lab., Urbana, Illinois.

220. *Science*. 1939. Soybeans. 89(2309):Supplement p. 8-9. March 31.

• **Summary:** "Soybeans, a crop without surplus, received high praise from agricultural and chemical leaders at the fifth annual meeting, at Jackson, Michigan, of the National Farm Chemurgic Council." Soybean production has grown from only 9 million bushels in 1930 to 58 million bushels in 1938.

Last year Illinois produced more than half of the nation's soybean crop, 31 million bushels. "With four [sic, three?] other neighboring states, from Iowa across to Ohio [incl. Illinois and Indiana], a new 'Soybean Belt' is growing up, that at present accounts for more than nine-tenths of the national production.

Several years ago Henry Ford attracted a lot of attention

to soybeans when he began to use soybean meal as an ingredient in making steering wheels, panels, knobs, and other plastic auto parts.

"H.W. Galley, of the National Soybean Processors Association, Decatur, Illinois, told some of the manifold uses of soybean oil. Refined, it has proved to be a very good food oil. Last year forty million pounds were used in the margarine industry, a jump from 1,750,000 pounds three years ago. Heavy use of the natural oil is made in paint, varnish, linoleum and other manufactured products requiring drying oils."

Note: This is the earliest document seen (April 2005) that contains the term "Soybean Belt" (or "soybean belt") as a multi-state term like "Corn Belt" or "Cotton Belt." The four states in the "Soybean Belt" are apparently Iowa, Illinois, Indiana, and Ohio. The term "Corn Belt" was in use by 1909 and "Cotton Belt" by 1915.

221. *Eire Department of Agriculture Journal*. 1939. The soya bean. 36(1):73-79. March.

• **Summary:** Contents: Introduction. Trials with soya beans in Ireland. Experiments in 1935. Experiments in 1936. County variety experiments with soya beans [in 1936]. Experiments in 1937. Experiments in 1938. Summary.

"Trials with soya beans in Ireland: Experiments in the growing of soya beans in this country were commenced at the Botanic Gardens, Glasnevin [suburb of Dublin], in 1923. A number of varieties were included in these trials, one being a variety acclimatised in England by the Curator of the Royal Botanic Society, London [J.L. North], and kindly supplied by him. From 1923 to 1928 the varieties tested gave poor results. In some instances the number of seeds harvested were less than the actual number sown.

"In 1929, small samples of seven varieties were obtained from the Curator, Royal Botanic Society. Of the seven varieties, four had been grown in England the previous year and the remaining three were obtained from Canada. The seed was sown in the Botanic Gardens, Glasnevin, and about 40 per cent. germinated. All varieties produced seed. Two of the Canadian varieties produced about the same number of seeds as were sown, while the third one produced only about one-eighth of the quantity of seed sown. The English varieties did better, but even the best of these produced only four times the quantity of seed sown.

"Seed selected from each variety of the 1929 crop was sown at the Botanic Gardens in 1930. The results were disappointing; none of the Canadian and only two of the English varieties produced seed... This result might be attributed to the season which was wet and unfavourable.

"In 1931 two varieties were obtained from the Curator, Royal Botanic Society. These were grown at the Munster Institute, Cork [about 200 miles to the south], and at the Botanic Gardens, Glasnevin. At the latter centre, one of the varieties produced about 50 per cent. more seed than was

sown. The other variety was a failure and produced only a few ripened seeds. At the Munster Institute, although both varieties grew vigorously no seeds ripened.

"In 1932 a number of different varieties were sown at the Botanic Gardens, Glasnevin, but only two produced seeds, the others being complete failures.

"Trials were again conducted at the Botanic Gardens in 1933, but owing to the prolonged drought experienced that year the plants made little progress and failed to produce seeds.

"Experiments in 1935. In 1935, seed of four varieties acclimatised in England, was obtained through the courtesy of Fordson Estates Ltd., London. The four varieties, Black 'O', Brown, 'C', Green 'Jap' and Yellow 'J' were grown at each of the following centres:—The Agricultural School, Athenry, The Agricultural School, Clonakilty, The Cereal Station, Ballinacura, The Munster Institute, Cork, and at two centres selected by the County Dublin Committee of Agriculture.

"Half of the area under each variety was sown with seed inoculated with a culture of nitrogen-fixing bacteria. Note 1. Is this the first year that the soya beans grown in Ireland were inoculated?

The varieties were sown on May 2 at all centres. Details of planting and fertilizer use are given. All varieties germinated well. A frost in late May, just as some of the seedlings were breaking ground, checked the growth in some centres and killed the young plants in County Dublin. Cold weather in May and June led to slow growth.

"All varieties were harvested between 18th September and 19th October. The varieties Brown 'C' and Green 'Jap' ripened earlier than Black 'O' or Yellow 'J'. No difference was apparent at any centre with inoculated seed and those which were sown with untreated seed.

"The yields from all varieties were very low and showed considerable variation at the different centres. The variety Brown 'C' gave the highest average yield, 2 3/4 cwt per statute acre." Note 2. 1 cwt is a hundredweight, usually 112 lb. Thus Brown 'C' yielded 308 lb/acre.

"Experiments in 1936." The varieties Green 'Jap' and Brown 'C' were tested at most of the same centres as in 1935 so as "to provide information as to the effect on time of ripening and yield of seed of:—1. Dates of sowing. 2. Manurial [fertilizer] treatments. 3. Distance between rows. Details are given. "The yields obtained at all centres and from all plots were again very low; the highest average yield obtained did not exceed 5 cwts. per statute acre. The variety Green 'Jap' gave a higher average yield than Brown 'C' at all centres. The early sowings of both varieties gave the better result."

County variety experiments in 1936 with the basic four varieties in Counties Dublin and Wexford gave very poor results. The "highest average yield did not exceed 1 cwt. per statute acre at any centre."

"Experiments in 1937." The variety Green 'Jap' was tested at the same four centres as in 1936. "The object of the

experiments was to ascertain the effect on time of ripening and the yield of seed of:—1. Dates of sowing. 2. Inoculation of the seed. 3. Manurial treatments." Details are given. "The returns from all plots were again very low; the highest got [gotten] at any centre was slightly under 3 cwts. per statute acre... The sowings from May 10th to May 20th were the most successful." Inoculation seemed to increase foliage which appeared to delay pod formation and harvesting, "with consequent damage to the produce" [soya bean production]. "The manurial treatments showed no material difference at any centre,..."

Experiments in 1938. Details are given "Yields from all plots were very low; the average yield was equivalent to about 1½ cwts. per statute acre."

"Summary. Trial with soya beans have been in progress in this country during the past sixteen years. During the course of the trials a number of acclimatized varieties were tested under varying conditions of soil and climate and with different manurial and cultural conditions. None of the varieties produced anything approaching an economic yield of beans, and the results of the experiments, in which the average yield was under 2 cwt. per statute acre, clearly indicate that the growing of soya beans in this country must be regarded as very far removed from being a profitable undertaking, and as offering no commercial possibilities in the future.

Note 3. This is best and most detailed document seen (May 2007) on the cultivation of soya beans in Ireland.

Note 4. This document contains the earliest date seen for the cultivation of soybeans in Ireland (1923, at the Botanic Gardens, Glasnevin, Dublin, 3.5 km / 2.2 miles north of Dublin's city center). The source of these soybeans was the Royal Botanic Society, London.

222. *Ford News (Dearborn, Michigan)*. 1939. Soy bean recipes. 19(3):69. March.

• **Summary:** Henry Ford tried unceasingly during the decade after 1934 to develop palatable foods and popularize recipes based on soybeans. Recipes shown here, include nut bread and waffles (each made with soy bean flour), soy loaf and croquettes (each made with "soy cheese" [tofu]), and salad (made with boiled soy beans).

223. *Ford News (Dearborn, Michigan)*. 1939. Another village industry. March. p. 53-54, 69.

• **Summary:** Gives a detailed description of the village industry at Milan, Michigan, a country town of 2,000 inhabitants on the Saline River. Ford rebuilt the dam next to a dilapidated grist mill, restored the mill to its former splendor, hired about 80 men from the vicinity and paid them the same wages as men at large Ford plants. "The one-time gristmill, a Milan landmark, is the soy bean processing plant, identical in its purpose to the one which began operation a few miles away at Saline, Michigan, last summer." Fields of soy beans

grow near the plant. This complex, the company's 11th village industry, developed as part of its industrial decentralization program, consists of the soybean mill and a coil plant. The latter manufactures ignition coils, which are encased in soy bean plastic.

The soy bean mill "produces soy bean oil and mash. The oil is used in the River Rouge Plant foundry for making casting cores, and in making finishes [paints] for Ford cars and trucks. It is also used in the soap for washing cars on the assembly line. Soy bean meal serves as a binder in making casting cores and in steel ingot production.

"The use of soy beans in manufacturing plastic articles is growing. The Ford gearshift lever knob, horn button, light switch handles, distributor and coil housings and window trim strips are made of soy bean plastic.

"As in the Saline Mill, 140,000 bushels of soy beans will be processed in the Milan plant, it is expected, in one year. Farmers within a 200-mile radius will grow beans for these plants." Contains 6 photos.

224. Heiser, Victor George. 1939. *You're the doctor*. New York, NY: W.W. Norton & Co., Inc.; London: J. Cape. 300 p. April. Index. 21 cm.

• **Summary:** The legumes (peas, beans, lentils), once so highly praised for their proteins, have fallen rather into disrepute as a staple article of diet, because it has been shown that they are lacking some of the most important amino acids—the building blocks of nutrition. But there is one noteworthy exception. "The easily digested 'little honorable plant,' the soy bean, known in the Orient as 'the meat without the bones,' is the richest in proteins of any food except dried egg white and is possessed of more of the properties of animal proteins than any other vegetable."

Note: This is the earliest document seen (Dec. 2010) that refers to the soy bean as "the meat without the bones"; in all previous documents, that phrase was used to refer to tofu.

In the tropics, milk is difficult to obtain. In Peking, China, a soy bean decoction was developed as an alternative. "To me, it was one of the vilest mixtures I've ever tried." Nevertheless, babies reared on this "nauseating beverage loved it;" they clamored for it and consumed it greedily. When given fine fresh cow's milk, they promptly spat it out.

"The addition of banana oil [or bananas] does wonders for the taste of soy bean milk... With the addition of calcium and certain vitamins it becomes an almost ideal food."

Henry Ford has always wanted to produce a "tin cow." He and his researchers have done a great deal "to popularize the soy bean; he practically lives on it himself. He drinks it and eats bread made from it, and with what is left over he produces buttons and insulators for his automobiles." Recently, at age 77, "to prove he was free of arthritis via soy beans, he showed me how he could jump over a table."

After lamenting the ways of "food faddists" (such as Mussolini [in Italy] and Hitler [in Germany]) he says that,

in all his travels, he has never met a person who eats a strictly vegetarian diet. He states (incorrectly) that those who consume milk and eggs are not "true vegetarians."

Victor George Heiser, born in 1873, has long worked with the Rockefeller Foundation. Address: M.D.

225. *New York Times*. 1939. Soy-bean textile is advanced by Ford; Crowds see new synthetic fiber made. May 17. p. 19.

• **Summary:** "A novel process for producing textiles from the protein of the soy bean, a part of which process is on display in the exhibit of the Ford Motor Company at the World's Fair in New York, is on the way to perfection in the Dearborn Laboratories of the company after a year and a half of research... The process, so far as the research chemists of the company have learned, represents the first time a textile filament has been spun from a protein derived from a vegetable source..."

"The discovery, so far, has not been put to industrial use, but experimental quantities of a soy bean textile have been spun, woven and manufactured into various articles, among them a necktie, presented to Henry Ford by the laboratories, consisting of 35 per cent of the protein product, in mixture with silk and wool. Probably the most important use of the product eventually will be in the automobile upholstery."

R.A. Boyer is in charge of Ford's chemical research laboratories. To make soy textiles, soy protein "is combined with various chemicals and, if desired, with dyestuffs in a secret process producing a viscous solution. This solution, in appearance about as heavy as tar, is forced through a spinnerette, which molds the heavy liquid into threads about as thick as human hair.

"This is the process partly demonstrated in the Ford exhibit at the [world's] fair. The screen-like spinnerette has 24 apertures, each three one-thousandths of an inch in diameter. The tiny filaments, dyed blue for better observation, pass through a chemical bath of a high proportion of acid, and as they rise from the liquid are automatically spun into a single thread about as thick as sewing cotton.

"Wound on a reel, they may, in the commercial process, be bleached and dyed. Specimens of the resulting skeins, on display at the Ford exhibit, seemed, to the touch, of about the consistency and texture of a silk-and-wool mixture, and apparently had considerable tensile strength..."

"Experiments with the soy bean as a source of paint material were begun in Dearborn in 1931."

The Ford Motor Co. reprinted this article as a 4-page pamphlet titled "Ford soy bean textile tests spur new factory-farm link." Note: This is the earliest document seen that uses the word "spinnerette" (spelled that way) in connection with spinning soy protein fibers.

226. Shoenfield, Allen. 1939. Soy beans put to new uses: Edible variety advanced as weight reducer. *Detroit News*. May 21. Section 1. p. 4, col. 8.

• **Summary:** The Mid-American Conference, called by the National Farm Chemurgic Council, had its closing sessions on May 20 in Columbus, Ohio. The leading speaker on soy bean culture and utilization was G.G. McIlroy of Irwin, Ohio, president of the American Soy Bean Association. He “predicted that, within a few years, every truck farm and vegetable garden would be growing recently introduced edible varieties of this ancient ‘beefsteak of the East.’ He described the flavor as a cross between the garden pea and the Lima bean.” He said it was ideal as a weight reducing food, as a main item in diabetic diets, and as a food that could counteract the acidity found in certain gastric disorders, especially those resulting from over-indulgence in rich foods and alcoholic beverages.

“Dr. H.S. Barnard, research director of the National Farm Chemurgic Council, revealed that rear deck doors of the 1940 Ford will be made with a new plastic, chiefly soy bean, moulded [molded] in a single unit, impregnated with color, requiring no polishing, and weighing one-third as much as pressed steel.

“He quoted Henry Ford as saying that within two years the entire body of the Ford automobile would be made of this material, light, lustrous, and yet so strong that it can not be dented or cracked with a hammer blow. Only inability to obtain huge dies for molding the material, Dr. Barnard said, prevents its introduction in forthcoming models.”

227. Coulter, Francis C. 1939. The soy bean: Important plant. *Bean-Bag (The) (Lansing, Michigan)* 21(11-12):9-11. April/May.

• **Summary:** From Seed World: An overview. Contents: Introduction (Engelbert Kaempfer). Introduction to America (by Admiral Perry). The soybean at home (in China; tofu, oil, meal, Ford Motor Co., industrial uses). The garden soy (“the garden soybean” is edible green soybeans).

228. Black, M.A. 1939. Soya beans. *New Zealand J. of Science and Technology* 21(1A):46a-60a. June. [23 ref]

• **Summary:** Contents: Introduction. Description. Chemical composition. Utilization: Human food, stock food, industrial uses (paint, soap, glue, plastics). Production: General, agriculture, effect of temperature on yield, vernalization, acclimatization, soils and manures, inoculation, seeding, cultivation, harvesting, storage, conclusion. Appendices: A. Soya-bean oil. B. Soya-bean varieties tested in New Zealand. C. Prices. D. Average analysis of soya beans grown in new Zealand.

“Summary: Under existing conditions the growing of soya beans in New Zealand cannot be recommended because—(1) The climate is generally unsuitable. (2) The potential market for human food is negligible. (3) There is no internal commercial market, and no possible export market in competition with the main soya-bean growing countries. (4) For stock feed other cheaper and more certain supplies of

forage and concentrates are available.”

“Widespread interest has been aroused from time to time in New Zealand by reports of the amazing variety of products derived from soya beans... As long ago as 1915 the Department of Agriculture conducted successful experiments on the growing of soya beans, but the crop has not found favour with New Zealand farmers... In Western countries the chief food use of soya-oil is in the manufacture of margarine... In New Zealand some 27,000 gallons of decoloured and deodorized oil are used annually by bakers for shortening, and for greasing baking tins. For the latter purpose it is of value because it does not change colour under baking temperatures... Curiously enough, there is a soya-milk factory in Denmark, a great dairying country. Note 1. This is the earliest English-language document seen (Oct. 2003) that contains the term “soya-milk.”

Industrial uses: “The chief industrial uses of soya-bean oil are in paint, varnish, soaps, linoleum and oilcloth, and printing ink. In paints the essential disadvantage of soya-oil is that it is a poor-drying oil, especially in comparison with linseed, perilla, and tung oils. This drawback can to a large extent be overcome by the use of cobalt driers, which, however, considerably increase the cost of the paint. Promising blends are being obtained with blends of perilla and soya oil...”

Tables 5 and 7 shows the average and range in the number of days to maturity, and the yields (1935-1938) for 14 soybean varieties tested in three seasons, two at Palmerston North, three at Ruakura, in New Zealand. In table 7, they are listed in ascending order of days to maturity: Manitoba Brown (128 days), Wisconsin Black (128), Cayuga (133), St. Annes (141), Mandarin, Manchu, O.A.C. 211, Black Eyebrow, Early Yellow, A.K. (Harrow), Henry Ford (a selection of A.K. grown at Ford's estate in England), Black Ontario, Laredo, Virginia (186 days). For each variety is given the days to maturity (average and range), yield in bushels per acre (average and range), and number of trials.

Appendix B lists the following 34 soya-bean varieties tested in New Zealand: A.K., Auburn, Biloxi, Bilton, Black Beauty, Black Eyebrow, Black Ontario, Cayuga, Chernie, Dixie, Early Brown, Early Yellow, Harbinsoy, Herman, Hollybrook, Illini, Ito San Laredo, Mammoth Yellow, Manchu, Mandarin, Manitoba Brown, Mikado, Morse, O.A.C. 211, Ogemaw, Otxi, Sable, St. Annes, Tashing, Tokio, Virginia, White Non-shatter, Wisconsin Black. Of these, 13 selections were sent by Mr. N.P. Neal of Wisconsin, as being likely to suit New Zealand conditions. Also four English acclimatized varieties, known as Jap, C, J, and O, have been grown.

Note 2. This is the earliest English-language document seen (Sept. 2006) that contains the term “soya-oil.” Address: Agronomy Div., Plant Research Bureau, Dep. of Scientific and Industrial Research, New Zealand.

229. *Rayon Textile Monthly*. 1939. Textile fiber for soy-bean successful. June. p. 319-21. [23 ref]

• **Summary:** "The Dearborn Laboratories of the Ford Motor Company have been working for over a year and a half on the production of a synthetic textile fiber from the protein of soy-bean, which is a part of the Ford exhibit at the World's Fair. This represents the first time that a textile filament has been spun from a protein derived from a vegetable source. The commercial significance of the discovery lies in the fact that soy-bean can be grown in almost any part of the world, especially our agricultural South and is an inexpensive source of vegetable protein.

"The discovery has not yet been put to industrial uses, but experimental quantities of a soy-bean-textile have been spun, woven and knitted into various articles, among them a necktie fabric presented to Henry Ford. It was made by the Dearborn Laboratories and consists of 35 per cent of the new protein product and the remainder silk and wool. The officials have in mind its ultimate use in the upholstery of Ford and Lincoln cars.

"According to R. H. McCarroll, chief chemist of the company, and R. A. Boyer in charge of research laboratories, they have had twenty-five chemists at work on this discovery.

"One may wonder what Ford is doing in textiles, but the discovery was a by-product of research conducted by Ford chemists for years on soy-bean as a source of raw materials for paints and plastics in the automobile industry. For these uses the company handles the product of 20,000 acres of soy-beans yearly, using the oil extracted as a base for paints and plastics made from it for gear shift level balls, light switches, and accelerator pedals.

A description of the method for manufacturing the fibers is given. "The skeins have the consistency and texture of silk and wool, which are our present protein fibers. Contrary to general expectation the soy-bean-yarn has considerable tensile strength. According to Ford officials, the material has been woven and knitted into goods by the usual textile methods and their suitability for upholstery fabrics in an automobile is definitely satisfactory and practical. Mr. Henry Ford has shown much personal interest in these experiments and has spent much time in the research laboratories."

Photos show: (1) The entire bench-scale apparatus for grinding soy beans into meal and extracting the oil; (2) A man holding an undyed skein of soybean yarn and comparing it with the dyed yarn wound on a reel.

230. Sharpless, George R.; Pearsons, J.; Prato, G.S. 1939. Production of goiter in rats with raw and with treated soy bean flour. *J. of Nutrition* 17(6):545-55. June. [16 ref]

• **Summary:** An unknown substance in soybeans seems capable of causing enlargement of the thyroid in experimental animals (rats). Unprocessed (raw) soy flour fed to rats caused enlargement of the thyroid to four times the size of the organ in controls. The goitrogenic effect of

soybean flour in rats can be diminished by extracting it with organic solvents (such as ether or acetone) or by heating with steam, or (to a greater extent) by autoclaving. As little as 20 micrograms of iodine per kilogram of diet corrected the thyroid enlargement they obtained with the basal diet containing 25% soybeans.

Note: This research was confirmed by Wilgus et al. (1941) and Halverson et al. (1949). Address: Dep. of Laboratories, Henry Ford Hospital, Detroit, Michigan.

231. Photograph of Henry Ford as he hunkers down to inspect a patch of soybeans near Saline, Michigan. Summer. 1939.

• **Summary:** His left hand is touching the plants and his right hand holds his straw hat. Negative number: unknown.

232. Photograph of the Soybean Laboratory building after remodeling has almost been completed. Sept. 14. 1939.

• **Summary:** A ladder leans against the right end of the building and two men are on the roof to the left. Negative number: B-94020.

A 2nd photo, taken the same day, shows the opposite side of the building. Negative number: B-94022.

A third photo, taken about a month earlier (8 Aug. 1939) shows another view of the building. Negative number: B-20224.

233. Borth, Christy L. 1939. *Pioneers of plenty: The story of chemurgy*. Indianapolis, Indiana and New York: Bobbs-Merrill. 303 p. Portraits. 22 cm.

• **Summary:** Soy is discussed at length (usually in connection with Henry Ford Sr. and Edsel A. Ruddiman) on p. 22, 40, 42, 202-06, 208-11. Henry Ford is also discussed on p. 21-22, 30, 69, 76-77, 118, 144, 246.

"A few years ago, Henry Ford was ridiculed when he said the time would come when most of an automobile would be grown on the farm. Since then, Ford chemists have perfected processes whereby soy beans are converted into plastic substitutes for automobile parts formerly made of metal. Ford Chemist Russell Hudson McCarroll estimated that the use of plastics for interior window moldings alone would increase that company's use of farm-grown metal-substitutes twenty-five million pounds annually." (p. 21-22).

"Dearborn was selected as the [first chemurgic] conference site because it was the home of Henry Ford, an industrialist who had demonstrated his understanding of the meaning of the farm problem, and because there were, in near-by Edison Institute, working exhibits of the processing equipment which Ford researchers had developed to convert soy beans into some thirty industrial products." (p. 40).

At the chemurgic conference Russell Hudson McCarroll, a Ford chemist, described how soy beans are converted into raw materials for industrial use. "From the bean oil Ford chemists make a lacquer which is claimed to be superior to

the pyroxylin paints usually used in coating metals. From the residue of meal after extraction of oil, Ford chemists make plastic parts for automobiles, these farm-derived parts being substitutes either for metals formerly mined or for rubber formerly imported." (p. 42).

Chapter 10, titled "Ford links farm and factory" (p. 200-12) is about Henry Ford, chemurgy, and soy beans. "Do you recall the gibes that greeted his [Henry Ford's] prediction that man would one day find a substitute for the cow, as revolutionary as the automobile which displaced the horse? It was very funny when the cartoonists and columnists leaped upon it gleefully—but it may not be so fantastic as it once seemed.

"Let's investigate it.

"Come now to the foot of Elm Street, in Dearborn, to a rejuvenated farmhouse whose homelike exterior masks a modern laboratory."

"Follow the truant chemurgists inside and meet Ford's boyhood companion, Dr. Edsel a. Ruddiman, the food-chemist whose services were enlisted by his old deskmate. In the back room, once a farm kitchen, is an electric refrigerator, filled with food made from soy beans. Milk, butter and cheese—the latter, fresh, dried, smoked and fermented—are there, soy-bean products all. In the pantry are breakfast foods, macaroni, salad oils, crackers, diabetic foods, infant foods, flour, bouillon cubes, soups, confections, coffee substitutes, sauces, gravies and beef substitutes—all produced from the soy" (p. 202-03).

A wonder bean indeed!" "During the World War [I], when Germany faced famine, German chemists extracted from the soy the glutamic acid which became the basis of the 'beef-tea' that kept patients alive in hospitals." The soy bean "gets into Heinz and Lea & Perrins' sauces and into oleomargarine" (p. 203).

A full-page photo (between pages 206 and 207) shows Irénée du Pont and Henry Ford talking and enjoying a meal together at a table.

234. Fricke, E.F. 1939. Soya beans: Recent Tasmanian trials. *Tasmanian J. of Agriculture* 10:197-98. Nov. 1. Also in *Plant Science Literature* 11(1):19 (1940).

• **Summary:** Over the last few years there have been numerous enquiries as to whether the Soya bean crop could be grown in Tasmania. "Some twenty-five years ago [i.e., in about 1914] attempts were made to introduce Soya beans by the Department of Agriculture, but without success. Since that time many new varieties have become available and we read of crops being successfully grown in England.

"In 1931 an attempt was made to grow the Mammoth Yellow variety by the Department, in co-operation with Mr. G.S. Parsons, in the Scottsdale district [of Tasmania]. The crop promised well in the early stages, but was later ruined by frost.

"The Van Diemen's Land company has been conducting

experiments with Soya beans at Ridgley since 1935. The Company's Directors in London sent out in that year a bushel of seed grown on the Fordson Estates in Essex [England]." The results have been disappointing. Address: Agronomist.

235. *Business Week*. 1939. Soybean exports soar. Nov. 11. p. 17-18.

• **Summary:** Europe will buy 15,000,000 bushels of this "most versatile vegetable"—a gain of almost 500% over last year's 2,645,000 bushels.

"No item of consequence in the last war, the soybean takes on new importance in these days of *Ersatz* economies—which explains why Germany last month was negotiating with the Soviet Union to obtain permission to ship the commodity from Manchuria, principal producing area, over the Russian state railway.

"The soybean is still used primarily as animal feed and as a human food, but its industrial uses—for example, in the production of plastics—account for a steadily increasing portion of the crop. Henry Ford's \$5,000,000 processing plant at River Rouge takes in soybeans and turns out window frames, gear shift knobs, horn buttons, distributor caps, and automobile paint. A host of other companies are similarly putting the bean to new and unusual uses."

Note: This is the earliest English-language document seen (March 1998) that uses the word *Ersatz* to refer to an inferior substitute.

236. *Bean-Bag (The) (Lansing, Michigan)*. 1939. Ford boosts soys in diet. 22(3-6):15-17. Nov.

• **Summary:** The [Edison Institute of the] Ford Motor Co. has recently published an 18-page pamphlet that contains soy recipes, many of which use soy flour in recipes such as soy bean waffles, cinnamon rolls, muffins, cookies, and biscuits. The pamphlet also contains basic information about the soy bean. This article contains long quotations from the pamphlet.

237. Bergen, Werner von. 1939. Soya bean fiber and its identification. *Rayon Textile Monthly* 20:633-35. Nov.

• **Summary:** "That the soya bean is not only an excellent food, and one of the best sources of oil, but that its protein can be converted to fibrous form, was brought home to the American people by the Ford exhibit at the New York World's Fair.

"The Glidden Company of Cleveland [Ohio] is preparing to set up a pilot plant for the experimental production of fibers from the soya bean. This was made known by W.J. O'Brien, Vice-President of the concern." Glidden now "produces the isolated soya bean protein in a plant in Chicago [Illinois], under the trade name of 'Alpha' protein. Its present production is about 7½ tons per day, with a future potential capacity of 15 tons per day. At present this protein is mainly used as a raw material for paints and plastics. It has

also found an outlet for paper board coating and as a sizing agent for rayon and cotton.”

“The soya bean fiber produced on the preliminary machinery built by Glidden, is about in the same place that rayon was 15 years ago. But many improvements are expected from the new pilot plant.”

The product’s main problem is that it is weak in strength compared with wool. Lanital, made from casein, had about the same weakness when it was first introduced in 1935. The soy fiber “shows the same deficiency in tensile strength, approximately *four times weaker than wool in the dry state* and approximately *eight times weaker in the wet state*.”

Note 1. This is the earliest English-language document seen (Aug. 2003) that contains the term “isolated soya bean protein” (or “isolated soya bean proteins”).

Note 2. Talk with Ed Meyer who worked at Glidden in 1939. 1993. May 10. The Glidden Company may have planned to set up a pilot plant making soy protein fibers, but they never did so.

238. *Ann Arbor News (Michigan)*. 1939. Soy bean capital moved to Saline: Ford’s use of oil increases production. Dec. 13.

• **Summary:** “Henry Ford, Detroit automobile magnate, literally moved the soy bean capital of Michigan, perhaps of the United States, to this little city in Washtenaw County in 1938 when he established his processing plant here.

“The plant has created a ‘home’ market for all the surplus soy beans produced in the state. Michigan’s surplus, however, is not large as farmers raise the crop chiefly for livestock feed. Ford imports large quantities from out of state to keep his mills operating.

“Through his research studies at Dearborn, Ford has done more to promote the soybean industry in the United States than perhaps any one person in the nation.”

“Ten years ago when Ford was just becoming interested in the crop, the entire soy bean production in the United States was less than 10,000,000 bushels. This year’s production was estimated at 79,689,000 bushels... Ford’s soy bean plant... is Saline’s leading industry. There are two buildings in the unit. One is the renovated Schuyler grist mill, which has been converted into a cleaning and storage plant. The other is a newly constructed building which houses the oil extraction equipment.

“Uses oil in paint: Thousands of gallons of soy bean oil are extracted for the use of the Ford Motor Co. in the manufacture of car finishes and a binder for foundry sand cores.”

“Seek new uses: Constant research is being carried on in the Dearborn experimental laboratory to find new uses for soy bean products. Several new items are being developed at the present time. Stearic acid, a necessity in the manufacturing of tires, is being made experimentally from soy bean oil. Glycerin, a by-product of the stearic acid

process, is an important constituent in Ford body enamel.”

239. *Grand Rapids Press (Grand Rapids, Michigan)*. 1939. Ford’s work is reflected in gains in soybean crop. Saline is Michigan’s soybean capital. Dec. 13.

• **Summary:** Photos show: (1) “Saline is Michigan’s soybean capital. Before Henry Ford took over the four-story plant in the upper picture, it was just an ordinary flour and grist mill in the city of Saline, near Ann Arbor. The automobile manufacturer converted it into a soybean mill where the beans are cleaned, ground and prepared for oil extraction in the smaller building in the picture.”

(2) “A soybean enthusiast, Ford was photographed in the field (lower view) last summer as he was inspecting soybeans on a plot of ground near the Saline plant.” He holds a straw hat in his right hand.

240. *Gazette (Kalamazoo, Michigan)*. 1939. Ford’s interest boosts soybean crop for nation: Saline becomes capital of manufacturing end due to recent plant. Dec. 14.

• **Summary:** “Saline [Michigan]—Through his research studies at Dearborn, Ford has done more to promote the soybean industry in the United States than perhaps any one person in the nation.”

One photo, titled “Saline is Michigan’s soybean capital,” shows the buildings (one with 4 stories) at the Saline plant. Another, taken in the summer of 1939 as he was inspecting soybeans on a plot of ground near his Saline plant, shows Henry Ford hunkering down to inspect a the soybean plants; his left hand is touching the plants and his right hand holds his straw hat.

Note: Except for the photos, this article a reprint of one published on Dec. 13 in the *Ann Arbor News (Michigan)*.

241. Brother, George H. 1939. [Plastic materials from farm products]. *Revue Generale des Matieres Plastiques (Paris)* 15:129-30, 148, 244. (Chem. Abst. 33:1834). [Fre]*

242. Photograph of a column of about 6 combines harvesting soybeans near Tecumseh, Michigan. 1939.

• **Summary:** Negative number: 188-17641.

243. Hale, William J. 1939. *Farmward march: Chemurgy takes command*. New York, NY: Coward-McCann, Inc. xi + 222 p. No index. 20 cm.

• **Summary:** With America’s organic chemical industry on a solid footing by 1925, the author offered suggestions for closer association between agriculture and chemistry. He wrote an article concerning a plan for the future of farming titled “Farming Must Become a Chemical Industry” which was rejected by a half-dozen or more magazine editors before it was published in Henry Ford’s *Dearborn Independent* on 2 Oct. 1926. In 1934 the *The Farm Chemurgic* was published and widely distributed free of charge by the Chemical

Foundation of New York City. It “brought such an avalanche of letters of commendation that the late Francis P. Garvan, then president of the Chemical Foundation, caused to be called together in May, 1935, at Dearborn, Michigan, a number of representatives of Agriculture, Industry and Science in order that free and open discussion of this great problem might be enjoyed. Mr. Henry Ford and Mr. Edsel Ford graciously acted as hosts. Out of this meeting grew the National Farm Chemurgic Council... The first three years of activity of this council are embodied in the Proceedings of the Dearborn Conferences of 1935, 1936 and 1937; since then in the *Farm Chemurgic Journal*.” Address: Ph.D., LL.D., Midland, Michigan.

244. Ford, Henry; Boyer, Robert A. Assignors to Ford Motor Company (Dearborn, Michigan; a corporation of Delaware). 1940. Soy bean crusher. *U.S. Patent* 2,186,066. Jan. 9. 3 p. Application filed 1 Nov. 1937. 4 drawings.

• **Summary:** “The object of our invention is to provide a crusher especially adapted for crushing soy beans in preparation for the extraction of the oil therefrom.” Less power is required to operate this crusher because of its improved design (see next page).

Below the 4 line drawings are three signatures: Henry Ford. R.A. Boyer, and Edwin C. McRae (attorney). Address: Dearborn, Michigan.

245. Cruse, Wm.T. 1940. Ford and plastics. *Modern Plastics* 17(5):23-29. Jan.

• **Summary:** “Inscribed prominently on the walls of the Ford rotunda at Dearborn is the following quotation: ‘There is nothing permanent about this organization except change. It is this spirit, indeed which has both cradled and nurtured Mr. Ford’s progress in the art of synthetic plastics... The agricultural reverberations of Ford’s extensive use of soybeans as a basis for certain plastic ingredients, has a sociological aspect to be taken into account by agronomic prognosticators. The plastics operations at the Ford plant devolve into two broad types of molding—conventional or compression, and injection. The molding material for compression molding is largely manufactured in the plant at Dearborn. It is widely known as *Soybean Plastic* and rightfully so, for the product of soybean refinement contributes the essentials of this molding powder.” Contains 17 photos related to Ford plastic machinery, parts, and cars. Address: Celluloid Corp.

246. Ozouf, René. 1940. Le soja [The soybean]. *Journal des Instituteurs et des Institutrices (France)* 86(12):47. March 2. [2 ref. Fre]*

• **Summary:** This article appears in the section of this issue titled “Partie Scolaire,” in the subsection titled “Pour les Grandes et les Adultes.” Contents: Introduction. Its cultivation (one of the oldest cultivated plants in the

world, widely cultivated for ages in East Asia (especially Manchuria)), it is an annual, which prefers temperate climates, there are more than 1,200 varieties, cultivated in the Corn Belt of the USA, and in Korea, Japan, Java, the USSR, Romania, Hungary, Bulgaria, Yugoslavia, and France (but yields here are low).

Its utilization: The bacteria in the nodules on its roots are a source of nitrogen fertilizer. It can be used as a green forage crop, like lucern / alfalfa. If this is dried, it can be made into hay or silage. Pigs can be raised on soybean pasture in the open air. It is much appreciated as a green manure. Because the seeds are rich in nitrogen, protein and oil, it is utilized in the form of beans or of oilseed presscake for the feeding of all farm animals. It also has many uses as an industrial product. Above all, it is used as a source of oil and cake / meal.

The modern soybean utilization industry is most highly developed in Manchuria, where the principal centers are (in order of importance) Dairen, Harbin, Antung and Yingkou (W.-G. Ying-kou; formerly Newchwang or Niuchwang); in China, above all in Nanking and Shanghai; in Korea at Konan (in today’s North Korea) and in the ports of Seishin (Ch’ongjin, Chongjin, in today’s North Korea), and Rashin; in Japan at Kobe-Osaka and Tokyo-Yokohama; in Siberia, in the Russian Far East at Khabarovsk and Vladivostok.

In Europe, Germany is in first place in the various soy industries, and especially of oil, lecithin, and cakes. Hamburg and its surroundings are the leading center, followed by Bremen, Stettin [Szczecin, in Poland as of Jan. 2011], Berlin, etc. In the years immediately preceding the war of 1939, the Reich imported 40-50% of the soybeans produced in Manchuria. Hull is the principal soybean crushing center in England. Throughout Scandinavia the soybean is transformed into cake and margarine, as well as in the Netherlands and in Belgium. In France, two factories that make oil and lecithin are in operation near Arras and Lille.

In the United States soybean processing industries are developed everywhere, particularly in Chicago and Milwaukee and in the towns of Illinois and New York. Ford automobile factories use soybeans to make plastic accessories.

Soybean trade and commerce.

247. Kajita, Toshiji; Inoue, Ryohei. Assignors to Showa Sangyo K.K., Yokohama, Japan. 1940. Process for manufacturing artificial fiber from protein contained in soya bean. *U.S. Patent* 2,192,194. March 5. 2 p. Application filed 8 Sept. 1937.

• **Summary:** “The invention relates to a process of manufacturing artificial fiber from protein contained in soya bean and consists in extracting the protein, with dilute alkaline solution, from the residue of the soya bean after the oil content has been extracted. The protein is then precipitated by adding acids or metallic salts thereof to said solution. The precipitate is washed with water, allowing a suitable amount of water to remain with the precipitate.

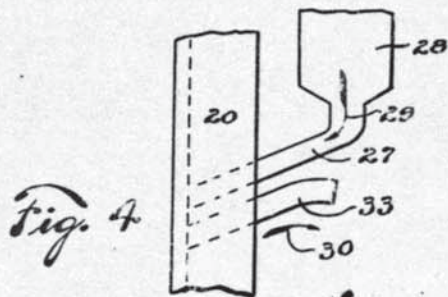
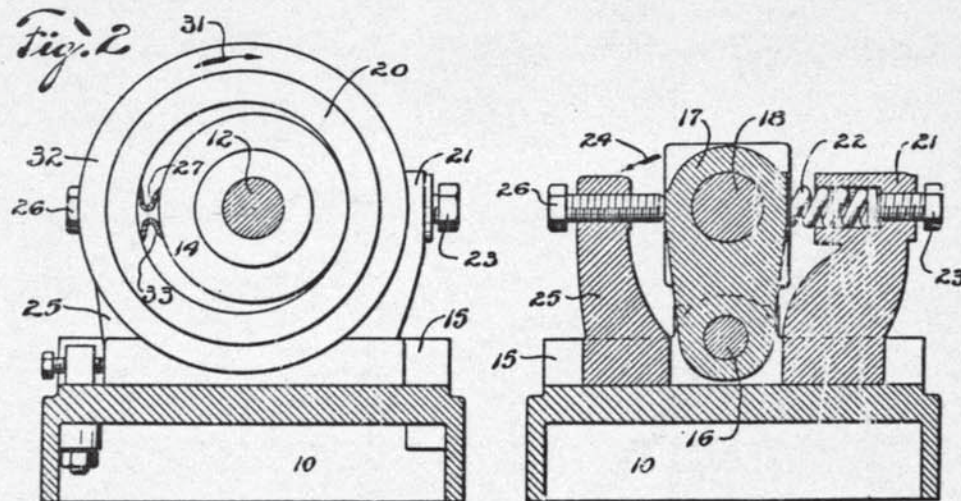
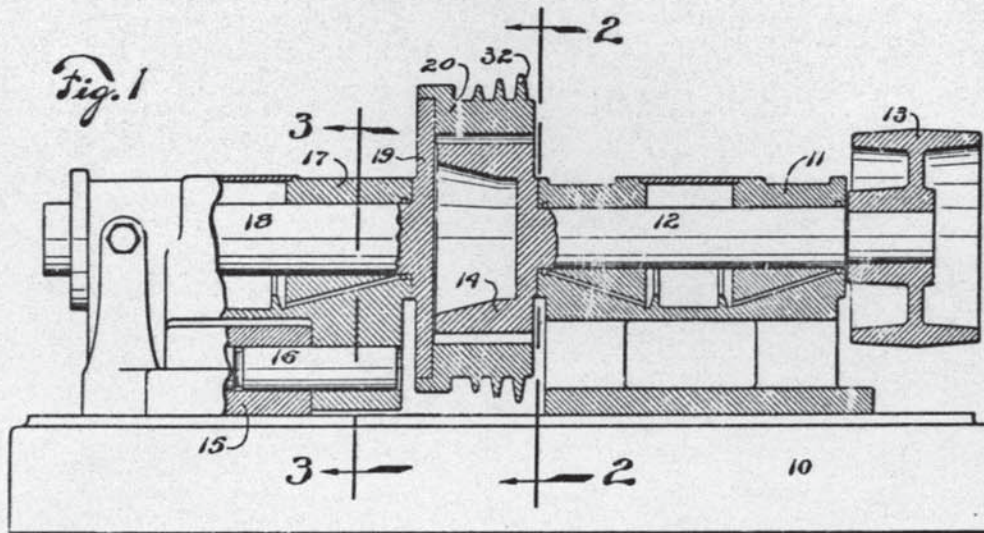
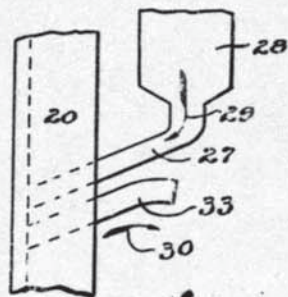
Jan. 9, 1940.

H. FORD ET AL

2,186,066

SOY BEAN CRUSHER

Filed Nov. 1, 1937

*Fig. 4*

BY

INVENTOR
Henry Ford
R. B. Boyer
Edwin C. McRae
 ATTORNEY

Lecithin is added thereto and then the mixture is dissolved in alkaline solution. The resulting solution is then allowed to mature after which the solution thus obtained is spun into an acid bath which may contain suitable organic coagulation agents. The object of this invention is to obtain a fiber of remarkably increased tensile strength and to employ the lecithin as stabilizer.”

Note 1. This process is very similar to that patented later by Robert Boyer, William Atkinson, and Charles Robinette, and assigned to the Ford Motor Company. The Boyer patent (U.S. Patent 2,377,854) was applied for on 7 June 1941, and issued on 12 June 1945.

Note 2. This is the earliest document seen (June 2001) that concerns the work of Showa Sangyo K.K. with soybeans. Address: Tokyo, Japan.

248. Apesech, Lowell. 1940. The manufacture of synthetic wool from oil-free soy-bean flakes. *Herald (Edison Inst., Dearborn, Michigan)* 7(5):16-17. March 29.

• **Summary:** “In 1936 the United States imported 247,000,000 pounds of wool, approximately 50 per cent of the total United States production of wool; and of this the Ford Motor Company consumed 3,000,000 pounds, the wool being used in the upholstery of the Ford cars.

“In 1928 the average price per pound of scoured 56’s wool was \$1.04; in 1932 it was 40 cents; in 1936 it was 80 cents; and in 1938 it was 76 cents. Due to the large fluctuation of the price level, the high prices, and the great importation of wool, a new kind of fiber that compares in properties with wool is being developed. This new wool fiber is essentially a soy-bean fiber.

“The principal steps in making this soy-bean wool consist of the preparation of the protein from the soy beans, the spinning of the protein into fiber, and the aftertreatment of the fiber.

“My afternoon work consists of assisting in the process of creating soy-bean protein fiber. This process is quite extensive and complicated.” Two photos show the author with soy-bean fiber as it is being prepared.

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term “soy-bean fiber” to refer to spun soy protein fiber used like a textile fiber.

249. Kajita, Toshiji; Inoue, Ryohei. Assignors to Showa Sangyo K.K. (Yokohama, Japan). 1940. Process for manufacturing artificial fiber from protein contained in soybean. *U.S. Patent* 2,198,538. April 23. 2 p. Application filed 8 Sept. 1937. In Japan, 25 May 1937.

• **Summary:** Extract soybean casein from soybean material with dilute alkali, precipitate with acid, add sugar while the precipitate is wet, then dissolve in alkali to produce a spinning solution. Address: Tokyo, Japan.

250. *Bean-Bag (The) (Lansing, Michigan)*. 1940. Peas, soy &

lima beans canned by Ford—Shelling of green soys is difficult. 22(11-12):15-17. May.

• **Summary:** “While expending enormous sums in finding new uses for farm products in industry, particularly the erstwhile lowly soy bean, the Ford Motor company has not overlooked the possibilities offered by this bean as a food product.

“Dr. Edsel A. Ruddiman, a close friend of Henry Ford since boyhood, has had much to do with this work. Employed as a research chemist, he has specialized during recent years in food research in this connection has supervised, from a scientific standpoint, the operations of a canning factory the company operates on the outskirts of Dearborn, Michigan.” “For industrial uses the Ford company is concentrating largely on the Giant Manchu. The food variety preferred here is the Willomi, although the Jogun is also recognized as a splendid food variety.

“The Ford crop of food soy bean in Dearborn last year occupied 110 acres of land. Of this crop, 18 acres were cut green for canning, the balance harvested later. The bulk of the dry beans have been converted into soy bean flour which his combined with wheat flour, in varying proportions, in the making of soy bean bread as well as many kinds of pastries.

“Canning process interesting: A cold pack process is used in canning peas, lima beans, and soy bean. the average housewife is well aware that the operation of shelling green peas and lima beans is both difficult and tedious. But when one considers that the green soy bean sticks to its overcoat even more tenaciously than does the green lima bean, the process used at the Ford cannery becomes doubly interesting.

“To start with the first operation in the process: Early in the morning a regulation wheat binder hauled by a tractor, started cutting. The vines were then tied in bundles, as would have been the case with wheat or oats. They were dropped in sizeable piles which were then forked onto trucks and hauled to the cannery.

“Here they were forked directly from the truck into an odd looking threshing machine called a ‘viner.’ The actual shelling occurs in a long cylinder which keeps the viner turning in a clockwise direction. Though the center of this cylinder extends a shaft which in turn, is fitted with numerous paddles. These rotate in an anti-clockwise direction and at a fairly high rate of speed; thus the shelling is actually a slapping operation.

“Then they start moving: Leaving this cylinder, the beans fall though a screen and roll down a canvas conveyor into hoppers, from which they are released by attendants into bushel baskets. The same canvas conveyor which drops them into a second truck at the back end of a viner.

“Upon being carried away from the viner, the bushel baskets are emptied into a fanning mill. This machine removes practically all hulls and cracked beans which may have passed though the screens into the viner. A conveyor then carries the beans to a fully automatic washing machine

where they move slowly through cold, fast-running water. To make the job of washing more thorough the machine creates a series of ripples which remind one of rapids such as would be found in a swift-flowing mountain stream.

"In sieve-like conveyor cups the beans travel next to the blanching machine, where they move for four minutes through water which has been heated to 198 degrees—not quite to the boiling point. As they leave the blancher they pass through a spray of cold water, then roll on to the hand-picking table.

"This table, in reality, is not a table at all, but a wide canvas conveyor belt which moves at a low rate of speed. On each side of this moving 'table' stands a group of young men, who complete the cleaning job by removing the few cracked beans and fragments of hulls that have not been eliminated by the fanning mill.

"Leaving this broad conveyor belt the beans fall on to the turn-table of a canning machine. As they leave this machine the cans are filled with the proper solution of hot salt, brine, then sealed, also by machinery. After that they are ready for cooking. There are two steam pressure cookers, each of which accommodates 1,170 No. 2 cans at a time.

"The actual cooking process requires approximately 40 minutes, after which the cans are placed in cooling vats where they remain in cold water for 15 minutes. Thereafter they are stored for two weeks, during which period they are watched for possible 'leakers.'"

"Labeling and packing come next, after which the beans are ready for shipment to jobber or wholesaler."

251. *Business Week*. 1940. New plastic mixture: Soybean research yields a solution already being used in textiles, paper, and leather. June 22. p. 32-33.

• **Summary:** "In 1936 the United States Department of Agriculture established a regional soybean industrial products laboratory at the University of Illinois, set it the task of finding some practical uses. Up to then, about the only applications in industry were paints, especially barn paint, and the much-discussed Ford products: automobile paint, and a plastic which contained twice as much phenolic resin as it contained soybean meal.

"A promising non-food use for soybean meal seemed to lie in plastics. The key discovery was that protein from soybean meal could be hardened by a 40% formaldehyde solution into a thermoplastic material. It was industrially useless, because it took too long to mold, and absorbed too much water when submerged. But it was a start.

"Soybean meal from which the oil has been extracted is much cheaper than the pure protein. Presently the researchers learned that the meal itself could be treated successfully with formaldehyde. Adding a phenolic resin or urea resin to hardened meal made it a quick-setting plastic. Molding together equal parts of the hardened meal, woodflour, and resin produced a distinctly new and

homogeneous plastic material.

"This mix is about 15% cheaper than the ordinary resin-and-woodflour product, and it can be made to brighter dye shades without weakening the material. Disadvantage: It still absorbs 3% water in a 48-hour submersion, which is six times as much as phenolic material absorbs..."

"Routine question that arises about every plastic: Has it a liquid form? The laboratory found that as much as 10% of soybean protein could be suspended in a formaldehyde solution. When this solution is applied to a material and dried, the residue is practically the same plastic. Used to impregnate paper, cloth, or other fibrous material, it can be partially dried and then hot-pressed into a strong, lustrous laminated board, in a broad range of bright or dark shades.

"The same solution is already being used in textiles, paper, and leather. As a leather finish, it produces a tough, flexible coating. One large tanner is using it to produce a premium grade of men's-shoe weight calfskin. Several paper mills use it as a water-resistant sizing. In a textile it produces a semi-permanent stiffening that resists several launderings.

"At least two big soybean processors, The Glidden Co. of Chicago and the Central Soya Co. of Decatur, Indiana, are promoting the use of this liquid material commercially, and are reported to be developing industrial uses along several related lines."

252. *Escanaba Press (Michigan)*. 1940. Soybean exhibit will be offered at U.P. [Upper Peninsula] fair here. June 27. *

253. *Detroit News*. 1940. Soy bean hoard feeds Nazi army. Aug. 19. p. 23, col. 5.

• **Summary:** Dr. [sic] W.J. Morse, senior agronomist at USDA, arrived yesterday at the Dearborn Inn [Dearborn, Michigan] for the twentieth annual meeting of the American Soybean Association. Noting that soy beans are being used extensively to feed Germany's fighting forces, he said that Germany had imported about 40 million bushels a year from Manchuria for several years before the war started and is using soy flour as a major source of protein, fats, and carbohydrates needed by its military forces.

G.G. McIlroy (Irwin, Ohio), president of the association, said soybean production in the USA has increased from about 50,000 acres in 1907 to about 11 million acres in 1939, "but edible varieties have formed a negligible percentage of the whole. The beans are grown here primarily as cattle feed for their oil content."

254. Shoenfield, Allen. 1940. Field widens for soy bean: Planes, cars, houses of plastics forecast. *Detroit News*. Aug. 20. p. 7, col. 1.

• **Summary:** Some 200 members of the American Soybean Association attended meetings on the closing day of their annual meeting at Dearborn Inn today. "E.F. Johnson, representing a St. Louis [Missouri] processing plant [probably

Ralston Purina Co.], said several airplane factories are experimenting with soy plastics for wings and fuselages.” Robert A. Boyer, of the engineering laboratory of the Ford Motor Co. conducted the group through a recently-opened unit of the Rouge plant, and showed them “a material closely resembling wool in color and texture, made of soy bean protein, which is to be spun and woven into upholstery for automobiles.”

Governor John W. Bricker of Ohio told the meeting: “Industry is progressively turning to the farm as a source of raw material.”

255. *Proceedings of the American Soybean Association*. 1940. Twentieth anniversary program. American Soybean Association. In session at Dearborn Inn, Dearborn, Michigan. August 18, 19, 20, 1940. p. 2-3. 20th annual meeting. Held 18-20 Aug. at Dearborn, Michigan.

• **Summary:** This meeting was held in Dearborn, Michigan, at the invitation of the Ford Motor Co., which had its headquarters in Dearborn. The company played an active role in the 3-day meeting. The first scheduled activity, after registration on Sunday, was general sight-seeing with suggested visits to Greenfield Village and Edison Museum. On Monday morning, Aug. 19, tours to those two places were scheduled from 9-12 a.m. Luncheon, at noon, was in the Alexandria Ballroom of the Dearborn Inn. Dr. E.A. Ruddiman (Engineering Laboratory, Ford Motor Co.) was in charge of the luncheon program, which included a welcome address by John L. Carey, Mayor of Dearborn. Carey praised Henry Ford's work with soy beans and referred to him as “Dearborn's first citizen.” After lunch Robert A. Boyer (Engineering Laboratory, Ford Motor Co.) gave a talk on “Chemurgy and the soybean.” After lunch was a tour of the Ford Rotunda and the Rouge Plant. Monday evening the dinner banquet was in the Alexandria Ballroom. Wheeler McMiller, President of the National Farm Chemurgic Council, was toastmaster. The first talk was by W.J. Cameron of the Ford Motor Co.

On Tuesday, Aug. 20, Dr. E.A. Ruddiman (Research Laboratories, Ford Motor Co.) presented an afternoon paper titled “Possibilities of soybean milk.”

256. *Proceedings of the American Soybean Association*. 1940. Twentieth anniversary meeting of the American Soybean Association at Dearborn Inn, Dearborn, Michigan. August 18, 19, 20, 1940. p. 1. 20th annual meeting. Held 18-20 Aug. at Dearborn, Michigan.

• **Summary:** Gives the names of the: Officers. Board of directors (1939-40), (1940-41). Educational and research committee. Legislative committee.

257. Ruddiman, E.A. 1940. Possibilities of soybean milk. *Proceedings of the American Soybean Association* p. 62-63. 20th annual meeting. Held 18-20 Aug. at Dearborn,

Michigan.

• **Summary:** “Infants who are not accustomed to cow's milk will take the soy milk as readily as the cow's... Soybean milk, either in the liquid or powdered form, works into baked goods to good advantage. It has about the same effect as cow's milk. Baked custard and custard pies have been made which could hardly be distinguished from that made with regular milk... The cost of ingredients which go into a gallon of soy milk is less than the cost of milk at present, but the labor runs it up to several times that of cow's milk. Proper machinery may reduce the cost so that in case of necessity it may be a competitor of cow's milk. From a therapeutic standpoint it seems to me that soy milk is a very important product.” Address: Research Laboratories, Ford Motor Co.

258. Ford Motor Co. 1940. Differences that mean dollars (Ad). *Proceedings of the American Soybean Association* p. 65. 20th annual meeting. Held 18-20 Aug. at Dearborn, Michigan.

• **Summary:** A full-page ad. A photo in the top half of this ad shows a man driving a tractor in a field of soybeans; two plows attached to the back are turning over the soil. This is “the new Ford Tractor with Ferguson system.” It is compact and lightweight. The “Ferguson system of unit implement linkage and hydraulic control act to give extra traction in hard going...” “The Ford tractor with Ferguson system is sold and distributed nationally by the Ferguson-Sherman Mfg. Corp., Dearborn, Michigan.” Address: Dearborn, Michigan.

259. McBride, Gordon W. 1940. Chemical engineering advances in soybean processing. *Chemical and Metallurgical Engineering* 47(9):614-18. Sept. [2 ref]

• **Summary:** A photo (p. 1) shows the new Archer-Daniels-Midland Co. solvent extraction plant at Decatur, Illinois. “Meal used in plastics: Although considerable discussion has been heard of the use of soybean meal in plastics, there has not been a great amount actually used. The meal corresponds to a filler, though in part it does react with formaldehyde to form a low-quality plastic. A superior molding compound has been achieved by the use of this meal with phenol-formaldehyde plastic. This has been publicized to a considerable extent by the Ford Motor Co.”

Industrial proteins “find application in the manufacture of paper sizings, adhesives, laminated fiber board, water paints, and miscellaneous coatings. Small molded parts are also being produced from preparations containing phenolic or urea molding compositions in admixture with varying amounts of purified soybean protein pre-hardened with formaldehyde.”

“One large potential outlet for the meal is in the manufacture of a protein fiber by techniques comparable to those of other synthetic fibers already well known.” Address: Chemical engineer, Washington, DC.

260. McIlroy, G.G.; Edmondson, J.B. 1940. American Soybean Association business session: Dearborn Inn. *Proceedings of the American Soybean Association* p. 81-83.

• **Summary:** The meeting was called to order by President McIlroy at 8:30 A.M. The secretary's report, and then the treasurer's were read and accepted by unanimous vote.

New business: "Jacob Hartz discussed the necessity of the Association broadening its policies in an effort to meet the growing needs of the soybean industry. Two definite suggestions were made to be developed by the Board of Directors, namely: that the Association make plans to employ an executive secretary, and that a soybean periodical be published as an official organ of the Association.

"In order to make way for the development of the above suggestions, amendments to the constitution were presented by the Secretary as follows:" These concerned the board of directors, executive committee, and state executive committee. After some discussion, the amendments were accepted.

There followed a discussion on the use of soybean oil in the manufacture of oleomargarine.

The report of the resolutions committee (K.E. Beeson, chair, George Strayer, George Banks, David Wing) was read by Prof. Beeson and accepted. The resolutions are given: (1) Appreciation to the Ford Motor Company, hosts of this occasion, and especially to Dr. E.A. Ruddiman and Dr. R.A. Boyer of that organization. (2) Gratitude to all agencies interested in soybeans and to the present efficient officers of the Association for their work in planning this meeting. (3) Thanks to all those participating in the 1940 program. (4) Renewed appreciation for the efforts of the U.S. Regional Soybean Industrial Products Laboratory, extension workers, commercial laboratories, National and State chemurgic councils, State Experiment Stations, and agricultural colleges. (5) Gratitude for the financial support of a sympathetic industry which makes possible the printing of the proceedings, and the leaders of the soybean industrial field. (6) Thanks to the Pennsylvania Railroad, through its agricultural representatives Russell G. East and Sydney Friend, for bringing up to date the soybean panel exhibit and making it available as a cooperative exhibit of the Association. (7) Urge the repeal of all federal and state laws imposing unnecessary and unfair restrictions on the sale of oleomargarine made of domestic oils and fats.

The nominating committee, under the chairmanship of Dr. W.L. Burlison, presented the names in nomination for the offices of the Association. State directors were: Illinois: John Smith, Tolono. Indiana: Ersel Walley, Ft. Wayne. Iowa: George Strayer, Hudson. Arkansas: Jacob Hartz, Stuttgart. Ohio: David Wing, Mechanicsburg. Wisconsin: James Swan, Delevan. North Carolina: D.W. Bagley, Moyock. The next meeting will be at Des Moines, Iowa. Address: 1. President; 2. Secretary-Treasurer [American Soybean Assoc.].

261. Photographs of Henry Ford and Robert Boyer seated at a wooden table, Oct. 31. 1940.

• **Summary:** They are seated at the left and right sides of a wooden table with a third unknown person sitting between them, probably in the Engineering Building. On the table are 5 piles of fibers (probably soybean wool, developed in mid-1938; Ford would begin its pilot-plant commercial production in Dec. 1940), a square piece of matting, some solid pieces (perhaps plastic auto parts) and bottles containing pellets. Negative number: 188-28316.

Another photo of the same meeting (Negative number: 188-28318) seems to show Mr. Ford holding a spool of thread. The unknown person may be a reporter from the Framingham [Massachusetts] News, since a photo of this scene appeared in that newspaper on 14 Feb. 1941, with a long caption titled "Finding new markets for farmers."

262. *Fortune*. 1940. Plastics in 1940: National defense is smoking out the "plastic plane" and much more. Plastics are a \$500,000,000 a-year business now, and growing up fast. 22(4):89-96, 106, 108. Oct.

• **Summary:** An excellent overview of the rapidly changing world of U.S. plastics, including the many types and their uses. Somewhere between 1935 and 1940 the infant U.S. plastics industry turned a key corner. During those 5 years production nearly doubled, and the number of plastics increased from 5 to 10. The various types with their year of introduction and a typical trademark are given (p. 96, 106): (1) Nitrocellulose. 1870—The oldest, Celluloid, a thermoplastic which is highly flammable. (2) Phenolic. 1909. Thermosetting phenol formaldehyde, Bakelite. Price: 14 cents a pound. Output: 84 million lb in 1939. Work horse of the industry in workaday colors like black and brown. Used in automobile parts, electrical equipment. (3) Casein. 1919. Casein formaldehyde, Galorn. Warps and cracks in humidity. Has gravitated to buttons, buckles, smaller items. (4) Alkyd. 1926. Phthaic or maleic anhydride-glycerin, G.E.'s Glyptal. Used mainly in tough, quick-drying, multi-colored, weather-resistant paints, lacquers, and varnishes. (5) Cellulose acetate. 1927. Like nitrocellulose but not flammable. (6) Urea. 1929. A thermosetting answer, in full color, to the drab molded phenolics. (7) Vinyls. 1932. Incl. polyvinyl acetate, polyvinyl chloride, etc. Much development in recent years. (8) Cellulose ethers. 1935. (9) Acrylic. 1936. Usually means methyl methacrylate. Röhm & Haas's Plexiglas, and du Pont's Lucite. Crystal transparency, rigid stability, glowing colors, highest price. Cockpits and gun turrets for fighting planes. (10) Styrene. 1937. Ethylene benzene. Dow's Styron. The plastic that tinkles. Lightest plastic known and very transparent. Brittle. (11). Lignin. 1937. Made from waste wood. Used mainly in panels or wallboard. (12) Cellulose acid butyrate. 1938. Related to cellulose acetate. (13) Vinylidene chloride. 1929. A flex plastic wrap. Dow's Saran. Highest tensile strength of any known plastic. (14) Melamine.

1940. Melamine formaldehyde.

The new technology, injection molding, is much faster than the old compression molding. Lamination is also new. This year Henry Ford is making all of his tractor seats out of phenolic-saturated papier-mâché pressed to the desired shape.

The future: The lowest-prices and most versatile plastics are the phenolics, which start at about 14 cents/pound—vs. 1.5 cents/lb for steel billets and 18 cents/lb for aluminum. Ford is the most plastic-minded of the auto makers. Yet a commercial all-plastic car body will have to wait until prices drop to near that of steel. Henry Ford “has been going around for a year with an experimental laminated phenolic door on the rear compartment of his car, walloping it with an ax for the benefit of skeptics, and then inviting them to do likewise on their own cars... Ford cars may well appear in the next year or two with plastic rear-compartment doors, light and easy to handle. And an entirely plastic fender might come out of the new aircraft processes and have the enormous selling point of being dentproof. The over-all use of plastics in automobiles—now placed at anywhere from 100 to 100 different parts—has been sharply rising for a decade. But the Plastic Car is still somewhat remote” (p. 108). Note: U.S. entry into World War II in December 1941 diverted Ford’s attention from plastic car research.

“The incredible fact about plastics is this: anything is possible in this industry that boomed up out of the depression, when all new enterprise was supposed to have stopped, and made itself part of the new age of power, chemistry, and alloys.”

263. McBride, Gordon W. 1940. What’s happening with soybeans? *Food Industries* 12(10):55-57. Oct.

• **Summary:** “Greatly increased production, with accompanying increase in soybean oil output and wider utilization of other soybean products, is influencing all food industries.” Discusses, with many statistics, the utilization of soybeans in the USA, including the amount used for oil (crude and refined; nonfood and food), meal, industrial proteins, and foods. An interesting table on page 56 states that the following foods are made from soybean meal: bean powder, bean curd, soy sauce, soy milk, breakfast food, invalid foods, soy flour, infant foods, ice cream, baked goods, macaroni, and sausage. Whole soybeans are used to make sprouts, cooked beans, soy sauce, confections, breakfast foods, meat substitutes, and coffee substitutes. Either whole soybeans or soy flour are used to make “fresh vegetable milk,” which can be further processed to make condensed milk, dried milk, confections, cheese, or casein.

“In addition to the increasing quantities of soybeans that are brought to the market as a fresh green vegetable, larger quantities of the green beans are being canned each year. One unofficial estimate placed the 1939 pack at 15,000 cases (24 one-pound cans each).”

A photo shows the soybean products plant of Archer-Daniels-Midland Co. recently erected at Decatur, Illinois. Address: Chemical Engineer, Washington, DC.

264. McBride, Gordon W. 1940. What’s happening with soybeans? Greatly increased production, with accompanying increase in soybean oil output and wider utilization of other soybean products, is influencing all food industries. *Food Industries* 12(10):55-57. Oct.

• **Summary:** A wide-ranging discussion of soybean production and utilization in the USA.

A large photo shows an aerial view of the Archer Daniels Midland Co, soybean products plant, recently erected at Decatur, Illinois. A table gives “Salient soybean statistics.” A diagram (p. 56) shows the many different food products made from soybeans, with estimated output of the major products in 1939.

Bar charts show: (1) The uses of soybean oil made in the USA each year from 1931 to 1939 (Source: USDA, based on Bureau of Census data). The three uses are: Food products, drying industries, and soap + miscellaneous and loss including foots. The total and the percentage used in food products increased dramatically after 1934, so that in 1939 about 83% was used in food products.

(2) Production, utilization, and average farm price of soybeans in the United States, 1924-1939. The price of soybeans fell steadily from 1924 (\$2.50 per bushel) until 1931 (\$0.50 per bushel) then it rose gradually to about \$0.80 a bushel in 1939. The bar for each year shows the total production, amount used for seed and feed, crushed by domestic mills, and exported. Soybeans were exported in 1931, 1932, 1935, and 1937-39. Address: Chemical Engineer, Washington, DC.

265. *Time*. 1940. Plastic Fords. 36:65. Nov. 11. Reprinted in *Soybean Digest*, Nov. 1940, p. 5, 11.

• **Summary:** “Last week Henry Ford, 77, gleefully swung an ax with all his lanky might against the plastic rear end of a special Ford car. Then he pointed to the undented, unmarred finish, announced his company would be mass-producing plastic-bodied automobiles in at least one, at most three years...”

“An ardent believer in boys, Henry Ford discovered Robert Boyer in 1925 while visiting Ford’s Wayside Inn, managed by the boy’s father, Earl Joseph Boyer. Attracted by Robert’s active interest in what made the world go round, Ford took him out of the Framingham High School (near Boston)... [and] enrolled him in the Ford Trade School...”

“In the summer of 1930 Ford built him a three-story frame laboratory behind the Museum in Greenfield Village. Designed as a temporary structure, the lab still stands. In it Boyer and his 28 aides have done many strange things—mostly with soybeans.”

“Boyer ‘never smokes nor drinks, likes the same old-

fashioned dances his boss likes, even likes to eat roasted soybeans, soybean bread, soybean soup.”

“Once formed, Ford’s plastic has not the tensile strength of steel, hence will not be used for frame, chassis or motor blocks. But sheets account for half the steel that goes into modern automobiles. If Ford’s plastic bodies become universal, total U.S. use of steel may be cut 10%. Worried, steelmen sent a long-nosed research committee to Dearborn last month, have not peeped since.”

A portrait photo shows Boyer—but NOT of Ford with his ax.

266. *Berkeley Press (Michigan)*. 1940. Ford to build autos with plastic bodies in 3 years. Nov. 21. *

267. *Detroit News*. 1940. Ford tests strength of plastic. Nov. 24. p. 4.

• **Summary:** Below this large photo is the following caption: “Henry Ford swings on the baggage compartment door [at the rear] of a car with an ax. The door panel is composed of vegetable fiber and soy bean resin binder. The polish was damaged but the blow left no dent.” Address: Michigan.

268. Smith, A.M. 1940. War in Europe is inspired by greed, asserts Henry Ford. Motor genius sees a new role for U.S. Nations blind to total use of soil, he says; Plastic auto body is efficiently developed. *Detroit News*. Nov. 24. p. 4.

• **Summary:** Sitting in the Chemical Laboratory of the Ford Motor Co. in Greenfield Village, his eyes fixed on a small model of the all-welded tubular automobile frame, Henry Ford spoke about what has been learned in the Laboratory about a new alliance between agriculture and industry. “If I had known in time that you were coming this morning I would have worn a suit of clothes in which the material is 25 per cent soy bean protein fiber.” He asked Robert Boyer “to bring in some samples of the soy protein fiber processed with sprayed rubber to make springy and durable padding for automobile seats.”

“The sheep is bested: ‘The advantage of this and the white soy bean “wool” we are making for upholstery padding,’ Boyer said, ‘is that you get several kinds of wool from every sheep, and their classification, separation, processing and manufacture into commercial wool, together with the constant variation in supply and changing market costs, simply puts the sheep’s wool out of the running, compared with this soy bean wool. The soy wool is the only plant protein wool this far developed.’”

Ford added: “‘The tensile strength of soy bean plastic as we now have it is about one half that of steel. But there is the ramie plant with fibers of great tensile strength, which we may add to the soy bean plastic where the latter needs greater strength.’”

“By way of illustrating what a door panel, made of plant fiber, with soy bean resin binder, will stand in resisting a

blow, Ford picked up an ax and smote mightily with the ax head on the panel lying convex surface up, on the floor. There was no dent. He shifted the ax and again came down on the panel, with the cutting edge. One blow did not cut. He hit harder, and the axe went through, making a clean cut, but not denting the surrounding surface.

“A similar blow on a steel door panel cut clear through the metal, bending in the edges of the cut and making a big dent in the surrounding metal surface.

“The fiber panel weighs about one-half the steel panel, of the same pattern. It is composed of 70 per cent fiber and 30 per cent soy resin binder. The fibrous element is compounded of 50 per cent southern flash pine fiber; 30 per cent field cereal straw; 10 per cent cotton; and 10 per cent hemp.

“We will make the entire superstructure of the automobile body, except the tubular welded steel frame, of this plastic fiber, and the first model will be finished this winter,” Ford said.”

“I wouldn’t be surprised if this laboratory comes to be the most important building of our entire plant,” he [Ford] said. “There are 28 young men working here, with average age of 24 years. There is the stuff! Always on their toes, enthusiastic, working hard, doing really useful things, looking forward always.”

269. Bergen, Werner Von; Krauss, Walter. 1940. Textile fiber atlas. IX. Protein and synthetic fibers. *Rayon Textile Monthly* 21:691-94. Nov.

• **Summary:** Under the heading “Casein Fibers” the authors discuss Lanital, Aralac, and Soya Bean Fiber. The first commercial fiber produced from milk casein was Lanital, introduced in Italy in 1935 as a “synthetic wool.” It was marketed under various trade names such as Aralac (USA), Lactofil (Holland), and Tiolan (Germany). Small amounts of Lanital were imported into the USA prior to Italy’s entry into World War II. The only commercial fiber presently made in the USA from milk casein is Aralac, manufactured by Atlantic Research Associates Inc. and introduced in the spring of 1940. The fiber is made in two forms, natural and opaque or delustered.

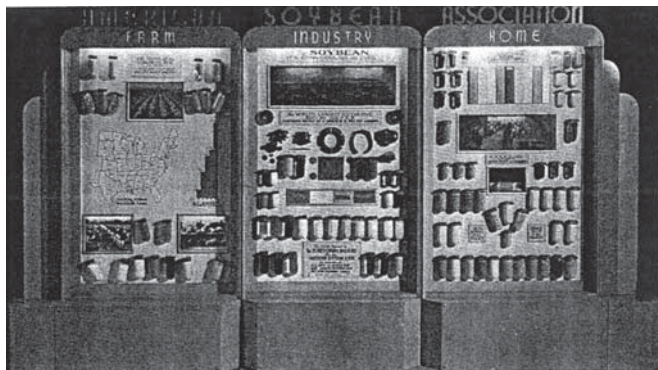
“Soya Bean Fiber: This fiber was first introduced to the American people at the New York World’s Fair of 1939 at the Ford exhibit. Its base is a protein of the soya bean produced by the Glidden Company, under the name of ‘Alpha’ protein. In its microscopical appearance as seen from Plate XVII, the fiber is very similar to Aralac and Lanital. Proper identification of these three fibers by physical, chemical, or microscopical means is hardly possible, because they are so alike in their physical and chemical make-up.

“Fineness: The high circularity of the casein and soya bean fiber makes the accurate diameter determination easily possible by the width as well as the cross-section method... A table shows width measurements made on various samples [of the 3 fibers] by the Forstmann Woolen Co. Laboratory.”

The diameter ranges from 21.5 to 27.9 microns. Plate XVII shows these fibers magnified 500 times in longitudinal and cross-sectional views.

Also discusses regenerated silk (introduced 1937), nylon (1938), and vinyon (1937, 1939). Note: This is the earliest document seen that uses the term “regenerated” to refer to synthetic fibers. Address: Director of Laboratories, Forstmann Woolen Co.; 2. Textile Microscopist, Technical Laboratories, Sears, Roebuck & Co.

270. *Soybean Digest*. 1940. Soybeans’ traveling emissary... 1(1):5. Nov.



• **Summary:** A photo shows a large, three panel traveling exhibit that will be shown, by request, during November in the first floor foyer of the United States Department of Agriculture Building in Washington, DC. The exhibit was prepared for the American Soybean Association by the agricultural department of the Pennsylvania Railroad with cooperation from the NSPA and the National Farm Chemurgic Council. The three panels are titled Farm, Industry, and Home, respectively. The display, debuted at the ASA meetings in Dearborn, Michigan on Aug. 18, 19, and 20, then went to several state fairs, and is now on the first floor foyer of the USDA building in Washington, DC. The industrial panel shows various paints, varnishes, and auto accessories. In the center of the third panel (Home) “is a Pennsylvania Railroad Dining Car finished inside and out with soybean oil and varnish, illustrating how this farm crop enters into the daily life of the traveling public”

“Flour for various uses, cooking and salad oils, nut butter, soy spread, wafers, nuts, macaroni, spaghetti, bread and cookies, together with soy milk, chocolate drink, coffee substitute, candy coated soy puffs are a few of the uses in which soybeans are prepared for human consumption.”

271. Boyer, R.A. 1940. Experimental production of soybean protein fibres. *Chemistry and Industry (London)* 59(49):811. Dec. 7.

• **Summary:** This is a summary of a paper presented at a meeting of the American Chemical Society, Div. of Industrial and Engineering Chemistry, at Detroit, Michigan, on 9-13 Sept. 1940. Production of fiber from soybean protein is

described. “Difficulties encountered in obtaining uniform protein necessitate strict control of the variety of the soybeans and thorough chemical analysis and fertilization of the soil on which they are grown.” When good protein is used, it is possible to obtain spinning solutions containing 20% protein. Soybean fiber presently has about 80% the strength of wool. It has more elongation, both wet and dry, and does not wet as easily as wool or casein fiber. It does not promote mold growth as readily as casein fiber. It blends well with wool or cotton. Plans are being made to construct a pilot plant capable of producing 1,000 lb/day of “soybean fibre.” Address: Ford Motor Co.

272. *Wall Street Journal*. 1940. Wall Street scene. Dec. 12. p. 4.

• **Summary:** Washington Food Market, which is getting a face life, sells all kinds of foods. The owner of one restaurant is Chinese; a metropolitan newspaper shows his picture and describes his special recipes. “Soy bean cheese [tofu], we notice. Darn clever these soy beans, good for anything from cheese to most parts of a Ford car.”

273. Boyer, R.A. 1940. Soybean protein fibers: Experimental production. *Industrial and Engineering Chemistry* 32(12):1549-51. Dec. Also in *Chemistry and Industry* 59(49):811 (1940).

• **Summary:** Soybean fiber as made at present has about 80% the strength of wool, has more elongation both wet and dry, and does not wet so easily as wool or casein fiber. It does not promote mold growth so readily as casein fiber. The fiber blends well with wool and cotton and has been processed satisfactorily on both cotton and worsted textile equipment. Plans are being made for a pilot plant capable of producing 1,000 pounds/day of soybean fiber. There are many ways of extracting protein, some of which are closely guarded secrets. One method is to treat carefully sized oil-free meal with a weakly alkaline solvent, such as 0.1% sodium sulfite solution, for a half hour. The resulting solution is clarified either by filtering or centrifuging. The protein in the solution is precipitated with an acid, and the resulting curd is washed and dried.

Soybean fiber is made from defatted soybean meal, which is treated at much lower temperatures than meal prepared for cattle food. Extraction of the protein from the oil-free meal is a critical and important part of the operation. There are many ways... The final steps are preparation of the solution for spinning, spinning and hardening, aftertreatment, and drying. Four photos show the equipment used. Address: Ford Motor Company, Dearborn, Michigan.

274. Mauersberger, Herbert R. 1940. The new synthetic textile fibers. *Rayon Textile Monthly* 21:743-45. Dec.

• **Summary:** The first section, titled “Soybean filaments and fibers,” states: “Heberlein & Co. back in 1929, submitted the extracted protein from soybean to a swelling operation

with water under pressure and heat or a dilute acid with simultaneous treatment with phenols, after which the filaments are formed by extrusion in the usual manner.

"In this country, the first announcement of research work on the production of a synthetic textile fiber from soybean pulp came with the opening of the World's Fair in 1939. A part of the Ford exhibit was devoted to its manufacture. The Dearborn Laboratories of the Ford Motor Company had been working on the idea of producing a synthetic textile fiber, that would simulate wool very closely since 1937. They had been using the soybean oil for paints and the meal for plastics, originating from 20,000 acres of soybean cultivation.

"The process used is about as follows:—After the soybean is crushed under pressure and the oil extracted with Hexane it is passed through a weakly alkaline solvent, which extracts the protein. The soybean meal is exceptionally rich in protein value, as high as 50 per cent. The protein is then combined with various chemicals and/or dyestuffs in a secret process and made into a viscous solution. It is then forced through a spinarete and coagulated into filaments in a bath containing sulphuric acid, formaldehyde and sodium chloride or aluminum sulphate. A formaldehyde solution is used to set the filaments during the winding process. They are then bleached and dyed, if desired, and ready for commercial use. The filaments are also cut to produce a staple fiber. The skeins have the consistency and texture of silk and wool, which are our present protein fibers. Ford officials have informed me that Henry Ford himself has shown considerable personal interest in these experiments and the yarn has been woven and knitted into goods and the company considers its suitability for auto upholstery definitely satisfactory and practical. Later, the Glidden Company at Chicago, Illinois, set up a pilot plant for experimental purposes of fiber production to the textile trade.

"The physical and chemical properties of textile fiber produced from soybean are particularly interesting. A sample of the product was submitted to Mr. von Bergen of the Forstmann Woolen Co. by myself late in 1939. He reported that it closely resembled "Lanital" in color, luster, touch and crimp. Its tensile strength was .94 gram per denier dry and .26 gram per denier when wet. The elongation of the filaments was 112 per cent dry and 47 per cent wet. This means that soybean fiber is about four times weaker than wool when dry and approximately 8 times weaker than wool when wet. The fineness and diameter of the soybean fiber is exceptionally uniform, approaching nylon in this respect. For identification purposes Mr. von Bergen suggests a sulfur content test to distinguish it from Lanital, if this is ever necessary. Water does not wet soybean fiber as readily as it does casein fiber and wool.

"Hence, the only deficiency is its tensile strength and the filaments and fibers otherwise show remarkable qualities. I am informed that in more recent samples from Ford and Glidden, that the strength had been improved. Development

work on upholstery fabrics has progressed satisfactorily and it looks as if the soybean fiber will soon be a commercially practical textile fiber, ready for the textile trade to use. It is now used in hat felts, suitings, upholstery fabrics, etc. A commercial plant for the production of this fiber is now planned for about 1,000 pounds per day." Address: Technical Editor.

275. *Soybean Digest*. 1940. New Ford soybean plant opens. Dec. p. 11.

• **Summary:** "Feedstuffs, Oct. 5, says that the new soybean processing mill of the Ford Motor Company at its River Rouge plant has been placed in operation. With a storage capacity of 80,000 bushels of unprocessed beans, the new mill supplements two smaller extraction plants operated in Michigan as village industries. Together, the plants can produce 5,400 gallons of oil and 259,000 pounds of soybean meal daily."

276. Ford Motor Co. 1940. Harvest of the years: Ford advertisement (Motion picture). Dearborn, Michigan. 836 ft., comp., black-and-white, 35 mm. No captions. See 200FC-1110, Reel 2 for duplicate sound track. *

• **Summary:** Running commentary on the following pictures: Soybean processing, workers, machinery. Various automobile parts as commentator explains that Ford produces all its own basic materials to keep costs down and quality up. View of Ford plants, waterworks. Address: Dearborn, Michigan.

277. Gras, Norman Scott Brien. 1940. A history of agriculture in Europe and America. 2nd ed. New York, NY: F.S. Crofts & Co., Publishers. xxvii + 496 p.

• **Summary:** In 1933 the first Agricultural Adjustment Act (AAA) was passed under Franklin D. Roosevelt. It was managed by USDA's Agricultural Adjustment Administration (AAA). The purpose of the act was to guarantee a fair return to agriculture or to put agriculture on a parity with industry. The commodities covered were wheat, rye, flax, barley, cotton, corn, sorghum, hogs, cattle, rice, tobacco, peanuts, sugar beets, sugar cane, potatoes, and milk. Page 464 discusses the expansion of soybean production. Production of soybeans for seed and crushing increased from about 2,283,000 bushels in 1917 to 57,665,000 bushels in 1938. The oil was used chiefly in the food and drying-oil industries. Pages 465-66 discuss "Agricultural Industries. Three efforts have been made to find more room for farm products in America's domestic market. The Republican emphasis has been to keep out foreign competition. The recent Democratic effort has been to increase the income of Americans so that they will buy more farm products. Henry Ford and many chemists have thought of creating new uses and demands for American farm products, particularly in American factory production... Grain is to be made into alcohol, for use with gasoline, to drive automobiles and tractors. Soybeans, once

used chiefly as hay or as a fertilizer, are being made into oil, meal, flour, stock feed, fertilizer, breakfast foods, macaroni, crackers, and glue. The oil is for use in paints in place of linseed oil but also in the making of enamels, varnish, glycerin, and explosives."

Synthetic textiles: Lanital is "an Italian invention but has been apparently independently discovered in America. It is synthetic wool—made out of casein from cow's milk. The casein is put through spinnerets and comes out like macaroni; when hardened, it is cut to any length. It can be dyed and woven into cloth... There are many who feel we are just beginning the development of synthetic textiles. In addition to rayon and lanital we have nylon and vinyon... A federal act of 1938 allotted four million dollars for four regional laboratories designed to discover new uses for farm products." Address: Prof. of Business History, Harvard Univ. [Massachusetts].

278. Hahto [Michigan]: New U.S. domestic soybean variety. 1940?

• **Summary:** Sources: Bernard, R.L.; Cremeens, C.R. 1970. "Evaluation of maturity group 00 to IV named varieties of the U.S.D.A. soybean collection." Urbana, Illinois: United States Regional Soybean Laboratory. iii + 31 p. Dec. RSLM 244. (A revision of RSLM 205, 1960). See p. 8-9. "Variety: Hahto (Michigan). Prior designation: Hahto Source: Unknown, possibly from 'Hahto' (group VI). Year named or released: by 1940 Developer or sponsor, year selected: Ford Motor Company."

Bernard, R.L.; Juvik, G.A.; Nelson, R.L. 1987. "USDA soybean germplasm collection inventory." Vol. 1. INTSOY Series No. 30. p. 10-11. Hahto [Michigan] is in the USDA Germplasm Collection. Maturity group: IV. Year named or released: by 1940. Developer or sponsor: Ford Motor Company. Literature: 18. Source and other information: Unknown origin, possibly selected from 'Hahto'. Prior designation: Hahto. Address: USA.

279. *Detroit News*. 1941. Boyer named one of outstanding 10. Jan. 11. p. 3, col. 3.

• **Summary:** Robert A. Boyer, age 31, head of one of the Ford Motor Co. research laboratories and developer of the plastic automobile body, was named today as one of "The 10 Outstanding Young Men of 1940" by the U.S. Junior Chamber of Commerce. Most of Boyer's research projects have involved uses of the soy bean in automobile manufacture. All of the outstanding men are age 35 or younger. Boyer, who lives at 700 Claremont Drive in Dearborn Hills, is married and has two children, Robert A., Jr., 6, and Nancy, 8.

280. *Detroit Free Press*. 1941. Ford expert wins '40 youth accolade: Boyer is named one of ten outstanding young men. Jan. 12.

• **Summary:** "Robert A. Boyer, thirty-one-year-old head of

the research laboratory of the Ford Motor Co., Saturday was named among the 'Ten Outstanding Young Men of 1940' selected by Future, official publication of the United States Junior Chamber of Commerce.

"Boyer was given the award for his achievement in perfecting the recently-displayed Ford plastic automobile body, which experts believe may revolutionize the automobile body. He has also taken a leading part in the development of other plastics from soy beans and other agricultural products." Address: Michigan.

281. *Detroit News*. 1941. Wednesday talk to reveal magic of modern plastics. Jan. 21.

• **Summary:** "Farming for Automobiles' is the subject of a talk to be delivered by Robert A. Boyer, chief of the chemurgic laboratory of Ford Motor Company, at the Green Lights vocational guidance program at 8 p.m. Wednesday in the Auditorium Studio of WWJ—The Detroit News. Boyer, who has won world renown for his work with Henry Ford in developing a plastic automobile body, last week was selected by Future, official magazine of the United States Junior Chamber of Commerce, as one of the 10 outstanding young men of 1940.

"Thirty-one-year old Boyer makes a practice of hiring only young men in his laboratory, the average age being 24-and-a-half. Most of the laboratory technicians are graduates of the Ford Trade School, as in Boyer...

"A color sound motion picture, 'Magic of Modern Plastics,' revealing developments in this industry will be shown through courtesy of Modern Plastics Magazine."

282. *Detroit News*. 1941. Chemist says plastic auto soon will be seen in city. Jan. 23.

• **Summary:** Robert Boyer, age 31, talked about the Ford Motor Company's work with plastic automobiles to "an overflow audience of students at the Green Lights program in the Auditorium Studio of WWJ—The Detroit News, Wednesday night." A small portrait photo shows Boyer.

283. *Detroit News*. 1941. Junior Chamber bestows honor on soybean expert. Jan. 24.

• **Summary:** "Robert Allen Boyer, 31-year-old head of the Ford research laboratory... was honored Thursday night by the United States Junior Chamber of Commerce as the outstanding young man in America. A man whose inspiration was Thomas A. Edison and whose guiding genius was Henry Ford today stood acclaimed as America's No. 1 young business man." A photo shows Robert Boyer. Address: Michigan.

284. *New York Herald Tribune*. 1941. Ford produces new auto body from plastics: Detroit students hear of car 'grown, not mined,' revolutionizing designs. Jan. 24.

• **Summary:** Robert A. Boyer of Ford Motor Co. described

the new car to “an overflow audience of Detroit senior science students today.” The new plastic bodies, which will be lighter and better insulators, will make it necessary to re-design the automobile from the ground up. Boyer prophesied that “you probably will be seeing experimental jobs on the streets of Detroit very soon now, the forerunner of a very novel car which will be common in a few years.”

285. Chase, Herbert. 1941. What's the past, present and future of plastic automobile bodies? *Iron Age (The)* 147(9):44-48. Feb. 27.

• **Summary:** “This is believed to be the first accurate and comprehensive account of the development [of plastic auto bodies], written by an engineer who is very well versed with plastics technology and also well versed in automotive engineering and in metal working subjects. The article... has been checked and released by Robert A. Boyer, who heads the Ford plastic body development work.

Remarkably, “the plastic automobile body appears to be entering the realm of reality,” although there are still many problems to be solved and automotive engineers and body designers still remain skeptical. Henry Ford and his able associates are doing the pioneering work. “At the bottom of his purpose to find out what can be done is a sound and abiding faith that the farmer needs industry and that industry needs the farmer. Mr. Ford has already proved this conclusively in developments based on the soya bean.” Phenol-formaldehyde resin, which Ford has long used to make plastic car parts, is envisaged as the basic binder for plastic body parts. Yet soya plastics are not presently part of the plastic body.

The plastic body will be built around a frame of tubular steel. Valuable experience has been gained at Ford by molding rear decks for baggage compartments [trunks] for conventional cars. Ford's rear deck panel, molded to shape, is only 0.175 inches thick. Several times thicker than steel, it is “not easily dented and will withstand the blows of an ax which would ruin a steel panel.

A detailed discussion of the plastic auto body and the problems to be solved is given. Presently, the tubular steel frame is expected to weigh about 227 lb. and the plastic panels about 155 lb for a total body weight of 382 lb; this is 150 to 200 lb lighter than a typical steel body and frame. Three large photos show men and huge machines forming plastic panels.

286. *Farming Today (Dearborn, Michigan)*. 1941. Soybeans made tougher than steel! 2(1):2. Feb/Spring. Publ: Ferguson-Sherman Mfg. Corp.

• **Summary:** “Henry Ford demonstrates toughness of new soybean plastic, developed experimentally for trunk lids of Ford cars. Blows from the heavy axe failed to dent or shatter this soybean plastic formed into a sheet.”

Photos show: (1) Henry Ford striking the trunk of his

farm-grown car with an ax. (2) An experimental tractor seat containing soybean plastic. (3) The huge Ford soybean processing plant at Dearborn, Michigan, where several hundred thousand bushels of soybeans are processed annually.

287. *Ford Home Almanac*. 1941. Automobile bodies that farmers help to build. Feb. p. 11-14. Also published as a brochure in 1941.

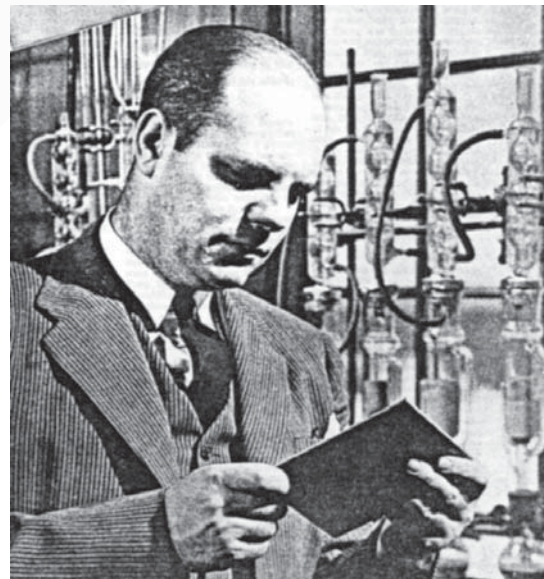
• **Summary:** “Twenty years ago Henry Ford told newspapermen: ‘You and I will see the day when automobile bodies will be grown on the farm.’”

“One of the best of the plastics developed by Ford chemists is a material composed of 70% cellulose fiber, and 30% resin binder.” This material will improve automobile bodies because “it will absorb, without denting, a blow 10 times as great as steel will stand.”

Photos show: (1) Henry Ford striking the trunk of his farm-grown car with an ax. Note 1. This was the first periodical to print this famous photo. (2) Ford and Boyer examining the trunk for damage; the caption notes: “The blow scarcely left a mark.”

Note 2. For a host of other newspaper stories on Ford's ax demonstration, see Clipbook 113 at the Henry Ford Museum, Dearborn, Michigan.

288. Garfield, George. 1941. For distinguished service: Robert Boyer. *Future*. Feb. p. 9-12.



• **Summary:** Robert Boyer, 31, designer of Ford's plastic car, received the Distinguished Service Award of the U.S. Junior Chamber of Commerce for 1940. This is the complete story of his work.

“Born September 30, 1909, in Toledo, Ohio, he spent the first years of his life there and in Royal Oak, Michigan, before moving with his family to South Sudbury, Massachusetts.

His father, Earl J. Boyer, had been placed in charge of famous Wayside Inn by Ford, and it was in 1925, during one of the latter's frequent visits to the inn, that Bob's wide awake curiosity about the world and things in it first attracted the manufacturer." The cover photo shows Boyer in a chemistry lab. A smaller cover photo shows Boyer sitting across a table from Henry Ford. The caption notes that they are discussing "some of the materials that are being used in making plastic body parts. Boyer is in charge of the chemical laboratory where this experimental work is carried on by young men whose average age averages only 24." Other photos show soybean fiber being spun for use in upholstery and seat cushion padding, and (p. 9) a portrait photo of Boyer.

289. Monahan, James. 1941. Little honorable plant. *Elks Magazine*. Feb. p. 14-17, 45-48.

• **Summary:** An overview of the soybean in America. Discusses industrial uses of soybeans as in glues, paints, varnishes, and plastics, the USDA Regional Soybean Industrial Products Laboratory at Urbana, Illinois, the very important work of William J. Morse, presently senior agronomist at the USDA Bureau of Plant Industry (Morse began work at USDA in 1907 under Charles Vancouver Piper), the use of the flakes of soybean meal in brewing to give beer more body and a sturdier, creamier "collar" of white foam, the work of Henry Ford in developing large-scale industrial uses of soybeans, soybean trading on the Chicago Board of Trade, food uses of soybeans (such as green-shelled soybeans, soybean flour, the Soyburger, and soybean bread). Contains 7 photos.

290. Photograph of Henry Ford striking the trunk lid of a black plastic Ford car with an ax, Feb. 1941. 1941.

• **Summary:** This famous photo was widely reproduced in magazines and newspapers in early 1941 (Negative number: 188-28273) (See next page).

Right after striking the car, Ford and Robert Boyer examine the back panel. "The blow scarcely left a mark." The license plate is "Mich. 41 AA-16-83." Negative number: unknown.

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

291. *Science News Letter*. 1941. Wool from soy beans is used in auto upholstery. 39(10):148. March 8.

• **Summary:** "Wool from the soy bean will shortly be adopted for automobile upholstery padding, just as plastic fiber panels will replace steel for the automobile body... 'The soy wool is the only protein fiber thus far developed from a vegetable source... Two acres of land devoted to sheep grazing will produce 8 to 10 pounds of wool per year. Two acres of

land in soy beans will produce 400 pounds of protein suitable for fiber.' Henry Ford has a suit of clothes in which the material is 25 per cent soy bean protein fiber."

292. *Detroit News*. 1941. Ford says farm plastics will form bulk of autos. March 11. p. 27. Night ed. Or p. 40H.

• **Summary:** "Ways, Georgia. March 11.-(AP)-Henry Ford envisions a day 'only several years off' when a farmer will grow most of the materials going into his motor car and perhaps provide the fuel from plants as well.

"We'll have an experimental body ready at our plant in a month or so made chiefly of plastics from cellulose fibers easily grown," Ford said in an interview today. "The plastic body will be several hundred pounds lighter, and will be a better body for several reasons," he added."

Henry Ford has a laboratory on his Georgia plantation where scientists are studying ramie, crotolaria, and other crops having potential uses by industry.

293. Chase, Herbert. 1941. Plastic car is studied: Molded body panels under intensive research by Henry Ford. *New York Times*. March 30. p. XX5 (Sec. 10, p. 5).

• **Summary:** Ford gained experience in making plastic automobiles by making one panel (a deck for the luggage compartment of the present Ford car); it is as large as any planned for the new plastic body. It is said "to have proved not only that the plastic panel has adequate strength but that it can be molded on a production scale."

"The plastic is not from the soy bean and makes no use, at present, of the many soya products which Ford already has developed." Address: Member, Society of Automobile Engineers.

294. Ford Motor Co. 1941. Soy Bean. The wonder plant. Oil for industry. Feed for the farmer. Food for the soil (Ad). *Soybean Digest*. March. p. 12.

• **Summary:** "It has been truly said the sacred grain of ancient China is becoming the wonder plant of modern America. The amazing expansion of the Soy Bean Crop in North America presages its destiny to become a source of new wealth. Of benefit to both the farmer and to industry, it is forming a partnership of growing importance.

"In the Ford industries, research on the manufacture of various products from the Soy Bean continues apace. Three processing plants are now in operation to recover Soy Bean oil for industry and to prepare Soy Bean oil meal as a protein supplement in feedstuffs. We invite your inquiry on white or toasted soy bean oil meal."

Note: This is the second earliest document seen (Dec. 2000) which refers to the soybean as a "sacred grain" or "the sacred grain of ancient China." Address: By-Product Sales



Dep., Dearborn, Michigan.

"Business is only exchange of goods. If we want the farmer to be OUR customer, we must find a way to be HIS customer."
—HENRY FORD

SOY BEAN



The Wonder Plant
OIL FOR INDUSTRY
FEED FOR THE FARMER
FOOD FOR THE SOIL

IT HAS been truly said the sacred grain of ancient China is becoming the wonder plant of modern America. The amazing expansion of the Soy Bean Crop in North America presages its destiny to become a source of new wealth. Of benefit to both the farmer and to industry, it is forming a partnership of growing importance.

In the Ford industries, research on the manufacture of various products from the Soy Bean continues apace. Three processing plants are now in operation to recover Soy Bean oil for industry and to prepare Soy Bean oil meal as a protein supplement in feedstuffs. We invite your inquiry on

White or Toasted
SOY BEAN OIL MEAL

Protein	Min.	.44%
Fat	Min.	.05%
Fiber	Max.	7.00%

Available for Sale by
FORD MOTOR COMPANY
By-Product Sales Dept.
Dearborn, Michigan

295. Prat, D. de. 1941. Le soja: Matière adhésive et matière textile [Soy: Its use in adhesive and textile materials]. *Revue Internationale du Soja* 1(2):49-54. March. [Fre]

• **Summary:** Soy flour can be used to make adhesives by mixing it with gelatin, glue, or casein. Details are given on making textile materials, including treatment of soybean stalks to isolate the fibers, treatment of the pods, treatment of the residue of oil extraction (isolation of protein from soybean cake or meal, then spinning it into fibers). In

America, the Ford Motor Company makes protein fibers from soy flour; they are condensed with formaldehyde. A process used in Japan by Nihon [sic, Nihon] Karyo Kogyo Kabushiki Kaisha is described. The cakes are first washed with a warm dilute (5-10%) alkaline solution at 20-30°C for 2-5 hours. The proteins extracted (10-20%) are then precipitated by the addition of acids or of metallic salts (acetic, sulphuric, or phosphoric acid) to this alkaline solution. The precipitated material is dissolved in a dilute alkaline solution, with the addition of lecithin. The precipitant is washed in water in order to give it an appropriate water content. The solution is allowed to "ripen" (mûrissement), and is then spun in a coagulating bath, to which a coagulant is added. In Japan, Showa-Sangyo makes and sells a product named "Silkool," which is an artificial fiber made from soy protein and which would have characteristics similar to that of Lanital. "Soja Bean Silk" is also made in Japan from soy protein.

296. *Soybean Digest*. 1941. Boyer gets JCC Service Award for '40. March. p. 9.

• **Summary:** "It was in December, 1931, that Henry Ford and Boyer decided to concentrate on the soybean as the farm crop that industry could best mould to its purposes. This was after a year's intensive research on the possibilities of nearly every farm crop known.

"The first obstacle was to design a solvent-process plant, then practically unknown commercially in the United States. Then a piece at a time, Ford began using soybeans in his cars. Plastics were used in horn buttons, electrical systems, instrument panels, body paint. The entire superstructure of the new car is to be a soy-bean plastic, and a mill is under construction to produce a synthetic soybean wool, developed in 1936, for use in upholstery."

297. Van Duyne, Schuyler. 1941. Mr. Ford tells of plans for stronger cars. *Popular Science* 138:127-31. March.

• **Summary:** Two years ago Henry Ford asked Robert Boyer, a young research chemist, to find out if plastic bodies for cars were practical. Recently Mr. Ford revealed that the answer was affirmative. The 77-year-old industrialist was looking for new raw materials to replace steel for use in making his cars. He feels that plastics will be safer, lighter, and less expensive. Robert Boyer, who directs Ford's plastic research, agrees. Photos show (1) Ford and Boyer seated at a table with a the author. For is discussing his plastic-car plans. The cagelike object is a model of the tubular framework proposed for use in future Ford cars. (2) Robert Boyer, who is directing plastic research for the Ford Motor Co., inspecting a synthetic-resin trunk lid being tested on Mr. Ford's car. (3-7). Production of molded plastic panels saturated with phenol resin. (8) A chemist studying soy-bean protein fibers for possible use in the upholstery of Ford cars. (9) Mr. Ford pointing to a hole he put in a sheet-metal trunk lid with an ax. "Beside it is a

plastic panel which got the same treatment but never lost its shape under the pounding. The new body material cannot be softened by any amount of heat, and has been found to be virtually impervious to moisture." Robert Boyer looks on.

298. Kajita, Toshiji; Inoue, Ryohei. Assignors to Showa Sangyo K.K., Yokohama, Japan. 1941. Process for manufacturing artificial fiber from protein contained in soybean. *U.S. Patent* 2,237,832. April 8. 2 p. Original application filed 8 Sept. 1937, Serial No. 162,954. Divided and this application filed 7 June 1939. Filed in Japan 25 May 1937.
 • **Summary:** Uses soybean protein and tartaric acid. Address: Tokyo, Japan.

299. Goss, W.H. 1941. Modern practice in solvent extraction. *Chemical and Metallurgical Engineering* 48(4):80-84. April.
 • **Summary:** The American soybean processing industry uses hydrocarbons "to solvent-extract about 350,000 tons of beans per year, i.e., over 20% of its operations."

"Solvent extraction of soybeans, as we know it, did not originate in the U.S. Its reduction to practice occurred in the twenties and early thirties and was the natural result of the requirements of Germany and the Low Countries for supplies of edible oils and of protein feeds for their livestock. In Europe, a soybean extraction industry evolved quite logically as a result of (1) the ability of the German trade program to make available plentiful supplies of Manchurian beans, (2) the necessity for recovering the utmost yield of oil in order to meet domestic deficiencies, and (3) the unique adaptability of soybeans to solvent extraction."

"As far back as the early twenties, efforts were made to solvent-extract soybeans in this country. A Bollman [Bollmann] type of extractor at Norfolk, Virginia [owned by the Eastern Cotton Oil Co.], ran local soybeans in 1924-1925 and attempted to process imported flaxseed, but the project was unsuccessful. Another Norfolk plant used Scott rotary extractors on a variety of oil-bearing seeds, including soybeans and copra, during the same period. About a year earlier, a batch solvent system at Monticello, Illinois, also failed. The first successful large-scale operations were those of the Archer-Daniels-Midland and the Glidden companies who installed Hildebrandt type extractors in Chicago during 1934 and 1935. The Glidden plant was destroyed by an explosion in 1935 but was immediately rebuilt with a doubled capacity."

"At present, there are 5 solvent systems used in large-scale soybean extraction in this country, 2 of them being of German and 3 of American origin. These are installed in 8 large (over 50 tons of beans per day) and 2 small plants. At least one other system is operated on a relatively small scale" (see table 2).

An extractor of the Allis-Chalmers type processes soybeans at Cedar Rapids, Iowa. Until recently, another processed soybeans at Evansville, Indiana (probably for American Soya Products Corp.).

"The enthusiasm which ran high in the early 1930's for the 'industrialized barn' type of soybean extractor has become more rationalized, and at least 2 technically satisfactory types of extractors have resulted. The Ford Motor Co. developed one consisting of an inclined tube housing an internal screw which conveys beans upward against a countercurrent solvent flow. It is now being used in one large and 2 small plants, all owned and operated by Ford.

"There has evolved, from work done by Iowa State College and by the R. & H. Chemicals Department of E.I. du Pont de Nemours & Co., an extraction system which, in simple terms, might be described as a Ford extractor running backwards. It is designed for solvents heavier than soybean oil, specifically trichloroethylene; hence it operates with an upward flow of solvent and downward flow of soybeans in the main extraction tube. There are no commercial installations at present."

"Apparently there is only one commercial soybean extraction plant in the world using any solvent other than a petroleum cut. The exception is the Manchuria Soybean Industry Co., in Dairen. Here, the so-called hot alcohol process is used with a battery of rotary extractors to process approximately 100 tons of soybeans per day. The solvent is 99.8% ethanol... Considerable research has been directed toward the use of methanol-benzene and ethanol-benzene mixtures for soybean extraction in cases where phosphatide recovery is of importance. In the late 1920's, the plant of the Hansa-Muehle, A.G., at Hamburg operated for a short time using such mixtures."

Tables show: (1) Soybeans (tons and percentage of total) processed annually in USA by expeller, solvent, and hydraulic methods (1936-39; in 1939 the percentages were 74.2, 20.2, and 5.4 respectively). (2) Estimated total capacities of installations of the various types of continuous solvent extraction systems worldwide and in the USA (Basis: short tons of oilseeds or oilseed press cakes per 24 hours): Bollman (German): 3,100 / 750. Hildebrandt 2,200 / 430. Fauth (German): 800 / 0. Allis-Chalmers (American): 170 / 170. French (American) 130 / 130. Ford (American): 75 / 75.

Photos show: (1) Aerial view of Central Soya's huge processing plant at Decatur, Indiana. It uses both a Bollman extraction system and expellers. (2) Ford Motor Company's soybean mill at River Rouge plant (exterior view). (3) Two small soybean extractors in Ford's soybean mill at Saline, Michigan. (4) The huge soybean mill of Hansa-Muehle, A.G., Hamburg, Germany, using the Bollman system. (5) Hildebrandt extractor. (6) Experimental extractor built by the R. & H. Chemicals Department of E.I. duPont de Nemours & Co., Niagara Falls, New York. Address: U.S. Regional Soybean Industrial Products Lab., Urbana, Illinois.

300. Morgan, Helen. 1941. Jack in the beanstalk. *Scribner's Commentator* 9:82-84. April.

• **Summary:** The subtitle reads: "Salad dressing, milk for the

baby, varnish, fertilizer, steering wheels for Fords—and profits—all come from the soybean, agriculture's miracle crop."

"Few plants have been subjected to such a thorough dissection in such a short space of time. Recently it's been found that the same protein of soybean, which, when mixed with water, chemicals, and coloring, makes the steering wheels and horn buttons for Henry Ford's cars, can also be whipped into a lofty meringue. Commercial bakers may use it instead of expensive egg-white."

Note 2. This is the 2nd earliest document seen (Aug. 2002) that uses the term "miracle crop" in connection with soybeans.

301. Kresin, William. 1941. From soy bean to automobile. *Ford News (Dearborn, Michigan)*. May. p. 122, 138.

• **Summary:** Describes how soy bean plastics are used as parts in Ford cars and soy oil is used in enamel paints. Photos show: (1) Ford Motor Company's Dearborn (Rouge) plant with the words "Ford Soy Bean Processing" written in large letters across top of front; here the products of agriculture are being converted for use in industry. (2) A man holding soybean plastics. Plastics of soybean composition mold solidly under pressure; many parts for Ford cars are made from this material.

302. Photograph of the "Ford Soy Bean Processing" plant, located in the Rouge complex. 1941.

• **Summary:** A huge, tall building. The "Eight Sisters"—stacks on the company's powerhouse—rise high at the far right. (Negative number: P833-74603-A). Robert Boyer notes that this plant was used for soybean oil extraction and plastic preforming for car body parts (see next page).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

303. Prat, D. de. 1941. Le soja: Matière adhésive et matière textile [Soy: Its use in adhesive and textile materials]. *Revue Internationale des Produits Coloniaux et du Matériel Colonial* 16(182):71-76. June. [Fre]

• **Summary:** A reprint of the author's article in the March 1941 edition of *Revue Internationale du Soja*.

304. *Daily Worker (New York City)*. 1941. Henry Ford may offer a plastic refrigerator. July 14.

• **Summary:** "Experiments on a completely synthetic cabinet, it is revealed, have been going on for some time, but no information is available regarding the auto manufacturer's plans... It will not come as a surprise to those who have been following the news of the Ford activities over a period of time, that soybeans will play an important part in the fabrication of these new refrigerator cabinets. Mr. Ford has long been extremely keen over the possibility of developing a wide variety of entirely new uses from chemical derivatives of soybeans, and the plastic refrigerator cabinet merely

constitutes another of the long list of items which, it is known, his technicians have been checking... Mr. Ford's enthusiasm for the possibilities and opportunities in products derived from soybeans is by now almost legendary."

305. *Christian Science Monitor*. 1941. New plastic suggests farmers may yet grow their own autos. July 28.

• **Summary:** "That is the conclusion drawn from the announcement by Henry Ford that he has an experimental motor car body ready at his plant made chiefly of plastics from cellulose fibers, easily grown... Already a car may contain over 200 parts made from plastics... The day may not be far distant when a farmer will remark..., 'Remind me to water the soybeans that the boys planted for our steering wheel.'" Address: The staff, Boston.

306. Photograph of Henry Ford on his 78th birthday seated in a wheat field, wearing a suit made of soybean fabric, July 30. 1941.

• **Summary:** He is holding some wheat stalks in his hands, with his straw hat in front of his right foot (Negative number: 188-29410).

307. Goss, W.H. 1941. Technological problems in processing soybeans. 2. The solvent process. *Soybean Digest*. July. p. 2-3.

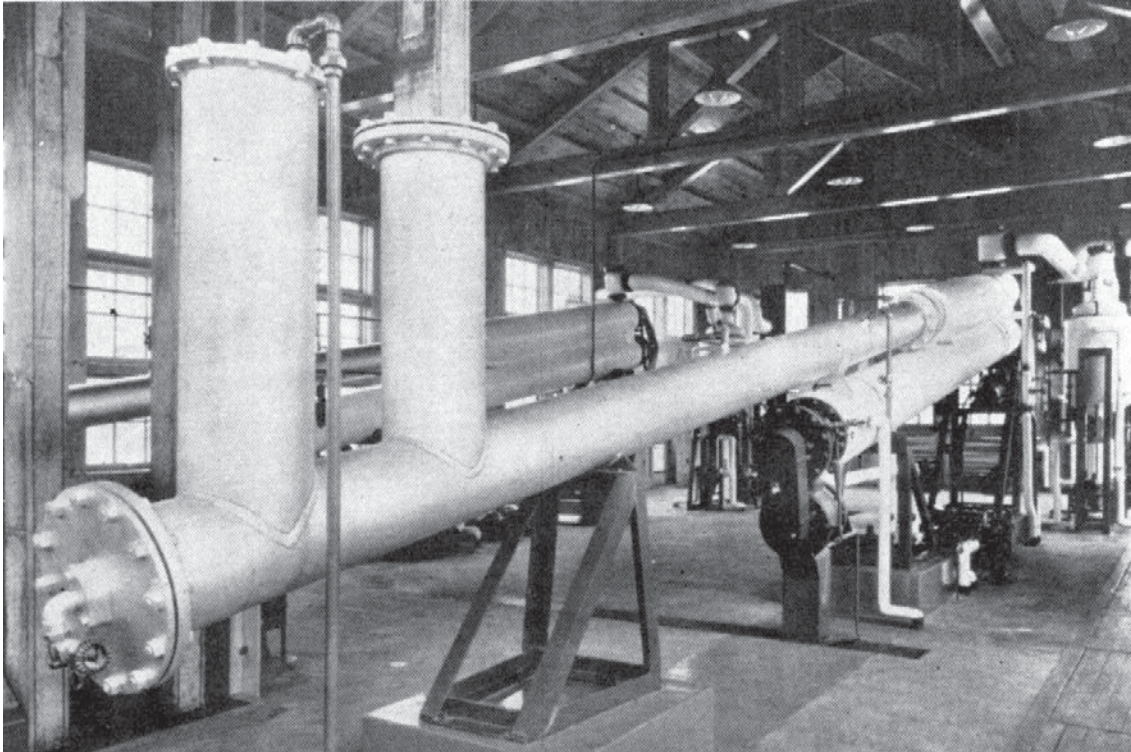
• **Summary:** Contents: Introduction. Bollman or Hansa-Muhle system. Hildebrandt system. Ford Motor Company's system. Allis-Chalmers system. French Oil Mill Machinery Co. system. Kennedy extractor. E.I. du Pont de Nemours and Co. system. Illustrations and diagrams show: (1-2) Bollman or Hansa-Muhle system ("paternoster")—side view and charging / discharging mechanism. (3) Hildebrandt system. (4) Allis-Chalmers system.

Photos show: (1-3) Hildebrandt system. 4. Ford system.

The Allis-Chalmers system (see figure): "The extractor consists of a vertical cylinder having circular plates between stationary scraper arms, the plates rotating at slow speed around a central shaft. Flakes are introduced at the top and pass downward, dropping through slots in successive plates so staggered that the material travels in a helical path. Solvent is introduced at the bottom and flows upward in a similar spiral course, overflowing through the miscella outlet connection shown near the top of the column. The extracted flakes settle into the bottom of the column where they are discharged by means of a revolving screw which forces the meal through an adjustable spring-loaded cone valve. This mechanism forms the extracted material into a solid plug, squeezing out most of the solvent and preventing the bulk of the bulk of the solvent in the column from running out along with the flakes. Extractors of this type have been built with a capacity of 50 to 75 tons per day.

"The French Oil Mill Machinery Company has recently entered the field of continuous solvent extraction. In general, their equipment resembles that of the German-manufactured





Bollman [Bollmann] system. The Kennedy extractor and the system developed by E.I. du Pont de Nemours and Company, Inc., also deserve mention, although neither is yet in commercial operation on soybeans.”

“... solvent-extracted meal for use in feeds requires a vigorous wet toasting process following the extraction in order to increase its nutrient value and palatability. It is the recent introduction of toasting methods which has largely accounted for the abatement of the long-standing prejudice against the use of solvent-processed meal in feeds.” Address: Chemical Engineer, U.S. Regional Soybean Industrial Products Lab.

308. *Times-Picayune (New Orleans, Louisiana)*.1941. Auto crunchies. Aug. 2.

• **Summary:** “The optimism of Henry Ford is such a hardy perennial.” Recently Clarence J. Bolander, of the Michigan Department of Agriculture, discussed “plastics made from farm products, a deserved specialty in Mr. Ford’s category of present and future prosperity potentials. Echoing the latter’s oft-repeated prediction that whole automobiles will be turned out from such things as soybeans, Mr. Bolander went him a considerable shade better by prophesying that when these machines wear out or get old, they will be used for cow feed. ‘Bossy,’ he said, ‘will take charge of those unsightly junk piles at the edges of cities.’”

“Is it possible that a cast-off plastic—say a broken ash tray or a smashed electrical casing—really is food for cows as well as goats? Do the vitamin content, the juiciness and

minerals of the succulent soybeans, etc. linger in the hard and varnished products of the chemist’s art?... Or it may be Mr. Bolander is breeding a special sort of cow with a special digestive apparatus. We pause for further enlightenment.”

309. *Ann Arbor News (Michigan)*.1941. Ford displays plastic car at Dearborn festival. Aug. 14. *

310. Associated Press (AP). 1941. Ford brings out plastic auto body: Result of 12 years’ laboratory work; impact strength greater than steel. *Evening News (Monroe, Michigan)*. Aug. 14.

• **Summary:** The plastic body is composed of approximately 70% cellulose and 30% resin binder. The mixture is pre-formed through a suction device and then moulded under 1,500 pounds of pressure per square inch.

Note: This AP story appeared in hundreds of daily newspapers across America (and especially in Michigan) on August 14, 1941. On the same day the United Press (U.P.) ran a story (see *Detroit News*, Aug. 14) about how automobile industry leaders had met with U.S. government officials to discuss ways of conserving and possible substitutes for various metals needed to help fight the war in Europe. Soyfoods Center owns copies of the AP “plastic car” article from: Argus Press (Owosso, Michigan), Bay City Times (Michigan), Benton Harbor News-Palladium (Michigan), Daily News (Ludington, Michigan), Daily Telegram (Adrian, Michigan), Herald-Press (St. Joseph, Michigan), Marquette Mining Journal (Michigan).

311. *Cheboygan News (Michigan)*.1941. Henry Ford's plastic car. Aug. 14. *

• **Summary:** The newspaper, alas, had to pass on the depressing news that its area could contribute little to the cars of the future, such as Henry Ford's experimental plastic car. "It is hard to get soybeans to mature here... Planting earlier might prove the solution." The *News*, however, offered a ray of hope: "Resin for plastics is made from pine pitch, and Cheboygan county might produce some of that."

312. *Dearborn Press (Michigan)*.1941. Dearborn Day audience first to see plastic car. Aug. 14. *

313. *Detroit Free Press*.1941. Ford's exhibits plastic auto at Dearborn fete: Dream car portends start of new era. Aug. 14.

• **Summary:** The car's is made of plastic composed of 70% cellulose fiber and 30% resin binder. The surface looks like polished steel. Address: Michigan.

314. *Detroit News*.1941. Dearborn Day--Henry Ford introduces a plastic auto. Aug. 14.

• **Summary:** Photos show: (1) "Part of the crowd of more than 20,000 persons who filled the natural amphitheater of Ford Field to see the pageant, 'Defenders of Democracy,' which was the highlight of Dearborn's fifteenth annual community festival." (2) America's founding fathers, in white wigs, seated around a table.

315. *Detroit Times-Red Line Edition*.1941. The preview of Ford's new plastic car. Aug. 14.

• **Summary:** A large photo shows "Designer Lowell E. Burly [sic, Overly] at the wheel of the car Henry Ford 'grew from the soil.'" The cream-colored, two-door sedan weighs 2,000 pounds as against 3,000 for steel. "The only steel in the body, the result of eight years of research and study, is found in the tubular frame which holds 14 plastic panels, said to be 10 times stronger than steel."

316. *Detroit Times*.1941. Ford's plastic car: 25,000 at Dearborn festival see trial spin of new auto which Henry "grew from the soil." Aug. 14.

• **Summary:** "The occasion was Dearborn's fifteenth annual festival but to approximately 25,000 persons the attraction was Henry Ford's new plastic automobile. Throughout Wednesday, throngs were entertained by pageantry at Ford Field in Dearborn but greatest thrill came when a cream-colored sedan took a trial spin."

"Robert A. Boyer, 31-year-old Ford research chemist, has been working on the newest model since 1934." Note: This article also appeared in the *Detroit Times Red Line* edition on the same day.

317. *New York Herald Tribune*.1941. Ford presents new car with body of plastic. Aug. 14. *

318. *New York J. of Commerce*.1941. Plastic automobile unveiled by Ford. Aug. 14. *

319. *New York Times*.1941. Ford shows auto built of plastic: Strong material derived from soy beans, wheat, corn is used for body and fenders. Saving of steel is cited. Car is 1,000 pounds lighter than metal ones--12 years of research developed it. Aug. 14. p. 19.

• **Summary:** "Dearborn, Michigan. Aug. 13. Ford Motor Company officials unveiled tonight Henry Ford's first plastic automobile at the annual community festival of this city. More than 10,000 spectators were present.

"The showing came as a surprise at the annual Dearborn Day celebration and was a climax to twelve years of research by twenty-nine young scientists whom Mr. Ford had commissioned to find out about 'using agricultural products in industry.' The car, mounted on a tubular-welded steel frame, has a super-structure made of a plastic which was said to be superior to steel in everything but tensile strength. Its manufacture on a mass-production basis, Ford officials said, would provide for widespread use of agricultural products, such as cotton, wheat, soybeans and corn, and huge savings of steel."

Henry Ford is now age 73 and more than 29 million automobiles have rolled off his production lines. "The model displayed tonight was powered with a 60-horsepower Ford V-8 engine. It was pointed out that the plastic material would absorb a blow ten times as great as steel without denting... Mr. Boyer said: 'If we made a million automobiles a year with plastic bodies, we would consume... 100,000 bales of cotton, 500,000 bushels of wheat, 700,000 bushels of soy beans and 500,000 bushels of corn.'"

Mr. Ford "said that the plastic body weighs nearly 2,000 pounds, while a steel unit of comparable size weighs about 3,000 pounds."

Note: This is the earliest document seen that mentions "mass production" in connection with Henry Ford.

320. *United Press (UP)*. 1941. Ford unveils 1st plastic car, lighter, cheaper: Production at rate of million annually forecast at Dearborn. *New York World-Telegram*. Aug. 14.

• **Summary:** The cream-colored coach was unveiled last night at the climax of Dearborn's 15th annual festival. "Mr. Ford wasn't there to hear the cheers as the low-slung machine swung slowly around the lighted field, but Robert Allen Boyer, his young research chemist who for 12 years has been experimenting with the manufacturer's idea of utilizing farm products in industry, was. Mr. Boyer, only 32, said the plastic car was lighter, tougher and more economical than any on the road. He thought its production in large quantities is 'at least' several months--and possibly years--away." Boyer noted that "the defense emergency and the shortage of steel and other materials has speeded our program." Officials would

not reveal the formula for the plastic used.

"Production of 1,000,000 cars annually with plastic bodies,' Boyer said, 'would consume at least 170,000 tons of agricultural products and 50,000 tons of synthetic chemicals. Moreover, it would free thousands of tons of steels and strategic materials for defense.'" Lloyd [sic, Lowell] E. Overly, an associate of Boyer, noted that Henry Ford seemed very pleased with the car.

Note: This United Press (U.P.) story appeared in many daily newspapers across America (and especially in Michigan) on August 14, 1941. This story was written by United Press staff correspondent Anthony G. de Lorenzo, but his name was omitted in many articles. On the same day the U.P. ran a story (see *Detroit News*, Aug. 14) about how automobile industry leaders had met with U.S. government officials to discuss ways of conserving, and possible substitutes for, various metals needed to help fight the war in Europe. Soyfoods Center also owns copies of the U.P. "plastic car" article from: *Battlecreek Enquirer-News* (Battle Creek, Michigan), *Muskegon Chronicle*, etc.

321. *Cleveland Press (Ohio)*.1941. Henry Ford has unveiled a car with a plastic body. Aug. 15.

• **Summary:** "The plastic body, which weighs less than half as much as a steel body, is made from a mixture of synthetic resin mixed with the fibrous material derived from wheat, flax and hemp. Just why Henry didn't use spinach is beyond us."

322. *Herald and Review (Decatur, Illinois)*.1941. Plastic cars, at last. Aug. 17. *

• **Summary:** Said of Henry Ford's experimental plastic car, "here is something an America on wheels has been waiting for. Please hurry it, Mr. Ford; hurry, hurry!"

323. *Indianapolis Star*.1941. Plastic auto body. Aug. 17. *

• **Summary:** Looked up Henry Ford's experimental plastic car as "an outstanding industrial achievement... an artistic triumph, no matter what the future may bring."

324. *New York Times*.1941. The plastic car. Aug. 17. Section IV. p. 6.

• **Summary:** Discusses the amount of various agricultural products that would be needed to manufacture 1 million plastic cars—including 700,000 bushels of soybeans.

325. *Bristol Press (Connecticut)*.1941. Garden on wheels. Aug. 18. *

• **Summary:** Concerning Henry Ford's experimental plastic car, the newspaper noted that the plastic was "dent resistant," and suggested that it might be used for battleship armor.

326. *Wheeling Intelligencer (West Virginia)*.1941. The American way. Aug. 18. *

• **Summary:** Predicted that Ford's experimental plastic car "will revolutionize the automobile industry."

327. *Arkansas City Tribune (Kansas)*.1941. A ride in vegetable bodies. Aug. 21. p. 2.

• **Summary:** "Ford displayed a new plastic motor car body last week, which he said to be stronger than steel one. He took an ax and struck it some resounding blows without leaving even a dent. Ingredients of the plastic material are cotton, wheat, soybeans, corn; cane and numerous garden products.

"A few years hence mi-lady may go to the salesrooms and demand that she have a sedan body made from garden radishes, and reject the one that was created from spinach, just because her father made her eat it when she was a child.

"The motor car manufacturer probably gained his ideas for future coach work from the story of Cinderella who went to the dance in a carriage created by the good fairy from a pumpkin."

"While it may seem funny to say: 'Let's take a ride in our new 'lettuce' car,' the world has only admiration and respect for Henry Ford, who like Edison, will leave so many testimonies of greatness and gifts to the masses by having put within their reach pleasures that otherwise would have been denied them."

328. *Cedar Rapids Gazette (Iowa)*.1941. Growing your auto. Aug. 21. *

• **Summary:** Suggests that the auto slogan of the future might be "ask the man who grows one."

329. *Detroit Legal Courier*.1941. Plastic airplanes next. Aug. 22. *

• **Summary:** The author believes that "when history is written and the achievements of Henry Ford are chronicled, the Soy Bean victory will stand out as his foremost contribution to mankind."

330. *Newsweek*.1941. Ford from the farm. Aug. 25. p. 39-40.

331. *San Diego Union*.1941. Ford tries another miracle. Aug. 25. *

• **Summary:** This article regards Henry Ford's intention to convert farm products to industrial uses as "more revolutionary than that which gave birth to the flivver," and predicted that Ford's experimental plastic car "may well bring about something in the nature of a highly desirable and peaceful agricultural revolution."

332. *Time*.1941. Plastic Ford unveiled. Aug. 25. p. 63.

• **Summary:** "The first plastic car was shown by Henry Ford in Dearborn [Michigan] last week. It was the product of his own long dream—that industry should use more farm crops—and of the chemical inventiveness of his protégé, 32-year-old

Robert Allen Boyer. His plastic, 70% cellulose with a resin binder, is made of soybeans, wheat, cotton, hides, plus a few imported, now hard-to-get ingredients... Last fall Boyer turned out a few panels, had his lanky boss whang at them harmlessly with an ax (see cut), was overjoyed when Ford gave him the go-ahead for a complete car. Chemist Boyer last week hoped for 'limited production' by 1943."

A photo shows Henry Ford striking the trunk of his farm-grown car with an ax. *Time* was the first famous magazine to print this famous photo.

333. *Mining Gazette (Houghton, Michigan)*. 1941. Here's how farm crops figure in producing autos. Aug. 26.

• **Summary:** "The automobile industry is one of the farmer's best customers, according to a report based on the extensive use of farm products by the Ford Motor company in building cars and trucks. It is estimated that for each 1,000,000 units it manufactures, Ford needs from the American farmer the following agricultural items: Cotton-69,300,000 pounds or the annual output of 433,125 acres. Wool-3,204,000 pounds or the wool from approximately 801,000 sheep. Wood-112,000,000 board feet or 20,500 acres of forestlands. Cattle-30,000 head to provide 1,500,000 square feet of leather. Soybeans-600,000 bushels."

Figures are also given for flax, tung oil, hogs, corn, wheat, goats, jute, pine pitch, sugar cane, honey bees, castor oil, beeswax.

"Soybeans have many uses in the Ford industries due to the pioneering efforts of Henry Ford in trying to find more and better uses for farm products in his plants. Chief among them are in the body finishes [paints], moulded electrical parts, and core oil and bond in the foundry."

334. Sullivan, Frank. 1941. Frank Sullivan studies the Ford of the future, finds it edible. *PM (New York City)*. Aug. 26.

• **Summary:** "Henry Ford estimates that he can make a million of his new plastic cars from 500,000 bushels of wheat, 500,000 bushels of corn, and 700,000 bushels of soy beans. Mr. Ford's new car is a fine idea and may well revolutionize the industry. A car made of corn, wheat and beans would have many advantages, of which the following are a few:

"It will need no gas. Just sprinkle a little salt, pepper and vinegar on it, and it will go to beat hell.

"In case of a head-on collision, instead of an unsightly heap of scrap iron, there would be a mess of delicious succotash.

"A man needn't buy a new car every year. He could have his last year's car warmed over.

"W.J. Cameron would either have to go to cooking school or yield his place on the Ford Hour to Fannie Farmer.

"A man could eat his car and have it too.

"The vegetable car would also have its disadvantages. For one, it would produce an avalanche of new Ford jokes, of which the following are examples:

"Joke No. 1. Farmer Corntassel-What crops ye growing this year, Zeke-Fords or Chryslers?

"Farmer Hayseed-Wall, if this corn don't git some rain pretty soon, the best I'll be able to do will be a crop of Baby Austins.

"Joke No. 2. Auto Dealer (to customer who has just bought new succotash car)-Mr. Gossplotch, in my opinion you've got a mighty good little car here. Shall I send it home for your?

"Customer-No thanks, I'll eat it here.

"Joke No. 3. Mother (to recalcitrant small son)-Now eat your succotash, Freddy, like a good boy.

"Small son-I say it's a flivver and I say the hell with it!"

335. Pooler, James S. 1941. Crowds from city and farm get together at state fair: Michigan melting pot. *Detroit Free Press*. Aug. 29. p. 1-2.

• **Summary:** "Having provided something of a link himself between industry and agriculture, Henry Ford was among those who visited the fair Thursday. He was accompanied by Edsel Ford and a group of friends. He visited the Ford display, where the Ford plastic car, made from farm products, was on display, as well as the near-by plot where the company has a growing soy-bean display from which the plastics are formed. He had little to say other than to observe, 'Its a fine thing to go back to the land.'" 500,000 people are expected to attend the fair this year. Address: Free Press staff writer.

336. *Times (Morning ed.) (Chattanooga, Tennessee)*. 1941. The lowly soybean rises. Aug. 29.

• **Summary:** "Most people don't know what soybean are. They associate them, rather loosely and vaguely, with cover crops on farm hillsides. Something cows eat, maybe. But the lowly soybean may hold the future of the world health in its little husk.

"Henry Ford has been experimenting with soybeans down on his Ways (Georgia) plantation for many years. He has grown a lot of soybeans and has turned them into plastic things. Mr Ford, it is said, drinks soybean milk. It is healthful.

"Over at the Madison (Tennessee) sanitarium they grow a lot of soybeans, too. The doctors at Madison have found out how to make the soybean look like beefsteak. It not only resembles steak, but it tastes like steak. The soybean is a fine source of protein. So is steak, but the soybean is said to have steak beaten for the most proteins. The Germans have been using the soybean in their blitzkrieg tactics. The Nazi soldiers have been partly on a soybean diet since the war began."

337. *Spartanburg Herald (South Carolina)*. 1941. Plastic coffins. Aug. 30. *

• **Summary:** The author believes that Henry Ford "might find greater profit in the manufacture of coffins than in automobile bodies." The paper declared that "Plastic coffins would be lighter, more durable and as attractive as the present

metal things, and they could be made at far less cost.”

338. Goss, W.H. 1941. Technological problems in processing soybeans. 3. Solvents for soybean oil extraction. *Soybean Digest*. Aug. p. 4-5.

• **Summary:** All commercial soybean solvent extraction plants in the world except one use a petroleum fraction. The single exception is plant in Dairen, Manchuria, using absolute ethyl alcohol and the hot alcohol process. In the USA, most of the solvent consists of hexanes—which are very flammable, explosive, and hazardous.

“Many solvents have been proposed and used experimentally in efforts to reduce the danger of extractor operation. Of these, the chlorinated hydrocarbons have received a great deal of attention. The R. and H. Chemicals Department of the E.I. du Pont de Nemours and Company, Inc. has developed an extraction system particularly suited to trichloroethylene. It consists of an inclined helical conveyor which carries the flakes downward against a rising stream of solvent. Its operation is approximately the reverse of that employed in the Ford extractor since, unlike hexane, trichloroethylene is heavier than soybean oil.

Hexane is the cheapest solvent. Although trichloroethylene is relatively expensive, it is entirely nonflammable and non-explosive; it is used in the extraction of caffeine from coffee.

The so-called “hot alcohol” process is used by the Manchuria Soybean Industry Co., which operates a large extraction plant at Dairen. The plant’s capacity is about 100 tons/day of soybeans, which are processed in a battery of rotary extractors. The solvent is 99.8% ethyl alcohol, which is dehydrated at the plant. The beans are selected, cleaned, then warmed slightly before flaking. “Since absolute ethyl alcohol is a dehydrating agent and loses its solvent power toward soybean oil in the presence of water, the flaked beans are dried prior to extraction. They are then charged into the extraction battery and leached with the hot alcohol under pressure.” At temperatures above about 150°F, soybean oil dissolves in the alcohol; a homogeneous solution is obtained. The resulting miscella is cooled and pumped into a conical separating tank, where oil containing 5% alcohol collects on the bottom. It is drawn off, and the solvent is removed in an evaporator, etc. “The principal advantage of the alcohol extraction method is the ease of byproduct recovery.

A table shows the properties of normal hexane, ethyl alcohol, and trichloroethylene: Chemical formula, boiling range, and specific gravity [relative density]. Address: Chemical Engineer, U.S. Regional Soybean Industrial Products Lab.

339. Wells, Linton. 1941. The farmer grows a car. *Ford Summer Hour*. Sept. 7. 3 p. (Dearborn, Michigan: Ford Motor Co.).

• **Summary:** This is the transcript of a radio broadcast

presented on 7 Sept. 1941 as part of the Ford Summer Hour. The fabrication of every million Ford V-8s requires “enormous quantities of soy beans.”

“Twenty years ago, Henry Ford predicted that the day would come when we would see automobiles grown on a farm. The skeptics smiled, but the industrialist was born and raised on a farm within eyesight of the great Rouge Plant.”

“Then, a few weeks ago, the Ford Motor Company’s research and production engineers fulfilled Mr. Ford’s 20-year-old forecast. They created an automobile body made of plastic material whose principal ingredients came from American farms: wheat, flax, cotton, hemp, and slashed pine pulp. After being mixed with a synthetic chemical binder, this cellulose fiber was molded into fourteen panels and attached to a tubular steel frame. The result was a streamlined automobile which weighs 1,000 pounds less than a comparable standard steel-built Ford car..

“Rouge Plant engineers say this new plastic material is superior to steel in every respect but tensile strength, which difference is considered relatively unimportant.”

David L. Lewis (1976, p. 329) notes that during the summers of 1939, 1940, and 1941, the Ford Motor Co. presented the Ford Summer Hour, a program of light music. Broadcast over CBS from 8 to 9 P.M. (Eastern Standard Time), it featured currently popular songs and selections from musical comedies and operettas. During the intermission a “Rouge Reporter” discussed Ford-related subjects, including the firm’s interest in soybean research. “The Hour, one of the most popular of summertime programs, reached an average audience of 9,000,000 people per broadcast. Its average annual cost was \$336,000.” Address: Commentator, Ford Motor Co., Dearborn, Michigan.

340. English, David C. 1941. George Washington Carver: A great chemist and a great man. *Herald (Edison Inst., Dearborn, Michigan)* 8(17):19. Sept. 26.

• **Summary:** This very nice but brief biography of Dr. Carver also discusses Booker T. Washington, Tuskegee Institute, research on peanuts, etc. In May 1937 Dr. Carver attended a chapel service in Greenfield Village and spoke to the pupils afterwards. Photos show: (1) Dr. Carver “with the finished standard upholstery material made of 30 per cent soy-bean fiber.” (2) Dr. Carver examining “some soy-bean fiber”—taken during his visit to the Village Chemical Laboratory.

341. Burns, W. 1941. The soybean—Its politics, performances and possibilities. *Indian Farming* 2(9):451-57. Sept. [7 ref]

• **Summary:** The author contends that soybeans should be cultivated and used on a large scale in India. Contains an excellent, early review of the history and past agronomic investigations of the soybean in India. Contents: Introduction. Wide range of uses. Soybean production. Iron ration. Spread in the U.S.A. Commercial exploitation. In the British Empire. Soybeans in Germany. Nutritive value.

A strange fact. Comprehensive tests. Doubtful palatability. Points for consideration. Preparation of recipes (Note: No actual recipes are given). Cultivation of soybean in India. Cultivation procedure. Some non-official experience.

"In the British Empire: In 1908 when the first large-scale importations began to be made into Europe, soybean was admitted into England without tariff, while other countries imposed an import duty. When the other countries recognized the disadvantages of this imposition they cancelled it and England then lost its premier place as a soybean importer. England withdrew soybean from its free list in 1935 in order to give effect to the principle of Imperial preference. Sir Philip Cunliffe-Lister, then Secretary of State for the Colonies, emphasized that every colony producing palm kernels, groundnuts or soya beans had asked for this preference owing to the increasing competition in soybeans. He hoped that the preference would stimulate the production of soybeans in the territories concerned. There was certainly ground for hope that there might be commercial production of soybeans within the Empire.

"The story of the successful introduction and cultivation of soybean in England is told by Elizabeth Bowdidge in a book *The Soya Bean* (Oxford University Press, London, 1935). This success was obtained by Mr. North on the Ford Company's farm at Boreham in Essex in 1933 and 1934. Soil inoculation and plant acclimatization were necessary but success was obtained and yields of from 15 to 25 bushels were got. Soybean cultivation has not yet, however, spread in England. As an imported crop it has been used as a food for farm animals, and until the outbreak of the present war a large part of the imports was converted into flour, oil, etc. as well.

"Soybeans in Germany: Under the auspices of the Forschungsdiest (the All-Germany Agricultural Research Organization) research on soybean in Germany was much speeded up in the years 1934-37. Attempts to introduce soybean into German cultivation had up till then been a failure, mainly for the same reason that keeps it from spreading in India, i.e. its low price on the world market. The fixing of a more attractive price for soybeans grown in Germany and a greater appreciation of their nutritive value put a different complexion on the matter. Scientific work has been mainly in the direction of plant breeding, one institution dealing with no less than 30,000 single plant cultures. The plant breeding work has shown that the supposed antagonism between high fat and high oil content does not always exist, and that it may be possible to breed varieties that are high in both.

"On the agricultural side the following are some of the results obtained [in Germany]: (1) Drill sowing is better than broadcasting. (2) Thick sowing accelerates maturity. Breadth between rows should not exceed 50 cm. (= 20 inches). The lighter the soil, the smaller the space between the lines, but not less than 35 cm. (= 14 inches). In the rows

the best distance between plants is 10 cm. (= 4 inches). (3) Seed rate should not be less than 15 kilograms per ¼ hectare (67 lb. per acre). (4) Soybeans can be successfully grown as a mixed crop with early potatoes. It is to be noted that these recommendations are for German conditions and might not suit India."

The author recently received a letter from an agricultural chemist who noted a strange fact: "I find that the explanation of why soybeans are not more widely grown than they are, in India, is because there is no market for them. Now in these days of deficient dietaries, financial stringency and other economic factors connected to the War, it does seem to me to be a very strange fact that there is no market for one of the most nutritious foodstuffs both for humans and animals in this country... Here is a produce which can be easily grown, easily transported, without deterioration, and for which in these days there ought to be an almost unlimited demand and yet it is not grown because we are told there is no market for it. I myself take soybean in vegetable curry two or three times a week and it is a most excellent food... We ought to be supplying this to the army in large quantities. In addition there are many industrial products which can be manufactured from the soybean and which are manufactured in other countries but not in India. I suggest that we ought to consider the soybean for India and get down to the problem of propaganda and the production of the soybean and soybean products on a considerable scale."

"Preparation of recipes: There are two ways by which soybean could be introduced into the Indian dietary. The bean might be prepared and cooked by domestic methods and consumed as an alternative or addition to other pulses... Alternatively, soybean flour of neutral taste could be manufactured [using the Berczeller process], as in Germany, and used as an ingredient in biscuits, cakes, etc." The author doubts that either approach would succeed. "In addition to the Darjeeling district of North Bengal, soybean is grown also in Nepal, Bhutan and Sikkim, the total area in all these places being probably about 20,000 acres. It is also grown in the Kumaun hills. In addition there has been experimental cultivation in almost every part of India and soybean has been grown in the Punjab, Bengal, Bihar, Orissa, Assam, the Central Provinces and Berar, Madras, Bombay, Baroda, the United Provinces, Sind, Mysore and Kashmir. The Agricultural Departments of several of these provinces and states have issued leaflets giving directions for its cultivation."

"Some non-official experience: Mr. M.R. Dokras, LL.B., of Chandur, Berar, published a small pamphlet in which he gave his experience of growing soybean since 1916." Seed yields ranged from 500 to 2,000 lb/acre. "Mr. George A.C. Hearsey has, since 1936, grown soybeans on his place—Palia Ranch, near Palia Kalan Station, R. & K. Railway, Oudh. In 1937 he harvested 185 maunds from 45 acres, an average of just over 4 maunds (330 lb.) per acre... His dairy cows ate greedily the dried soybean plants and soybean *bhusa*. "In 1940 Dr. W.

Thompson, of St. Luke's Hospital, Chabua, Upper Assam, grew for the first time soybean supplied by the Assistant Director of Agriculture, Shillong. Two sowings done in August ripened together and gave a heavy yield.

"Economics: In 1934 a Crop Planning Conference was called in Simla by the Government of India, when consideration among other things was given as to what new or substitute crops should be encouraged. Notes were submitted by various Directors some of which reported that soybean could be grown quite well in their provinces or states but that the price was so low that it was not worth while to try to produce it." In 1934 the Director of Agriculture from Sind (Karachi), and from Punjab each made such a statement. "It is not an impossibility to introduce a new crop into India (the history of groundnut in India shows this) but the new crop must put more money in the pocket of the cultivator than the crop it is going to replace." Address: C.I.E., D.Sc., I.A.S., Agricultural Commissioner with the Government of India.

342. *Modern Plastics*. 1941. Ford builds a plastic auto body. 19(1):38-40, 78. Sept.

• **Summary:** "Our work was started on the plastic car last December," said Robert Boyer. The car with the welded tubular frame and plastic body weighs about 2,000 pounds. A steel unit of comparable size weighs approximately 3,000 pounds. Henry Ford said, "Plastic raw materials may cost a little more, but we anticipate a considerable saving as a result of fewer fabricating and finishing operations."

Photos show: (1) The welded tubular car frame with the engine and tires in place. (2) Ford and Boyer standing to the left of the white car with a Dearborn license plate, and production of the plastic panels from fibers and resins.

343. Ramseyer, D.R. 1941. Ford develops soybean upholstery fiber. *Soybean Digest*. Sept. p. 12, 18.

• **Summary:** The project that has advanced most rapidly during the last year at the Ford Motor Co. "is the development of synthetic fibers from soybeans. These wool-like fibers are made from the protein fraction of the soybeans." The five steps in the production process are discussed. The solution of protein, extracted from the oil-free meal, is clarified by continuous self-cleaning centrifuges. The clarified protein solution is then precipitated with an acid, washed, filtered, and dried. This dried protein is dissolved to produce a very viscose, stringy solution. After aging, it is pumped through a filter and then through "spinnerettes into a coagulating bath where the stringy solution is coagulated into threads. The coagulated threads are the wound on a reel; at present we are using spinnerettes with 500 holes.

"During this winding process the fibers are run over Godet wheels. The second wheel turns faster than the first, thereby causing a stretching of the fibers. This is an important operation, as the stretching orients the molecules and

produces a strong pliable fiber." The stretched fiber is then treated with formaldehyde to set it; it is cut into fixed lengths and dried under closely controlled conditions. Finally the fiber is spun into yarn, then put through a picker and blender, then through a carding machine, then through a warping machine to give it its primary twisting and to blend in other fibers such as wool, rayon, and silk. The warped fiber goes to the final spinning frame and a loom makes it into finished upholstery cloth.

"Successful blends using 40 per cent soy and 60 per cent cotton have been made. We have tested suiting material using 30 per cent soy fiber. Tests on upholstery containing 30 per cent soy fiber are very promising. At present we are installing equipment to produce 1,000 pounds per day and process it into finished cloth. Felt manufacturers are very much interested in this development. A 50 per cent blend of soybean fiber has proven to be equal to the felt now available for hats."

Note 1. Felt is a process, not a fiber. Felt was traditionally made of wool and fur often mixed with natural or synthetic fibers through the action of heat, moisture, chemicals, and pressure.

Note 2. This is the earliest document seen that mentions the word "felt" in connection with Ford's work with soybean fiber. Felt would soon become the first commercial outlet for this fiber. Address: Ford Motor Co.

344. Williams, Simon; Tonn, W.H. 1941. Qualitative methods of identifying soybean fibers in mixtures of casein fiber, wool, or other textile fiber. *Rayon Textile Monthly* 22:523-24. Sept. [8 ref]

• **Summary:** The author first obtained soybean fiber from (1) the Engineering laboratories of the Ford Motor Company, Dearborn, Michigan, (2) The Glidden Company, Cleveland, Ohio, (3) United States Soybean Laboratory, Urbana, Illinois, through the courtesy of the A.E. Staley Manufacturing Company, Decatur, Illinois. He then developed a number of color tests for distinguishing these soybean fibers from Aralac (pigmented or non-pigmented), Lanital, wool, silk, and nylon. These were: Alpha-naphthol hypobromite test for arginine, ninhydrine test for beta-alanine, Adamkiewicz test for tryptophane, vanillin test for tryptophane, Morse test for hydroxy-proline, solubility in 18% sodium hydroxide (1 hour hot), and sulphur test for cystine. Address: 1. Research Technologist; 2. Research Asst. Both: Bureau of Industrial Chemistry, Univ. of Texas, Austin, Texas.

345. Arnold, L.K. 1941. A call for community plants [using solvent extraction]. *Soybean Digest*. Oct. p. 4-5, 12.

• **Summary:** Contents: Introduction. Close to supply (5-25 tons/day of soybeans). Oil amount important (4 reasons for choosing trichloroethylene as a solvent for small plants). Counter current (the Ford system; it cannot use trichloroethylene). Meal driers. Address: Iowa State College,

Ames.

346. Re: Experimental work with plastics, soybean protein fiber, vegetable milk, etc. 1941. Dearborn, Michigan. 2 p. Dec. 4. Unpublished typescript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453.

• **Summary:** "Plastics: Plastics for use in structural applications has occupied much of our attention in the laboratory during the last few years." Formulas for these plastics are generally based on the use of cellulose fibers held together and waterproofed with phenolic resin. Mass product methods have been developed; forming the slurry with a "vacuum mold has shown the most promise. A complete automobile body was made by this method this summer.

"Soybean protein fiber: Our work with the soybean led us a few years ago into the development of a synthetic fiber from the soybean protein. This development has now reached the point where the fiber is suitable for many commercial uses such as the manufacture of felt for mens [sic, men's] hats and for the blending with wool and mohair [goat's hair] for the manufacture of automobile upholstery." The steps for making this fiber are described briefly. "The resulting fibers have will like characteristics and at the present time have about 80% the strength of upholstery grade wool. This procedure has been used on other vegetable proteins such as peanuts and wheat. The peanut protein has given very promising results to date."

"Vegetable milk: Recently a project to develop a vegetable milk to replace cows milk was undertaken. Tests conducted with the Henry Ford Hospital show that rats can live and reproduce for five generations on nothing but a soybean milk. The problem today is to produce a milk that will taste equally as good as cows milk."

"Miscellaneous protein uses: Our work with the soybean protein in the fiber job has led us into other possible uses for the vegetable protein such as a base for water paint, a paper sizing material to substitute for milk casein and as a material for making transparent films. Because of the defense program milk casein is becoming very scarce and expensive and it is imperative that some substitute be found. To date the soybean protein is showing increasing promise of being an excellent substitute. Likewise if the protein is spread in a film under certain conditions a transparent film similar to cellophane can be produced. We are at present experimenting with a small laboratory machine for preparing transparent films from soybean and other vegetable proteins."

Also discusses: Recovery of iron from low grade ores, new sources of magnesium, possible industrial uses of wheat, preservation of fruits and flowers, artificial parts for the human body [prosthesis].

Ford R. Bryan (Jan. 1993) is quite certain that R.H. McCarroll was the author of this document; he "was instructed to keep Carver apprised of Ford research

programs. McCarroll was 'Chief Chemist' of the Ford Motor Co., and spokesman for Ford research in general." Address: Dearborn, Michigan.

347. *Detroit News*. 1941. Ford to spin bean fiber: New material to cost less than wool. Dec. 21. Section 1. p. 13, col. 8.

• **Summary:** "A soybean fiber, which can be manufactured for 'considerably less than half the cost of sheep's wool,' is ready for production," the Ford Motor Co. announced Saturday. Ford has operated a pilot mill for several months at its Highland Park plant; the company is now moving the entire operation to Dearborn where it will occupy part of a new building opposite the Ford airport. Production will be limited to about 1,000 lb/day for the time being. It is expected to replace about 25% of the sheep's wool in auto upholstery, for which its natural crimp and high resiliency make it especially suitable.

The new material represents several years of research in Henry Ford's effort to forge a partnership between agriculture and industry.

Ford officials said that, as far as they know, this fiber is the first produced from the protein of a plant. Similar fibers have been made from proteins of animal origin.

To make the fiber, soy protein, extracted from oil-free meal, "is forced through a 500-hole spinneret."

348. *Detroit Times*. 1941. Soybean suit delights Ford. Dec. 21. *

• **Summary:** Henry Ford made a public appearance in his new "soybean suit" with which "he is as delighted as a boy in his first pair of long pants."

349. *New York Times*. 1941. Ford ready to make a fiber of soybeans: New mill at Dearborn will be devoted to converting crop. Dec. 25. p. 6, col. 4.

• **Summary:** "The Ford Motor Company announced today that it was ready to begin limited production of synthetic fiber developed from soybeans. The fiber is similar to sheep's wool... For several months the company has been operating at its Highland Park plant a 'pilot' mill capable of spinning upward of 1,000 pounds of the fiber a day." The entire operation "is being moved to Dearborn, where it will occupy part of a new building opposite the Ford airport. For the present the fiber production rate will be about 1,000 pounds a day, according to company officials.

"The synthetic fiber is said to be best used when blended with sheep's wool. The fiber, which Ford officials said could be produced for considerably less than half the cost of sheep's wool, probably will be used at first in upholstery, and eventually in many other ways."

350. *Ledger-Dispatch (Norfolk, Virginia)*. 1941. Ford produces soybean fiber—New products can be used in upholstery. Dec. 27. *

351. Smith, Robert A. 1941. Re: Experimental work with soy bean milk, etc. Moore [sic, Moir] House Lab., Dearborn, Michigan. 2 p. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453.

• **Summary:** "Soy bean milk: A method was developed for the preparation of soy milk that differs from other soy milks on the market. The milk is prepared from purified soy protein, hydrogenated soy oil and corn sugar. It is more like cows milk in appearance, taste and chemical composition than other soy milk products which are made from the whole bean. It has been tested in the nutrition laboratory of the Ford Hospital in rat feeding tests and when supplemented with the proper vitamins, has produced normal growth when fed exclusively to rats for four generations.

"pH instrument: To aid in the production of soy bean milk and for general laboratory work, a glass electrode pH instrument was designed and constructed. The circuit, which uses for the most part standard radio parts has proven to be accurate, rugged, dependable and easily used."

Also discusses research on water sterilization, fertilizers (synthetic manure vs. composted grass cuttings, and using waste materials), soil analysis, furnace, weeds (fibrous weeds were tested for their fiber strength and retting qualities for use in cellulose plastic). Note: To "ret" is to soak (as flax) to loosen the fiber from the woody tissue. Address: Dearborn, Michigan.

352. Photographs of Henry Ford and Robert Boyer standing near the white "plastic" car. 1941.

• **Summary:** Ford and Boyer standing (at right of photo) behind the left front fender of the white "plastic" car, whose license plate reads "Dearborn, Mich. 8-13 1941" (Negative number: P189-16351) (see next page).

Another photo (taken the same day) of Ford and Boyer standing by the white plastic car. This time they are standing (at left of photo) behind the car's right front fender (Negative number: 189.16352).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

353. Ford Motor Co. 1941. The news review of 1941 (World War II activities) (Motion picture). Dearborn, Michigan. 680 ft., silent, black-and-white, 35 mm. No captions. *

• **Summary:** Shows: Edsel Ford and Charles Sorenson. The 29 millionth Ford, a station wagon with Red Cross emblem on side. Robert Boyer, research director of Ford Motor Co., in Chemistry Laboratory talking with another man. Boyer picking up a handful of soy beans and the two men examining them. Dinner table, man at microphone presenting key to Robert Boyer. Group at table standing and applauding Boyer, who then speaks. Boyer and another man standing beside Ford experimental soy bean plastic

automobile covered with snow. Boyer repeatedly striking trunk of car with sledge hammer. Another person wiping gloved hand across trunk to show that no damage was done. Experimental car driven past Ford Rotunda. Henry Ford beside Liberator Bomber on air field. Address: Dearborn, Michigan.

354. Mauersberger, Herbert R. 1941. The new synthetic textile fibers: Soybean filaments and fibers. *Smithsonian Institution, Annual Report* p. 211-19. For the year 1941.

• **Summary:** Contents: Introduction. Nylon. Aralac (from Casein). Soybean filaments and fibers. Fibers from corn. Fibroin filaments. Nylon is a generic name chosen by the du Pont Co. They began research on nylon in 1928 and announced that it was successful on 27 Oct. 1938. Today 4 million lb/year are made and 90% goes into the manufacture of women's stockings.

"Heberlein & Co., back in 1929, submitted the extracted protein from soybean to a swelling operation with water under pressure and heat or a dilute acid with simultaneous treatment with phenols, after which the filaments are formed by extrusion in the usual manner. In this country, the first announcement of research work on the production of a synthetic textile fiber from soybean pulp came with the opening of the World's Fair in 1939. A part of the Ford exhibit was devoted to its manufacture. The Dearborn Laboratories of the Ford Motor Co. [in Michigan] had been working since 1937 on the idea of producing a synthetic textile fiber that would simulate wool very closely...

"Later the Glidden Co. at Chicago set up a pilot plant for experimental purposes of fiber production for the textile trade... Soybean fiber is about four times weaker than wool when dry and approximately eight times weaker than wool when wet... Hence, the only deficiency is its tensile strength; the filaments and fibers otherwise show remarkable qualities. I am informed that in more recent samples from Ford and Glidden the strength had been improved." Address: Technical editor, *Reyon Textile Monthly*.

355. *Business Week*. 1942. Soybean synthetic. Jan. 3. p. 42.

• **Summary:** A new wool-like synthetic fiber for textiles is being made by the Ford Motor Co. A pilot plant at Highland Park, Michigan, turns out 1,000 lb/day. A protein from the soybean, dissolved, becomes a viscous substance. "Extruded through 500-hole spinnerets into an acid bath, and later 'set' in formaldehyde bath, it emerges as crinkly fibers, ready for washing, drying cutting into staple lengths, and spinning. It is produced at 'considerably less than half the cost of sheep's wool' with which it must be blended for optimum results. Early production will go into auto upholstery fabrics, but Henry Ford already wears a soybean fiber suit."

356. *Science News Letter*. 1942. Soybean rubber substitute sought by U.S. government. 41:30. Jan. 10.



• **Summary:** “Uncle Sam’s scientists in the Department of Agriculture are feverishly developing a confidential process whereby they believe soybean meal can be transformed into a substitute for rubber, Science Service has learned...”

“Meanwhile soybean oil, extracted by chemistry, already is being substituted for tung oil in paints. Tung oil was imported from China before the war, and diminishing stocks lend special emphasis to soybean substitutes...”

“The production of a synthetic fiber from soybeans has already begun by the Ford Motor Company. The fiber is similar to sheep’s wool... ‘Pilot’ mills at Highland Park, Michigan, can spin 1,000 pounds of fiber daily. The Highland Park mills are being moved to Dearborn where they will undertake regular production.

“The synthetic product is best when blended with sheep’s wool. Early production, say Ford officials, will go into upholstery.”

357. *Chemurgic Digest*. 1942. Soybean fiber. Jan. 15. p. 1.

• **Summary:** “The Ford Motor Company has announced that it is ready to begin limited production of synthetic fiber developed from soybeans. The fiber is similar to sheep’s wool. Spun by ingenious methods from a molasses-like substance that contains soybean protein as its principal ingredient, the fiber is derived from the lowly farm crop that Henry Ford assisted in bringing into industrial prominence. The company has been operating a ‘pilot’ mill at its Highland Park plant for several months which is capable of spinning upwards of 1000 pounds of the fiber a day.” Address: Columbus, Ohio.

358. Campsall, Frank. 1942. Re: Shipment of Willomi variety soybeans and soybean products to Dr. Carver. Letter and Request for Shipping Order sent to George Washington Carver, Tuskegee Inst., Alabama, Jan. 27. 2 p. Typed, without signature (carbon copy).

• **Summary:** “Some time ago, mention was made in one of your letters of an edible soy bean. We are sending you five pounds of the Willomi variety which can be cooked on top of a stove. I understand a pressure cooker is used to prepare other varieties of soy beans for table use.”

In addition to the 5 pounds of Willomi soybeans (from the Flour Mill), Campsall sent Dr. Carver 1 sample each of soy bean protein water paint, paper coated with soy bean protein, and soy bean protein fiber.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: [Personal secretary to Henry Ford] Box 100, Dearborn, Michigan.

359. Russell, Joseph A. 1942. Synthetic products and the use of soy beans. *Economic Geography* 18(1):29-40. Jan.

• **Summary:** Contents: Introduction. Shifts in basic raw materials. Plastics. Industrial chemistry and the farm. Use of farm products by the Ford Motor Company. Use of soy

beans by the Ford Motor Company. Soy bean production and manufacture in the United States. Industrial use of soy beans. Bean production for the Ford Motor Company. The Ford farms. Processing the beans. Uses of soy bean oil and meal. Future of soy beans in the Ford Motor Company. Conclusion.

A map (p. 30) shows Ford soy bean farms and processing plants in southeastern Michigan.

360. Carver, George Washington. 1942. Re: Bisque powder for cream filling, icing, and breakfast food. Letter to Henry Ford at Box 100, Dearborn, Michigan, Feb. 3. 1 p. Typed, with signature on letterhead (carbon copy).

• **Summary:** Dr. Carver has made and sent to Henry Ford a preparation known as bisque powder. It is prepared by the careful blending and intermittent roasting of sweet potatoes, peanuts, and pecans. Carver used it like chocolate to make the cream filling and icing for a double-layer cake, decorated “with half pecan nuts and half blanched peanuts. It was said to be perfectly beautiful and absolutely delicious in taste... Made a little bit different from this, it makes an excellent breakfast food, and as soon as I get the soybeans you are sending me I want to try them out with this as a breakfast food made in much the same way.”

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: The George Washington Carver Foundation, Tuskegee, Alabama.

361. Carver, George Washington. 1942. Re: Soap from soybean waste, soybean bisque cake filling, and soybean meal. Letter to Henry Ford at Dearborn, Michigan, Feb. 4. 1 p. Typed, without signature (carbon copy).

• **Summary:** In an accompanying letter to Mr. Grady Porter of the Tom Huston Peanut Company in Columbus, Georgia, Dr. Carver thanks Mr. Porter for the refuse scraped up off the floor of the peanut shelling plant. “I have just completed now the making of a soap from this and from the fatty acids collected from the purification of crude peanut oil. It excels, to my mind, any cleaning soap that I have ever gotten hold of. Its lathering properties are perfectly marvelous.”

Dr. Carver then writes to Henry Ford in Dearborn: “I am more pleased with this soap as it dries out, and I am very confident that soybean waste of that type could be converted into a very useful cleansing soap.

“I want to say also that the preparation, the bisque powder that I sent you yesterday for making filling and icing, should be ground very very fine like chocolate but my mill is not sufficient for grinding it that fine.”

Dr. Carver just received the box that Henry Ford (via Frank Campsall) sent him on Jan. 27. “I am delighted with every article that you have sent me. It shows conclusively how far ahead in thought and execution that you and your workers are to those who move along the lines of the least resistance... I am beginning on the soybean today and you

will hear from me later. I imagine that the soybean meal would work nicely in this bisque preparation...

"With the hope that nothing will prevent you from coming down this Spring..."

Note: The letterhead states that The George Washington Carver Foundation (Incorporated) was founded Feb. 10, 1940. The 8-member board of trustees includes F.D. Patterson (chairman), A.W. Curtis, Jr. (secretary), and G.W. Carver.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: The George Washington Carver Foundation, Tuskegee, Alabama.

362. Perry, Robert L. 1942. Ford has a war baby in soybean fiber mill. *Detroit Free Press*. Feb. 8.

• **Summary:** In a big modern garage, formerly used to house farm machinery and located across Oakwood from the Ford Airport, America's first soybean fiber production plant and textile mill is in production (producing about 1,000 lb/day of fiber) and will soon be air conditioned. Robert Boyer, Ford's chief chemist, is in charge of the plant. "Mr. Ford, he said, was especially interested because the War Department has made inquiry about blending soybean fiber with wool, to ease a threatened wool shortage." In the adjacent textile mill is a gleaming big new loom, whose shuttles flash back and forth 120 times a minute. On it, Boyer will test out the wool-soybean fiber blends for Army blankets, uniforms, or whatever the need may be. Two acres of land will yield 10 lb of wool from sheep but 400 lb of protein suitable for making fiber. 100 lb of soybeans make about 25 lb of fiber.

The process for making the fiber is described. The oil is first removed from the soybeans using hexane solvent at the Milan, Saline, or Rouge plants. Protein is then extracted from the using caustic soda, treated with sulphur dioxide gas, and precipitated. This protein is specially processed to prepare it for spinning. Address: Free Press Automotive writer.

363. Carver, George Washington. 1942. Re: Bisque powder and breakfast food made from soybeans. Letter to Henry Ford at Box 100, Dearborn, Michigan, Feb. 13. 1 p. Typed, with signature on letterhead (carbon copy).

• **Summary:** "Under separate cover I am sending you a small sample of two products which I think you will be interested in. In fact, I believe they contain enough food for thought for something worthwhile to be worked out.

"The first, or one of them is a bisque powder made from soybeans. The other is a breakfast food made from soybeans. Each of them are blends of the soybeans that you sent me, pecans, and sweet potatoes. They are carefully blended, and the breakfast food roasted at a very low temperature, the bisque at a higher and more rapid temperature.

"I wish you would try the breakfast food out in the following ways: try it with cream and a little sugar, if you desire it sweeter; and also with various fruit purees. For

supper last night I had two tablespoons of dried apricot puree, and I took about one heaping teaspoon of the soybean breakfast food and stirred into it with a little sugar added. I enjoyed it so very much. I should like very much to have your opinion with reference to it as it is something that may not only fit into the defense program but will be equally good at all times, as everything that enters into it can be raised on the farm."

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: The George Washington Carver Foundation, Tuskegee, Alabama.

364. Carver, George Washington. 1942. Re: Soybean sprouts. Letter to Frank Campsall at Ford Motor Co., Box 100, Dearborn, Michigan, Feb. 27. 1 p. Typed, with signature on letterhead (carbon copy).

• **Summary:** Dr. Carver has just enjoyed an uncooked salad of soybean sprouts and peanut sprouts (that he sprouted himself), plus some wild onions and wild Oxalis (commonly called sour grass). "They were served with a little French dressing, and I do not know when I have enjoyed a meal more."

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: The George Washington Carver Foundation, Tuskegee Inst., Alabama.

365. *Ford News (Dearborn, Michigan)*. 1942. Soy-bean fiber for upholstery. Feb. p. 39, 52.

• **Summary:** "Following an announcement in the latter part of 1941 of the production of synthetic fiber from soy beans for textile use, the Ford Motor Company has installed machinery for full-scale production of the material in a new building in the Dearborn area. There, oil-free, soy-bean meal is being converted into yarn for fabrics.

"The new material representing years of research in Henry Ford's effort to form a closer partnership between agriculture and industry, is said to be the first produced from the protein of a vegetable, other protein fibers having their origin in animals."

A description of the process for making spun soy protein fibers and synthetic wool is accompanied by four photos. "Once the fibers have been set and dried, they are prepared for textile use in a manner similar to that used for raw wool or cotton."

The finished fiber is "given to the textile division where it is made into yarn under carefully regulated conditions." This wool is being used primarily to make upholstery for Ford cars.

Photos show: (1) A technician examining a batch of soybean protein solution to check that it is of the right viscosity before it is fed into the spinning machine. (2) In the Ford laboratory, experimentally, the protein solution is forced through a spinnerette by nitrogen pressure into an acid-coagulating bath that sets the fibers. The strands are then

would on glass reels and treated with chemicals to harden and strengthen them. (3) The fibers being loosened and opened on a carding machine. (4) Robert Boyer, who is in charge of the project, examining samples of “soy-bean yarn” as the new material is wound on bobbins.

366. Carver, George Washington. 1942. Re: Soybean sprouts and sprout salad. Letter to Frank Campsall at Ford Motor Co., Dearborn, Michigan, March 9. 1 p. Typed, with signature on letterhead.

• **Summary:** “I wish very much that you could see a large container of soybeans that are just sprouting. I have fully a hundred or more soybeans in this vessel of those that you sent me and it seems as if though everyone of them are coming up. I shall have the sprouts about tomorrow for my dinner and supper. They are positively delicious as an uncooked salad and so very nutritious.”

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: The George Washington Carver Foundation, Tuskegee Inst., Alabama.

367. *Chemurgic Digest*. 1942. War and soybeans. March 15. Reprinted from *The Research Viewpoint*, issued by Gustavus J. Esselen, Boston, Massachusetts. [1 ref]

• **Summary:** Soybean fiber, developed by the Ford Motor Co., may be useful in the war effort for making clothes and blankets. Address: Boston, Massachusetts.

368. Photograph of Henry Ford standing with Clem Glotzhober outdoors, Dearborn, Michigan, March 28. 1942.

• **Summary:** Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: “Ind-Autos-FMC-Eng & Des” which means “Industry-Autos-Ford Motor Co.-Engineering and Design.”

369. Abeele, M. van den. 1942. L'extension de la culture du soja [The spread of soybean cultivation]. *Bulletin Agricole du Congo Belge* 33(1):199. March. [Fre]

• **Summary:** Soybean area and production has expanded most in the United States. Innumerable patents concerning the extraction of its numerous products and by-products are being exploited by powerful food and industrial companies. The Ford Motor Company, which uses several kilograms of soya in each of its automobiles, has popularized the cultivation of soybeans and used these soybeans to make industrial products. In Europe, Romania is the country most actively involved in growing soybeans; production has grown from 11,000 tonnes in 1935 to 52,500 tonnes in 1938. Germany has done research on increasing soybean yields through better use of fertilizers. Soybean production has also expanded considerably in Bulgaria—according to the *Monthly Statistical Bulletin of the International Institute of Agriculture*.

370. Carver, George Washington. 1942. Re: Soy beans and the secrets of good health. Letter to Henry Ford, Dearborn, Michigan, April. 13. 2 p. Typed, with signature on letterhead.

• **Summary:** “My great inspiring friend, Mr. Ford: This is just a word of greeting to let you know that I am going ahead daily (if possible), with greater enthusiasm than ever since your last visit, as your vision seems to unfold before me with such a clear understanding of what you are working out.

“The attached recipe from Nature’s Garden is self explanatory. Every evening I have a bowl of this soup just before retiring. I am also using the same recipe with this change: 2/3 soy beans (by measure), 1/3 raw peanuts, blanched (by measure). Boil all together in plenty of water until both are thoroughly done. (I used your Willomi [soybean variety]). Press through a colander. Season as per above, being very careful not to add but little, if any, other kind of fats or oils as it will make the soup too greasy. It is truly delicious. I hope you will try them both. In serving I used the wild bergamot flavoring.” Note: Wild bergamot is a fragrant North American herb (*Monarda fistulosa*) of the mint family.

Dr. Carver then suggests a name or sign for what he considers one of Henry Ford’s most important buildings, a truly rehabilitating one: “Come into Nature’s Vegetable Garden and Learn the Secrets of Bodily Vigor Mental Alertness, and Spiritual Uplift.

“And God said, I have given to every beast on the earth, and to every fowl of the air, and to everything that creepeth upon the earth, wherein there is life, I have given *every green herb* for meat.’ Genesis 1:29 and 30.”

Note: Dr. Austin W. Curtis, Jr. (Dec. 1992) thinks that the building Dr. Carver was referring to in the last paragraph was probably what became the Carver Laboratory in Dearborn, Michigan, but Dr. Curtis never saw any quote resembling this on or inside the building. The Biblical quote from Genesis was one of Dr. Carver’s favorites.

Ford R. Bryan (Jan. 1993) notes, concerning the building and sign in question: “This pertains to the rehabilitation of Ford’s Waterworks Building in Dearborn, which was to become the Ford Nutritional Laboratory, and later—after Carver’s death—the Carver Laboratory. Dr. Carver was fond of quoting from the Bible and generating his own sayings to state his philosophy of human nutrition. He proffered many more such sayings during his visit to Dearborn in July 1942. Henry Ford listened politely.”

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: The George Washington Carver Foundation, Tuskegee, Alabama.

371. Dies, Edward J. 1942. Soybeans: Gold from the soil. New York, NY: The Macmillan Co. 122 p. April. Index. 21 cm. Revised ed. March 1943. 122 p. Includes index, Illust., 22 cm. [205 ref]

• **Summary:** A landmark popular book and a good

description of the pioneering period of soybean production and processing in the United States. Contents: 1. A certain man of science (William Morse and Dr. C.V. Piper). 2. Vignette from antiquity (how the soybean vine saved a caravan in China besieged by bandits). 3. Birth of an industry (U.S. soybean crushing). 4. The big drive starts (A.E. Staley, Glidden, Central Soya, Buckeye Cotton Oil Co., Drackett Co., ADM, Allied Mills, Ralston Purina, Spencer Kellogg and Sons, Swift & Co., Shellabarger Grain Products Co. Standard Soybean Mills, Iowa Milling Co.). 5. Breeding new types (Burlison, Hackleman). 6. Scientists commend product (oil and meal). 7. Lakes of oil. 8. In the field of industry (U.S. Regional Soybean Industrial Products Laboratory, and Henry Ford). 9. Listening post for soy (NRRL at Peoria). 10. Whims and price turmoil. 11. Milk for the tots of China (Dr. Harry Miller). 12. Soys in the home garden ("the vegetable soybean for table use," "garden varieties of soybeans," "green soybeans," "green vegetable soys," "vegetable type soybeans," "edible varieties"). 12. Americanizing soy foods (mainly about soy flour and improving its taste for use during World War II). 14. Little bean, what now? Appendix: Chronology of the soybean (27 entries). Bibliography. Dies was born in 1891.

Illustrations and diagrams show: (1) Principal centers of U.S. soybean production (p. 19, map). "Almost 90 per cent of all soybeans are harvested in Illinois, Iowa, Indiana, and Ohio. If three other states are included as shown on the map—Missouri, Michigan, and Virginia—the total is 97 per cent. (2) Principal centers of U.S. soybean processing (p. 20, map). Discs of different size show the various centers. Since Illinois produces 52% of the harvested soybeans, central Illinois is the center of soybean processing [crushing] in the USA. "Total processing capacity in late 1942 exceeded 100 million bushels for the regularly established soybean processing plants." (3) Diagram of uses of the soybean (p. 68).

Chapter 2, "Vignette from antiquity" begins: "Even when the Pyramids were being built, three hundred years before the Tower of Babel, and twelve centuries before Solomon fashioned his temple, the soybean was hoary with age. The earliest writings on the subject go back to the period of the Pyramids.

"But of the science of soybean growing you will find no recorded beginnings in the musty tones [sic, tomes] of oriental history. No book reveals the name of the inquisitive oriental who in the misty long ago began sowing the seeds, harvesting the beans, pounding them into a mash for cooking and eating, and probably boring his friends no end with tales of their merit. There is no record depicting this unsung hero's foresight in saving the seed of the magic plant against next year's hunger. Likely as not he was a crude dreamer who fumbled his hunches and accomplished little in a lifetime of wrestling with the problem of proper cultivation.

"Oriental literature of a later date contains much about the plant but of its origin as a food product again there are only legends.

"A choice vignette from antiquity on the initial use of soybeans runs something in this fashion. Long, long ago, far back in the dim past, a caravan pulled out of an eastern China town. It consisted of a number of merchants and their servants... The caravan was bound for a distant inland settlement intent upon disposing of its valuable wares." After trading in the north, the caravan headed home, "now laden with gold, silver, and choice furs received in payment for the merchandise. Suddenly at dusk on a day when the caravan was still far from home it was surrounded by bandits who had learned of the rich prize at hand. Merchants and servants took quick refuge in a rocky defile easy of defense. Here they were besieged day on day until their scanty provisions ran low and starvation seemed inevitable. At length a servant whispered to his master and pointed to a vinelike plant bearing some sort of legume. No one could recall having seen such a plant before but all were touched with the pinch of hunger. So with grave doubts the men pounded the beans into a thick flour, mixed it with water, and made coarse cakes. Upon these cakes the caravan survived, and with renewed strength fought off the foe until help arrived. And, so the legend goes, from that day forth the miracle bean became the staff of life in China." Note 1. This story of the caravan besieged by bandits in China is a longer and embellished version of the tale first dreamed up and told by H.W. Galley in *Soybean Digest* (Dec. 1940).

"True or false, the story has lived through the ages.

"For the first written record of the soybean one must turn to 'Materia Medica,' written by Emperor Shen-nung in 2838 B.C. It describes many plants of China including that of the soybean, but even the name is clouded with antiquity. In the early Chinese history the name 'Shi-yu' [sic] and the 'Ta-tou' were applied to the soybean. These names probably antedate the first authoritative records of the plant."

Dies then discusses Engelbert Kaempfer, Linnaeus, and Moench.

"Then in 1804 a Yankee Clipper ship in full sail glided down the coast of China searching for ports for a return cargo. Not sure of the length of the return journey, the captain ordered several bags of soybeans tossed into the hold as a reserve food supply. And thus did the first soybeans enter America. Little was done about the soybeans then. Note 2. This is the earliest document seen (June 2003) that further embellishes the myth of the "clipper ship" with phrases like "glided down the coast of China" or "ordered several bags of soybeans tossed into the hold"—all supposedly in connection with the introduction of the soybean to the United States. This is also the earliest document seen (Aug. 2000) that compares the age of the soybean with that of the pyramids (in Egypt; the oldest and largest was built for Khufu at Giza in the 26th century B.C.), the Tower of Babel (in Babylon [today's Iraq]), or Solomon's Temple (in today's Israel), arguing that the soybean was much older than all of them.

"James Mease of Pennsylvania first mentioned in

American literature shortly after this importation that the soybean was adaptable to Pennsylvania and should be cultivated" (p. 9).

In Chapter 3 (p. 14) Dies notes: "The first soybeans processed in this country were imported from Manchuria in 1911 and sold to Herman Meyer who had a small crushing plant in Seattle, later called the Pacific Oil Mills. From the raw material he produced the two chief products—soybean oil meal for livestock feed and soybean oil, selling the latter locally for industrial use. The meal was advertised and sold as 'Proteina,' a high-protein feed. The venture did not last for any considerable period; a few years later Meyer passed away." Note 3. This is the earliest document seen (May 2010) that mentions Herman Meyer.

"Soybeans grown in this country were first processed by the Elizabeth City Oil and Fertilizer Company at Elizabeth City, North Carolina. W.T. Culpepper, now postmaster at Elizabeth City, was manager of the new mill, started in 1912. The first domestic soybeans were crushed for commercial purposes there in the late fall of 1915. It was a small operation." Note 4. This is the earliest document seen (May 2010) that mentions W.T. Culpepper.

"At that time, most of the soybeans were grown in North Carolina, and the Winterville Cotton Oil Company at Winterville, North Carolina, purchased expellers for processing purposes, and these operated on soybeans for a limited period. Still another mill, operated by Havens Oil Company at Washington, North Carolina, crushed thirty thousand bushels of beans as an experiment in 1916." Note 5. This is the earliest document seen (May 2010) that mentions the Winterville Cotton Oil Company.

"My uncle, Jonathan Havens," says J. Havens Moss, "was the first to plant soybeans in this section, devoting considerable acreage to the mammoth yellow [Mammoth Yellow] type which grew and matured splendidly from the very start. Its value to the land was obvious" (p. 14-15).

Note 6. On the first page of the copy owned by Soyfoods Center is a signed inscription, in dark blue ink, which reads: "With kind regards to Russell East, who has done much on behalf of the soybean—Edward Jerome Dies."

Note 7. Only minor changes were made on about 13 pages of the revised edition published in March 1943. None of the statistics in the many tables were been updated, and the bibliography was not changed. Address: USA.

372. Dies, Edward J. 1942. Soys in the home garden (Document part). In: E.J. Dies. 1942. Soybeans: Gold from the Soil. New York, NY: The Macmillan Co. 122 p. See Chap. 12, p. 83-89. April. 21 cm.

• **Summary:** This chapter is about green vegetable soybeans and vegetable type soybeans. "If the second World War is a long one the vegetable soybean for table use is expected to make its initial appearance in home gardens of many states. It might even have considerable influence on the nation's diet.

In the food division of the general war program the soybean holds a place of importance."

The easiest and most direct way for most Americans to contact the soybean is through home gardening. "Progress of the garden varieties of soybeans has been encouraging. The vegetable type was unknown in this country until Explorer Bill Morse planted the imported varieties at Arlington Experiment Station [Virginia]. In 1934 seed from these plantings was distributed to a number of agricultural experiment stations. The work of testing for performance and palatability was begun by state agricultural experiment stations in Illinois, Indiana, Ohio and Iowa. Funk Bros. Seed Co. did constructive research work."

"Seed of the vegetable type was difficult for the public to obtain until early 1940. Now seed is featured in a number of catalogs. A list of growers may be obtained upon request from state universities in the soy belt."

"There are several promising edible types with a varied range of maturity of from eighty to one hundred and thirty days. For home gardens three or four varieties of different lengths of maturity should be planted to provide green soybeans over a continuous period. Of these varieties, Bansei, No. 80494, and Fuji are early. Willomi, Hokkaido, Aoda, Jogun, and No. 80490-I are mid-season. Illington, Imperial, Funk Delicious, Emperor, and Higan are late."

"It would be difficult as yet to determine the most desirable varieties of vegetable soybeans. In a general way, for the extreme North the Sioux, Agate, and Green Giant are most suitable. For the Corn Belt or middle section of the country the Hokkaido, Kanro, and Aoda are recommended. For the South the Nanda, Seminole, and Rokusun.

"For use as a green vegetable, or for canning, the pods should be picked before the soys have reached full size and before there is any tendency to turn yellow... Pods can be shelled easily if placed in boiling water for one minute. Incidentally, some ingenious housewives reported to experiment stations that they had evaded the task of shelling garden soys by hand. They simply adopted the oriental method. This means cooking the beans in the pod and letting each guest do his own shelling. It adds a leisurely touch to the luncheon or dinner. The fingering is no more objectionable than that involved in eating a burr artichoke salad." "Green vegetable soys may be prepared in the same manner as other garden beans, including lima and navy beans."

"In the directory of the National Cannery Association, 1940 edition, ten companies are listed as canners of vegetable soybeans. An association was organized, with the head of one of these companies, W.L. Schroeder, Hortonville, Wisconsin, as president. Up to 1940 the largest annual production of a single canning company was eight carloads.

"Wisconsin has shown considerable leadership under the scientific direction of Professor G.M. Briggs, University of Wisconsin, in the development and the actual marketing of vegetable soys. Dr. J.B. Park of Ohio State University has

carried on highly important research work. It is unfortunate that more of the findings have not been published.

"A relatively small number of the vegetable type variety is well adapted to canning. Experience still is so limited that there is some disagreement among the experts. However, promising varieties for canning include the Aoda, Bansei, Funk Delicious, Rokusun, and Willomi.

"Ford Motor Company was reported to have planted enough acreage of the Bansei variety to yield about two hundred thousand cans of green vegetable soys in 1941. The entire pack was to be used in the company commissary and stores."

Note: This is the earliest English-language document seen (June 2009) that contains the term "garden soys," which is used to refer to green vegetable soybeans. Address: USA.

373. Guillaume, A. 1942. L'utilisation du Soja dans l'alimentation et dans l'industrie [The utilization of soybeans in food and industry]. *Revue de Botanique Appliquée & d'Agriculture Tropicale* 22(247-248):191-97. March/April. [7 ref. Fre]

• **Summary:** Contents: Introduction. Food uses: Whole soybeans, soy sprouts, soy coffee, soy milk, tofu, shoyu, miso, natto, soy flour. Industrial uses: Soy oil, Henry Ford and hexane solvent extraction, lecithin, soybean cake, animal feeds, plastics, green forage. Address: Professor, Univ. of Strasbourg.

374. *Scientific American*. 1942. Soybean fiber: Now being produced on limited scale. 166:176. April.

• **Summary:** "Limited production of a synthetic fiber developed from soybeans—a fiber similar to sheep's wool—has been announced by the Ford Motor Company."

375. Glotzhober, Clem. 1942. Conversation with Mr. Ford, Dr. Carver, Dr. Curtis and the men of the Water Building Laboratory, July 22, 1942. Dearborn, Michigan: Ford Motor Co. 4 p. Unpublished manuscript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** In July 1942, Dr. George Washington Carver visited Henry Ford in Dearborn, Michigan, at Mr. Ford's invitation. Henry Ford, Dr. Carver, and Dr. Austin W. Curtis engage in a lively discussion of Genesis 1:29 and other Biblical passages, Liebig, the importance of being well organized to work efficiently, Louis Carnaro and his book titled *The Art of Living Long*, preachers and creeds as a cause of quarreling, the cause of wars (creed, greed, and boundary lines), all legumes being alkaloidal, instinct, commercial mineral fertilizer, importation as a cause of greed. "Mr. Ford commented that quadrupeds and politicians must go off the earth... Boundary lines must go."

"Dr. Carver said, 'The first work to come out of here should be an analysis of the wild vegetable sandwiches and

that we should not try to study the vitamins in them.' He said we should show people what we are losing in available food.

"He concluded by saying that nothing can take the place of common sense." Address: Food Lab.

376. Photograph of Dr. George Washington Carver placing or adjusting a floral sprig in his buttonhole, July. 1942.

• **Summary:** Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

377. Photograph of Henry Ford and George Washington Carver standing together by a car in Dearborn, Michigan, July. 1942.

• **Summary:** Each is holding a hat in one hand, in front of a car door during Carver's visit to Dearborn (Negative number: 0-930) (see next page).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

378. Photograph of ten members of the laboratory staff (including Bob Smith and Austin Curtis) standing in warm coats in front of the food laboratory. 1942.

• **Summary:** Over the laboratory door is written in large letters "George Washington Carver." Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

379. Photograph of twelve members of the Food Laboratory Staff seated on the laboratory steps. 1942.

• **Summary:** In Dearborn, Michigan. Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

380. Photographs of Dr. George Washington Carver and Henry Ford in the Carver Lab., Dearborn, Michigan, July. 1942.

• **Summary:** Dr. Carver and Henry Ford (both smiling) standing together in the Carver Lab. Carver is serving some food (probably wild vegetables) in a white bowl to Henry Ford (Negative number: 188-70495).

On the same day, Dr. Carver is bending over and holding a plate (probably containing wild vegetables) on a table in front of Henry Ford. Behind them are shelves filled with many bottles of chemicals against the wall (negative number: unknown).

Source: From the collections of Henry Ford Museum & Greenfield Village.



381. Photographs of the inside of the Carver Lab. in Dearborn, Michigan. 1942.

• **Summary:** (1) Shows work benches, equipment, and bottles of chemicals. (2) Twelve men at work in the Lab. Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

382. Cavanaugh, Robert. 1942. The development of a new laboratory. *Herald (Edison Inst., Dearborn, Michigan)* 9(14):12.



• **Summary:** About the laboratory recently dedicated by the noted negro scientist, Dr. George Washington Carver. There is a small brick building on Michigan Ave. in Dearborn a few hundred feet east of Elm St. It was erected in 1914, used for 2-3 years as a water pumping station, then abandoned as the needs of the City of Dearborn outgrew its capacity. "It is now being remodeled and will house the new nutritional laboratory of the Ford Motor Company. It will be devoted to the extensive study of the nutritional value of various foods, vegetables, and weeds, and their effects on the human body." The building was dedicated by Dr. Carver. A photo shows Mr. Henry Ford and Dr. Carver conversing in the new lab. Behind them are shelves by the wall holding bottles of chemicals. "Outside the building, adding to the completeness of the entire enterprise, is a garden in which corn, soy beans, potatoes, and other vegetables are under cultivation. The feature, of course, of this venture is the experimental kitchen." One recipe calls for a host of finely ground vegetables and weeds, mixed with lemon juice, salt, and mayonnaise on soy-

bean bread.

Note: Most of this issue of the *Herald* is about Dr. Carver. Pages 1-3, and p. 10 discuss the George Washington Carver Memorial Cabin. Pages 11 and 14 contain the text of an "Address of Dr. George W. Carver given at Martha-Mary Chapel, Greenfield Village, July 24, 1942." Various photos show Dr. Carver and his cabin.

383. Edison, Thomas. 1942. Dr. Carver's research. *Herald (Edison Inst., Dearborn, Michigan)* 9(14):12-13.

• **Summary:** Focuses on George Washington Carver's research on peanuts. "Dr. Carver found use for the peanut in making linoleum and even face powder. Perhaps one of the most promising uses to which the peanut may be put in the future is in making plastics. The peanut plastic, although not developed to the extent that the soy-bean plastic has been, is a promising field in itself.

"Through Dr. Carver's research a \$60,000,000 industry was born in the south."

384. Nicholson, Joseph L.; Leighton, George R. 1942. Plastics come of age. *Harper's Magazine* 185:300-03. Aug.

• **Summary:** "When America went to war plastics had already in their brief span of years entered into our life at innumerable points. They had made the billion dollar motion picture industry possible; they had made television possible... plastic toothbrushes, ash trays, and soap dishes piled the counters of the Five and Ten... Yet as late as 1941, plastics occupied an anomalous position in the public mind. On the one hand they were regarded as trivial... On the other hand, the word 'plastics' had been glamourized as a mystery and the materials themselves had been declared to be the evidence of a chemical revolution so far-reaching that our very lives might be altered.

"Then things began to happen. Henry Ford had his picture taken standing beside his automobile body made of plastic panels. He had to put the automobile away for the duration with some of the problems of its manufacture still unsolved, but still a demonstration had been made: plastics were ready to go beyond the gadget stage. Both plastics and the materials from which they are made were rushed into use for war purposes."

Up until now, most people have thought of plastics as substitutes for other materials. Now they are "emerging as materials in their own right, which will displace the older materials wherever—and only wherever—they prove better for a specific purpose... It is conceivable that plastics may one day become a dominant material." More important, plastics are synthetics, substances whose molecules have been constructed to order by man. As such, they are truly revolutionary.

There follows a brief history of synthetics and plastics. In 1828 the German chemist Wohler synthesized urea. He was the first person to make a carbon compound without the help

of nature. In 1868 John Wesley Hyatt discovered Celluloid, the first great plastic discovery. Then came Bakelite, which appeared on the market in 1909. After 1919, new plastics and new processes for their application piled up at a prodigious rate. A chronology of the latter is given, starting with: "1875 Celluloid—Sheets, tubes, rods. 1904 Casein—Thick sheets, rods. 1909 Phenol-formaldehyde (Bakelite)—Castings..." 1924 Phenol formaldehyde—Molding powders... 1931 Phenol-formaldehyde—Modified cast resins.

385. *Soybean Digest*. 1942. Soybeans and people... Aug. p. 9.



• **Summary:** The Iowa Experiment Station is working on better ways to shell "green soys." "No need for bossy: If you wish to make your own butter, milk, and cheese, here are some recipes to help you, from the Edison Institute, Dearborn, Michigan." Contains 3 short recipes: Soy bean milk. Soy bean cheese (tofu, coagulated with dilute acetic acid or vinegar). Soy bean butter (like peanut butter). A photo shows a woman cooking green soybeans in a glass pot on an electric stove. The beans should be precooked before freezing.

386. *Vegetarian Messenger and Health Review (England)*. 1942. Soya upholstery. Aug. p. 147. [1 ref]

• **Summary:** The following is summarized from an article in *Bus and Coach*, June 1942. "One prominent transport engineer in this country has long advocated the operation of diesel engines on oil extracted from the soya bean. Another use of this accommodating vegetable product has been developed by the Ford Company in America, and is a link in

Henry Ford's efforts to bring agriculture and industry into a closer relationship. From the soya bean is prepared a protein fibre which is at present 80 per cent. as strong as sheep wool, and it is hoped to improve still further on this.

"The fibre can be used in the same way as wool, being suitable for felting as well as weaving. Though primarily intended for the production of upholstery for Ford cars, it can also be made into suitings, heavy clothing materials or carpets, and as either clothing or furnishing material it hangs and drapes well."

387. Williams, Earl. 1942. A biographical sketch [of George Washington Carver]. *Herald (Edison Inst., Dearborn, Michigan)* 9(14):13-14.

• **Summary:** Greenfield Village has recently been honored with a laboratory dedicated by the noted negro scientist, Dr. George Washington Carver. Dr. Carver was born in about 1864 in a Missouri plantation slave hut. "In that same year the slave baby and his mother were kidnapped by night riders. Their owner sent money and a race horse (valued at about \$300) for the return of his slaves. The mother was, however, never seen again, and the baby boy was returned nearly dead from whooping cough. Dr. Carver later took the surname of his owners since he knew not his own name.

"Because of his sickly nature, the young child was not fit for heavy work and hence he helped Mrs. Carver with the household tasks. Impressed by the boy's extraordinary eagerness to learn and as a reward for his tireless work, his owners presented him with a blue-backed Webster speller. The young boy quickly learned the book from cover to cover and so Mrs. Carver gave him a Bible. Dr. Carver enthusiastically read this also and to this day can recite long passages from the Bible. It was about this time that they named him George Washington because of his unquestionable honesty.

"The educational facilities of the plantation were, of course, very few indeed. Determined to get more education, the young man looked for a school to attend. One day he set out with the blessing of the Carvers for a small town called Neosho—some eight miles away—where there was a school. The young Carver was then but 10 years old.

"Having mastered all his teachers could teach him, Dr. Carver set out for Minneapolis, Kansas. Here he again did odd jobs so as to finish high school. After completing this course, he sent in his application by mail to a college in Iowa. When he arrived he was refused admittance because he was colored. All of his money having been used up, he had no choice but to remain in this town. Again he set to work at odd jobs doing cleaning, cooking, washing, and anything else he could find.

"A year later, when he had the enrollment funds, Dr. Carver entered Simpson College in Indianola, Iowa. (Later the college bestowed upon him an honorary Doctor of Science degree.) After three years at Simpson, he transferred

to Iowa State College of Agriculture and the Mechanic Arts, where he got his Bachelor of Science degree in 1894 and Master of Science two years later. Having made such a fine record through his entire school career, Dr. Carver was kept on and given a post on the faculty of the school. Some time later Booker T. Washington became interested in him, and it was from this post that Dr. Carver went to Tuskegee Institute, where he became the first Director of Agriculture.

"The list of Dr. Carver's honorary degrees and rewards is nearly as long as his countless accomplishments. He was made Fellow, Royal Society of Arts, London, in 1917. He received the Spingarn Medal in 1923 and his Doctor's degree in 1928. He has served as a collaborator in one of the bureaus of the Department of Agriculture. In 1942 he was awarded the 'Man of the Year in Service to Southern Agriculture' by the *Progressive Farmer* magazine...

"He is a devout believer in God, and does not accept money for his discoveries because he believes they are God's handiwork rather than his own."

388. *American Bee Journal*. 1942. Soybean fiber. 83(9):390. Sept.

• **Summary:** Two photos (one with Robert Boyer) show "soybean fiber and yarn on its way to becoming a textile. Honey from soybeans? Why not select until we have it? Occasionally there are reports of honey and by selection it may finally become important."

389. Dos Passos, Katharine. 1942. Science and the beanstalk. *Woman's Home Companion* 69:14-15, 105. Sept.

• **Summary:** An overview of the many new ways that soybeans are used in America, with emphasis on industrial uses as for artificial wool, plastics, and enamel. Discusses the work of Henry Ford and the "U.S. Regional Soybean Laboratory." "Then the young science of farm chemurgy and the new science of nutrition began to focus a searchlight on its [the soybean's] chemical make-up and the sacred grain of China has turned out to be a powerhouse of energy." Soybean protein is so much like that of meat that "it is difficult for chemists to distinguish between the two. Our army is using soy flour and some ninety mills are turning out soy flour and grits of fine quality for army use; but as yet it is not widely available in the United States.

"Nutrition is a fighting word today. To those who will profit by it, the new nutrition 'definitely promises greater vigor, longer life, keener minds and a higher level of cultural attainment.'"

390. Martindale, Thomas C. 1942. The soybean—Today's wonder food: Many are the uses of this remarkable legume that was known in China centuries ago. *American J. of Health*. Sept. p. 10.

• **Summary:** "Although Henry Ford is popularly credited with having discovered the soybean, actually this interesting little

legume is more than 25,000 years old, and possibly is as old as vegetation itself."

"Bread made from soybean flour, owing to its lecithin content, makes a lighter loaf than wheat flour. Lecithin is a phosphorous substance found widely in the body and in plant tissues."

391. *Science Digest*. 1942. "Wool" fiber from soybeans. 12:28. Sept. Reprinted from *The Research Viewpoint*, issued by Gustavus J. Esselen, Boston, Massachusetts.

• **Summary:** Soybean fiber, developed by the Ford Motor Co., may be useful in the war effort for making clothes and blankets.

392. Carver, George Washington. 1942. Re: Soy flour and its uses. Letter to Robert A. Smith, Director, Engineering [sic, Nutritional] Laboratory, Ford Motor Co., Dearborn, Michigan, Oct. 15 and Oct. 18. 1 p. Typed, with signature (carbon copy).

• **Summary:** On Oct. 17 a box sent by Bob Smith containing several types of soy paste, soy flour, etc. arrived. "I made oyster soup for supper. I put one half teaspoon of this delicious flour into the soup just to try it. It goes into a bowl of chicken soup tonight. It is a great product, has almost unlimited possibilities... Have you plenty of this flour?"

"That Mr. Henry Ford is the greatest man living today is generally conceded. This is such a fine work you are doing. Love to all..."

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: The George Washington Carver Foundation, Tuskegee, Alabama.

393. Carver, George Washington. 1942. Re: Miniature food wafers made from soybean flour. Letter to Frank Campsall at Ford Motor Co., Dearborn, Michigan, Oct. 21. 1 p. Typed, with signature on letterhead.

• **Summary:** "Under separate cover I am sending you a few miniature wafers made from the soy bean flour from the Engineering Laboratory [at the Ford Motor Co. in Dearborn, Michigan]. These miniature wafers are simply the soy bean flour combined with ordinary cream cheese in proportion of about one-third cheese to two-thirds soy flour. You can see what a very high protein ration that would make.

"Think also how nice it would be to use the Bulgarian soy milk made into cheese, instead of cow's milk.

"The reason that this is rather skimpy is the fact that I haven't but very little of the soy flour, and therefore, have to use it very sparingly.

"Please see that Mr. Ford, yourself (naturally), and others who may be interested get a taste. Be sure that the Engineering Laboratory gets a sample. I should like to know just how they like it. Any modification as to quantity of flour or cheese can be used."

Courtesy of Henry Ford Museum & Greenfield Village

Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: The George Washington Carver Foundation, Tuskegee Inst., Alabama.

394. Carver, George Washington. 1942. Re: Soy bean products and sweet potato candies. Letter to Frank Campsall at Ford Motor Co., Dearborn, Michigan, Oct. 23. 1 p. Typed, with signature on letterhead.

• **Summary:** “Under separate cover I am sending you another package of soy bean products. This package is composed of pecans, sweet potatoes and soy bean flour as manufactured in the Engineering Laboratory. You will notice it has a little sweetness to it, and it will be sweet in proportion to the amount of potatoes used, and the sweetness of the potatoes. No sugar is used so that everything comes out of the ground and would make such a nice Christmas candy for the children, nourishing, full of nuts, and without additional sugar...”

“Please do as you did before, let Mr. Ford sample them, you sample them, and let others you feel will be interested sample them. I should like to have your opinion, and turn the rest over to the Engineering Laboratory.”

Note: Each of these products contained soy bean flour combined with other ingredients.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: The George Washington Carver Foundation, Tuskegee Inst., Alabama.

395. Campsall, Frank. 1942. Re: Shipment of soybean meal to Dr. Carver. Letter and package to George Washington Carver, Tuskegee Inst., Alabama, Oct. 28. 1 p. Typed, without signature (carbon copy).

• **Summary:** “We are forwarding to you today 5 lbs of the horse chestnuts and have included in the package 5 lbs of the pre-cooked soy bean meal from Mr. Robert Smith at the Food Laboratory.”

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: [Personal secretary to Henry Ford] Box 100, Dearborn, Michigan.

396. Campsall, Frank. 1942. Re: Thanks for foods made from soy bean meal. Letter to George Washington Carver, Tuskegee Inst., Alabama, Nov. 5. 1 p. Typed, without signature (carbon copy).

• **Summary:** “We wish to acknowledge the interesting letters which were received from you recently; also to thank you for sending the food preparations made from soy bean meal which you combined with other ingredients to make an edible and nourishing food. These were sent over to the Food Laboratory, each having been sampled by Mr. Ford and myself.”

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Address: [Personal secretary to Henry Ford] Box 100, Dearborn, Michigan.

397. *Scientific American*. 1942. Miracle beans: Long called “The Cow of China,” the soybean is now invading almost every field of endeavor. 167(5):216-18. Nov.

• **Summary:** This article begins: “America in general has just begun to ‘discover’ the widely varied possibilities of the soybean. Henry Ford makes steering wheels of it, midwestern farmers look on it as a promising money crop, diet and health practitioners are starry-eyed about its protein, calcium, and iron content... the little bean is a capital meat substitute; that coffee, cheese, candy, salad oil, lubricating oil, printer’s ink and celluloid and glue, airplane bodies and rubber substitutes are made from it. It’s good for cattle—good for dog food and linoleum and paint and rayon panties, good for explosives, good for building bone and muscle in fighting men. It’s a fine forage crop and, like alfalfa, it will enrich the soil.”

“But five years from now, when the present war has made the soybean as familiar an institution in America life as cellophane and synthetic rubber, it will be well to remember that the ‘discovery’ of today was known to the Chinese thousands of years before the birth of Christ. The emperor Shen Nung speaks of it in his “Materia Medica,” written in 2838 B.C. Whole ages before this... a legend was current which had been handed down in northern China and Manchuria to the present day, telling how man first became acquainted with the soybean.”

“A caravan of merchants, says the legend, was homeward-bound, loaded with gold after a successful trading expedition, when it was attacked by bandits. Taking shelter in an easily defended ravine, the traders held off the attackers for several days until their food ran low. Starvation threatened—until one of the servants returned to camp with a sack of beans he had found on a vine-like plant which the animals were eating. They mashed up these beans to a paste with a little water and baked them—and on this crude biscuit the famished men regained enough strength to hold off the attackers until help arrived.”

“The Chinese have looked on the soybean as their staff of life for ages.” Many have never tasted milk except that from the soybean, which costs one-fourth as much as cows milk. “Long it has been called the Cow of China. The Orient uses the bean not so much as a vegetable as for making cheese [tofu], [soy] sauce, bread, and meat substitutes. For thousands of years it has been the basic protein food in Manchuria, China, Korea, Japan, and the Malay Peninsula.”

“Soybeans first came to America in 1804 on a clipper ship whose Yankee master had ordered several bags tossed in the hold in case his provisions ran low.”

William J. Morse, now senior agronomist at the USDA, worked for 34 years “with the quiet fervor of a missionary to bring the miracle bean prominently into the agriculture of this country.”

In 1929 some 9 million bushes of soybeans were grown in the USA, increasing to 91 million bushels in 1939. The

soybean is now America's fourth largest cash grain crop; "we grow as much as Manchuria. The cow of China has become a hundred-million-dollar American industry.

More than 75% of America's soybean oil goes into food products; most of the rest goes into paint, lacquers, and soaps. About 95% of the soybean meal is fed to livestock; the remaining 5% is used to make plastics, flour for baking, glue, fertilizer, dog food, breakfast cereals, macaroni, baby foods, reducing diets, and diabetic foods.

Discusses (at great length) the work of Henry Ford and Robert Boyer with soybeans, including soy fiber (which has the potential to replace wool), Ford's suit made of 25% soybean fiber, plastic parts in cars, the car of the future with a plastic body over a tubular steel framework (it will weigh only 85% as much as 1942 models did), and his solvent extraction system.

Note: This is the earliest document seen (Dec. 2009) with the term "Cow of China," referring to the soybean, in the title.

398. Stouffer, Lloyd. 1942. Development of soybean fiber by Ford. *Rayon Textile Monthly*. Nov. p. 640-52. [5 ref]

• **Summary:** This article was "Exclusively contributed and approved by Ford Motor Co." Contents: Introduction. Permanent crimp gives resiliency. Soybean yarn only used by Ford. Goes at present into army goods. Strength increased. Fiber production process. Dyeing of soybean fiber. May license process later. Mandarin soybean best suited [to making soybean fiber]. More technical process details. Extraction of protein. Dissolving the protein. Spinning the solution. Spin, harden and aftertreatment continuous. Has fixed permanent crimp. "Production of soybean textile fiber and yarn by the Ford Motor Co. has progressed from the experimental phase and is shortly to be placed on a volume basis in a large plant near the River Rouge Works, air-conditioned and elaborately outfitted with large-scale machinery. Output of the synthetic fiber—the first successful textile filament to be derived from a vegetable protein source—is already around 1,000 pounds a day in the pilot plant, which has been in operation since early 1941, and will reach 5,000 pounds a day in the new plant.

"Immediate operation of the big plant is assured by the recent granting of A-1-a priorities for equipment needed to complete the air-conditioning system, which will hold humidity constant and temperatures within the remarkably close range of plus or minus one degree.

"The machinery in the new plant was designed and built by Ford engineers... Aside from the development of large-scale facilities, the most important developments since this fiber was last reported on are the increase in its strength to well above 80 per cent of that of virgin wool, and the very recent discovery by Ford technicians of a secret means of putting into the fiber, at will, a permanent crimp which gives it approximately the resiliency of wool."

"Ford's production of soybean fiber was originally

intended only for the company's own use in its automobile upholstery materials, and it is expected that when auto output is resumed after the war the entire 5,000-pounds-per-day output of the new plant will be consumed in this way.

"The secret of the present development under wartime priorities, however, is the shipping problem of the country's wool supply, 35 per cent of which is normally imported. After Pearl Harbor, the War Production Board deemed the possibilities of the soybean fiber as a "wool substitute" sufficiently important to justify high priorities to add new equipment to the soybean fiber plant.

"The bulk of the present and future output of Ford soybean fiber yarn is going into textile products for the armed services. Although details of these uses cannot be disclosed, it is indicated that principal uses so far are in [army] blankets, overcoatings and experimentally in some uniform suitings in place of wool. Thanks to the newly discovered crimp, the fiber is being used as high as 100 per cent in heavy fleece materials, and is said by Mr. Boyer to be slightly warmer than pure wool. In several cases, soybean fiber is blended 50 per cent with wool, or with wool and rayon; and in suiting materials it has been found most satisfactory with a 25 per cent content."

"Mr. Boyer's chemists have developed their own method for dyeing soybean fiber" They have found that it takes the dye better than virgin wool. The Mandarin soybean variety has been found to give the best fiber; for uniformity in the fiber processing, it has been found necessary to closely control the analysis and fertilization of the soil in which the soybeans are grown. Ford alone now consumes the product of 30,000 acres of soybeans yearly.

Photos show: (1) Robert A. Boyer, Research Chief of Ford Motor Co., examining a "spool of soybean roving." (2) A large cylindrical machine use for dewatering the protein curd in soybean fiber manufacture. (3) Finish Centrifuges (eight in a row) for extracting soybean fiber. (4) Warping equipment using large yarn spools. (5) Longitudinal and cross-sectional views of soybean fibers (700 x magnification). (6) Control Testing Laboratory for soybean fiber manufacture.

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term "soybean fiber yarn" to refer to spun soy protein fiber used like a textile fiber (such as wool).

399. *Newsweek*. 1942. Soybean rubber [Agripol]. 20:69-70. Dec. 7.

• **Summary:** "Henry Reichhold, ambitious head of the booming Ford Motor Co.'s paint laboratory, decided back in 1925 he could make more money working for himself. So that year he left Ford and founded Reichhold Chemicals, Inc., at Detroit [Michigan]. By 1942 he had parlayed his original plant into the world's largest manufacturer of synthetic resins, with six more factories in the United States, Great Britain, and Australia... Last week Reichhold announced he is turning out the world's first commercial production of synthetic

rubber from soybeans. Called 'Agripol' (from 'agriculture' and 'polymer'), the new synthetic is a combination of fatty acids from soybean oil and ethylene glycol from ethyl alcohol, plus customary fillers used in compounding natural rubber, such as sulphur, carbon black, zinc oxide, and an appropriate plasticizer...

"While inferior to natural rubber where high tensile strength and long-wearing qualities are needed (as in auto tires), Agripol is said to be equal and even superior to natural for static uses, such as molded products... Nonmilitary uses also planned include such things as gaskets, belting, insulating mats, hose linings, and adhesives."

400. Carver, George Washington. 1942. Re: Great prospects for soybean fiber and artificial rubber. Letter to Henry Ford at Dearborn, Michigan, Dec. 18. 2 p. Typed, with signature on letterhead (carbon copy).

• **Summary:** The letter begins: "To Mr. Henry Ford, my greatest inspirer and Divinely ordained prophet: Mr. C.T. Lucey has given you the facts and as I look upon that great picture I can see so clearly what I have known all these years. The pose, the prophetic vision in your face, all tell me this subject is not new to you. You are doing, and have been all these years, just what you were ordained to do."

"Possibly the thing that I believe you are going to astonish the world with is your new fiber mixture [containing spun soy protein fibers]. It improves right along, and as trial mixtures perfect it I am expecting to see from your looms not only finer cloth, but rugs equal to the best Axminster, Wilton, etc. And why not? I see unlimited possibilities here."

"Rubber [artificial]: You are just as clear on this as the rest. We will discuss this when you come down. What little I did seems so negligible that it hardly seems worth mentioning. 'Yes, you are going to win.' More next time Mr. Ford. Love to all. Sincerely yours, G.W. Carver."

Note: This is the last letter seen that Dr. Carver wrote to Henry Ford concerning soya before his death on 5 Jan. 1943. Thus he was actively interested in soya up until the month before he died.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Acc. 285, Henry Ford Office (Correspondence), Box 2453. Address: The George Washington Carver Foundation, Tuskegee Inst., Alabama.

401. Ford Motor Co. 1942. Notes on some of the development work now under way at the Ford Motor Company. Dearborn, Michigan. 3 p. Undated. Unpublished typescript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** Note that the U.S. has now entered World War II. Contents: Rubber (from the Russian Dandelion "Kok-Seghyz"). Synthetic rubber (by polymerization of butadiene; fermentation of corn meal yields butylene glycol, which can be converted to butadiene; also investigating thiokol rubber).

Plastic development work (use of fibrous plants as fillers and strengtheners for use in plastic airplane parts). Protein developments.

The section titled "Protein Developments" states: "The plant for producing synthetic fibers from soybean protein is progressing well. The government considers this work quite important as evidenced by the fact that it has assigned a A-1-A priority rating to this work. Since Dr. Carver's visit here this summer [July 1942] many interesting applications of the fiber have been developed. Among these are carpets made of 50% soybean fiber and a specially constructed underwear material for the Air Corp. This underwear contains a mixture of cotton and soybean fiber which gives good strength, warmth and light weight. The extraction of the protein from soybean meal is still the most difficult part of the problem and much development work remains to be done for large scale production. The pH and temperature are extremely critical and evidently must be controlled as accurately as in the human body. An elaborate air conditioning system is being installed enabling us to control temperature throughout the building and making it possible to produce 1000 pounds of this fiber a day.

"An interesting use has been developed for the off grade protein not converted to fiber. An extrusion process and subsequent hardening in formaldehyde enables us to produce a pure protein plastic which has many possibilities for use as buttons, buckles and other decorative objects. Samples as attached.

"Soybean protein has also shown interesting film properties. The water paints which we have been making for several years are based on this property. At the request of the Air Corp a special camouflage paint using soybean protein as a binder has been developed for spraying on the run way at the Willow Run Airport. There are about 800 acres of concrete to be sprayed and a paint that can be sprayed by our ordinary Orchard spray machine and which blends perfectly with the surrounding landscape is now ready for application when ever the Air Corp sees fit." Address: Dearborn, Michigan.

402. **Product Name:** Alysol (Industrial-Grade Isolated Soy Protein).

Manufacturer's Name: Drackett Company (The).

Manufacturer's Address: 5020 Spring Grove Ave., Cincinnati, Ohio.

Date of Introduction: 1942.

New Product-Documentation: Werner Von Bergen and Walter Krauss. 1942. *Textile Fiber Atlas*. p. 33. "Soya bean fiber was first introduced to the American people at the New York World's Fair of 1939 at the Ford exhibit. Its base is a protein of the soya bean produced by the Drackett Product Co., Cincinnati, under the trade name of Alysol protein. In its microscopical appearance as seen from Plate XXIII, the fiber is very similar to Aralac and Lanital."

Interview with Charles Butke. 1993. May 26. "The Drackett Company's work with 'Alysol' soy protein." Chuck went to work for Drackett in 1946 at about the time when the Sharonville plant began operations. At about that time he recalls reading in a report that a soy protein product named "Alysol" was being made by Drackett before he arrived. The Alysol was made at the Drackett plant at 5020 Spring Grove Ave. in what was then northern Cincinnati. That was the location of Drackett's original soybean extraction plant which began operations in about 1937.

403. Bergen, Werner von; Kraus, Walter. 1942. Textile fiber atlas: A collection of photomicrographs of common textile fibers. New York, NY: American Wool Handbook Co. 38 p. Plus 25 full-page black-and-white plates and a 6-page index. [1 soy ref]

• **Summary:** The chapter titled "Prolons and Synthons" (p. 33-34) states that prolons are man-made protein fibers, whereas synthons are purely synthetic fibers such as nylon and vinyon. The proteins used to make prolons are casein (from milk; used to make Lanital and Aralac), soya bean protein, zein (from corn), and fibroin (obtained by dissolving silk wastes).

"Soya Bean Fiber: This fiber was first introduced to the American people at the New York World's Fair of 1939 at the Ford exhibit. Its base is a protein of the soya bean produced by the Drackett Product Co., Cincinnati [Ohio], under the trade name of Alysol protein. In its microscopical appearance as seen from Plate XXIII, the fiber is very similar to Aralac and Lanital.

Proper differentiation of soya bean and casein fibers is possible on the basis of their variation in the amino acids present by qualitative color reactions, as reported by Williams and Tonn" [1941]. Also discusses the fineness and size of the fibers.

Plate XXIII show soya bean fibers in both longitudinal and cross-sectional views. Address: 1. Director of Laboratories, Forstmann Woolen Co., Teacher of Wool Manufacture, Columbia Univ., New York; 2. Textile Microscopist, Technical Laboratories, Sears, Roebuck & Company.

404. Glotzhober, Clem. 1942. Annual report (August–December). Dearborn, Michigan: Food Laboratory (Ford Motor Co.). 14 p.

• **Summary:** Research was conducted on a coffee substitute made from roasted soybeans mixed with other plants, patties made from pre-cooked soybeans, and the effects of hydrochloric acid and sodium hydroxide on the pH of solutions of "soy protein."

The last section, titled "Hard soy cheese," describes the author's attempt "to make a similar cheese from soy milk. Several batches of soy milk were curdled by several methods including acetic acid plus heat, and lactic acid plus pepsin,

and then the curds were pressed." The cheese was then cured for 3 months or more.

Note: This is the earliest English-language document seen (Feb. 2007) that uses the term "Hard soy cheese" to refer to a Western-style soy cheese. Address: Food Lab.

405. Markley, Klare S.; Goss, Warren H. 1942. The chemistry and technology of the soybean and its derived products. II. Processing of soybeans and soybean products. *USDA Bureau of Agricultural Chemistry and Engineering*. ACE-142. Part II. 69 p. Illust. 28 cm. Part II, by W.H. Goss. [207 ref]

• **Summary:** Contents: Processing soybeans: Development of the soybean processing industry, grading and storage, methods of processing soybeans, processing by means of continuous presses, processing by means of continuous solvent extractors, hydraulic pressing, miscellaneous processing methods, soy flour, cost of processing soybeans. Production and refining of phosphatides. Processing soybean oil for food uses: Neutralization and washing, bleaching, hydrogenation, deodorization, winterizing, shortening, margarine. Literature cited. Address: Urbana, Illinois. U.S. Regional Soybean Industrial Products Lab.

406. Borth, Christy L. 1943. Modern chemists and their work: Pioneers of plenty. New enlarged edition. New York, NY: The New Home Library. [12] + 13-410. See p. 200-12, 359-74. Index. 21 cm.

• **Summary:** This book was originally published in Sept. 1939 as *Pioneers of Plenty: The Story of Chemurgy*. This is an enlarged version of that book.

Partial contents: Foreword, by the publishers. Introduction: 1. Chemurgy. Book one: Chemurgy's cradle rockers. 2. Chemurgy's crowded stage. 3. Hale–Father of chemurgy [Dr. William J. "Billy" Hale, a great organic chemist]. 4. Hale and Herty hunt. 5. Herty–Pioneer of the pines. 6. The Herty heritage. 7. Garvan–A career of contrasts [Francis Patrick Garvan, a Manhattan lawyer, who transformed undisciplined ideas into the potent reality of chemurgic action]. 8. Garvan–The chemurgic crusader.

Book two: Pioneers and problems. 9. Baekeland–Plastic pioneer. 10. Ford links farm and factory [mostly about the work of Henry Ford and his researchers with "the soy" / soy bean]. 11. Chemurgic oil fields [about soy oil and other vegetable oils, incl. coconut, palm, flax, cotton, corn, tung, perilla, chia, sesame, pine, peanut]. 11. The first and greatest chemurgist [George Washington Carver]. 12. Too much food! [for the first time in history]...

Book three: Americans discover America... 19. Research pays off [Henry Ford, soy beans, A.E. Staley, Dr. W.L. Burlison of the University of Illinois, Adolf Hitler, American Soybean Association, the four regional laboratories]. 20. The farm grown automobile arrives [Henry Ford's and Bob Boyer's plastic car].

Since Ford began his soy research in 1930, he has spent

more than \$3 million on this project, upon which more than 20 scientists have been constantly employed (p. 206). Since as early as 1919, Henry Ford's "mind was moving toward chemurgic conclusions." Many of his statements in interviews during the 1920s, although "they must have sounded far-fetched at the time, dovetail nicely into the currently unfolding pattern of chemurgic thinking" (p. 207). For every million Ford automobiles, about 2 million lb of soy-bean oil are used (p. 207-08). Even today about two thirds of the world's annual crop of soybeans (6 million tons) are raised in Japan's "puppet state" of Manchukuo (p. 209).

407. Stidger, William L. 1943. Henry Ford on plastics.

Rotarian (The). Feb. p. 15-18, 58. [1 ref]

• **Summary:** In a metal-short world, soybeans are being used in a surprising number of new ways. Henry Ford has a suit made of spun soybean fibers, drinks soybean milk, and has an experimental plastic car, many parts of which are made from soybeans (only the tubular frame is made of steel; the car weighs only 2/3 as much as a steel car). A chronology of major plastic products—from celluloid in 1875 to vinylidene chloride in 1941—is given.

408. Dies, Edward J. 1943. Soybeans: Gold from the soil. New York, NY: The Macmillan Co. 122 p. March. Index. 21 cm. First published in April 1942. [205 ref]

• **Summary:** This revised edition is very similar to the first edition published in April 1942. Minor changes have been made on the following pages: 20, 28, 70-73, 84-85, 90-94, 121-22. None of the statistics in the many tables have been updated, and the bibliography is unchanged. Address: USA.

409. Glotzhober, Clemens T. 1943. Scientist and Christian. *Walther League Messenger (The)*. March. p. 374-75, 406. [3 ref]

• **Summary:** Contains a brief biography, with photos, of Dr. George Washington Carver, and describes his last visit to the Ford Motor Co. in July 1942. Dr. Carver was a devout Christian and student of the Bible. Some of his favorite Biblical passages are given.

"In 1896 Carver accepted Booker T. Washington's invitation to come to Tuskegee Institute in Alabama, where he stayed until he died. Edison once asked Carver to work for him, but Carver preferred to stay in the South and help the Negroes."

The article begins: "'In all thy ways acknowledge Him, and He shall direct thy paths' (Proverbs 3, 6). This has been the basis of my life's work," said Dr. George Washington Carver, the famous Negro scientist who died recently. I heard him make this statement to a small group of workers in one of Henry Ford's laboratories at Dearborn, Michigan. One of Dr. Carver's favorite Scripture passages was, 'I can do all things through Christ, which strengtheneth me' (Philippians 4, 13)."

Photos show: Dr. Carver sitting by the fireside, reading his Bible. Dr. Carver and Henry Ford in the new Carver Laboratory in Dearborn, Michigan, examining a dish of weeds. Address: Ford Motor Co., Dearborn, Michigan.

410. Yoder, Robert M.; Thiem, George. 1943. Soya can do! *Rotarian (The)* 62:26-27, 54-55. March. [2 ref]

• **Summary:** Scientists are transforming soybeans into glue, clothing, doorknobs, paint oils, and a thousand other needed items. A sausage (containing 22% soybean meal and 66% meat), "undoubtedly doomed to be called 'soysage,'" is helping to feed a hungry world (p. 27).

"The Germans, it is known, have fortified practically all their Army rations with soybean flour. As far back as 1939, they added the protein-rich powder to the ten basic foods of the German Army—barley, noodles, wheat flour, conserves, peas, potatoes, rice, lentils, cabbage, and turnips" (p. 54).

"A year or so ago, Henry Ford, wearing a suit made of soybean 'wool,' treated a visitor to a glass of soybean milk and took him for a ride in a soybean Ford, in which soybean plastics had replaced everything replaceable. Mr. Ford predicted that this bean will in time replace both the cow and the hog on Midwestern farms, and the corn belt will inevitably become known as the soybean belt" (p. 54).

"A clipper ship brought the first soybeans to the United States in 1804... Soybeans growing in a garden plot were a curiosity in the Oriental exhibit at the Chicago [Illinois] World's Fair [Columbian Exposition] in 1893" (p. 54).

"Two years ago, at Kutsing, a refugee center deep in the interior of China, an American-educated Chinese girl opened a soybean dairy. China Child Welfare, Inc., of New York, sponsored her project" (p. 54).

Three somewhat racist cartoons from the *Chicago Tribune* shown how the soybean, in the form of a Chinese man, has become Americanized. A photo shows a man driving a tractor, whose wheels straddle two rows of soybeans; he appears to be cultivating.

Note 1. This is the earliest document seen (Oct. 2009) that contains the word "soysage."

Note 2. This is the earliest English-language document seen (Oct. 2003) that contains the term "soybean dairy" (or "soy bean dairy" or "soy-bean dairy").

411. Photograph of Clem Glotzhober watering plants in the Carver greenhouse, Dearborn, Michigan, April 20. 1943.

• **Summary:** Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

412. Photograph of outside of Carver Laboratory, Dearborn, Michigan. April 20. 1943.

• **Summary:** Including a powerhouse. Negative number: unknown.

Note: This photo negative may be filed in the Ford Archives at: "Ind-Autos-FMC-Eng & Des" which means "Industry-Autos-Ford Motor Co.-Engineering and Design."

413. Planiol, M. 1943. Notes sur la Soja [Notes on soya]. Paris. 36 p. May 12. Unpublished typescript. 30 cm. [Fre]

• **Summary:** These notes, based largely on extracts from existing publications, were compiled in Paris during the month before publication on May 12.

Contents: A word of introduction: History of personal interest in soybeans, and sources. The soybean around the world: Climate, acclimatization (USA, Central Europe, France, England). Characteristics and varieties. The soil. Preparation of the soil. Fertilizer. Inoculation. Date of planting. Planting. Crop maintenance. Date of harvest. Harvesting. Soybean yields. Storage. The soybean as a food. Green forage and pasture. Soybean hay—its production. Soybean hay—its consumption. Mixed forages. The soybean for ensilage. Soybean seeds as animal feeds. Soybean cake. Soybean straw. Effect of fertilizers on soybeans. Enemies of soybeans. Photoperiodism and its discovery. Views of the future. Henry Ford and the soybean.

In the Introduction, the author explains that upon arriving in Enfidaville [Enfida, a town in northeast Tunisia] in Oct. 1912 for a course in agriculture, he first heard about soybeans at the Colonial School of Agriculture (*l'Ecole Coloniale d'Agriculture*) in Tunis, where the crop was being studied. In July, in the region of Mornag, he had seen the first field of soybeans (Mammoth variety), which had made a strong impression on him.

In 1920 he discovered a report by Léon Rouest, a veritable unrecognized genius who died poor in 1938 after battling for 30 years in favor of soya, and spending six years in the Soviet Union working on soybean selection. He created some of France's best varieties and wrote, with Mr. de Guerpel, a book that is today impossible to find.

In 1921 his contact with soya was interrupted for 20 years. Then in 1941 he rediscovered the soybean at Rennes, where Mr. Winter was Director of the Botanical Garden (*Jardin des Plantes*), and himself a remarkable geneticist and convinced experimentalist. Winter introduced Planiol to *The soybean in France*, by Blanchard, Marcel (1941), an excellent book. Blanchard was director of the Station for Seed Trials (*Station d'Essais de Semences*) at 33 rue de Picpus in Paris, where he maintained a collection of many soybean varieties; in addition he had organized here a veritable headquarters for soybean trials conducted throughout France—and all of this (remarkably) on his own initiative.

Mr. Winter introduced him to Mr. Cuisance at Reims. In late March 1943 Mr. Blanchard introduced him to many of the world's key publications on soybeans—which he cites.

414. Holt, Rackham. 1943. George Washington Carver: An American biography. New York, NY: Doubleday Doran & Co.

342 p. 2nd ed. 1963, 360 p. [18* ref]

• **Summary:** This is considered by some to be the best biography of Carver. The author is a woman. There are ten entries on soy in the index of the 1963 second edition.

Dr. Carver was born a slave in Missouri, around 1864. After working his way through school by washing clothes, Carver applied for registration at the University of Iowa and received a letter of acceptance. However, when he arrived, and officials learned that he was a Negro, he was rejected. Later he attended Simpson College at Indianola, Iowa, and then Iowa State College, where he was appointed to the faculty after graduation. In 1896 Carver accepted Booker T. Washington's invitation to come to Tuskegee Institute in Alabama, where he stayed until he died. The Iowa State College of Agriculture and Mechanic Arts was already an eminent institution in 1891. "It was the seed bed from which sprouted 3 men who were to rule the agricultural destinies of the United States for 28 years.

"James G. Wilson, director of the Agricultural Station, was soon to become Secretary of Agriculture in the cabinets of McKinley, Theodore Roosevelt, and Taft; Henry Cantwell Wallace was Assistant Professor of Agriculture, later to become Secretary of Agriculture in the cabinets of Harding and Coolidge until he died in 1924. His son, Henry Agard Wallace, was to fill the same post during the first 2 administrations of Franklin D. Roosevelt." The school term had already started when George Washington Carver arrived in May.

Before the turn of the century, Carver was preaching that the South should balance its agriculture by growing peanuts and sweet potatoes. He later developed more than 300 uses for the peanut.

Shortly after arriving at Tuskegee in Oct. 1896, Prof. Carver started experimentation on various relatively new members of the legume family, which he felt could enrich the soil and serve as valuable additions to the diets of livestock. "In 1896 there was no crimson clover anywhere in the county, nor for many counties roundabout. He planted this and the cowpea and hairy vetch. In '97 [1897] he secured a pint of velvet-bean seed which yielded fully three pecks. He experimented with the peanut, which was no more considered a farm crop than was parsley; the children liked to eat peanuts, so a few families had a few vines.

"Developing agriculture means keeping an eye out for new things. The soja pea, now known as the soybean (*Glycine soya*), the little honorable plant and the main dependence of China for its food supply, was said to have been brought back by Commodore Matthew C. Perry, but nothing had been done about it in this country. This, too, Professor Carver planted" (p. 168). He would make every effort to educate away from the one-crop system. A photo (p. 169) shows young Carver at Tuskegee.

In 1901 Carver noted the occurrence of a fungus, which he designated as *Cercospora canescens* E. & M., on soybean

and several other unrelated hosts. This appears to be the earliest reported occurrence of a *Cercospora* on soybean in America.” It was not recorded in the U.S. again until 1924. In 1903 Professor Carver’s exhibit in the capitol drew crowds to see his dried foods and soja peas and demonstrated the value of sweet potatoes and cowpeas.

With the notable exception of Professor Carver, few people in the U.S. had heard of the soybean until 1907 when the Department of Agriculture instituted experimentation on imported plants and tried adapting it to American soils and climatic conditions. Professor Carver had already successfully tried his own hand at experimentation. He was lecturing on the soybean and the derivatives he had found—flour, meal, coffee, breakfast food, oil, milk—long before it had been picked up by Midwestern growers. He could not emphasize the soybean for industrial purposes, however, because of Southern unfamiliarity. He concentrated his efforts, therefore, on the peanut.

Concerning peanuts, page 237 notes that “Professor Carver had started publishing recipes for cooking peanuts for the table before 1913, but these were constantly being augmented, and the bulletin was in its sixth edition by 1916, carrying directions for growing and 105 ways of preparing it for human consumption.” During this time he was teaching senior girls at Tuskegee Institute how to cook with peanuts. The girls served a 5-course luncheon to Booker T. Washington and nine guests—“soup, mock chicken, creamed as a vegetable, salad, bread, candy, cookies, ice cream, coffee—all from peanuts.”

Pages 239-40 describes a conversation, in “God’s Little Workshop,” between Prof. Carver and God in which Carver asks God about the meaning of the universe, of human life, and of the peanut. Responding only to his third question, God replied that “my mind was too small to know *all* about the peanut, but He said He would give me a handful of peanuts. And God said, ‘Behold I have given you every herb bearing seed, which is upon the face of the earth... to you it shall be for meat...’ Then God instructs Carver what to do with peanuts in order to unravel their mysteries and uses. Page 242 describes Carver’s preparation of peanut milk. “Cream would rise upon it which could be turned into butter without souring. The cream could be removed to produce buttermilk, and from either an inexpensive, palatable, and long-lasting cheese could be manufactured; where a hundred pounds of cows’ milk made ten pounds of cheese, the same amount of peanut milk made thirty-five pounds. This milk proved to be truly a lifesaver in the Belgian Congo. Cows could not be kept there because of leopards and flies, so if a mother died her baby was buried with her; there was nothing to nourish it. Missionaries fed the infants peanut milk, and they flourished.”

On 22 Jan. 1921 Carver spoke at the hearings of the General Tariff Revision before the Committee of Ways and Means of the House of Representatives. Given 10 minutes

to speak, he was found to be so interesting and persuasive that his time was extended to 105 minutes. He showed the Committee a bottle of peanut milk on which the cream had risen, a bottle of rich peanut milk for ice cream, plus samples of buttermilk and evaporated milk. He explained that Secretary of Agriculture Wilson had been his instructor at Iowa State College for 6 years.

William Jay Hale, a chemist, coined the term “chemurgy,” which first appeared in print in 1934 in his book *The Farm Chemurgic*. “Chemi,” the root from which “chemistry” was derived, originally meant the black earth of Egypt; “ergon” was the Greek word for work. Hence “chemurgy” could be defined as “chemistry at work,” an implied the application of this work to the soil.

In his book *Pioneers of Plenty*, author Christy Borth called Carver the first and greatest chemurgist. Carver later became close friends with Henry Ford.

415. Perry, Robert L. 1943. Ford’s soybean expert goes to Ohio: Fiber mill leaves Dearborn. *Detroit Free Press*. Sept. 17.

• **Summary:** “Robert A. Boyer, who turned soybeans into dozens of industrial products for Henry Ford... has joined The Drackett Co., a chemical firm of Cincinnati, Ohio., it became known in Detroit Thursday.

“At the same time it was revealed that the soybean fiber mill, which was Boyer’s latest project before he resigned July 1 from the Ford Motor Co., had been shipped to Cincinnati, and will be assembled there by The Drackett Co., to enable Boyer to continue the project he began in Dearborn.

“The dramatic, and hitherto unrevealed story of Boyer’s parting with Ford, also has come to light. It happened the week Edsel Ford lay dying, and Henry Ford, faced with the certain grief of the loss of his only son, went to Boyer and sat down with him in the young chemist’s laboratory to tell him that the soybean fiber project, which the elder Ford visited almost daily, would have to be discontinued.

“Henry Ford faced the responsibility he would have to shoulder in resuming the full load of president of the company, and the burden of more than four billion dollars worth of war contracts, and made his decision in order to devote himself to his war job.

“That week dismantling of the soybean fiber mill began, and when Boyer made his new connection, the mill went along.” Address: Free Press automotive editor.

416. Voellmig, Gertrude. 1943. Soy bean luncheon served to Detroiters: Soy milk introduced to public. *Detroit Free Press*. Sept. 25.

• **Summary:** “A world premier of soy bean milk was part of a complete soy bean luncheon served by the Ford Motor Co. to a selected group of Detroit newspaper women, Friday noon, Sept. 24.

“While they had looked forward eagerly to the first all soy bean meal that has ever been served, they were amazed at

the variety of fascinating dishes produced from this miracle bean... Henry Ford II, enjoying with the rest of his guests the foods prepared in special kitchens at the Administration Building, commented favorably about the soy bean butter...

"Planned especially to introduce practical soy bean dishes to the world's housewives, the luncheon menu was as follows: Celery stuffed with soy pimento cheese. Canapes of soya crackers with soy butter. Soy bean soup. Soya melba toast. Soy cutlets. Soy sprouts creole. Buttered green soya beans. Baked soy beans. Parsley potatoes. Soy bean coffee. Soy bean milk. Soy sprout salad. Soy bean bread, butter and crackers. Soya ice cream. Soy custard. Soya cookies." The ice cream, described as "rich" and "delicious," was one of the highlights of this "World Neighbor Luncheon."

"Robert Smith, soy bean chemist of the Carver Experimental Laboratory at Dearborn, Michigan, explained that the luncheon was held to demonstrate how the soy bean can help to rehabilitate the war-devastated countries where dairy herds and food sources have been destroyed..."

Note 1. Ford served a similar (but not identical) all-soy luncheon to reporters nine years earlier, in Aug. 1934, at the Chicago World's Fair. Soy bean milk was also served at the 1934 luncheon, but not soy ice cream.

Note 2. This is the earliest English-language document seen (March 2007) that uses the term "Soya ice cream" to refer to soy ice cream.

417. Ford Motor Co. 1943. Tomorrow a motor car body, a square meal, and a suit of clothes from the same crop! (Ad). *Soybean Digest*. Sept. p. 25.

• **Summary:** That crop is the soybean. "Durable fabrics, for instance, are woven from Soydon, a new synthetic wool-like fiber, produced by Ford..." In a normal year of car production, the Ford Motor Co. uses 2,000,000 lb of soybean oil. A photo shows Henry Ford and Harry Ferguson, close collaborators in creating today's Ford tractor with the Ferguson system (see next page).

418. *Drackett Dotted Line (The) (Cincinnati, Ohio)*. 1943. Expansion results in management changes. Oct. p. 1-2.

• **Summary:** "Robert A. Boyer has joined the Executive Department of The Drackett Company as Director of Scientific Research. Bob formerly headed up soybean research for the Ford Motor Company. In that position he was responsible for the development of dozens of commercial products from the soybean. In his new position he will have the executive direction of all scientific work both chemical and engineering in the development of new products and the improvement of old."

Donald C. Spice has been appointed Chemical Director at the Sharon Plant. He was formerly chief chemist. "When the Sharon plant began operations, he was placed in charge of the laboratory supervising both control work and research on soybean oil and meal."

Dr. W. C. Gangloff, who joined the company in 1925 as Chemical Director, was responsible for building up the research staff now active in developing products from soybeans.

Mr. R.B. Alspaugh, formerly Director of Sales, Soybean Division, has been Elected Vice President of The Drackett Products Company-Soybean Division. He joined the company in 1939 and has since handled the sale of soybean meal and oil.

A photo shows each man, and H.R. Drackett (president) and his son, Roger Drackett. Roger joined the company in 1934 after completing post graduate work at the Harvard School of Business Administration. He is now Executive Vice President. The Drackett Co. is a manufacturing company; all its products are sold by The Drackett Products Co.

419. *New York Times*. 1943. Plans commercial output of soybean textile fiber. Nov. 25. p. 47, col. 4.

• **Summary:** "H.R. Drackett, president of the Drackett Company, announced today that his company will begin production of a new textile fiber, developed from soybeans, early next month. According to the announcement, it will be produced on a commercial basis at prices competitive with wool.

"The new product is said to be elastic, resilient and moisture absorbent and the first non-animal protein fiber. It can be blended with both wool and cotton and is now used experimentally in hats, underwear, blankets and other textiles. The process, originally developed by the Ford Motor Company, has been taken over, with personnel and equipment, for commercial exploitation."

420. **Product Name:** Soybean Oil, and Soybean Oil Meal.

Manufacturer's Name: Ford Motor Co.

Manufacturer's Address: Milan, Michigan.

Date of Introduction: 1943. November.

Ingredients: Soybeans.

How Stored: Shelf stable.

New Product-Documentation: USDA Northern Regional Research Laboratory. 1943. "Soybean processing mills in the United States." *USDA Bureau of Agricultural and Industrial Chemistry*. AIC-26. 10 p. Nov. See p. 2. Milan, Michigan: "Ford Motor Co." (Small = capacity of less than 50 tons/day of soybeans). Solvent extraction plant.

421. **Product Name:** Soybean Oil, and Soybean Oil Meal.

Manufacturer's Name: Ford Motor Co.

Manufacturer's Address: Saline, Michigan.

Date of Introduction: 1943. November.

Ingredients: Soybeans.

How Stored: Shelf stable.

New Product-Documentation: USDA Northern Regional Research Laboratory. 1943. "Soybean processing mills in the United States." *USDA Bureau of Agricultural and Industrial*

Tomorrow a Motor Car Body, a Square Meal and a Suit of Clothes from the same crop!



IN THE test-tube of Science, a vegetable which for thousands of years had given man food and oil, suddenly revealed a storehouse of hidden riches.

And as a result of Ford pioneering in organic chemistry, soon a motor car body, a nutritious meal or a fine suit of clothes can be made from this self-same vegetable—the soybean! Durable fabrics, for instance, are woven from Sylon, a new synthetic wool-like fiber, produced by Ford, which tests prove to be highly useful for many purposes.

Moreover, this remarkable soybean, at the scientist's touch, is producing an amazing variety of other useful products, such as enamels, paints, soap, pressed board, building materials and molded plastic parts for airplanes and automobiles, replacing critical materials for many manufacturing uses.

From this one crop we today foresee better, cheaper clothing, self-sufficiency in certain vital oils, and an inexhaustible source of raw materials for scores of modern industrial products.



The Ford tractor and hydraulically controlled, wheelless plow are designed and built as a unit. The basic idea of this development is to permit economical and profitable mechanized operation of small as well as large farms.



At the Ford Research Laboratory, the test-tubes of science constantly seek other undreamed-of uses for more farm products—profitable employment for more farm acres.

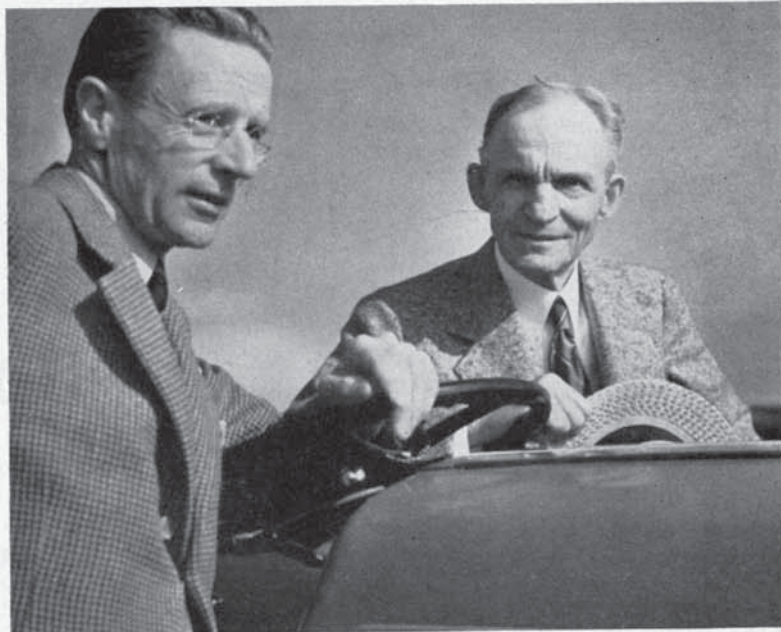
No wonder, with our increased knowledge, that the soybean crop has grown from 50,000 bushels in 1914 to more than 200,000,000 bushels in the present year. In a few years, it has become the staple crop of some of America's largest

agricultural states. Yet, the new sources of earth-wealth, opened by industrial chemistry, have barely been scratched.

American farmers grow for commercial car-lot sale about 200 different crops.

And organic chemistry in a short span of years has developed a myriad of new uses for these agricultural products.

Now chemists here at Ford are exploring the possibilities of finding industrial uses for some of the other 300,000 plants which botanists have identified.



Henry Ford and Harry Ferguson, close collaborators in creating today's Ford tractor with the Ferguson System

Some of the Farm Products Used by the Ford Motor Company in a Normal Year of Car Production

2,000,000 Pounds of Soybean Oil
89,000,000 Pounds of Cotton
800,000 Bushels of Corn
2,400,000 Pounds of Linseed Oil
2,500,000 Gallons of Molasses
3,200,000 Pounds of Wool
1,500,000 Feet of Leather
1,000,000 Pounds of Lard
350,000 Pounds of Mohair

Many farm materials formerly used in Ford car manufacture are now devoted to war production. But when the return of peace again sets the Ford car production line in motion, the new car demand which has accumulated during war years will require even greater amounts of agricultural products as raw materials.

Such comparative newcomers as guayule and milkweed, as sources for rubber, indicate the almost limitless opportunity for expansion in this direction.

And as cheaper means of conversion are found, marketable value will be given to 250,000,000 tons of agricultural materials now practically wasted.

The time is not far, when a permanently prosperous farm-industry will banish mass unemployment and give new meaning and stability to American prosperity.

FORD MOTOR COMPANY



Chemistry. AIC-26. 10 p. Nov. See p. 2. Saline, Michigan: "Ford Motor Co." (Small = capacity of less than 50 tons/day of soybeans). Solvent extraction plant.

422. Product Name: Soy Bean Oil, and Soy Bean Meal.

Manufacturer's Name: Ford Motor Company.

Manufacturer's Address: Dearborn, Michigan.

Date of Introduction: 1943. November.

Ingredients: Soybeans.

New Product–Documentation: USDA Northern Regional Research Laboratory. 1943. "Soybean processing mills in the United States." *USDA Bureau of Agricultural and Industrial Chemistry*. AIC-26. 10 p. Nov. See p. 2. Dearborn, Michigan: "Ford Motor Company. Valley Soy Bean Cooperative Association." (M = Medium capacity, between 50 and 200 tons/day of soybeans). Solvent extraction plant.

Note: In Sept. 1934 the Ford Motor Co. began crushing soybeans using solvent extraction at a small solvent extraction plant located in "The Industrialized American Barn," on Ford property. It is not clear whether this is: (1) The same plant in the same place; (2) The same plant in a different place run by a cooperative; (3) A different plant in a different place run by a cooperative.

423. Soybean Digest. 1943. [Boyer leaves Ford Motor Co.]. Nov. p. 14.

• **Summary:** "Announcement has been made of the resignation of Robert A. Boyer as head of Ford Motor Co. Chemurgic Laboratories. Under his direction, the Ford research laboratory perfected processes for extracting soybean oil, and developed soybean paint. Mr. Boyer in his new position as development director of Drackett Co., Cincinnati, Ohio, will continue work on the development of soybean fibre."

424. USDA Northern Regional Research Laboratory. 1943. Soybean processing mills in the United States. *USDA Bureau of Agricultural and Industrial Chemistry*. AIC-26. 10 p. Nov. Revised edition, 1948. CA-5, 14 p.

• **Summary:** "The following list of soybean processing mills is divided into three parts: (1) mills in which soybeans regularly constitute the bulk of the throughput, (2) mills which are currently under construction or whose construction is being seriously considered, and (3) mills which are engaged in soybean processing temporarily or part time, or which have otherwise participated in the soybean program by signing a soybean processor contract. It must be realized that changes are occurring very rapidly at the present time, throughout the entire soybean processing industry.

"Solvent extraction plants in group No. 1 are designated with an asterisk (*). Many of the solvent type mills also contain expellers and screw presses. After the name of each mill in group No. 1, the letter S, M, or L is used to designate whether it is a small, medium, or large installation. These

ratings are only approximate and divide mills into three capacity groups: S (small), capacities less than 50 tons of soybeans per day; M (medium), capacities between 50 and 200 tons per day; and L (large), capacities over 200 tons per day."

(1) Mills specializing in soybeans:

Arkansas: West Memphis–Arkansas Mills, Inc. (S).

Wilson–Wilson Seed and Feed Company (S).

California: Oakland–Albers Brothers Milling Company (S).

Illinois: Bloomington–Funk Brothers Seed Company (M). Cairo–Swift and Company (M). Champaign–Swift and Company (L). Chicago–Archer–Daniels–Midland Company (M)*; The Glidden Company (L)*; Norris Grain Company (S); Spencer Kellogg and Sons (L). Decatur–Archer–Daniels–Midland Company (L)*; Decatur Soy Products Company (M); Spencer Kellogg and Sons (L)*; A.E. Staley Manufacturing Company (L). Galesburg–Galesburg Soya Products Company (M). Gibson City–Central Soya Company, Inc. (L). Monmouth–Ralph Wells and Company (S). Peoria–Allied Mills, Inc. (L). Quincy–Quincy Soybean Products Company (M). Springfield–Illinois Soy Products Company (M). Taylorville–Allied Mills, Inc. (M).

Indiana: Decatur–Central Soya Company, Inc. (L)*.

Indianapolis–Evans Milling Company (M). Lafayette–Ralston Purina Company (M). Marion–Hoosier Soybean Mills, Inc. (M). Windfall–Elevators and Mills, Inc. (S).

Iowa: Cedar Rapids–Honeyamead Products Company (M)*; Iowa Milling Company (M). Centerville–Standard Soybean Mills (M). Clinton–Clinton Company (M)*. Des Moines–Spencer Kellogg and Sons (M); Swift and Company (M). Fayette–Wilbur Bell, Inc. (S). Fort Dodge–Plymouth Processing Mills (M [co-op]). Gladbrook–Central Iowa Soybean Mill (S). Iowa Falls–Ralston Purina Company (M). Quimby–Simonsen Soybean Mill (M). Sioux City–Sioux Soya Company (S). Waterloo–Soy Bean Processing Company (M).

Kansas: Emporia–Kansas Soy Bean Mills, Inc. (M).

Kentucky: Henderson–Ohio Valley Soy Bean Cooperative Association (M). Louisville–Buckeye Cotton Oil Company (L)*. Owensboro–Owensboro Grain Company (S).

Michigan: Dearborn–Ford Motor Company (M)*. Milan–Ford Motor Company (S)*. Saline–Ford Motor Company (S)*.

Minnesota: Mankato–Mankato Soya Products Company (S). Minneapolis–Archer–Daniels–Midland Company (S).

Missouri: Galesburg–Spring River Mill (S). St. Joseph–Dannen Mills (M). St. Louis–Ralston Purina Company (M).

Nebraska: Fremont–Pete Marr Soybean Processing Company (S). Omaha–Allied Mills, Inc. (M).

New York: Buffalo–Spencer Kellogg and Sons (M).

Oswego–Oswego Soybean Products Corporation (M).

Ohio: Berea–Berea Milling Company (M). Cincinnati–Drackett Company (M)*. Circleville–John W. Eshelman and Sons (M); Ralston Purina Company (M). Fostoria–Swift

and Company (M). Marion–Old Fort Mills, Inc. (M). New Washington–Ohio Soya Company (S). Painesville–A.E. Staley Manufacturing Company (L). Toledo–Archer-Daniels-Midland Company (L); Toledo Soybean Products Company (M). Wooster: Soya Processing Company (M).

Pennsylvania: Jersey Shore–Pennsylvania Soy Bean Cooperative Association (S).

Tennessee: Memphis–Buckeye Cotton Oil Company (M).

Virginia: Norfolk–Davis Milling Company (S).

Portsmouth–Allied Mills, Inc. (M); I.F. Laucks, Inc. (S).

Wisconsin: Milwaukee–Archer-Daniels-Midland Company (M).

Note 1. This is the earliest document seen (Dec. 2005) that mentions Dannen Mills (St. Joseph, Missouri) in connection with soybeans.

Note 2. This is the earliest document seen (June 2005) that mentions Honeyhead Products (Cedar Rapids, Iowa) in connection with soybeans.

Note 3. This is the earliest English-language document seen (Sept. 2003) that contains the term “screw presses” (or “screw press”) in connection with mechanical pressing of soybeans to give oil and meal (one of two documents).

425. *Drackett Dotted Line (The) (Cincinnati, Ohio)*. 1943. Soy bean fiber plant starts operation. Dec. p. 5-6.

• **Summary:** On 2 Dec. 1943 Drackett’s new “soybean fiber plant was officially declared in operation. The Drackett Company is a true pioneer in this promising development. We are now operating the only plant in the country producing this new synthetic fiber.

“This new fiber is as warm as wool. It is resilient, strong and durable, and can be made either moisture absorbent or moisture repellent. It is not a competitor of any other fiber, but is an entirely new raw material with a growing field of usefulness. It may be blended with either cotton or wool or it may be woven or spun into fabrics. It has already been made experimentally into such products as blankets, felt hats, underwear, hosiery, suitings and upholstery fabrics. The manufacturing process can be so controlled as to build into the fiber various desirable characteristics which enable it to meet a variety of requirements. The capacity of the soybean fiber plant will be increased as rapidly as war conditions will permit.” The process used to make the soybean fiber is then described.

“And so the first of our soybean products—other than the basic products meal and oil—is launched. As fast as conditions permit, others will be put into production.”

Five photos show the following: (1) Robert Boyer, H.R. Drackett, and Bill Atkinson are inspecting a batch of soybean protein which has just been liquefied in a large vat. It will be forced under pressure through hundreds of spinnerettes to emerge ultimately as a fiber. (2) Liquefied soybean protein emerges from the spinnerettes as hundreds of fibers. Mr. Drackett inspects these fibers with tongs as they are being

given one of several chemical baths. (3) Mr. Drackett and Mr. Boyer inspect the first batch of fiber produced in the new fiber plant. Behind the two men is a large pile of the white fiber. “Today this fiber, which four years ago was a laboratory curiosity, is finding many commercial uses.” (4) John O’Leary and Fred Wilson are in the laboratory testing the strength of a patch of soybean fiber. (5) Roger Drackett (Executive Vice President), H.R. Drackett (President), Arthur H. Boylan (V.P. in Charge of Advertising & Marketing Research), and Robert Boyer (Director of Scientific Research) examine several products [fabrics] made experimentally from the new fiber.

Note: This article seems a bit misleading since it gives the impression that Drackett pioneered in the development of soy protein fiber. It makes no mention of the following facts: 1938 April–The world’s first soy protein fiber was developed and exhibited by Robert Boyer of the Ford Motor Company at the Fourth Annual Conference of the Farm Chemurgic Council, in Omaha, Nebraska. 1939 May–This fiber was exhibited at the World’s Fair in New York as part of the theme “Textiles from soybean protein.” 1941 Dec.–After several months of operating a pilot plant in Ford’s Highland Park plant, the pilot plant was moved into a separate building and began producing about 1,000 lb/day of soy protein fiber. Many experimental, but no commercial, products were made. 1943 Dec.–The Drackett Co. of Cincinnati, Ohio, purchased the Ford Motor Company’s entire soybean protein operations, including its pilot plant for producing soy protein fiber. Robert Boyer, Bill Atkinson, Fred Wilson, and several others who had developed the product at Ford went to Drackett as part of the deal. Note that this article, Drackett’s first on the subject, does not even mention Ford, but instead says: “The Drackett Company is a true pioneer in this promising development.”

426. Lougee, E.F. 1943. *Plastics from farm and forest*. New York, Los Angeles, Chicago: Plastics Institute. ix + 157 p. Illust. No index. 18 cm.

• **Summary:** This book “is written for those who know little or nothing about plastics but would like to learn more.”

Chapter 6, titled “Soybeans—an industrial crop,” is largely about the work of Henry Ford and his researchers (esp. Robert Boyer), but also includes the National Farm Chemurgic Council, the 1936 Bankhead-Jones Act and the U.S. Regional Soybean Industrial Products Laboratory (Peoria, Illinois). Contains four photos. Address: La Cañada, California. Former editor of *Modern Plastics*.

427. Simonds, William Adams. 1943. *Henry Ford: His life, his work, his genius*. Indianapolis and New York: The Bobbs-Merrill Co. 365 p. See p. 228, 231, 254-55, 317. Index. 25 cm. [110* ref]

• **Summary:** Contains scattered passages concerning Ford’s work with soybeans. The original testing of farm crops in 1933 was conducted following the old Edisonian method of

trial and error. "Thousands of bushels of cabbages, carrots, onions, watermelons and whatnot went into the caldrons. Late in 1931 the experimenters decided that the soy bean offered most possibilities, and they began to concentrate on it.

In the anxious months that preceded Pearl Harbor, America, led by President Franklin Roosevelt, began an all-out program to save the nation from the state of unpreparedness such as had existed in 1917. The Ford organization began the transition for a peacetime to a wartime basis. Mr. Ford gave the signal that set a crew of men clearing ground on his soybean acres near Camp Willow Run for a giant bomber factory.

A nice photo (frontispiece, facing the title page) shows Henry Ford seated on a stool in a laboratory.

428. Ford News Bureau. 1943? [Ford soy milk: Background—not for release]. Administration Building, Dearborn, Michigan. 3 p. Typed. Double-spaced. Undated. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** This undated, untitled background document, probably written between 1943 and 1945, describes the production of soymilk based on isolated soy protein. "The undernourished of a war-devastated world will receive abundant protein as a result of a mass production process for making soybean milk now being perfected in the laboratories of the Ford Motor Company. Note: This is the earliest English-language document seen (Nov. 2002) that uses the word "undernourished."

"Since soy milk is laboratory and not animal produced, it is possible to scientifically control bacteria and procure—quickly and cheaply—sufficient quantities of protein-giving liquid at a cost equal to, or less than milk.

"The implications of mass production of life-sustaining milk are of terrific import. Herds in occupied countries have been slaughtered. During the four to five years that must pass before cow's milk can be available to malnutrition-threatened millions, synthetic milk may supplement the world's diminishing supply of proteins. Ford soy milk may enable the people of regions like the tropics, where the breeding of cattle is difficult and unsatisfactory, to receive the necessary benefits of dairy products...

"Nine bushels of soybeans will produce one ton of milk, 232 gallons or 928 quarts of milk.

"Soy milk has been used for hundreds of years by the Chinese and of recent years has been manufactured in considerable quantities to supply the dietary needs of children allergic to cow's milk. However, soy milk made by the Chinese method is often inferior to cow's milk in both composition and flavor and those produced by many of the newer formulae, while comparing with cow's milk in composition, are expensive and to many tests have an objectionable flavor. The Ford chemists, under Mr. Ford's

personal direction, have developed a soy milk having similar appearance and composition to cow's milk and which can be produced by mass production methods at a cost equal to, or less than, cow's milk.

"The process of manufacture of soy milk from the bean may be considered in three steps: first, the separation of the oil from the bean and its subsequent hydrogenation and de-flavoring; second, the extraction of the protein from the oil-free meal and its purification; third, the mineralization and the mixing of the protein and the addition of the ingredients necessary to complete the product.

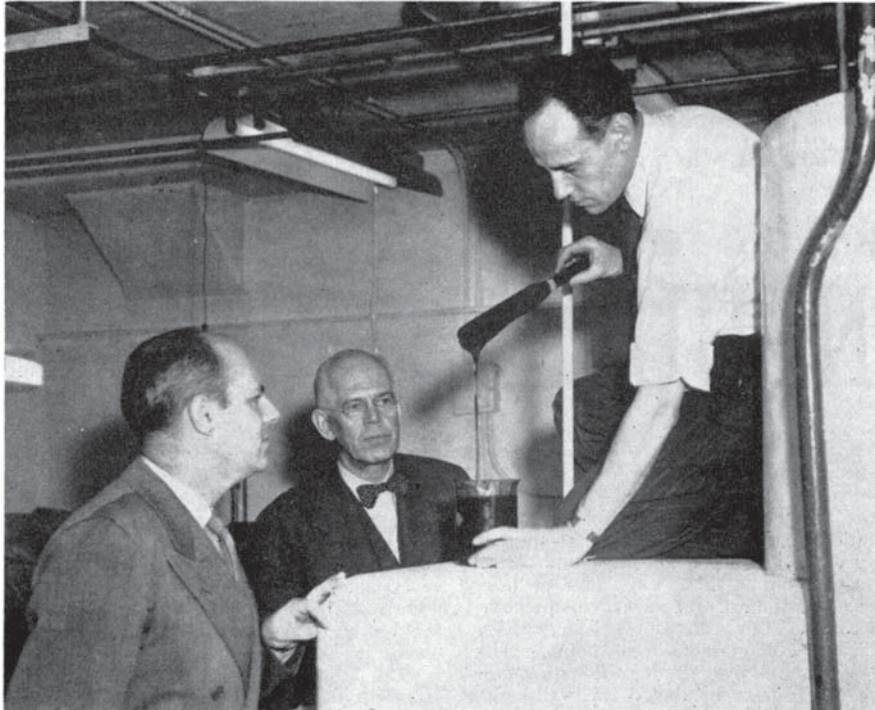
"The oil is removed from the soybean at Saline, Michigan—an attractive, white frame, reconditioned mill—located like 17 other Ford village industries near power-producing streams and small country towns which furnish the labor.

"As soybeans arrive from neighboring farms, the beans are cleaned, cracked, and conveyed from the Saline mill to another spotless building. From then on, gigantic telescope-shaped equipment separates oil from the meal in one continuous cycle of solvent extraction. The soybeans are pressed into yellowish bits similar to corn flakes. These flakes are carried countercurrent through a 32-foot tube where Hexane, a petroleum solvent, separates the oil and meal. After flakes are freed from solvent and dried in the middle and lower tube, the solvent is fed into a long tube, or percolator, near the upper end. Flowing through a filter and into a still, the oil is freed from the solvent. The solvent from both sources is now collected and recovered in the decanter from which it is taken and used again. The extracted soybean oil flows into a container at one end of the unit; flakes emerge in the finished form, ready for the next step.

"The dry, protein-containing meal is taken to the George Washington Carver Laboratory, a neat sunlight-filled brick building near the little Michigan town of Dearborn. There, inside towering glass tubes, protein is extracted from the yellowish meal. Piped into a settling tank, most of the once pithy, flaky meal separates from the yellow-greenish solution of water and protein. Any meal remaining in the mixture is removed by whirling centrifuges, their 6,000 revolutions per minute revolving like a cream separator. The combined water and protein goes to a de-airating [de-aerating] tank where any excess air is removed.

"Looming over the shiny tanks and maze of giant tubes, controller-recorder dials chart a graphic red ink progress of precipitation of the proteins into bits of whipped-creamy white. Swirling water in huge tanks complete the purification of the protein. At present, the George Washington Carver Laboratory produces enough protein in 24 hours for 300 gallons of milk.

"Since Ford soy milk is approximately the same composition as cow's milk—3.5 per cent protein, 4.8 per cent carbohydrates, 3.5 per cent fats, and 0.7 per cent minerals—the final operation is simple mixing and addition



of minerals, the proper amount of potassium phosphate, calcium chloride and citric acid. The glucose, maltose and dextrin found in corn syrup provide sufficient carbohydrates without making the milk too sweet to be palatable. Refined, hydrogenated soybean oil forced through viscolizers at high pressure supplies fat with such reduced globules that they stay in suspension like those of homogenized milk. Vitamins are added to make the soy milk equal to the best grades of cow's milk in this respect. The result is a tasty, more digestive beverage, Ford soy milk.

"Daily, more and more soybean milk is being produced to meet the demands of experiments taking place at the Henry Ford Hospital in Detroit—dietary experiments conducted among children and infants to determine how completely vegetable protein may replace animal protein so vital to life. Synthetic dairies pouring forth soybean milk in mass production quantities may be one of the most important contributions of America to a war vitiated world." Address: Dearborn, Michigan.

429. *Rayon Textile Monthly*. 1944. Drackett Co. produces new soy bean textile fiber. Jan. p. 85.

• **Summary:** "The commercial production of a new soybean fiber started in Cincinnati on Dec. 2nd in a new plant of the Drackett Co., H.R. Drackett, president, announced last month. This new soybean fiber has yet to be named." The company plans to increase the capacity of its plant as rapidly as war conditions will permit. A brief description is given of how the fiber is produced.

"The Drackett Company has pioneered in soybean developments. The company's technologists have made many

products experimentally from soybeans including plastics, wallboard and paints. Currently the company produces about 70,000 tons of soybean meal annually, and approximately 30 million pounds of soybean oil."

Photos show: (1) H.R. Drackett inspecting the new fiber made from soybeans as it emerges from the spinnerettes. (2) H.R. Drackett and Robert Boyer examining the first batch of the new soybean fiber.

Note: This article appears to be based on a similar article published in Drackett's in-house newsletter *The Drackett Dotted Line* (5-6 Dec. 1943). It is the earliest article seen in a trade journal stating that Drackett has started commercial production of a new soybean fiber.

430. *Soybean Digest*. 1944. Soybean fiber. Now in commercial production [by The Drackett Co.]. Jan. p. 8.

• **Summary:** "The first commercial production of a new fiber made from soybeans started in Cincinnati December 2 in a plant which is expected to be of major postwar importance, H.R. Drackett, president of The Drackett Company, has announced. Less than five years ago, this fiber was a \$400.00 a pound laboratory curiosity. Present plans call for marketing it at a price which will permit its widespread use in textiles and fabrics.

"This new soybean fiber, which is so new it has yet to be named, is as warm as wool. It is resilient, strong and durable, and can be made either moisture absorbent or moisture resistant..."

"Coincident with the opening of the new plant Mr. Drackett and Robert Boyer, the company's director of research, disclosed for the first time just how this fiber is

produced from the versatile soybean...

"The Drackett Company first became interested in soybeans about 1936 when, after a long study of this agricultural product, Mr. Drackett believed it had the promise which attended the development of hydrocarbons several decades ago...

"Currently the company produces about 70,000 tons of soybean meal annually, and approximately 30 million pounds of soybean oil, which is currently distributed under government allocations." A photo shows Robert Boyer and H.R. Drackett standing by a vat of liquefied soy protein. Bill Atkinson, atop the vat, draws up some of the viscous protein.

431. *New York Times*. 1944. Soybean protein. Feb. 13. Section 4. p. 9.

• **Summary:** "An unlimited supply of pure low-cost protein can now be extracted from soybeans for industrial use, Robert A. Boyer told the National Forecast Council recently. When the loss of the Philippines deprived us of about a billion pounds of fat annually, soybean oil stepped into the breach."

432. Holman, Ross L. 1944. Know your soybeans. *American Mercury* 58:177-79. Feb.

• **Summary:** Used as a raw material in industry, the soybean can provide automobile bodies, steering-wheels, paints, buttons, rubber, candles, linoleum and explosives. It makes excellent wool for clothing when spun into fiber. Future uses as a plastic include: clocks, chairs, houses, fountain pens, and all the other synthetic industrial products devised by modern chemistry.

Soy flour is mixed with bread, cereals, doughnuts and cakes. "Oil extracted from the bean is made into margarine, and in its pure form has helped replace the imported oils and fats lost to us when the Japanese overran Malaya and the Netherlands' Indies." Soy sausages are 25% cheaper than those made from pork and "are an important item in our lend-lease supplies to Great Britain." Robert Boyer, Henry Ford's engineer at Highland Park, perfected a method of making soy fiber which can be manufactured into a cheaper textile than yet produced in America. It yields a wool which costs less than half as much as sheep's wool. Ford's pilot plan went into production several months ago and produces 1,000 pounds of soy fiber daily. 2 acres of land used for sheep grazing will produce 8 to 10 pounds of wool a year. The same acres planted to soybeans will produce 400 pounds of protein suitable for fiber, according to Boyer. Address: Tennessee.

433. *Soybean Digest*. 1944. Grits and flakes... from the industry: The 10th annual Farm Chemurgic Conference will be held at St. Louis [Missouri], March 29-31,... Feb. p. 12.

• **Summary:** "... with headquarters in Hotel Statler, Managing Director Ernest L. Little has announced. Of special interest to soybeaners will be discussion of the present soybean situation

by Lamar Kishlar, president of the Soybean Nutritional Research Council; and the full story about the new soybean fiber by Robert Boyer of the Drackett Co. There will be a session devoted to plastics and one with the theme of chemurgy throughout the world, with representatives from five foreign countries discussing their respective chemurgic problems."

434. Bird, John. 1944. One foot on the land. *Saturday Evening Post* 216(38):12-13, 46, 48. March 18.

• **Summary:** Henry Ford, who believed strongly in decentralization of industry, set up a number of hydropowered "village industries," as at Saline and Milan, Michigan. There he produced auto parts of various kinds. This article discusses the Milan plant, which was started in 1938 and now has 180-190 workers. Today there are 25 Ford village industries, with a total of 4,500 employees; most are located within a radius of 50 miles of Dearborn. Some of the farmers who work at Milan grow soybeans, which they take to the mill to be crushed; they get back the high-protein meal to use as a supplement in livestock rations.

435. Chapman, Paul W. 1944. Cowless milk. *Atlantic Journal*. April. p. 3-. *

• **Summary:** The author believes that Americans will not accept (as Henry Ford suggested) a vegetable drink as a substitute for a glass of cold cow's milk, nor a plate of sprouting soybeans in place of a thick, juicy steak. Address: Dean, College of Agriculture, Univ. of Georgia.

436. *Southern Dairy Products Journal*. 1944. Can the soybean say moo? April. p. 2. *

• **Summary:** This editorial wondered if Henry Ford had estimated all his costs when he announced that soybean milk could be produced for 3 cents a quart.

437. Bergen, Werner von. 1944. The soybean fiber as seen by a wool man. *Rayon Textile Monthly* 25(5):225-26. May. [3 ref]

• **Summary:** Contents: Introduction. Manufacturing process. Properties of soybean staple fiber: Microscopical characteristics, fineness measurements, tensile strength, moisture content. Chemical properties: Caustic soda reaction, swelling characteristics, carbonizing and dyeing. Conclusions.

"In December 1943, H.R. Drackett, president of the Drackett Company announced that his company had acquired from the Ford Motor Co. their soybean process including the equipment of the pilot plant and personnel. Robert Boyer, who was chief research chemist of the Ford Motor Co., has joined the Drackett Company in the capacity of Director of Research. The commercial production of the new soybean fiber started in Cincinnati on December 2, 1943, in the new plant of the Drackett Company. This company has pioneered in soybean development and

originally supplied the Ford Motor Co. with the soybean protein 'alysol.'"

"In its general appearance such as lustre, touch, and crimp, it [The Drackett soy protein fiber] very closely resembles rayon staple fiber, but it has a poor light tan color... In the dry state the soybean fiber is approximately 45 per cent weaker than a corresponding grade of wool and 76 per cent weaker in the wet state than a corresponding grade of wool..."

"In its present form, soybean fiber still has a low tensile strength, especially when wet. The only improvement which can be noted over the 1939 product, is its higher resistance to alkali, but in achieving this, part of its resistance to acid was sacrificed. The fiber, in its present form, may be suitable for blends with rayon and cotton, but certainly not with wool." Address: Director of Research Labs., Forstmann Woolen Mills.

438. Drackett, H.R. 1944. By-passing the sheep: An artificial fiber with the best characteristics of wool, is now being made commercially from soybean protein. *Scientific American* 170:217-19. May.

• **Summary:** "An artificial fiber, with many of the best characteristics of wool, is now being made commercially from soybean protein" by The Drackett Co. A detailed description of the process is given.

Photos show: Boyer, director of scientific research at The Drackett Co. in Cincinnati, H.R. Drackett, president, and Bill Atkinson (atop the tank) inspecting a batch of liquefied soy protein that can be spun to make Soybean Azlon fibers. John O'Leary and Fred Wilson testing soybean fibers in a corner of the laboratory. Soybean fibers emerging from tiny holes in spinnerettes into an acid precipitating bath. The filaments are stretched as they are collected on bobbins or spools. The fiber is then set by long immersion in a formaldehyde bath. After being dried, it is cut into desired lengths. Address: President, The Drackett Co, Cincinnati, Ohio.

439. *Soybean Digest*. 1944. American Soybean Association will hold its silver jubilee at Urbana, Illinois, September 12-13, 1944. May. p. 11.

• **Summary:** A large table lists the ASA's annual meetings and officers, 1920-1944 inclusive. 1st annual meeting. Sept. 1, 1920, Camden, Indiana. President: Taylor Fouts, Camden, Indiana. Secretary: W.A. Ostrander, Lafayette, Indiana. 2nd. Sept. 1, 1921, Urbana & Tolono, Illinois. President: W.E. Riegel, Tolono, Illinois. Secretary: W.A. Ostrander. 3rd. Sept. 1, 1922, Columbia, Missouri. President: C.E. Carter, Columbia, Missouri. Secretary: W.A. Ostrander. 4th. Sept. 11, 1923, Madison, Wisconsin. President: G.M. Briggs, Madison, Wisconsin. Secretary: W.A. Ostrander. 5th. Aug. 29-30, 1924, Ames, Iowa. President: W.J. Morse, Washington, D.C. Secretary: C.L. Meharry, Attica, Indiana.

6th annual meeting. Sept. 1-3, 1925, Washington, DC. President: W.J. Morse. Secretary: C.L. Meharry. 7th. Aug. 10-

12, 1925, Stoneville, Clarksdale, and Greenville, Mississippi. President: W.E. Ayres, Stoneville, Mississippi. Secretary: C.L. Meharry. 8th. Aug. 9-11, 1927, Belhaven, Washington, and Elizabeth City, North Carolina. President: F.P. Latham, Belhaven, North Carolina. Secretary: W.E. Ayres. 9th. Aug. 15-17, 1928, Camden and Lafayette, Indiana. President: Taylor Fouts. Secretary: W.E. Ayres. 10th. Aug. 22-24, 1929, Guelph, Ontario, Canada. President: G.I. Christie, Guelph, Canada. Secretary: J.B. Edmondson.

11th annual meeting. Sept. 10-12, 1930, Urbana, Illinois. President: W.L. Burlison, Urbana, Illinois. Secretary: J.B. Edmondson. 12th. Aug. 17-18, 1931, Columbia, Missouri. President: W.C. Etheridge, Columbia, Missouri. Secretary: W.L. Burlison. 13th. Sept. 2-3, 1932, Washington D.C. President: W.J. Morse. Secretary: J.B. Park. 14th. Aug. 3-5, 1933, Baton Rouge and Houma, Louisiana. President: John Gray, Baton Rouge, Louisiana. Secretary: W.E. Ayres. 15th. Aug. 22-24, 1934, Little Rock and Stuttgart and Marianna, Arkansas [Jacob Hartz of Stuttgart spoke]. President: C.K. McClelland, Fayetteville, Arkansas. Secretary: P.A. Webber.

16th annual meeting. Aug. 22-24, 1935, Evansville and Lafayette, Indiana. President: K.E. Beeson, Lafayette, Indiana. Secretary: P.A. Webber. 17th. Sept. 14-16, 1936, Ames and Cedar Rapids and Hudson, Iowa. President: E.C. Dyas, Ames, Iowa. Secretary: K.E. Beeson. 18th. Sept. 14-16, 1937, Urbana, Illinois. President: J.C. Hackleman, Urbana, Illinois. Secretary: K.E. Beeson. 19th. Sept. 12-14, 1938, Columbus and Wooster, Ohio. President: J.B. Park, Columbus, Ohio. Secretary: K.E. Beeson. 20th. Sept. 11-12, 1939, Madison, Wisconsin. President: G.G. McIlroy, Irwin, Ohio. Secretary: J.B. Edmondson.

21st annual meeting. Aug. 18-20, 1940, Dearborn, Michigan [Hosted by Henry Ford]. President: G.G. McIlroy. Secretary: J.B. Edmondson. 22nd. Sept. 12-13, 1941, Ames and Des Moines, Iowa. President: G.G. McIlroy. Secretary: J.B. Edmondson. 23rd. Sept. 15-17, 1942, Lafayette, Indiana. President: D.G. Wing, Mechanicsburg, Ohio. Secretary: G.M. Strayer. 24th. Sept. 5-7, 1943, Cedar Rapids, Iowa. President: D.G. Wing. Secretary: G.M. Strayer. 25th. Sept. 12-13, 1944, Urbana, Illinois. President: J.E. Johnson, Champaign, Illinois. Secretary: G.M. Strayer.

440. **Product Name:** Delsoy (All-Vegetable Soymilk-Based Non-Dairy Whip Topping).

Manufacturer's Name: Russell-Taylor Inc. Renamed Delsoy Products, Inc. by July 1945.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1944. August.

Ingredients: Incl. soymilk, vegetable oil, sugar.

Wt/Vol., Packaging, Price: ½ pint wax paper carton in the shape of a truncated cone.

How Stored: Refrigerated.

New Product-Documentation: This is the world's earliest

known commercial non-dairy whip topping. Letter from Herb Kusche to Bob Rich, both of Rich Products Corp. in Buffalo, New York. 1945. March 22. "Glad to hear you are progressing favorably with your topping with the exception of the Washington delay. It sounds as if you might be on the market very soon. Let's hope so anyway. The government restricted Taylor [Herbert Marshall Taylor] for selling 'topping' for about a month due to the fact that he was overselling his quota. Now I understand he has come out with a complete soy product containing no butterfat. I am going to get a carton of it and send it to you."

Detroit News. 1945. April 16. "Who's who and why." [About Herbert Marshall Taylor and Delsoy]. A photo shows Taylor. In Nov. 1942 the War Food Administration issued an order prohibiting the sale of whipping cream in America. After dairy interests forced Taylor to leave Chicago, he picked up a partner, Eric R. Swanson, who is still with him, and in Dec. 1943 started a business in Detroit. Though dairy people continued to oppose him, his "business soared. In 1944 it jumped from 1,400 to 20,000 gallons a month. He sold at wholesale, then added half pints for the home trade. Now he claims 1,500 independent distributors here [in Detroit]. But along came a War Food Administration order placing a 19 per cent limit on all fats—animal or vegetable—used in his product [which combined a milk base with vegetable fat]. WFA also cut his milk quota. So he started using soy milk as a base, producing an all-vegetable product.

An ad (below this article in Rex Diamond's binder; original source and date unknown) is titled "What is Delsoy? It's the dessert topping that's winning the enthusiastic approval of housewives by the hundreds of thousands. Delsoy is the original topping made of natural vegetable products." The ad shows illustrations of two non-dairy whip toppings: (1) In the foreground, "Delsoy Super Whip: Instant Dessert Topping" which is sold in a pressurized can. The ad states: "Introduced in August 1944, the first product of its kind, Delsoy dessert topping has gained tremendous popularity. Continuing to grow by leaps and bounds..." (2) In the background, "Delsoy: A delicious whip," a refrigerated perishable product which is sold in a half-pint paper container shaped like a truncated cone.

Letter from H. Marshall Taylor to Mr. Holton W. Diamond, c/o Russell-Taylor, Inc., 2001 S. Telegraph Rd., Dearborn, Michigan. 1945. July 6. "Dear Diamond: At the suggestion of Mr. [Bob] Smith, and with my consent, we take pleasure in handing you... ten shares of the common stock of Delsoy Products, Inc. We feel that since you have taken such a great interest in our operations, and that you would like to continue working with us, that we can possibly cement our relations by inviting you to join the small family." At the top of the letter is "Devonshire Topping, Inc." Just above Marshall's signature is typed "Delsoy Products, Inc."

Soybean Digest. 1945. Aug. p. 24. "Delsoy topping: An all-vegetable cream." Note 1. This early non-dairy whipped

topping was NOT made with enzyme-modified soy protein.

Note 2. This is the earliest known commercial soy product made by Delsoy Products, Inc.

A W-2 form shows that during 1945 Holton W. Diamond (who lived at 1648 May Ave., Dearborn, Michigan) was employed by "Russell-Taylor Inc., 1951 E. Ferry Ave., Detroit 11, Michigan." [Note the spelling of the company's name; Diamond was working on their whip topping]. His wages totaled \$552.13 in 1945. A 1946 form shows he was paid wages \$68.25 by Russell-Taylor in the first quarter of 1946.

Shurtleff & Aoyagi. 1979. Feb. Tofutti & Other Soy Ice Creams. p. 22-23. Shurtleff & Aoyagi. 1985. History of Rich Products' work with soy proteins. "In 1944 or 1945 Bob Smith (a former Ford researcher) and Herbert Marshall Taylor introduced Delsoy, a soymilk-based non-dairy whip topping. Launched in the Detroit area, it was sold mostly to the restaurant trade. In the spring of 1945 it was introduced through retail stores in New York. Delsoy was America's earliest known commercial non-dairy whip topping. But it never became a very successful product. In part because it was not a frozen food, its distribution was limited to the Detroit area."

Robert A. Smith. 1979. "The Ford Experimental Laboratory and the 'Square House.'" Interview conducted by Donald V. Baut of Dearborn Historical Museum, May 31. Pages 44-48. This is one of the best sources seen on the origin and history of this product and of Presto Whip, its counterpart in a pressurized can. Starting in the spring of 1943, Smith worked in his spare time, designed the equipment (based on the design of the equipment in the Carver Laboratory but on a larger scale), and built a plant in the old Livonia Dairy on Telegraph Road at Harvard in Dearborn; its initial capacity was about 1,000 gallons per day (one shift). The equipment in Ford's Carver Lab was designed to produce 150 gallons of soymilk per day in a small non-stop stream. The funds needed to equip and establish the plant in Dearborn came from profits made by selling Devonshire Topping in Detroit. They began production [of Delsoy] in the Livonia Dairy "in the latter part of 1943" (p. 45). [Note 3. This introduction date of late 1943, recalled by Smith in 1979, does not fit with the date given in several earlier documents. 1. Olmsted (April 1945) says that H.M. Taylor started making a filled dairy milk in Detroit in Dec. 1943. He did not start using soy milk until WFA cut his milk quota, apparently in 1944. 2. An undated Delsoy ad from about 1945 states that the Delsoy was "introduced in August 1944, the first product of its kind"]. For the first year or so the company's name in Dearborn was the Russell Taylor Co. Harvey Whitehouse, a Detroit dairyman who was qualified to operate both refrigeration and steam equipment, was hired to operate the plant. Smith left the Ford Motor Co. in Aug. 1945 to work full time with Delsoy Products.

Talk with Herb Kusche, executive vice president of Rich Products Corp. 1993. July 14. He thinks that Delsoy was on

the market only several months before Whip Topping, made by Rich Products Corp.

441. Ford Motor Co. 1944. Plain proof that agriculture and industry can be, and must be, one (Ad). *Soybean Digest*. Sept. p. 53.

• **Summary:** A photo shows the relatively small Ford Motor Co. plant in Saline, Michigan. Located on the banks of the Saline River, 31 miles west of Dearborn, it was bought and reconstructed by Ford in 1934 and is now one of 19 Ford Village Industries. The plant processes raw soybeans into oil, meal, and other products. Forty men are employed here; most of them are also farmers. Mr. Ford has "one foot on the soil and the other in industry." His company uses 2,000,000 lb of soybean oil a year, mostly in automobile paints and sand cores for casting.

442. Sprague, P.E. 1944. Utilization of soya proteins in industry. *Soybean Digest*. Sept. p. 47-48, 51. [15 ref]

• **Summary:** "The incentive to try to make and to use soya protein industrially sprang originally from the fact that all types of proteins that had found an established use in manufacturing operations were of animal origin and fairly high in price." It is important to realize that soya protein is a very complex and sensitive substance. About 20 years ago I.F. Laucks in Seattle, Washington, made the first determined efforts to use soya protein on a substantial in U.S. industry. He was successful in making plywood adhesives. Alpha Protein, a pure or isolated protein made by the Glidden Co. Soya Division, is the only isolated protein manufactured at this time on a commercial scale. While much valuable research has been done in this field, the actual usage of soybeans for the production of industrial protein products has been principally realized by Laucks and Glidden.

The principal use for the isolated protein is in the field of foam solutions, paper coatings, paper sizing (Prosize), and certain types of interior emulsion paints (Spred). "About 100 million square feet per month of water-resistant 3-ply plywood are currently being manufactured with soybean glue" (Personal communication, I.F. Laucks, Inc.).

"The Ford Motor Co. advise that whereas for the duration they have abandoned the use of soya proteins, at the peak of their use treated soybean meal in core binder compounds was consumed at the rate of about a million pounds annually, and of the several million pounds of thermo setting plastics Ford used annually, about half of this was a soybean molding compound, which in turn contained about one-third soybean meal. As you know, prior to the war very substantial tonnages of meal were used in the manufacture of mixed fertilizers because of the protein content, and no doubt this is properly to be included in the category of industrial usage."

There have been commercial failures in this field.

Synthetic soya wool is but one example.

Presently about 2.5 million bushels of soybeans go into

industrial uses. Fully 75% or more of this is required for proteins used in critical wartime industrial applications. Given that the U.S. soybean crop is presently about 200 million bushels/year, industrial uses account for only about 1.25% of the total. This crop contains about 4,800 million lb of protein. The million pounds of core binder and the half million pounds of soybean molding compound required each year by the Ford Motor Co. required only about 30,000 to 35,000 bushels of soybeans—a mere drop in the bucket.

"Do not miss the significance of the fact that the 1943 crop of beans was the first which ever went to market on the basis where the oil and the moisture content was recognized from the processor's standpoint nor the recently announced ceiling regulations from OPA [Office of Price Administration] which are recognizing the protein content of meal and by-products in terms of penalties for any deficiency."

Concerning the future, about 40% of all softwood plywood and 80% of all hardwood plywood is made with glues other than soybean glue—and principally with synthetic resin glues. The latter are gaining in popularity at the expense of soya glues because they have desirable performance characteristics.

A small portrait photo shows P.E. Sprague. Address: Vice president, The Glidden Co.

443. Lee, Hsiang Kai. 1944. Miracle bean for starving millions. *Soybean Digest*. Nov. p. 10.

• **Summary:** "Because of the importance of the soybean as human food" the history of China has been "marked with bloody clashes. The invasion of China in 1931 by greedy Japs was caused primarily by the lush prize of the immense soybean crops of China, which in the past decade have averaged more than 250 million bushels a year. China's rich soybean land was seized with two objectives: The first one is the insidious scheme to subjugate China's 450 million people through starvation, the second one is to utilize the immense crops of soybeans to build up Japan's industrial strength for world conquest."

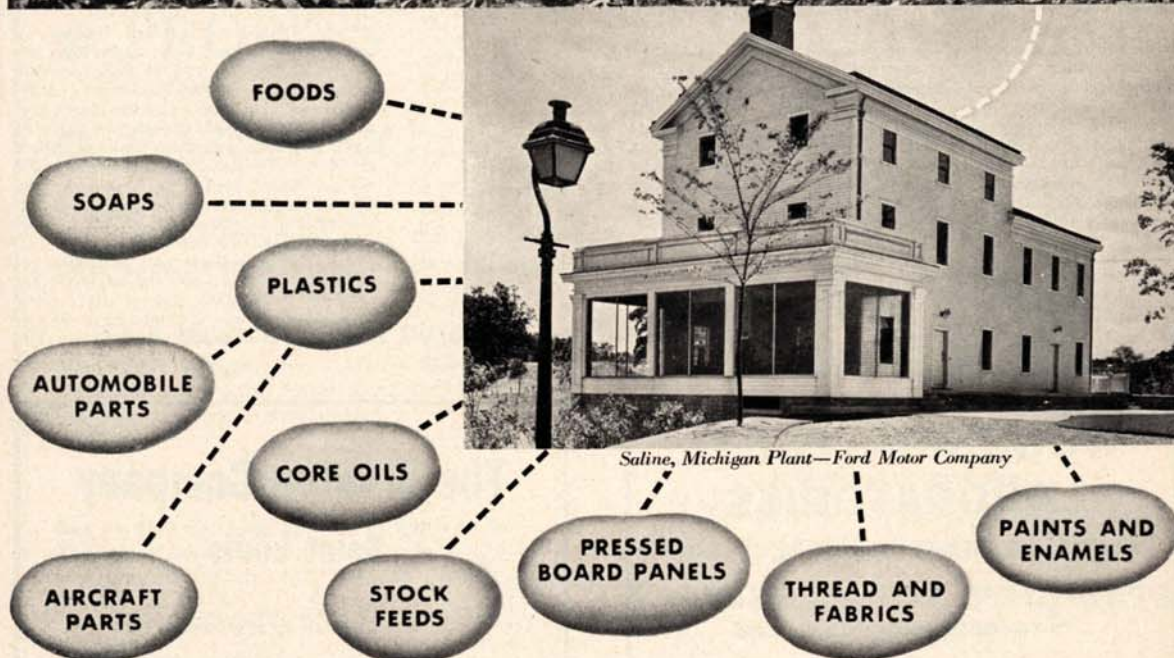
The author "was born and raised on soybeans in Honan, China." Address: Engineer, Ford Motor Co.

444. Boyer, Robert. 1944. Industrial possibilities of soybean protein. In: Farm Chemurgic Council, ed. 1944. Proceedings of the Tenth Dearborn Conference of Agriculture, Industry, and Science. St. Louis, Missouri. *

445. Markley, Klare S.; Goss, Warren H. 1944. Soybean chemistry and technology. Brooklyn, New York: Chemical Publishing Co. vii + 261 p. Illust. Index. 28 cm. [684 ref]

• **Summary:** Contents: Part I: Foreword, by Edward Jerome Dies, President, Soybean Nutritional Research Council. Introduction. Composition and properties. Mineral constituents. Protein and other nitrogenous

Plain Proof that AGRICULTURE and INDUSTRY can be—and must be—one



The relatively tiny Ford plant pictured is one of 19 Ford Village Industries. It is located on the banks of the Saline River, 31 miles west of Dearborn.

Neither this plant, bought and reconstructed in 1934 by Mr. Henry Ford, nor any of the other Ford Village Industries plants, on water-power sites scattered through the Michigan countryside, are mere monuments to sentiment. They are thoroughly practical little establishments, profitable and self-sufficient.

The function of this plant is the processing of raw soybeans into oil, meal, and other products. Its output of oil now is meeting essential war requirements. Normally Ford Motor Company uses it in making automobile paints, sand cores for casting, etc. The meal today is a vital part of the huge War Foods program as stock food. In peacetime some meal goes into plastics.

Forty men are employed here. Most of them are also farmers, who thus augment

the return from their farms with a direct cash income (never less than \$6 per working day). Here is a demonstration of the sound economic principle, graphically characterized by Mr. Ford as "one foot on the soil and the other in industry."

But this tangible personal benefit to the 40 workers who man the plant is only one phase of the vivid object-lesson which Saline has furnished for all America to see. Here, also, is proof-positive that vast plant structures are not essential in the linking of Agriculture ever more closely to Industry.

Hundreds of such small local plants are not only practical, but more desirable than a few great centralized establishments would be. They can be built more quickly, financed more readily with local capital, manned more efficiently by home folks, operated more effectively to meet peak harvesting seasons.

And they eliminate much unnecessary transportation of the raw beans.

FARM PRODUCTS REQUIRED BY FORD MOTOR COMPANY IN A NORMAL YEAR

2,000,000 Pounds of Soybean Oil
89,000,000 Pounds of Cotton
800,000 Bushels of Corn
2,400,000 Pounds of Linseed Oil
2,500,000 Gallons of Molasses
3,200,000 Pounds of Wool
1,500,000 Feet of Leather
1,000,000 Pounds of Lard
350,000 Pounds of Mohair

—and with the resumption of peacetime automobile production, this list will grow longer, and the totals of farm products used greater and greater.

FORD MOTOR COMPANY
Dearborn, Michigan



constituents. Enzymes. Carbohydrates. Glycosides: Saponins, phytosterolins, isoflavone glycosides. Pigments. Vitamins. Oil and oil-soluble constituents. Physical and chemical characteristics of soybean oils: Acetyl value (see hydroxyl number), acid value (see free fatty acids), break material (mostly phosphatides, pigments, and mucilaginous materials), color, congealing temperature, density, diene numbers, fatty acids, flash, fire and smoke points, fluorescence, free fatty acids, Henner number, hexabromide number, hydroxyl number, iodine number, optical rotation, refining loss, refractive index, Reichert-Meissl number, saponification number (or Koettstorfer number), smoke point (see flash), specific heat, thiocyanogen number, titer, unsaponifiable matter, viscosity, miscellaneous data (Weight of soybean oil per gallon: 7.67 pounds. Weight of soybean oil per standard U.S. tank car: approximately 61,000 to 62,000 pounds. Volume of soybean oil per standard U.S. tank car, approximately 8,000 to 8,060 gallons).

Fatty acids and glycerides. Sterols and other unsaponifiable constituents. Oil-soluble pigments. Antioxidants. Phosphatides. Literature cited.

Part II: Development of the soybean processing industry. Grading and storage. Methods of processing soybeans. Processing by means of continuous presses: The Anderson expeller, the French screw press, operation of continuous presses. Processing by means of continuous solvent extractors: The Hildebrandt system, the Bollmann system [or Hansa-Mühle], extraction system of the French Oil Mill Machinery Company (so closely resembles the Bollmann system in most respects that a detailed description will not be given), the Allis-Chalmers extractor, the Ford extraction system, the Detrex continuous extractor (uses non-inflammable trichloroethylene), other solvent systems, solvents, hot alcohol extraction process, extractor design data. Hydraulic pressing. Miscellaneous processing methods. Soy flour. Cost of processing soybeans: Manufacturers of soybean processing equipment, soybean processing mills in the United States. Production and refining phosphatides. Processing soybean oil for food uses: Neutralizing and washing, bleaching, hydrogenation, deodorization, winterizing, shortening, margarine. Literature cited.

The Allis-Chalmers extractor (p. 180-82): An early edition (Fig. 20) consists of a vertical, cylindrical column containing "a series of horizontal circular plates, equally spaced and fixed to a central shaft which is slowly rotated by a gear-motor. The upper surface of each plate is wiped by a stationary scraper arm fastened to the inner wall of the cylinder. Slots are cut in the plates so that, during rotation, the stationary baffles sweep material, resting upon the disks, through the slots into the plate immediately below." Footnotes explain that this design is based on U.S. Patents issued to Michelle Bonotto in 1937, 1938, and 1939, and called the Extractol Process.

Figures (photos unless otherwise noted) show: (1) The soybean plant, in foliage and mature. (2) Graph of spectral

transmittance and color of crude pressed soybean oils. (3-4) Graph of spectral transmittance and color of crude, solvent-extracted soybean oils. (5) Elevators at a soybean processing mill (Central Soya Co.). (6) Cracking rolls used to prepare soybeans for pressing in expellers or screw presses (Allis-Chalmers). (7) Two steam-heated rotary driers connected in series for drying cracked soybeans (Allis-Chalmers). (8) V.D. Anderson Super-Duo oil expeller. (9) French screw press (French Oil Mill Machinery Co.). (10) An installation of two rows of many Anderson expellers crushing soybeans. (11) A battery of French screw presses crushing soybeans. (12) Flaking mill for rolling cracked soybeans into thin flakes, in the solvent extraction process (Allis-Chalmers). (13) Flowsheet [Flow sheet] of the Hildebrandt system of solvent extraction, and cross-sectional view of the extractor-vertical screw (Sieck and Drucker, Inc.). (14) Side view of Hildebrandt extractor (3 floors cut away). (15) An installation of two Hildebrandt extractors (3 floors). (16) Hildebrandt solvent distillation equipment (3 floors). (17) Illustration of basket filling and discharging mechanism of Bollmann solvent extractor. (18) Cross-sectional diagram of Bollmann paternoster extractor. (19) An installation of the Bollman system of solvent extraction. (20) Cross-sectional diagram of Allis-Chalmers extractor. (21) Side view diagram of Ford system of solvent extraction. (22) The horn-angle flaking rolls used in Ford extraction system. (23) Interior of Ford plant at Saline, Michigan. (24) Side view of the Detrex oil extractor. (25) Flow diagram of the Detrex oil extractor. (26) Primitive Manchurian oil mill powered by ox. (27) Old Chinese wedge presses. (28) vertical screw presses at soybean oil mill in Dairen, Manchukuo. (29) Five-high flaking rolls (sectional view). (30) Phantom view of stack cooker used to prepare material for hydraulic pressing and for toasting solvent-extracted soybean flakes. (31) Cake former in which cooked soybean flakes are molded into flat cakes and wrapped in cloths, preparatory to hydraulic pressing (French Oil Mill Machinery Co.). (32) A hydraulic press. (33) Hydraulic press boxes. (34) Battery of Sharples Super-Centrifuges, soybean oil refinery, A.E. Staley Mfg. Co. (35) Battery of National Acme Centrifuges for continuous refining of soybean oil. Address: 1. Principal Chemist, Southern Regional Research Lab., New Orleans; NRRL 2. Senior Chemical Engineer, NRRL, Peoria, Illinois.

446. Schofield, Maurice. 1945. The amazing soya bean. *Contemporary Review (London)* 167:48-51. Jan. [4 ref]

• **Summary:** Contains a good but brief history of the soybean, including the history of its cultivation in Britain. Samuel Dale, the British botanist, probably thought of soybean cultivation long ago. The "Royal Botanical Gardens at Kew saw some specimens in 1790. But it was the awakening in the West which stirred up the ground at Woburn, where prior to 1914 the Royal Agricultural Society had several years' experimenting with it before concluding that soya needed a

warmer climate than ours. In 1916 the Board of Agriculture, though maintaining that the Japanese and Manchurian varieties hitherto tested would not produce seed in economic amounts in Britain, suggested the possibility that varieties more suitable might be bred...

"After Mr. Henry Ford's success with thousands of acres of soya near Detroit [Michigan], it was not surprising in 1933 to hear of part of the Fordson Estate at Boreham, Essex, being turned over to soya cultivation. A six-acre field was prepared, 47 varieties of soya from North America, Manchuria and Japan being sown. Despite very good weather in that year, the initial fast-growing period (experienced in the hot season of Manchuria) was not good enough: our merry month of May was not so merry for soya. By September many plants had very small pods; others had not got beyond the flowering stage; others yet again had not bloomed at all. A year later a twenty-acre field was prepared to utilise what was hoped to be acclimatised seed from the previous year. There was a good race to maturity between 'green Jap', 'brown C', and 'black O', with the 'Jap' variety winning...

"That there is still a case for soya in England is the belief of enthusiasts like J.L. North, of the Royal Botanic Society, Miss Elisabeth Bowbridge, who was connected with the Essex experiments, and Dr. H. Hunter, director of the National Institute of Agricultural Botany at Cambridge. Dr. Hunter, after twelve years' experience, holds that only varieties like 'Jap' and 'brown C' have a tolerable chance of full maturity in this country, yet soya cultivation is still worthy of a place in British agriculture because of its superior qualities." Address: England.

447. Diamond, Holton W. 1945. Laboratory notebook. Dearborn, Michigan: George Washington Carver Laboratory. Unpublished manuscript. 23 cm. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Microform negative, Acc. 89.432.

• **Summary:** During January and February 1945, Diamond was doing research on a "soy cheese" made by culturing soymilk curds at the Ford Motor Company's Carver Laboratory. On Jan. 8 he wrote the words "Soy cheese" at the top of his notebook page. Note: This is the earliest English-language document seen (March 2007) that uses the term "Soy cheese" to refer to a Western-style soy cheese.

During March and April he worked on whipped toppings. On 24 March 1945 Diamond noted in his notebook that the previous day he had made two batches of "Exptl. topping" (experimental whipped topping). Concerning the first batch, he wrote: "Flavor excellent; definite improvement [perhaps compared with a sample Florence Diamond says was brought to the lab by Herbert Marshall Taylor]. Did not whip." The ingredients were: 125 gm hydrogenated soy oil ("accident-intended to be 62.5 gm), 62.5 gm liquid soy oil, 125 gm skim soy milk, 250 gm water, 4 gm Span 20 emulsifier. 1 gm NaCl (table salt), 12 drops butter color, 2 gm B.V. meat flavor, 2 gm

butter flavor, SM."

During April, Diamond's toppings vary from "thin" to "thick," with some "dark" and others "soapy." None of the 4 experimental toppings he made on 10 April 1945 whipped, but two of the three batches he made the next day did whip but were very thin. On April 13 the first batch finally whipped although it was somewhat thin. It contained 170 gm soy milk, 170 gm water, and 170 gm fat (composed of 92% hydrogenated soy oil, 5% glycerin, 2% glyceryl monostearate, and 1% Soyemuls); increasing the glycerin was the key to success. On April 19, the first topping whipped satisfactorily—in 4½ minutes; the basic ingredients were the same but the pH was adjusted after preparation (probably by adding citric acid) to 6.60 or 6.68. By April 30 the first sample was "usable."

In May and June Diamond concentrated his research on soymilk, then started to work on ice cream in early June 1945. On June 28 (p. 80) he gave the formula for his soy ice cream then noted: "This batch was exceptionally good. The flavor was mild, not at all 'beany,' and the texture smooth. The fat used was hydrogenated soy oil. The mix was frozen in a hand freezer and packed in freezing compartment of refrigerator in tray. Some crystallization, or 'iciness' was observed after a couple of weeks."

This Carver Laboratory film only covers the first half of 1945. Numerous other log books in this accession in the Ford Archives cover work elsewhere during the 1950s.

Note: This is the earliest document seen (Sept. 2001) concerning Holton W. ("Rex") Diamond and soy. Address: Dearborn, Michigan.

448. Olmsted, Fred L. 1945. Who's who and why [Herbert Marshall Taylor and Delsoy]. *Detroit News*. April 16. p. 4.

• **Summary:** Herbert Marshall Taylor is a native of Canada. When "hail, frost, and influenza" put an end to his farming in Alberta, he returned to Toronto, where he had received a university degree 6 years earlier. "He acquired American rights to a gadget which British housewives had bought in quantity to make cream from butter and milk through homogenization. He sold 30,000 in the United States, but it wasn't a big-time success.

"By 1937 Taylor had perfected a product using a milk base and vegetable fat. And he had motorized the gadget. He started selling the product to bakers in New York. It saved them \$1 a gallon on whipping cream. The idea spread to other cities."

In Nov. 1942 the War Food Administration issued an order prohibiting the sale of whipping cream in America. After dairy interests forced Taylor to leave Chicago, he picked up a partner, Eric R. Swanson, who is still with him, and in Dec. 1943 started a business in Detroit. [Note: Swanson lived most of his life in Dearborn.] Though dairy people continued to oppose him, his "business soared. In 1944 it jumped from 1,400 to 20,000 gallons a month. He sold at wholesale, then added half pints for the home trade. Now he claims 1,500

independent distributors here [in Detroit]. But along came a War Food Administration order placing a 19 per cent limit on all fats—animal or vegetable—used in his product [which combined a milk base with vegetable fat]. WFA also cut his milk quota. So he started using soy milk as a base, producing an all-vegetable product.

“Taylor drew the fire of OPA [Office of Price Administration], too. He says it is demanding damages for overcharges which would put him out of business. But Taylor isn’t through. He grossed \$267,000 last year. He added a plant in Dearborn to his start in Detroit. He’s planning to market soy milk, butter, cheese [tofu?], and frozen dessert [soy ice cream]. There is an indication that Henry Ford is interested.”

Note 1. This is the earliest English-language document seen (March 2007) that uses the term “frozen dessert” to refer to soy ice cream.

Note 2. Herbert Marshall Taylor learned how to make soymilk and soy-based whipped topping from Bob Smith and Rex Diamond at Henry Ford’s George Washington Carver Laboratory in Dearborn.

“The dairy lobby in Washington [DC] is powerful,’ says Taylor. ‘But I’ve been fighting the dairy interests for 12 years. They’ll never stop me.’” A photo shows Mr. Taylor.

An ad below this article (not in *The Detroit News*, but in Rex Diamond’s scrapbook; original source and date unknown) is titled “What is Delsoy? It’s the dessert topping that’s winning the enthusiastic approval of housewives by the hundreds of thousands. Delsoy is the original topping made of natural vegetable products.” The ad shows illustrations of two non-dairy whip toppings: (1) In the foreground, “Delsoy Super Whip: Instant Dessert Topping” which is sold in a pressurized can. The ad states: “Introduced in August 1944, the first product of its kind, Delsoy dessert topping has gained tremendous popularity. Continuing to grow by leaps and bounds...” (2) In the background, “Delsoy: A delicious whip,” a refrigerated perishable product which is sold in a half-pint paper container shaped like a truncated cone.

449. Shollenberger, J.H.; Goss, W.H. 1945. Soybeans: Certain agronomic, physical, chemical, economic, and industrial aspects. *USDA Bureau of Agricultural and Industrial Chemistry*. AIC-74. 84 p. May 15. Mimeographed. Slightly revised 1947. 81 p. [39 ref]

• **Summary:** Contents: Origin and description. Structure. Chemical composition: Protein, oil, carbohydrates, ash, vitamins. Culture and harvesting. Production. Crop disposition: Relative importance as a crop. Marketing: Grades, international trade, prices. Utilization of whole soybeans: Seed, feed, food. Industrial development: History of industry, processing (derived products, production of oil and meal), considerations in determining size, type, and location of plants (processing costs, size of plant, milling-in-transit privilege, other economic factors), location and capacity of existing plants. Utilization of soybean

oil: Shortening, margarine, other edible products, soap, paints and varnishes, linoleum and oilcloth, printing inks, miscellaneous products, new developments. Utilization of protein fraction: Feed, food, industrial. Selected references. Acknowledgments. Address: 1. Commodity Development Div.; 2. Engineering and Development Div. Both: NRRL, Peoria, Illinois.

450. Boyer, Robert A.; Crupi, Joseph; Atkinson, William T. Assignors to Ford Motor Company (Dearborn, Michigan; a corporation of Delaware). 1945. Protein manufacture. *U.S. Patent* 2,377,853. June 12. 3 p. Application filed 10 May 1941.

• **Summary:** “This invention concerns the processing of proteins to be used in spinning fibers, in water paints, glues, sizes and similar compositions. We have discovered that if protein precipitates are subjected to a slow-freezing process, they are not only effectively dehydrated, but their physical characteristics are greatly changed and improved.” Address: 1. Dearborn, Michigan; 2-3. Detroit, Michigan.

451. Boyer, Robert A.; Atkinson, William T.; Robinette, Charles F. Assignors to Ford Motor Company (Dearborn, Michigan; a corporation of Delaware). 1945. Artificial fibers and manufacture thereof. *U.S. Patent* 2,377,854. June 12. 3 p. Application filed 7 June 1941.

• **Summary:** A detailed description of spinning artificial fibers, based on soy protein, using a spinnerette. The spinning solution is typically composed of 90 gm pure soy protein, 15 ml sodium hydroxide (or other alkali metal hydroxide), 350-400 ml water, and 3 ml xanthate. Address: 1. Dearborn, Michigan; 2-3. Detroit, Michigan.

452. Taylor, H. Marshall. 1945. Re: Stock in Delsoy Products, Inc. Letter to Mr. Holton W. Diamond, c/o Russell-Taylor, Inc., 2001 S. Telegraph Rd., Dearborn, Michigan, July 6. 1 p. Typed, with signature on letterhead.

• **Summary:** “Dear Diamond: At the suggestion of Mr. [Bob] Smith, and with my consent, we take pleasure in handing you herewith Certificate No. 12 for ten shares of the common stock of Delsoy Products, Inc. We feel that since you have taken such a great interest in our operations, and that you would like to continue working with us, that we can possibly cement our relations by inviting you to join the small family.”

At the top of the letter is “Devonshire Topping, Inc.” Just above Marshall’s signature is typed “Delsoy Products, Inc.” Address: President, Delsoy Products, Inc., Graybar Building, 420 Lexington Ave., New York 17, NY. Phone: Murray Hill 3-3079.

453. Brochon, René. 1945. Le roman du soya [The romance of the soybean]. *Present (France)*. Aug. 23. [Fre]

• **Summary:** The story of the soybean is a saga, the most passionate and the longest of all—since the first chapter begins several thousand years ago, long the Jesus-Christ, with

emperor Shen Nung of China. The last chapter has not yet been written.

454. Shollenberger, J.H.; Goss, W.H. 1945. Processing plants: Considerations in determining size, type and location. *Soybean Digest*. Aug. p. 8-10.

• **Summary:** This article is reprinted from Shollenberger and Goss. 1945. "Soybeans: Certain agronomic, physical, chemical, economic, and industrial aspects." USDA Bureau of Agricultural and Industrial Chemistry. AIC-74. 84 p. Address: 1. Commodity Development Div.; 2. Engineering and Development Div. Both: NRRL, Peoria, Illinois.

455. *Soybean Digest*. 1945. Delsoy topping: An all-vegetable cream. Aug. p. 24.

• **Summary:** "Delsoy is the new brand name for Devonshire Topping, all-vegetable whipping product. And the name of the manufacturing firm has been changed from Devonshire Topping, Inc., to Delsoy Products, Inc., Herbert Marshall Taylor, the manufacturer, has announced. Headquarters are in the Graybar Building, New York City.

"Delsoy Topping has had an interesting history, having encountered the usual pitfalls of a new food product that is bedeviled with bureaucratic interference and the opposition of powerful economic interests.

"Topping is the name bakers have for the fluffy white dressing they use on the top of pies. Whipped cream is the traditional topping.

"Taylor began over a decade ago by manufacturing and selling a machine with which bakers could whip up their own cream from mixtures of powdered milk and butter, an operation saving them a dollar a gallon.

"When, as he says, the Chicago creameries put him out of business, he moved to Detroit and began to manufacture the topping to sell through retail stores. The product was made from a milk base and a vegetable oil until WFA [War Food Administration] cut the firm's milk allotment. Then Taylor switched to a soy milk base and the topping became an all-vegetable product. According to the *New York Herald Tribune* it whips to two and one-half times its original volume and looks, tastes and acts like whipped cream.

"Taylor claims 1,500 independent dealers for Delsoy Topping in Detroit. He has added a plant in Dearborn to the one in Detroit, and announces that he plans to manufacture and sell soy milk, soy chocolate milk, soy butter, soy cream cheese and ice cream. This spring the topping was introduced through retail stores in New York City."

A large photo shows Herbert Marshall Taylor using a spatula to scoop his whipped Delsoy Topping from a metal bowl onto the top of a pie. Nearby is an eggbeater and a truncated conical carton, in which Delsoy is sold.

Note 1. Rich Products Corp.'s Whip Topping was introduced shortly after Delsoy, and sold in the same shaped container. Note 2. No mention is made in this article of

Delsoy sold in a pressurized can.

Note 3. This is the earliest English-language document seen (March 2007) that uses the term "soy cream cheese."

Note 4. This is the earliest English-language document seen (March 2007) that uses the term "soy ice cream," but in the form "soy cream cheese and ice cream."

456. Diamond, Holton W. 1945. Excerpts from "Cumulative Work Report," George Washington Carver Laboratory—June 1943 to September, 1945. Dearborn, Michigan. 5 p. Unpublished manuscript.

• **Summary:** At some unknown date (after Sept. 1945 and probably before Aug. 1947) "Rex" Diamond wrote a summary of the work he had done at Henry Ford's George Washington Carver Laboratory in Dearborn: 1. Chlorophyll and its derivatives: Edible and inedible chlorophyll compounds. 2. Soybean oil. Two types of investigations were made: (A) Deodorizing and deflavoring. "Experiments were made to determine the optimum conditions for removing the unpleasant odor and flavor from the oil produced at the Rouge Plant. There were found to be: Temperature of the oil, 140°C; temperature of the steam, 70-80°C; pressure, less than 4 inches of mercury; time, 40-60 minutes. (B) Extraction of oil from wet soybean flakes following alkaline extraction of protein." Only 50% of the oil was recovered in this process compared with 97% in the extraction of the whole dry flakes with hexane. However the flavor of the oil was better.

3. Gelatinous form of soybean protein. "During experiments which were directed toward obtaining a 'soy cream' which would not curd in coffee, a 'protein' with phenomenal gelatinous properties was prepared... It was thought such a 'vegetable gelatin' might find use in the food and pharmaceutical industries... Note 1. This is the earliest document seen (May 2005) concerning a non-dairy coffee creamer; in this case it was made with soy protein.

"4. Wheat Milk. Several attempts were made to make milk by process similar to that used in making soy milk, but were largely unsuccessful... 5. Peanut Milk. A few experiments were conducted with peanut protein. One batch of milk was made, of unpleasant color and flavor, due to the inclusion of the red 'skins' and the staleness of the nuts themselves.

"6. Soybean 'dairy' products. (A) Soy Milk. Since the manufacture and development of soy milk is one of the major projects of the Carver Laboratory, much of my work has had to do with this product. Investigations were largely in six general fields. (B) Soy Cream. (1) Non-curdling cream for coffee. Quite a large number of experiments have been made to prepare a 'soy cream' which will not 'curd' when used in coffee. These experiments are still proceeding. As yet, no palatable non-curdling cream has been prepared. (2) Soy whipping cream. Various types of vegetable fats, emulsifiers, and proportions of these with 'skim soy milk' were tried in seeking a cream that would 'whip'. 'Sweetex' fat, manufactured by Procter and Gamble, homogenized



at pressures under 500 pounds per square inch with soy skim milk makes an acceptable 'topping' which 'whips' and resembles whipped cream in appearance. The flavor of this product is generally considered to be an improvement over the flavor of regular soy milk, probably due to the dilution of the soy protein with fat and air. [Note 2. No mention is made of mono- or diglycerides. See Florence Diamond interview of Dec. 1992.]

"(C) Soy 'cream cheese' spreads. Different methods of chemically 'souring' straight 16% soy cream were tried, using citric acid and calcium chloride as precipitating reagents, and different combinations of the drained and pressed precipitate with pimentos, pickles, and other flavoring materials were made. A number of different varieties of 'cheese spread' of this sort were made. The texture and flavor of these spreads are comparable with the flavor and texture of the common spreads made from cow's milk.

"(D) Soy 'Cheddar' cheese. A number of attempts were made to prepare an acceptable 'hard' or 'Cheddar' cheese from soy milk by chemical souring and mechanical pressing. In all cases, however, the pressed cake was brittle, with a tendency to crumble, quite different in texture from ordinary Cheddar cheese. The flavor in each case was considerably inferior to ordinary American cheese.

Note: This is the earliest English-language document seen (Feb. 2007) that uses the term "Soy 'Cheddar' cheese" to refer to a Western-style soy cheese.

"(E) Soy ice cream. (1) Refrigerator tray type. It was found that by substituting soy topping for whipping cream and 16% soy cream for coffee cream specified in ordinary cow's-milk recipes for refrigerator ice cream, an acceptable product could be obtained."

See also Diamond's "Laboratory Notebook," starting Feb. 1945. Address: Dearborn, Michigan.

457. Ford Motor Co. 1945. No wage is "too high" that is earned! (Ad). *Soybean Digest*. Sept. p. 13.

• **Summary:** This ad is signed by Henry Ford and Henry Ford II.

458. Holman, Ross L. 1945. A chemurgic fantasy. *Yale Review* 35(2):282-91. Dec. Condensed as "New riches from farm synthetics" in *Science Digest*. 1945. 17:53-55. March.

• **Summary:** The farm chemurgic movement, started in 1934 to find industrial markets for surplus farm crops, has begun to grow. W.J. Hale is the founder of the present chemurgic movement. "There is no farm crop that the test tube has turned into more industrial products than soy beans. It is surprising to see what the soy bean can become in the hands of a chemical juggler. To offset war scarcities it can be processed into many things, from gunstocks for guns to a good substitute for butter; from vitamin K for our blood to a handkerchief for our tears.

"America's industrial pioneer number one with soy beans

is Henry Ford. With a staff of chemists, a laboratory, and several thousand acres of soys he is turning these beans not only into a large variety of things to eat but into something to wear and ride, to keep the rain off and to doctor our liver troubles. We may recall how extravagant Ford sounded to us in the Twenties when he said that some day we would be able to dispense with the farm cow and drink synthetic milk [See *New York Tribune*, 9 Feb. 1921]. This fantastic prophecy made rich material for newspaper reporters and cartoonists. There were comic caricatures of a robot cow pouring out synthetic milk to be churned into a synthetic butter. Today reporters and cartoonists know that the joke has backfired. Ford's chemists have been getting milk from soy beans for years. The milk has been shown to have important food values. The list of Ford's soy foods includes meats, cheese, breakfast foods, macaroni, bread, crackers, sweet milk, buttermilk, and coffee."

Reichhold Chemical Corporation and one or two other companies are producing soy-bean rubber at the rate of 25,000 tons a year.

The author also discusses Henry Ford uses soy beans to make synthetic wool. "Ford himself frequently wears a soy-bean suit, and experiments seem to prove that it can be manufactured at less cost than any other textile fiber. Two Japanese scientists processed a wool from soys before the war and insisted that wool for a whole suit of clothes could be manufactured for less than a dollar."

"The climax of Ford's pre-war chemurgic achievements was the manufacture of a car with a all-plastic body. The body, made largely of soys, was 1,000 pounds lighter than a similar car with a steel body... Just about the time it was ready to go into production Pearl Harbor stalled the manufacture of cars for the duration.

"Madison College near Nashville, Tennessee, is an educational institution that has turned farm chemurgy into a bonanza... The chief crop handled here is the soy bean, which is manufactured into 30 foods ranging from meat to coffee." The students, working their way through college, make the foods and student nurses and boys taking pre-medical courses play a major role at the school's sanitarium, where "patients are nursed back to health on soy foods."

At Taftville, Connecticut, the National Dairy Products Corporation is now manufacturing 10 million pounds a year of Aralac, a wool-like fiber made from the casein in skim milk.

"America's pioneer chemurgist, who performed scientific miracles before chemurgy ever got its name, was the late Dr. George W. Carver, of Tuskegee Institute in Alabama. Dr. Carver's record of processing over 300 industrial products from the peanut and 120 from the sweet potato is too well known to need discussion here."

Note: This is the earliest document seen (April 2002) that mentions vitamin K in connection with soy.

459. Lager, Mildred. 1945. *The useful soybean: A plus factor in modern living*. New York and London: McGraw-Hill Book Company, Inc. xii + 295 p. Illust. General index. Index of recipes. 22 cm.

• **Summary:** One of the most important and innovative books on soyfoods ever written. Contents: Preface. 1. Agriculture's Cinderella: America discovers the soybean, our wonder beans, soy as a food in the United States, soy in rehabilitation food programs, soybeans as an emergency crop, soybean terminology. 2. World-wide use of soybeans: A real antique, monarch of Manchuria, soybeans in mechanized warfare—Germany, soybeans in other countries (USSR, Italy, Spain, Belgium, Holland, Norway, Denmark, Sweden, Great Britain, Canada), soybeans in Lend-Lease and United States Agricultural Marketing Administration, Food for Greece, soybeans and the Mexican Indian, soybeans in Hawaii (Mr. C.G. Lennox). 3. Soybeans and industry: The versatile soy, uses of soybean in industry, soybean paint (from soy oil, incl. Duco finishing), soybean protein (used in making plywood, plastics, water paints, paper sizing, leather finishes, and insecticide sprays), Henry Ford and soybeans, soybean glue (I.F. Laucks and the firms he has licensed turn out some 30,000 tons of soybean glue annually), rubber substitute (Norepol), paper industry (Glidden), plastics, soy-cotton helmets, firefighting compounds, lecithin, fertilizers. 4. Nutritional nuggets: Food value of soybeans and soy products (vegetable or edible types of soybeans, protein, fat & carbohydrate, minerals, vitamins, lecithin, alkaline ash, economy, exaggerated claims), principal uses of soybeans and soy products (meat substitutes, meat enrichers, fortifying foods with soy flour). 5. From soup to nuts: Green beans, dry beans, frozen beans, roasted soybeans, sprouted soybeans, the cow of China—soy milk, the meat without a bone—tofu or soy cheese, the little giant among protein foods—soy flour, soy grits, puffed grits, soy oil, miscellaneous soy products (soy butter [soynut butter, p. 99-100], sandwich spreads, malts, coffee substitutes, soy sauce, soy albumen—a new product, greatly improved during the past two years, is now used to “replace egg albumen in candy manufacture” [as in marshmallows]).

Note 1. This is the earliest English-language document seen (March 2001) that refers to tofu as ‘the meat without a bone.’ In 1938 Horvath called tofu ‘the meat without the bones.’ Note 2. This is the second earliest document seen (Aug. 2002) in which the soybean is called the “cow of China.”

Note 3. This is the earliest English-language document seen (Aug. 2003) that uses the term “soy albumen” (or “soy albumens”) to refer to isolated soy protein as a product.

6. The blazed trail: Introduction (history and pioneers), our tardy acceptance, food pioneers (health-food stores, Dr. W.D. Sansum of Santa Barbara and soy bread, allergy studies, vegetarians, Seventh-day Adventist food companies, meatlike products, Madison College of Tennessee, Loma

Linda Food Co., the International Nutrition Laboratory and Dr. H.W. Miller, special dietary concerns and diabetic diets), establishing soybeans in the kitchen (The Edison Institute and Henry Ford, the USDA and the U.S. Bureau of Home Economics, the Agricultural Marketing Administration, U.S. railroads, the Soy Products Division of the Glidden Co., the Soy Flour Association). 7. The challenge of nutrition: The dangers of hidden hungers, nutrition and health, corrective nutrition, starch-restricted diets, meatless diets, allergy diets, bland diets, building diets, reducing diets, acidophilus culture, lecithin. 8. Our wonder crop: Jack and the beanstalk, early history, new varieties, aids to the industry (Regional Soybean Industrial Products Laboratory, American railroads, American Soybean Association, Fouts Brothers of Indiana, *Soybean Digest* and George Strayer in Hudson, Iowa, Soy Flour Association with Edward Kahl as first president, Soya Kitchen in Chicago (Illinois) opened in Jan. 1943, National Soybean Processors Assoc., National Farm Chemurgic Council), educational program, restrictive regulations. 9. Soybeans and the farmer: Varieties, sources of information, seeding and inoculating, harvesting, grading, soybean diseases, crop rotation, damaged beans. 10. Tomorrow: Acreage and production, soybeans on the farm, soybeans in nutrition, postwar industrial uses, future improvements. 11. A few suggestions for better living: Kitchen diplomacy, personal opinions, soybeans for everyone. Recipes: Green soybeans, dry soybeans, sprouted soybeans, roasted or toasted soybeans, meat-substitute dishes, soy-enriched meat dishes, soy noodles, macaroni, spaghetti, sauces and gravies, soups, salads, dressings, soy spreads, soy milk, tofu or soy cheese, soy butter, soy cereals, soy desserts, soy candies, soy beverages, soy-flour recipes, bread and muffins, pancakes and waffles, soy gluten recipes, baking-powder biscuits, pastry, cookies and doughnuts, cakes.

Contains recipes for “Soy milk molasses shake (p. 238). Soy puddings. Soy ice cream (p. 250; “Soy milk may be used in place of milk in ice-cream recipes... adding whipped cream”). Soy fruit ice cream. Soy chocolate dessert (Eggless) (p. 250-51). Soy shake “(p. 254, made in a “liquefier or mixer”).

The story of Allied aid to Greece [p. 24-26] is one of the great mercy stories of World War II. Starting in March 1942, as many Greeks were starving, the first mercy ship sailed to Greece with food and medicine. Up to Nov. 1943, the United States through Lend-Lease sent 82 million pounds of food to Greece. A number of these foods (including soup powders, stew mixes, and spaghetti) were based on soy flour and grits, and specifically developed to suit Greek tastes.

Concerning Henry Ford (p. 35-38), his “first experiments were made in a laboratory in connection with the Edison Institute in 1930. In these experiments, several tons of wheat were used, also several thousand bushels of carrots; sunflower seeds, which have a high oil content; cabbages; onions; and cornstalks. It was not until December, 1931, after a long

series of experiments with the soybean, that Mr. Ford and his chemists felt that they were at last approaching a solution to the problem of finding a basic farm material from which the ordinary farmer could develop a commercially profitable product.”

Note 4. This is the earliest English-language document seen (March 2007) that uses the term “Soy ice cream” (p. 250).

Note 5. This is the earliest document seen (July 2007, one of two) that uses the word “Cinderella” in connection with the soybean. The author, however, does not elaborate on this idea.

Note 6. This is the earliest English-language document seen (June 2011) that uses the term “soy-flour.” Address: Southern California.

460. Lager, Mildred. 1945. Preface (Document part). In: Mildred Lager. 1945. *The Useful Soybean: A Plus Factor in Modern Living*. New York and London: McGraw-Hill Book Company, Inc. xii + 295 p. See p. vii-ix.

• **Summary:** “We of the occidental world are just discovering that soybeans are indeed nuggets of gold in our modern civilization. During the last twenty-five years [i.e., since 1920], they have mushroomed from an almost unknown forage crop to one of our most important cash crops, vital to the fields of agriculture, commerce, nutrition, and industry. Nutritionally soybeans have become a vital food for a world at war and a postwar world at peace. Industrially they are a challenge to the chemists’ flasks and test tubes; for more than two hundred commercial products have been made from the little beans. Hence soybeans and soybean products are indeed destined to be a vital plus factor in our world of tomorrow.

“Food has always been my hobby. When Fate, that unseen hand that sometimes guides us to our rightful groove in life, gave me firsthand experience with the miracles of proper diet, teaching fundamental facts on nutrition became my goal. I have tried to pass on the message of better eating via the platform, the printed page, and the radio, and for the last dozen years have enjoyed the unusual opportunity of occupying a vantage point on a busy crossroad of nutrition. I have seen, too, the value of soybeans in the so-called ‘corrective regime,’ and it has convinced me of their rightful place in the average diet.

“I experimented with soy as a food, secured special soy products for special diets, made up recipes, and in my classes taught the cooking of soybeans when they were practically unknown, when soy was eaten because it was soy and regardless of taste or palatability. In 1942, when soybeans became prominent as a war emergency food, a collection of these recipes was published under the title of ‘150 Ways to Use Soybeans.’”

“Because my main interest in soybeans and soy products is nutritional, the purpose of this book is to help bridge the gap from the unusual to the usual. I have tried to present

the story of Asia’s ancient food in a true, authentic manner—to give credit where credit is due. I am not a vegetarian, not affiliated with any organization or group advocating a meatless diet. I believe that proper nutrition and common-sense living are man’s best medicine.”

“I want to acknowledge the material, encouragement, and help that I have received from the men and women of medicine, research, industry, and business as well as homemakers and friends. I am especially grateful to

“Edward J. Dies, Soy Flour Association, Chicago, Illinois.

“E.L. Rhoades, Soy Flour Association, Chicago, Illinois.

“Kent Pellett, Soybean Digest, Hudson, Iowa.

“Edward Kahl, Los Angeles, California.

“National Soybean Processors Association, Chicago, Illinois.

“Dr. Walter C. Alvarez, Mayo Clinic, Rochester, Minnesota.

“Dr. Francis Pottenger, Jr., Monrovia, California.

“Dr. Irving D. Ewart, Hollywood, California.

“Dr. J.A. LeClerc, U.S. Department of Agriculture, Washington, D.C.

“W.J. Morse, Department of Agriculture, Washington, D.C.

“Dr. Louise Stanley, Chief, Bureau of Home Economics, Washington, D.C.

“Donald S. Payne, Chief of Soya Products Section, Food Distribution Administration, Washington, D.C.

“Dr. Clive M. McCay and Mrs. Jeanette McCay, Cornell University, Ithaca, New York.

“Dr. H.W. Miller, International Nutrition Laboratory, Mount Vernon, Ohio.

“Col. Rohland A. Isker, Quartermaster Corps, Chicago, Illinois.

“Prof. Oscar Erf, The Ohio State University, Columbus, Ohio.

“National Farm Chemurgic Council, Columbus, Ohio.

“Agricultural Experiment Station, University of Illinois, Urbana, Illinois.

“Agricultural Experiment Station, Iowa State College, Ames, Iowa.

“Purdue University, Lafayette, Indiana.

“College of Agriculture, University of California, Berkeley, California.

“Department of Home Economics, University of Illinois, Urbana, Illinois.

“Bureau of Home Economics, U.S. Department of Agriculture.

“A.A. Levinson, Glidden Company, Chicago, Illinois.

“H.A. Olendorf, Spencer Kellogg & Sons, Inc., Decatur, Illinois.

“James L. Doig, Floya Milling Company, Montreal, Canada.

“J.A. Audiss and L.E. Bauer, Loma Linda Food Company, Arlington, California.

"Russell G. East, The Pennsylvania Railroad, Richmond, Indiana.

"Ollie Jones, Los Angeles, California.

"Madison College, Madison College, Tennessee.

"Ford Motor Company, Dearborn, Michigan.

"The Fox Valley Canning Company, Hortonville, Wisconsin.

"The Michigan Paper Company, Plainwell, Michigan.

"I.F. Laucks, Inc., Seattle, Washington.

"The Baltimore & Ohio Railroad, Baltimore, Maryland.

"John Deere, Moline, Illinois.

"Hawaiian Sugar Planters' Association, Honolulu, Hawaii.

"Maren Elwood, Hollywood, California (for her help in editing the manuscript).

"Ellender McGraw, my secretary." Address: Southern California.

461. L  bbe, Henrique. 1945. *Cultura da soja no Brasil*. 7th ed. [Culture of soybeans in Brazil. 7th ed.]. Rio de Janeiro, Brazil: Directoria de estatistica da producao, Ministerio da Agricultura. 74 p. 2nd ed. was 1935. [Por] Address: Eng. Agronomo, Brazil.

462. Swingle, Walter T. 1945. Our agricultural debt to Asia. In: Arthur E. Christy, ed. 1945. *The Asian Legacy and American Life*. New York: The John Day Co. x + 276 p. See p. 84-114. Index. 21 cm. Also published by The Asia Press, 1942. [2 ref]

• **Summary:** "The beginning and foundation of the Library of Congress Orientalia Collection was the great Chinese encyclopedia, the *Ssu k'u ch'uan shu*, a gift of the Empress Dowager of China.

"About 1914, Dr. Swingle, then head of the Office of Crop physiology and Breeding, Bureau of Plant Industry, U.S. Dept. of Agriculture, was able to secure the services of a Cornell graduate, Dr. Hing Kwai Fung, to make abstracts and/or translations of information in the *Ssu k'u ch'uan shu* regarding economic plants. Dr. Swingle interested Dr. Herbert Putnam, Librarian of Congress in increasing the holdings of Chinese books, especially gazeteers [sic, gazetteers] which contain local information. When Dr. Fung returned to China, he was given a modest sum for purchasing books. Dr. Fung was able to persuade the Commercial Press (the largest publishing firm in China, located in Shanghai) to act as receiving agent for books for the Library of Congress, and to ship them to Washington [DC]. Soon after, Dr. Swingle was sent to the Orient—in March 1918—by the Dept. of Agriculture." There he made arrangements for collecting books in Tokyo and Shanghai.

"As American merchants and missionaries gradually penetrated into China, they sent home more and more plants and trees. The Arnold Arboretum, organized and directed by the great tree expert, C.S. Sargent, financed extensive trips to the Orient to obtain botanical specimens and seeds of

ornamental trees and shrubs as well as photographs of them as they grew in their native habitat. These trees and shrubs revolutionized the garden and park plantings of the northern parts of the United States. The illustrated popular books of E.H. Wilson, who made many trips to the Orient for the Arnold Arboretum, helped to arouse interest in the very rich arboreal flora of China...

"The Plant Introduction Service of the U.S. Department of Agriculture was organized by David Fairchild in 1897; he did very extensive exploring for foreign economic and ornamental plants from 1898 on, and directed the Plant Introduction Service from 1909 to 1928. I was fortunate enough to be one of the first 'agricultural explorers.'" Of these men Frank N. Meyer and P.H. Dorsett were outstanding, not only for the number and value of the plants they secured, but also for the detailed and accurate descriptions of every plant they sent to Washington.

"P.H. Dorsett some years later, during the twenties, traveled widely in North China taking many fine photographs of Chinese crop plants and writing descriptions of the culture, harvesting and curing of each. On these trips he collected many varieties of soy beans largely through the utilization of a new and potent method of securing the willing cooperation of all educated Chinese people. A complete translation, prepared by Michael J. Hagerty under my direction in 1917 of the chapter on soy beans contained in a standard Chinese work on economic plants (the *Chih Wu Ming T'u Kao* by Wu Ch'i-chun) had been furnished the plant explorers looking for soy bean varieties. This translation, covering eighty-two pages, discussed several hundred varieties, telling where they were largely grown. In all cases the name of the variety and the name of the locality where it was grown were not only spelled out in English but also written carefully in Chinese characters. An index made it easy to turn to any variety under discussion and see what was said about its culture.

"This was a turning point in field explorations in China. Such indexed translations in the hands of foreign plant explorers insured the attention of all educated Chinese, who gladly directed the explorer to the nearest source of the various named varieties. I had learned this at first hand in 1915 when studying varieties of Citrus in southern China. Surprise and skepticism about the foreigners knowledge of Chinese books gave way to astonishment and warm approbation."

"The soy bean is a striking example of the introduction of a new crop... Soy beans were sent from China to France as early as 1740 and from 1779 were grown in the famous Botanic Garden of Paris. Benjamin Franklin, who had been a member of the French Academy of Sciences since 1772, sent seeds back to the United States and urged that they be given a trial. But in spite of his plea, the soy bean remained merely a curiosity in this country for more than a century.

"In the late eighties [sic, 1890] Prof. C.C. Georgeson

brought soy bean seeds from Japan, where he had been teaching at the Agricultural College at Komaba, and planted them in a field on the campus of the Kansas State Agricultural College. I could see the stunted soy bean plants from the windows of the botanical laboratory where I was a teen-age research assistant. This variety, adapted to the perpetual spring climate of Komaba near Tokyo, did not do well on the bare Kansas hills, often swept by hot dry winds. And nothing happened. Soy beans did not arouse interest among Kansas farmers until many years after this failure.

"In the third decade of the twentieth century Dorsett sent to Washington more than 800 named soy bean varieties from China, Manchuria and Japan. These together with shipments secured by Dr. David Fairchild from his numerous correspondents in the Old World, especially in Asia, amounted by 1928 to a total of more than 2800 packages of soy beans, almost all named varieties but many of them duplicated, some of them many times. Meantime tests made by W.J. Morse, in charge of soy bean culture for the Bureau of Plant Industry, showed that many varieties had a narrow range of adaptability. Accordingly, from 1929 to 1931, Morse joined Dorsett in the Orient and these two experts, with trained Chinese helpers, brought to this country the largest single collection of soy bean varieties ever assembled. As soon as Morse returned from studying soy beans in Asia and attacked the problem of finding which Asiatic varieties adapted to the different regions and selecting and breeding to make them fit various American soils and climates, a remarkable change occurred in soy bean culture. Yields went up and plantings increased year by year...

"One of the best-known industrial uses for soy bean proteins is for making water-resistant glue. No less than 30,000 tons of soy bean glue were made in 1942 by a single firm and its licenses annually, most of it being used in the rapidly growing plywood industry. Soy bean proteins have been enthusiastically used by Henry Ford in his automobiles, being mixed with the more expensive phenolic resins, thereby reducing costs and also yielding a more plastic, freer-flowing mixture which takes dyes better...

"As long ago as 1917-1918 Dr. Yamei Kin set up under my general supervision for the U.S. Department of Agriculture a soy bean mill in New York City in the hope of supplying tofu to increase the bulk and food value of meat dishes served to soldiers in training at near-by camps. Dr. Kin succeeded in making excellent tofu. She even served to a group of army officers a meal composed entirely of soy bean dishes! However, it proved impossible to test tofu on a large scale at that time, since we could not get priority for transportation of soy beans from North Carolina, then the nearest region where they were grown on any considerable scale.

"A splendid example of a double fermentation is the soy bean cheese called *nam yüe* by the Cantonese and *sufu* in North China. It is preferred even to the best Roquefort as a salad dressing constituent by those who have had the

opportunity to try it. It is made by Chinese masters of the cheesemaker's art who believe that its fermentation is an insoluble mystery.

"Shih Chi-yien, then working in the American University of Soochow, published in 1918 the first English account of the most important fermented bean foods. He traced the making of *tofu* from soy beans back to the Han dynasty (A.D. 22). Ten years later Wai Ngan-shou [Nganshou], one of the first scientifically-trained Chinese microbiologists and fermentation experts, was able to isolate and identify as a new species of *Mucor* the mold that makes possible the *nam yüe* fermentation. It is a curious fungus, *Mucor sufu*, distantly related to the miraculous *Penicillium notatum* whose marvelous curative action has only recently been discovered. A third fermentation expert, Shih You-kuang, studied another soy bean fermentation product, *meitauza*, made by another species of *Mucor*, and published an illustrated account of it in German in 1937. In his review of the literature of *Mucor* fermentations, Shih You-kuang cites no fewer than thirty articles by eighteen authors all based on Chinese fermentations...

"Miss Elizabeth Groff, under my direction in 1918, made a thorough study of the fermentation of soy sauce in the famous factories of Canton, China, and published the first detailed account of the process in the *Philippine Journal of Science* for 1919."

"It has been my privilege to assist in building up a great Chinese library in the Library of Congress, under the enlightened policy of Dr. Herbert Putnam, beginning in 1912. The Orientalia Division, headed by Dr. Arthur Hummel, is now the largest Chinese library outside of Asia and is probably larger than all the European libraries of Chinese books combined. It now contains, Dr. Hummel estimates, about 230,000 Chinese volumes (*Chüan*) and some 20,000 more will soon be added in the form of bibliofilm copies of very rare works from the Chinese National Library, sent to Washington for safekeeping."

Note 1. This is the earliest secondary document seen that mentions the early introduction of soybeans to America by Benjamin Franklin.

Note 2. This is the earliest English-language document seen (Feb. 2007) that uses the word *nam yüe* to refer to Chinese-style fermented tofu. It is 2nd earliest English-language document seen (Feb. 2007) uses the word "sufu" to refer to Chinese-style fermented tofu, and the first such document written by a Westerner. Photos show Dr. Walter Tennyson Swingle, and his wife Maude K. Address: Collaborator, Bureau of Plant Industry, USDA; Consultant on Tropical Botany, Univ. of Miami, Florida.

463. Glotzhober, Clem. 1945? Notes on Henry Ford. Dearborn, Michigan. 3 p. Undated. Unpublished manuscript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** In the summer of 1935 Clem got a job in the gardens of Greenfield Village and continued working there summers for Mr. Gus Munchow until Clem graduated from Michigan State in 1940. Whenever Mr. Ford drove by, he waved at young Clem. Later when Clem and his wife had their first child, Mr. Ford spent about half an hour congratulating him and talking about children. "I always marveled at Mr. Ford's sincere interest in simple people."

Before the Carver Lab opened, Clem worked for Bob Smith at the Moir House Lab. At one point Clem's boss was Robert A. Boyer. He recalls that one year a lot of barnyard grass grew in the soybean fields around Dearborn. This manuscript ends with two stories that illustrate Mr. Ford's sense of humor. One is about Clara Ford and a duck, the other about Ray Dahlinger (Mr. Ford's farm manager) and his racing cars. Address: Food Lab.

464. Re: The Quirk Farms. 1945? Letter of memorandum. 1 p. Typed. Undated.

• **Summary:** "In January 1931, Mr. [Henry] Ford purchased all of the outstanding capital stock (782 shares) of the Quirk Farms, a Michigan Corporation, for \$300,000... Mr. Ford by this transaction acquired approximately 1748 acres of farm land in Van Buren Township, southeast of the city of Ypsilanti..."

For convenience only, the corporation held title to these lands and some 200 other purchases of approximately 12,500 acres costing in the neighborhood of \$1,650,000 in the Townships of Clinton, Macon, Milan, Raisin, Saline, Superior, Tecumseh, Van Buren and Ypsilanti. Mr. Ford paid taxes, upkeep and maintenance expenses and all other charges which accrued.

"In 1945, after all of these lands had been disposed of, the corporation [Quirk Farms] was dissolved."

Note 1. By Jan. 1931, just before Henry Ford bought the Quirk Farms, he owned 8,486 acres in southern Michigan. Over the years, almost all of this land, which was part of the Ford Farms, was used for agriculture. This land was sold in 1945, the year the Ford Motor Co. was liquidating many of its peripheral assets to try to offset its large losses in automotive manufacturing. Note 2. The acquisition of Henry Ford Farms took place principally during two periods: 1909-19 in the Dearborn area and 1931-34 in the Tecumseh, Michigan, area. During the first 15 years or so, Ford's experiments focused on application of tractors to farming. During the second period, experiments focused on the use of farm crops (including soybeans) for industrial, non-food applications. Until the great farm depression of 1921-23, the emphasis had been entirely on increasing farm efficiency and productivity. During and after that depression the emphasis was on finding new uses for the abundant / surplus farm crops.

Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). Records of L.J. Thompson, Acc. 844, Box 1.

465. Gunther, J.K. 1946. Re: Availability of isolated purified soybean protein for food manufacturing use. Letter to Holton W. Diamond, 1648 May St., Dearborn, Michigan, Feb. 15. 1 p. Typed, with signature on letterhead.

• **Summary:** Mr. Diamond wants to manufacture a soy-based whip topping. In response to Mr. Diamond's letter of Jan. 31, Ken Gunther writes: "I do not know of such a source at the present time, however, it is quite probable that you would not have very much difficulty in having such a source develop, if a sizable market should appear for such a material. We have not produced pure protein on a commercial scale ourselves, but we have given considerable thought to the matter and would be interested in going into the matter with you if your plans are sufficiently well advances."

"I have had a desire for some time to visit the Carver Laboratories at Dearborn and it may be possible for me to get to Dearborn within the next month. If this can be arranged I am wondering if you will be available for a discussion of the isolated protein matter." Address: Research Director, Central Soya Company, Inc., Decatur, Indiana. Phone: 336.

466. *Borden's Economic Digest*. 1946. The economics of soy. 2(3):1-8. Feb.

• **Summary:** Contents: The economics of soy. Why soy? Soy and soil. Soy feed and food. The industrialization of soy. The future of soy. Address: New York.

467. Doherty, Lawrence E. 1946. Imitation or improvement? Dairy 'replacement' products widening market, seeking to equal margarine's success. *Food Business*. March. p. 22-23, 56.

• **Summary:** "In the family of vegetable-fat dairy replacements, the Big Brother Who Made Good is oleomargarine. The other family members—including whipped topping, coffee whiteners, and melleorene [mellorine]—are working to be equally successful... Today vegetable whipping preparations, both powdered and aerosol, reportedly outsell dairy whipping cream." Two companies long associated with the dairy industry now make powdered coffee whiteners or creamers: Carnation makes Coffee-mate (launched in 1961, and now the market leader), and Borden's makes Cremora (launched in the autumn of 1963). Photos show a jar of each product. "The non-dairy coffee whitener market" is now experiencing fast growth. These products have two advantages over cream: they are less expensive and they keep longer. It was during World War II "that 'ersatz' dairy products got their big boost, due to some shortages of dairy products on the home front, and the need to develop non-spoiling dairylike foods for military men on the move."

"Since that time whipped topping and coffee whiteners have made important strides, especially in the institutional field where lower cost and increased shelf life are telling advantages. On almost all coffee vending machines, the 'cream' button releases what is actually a vegetable-base

cream replacement, either powdered or liquid.”

“Robert E. Rich, whose Rich Products Corp. sells frozen liquid Coffee-Rich, predicts that within five years vegetable fat coffee whiteners will be outselling dairy cream for coffee. Rich Products, of Buffalo, New York, is a pioneer in the non-dairy field. In 1945 Bob Rich, who then (as now) operated a large dairy company, learned of work done by the George Washington Carver Laboratories [of the Ford Motor Co., Dearborn, Michigan] on making milk and cream from soy beans, and used this work plus other research to produce a soy cream that would whip. Rich’s Whip Topping produces more volume when whipped, remains firmer longer, combines with any acid fruit or juice, and costs less. This was followed in 1961 by Coffee-Rich, and this is where the company ran into a barrage of legal battles...”

“Rich’s Coffee-Rich is probably the largest seller of liquid non-dairy coffee whiteners. Carnation’s Coffee-Mate is said to be the leader among the powdered cream... In the whipped topping field, Rich is said to be the largest seller of liquid topping. General Foods’ Dream Whip, introduced in 1957 in powdered form, is the leader among the dry packaged whips. Lever Bros’ Lucky Whip mix, introduced in 1961, is considered in second place. Lucky Whip is also sold in aerosol containers, as is Whip Topping.”

“H.W. Diamond, research vice-president of Rich Products, who holds the ‘Diamond process’ patents for vegetable fat whippable emulsions, foresees a fine future for non-dairy products. ‘Generally speaking, vegetable fat replacements for dairy products can be created, manufactured, distributed, and sold at a lower cost in man hours of effort than can comparable dairy products. The vegetable fat products represent a more efficient utilization of the food producing capacity of the soil and the labors of man,’ he said.”

One ad for Rich’s Coffee Rich shows it being poured into a cup of coffee. “New non dairy coffee compliment. Shipped frozen. Keeps 3 weeks after thawing in your refrigerator.” It is sold in a Pure Pak carton. A second ad states “Rich’s Coffee Rich wins again!” A Wisconsin cow, so labelled, is being carried away in a cage. The sign across the top which read “Legally Dangerous” has been changed to “Legally Meek,” since Coffee Rich won a big legal victory in the dairy state of Wisconsin. Coffee Rich can be sold there and it need not be labeled “imitation cream.” Rich has now won this legal battle in 7 states.

Note 1. This is the earliest document seen (Jan. 1999) that uses the term “coffee whiteners” (or “coffee whitener”). It is also the earliest document seen (Jan. 1999) that uses any term to refer to this new product category, and the earliest document seen (March 2001) concerning the etymology of such products.

Note 2. This is the earliest English-language document seen (March 2007) that uses the term “mellorene” to refer to a frozen dessert made with vegetable oils instead of butterfat.

Note 3. This is the earliest English-language document seen (March 2007) that uses the word “dairylike” to refer to products resembling dairy products. Address: Assoc. editor.

468. Soybean Research Council, National Soybean Processors Assoc. 1946. Proceedings—Conference on Flavor Stability in Soybean Oil. Chicago, Illinois. 98 p. Held 22 April 1946 at the Bismarck Hotel, Chicago, Illinois. [53 ref]

• **Summary:** This historic meeting was called by Edward J. Dies, chairman of the board, National Soybean Processors Association. The 28 attendees, listed alphabetically, included: O.H. Alderks (The Procter and Gamble Co.), H.C. Black (Swift and Co.), R.A. Boyer (The Drackett Co.), G.N. Bruce (Durkee Famous Foods), John C. Cowan (Northern Regional Research Lab.), B.F. Daubert (Univ. of Pittsburgh), Edward J. Dies (National Soybean Processors Assoc.), Maurice Durkee (A.E. Staley Mfg. Co.), Herbert J. Dutton (Northern Regional Research Lab.), Egbert Freyer (Spencer Kellogg and Sons, Inc.), Calvin Golumbic (Univ. of Pittsburgh), Warren Goss (Northern Regional Research Lab.), Arne Gudheim (Lever Brothers), J.K. Gunther (Central Soya Co., Inc.), Fred Hafner (Archer-Daniels-Midland Co.), R.G. Houghtlin (National Soybean Processors Assoc.), H.T. Iveson (The Glidden Co.), J. Jakobsen (General Mills, Inc.), N.F. Kruse (Central Soya Co., Inc.), Herbert W. Lemon (Ontario Research Foundation, Toronto, ONT, Canada), Herbert E. Longenecker (Univ. of Pittsburgh), Ralph H. Manley (General Mills, Inc.), Karl F. Mattil (Swift and Co.), R.T. Milner (Northern Regional Research Lab.), W.W. Moyer (A.E. Staley Mfg. Co.), F.W. Quackenbush (Purdue Univ.), H.E. Robinson (Swift and Co.), J.H. Sanders (The Procter and Gamble Co.), L.A. Spielman (The Glidden Co.). Address: [3818 Board of Trade Building, Chicago, Illinois].

469. Ball, Robert S. 1946. Dr. Carver’s follower: Savant’s former aid carries on work. *Detroit News*. June 12. p. 4, col. 2. Night edition.

• **Summary:** Austin W. Curtis Jr., a young negro scientist and plant physiologist, has a little backyard laboratory at 6330 Thirtieth St. [in Detroit], where he is seeking to carry on where his mentor, the late George Washington Carver of Tuskegee Institute, left off. In his modest laboratory he “manufactures a small line of cosmetics in order to make enough money to finance his research. Both operations are carried on there.

“In addition to continuing the research in peanut derivatives carried to such lengths by his mentor, Curtis hopes to provide an opportunity for other young men of his race whose interests and education lead them into that field of research and who face closed doors at so many of the nation’s experimental plants...”

“Born July 28, 1911, in Institute, West Virginia, Curtis was graduated from Cornell University [New York] in 1932... He went with Dr. Carver in September, 1935, remaining with

him until his death in January, 1943.

"Curtis was appointed director of the Tuskegee research department, but left a year later to take a job in the Ford Motor Company's laboratories in Dearborn, specializing in soy bean oil paint research. Curtis started his own laboratory in January, 1945."

Note: As of 1980, Dr. A.W. Curtis Jr. lives at 454 Farnsworth, Detroit, Michigan 48226. As of Dec. 1992 A.W. Curtis Laboratories were located at 46 Selden, Detroit, Michigan 48201. Phone: 313-833-6979.

470. Smith, A.K. 1946. Proteins as industrial raw materials. *Chemical Industries* 58:974-77. June. Reprinted in Soybean Digest, Dec. 1946, p. 14-17. [13 ref]

• **Summary:** Discusses both animal and vegetable proteins. Animal glues were used in early Egyptian civilizations, but the supply was limited. This situation changed about 60 years ago when adequate refrigeration and transportation facilities led to an organized U.S. meat-packing industry, with more animal wastes available for processing. "It is interesting to note that vegetable proteins derived from farm crops did not make their appearance until after World War I—the isolated soybean protein coming on the market in 1933 and the corn protein in 1938."

Two basic reasons account for the slow development of industrial proteins: (1) The great importance of proteins for food use has limited the supply available for industrial use. (2) The very complicated chemistry of proteins has slowed their development for industrial applications.

"Production figures for isolated soybean protein are not available, but the annual capacity is reported to be in excess of 15 million pounds, and more production capacity is known to be contemplated."

"Before the war, soybean protein was sold principally to the paper industry for sizing and coating paper; substantial amounts were used also for the manufacture of water paints. During the war, the greater share of the production was allocated to the Navy as a fire extinguisher, a use in which it is unexcelled."

"The I.F. Laucks Co. introduced soybean oil meal glue to the Douglas Fir Plywood Industry in 1927 where it has played an important role in plywood development. The tonnage consumed is greater than that of any other plywood adhesive, and total consumption in the hard and soft plywood industries has ranged from 20 million to 45 million pounds annually."

"The Ford Motor Co. was probably the first to use soybean oil meal as an extender for phenolic resins. Laboratory investigations have shown that the standard soybean meal, normally used for stock feed, is not as satisfactory for this application as the special meal preparations which have had their water-soluble fractions removed. The war interrupted the progress of this plastic development, but with the return of peace a renewed interest

in this application is expected."

Recent research has show that soybean oil meal can be used to excellent advantage in extending phenolic resin for making waterproof plywood glue.

"Burnett and associates (1945), working with peanut and soybean proteins, have demonstrated for the first time that these materials can be used in the preparation of tacky and remoistening adhesives. With the paper industry intensively developing new types of packaging and other designs of paper fabrication, an additional supply of tacky adhesives should find a ready market."

Photos show: (1-2) Commercial production of synthetic fiber from milk casein by Aralac, Inc. (3) A man in a fire fighter's suit holding a hose and long nozzle from which he is spraying Aer-O-foam, a soy-based fire-fighting foam in a can. Address: Oil and Protein Div., NRRL, Peoria, Illinois.

471. Diamond, Holton W. 1946. Re: Costs of manufacturing non-dairy whip topping, cheese, chocolate malted, and ice cream in a "soy bean dairy" using isolated soy protein rather than soy milk. Letter to Arthur M. Smith, Esq., 23913 Michigan Ave., Dearborn, Michigan, Aug. 4. 4 p. Typed, without signature (carbon copy).

• **Summary:** Diamond gives material costs per day and per gallon for each of the 4 soy-based products listed above based on a production rate of 2,000 gallons per day. "I have come to the conclusion that the cheapest, most practical way to obtain the protein component of the soy bean foods is to purchase it from a large-scale processor. A spray-dried commercial product has advantages other than low cost. It can be stored without refrigeration, requires little storage space, and is light and much easier to handle than a 'curd' which contains 95% water, has to be pumped from place to place, and must be used immediately."

"The Carver Lab protein cost us more than 5 dollars per pound to make, whereas chemically isolated industrial soy protein sells at 15 to 18 cents per pound... his use of skim milk powder [dairy, not soy] was a principal reason why [Herbert Marshall] Taylor, during October, November, and December of 1944, at a production rate of about 1,200 gallons per day, was able to make more than \$25,000 profit each month."

Diamond estimates that to process 2,000 gallons of liquid per day, the basic manufacturing equipment (but not all equipment) would cost roughly \$17,675. He would like to make 1,000 gallons of topping, 1,800 gallons of ice cream, 425 pounds of cheese, and 50 gallons of chocolate malted per day. "If we had an operating fund of \$10,000 this would bring the capital investment required to start a 'soy bean dairy' to about \$55,000. Of course, if we could buy some of this equipment used, we could whittle this down a little."

"I believe you are right in thinking Rich [Bob Rich of Rich Products Corp.] has something in freezing his product [soy-based Whip Topping]." The late fall months, which include

Thanksgiving and Christmas, are the months of peak demand for whip topping. But Diamond does not think he can get his proposed new company started by that time. He has “a feeling that research work along the line of soy foods is going on all over the country, and it just might be possible that someone else is as smart as we are.” He discusses The Borden Company, The Glidden Company (“the largest producers of industrial soy protein in the world”), the A.E. Staley Mfg. Co., and Central Soya.

“Will you give me a ring when you have looked over these data and let me know what our next step should be?” Note: Arthur Smith was an attorney who Rex met through Florence Diamond (Smith lived 2 doors down the street from the Diamond family on Elmwood in Dearborn) and who helped Rex start Vegetable Products Corp. and find investors. Later, president Eisenhower appointed Smith a judge to the U.S. Court of Customs and Patent Appeals in Washington, DC. Address: 1648 May St., Dearborn, Michigan.

472. Diamond, Holton W. 1946. Re: Offer to license to The Glidden Company rights to manufacture soy bean food products that he has invented. Letter to Mr. Adrian D. Joyce, President, The Glidden Co., 11001 Madison Ave., Cleveland, Ohio, Aug. 16. 2 p. Typed, without signature (carbon copy).

• **Summary:** “For the past three years I have been employed as an organic chemist at the George Washington Carver Laboratory of the Ford Motor Company, acting as chief chemist for a portion of that time. During the course of experimentation on soy bean foods, chlorophyll pharmaceuticals, and other biochemical problems, I originated some developments in soy foods which I believe are valuable...”

“The patents now pending relate to a synthetic whipping cream, and similar soy bean products. I believe these products are unique. Especially popular among our visitors at the Carver Laboratory is a vegetable ‘cream cheese’ flavored with pimentos, chives, and the like.”

Diamond would like to meet with Joyce, show him samples, and discuss granting him a license to manufacture these foods.

Note: This letter was “ghost written” for Diamond by Judge Arthur M. Smith. Address: 1648 May St., Dearborn, Michigan.

473. McWethy, John A. 1946. Soybean success: War boom continues as many plants expand, bring out new products. Examples: Meat flavor, wool-like fibre, bottle cap adhesive, soymilk cheese. St. Louis meeting draws 400. *Wall Street Journal*. Aug. 31. p. 1.

• **Summary:** This article is about the 3-day meeting of the American Soybean Association in St. Louis, Missouri. The soybean industry thrived during the depression, more than doubled in size during World War II, and is now continuing to grow. The A.E. Staley Manufacturing Co., America’s largest

soybean processor, has just started construction of a new \$1 million plant that will turn soybeans into monosodium glutamate (MSG), making one million pounds a year. MSG has been previously made on a small scale in the USA from wheat, but Staley’s plant will be the first to make it on a large scale from soybeans.

The Drackett Co. in Cincinnati is putting the finishing touches on a commercial plant that will make a wool-like fibre from soybeans. Robert A. Boyer, the firm’s research director, said the new fibre will be used mostly for blending with rayon. He thinks it may sell for less than wool.

ADM, one of America’s four largest soybean processors, earlier this year completed a plant to make a “whipping agent” from the versatile soybean; it can replace egg albumin, which is much more expensive.

Dr. Harry W. Miller, president of the International Nutrition Laboratory (Mt. Vernon, Ohio), “started making soybean products in Shanghai, China, in 1935. Bombed out in 1937 by the Nips [Nipponese = Japanese], he came to this country and began making similar products here in 1939. Now his firm does a \$500,000 a year business and could do a lot more if sugar and other ingredients used with soybeans were available.” His most popular items are [soy] milk, cutlets, and canned green soybeans. He says the milk tastes “rather like malted milk and is especially good for infants and others allergic to animal milk. His company has also developed a cheese made from soymilk, a prepared mix for ice cream from the soymilk, and “albumen sheets” [yuba], which are very popular in China.

These sheets aren’t much thicker than a piece of paper and are used in China to make the layers of a loaf filled with mushrooms. The Chinese also use soybeans [yuba] to make products that taste like both fish and chicken. In American kitchens, an excellent substitute for butter can be made “by combining soya oil, soya milk,” carotene oil for color, and salt.

One big American breakfast cereal maker is said to be planning to introduce a “soya flake cereal soon, similar in appearance to cornflakes. Another may soon market a puffed soyabean cereal, a third may introduce a cooked cereal made from soybeans, oats and wheat.”

General Mills is building a factory for producing a synthetic resin from soybeans—a product developed at the Northern Regional Research Laboratory in Peoria, Illinois. Dr. G.E. Hilbert, NRRL’s director, says this new resin shows “considerable promise as a protective coating and as a heat-sealing and moisture-proofing agent.

During the past few years, soybean processors have been switching to the solvent extraction systems, from the expeller system, for obtaining oil from soybeans. Most newer plants use hexane solvent. The advantage of the solvent system is that it removes all but about half of one percent of the oil, compared with 3½% to 5% left in the meal when expellers are used. The meal currently sells for 3 cents/lb compared with 11.75 cents/lb for the oil.

NRRL has recently developed a process that uses alcohol instead of hexane. This yields superior "soyflour." Before the war, production of soyflour was 25 million lb/year; this year it is expected to top 400 million lb. Roth Products Corp. of Chicago has already used 6 million pounds of soyflour this year in its dehydrated soups, baked goods, pancake flour mixes, and sausage filler.

The soybean industry (especially the NRRL) is also working to make soybean oil more stable. It "has a tendency to develop a grassy or painty flavor on standing." A process obtained from Germany "goes a long way toward preventing the development of these objectionable flavors."

The Lincoln soybean variety, developed at the U.S. [Regional] Soybean Laboratory at Urbana, Illinois, and first made available to farmers during the war, is playing a major role in increasing yields. Today farmers in the corn belt are getting 25-30 bushels/acre with Lincoln, compared with only 15-16 bushels/acre in the early 1920s with varieties then available. Moreover, today's soybeans contain 20-21% oil compared with only 15-17% about 20-25 years ago.

474. Betzold, N. 1946. Soybean oil: Its future in margarine and related products. *Soybean Digest*. Sept. p. 52, 61-62, 64-65.

• **Summary:** The author, former chairman of the executive committee of the National Association of Margarine Manufacturers, recommends a campaign to educate farmers about the true uses of soybean oil. One table, based on Bureau of Internal Revenue figures, shows the amount of soybean oil used in margarine each year from 1932 to 1945. The amount grew very rapidly from 3,000 lb in 1932, to 7,000 lb in 1933, to 24,000 lb in 1934, to 1,740,000 lb in 1945, to 14,261,000 lb in 1936, to 87,103,000 lb in 1940, to 206,643,000 lb in 1945.

Another table, based on *Bureau of the Census-Facts for Industry*, shows that the amount of soybean oil used in shortening jumped from 212,317,000 lb in 1940 to 683,011,000 lb in 1945.

Less than 5% of American farmers interviewed recently were aware that margarine was made from soybean oil. Approximately 75% of these farmers mentioned paint first in thinking of uses for soybean oil. Another common answer was "plastics." Still another response included "parts for Ford automobiles." Only about 18% of the farmers included "food products" in their responses.

The main use for soybean meal is as a feed for poultry; very little is fed to dairy cattle. A photo shows Betzold. Address: General sales and advertising manager, Package Products Div., Durkee Famous Foods [Glidden].

475. *Business Week*. 1946. Soybean whip: Buffalo dairy is meeting housewives' need for whipping cream substitute. New product nationally distributed. Oct. 12. p. 44, 46.

• **Summary:** The story of Rich Products Corp. "Long before

present shortages developed, the Wilber Farms Dairy of Buffalo foresaw an extended scarcity of whipping cream. Wilber's president, Robert E. Rich, then formed the Rich Products Corp. and began experimenting with a substitute made from soybeans. Now the new product is hitting the market under the brand name 'Whip Topping,' with initial distribution in 30 states, Alaska, Hawaii, and Bermuda. Other areas will be added as more product becomes available.

"Frozen package-Whip Topping consists of soy protein, vegetable fat, carbohydrates, salt, flavoring, and coloring. The mixture is sold in a frozen state and is said to fluff up like regular cream."

Note: This is the earliest major article seen on Rich Products Corp. It is not clear exactly what is meant by the term "soy protein."

476. *Detroit News*. 1946. Ford sells plant. Oct. 24. p. 53, col. 5.

• **Summary:** "The Ford Motor Co. has sold its soybean processing plant at Saline, Michigan, to Soybrands, Inc. The sale is in line with the company's recently announced policy of eliminating operations unrelated to the production and sale of automobiles and trucks."

Note: This is the earliest document seen that mentions "Soybrands" (one of two documents).

477. Soybrands, Inc. 1946. Soybrands, Inc. (Ad). *Observer (Saline, Michigan)*. Oct. 24.

• **Summary:** "Announce the reopening of the Soy Bean Processing Plant at Saline, formerly operated by the Ford Motor Co. and are prepared to offer a continuance of the courteous service and on the same trade basis as heretofore. Dan Levleit, Gen. Mgr." [General Manager]. Ad is 4 inches on a side.

Note: A letterhead [undated] from this same period is titled "Soybrands Division, Valley Chemical Co." At the bottom is written "Forty-Four Per Cent Protein Soybean Oil Meal." A business card for Bruce L. Parsons is also on file.

Note: This is the earliest document seen that mentions "Soybrands" (one of two documents). Address: Saline, Michigan. Phone: 15.

478. *Soybean Digest*. 1946. Grits and flakes... from the world of soy: Ford Motor Co. has formulated an enamel expected to outlast the steel car body. Oct. p. 22.

• **Summary:** "It is made of a soybean oil modification of glyceryl phthalate type resins."

479. Soybrands, Inc. 1946. We want your soy beans in carlots or truck loads (Ad). *Observer (Saline, Michigan)*. Nov. 14.

• **Summary:** "Farmers can bring direct to the Mill. 44% Soy Bean Oil Meal available at all times in any quantity. Soybrands, Inc. Successors to Ford Motor Co." Ad is 4 inches on a side. Address: Saline, Michigan. Phone: 15X.

480. McMillen, Wheeler. 1946. *New riches from the soil: The progress of chemurgy*. New York, NY: D. Van Nostrand Company, Inc. xii + 397 p. Nov. See p. 90-110. Index. 22 cm.
 • **Summary:** McMillen, an outstanding popular writer with a solid knowledge of the history of the chemurgic movement, gives here the single best account ever written. Contains extensive information on the role of soybeans in the chemurgic movement.

“Chemurgy may be accurately defined as a concept devoted to advancing, through applied science, the development of new industrial uses for farm-grown crops, and the establishment of new farm crops. Chemurgy is exclusively concerned with the vegetable kingdom (which reproduces itself), and not with the mineral world (which does not). Chemurgy is not much concerned with food; the human stomach is inelastic. It has to do almost solely with non-food utilization of farm-grown materials. Three primary activities come under the heading of chemurgy: 1. Development of new, non-food uses for established farm crops. 2. Establishment of new crops for new or old uses. 3. Discovery of profitable uses for agriculture wastes and residues. Three new tools have give birth to this new field: The sciences of organic chemistry and plant genetics, and the art of the agricultural engineer, developing farm machinery, etc.

Chapter VII, titled “Soybeans: A new crop that has arrived” (p. 90-110) gives an excellent overview, discussing: soybean foam that extinguished fires on ships during World War II; Mr. Russell G. East of the Pennsylvania Railroad; I.F. Laucks who developed soybean glue for the young plywood industry in the Pacific Northwest; Robert Boyer, Henry Ford, The Drackett Co. and soybean fiber; and soybean plastics. “While their individual stories are infinitely more fascinating, the non-food uses of soybean meal so far have probably not exceeded five percent of the total production.”

Concerning Russell G. East (p. 91): “It was Mr. East who, as general agricultural agent of the Pennsylvania Railroad, conceived and executed in the late thirties an educational dramatization of soybean progress. He persuaded the railroad to build and exhibit over its lines a soybean exhibit car. The car ran on wheels which were cast with the aid of soy protein and oil used in the foundry cores. Inside and out, ‘from rails to roofs,’ it was adorned with paint and varnish made from soybean oil. The interior finish was plywood put together with soybean glue. The car was filled with material manufactured from the soybean. Exhibits included foods, paints, wallpaper, soap, flyspray, automobile parts, linoleum, explosives and livestock feeds, among other soybean products. The car paid off, incidentally, by stimulating farmers’ desire to produce the crop. In subsequent years the railroad hauled more soybeans as freight and took more goods back to the farm towns to be sold for soybean money. Other railroads borrowed the car for display later on their own lines. During 17,643 miles of travel through eighteen

states 198,286 people inspected the exhibits.”

A book review by Abel Banov from the *Philadelphia Enquirer* is reprinted in *Chemurgic Digest*. 1947. Aug. 30. p. 242. Address: President, National Farm Chemurgic Council. Editor of the Farm Journal, Philadelphia.

481. *Soybean Digest*. 1946. Soybean base for Ford Co. enamels. Nov. p. 17.

• **Summary:** “Ford Motor Co. automobile enamels made from a soybean oil base have reached the point in durability where it can be said they will outwear the steel bodies on which they are applied.”

482. *Soybean Digest*. 1946. Ford Motor Co. drops soybean operations. Dec. p. 21.

• **Summary:** “The Ford Motor Co. has announced sale of its soybean processing plant at Saline, Michigan, to Soybrands, Inc.

“The sale is in line with the firm’s recently announced policy of eliminating many operations unrelated to actual production and sale of automobiles and trucks.

“The Ford firm, one of the early pioneers in industrial uses of soybeans, is now entirely out of the soybean business. The firm’s processing plant at Rouge was dismantled 6 months ago. The Saline plant was built in 1936.”

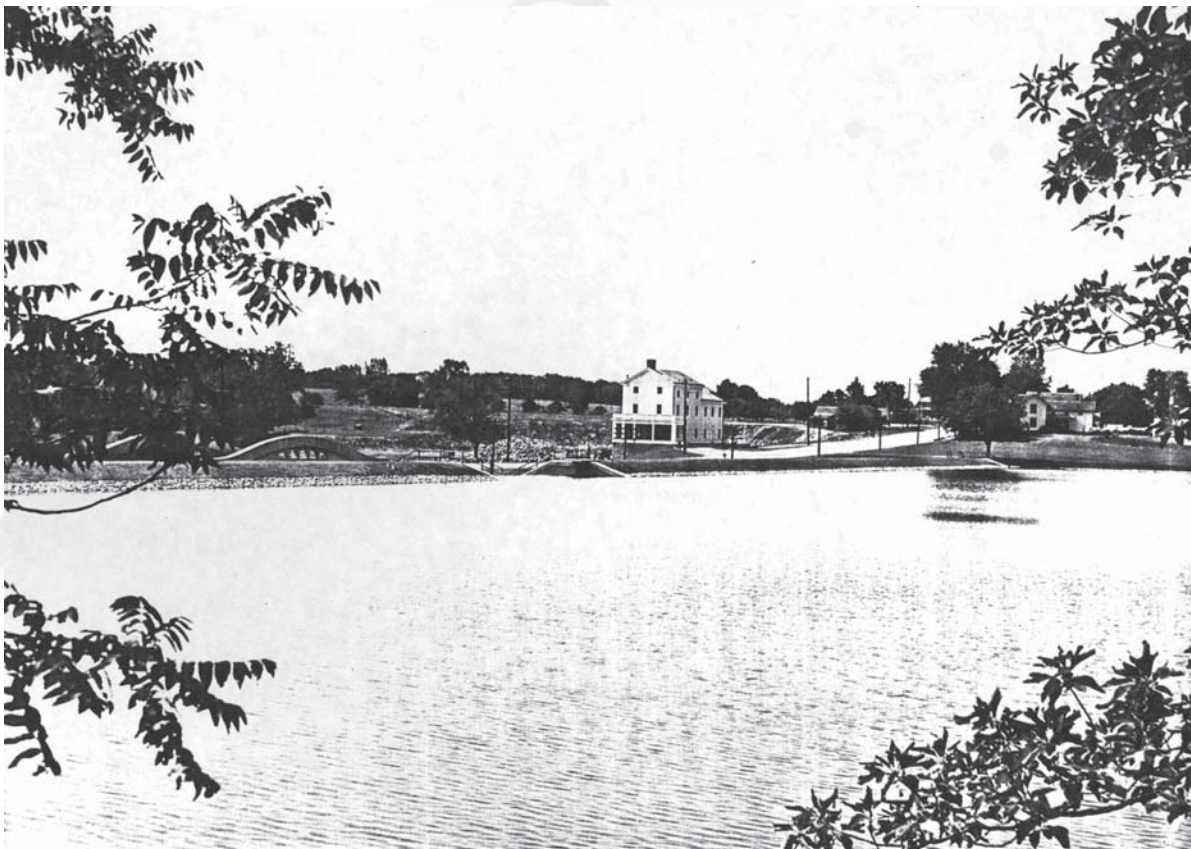
483. Photos of Schuyler Mills and its millpond (Saline, Michigan), taken in 1927 and 1946. 1946.

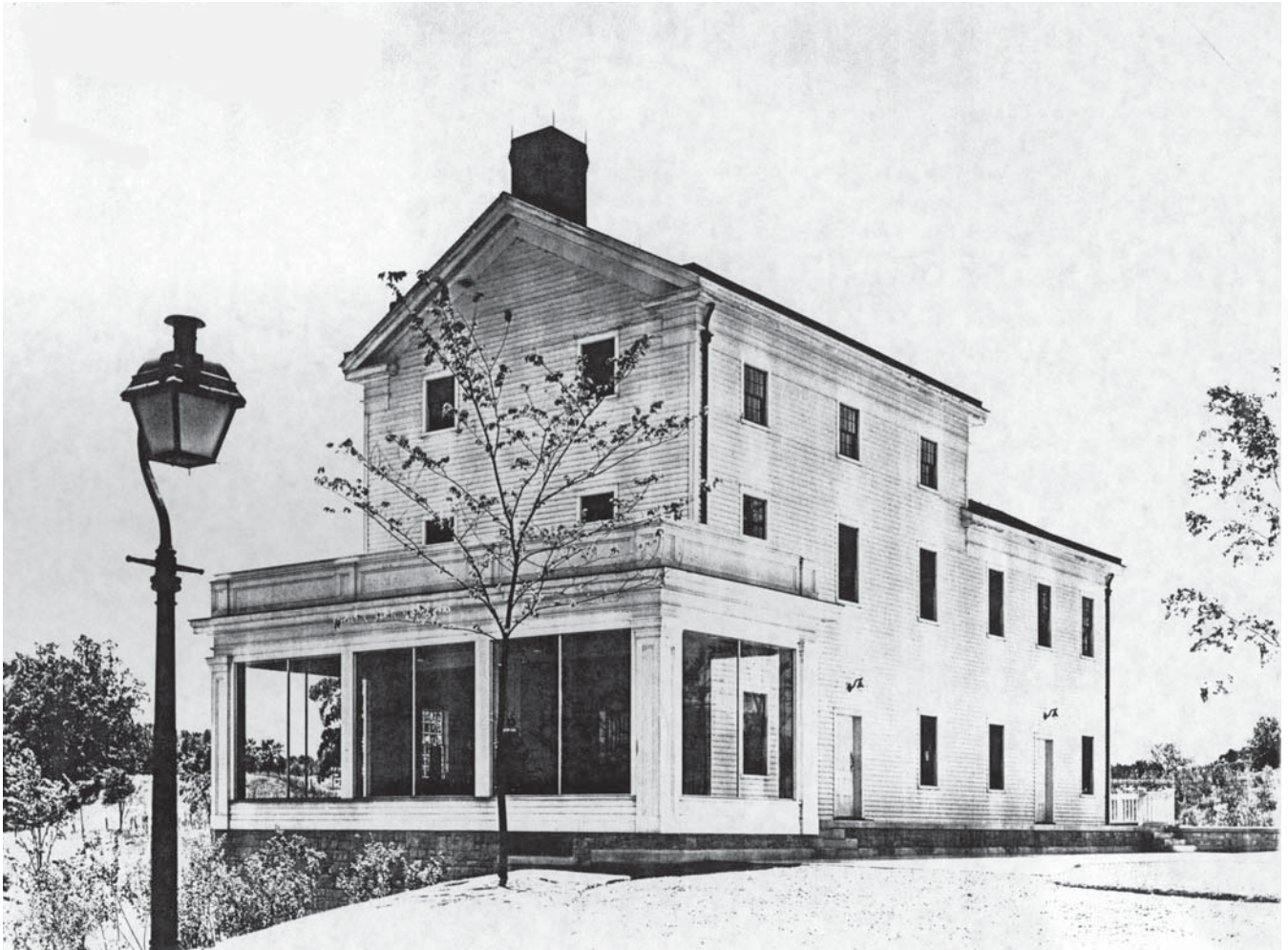
• **Summary:** These photographs were sent to Soyfoods Center in 2001 by Bruce Parsons and are reproduced here with his permission. (1) The old mill in about 1927. (2) The mill at the far end of the pond, with its restored dam, in about 1946. (3) The restored mill in about 1946. (4) The overflow. “They almost lost it, road and dam,” a year or so before 1940.” (5) An aerial view, 1946.

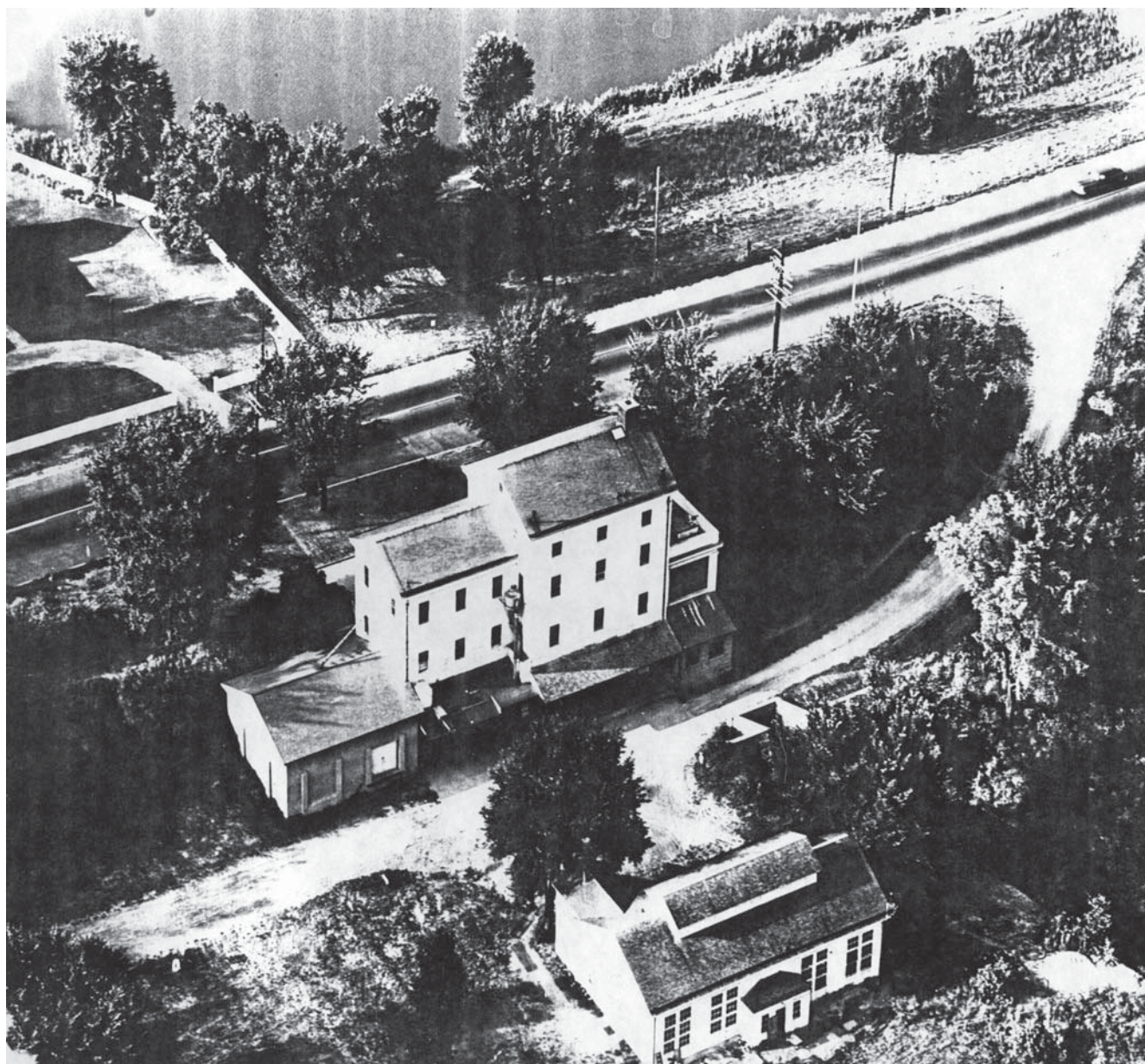
484. Sherman, Joseph V.; Sherman, Signe Lidfeldt. 1946. *The new fibers*. New York, NY: D. Van Nostrand Co. lx + 538 p. Illust. Index. 23 cm. [17 ref]

• **Summary:** The idea of man-made fibers is not new. As early as 1664 Robert Hooke was suggesting that fibers might be spun by man using methods similar to those of silkworms and spiders. It may not be remembered today that the first rayon was made before 1889. But true synthetic fibers were not manufactured until about 10 years ago, when nylon and vinyon emerged. Soybean—or azlon—is among the protein-base fibers discussed.

Chapter X (p. 183-88), titled “Soybean protein fiber,” notes that Soybean fiber is the first protein fiber made directly from a plant rather than from an animal product. The Drackett Co., manufacturer of the soybean fiber, expects soon to maintain a limited scale of commercial production. “Soybean fiber was first developed by the Ford Motor Company about 1939. Pilot plant production started in early







1941, and by the end of 1942 output was reported to have reached a level of 1,000 lbs. a day. In December 1943, H.R. Drackett, president of The Drackett Company, announced that his company had acquired from the Ford Motor Company their soybean process and pilot plant equipment. Robert Boyer, who was chief research chemist of the Ford Motor Company, joined The Drackett Company as its research director. The Drackett Company had pioneered in soybean development work and originally supplied the Ford Motor Company with the soybean protein 'alysol.'

Discusses the manufacture, properties (incl. microscopic characteristics, tensile strength, moisture regain, heat resistance, chemical properties, and carbonizing and dyeing), applications, economic aspects, and status of development of soybean protein fiber in 1945. The product is still in the development stage. A large photo shows H.R. Drackett inspecting a batch of soybean fiber as it emerges from spinnerets. Address: 1. Associate, Herbert R. Simonds, Consulting Engineer. Formerly Vice President, Economic Analysis, Inc., New York; 2. Fellow of The American Inst. of Chemists, Inc. Formerly Research Chemist, Eastman Kodak Co., Rochester, New York.

485. *Observer (Saline, Michigan)*. 1947. 600 Ford acres sold. Jan. 30.

• **Summary:** "Six hundred of the 9,600 acres of farm land the Ford Motor Co. owned in the Macon area have been sold in a dispersal of the holdings that started last month according to R.H. Powell, director of real estate for the company."

486. Jones, Paul H. 1947. Re: Clearing out the Chemical Plant in Greenfield Village. Letter to Mr. B.J. Craig, Secretary and Treasurer, Ford Foundation, 2612 Buhl Building, Detroit 26, Michigan, May 7. 1 p. Typed. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** Note: This letter was written exactly one month after Henry Ford died. "Mr. Smith [who was in charge of the museum; Not Bob Smith] has been given the assurance that his department will assume responsibility for removing the furniture, plumbing, and electrical equipment from the Chemical Plant in the Village. It is Mr. Smith's belief that what remains in the Chemical Plant rightfully is the property of the Ford Motor Company, and it should be their responsibility to clear out this building. This belief was confirmed by Mr. James Sellars, former secretary to Mr. Boyer..."

Talk with Ford Bryan. 1992. Nov. 17. Mr. Bryan is working to try to have the Chemical Plant restored and interpreted due to its historical importance related to soybeans. Address: Mr. Jones: Administrative and Educational Consultant to the Edison Inst. [Dearborn, Michigan].

487. Brillmayer, Franz A. 1947. *Die Kultur der Soja in*

Oesterreich [The cultivation of soybeans in Austria]. Vienna, Austria: Scholle-Verlag. 97 p. Scholle-Buecherei, Bd. 80. With 33 illust. and 16 tables. 22 cm. [Ger]

• **Summary:** Contents: Foreword (written in May 1947 at Braunsdorf-Wien). 1. The origin of the soybean and how it spread throughout the world. 2. The history of its introduction into Europe: Into Austria, into Germany, into France, into Poland, Hungary, and the Balkans. 3. Botanical information about the soybean: Its morphology, physiology, Austrian varieties, European varieties, diseases and pests, nodule bacteria and hormones. 4. Breeding, the goals of breeding, and conduct of investigations (*Versuchswesen*). 5. Climate and suitable varieties. 6. Culture: Soil, preceding and subsequent crops in rotations, preparation of the soil, fertilizing the soil, time of seeding, inoculation, seeds, scarification (*Beizung*) of the seeds [to "wound" or scratch the seed coat so that the seeds imbibe water and thus germinate better], plant spacing and density of planting, amount of seeds and depth of planting, damage done by wild animals (game), care of the crop, harvest, threshing, storage.

Note: Throughout this book, the author uses the word "Soja" to refer to the soybean. Occasionally he also uses the German words *Sojafrucht* (for the bean / seed).

During the summer months, the days grow longer the further north you go and the closer you get to the summer solstice (p. 33-34).

Soybean varieties in Austria (p. 41-43): Soybean breeding in Austria began with the small-seeded black Platter SS 14; the weight of 1,000 seeds was 65 gm. But from it large-seeded varieties were developed with a 1,000 seed weight of 160 gm. The yield of SS 14 was low. In the 1929 seed catalog from Platt the following new soybean varieties appeared for the first time: *Platter gelbe Riesen* (Platt Yellow Giant). *Platter gelbe* (Platt Yellow). And on the price list the following varieties appeared: *Frühe Braune* (Early Brown). *Braungelbe I und II* (Brownish Yellow I and II). *Fruhwirth's Black Eyebrow*. *Schwarze von Rastatt* (Black from Rastatt [in Baden-Württemberg]).

In 1927 twenty varieties were received from the USA; they names and days to maturity are given.

In 1937 in Austria the Soya Ring (*Sojaring*) was founded. Growing contracts were signed with industry and prices agreed upon. The processing industry was built mainly on processing imported soybeans, but it was soon agreed that with the import license a part of the duty could be used to buy a certain amount of domestic soybeans and process them.

European varieties (p. 45-47): A List of 10 German varieties, two Polish varieties, eight Austrian varieties, one Hungarian variety, and 20 French varieties is given. In 1947 most of the French varieties were developed by Rouest. A report by H. Gay in Tunisia reports on various U.S. soybeans grown there. When Henry Ford went to Europe, he first tried growing soybeans he brought from Michigan. But when

they didn't ripen, he began to work with Mr. J.L. North. Two Yugoslavian and two Romanian varieties are mentioned.

The Romans understood that growing legumes improves the soil for later crops. The Chinese probably understood that too. But Hellriegel was the first to clearly understand the nature and function of root bacteria. (p. 50-51).

Soybean breeding in central Europe started in about 1927 (p. 54). The soybean is a plant that prefers warmth (p. 65).

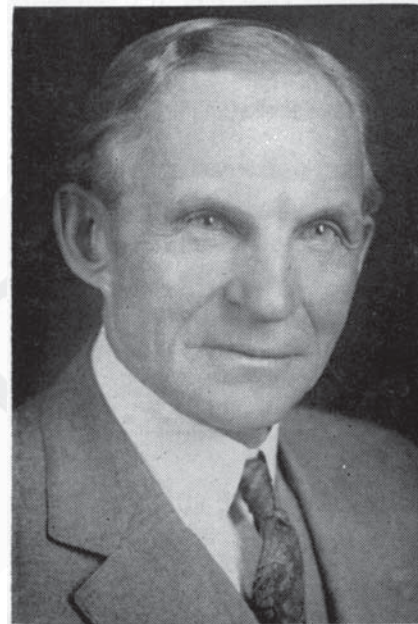
Illustrations show: (1) Exports of soybeans from Asia to Europe, 1908-1933 (p. 7). (2) Soybean growing areas in Asia, Africa, and Europe (p. 8). (3) Soybean growing areas in the USA (p. 9). (4) The four stages of a soybean seed as it sprouts in the soil (p. 26). (5) A young soybean plant. (6) The main axis of a soybean plant (p. 27). (7) Three soybean plant growth types (p. 28). (8) Growth of the plant's root systems (p. 28). (9) The shape of two different sets of leaves. (10) Pods filled with seeds on a stem (p. 30). (11) Empty pods on a stem. (12) Vegetative and reproductive of the soybean plant (p. 31). (13) Development of the underground portions of the plant with time. (14) Graph of day length in Vienna. Maximum length on June 20 (p. 34). (15) Graph of day length in Vienna and Lamagistere (shorter days than Vienna). (16) Relationship between planting date and yield of seeds and straw (p. 41). (17) Damage by rabbits to young soybean plants (p. 49). (18) Development of the vegetative phases of the soybean plant with time (p. 55). (19) Vegetative development of a late variety. (20) Vegetative development of a very late variety. (21) Vegetative development of an ideal variety (p. 56). (22) Shortening of the vegetative period. (23) Map of Europe showing where large-scale cultivation of soybeans is possible (p. 63). (24) Map of Austria showing three zones where large-scale cultivation of soybeans is possible; most are in eastern Austria (p. 64). (25) The soybean root system needs deep penetration of the soil (p. 67). (26) A crust on the soil surface reduces water loss from sun and wind (p. 68). (27) One ha of soybeans takes from the soil: 80 kg water, 130 kg nitrogen, 120 kg lime / calcium, 80 kg silicon, 56 kg potassium, 40 kg phosphorus, 40 kg magnesium. (28) Record the dates of soybean planting and harvest (p. 70). (29) How to store soybeans: right way and wrong way. (30) Different distances between seeds in a row: 5, 7½, 10 and 15 cm. (31) Widths between rows. (32) Planting rows for mechanical harvest. (33) Square, rectangular and triangular planting patterns (p. 76).

The 33 interesting photos at the back of the book include: 3. The first soya field in 1924 growing the variety Platter SS 14. 5 and 6. A breeding plot in southern France (Lamagistere). In April 1937 the best Austrian soybean varieties were planted at St. Sylvain d'Anjou. 7. Threshing of Platter gelbe Riesen varieties harvested in Casablanca, Morocco. 8. A field of Austrian soybean varieties in Marrakech (Marakesh), French Morocco. 10. Marcel Blanchard with a breeding nursery of Austrian soybeans at Agen (Garonne), France. 11. Soybean nodules inoculated

with Radicin. 11-12. The Radicin factory. 26. The soybean breeding plots at Platt.

A ¼-page ad on page 79 states: Seed breeding enterprise. F.A. Brillmayer. Braunsdorf, Post Roseldorf, Nieder Oesterreich [Lower Austria]. High quality varieties of the following: Soybeans, bush beans, red beetroots, sunflowers, polebeans, carrots, flat millet, Kolben millet. Address: Braunsdorf, Post Roseldorf, Niederoesterreich (Lower Austria), Austria.

488. *Soybean Digest*. 1947. Henry Ford was a soybean pioneer. May. p. 37.



• **Summary:** "Henry Ford, who died at his home in Dearborn, Michigan, April 7, left a name that will be closely associated with the soybean for years to come.

"The Ford Motor Co. had discontinued all its soybean operations at the time of the great industrialist's death. But Ford did some of the pioneering work in developing new uses for the crop; and gave soybeans publicity that vastly increased the interest of the public in them...

"Ford's policy was to produce raw materials as close to the point of processing as possible. With this in mind, he gave a great deal of effort to increasing soybean acreage near the Ford plants in southern Michigan. Then in 1937-39 the Ford Motor Co. built three solvent extraction plants at Saline, Milan and at the Rouge plant in Dearborn.

"Before the war Ford was using soybean products in many ways in the manufacture of automobiles. For a number of years the car body enamel contained 35% soybean oil. In 1937, 300,000 gallons of soybean oil was used for this purpose. The firm used thousands of gallons for shock absorber fluid. The foundry used both soybean oil and meal, the latter as core binder.

"But by far the most spectacular in the public mind was Ford's work with plastics. The actual usage was small compared with the tremendous publicity resulting. But some auto parts were made for several years from soybean molding compound. These included coil cases, accelerated pedals, horn buttons and distributor heads.

"Work on soy fibers was done at the Ford plant. This was under Robert Boyer, who has continued the project with The Drackett Co. Ford also experimented with soy food products, manufacturing soy milk and canning edible soybeans.

"It was the efforts of the Ford publicity machine, probably more than anything else, that caused the soybean to become associated chiefly with paint and plastics in the public mind, although other uses have always been far more important.

"Most soybean usage was discontinued by the Ford firm during the war and all its soybean processing plants have been sold.

"Ford offered considerable inspiration to the farm chemurgic movement. He was one of the founders of the National Farm Chemurgic Council." A small portrait photo shows Henry Ford at about age 60.

489. Boyer, Robert A. 1947. A modern shirt from ancient soybean. *Soybean Digest*. June. p. 12-13.

• **Summary:** The author, who is director of scientific research at The Drackett Co. in Cincinnati, Ohio, notes that "This fiber has been produced for several years on a pilot plant basis. Today a new plant, the first of its kind in this country, is under construction which will produce this soybean fiber in large volume... It has been found that fabrics made from a blend of soybean fiber and rayon or cotton have a 'hand' that is unique; a 'hand' in fact that cannot be obtained with any other fiber—even wool. Although the fiber in its present state cannot be considered a true wool substitute, it does have, for instance, the warmth which is characteristic of animal protein fibers and also an ability to improve the draping properties of fabrics in much the same manner as wool.

"A great deal of work remains to be done, but already enough is known about soybean fiber to be able to predict for it a bright future. The Federal Trade Commission, recognizing the potential and increasing importance of man-made protein fibers, last year adopted for them the generic name 'Azlon,' following the same pattern of using the word 'Rayon' for all man-made cellulose fibers. And so, as time goes on, it will become more and more a common occurrence, when purchasing one of the popular new sport shirts that has the *warmth* and *appearance* of wool but the *softness* of cotton flannel, to see on the label '50 percent Rayon, 50 percent Soybean Azlon.'"

A photo (identical to that in the Jan. 1944 issue of this magazine, p. 8) shows Boyer and H.R. Drackett, president, inspecting a batch of liquefied soy protein that can be spun to make Soybean Azlon fibers. Address: Soybean Research Council.

490. Soybrands Inc. 1947. Soy beans for seed: Lincolns-Mandarins (Ad). *Observer (Saline, Michigan)*. Aug. 7.

• **Summary:** Note: Formerly the company only crushed soybeans. Now they are apparently also selling soybeans seeds to farmers. Address: Saline, Michigan. Phone: 15.

491. Diamond, Holton W.; Hamel, John J., Jr. 1947. Agreement. Detroit, Michigan. 5 p. Aug. 26.

• **Summary:** This is a contract between Rex Diamond and Vegetable Products Corporation (VPC). "Diamond has knowledge of processes by means of which it is possible to manufacture a whipped topping and certain other food products, chiefly from materials of vegetable origin." He has applied for at least one patent. He "agrees to grant to the corporation the sole and exclusive right and license to make, have made, and sell products made under each and every one of Diamond's inventions..."

Hamel signs this agreement as President of VPC, and Diamond as its treasurer.

Talk with Florence Diamond. 1993. Jan. 27. Rex had plenty of good ideas but no money. He found investors and set up this corporation to raise money in order to get his non-dairy whipped topping on the market. Florence recalls that there were about 5 investors, who probably contributed equal amounts of capital, totaling about \$10,000 to \$20,000—a relatively small amount. The investors were John J. Hamel Jr., A. Roy Barbier (Florence's father), Robert Walker, Elmer Hitt, and probably one other man. Rex did not invest any capital. The corporation was headquartered in Birmingham, Michigan, which was where John Hamel, the president, had his office and lived. However Hamel didn't participate much in VPC. It was about 2 months after this agreement was signed that VPC began to manufacture Wonder Whip at Bodker's Dairy in Detroit. Address: 1. Chemist, 1648 May St., Dearborn, Michigan; 2. John J. Hamel, President, Vegetable Products Corp., 1161 South Adams St., Birmingham, Michigan.

492. **Product Name:** Wonder Whip (Soy-Based Non-Dairy Whipped Topping).

Manufacturer's Name: Vegetable Products Corporation.

Manufacturer's Address: Saline, Michigan.

Date of Introduction: 1947. September.

Ingredients: 28% vegetable [soy] proteins, water, salt, vitamins A, D, thiamine, B-1, riboflavin B-2, niacin, hydrogenated vegetable oil, calcium, sodium, phosphorus and chlorine, also rich in dextrose, artificial flavor and color added.

Wt/Vol., Packaging, Price: ½ pint wax paper carton in the shape of a truncated cone.

How Stored: Refrigerated.

New Product—Documentation: R.S. Burnett of Chicago, Illinois, cites the following private communication in 1951.

Soybean Protein Food Products. In: K.S. Markley, ed. "Soybean and Soybean Products." p. 986. It is a letter dated 12 Dec. 1947 to Burnett from H. [Holton] W. Diamond of Vegetable Products Corp., Saline, Michigan, concerning the use of soybean protein in toppings: "A topping which has whipping properties similar to whipped cream can be prepared with the type of soybean protein just described [neutral spray-dried soybean protein isolate]. About 30-40 parts fat having a suitable melting point, such as a margarine or butter fat, and containing a monoglyceride emulsifier are homogenized at 105°F with 60-70 parts of a 3% solution of the neutral soybean protein. According to Diamond the composition of the resulting emulsion is approximately equivalent to 'heavy cream' but somewhat lower in fat and protein. The soybean protein is used in proportions of about 1-2% by weight of the total ingredients."

Talk with David and Harvey Whitehouse, formerly of Delsoy Products. 1992. Feb. 4. Originally Rex Diamond worked for Henry Ford (with Bob Smith) at Carter Laboratories. There he learned about use of soybeans in foods. Rex Diamond was never employed full time for Delsoy Products. In the early days he worked at the company for a day or two now and then in the plant doing soybean extraction—not as a consultant, but as a friend of Bob Smith's. Then Rex pulled a fast one. He left, set up his own company named Vegetable Products Corp. in Saline, Michigan (located inside Henry Fords' old soybean extraction plant there), and began to make a soy-based whipped topping named Wonder Whip (non-pressurized in a cone-shaped container), which was designed to be whipped with an egg beater. But he did not know how to run a food plant. One day Bob Smith was visiting one of his chain store accounts when the buyer told Bob that Rex Diamond was telling all the distributors that Delsoy Products had quit making their topping—so that Rex could take over the accounts. Diamond had so many problems with the quality of his product that his company never got off the ground, and in less than a year went out of business. He tried to sell his used equipment to Delsoy.

Business card, letterhead, and label from 1947, plus ads from 1948, sent with note, by Florence Diamond, Rex Diamond's widow. 1992. Dec. 17. The business card (blue and black on white) reads: "Wonder Whip. Vegetable Products Corporation, 25440 Five Mile Road, Detroit, 23 Michigan. H.W. Diamond. Phone: RE 7755." This was the location of Chris Bodkin's Dairy, out of which the company operated for several months (but made no products) probably in early 1947. The letterhead (blue on white) reads: "Vegetable Products Corporation, Saline, Michigan. Wonder Whip."

The Label (blue on white), when folded, becomes a truncated cone, and contained ½ pint of Wonder Whip. Note that the ingredients (shown above) are apparently not in descending order of predominance. "Not so fattening. Hospitals use it. Delicious on jello, cakes, pies, puddings. Keep cool. Easy to use. Nothing to add. Shake contents well

and whip." On the 1.75-inch diameter top is written "The Tops in Topping. Sales Office—L.C. Tabor."

Ad #1. Wonder Whip recipes. 1947-49. 2.25 by 3 inches, 4 panels. Describes the product (It contains "easily digested hydrogenated vegetable oil, energy-producing dextrose from corn and nutritious soya protein") and gives recipes for Frozen Pudding and Sherry Cream. Ad #2, 1948. "The tops in topping. Wonder Whip." Tops on strawberries, cakes, pies, or gelatins. Tops with all the family. Ad #3, 6-14 Nov. 1948. "Wonderful desserts made from sensational, new Wonder Whip. \$0.25 per half pint." Demonstrations Nov. 5 and 6 at 8 packers outlets. Ad #4, 1948. "55,000 customers asked where to buy Wonder Whip." They asked this after tasting the product in the Wonder Whip booth (a photo of which is shown) at the Michigan State Fair. The ad gives the names and addresses of 95 grocery stores in Detroit that sell Wonder Whip for \$0.25 per half pint. Mass demonstrations of Wonder Whip will be conducted in 20 of Candler's Quality dairy Shops.

493. Soybrands Div. 1947. Producers of 44% Toasted Soy Bean Oil Meal, Alkali Refined Soy Bean Oil (Ad). *Observer (Saline, Michigan)*. Oct. 2.

• **Summary:** "Plant in operation Oct. 20th. Bruce L. Parsons. Elmer F. Hamel." Note: The soybean plant in Saline, once owned by Henry Ford, has changed hands again. Soybrands, Inc. has sold it to the Valley Chemical Company, a rendering firm based in Mount Pleasant, Michigan (about 125 miles drive to the north). It is now the Soybrands Division of Valley Chemical Co. Address: Saline, Michigan.

494. **Product Name:** Delsoy Super Whip: Instant Dessert Topping (All-Vegetable Soymilk-Based Non-Dairy Whip Topping Sold in a Pressurized Can).

Manufacturer's Name: Delsoy Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1947.

Ingredients: Incl. soymilk, vegetable oil, sugar.

Wt/Vol., Packaging, Price: Pressurized metal can.

New Product—Documentation: Detroit News. 1945. April 16. "Who's who and why." [About Herbert Marshall Taylor and Delsoy]. A photo shows Taylor. An ad (below this article in Rex Diamond's binder; original source and date unknown) is titled "What is Delsoy? It's the dessert topping that's winning the enthusiastic approval of housewives by the hundreds of thousands. Delsoy is the original topping made of natural vegetable products." The ad shows illustrations of two non-dairy whip toppings: (1) In the foreground, "Delsoy Super Whip: Instant Dessert Topping" which is sold in a pressurized can. The ad states: "Introduced in August 1944, the first product of its kind, Delsoy dessert topping has gained tremendous popularity. Continuing to grow by leaps and bounds..."

Interview with Robert A. Smith by Donald V. Baut. 1979. June 21. "Delsoy Products." p. 44-72. This is the single best source seen on the origin and history of this product. However Bob Smith calls the product Presto Whip (which is also sold in a pressurized can) and gives the date of introduction as 1946 or 1947, which is 2-3 years after Delsoy Super Whip was introduced.

Talk with Robert Rich, Sr., founder and chairman of the board of Rich Products Corp. 1993. July 13. He strongly disagrees with Bob Smith's statement that Delsoy was the first non-dairy whip topping to be sold in a pressurized can. Mr. Rich believes that Rich Products' non-dairy Whip Topping was the first such product to be sold commercially in a pressurized can. It was on the market in Oct. 1948. Bob never heard of Delsoy Super Whip; he thinks Delsoy's product in a pressurized can was named Presto Whip.

495. Drackett Company (The). 1947. Annual report. Cincinnati, Ohio. 28 p. 28 cm. For the fiscal year ended Sept. 30, 1947.

• **Summary:** Sales rose 40% over the previous year to \$22,681,897. Net earnings (profits) rose 58% to \$975,131. "The reported increase of 58% in profits of the last year over the preceding year has been due largely to very favorable market conditions in the purchase of soybeans, and in the sale of soybean oil and soybean oil meal."

"Proteins: During the past year our laboratories and plant made quality improvements in our isolated industrial proteins far beyond our expectations. Our present product is so superior to that of a year ago, that we have been able to enter large and important fields that heretofore were closed to us. In one industry we are now supplying about 10% of the total tonnage of such products used by that industry... Plans are under way for the expansion of our production facilities.

Plastics: The company's "new plant went into production about mid-year and is now turning out high strength molding compounds in considerable volume... The method which we developed for making this material into preforms of a size and shape to fit the molders particular job has gained us a marketing advantage."

"Azlon: A market change occurred in 1947 in the textile industry that has postponed the date when Azlon can be expected to contribute importantly to our profit. We realized from the time that we began to sell [note the word "sell"] Azlon in the war period that the shortage of textile fibers was to some degree responsible for its acceptance. We realized that our product must be constantly improved if it were to be continuously successful under normal peacetime conditions.

"During the early months of 1947, the sellers' market in textiles, that had obtained during the war period, changed rather suddenly to a buyers' market. Competition again became keen [especially from Dupont's nylon, which had been used by the military during World War II] and quality was again an important consideration. While we had made

considerable improvement in our product, it did not meet the higher quality standards in the textile industry. It became apparent that to attempt the marketing of our product under these changed conditions, even though quality was improved over that considered satisfactory a year before, might inflict permanent injury on our product's potential. We, therefore, reduced our production to an experimental level. Orders were placed for new equipment and work was started on the redesigning and rebuilding of some equipment already in the plant.

"But we know that there is a most attractive potential market for Azlon when perfected. We continue to carry on an aggressive program of research and plant development and that program is obtaining important results. It is our judgment that we should not aggressively market a product that is merely salable, but rather proceed slowly with that phase of the program until research has established a quality and dependability that will make this Azlon product as highly appreciated in the textile industry as other Drackett products are elsewhere."

Large sepia photos (p. 2-3) show Drackett soybean oil in railroad tank cars, Drackett 44% protein soybean oil meal in 100 lb gunny sacks, Ortho Protein in 100 lb multiwall paper sacks, and a skein of unpackaged "Azlon Fiber." Another photo (p. 19) shows a woman "testing fiber in the Azlon laboratory." Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.

496. **Product Name:** Presto Whip (All-Vegetable Soymilk-Based Non-Dairy Whip Topping in a Pressurized Can with Valve-Refrigerated).

Manufacturer's Name: Delsoy Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1947?

Ingredients: Incl. soymilk, vegetable oil, sugar.

Wt/Vol., Packaging, Price: 10 oz pressurized can with valve.

How Stored: Refrigerated.

New Product-Documentation: Interview with Robert A. Smith by Donald V. Baut. 1979. June 21. "Delsoy Products." p. 44-72. This is the single best source seen on the origin and history of this product. Originally Delsoy Topping was sold in paper containers purchased from the Sutherland Paper Co. in Kalamazoo, Michigan. Delsoy bought the containers by the carload, 300,000 at a time. When Sutherland went out of business, Delsoy switched to buying containers from the Crown Cork and Seal Co. in Philadelphia. During World War II Crown Cork and Seal had developed a pressurized can to use for insecticide sprays by the military. Delsoy was the first to realize that the can's unique valve (produced by the Super Whip Co. in Chicago and used with nitrous oxide gas) made it suitable for whipping cream. So the company modified its formula for Delsoy Topping, put it in this pressurized can, and in 1946 or 1947 named it Presto Whip. Delsoy Products

was the first company to ever put a topping in a pressure can and sell it. It immediately became a huge success, was widely advertised, and was soon sold by every chain store in the area. Soon Delsoy Products was working 3 shifts, making 25,000 cans a day—sold mostly in the Detroit area. Soon they were selling the products over a range of 350 miles in lower Michigan, Ohio, and parts of Indiana, Pennsylvania, and New York. By 1963 they had 23 distributors.

Letter from Robert A. Smith (of Delsoy Distributors, 1847 South Telegraph Rd., Dearborn 8, Michigan) to Mr. Holton W. Diamond (in Whiting, Indiana). Smith expresses interest in obtaining Rex Diamond's services and patents. Printed in the lower left corner of the letter is a picture of a pressurized can of Delsoy Presto Whip. In the lower right corner is a picture of a container of Delsoy Topping in the shape of a truncated cone.

Talk with Robert Rich, Sr., founder and chairman of the board of Rich Products Corp. 1993. July 13. He strongly disagrees with Bob Smith's statement that Delsoy was the first non-dairy whip topping to be sold in a pressurized can. Mr. Rich believes that Rich Products' non-dairy Whip Topping was the first such product to be sold commercially in a pressurized can. It was on the market in Oct. 1948. Delsoy Products had problems with the name of its product "Presto Whip." Delsoy Products and the Presto Whip Co. in California both had a lawsuit against each other since they were both using the same name. The California company probably won, since they used the name for many years afterwards.

Note 1. The relationship between this product and Delsoy Super Whip, both soy-based whip toppings sold in a pressurized can and made by Delsoy Products, is not clear. Note 2. This early non-dairy whipped topping was NOT made with enzyme-modified soy protein.

497. Savage, Kay. 1948. Sub found for whipped toppings. *Detroit Free Press*. Aug. 24. p. 9.

• **Summary:** "Pennies are pocketed when favorite desserts go to the table topped with the newest alternate for whipped cream. Developed from a formula by Rex Diamond, a young chemist, following research work in the George Washington Carver Laboratory, the new whip is composed of vegetable oils.

"Attractively priced at 25 cents for a half-pint, the vegetable whip is sweetened and flavored with vanilla. It may be used as a topping or filling. It may also be combined with other ingredients in practically all recipes calling for whipping cream.

"When using it in such combinations, it should be remembered the whip is already sweetened and sugar must be decreased. The sugar in these recipes has been adjusted."

Recipes are given for cherry banana mold, sherry cream, and banana whip. Address: Free Press Food Writer, Michigan.

498. USDA Northern Regional Research Laboratory. 1948. Soybean processing mills in the United States. *USDA Bureau of Agricultural and Industrial Chemistry*. CA-5. 14 p. Sept.

• **Summary:** Footnote: "This is a revision of AIC-26 [Nov. 1943]—Revised June 1946 under the same title."

"The following list of soybean processing mills is divided into three parts: (1) Mills specializing in soybeans. (2) Mills processing soybeans on part-time basis. (3) Distribution of soybeans processed by solvent extraction, screw press, and hydraulic press methods (Estimates based on data compiled by Bureau of the Census in cooperation with the Northern Regional Research Laboratory). A year by year table from crop year 1936-37 to 1946-47 (Oct. to Oct.) shows the number of tons processed and the percentage of the total processed by each of the three processes. The percentage processed by solvent extraction doubled from 13.2% to 26.6% while the percentage processed by hydraulic press dropped by half from 18.4% to 9.5%. The total tons of soybeans processed rose 8.2 fold from 619 to 5,107 during the 11 year period.

Processors are listed by state (alphabetically), and within each state alphabetically by city. Three symbols are used (in parentheses) to express each plant's processing capacity in tons of soybeans per day: S = Small—less than 50. M = Medium—50 to 200. L = Large—more than 200. Three other symbols are used to express the type of soybean processing equipment used: X = Extraction (solvent). P = Screw press [or expeller]. H = Hydraulic press.

"1. Mills specializing in soybeans. Arkansas—West Memphis: Arkansas Mills, Inc. (MX). Wilson: Wilson Soya Corporation (MXP). Delaware—Laurel: Laurel Processing Co. (SX).

"Illinois—Alhambra: Alhambra Grain and Feed Co. (SP). Bartonville: Allied Mills, Inc. (LP). Bloomington: Funk Brothers Seed Co. (MP). Ralston Purina Co. (LX). Champaign: Swift and Co. (LXP). Chicago: Archer-Daniels-Midland Co. (MX). The Glidden Co. (LXP). Spencer Kellogg and Sons, Inc. (LP). Colchester: Colchester Processing Co. (SP). Decatur: Archer-Daniels-Midland Co. (LXP). Decatur Soy Products Co. (MP). Spencer Kellogg and Sons, Inc. (LXP). A.E. Staley Manufacturing Co. (LXP). Galesburg: Galesburg Soy Products Co. (MP). Gibson City: Central Soya Co., Inc. (LXP). Kankakee: Borden's Soy Processing Co. (MX). Mascoutah: Phillip H. Postel Milling Co. (SP). Monmouth: Ralph Wells and Co. (SP). Nashville: Huegly Elevator Co. (SP). Norris City: Norris City Milling Co. (SP). Pana: Shellabarger Soybean Mills (MP). Poplar Grove: Northern Illinois Processing Corporation (SP). Quincy: Quincy Soybean Products Co. (MP). Roanoke: Eureka Milling Co. (SP). Rock Falls: Sterling Soybean Co. (SP). Springfield: Cargill, Inc (MP). Taylorville: Allied Mills, Inc. (MX). Virden: Hulcher Soy Products Co. (SP).

"Indiana—Bunker Hill: Ladd Soya, Inc. (MP). Danville: Hendricks County Farm Bureau Cooperative Association (SX). Decatur: Central Soya Co., Inc. (LXP). Frankfort: Swift

and Co. (MX). Indianapolis: The Glidden Co. (LX). Lafayette: Ralston Purina Co. (MP). Marion: Hoosier Soybean Mills (MP). Oaktown: Knox County Farm Bureau Cooperative Association (SP). Portland: Haynes Soy Products, Inc. (MP). Rockport: Martin Serrin Co., Inc. (SP). Rushville: Rush County Farm Bureau Cooperative Association (SP). Wabash: Wabash County Farm Bureau Cooperative Association (SP).

“Iowa–Belmond: General Mills, Inc. (LX). Cedar Rapids: Cargill, Inc. (MX). Iowa Milling Co. (MP). Centerville: Pillsbury Mills, Inc. (MP). Clinton: Pillsbury Mills, Inc. (MX). Des Moines: Spencer Kellogg and Sons, Inc. (LX). Swift and Co. (MP). Dike: Farmers Cooperative Association (SP). Dubuque: E.E. Frith Co. (SP). Eagle Grove: Boone Valley Cooperative Processing Association (SP). Fairfield: Doughboy Industries, Inc. (MP). Fayette: Fayette Soybean Mill (SP). Fort Dodge: Cargill, Inc. (LXP). Gladbrook: Central Iowa Soybean Mill (MP). Hubbard: Boone Valley [Cooperative] Processing Association (SP). Iowa Falls: Ralston Purina Co. (LXP). Manly: North Iowa Cooperative Processing Association (SP). Marshalltown: Marshall Mills, Inc. (SP). Martelle: Farmers Cooperative Elevator (SP). Muscatine: Hawkeye Soy Products Co. (SP). Muscatine Processing Corporation (MX). New Hampton: Eastern Iowa Milling Co. (SP). Plainfield: Roach Mills (SX). Quimby: Simonsen Mill Rendering Plant (MP). Ralston: Farmers Cooperative Association (SP). Redfield: Iowa Soya Co. (MX). Sac City: Williams Milling Co. (MP). Sheldon: Big Four Cooperative Processing Association (MP). Sioux City: Sioux Soya Co. (MP). Spencer: Cargill, Inc. (SX). Washington: Cargill, Inc. (MX). Waterloo: Borden’s Soy Processing Co. (LXP). West Bend: West Bend Elevator Co. (SP).

“Kansas–Coffeyville: Consumers Cooperative Association Soybean Mill (MP). Emporia: Kansas Soya Products Co., Inc. (MXP). Girard: Farmers Union Jobbers Association (SP). Hiawatha: Thomson Soy Mill (SX). Kansas City: Kansas Soya Products Co., Inc. (MP). Wichita: Soy-Rich Products, Inc. (MXP). Kentucky–Henderson: Ohio Valley Soybean Cooperative (MXP). Louisville: Buckeye Cotton Oil Co. (LXP). Louisville Soy Products Corporation (MX). Owensboro: Owensboro Grain Co. (MXP).

“Maryland–Baltimore: Soya Corporation of America (MP). Michigan–Concord: Concord Soya Corporation (SP). Saline: Soybrands, Inc. (SX). Minnesota: Lakeville: Consumers Soybean Mills, Inc. (MP). Mankato: Honeyamead Mankato, Inc. (LXP). Minneapolis: Crown Iron Works Co. (SX). Preston: Hubbard Milling Co. (SP).

“Missouri–Kansas City: Ralston Purina Co. (MP). Kennett: Hemphill Soy Products Co. (MP). Mexico: MFA Cooperative Grain and Feed Co. (MP). New Madrid: Buckeye Cotton Oil Co. (MX). St. Joseph: Dannen Mills, Inc. (MXP). St. Louis: Blanton Mill, Inc. (MP). Ralston Purina Co. (MP). Pennsylvania–Jersey Shore: Pennsylvania Soybean Cooperative Association (SP). Rossmoyne Processing Co. (?). Paoli: The Great Valley Mills (?). South Dakota–Sioux Falls:

Western Soybean Mills (MP).

“Tennessee–Tiptonville: West Tennessee Soya Mill, Inc. (LXP). Virginia–Harrisonburg: Central Chemical Corporation of Virginia (SP). Norfolk: Davis Milling Co. (SP). Portsmouth: Allied Mills, Inc. (MP). Wisconsin–Janesville: Janesville Mills, Inc. (SP). Menomonie: Northwest Cooperative Mills (SP).

“Mills processing soybeans on part-time basis.” Alabama (6 mills), Arkansas (13), California (7), Florida (1), Georgia (7), Illinois (2), Iowa (2), Kansas (1), Louisiana (9), Minnesota (2), Mississippi (13), Missouri (1), New York (2), North Carolina (14), North Dakota (1), Ohio (2), Oklahoma (13), Pennsylvania (2), South Carolina (4), Tennessee (4), Texas (27), Wisconsin (1).

499. Vegetable Products Corporation. 1948. Wonder Whip: 55,000 customers asked where to buy Wonder Whip, You, Mr. grocer, can provide the answer... profitably (Leaflet). Saline, Michigan.

• **Summary:** The customers asked this after tasting the product in the Wonder Whip booth at the Michigan State Fair. A photo shows the booth and people lining up to sample the product. It costs \$0.25 per half pint. “Ideal all vegetable substitute for whipping cream.”

“Wonder Whip is a sensational new vegetable food for use as topping and in making delicate new desserts. It is packaged attractively in half pints, already sweetened and flavored, ready to whip and serve. It costs only a quarter. Wonder Whip is backed by consumer advertising and store demonstrations that show results. You can order Wonder Whip for your store today. Call WO. 1-1468–Ask for Tabor.”

The ad gives the names and addresses of 95 grocery stores in Detroit that sell Wonder Whip for \$0.25 per half pint. Mass demonstrations of Wonder Whip will be conducted in 20 of Candler’s Quality Dairy Shops.

Talk with Florence Diamond. 1993. Jan. 27. This leaflet, which may have also been run as an ad, was probably developed and paid for by Mr. Tabor (nick-named Tabe), a friend of Florence’s father who owned a meat distributing company in Detroit that also distributed Wonder Whip. Address: Saline, Michigan.

500. *Madison Health Messenger (Madison, Tennessee)*. 1948. Soybeans–A wonder food: Madison College works with the soybean. Fall. p. 1, 3-4.

• **Summary:** The soybean originated in China. However this “food of the ancients now seems destined to turn its antiquity into one of the most valuable foods in the modern world.

“The first actual mention in the literature of this wonder bean is recorded in Emperor Chen Nung’s *Materia Medica*, written under date 3838 B.C. In the Legendary period of China the story of bandits attacking a merchant caravan has been handed down through generations in which it is said that the miracle wonder food, soybeans, were the lifesavers

of some merchants, who, being surrounded and besieged by bandits until their own provisions were exhausted, noticed a vinelike plant bearing a legume which they had never seen before from which they made flour and baked cakes. Energized therewith, they fought off the enemy until help came. So the legend goes, soybeans became the staff-of-life in the great nation of China which still ranks first in population in all the world."

Soybean "oil is used extensively in Margarine in which it is used up to 80% in certain brands (Sure Good, sold by A. & P., and Nu-Maid, sold by Kroger)." Many brands of margarine contain 20-80% soybean oil.

Discusses the work of Henry Ford with soybeans and soyfoods. "His research staff made soybean milk and cheese, soybean-nuts, canned green soybeans, soybean sprouts, and a hundred other things."

"With the knowledge of widespread disease in the animals used for food by man, the founders of Madison College adopted a vegetarian diet supplemented with dairy products and eggs. For over 44 years this has been strictly adhered to in the food preparation for the students, faculty, workers, and patients at its 165 bed sanitarium and hospital... For over 30 years [since 1918 or before] Madison has been growing soybeans. They have occupied a place of prominence in its menus for many years." Then Madison began to manufacture soybean food for the public. More and large equipment was added. "In 1941 a new plant was started and today Madison Foods are produced in a fine daylight plant of modern design and construction..."

A list of Madison's foods is given, together with the weight of the can or bag in which each is sold: Kreme O'Soy, Zoy-Koff, Stake-Lets, Yum, Zoyburger, Vigorost, Not-Meat, Soy Cheese [Tofu].

501. Diamond, Holton W. 1949. Re: Payment of back taxes related to Vegetable Products Corporation. Letter to Collector of Internal Revenue, Detroit, Michigan, March 15. 1 p. Typed, without signature (carbon copy).

• **Summary:** "Vegetable Products Corporation was organized a year and a half ago to exploit some chemical processes I had developed. Since we have been in operation, we have operated consistently at a loss.

"I am a chemist, the only full-time employee of the company, and the other stockholders agreed originally on a 'subsistence' salary for me of \$250 per month until such time as the company operations showed a profit. However, because there usually has not been enough money in the corporation treasury to pay me even a week's salary at a time, I have taken ten to twenty dollars at a time for living expenses, and a total of \$2,783.86 in this way in the past year.

"There have been so many problems incident to running a tricky chemical process with used equipment, and trying to conduct a business with too little capital, I have neglected to do a thorough job of bookkeeping, a kind of work which is

unfamiliar to me. In this way I have neglected to 'withhold' my income tax, and am not now able to pay it at once.

"I am enclosing \$117.00. It appears likely that Vegetable Products Corporation will be forced to suspend operations this week or next for lack of funds. I have already applied for a job with a large company in Ann Arbor, and expect to have it or another source of steady income soon. Thereafter, I expect to be able to pay the remaining \$100 of 1948 tax within the following three months.

"I understand that there is a penalty, in the nature of interest, for delinquency, and I trust that this plan will be satisfactory to you." Address: [208 South Ann Arbor St., Saline, Michigan].

502. Diamond, Holton W. 1949. Re: Offer to grant a license to American Maize Products Co. to manufacture soy products. Letter to Mr. Theodore Sanders, Jr., American Maize Products Co., 100 East 42nd St., New York 17, N.Y., March 18. 2 p. Typed, without signature (carbon copy).

• **Summary:** Mr. Diamond gives a brief history of his work "while employed as chief chemist at the George Washington Carver Laboratory of the Ford Motor Co. There he developed a popular vegetable "cream cheese," a vegetable "ice cream" and related products.

"I licensed a newly-formed small Michigan company, Vegetable Products Corporation, to manufacture and distribute these items. This company started on the proverbial shoestring, and after a year and a half of business, manufacturing only the vegetable whipping cream, in refrigerated, liquid form, this company, through a local distributor, is now servicing seven hundred groceries in the Detroit area, and a few larger accounts, such as the University Hospital in Ann Arbor, and several large bakeries who use the product for filling puffs and eclairs and the like, and as a low cost extender for natural cream. The acceptability of this product is attested by the four thousand housewives who buy it each week, and by the fact that bakeries and institutions have found it more dependable in whipping performance than natural cream. Both the whip end the vegetable ice cream mix are of appropriate solids content for reduction to a dry powdered form by spray-drying. However, this company at present is not able to carry the development and merchandising of these products further for lack of sufficient funds, and I am considering withdrawing from the venture."

He offers to bring samples to show the company (if the company will defray his expenses for so doing), and to grant a license to American Maize Products Co. if they wish to manufacture these products.

Note: A similar letter was sent to Mr. Austin S. Ingleheart of General Foods Corp. (250 Park Ave., New York 17, New York). Both letters were "ghost written" for Diamond by Judge Arthur M. Smith. The American Maize response by Mr. B.R. Taylor, who was then manager of Planning and Development, and later Vice President in Charge of Research

and Finance of the company, led to Diamond's subsequent years of association with American Maize Co. Address: 208 South Ann Arbor St., Saline, Michigan.

503. *Soybean Digest*. 1949. Conducts soybean trials in Britain. March. p. 34. [3 ref]

• **Summary:** J.C. Ferree, director of Soya Foods, Ltd., London, believes that the question of growing soybeans in the British Isles should be considered. He has been growing a number of varieties experimentally; they come from Yugoslavia, Manchuria, Canada, the USA, etc.

Henry Ford's Fordson Estates grew soybeans in Essex, England, in the early 1930s on a significant scale. "The crop was successful agriculturally but not economically."

Photos show: (1) A Yugoslavian variety that matured and produced small yellow seeds in 1948; it was suggested for forage and silage. (2) Canadian Mandarins, which also matured in 1948; a 100-day variety in Canada, they took 160 days to mature in England.

504. Diamond, Holton W. "Rex." 1949. Re: Newly developed soy ice cream, financial condition of Vegetable Products Corporation, and Delsoy. Letter to Mr. John J. Hamel, Jr., 200 Cedar Point Dr., Sarasota, Florida, April 6. 2 p. Typed, with signature (carbon copy).

• **Summary:** John Hamel is an investor in Vegetable Products Corp. (VPC) and a part owner of the building in which the VPC plant is located. Diamond is sending Hamel by air express, frozen, several samples of a newly developed ice cream, which contains the same ingredients as Wonder Whip, a soy-based whip topping. Diamond has talked with a man who sells 10,000 gallons/week of custard mix during the summer, and who believes he could sell as much of this ice cream mix in liquid form. It might also be able to be spray dried and sold in powdered form.

"I have not sold Tabe [Tabor meat distributing company in Detroit, the main distributor of Wonder Whip] any topping during the past week. Tabe has notified the trade that, 'Due to a serious breakdown at the plant, Vegetable Products Corporation has advised us that Wonder Whip will not be available for two weeks or more. We will notify you immediately upon advice from Vegetable Products Corporation that Wonder Whip is again available.'

"Bob Smith of Delsoy called me a few evenings ago and asked me to drop in for a visit, which I did yesterday. He has some interest in my pending patent applications and the name of our company which he thinks is a better name than his own 'Delsoy Products Incorporated', however he made no definite offer to me other than to suggest that I could have a job with them any time I wanted it. I believe that they have been making expenses and a little more for some time, but with a little outside financial aid, they have recently been doing very well. Bob told me that last week they sold 42,000 units, which compares with our 4000 to 4500.

"The financial condition of Vegetable Products Corporation is such that when Tabe and the University of Michigan pay what they owe us, and we pay our bills, we will be about three to four hundred dollars behind."

Talk with Florence Diamond. 1993. Jan. 27. By the time Rex wrote this letter, Bob Rich's frozen soy-based whipped topping [which he began freezing in late 1945] was being widely distributed. That severely hurt Vegetable Products Corp. Rex tried to expand into new products but VPC didn't have the funds to develop and launch a new product such as a soy ice cream, so the latter was never sold commercially. The University of Michigan may have been buying Wonder Whip (even though whipping cream had been back on the market since late 1947) to serve in their cafeterias and/or university hospital, both because of its lower cost and/or superior properties. Address: 208 South Ann Arbor St., Saline, Michigan.

505. Diamond, Holton W. 1949. Re: Decision by Diamond to terminate agreement of 26 Aug. 1947 with Vegetable Products Corporation. Letter to Vegetable Products Corporation, 519 W. Maple, Birmingham, Michigan, June 28. 1 p. Typed, without signature (carbon copy).

• **Summary:** Diamond has decided to terminate his agreement with Vegetable Products Corporation because the corporation has failed, since 26 March 1949, to (1) furnish the capital and manufacturing facilities necessary for the manufacture of Diamond's food products (Wonder Whip), (2) employ Diamond at a salary of \$250 per month, and (3) make any effort toward the commercial exploitation of his inventions. All three of these activities are required by the Agreement of 26 Aug. 1947.

Talk with Florence Diamond. 1993. Jan. 27. This letter was written somewhat as a formality, to get the fact down on paper that Rex was ending his involvement with Vegetable Products Corporation. Address: 208 South Ann Arbor St., Saline, Michigan.

506. Diamond, Holton W.; Smith, Robert A. Assignors to Ford Motor Company (Dearborn, Michigan; a corporation of Delaware). 1949. Soluble compound of chlorophyll and synthesis thereof. *U.S. Patent* 2,476,358. July 19. 3 p. Application filed 9 May 1945. [2 ref]

• **Summary:** This is the first patent that Rex Diamond applied for and was issued while working at the Ford Motor Co. Address: Dearborn, Michigan.

507. National Soybean Processors Association. 1949. Year book, 1949-1950 (Association year). Chicago, Illinois. 73 p.

• **Summary:** On the cover (but not the title page) is written: "Year Book and Trading Rules, 1949-1950." Contents: Constitution and by-laws (incl. committees, code of ethics). Officers, directors and committees for 1949-50. Membership of the National Soybean Processors Association.

Trading rules governing the purchase and sale of soybean oil meal. Appendix to trading rules on soybean oil meal: Official methods of analysis (moisture, protein, oil, crude fiber—official, sampling of soybean oil meal). Trading rules on soybean oil. Appendix to trading rules on soybean oil: Uniform sales contract, standard specifications for crude soybean oil for technical uses, methods of analysis (A.O.C.S. official methods): Refining loss (expeller and hydraulic soybean oil)—Ca 9a-41, refining loss (extracted soybean oil)—Ca 9b-46, refining loss (degummed hydraulic and extracted types soybean oil)—Ca 9c-49, refining loss (degummed expeller type soybean oil)—Ca 9d-49, bleaching test (refined soybean oil)—Cc 8b-49, grading soybean oil for color (N.S.P.A. tentative method), color—Wesson method using Lovibond glasses—Cc 13b-45, sampling—C 1-47, flash point (A.O.C.S. tentative method—Cc 9b-48). Moisture and volatile matter: Vacuum oven method—Ca 2d-25. Break test—Modified Gardner method—Ca 10-40. Iodine value—Wijs method—Cd 1-25. Unsaponifiable matter—Ca 6a-40.

Handwritten: *Soybean Farming* is now available; prices are given for non-members and members, for 100 to 1,000 copies. Assessments: Regular \$.0004 per bushel, 40 cents per 1,000, \$400 per million. Max. \$3,200 per year. Min. \$100 per year. July 6 meeting decreases the regular assessment to \$.0003 per bushel.

The section titled "Officers, directors, and committees" (p. 12-15) states: President: R.G. Houghtlin. V.P., Chairman Executive Committee: G.G. Golseth. Secretary: W.L. Shellabarger. Treasurer: H.E. Carpenter. Executive Committee: R.G. Golseth, Chairman, H.E. Carpenter, E.A. Cayce, Philip S. Duff, W.H. Eastman, Jasper Giovanna, R.G. Houghtlin, W.L. Shellabarger.

Board of Directors (Term expiring Sept. 1950): D.O. Andreas, E.A. Cayce, Jasper Giovanna, R.G. Golseth, H.R. Schultz, H.R. Scroggs. (Term expiring Sept. 1951): Dwight Dannen, Roger Drackett, W.H. Eastman, R.B. Jude, W.H. Knapp, Karl Nolin. (Term expiring Sept. 1952): S.E. Kramer, Philip S. Duff, D.W. McMillen, Jr., Clarence E. Peters, J.J. Quinlan, Ralph Wells.

Standing committees: For each committee, the names of all members (with the chairman designated), with the company and company address of each are given—Traffic and transportation. Technical. Soybean grades and contracts. Oil trading rules. Meal trading rules. Crop improvement. Soybean research council. Uniform rules and standards for soybean oil meal. Safety and insurance. Lecithin. Regional: Ohio, Michigan, and East; Illinois, Indiana, Kentucky, Wisconsin; Iowa, Minnesota, Nebraska, South Dakota; Missouri, Kansas, and Mississippi River Delta Sections. Handwritten on blank facing pages: Nominating committee. Reception committee. Official weights committee. Crop Improvement steering committee. Two new members (people; Francis E. Calvert, The Drackett Co., Oct. 1949).

The following organizations, and individuals are members

of NSPA: Albers Milling Co., Los Angeles, California (W.P. Kyle). Allied Mills, Inc., Board of Trade Bldg., Chicago, Illinois; Peoria, Illinois; Taylorville, Illinois; Omaha, Nebraska; Portsmouth, Virginia. Archer-Daniels-Midland Co., Box 839, Minneapolis 2, Minnesota; Chicago, Illinois; Decatur, Illinois; Fredonia, Kansas. Big 4 Cooperative Processing Assn., Sheldon, Iowa (Chas. W. Hanson). Blanton Mill, Inc., St. Louis, Missouri (Ross A. Woolsey, Jr.). Boone Valley Cooperative Processing Assn. Eagle Grove, Iowa (Edward Olson); Hubbard, Iowa (D.E. Weld). Borden's Soy Processing Co., Chicago 4, Illinois (C.E. Butler -> J.R. Pentis); Kankakee, Illinois; Waterloo, Iowa. Buckeye Cotton Oil Co. (The), Cincinnati, Ohio (W.H. Knapp); Louisville, Kentucky; New Madrid, Missouri; Raleigh, North Carolina; Memphis, Tennessee. Cargill, Inc., Minneapolis, Minnesota (D.O. Andreas); Springfield, Illinois (Eric Nadel); Cedar Rapids, Iowa (C.W. Bohlander); Fort Dodge, Iowa (H.E. Marxhausen -> R.F. Hubbard); Spencer, Iowa (W.J. Wheeler); Washington, Iowa (Hugo Lensch). Central Iowa Bean Mill, Gladbrook, Iowa (Paul H. Klinefelter). Central Soya Co., Inc., Fort Wayne 2, Indiana (E.W. McMillen, Jr.); Gibson City, Illinois (T.H. Allwein); Decatur, Indiana (C.I. Finlayson); Marion, Ohio (R.W. Fay). Clinton Industries, Inc., Clinton, Iowa (E.W. Myers). Colchester Processing Co., E. St. Louis, Illinois (E.L. McKee). Concord Soya Corporation, Concord, Michigan (Harold K. Rapp; crossed out). Consumers Co-op Assn., Kansas City 13, Missouri (F. Dean McCammon). Consumers Soybean Mills, Minneapolis 15, Minnesota (Riley W. Lewis). Dannen Grain & Milling Co., St. Joseph, Missouri (Dwight L. Dannen). Decatur Soy Products Co., Decatur, Illinois (Jasper Giovanna). Delphos Grain and Soya Products Co., Delphos, Ohio (Floyd E. Hiegel). Doughboy Industries, Inc., Fairfield, Iowa. Drackett Co. (The), Cincinnati 32, Ohio (Roger Drackett). Eastern Iowa Milling Co., New Hampton, Iowa (G.A. Ward). Farmers Cooperative Assn., Ralston, Iowa (Karl Nolin). Farmers Cooperative Co., Dike, Iowa (C.M. Gregory). Farmers Cooperative Elevator, Martelle, Iowa (H.B. Lovig). Fayette Soybean Mill, Fayette, Iowa (L.A. Rose). Fremont Cake and Meal Corp., Fremont, Nebraska (Harry E. Wiysel). Frith (E.E.) Company Inc., Dubuque, Iowa (E.M. Weicher). Funk Bros. Seed Co., Bloomington, Illinois (H.A. Abbott). Galesburg Soy Products Co., Galesburg, Illinois (Max Albert). General Mills, Inc., Chem. Div., Minneapolis 1, Minnesota (W.H. Eastman); Belmond, Iowa (E.E. Woolley). Glidden Co. (The), Chicago 39, Illinois (R.G. Golseth). Gooch Milling & Elevator Co., Lincoln 1, Nebraska (M.R. Eighthy). Haynes Soy Products Inc., Portland, Indiana (Clarence E. Peters). Hemphill Soy Products Co., Kennett, Missouri (W.A. Hemphill). Holland Pioneer Mills, Inc., Ohio City, Ohio (G.A. Holland). Honeymead Products Co., Mankato, Minnesota (L.W. Andreas); Hoosier Soybean Mills, Inc., Marion, Indiana (J.H. Caldwell, Jr.). Huegely Elevator Co., Nashville, Illinois (J.W. Huegely). Hulcher Soy Products, Virden, Illinois (Norman E. Hulcher). Iowa

Milling Co., Cedar Rapids, Iowa (Jos. Sinaiko). Iowa Soy Co., Redfield, Iowa (H.R. Straight). Ipava Farmers Processing Co., Ipava, Illinois (F.P. Brown). Janesville Mills, Inc., Janesville, Wisconsin (A. Roger Hook). Kansas Soya Products Co. (The), Emporia, Kansas (Ted W. Lord); Kansas City 3, Kansas (Richard W. Lord). Ladd Soya, Inc., Bunker Hill, Indiana (Wayne Ladd). Lexington Soy Products Co. (The), Lexington, Ohio (H.E. Carpenter). Louisville Soy Products Corp., Louisville, Kentucky (H.A. Miller). Marshall Mills Inc., Marshalltown, Iowa (J.I. Johnson). Muscatine Processing Corp., Muscatine, Iowa (G.A. Kent). North Iowa Cooperative Processing Association, Manly, Iowa (Glenn Pogeler). Northwest Cooperative Mills, St. Paul, Minnesota (Anthony H. Roffers). Ohio Valley Soybean Co-op, Henderson, Kentucky (G.W. Allen). Owensboro Grain Co., Owensboro, Kentucky (William M. O'Bryan). Pacific Vegetable Oil Corp., San Francisco 7, California (B.T. Rocca, Jr.). Pillsbury Soy Mills, Clinton, Iowa (H.R. Schultz); Centerville, Iowa (H.R. Schultz). Postel (Ph. H.) Milling Co., Mascoutah, Illinois (A.S. Lee). Quincy Soybean Products Co., Quincy, Illinois (Irving Rosen). Ralston Purina Co., St. Louis 2, Missouri (D.B. Walker); Kansas City, Missouri (F.G. Franze); Lafayette, Indiana (Ralph Guenther); Iowa Falls, Iowa (H.N. Johnson); Circleville, Ohio (A.V. Couch); Champaign, Illinois -> Bloomington, Illinois (N.B. Morey). Roach Soybean Mills, Plainfield, Ohio (Howard L. Roach). Shellabarger Soybean Mills, Inc., Decatur 30, Illinois (W.L. Shellabarger). Simonsen Mill Rendering Plant, Quimby, Iowa (W.E. Simonsen). Sioux Soya Co., Sioux City 2, Iowa (J.L. Ward). Southern Cotton Oil Co. (The), Goldsboro, North Carolina (W.V. Westmoreland); Tarboro, North Carolina (W.A. Moore). Southland Cotton Oil Co., Paris, Texas (Richard H. Blyth). Soya Processing Co., Wooster, Ohio (H.H. Heeman). Soya Extraction Div., Continental Grain Co., Columbus 9, Ohio (D.H. Wilson—company crossed out). Soy-Rich Products, Inc., Wichita, Kansas (Ralph S. Moore). Spencer Kellogg and Sons, Inc., Buffalo 5, New York (Robert B. Jude); Chicago, Illinois; Decatur, Illinois; Des Moines, Iowa; Bellevue, Ohio (Harry Stokely). Sterling Soybean Co., Inc., Rock Falls, Illinois (Edward J. McGinn). Swift & Co., Union Stock Yards, Chicago 9, Illinois (S.E. Cramer). Thomson Soya Products, Hiawatha, Kansas (A.G. Thomson). Toledo Soybean Products Co., Toledo, Ohio (J.H. Brown). Wells (Ralph) & Co., Monmouth, Illinois (Ralph Wells). West Bend Elevator Co., West Bend, Iowa (R.W. Jurgens). Western Soybean Mills, Sioux Falls, South Dakota (E.A. Woodward). Williams Milling Co., Sac City, Iowa (Leo W. Williams).

Organizations represented on committees: U.S. Regional Soybean Laboratory, Urbana, Illinois (John C. Cowan, R.T. Milner).

Handwritten: New members added since publication of the Trading Rules Book—1949. Falk & Co., Pittsburgh, Pennsylvania (Willard Lighter, Jan. 1950). Minnesota Linseed Oil Co., Minneapolis 21, Minnesota (R.J. Lundquist,

May 1950). Farmers & Merchants Milling Co., Glencoe, Minnesota (L.H. Patten, Mgr., May 1950). Riverside Oil Mill, Marks, Mississippi (William King Self, Aug. 1950). Planters Manufacturing Co., Clarksdale, Mississippi (A.K. Shaefer, Sept. 1950).

Associate Members: Arcady Farms Milling Co., Chicago 6, Illinois. Armour & Co., Chicago 9, Illinois (John H. Noble). Aubrey & Co., Louisville, Kentucky. Best Foods, Inc., New York, NY. Capital City Products Co., Columbus, Ohio. Cooperative Mills Inc., Baltimore 30, Maryland. Cox (Chas. M.) Co., Boston, Massachusetts. Foxbilt Inc., Des Moines, Iowa. Humco Co. (The), Memphis 1, Tennessee. Kraft Foods Co., Chicago, Illinois. Lever Bros Co., Lever House, Cambridge, Massachusetts. Pittsburgh Plate Glass Co., Paint Div., Pittsburgh, PA. Procter & Gamble Co., Cincinnati, Ohio. Spartan Grain & Mill Co., Inc., Spartanburgh, South Carolina. Tuckers (Mrs.) Foods, Inc., Sherman, Texas. Wilson & Co., Chicago, Illinois. Handwritten: New Associate Members: Clark Mills Inc., Minneapolis 15, Minnesota.

Note: This is the earliest document seen (July 2005) concerning Continental Grain Company's work with soybeans. Address: 3818 Board of Trade Building, Chicago 4, Illinois.

508. *Soybean Digest*. 1949. Solvent mill of Soybrands division (Photo caption). Sept. p. 76.

Solvent Mill of Soybrands Division



• **Summary:** This photo (4½ by 3 inches) shows the mill, and millrace partly filled with water. The lower caption reads: "Originally a flour mill restored by Henry Ford in 1934, the solvent extraction plant of Soybrands Division, Saline, Michigan, stands in a picturesque spot on the Chicago-Detroit highway. Newer extraction building in foreground connects with old building by a two-way Redler conveyor. Beans are trucked in from rail siding 1 mile distant. Daily capacity of the mill is 33 tons and storage capacity is 15,000 bushels. Most beans are grown locally. In the foreground winds the mill pond that furnishes power for the operation. Officers of Valley Chemical Company, the parent company, are John J. Hamel, president; E.F. Hamel, treasurer and plant

manager; and J.J. Hamek, Jr., Secretary.”

509. Diamond, Holton W. 1949. Topping for salads, desserts, and similar products. *U.S. Patent* 2,487,698. Nov. 28. 3 p. Application filed 21 Feb. 1946. [6 ref]

• **Summary:** Concerns a vegetable topping of predictable whipping qualities (it will incorporate and hold a predetermined quantity of air) made from 0.8%–1.5% vegetable protein (e.g. soy bean protein), 4–8% vegetable carbohydrate (e.g. dextrose or glucose), 25–35% plain refined vegetable oil (e.g. hydrogenated soybean oil), 0.8%–3.0% monoglyceride prepared from glycerin and an edible fat of vegetable origin (e.g. hydrogenated soy bean oil), 52.5%–69.4% water, etc. Address: Dearborn, Michigan.

510. Johnson, E.F. “Soybean”. 1949. History and accomplishments of the American Soybean Association. *Soybean Digest*. Nov. p. 28, 30–31.

• **Summary:** This article is from a talk before Ohio soybean producers. “The American Soybean Association was organized in the fall of 1920 at a meeting of some 600 soybean enthusiasts at Taylor Fouts Farms at Camden, Indiana. The 1921 meeting was held on Riegel–The Meharry Farms at Tolono, Illinois.

“In this same year a sectional meeting was held in Williams County, Ohio, on my farm. This was the first soybean meeting for demonstration of farm practices for growing soybeans ever held in Ohio. Many of you may recall this meeting. That was back in the days when the Ito San was still a base variety, and Manchu, Black Eyebrow, Medium Green, Peking, Elton and A.K. were major varieties.

“For many years the Association existed mainly through the untiring efforts of W.J. Morse of the USDA.” Now rightfully recognized as the ‘daddy’ of soybean production and promotion in America, he was ably assisted by many other university agronomists. “In this honor roll must appear such names as W.L. Burlison and J.C. Hackleman of Illinois, Keller Beeson of Purdue [Indiana], Hanger and Parks of Ohio State, Hughes and Dyas of Iowa, and Briggs of Wisconsin...

“It is conceded today that the activities of your Association had much to do with the adaptation of the large combine to soybeans. All of us today realize that without the adaptation of the combine, the soybean industry as we know it could not have existed...

“The 1940 annual meeting of the Association held at Dearborn, Michigan, as guests of Henry Ford, was perhaps the most significant of all meetings of the Association to that date. As I read the published report printed after the meeting, I find in rather small print two significant statements. “Two definite suggestions were made to be developed by the board of directors, namely that the Association make plans to employ an executive secretary, and that a soybean periodical be published as an official organ of the Association. That, my friends, marks the official birth of Geo. Strayer, and the

Soybean Digest, as far as the American Soybean Association is concerned.

“The policy of having a university agronomist serve as chief officer of the Association had been abandoned the previous year. Much of the reorganization and solid foundation built was due to the able leadership of Glen McIlroy who served as president for 3 consecutive years during this period.”

A photo shows E.F. Johnson standing in the office of Delphos Grain and Soya Products Co. Address: Delphos Grain and Soya Products Co., Delphos, Ohio.

511. Dies, Edward Jerome. 1949. *Titans of the soil: Great builders of agriculture*. Chapel Hill, North Carolina: University of North Carolina Press. ix + 213 p. Illust. Index. 25 cm. [235 ref]

• **Summary:** This book is about U.S. farmers and agriculturists only. Contents: Food and freedom. George Washington, farmer of Mount Vernon. Thomas Jefferson, farmer of Monticello. Elkanah Watson, father of state fairs. Eli Whitney, immortal mechanical genius. Henry L. Ellsworth, soldier of the land. Edmund Ruffin, father of soil chemistry [1818, 1843–55; contemporary of Justus Liebig of Germany, 1840]. John Deere, he turned the prairies [with his plow]. Cyrus Hall McCormick, man with the reaper. Justin S. Morrill, he ‘lighted candles of wisdom.’ Samuel W. Johnson, genius of the test tube. Wilbur Olin Atwater, master of nutrition. Seaman A. Knapp, schoolmaster of agriculture. Stephen Moulton Babcock, the jolly scientist. Theobald Smith, conquest of Texas fever. Mark A. Carleton, wheat explorer. Harvey W. Wiley, apostle of pure food. George Harrison Shull, creator of hybrid corn. And these, too, served: Abraham Lincoln, Horace Greeley, Luther Burbank, David Fairchild, Liberty Hyde Bailey, Cyril George Hopkins, the Coker family of South Carolina, Henry Ford (incl. William J. Morse and soybeans), George Washington Carver. Prelude to future. References. Each chapter is accompanied by a full-page illustration or photo of the man described, a brief chronology of vital statistics and major accomplishments, and 5–15 key bibliographic references. Address: USA.

512. Lundgren, Harold P. 1949. Synthetic fibers made from proteins. *Advances in Protein Chemistry* 5:305–51. [174* ref]

• **Summary:** Proposes a means of preparing edible structures from protein isolates and protein-rich vegetable meals. Soy is not mentioned, but note that this is a very early paper on edible protein fibers. It was published the same year that Robert Boyer filed his first patent application for edible protein fibers (28 Sept. 1949), and 3 years before Boyer filed the application (May 1952) for the landmark patent that he was finally issued on 29 June 1954.

Contents: Introduction. General considerations of proteins chain behavior. Preparation of fibers from proteins: Outline of methods, chain length and fiber strength,

alkaline agents in protein fiber preparation, factors relating to solubility, denaturation, and unfolding of proteins, application of detergents to protein fiber preparation, complex formation of silk fibroin with cupriethylenediamine, synthetic fibers made from collagen, extrusion of powdered proteins moistened with plasticizing agents, synthetic fibers of proteins mixed with other linear polymers, summary. Molecular basis for mechanical properties of fibers made from proteins: introduction, orientation and mechanical properties, crystallization in fibers, folding and unfolding of chains in fibers, mechanical properties related to chain folding and chain interaction, experimental methods in the study of molecular basis of fiber behavior, theoretical interpretations of stress-strain behavior of fibers, thermoelastic behavior as related to chain interaction, chain interaction in synthetic fibers made from feather keratin. Summary and conclusion. Address: Western Regional Research Lab., USDA, Albany, California.

513. Diamond, Holton W.; American Maize-Products Company. 1950. Agreement. Whiting, Indiana. 8 p. Aug. 23.
• Summary: This is a contract between Rex Diamond and American Maize-Products Co. ("Maize"). Diamond has now been employed by Maize and has executed a standard form of employment contract with Maize. He owns a patent and applications for a patent concerning foods (particularly a dessert mix [soy ice cream] and a whippable topping) in which a principal constituent is vegetable proteins derived from soy beans. Diamond agrees to transfer his rights to his patents and inventions to Maize, and Maize agrees to pay him "an indeterminate sum which shall be equivalent to 5% of the actual sales value... of all products made under the inventions of said Patent Rights and sold by Maize..." but not more than 20% of profits from these products. Address: 1. 1831 Davis, Whiting, Indiana; 2. Whiting, Indiana (a corporation of Maine).

514. Moncrieff, R.W. 1950. Artificial fibres. New York, NY: John Wiley & Sons, Inc. x + 313 p. Illust. Index. 22 cm. [4 soy ref]

• Summary: Part III of this book, titled "Regenerated Protein Fibres," contains 4 chapters (13-16), one each on fibers made from casein (Lanital, Aralac, Fibrolane), peanuts (Ardil), soybeans, and corn protein (zein, Vicara). Chapter 13, titled "Casein Fibres-Lanital, Aralac, Fibrolane" notes that the early attempts to make fibres from casein were unsuccessful, and it was not until 1935 that the problem was really solved. An Italian, by name [Antonio] Ferretti, carried out a series of researches in 1924-1935 and succeeded in making pliable fibres with certain wool-like characteristics. The Italian rayon producers, Snia Viscosa, purchased Ferretti's patents and undertook large-scale production of casein fibre from milk. This fiber they called 'Lanital' (*lana* is Latin for wool), and in 1937 some 1,200 tons of this fiber was made. In the U.S.A.

the Atlantic Research Associates, Inc., carried out research independently, and in 1939 undertook production of a casein fibre, to which they gave the name 'Aralac'. The company which manufactured this material is named Aralac Inc., and in 1943 the production was about 5,000 tons. However, in 1948, Aralac Inc. sold their entire plant and property [in Taftville, Connecticut] to the Virginia-Carolina Chemical Corporation [of Richmond, Virginia], who are using it to make 'Vicara' fibre from corn protein. 'Aralac' is not at present (1949) being manufactured." Fibrolane is the name of a fibre made from casein in the UK by Courtaulds Ltd.

Chapter 14, titled "Ardil," notes that "Ardil" is a vegetable protein fibre made from the proteins in ground-nuts or 'monkey nuts'. It is a product of research carried out by I.C.I. Ltd., and was developed at their Ardeer factory in Scotland, from which its name is derived." Research on the product was begun in 1935 by Professors Astbury and Chibnall, and in 1938 the first filaments were spun at Ardeer. Plans were made to construct a pilot plant, but due to the intervention of World War II, the plant was not established until 1946. Its output in 1948 was half a ton per week. Also discusses the development, chemical structure, manufacture, properties, dyeing, and use of Ardil—with a photo and 3 references.

The contents of chapter 15, titled "Soybean Fibres" is as follows: Introduction. Manufacture. Properties. Dyeing. Uses. The chapter begins: "The Ford Motor Co. carried out research on the separation of proteins from the soy bean and their solution and regeneration as fibres. The fibres, which came into production in 1939, were spun and woven to make upholstery for motor-cars. In 1942 about half a ton a day of fibre was being produced. The process was taken over by the Drackett Products Co. of Cincinnati [Ohio] in 1943. Considerable earlier work had been done in England and Japan, and it is possible that in the latter country production anticipated that of the Ford Motor Co... A new plant for the commercial production of Azlon is now (1949) being built [by Drackett].

Chapter 15, titled "Zein Fibres—'Vicara,'" begins: "The production of a fibre from zein or maizin, the protein of corn, has been developed by the Corn Products Refining Co. of Illinois and by du Pont de Nemours and Co. The former company patented in 1939 a process for the production of zein from corn protein, but afterwards little more was heard of fibre production until 1948. Probably the hiatus was due to the world shortage of corn; but despite the shortage, research was carried on by the Virginia-Carolina Chemical Corporation of Richmond, Virginia, so that production could be started when the supply of corn permitted. In 1948 this organization purchased the fibre plant in Taftville [Connecticut] which had formerly been used [by Aralac Inc. and Atlantic Research Associates] for the production of 'Aralac', the casein fibre. The factory was re-tooled and re-designed, and the production of 'Vicara', which is an attractive fibre, is now a commercial undertaking.

Chapter 8 (p. 86-126), titled "Viscose, is about viscose rayon, a regenerated cellulose. "Development of Viscose: The greatest single factor in the development of the viscose process has undoubtedly been the support given to it by Courtaulds, Ltd., although there have naturally there have naturally appeared other viscose producers. The pioneer work was undoubtedly carried out by Courtaulds, who not only founded and developed an important new industry, but also introduced it to America under the name 'The American Viscose Co.' During the 1939-45 War this American company was sold to American interests in order to provide dollars for Britain... The present happy position of the viscose industry not only in this country [England], but throughout the world is undoubtedly due to the industrial genius of the late Mr. Samuel Courtauld." World production increased from 1,000 tons in 1900 to 8,000 tons in 1910, to 15,000 tons in 1920, to 200,000 tons in 1930, to 1,100,000 tons in 1940.

Note: The book is dedicated "To my father, William Moncrieff (1875-1954), a pioneer in the weaving of artificial fibres." A second edition was published in 1954, and a third edition in 1957.

Note: This is the earliest document seen that refers to "regenerated protein fibers." Address: B.Sc., F.R.I.C., F.T.I.

515. Jewell, Evelyn M. 1950? History of the Soybrands Mill at 555 W. Michigan Ave., Saline, Michigan (Interview). Conducted by Mr. Ceck of the Saline Area Historical Society. 3 p. transcript. Undated.

• **Summary:** "The Soybrands Mill, 555 W. Michigan Ave., now out of business and up for sale, was once the center of business in a very prosperous town named Barnegat." Schuyler Haywood built the mill in 1845. It had 3 stories and a basement, and used a "breast wheel" design, in which water from the millrace approaches the waterwheel at about axle height, then flows down and underneath it, turning it both by impulse and by the weight of the water. (Note: Other waterwheel designs include the overshot or undershot wheel.) Haywood's breast wheel was 16 feet in diameter and 18 feet long, with a shaft that was 3 feet thick.

Only a large hill separated the small village of Saline from the industrious community of Barnegat. "This great hill made it necessary to chain the rear wheels of all vehicles, so as to make a safe descent down into town." In 1937, Henry Ford bought the property from Joseph Schmidt; the mill had been idle since 1927.

"After Henry Ford obtained the mill, he tore down the structure and rebuilt it exactly as it was before. He dammed up the river and made a lake. He opened up the new mill on July 28, 1938." The power was supplied by a hydroelectric plant fed by water brought by a millrace from a dam built across the Saline River. More than 700 farmers grew soybeans from seed furnished by Ford on 22,588 acres. In addition, Henry Ford had 15,624 more acres seeded under contract. The total yield of soy beans for the season was 312,480

bushels, or about 20 bushels per acre. The extraction plant in the rear of the grist mill at Saline has a capacity of 140,000 bushels per year.

In 1946 a corporation with Dan Levleit as president purchased the mill from Ford and changed the name to Soybrands, Incorporated. They kept it for one year, then in 1947 Valley Chemical Co. of Mt. Pleasant, Michigan, purchased it and ran it until the 1950 season. Because of a lack of market for their product, they have shut it down and offered it up for sale. The plant, whose capacity was rated at 33 tons, made soy oil; 90% was used in edible products such as shortening, and 10% in non-food (industrial) products such as plastics, paints, and putty.

Note: This is the earliest interview seen (June 2011) that mentions soy. Address: 301 N. Ann Arbor St., Saline, Michigan.

516. Rich, Robert E. 1951. Rich's testimony. I. Buffalo, New York. 7 p. March. Unpublished manuscript.

• **Summary:** Frank S. Mitchell, a former early key employee of Rich Products Corp., sued Rich Products Corp. and Robert E. Rich. On 7 Feb. 1951 a summons was served on the defendants. This draft was presumably prepared in anticipation of a hearing which was scheduled from 19 March 1951. The testimony contains a detailed early history of Rich Products Corp. and its relationship with Frank Mitchell seen from Robert Rich's point of view.

"When in Detroit, serving as Milk Administrator for the War Food Administration, I became interested in a filled cream called Devonshire Topping. This product had a milk base and any product combining milk and vegetable fat is not allowed to be sold in New York State.

"However, the purchasing agent of the Ford Hospital [in Dearborn, Michigan] came to my office one day on another matter, and during our conversation he told me that the Ford Motor Company was making soybean milk and soybean cream at their laboratory, the George Washington Carver Laboratory, and that this soy milk and cream was being used exclusively in the Ford Hospital. He advised me further that one of the employees at the George Washington Carver Laboratory had been attempting to interest the Devonshire Topping people in placing a whole soy cream on the market instead of the milk base soy cream that they were making at that time. He mentioned that the Ford Company was going to sell the rights to the continuous flow soybean milk extraction to the Devonshire Topping people for \$1.00 a year. He mentioned further, he was sure the Ford Company would make the same offer to any other company deciding to manufacture a soybean milk or cream.

"Several weeks later, Mr. Sam Lustig, Manager of Dealer Dairy Products, Detroit, came to see me and advised me that Devonshire Topping was making plans to put a whole soy cream on the market. He stated, that he had been granted the franchise for this product for New York and Pennsylvania

and wondered if I would be interested in distributing this product in the Buffalo area. I advised him I was interested and we arranged tentatively for the rights to distribute in Syracuse, Rochester, Buffalo and Erie.

"About a week later, Lustig called and advised me that it would not be possible for him to grant us the distribution in the area mentioned, as Mr. Taylor, the head of the company placing Devonshire Topping on the market, did not want to deal with dairies, but rather with jobbers, who were handling noncompetitive products that were held at dairy case temperature.

"Shortly after obtaining this information from Mr. Lustig, I requested our dairy sales manager to go to Toledo and purchase some of the whole soy cream that Devonshire Topping had just placed on the Toledo market. Mr. Hannon purchased eight or ten samples in Toledo and flew them back to Buffalo. I immediately took several of these samples downtown to Dr. Alexander Schwarcman, who is Research Director and Vice President of the Spencer Kellogg Company. I whipped up one of the samples to show Dr. Schwarcman the whipping ability of this product and told him I wished to breakdown the product and manufacture a similar product in Buffalo, in as much as, the Devonshire Topping people did not wish to do business with us. Dr. Schwarcman, after studying the ingredients, advised me that such a product could be placed on the market at a price much lower than dairy cream."

Mr. Chase, in charge of sales of edible fats for the Spencer Kellogg Co. advised Mr. Rich "that there were several chemists working for the Spencer Kellogg Company, who would be interested in earning some extra money working on the breakdown of this product after hours. At that time he mentioned the name of Frank Mitchell, a friend of his." The following Saturday Mitchell expressed interest in doing the work. Mr. Rich "gave him several samples of a new batch of the soy cream which I had purchased in Detroit the previous week, as Devonshire Topping had turned over part of their production to a whole soy cream topping, which they sold in addition to their topping with a milk base." Mitchell worked on developing the product, aided by information from the Buffalo Testing Laboratory. "However, it took slightly longer than we had anticipated and we [Rich Products Corp.] did not put a soy cream on the market until the last day of March [1945] instead of early March as we had hoped.

"During this time I was working with Mr. Howard Fanet, president of the R.G. Wright Company, on picking up used pieces of equipment that could be used in the manufacture of the soy cream itself. This equipment included two Cherry Burrill pasteurizers, a Manton Gaulin homogenizer, a surface cooler, a Cherry Burrill filler and the necessary amount of tin copper piping lines. This was the equipment we needed with the exception of the equipment necessary to make the soy milk which we were going to use as the base and which Mitchell was working on at that time. In the meantime, we

were attempting to obtain the authorization from the Ford Motor Company for the use of their patent, which we had been given to believe would be granted us for \$1.00 per year. We were not successful in our attempt, so I asked Mr. Faust if he would go to Detroit with Mr. Mitchell and look at the equipment being used at the George Washington Carver Laboratory for the manufacture of the soybean milk base. This he did and when he returned he advised me that the same work could be done by a batch system with the addition to our equipment of a 300 gallon extraction tank, two 300 gallon settling tanks and a clarifier. This equipment was purchased and once it was set-up, we obtained a 43% extraction, which was considerably higher than the extraction obtained by the Ford Company on the continuous flow system."

"On February 21, 1949, Mr. Mitchell incorporated as Mitchell Food, Incorporated and began the manufacture of a soybean cream similar to ours. He attempted without much success, to obtain our customers for his product. He was of considerable nuisance but not much competition." Continued. Address: Rich Products Corp., 1145 Niagara St., Buffalo 13, New York. Phone: GARfield 3211.

517. *Soybean Digest*. 1951. Hold first Ontario soybean convention. March. p. 28.

• **Summary:** "The first annual Ontario Soybean Convention held at Chatham, Ontario Feb. 15 and 16, was a big success; as a result its sponsors plan to make it an annual affair.

"About 400 soybean growers, processors and others attended the event. Sponsors were Canadian processors, the Ontario Elevator Association, the Ontario Soybean Marketing Board and the Farm Products Marketing Board of Toronto.

"The Ontario soybean growers, concentrated in Essex and Kent Counties, were told that they should at least double the 3 million crop they grew in 1950, by Harry Pugh, chairman of the Ontario Soybean Marketing Board. He suggested that the growing area could be extended further north and east with earlier maturing varieties."

"The problems of marketing and storage of soybeans were also discussed by Geo. M. Strayer, secretary-treasurer of the American Soybean Association, who was on the program.

"New varieties should be available soon with a higher oil yield, C.E. Jones, field husbandry department, Ontario Agricultural College, told the group. Jones said Mandarins are proving to be the highest yielders of oil." Other promising varieties are Blackhawk, Monroe, and Hawkeye.

"The film, Soybeans, the Feature Story, was shown twice during the meeting."

"Other speakers included: Dr. F. Dimmock, Dominion Department of Agriculture, Ottawa; C.W. Owen, Dominion Experimental Farm, Harrow; Dr. S.J. Slinger, poultry department, Ontario Agricultural College, Guelph; Don McLachlin, Tupperville, Ontario; Gillis De Putter, Appin,

Ontario; and James Ferris, sales manager, Ford of Canada.”

Note: This is the earliest document seen (Feb. 2000) that mentions the “Ontario Soybean Marketing Board.” The name, written exactly like this, is mentioned twice.

518. Smith, Robert A. 1951. Re: Notice of meeting of stockholders of Delsoy Products, Inc. Letter to Mr. Holton W. Diamond, 1831 Davis St., Whiting, Indiana, April 26. 2 p.

• **Summary:** The stockholders meeting will be held at 30 Broad St. in New York City on May 15 to reduce the number of directors of the corporation from 7 to 3, to amend the Certificate of Incorporation and By-Laws, to change the office of the corporation from the City of New York to the city of Buffalo, New York.

“3. To authorize a dissolution of the corporation and a sale of its assets and, after payment of all debts and liabilities, a distribution of the proceeds of the sale to the stockholders, or, in the alternative, to authorize a merger or consolidation of the corporation with a new corporation to be organized under the laws of the State of Michigan to which all of the assets of the corporation shall be transferred in exchange for all of the stock of such Michigan corporation, and to authorize the distribution of such stock of the Michigan corporation to the stockholders of Delsoy Products, Inc., on a share for share basis.” Address: President, Delsoy Products, Inc., 1847 S. Telegraph Rd., Dearborn, Michigan. Phone: L Logan 1-3341.

519. *Observer (Saline, Michigan)*. 1951. Former Ford mill offered to city. July 12.

• **Summary:** “According to a report from Mayor E.D. Wolfin, the City of Saline has been offered the opportunity to purchase the buildings and property of the former Soy Brands plant located at the west limits of the city. The property was offered by Valley Chemical Company which purchased it from the Ford Motor Company a number of years ago.

“An inspection of the plant and other buildings was made last Thursday evening by Mayor Wolfin and other council members, to see if it could be adapted to the needs of Saline as municipal offices and storage barns.”

520. Arthur D. Little, Inc. 1951. Marketing potential for oilseed protein materials in industrial uses. *USDA Technical Bulletin* No. 1043. 120 p. Sept. No index. 28 cm. (A Research and Marketing Act Report). Summarized in *Soybean Digest*, Dec. 1951, p. 26. [30 ref]

• **Summary:** This study was undertaken jointly with Bureau of Agricultural Economics and Bureau of Agricultural and Industrial Chemistry.

Contents: Summary regarding uses in industry. Paper coating increasing in use. Woodworking glues a large market. Other adhesive uses—some markets appear promising. Water paints good potential market for oilseed proteins. Rubber—

latex adhesives. Plastics—limited potential for oilseed proteins. Asphalt products—expansion in use of oilseed proteins not probable. Supplies of oilseed proteins.

The quantity of oilseed protein consumed in industrial uses has been increasing gradually for several years. The decline in industrial use of protein has been attributable chiefly to the use of starches and synthetics in the adhesives fields.

Textiles offer an interesting potential for oilseeds:

Regenerated protein fibers. “Apparently the first large-scale production of protein fibers from casein was initiated in Italy in 1935. These fibers were sold there under the name of Lanital. At the same time they were manufactured and sold in Germany under the name of Tiolan, and in Belgium under the name of Cargau.

“Soy-protein isolate has also been used in the manufacture of fibers. In this country interest in this development was noted, and as early as 1939 textile fibers made from soy protein were exhibited. The soy protein fibers manufactured in this country have been on an experimental basis and have not reached commercial production. The production of textile fibers from soy protein was noted in Germany as early as 1940.”

Most of the fibers of this type show some color; only casein fibers can be made almost white. None of these fibers has yet achieved a dry tensile strength equal to that of wool. Regenerated protein fibers tend to putrefy, because of the action of bacteria and fungi, and tend to be deficient in flexibility. The high cost of protein fibers in comparison with rayon depends partly on the cost of the base raw materials of pure proteins—which was about \$0.20 per pound or more compared with about \$0.07 a pound for dissolving pulp.

521. Ruddiman, Edsel A. 1951. The reminiscences of Dr. Edsel Ruddiman. Dearborn, Michigan: Ford Motor Company Archives, Oral History Section. iv + 9 p. Oct. Unpublished manuscript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan).

• **Summary:** These reminiscences are based on a tape-recorded interview with Dr. Ruddiman conducted by Mr. Owen Bombard in March and April, 1951. A chronology of Dr. Ruddiman states: 1864 Dec. 27—Born in Dearborn, Michigan. 1886—Pharmaceutical Chemist, University of Michigan. 1887—Master, Pharmacy, Univ. of Michigan. 1887-1890—Chemist in charge of manufacturing laboratory, Milburn and Williamson. 1893—M.D., Vanderbilt Univ. 1897-1920—Chemist to Tennessee Board of Pharmacy. 1890-1920—Prof. of Pharmacy and Materia Medica, Vanderbilt Univ. 1919-1920—Dean, School of Pharmacy, Vanderbilt Univ. 1921-1926—Chief Chemist, John T. Milliken & Co. [St. Louis, Missouri]. 1926-1942—Research Chemist, Ford Motor Co. [Dearborn, Michigan].

He was born in what was then known as the Scotch Settlement in Dearborn, about 2 miles from Henry Ford’s

father's farm. He and Henry Ford attended the same primary school and from the first day of school they sat together in the same wooden seat, and often attended the same Episcopal church on Sundays. As a young man, Henry showed his mechanical genius. He often drove his cars himself in early automobile races. In 1926 Dr. Ruddiman accepted an invitation from Henry Ford to work for him. Dr. Ruddiman's laboratory was in what was then called the Engineering Laboratory, in Greenfield Village, not far from Mr. Ford's office. "In my work I followed a more or less independent line of research." "Most of the time I worked for him, it was along the dietary line. When he talked to me about food and diets, it was about making more healthy foods and improving the parts, protein and so on.

"Most of my work was with soybeans. It was just about the time they were beginning to grow them around there, and Mr. Ford wanted to know particularly if they were good as food. I did a lot of chemical analysis on them; separating them, of course, into their parts (protein, carbohydrates, etc.) and then fed those to the rats. I had quite a number of white rats to experiment on. I used them to test the food values.

"I used to enjoy that work; I was interested in it and I wanted to do what he wanted me to do, of course. I followed out his suggestions. He came in frequently and made suggestions, or to see what I was doing, and what the results were.

"I guess I was as responsible as anyone for the making of synthetic milk from soybeans. We just rubbed it up with water and saw that it had properties that made it look like milk, then we tested it to see the amount of protein, sugar, etc. it had in it. We then made up the soybean milk to agree with the ordinary cow's milk in those constituents that were deficient. I was very well satisfied with it. It tested out very well on the rats.

"We talked of putting it on the market commercially but decided not to, though I don't remember any particular reason why we did not.

"We also made up a powder from the beans, like a flour. That was used somewhat in place of wheat flour. Mr. Ford used some of this in his home occasionally, though he didn't make a practice of it. He had a great interest in this line of research.

"I also worked in making plastics from the soybean. We broke the beans into their parts, the proteins largely, and worked this into a stiff mass. We didn't use it much as a powder. I didn't do much in making the plastic for the car, but it was through my work in showing what could be done with the soybean that the car was made." Address: 22179 Long Boulevard, Dearborn, Michigan.

522. *Newsweek*. 1951. Chemurgy: A new and more bountiful era... emerges from our farms and factories. Dec. 3. p. 82-83.

• **Summary:** One of the best summaries seen up to this time on the history of the chemurgic movement in the

USA. Most of the National Farm Chemurgic Council's (NFCC) 5,000 members foresee in chemurgy a way of life "as inevitable as tomorrow's sunrise... Chemurgy started as a peculiarly American movement shortly after the first world war. Its roots were in the organic-chemicals industry... and in the postwar era of food surpluses and farm-mortgage foreclosures, which drove farmers to look desperately for new cash crops.

"The word was coined in 1919 by Dr. William Jay Hale, a Dow Chemical Co. chemist... The first year the NFCC was financed by \$125,000 of the Chemical Foundation's money. But the patents expired, Garvan died in 1937, and the council had to fall back on contributions from individual members and corporations. Today under McMillen, who succeeded Garvan, a \$65,000 budget goes mostly to collect and distribute chemurgic information to members."

Slave-born George Washington Carver of Tuskegee Institute invented 120 chemurgic uses for sweet potatoes, 300 products from the peanut, and more from cotton, soybeans, yucca, poultry feathers, etc. The most prolific living chemist is probably Dr. Percy Lavon Julian, "soya research director of the Glidden Co. From soybeans he has synthesized sex hormones, a pure protein for coating slick paper, a foam for smothering oil and gas fires, lecithin for making chocolate and other foods creamier, and recently the wonder hormone cortisone."

Fibers: Kenaf, which thrives in Florida, may be substituted for jute. Nylon: A large photo shows a nylon bevel gear held in front of a mechanical drawing. Nylon will replace metal in the gear of 1951 Ford speedometers. By 1952 almost 40% of all nylon plastic and fiber will be made from furfural instead of coal-tar benzene. Furfural comes from oat hulls and corn cobs.

The article concludes with some words from Wheeler McMillen of the NFCC: "The chemurgic idea has more applications than we ever dreamed of at first... We have only scratched the surface."

523. Burnett, R.S. 1951. Soybean protein industrial products. In: K.S. Markley, ed. 1951. Soybeans and Soybean Products. Vol. II. New York: Interscience Publishers or John Wiley & Sons. xvi + 1145 p. See p. 1003-54. [139 ref]

• **Summary:** One of the best early summaries of industrial uses of soybeans. Contents: 1. Manufacture of soybean protein: Introduction, nature and evaluation of protein modification, choice of raw materials, industrial isolation and modification processes, improvement of color, plant operation and equipment. 2. Industrial utilization of soybean flour and isolated protein: Introduction, control of bacterial and mold growth, plywood glues, soybean flour paper-coating adhesives, Soybean protein [isolate] paper coating adhesives, paper and textile sizes (paper sizes, textile sizes), water-thinned paints, plastics, textile fibers, fire foam stabilizers, tacky and remoistening adhesives, printing inks,

miscellaneous uses.

"The first large-scale industrial use of soy flour was the development of plywood glue in the Pacific Northwest about 20 years ago by I.F. Laucks and Glenn Davidson, who imported specially prepared hydraulic pressed soybean meal from Manchuria. The Douglas fir plywood industry needed a cheap, water-resistant adhesive. While casein was suitable for the purpose, it was more costly and subject to wide fluctuations in price and availability. Soybean flour adhesives produced a strong bond which, although not waterproof, is highly water resistant. Because the adhesive mixtures are not tacky, the glued veneer is easy to handle, and therefore the manufacturing process can be speeded up considerably... In 1942, 60 million pounds of soybean glue (dry basis) were used for gluing plywood. This amount, together with a small amount of casein glue, represented 85% of the total plywood glue production. By 1945, the amount had fallen to 70%. In 1947, consumption of soybean glue was 25 million lb. Dike (pers. comm. 1947) estimates that two-thirds of the 1947 production of Douglas fir plywood was glued with soybean adhesive and hence intended for interior use, while one-third (wet basis) was glued with phenolics and intended for exterior use. In the plywood industry as a whole, soybean glues represent, on a dry basis, by far the largest tonnage of any type of adhesive."

"It is noteworthy that the single largest use of casein and [isolated] soybean protein is in paper coatings. The average 1940-46 consumption of casein in the U.S. was about 65 million lb and of soybean protein about 15 million lb, approximately one half of each amount being consumed in paper coatings.

"Production of soybean fiber had reached 900,000-1,200,000 pounds by 1939 in Japan. No production of soybean fiber in Japan during and after the war has been reported. Pilot plant production of soybean fiber by the Ford Motor Company reached 5,000 pounds per day in 1940, but production was subsequently discontinued and the plant and equipment disposed of to The Drackett Company.

"The Federal Trade Commission, recognizing the potential and increasing importance of man-made protein fibers, has adopted for them the general name 'Azlon,' following the same pattern of using 'Rayon' for synthetic cellulose fibers... All protein fibers made on a commercial or pilot plant scale possess low dry and especially low wet strength."

Synthetic protein fibers can be classified and discussed in terms of the "wool model" or the "silk model." The mechanical properties of each of these two fibers is related to its structure. Wool has long-range elasticity but moderately low strength, whereas silk has much greater strength, but a significantly lower range of elasticity. The "full realization of the fact that textile fibers are, for the most part, made of fibrous molecules has undoubtedly been one of the major factors contributing to the present activity in the field of

synthetic fibers."

"During World War II, the greater part of the isolated soybean protein produced was hydrolyzed and used by the U.S. Navy to prepare a foam for fighting oil and gasoline fires on war ships. A soybean protein solution was fed into a water stream and the mixture converted into a foam by means of an aerating nozzle."

Tables show: (165) Effect of water-flake ratio on recovery of soybean protein. (166) Performance of gyrating screen with petroleum-naphtha extracted flakes extracted at pH 9.5. (167) Properties of phenolic plastics, containing treated soybean meal, prepared by wet and dry compounding. (168) Properties of high-impact, cord-filled, soybean protein-modified phenol-formaldehyde molding compounds. (169) Properties of Soybean Azlon Fiber (R.A. Boyer, The Drackett Co., private communication, 1 Nov. 1948).

Figures show: (203) Graph of viscosity-pH curves for 14% solutions of unmodified soybean protein, 18% solutions of modified soybean protein, and 18% solutions of casein. (204-210) Graphs concerning paper coating with isolated soybean protein: Parts of adhesive per 100 parts of pigment in Denison wax test; amounts of casein, soybean protein, oxidized corn starch, and thin boiling starch that must be used with clay and calcium carbonate to produce a coated paper with Denison wax test of 4-5; brightness of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; opacity of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; receptivity of ink on papers coated with clay and calcium carbonate, sized with soy protein and other sizings; smoothness of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; gloss of papers coated with clay and calcium carbonate, sized with soy protein and other sizings, to produce a coated paper with Denison wax test of 4-5. Address: Protein By-Products Research, Research and Technical Div., Wilson & Co., Chicago, Illinois.

524. Langhurst, Louis F. 1951. Solvent extraction processes. In: K.S. Markley, ed. 1951. Soybeans and Soybean Products. Vol. II. New York: Interscience Publishers or John Wiley & Sons. xvi + 1145 p. See p. 541-90. [26 ref]

• **Summary:** Contents: 1. Introduction. 2. Solvents: Chlorinated solvents, alcohol, hydrocarbon solvents (development of extraction naphthas, hazards of petroleum solvents, ventilation, asphyxiation, fire control, flame arrestors, sewer traps, safety tools, electrical equipment). 3. Power, steam, and water requirements. 4. Extractors: Batch-type extractors, basket-type extractors, vertical U-tube extractors, vertical gravity-type extractors, other types of extractors (Ford inclined screw-conveyor, Detrex Corp. drag chain, Blaw-Knox Rotocel, etc.). 5. Preparation and handling soybeans for solvent extraction: Flaking, flake conveyors, vapor seals (rotary-vane seals, screw plug seals).

6. Extracted Meal: Meal dryers (horizontal jacketed dryers, vertical dryers, recycled vapor dryers), toasting, grinding. 7. Miscella: Pumps, filtration (plate and frame filters, enclosed leaf filters, revolving-plate filters), centrifugation, distillation (horizontal short-tube evaporators, vertical or calandria evaporators, falling-film evaporators, rising-film evaporators, recirculating evaporators), stripping (packed tower, sieve plate towers, bubble cap towers), combination of distillation and stripping, spray drying. 8. Condensation and recovery of solvent: Condensation of solvent, vapor scrubbers, solvent-water separation, vent condensing systems. 9. Degumming and recovery of phosphatides: Degumming, bleaching and drying.

“Chlorinated solvents: The use of the nonflammable solvent trichloroethylene is limited to a few rather small extraction plants processing soybeans. The use of this solvent is inviting because it entails none of the fire and explosion hazards encountered in using petroleum hydrocarbons. Table 93 shows the physical properties of trichloroethylene.” According to a private communication from L.K. Arnold (1948): “Studies on the solvent extraction of soybean oil by trichloroethylene were initiated by the Engineering Experiment Station at Iowa State College and from 1937 to 1939 this work was carried out under a fellowship from the DuPont Company. The later work was done with state funds. The early studies resulted in a pilot plant extractor in which the flaked soybeans were carried down into the solvent and out by screw conveyors. Research by the Detrex Corporation on this type of extractor led to the development of a commercial unit...” (p. 545-46).

Continuous extractors—“Basket-type extractors: The original Bollmann extractor was patented in 1919 (German Patents 303,846 and 322,446) and operated by Hansa-Muehle of Hamburg, Germany, who subsequently sold complete installations to foreign processors. Two such plants were purchased and erected in the United States, the first by the Central Soya Co., Decatur, Indiana, in 1937, and the second by Archer-Daniels-Midland Co., Decatur, Illinois, in 1940. Both these plants had a capacity of several hundred tons per day. The principles of the Bollmann [paternoster] extractor are shown schematically in Figures 128 and 129” (p. 556-57).

“Vertical U-tube extractors: The first Hildebrandt extraction plant erected in the United States was imported from Germany in 1934 and installed by the Archer-Daniels-Midland Co. at Chicago” (p. 561). It based on 3 revolving screws in a u-shaped tube.

“Vertical gravity-type extractors:... The first continuously operating solvent extraction plant employing this type of extractor was built in 1938 by the Allis-Chalmers Manufacturing Co. following the principle patented by M. Bonotto (U.S. Patent 2,086,181, of 6 July 1937). This plant was built for the Honeyamead Products Co., Cedar Rapids, Iowa, and was designed to operate at 50 tons per day, but was later modified to operate at well over 100 tons per day.”

“Other types of extractors:... A unique type of soybean extractor developed by the Blaw-Knox Co. and known as the Rotocel has been in successful operation at the Indianapolis [Indiana] plant of the Glidden Company since 1949.”

Illustrations show each of these extractors. Address: The Iowa Milling Co., Cedar Rapids, Iowa.

525. McCloud, J.L. 1952. *Reminiscences*. 5 vols. Dearborn, Michigan: Ford Motor Company Archives, Oral History Section. 423 p. Unpublished manuscript. Index. 28 cm. Courtesy of Henry Ford Museum & Greenfield Village Archives. Acc. 65.

• **Summary:** These lengthy reminiscences are the result of a series of interviews with Mr. John Lanse McCloud conducted by Owen Bombard during the months of March, April and May, 1952, at Dearborn, Michigan. These interviews were held under the auspices of the Oral History Section of the Ford Motor Company Archives. The author, a chemist and friend of Henry Ford, describes his business and social experiences from 1914 to 1949, when he retired as manager of the manufacturing research department. Topics discussed in volume III include: Robert Boyer, Dr. J.S. Laird, chemurgy, Hud McCarroll, soy protein fibers, Catalin, Bob Smith, Dr. Edsel Ruddiman, Ben Lovett, and soybeans.

In 1927 the Ford Motor Co. started to use lacquer in painting their car bodies; this led to a significant decrease in the time and cost to paint one body. In 1933 the company started using synthetic resin enamel in order to further reduce costs and improve quality. McCloud told Henry Ford that “the synthetic resin enamel was so good you could even use soybean oil in the enamel and get a high grade paint finish... Mr. Ford seized on the idea of using soybean oil but completely reversed it. He told the newspaper reporters... that the next year’s Ford car was going to be painted with soybean oil paint. I hadn’t intended it to be used in that way, but I realized the way newspapers took up the story and repeated it, how news worthy his remark was. They weren’t interested particularly in the fact that the paint was to be made of synthetic resin, but the fact that the paint was made with soybean oil made a big hit with the newspapers... “Incidentally, we did use soybean oil in the synthetic resin enamel, and the soybean oil use in synthetic resin enamel has continued and has demonstrated since that it was a very wise and sensible move.

“The Du Pont Corporation made the first paint, and then the Ford Motor Company later made an agreement with the Du Pont Company, under which we got rights under their patents... Our contribution was in the application of the synthetic resin. We were the first company to use it to any extent. It has since become quite standard practice in the whole automobile industry” (p. 33-35).

The Ford Motor Co. made an early commercial plastic that was “in quite full production back in 1915. That was the case for the coil units... That plastic, as I recall it, used wheat

gluten, the protein of wheat, as a binder. It had asbestos in it and some pigments. It was mixed up in Highland Park and then they were molded. It became really a thermo plastic" (p. 148).

"At the time Greenfield Village was being developed by Mr. Ford, he brought Bob Boyer out of the Trade School and decided to set him up in an experimental laboratory in Greenfield Village. The first place, I believe, was over in the original Edison Laboratory. Actually the first man who was set up in this laboratory was Dr. J.S. Laird who now works in manufacturing research." McCarroll put Laird in the Rouge and Mr. Ford then brought Boyer in. "Shortly after this initial start they decided to build a replica of the Iron Mountain wood distillation outfit. The still was built in Dearborn. It was a small sized still... It wasn't torn down until after Mr. Ford's death.

"This was part of the Badger-Stafford process. It was built and operated to distill various products from the farm. It was originally tied in with Mr. Ford's interest in what is called chemurgy, in other words, a combination of industry and chemistry. Not having any specific plan as to what to do, Mr. Ford brought Boyer in and gave him quite a free hand. He brought quite a number of employees in with him to do pretty nearly anything they wanted to do. Eventually there was built up quite a staff of chemists. Some of the chemists were trained as chemists, although most of them had no prior training. Boyer, himself, had no prior training, only what he had acquired by his directing some experimental work himself and under Mr. Ford.

"Mr. Ford used to use Boyer to, for one thing, annoy Hud McCarroll in much the way that Harry Bennett in one instance in his book said, about the plastic body, that he didn't think anything would come of it except that it would worry Hud McCarroll. Mr. Ford would speak to Hud and say, 'Hudson, you watch what Boyer is doing and don't let him get off the track. Have him direct his energies in this way.'

"Then Mr. Ford would see Boyer before Hud could find him and give him some quite contradictory instructions. Hud repeatedly was completely confused as to what he should do about Boyer. In fact, he couldn't do anything about Boyer, and Boyer had the impetus of quite a staff. I can't remember how many, but I would say that he had two or three dozen men at one time working. There must have been at least that many because when, early in the war in 1943, Mr. Ford decided that this work Mr. Boyer was doing, particularly on fibers, should be continued, Mr. Ford tried to get Government approval for continuing this and get some Government backing for priority to expand this, feeling that wool fiber was becoming particularly scarce, and therefore it might be possible to get Government backing, but he couldn't.

"I would guess that perhaps the Government technical people who were asked to check on it thought that the approach was not sound. All I can say about that approach is that it is possible to make fibers from protein derived from

soybeans, but it isn't economical. I think that the measure of the economic value of it is that now some ten years after this work was done under Boyer, it still isn't in operation any place and the likelihood of its blossoming seems to be scarcer than it did before. Protein is a possible but not an ideal raw material for fibers.

"Mr. Ford had a suit made out of soybean fiber. Another thing made were hats. Generally felt hats are made of a mixture of rabbit fur and wool and matted to felt it. Protein fiber in place of wool was supplied to some company that made felt for hats, and I remember that Hud McCarroll had a felt hat which was, he was told, made from soybean fiber with rabbit fur. It was a nice looking hat. Whether or not it was economical was something else, and that was not the main purpose." The new synthetic fibers like nylon, dacron, and rayon had superior properties to soybean fiber.

"When Mr. Ford first set this laboratory up with Dr. Laird, he just wanted to have some experimental work going on in the Edison Laboratory. One of the first two things that Dr. Laird worked on were paint from soybeans and also body deadener, but particularly paint. Mr. Ford had some boys from the Trade School who worked under Dr. Laird...

"When Boyer went in, he was more or less given a free hand to carry on experiments along the chemurgy line. I would place the date that Boyer started somewhat ahead of Mr. Ruddiman, but they were quite separate. Mr. Ruddiman's work was exclusively foods" (p. 148-52).

"I would say that Mr. Ford's interest in soybeans wasn't too much for food. It was only casually that it was a possible means of diet improvement which he thought of. I would also say that he was intrigued from the start of his experiments with soybeans, in the commercialization and industrial use of soybeans" (p. 167-68).

"I would date Mr. Ford's interest in diets prior to 1915. It was when the plant was on Piquette Avenue... I was out at Highland Park, and I started in 1915. I would place it around the time the Model T started. I think that back at that time he was particularly interested in soybeans" (p. 354). Address: Chemist, in charge of the Chemical and Metallurgical Lab.

526. McCloud, J.L. 1952. *Reminiscences: The plastic automobile body, Robert Boyer's major accomplishments, and solvent extractors* (Document part). Dearborn, Michigan: Ford Motor Company Archives, Oral History Section. 423 p. See p. 152-62. Unpublished manuscript. 28 cm. Courtesy of Henry Ford Museum & Greenfield Village Archives. Acc. 65.

• **Summary:** The idea of a plastic car or plastic parts that were made from soybeans was a natural outgrowth of Henry Ford's interest in chemurgy and Robert Boyer's research in that area. "Actually I think that the statement that this plastic automobile body, which was eventually built, had anything to do with soybeans was a complete misnomer. It was a plastic body, but the plastic wasn't made from soybeans. It was a

phenolic plastic and reinforced. Mr. Boyer, in Dearborn, developed a combination of phenolic and protein plastic. Protein plastics are not new...

"The plastic that Boyer is credited with having started and which we equipped the Glass plant to make, and made in quite a substantial volume, actually was a phenolic plastic in which some of the soybean protein just replaced some of the filler, such as wood or asbestos fiber. We used to kid Mr. Boyer and I used to kid Hud McCarroll about it, that all they did was to raise sawdust on bean vines in order to use up the product of the bean vine. It annoyed Hud but he knew damn well that that was about all they succeeded in doing.

"Of course, the fact is it didn't continue because it just wasn't economical. Furthermore, while it was perfectly successful for the part, you can't keep on pulling yourself up by your bootstraps and paying more money than you can buy it, so the manufacture of plastics was discontinued...

"The plastic body that was produced, however, was a phenolic plastic. The only soybean that got anywhere near it was soybean oil that was used to paint it, and the only reason that it was painted was because it was never possible to put the plastic body together in such a good way that it had a good finish without painting it. Consequently the plastic body which was made actually was painted and as all automobile bodies were then and now painted with soybean oil paint...

"I would say that the first big thing that Mr. Boyer did was this development of a combination of a phenolic plastic with a protein plastic which we used for quite a little while and successfully in electrical insulation parts such as the distributor and so on. That was very good. The only trouble was that it wasn't economical.

"The other thing was the actual production of protein fibers. Of course, there was little poetic license in that, because Mr. Boyer never succeeded in Dearborn in purifying protein produced around here to the extent that it was possible to spin and make fibers. He actually had to buy the purified protein from some other people [Note: Boyer probably bought Alysol brand industrial soy protein from The Drackett Co., at least during the early 1940s]. That was a step that was blithely jumped. Mr. Ford undoubtedly realized this. He felt that that was a detail or hurdle that could have been overcome. Probably the answer is correct. It probably could have been overcome if Mr. Boyer had a little more time.

"The third thing that I would say that Mr. Boyer did was the making of a continuous percolator or extractor. Several of them were built in Dearborn. I think some of them are actually running now."

Concerning the solvent extractor, there existed a type of roller press used in the oil extraction industry that was better than one press designed by Ford and Boyer. "Mr. Ford wouldn't let Boyer buy one of these because he wanted to make his own, and for that reason it [the extraction system] wasn't as successful as it ought to have been, but he just

wouldn't accept such a combination... The Rouge extractor was eventually sold to a Canadian company. One of the men who worked under Mr. Boyer who remained here and had charge of this extractor after Mr. Boyer left went along with the sale of this outfit to the Canadian company, and to the best of my knowledge the Canadian company uses this extractor, and this man is in charge of it."

The soybean solvent extractor at Milan had the advantage of railroad access, so you could bring in soybeans by rail and send out the oil and meal by rail. But a study indicated that the soybean operations at Milan were not very successful economically, so the equipment was moved to Saline. In Saline it had two other handicaps. First there was no railroad access, so all soybeans had to be brought in by farm wagon and the product sent out by truck. Second the soybeans could not be purchased at the best times for the best prices because of insufficient soybean storage silo facilities. "They had to buy from hand to mouth in Saline." In addition they had no equipment to process the oil to produce a non-break oil, the type Ford used in making varnished.

"Mr. Ford's interest in the extraction of oil from soybeans for developing a cash crop was lost before he retired from the Company. He lost interest in it in the beginning of World War II, when his attempt to get the Government backing failed. From that time on there was never any evidence of Mr. Ford's personal backing of the soybean business, including oil.

"I would say that Mr. Ford thought the plastic car was just a stunt and that it had been proven, but from this point on it would depend upon whether or not anybody wants to take it up enough to successfully make it. He had no idea of setting up a small pilot plant of his own to produce that plastic car. I would say that he gave Mr. Boyer a terrific backing for a while, even to the annoyance of a good many people in the Company by actually diverting and earmarking presses in the Dearborn Tool and Die plant that were brought in for some other purpose to work on this plastic car job. It just stymied some other work in the Ford Motor Company. Unless Mr. Ford saw to it continuously that Mr. Boyer did get the backing for the job of making the plastic car, Mr. Boyer wouldn't get it.

"There was a very definite break in the relationship between Mr. Boyer and Mr. Ford. I didn't know any of the circumstances except that Mr. Boyer seemed to get going along and was riding quite high...

"It was progressing along at a pretty good clip, and when it was obvious that the Government wasn't going to give Mr. Ford backing on the thing, Mr. Boyer was given his walking papers. Who Mr. Ford delegated to do this, I don't know. We just got word that Mr. Boyer was out. I saw Mr. Boyer and he told me he was going to leave.

"About that time one man who was a pretty capable man and had been working under Mr. Boyer was up here. He was working for The Drackett Company in Cincinnati [Ohio]

and was supplying Mr. Boyer with purified protein which Mr. Boyer was using to make the protein fibers. He had tried to lure Boyer away from the Ford Motor Company.

"Mr. Boyer had considered that he was going very well in the Ford Motor Company, so he wanted to stay. When it looked like he was slipping, Mr. Boyer immediately said that he would reconsider what he had told him and that he would go with The Drackett Company.

"The Drackett Company offered to buy practically all the equipment that Mr. Boyer had for making soybean fibers, and anything that Mr. Boyer said goes with the making of soybean fibers just went. We didn't save much of anything except some laboratory benches. Drackett got just about everything they wanted in that respect from the Dearborn setup."

527. McCloud, J.L. 1952. Reminiscences: Bob Smith, Rex Diamond, and Delsoy Products (Document part). Dearborn, Michigan: Ford Motor Company Archives, Oral History Section. 423 p. See p. 162-64. Unpublished manuscript. 28 cm. Courtesy of Henry Ford Museum & Greenfield Village Archives. Acc. 65.

• **Summary:** Originally Bob Smith worked for Robert Boyer, then Mr. Ford had him operating a separate research laboratory. "Under Boyer they had worked up soybean milk and soybean cream which they found could whip quite well and from which the present product Delsoy is made. When Boyer was concentrating on soybean fiber, Smith was concentrating on milk and cream. Actually he was in a sense competing with Dr. Ruddiman, so you might say there were two food laboratories out there." Boyer's laboratory was focused on chemurgic applications. Dr. Ruddiman "was moved from the little rat house [where he kept is laboratory rats and did food experiments; it had previously been a private dining room] to the building that had been originally built for the Dearborn Water Works. This was empty and wasn't being used for anything else. I am quite sure, but I believe that Smith either went over to work in this laboratory under Ruddiman or about the time that Ruddiman retired..."

A man by the name of Jack [sic, Holton W. "Rex"] Diamond claims that he developed this product which Smith sold and commercialized under the name Delsoy. I don't know very much about it, except that it was very confusing. There was a man from New York [probably Herbert Marshall Taylor] who came over here and told us a great long story about how Smith had stolen something from him, and he was going to sue Smith and the Ford Motor Company and so on. This man went out to see Frank Campsall, and I got assigned the job of interviewing him and trying to smooth his feathers."

At one time, Mr. Smith reported directly to Mr. Ford. "Mr. Ford went to see him regularly and was keenly interested in the work Bob Smith was doing. Later Bob Smith left the Company and set up a business of his own, based on

the Delsoy product, which was developed into quite a nice commercial affair.

"Jack [sic, "Rex"] Diamond left and I think he tried to set up competition to Bob Smith. Bob Smith had no prior technical training. I think he was another Trade School graduate. I would classify the Trade School not as a collegiate rank but as junior collegiate training that many of the boys acquired. Jack Diamond, however, was a trained chemist, and he may be right when he stated that he developed it" [soy-based whip topping]. Address: Chemist, in charge of the Chemical and Metallurgical Lab.

528. Gangloff, W.C. 1952. Technical consultants report #TC-91. History of the Drackett Co. soybean plant at Sharonville, Ohio (Document part II-Soybean proteins). Cincinnati, Ohio: The Drackett Co. 9 p. See p. 4-6. June 12. Unpublished manuscript. 28 cm.

• **Summary:** "Soybean Protein Development: Laboratory work on the extraction of soybean protein from oil-free soybean flakes was started in The Drackett Co. in 1935 by W.C. Gangloff, J.N. Lawrence and R.H. Hieronymus. In the last quarter of that year samples of soybean protein were submitted to the Champion Coated Paper and Fiber Co. for examination as to use in paper coating formulations in place of milk casein. In 1936 a pilot plant scale of operation on the batch system was started at the Spring Grove plant site. This was extended during 1937 and 1938 despite the decline of milk casein prices from about 25¢ per lb. down to 8½¢ per lb. New procedures for proper extraction and a study of tailoring the product to particular use was undertaken. This resulted in securing a number of patents in this field and a large technical background was built up.

"Development work was carried on continuously through the war period and the pilot plant operated round the clock. All output was grabbed up at once by concerns like Beaunit Mills, Shinola Shoe Polish Co., etc. Expansion and installation of a new unit at Sharonville was not possible until 1946 due to war restrictions. By 1947 the new unit was under operation on a full 24 hour basis. Many changes and improvements had to be made. In 1950 capacity was expanded by installation of greater drying capacity..."

"Soybean Protein Production: Prior to 1940, all the Pilot Plant production of soybean protein was used in connection with experimental studies from process and utilization angles. During the latter part of 1939 the price of milk casein jumped from 5½¢ per lb. to 20½¢. This made soybean protein production much more interesting and calls for samples in various industries came in. During the last quarter of 1939 about 1500 lbs. were supplied to Champion Coated Paper and Fiber Co. and many smaller samples to others interested.

"It was soon learned that different industries required different types of protein, varying as to modification for adhesive character, molecular breakdown or unfolding.

During the first quarter of 1940, 500 lbs. of one type were furnished Miami Valley Coated Paper Co., Franklin, Ohio; 350 lbs. to Lowe Paper Co., Ridgeway, New Jersey; and 1000 lbs. to Ford Motor Co., Detroit, Michigan. The latter were interested in developing soybean water paints and also a spinning fiber for later weaving into upholstery cloth, so 200 lbs. of a different type were furnished to them at Dearborn, Michigan for experimental work at the Edison Institute. About 1500 lbs. of soybean protein were produced in the Pilot Plant during this quarter.

"In 1941, about 15,018 lbs. were produced and 7,039 lbs. sold. [Note: This was the first soy protein sold.] In 1943, about 112,704 lbs. total were produced and 118,157 lbs. sold. Following several years cooperation with the Ford Motor Co. on soybean fiber development with the isolated protein produced in The Drackett Co. pilot plant, war conditions and the death of Edsel Ford caused The Ford Motor Co. to terminate its work in soybean development in 1943 and the equipment for fiber spinning and the staff available, under R.A. Boyer were taken over for further exploitation. The spinning equipment previously set up in the Drackett Laboratories by S.O. Fiedler was thus augmented to a pilot plant scale of operations. Information as to soybean protein extraction was pooled. W.C. Gangloff was moved to other executive duties as Technical Consultant and R.A. Boyer was named Director of Scientific Research with chief duties on soybean fiber development. Concentration on soybean fiber work took the majority of isolated soybean production during 1944, 1945 and 1946. A shift to continuous extraction in place of batch operation was made and operations moved from the Spring Grove plant to the new unit at Sharonville. In addition to producing material needed for fiber operations, during 1944 about 78,245 lbs. were sold and in 1946 about 60,350 lbs. were sold during the second half. In 1947 regular continuous protein production operation was in full swing and has progressed rapidly ever since."

Soy protein production grew as follows each fiscal year: 1947-908,975 lb. 1948-2,496,797. 1949-2,995,272. 1950-4,284,090. 1951-6,088,469. Thus through May 1952 a total of 21.661 lb were produced beside that used in experimental production.

"In 1950-51 production facilities were increased and a continually increasing tonnage of isolated soybean protein has been sold. Much has found its way into paper coating, adhesive use and more recently as an important component of the protein-latex water paints which are rapidly supplanting the earlier milk casein and soybean protein water paints." A chart compares soybean protein sales (in pounds) with production from 1941 to 1951. In 1941 some 15,018 lb of isolated soybean protein were sold. In 1951, the peak year, 6,086,350 lb of isolated soybean protein were sold.

Note: No mention is made of the brand names under which this protein was sold—such as Alysol, Drackett Protein 110, 112, and 220, Ortho Protein, or Drackett Industrial

Protein. Address: PhD, Technical Consultant.

529. Gangloff, W.C. 1952. Technical consultants report #TC-91. History of the Drackett Co. soybean plant at Sharonville, Ohio (Document part III—Soybean plastics). Cincinnati, Ohio: The Drackett Co. 9 p. See p. 6-7. June 12. Unpublished manuscript. 28 cm.

• **Summary:** "Soybean Plastics: In connection with a correlated program for utilizing oil-free soybean meal and residual scalped meal from isolated soybean protein operations, laboratory work was started in the latter part of 1936. During 1937 equipment was installed at the Spring Grove plant on a small pilot plant basis and personnel hired for soybean plastics research and development. By early 1938 soybean plastics had been worked out to a point where bottle caps could be produced from them. The type of plastics developed was a modified phenolic of the general purpose type. During 1938 cooperative work was carried on with Owens-Illinois Glass Co. at Toledo on a Lauterback machine for making plastic caps for Windex bottles. Piano keys and phonograph records from soybean plastics were worked out in a cooperative effort with the Starr Piano Co. and Decca Records at Richmond, Indiana. Much cooperative work was done with the local Recto Molded Products Co. and with Kurz-Kash Co. at Dayton, Ohio on a wide variety of custom moldings.

"In 1939 a larger pilot plant was set up at the Spring Grove plant and a production of about 100 lbs. per day obtained. During 1940 material satisfactory for bottle cap molding was successfully produced on a tonnage basis. Products using either oil-free meal or the residual meal from isolated soybean protein operations were successfully produced in quantity. Regular and repeated sales of product were made to the local Recto Molded Products Co.

"During 1941 tonnage of general purpose stock was produced with the pilot plant operating on a semi-commercial production basis. Toward the end of the year, scarcity of formaldehyde under war conditions hampered production. Research was then pointed to the production of high-impact material. Several patents resulted from the studies of P.A. Bury and F.E. Calvert.

"In 1942, scarcity of phenol showed the advantage of soybean protein plastics as modified phenolics. By proper tailoring a plastic averaging 6000 lbs. per square inch tensile strength and 9000 lbs. per square inch flexural strength was produced. Practically all production went into war contract material. Experiments on suitable high impact stock for supplanting aluminum, magnesium and their alloys resulted in the production of a satisfactory M-18 flare breach cap and housing for use in star shell flares for the Signal Corps. Another application was for gun sight housings.

"During 1943 attention was turned to developing satisfactory soybean plastic resins as modified phenolic adhesives, especially for wood lamination. This research

work resulted in a patent to Hieronymus. A start was made on tailoring soybean plastics for extrusion operations, particularly for button manufacture. Contacts were established with the Waterbury Button Co., Waterbury, Massachusetts and the George Morrel Corporation at Muskegon, Michigan.

"In July 1943 the direction of further work in soybean plastics was turned over to R.A. Boyer. Pilot Plant production on general purpose and high impact stock was continued with concentration of sales effort on a variety of outlets. In 1947 a new unit for soybean protein manufacture was set up at Sharonville and production continued.

"In 1946 the production of preforms for the molding industry was begun. Both bulk molding powder and preforms were produced and sold until July 12, 1949 when soybean plastics operations were entirely discontinued."

A chart shows production and sales of soybean plastics and preforms each fiscal year (Oct. 1–Sept. 30) from 1940-41 to 1948-49. Production in 1938 and 1939 were for experimental and development purposes only. Production of bulk plastics increased from 19,810 lb in 1940-41 to a peak of 140,697 lb in 1947-48. Production of preforms increased from 115,536 lb in 1946-47 (the first year) to 286,361 lb in 1948-49. The sales value of both types of soybean plastics increased from \$3,079 in 1940-41 to a peak of \$142,262 in 1947-48 (the peak year), falling to \$134,464 in 1948-49. Address: PhD, Technical Consultant.

530. Gangloff, W.C. 1952. Technical consultants report #TC-91. History of the Drackett Co. soybean plant at Sharonville, Ohio (Document part IV–Soy protein fiber). Cincinnati, Ohio: The Drackett Co. 9 p. See p. 8. June 12. Unpublished manuscript. 28 cm.

• **Summary:** "Soybean Fiber: As indicated previously in this report, The Drackett Co. worked cooperatively with the Ford Motor Co. [apparently starting in the first quarter of 1940] to develop a soybean protein suitable for spinning into fiber from which upholstery cloth could be made.

"Following the purchase of equipment from the Ford Motor Co. in the summer of 1943 and the taking on of the personnel who had worked on soybean fiber at The Edison Institute, a pilot plant scale operation was set up at the Spring Grove plant. Soybean protein processing was tied in with this venture to supply soybean protein as needed. Following several years of experimental work, the operations were moved to a new pilot plant at the Sharonville plant. Production was shipped to various mills for use as a blend fiber, particularly for admixture with wool. The chief fault of soybean protein fiber as well as all other protein fibers lay in its weak wet strength and its tendency to become brittle on aging. These drawbacks were never overcome and the operation was never successful from either a product or cost standpoint. In July 1949 the production operations were discontinued and a few months later all further research

on soybean fiber was dropped and much of the personnel dispersed. R.A. Boyer who had been connected with this work from its start at the Edison Institute of The Ford Motor Co. severed connections with The Drackett Co. early in 1950."

Note: It is not clear from the above whether or not The Drackett Co. ever sold their soy protein fiber commercially, and if so, to whom. Address: PhD, Technical Consultant.

531. Diamond, Holton W. 1952. Dessert mix and method of making the same. *U.S. Patent* 2,619,422. Nov. 25. 7 p. Application filed 23 March 1950. [1 ref]

• **Summary:** Concerns the production of a "dessert mix" or "frozen dessert" made with the neutral sodium proteinate of soy protein, plus dextrose, sucrose, hydrogenated vegetable oil, stabilizer, water. "I have discovered that a frozen dessert of the ice cream type can be produced with acceptable body, texture, and overrun characteristics by effecting a partial reversal of the phases of the dessert mix emulsion during aeration and chilling." In the 9 examples given, hydrogenated cottonseed oil is used as the source of fat in 7, but hydrogenated soy bean oil in the other two.

Note: Rex Diamond was working for the American Maize Co. when he applied for this patent. Address: Whiting, Indiana.

532. Diamond, Holton W. 1952. Powdered topping and method of making same. *U.S. Patent* 2,619,423. Nov. 25. 5 p. Application filed 23 March 1950. [1 ref]

• **Summary:** The process described in this patent was developed while Rex Diamond was working for American Maize Products Co. in Whiting, Indiana, from 1949-1955. They wanted a spray-dried product with a long shelf-life since they had no facilities for handling a refrigerated product. For 7 years, Rex worked closely with Niro Spray-Drying Company, but they were unable to develop equipment that would successfully spray dry a high-fat product. After sitting on the shelf for a while, the fat would seep out from each particle in the high-fat product causing the particles to clump together.

Example 1 shows the ingredients (by weight) that might typically be used in the process: Neutral sodium proteinate of soy protein 2.6, dextrose 10.0, sucrose 17.0, hydrogenated cottonseed oil 64.4, stabilizer 2.4, residual moisture 1.0, flavoring substances 2.6. Address: Whiting, Indiana.

533. *Observer (Saline, Michigan)*. 1953. Saline Mill theater to open soon. June 18.

• **Summary:** "On Monday Saline's first resident company of professional actors moved in and began renovating the ex-soybean mill to accommodate their renovated version of the American drama, called 'Dramarama.' The Mill, located on northeast 112, is to be the scene of four classic comedies this summer." The director of the group is Warren Pickett, and the producer is Barbara Hamel. The first theater-in-the-round

performance of the company's first summer season will be "Bell, Book, and Candle" by John Van Druten, scheduled to open on Friday, July 3.

534. Benedict, Murray Reed. 1953. Farm policies of the United States, 1790-1950: A study of their origins and development. New York, NY: The Twentieth Century Fund. xv + 548 p. Index. 27 cm.

• **Summary:** Chapter 10, titled "Equality for Agriculture," discusses and analyzes the McNary-Haugen plan, and its predecessor the Peek-Johnson plan of the early 1920s. The first McNary-Haugen Bill was introduced in Jan. 1924 by Senator McNary of Oregon and Representative Haugen of Iowa (S. 2012 and H.R. 5563). The first plan calling for U.S. government intervention in agriculture, it was to become the central feature in the struggle over farm legislation during the second half of the 1920s. The bill was introduced 5 times, once each year from 1924 to 1928. Each time it either failed or was vetoed by President Calvin Coolidge. However many of the ideas developed in the McNary-Haugen era were to reappear in the Roosevelt period starting in 1933.

Chapter 11 discusses "The Hoover Period," the Agricultural Marketing Act of 1929 (which was not accepted with enthusiasm by the major farm groups), the Smoot-Hawley Tariff Act of 1930, and the drought of 1930.

Chapter 12, titled "From Defense to Attack," discusses the Roosevelt period and the New Deal starting in 1933. "In a sense, Herbert Hoover rather than Franklin Roosevelt inaugurated the New Deal." Hoover was the first American president who "undertook to apply the powers of government, and his own personal leadership, in solving the problems facing the nation." There were many early initiatives related to agriculture including the Emergency Farm Mortgage Act of 1933, the Farm Credit Act of 1933, and the Agricultural Adjustment Administration (AAA; Title I of the Agricultural Act of May 1933—which had many similarities with the McNary-Haugen plan; it worked to curtail farm production and raise prices). Henry A. Wallace, editor of *Wallaces' Farmer*, was appointed secretary of Agriculture.

The Agricultural Adjustment Act of 1938 (section 202) "provided for the establishment, under the direction of the Department of Agriculture, of four regional laboratories for scientific research, to develop new uses and outlets for farm commodities and their products. This feature of the act grew out of a persistent belief on the part of certain farm leaders that vast new markets might be opened up for by-products and farm wastes by producing new kinds of products for use in industry... The possibilities of farm relief by such means had been grossly oversold, and assumed far larger proportions in the minds of some farm leaders and congressmen than the cold facts of the situation would seem to warrant*" (p. 379-80).

Footnote 10 (p. 380): "This exaggerated conception of the place of so-called 'Farm Chemurgic' in solving the farm

problem had been widely propagandized for many years by the Farm Chemurgic Council. This Council grew out of a Conference held at Dearborn, Michigan, as a result of the wide interest created by William J. Hale's book *The Farm Chemurgic* (1934)... This and numerous other propaganda books were financed by the Chemical Foundation, a nonprofit agency set up by President Woodrow Wilson in 1919 to license the use of German patents taken over under the 'Trade with the Enemy Act.' The Farm Chemurgic Council, in its various publications presented glowing accounts of the possibilities of the gains to agriculture from the industrial use of farm products, and also carried on intensive propaganda for American self-sufficiency and high tariffs." This footnote further discusses chemurgy and the Farm Chemurgic Council—though neither term is listed in the index!

Soybeans are discussed only in relation to World War II. During that war, the Commodity Credit Corporation (CCC) subsidized soybean production to permit increased grower returns and encourage production of oil. In 1945 the cost of the soybean subsidy was \$44.0 million. The soybeans were purchased at support prices and resold at a loss to processors [crushers] at differentiated prices based on processor efficiency (p. 429).

"For soybeans, the 1942 goal was more than twice the prewar average, and was more than filled. The goal was stepped up again in 1943, from 9 million acres to 12 million, but performance fell short. Only 10.4 million acres were planted" (p. 436).

During the war, the largest production increase was in "oil crops, from a index of 165 (1935-1939 = 100) in 1940 to 274 in 1945, having reached a peak of 300 in 1943. These crops, principally soybeans, had started to increase sharply as early as 1938. The stimulus given in the war years was thus an acceleration of a shift already well under way. Peanut acreage was nearly doubled during the war years" (p. 441). Address: Prof. of Agricultural Economics, Prof. of Agricultural Economics, Giannini Foundation of Agricultural Economics, Univ. of California, Berkeley.

535. Ticknor, John W. 1954. History of chemurgic meetings. *Chemurgic Digest*. March. p. 5-6.

• **Summary:** "The first chemurgic meeting was held in Dearborn, Michigan, May 7-8, 1935, when some 300 industrialists, scientists, and farmers met at the joint invitation of Francis P. Garvan and Henry Ford." At the second Dearborn Conference, held in May, 1936, the word "chemurgy" was first uttered from the speakers platform. The third conference was also held in Dearborn. "Dr. George Washington Carver appeared on the program together with Dr. William J. Hale and the late Dr. John Widtsoe."

E.P. Garvan, first president of the Farm Chemurgic Council, died in the late autumn of 1937, and Wheeler McMillen was elected president. The fourth conference was

held in April 1938 at Omaha, Nebraska.

A complete session on soybeans and their uses in industry was conducted in 1940. Soybeans and their myriad uses were emphasized at a round table dinner meeting that was well attended at the 1943 Conference. A progress report from the four USDA Regional Laboratories was made for the first time at the 1944 Conference. Address: National Farm Chemurgic Council.

536. Boyer, Robert A. 1954. High protein food product and process for its preparation. *U.S. Patent* 2,682,466. June 29. 5 p. Application filed 6 May 1952. [6 ref]

• **Summary:** This landmark patent, which describes the preparation of textured foods from spun vegetable protein, started the spinning of soy protein filaments. The patent begins: "This invention relates to a food product and is a continuation-in-part of my copending application, Serial No. 118,445, filed September 28, 1949. In particular it relates to synthetic meat and to methods of producing synthetically foodstuffs which will have the flavor, coloring, taste and 'chewiness' of meat. By the term meat I mean to include not only the meat of mammals, but also the meat of fish, fowl, shell fish and crustaceans."

"The stumbling block up to this point has been in the reproduction of the texture and appearance of natural meat, the texture of course involving the factor of 'chewiness.' Vegetable chops using wheat gluten as a base have a certain amount of 'chewiness,' but they do not duplicate the fibrous character of meat; and they fail to give that satisfaction that comes from the breakdown in the mouth during the mastication of a piece of meat."

"Artificial textile fibers have been made synthetically from vegetable protein such as soy beans, corn, or peanut protein, as well as from animal proteins such as casein and keratin."

Filaments were prepared by dispersing the protein material, forcing the dispersion through a porous membrane such as a spinneret of the kind used in the production of rayon, coagulating the emerging streamlets in an acid bath, and stretching the oriented filaments to develop desired fiber strengths, each fiber commonly having an average thickness of about 20 micrometers. One spinneret was capable for forming several thousand individual fibers which when taken together exist as a group having an overall diameter of perhaps one-quarter inch. "If a battery of spinnerets or dies as above outlined are provided, there will be a considerable number of bundles or groups of filaments which, when assembled together, may constitute what I have hereinafter called a 'tow' of filaments, which tow, depending upon the number of dies or spinnerets used, may be conveniently three to four inches in diameter."

The formed filaments are then placed in a salt solution to prevent them from dissolving. The pH of this solution is typically adjusted to be in the range of 5.6 to 6.4—the same as most meats. In this way a palatable food product can be

produced without the use of binders or fats. The fibers are stretched in this salt bath using a take-away reel or godet wheel. "In practicing my invention with soy bean protein I have applied stretching tensions satisfactorily as high as 400%." To summarize: This is a process of preparing synthetic meat by preparing a quantity of filaments of protein material, such as "filaments of soy bean protein material." It is: "A meat-like product comprising oriented edible fibers" or "edible filaments."

Note 1. This is the earliest document seen (Jan. 2005) concerning the spinning of soy protein isolates to make spun soy protein fibers for food use.

Note 2. This is the earliest English-language document seen (Nov. 2003) that contains the term "synthetic meat" (or "synthetic meats"—with any combination of quotation marks). The phrase "The process of preparing synthetic meat..." is used repeatedly in this patent.

Note 3. This is the earliest English-language document seen (Dec. 2004) that uses the word "filaments" or the term "edible filaments" to refer to edible spun soy protein fibers.

Note 4. This is the earliest English-language document seen (March 2009) that uses the word "spinneret" (or "spinnerets") in connection with edible spun soy protein fibers.

Note 5. This is the earliest English-language document seen (March 2009) that uses the word "tow" (or "tows") in connection with edible spun soy protein fibers.

Note 6. This is the earliest document seen (Jan. 2009) concerning the etymology of textured soy protein isolates. Address: Cincinnati, Ohio.

537. Smith, Allan K. 1954. Isolation and utilization of vegetable proteins. *Economic Botany* 8(4):291-315. Dec. [161 ref]

• **Summary:** Contents: Introduction. Vegetable protein sources. Raw materials for protein isolation. General procedures for protein isolation. Flax seed (*Linum usitatissimum* L.). Sunflower seed (*Helianthus annuus* L.). Soybean seed (*Glycine max* (L.) Merrill). Castor-beans (*Ricinus communis* L.). Seed of peanuts (*Arachis hypogaea* L.). Seed of cotton (*Gossypium* sp. L.). Corn (*Zea Mays* L.). Literature cited.

The lengthy subtitle reads: "Among these proteins, those of soybean are isolated in the United States to the extent of about 30 million pounds annually, more than half of which are used in pigment coating of paper. Others, also discussed in this article, are derived from the seed of flax, sunflower, castor, peanut, cottonseed, and corn."

"Introduction: Vegetable protein isolation on a large scale for use in industrial processing operations is comparatively new, having its beginnings in 1935 in a small plant in Chicago [run by the Glidden Co.]. The development of a process for vegetable protein isolation was preceded by the use of vegetable protein concentrates for plywood glue [by

I.F. Laucks Co.], in the form of soybean meal containing 40 to 50 percent protein, by the Douglas fir plywood industry of the Northwest in the early 1920s... Looking backward it is easy to see that the slow development of protein utilization, even in recent history, is attributable to the highly complex structure of the protein molecule... The chemistry of protein lags far behind the chemistry of the other two classes of major agricultural chemicals produced in such abundance by nature, namely, the carbohydrates and fats." The "process of building one pound of animal protein requires six to ten pounds of vegetable protein..." (p. 291).

Worldwide, the soybean is by far the largest oilseed crop, followed by peanuts, then cottonseed. Before the soybean became a major crop in the USA, peanuts led all other oilseeds in world production. (p. 292).

"Soybean protein is the only industrial protein isolated from oilseeds in the U.S." Soy protein has a higher yield and better color.

"The largest potential use of soybean protein is for textile fibers, but this use has not yet been developed. Fibers comparable to the casein fiber, Aralac, which was produced during World War II, have been made experimentally by the Ford Motor Co. (1937), The Drackett Company (1940), and the U.S. Department of Agriculture (1942). The great weakness of Aralac was its wet strength, and commercial production did not prove feasible. The Japanese, who were experimenting with soybean fibers before the war, have resumed their research. The British development of a commercial fiber from peanut protein and the American development of a protein from zein support the belief that a successful fiber can be made from soybean protein. Such a development might very well double the present rate of soybean protein production."

Soybean meal, when dehulled, contains about 50% protein and has several industrial uses including plywood glue, wallpaper coating, and adhesive formulations for the manufacture of paper products. A 1951 survey stated that 51.5 million lb of soybean meal were used in such industrial products. The largest single use, 35 million lb, was for plywood glue in Douglas fir plywood. Recent reports indicate this application has increased to 60 million lb.

Large amounts of wheat gluten and some corn gluten are used to make monosodium glutamate (MSG), which originated in Japan under the name "ajinomoto." The MSG shaker is rapidly finding a place in American homes next to the salt and pepper shakers. Smaller amounts of wheat gluten are used to make a taste product somewhat resembling pork chops.

Table I (p. 293) shows U.S. production of 7 oilseeds (soybeans, cottonseed, flax, peanut, castor bean, safflower, and sunflower) and protein concentrates made from them in 1951-52. Apparently soybean meal is considered a protein concentrate, since 5,704,000 tons were made in 1951-52. By far the largest amount of "protein concentrate" is made from

soybeans, followed by cottonseed (2.5 million tons), flax (495,000 tons), peanut (150,000 tons), and safflower (6 tons). Address: Northern Utilization Research Branch, Peoria, Illinois.

538. Gray, James. 1954. *Business without boundary: The story of General Mills*. Minneapolis, Minnesota: University of Minnesota Press. 343 p. Illust. 24 cm.

• **Summary:** General Mills was founded on 20 June 1928. "But General Mills had forebears whose history carries the record back for more than a hundred years into the clamorous days of the mid-nineteenth century. Four major groups of interests came together starting with the formation of General Mills in 1928: the Washburn Crosby Company with headquarters in Minneapolis [Minnesota] and its associated companies; the Sperry Company whose mills in California, the Pacific Northwest, and Utah were presided over from San Francisco; the Kell group of mills in Oklahoma and Texas; and the Larowe Milling Company, specialists in animal feeds with Detroit [Michigan] as its base. The largest of these was Washburn Crosby which had come into being at the Falls of St. Anthony during the period of expansion that immediately followed the Civil War. The oldest was the Sperry Company which sprang out of the needs of the forty-niners, who as they devoted themselves feverishly to the search for gold had to be fed by someone."

Chapter 17, titled "Paths of Tomorrow: Research, new style," discusses General Mills' work with soybeans and gluten. "In 1942 when General Mills decided to enter the soybean industry, Leslie Perrin, shortly to be elected executive vice president, brought into the company a man well trained to head the new experiment. Whitney Eastman had behind him thirty years of experience in the field. He and Perrin between them were responsible for the striking success of the soybean development."

"The first project which Hyde and Eastman made their own, under the supervisory guidance of Bell, Bullis, and Perrin, was the creation in 1943 of the Chemical Division."

"Eastman knew his way about in administrative as well as in research affairs. In the 1920s and 1930s he had worked with Henry Ford on every aspect of the problem of developing a soybean protein that might be used to make plastic parts for motor cars. He had processed soybeans, produced at the Ford Dearborn farms, in a project to evolve an oil for car finishes [paints]. At the same time he had collaborated with I. F. Laucks in developing a special soybean protein for the manufacture of plywood glue."

"In 1934 he built, after a design imported from Germany, the first continuous soybean solvent equipment to be used in this country. As one of the original (now one of the few surviving) pioneers of the soybean adventure, he knew exactly what he wanted when he set out, in the employ of General Mills, to build a new plant."

"Eastman went straight to the heart of the soybean

country and, at Belmond, Iowa, found a set of buildings that suited his requirements well... The next project of the expansion program in the Chemical Division was to develop from polyamide resins a great army of products to be sent into the commercial field... The third project of the Chemical Division, which Eastman and his associated had under study and consideration for five years before it was inaugurated successfully, was the development of new careers for fatty acids.

"In accordance with the principle of spreading its base of operations over the surface of the United States, the company established its Chemoil Plant in Kankakee, Illinois.

"Wheat gluten, the mixture of protein left when starch is washed from wheat flour, is the best source material for the manufacture of glutamic acid and its compounds. When wheat gluten is converted by acid hydrolysis, it gives glutamic acid hydrochloride, used to compensate for hydrochloric acid deficiency in the digestive tract. Most dramatic of gluten derivatives is monosodium glutamate, one of the most effective of all flavoring agents. Its appeal to the 'little nerves that fringe the tongue' is so great that one part dissolved in 3000 parts water can be detected; salt loses its savor in any combination less than seven times as strong."

539. Haynes, Williams. 1954. American chemical industry: A decade of new products. Vol. 5. Toronto, New York, London: D. Van Nostrand Co. li + 622 p. Index. 24 cm. [9 soy ref]

• **Summary:** This volume of the 6-volume history, covers the period 1930-1939. Chapter 3, "The Depression-Proof Industry," discusses Dr. William J. Hale and the origins of chemurgy. He dramatized his idea at the 1931 meeting of the Manufacturing Chemists' Association, then in 1934 he coined the word "chemurgy," analogous to metallurgy, meaning working with chemicals, and published his provocative volume, *The Farm Chemurgic*. In 1935, with the active support of Francis P. Garvan and Henry Ford, the Farm Chemurgic Council met at Dearborn, Michigan, and formally organized, with Garvan as president, Wheeler McMillen as vice-president for science, etc. In 1938 Wheeler McMillen succeeded Garvan as president. The chemurgic movement spread far and fast, particularly in the South. At the second Chemurgic Conference in 1936 there was an active discussion of alcohol-gasoline blends. Garvan said that if the 33½% alcohol fuel marketed in England were adopted in the USA, it would put 90 million acres and 6 million unemployed back to work. Henry Ford became interested in growing crops for alcohol to use in lacquers and fuels (power alcohol).

Chapter 16, titled "New Raw Materials" (p. 226-42), notes that "Depression conditions put a premium upon low-cost supplies and emphasized, especially in the chemical industry, every possible salvage of any waste... Henry Ford not only underwrote the early meetings of the National Farm Chemurgic Council, but he set up at Dearborn a farm

products research group... where soybeans became the chief project.

"In the South, where the great staple crops cotton and tobacco had been true chemurgic enterprises generations before Dr. Hale had coined the word, the interest was particularly keen, and in 1937 Senator Bilbo of Mississippi introduced a bill (S. 2140) appropriating \$1,000,000 to be administered by the Department of Agriculture in establishing a research center to solve Southern agricultural problems by finding suitable new crops and profitable new uses for farm products. This idea was altogether too promising to be confined to a single section. Accordingly, the Farm Relief Act of 1938 carried a rider appropriating \$4,000,000 for the establishment of four regional laboratories devoted primarily to chemurgic research...

"Eventually the laboratories were well located at New Orleans, Louisiana; Peoria, Illinois; Albany, California, across the bay from San Francisco; and Wyndmoor, a suburb of Philadelphia [Pennsylvania]."

Pages 277-78 note that the isolation of progesterone, a female sex hormone, was announced almost simultaneously by 4 groups of workers in 1934. It "can be extracted from animal ovaries or synthesized from sterols such as stigmaterol, obtained from soybeans, or obtained from brain or spinal cord of animals..."

In the chapter "New Constituents for Coatings," pages 355-57 note: "Henry Ford helped the soybean mightily. In 1932 the Ford Motor Company planted 8,000 experimental acres, increased two years later to 12,000, on which 300 varieties were tested, and the harvested crop was processed in an experimental six-ton plant in Greenfield Village. Over 1,000,000 gallons of [soy] oil were used in the 'paint job' on Ford cars, 540,000 gallons more made into glycerin to charge the shock absorbers, while 200,000 gallons were used as sand-core binder in the foundry, requirements that demanded beans from 64,000 additional acres. These chemurgic feats were not hidden under a basket, and Ford publicity induced many Middle West farmers to grow this crop.

"The soybean has had an interesting part in crushing techniques. In 1927, when the crop passed 2,000,000 bushels, only a small part of it went to the crushers, the largest at the time, A.E. Staley Manufacturing Company of Decatur, Illinois, handling that year only 165,000 bushels. Staley, which first crushed soybeans in 1922, had been followed by Funk Brothers and a little later by Allied Mills, and with the exception of the pioneer, all the early crushers used plate-type hydraulic presses, standard equipment for linseed crushing. Staley was a trail blazer, demonstrating the expeller press as more efficient for use with soybeans. In 1934 the first large-scale solvent-recovery plant was put in operation by Archer-Daniels-Midland, followed shortly by a similar installation by the Glidden Company, which was demolished by an explosion soon after its completion. This disaster retarded the development of this process, and during

the thirties expeller-type equipment was almost universally adopted. Spencer Kellogg & Sons first crushed soybeans at its Des Moines [Iowa] plant in 1934 and each year following installed equipment at another of its plants, employing both the expeller and solvent methods. In establishing this new industry, the individual leaders were Augustus Staley, late president of A.E. Staley Manufacturing Company and Whitney Eastman, formerly with Archer-Daniels-Midland and more lately with General Mills...

"The earliest extraction operations, installed in 1934-35 by Archer-Daniels-Midland and Glidden, employed Hildebrandt extractors, and a variety of solvents were tried out: acetone, benzene, gasoline, carbon bisulfide, and some of the chlorinated solvents. Glidden embarked on chemical exploitations of soybeans, extracting lecithin, marketed by the American Lecithin Company (Joseph Eichberg, president), and developing a paper-coating product known as Alpha-Protein. In 1934 Archer-Daniels-Midland reopened the plant of its subsidiary, Wm. O. Goodrich Company at Milwaukee, Wisconsin, as a soya operation, and in 1938 Spencer Kellogg purchased the Shellabarger Grain Products Company's oil mill at Decatur. Other well-known firms interested in soybean products during the 1930s were the Buckeye Cotton Oil Company, subsidiary of Procter & Gamble, soaps, and Larowe Milling Company, feedstuffs."

Pages 471 and 472 give the high and low price per pound for crude domestic soybean oil in tanks from 1930 to 1939.

Appendix X (p. 486-490), titled "The Farm Chemurgic Movement" by William J. Hale, gives an excellent, concise history of the subject.

Appendix XXVII gives a detailed table showing factory consumption of primary fats and oils in 1939. The leading vegetable oils (in million lb) were: cottonseed oil 1,321, coconut oil 529, soybean oil 370, linseed oil 344, and palm oil 271. The soybean oil was used mostly in shortening (201.6), followed by oleomargarine (70.8), and other edible products (32.3). The main non-food industrial uses were paint and varnish (21.7), soap (11.2), and linoleum & oilcloth (6.4). Address: Stonington, Connecticut.

540. Nevins, Allan; Hill, Frank Ernest. 1954. *Ford: The times, the man, the company*. Vol. 1. New York, NY: Charles Scribner's Sons. xix + 688 p. Illust. Index. 24 cm. [1000+* footnotes]

• **Summary:** This is a history of Henry Ford and the Ford Motor Co. until about 1914-15. The years from 1906 to 1923 were years of spectacular growth. William C. Durant (perhaps with an idea from Benjamin Briscoe) incorporated General Motors in 1908; the capitalization soon rose to \$12.5 million. "Once started, Durant moved with dazzling speed—for he had Napoleonic qualities. Within a year and a half, he had brought more than a score of companies, makers of cars or parts, into his combination. They included three major units in the field: the Cadillac, the Oldsmobile, and the

Oakland companies. By 1910 Durant, with fourteen thousand employees, was producing one-fifth of all the automobiles made in America. In its first year General Motors had net sales of \$29,000,000 and net profits exceeding \$9,000,000." Buick, Cadillac, and Oldsmobile were General Motors' leading cars. But by the summer of 1910 General Motors was in perilous financial trouble. It had tried to grow too fast. Durant was forced to relinquish his leadership, and a banking group took control. "Before long, however, General Motors made a sturdy recovery under Charles W. Nash, chosen president in the autumn of 1912, and Walter P. Chrysler, a Western railroad man by origin who was made works manager. From the moment of its establishment General Motors was the chief rival of the Ford Motor Company. The day of the giants had indeed arrived."

In 1908 the Ford Motor Co. had a gold mine in its Model T, now being marketed in five types—roadster, touring car, tour-about, town car, and landaulet. In 1910 Ford expanded into its new Highland Park plant. In 1913 mass production was fully born—the mass production that Ford gave its classical definition as the focusing of power, accuracy, speed, and continuity. In 1908 Ford produced 9.4% of all automobiles made in the USA. This figure rose to 20.3% in 1911, 39.6% in 1913, and 48% in 1914. In 1913 Ford was far and away the leader maker of low-priced cars (\$600 or less), with 96% of the market. In 1911 the Chevrolet Co. was incorporated; the designs of the talented automobile engineer Louis Chevrolet were its chief asset. By 1914, with the help of the financial genius of Wm. Durant and its plant at Flint, Michigan, Chevrolet had emerged to take an important place among the makers of medium-priced cars. Durant used Chevrolet to regain control of General Motors.

Appendix III gives total sales of Ford cars each year from 1903 to 1921. Appendix 4 gives the dollar value of sales of Ford cars from 1903 to 1921. In the peak year, 1921, sales were \$546 million on 933,720 cars. Appendix VI gives incomplete net income figures for the Ford Motor Co. from 1903 to 1921. In the peak calendar year, 1921, net income was \$75,890,836. Address: 1. Columbia Univ., New York.

541. Calvert, F.E. 1955. Recent technological developments in industrial soybean proteins. *TAPPI* 38(3):145A-147A. March. [1 ref]*

• **Summary:** Soybean proteins develop water resistance rapidly on aging of the dried coatings at room temperature. Address: The Drackett Co., Cincinnati, Ohio.

542. Diamond, Holton W. 1955. Vegetable fat whips for bakery and household use. Paper presented to the Institute of Food Technologists. 9 p. + 7 p. of descriptions of slides. June 12.

• **Summary:** The term "vegetable whip fats" is used to mean whippable emulsions used as alternatives for whipping cream. "When we say that an emulsion is whippable, we

mean that it is capable of undergoing a change in physical state from a liquid to a solid form by the retention of ingested air or other gas." No one knows for sure why some emulsions are whippable and others are not.

"In addition to fat and water, two other ingredients are essential in the formulation of whippable emulsions. One of these is a dispersant, generally a proteinaceous material of some kind; for example, non-fat milk solids, soy bean protein, gelatin, or whole egg. The other is a surface active material, without which the emulsion may be stable, but not whippable. Among the materials of this kind often used are mono- and diglycerides, phospholipids, sorbitan derivatives, and polyoxyethylene derivatives. Additional ingredients such as corn syrup solids, sucrose, and salt are usually added, but fat, surfactant, dispersant and water are the four essential elements of the emulsion."

Pages 4-5 state: "The use of special vegetable shortenings which contain not only hydrogenated vegetable oil, but also one or more surface active materials, is quite common in the topping business. It is well to remember in this connection that if these shortenings are made for some other use, they may introduce variations in the properties of the topping emulsions. A shortening containing mono and diglycerides may be controlled within tolerances which are adequate for its use in baked goods but not for its use in toppings."

"The careful selection and formulation of the essential emulsion ingredients comprises the most important factor in the control of whippable emulsion properties."

Note: Diamond felt this new understanding of the crucial role played by mono- and diglycerides represented an important discovery related to non-dairy whipped toppings. Address: American Maize-Products Co.

543. Smith, Robert A. 1955. Re: Interest in obtaining Rex Diamond's services and patents. Letter to Mr. Holton W. Diamond, 1542 Warwick Ave., Whiting, Indiana, Sept. 14. 1 p. Typed, with signature on letterhead.

• **Summary:** "Confirming our conversation of last Saturday, we are interested in acquiring your services and the patent rights and applications which we discussed.

"We are willing to pay the sum of \$5,000 for your patents and applications and offer you a salary of \$7,000 per year, plus a profit sharing bonus which will vary according to company profits, but we will guarantee a minimum of \$500.00 per year.

"We would like to sign a contract with you covering a period of three to five years on these terms. We will pay the cost of moving your furniture from Chicago to Detroit if we get together on this deal."

Note that the company name has changed from Delsoy Products, Inc. to Delsoy Distributors. Printed in the lower left corner of the letter is a small photo of a pressurized can of Delsoy Presto Whip. In the lower right corner is a photo of a container of Delsoy Topping in the shape of a truncated cone.

Address: Delsoy Distributors, 1847 South Telegraph Rd., Dearborn 8, Michigan. Phone: LOgan 3-1007.

544. Rich, Robert E. 1955. Re: Proposal to use Diamond's name in name of new product. Letter to Mr. Holton W. Diamond, 1542 Warwick Ave., Whiting, Indiana, Nov. 3. 1 p.

• **Summary:** "We are now getting the preliminary work readied to go into the bakery field with both feet. Rex, I think with your new formula, plus our country-wide distribution, we can make a terrific dent in this bakery field in short order..."

"I believe we will differentiate this new bakery product from our regular line by calling it 'Rich's Whip Topping-Diamond Process', if you think this is a good idea. The world 'Diamond' gives us possibilities showing diamonds on the sketches as well as using diamonds on our brochures and literature. In addition, it should help to make you well-known to the trade."

Concerning 4 questions that Rich asked Diamond about the product, Diamond responded on Nov. 7 that he would: (1) flavor the product with only a trace of ethyl vanillin to mask any native shortening aroma; (2) prefer a concentrate to a regular strength product; (3) suggest a tin can container, appropriately lines, rather than a paper one; (4) suggest two sizes, quart and 3 quart (#10 can). He notes that B.R. Taylor is Vice President of Finance for American Maize. Rex plans to arrive in Buffalo on Nov. 15. Address: Rich Products Corp., 1145 Niagara St., Buffalo 13, New York. Phone: GARfield 3211.

545. Rich Products Corp. 1955. Assignment. Buffalo, New York. 2 p. Nov. 25. Unpublished manuscript. [4 ref]

• **Summary:** In Nov. 1955 Holton W. "Rex" Diamond went to work for Robert E. "Bob" Rich, president of Rich Products in Buffalo, New York. Rex and Florence lived at 29 Campus Dr. in East Buffalo. This document shows that on 25 Nov. 1955, as part of a business deal, Rex sold, assigned, and transferred all rights, titles, and interests to all of his patents (3 issued and 1 applied for) to Bob Rich in return for \$5,000. American Maize Products Co. was granted a royalty-free, non-exclusive license under the invention of patent application No. 473,044 titled "Salad and Dessert Topping and Method of Making Same" [which was issued as U.S. Patent 2,863,653 on 13 Jan. 1959]. The agreement is signed by Holton W. Diamond.

Note: The process described in the patent titled "Salad and Dessert Topping and Method of Making Same" (No. 2,863,653) was used to make a new version of Rich-Whip, which soon became Rich Products' most successful product. It was a non-dairy protein-free whipped topping that used methyl ethyl cellulose as its key ingredient. Address: Buffalo, New York.

546. Rich Products Corp. 1955. Employment contract. Buffalo, New York. 3 p. Nov. 1. Unpublished manuscript. [4

ref]

• **Summary:** Rich Products hereby employs Holton W. Diamond for a period beginning November 15, 1955, for 3 years. "Diamond shall be in charge of the laboratory and development and research of Rich Products." Diamond shall receive a "minimum fixed salary" of \$8,500 per annum the first year and until 31 Dec. 1956, \$9,500 for 1957 and \$10,000 for 1958. He will also be paid "an amount equal to .0017% of the volume (in terms of dollars) of sales of all of the products of Rich Products in any contract year." The contract shall renew itself for additional 3-year periods unless either party gives 6 months prior written notice. Robert E. Rich and Holton W. Diamond signed the document. Address: Buffalo, New York.

547. *Buffalo Evening News (New York)*. 1955. New research head of Rich Products. Dec. 1. Financial section IV-61. Thursday.

• **Summary:** "Holton W. Diamond has been appointed research director of the Rich Products Corporation, 1145 Niagara St.

"Mr. Diamond has been in research and development of new food items for the American Maize Products Co., Roby, Indiana, and is a former chief chemist of the George Washington Carver Laboratory of the Ford Motor Co. He holds a number of basic patents in the soy bean whipping-cream field. Mr. Diamond is a 1936 graduate of Wilmington College [Ohio] and has studied in Wayne University and the Massachusetts Institute of Technology."

A portrait photo shows Rex Diamond.

548. Boyer, Robert A. Assignor to Swift & Company (Chicago, Illinois). 1956. Method of manufacturing a high protein food product and the resulting product. *U.S. Patent* 2,730,447. Jan. 10. 6 p. Application filed 2 Feb. 1953. [7 ref]

• **Summary:** A patent for spun soy protein fibers for food use. Numerous photomicrographs show the cross section of these fibers. Address: Cincinnati, Ohio.

549. Boyer, Robert A.; Saewert, Harold E. Assignors to Swift and Company (Chicago, Illinois). 1956. Method of preparing imitation meat products (pH control). *U.S. Patent* 2,730,448. Jan. 10. 2 p. Application filed 2 Feb. 1953. [7 ref]

• **Summary:** "The present invention relates in general to the treatment of edible protein material preparatory to forming the same into food products. This invention represents an improvement over the method disclosed and claimed in the earlier-filed application of Robert A. Boyer, Serial No. 118,445, entitled 'Synthetic Meat,' filed September 28, 1949, and now abandoned, and in the continuation-in-part thereof, Serial No. 286,447, filed May 6, 1952, now Patent No. 2,682,466."

In "the production of synthetic meat" soy protein is formed into fibers or filaments through the use of a

"spinneret." Groups of these "protein filaments" "are formed into bundles or tows and then freed from excess liquid by squeezing or centrifuging. The bundles of filaments are then mixed with a suitable binder..." Example II starts with "A tow of soybean fibers..."

Note 1. This is the earliest English-language document seen (Nov. 2003) that contains the term "imitation meat" or "imitation meat products" (with any combination of quotation marks).

Note 2. This is the earliest English-language document seen (Dec. 2004) that uses the term "protein filaments" to refer to edible spun soy protein fibers.

550. Cavert, William L. 1956. The technological revolution in agriculture, 1910-1955. *Agricultural History* 30(1):18-27. Jan. [23 ref]

• **Summary:** In 1910 practically all power on farms was human and animal power. Autos were largely playthings of the wealthy. In 1910 automobiles began to appear on farms, and by 1920 there were 2.15 million autos on farms or one car for every 3 farmers. At the same time there were only 139,000 trucks, or about 15 autos for each truck.

In 1910 over 25% of U.S. harvested crop land was used to grow crops that were fed to horses. Gasoline tractors were not common until the early 1920s and were at first used largely for plowing. The gasoline engine in its many applications after 1910 largely eliminated animal power on farms and revolutionized rural transportation.

Harvesting with combines did not make much progress east of the Rocky mountains until about 1930. The USDA estimated that less than 5% of America's wheat was harvested by combines in 1920, but this figure had increased to 50% in 1938. In 1930, 61,000 combines were reported by the census; in 1945, 375,000 and in 1953 918,000 were reported.

Electricity came later than the gas engine. The earliest known electrical line was in Oregon in 1906. In 1919 only 100,000 farms had electricity. The rapid increase in rural electrification came after 1935 with the establishment of the Rural Electrification Administration.

In 1910 some 72 million acres, or 25% of the harvested crop land, was used to provide feed for farm horses and mules, and another 16 million acres were used to provide feed for non-farm horses. In 1953, only 14 million acres of harvested crop land, or 4% of the total, were used for this purpose. Address: Director of Research, Farm Credit District of St. Paul.

551. **Product Name:** Rich's Whip Topping-The Diamond Process (Institutional Quart Size).

Manufacturer's Name: Rich Products Corporation.

Manufacturer's Address: 1145 Niagara St., Buffalo 13, New York. Phone: GARfield 3211.

Date of Introduction: 1956. May.

Ingredients: 1956: Water, hydrogenated vegetable oil 23.0%,

invert sugar 16.0%, modified vegetable stabilizers [incl. methyl ethyl cellulose], vegetable emulsifiers (less than 2% for both; derived from vegetable sources), salt, artificial flavor, carotene.

Wt/Vol., Packaging, Price: 7 lb can.

How Stored: Frozen.

New Product–Documentation: *Whip Topics* (Rich Products Corp., Buffalo, New York). 1956. June 13. Discusses the great success of “Diamond Process” institutional whip topping, apparently launched in a quart size in May 1956.

Letter from Robert E. Rich to his brokers. 1956. Aug. 22. “In all my years in the frozen food game, and you know we are the oldest specialty packer in operation today, I have never seen a single product with the sales potential of our Rich’s Diamond Process Whip Topping. We’re so enthusiastic about it that we’ve already begun the second story on our plant just to begin to handle the increased production we know is forth coming...”

Leaflet. ca. 1956. “Dietitian’s Data Sheet. Rich’s Diamond Process Whip Topping.” A photo shows a smiling woman holding a spoonful of a white topping. Next to her is a can of “Rich’s Whip Topping.” On the front panel, below the product name is written prominently “diamond process.” Ingredients: Water, hydrogenated vegetable oil 23.0%, invert sugar 16.0%, modified vegetable stabilizers, vegetable emulsifiers (less than 2% for both; derived from vegetable sources), salt, artificial flavor, carotene. “One quart of heavy cream ordinarily whips to 1.8 quarts; one quart of Rich’s Diamond Process whips to 4.0 quarts” but under ideal conditions can whip to 4.9 quarts. Whipped cream contains 3.8 calories per gram, whereas Rich’s Diamond Process Whip Topping contains only 2.9 calories per gram (less than one-half as many).

Contest form. 1956, autumn. “Rich’s Diamond Process Whip Topping kickoff promotion salesmen’s contest form.” This promotion ends on 30 Nov. 1956. Note: Rex Diamond writes (Letter size binder, Jan. 1966, p. 30): “Since the ‘Kick-Off’ promotion of 1956 until the ‘21st Anniversary’ promotion of 1965, the annual autumn promotion of Rich Products Corporation has been called ‘Diamond Dividend Days’ each year (1957-1964 inclusive).”

Rich Products Corp., Bakery Div. 1957. “New recipes for top profits: Rich’s diamond process Whip Topping.” Note: The company is still at 1145 Niagara St.

An undated photo sent by Rich Products Corp. to Soyfoods Center shows a large photo of can of this product on the back wall of an exhibit. The label on the can is the same as the product name shown above. But the larger sign next to the can on the back wall of the display reads: “Rich’s diamond process Whip Topping.”

An undated leaflet titled “Technical data for Rich’s Whip Topping–Diamond Process” shows a man looking into a microscope and discusses the following: Fat, cholesterol, carbohydrates, protein, stabilizers, emulsifiers, ash, and color. “Rich’s Diamond Process Whip Topping emulsions contain

no protein. They are unique in this country in this respect and are protected by United States Patent No. 2,868,653.” Stabilizers include cellulose gum, methyl cellulose, methyl ethyl cellulose, and sodium carboxy methyl cellulose (carboxymethylcellulose or CMC). Note 1. The latter, a word first used in 1947, is used as a thickening, emulsifying, and stabilizing agent.

On the reverse side of the leaflet a page, titled “proximate analysis” compares the composition of two types of Rich’s Diamond Process Whip Topping: (1) Ready to use in 2 lb cans; or Base for dilution in 2 lb, 7 lb, or 30 lb cans.

Note 2. This product contained no soy and no protein.

Rich Products of Canada, Ltd. (Fort Erie, Ontario, Canada). 1964. Oct. “You can win three big ways during Rich’s Diamond Dividend Days.”

552. Dudman, Ruth K. Assignor to Swift & Company (Chicago, Illinois). 1957. Method of making high-protein food products [Meat analogs]. *U.S. Patent* 2,785,069. March 12. 2 p. Application filed 5 Oct. 1953. [1 ref]

• **Summary:** Describes the preparation of a meat substitute made from protein filaments which are fused using heat alone. One object of this invention is “to provide a method for preparing food products from man-made, edible protein fibers without the use of extraneous binders.” An additional object is “to utilize the protein fibers themselves as the binding agent...” In this invention, “edible, man-made protein fibers” are subjected to the action of heat alone, causing them to fuse.

The author considers this process superior to the Boyer process. “Example 2. Soybean fibers... with a pH of 5.2 and a salt concentration of 3%, were squeezed to remove excess moisture. One hundred grams of these fibers were shaped into a 1 inch diameter bundle and placed on a rack in an uncovered pan in a 185°F oven. Fusion required 2 hours of heating at this temperature. A similar run in a 240°F oven required 1 hour of heating to produce fusion.”

553. Nyberg, Chris. 1957. Highlights in the development of the combine. *Agricultural Engineering* 38(7):528-29, 535. July.

• **Summary:** The earliest known operational combine was built and patented by Hiram Moore and J. Haschall of Kalamazoo, Michigan. The patent was issued on 28 June 1836. The machine was actually tested near Flowerfield, Michigan in 1835. Fig. 1 shows a model of the machine. On July 12, 1838, this machine, pulled by 20 horses and cutting a 15-foot swath, harvested a 30-acre field near climax, Michigan.

Early combines were pulled by horses (see Fig. 2). In the 1880s a steam engine was added to supply the power; in 1887 a Mr. Berry, who farmed 4,000 acres of wheat in Tulare County, California, built a 22-foot cut steam-driven self-propelled combine (Fig. 3). By 1912 steam engine had been replaced by an internal combustion engine.

Not much progress was made with self-propelled combines until the late 1930s, although experimental work was done in several places. Curt Baldwin had one in 1917, or perhaps earlier, and in 1923 in conjunction with his brothers and others, he had developed a model that mounted on a Fordson tractor.

A self-propelled combine called the Sunshine Auto Header (Fig. 5) was developed in Australia and made its first appearance in the USA and Canada in 1924. In the late 1920s some Australian combines were actually being made in Canada. "They used a different method of gleaning from that used by the American-made machines, in that instead of cutting off part of the stems along with the heads, they just simply stripped the heads off."

"The present type of self-propelled combine was introduced in 1938, and a number of them were sold in the United States and Canada. Sales remained rather small until 1944, when the shortage of labor caused by World War II, and the need for growing large acreages of wheat brought about a real impetus to the sales of these machines." Address: Senior Product Engineer, Implement Engineering, Tractor and Implement Div., Ford Motor Co.

554. Nevins, Allan; Hill, Frank Ernest. 1957. Ford: Expansion and challenge 1915-1933. Vol. 2. New York, NY: Charles Scribner's Sons. 714 p. Illust. Index. 24 cm. [350+* footnotes]

• **Summary:** By 1923 Henry Ford's company stores and commissaries were very efficient, had low prices, and "did a tremendous business... The Highland Park store alone, crowded every day, had a staff reaching 100 persons. Some of the food stuffs came from Ford farms—wheat grown on Ford land, with such rarities to gladden the heart of food faddists as soya bean flour bread, unbleached flour bread, 100 per cent whole wheat flour, and canned green soya beans."

Ford was strongly opposed to smoking and drinking, especially by his workers. His interest in diet came later. "He believed firmly that only one or several 'harmonious' types of food should be eaten at each meal, that tea and coffee should be avoided, and that sound diet should comprise mostly vegetables and very little meat. (This was related to his prejudice against animal husbandry, an activity he thought unworthy of man... He pointed out on one occasion that the automobile would do away with the horse, while 'we could make milk commercially and get by without eating meat, and so cut out these wasteful animals.')

"In 1929 Ford began experiments at Dearborn to discover a farm crop that would have both food value and possibilities for industrial use. After an extended exploration, he chose the soybean [in Dec. 1931], the value of which, particularly for nutritive purposes, was later to be confirmed scientifically. In this activity he was seeking once again to relate farming to manufacturing. Michigan farmers were soon urged to plant [soy] beans with the assurance that the Ford Motor Company would do everything possible to provide a market." Address:

Columbia Univ., New York.

555. *Buffalo Evening News (New York)*. 1958. Rich Products elects two vice presidents. Jan. 15.

• **Summary:** "The election of Jerrold W. Hannon as vice president in charge of sales and Holton W. Diamond as vice president in charge of research of Rich Products Corp., 1145 Niagara St., was announced today by President Robert E. Rich.

"Mr. Hannon has been with Rich Products since its inception in 1945 and for the past 12 years has been national sales manager. Prior to that time he was sales manager of the Wilber Farms Dairy, a Rich-owned operation.

"Mr. Diamond has been with Rich Products since 1955. Before joining Rich, he was chief chemist of the Ford Motor Co.'s George Washington Carver Laboratory." Photos show both men.

556. Diamond, Holton W. 1958. Re: Update on his life and work. Letter to Dr. O.F. Boyd, Prof. of Chemistry, Emeritus, Wilmington College, Wilmington, Ohio, April 15. 2 p.

• **Summary:** Prof. Boyd apparently taught Rex Diamond chemistry at Wilmington College in Wilmington, Ohio. "Following my graduation in 1936, I roved among a number of jobs and activities, never quite satisfied. This orientation period included a term in the Methodist ministry, at Drew University Graduate School of Theology. You may recall my interest in YMCA and Gospel Team Work while I was a student at Wilmington College."

"During 1942, while working in Detroit [Michigan], I enrolled in night school at Wayne State University [in Detroit], taking courses, among others, in Advanced Organic and High Polymers. From the University I obtained a position in the Research Department of the Ford Motor Company, in the synthetic rubber development department, supervising a project group on butadiene synthesis. When the entire synthetic rubber research program at Ford was abandoned, I was given a choice of three other jobs in the Company's technical organizations, and chose to go to the George Washington Carver Laboratory in Dearborn, where I became acquainted with soy bean foods and the late Henry Ford, who maintained the laboratory as a sort of personal hobby, officially as a memorial to his good friend, Dr. Carver. Mr. Ford spent a great deal of time at the laboratory, usually dropping in two or three times a week to visit, and often spending the entire day with us. Working for him and sharing his ideas, as you can imagine, was a stimulating and interesting experience.

"I also became acquainted at the George Washington Carver Laboratory with a girl whom I interviewed for a job in the laboratory, Florence Barbier, a graduate of Stephens College, and with whom I have since become much better acquainted. Before we were married, *she* washed the dishes for *me*.

"I have been interested in soy foods, particularly 'soy cream', and the phenomenon involved in the 'whipping' or phase-reversal, of such emulsions, for the past fifteen years.

"Rich Products Corporation is America's oldest and largest manufacturer of frozen whippable emulsions, and the oldest specialty packer in the entire frozen food industry. We carry inventories in over one hundred public warehouses across the country, and number the world's largest users among our customers. We manufacture a variety of these emulsions, some for fountain use, some for household use, and others for bakery applications. Most people are a little surprised to learn of the large quantities of these materials used; as for example, a customer of ours in New England whips 700 to 1000 gallons of our emulsion per day, to cover the tops of 'soft' pies, chocolate, coconut cream, and the like. I have enjoyed very much being associated with such a new and growing technology, and being a part of a dynamic and thriving business. In January of this year I was elected to the Board of Directors of Rich Products Corporation, and appointed a vice-president.

"We have no children, and Flo and I are conveniently cliff dwellers at the address shown above, on the top floor of Buffalo's tallest apartment building." Address: 800 West Ferry St., Buffalo, New York.

557. *State Times (Jackson, Mississippi)*. 1958. Buckeye plant to close here. Cotton declines. Nov. 4. p. 5-A.

• **Summary:** "The Buckeye Cellulose Corp. will close its plants here and in Macon, Georgia, at the end of the current crushing season, the firm announced Tuesday. President Walter L. Lingle, Jr. said in Cincinnati, Ohio, headquarters of the firm, that the permanent closing of operations of the two plants is due to continuing decline of cotton crops in this part of the South."

"Simultaneous with announcement of the closing here, Buckeye announced plans to sell four soybean crushing mills to Ralston Purina Co., St. Louis, manufacturer of animal feeds. In making this announcement, Lingle said: 'Buckeye entered the soybean crushing business primarily to supply Procter and Gamble with soybean oil for food products. Recently, however, the increasing importance of soybean meal for animal feed has made it desirable for soybean crushers to enter the mixed animal feed business. That's just not Buckeye's or Procter and Gamble's kind of business, so it became sound business policy for us to buy soybean oil on the open market and to dispose of the facilities for crushing soybean seed. Purchase of the mills is logical for Ralston Purina...' The mills are located in New Madrid, Missouri; Louisville, Kentucky; Raleigh, North Carolina; and Memphis (Binghampton), Tennessee."

Note: This is the earliest document seen (Oct. 2005) that mentions "Buckeye Cellulose Corp." in connection with soybean processing. The name "Buckeye Cotton Oil Co." had previously been used.

558. *Nebraska Certified Seed News*. 1958. Ford—A new soybean variety. 15(10):3, 7. Nov.

• **Summary:** This new soybean variety, which was developed by the Iowa Experiment Station, will first be available to Nebraska farmers in 1959. It is expected to be higher yielding than Hawkeye, Adams, or Lincoln—and is expected to replace all of the Lincoln acreage and part of Adams and Hawkeye in Nebraska. In yield, it consistently exceeds Adams and Lincoln by 1-3 bushels/acre. In maturity, it is 7 days earlier than Clark, one day earlier than Lincoln, and about 5 days later than Hawkeye. In lodging, it stands somewhat better than Adams and Lincoln. In oil and protein content, it is comparable to Lincoln. A table shows the results of yield tests at four locations in Nebraska (northeast, east-central, central, and southeast) from 1953 to 1957. A large photo shows LaMoine Brownlee, Assistant Manager of the Foundation Seed Division, holding several Ford soybean plants and standing in front of a field of Fords.

Development of the Ford variety: In 1941, to improve the standability of the Lincoln, it was crossed with the Richland (which is resistant to lodging) at the Iowa Experiment Station. His hybrid was then crossed back to Lincoln at the Illinois Experiment Station. Hundreds of selections from this backcross were made at Iowa State College over a period of 13 years. The best of these was tested in Iowa, Nebraska, and other North-Central states. The U.S. Regional Soybean Laboratory also cooperated. Ford was the one that proved most outstanding.

Appearance: Ford looks very much like Lincoln with white flowers. Its seeds are yellow with a black hilum, and nearly round.

"Availability of seed: Ford is being increased in Iowa, Nebraska and South Dakota in 1958. Seed available from the Foundation Seed Division of the Nebraska College of Agriculture for 1959 planting will go to certified seed growers in the areas where the variety is best adapted. Seed should be generally available to soybean growers in 1960."

Note: This is the earliest document seen (Dec. 1998) that mentions the Ford soybean variety.

559. Weber, C.R. 1958. A new soybean—it's Ford! *Iowa Farm Science* 13(5):95-96. Nov.

• **Summary:** Ford, which considered best suited for Central Iowa, has outyielded Adams and Lincoln by an average of 2.5 bushels/acre; it matures 1 day earlier than Lincoln, 2 days earlier than Adams, and 1 week earlier than Clark. The oil and protein content of the seed of Ford is similar to that of Lincoln and Clark; the plants are similar in height to Lincoln, Adams, and Clark, but is less susceptible to lodging. A photo shows Weber standing in a field of breeder's stock Ford soybeans in 1958. Address: Assoc. Prof. of Agronomy, Iowa State College, and Agronomist, CRS, ARS, USDA.

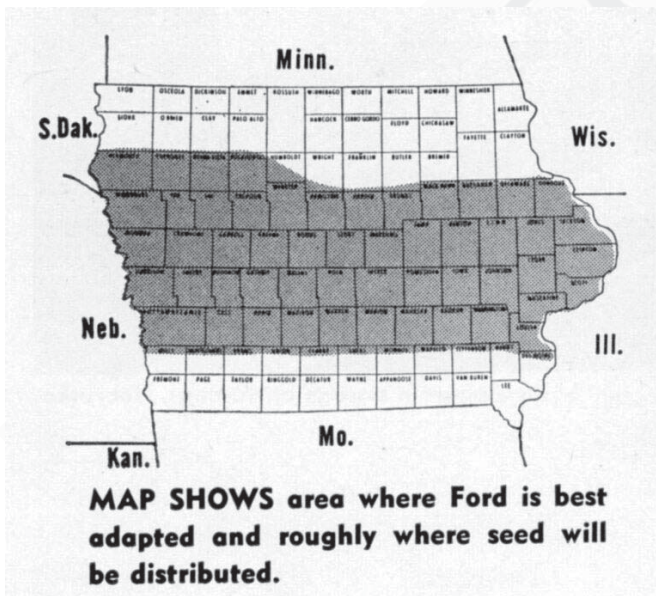
560. Ford: New U.S. domestic soybean variety. 1958. Seed color: Yellow, hilum black.

• **Summary:** Sources: *Nebraska Certified Seed News*. 1958. "Ford—A new soybean variety." Nov. p. 3, 7. Ford is new soybean variety, which was developed by the Iowa Experiment Station; it will first be available to Nebraska farmers in 1959.

Weber, Charles R. 1958. "Ford—A new soybean." *Soybean Digest*. Dec. p. 14-15. "The new soybean variety, Ford, will be grown by farmers in north central and south Central Iowa for the first time in 1959." Ford outyields Adams and Lincoln by an average of more than 2½ bushels/acre in Iowa; it ranks just below Clark in yield. Chippewa is now best for northern Iowa, Ford for central Iowa, and Clark for southern Iowa. Details on its performance are given. Photos show: C.R. Weber looking over a field of breeder's stock Ford soybeans in 1958. Individual Chippewa, Ford, and Clark soybean plants. A map shows the counties in Iowa to which Ford is best adapted.

Johnson, Herbert W. 1960. *Registration of soybean varieties, VII* [Acme, Bienville, Comet, Ford, Hill, Hood, Lindarin, Merit, Shelby]. *Agronomy Journal* 52(11):659-60. Nov. The soybean variety Ford was developed in a cooperative program of the Iowa Agricultural Experiment Station and the U.S. Regional Soybean Laboratory. Released in 1958, it has seeds that are nearly round and have black hila, yellow seed coats, and yellow cotyledons. Address: USA.

561. Weber, Charles R. 1958. Ford—A new soybean. *Soybean Digest*. Dec. p. 14-15.



• **Summary:** "The new soybean variety, Ford, will be grown by farmers in north central and south Central Iowa for the first time in 1959." Ford outyields Adams and Lincoln by an average of more than 2½ bushels/acre in Iowa; it ranks just



below Clark in yield. Chippewa is now best for northern Iowa, Ford for central Iowa, and Clark for southern Iowa. Details on its performance are given. Photos show: C.R. Weber looking over a field of breeder's stock Ford soybeans in 1958. Individual Chippewa, Ford, and Clark soybean plants. A map shows the counties in Iowa to which Ford is best adapted. Address: ARS-USDA, Assoc. Prof. of Agronomy, Iowa State College, and agronomist, crops research div.,

562. Altschul, Aaron M. ed. 1958. *Processed plant protein foodstuffs*. New York, NY: Academic Press, Inc. xv + 955 p. Illust. Author index. Subject index. 24 cm. [3300 ref]

• **Summary:** This book contains 33 chapters by various authors; chapters related to soya are cited separately. Contents: List of contributors. Preface, by Altschul. 1. Introduction, by M.L. Anson and A.M. Altschul. Part I: General properties of plant proteins and their utilization. 2. Proteins, by C.M. Lyman. 3. Plant proteins, by A. Bondi. 4. Processing of oilseeds, by H.D. Fincher. 5. Effect of heat on plant proteins, by Irvin E. Liener. 6. Effect of other processing factors on vegetable protein meals, by K.A. Kuiken. 7. Evaluation of protein quality, by C.R. Grau and R.W. Carroll. 8. Use of processed plant proteins in mixed feeds, by N.R. Ellis. 9. Use of processed plant proteins as human food, by R.F.A. Dean. 10. Vegetable protein isolates, by Allan K. Smith. 11. Potential uses of oilseed protein in foodstuffs, by M.L. Anson. 12. Chemical sources of nitrogen as supplements to protein feeds, by J.K. Loosli. 13. Supplementation of plant protein with amino acids, by J. Waddell.

Part II: Processed plant proteins. 14. Soybean oil meal, by W.W. Cravens and Endre Sipos. 15. Edible isolated soybean protein, by Circle and Johnson. 16. Groundnuts (peanuts) and groundnut meal, by Gordon D. Rosen (J. Bibby & Sons, Ltd., Liverpool, England). 17. Cottonseed meal, by A.M. Altschul, C.M. Lyman, and F.H. Thurber. 18. Sesame meal, by Robert W. Caldwell. 19. Sunflower seed oil meal, by D.R. Clandenin. 20. Rapeseed, mustard-seed, and poppy-seed meals, by B.C. Christian. 21. Linseed oil meal,

by Seth W. Peterson. 22. Minor oilseed and tree nut meals, by J.A. Kneeland (safflower, almonds, walnut, babassu, hempseed, pecans, Illipé nut). 23. Coconut oil meal, by Leo V. Curtin. 24. Palm kernel meal, by J.G. Collingwood. 25. Alfalfa and other leaf meals, by C. Ray Thompson. 26. Peas and beans, by I. Deschamps. 27. Fermentation feedstuffs, by C.S. Boruff and J.M. Van Lanen. 28. Milling feeds, by R.D. Seeley. 29. Microbial proteins, by J.L. Stokes. 30. The algae, by W.A.P. Black. 31. Inedible oilseed meals, by Don S. Bolley and Raiford L. Holmes (castor, tung, aceituno, other). 32. Plant residues and pomaces, by E.G. Kelley. 33. Amino acid composition of foodstuffs. Appendix: National average food supplies.

Note: This is the earliest publication seen written by Aaron Altschul about soya. Address: USDA, New Orleans, Louisiana.

563. Anson, M.L. 1958. Potential uses of isolated oilseed protein in foodstuffs. In: A.M. Altschul, ed. 1958. *Processed Plant Protein Foodstuffs*. New York: Academic Press. xv + 955 p. See p. 277-89. Chap. 11. [12 ref]

• **Summary:** Contents: Introduction. Preparation and advantages of isolated protein: Conditions for consumption of oilseed protein by man, soybean products eaten by man, oilseed components and isolation of the protein, advantages of protein isolation, soybean curd, modern possibilities of utilizing isolated soy protein, isolated soy protein. Uses of isolated protein: Fortification of bread and cereals, products like animal protein products (products like milk products, meatlike textures, nutrition and flavor, no necessity for perfect imitation of existing protein products), special uses for young mammals and the sick (isolated protein for young mammals, isolated protein for infants, isolated protein for the sick). Cost of isolated protein: Cost of protein for man, limitation of soy flour. Fermentation products. Cheap animal products: Fish protein, skim milk powder. Summary.

"The only oilseed protein consumed by man on a large scale in any form is soy protein. This has been done for thousands of years in the Orient as a basic part of the way of life for large populations, but only because methods were discovered for converting soybeans into acceptable products by radical processing beyond the mere removal of oil."

Soybean curd: "The ancient Chinese discovery of the technology of producing curd was a great historic step in the direct utilization of oilseed protein by man and has made possible a great protein nutritional experiment on many millions of subjects.

"Modern possibilities of utilizing isolated soy protein: The traditional manufacture of soybean curd, which is still carried out on a vast scale in the Orient, points the way to a modern technology of using soy protein for man based on the separation of the soy protein from the other components of the bean. The wonder is that the oriental experience has been so long neglected." (p. 279).

Concerning products like milk products: "For a while during World War II, the Ford Motor Company, as a result of Henry Ford's interest in soybean products, sold soybean 'ice cream' in its cafeterias. All the usual ingredients of ice cream were replaced by soy ingredients." Note: This is the earliest document seen (April 2000) that mentions soy ice cream in connection with the Ford Motor Co.

"My own opinion is that, just as the conversion of oilseeds to oilseed meals through processing created a revolution in animal feeding, so the further processing of oilseed meals into isolated protein and into complex foods containing isolated protein will create a second revolution. The millions of tons of oilseeds throughout the world, the basic complex raw materials which neither man nor beast can synthesize cheaply, are readily available as a starting point for the new technology." Address: Cambridge, Massachusetts (Present address: 100 Eaton Square, London, S.W. 1, England).

564. Didzun, Stewart. 1959. Henry Ford knew his onions: But he kept 'em off his hamburgers. *Detroit News*. Jan. 11. p. A-1, col. 1.

• **Summary:** A discussion of Henry Ford's views on diet. He died in 1947 at age 83. Last week Russia's No. 2 man, Soviet Deputy Premier Anastas I. Mikoyan, visited Detroit and met with Henry Ford's grandson, Henry Ford II, present head of the Ford auto empire. Mikoyan said that Henry Ford advised him not to build meat packing plants in Russia because meat was bad for people to eat. "Henry Ford II replied: 'Yes, grandfather preferred soybeans.'"

Henry Ford's views on diet were controversial. In 1929 he told American clergymen that they should use the pulpit to tell people how to eat. He encouraged American housewives to stay out of politics and spend more time in the kitchen "so there would be less sickness in the world." He advocated and practiced eating only fruits for breakfast, only protein foods for lunch, and only starchy foods for dinner. Research at Ford had found that the three food groups do not mix well in the stomach. He believed that only vegetables can be eaten safely with any meal.

Ford did not drink alcohol and was a strong prohibitionist. He believed that the desire for liquor is created by wrong combinations of food. He once said: "If people would learn to eat the things they should eat, there would be no need for hospitals. Jails and prisons would have less to do."

Ford was probably the most publicized advocate of the soybean. In 1930 he began investigating soybeans, and he spent more than a million dollars over the next few years investigating how to grow and to use them. There follows a summary of the many ways he used soybeans.

565. Diamond, Holton W.; Powell, Eugene L. Assignors, by mesne assignments, to Robert E. Rich, Buffalo, New York. 1959. Salad and dessert topping. *U.S. Patent* 2,868,653. Jan. 13. 3 p. Application filed 3 Dec. 1954. [5 ref]

• **Summary:** This is the patent for the “Diamond Process” whip toppings that played a key role in making Rich Products a successful company. Rex Diamond developed this process while he was working for American Maize Co. The product is unique among whip toppings in that it contains no protein. Methyl ethyl cellulose is the key stabilizer. One example of the ingredients by weight: Water soluble methyl ethyl cellulose 2.0, hydrogenated cottonseed oil 30.0, polyoxyethylene glycol monostearate 0.2, water 67.8. The rights to the patent were assigned to Robert E. Rich by Holton W. Diamond on 25 Nov. 1955. Address: 1. Whiting, Indiana; 2. Chicago, Illinois.

566. Cavanagh, Helen M. 1959. The miracle bean (Document part). In: Helen M. Cavanagh. 1959. Seed, Soil and Science: The Story of Eugene D. Funk. Chicago, Illinois: Lakeside Press, R.R. Donnelley & Sons Co. xii + 544 p. See p. 349-77, 503-05 (Notes). Chap. 26. 22 cm. [92 endnotes]

• **Summary:** This chapter is about Funk Bros.’s work with soybeans. “As part of its field seed business, Funk Bros. sold soybeans for feed purposes as early as 1903... Eugene was among the early advocates of increased planting of soybeans in the early nineteen twenties... Eugene Funk watched with growing attention a mill operated by George Brett and I.C. Bradley at Chicago Heights, Illinois. This mill processed soybeans in 1919 with an expeller plant... Through the efforts of Otto Eisenschiml of Chicago four tanks of oil produced in 1921 were sold...”

“E.D. Funk, Sr. described the coming of the soybean to the farming system of corn, oats, wheat and clover rotations in the Central Corn Belt as follows: ‘Once in a life time! Yes, only once in the annals of crop production has our agronomy experienced anything like the Soybean... Oats fell in acreage before it. Corn and wheat were challenged as cash income crops. Even in the realm of soil building, it threatened established legumes.’ At Funk Farms acreages were turned over to producing seed to meet the demand. Over 2,000 bushels of their crop were hand picked in 1921 to obtain every possible pound of pure merchantable beans.”

In 1924 Gene Funk, Sr., established a soybean processing plant in Bloomington. It started in the fall of that year, with two expellers and a capacity of 300-350 bushels per day. During its first year, the plant operated for about 5 months and processed approximately 20,000 bushels of soybeans. The company showed a profit in 1925, following a loss during the first year. By 1929 the plant had a capacity of 800 bushels/day. I.C. Bradley came to the Funks as manager of their soybean mill.

Concerning the origins of the Peoria Plan (p. 352): “A second step in the expansion of soybean production was possible because of leadership in central Illinois. There was a need for meal on the part of the Grange League Federation organization of New York. The acquaintanceship of H.G. Atwood of American Milling Company of Peoria with James A. McConnell of G.L.F. on the one hand and with Funk

Bros. of Bloomington on the other, facilitated a discussion of the problem. I.C. Bradley stated that he and Eugene Funk interested Atwood in an idea sometimes attributed originally to American Milling Company. It is fair to say that Funk and Bradley did as much to initiate the introduction of a guaranteed price as anyone. Without Eugene Funk’s initiative and knowledge of agricultural conditions a combination of cooperative leadership might not have resulted. H.H. Miller also provided able guidance for this program. It is also fair to say that without Atwood and McConnell the plan would not have succeeded. The American Milling Company placed in operation an unused factory in Peoria where I.C. Bradley helped to install machinery to remove oil and grind soybean cake into meal. The decision of G.L.F. to buy meal for the New York Milkshed created a wide market. A guaranteed price of \$1.35 per bushel was offered up to a total of a million bushels in 1928 to 1,500 Illinois farmers for beans by Funk Bros. of Bloomington, by the American Milling Company of Peoria and by Cooperative G.L.F. Incorporated. The *G.L.F. Shareholder* (Jan. 1929, p. 27) stated that their organization realized that prospective supplies would be inadequate, and knew that a protein shortage would be costly to G.L.F. patrons. They, therefore, entered he agreement to secure a supply of protein with the dairy feed market as its primary outlet. The source was the farms of Illinois and the product was soybeans. The Illinois College of Agriculture, the Farm Bureau and the *Prairie Farmer* cooperated.

“The final decision regarding the guarantee for the 1928 crop was made at a meeting in Urbana of fifteen county farm advisors, representatives of Funk Bros. and of the American Milling Company. A committee of three was named to draw up the agreements. I.C. Bradley commented many years later:

“We solicited the aid of the late Mr. H.G. Atwood, President of American Milling Co., at that time, which later became Allied Mills, Inc. His first reaction was in this response... “The farmers are our customers. His stock needs protein. He should produce it.” That was the “Spark Plus” for the beginning of a new and great industry. He said we will take all of the meal your plant can produce.”

Note: Endnote #22 (p. 519) states that the American Milling Co. received signed contracts for 32,000 acres by May 1, 1928 and 50,000 acres by October, 1928.

“A.E. Wand of Staley’s attended the Urbana meeting. He left with word that he would urge them to join but he apparently was not instrumental in gaining this action. However, Staley continued to provide a market for beans and was increasingly interested in the development of this crop.

“The million bushel limit in 1928 was considered adequate. Only one-half that amount was offered to mills in the area during the previous season. The 1927 U.S.A. crop was 2,288,000 bushels. About three-fourths of this amount was used for feed and for purposes other than for milling. The guaranteed price in 1928 of \$1.35 per bushel was for No. 2 grade beans and was considered satisfactory by the farmers.

Under the agreement, if the farmer negotiated to grow beans he was not compelled to ship to either of the participating companies if others offered higher prices. Agreements for 1928 in order to stimulate production were made in terms of acres instead of bushels. [Endnote #25 (p. 519): "Contracting mills received contract and non contract beans on the same basis. Contract buyers were compelled to take nearly 40 per cent more beans than intended."] Strictly speaking, this announcement was a guarantee, not a contract." J.A. Waring, who came to work for Funk Bros. in 1927 after many years experience in the grain business, handled the paper and contracts for the program in 1928 from the office of Funk Bros. He recalled (Jan. 1956) that most of the contracts of the three companies were mailed from the Funk office.

"The legume project of the University of Illinois during the season 1928 placed its chief emphasis on the soybean. This program was composed of two parts: (1) To standardize better adapted varieties through publicity and field demonstration; (2) To assist in supplying a satisfactory market for surplus seed and for beans of lower quality."

The three companies who used nearly all of the crop were interested for different reasons: (1) Funk Bros. for production of oil and meal from soybeans; (2) The American Milling Company for production of soybean meal and; (3) The G.L.F. Exchange as the largest buyer of soybean meal in the United States. Deliveries reached 650,000 bushels in Peoria and 350,000 at Funk Bros. in December when the million bushels were received.

"Better varieties of beans were used: Manchu, a good yielder with a high oil content and the Illini which stood better than other varieties. Grading also was important. Probably 90 percent of the farmers were satisfied with the agreement."

"The manufacturers were equally pleased."

This chapter also notes: "A new wooden elevator with a capacity of 40,000 bushels was constructed by Funk Bros. near the warehouse during the fall of 1928. On the morning of March 12, 1929 with the elevator about two-thirds full, fire destroyed the structure. Some [soy] beans were destroyed, and many more were water soaked. Arrangements were made with Allied Mills of Peoria to dry the beans... Fortunately the full amount of the insurance was paid. This was indeed a disheartening moment in the development of the soybean business at Funk Bros. Decision to proceed with the construction of a concrete elevator of 140,000 bushel capacity followed almost immediately" (p. 360-61).

Also discusses: I.C. Bradley, who became manager of the Funk Mill at Taylorville (p. 361). The Soybean Marketing Association, which held its first meeting on 7 Dec. 1929 (p. 361, 363-67). Soybean standards, announced by the USDA in 1925 (p. 362). The National Soybean Oil Manufacturers Association, which held its organizational meeting on 21 May 1930 (p. 362-63). The formation of Soya Products, a company run jointly by Funk Bros. and Allied Mills (p. 367). I.F. Laucks

Inc., which used soybean flour to produce a waterproof glue (p. 368). Dr. W.L. Burlison (p. 369, 373). Early use of soybean meal in mixed feeds (p. 370). The big 1936 Farm Chemurgic Council meeting in Detroit and Dearborn, Michigan; Eugene Funk, Sr. spoke (p. 370). Henry Ford's work with soybeans (p. 370). E.D. Funk, Jr. is chairman of the Edible Soybean Committee of the National Soybean Processors Association from 1939-1947 (p. 372-73). Dr. Earl Sieveking of Funk Bros. develops "edible soybeans," especially Funk's Delicious (p. 373). Other popular varieties of "vegetable soybeans" were Giant Green, Bansei, and Hokkaido (p. 373-74). Expansion of the Funk Bros. soybean processing plant; capacity reached 4,350 bushels/day in 1944 (p. 374-75). Acquisition of new French solvent extractor, which begins operation in Jan. 1952 (p. 375-76). The largest users of Funk's soybean meal included Ralston Purina, Allied Mills, Arcady Farms, and Hales and Hunter. Major buyers of Funk's crude or unrefined soybean oil included Procter & Gamble, Lever Bros., Glidden, Swift & Co., and Anderson-Clayton (p. 377).

This chapter concludes: "The decision by Funk Bros. to install the soybean mill in 1924 gave greater diversification to the seed business. It is an interesting fact in agricultural history that the sudden rise of the soybean to prominence as a cash crop in the 1920's and 1930's paralleled the spectacular advancement in hybrid corn. Eugene D. Funk was a recognized leader in the expanding development of both crops essential to the well being of many Americans. Again Gene Funk led in an effort to better conditions for the farmers in the Corn Belt." (p. 374-75).

Photos show: (1) Eugene D. Funk, wearing a cowboy hat and necktie, standing tall by tall corn (opposite the title page). (2) Aerial view of the Funk Bros. Seed Co., and side view of the Research Center, both Bloomington, Illinois (p. 324). Address: Bloomington, Illinois.

567. Cook, J. Gordon. 1959. Handbook of textile fibres. Watford, Herts., UK: Merrow Publishing Co. Ltd. xxv + 422 p. Index. 19 cm.

• **Summary:** Contents: I. Natural Fibres: A. Natural fibres of vegetable origin. B. Natural fibres of animal origin. C. Natural fibres of mineral origin (asbestos). Part II: Man-made fibres. A. Regenerated fibres (Rayons, cellulose ester fibres, protein fibres [incl. casein fibres and soya-bean fibres]), B. Synthetic fibres (Polyamides [incl. Nylon], Polyesters [incl. Dacron], Polyvinyl derivatives [incl. Orlon, Saran, Teflon], Polyolefines, Miscellaneous synthetic fibres).

Page 227 states that the Ford Motor Co. has pioneered in the spinning of soy protein into fibers. Production was begun in 1939 and reached more than 3 tons a week by 1942. The fiber was used for making car upholstery. Production was taken over in 1943 by The Drackett Products Co. of Cincinnati, Ohio, but discontinued after a few years. Address: Ph.D., F.R.I.C., England.

568. Zeisler, Karl F. 1960. Soy beans. *Flower Grower and Home Garden Magazine* 47(2):20, 22. Feb.

• **Summary:** Few American bean eaters know the flavor of the edible soy bean. "I have grown soy beans in my garden for nearly 20 years, have never had a crop failure, have never been disappointed in the abundant yield, and still delight in introducing gourmets to a new vegetable taste that is nutty as dry sherry, crisp as water chestnuts, aromatic as fresh-picked baby limas and yet almost as sweet as early peas. It's a home garden crop you can't miss on... It is a piquant nugget for tossed salads, a meat-extender for meatloaf and substitute for cracker crumbs atop a casserole." He likes the Bansei variety. Discusses how Henry Ford grew non-edible soy beans on 10,000 acres in Lenawee County, Michigan. To keep cottontail rabbits from eating young soybeans, cover them with chicken wire. Address: Teacher of journalism, Univ. of Michigan.

569. Johnson, Herbert W. 1960. Registration of soybean varieties, VII [Acme, Bienville, Comet, Ford, Hill, Hood, Lindarin, Merit, Shelby]. *Agronomy Journal* 52(11):659-60. Nov. [21 ref]

• **Summary:** Gives details on the following soybean varieties: Acme (No. 25), Bienville (No. 26), Comet (No. 27), Ford (No. 28), Hill (No. 29), Hood (No. 30), Lindarin (No. 31), Merit (No. 32), and Shelby (No. 33). Address: Research Agronomist, Crops Research Div., ARS, USDA, Beltsville, Maryland.

570. **Product Name:** Presto Whip (All-Vegetable Soymilk-Based Non-Dairy Whip Topping in a Pressurized Can with Valve-Frozen).

Manufacturer's Name: Delsoy Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1960.

Ingredients: Incl. soymilk, vegetable oil, sugar.

Wt/Vol., Packaging, Price: 10 oz pressurized can with valve.

How Stored: Frozen.

New Product-Documentation: Talk with David and Harvey Whitehouse. 1992. Feb. 4. In about 1960 Harvey Whitehouse began freezing Presto Whip, so that they could store the product frozen and ship it nationwide—but the product was never advertised as frozen.

571. **Product Name:** Delsoy Topping (All-Vegetable Soymilk-Based Non-Dairy Whip Topping-Frozen).

Manufacturer's Name: Delsoy Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1960.

Ingredients: Incl. soymilk, vegetable oil, sugar.

How Stored: Frozen.

New Product-Documentation: Talk with David and Harvey Whitehouse. 1992. Feb. 4. In about 1960 Harvey Whitehouse

began freezing Delsoy Topping, so that they could store the product frozen and ship it nationwide—but the product was never advertised as frozen.

572. Hollander, Stanley C.; Marple, Gary A. 1960. Henry Ford: Inventor of the supermarket? East Lansing, Michigan: Bureau of Business and Economic Research, Graduate School of Business Administration, Michigan State University. 54 p. 25 cm. MSU Marketing and Transportation Paper No. 9. [164+* ref]

• **Summary:** "In 1927 *The Ford Tradesman* (a retail trade magazine) described Henry Ford as a '... distributing and marketing genius such as the world has never before produced.' The accolade was not conferred without resentment. Both the praise and the irritation were caused by Ford's unique venture into grocery and clothing retailing: the Ford commissary stores.

"The first Ford commissary was opened in December, 1919 for the benefit of workers at the Ford Highland Park plant, and was soon followed by others. In 1926, when the stores reached a peak in their growth and excited national attention, there were eleven, scattered from Michigan's Upper Peninsula to Twin Branch, West Virginia...

"In many ways, the Ford stores were really *super* supermarkets... Ford commissaries exemplified modern techniques of mass retailing. The logistics of stock handling and merchandise movement within the stores was developed to a high degree of efficiency. In 1926, the eleven commissaries sold \$12 million worth of merchandise. Sales at Highland Park alone reached almost \$7 million that year. This one store... undersold all competitive stores including the chains (except on leader items), and earned a profit of \$262,538, or approximately 3.8 percent on sales...

"Most authorities consider the early 1930's as the birthdate of the supermarket. If so, Henry Ford anticipated this major retailing innovation by at least ten years... The genesis of the Ford stores can best be appreciated in the light of the economics of 1914-1920. Consumer prices had risen sharply during both the war and the first two postwar years."

Henry Ford lived 1863-1947. Address: 1. Prof. of Business Administration; 2. Asst. Instructor. Both: Dep. of Marketing and Transportation Administration, Michigan State Univ.

573. **Product Name:** Delwhip Topping (All-Vegetable Soymilk-Based Non-Dairy Whip Topping-Frozen), and Delwhip Topping Base.

Manufacturer's Name: Delsoy Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1960?

Ingredients: Incl. soymilk, vegetable oil, sugar.

How Stored: Frozen.

New Product-Documentation: Talk with David and Harvey Whitehouse. 1992. Feb. 4. Most of the sales of Delsoy

Topping were to bakers and restaurants—not to consumers. At some point prior to 1961 the name of their frozen product, Delsoy Topping, was changed to Delwhip Topping, and a new product named Delwhip Topping Base was introduced; it was a concentrate to which one had to add water to reconstitute it. The name of Presto Whip remained unchanged.

574. Ford Motor Co. 1960? Chemical Laboratory (#95) (Leaflet). Dearborn, Michigan. 1 p. Undated.

• **Summary:** “I. Built in Greenfield Village early in 1929 as a chemical laboratory. A. Henry Ford had long sought a link between agriculture and chemistry. 1. Many experiments with farm products conducted to find basis for durable plastic material. 2. In 1931 soybeans found to have best plastic potential... Soybeans today yield many products—have many uses. (1) Oil: extracted for paints, printer’s ink, explosives, butter and rubber substitutes. (2) Meal: basis for plastics, glue, food for animals and people (flour—bread). (3) The plant itself is used for livestock silage and fodder.

“B. Laboratory experiments produced hard plastic material from soybean meal. 1. 1933—used to make horn buttons, gearshift knobs for Ford cars. 2. By 1941—soybean plastic produced distributor caps, coil cases, accelerator pedals. 3. About 1941, soybean plastic industry moved to more adequate quarters at Ford Rouge Plant— shortly after, all work terminated, due to World War II.

“II. Building now used as shipping and receiving depot of The Edison Institute.

III. Building is significant as site of one of Henry Ford’s many activities and as essentially the world’s first industrial plastics laboratory.”

Note 1. An earlier but less complete version of this leaflet, with the same title, is No. 84, dated Feb. 1956.

Note 2. Interpretation by Ford R. Bryan (of Henry Ford Museum & Greenfield Village) in letter to William Shurtleff (29 Sept. 1993). “This sheet... was written as information for interpreters as they toured the Village with groups of visitors during winter months. The visitors did not go into the buildings. This might have been about 1960. The public was never invited inside the Chemical Laboratory, winter or summer. For several years the Laboratory was used as a shipping-receiving warehouse. Now it serves as a railroad ticket office.” Address: Dearborn, Michigan.

575. **Product Name:** Rich’s Diamond Process Whip Topping Base (Concentrated).

Manufacturer’s Name: Rich Products Corporation.

Manufacturer’s Address: 1145 Niagara St., Buffalo 13, New York. Phone: GARfield 3211.

Date of Introduction: 1961. August.

Wt/Vol., Packaging, Price: 7 lb and 30 lb cans.

How Stored: Frozen.

New Product—Documentation: Letter from Rex Diamond to Dr. Norman Potter, manager of Food Technology, AMF

(Springdale, Connecticut). Diamond is sending a free sample of Rich’s Diamond Process Whip Topping Base. His letter describes the history of the product’s development and its composition.

Leaflet. 1960 or 1961. How to get the most from Rich’s Whip Topping (“the diamond process; 7 lb. concentrated base product”). It is shipped frozen. Keep it stored under refrigeration. Let it thaw gradually to 40°F. Mix it with cold water, below 38°F. Keep refrigerated. The company is at 1152 Niagara St.

Undated 2-page leaflet titled “Rich’s Diamond Process Whip Topping Base—Concentrated!” shows a can of the product, states that it comes in 7 lb and 30 lb. tins, and states that Rich’s Diamond Process Whip Topping is the “largest selling whip topping and filling in the world.” The product is Pareve and endorsed by the Union of Orthodox Jewish Congregations. The back of the leaflet states, with 7 photos: “Perfect taste. Unmatched stability. Unequalled economy. Rich’s Whip Topping combines them all in one whippable topping and filling. Rich, natural taste! Never too sweet. Saves time—saves work. Non-perishable. Acid-fruit compatibility. Extended shelf life. Versatile. Manufactured under 4 U.S. Patent Nos. 2,487,698, 2,868,653, 2,619,422, 2,619,423.”

An undated leaflet titled “Technical data for Rich’s Whip Topping—Diamond Process” shows a man looking into a microscope and discusses the following: Fat, cholesterol, carbohydrates, protein, stabilizers, emulsifiers, ash, and color. “Rich’s Diamond Process Whip Topping emulsions contain no protein. They are unique in this country in this respect and are protected by United States Patent No. 2,868,653.” Stabilizers include cellulose gum, methyl cellulose, methyl ethyl cellulose, and sodium carboxy methyl cellulose. On the reverse side of the leaflet a page, titled “proximate analysis” compares the composition of two types of Rich’s Diamond Process Whip Topping: (1) Ready to use in 2 lb cans; or Base for dilution in 2 lb, 7 lb, or 30 lb cans.

Undated leaflet. “Balance your summer profits with Rich’s lemon or lime parfait pies.” “When you use Rich’s Diamond Process Whip Topping, you have guaranteed high summer profits.” Recipes for each pie call for the use of “Rich’s Whip Topping Base.” Note: This product contained no soy and no protein.

Letter from Robert E. Rich, CEO of Rich Products Corp. 1993. July 26. This product was frozen had to be defrosted and mixed with equal parts of water or skim milk or fruit juice. It was packed in 2 sizes: 7 lb and 30 lb cans.

576. Carpentier, Charles F. 1961. History of motor vehicle license plates, state of Illinois. *Model T Times* No. 75. p. 13. Sept/Oct.

• **Summary:** “During the metal-shortage years of World War II, we departed from the customary steel or aluminum plates to a fiber board type of material made from a soybean base. These plates were issued from 1943 through 1948. Illinois

received nationwide publicity because of them when a goat took a liking to one and ate it. As far as we know, there was only one instance where that occurred, but by now the story has grown to include dogs and cows munching our plates during that period... Thanks to Ed Sackley for submitting the above interesting material."

A long table shows license plate color combinations from 1911-1961 in Illinois. For each year is given the background color and the number color, which changed annually. In 1943, for example, the plates had a green number on an ivory background.

In 1907 the first motor vehicle licensing law was adopted. From 1907-1910 the State did not issue license plates but only a metal tag 'not to exceed 2 inches in diameter' with a number stamped on it. Since owners were required to display plates, they turned to local blacksmiths and machinists to have their own plates made. In 1911 the State began issuing plates, and in 1912 the practice of showing the current year was started.

A photo shows many early Fords parked in a line at a rally. Address: Secretary of State [Illinois].

577. Strother, Robert S. 1961. Henry Ford and his magic beanstalk. *Quest*. Autumn-Winter. p. 23-27. Condensed in *Reader's Digest*. Nov. 1961, p. 188-92.

• **Summary:** A colorful overview of Henry Ford's work with soybeans and soyfoods. "One day back in the 1930's, I was summoned, along with half a dozen other Detroit newsmen, to a special luncheon in Dearborn, Michigan. Our host was the first Henry Ford, then at one of the several pinnacles of his fabulous career. The luncheon, and the conversation that went with it in the pine-panelled dining room in the Ford Engineering Laboratory, consisted entirely of soybeans. The peppery old motor magnate, then a vigorous 71, held no convictions lightly, and soybeans were his current enthusiasm. From the moment he strode in and took his seat at the head of the long oval table we talked of nothing else..."

"At the luncheon that day Ford saw to it that everyone gave the food a fair trial. His sharp blue eyes were on us as we politely worked our way through 16 soybean foods, starting with salted soybeans and ending with soybean ice cream and soybean cookies. There were buttered green soybeans, pineapple ring with soybean dressing, soybean butter, and apple pie with crust of soybean. For drinks the choice was soybean milk, cocoa made with soybean milk, or soybean coffee. The bread, made of soybean flour would keep fresh nine days, the magnate said, and he urged us to slip a slice in our pockets to prove the point.

"Though the Ford executives seemed to enjoy the luncheon, nothing we newsmen ate that day led us to foresee that soybeans were destined a few years later to become an ingredient in many popular food products, some of them delicious. We accepted as reasonable the possibility that the bean might become a leading cattle feed or industrial

material, and we all felt Ford's chef had outdone himself in versatility for this occasion." Note: This document contains the earliest date seen for Henry Ford's work with soy ice cream (between July 1934 and July 1935, since Ford was born on 30 July 1863 and was age 71 at the time of this meal).

"After lunch, Mr. Ford led us through his vast, high-ceilinged laboratory. He walked steadily, putting his feet straight ahead as an Indian does. He wore old-fashioned shoes made for him by a cobbler he maintained in an antique shop in Greenfield Village. He was about average height, only slightly stooped, and as thin as Mahatma Gandhi. He could chin himself five times without drawing a deep breath, and as most of us knew, from previous visits, he liked to challenge reporters to a 50-yard race, especially if they were fat..."

"The automobile king, who often fired predictions from the hip, had scored some wide misses in his role of free-ranging prophet. But this one [concerning the future of soybeans] proved to be a spectacular hit... By 1959, soybeans had climbed to fifth place among all American crops..."

"The Old Man's last connection with soybeans contains an ironic reverse twist. It came when he gave a barely perceptible nod that set bulldozers to work ploughing up a nourishing soybean crop. The time was April, 1941, and the place was Willow Run. Eleven months later the world's largest airplane factory stood on the soybean field and in it production rose to a war-time peak of one complete bomber an hour.

"The history books credit Ford with pioneering industrial mass production techniques. His role in promoting factory uses for farm products rates only a footnote. Yet it, too, brought changes felt everywhere today. And of all his great achievements this may well have pleased him most—his contribution to the proof that, indeed, there was industrial magic in a beanstalk."

578. Strother, Robert S. 1961. Mr. Ford and the magic beanstalk: When genius is propelled by enthusiasm—anything can happen. *Reader's Digest* 79:188-90, 192. Nov.

• **Summary:** Condensed from *Quest*, Autumn-Winter 1961, p. 23-27.

579. Deutsch, Ronald M. 1961. The nuts among the berries. New York, NY: Ballantine Books. 224 p. No index. 18 cm. 2nd ed., 1967 (320 p.). Revised 1977 as *The new nuts among the berries*. Palo Alto, CA: Bull Publ. Co. 359 p.

• **Summary:** The rear cover states: "From Dr. Graham (inventor of the Graham cracker) to Dr. Jarvis, the best-selling author of 'Folk Medicine', this book tells the astonishing story of a hundred years of health foods and faddists. It names the promoters and the products. It cites the findings of the Food and Drug Administration. It quotes the warnings of the American Medical Association. It completely exposes the hokum and ballyhoo of the health food business—now bilking the public of \$2,000 million ever year—and shows why crackpot food fads are a waste of money at best and

a serious danger to the health of those suffering from real illnesses.

“We are facing an organized dissemination of medical and nutritional quackery which takes the concentrated efforts of all of us to combat”—George Larrick, Commissioner Food and Drug Administration.”

In fact, this book ridicules the very people whose ideas and lives it purports to discuss; it sarcastically paints them all as “nuts.” Its goal is not understanding but a tacit—and not so thinly veiled—endorsement of the contemporary Big Food and medical industries.

Contents: 1. Of cabbages and things (a brief history of “health-foodism”; “For example the Greeks Porphyry and Pythagoras maintained that meats are unnatural foods for men, and repugnant, while fruits and vegetables were the natural nutriment). 2. Mr. Graham bakes a cracker (Sylvester Graham, William Cowherd, the Bible Christians, William Metcalfe). 3. Little men, little women, little food (Louisa May Alcott, Amos Bronson Alcott, William A. Alcott, vegetarianism, and the American Vegetarian Society; Fruitlands, Sylvester Graham). 4. Father Kneipp and his watering can. 5. Mother White casts her brood upon the waters (Ellen G. White and James Caleb Jackson). 6. Snap! Crackle! Enter Dr. Kellogg! (Dr. John Harvey Kellogg). 7. The battle of Battle Creek (Michigan and Seventh-day Adventists). 8. From pillar to Postum (Charles W. Post, Dr. J.H. Kellogg, Ellen G. White, the evils of coffee, Postum Cereal Food Coffee). 9. Kickapoo and Kellogg, too. 10. The Jungle, the sausage, and the law (Upton Sinclair, Harvey W. Wiley, and the formation of the FDA). 11. Chew, chew, baby (Fletcher, Chittenden). 12. Life along the alimentary canal (Metchnikoff, Kellogg, Henry Ford). 13. The bare torso king (Bernarr Macfadden). 14. The bare torso king rampant (Macfadden). 15. I see America starving (Alfred W. McCann). 16. How to stop your cow from drooling (selling nutrition, Colonel Dinshah Pestanji Framji Ghadiali of Bombay, India, and Malaga, New Jersey). 17. A plague on both your Hausers (Gayelord Hauser, Benedict Lust). 18. How to write about health foods (Lelord Kordel, Cathryn Elwood). 19. Mrs. Spratt’s millions (fat and dieting). 20. My mother squeaked (Dan Dale Alexander PhD and arthritis; Dr. D.C. Jarvis, *Folk Medicine*, honey and vinegar). 21. The poisons in your health food (how the public is being duped by health food hucksters; the American Medical Assoc. estimates this racket is now costing 10 million Americans over \$500 million a year). 22. Postscript to a sad tale.

In the Introduction, page 9 notes that many health nuts and food faddists “are of the most respectable sort.” “Among their number are best-selling authors such as Louisa May Alcott, Gayelord Benjamin Hauser, Upton Sinclair, D.C. Jarvis, and Elbert Hubbard. There are such distinguished scientists and innovators as Elie Metchnikoff, Dinshah Ghadiali (developer of Spectro-Chrome Therapy), Amos Bronson Alcott (the Seer of New England), and Dr. John

Harvey Kellogg (inventor of cereal flakes, peanut butter, and the mechanical horse). There are famed industrialists, Henry Ford, Bernard Baruch, and John D. Rockefeller. There are entertainers, as Great Garbo and Robert Cummings, and religious leaders, as Sister [Ellen G.] White, founder of Seventh Day Adventism.”

Colonel Dinshah Pestanji Framji Ghadiali was born in Bombay, India, in 1873, and came to the USA at the age of 38 (i.e. in about 1911). “His title derives from his position during the first world war as commander of the New York Police Reserve Air Service, a little-known organization which served little purpose. It was, however, an honorable civilian patriotic group... In 1920 Ghadiali brought forth one of the scientific wonders of our age—Spectro-Chrome Therapy.” Based on a vegetarian diet (also free of alcohol, tobacco, coffee and tea), the system also made liberal use of colored lights. “By 1924 Ghadiali was so successful that he opened a Spectro-Chrome Institute on 50 acres at Malaga, New Jersey.” In the early days Ghadiali earned more than \$3.5 million from sales of memberships, equipment, and his course. He served a 5-year sentence in a federal penitentiary for a violation of the Mann Act by a book he wrote, “Railroading a Citizen,” in which he accuses jealous doctors of trumping up charges against him. In the 1940s Colonel Ghadiali was prosecuted on the basis of his medical work. He was found guilty and sentenced to 3 years in jail—though his sentence was suspended—and he was fined \$20,000. His work, however, still has devoted followers (p. 151-52).

The author acknowledges the help of the U.S. Food and Drug Administration (FDA), Frederick Stare M.D., and the American Medical Association (AMA). Address: Popular scientific and medical reporter.

580. *Soybean Digest*. 1962. Leading soyabean varieties. Feb. p. 8-9.

• **Summary:** Gives the name and location of the organization that developed each variety, the year of release, and the botanical and agronomic characteristics of 26 northern and 10 southern soybean varieties. The most widely grown northern varieties (listed in order of maturity from earliest to latest) are: Acme, Crest, Flambeau, Norchief, Merit, Comet, Grant, Mandarin (Ottawa), Hardome, Capital, Chippewa, Monroe, Blackhawk, Lindarin, Harosoy, Hawkeye, Harman, Adams, Ford, Shelby, Clark, Wabash, Perry, Kent, Bethel, Scott.

Southern varieties (listed in order of maturity from earliest to latest) are: Hill, Hood, Ogden, Lee, Jackson, Rebel, Bienville, Hampton, JEW 45, Improved Pelican. A map of the USA and Canadian growing areas shows recommended areas for production of these varieties.

581. Andrews, Peter C. 1962. Whip-topping profits grow: Buffalo firm’s success. *Courier-Express (Buffalo, New York)*. May 27.

• **Summary:** “A wartime developed substitute for whipped cream has today evolved into a product that is in several respects superior to the thing it was designed to replace and has become the basis for a profitable \$10-million business for a Buffalo firm. It all started in 1945 when Robert F. Rich, then milk market administrator for the State of Michigan under the wartime controls systems set up by the Department of Agriculture, saw market possibilities in some experiments being conducted at the George Washington Carver Laboratories sponsored by Henry Ford.” Rich developed a soy-based whip topping “with help from some of the chemists at the Spencer Kellogg laboratory here. Spencer Kellogg & Sons Co. supplied the soybean oil... It met with instantaneous success. Sales in 1946 totaled more than \$100,000.” As early as 1949 Rich started marketing his product in pressure cans. And “today whip topping sales for his company exceed \$7 million.” The formula has been changed greatly. In 1957 the firm eliminated the soybean oil base entirely and went to more expensive, and better, nut oils. These gave the product a lighter, cleaner taste. [Note: A major change in 1956 was the switch to the “Diamond Process” which uses no protein. This is not mentioned.]

“Today Rich Products Corp. is the largest producer of whip topping in the nation.”

582. *Chemical and Engineering News*. 1962. People: Robert A. Boyer. Sept. 3. Part 1. p. 63.

• **Summary:** Boyer has been named technical director in protein products sales, Soybean Div., Ralston Purina Co., St. Louis, Missouri.

583. *Soybean Digest*. 1962. Boyer heads Ralston protein products sales. Sept. p. 72.

• **Summary:** “Robert A. Boyer has been named technical director, protein products sales, in the soybean division of the Ralston Purina Co., it has been announced by Donald B. Walker, Purina vice president in charge of the soybean division.

“Mr. Boyer will headquarter at the company’s general office in St. Louis. For the past 2½ years he has been serving as consultant to Purina on a full-time basis. His work has been in product development and technical sales in the special soy products department. He will continue in that field, working with Wayne E. Tjossem, manager of the special soy products department.

“Mr. Boyer has been a consultant in the edible protein field since 1949, serving a number of large food manufacturers both in the United States and Europe. He developed and patented the technique for producing man-made edible protein fibers to be used in the fabrication of food products. The process developed by Mr. Boyer has far reaching implications in the food field. For the first time it makes possible the fabrication of food products to specifications, since now protein is prepared in a form that

can be engineered into any desired form of human food.

“Mr. Boyer’s career in research and product development goes back 35 years... In 1930 Mr. Boyer joined the Ford Motor Co... From 1943 to 1949 he was research director for The Drackett Co., Cincinnati, Ohio. Mr. Boyer and his wife and family have moved their home from Cincinnati to St. Louis [Missouri].”

584. McMillen, Wheeler. 1962. Re: Henry Ford’s contribution to chemurgy and early talk with Ford concerning the idea of new uses for farm products, and new crops. Letter to Dr. David L. Lewis, Assistant to President John F. Gordon of General Motors Corp., Detroit, Michigan, Oct. 1—in reply to inquiry. 1 p. Typed, with signature on letterhead.

• **Summary:** This letter is written by a major leader of the farm chemurgic movement on *Farm Journal* stationery. “Henry Ford’s contribution to chemurgy was really very great, although a little different than generally supposed.

“I first discussed the idea of new uses for farm products, and new crops, with him early in 1928. This was a little before his active interest in developing soybeans appeared. Although his work with soybeans was eventually discontinued, he did much to create interest in the crop.

“The outstanding single thing Mr. Ford did in behalf of chemurgy was to lend his name to the call for the first national conference on the subject and to ask that it be held in Dearborn, Michigan. With his name as one of the sponsors, the attendance was excellent and of high order. This launched the Chemurgic Council quite effectively.

“For some years Mr. Ford employed research scientists on chemurgic ideas. So far as I know not much of practical value emerged, although undoubtedly they advanced the general knowledge to some degree.

“Your university library may contain a few items that may suggest sidelights to you. Full proceedings of the First, Second and Third ‘Dearborn’ Conferences were published. Also, the library may have a copy of my ‘New Riches from the Soil,’ which tells a little of my talks with Mr. Ford on this subject.

“I might add that although he helped with the early conferences, and always provided material for exhibits when requested, he made no other financial contributions to the Chemurgic Council. ‘We’ll take ours out in work,’ he said.

“Whether his contribution in development and implementation of the chemurgic idea was ‘as great as anyone else’s’ is doubtful. It was important, but many others did much more to carry the idea forward and to make it effective.”

Note: David L. Lewis cites this letter in his book *The Public Image of Henry Ford* (1976, p. 529, footnote 22). Lewis notes: “There are no articles in the Ford clipbooks concerning Ford’s interest in the chemurgic concept prior to 1931.”

Address: Chairman of the Board, National Farm Chemurgic Council.

585. **Product Name:** Textured Edi-Pro (Spun Soy Protein Fibers).

Manufacturer's Name: Ralston Purina Co. Special Soy Products Dept.

Manufacturer's Address: Plant: Louisville, Kentucky. Offices: Checkerboard Square, St. Louis, MO 63102.

Date of Introduction: 1962. October.

New Product–Documentation: G.H. Kyd. 1963. Food Processing (Chicago). May. p. 123-26, 138. "Edible soy protein fibers promise new family of foods." Ralston Purina makes "Textured Edi Pro," an edible spun soy protein fiber. Products amazingly like meat can be made from these fibers.

Soybean Blue Book. 1966. p. 111. "Textured Edi-Pro, spun edible isolated protein fibers as a basis for unique and novel human foods. Provides both texture and excellent protein nutrition."

Soybean Digest. 1969. Nov. p. 43. "Ralston Purina Co." A photo (p. 40) shows "Chiplike products made from Ralston Purina's textured Edi-Pro." A chart of "Edible grade food ingredients" indicates that Ralston Purina makes only soy protein isolates and spun fibers.

W.Z. Gottschall. 1969. "Ralston Purina Yesterday and Today." Nov. p. 15. "Textured Edi-Pro is purified, isolated soy protein which has been converted into continuous filament or fiber form by a patented process."

Horan, Odell & Forman. 1971. PAG Bulletin No. 13. p. 25. Textured Edi-Pro was "in commercial production beginning in 1967." Shurtleff & Aoyagi. 1983. History of Worthington Foods. p. 7.

Worthington Foods. 1989. "The Tradition of Healthy Foods" (50th anniversary booklet). p. 21. "Worthington was too small to go into the business of crushing soybeans and disposing of the oil, or of purchasing the protein extrusion or spinning equipment. So [Robert] Boyer negotiated with Ralston-Purina to set up a pilot plant to make the protein for Worthington. As it turned out, Ralston-Purina made the protein, did the spinning, and Worthington bought the output and put it into new products. When the new Ralston-Purina plant was operational, it had the capacity of 10,000 pounds a day. Worthington was not ready for this kind of volume, but working out these difficulties involved Jim Hagle in further negotiations with executives of a large corporation. Finally, Worthington agreed to take all the production, and sales took off."

Talk with Ed Meyer of Central Soya. 1993. April 3. Ralston Purina went into a joint venture (for a short time) selling frozen spun soy protein fiber with National Can Co., which had a small protein division, with they called National Protein.

Letter from Susan W. Vorih, Communications Manager, Protein Technologies International. 1993. June 17. A semi-works plant to produce edible soy proteins was erected in 1961 at Louisville, and both spray-dried and spun fiber

proteins began to be produced and sold in October 1962.

586. *Soybean Digest*. 1962. Francis Calvert joins Ralston Purina staff. Dec. p. 11.

• **Summary:** "Francis E. Calvert, nationally known chemist in the industrial protein field, has joined the staff of the special products research laboratories for the Ralston Purina Co. Mr. Calvert will headquarter in the company's research laboratories in St. Louis and will work with W.B. Brew, manager of the special products research laboratories. He will be concerned with research in the utilization and production of isolated soy protein for industrial and edible purposes. He will also engage in customer service work. He assumed his new duties Nov. 5.

"Since 1957, Mr. Calvert has been technical director, Evendale operations, for Archer Daniels Midland Co. at Evendale, Ohio. Prior to that he was research director for the Drackett Co. in Cincinnati. His principal fields of research have been organic and polymer chemistry."

587. Anson, M.L. 1962. Oilseed proteins in foods. *Archives of Biochemistry and Biophysics*. Supplement 1. p. 68-77. [23 ref]

• **Summary:** "A major occupation of man is to feed plant materials to animals and to use the animals as a source of animal protein foods. It is now possible, by applications of modern biochemistry and technology, to feed oilseed materials into a factory and to come out with protein foods similar to animal protein foods in nutritional value, taste and texture.

"Protein technologies were developed in the Orient thousands of years ago to produce products such as soybean curd and fermentation foods which still play a big role in the protein economies of hundreds of millions of people. The modern oilseed meals now produced at very low price give promise of being very useful in the fight against protein malnutrition in poor countries."

"During World War II, Henry Ford, who had the soybean religion, made large amounts of good 'ice cream' entirely from soy protein and fat, until he was stopped. The Chinese have a variety of cheese made from soybeans."

In the section titled "Ancient foods based on oilseeds," the author discusses soy milk and bean curd (tofu) in detail. He notes that traditional fermented foods serve primarily as a source of flavor, and perhaps of vitamins. "In Japan today scores of thousands of factories, big and little, make the traditional soy foods. These factories use up not only local soybeans but almost 10% of the huge American crop. The Japanese eat much more soy protein than meat protein." Address: 100 Eaton Square, London, S.W.1, England.

588. Wik, Reynold Millard. 1962. Henry Ford's science and technology for rural America. *Technology and Culture* 3(2):247-58. Summer. [37* endnotes]

• **Summary:** "Unquestionably Ford's greatest contribution

to the application of technology to American agriculture lay in his insistence that mechanical power should supersede animal power on the farm... The story of how Ford's mechanical contraptions changed rural life in America is well known. Not so well known, however, are his attempts to introduce scientific technology into American agriculture."

One of Ford's early scientific efforts to improve agriculture consisted of experiments to produce alcohol as a motor fuel by distilling it from farm crops. When World War I threatened to create a gasoline famine, he announced in 1915 that alcohol could be extracted from grain and from garbage. The new Fordson tractor would be designed to burn alcohol as well as gasoline; thus the supply of fuel would be unlimited... Although the Ford Motor Company experimented with alcohol distillation in the Engineering Laboratory in Dearborn from 1915 to 1917, the efforts were feeble and inconsistent.

Note that Ford did not invent the idea of fuel alcohol. "As early as 1908, the British attempted to secure motor fuel for transport in Africa by distilling alcohol from sugar cane. In the same year, the Hart-Parr Company of Charles City, Iowa, equipped some of their tractors in Idaho, Colorado, and Cuba with alcohol-burning carburetors."

In the spring of 1921 Ford exploded one of his journalistic bombshells "when he exclaimed, 'The cow must go.' To replace the milk produced by cows he proposed artificial milk made synthetically. His dislike of dairy cows stemmed from unpleasant experiences on his father's farm where milking had been a most disagreeable and exasperating chore. Now he regarded cows as inefficient and unsanitary animals. [Their milk carried tuberculosis.] At times he refused to drink milk. "When asked why he owned 150 head of excellent Durham and Ayrshire dairy cows and one of the best dairy barns in the state, he replied that these were kept just to prove they were all wrong."

Yet it was the soybean which gave Ford his best opportunity to apply science and technology to farming practice. The 'Ford and the Beanstalk' story originated as another panacea to fight the depression following the stock market crash of 1929." Rejecting other plans, "Ford came up with his own self-help solution which called for closer cooperation between industry and agriculture. If industry could use more agricultural products, this new demand would raise prices of farm crops..."

"After some experimentation in the new Edison Institute of Technology in Dearborn in 1930, Ford chemists chose the soybean as the most promising raw material... The company spent \$1,250,000 on soybean research in 1932 and 1933. Three hundred varieties of the bean were planted on 8,000 acres on the Ford farms."

Note 1. This is the earliest document seen (Jan. 1998) that uses the word "technology" in connection with soybean farming and production.

Note 2. The author is one of the country's leading

authorities on the history of American technology. Address: May Treat Morrison Prof. of American History, Mills College, Oakland, California 94613.

589. Kyd, George H. 1963. Edible soy-protein fibers promise new family of foods. *Food Processing (Chicago)* 24(5):122-26, 138. May.

• **Summary:** "Products amazingly like meat such as the ham-like product shown below and the chicken-style products shown on page 124 can be fabricated from protein fibers shown opposite" (in a full-page photo), magnified slightly more than two times. Ralston Purina now makes "Textured Edi Pro," an edible spun soy protein fiber made from "an isolated edible soy protein that is almost pure protein. It contains no fat."

Page 124 has the heading: "Is the web of spun soy-protein fibers first of the modern superfoods? Meat-like production. These Textured Edi Pro foods—already on the market—look, taste, and chew amazingly like the meat item they so closely resemble, yet they may have a fat content as low as a fraction of one per cent, and a protein content of almost any level desired." Photos show packages and labels of Chicken Style Roll (Minute Entrees, refrigerated roll), Worthington Soyameat Fried-Chicken Style (canned), Worthington Sliced Whitemeat Style (Frozen Minute Entrees). Shown without a package or label are is a ham-shaped, ham-like product [Wham].

Page 126 states: "Tons of the textured product [Textured Edi Pro] each week go into the following products made by Worthington Foods: canned 'Soyameat': refrigerated Chicken-Style Roll; frozen fried-chicken style Minute Entree; and frozen chicken whitemeat style Minute Entree. These products resemble chicken meat in taste and texture. They are new but already fast-selling products, distributed largely through health food stores."

"The edible soy protein work is being carried on under the direction of Dr. H.L. Wilcke, Purina Research Vice President, and D.B. Walker, Vice President in charge of the Soybean Division. Two nationally known scientists who have pioneered soy development have performed much of the development work. They are Robert A. Boyer and Francis E. Calvert. Both at one time were associated with Henry Ford, and, through him, with Thomas A. Edison.

"The work has been coordinated under supervision of W.E. Tjossem, Manager of Purina's Special Soy Products Department, and W.B. Brew, Manager of Special Products Research. Ralston Purina is the largest manufacturer of animal rations, and one of the principal processors of soybeans in this country [USA]. Textured Edi Pro and Edi Pro are developments of Ralston Purina Company, Checkerboard Square, St. Louis 2, Missouri."

"Fifty million people in the U.S... are not able to eat the meat of animal or fowl some or all of the time by reason of their religions, restrictions of their doctors, or by personal

preferences. For these many millions who for one reason or another cannot eat meats, the Textured Edi Pro meat-like products will supplement the supply of food items which they approximate... The versatility and adaptability of these new edible soy products make them 'the most exciting and most promising group of new foods of this decade,' says Purina vice president D. B. Walker. 'They are so characteristic of present health theories that they are likely to establish themselves in diets of the future. And the meat-like products will find an eager market among those 50 million who can't eat real meat.'

Note: This is the earliest English-language document seen (March 2009) that mentions Textured Edi Pro, made from spun soy protein fiber. Address: Ralston Purina Co., St. Louis, Missouri.

590. Product Name: Whitehouse Whipped Topping, Whitehouse Whipped Topping Base, and Whitehouse Presto Whip.

Manufacturer's Name: Whitehouse Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1963.

New Product–Documentation: Talk with David and Harvey Whitehouse of Delsoy Products and Whitehouse Products. 1992. Feb. 4. Harvey Whitehouse bought out Bob Smith in 1963, and a month or so thereafter David became president of the company. Shortly after the buyout, the company name was changed from Delsoy Products to Whitehouse Products. The brand and logo then became Whitehouse and product names were changed. Delwhip Topping became Whitehouse Whipped Topping, Delwhip Topping Base became Whitehouse Whipped Topping Base, and Presto Whip became Whitehouse Presto Whip. All continued to be made with soy protein. At about the same time, the company began to private label their products for other companies under other brands. They continued to sell the products under their own brands as well.

591. Lager, Mildred; Jones, Dorothea Van Gundy. 1963. The soybean cookbook: Adventures in zestful eating. New York, NY: Devin-Adair Co. xiv + 240 p. Foreword by Ruth Stout. Index. 22 cm.

• **Summary:** The copyright page states: "Note: This is a revised and updated version of a privately printed book, *How to Use the Soybean*, by Mildred Lager which was first printed in 1955 and reprinted in 1959." This lacto-ovo-vegetarian cookbook contains over 350 recipes, including 72 tofu recipes.

Contents: Preface to 1955 edition. Preface to 1963 edition. Part I: The versatile soybean. History of the soybean. Nutritional value. Abbreviations and special terms. Soup to nuts: Introduction, green soybeans [green vegetable soybeans], dry soybeans, roasted soybeans, sprouted

soybeans, the cow of China–soy milk (kinds of soy milk), "the meat without a bone"–tofu or soy cheese, the little giant among protein foods–soy flour, soy grits and bits (puffed grits), soy oil and soy butter, meat replacement foods, sandwich spreads, malts, coffee substitutes, soy sauce, other soy products (soy albumen, Glidden's product that contains on a dry basis 96.6% protein [soy protein isolate]).

Part II: Soybean recipes. Green soybeans. Dry soybeans. Roasted or toasted soybeans. Sprouted soybeans. Meat replacement dishes. Soy noodles, macaroni, and spaghetti. Sauces and gravies. Soy soups. Salads. Soy spreads and soy butter ["a butter resembling peanut butter may be made from finely ground soybeans or soy flour... Roasted soy butter is made from the roasted beans that have been ground into a fine flour."]. Soy milk. Tofu or soy cheese. Soy cereals and breakfast dishes. Soy desserts. Soy candies. Soy flour breads: Full-fat soy flour, low-fat or fat-free soy flour. Pastry. Cookies. Cakes. Extra tips. Appendix. Menus.

The chapter titled "History of the Soybean" (p. 3-7) discusses: W.J. Morse and the U.S. Department of Agriculture, Dr. J.A. LeClerc, the American Soybean Association (which has held a national convention every year since it was founded in 1920), its publication *Soybean Digest*, Henry Ford and his work with both industrial and edible soy products, T.A. Van Gundy, Harry W. Miller, M.D., Dr. Clive McCay of Cornell University (Ithaca, New York), and the Sept. 1961 Conference on Soybean Products for Protein in Human Foods (held at Peoria, Illinois).

Concerning T.A. Van Gundy we read (p. 5): "The father of one of the authors, T.A. Van Gundy, became interested in the nutritional value of soybeans while attending the World's Fair in San Francisco in 1915, where they were featured in the Oriental exhibits. Upon going home he purchased some soybeans and began experimenting in them. As far as we know he was the first person on the Pacific Coast to develop a line of commercial foods from this wonder bean. By 1927 he had developed a number of palatable products which he manufactured and sold through health food stores. Soybean foods were virtually unknown at this time, and it took courage and perseverance to put them across."

Recipes for "Soy Ice Cream" (p. 175-76) now include vanilla, maple nut, orange, and strawberry flavors. A recipe for "Granola" (p. 161) calls for 1 cup soy flour. The rest of the ingredients (such as wheat and barley flour) appear to be similar to those found in the earliest granola recipes of the mid-1800s. Address: Southern California.

592. Moncrieff, R.W. 1963. Man-made fibres. 4th ed. London: Heywood & Co. Ltd. x + 742 p. See p. 287-95.

• **Summary:** Part II of this book is titled "Fibres made from natural polymers." Within Part II, chapter 18, titled "Ardil, Vicara, Soybean," notes that Ardil fiber, made from peanut (groundnut) protein, was first spun at Ardeer [Scotland] in 1938 and after World War II was manufactured at Dumfries

[Scotland] until 1957, when it was discontinued. Vicara was made from corn (maize) protein, named zein, by the Virginia Carolina Chemical Corporation from 1948 until 1957.

The contents of the section titled "Soybean" is as follows: Introduction. Manufacture. Properties. Protein fibres and body comfort: Low stiffness for small stretches or bends, compliance, frictional coefficient of the fibre, resilience, loftiness, moisture absorption, heat of wetting (protein fibres generally give out heat when they are wetted), thermal conductivity, static, filament cross section.

"For short periods several manufacturers have made fibre from soybean protein. At one time the Ford Motor Co. made it and used it for car upholstery; it was once made in Japan under the name Silkool. The attraction of soybean as raw material for a fibre lies in its high protein content (35 per cent) compared with groundnuts (25 per cent) and maize (10 per cent). Furthermore the beans which look like light brown peas grow prolifically in the East and in America." The manufacturing process and properties are then discussed briefly. The main disadvantage of soy protein fiber is that it loses strength when it gets wet. Its main attraction lies in the abundance and low cost of soybeans.

Note: The first edition of this book, published in 1950, was titled *Artificial Fibres*. Address: BSc, F.R.I.C., United Kingdom.

593. Nevins, Allan; Hill, Frank Ernest. 1963. Ford: Decline and rebirth 1933-1962. Vol. 3. New York, NY: Charles Scribner's Sons. xviii + 508 p. See p. 71-73, 323. Illust. Index. 24 cm. [531 endnotes]

• **Summary:** Of the superb three-volume history of the Ford Motor Co. by Nevins and Hill, this volume contains the most information about Henry Ford's work with soybeans. During the 1930s, Henry Ford had a number of interests and activities outside of auto manufacturing. "One of them was Greenfield Village, where exhibits and historic buildings spoke for Ford to the Public. Its opening in 1933 had been preceded by a decade of collecting and planning on Ford's part." He established four schools in the Village from 1929 to 1943.

"A second project in which Ford was interested was the cultivation and processing of soy beans. He felt that the crop had a great dietary importance, could aid the farmer, and had a definite place in his own business. While he had begun experiments in 1929, they were carried on for some time in an informal fashion at Dearborn. But in 1935 a complete processing plant was established at the Rouge and in 1938 two others began operations at Saline and Milan, Michigan, for the extraction of oil from the bean, and the making of plastic units for Ford cars. These came to include lever knobs, horn buttons, switch handles, and distributor housings. In 1939 the Ford Motor Company grew about 100,000 bushels of soy beans, and bought an additional 500,000 bushels...

"A third and far more extensive activity that commanded

Ford's energies was his village industries... During the 1930s Ford unquestionably intensified his interest in small plants. After 1935 no year passed in which he did not found at least one new unit. In six years he constructed 13 (including his two soy bean plants), and in 1938 could contemplate a list of 212 possible sites which E.G. Liebold had prepared. W.J. Cameron in his Ford Sunday Evening Hour and in magazine articles discussed the 'decentralization' which such activity represented. Even *Fortune* picked up the term. 'Mr. Ford now feels that he has learned all centralization can teach,' it remarked late in 1933. 'The next step is decentralization.'

The small plants "were important in that they contributed to the decentralization of Ford's own activity." They "all engaged his attention and even his passionate interest, and gave him less time for the V-8 and the Ford truck."

"The soy-bean processing factories had been discontinued during the war, and in November 1946 the principal one at Saline, Michigan, was sold to a commercial company. Much of the elder Ford's farm land had been put up for sale in the spring of 1946."

Appendix I (p. 478-79) gives very revealing Ford Motor Co. vehicle production statistics by vehicle type for each year, in the USA, Canada, and overseas, each year from 1903 to 1955. Sales of the Ford truck began in 1916, the tractor in 1917, the Lincoln in 1922, the Mercury in 1938, and the Metro-Coach in 1938. In the U.S. Ford's boom years in terms of total vehicles produced were from 1905 (1,599 vehicles) to 1923 (2,120,898 vehicles produced). The company did not surpass its 1923 record until 1955. After 1923 production was static to downhill. In 1927 there was a huge drop to 518,401 vehicles as the company phased out the Model T and prepared to launch the Model A. From 1930 to 1939 (the years when Henry Ford was most interested in soybeans) annual production averaged 855,000 vehicles, or 40% of the 1923 high. In the depths of the Great Depression, in 1932 and 1933, production was only about 400,000 vehicles, roughly 21% of the 1929 figure of 1,870,257. Address: Columbia Univ., New York City, New York.

594. *Soybean Digest*. 1964. Leading soybean varieties. Feb. p. 14-15.

• **Summary:** Gives the name and location of the organization that developed each variety, the year of release, and the botanical and agronomic characteristics of 28 northern and 10 southern soybean varieties. The most widely grown northern varieties (listed in order of maturity from earliest to latest) are: Acme, Crest, Flambeau, Norchief, Merit, Grant, Mandarin (Ottawa), Hardome, Capital, Chippewa, Monroe, Blackhawk, Lindarin, Lindarin 63, Harosoy, Harosoy 63, Hawkeye, Hawkeye 63, Harman, Adams, Ford, Shelby, Clark, Clark 63, Kent, Bethel, Delmar, Scott.

Southern varieties (listed in order of maturity from earliest to latest) are: Hill, Hood, Ogden, Lee, Jackson, Rebel, Bienville, Hampton, JEW 45, Hardee.

595. *Food Processing (Chicago)*. 1964. The courts are raising the 'imitation barrier.' 25(4):25-27, 30-32, 34. April.

• **Summary:** "In an unbroken series of favorable decisions, nine different courts in seven states have recognized the legal right of Coffee-Rich, Inc. of Buffalo, New York, *not* to use the crepe-word 'imitation' on the company's new coffee-Rich coffee whitener—a replacement for traditional dairy cream.

"Because the issues involved in the Kansas decision are typical of all seven states in which Coffee-Rich has overcome the legal challenge of local dairy interests, Food Processing is reproducing *in toto* the Syllabus and opinion handed down by the Kansas Supreme Court."

The states in which Rich Products has won its legal battles against the dairy industry and the dates of the decision are as follows: Louisiana, 17 Nov. 1961; Indiana, 18 May 1962; Virginia, 29 Oct. 1962; Kansas, 4 Sept. 1962; Washington state, 28 Jan. 1963; Wisconsin, 1 Nov. 1963; Michigan, 23 Dec. 1963. In each case it was decided that Coffee-Rich was not an imitation cream, milk, or half-and-half and therefore did not need to have the word "imitation" printed on its label. "General Counsel for Rich Products Corporation and its wholly owned subsidiary, Coffee Rich Inc., is Arnall, Golden & Gregory of Atlanta, Georgia. All of the successful litigation has been handled by Ellis Arnall, Senior Partner, and Elliott H. Levitas, Junior Partner. Mr. Arnall is former Attorney General and Governor of Georgia."

Within the article is a 2-page sidebar titled "How a man's vision furthers new forms of food." It shows portraits of Robert E. Rich and Holton W. Diamond (holding a carton of Coffee-Rich), and states: "Weaning the world from the cow by means of tailor-made vegetable-fat and vegetable-and-protein products that do specific jobs better than their cow-born counterparts—and usually at much lower cost—has been almost a personal crusade for Robert E. Rich, President of Rich Products Corporation and Coffee-Rich, Inc., its wholly owned subsidiary.

"Like all crusades, this one is costly; Rich has spent upwards of a half-million dollars and continues to spend large sums of money for legal fees, court costs, etc., as he 'blazes the trail' for technological advance in state after state (see box score at left).

"Interestingly, considering the consternation he produces among entrenched dairy interests, Rich has a dairy-plant background, and even today continues to head up the largest solely-owned dairy in the U.S.

"Rich's pioneering in non-dairy whip toppings and whippable emulsions began immediately after World War II. As milk order administrator for the state of Michigan during the war, he had learned about the Ford Motor Company's George Washington Carver Laboratories' successful development of a continuous method of producing soy milk and cream by extracting soy protein from the bean

"In April, 1945, using a new batch-extraction process that

surpassed the original Carver extraction method in efficiency, Rich produced his original soy-cream Whip Topping. By freezing it, he was able to market it throughout the U.S., over extended periods of time.

"The new synthetic product had several advantages over cream. It could be re-whipped, even several days after initial whipping. It produced almost twice the whipped yield of regular cream—more than tripling its liquid bulk when it was whipped. Stiffness and overrun were retained longer, and the product possessed markedly better keeping qualities. And, it cost less.

"In addition, when kept frozen, it can be stored for more than two years—then thawed and used. This is utterly beyond the capabilities of whipping cream.

"In 1956, Rich acquired the research "jewel" who since has boosted the company into the position of largest U.S. specialist manufacturer of whippable emulsions. Holton W. Diamond, who had been chief chemist of The George Washington Carver Laboratory of The Ford Motor Company, came to direct Rich Products' research.

"Diamond's 'Diamond Process' patents for producing vegetable-fat whippable emulsions enabled Rich to market a line of bases and toppings with remarkable shelf-life, resistance to mechanical breakdown, compatibility with fruit acids and other qualities that could not be approached by conventional cream-derived products.

"Newest all-vegetable-fat emulsion product—liquid 'Coffee-Rich' is a coffee 'whitener' which, although shipped frozen, exhibits great stability after thawing, remaining fresh up to two-to-three weeks under normal refrigeration. This unusually protracted shelf-life results principally from absence of protein—except for .8 per cent of sodium caseinate, used as stabilizer.

"Since Coffee-Rich is slow to sour or spoil or curdle, it eliminates a major problem encountered with coffee-vending machines. Restaurants, hospitals, cafeterias and other large-volume feeding outlets also are prime prospects."

Concerning Chil-Zert soy ice cream: In *United States v. 651 Cases, Etc.* the court held that Chil-Zert was an imitation of chocolate ice cream since it "contained the identical ingredients of Chocolate-flavored ice cream in approximately the same proportions, 'except that soy fat and soy protein are used therein in place of milk fat and milk protein'; that it was manufactured in substantially the same manner as Chocolate ice cream, and with the use of similar machinery; that it was similar in taste, appearance, color, texture, body and melting qualities; that it had identical use and that 'its composition differs only from ice cream in the substitution of a cheaper ingredient; namely vegetable oil in place of milk products.'"

596. Kusche, Herbert R. 1964. Re: Dollar sales of Rich's Whip Topping sold in various containers from 1946 to 1963. Letter to Mr. Hugh H. Chapin, Kenyon & Kenyon, 165 Broadway, New York 6, New York, Sept. 2. 1 p.

• **Summary:** Sales of Whip Topping in ½ pints decreased from \$422,848 in 1946, to \$111,366 in 1949, to \$195 in 1953, the last year it was sold.

Sales of Whip Topping in pressure cans rose from \$104,478 in 1949 (the first year it was sold) to \$1,329,888 in 1952, to \$2,242,669 in 1962 (the peak year).

Total sales of Rich's Whip Topping in all containers rose from \$495,040 in 1946 to \$559,878 in 1950, to \$1,520,207 in 1955, to \$3,587,272 in 1960, to a record \$6,897,951 in 1963. Address: Rich Products Corp., 1145 Niagara St., Buffalo 13, New York. Phone: TT3-3211.

597. *Soybean Digest*. 1964. ASA's honorary life members—1964: Dr. Leonard F. Williams and Dr. Alvin John Ohlrogge. Sept. p. 10.

• **Summary:** Geneticist Leonard Williams has had a part in the development of most of the newer Cornbelt varieties of soybeans. He was primarily responsible for the Lincoln, the first soybean variety to be developed and released by the U.S. Regional Soybean Laboratory. At one time, Lincoln was grown on 75% of the soybean acreage in Illinois, and on a very substantial acreage in surrounding states. Williams was also responsible for making the crosses that led to such varieties as Clark, Shelby, Ford, Kent, and Chippewa. Williams received his B.S., his M.S. and his Ph.D. degrees all at the University of Illinois. He was on the staff of the Univ. of Illinois from 1931 to 1936, and has been a research agronomist at the U.S. Regional Soybean Laboratory from 1936 onwards. Note: In late 1951 he was transferred to Columbia, Missouri.

Dr. A.J. Ohlrogge is a recognized authority on soybean fertility. He has helped to bring about a better understanding of the physiological processes of the soybean as they relate to mineral nutrition. He has been a member of the Purdue University staff since 1937, and has been a professor of agronomy since 1958. Photos show Williams and Ohlrogge.

598. Dearborn Chamber of Commerce. 1964. Map of Dearborn, Michigan. Dearborn, Michigan. 1 p.

• **Summary:** Includes the following places of interest: 23. Dearborn Inn and Motor House. 25. Fair Lane (Henry Ford's home on the River Rouge). 30. Ford Motor Co. Research and Engineering Building. 31. Ford Motor Co. Rouge Plant. 33-34. Henry Ford Museum and Greenfield Village. 35. Henry Ford birth site—historical marker.

599. Schwarz, Richard William. 1964. John Harvey Kellogg: American Health Reformer. PhD thesis in modern history, University of Michigan. vi + 504 p. 23 cm. [234 + 1,308 footnotes]

• **Summary:** This is one of the finest examples of recent Adventist scholarship. John Harvey Kellogg was born on 26 Feb. 1852 in rural Tyrone Township, Livingston County, Michigan. His parents were John Preston Kellogg and Ann

Stanley, his second wife. His birth was spaced almost midway between those of his seven half- and eight full brothers and sisters. Contents: Preface. 1. The making of a health reformer. 2. "What manner of man." 3. Biologic Living: The Kellogg "Gospel of Health." 4. Kellogg and the Battle Creek Sanitarium. 5. Lecturer, author, publisher. 6. Surgeon and inventor. 7. His brother's keeper. 8. Kellogg's break with the Adventist church. 9. Food manufacturer and eugenicist. 10. Concluding years. Bibliography: Primary sources (Manuscript collections, books by John Harvey Kellogg, articles by John Harvey Kellogg, newspapers and periodicals, official reports and records, interviews, other primary sources, secondary sources).

Concerning the invention of peanut butter: (p. 283-84): "Another important item in the modern American diet first introduced by Dr. Kellogg was peanut butter. Shortly after 1890, John Harvey had a quantity of roasted peanuts ground up into a paste for use by patients who had difficulty in masticating nuts well enough to digest them properly. Later the doctor decided that roasting caused the fat content of the nuts to begin to decompose and that this irritated the digestive organs. From that time forward Sanitarium peanut butter was made from nuts which had been steam-cooked rather than roasted. Kellogg devised a variety of other nut butters which he claimed were 'sweeter, more palatable, and more digestible' than regular butter. He directed that these nut butters be used as shortening in the preparation of all baked goods produced at the Sanitarium. John Harvey made no attempt to control through patents the production of either peanut butter or any of his other nut butters. He announced that he believed that these were products that 'the world ought to have; let everybody that wants it have it, and make the best use of it.'" Address: Univ. of Michigan.

600. *Soybean Blue Book*. 1965. Leading soybean varieties. p. 22-25.

• **Summary:** Gives the name and location of the organization that developed each variety, the year of release, and the botanical and agronomic characteristics of 26 northern and 10 southern soybean varieties. The most widely grown northern varieties (listed in order of maturity from earliest to latest) are: Acme, Crest, Flambeau, Norchief, Merit, Grant, Mandarin (Ottawa), Hardome, Chippewa, Chippewa 64, Blackhawk, A-100, Lindarin, Lindarin 63, Harosoy, Harosoy 63, Hawkeye, Hawkeye 63, Adams, Ford, Shelby, Clark, Clark 63, Kent, Delmar, Scott.

Southern varieties (listed in order of maturity from earliest to latest) are: Hill, Hood, Ogden, Lee, Bragg, Jackson, Rebel, Bienville, Coker Hampton 266, Hardee.

A 2-page map of the USA (p. 24-25) shows the area of adaptation for each of these varieties.

601. *Food Processing (Chicago)*. 1965. The courts continue to remove the 'imitation barrier.' 26(4):24, 28. April.

• **Summary:** “Progress report! Massachusetts high-court’s final decision—upholding retail sale of Coffee-Rich all-vegetable-fat creaming agent as a replacement for dairy cream—is the latest in a series of unbroken state-by-state legal victories for Coffee-Rich...”

The new states in which Rich Products has won its legal battles against the dairy industry and the dates of the decision are as follows: The Wisconsin Supreme Court, on 29 Sept. 1964 affirmed the 1 Nov. 1963 judgment of the Circuit Court of Dane County that Coffee-Rich is not an imitation product and does not purport to be any other product; West Virginia is “representative of a number of states that have been persuaded by Coffee-Rich legal counsel to voluntarily sanction the marketing and sale of Coffee-Rich as a *sui generis* non-dairy coffee creamer”; The Massachusetts, 1 Feb. 1965. In Oregon a trial is scheduled for 3 May 1965. In Michigan, the Coffee-Rich victory in the Circuit Court of Wayne County (decision rendered on 23 Dec. 1963 in favor of Rich Products) has been appealed to the Michigan Court of Appeals by the State Department of Agriculture. The case will probably be argued in early April 1965.

See also previous article in *Food Processing* (April 1964).

Note: This is the earliest document seen (Jan. 1999) that uses the term “coffee creamer” or the term “creaming agent.”

602. Thulin, W.W.; Kuramoto, S. 1965. A new class of textured ingredients from spun protein (Abstract). In: 25th Annual Meeting of the Institute of Food Technologists, Program. See p. 43. Held 16-20 May 1965 in Kansas City, Missouri.

• **Summary:** This abstract states: “Spun oilseed proteins, when combined in a shaped system with fats, flavors and coloring, yield a series of new protein foods which contribute texture, visual appeal and nutritional quality to formulated foods. They are less costly than meat, significantly more stable, and their flavor, texture, and appearance can be tailored to meet the needs of specific food systems. While these new textured foods may contain meat, they can be meat-free to allow use in situations where meat cannot be handled or consumed, and their caloric and other nutritional characteristics can be precisely controlled.

“Illustrative applications in institutional and consumer products will be outlined.”

Note: The theme of IFT’s 25 Annual Meeting is “Ideas and technology for changing food concepts.” This paper was presented on Monday afternoon, May 17, in the session titled “Special purpose rations.” The authors are describing Bontrae. Although that word does not appear in this abstract, it may well have appeared in the paper / speech that was presented—which was published in full in the Feb. 1967 issue of *Food Technology* under the title “Bontrae—A new meat-like ingredient for convenience foods.” Address: James Ford Bell Research Center, General Mills, Inc., 900 Plymouth Ave., North, Minneapolis, Minnesota.

603. Strayer, George M. 1965. Have lost a staunch friend. *Soybean Digest*. Aug. p. 6.

• **Summary:** “The soybean industry has lost one of its staunch and true friends with the passing of Keller Beeson. President of the American Soybean Association for 2 years, secretary for 5 years, extension agronomist at Purdue University for about 40 years, he was one of the men who was responsible for the present status of the crop in the United States...”

“He is the man who made the transition from the strictly volunteer organization which met at Dearborn Inn in September of 1940 to an organization which was started on its way to permanence. He is one of the men responsible for the starting of the *Soybean Digest*, for he earnestly pled at the Dearborn [Michigan] meeting for the establishment of some type of newsletter or publication for ASA. One of our grand men of soybeans has departed from our midst. He can never be replaced. His indelible mark has been left on America’s third most important crop. We will miss him more than words can say.”

604. *National Provisioner*. 1965. New foods from spun protein. 153(15):15-18. Oct. 9. [13 ref]

• **Summary:** “Will emerging food technology’s version of a protein spinning wheel, actually more like the nylon factory’s counterpart of the spinneret in the head of a silkworm, send livestock the way of the silk stocking?”

“Is there danger that new structured food products which can be made from many varieties of spun vegetable protein, and are being made from soy protein isolates, will make meat animals, eat and meat packers obsolete?”

Dr. Arthur D. Odell and W.W. Thulin, both of the James Ford Bell Research Center, General Mills, Inc., Minneapolis, feel that spun protein fibers, rather than being a competitive threat, “can improve the market for natural meat while serving special dietary needs, adding variety to menus and helping to close the widening world food gap.”

Last month Odell gave a “talk on the new structured foods at the Minnesota Nutrition Conference in St. Paul,” where samples of the new foods made of “spun fibrils” were also served.

“The first edible fiber was made in 1949 under the direction of Robert A. Boyer at a Connecticut factory where vegetable protein was being spun for textiles. Boyer obtained a patent on the process (U.S. 2,682,466) in 1954. Originally, five companies were licensed to manufacture edible fiber under this patent but only two, General Mills and Ralston Purina, have continued using the process.” Development of the first undenatured, edible soy protein [isolate, Promine] by Central Soya Co. in 1958 stimulated other firms to engage in similar research for a widely available protein product. Details of the process for making spun soy protein fibers are given; a flow chart is also given. “Smoky Bits” simulating bacon are being test marketed in peanut butter. Complete citations for 13 patents issued in connection with the new

spun protein foods are given.

A photo shows a kit distributed by General Mills; it contains spun soy fibrils in the middle compartment and dehydrated foods made from the fibrils in six other compartments.

Note: This is the earliest English-language document seen (March 2009) that uses the word “structured” to refer to soy protein products, or specifically to new “spun protein foods analogous to meat.”

605. *Quick Frozen Foods*. 1965. The Rich Products story: It surges with the strength and vigor of the mighty waterway on whose shore it makes its home. 28(5):139-62. Dec. Also repaginated and reprinted by Rich Products Corp.



• **Summary:** Rich Products, a 20th century pioneer and leader in frozen food specialties, now in its 21st year of operation, is located on the banks of the Niagara River above Niagara Falls. “When the Buffalo concern introduced its Whip Topping as a ‘wartime replacement’ in 1945, the frozen food industry was doing a total annual volume of less than \$200,000,000 a year. Today the industry is generating more than \$5,000,000,000 in sales annually. Included in the story are bits of history.

“The fledgling Buffalo concern did \$28,000 worth of business in 1945. Today its total sales are exceeding \$25,000,000 a year. The largest portion of sales are in the frozen food division, the remainder in dry Coffee Rich, Whip Topping, and the fluid milk operation.”

The two opening pages (printed with black and blue, then black and red ink) showcase Rich’s many non-dairy products—mostly frozen—such as Rich’s Whip Topping, Non-Dairy Coffee Rich, Sundi-whip. Photos show: (1) Bob Rich seated at his desk. (2) Small portrait photos of Herb Kusche, Jerry Hannon, Joe Robida, Ed Andrews, Rex Diamond, Bill Meyers, Oscar Albert PhD, Jo Ann Lang, Bill Wright, Dick Middleton, Bob Steele, Gordon Tebb. (3) Six individual



photos of products (p. 144). (4) Rich’s West Palm Beach, Florida, plant that makes Frozen Chocolate Eclairs. Robert E. Rich, Jr., vice-president of Rich Products of Canada, Ltd., Rich’s plant in Ft. Erie, Canada (built in March 1964). (5) Frozen food trucks. Many shots of the inside of Rich’s plants.

Throughout the story are many pages of congratulatory ads, big and small, from suppliers, distributors, contractors, packagers and container manufacturers, food brokers, etc. On the last page is a letter of thanks from Bob Rich (typed, with signature on letterhead) to all the above companies and individuals that have contributed to the growth of Rich Products over the past 21 years. Address: Buffalo, New York.



606. Diamond, Holton W. “Rex.” 1966. In re: Holton W. Diamond: History, commentary. 2nd ed. Buffalo, New York. 360 p. Jan. 30. Unpublished manuscript. 36 cm.

• **Summary:** These are legal-size documents, divided into 8 sections with divider tabs, with each page numbered in red, in a large 3-ring loose-leaf binder. These documents cover the period 1945-1966, including Diamond’s youth, and work for the Ford Motor Co. at the Carver Laboratory, Vegetable Products Corp., American Maize Products Corp., and Rich Products Corp. Diamond prepared this

Success Story



Rich Products

IN 1944 . . . AN IDEA
— IN 1965 . . . THE QUALITY
STANDARD BY WHICH ALL
COMPARISONS ARE MADE

We're proud to have played a part.

John L. Lutz Co., Inc.

210 BOYLSTON ST., CHESTNUT HILL, MASS.

Telephone 617/969-9230

collection of documents for use by his attorney, Arthur Allan Smith, of Dearborn, Michigan, in a possible lawsuit by Diamond against Rich Products Corp. The materials were sent on 4 Jan. 1966. On the first page is written: "The peregrinations, perils, and adventures of an inventor-entrepreneur. Question: How can I get out of my present predicament legally and ethically without further injury and with reasonably favorable prospects of continuing my work profitably?"

A 1965 Internal Revenue Service W-2 form, sent to Rex Diamond on 25 Jan. 1966 and pasted to the inside front cover of the binder, states that in that year, Rex Diamond received \$58,851 in wages paid and subject to withholding. A typed note from Herbert R. Kusche states: "On March 31, 1965, Rich Products Corporation became a Delaware Corporation. Prior to March 31, 1965, Rich Products was a New York State Corporation."

A photo shows that the Diamonds moved into their home at 300 Depew Ave. in Jan. 1963. Address: 300 Depew Ave., Buffalo, New York, 14214.

607. Diamond, Holton W. "Rex." 1966. In re: Holton W. Diamond: Exhibits and complementary material. Vol. 2. Buffalo, New York. 197 p. Jan. 30. Unpublished manuscript. Jan. 28 cm.

• **Summary:** These are letter-size documents, divided into 5 sections with divider tabs, with each page numbered in blue, in a 3-ring loose-leaf binder. Diamond prepared this collection of documents, which cover the period 1955-1966, for supplementary use by his attorney, Arthur Allan Smith, of Dearborn, Michigan, in a possible lawsuit by Diamond against Rich Products Corp. Address: 300 Depew Ave., Buffalo, New York, 14214.

608. Hartman, Warren E. 1966. Vegetarian protein foods. *Food Technology* 20(1):39-40. Jan.

• **Summary:** "Early Worthington products bore the mark and influence of John Harvey Kellogg and the Seventh-Day Adventists. In 1866 the Adventists established the forerunner of the Battle Creek Sanitarium and the Battle Creek Food Company, in Michigan. Continuous experimentation with materials and methods to provide a wholesome palatable non-flesh diet led to the invention of breakfast cereals, peanut butter, cereal coffee substitutes, and decaffeinated coffee. It is not generally realized that these products, now a regular part of the diet of both meat-eaters and vegetarians, emanated from the vegetarian habits of the early Adventists."

"Until recently, the majority of the U.S. population was totally unaware of the so-called vegetarian protein food products, and the food industry gave them little more than passing attention. Undoubtedly, the greatest contribution to the present technology and status of vegetarian protein foods was that of Robert A. Boyer and his method of processing edible protein, first by solubilizing and then utilizing textile

spinning techniques to orient the molecules in continuous filaments. Convinced of a future for vegetarian protein foods, Worthington obtained a license in 1957 under the Boyer patent..."

"In 1960, Worthington acquired Battle Creek Food Company, pioneer of the vegetarian protein foods industry. And in line with its modernization and diversification policy, Worthington has recently acquired Nutrition International Corporation and its subsidiary, Madison Foods, Tennessee. Prime interest focused on 'Inf-a-soy,' Nutrition International's highly palatable hypoallergenic liquid soy formula for infants. Another important addition to the Worthington complex is the new Research and Development Center..."

"The first textured soybean protein fiber product marketed in the U.S. is Worthington's frozen 'Fri-Chik,' an extruded formulation simulating a small fried portion of white chicken meat. This same formulation was next canned in a light gravy and called 'Soyameat-Fried Chicken Style,' and was also later marketed as frozen and canned 'White-Chik' in large rolls for slicing, dicing, etc. The approximate analysis of these simulated chicken products: protein 20-26%, fat 18-25%, and carbohydrate 2-3%."

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term "soybean protein fiber" to refer to edible spun soy protein fiber. Address: Worthington Foods, Inc., Worthington, Ohio.

609. Boyer, Robert A.; Schulz, A.A.; Schatzman, E.A. Assignors to Ralston Purina Company. 1966. Method of manufacturing a protein food product. *Canadian Patent* 727,064. Feb. 1. 10 p. *

• **Summary:** Describes production of soy protein fiber.

610. **Product Name:** TVP Textured Vegetable Protein (Textured Soy Flour) [Meat Flavors, Nut Flavors, and Unflavored].

Manufacturer's Name: Archer Daniels Midland Co.

Manufacturer's Address: Decatur, Illinois.

Date of Introduction: 1966. April.

Ingredients: Defatted soybean meal.

Wt/Vol., Packaging, Price: Sold in bulk.

How Stored: Shelf stable.

Nutrition: Moisture 6%, protein 52%, fat 1%, ash 6%, crude fiber 3%, other carbohydrates 32%, calories 280/100 gm.

New Product-Documentation: Ziemba. 1966. Food Engineering. May. p. 82-93. *Soybean Digest*. 1966. Dec. p. 14. "ADM Begins Production of New Protein Foods." *Soybean Digest Blue Book*. 1968. March. p. 112. Company is now at 733 Marquette Ave., Minneapolis, Minnesota. *Soybean Digest*. 1968. May. p. 38. "Atkinson Pioneered Textured Protein." Ad in *Soybean Digest*. 1969. May. p. 9-12. "A fabulous new food: TVP. Dip in batter, saute, and see what you can do with it." *Soybean Digest Blue Book*. 1969. p. 114. Company is now at 4666 Faries Parkway, Decatur, IL 62526. "TVP, via extrusion

process, in meat flavors, nut flavors, and unflavored.”

William Atkinson. 1970. U.S. Patent 3,488,770. Predicasts. 1974. World Manufactured Soybean Foods. p. 9. “Archer-Daniels-Midland (Decatur, Illinois), through its ADM Protein Specialty Division, has been the world’s leading producer of soybean protein foods since 1965. Its ‘TVP’ extruded textured soy protein is used in meat patties, pizzas, chili, stews and a myriad of other prepared meat products.” Main soy meat extender plants are in Decatur, Illinois and Fredonia, Kansas.

611. *Business Week*. 1966. Soybeans move up on the menu. July 23. p. 82, 84, 87.

• **Summary:** “General Mills, under its Betty Crocker Red Spoon trademark (A.D. Odell in charge), is test marketing the first of a series of projected foods spun out of a protein isolated from soy. Called Bac*Os, it is designed as a condiment and looks and tastes like lean, crumbled, cooked bacon. Priced at \$0.69 for 3.25 ounces, the jar is equal to 1 lb of cooked bacon.” Corn Products’ (CPC) Best Foods Div. is marketing Skippy peanut butter containing the product. “Thomas J. Lipton, Inc., a Unilever subsidiary, recently launched four dried gourmet main dish meals including beef stroganoff and chicken la scala. Lipton has patented a process to use isolated soy protein (ISP) as a binder for dried meats... Ralston Purina has developed a series of spun soy protein foods resembling ham, chicken, and turkey out of ISP. It is selling its spun ISP base, Edi-Pro, to Worthington Foods Inc. Worthington has developed its own line of chicken and ham-like products for sale to religious groups.

“Central Soya makes an isolated soy protein binder called Promine, which goes into sausage and other processed meats. Sales of the binder at \$0.35/lb—twice the cost of the binder it is replacing—are so promising that production will be doubled to 2.5 million lb monthly when a new plant opens in Chicago next month... In addition the company this fall hopes to start exporting a frozen soy dessert to tropical countries with no dairy industries.” General Mills, Ralston, ADM, Central Soya, and Worthington combined spend some \$4 million annually on research. Half of this sum is going into basic research and half into product development. ADM recently shipped 3 million lb of a new protein rich soy beverage to Latin America and the East Asia under a USDA program.

612. Hartman, Warren E. 1966. Research and development in synthetic foods. *New York State Association of Milk and Food Sanitarians, Annual Report* [19 ref]

• **Summary:** “Research and development in synthetic foods is no longer a skeptical venture. Today it is fast becoming an alarming necessity! Two most basic and major problems face the world today (1) The world population explosion accompanied by (2) The skyrocketing need for food. Synthetic foods are already a part of big business.”

“Worthington Foods has been in the vegetarian protein

food business for some 25 years. Primarily, the business was concerned with supplying such foods to consumers who had medical, philosophical, or religious reasons for wanting them. Early products were based on wheat proteins or ‘gluten.’ Worthington had accumulated considerable flavoring ‘know-how’ by the time soy products such as flakes, toasted grits and isolated protein became available. One of the first Worthington products based on soy protein was a powdered milk-like product, Soyamel, which was designed primarily as a hypoallergenic formula for infants and children who were allergic to milk... Perhaps one of the first companies to explore the protein spinning technique developed by Robert Boyer (U.S. Pat. # 2,682,466) was Worthington Foods. For the past ten years Worthington has pioneered in the field of vegetarian protein foods; seeking suitable protein isolates for spinning, developing spinning technology, formulating and adapting these spun protein fibers to acceptable consumer end-products.”

“The present technology of spinning as practiced by Worthington Foods, uses as a raw material relatively pure soy protein isolate as obtained from Ralston Purina, Central Soya or other suppliers of protein isolates.”

A photo shows Hartman, who has been with Worthington Foods since 1947. “His academic training was acquired at Andrews University, Berrien Springs, Michigan; University of Michigan, Ann Arbor; and at Massachusetts Institute of Technology. Dr. Hartman was employed as a biochemist-bacteriologist for four years by the Michigan State Department of Health Laboratories in Lansing, Michigan, and was a consultant-instructor for a year for the U.S. Public Health Service.” Address: Director of Research and Development, Worthington Foods, Inc., Worthington, Ohio.

613. Deutsch, Ronald M. 1967. The nuts among the berries: An exposé of America’s food fads. New York, NY: Ballantine Books (mass market paperback). 320 p. Foreword by Frederick Stare, M.D. Index. Feb. 18 cm. Revised in 1977 as The new nuts among the berries. Palo Alto, CA: Bull Publ. Co. 359 p.

• **Summary:** The rear cover states that “this book tells the astonishing story of a hundred years of health foods and faddists. It names the promoters and the products. It cites the findings of the Food and Drug Administration. It quotes the warnings of the American Medical Association. It completely exposes the hokum and ballyhoo of the health food business—now bilking the public of \$2,000 million ever year—and shows why crackpot food fads are a waste of money at best and a serious danger to the health of those suffering from real illnesses.”

Contents: Foreword. Introduction. 1. Of cabbages and things (a brief history of “health-foodism”). 2. Mr. Graham bakes a cracker (Sylvester Graham). 3. Little men, little women, little food (Amos Bronson Alcott, Louisa May Alcott, and vegetarianism). 4. Father Kneipp and his watering can.

5. Mother White casts her brood upon the waters (Ellen G. White and James Caleb Jackson). 6. Snap! Crackle! Enter Dr. Kellogg! (Dr. John Harvey Kellogg). 7. The battle of Battle Creek (Michigan and Seventh-day Adventists). 8. From pillar to Postum. 9. Kickapoo and Kellogg, too. 10. The Jungle, the sausage, and the law (Upton Sinclair, Harvey W. Wiley, and the formation of the FDA). 11. Chew, chew, baby (Fletcher, Chittenden). 12. Life along the alimentary canal (Metchnikoff and yogurt). 13. The bare torso king (Bernarr Macfadden). 14. The bare torso king rampant (Macfadden). 15. I see America starving. 16. How to keep your cow from drooling (selling nutrition). 17. A plague on both your Hausers (Gayelord Hauser). 18. How to write about health foods (Lelord Kordel, Cathryn Elwood). 19. Mrs. Spratt's millions (fat and dieting). 20. My mother squeaked (Don Dale Alexander and arthritis). 21. The poisons in your health food (how the public is being duped by health food hucksters). 22. How to be an expert. 23. What the law can do. 24. Taller in the saddle. 25. The unteachables. 26. To market, to market. 27. On learning to be a faddist. Address: Popular scientific and medical reporter.

614. Thulin, W.W.; Kuramoto, S. 1967. "Bontrae"—A new meat-like ingredient for convenience foods. *Food Technology* 21(2):64-67. Feb. [14 ref]

• **Summary:** Bontrae is made from spun soy protein fibers. "Although regeneration of oriented protein systems had been studied earlier (Lundgren, 1949), techniques for spinning protein were reduced to practice in the early 1930s by a group at the Ford Motor Company led by Robert A. Boyer. The Ford efforts were directed toward textile applications." In 1954 Boyer was granted a patent for using spun protein fibers to create edible structures. Research directed to this end has been undertaken by a number of food processors including Swift & Co., Unilever, General Foods, National Biscuit Co., Worthington Foods, Ralston Purina, and General Mills.

A photo shows two hands holding a "protein ribbon expanded to display individual filaments." A note at the end of the article states: "Presented at IFT 25th Annual Meeting."

Note: The 25th Annual Meeting of the Institute of Food Technologists was held 16-20 May 1965 in Kansas City, Missouri. An abstract (10A) of this paper appears on p. 43 of the program. Address: James Ford Bell Research Center, General Mills, Minneapolis, Minnesota 55427.

615. Fischer, R.W. 1967. The use of soy in food products. *Soybean Digest*. May. p. 29, 31-32, 35-36, 38.

• **Summary:** An excellent overview, with considerable history. Contents: Introduction. Grisly hand of hunger. Soybean oil. Oriental soy foods. Soy flour and grits (with a good history of Berczeller, A.E. Staley, Shellabarger, Allied Mills, J.R. Short Milling Co. and Wytase). Isolates and concentrates. The war years (during and immediately after World War II, soy flour and grits come to be widely disliked). New products and

know-how.

"Oriental soy foods:... In the Orient soybeans have, for centuries, played an important part in human diets as soy milk for infants, shoyu, or soy sauce as we call it, miso, tofu, tempeh, kinako, natto, yuba, etc."

"Isolates and concentrates: In the mid-1930's processes for further refining the protein factors of soy began to appear. The first 70% soy protein concentrate was turned out by Mead Johnson Co. using the Bonato process of sulfur dioxide and sulfurous acid extraction, but was discontinued for lack of adequate markets for the product. In 1936 the Glidden Co. began working on the production of an isolated protein [90-100% protein] from extracted soy flakes for industrial uses. Glidden, as a major manufacturer of resin, wanted the isolate as a stabilizer for the resin used in sizing paper to provide wet strength. By 1939 Glidden was producing an enzyme hydrolyzed isolated protein to be used with egg albumen for its whipping capacity in producing food toppings... Over the years soy protein isolates have found their greatest application in the industrial field, particularly as paper coatings for high gloss products."

A photo shows cans of Worthington Choplets, Soyameat (3 varieties), and Numete—all made from spun soy protein fibers. Address: Soypro International Inc.

616. Diamond, Holton W. 1967. Profit potential of new vegetable fat products. Paper presented at the 60th annual convention of the Milk Industry Foundation and the 63rd annual convention of the International Association of Ice Cream Manufacturers. 9 p. Held jointly in Los Angeles, California. Session on Marketing and Technology, Tuesday, Oct. 24, 1967.

• **Summary:** Pages 5-6 state: "The finest vegetable milk which I have seen is that which was made at one time at the George Washington Carver Laboratory in Dearborn, Michigan. During my work there in the years between 1940 and 1946, a great deal of technology was developed in the manufacture of many kinds of vegetable dairy products. A pilot type soy bean milk plant in which we made 150 gallons per day of soy bean milk and soy bean cream was part of the laboratory. The milk and cream were supplied at no cost to mothers of infants who were allergic to cow's milk, and to others; and the technology was shared freely with all who were interested. The laboratory was supported by the late Henry Ford, and he visited us often. A very great deal has been done since, but much of the basic technology now in use in this field originated in this small laboratory, in research which was made possible by the interest of Henry Ford in the soy bean and in what has come to be called 'chemurgy,' the industrial use of the products of the farm and of the soil..."

"If you will share with me one experience, you can imagine how I may have become prejudiced in my outlook on cultured cheeses. Across a period of several months, at my direction, a laboratory technician at the George Washington

Carver Laboratory inoculated samples of soy bean milk and soy bean cream with portions of Cheddar, Limburger, Roquefort, Camembert, Liederkranz and other cheeses.” None of the workmen wanted to open the incubator door; in fact, they drew straws each Monday morning to see who would have to do it.

Concerning the concept of “imitation” products: “A product which is demonstrably less well suited to its intended purposes than is a well known precursor which it resembles and which is used for the same purposes is inferior. Because of its inferiority, it is properly labeled and referred to in a derogatory way as an ‘imitation,’ for this word, both as an adjective and as a noun, connotes inferiority.

“We are no longer ashamed of new or mixed-ingredient materials merely because they are new or comprised of components of different origins.” In almost every case they are less expensive, and in some cases they are clearly superior in at least some characteristics to their dairy counterparts. Address: Rex Diamond Laboratories, Inc., Detroit, Michigan.

617. *Chemurgic Digest*. 1967-69. The Chemurgic Council (The Council for Agricultural and Chemurgic Research). Jan/Feb. p. 2, 8.

• **Summary:** This is the last issue of *Chemurgic Digest*, published by the Chemurgic Council, 350 Fifth Ave., New York 1, NY. The Council’s logo shows that chemurgy is the union of agriculture, industry, and science. Chemurgy is now defined as “That branch of applied chemistry devoted to industrial utilization of organic raw materials, especially from farm products.” Discusses: What is Chemurgy? What is the Chemurgic Council? How did the Chemurgic Council get started? What has been accomplished as a result of the Chemurgic Council’s activities? What is presently being done by the Chemurgic Council?

“When Chemurgy first originated it was concerned with new or improved industrial uses of agricultural products and wastes. Today this concept has been broadened... The modern definition of chemurgy is built around the idea of making industrial products from renewable resources grown on the soil or in the sea... The Chemurgic Council originated at Dearborn, Michigan, during 1935.”

618. Call, D.L. 1968. The impact of meat analogs: Expanded use of soy products in the meat industry is seen as favoring the expansion of animal agriculture. *Meat (Minnesota)* 33(13):34-37. Jan. (Actually: Vol. 34, No. 1). [6 ref]

• **Summary:** The use of soy protein concentrates and isolates in sausage and prepared meats is the most important for soy proteins that could be considered as competition for the meat industry. An estimated 4.2 billion pounds of sausage are made in the USA, and an estimated 75% of this is supplemented with dried milk, soy or other ingredients. If soy protein isolates were used at the 2% level to supplement all of this 75%, over 60 million pounds would be needed. This

is not about to happen, since current production of isolated soy protein for all purposes is about 15 million pounds per year.

“Since Henry Ford ‘discovered’ the soybean, large amounts of time and money have been spent in attempts to unlock the potentials of this bean. The two ‘F’s’ flavor and flatulence, have been tough to conquer but soy protein isolate and other forms seem to have great potential as raw materials.”

“The expanded use of soy products in the meat industry is seen as favoring the expansion of animal agriculture.” Address: Graduate School of Nutrition, Cornell Univ., Ithaca, New York.

619. Sanford, David. 1968. Unfoods: Do you know what you’re eating? *New Republic* 158(2):13-15. May 18.

• **Summary:** Discusses (critically) the meat-like products made by Thomas J. Lipton Co., Loma Linda Foods, Worthington Foods, and General Mills (Bac*Os). “Swift & Co. markets a soy larded chili, salisbury steaks, canned meat loaf and sloppy joes to restaurants, which call them pretty much what they like.

“The transforming of soy protein into edibles involves, in the case of Worthington Foods, General Mills and Ralston Purina a process licensed by Robert Boyer, an inventor and protégé of Henry Ford.” Note: No mention is made of Loma Linda using spun soy protein fibers. Many legitimate issues regarding the labeling of modern soy protein products are raised.

“Bac*Os, the bacon-like bits test marketed over the past 18 months in Denver [Colorado], Buffalo [New York] and Sacramento [California], is about to be advertised nationally. Two years ago a token quantity of Bac*Os was seized by the Food and Drug Administration in Buffalo and a case was brought in the US Federal District Court (Western Region) in New York to force General Mills to identify their product as ‘imitation bacon.’...”

“Bac*Os bottles didn’t say that Bac*Os were bacon, just that they were a lot *like* bacon... Its label now reads ‘Crispy Bontrae bits with a flavor like bacon.’ Bontrae, the label explains, is a registered trademark for a vegetable protein product. Arthur Odell, who manages General Mills’ isolated protein program, thinks that that is sufficient.”

620. *Soybean Digest*. 1968. Atkinson pioneered textured protein. May. p. 38.

• **Summary:** William T. Atkinson invented the method for manufacturing textured vegetable protein (TVP), a new and versatile soybean-derived food. “Atkinson started his soy research in the 1930s when he developed an automobile upholstery fiber from soybean meal while working for Henry Ford. He continued with the fiber operation after it was sold to The Drackett Co. and moved to Archer Daniels Midland Co. when Drackett sold the agricultural portion

of its business to Archer Daniels.” Atkinson is now active in other areas of ADM’s food research program. A photo shows Atkinson.

621. Wilcke, H.L.; Martinez, W.; Calvert, F.E. 1968. Oilseed meals and flours for food use: Export issue. *Soybean Digest*. May. p. 18, 20.

• **Summary:** Contents: Introduction. Flour for humans. Categories of use: Functional characteristics (binder, emulsifier, etc.), texture, color, nutrition. We never buy protein (“In fact, if the average housewife were asked to define protein, she would probably respond in terms of meat, milk, or eggs”).

Flour from oilseeds (at a 6% moisture level) typically contains about 50% protein, 1½% fat, and 3% fiber. Full-fat soy flour is available on the market, as well as the typical defatted flour.

Soy concentrate has been defined as, “The product prepared from high-quality, sound, clean dehulled soybeans by removing most of the oil- and water-soluble nonprotein constituents and shall contain not less than 70% protein (N x 6.25) on a moisture-free basis.

“The isolates, as the name implies, are protein fractions isolated from the defatted flakes or flour. The protein content of the isolate, when calculated on a nitrogen x 6.25 basis, varies from approximately 92% to 95%, or on a moisture-free basis from approximately 97% to 100% protein equivalent. The fiber is quite low and the ash is also low. This the protein is provided in a much more concentrated form, and consequently less of these products are added than when the flour is used directly.”

Note: Frank E. Calvert came to Ralston Purina from the Ford Motor Company, where he did research on soy proteins. Address: Ralston Purina.

622. *Soybean Digest*. 1968. Joins Ralston Purina Co. July. p. 22.

• **Summary:** “Dr. Charles W. Kolar has joined the protein division research organization of Ralston Purina Co., it has been announced at company headquarters in St. Louis by W.L. Golden, director, new venture management, and F.E. Calvert, director of protein division research. Dr. Kolar received his Ph.D. in food science in 1967 from Michigan State University at Lansing.”

623. Calvert, F.E. 1968. Re: Your request for fresh sample of Textured EdiPro (spun protein fiber). Letter to W.J. Wolf, Acting Head, Meal Products Investigations, USDA ARS Northern Utilization Research and Development Div., 1815 N. University St., Peoria, Illinois 61604, Aug. 30. 1 p. Typed, with secretary’s signature on letterhead. [1 ref]

• **Summary:** In response to Wolf’s letter of Aug. 28, Calvert is sending a 1-quart sample of fresh Textured EdiPro. Address: Director, Protein Research, Protein Div., Ralston Purina Co., Checkerboard Square, St. Louis, Missouri 63199. Phone:

CHestnut 1-3600.

624. Atkinson, William T. Assignor to Archer-Daniels-Midland Company (Minneapolis, Minnesota; a corporation of Delaware). 1969. Process for preparing a high protein snack. *U.S. Patent* 3,480,442. Nov. 25. 3 p. Application filed 22 June 1966. [8 ref]

• **Summary:** “Abstract: A process for the precipitation of a friable, crisp, edible snack in which the cells are of random distribution and size of high protein content obtained by extruding a protein mix of a solid protein derivative having a protein content of at least 30% by weight of the solid and from 12 to 20% by weight of the mix of water at a temperature of 20 to 480°F. at a pressure of at least 1000 p.s.i.”

“The preparation of expanded cellular carbohydrates in the form of cheese and meat-flavored snacks by the so-called puffing techniques is known to the art. Such techniques are, however, not satisfactory in the preparation of expanded, cellular products from edible, bland protein derivatives such as [solvent] extracted oil seed proteins, fish proteins, and animal proteins. Nevertheless it would be highly desirable to produce such protein snacks in view of the high nutritional value and low caloric content of the described protein derivatives.” Address: Minneapolis, Minnesota.

625. *Chemical Engineering*. 1969. General Mills’ engineered foods score high in technical, commercial and sociological impact. Dec. 1. p. 79-85. [10 ref]

• **Summary:** General Mills has won the 1969 Kirkpatrick Chemical Engineering Achievement Award based on its innovative work with spun soy-protein monofilaments. The firm’s Bontrae line of protein foods first won strong consumer retail acceptance “with an analog of bacon, Bac*Os.” This product is already widely sold in grocery stores throughout the USA (except on the West Coast, due to lack of production capacity). “Meanwhile, quick-frozen, precooked chunks and crumbles of analogs of beef, poultry, and a frozen ham-analog sandwich spread, have been successfully test-marketed at hotels, restaurants and institutions in Albany, New York, as well as in certain outlets of national restaurant chains. What’s more, General Mills is supplying its new textured-foods line as ingredients for products sold by Thomas J. Lipton, Inc., Hunt Foods & Industries, Inc., Lawry’s Foods, Inc. and others.

Dr. Arthur D. Odell (Director of Special Programs) has been the prime mover in the development of this product line. He often cites the “protein gap” that exists in many poorer parts of the world. Photos show: (1) Dr. Odell with a quotation from him on the dire consequences of dietary protein inadequacy. (2) Five views of the process and products (with meat analog flow sheet). (3) Half-finished plant in Cedar Rapids, Iowa, that is scheduled to start operation in April 1970 and to produce 20 to 30 million lb/year of “wet” or “dry” meat analogs.

Also discusses: Nutrition, versatility, acceptance. Solving upstream problems. Complications during spinning.

The initial base patent for this process was U.S. patent 2,682,466 (Boyer 1954).

626. McMillen, Wheeler. 1969. *The green frontier: Stories of chemurgy*. New York, NY: G.P. Putnam's Sons. 192 p. Illust. Portrait. Index. 21 cm.

• **Summary:** The folded-inside front book jacket (dust cover) flap features the soybean: "Agricultural scientists turned the soybean into a major raw material for industry and perfected the same bean as a nourishing food [feed] for livestock. The soybean story is just one example of how existing plants have been improved in their natural growth and processed into valuable commodities."

Page 41 states: "The greatest of all the new crop stories is that of the soybean. That *is* a success story and will have a chapter to itself."

Chapter 5, titled "The Soybean: America's Big New Crop," notes: "There is no great miracle about the soybean, unless it is that men were so slow to discover its amazing usefulness, and that they have been endlessly surprised at the apparently inexhaustible values that turned up after they really began to look." The author then chronicles the rise of the soybean in America, including the work of Piper and Morse (with many photos of Morse in East Asia in 1929-31). By 1966, with 931 million bushels produced, it had become the nation's third-largest cash crop. Henry Ford and Robert Boyer used soys extensively to make automobile parts. Despite earlier expectations, the strictly industrial consumption of soybeans has probably taken not more than 7% of the annual crop. A photo (frontispiece, facing the title page) shows Dr. George Washington Carver in his laboratory with his assistant, Dr. Austin W. Curtis. Address: Anna Maria Island, Florida.

627. **Product Name:** Whitehouse Coffee Fresh (Non-dairy Soy-based Coffee Creamer).

Manufacturer's Name: Whitehouse Products, Inc.

Manufacturer's Address: Livonia Dairy, 2001 S. Telegraph Rd. at Harvard, Dearborn, Michigan.

Date of Introduction: 1969?

New Product-Documentation: Talk with David and Harvey Whitehouse of Delsoy Products and Whitehouse Products. 1992. Feb. 4. In the late 1960s, Whitehouse Products (formerly Delsoy Products) developed a soy-based non-dairy creamer named Whitehouse Coffee Fresh. After several years the soy was replaced by another ingredient.

628. Atkinson, William T. Assignor to Archer Daniels Midland Company (Minneapolis, Minnesota; a corporation of Delaware). 1970. Meat-like protein food product. *U.S. Patent* 3,488,770. Jan. 6. 6 p. Application filed 7 March 1969. 1 drawing. [8 ref]

• **Summary:** This is ADM's basic U.S. TVP patent based on

extrusion cooking of defatted soybean flakes. "Abstract of the disclosure: A hydratable food product is obtained by forming a protein mix of a proteinaceous material having protein content of at least 30 percent, and preferably a solvent-extracted oil seed protein material, with 20-60 percent of water based on the weight of the protein mix, masticating this mix at temperatures substantially above the boiling point of water, and thereafter extruding this mix at elevated pressures and temperatures through an orifice into a medium of lower pressure and temperature.

This application is a continuation-in-part of application Ser. No. 587,939, filed Aug. 17, 1966, which in turn is a continuation-in-part of application Ser. No. 369,189, filed May 21, 1964, now abandoned. The present invention relates to the production of meat-like food products from vegetable, fish, and similar protein sources. More particularly, the present invention relates to the production of protein structures having a texture and appearance very similar to muscle protein found in common meat products like steaks, fowl, chops, hams, and the like."

In Example 1 the following components, listed in the order that they are added, were mixed in a ribbon blender at 120°F for about 20 minutes: 11,350 gm of extracted soybean flakes containing 50% soy protein and 6.5% moisture; 45 ml of 50% hydrogen peroxide for purposes of flavor and odor control dilutes in 380 ml water; 1,700 gm imitation beef seasoning; 3,785 ml of water, 90 gm of 97% pure sodium hydroxide; and 340 gm of calcium chloride dissolved in 500 ml of water. The resulting mixture was extruded.

In "Meat Analogs," Horan (1974, p. 375) notes that the product described in this patent has probably had "the greatest impact in bringing the low-cost, textured vegetable products into commercialization: defatted soy flake or flour (50% protein) is put through a continuous process in an extruder to give an expanded and molecularly oriented material having textural properties described as plexilamellar. The product contains an open cell structure in which the majority of the cells have dimensions of greater length than average width and are aligned in the direction of flow of the plastic mass through the extruder. These types are commonly referred to as thermoplastic-extruded products."

Brian (1976) reports that "Approximately 60% of the soy flour and grit texturizing capacity in the U.S. is licensed under this Atkinson patent." The process yields a plexilamellar fibril and is best known in ADM's product trademarked TVP. The product resulting from Atkinson's patent was given a large new market in 1971 when it was accepted into the school lunch program in the USA.

Note 1. The Atkinson patent dominated the industry from 1970 to 1976, and during that time ADM very effectively marketed and promoted TVP. However in Feb. 1976 a very similar U.S. patent (No. 3,940,495) was issued to Ronald J. Flier and assigned to Ralston Purina. A lawsuit and trial concluded that the Flier patent now dominated the Atkinson

patent because it could be traced back to a July 1964 patent application. Thereafter most large manufacturers of textured soy flour took licenses on the Flier patent—even ADM!

Note 2. Interview with Don Aldon, former soy researcher at Swift & Co. 1985. Feb. 26. In about 1963-64 Dean Wilding of Swift invented a product named Texgran; it was a textured soy flour, somewhat like today's TVP. Wilding invented a texturization process while trying to find a way to extrusion cook soy flour. He visited Wenger and saw a variety of products they made. He recognized their value and bought a machine. Aldon worked for about 18 months developing the process, doing research, and generating information to be used in the patent. Swift started selling the product before they applied for the patent. "As soon as our competitors saw this product, they recognized its value because they had been extruding dog food. Ralston Purina slammed things together and got a patent application in first. Two weeks later ADM had one in. Then 3-4 weeks later Swift applied." Swift started selling Texgran in 1964-65. The patent was finally issued in about 1971-72. Litigation went on for years and years between the three companies. Finally Ralston got the basic patent since they had applied first. ADM and Swift got a royalty-free license. They did that just to settle the litigation. Address: Minneapolis, Minnesota.

629. *Ralston Purina Magazine (St. Louis, Missouri)*. 1970. Thanks to Mr. Ford. May/June. p. 26-29.

• **Summary:** Henry Ford had an eye for promising young men. And two of Ralston Purina's key research men, Frank Calvert (R&D director for new venture management) and Bob Boyer (senior scientist, central research) received a truly unique education." In 1930 the new Chemical Laboratory opened in Greenfield Village; Calvert and Boyer were among the 15 boys from the Ford Trade School, Henry Ford's technical school in Massachusetts, who were chosen to work there. Boyer, age 21, who had attended the Ford Trade School [at the Rouge Plant in Dearborn, Michigan] from 1927 to 1930, was put in charge of the project. After deciding to focus on soybeans in 1931, they developed a process for extracting soybean oil. Every morning at 8:00 sharp, Henry Ford used to appear at Boyer's office to see how his pet project was going.

"In 1938 Frank Calvert joined The Drackett Company in Cincinnati [Ohio], and he was followed in a few years by Boyer. 'At Ford we were trying to make synthetic wool out of [soy] protein but the war cut these efforts short,' says Boyer.

The work on 'soybean fabric' continued at The Drackett Company during the early 1940s. 'We tested the wool fabric for salt content and other factors and one day—I'll never forget it—it occurred to me that if we could make something for the outside of man, why not for the inside.' That's how it came about that in 1949 Bob Boyer filed the patent for edible soy protein fiber.

"He obtained the use of a textile pilot plant and hand made samples of 'synthetic meats.' Later that year, armed with

a soy protein 'ham loaf' he contacted Worthington Foods, a firm making meat substitutes for people who shun meat for religious, health or other reasons "If they hadn't shown interest I probably would have dropped it because I had no income at the time."

"Swift was the first company to take out a license on the patent and Worthington followed not far behind. Soon several companies were licensed to use the patent and Boyer was kept busy with consulting work...

"In 1957 The Drackett soybean operation was sold to Archer Daniels Midland, and Calvert became technical of their protein operations. The paths of Boyer and Calvert crossed again in 1962 when they both joined soybean research activities at Ralston Purina. Boyer had worked as a consultant to Purina when the company began investigating industrial and edible uses of soybean. When he joined the company he assigned his patent ownership to Purina."

"Back in the 1930s many people thought our work was crazy," recalls Boyer. "But Mr. Ford was shrewd enough to know" better. "The best thing he did was to help popularize the soybean."

Photos show: Calvert and Boyer, together and separately. The automotive products made at Ford's lab being displayed in New York in 1931; Calvert and Boyer are present. Boyer and Ford conversing. Ford and Boyer standing behind the famous white "plastic" car.

630. Ashton, Maureen R.; Burke, Carole S.; Holmes, A.W. 1970. Textured vegetable proteins. *British Food Manufacturing Industries Research Association, Scientific and Technical Surveys* No. 62. 36 p. Aug. [92 ref]

• **Summary:** Contents: Introduction. Protein sources. Extraction. Spinning. Extrusion. Gelation. Other methods for generating texture. Commercial aspects. Nutritional aspects. Legal aspects. References. Appendix. The appendix contains an extensive list of patents (mostly British and U.S.) on textured vegetable proteins grouped by the company assigned to or inventor. For each patent, the inventors, country, patent number and year are given, with a brief description of the subject. No patent titles are given in either the appendix or bibliography. The companies/inventors are Archer Daniels Midland Co. (2 patents), R.A. Boyer (3), F.P. Research Ltd (1), General Foods Corp. (7), General Mills Inc. (23), C. Giddey (1), J.H. Kellogg (2), Lever Bros. and/or Unilever (20), G.K. Okumura and J.E. Wilkinson (1), Ralston Purina (4), Swift & Co. (4, including 2 listed for R.A. Boyer), Dr. A. Wander A.-G. (2 Swiss), Worthington Foods Inc. (2), C.L. Wrenshall (1). Address: 1-2. BSc; 3. PhD, FRIC. All: British Food Manufacturing Industries Research Assoc., Randalls Road, Leatherhead, Surrey, England.

631. Dies, Edward Jerome. 1970. In the beginning... *Soybean Digest*. Aug. p. 42-44.

• **Summary:** The article begins: "Far back when the Pyramids

were being built, 3 centuries before the Tower of Babel, and 12 centuries before Solomon fashioned his temple, the little soybean was hoary with age.

"As to the first brave men to eat the legume, we must accept a charming little vignette from antiquity. It tells of a rich caravan, laden with gold and furs, crawling homeward from an east China town. It was surrounded by bandits. The fat merchants took refuge in a rocky defile easy of defense. Days later, with food supplies exhausted, in desperation they ate beans from a curious plant until rescued.

"For the first written record of the soybean one must turn to 'Materia Medica' by Emperor Shennung [Shennong, Shên Nung of China] in 2838 B.C.

"It was not until 1712 that the soybean was introduced to Europe by Engelbert Kaempfer, a German botanist, who had spent 1691 and 1692 in Japan. Europe was mildly bored."

"In 1804 a Yankee Clipper ship in full sail glided down the coast of China searching for a cargo. Uncertain as to the length of the return journey home the captain ordered several bags of soybeans tossed into the hold as a reserve food supply."

This history of the early days of the soybean also discusses William Morse (who graduated from Cornell University on 20 June 1907 and 2 days later reported for duty at the Bureau of Plant Industry in Washington, DC, to work under Dr. C.V. Piper), Burlison, Hackleman and Woodworth of Illinois, Beeson and Ostrander of Indiana, Delwiche and Briggs of Wisconsin, Wilkins of Iowa, Park of Ohio, Wiggans of Cornell and New York, Williams of North Carolina, and Barr of the USDA.

The pioneer growers were Smith and Riegel in Illinois; Elmer and E.F. (Soybean) Johnson, and G.G. McIlroy in Ohio; J.B. Edmondson, the three Fouts brothers, and Charles Meharry in Indiana. The pioneer soybean processors and NSPA, the American Soybean Assoc., and Henry Ford.

"E.J. Dies is a former staff correspondent of the Associated Press, magazine writer, and public relations man. He is the author of at least eight books including the well-known 'Soybeans: Gold from the Soil,' which he wrote while he was president of the National Soybean Processors Association. He headed the processor group in a period 'when products had to fight every inch of the way into a fiercely competitive field,' terminating his association in 1945."

632. *Soybean Digest*. 1970. Henry Ford and his plastic car (Photo caption). Aug. p. 45.

• **Summary:** This photo (half-page, black-and-white) shows Henry Ford in about 1941 swinging an ax into a car trunk lid made of soybeans, to show the trunk's toughness.

A smaller photo shows Robert Boyer and Henry Ford in the soybean laboratory where Boyer developed spun soy protein fibers. Boyer is now with Ralston Purina Co. Photos courtesy of Ford Archives.

633. USDA Northern Regional Research Laboratory. 1970. Soy proteins. *Soybean Digest*. Aug. p. 75-76.

• **Summary:** A brief chronology of major food and industrial developments with soy proteins from 1917 to 1969. Address: Peoria, Illinois.

634. Wing, David G. 1970. My 60 years with soybeans, "pleasant and profitable." *Soybean Digest*. Aug. p. 46-47.

• **Summary:** This brief history tells how David Wing has grown up with the soybean and the American Soybean Association in America. About 60 years ago, in about 1910, his father and uncle planted a field of Ito San soybeans in Ohio. David and a hired man harvested the crop by cutting the plants off with a sharp hoe and shocking them in piles with a pitchfork. Later they were run through a grain separator and sold for seed.

Since there were no commercial inoculants at the time, David would sack up top soil from the same field where the soybeans had grown, lift the bags onto an old spring wagon, haul them to the express office, and ship them to new growers who wished to ensure the success of their first attempt at soybeans by growing them in inoculated soil.

The Wing family also raised Mikado and Mongol soybean varieties, which were used for hay.

"There were soybeans on Woodland Farm off and on for the next 20 years, but no progress was made until we got a combine and the elevators began to handle the beans for the processors."

"The American Soybean Association was 20 years old when I became president in 1941. It was organized in 1920, but for 20 years it was run by various extension agents and agronomy heads from the Cornbelt universities. These men did a fine job of promotion, so by 1940 when Glen G. McIlroy of Farm Management Inc., Irwin, Ohio, became president we were ready to hire a secretary and branch out as a farm organization.

"The Ford Motor Co. at Dearborn, Michigan, entertained us that year. Henry Ford had been working on soybean plastics and textile fibers, since there was then a surplus of soybean meal. Today this surplus is difficult to imagine, but at that meeting one speaker even suggested that soy plastics could be used for window frames and table tops!

"It was at this Dearborn convention in 1940 that we hired George Strayer as executive secretary of the American Soybean Assn., and it was due in part to his work and devotion that we have developed into our present worldwide organization.

"I notice in the *Soybean Digest* that A. E. Staley, founder of the Staley Co., died that same year. He was the first processor to really push soybeans. Expansion came along very fast. The Baltimore & Ohio Railroad sponsored a special train that traveled through Ohio, Indiana, and Illinois. There was great interest shown in the exhibits and lectures presented on this train."

Photos show: (1) David Wing in 1947, holding a clipboard and standing in a field of soybeans. (2) George M. Strayer and Howard L. Roach standing by a globe of the world in 1960 at the time of signing the historic first contract with the Foreign Agricultural Service, USDA, for global market development work by the Soybean Council of America in 42 countries. Roach was then president of the Council, Strayer executive director and executive vice president of ASA.

Note: Many early soybean varieties were developed by the Wing Seed Company of Ohio. Address: Mechanicsburg, Ohio.

635. Wilding, M.D. 1970. Oilseed proteins. Present utilization patterns. *J. of the American Oil Chemists' Society* 47(10):398-401. Oct. [10 ref]

• **Summary:** A review of the uses of soy protein. Soybean is the most economical source of protein in terms of yield/acre. Flavor problems have been solved. Textured soy protein is reported. Figure 1 shows the relative efficiencies of protein conversion from some major protein sources. "The time has now come as predicted by Harry W. Miller in 1943, that our chief interest in the soybean is in its value as a human food."

The first significant development in texturizing proteins was made by Robert Boyer in 1947; he developed an edible soy protein fiber using a process similar to that for making textile fibers. This process is described. Today such fibers are being produced commercially by General Mills, Worthington Foods, and Ralston Purina, and used in some very sophisticated "engineered meat-like items." General Mills recently announced its intention to construct a multimillion dollar plant to make these "fabricated engineered foods."

Figure 1 shows the number of days of protein requirement (by a moderately active man) produced by one acre, yielding selected food product. Legumes make very efficient use of the land, grains make fairly efficient use, and livestock make very inefficient use. Soybeans make the most efficient use of the land to produce protein; they will sustain a man for 2,224 days. Beef cattle make the least efficient use; they will sustain a man for only 77 days.

Tables show: (1) The estimated production and prices of soy proteins. Soy flour and grits (120-126 million lb, 7-8 cents/pound). Soy concentrates (19-33 million lb, 18-26 cents/pound). Soy isolates (24-38 million lb, 35-45 cents/pound). (2) Amount of soy flour (million lb) used in various applications (both extrapolated from Eley 1968). (3) Physical properties and functional advantages of textured soy protein.

Large amounts of soy protein are also now being used to make fluid beverages. In Brazil, the Coca-Cola Co. has launched Saci, a chocolate flavored soy beverage. In British Guiana, Monsanto is making Puma. In Hong Kong Vitasoy is a commercial success. Address: Research & Development Center, Swift & Co., Oak Brook, Illinois.

636. Barnard, W.G. 1970. Health via the carrot and other vegetables. St. Catharines, Ontario, Canada: The Provoker Press and Paul S. Eriksson, Inc. xiv + 144 p. No index. 19 cm.

• **Summary:** This is apparently a reprint (with several words missing from the title) of the original edition (which Soyfoods Center has never seen), published in about 1939 by the Natural Foods Institute of Cleveland, Ohio. This edition contains 37 short chapters on a variety of subjects such as: What causes good health and poor health? Personal experiences of the author. The natural laws that govern health—God's simple rules of natural living. About vitamins and minerals. Various health problems or diseases and testimonials of cures and prevention. Good and bad foods, etc. Enemies of health: Coffee, alcoholic liquors, tobacco, denatured foods, tea, cocoa, cola drinks.

The introduction begins: "One of the most wonderful gifts God gave to man is a healthy body. It costs not one penny to preserve your health, but it may cost you a fortune, untold suffering, yes, even life itself, once health is lost... Primitive man sustained himself on natural foods..." (p. ix). "In our opinion some of the worst enemies man has today are High Pressure Advertising of Denatured foods, drugs, etc... Through the powerful medium of radio, billboard, magazine, and newspaper advertising, the public has fastened themselves upon the use of aspirins, alkalizers, narcotics, pills, laxatives, seltzers, cold cures,... Some of the largest buildings in our cities are the hospitals... Oh, what tragedy!" Sadly man fails to recognize that he has brought all these diseases upon himself (p. xiii).

Chapter 3, titled "My personal experiences with carrots and other fruits and vegetables" (p. 11) begins: "For the past 14 years the writer has been lecturing in food shows, trade shows, and expositions on the proper preparation of foods. I lectured at the Century of Progress in Chicago [Illinois] in 1933 and again in 1934, and at the Great Lakes Exposition in Cleveland in 1936 and again in 1937. I am the founder of the Natural Foods Institute in Cleveland, Ohio. He has proclaimed the health-giving carrot to thousands.

"Up to ten years ago, I had been living the average life, eating anything and everything, drinking coffee, tea, cocoa, and colas. The base of my meal was potatoes and white bread. I acquired an excessive weight of 212 pounds. Heartburn followed every meal." He then describes a typical day's diet, loaded with meats, sugar, fat and refined foods—and the agony that followed. He lost his pep and ambition, and was refused life insurance because of sugar in his urine. His family became very concerned. A doctor warned him of the possibility of immanent death, and "prescribed a diet of milk, bananas, lots of raw vegetables and vegetable and fruit juices, which I heeded" (p. 14). He began to feel better from the first day. "Today I feel like a new man... at the age of sixty-six my recovery is so complete that I am now enjoying exceptionally good health" (p. 15).

"With the return of spirituous liquors [in Jan. 1934],

cocktail recipes and cocktail bars are prevalent all over the land. We all know that alcoholic cocktails are injurious regardless of the content as long as alcohol prevails... There are cocktails however, that can be made from Nature's vegetables and fruits that are healthful, exhilarating and bracing." "A new machine called a liquefier propelled by electricity liquefies vegetables in from one to three minutes and marvelous Health-Cocktails can thus be prepared at least once each day for the entire family" (p. 16-17). He also mentions the "liquefier" on p. 34, and p. 53 ("liquefying machine"). So this book was apparently not written mainly to promote the liquefier. Note: This liquefier would later become known as a "blender" and Barnard's company would later make and market the Vita-Mix or Vitamix, a powerful type of blender.

"Constipation is a disease known mainly to the civilized races" (p. 29). Barnard regularly cites and summarizes the writings of Dr. John Harvey Kellogg.

Essential for good health is a "pure, red blood stream created by natural foods, fresh air, sunshine, and exercise. Soy bean products, spinach, parsley, celery, cabbage and beets, as well as carrots help make good red blood. Eat a plate of salad made of three grated carrots together with orange juice dressing. Drink freely of carrot juice daily" (p. 49). "Carrot juice and other vegetable and fruit juices can be included in the diet of every child every day." In growing boys or girls, beware of "False Sugar Appetites."

"A strict vegetarian diet is used in the treatment of cancer with notable success..." (p. 88).

Like many in the 1930s, the author believes that an alkaline diet fights acidosis and promotes good health (p. 91). "Salt is a very harmful substance if not used in moderation" (p. 119).

Chapter 35, titled "Soy bean (the perfect protein food)" (p. 127-28) begins: "For centuries the Chinese have used the Soy Bean as a source of protein and fat and the necessary Amino acids that are found in flesh foods. In America the production of the soy bean is now running into millions of bushels and vegetable meat factories and milk factories are springing up all over the country.

"Henry Ford, who has done so much to educate the American people to the value of the Soy Bean, recently made the prophecy that the cow and hog were destined to oblivion and we will soon be eating our meat from the Soy Bean and drinking our milk from the Soy Bean. In other words obtaining our food direct from the soil first hand instead of second hand..." "It is the experience of the Natural Foods Institute that babies taken from the natural mothers milk thrive on soy bean milk and we have found no one allergic to it.

"Soy Meat substitutes, Soy Milk, Soy Flour, Soy Cheese [tofu], Soy Coffee substitutes, canned green soy beans, canned soy beans in tomato sauce, soya macaroni are fast becoming popular among health minded people."

In conclusion (p. 133-34): "In writing this book I have consistently followed one line of reasoning. It is agreed to by many physicians, dieticians [sic, dietitians], and food scientists, that vegetables and fruits are absolutely essential for maintaining good health, natural balance, and physical well being. I have tried to help those who are afflicted by giving this information." I also want to help those who are healthy to stay healthy. At the end of the book is a food dictionary and lists of acid-forming foods (bad) and foods with an alkaline reaction (good). Address: Cleveland, Ohio.

637. Schwarz, Richard W. 1970. Work to expose the dangerous effects of using alcohol, tobacco, tea, and coffee (Document part). In: Richard W. Schwarz. 1970. John Harvey Kellogg, M.D. Nashville, Tennessee: Southern Publishing Assoc. 256 p. See p. 106-07. Chap. 9.

• **Summary:** Dr. Kellogg's activities in this area of health education began at the two Battle Creek colleges, the American Medical Missionary College, and the variety of schools associated with the Battle Creek Sanitarium. "He entered the modern field of audiovisual education as early as the 1880's, when he prepared a series of ten colored charts depicting the harmful effects of alcohol and tobacco. Temperance lecturers used them widely. Several years later he developed two series of charts for school use. Going beyond the conventional fundamentals of anatomy and physiology, the charts showed the effects of bad habits in dress and posture and the results of neglecting to secure sufficient exercise.

"The doctor also participated in a wide variety of adult education ventures. Along with James and Ellen White and G.I. Butler, he had organized the American Health and Temperance Association in 1878 in an effort to expose the dangerous effects of using alcohol, tobacco, tea, and coffee. Dr. Kellogg served as the Association president during its fifteen-year life-span and actively organized public meetings and campaigns to distribute temperance tracts and pledges. In later years John Harvey served as president of the Michigan Anti-Cigarette Society, and following World War I he became a member of the Committee of Fifty to Study the Tobacco Problem. Kellogg assisted the latter group—which included Henry Ford, George Peabody, and John Burroughs—in producing one of the first educational motion pictures devoted to the dangers of tobacco smoking." Address: Andrews Univ., Barrien Springs, Michigan.

638. Harris, Jean. 1971. Engineered food is on the way! *News and Observer (Raleigh, North Carolina)*. Jan. 17.

• **Summary:** Henry Ford's desire to make cloth from soy protein started the original research on "meat analogues." The technology for producing spun soy protein products developed from a process to produce casein fibers in Italy in the mid-1920s. A second group of "soy meats," called textured meat analogues, is made by an extrusion process applied to

textured vegetable proteins made from soy protein isolates; one example is Bac-Os.

"Most of these soy meats are available only to the institutional trade. They are now in use in prisons, hospitals, and orphanages." Two manufacturers of such products are Loma Linda Foods and El Molino Mills.

In North Carolina a full soybean product, made from toasted soybeans, is sold under the name of Golden Nuggets; all Raleigh seems to be eating them.

Recipes are given for: Soya cake (with sifted soya flour). Soyanaise (with Soyamel soymilk). Golden nut pie crust (with soya flour). Soya cookies (with soya flour). Roasted soybeans (made from canned soybeans, either dry roasted at 350 degrees or deep fat fried). Puree of soybean soup (with sieved soybean pulp). Address: Food editor.

639. Medina, Julio Cesar. 1971. La soja: Una leguminosa versátil [The soybean: A versatile legume]. *Bolsa de Cereales: Revista Institucional* (Buenos Aires) 99(2837):28-30. Feb. [Spa]

• **Summary:** Discusses the early history of the soybean in Europe and America, the rise of industrial products (incl. those made by I.F. Laucks and Henry Ford), the composition of the soybeans, several foods made from it, and the development of soy-based adhesives. A table shows the growth of soybean hectareage and production in Argentina from 1960/61 (10,260 hectares, 11,220 tonnes) to 1968/70 (30,470 ha, 26,800 tonnes). The peak year was 1967/68 (30,800 ha, 31,800 tonnes). Address: Prof. del Instituto Superior de Química Industrial.

640. Leng, Earl R. 1971. Report of Earl R. Leng, Crop Production Consultant (short term), MUCIA/ AID/ Indonesian Higher Agricultural Education Project. Urbana-Champaign: University of Illinois, College of Agriculture. 41 p. Unpublished typescript. 28 cm.

• **Summary:** Contents: 1. Introduction. 2. General observations on field crop agriculture in Indonesia. 3. Institut Pertanian Bogor (Bogor Agricultural University). 4. Gadjah Mada University. 5. Agricultural research planning in Indonesia-Relation to MUCIA / AID project. 6. Soybeans in Indonesia-A special opportunity for an action program. 7. Comments on the MUCIA / AID/ Indonesia project. 8. Summary of conclusions and recommendations. Appendix I-Proposal for cooperative soybean research project. Appendix II-Chronological activities report.

Note: MUCIA is the Midwest Universities Consortium for International Activities, Inc. Established in 1964 with the support of the Ford Foundation, MUCIA is a not-for-profit consortium of five of America's largest land grant research universities, including: University of Illinois at Urbana Champaign, Michigan State University, University of Minnesota, The Ohio State University, and Purdue University (Indiana).

Source: University of Illinois at Urbana-Champaign (UIUC) archives. 8/1/44 Agriculture, Dean's Office, Box 4, Leng. Address: Agronomist, Univ. of Illinois, Urbana-Champaign, Illinois.

641. *Journal Star* (Peoria, Illinois). 1972. Agreement reached on soybean patent. April 9.

• **Summary:** Discusses the settlement of litigation entered into by ADM, Ralston Purina Co. and Swift & Co. involving a high-protein meat-like product made from soybeans. Swift claims that "Morris D. Wilding filed for the patent March 1, 1965. ADM says William T. Atkinson applied for the patent Aug. 7, 1966, and Ralston claims Ronald J. Flier filed for it Sept. 9, 1966.

"On Aug. 13, 1971, the U.S. Patent Office Board of Patent Interferences wrongly rule that Flier was the inventor, says ADM's suit. Ralston contests ADM's claim."

642. *Journal Star* (Peoria, Illinois). 1972. Soybean dispute settled. April 11.

• **Summary:** On 18 Aug. 1971 ADM filed against Ralston Purina Co. (St. Louis, Missouri) and Swift and Co. (Chicago, Illinois). They filed countersuits. Each of the companies claimed the patent for making simulated meat from vegetable sources (mainly soybeans; for human consumption and pet foods) had been assigned to them by inventors. ADM granted to Ralston and Swift a nonexclusive license to make and sell products under a process patented by William T. Atkinson. They will pay ADM a \$30,000 royalty.

Ralston Purina granted to ADM a license to make and sell the product under a patent of Ronald J. Flier; ADM will pay a royalty of up to \$30,000. Swift granted to ADM and Ralston a royalty-free license.

643. Lewis, David L. 1972. A bushel in every car! The versatile soybean and the inquisitive mind of Henry Ford produced one of the most interesting chapters in the annals of Ford Motor Company history. *Ford Life* 2:14-24. May/June. Also published as: "Henry Ford's plastic car." 1972. *Michigan History*. Winter. p. 319-30.

• **Summary:** One of the best articles seen summarizing Henry Ford's work with soybeans.

"... 30 years ago Ford unveiled the first car with a complete plastic body, thereby paving the way for 100 to 110 pounds of plastics to be built into today's autos.

"Ford's research into plastics was tied in with his promotion of farm chemurgy—an emerging agricultural concept which strove to put chemistry and allied sciences to work for agriculture—which in turn was keyed to his life-long efforts to improve the lot of the farmer...

"Ford planted 300 varieties of the soybeans on some 8,000 acres of his Michigan farms in 1932 and 1933. He also urged neighboring farmers to plant the beans with the assurance that his company would provide a market for them. By 1933,

the industrialist's experimentation, at a cost of \$1,250,000, had been rewarded with the discovery of soybean oil which made a superior enamel for painting automobiles and for oiling casting molds and a soybean meal which was molded into the horn button...

"Two years later a bushel of soybeans went into the paint, horn button, gear-shift knob, inside window riser knobs, accelerator pedal, and timing gears of every Ford car..."

"By late 1937, Ford's research laboratory—under the direction of youthful, self-trained Robert Boyer—had developed a curved plastic sheet which Ford hoped would replace steel in automobile bodies." Ford unveiled his handmade car with complete plastic body on August 13, 1941, at the climax of Dearborn's annual community festival.

Early in World War II, Ford tried unsuccessfully to interest the armed forces in making uniforms out of soybean fabric. He finally sold his fabrication process and machinery to The Drackett Company of Cincinnati in November 1943. "Neither Drackett nor any other firm has been commercially successful in producing textile fibers from soybean protein.

"Ford's efforts to develop palatable foods and popularize recipes based on soybeans were no more successful than his experiments with fabrics. To develop the nutritional possibilities of the bean, Ford set to work his boyhood friend, Dr. Edsel Ruddiman, ex-dean of the School of Pharmacy at Vanderbilt University. Dr. Ruddiman prepared a soybean biscuit, described by one of Ford's secretaries as 'the most vile thing ever put into human mouths' (but which white rats liked and the auto king professed to like) and a variety of other recipes."

"... few of Ford's achievements pleased him more than to help prove that there was industrial magic in a beanstalk."

"During 1939, Ford Motor Company imports of wool were close to 250,000,000 pounds—approximately 35% of the total used—with the bulk of shipments coming from Argentina and Australia. Fearful of losing trade with Australia because of Pacific conditions, Ford stepped up production of soybean fibers."

Photos (from the Ford archives) show: (1) A tractor in a field of soybeans. (2) Henry Ford and Robert Boyer mixing ingredients. (3) Ford Soy Bean Processing plant, located in the River Rouge complex. (4) Cartoons about car bodies made from soybeans. (5) A huge French Oil Mill hydraulic press in Ford's River Rouge Tool & Die Shop stamps out a short run of soybean plastic trunk lids for experimental work in 1940. Henry Ford installed one on his personal car in 1941. (6) Henry Ford, dressed in coat and hat, swinging an axe at his 1941 trunk lid made of soybean plastic for the press to prove that the lid was axe resistant. (7) Film star James Cagney examines a souvenir gear shift knob made of a soybean compound during a visit to the Ford Building at the 1935 California Pacific International Exposition, held in San Diego, California. The illustrated knobs were sold to visitors for a nickel each and are much prized by collectors today. (8)

Henry Ford's plastic car (white, with "Dearborn" written on the black license plate). At the wheel is Lowell Overly, the project engineer who designed the plastic body. The car was first unveiled to the public on 13 August 1941 at the climax of Dearborn's annual community festival. (9) Inside the Ford Exposition Building at the 1939 World's Fair in New York. A turntable (called "the Ford Cycle of Production") 100 feet in diameter is topped by a circular platform on which is displayed a new Ford, Mercury, and Lincoln-Zephyr. Soybeans were a prominent part of the display. (10) A male worker assembling a soybean plastic distributor rotor on a 1937 Ford V-8 engine. Soybean meal was converted into a resin and mixed with wood flour, stearic acid, and coloring, then shaped in high-pressure molds. (11) A lady worker doing final assembly on a Ford V-8 distributor coil, on 14 July 1937 at the Rouge River Plant. (12) Illustrations (line drawings) of a distributor coil, rotor, and distributor cap. (13). Biscuits of soybean extract are being molded in 1937 into the upper and lower coil housing. (14) A workman spraying a 1938 Lincoln Zephyr with the very durable soybean enamel paint, which had been introduced in 1933. (15) A workman in about 1939 with a machine that makes soybean fiber for automobile upholstery. The process for making the fiber is described. (16) Interior parts for Ford cars cast from soybean plastic were used on the Zephyr, Mercury, Ford Deluxe (1940), and Ford Standard. These included door escutcheons (1938), gear shift lever balls (1939), etc. (17) Henry Ford and George Washington Carver, old friends, at Carver's laboratory at Tuskegee Institute in 1938. Carver smiles as enjoys one of the grass tidbits they developed. (18) Dishes made from soybeans, developed after 1934, published in the March, 1939 issue of *Ford News*. Soy bean recipes are included for: Nut bread (using 1 cup soy bean flour); waffles (using 1¼ cups soy bean flour); soy loaf (using 2 cups of soy cheese); croquettes (using 2 cups soy bean cheese); and salad (using 1½ cups of boiled soy beans). (19) Henry Ford with his top executives at one of the daily roundtable luncheons at the wood-paneled Dearborn Engineering Laboratory. Dishes containing soy were often served at these meals. Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan.

644. Webber, Ella V. 1972. Perry A. Webber: Pioneer missionary in true education to Japan. Chattanooga, Tennessee: Southern Missionary College. 87 p. *

• **Summary:** Perry A. Webber was born on 15 June 1890 in Northville, Michigan. His parents became Seventh-day Adventists (SDAs) during his early childhood. In 1904 the family moved to Berrien Springs, Michigan, and Perry was educated there. In 1911 Perry graduated with a BA from Emmanuel Missionary College [in Berrien Springs] and in 1912 he was married to Ella Mae Verney.

In 1913 he was appointed by the SDA General Conference Foreign Mission Board to go, with his wife, as missionaries to

Japan. In Tokyo they studied Japanese language for 2 years, then began pioneering educational work in Japan until 1927. For 4 years (1915-19) they worked in Fukuoka (in northern Kyushu), then returned to Tokyo. A son, Alfred B. Webber, was born in Dec. 1919; he later became a medical doctor. In Tokyo they worked at a school in Ogikubo. By 1921 Perry was teaching about the virtues of brown rice. In 1923 Perry found 25 acres of land in Sodegaura; in September of that year the Great Tokyo Earthquake (*Kanto Daishinsai*) took place. Later in 1923 the family returned to California because of the wife's respiratory problems. Harry Webber was born in Glendale. After a year in Honolulu, Hawaii, in 1934, they returned to Japan in the summer of 1925 and moved the college into the country. In the spring of 1926 the students and teachers started to build their own self-supporting school, with Perry as principal. This school later grew into the Japan Missionary College (*Saniku Gakuin*). The Japanese name means "three-sided school" since equal emphasis was placed on mental, moral, and manual development.

During these years Perry grew very fond of Japanese food and especially of Inari-zushi (made of deep-fried tofu pouches filled with vinegared rice). On his way to language school, he used to stop in regularly at the Shinoda Sushi Shop in Kanda (in Awaji-cho by the 1970s) to enjoy their Inari-zushi. The shop once developed a special Webber Sushi, named after him, and they used his name in some of their promotional materials. He was also very fond of regular tofu and of miso soup.

In 1927 the Webbers returned to America to educate themselves in good health. At this time Adventists believed that the true remedies are "pure air, sunlight, abstemiousness, rest, exercise, proper diet, the use of water, and trust in Divine power" (*Ministry of Healing*, p. 127). In the fall of 1928 Perry entered Michigan State University to study biological chemistry while his wife, Ella Mae, studied nutrition; both were deeply interested in understanding the principles of good health. By May 1929 Perry was considered "one of our teachers" by Madison College in Madison, Tennessee.

During the early 1930s and the Great Depression, many students' only hope of getting an education was to rely on their own efforts. Madison, which offered a work-study program, became a very attractive alternative school.

In Sept. 1930 the family moved to Madison while Perry finished his thesis. In June 1931 Perry was awarded his PhD degree in biological chemistry, with special interest in chemistry and soyfoods development. At Madison he became an instructor of chemistry with a strong interest in food chemistry. In the following years he became the main person at Madison responsible for the school's growing involvement with soyfoods. In Nov. 1931 Perry wrote a long two-part article for *The Madison Survey* titled "Facts Concerning the Soybean." During the early 1930s he put a great deal of creative energy into expanding Madison's line of commercial soyfood products. Most of the products that were introduced

between 1931 and 1934 were the result of his work. In August 1933 Perry Webber and Frances L. Dittes attended the annual convention of the American Soybean Association (ASA) in Baton Rouge, Louisiana. Webber presented a lecture with slides about the importance of soyfoods in Asia and their potential in America. He also prepared an exhibition of Madison soyfoods that was displayed at the convention. Webber was secretary-treasurer of the ASA for one year at this time. He visited Edsel A. Ruddiman at the Ford Motor Company and gave a talk to him and other leading research scientists about soyfoods. He was also a close friend of Dr. John Harvey Kellogg. He visited Kellogg, talked about soyfoods, and did some work developing a preservative for some of Kellogg's crackers.

Perry Webber worked at Madison until Sept. 1935 when, after a big farewell party, he returned to Japan to serve as principal of the Japan Missionary College (Saniku Gakuin). There he taught a lot about nutrition and the value of a vegetarian diet. In about 1936 Webber visited Dr. Harry Miller in Shanghai, China, and helped him set up a sanitation and research lab for analyzing the Vetose soymilk products at his new plant.

From 1939 to 1943, during World War II, Webber was back in the USA, teaching at Madison as head of the chemistry department. He was also at Madison from 1946 to 1953 and from 1959 to 1962, each stay punctuated by work in Japan. While serving as an administrator at Madison Foods (1959-1963) he and Sam Yoshimura pulled the factory out of debt and put it several thousand dollars into the black in one year's time.

During his trip to Japan that began in the spring of 1953, he taught one food plant how to make gluten, soymilk, and soy croquettes. Also in 1953 he started a self-supporting organization at Mt. Akagi, about 125 miles northwest of Tokyo; there he worked for more than 7 years. In the winter of 1956 he suddenly became ill with pneumonia. He returned to America in the summer of 1958 and was found to have Parkinsonism; no medicine was prescribed until 1962. In 1966 Perry was an outpatient at the Madison Sanitarium/Hospital for a time, then he became an inpatient from Oct. 1967 to Jan. 1968. In Sept. 1968 he went to a convalescent home in Lodi, California. His son, Dr. Alfred B. Webber, was living and practicing medicine in Lodi. In 1969 he returned to the Wildwood Sanitarium, a self-supporting Seventh-day Adventist convalescent home and health care facility in Wildwood, Georgia (northern Georgia). He passed away there in January 1973 at age 82 of Parkinsonism.

645. Davis, Michael W.R. 1972. Plastic Fords: Ford hoped to tie farm to factory via a \$400 plastic car. *Special-Interest Autos*. June/July. p. 18-19.

• **Summary:** Five photos show the plastic car and two photos show equipment and factories.

646. Hellman, Hal. 1972. The story behind those meatless "meats." *Popular Science*. Oct. p. 78-80, 164.

• **Summary:** Discusses the production of meat analogs from soybeans, with their economic and health advantages. The article focuses on meatlike products made from spun soy protein fibers by Worthington Foods of Ohio. Gives the history of how Robert Boyer and Henry Ford developed spun soy protein fibers. One color photo shows about 50 of Worthington's "meatless meats," most of which are canned. Four black-and-white photos show how spun protein fibers are made into meatless meats (such as Stripples and Add-A-Bits) in the Worthington plant. Frank Poston predicts that the "meat analogs will be generally available in supermarkets by 1975." Worthington president Jim Hagle is more cautious, putting the date at 1976 or 1977.

647. DuBois, J. Harry. 1972. *Plastics history U.S.A.* Boston, Massachusetts: Cahners Books. xii + 447 p. Illust. Index. 25 cm. [71* ref]

• **Summary:** Contents: 1. The natural plastics. 2. The celluloid era. 3. Baekeland's phenolic resin, the first synthetic plastics. 4. Machinery for thermosets. 5. The great thermosetting era. 6. Developments in thermoplastics machinery and method. 7. The thermoplastics explosion. 8. Extrusion and blow molding. 9. Vulcanized fibre, laminated and reinforced plastics. 10. Plastics industry services. Bibliography.

A history of the U.S. plastics industry and trade, copyrighted in 1972 but apparently published in 1979. Chapter 1, titled "The Natural Plastics," begins: "Today many people consider the synthetics as plastics. Actually the plastics industry started with animal horn and hoof, tortoiseshell, bone, ivory, gutta-percha [made from the latex of several Malaysian trees; it resembles rubber], shellac, glue, and other compounds which necessitated the development of extruders, presses, molds, calenders, etc., which were used later for the synthetics as they arrived. Plastics were defined in the industry's first magazine *Plastics*, March 1926."

The section in this chapter titled "Soybean Plastics" states: "The U.S. Regional Soybean Industrial Products Laboratory at Urbana, Illinois, studied the potential for soybean materials for plastics products in the middle thirties. When mixed with formaldehyde, soybean meal is moldable. Good products required the addition of phenolic resin also, and this was highly publicized by Ford Motor Company at one time, who used it for a few molded parts. It had high moisture absorption, poor dimensional stability, and was short lived as an industrial material."

The real pioneer of the plastics industry was John Wesley Hyatt (1837-1920), inventor of Celluloid and many of the plastics processing methods. A chronology of the development of cellulose is given. The first synthetic plastics were Baekeland's phenolic resin. Address: President, Mykroy Ceramics Corp., Craftsman Farms, Morris Plains, New Jersey.

648. Quick, Graeme Ross. 1972. Historical perspective (Document part). In: G.R. Quick. 1972. *Analysis of the Combine Header and Design for the Reduction of Gathering Loss in Soybeans*. PhD thesis, Iowa State University, Ames, Iowa. 282 p. See p. 6-13. [83 ref]

• **Summary:** Patrick Bell in England (1826), and the McCormicks (1816-1850s; Cyrus Hall McCormick, lived 1809-1884 was an American inventor) and Hiram Moore (1838) in the U.S. developed and used cutting reapers. Shortly thereafter (in 1842) Australian inventors initiated the development of the "header-stripper" for standing cereal crops.

"The American horse-drawn machines probably evolved out of Cyrus Hall McCormick's 1831 reaper. They employed a cutterbar reciprocating through guards, conveying canvas and the bat reel. The first successful Australian machine, John Ridley's, used a stripping comb over which revolved a set of beaters to knock off" the heads, thresh them, and "deliver them to a box. There was no knife and the full straw was left standing."

"A 22-foot wide platform, side-fed harvester, with a steam engine replacing the horse team, was probably the first self-propelled machine. This was built by Wm. Berry in California in 1887 and was capable of harvesting 50 acres of wheat in a day. By 1893, Benjamin Holt had built and operated a 50-foot cut combine in California (Nyberg 1957). Daniel Best of San Leandro was credited with having built the first combine which replaced ground wheel drive power with an auxiliary steam engine drive (Caterpillar Tractor Co. 1954). The need for traction and flotation for these enormous combine harvesters led to the development of the first successful crawler track. Best and Holt later merged their interests to form the Caterpillar Tractor Company in 1925."

In Australia, by 1884, Hugh Victor McKay had added a winnower cleaning section to the basic Ridley-type, and in 1909 McKay built a 24-foot self-propelled stripper-harvester with an internal combustion engine side-mounted on the chassis. A market was growing for the stripper-harvesters made at McKay's "Sunshine" factory and, between 1895 and World War I, the company even exported 10,000 of its machines. This huge volume of exports caused North American harvester manufacturers to take note, and one result was that in 1901 Massey-Harris of Toronto, Ontario, Canada, began production of stripper-harvesters, followed in 1904 by International Harvester Co. of Chicago. Neither company sold these machines on their domestic markets (Baker 1961).

The Australian-born "stripper-harvester revolutionized the harvest operation by combining the gathering and threshing operations into one machine, but the [Ridley-type] stripper-beater, with its knifeless long tooth comb had severe limitations in wet or down and tangled crops. Grain loss was also high in sparse crops. The challenge to produce a machine in Australia which could cope with these conditions

was partially met by some farmers in New South Wales. They worked with Massey-Harris representatives, and adopted the knife into their 'reaper-thresher' (Wheelhouse 1966). By 1910 the Canadian firm was manufacturing this long tooth combed machine specifically for export to Australia. It was another New South Welshman, Headlie S. Taylor, who finally overcame the problem of harvest lodging with the long toothed comb, after several years of development of his header-harvester. He installed augurs over the comb. This development attracted the interest of machinery manufacturer, H.V. McKay, who became impressed with the possibilities. McKay bought the manufacturing rights and then employed Taylor to work at the Sunshine factory in Victoria. In 1920, after a wet season in the Eastern Australian wheatbelt, the Sunshine header had won a wide reputation." Five reasons are given for the success of the twin-auger-header over the stripper-harvester.

"In 1924 Taylor produced the first Sun Auto-Header, a 12-foot self-propelled combine 'with the comb front forming the widest part of the machine.' The Tee-shaped combine configuration had arrived! This concept was patented and no other make of self-propelled combine with full-width header was commercially released until the patent expired 17 years later. In 1938 a Sun Auto-Header harvested 3,300 bu of wheat in one day—a record that was unsurpassed during the next 33 years.

The pioneering research on combine design and manufacture in far-away Australia, conducted between the 1880s and 1924, was about to have a major and direct effect (via Canada!) on soybeans in America.

"Elmer J. Baker, 'the Reflector,' of *Farm Implement News* fame (later *Implement* and *Tractor Magazine*), was to be instrumental in directing the Massey-Harris Company to deliver a combine for soybean harvesting to a subscriber in Illinois. The subscriber was an International Harvester dealer who was disgruntled because his company refused to ship him a combine for sale to the Garwood Brothers—clients who were growing soybeans near Stonington, Illinois. There is no record of a combine having been tested in any crop in Illinois to that date, 1924. The Reflector referred his reader to Massey-Harris at Toronto, with full knowledge that they had no sales facilities in the U.S. What followed is history." Baker wrote about what happened in the 20 Nov. 1924 issue of *Farm Implement News* (which see).

"The success of the combine in the Illinois soybeans was followed by intensive breeding trials for the Garwood farms. The increase in plant size and yield led to a preference for the wide cylinder type combine. Several other harvesters were developed concomitantly for soybeans, but none could even approach the efficiency of the combine header (Sjogren 1939). No other method succeeded as well. The American self-propelled and pull-type combines of this era continued to use the draper-conveyor and side feeding.

"The 'straight-through' or 'scoop' design, with full-width

threshing cylinder, made its appearance around 1935 and in 1938 Massey-Harris released the first self-propelled version, the 'Clipper' (Massey-Ferguson Inc., 1964). In 1939, coincident with the expiration of Taylor's patent, Massey-Harris offered the Model 21 combine of Tee-configuration" which now competed with McKay's Auto-Header made in Australia.

"Possibly the first U.S. combine to employ the auger was Curtis Baldwin's 'Gleaner.' Baldwin's earliest machines anticipated the 'Unisystem' approach to farm machinery design, whereby the same power system is used for a variety of field machines. Baldwin mounted his machine on a Fordson tractor in 1923. His concept of mounting the threshing-cylinder on the header still lingers in the modern 'down-front' Allis-Chalmers combines. All U.S. combines now utilize the auger conveyor for header cross-feeding."

"Combine sales did not increase significantly until World War II when wartime shortages of manpower and grain spotlighted the need for more efficient harvesting. Today an estimated 3 million combines are in use throughout the world.

"The present day version is more versatile than ever—the same machine can harvest a 5000-fold range of seed sizes—but it is also more complicated, containing an estimated 35,000 parts in one machine. It is more efficient, but it is more expensive than ever."

An illustration (p. 7) shows landmarks in the history of the harvester and header. Address: Iowa State Univ., Ames, Iowa.

649. Shaikh, M.A.Q. 1972. Effect of population and spacing on the protein and the oil content of soybean seeds. *Bangladesh J. of Biological and Agricultural Sciences* 1(2):24-26. [10 ref]

• **Summary:** These field trials were conducted at the Agricultural Research and Education Centre of the American University of Beirut, Lebanon, situated in the Beqa's plain [Bekaa Valley]. Soybean cultivars Ford, Perry, and Clark were sown with between-plant spacings of 2, 3 or 4 cm, and between-row spacings of 20, 50 or 75 cm. The seed protein contents of Ford, Perry and Clark averaged 35.62%, 35.58% and 36.19% respectively, and were not affected by spacing. The highest protein content was obtained with Ford grown at 3 x 25 cm spacing, and the lowest protein content with Ford grown at 4 x 25 cm spacing. Ford seeds contained an average of 22.39% oil and these values were not affected by spacing.

"Acknowledgement: The author is grateful to Prof. W.W. Worzella, Head of Crop Production and Protection Division, Faculty of Agricultural Sciences, American University of Beirut, Lebanon for guidance and constructive criticism and to the U.S. A.I.D. for financial support during the course of this study."

Note 1. This study is part of the author's M.S. Thesis of the American University of Beirut, Lebanon.

Note: This is the earliest document seen (Oct. 2010) concerning soybeans in connection with Bangladesh after it became an independent country in March 1971. However these soybeans were not in Bangladesh and were not cultivated in Bangladesh, even though the trial was conducted by a researcher from Bangladesh and the results were published in a journal in Bangladesh. Address: Agriculture Div., Atomic Energy Centre, Bangladesh.

650. Wik, Reynold M. 1972. *Henry Ford and grass-roots America*. Ann Arbor, Michigan: The University of Michigan Press. viii + 266 p. See p. 142-57, 207. Illust. Index. 24 cm. [376* footnotes]

• **Summary:** The author devotes considerable attention to Ford's work with soybeans in chapter 8, titled "Ford, Science, and Rural Ecology." Ford considered dairy farming inefficient and a waste of time.

Note: The author is one of the country's leading authorities on the history of American technology. Address: May Treat Morrison Prof. of American History, Mills College, Oakland, California 94613.

651. *Forbes*. 1973. Why the makers of Alka-Seltzer want to help reduce your meat bill. April 1. p. 25-26.

• **Summary:** Miles Laboratories, the \$319-million-a-year pharmaceutical company of Elkhart, Indiana, is famous as the maker of Alka-Seltzer. The company's food group [Worthington Foods] has sales estimated at \$18 million a year. The company's "newest products are Morningstar Farms breakfast 'sausage' and 'ham.' They are currently being test-marketed in Florida and soon will be in Arizona and Southern California. Earlier tests, in Erie, Pennsylvania, and Fresno, California, were very successful. If the latest tests confirm the earlier results, Miles reportedly will go national next year, backed with a \$9 million advertising campaign." Currently the biggest problem with these products is that they cost more than meat.

In one sidebar, titled "How it all happened," Robert Boyer tells how he developed spun soy protein fibers, starting with his work at the Ford Motor Co. "I first approached Worthington when I filed my first patent on an edible fiber in 1949 and they became interested immediately." A photo shows Boyer, who is now building a house in Florida, where he plans to retire eventually.

A second sidebar, titled "Verdict: Not as good, but not bad, either," gives the results of a 15-member taste panel test for taste and texture. 11 participants ranked the products as good in taste as their meat counterparts; 1 said excellent and 3 said fair. In texture, 4 said excellent, 9 said good, and 2 said fair. "As to price, four of the participants said they'd buy the products if they could save 10% on meat price; 11 said the prices would have to be 20% cheaper or more. One participant (middle-aged) said he'd consider buying the products at full meat prices because of the anticholesterol

feature. The overwhelming conclusion was that most participants would prefer meat, but that price advantage could make them switch."

Note: This is the earliest English-language document seen (Jan. 2008) that uses the term "Morningstar Farms" to refer to products made from edible spun soy protein fiber.

652. *Detroit News*. 1973. Ford: Model T first, then the soybean. June 13. p. E-1, col. 5.

• **Summary:** Henry Ford was one of the first Americans to recognize the value of soybeans. He made great contributions to their use in industrial applications and in foods. Robert Boyer recalls that when the Depression came, Ford wanted to do something for American farmers, who were among his best customers for the Model T and Model A. So he built a laboratory to investigate industrial uses of farm crops.

Ford was the first to use soybean oil to make enamel (paint) finishes for cars. He used the protein to make plastics used for horn buttons and gearshift knobs, and synthetic wool. Boyer filed his first patent for edible fiber in 1949.

653. *Atlanta Journal and Constitution*. 1973. Henry Ford's soybean auto "Just got lost in the files." July. 22. p. 10B.

• **Summary:** If World War II had not intervened, Ford's dream of a plastic car body and "growing cars out of the ground" might have been realized. Today the average U.S. car contains about 250 parts made of plastic. On Ford's plastic car, the I-beam was discarded in favor of a lighter tubular frame, which weighed less than 250 pounds. The tubular frame also permitted the car to be made of only 14 surface panels. Ford was a pioneer in using phenolic plastics. But the soybean car had to be put aside after Pearl Harbor. Ford died in 1946 before normal auto production was resumed after the war. The tubular frame, reinforced phenolic car was just one of many ideas that "got lost in the files."

654. Lewis, David L. 1973. Ford village industries—A history and a tour route. *Horseless Carriage Gazette* 35(4):14-5, 17-19. July/Aug.

• **Summary:** "Henry Ford was one of the most visionary Americans of his time. His dreams led him to build the Model T, introduce the moving assembly line, double his workers' pay overnight, and reduce car prices by a third. They also inspired him to become one of the first to recycle waste products, make auto parts out of man-made fibers, proclaim that cigarettes were hazardous to one's health, advocate the abolition of capital punishment, and insist that criminals and alcoholics should be rehabilitated.

"But few of the motor king's visions were more novel than his plan to dot many of America's rivers with small water-driven auto parts factories which would offer employment to farmers. The city, Ford pointed out, had been a mistake. It meant high land costs, high taxes, poor housing, and congested transportation. The country, in contrast, was

an area of hope. 'Factory and farm should have been organized as adjuncts one of the other, not as competitors,' Ford declared. 'With one foot in industry and one foot in agriculture, America is safe.'

In 1919 Henry Ford began buying sites for his village industries, including those on the Rouge and Raisin Rivers in southeastern Michigan. "The first rural production center, a reconverted mill at Northville, twelve miles up the Rouge from Ford's home in Dearborn, began making Model T valves in early 1920. By 1925 nine hydroelectric plants were in operation.

"Some of these factories were truly 'village industries' employing only a dozen to three or four dozen workers. Others were sizeable plants employing a work force of up to 1,000 or 2,500. All of the factories, large and small, were fully or partly driven by waterpower. Ford, eager to show people that hydropower was effective, usually displayed his generators in glass-enclosed rooms so that visitors could more easily view his plants' inner workings."

"Ford's village industries were not a financial success, but the auto king, breaking ground, did not count what he spent. In fact, between 1935 and 1941 he established a dozen additional hydroelectric plants [including the one in Saline] on small Michigan streams; and in 1938 he had drawn up a list of 212 additional potential sites. Making such parts as cigarette lighters, carburetors, horns, and ignition coils, his factories employed 2,460 persons in 1939...

"... Despite these glowing accounts, village industries did not proliferate throughout the land. Indeed, only a handful of Henry Ford's own rural plants were kept in operation by the cost-conscious Ford organization after the founder's retirement in 1945. Eight of the factories were making Ford parts in 1945; five in the mid-1950's; three in the early 1960's; and today only the Northville plant, still making valves, remains a part of the Ford empire."

This tour of nine of Ford's village industries begins at Saline, on U.S. highway 12, some 44 miles west of Detroit. The "starting point is a former Ford soy bean extraction plant at 555 West Michigan Avenue, Saline, now the home of Weller's country store. Ford acquired the three-story Saline River mill in 1938, and its 19 employees processed soybeans into oil for plastic auto parts until 1946. The mill's water wheel and generators were sold several years ago, but the nearby dam and lake, washed out by floods in 1970, are being restored. Country store proprietors Carl and Micki Weller live in the mill's former grain hopper on the second floor. They sell a bit of everything to 'junk-o-holics,' as they affectionately describe their patrons and keep their store open from 10 to 6 weekdays and 12 to 6 Sundays." Address: Prof. of Business History, Univ. Michigan, Ann Arbor, Michigan.

655. Manchester, Harland. 1973. And a new way to trim your meat bill. *Reader's Digest*. Oct. p. 119-21.

• **Summary:** About the rise of TVP in the USA as a meat

extender. It started to be used in school lunch programs but has now moved into supermarkets. In March 1973 "Red Owl Stores, Inc. of Minneapolis [Minnesota], placed a ground-meat product containing 25-percent soybeans and selling for about 20 cents a pound less than the all-beef hamburger at the meat counters of 51 of its stores in the Minneapolis-St. Paul area. It outsold all-beef hamburger three to one and is now marketed in all 136 Red Owl Stores, as well as 200 franchise stores. Red Owl also sells frozen pizzas and patties in which soybean proteins are used." Discusses ADM, Worthington Foods, Henry Ford, and Robert Boyer.

656. Greenberg, Daniel S. 1973. Slaughterhouse zero: How soybean sellers plan to take the animal out of meat. *Harper's* 247:38-43. Nov.

• **Summary:** Discusses economics and marketing in the growing industry that makes meatlike products from soybeans. "Among some dozen major firms in America's vast culinary-industrial complex, the rise of simulated meats is regarded as the biggest opportunity for the triumph of an ersatz product since margarine took over two-thirds of the nation's butter trays."

"Numerous regional hamburger chains now serve mass-produced 'extended' hamburger patties, and all-vegetable simulations of breakfast sausage and patties are routinely available in supermarkets."

"Research on the texturizing process began in the 1930s, when the elder Henry Ford became fascinated with the soybean and assigned a team of researchers to transform it into products ranging from fenders to upholstery material. Following laboratory successes that were not economical enough for the production line, the team eventually split up, but two of the researchers, Robert A. Boyer and William T. Atkinson, maintained an interest in rendering the soybean palatable to American tastes. In 1954, Boyer patented a process for isolating protein from soybean meal and spinning it into resilient threads that could be fabricated into simulated meat products, known in the trade as 'analogs.' In other words, they look and taste like the real thing. The process, however, was relatively expensive, and beyond the vegetarian market there was little demand for these simulations.

"The real break came in 1970, when Atkinson patented a cheap and comparatively simple process for imparting 'chew' to soybean flour by moistening it into a 'plasticized' mass, bringing it to a high temperature, and rapidly forcing it through perforated dies into a chamber of lower temperature and pressure. The result is a neutral-tasting granular material of any desired size and shape, depending on the dies, which contains about five percent moisture. When these granules are mixed with water, they retain their structural integrity, and in feel and texture resemble moist bits of hamburger."

"Dr. Aaron M. Altschul, head of the nutrition program at the Georgetown University School of Medicine, is more outspoken: 'The ability to produce texture out of soy flour

will probably rank with the invention of bread as one of the truly great inventions of food.”

“ADM... is venturing beyond the hamburger market. Its subsidiary, Gooch Foods, Inc., of Lincoln, Nebraska, is marketing ‘Noodles Stroganoff with Beef-flavored Vegetable Protein Chunks,’ as well as other dishes containing simulated beef.”

“In February 1971, after years of badgering by the industry, the Food and Nutrition Service of the U.S. Agriculture Department finally sanctioned the use of extenders for the meat portion of the school diet to a maximum of 30 percent. The enabling document—FNS Notice 219—is generally regarded as the Magna Carta of textured vegetable protein. During the first year of certification, the schools used 23 million pounds of the stuff; this year they’re up to 40 million pounds, and with meat prices soaring, no one thinks it unreasonable to expect at least a doubling of that amount in the next year or two.”

“The Red Owl supermarket chain, some 130 stores in the Midwest, had recently introduced ground meat extended 25 percent with textured vegetable protein, labeled ‘Juicy Blend II’ to conform with a Minnesota ban on using ‘burger’ for extended products. It sells at about 20 cents a pound below the undiluted version, and is said to be outselling the all-meat counterpart by three and four to one.”

“The old rules specified that ‘A food shall be deemed to be misbranded’ if it is an ‘imitation’ of another food and does not bear the word ‘imitation’ on the label. The new rules simply say that ‘nutritional inferiority’ shall be the only criterion for evaluating the difference between reality and verisimilitude. The man-made version, if it’s nutritionally equal, need not bear the pejorative ‘imitation,’ though it may not be labeled as the real thing either.” Address: Publisher of *Science and Government Report*, a Washington-based newsletter.

657. Nagelberg, Alvin. 1974. They’ll eat (soy) shrimp, (soy) ham, (soy) filet: Boyd [sic, Boyer]. *Chicago Tribune*. April 14. p. A7.

• **Summary:** This is a brief biography of Robert Boyer [mistakenly called “Robert Boyd” throughout], age 64. He predicts that within five years housewives will buy shrimp, ham, and filet mignon made from soybean protein. More than 40 years ago, during the Great Depression, he was hired by Henry Ford to find industrial uses for farm crops. World War I interrupted the experiments. Boyer resumed work at a laboratory in Cincinnati, Ohio [Drackett Co.], and in 1949 he applied for his patent, which was issued in 1951.

Today Boyer is a part-time consultant to the Marshall division of Miles Laboratories (Worthington, Ohio); his patent for making edible protein fibers from soybeans expired in 1971. Yet he has done well. He is semi-retired, has a 57-foot cruiser, and condominiums in Florida and Columbus, Ohio.

Miles’ first products have been targeted at the vegetarian and health foods markets. One of Miles’ latest products is Morningstar Farms sausage, a frozen product made of soy protein, egg albumen, and wheat gluten. “The egg is a binder and the wheat makes it chewy.”

658. Atkinson, William Thomas. Assignor to Archer Daniels Midland Company (Decatur, Illinois). 1974. Process for extruding oil seed protein material. *U.S. Patent* 3,845,228. Oct. 29. 3 p. Application filed 27 March 1973. [3 ref]

• **Summary:** “Process for preparing textured oil seed protein food products by extruding an oil seed protein material mixed with a small portion of lecithin to provide improved throughput in the extruder as well as a denser and tougher product.”

Soy or corn lecithin increases the capacity of an extruder for soy texturizing by up to 50%. Address: Decatur, Illinois.

659. Stone, David E. 1974. Profile: Francis E. Calvert pioneer of soybean protein. *Food Engineering* 46(10):40, 42. Oct.

• **Summary:** Francis Earle Calvert was born in 1912 in Cambridge, Massachusetts. He was selected by Henry Ford to be part of a special group attending Ford’s Wayside Technical School in Sudbury, Massachusetts. There was no tuition—a Godsend during the Great Depression. Then he attended Ford’s Edison Institute at Dearborn, Michigan. Calvert’s introduction to the soybean came directly from Ford himself—in the early 1930s. One day the great entrepreneur dropped in lugging a 100-pound sack of soybeans, saying that there must be something valuable in them since Orientals had been using them for 4,000 years. He challenged the young students to find out how to use them.

He and his young co-workers at the Greenfield Village laboratory had developed a destructive distillation process. It decomposed the soybeans using heat in a closed container. Later Calvert helped to design a new solvent extractor for soybean built like an Archimedes screw; it removed soybean oil using a counter-current solvent. Soon Calvert, and colleague Robert Boyer, were making spun protein fibers for upholstery in Ford cars, as well as plastic car parts.

Because soybeans were hard to get, the young men had to grow their own. They planted several thousand acres of soybeans, then had to develop mechanical equipment to harvest them. Now they set out to adapt them to human consumption. In 1936 the lab delivered fortified soymilk to Dearborn families, made a soy sherbet that was sold in the Ford employee cafeteria, and canned green soybeans for use as a vegetable.

Why do soybeans have a bitter taste? Its a survival mechanism.

The Drackett Corporation hired Calvert, and shortly thereafter they purchased the Ford Textile Fiber Division. They put Calvert in charge of basic protein research. In 1949 he was appointed research director at Drackett. In 1962

Calvert joined Ralston Purina Co. in special soy products research. He retired in Aug. 1973. Address: Product Mgr., Food Protein Div., Ralston Purina Co.

660. *Progress Thru Research (General Mills, Inc., Minneapolis, Minn.)*. 1974. The ground beef-soy introduction: Case history of a new product. 27(2):1-3.

• **Summary:** With the new ground beef-soy mixtures, now popular with consumers, General Mills introduced a whole new class of foods. The story begins on 11 March 1973, at which time scientists at General Mills' research laboratories had accumulated 400 man years of research and development on textured vegetable protein. They had begun many years earlier with a license in the early 1950s from Robert A. Boyer to develop an edible product from pure soy protein. The first product was Bac*Os, made at a new plant in Cedar Rapids, Iowa. The frozen, precooked product was sold under the Bontrae trademark.

March 11 was the date that Juicy Burger hit the retail market—a national “first” for Owl Stores, Inc. in Minneapolis, Minnesota. That product was soon improved and renamed Juicy Blend II.

661. Read, Hadley. 1974. *Partners with India: Building agricultural universities*. Urbana, Illinois: University of Illinois College of Agriculture. 160 p. Illust. No index. 29 cm. [60 ref]

• **Summary:** A superb book, telling the story of how American Land-Grant colleges and universities, starting in the 1950s, helped India to establish similar agricultural universities in India. A number of these Indian organizations did pioneering research on soybeans in India.

On the page facing the start of the Preface is a map of India titled “The nine U.S. university-assisted Indian agricultural universities.” The names of nine Indian states are on the map. Within each state is a number, keyed to the names of the universities below. The main work with soybeans was done in: (3) Uttar Pradesh, at the G.B. Pant University of Agriculture and Technology, Pant Nagar, by the University of Illinois. (5) Madhya Pradesh, at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh Agricultural University), again by the University of Illinois.

Contents: Part 1: A distinctive spirit. 1. Universities serving two democracies: An overview. 2. We, to, were a developing nation. 3. A new democracy must serve its people. 4. A partnership for progress in education. 5. The shift toward agricultural university development. “Part 1 establishes the historical setting for the partnership. It reviews the origin of the U.S. land-grant universities, relates this origin to the strikingly similar needs of India after her independence, and traces the creation and early progress of the AID-university technical assistance efforts in India.”

Chronology of key early events in the USA: “1850 May—Jonathan Baldwin Turner addressed the Illinois Teachers

Institute at Griggsville, Illinois, calling for a new kind of university for the industrial classes that would stress the teaching of agriculture and other ‘vocational’ subjects.” At this time, all American universities (such as Harvard, Princeton, Yale, etc.) offered a “classical education” which included the study of Latin and Greek so that students could read the Classics of Western Civilization. They taught logic, rhetoric (debate and composition), grammar, history, mathematics, astronomy, music, philosophy, and the like.

“1857 Dec.—Congressman Justin Smith Morrill [a Republican from Vermont] introduced a bill that would grant public lands to the various states to endow a college for teaching subjects related to agriculture and the mechanical arts.

“1858 April—Congressman Morrill made his first major speech in Congress supporting his ‘land-grant bill.’ The House of Representatives passed Morrill’s bill two days later and referred it to the Public Lands Committee of the Senate.

“1859 Feb.—The Senate passed Morrill’s bill, including two amendments which the house had accepted earlier. President James Buchanan vetoed the bill...

“1862 June—The Senate passed a revised version of Morrill’s land-grant bill, introduced by Senator Benjamin Franklin Wade [Republican from Ohio]. The House approved the Senate’s version of the bill

“1862 June—President Abraham Lincoln signed the Land-Grant Act.

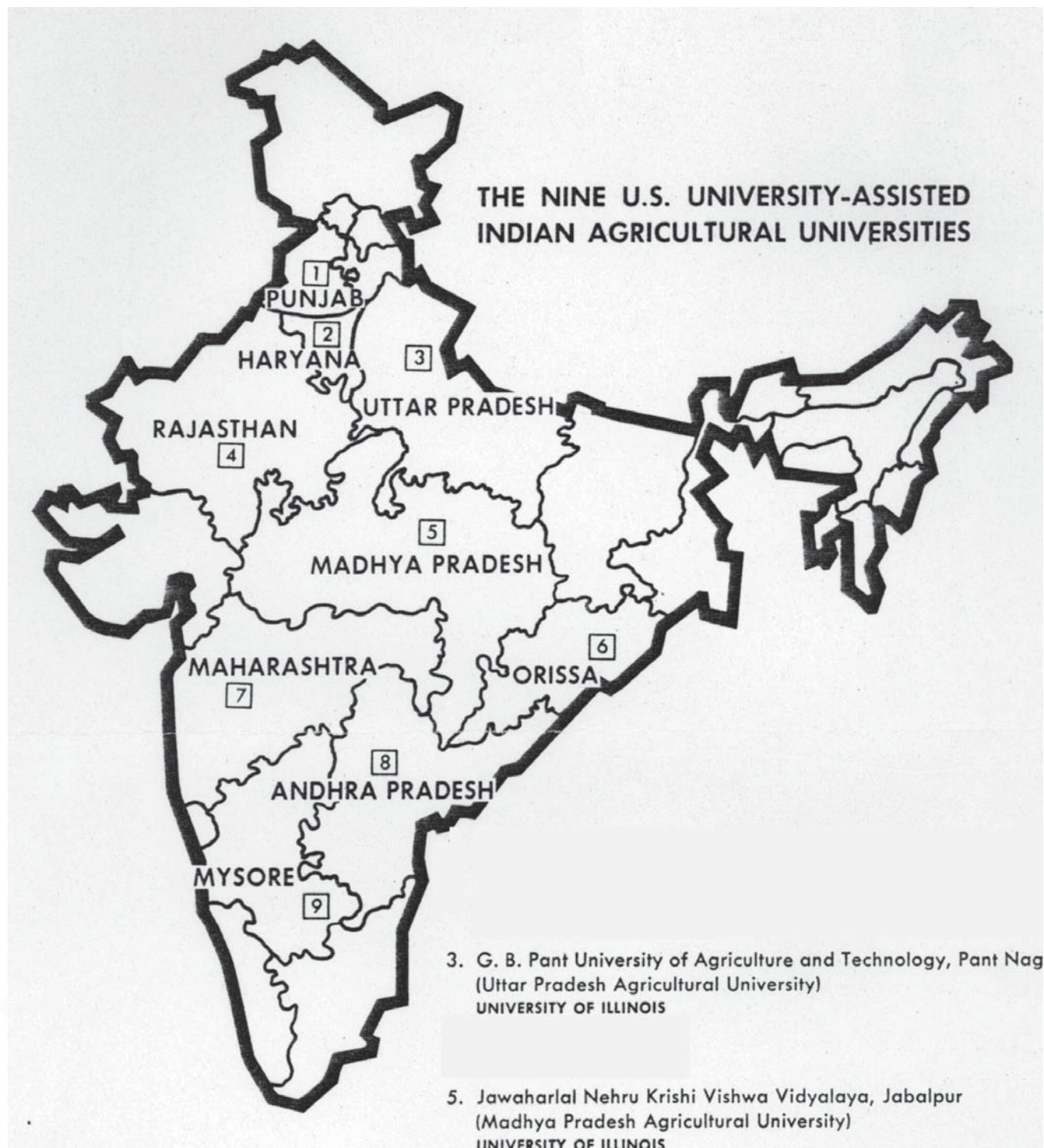
Note: This Act ushered in a new era of higher education in the United States. Under the act, each eligible state received a total of 30,000 acres (120 square km) of federal land for each member of congress the state had as of the census of 1860. This land, or the proceeds from its sale, was to be used toward establishing and funding the educational institutions described above.

1887 March—The Hatch Act was approved. Introduced by Congressman William H. Hatch of Missouri, it provided federal money for the support of agricultural experiment stations at colleges and universities endowed under the Land Grant Act of 1862.

1887 Oct.—Delegates from the established land-grant colleges and universities met in Washington, D.C., and formally organized the Association of American Agricultural Colleges and Experiment Stations.

1914 May—The Smith-Lever Act was approved. Sponsored by Congressman Ashbury F. Lever of South Carolina and Senator Hoke Smith of Georgia, the act provided federal funds for cooperative agricultural extension work by the established land-grant colleges and universities.

Part 2: From concept to reality. 6. Translating the Illinois blueprint to two states: Introduction, Uttar Pradesh Agricultural University (From jungle swamp to state farm, the race to be first, from state farm to college campus, a clear-cut mandate, a hostile [physical] environment for growth, the Tarai heritage, drastic action is needed {D.P. Sinhg is



appointed vice chancellor}); Jawaharlal Nehru Agricultural Agricultural University (The need for consolidation, eight colleges into one university, a research team, “pulled by our dreams,” concept is crucial, pride in research, less push for extension, different versions of one model)... 13. U.S. Foundations: Catalysts for progress (Ford and Rockefeller foundations).

Part 3: The road taken and the road ahead. 14. The dimensions of our effort. 15. Profiles of progress. 16. An author’s perspective.

Chronology of significant events in India: 1947 Aug. 15–India wins independence from Great Britain; a new democracy is born. However the country is suddenly and violently split into two countries: the Republic of India (with a Hindu majority) and Pakistan (itself divided into East and West, located far apart, with a Muslim majority). India has 21 universities, but they were not well suited to address India’s social, economic, or agricultural needs. At this time, India urgently needs to increase food production and find homes for the millions of displaced persons, many of whom had fled from West Pakistan at the time of partition. Approximately 8.6 million Hindus and Sikhs fled from Pakistani territory, and about 7.9 million Muslims fled from Indian territory. It was one of the largest and most sudden human migrations in world history.

1948 Nov.–The Government of India establishes the University Education Commission under the chairmanship of S. Radhakrishnan, to recommend improvements in university education to serve the future needs of the nation. Commission members included Americans Arthur Morgan and John Togert.

1949–Three historical events converge in a common cause that will profoundly affect the direction and structure of higher education in India.

1949 Jan.–U.S. President Harry S. Truman, in “Point Four” of his inaugural address, promises to share U.S. technical knowledge with the “peace-loving peoples” of developing nations of the free world.

1949 Feb.–The National Association of State Universities and Land Grant Colleges pledges to help in achieving the Point Four objectives.

1949 Aug.–India’s University Education Commission issues its report calling for reforms in higher education, including the establishment of new “rural universities.”

1951 Nov.–India’s state ministers of agriculture, university vice chancellors, and deans of the faculty of agriculture issue a resolution urging “sisterhood relations” between Indian and U.S. universities.

1951 Nov.–Douglas Ensminger arrives in India to head the Ford Foundation’s program to assist India’s Community Development Program.

1952 Jan.–The United States signs a formal agreement to provide India with technical assistance in the field of agriculture.

1952 June–The University of Illinois signs a contract with the U.S. Technical Cooperation Administration, predecessor of the Agency for International Development (AID) to assist India’s Allahabad Agricultural Institute in improving its educational programs.

Frank Parker arrives in New Delhi as chief agriculturalist for the USAID mission and advisor to the Indian Minister of Food and Agriculture.

1955 April–The first of five two-man survey teams from the University of Illinois etc. leave for India to study Indian agricultural colleges. All five teams complete their 4-6 week study trips between April 1 and Oct. 1.

1955 Sept. The Joint Indo-American Team submits its study report which contains 118 recommendations for improving agricultural research and education in India and urging consideration of new rural universities. Address: Prof. and Head of Agricultural Communications, Univ. of Illinois.

662. Gray, Roy Burton. comp. 1975. *The agricultural tractor: 1855-1950*. Revised ed. St. Joseph, Minnesota: American Society of Agricultural Engineers (ASAE). 91 + 60 p. Illust. Index of manufacturers. Index of brand names. 28 cm.

• **Summary:** First published in 1954 under the title *Development of the Agricultural Tractor in the United States*. In this 1975 edition, the original format was completely revised. The text, however, remains true to the original, except where altered to fit the new format. One substantial change was made, with the addition of two indexes (Manufacturers, and brand names) following Part II.

Contents: Part I–1855-1919: Introduction. The beginnings of mechanical power (1705+). Self-propelled steam engine (traction engine). Some steam tractors (1877-1919, with photo and year of introduction of each). Functional units of steam traction engines. Early internal combustion engines and tractors. V. Early tractor development (1889+). Some early gasoline tractors (year by year from 1889, with photos): Ignition systems, lubrication, governing and carburetion, cooling, clutches, transmissions, wheels and tracks (type and arrangement), miscellaneous. VI. Track-type tractors.

Part II–1920-1950. Introduction. Tractor development in the 1920’s (year by year from 1920, with photos). Table 1 (p. 1) shows the number of tractor companies, tractors produced, and number of horses and mules on farms, 1904-1920. The number of tractors produced jumped from 2,000 in 1909 to 62,742 in 1917, to 203,207 in 1920. This table is continued (Table 2, Part II, p. 21) for the years 1921-1930. The number of horses on farms peaked in 1919 at 26.436 million. The number of tractor companies peaked in 1921 at 186. Table 3 (p. 21) shows the U.S. Census of tractors on farms in 1920, 1925, and 1930. In the latter year, the top five states were Illinois (69,628), Kansas, Iowa, Ohio, and Wisconsin (50,173). Table 4 (p. 29) shows number of tractors on farms from 1925-1935.

The word “tractor” first appeared in 1890, in U.S.

patent No. 425,600 issued on a tractor invented by Geo. H. Edwards of Chicago. It next appeared in 1906 as a popular replacement for the longer expression “gasoline traction engine,” in an ad for a tractor made by the Hart and Parr Co. of Charles City, Iowa. This company is credited with having built the first successful internal combustion engine tractor and founding the gasoline tractor industry. In 1907 the Ford Motor Company of Detroit, Michigan, produced an experimental tractor using some of the parts from a Ford car and a binder (p. 23). A photo of the 1906 Ford tractor and a 1906 International Harvester tractor appear on p. 25. In 1917 the Ford Motor Co. introduced its Fordson tractor; it was not called a “Ford” because that name had already been preempted by a competing firm, the Ford Tractor Company of Minneapolis, Minnesota (p. 50, 52).

“In 1918, the United States, in its second year of war, was faced with an acute shortage of labor and work animals. The farm tractor played an important part in meeting the situation and that year 132,000 tractors were produced.” The Fordson accounted for more than 25% of all these tractors. In 1918 Ford announced that its Fordson tractors would be sold only to state and national governments. But some were also sold through Ford auto dealer agencies. By August 1920 Ford claimed that 100,000 Fordsons had been sold (p. 53). A nationwide depression in 1921 reduced the demand for tractors. In 1921 the low-priced Fordson accounted for about 50% of U.S. tractor production; and in 1923 and 1925 more than 100,000 Fordson tractors were produced each year, or 60 to 75% of the tractors produced by all companies. “After 1925 with returning normalcy augmented by the influence of the general purpose tractor, Fordson production decreased and its manufacture was finally discontinued in this country in 1928.” It continued to be made at the Ford plant in Cork, Ireland (until about 1931), and imported to the USA. General purpose tractors were produced by International Harvester Co. (their important Farmall 20 line was launched in 1922), Oliver Farm Equipment, Massey-Harris, Minneapolis-Moline, Case, and Allis-Chalmers.

Based on the number of entries in the Manufacturers Index, the most important tractor makers (listed alphabetically) were: Allis-Chalmers Co. (2.6 lines of entries), Avery Farm Machinery Co. (2.4), J.I. Case Co. (3.1), Caterpillar Tractor Co. (1.5), Cleveland Tractor Co. (1.8, Cletrac), John Deere Tractor Co. (2.0), Ford Motor Co. (1.5, Fordson), Hart-Parr Co. (1.7), Huber Mfg. Co. (1.6), International Harvester Co. (3.2, Farmall), Massey-Harris Co. (1.5), Minneapolis-Moline Co. (2.7, Universal), M. Rumely & Co. (1.5), and Russell Tractor Co. (1.7 lines). Address: Former Head, Farm Machinery Section, Agricultural Engineering Research Branch, USDA.

663. Moncrieff, R.W. 1975. *Man-made fibres*. 6th ed. New York and Toronto: John Wiley & Sons. A Halsted Press Book. 9 + 1094 p. See p. 289-90. 23 cm.

• **Summary:** Today, the nylons, the polyesters, and the acrylics are the dominant fibers, having replaced large amounts of cotton and wool. In part 2 of this book, titled “Fibres Made from Natural Polymers,” chapter 8, “The first rayons” (p. 157-61) notes that the first rayons were developed, starting in the 1830s, as “artificial silk” from natural sources of cellulose, especially wood-pulp. The first practical process for making artificial silk (later called rayon) was invented by Count Hilaire de Chardonnet and patented in 1885; large amounts of Chardonnet silk were first produced starting in the 1880s. The process for making viscose rayon was discovered in 1891 by C.F. Cross and E.J. Bevan, then patented in 1892. “The greatest single factor in the development of the viscose process has undoubtedly been the support given to it by Courtaulds, Ltd. The pioneer work was undoubtedly carried out by Courtaulds, Ltd., who not only founded and developed an important new industry, but also introduced it to America under the name “The American Viscose Co.” In 1900 world production of viscose rayon was about 1,000 tons. In 1920 it was 15,000 tons and in 1940 it was 1,100,000 tons. Note: Courtaulds, Ltd. was a pioneer in making a spun soy protein fiber named Kesp for food uses in the UK, starting in 1973.

Chapter 17 in Part 2, titled “Casein fibres” (p. 307-09) discusses Lanital, Aralac, Fibrolane, and Merinova. In 1904 Todtenhaupt disclosed a method of making casein filaments, but they were brittle and lacked sufficient resistance to water to withstand wet processing. Early attempts by him and others to make a commercially successful casein fibre were unsuccessful, and it was not until 1935 that the problem was really solved by an Italian named Ferretti, who conducted his research from 1924 to 1935. He succeeded in making pliable fibres with certain wool-like characteristics. The Italian rayon manufacturer Snia Viscosa purchased Ferretti’s patents and began large-scale production of casein fibre, named Lanital (*lana* means “wool” in Latin) from milk. In 1937 they made 1,20 tons Lanital.

Chapter 18 in Part 2 is titled “Ardil, Vicara, Soybean.” It is very similar to the same chapter in the 1963 edition. Ardil fiber is made from peanuts (groundnuts), and Vicara from corn (maize) protein.

Chapter 19 discusses nylon, which was a product of the genius of Wallace H. Carothers. This brilliant organic chemist left his academic life at Harvard University to undertake fundamental research work in 1928 with the huge American chemical combine of E.I. du Pont de Nemours & Co. He was interested in fibers made of polyesters and polyamides. By 1938 the du Pont Co. was making nylon at a small pilot plant in Wilmington, Delaware. In the UK this fiber is spun by I.C.I. Ltd. (the huge chemical combine) at Doncaster, Pontypool, and Gloucester. Address: United Kingdom.

664. Boyer, Robert A. 1975? *Resumé of Robert A. Boyer*. Dunedin, Florida. 3 p. Undated. Unpublished manuscript.

• **Summary:** Born 30 Sept. 1909 in Toledo, Ohio. Personal history: Lived in Toledo area until 1916. Lived in Detroit [actually Royal Oak], Michigan until 1923 [His father worked in the accounting dept. of the Ford Motor Co. in nearby Highland Park]. Moved to South Sudbury, Massachusetts, and lived at Wayside Inn [where his father was business manager] until 1927. Returned to Detroit, where he lived until 1943. Lived in Cincinnati, Ohio, 1943 to 1963. Lived in St. Louis, Missouri until 1972. Have lived in Dunedin, Florida since 1973.

Educational background: Attended grade schools in Toledo and Detroit. Attended high school in Framingham, Massachusetts, graduating in 1927. Attended Henry Ford Trade School 1927-1929. From 1929-1933 attended Edison Institute of Technology at Greenfield Village, Dearborn, Michigan. This was the school founded by Henry Ford and Thomas Edison as a school for inventors.

“Work experience: 1933–Research studies at Edison Institute gradually became more and more involved in Ford Motor Co. research projects. The Main Lab. at The Edison Institute was absorbed by the Ford Motor Co. Since I was directing the work at the time, as Manager, I became a Ford employee.

“The main purpose of the Lab. was to develop industrial products from farm crops. Thereby providing new outlets for the farmers hard hit by the ‘Great Depression’. One of the most publicized projects was our work with soybeans.

“In the 1930’s the soybean was practically an unknown crop in the U.S. Today it is the second largest cash crop in America. A great deal of the credit for its tremendous growth goes to the Ford Motor Co. and our research.

“Due to World War II, all activity of a non-military nature was terminated, which included our work with the Soybean.

“After the war, The Ford Motor Co. did not resume its work on the soybean. I continued the research, independently, and in 1951 I obtained a pioneer patent on texturized vegetable protein. A second major patent was granted in 1954.

“In 1951 I started a consulting business based on soy and other proteins.

“Within a few years several of the largest food firms in the world took out licenses from me on my patents.

“The rest is history. The soybean is now an important agricultural commodity throughout the world, and is playing a major role in feeding the world’s population.

“1970’s -

“I decided to retire and gradually began to terminate my consulting contracts.

“Today, except for a few patent infringement suits where I appear as an ‘expert witness’, I am fully retired, and enjoying worldwide travel.” Address: Dunedin, Florida.

665. Flier, Ronald J. Assignor to Ralston Purina Company, Inc. (St. Louis, Missouri). 1976. Protein product and method

for forming same. *U.S. Patent* 3,940,495. Feb. 24. 10 p. Application filed 17 Jan. 1973. [5 ref]

• **Summary:** “Related U.S. Application Data: Continuation of Serial Number 600,471, Dec. 9, 1966, abandoned, which is a continuation-in-part of Serial Number 381,853, July 10, 1964, abandoned.”

“Abstract: A method of producing an expanded product which resembles meat, directly from soybean meal itself, including the steps of utilizing soybean meal that has substantially all the fat removed to an amount of about 5% or less, and preferably 2% or less, moistening the soybean meal such as mixing the soybean meal with water to obtain a moisture content of about 20%-40% by weight, controlling the pH within the range of 5 to 12, preferably 6 to 9, preferably adding an edible pH altering electrolyte while maintaining the controlled pH, and then simultaneously, mechanically working, heating above 212°F, and pressurizing the moistened soybean meal in an extruder chamber sufficiently to cause continuous conversion of the meal to a flowable substance, and forcing the substance through and out of restricted orifice means to expand it into a lattice network structure having resilience, body strength, and appearance approaching that of meat. 52 claims, 1 drawing figure.”

Note 1. “Abandoned” means that the patent examiner probably gave the inventor a hard time on the patent application so that the inventor abandoned all or part of it.

Note 2. At the time this patent was issued, there was another rather similar U.S. patent (No. 3,488,770) that had been issued to William Atkinson of ADM on 6 Jan. 1970. The Atkinson patent, between 1970 and 1976, and played a major role in making TVP a very widely used product in the USA. However after the Flier patent was issued, a lawsuit and trial determined that the Flier patent dominated the Atkinson patent largely because it could be traced back to 1964. For more details, see the interview with Ed Meyer on 10 May 1993.

Note 3. On 6 Sept. 1989 the United States District Court—Central District of Illinois ruled in a case of Ralston Purina vs. A.E. Staley that patent No. 3,940,495 (the Flier patent) “is held to be unenforceable by virtue of inequitable conduct.” Address: Ladue, Missouri.

666. Boyer, Robert A. 1976. Early history of the plant protein industry. *Cereal Foods World* 21(7):297-98. July.

• **Summary:** “Shortly after the turn of this century, there appeared on the American scene one of the first examples of a food product based on a processed plant protein. Dr. John Harvey Kellogg, in an effort to add more vegetable protein foods to the menu of his famed Battle Creek Sanitarium [in Michigan], developed a method for producing wheat gluten from ground wheat and converting it into an attractive entree resembling a cut of meat.”

Yet long before, people of the Orient have obtained a

major portion of their protein from bean curd or tofu. There follows a good history of modern soy protein development from 1930 to the present. In the "late 1950s, the first edible soy protein plant went on stream in Chicago [Illinois, where Central Soya made Promine]. This was followed a few years later at another edible plant in Louisville, Kentucky [owned by Ralston Purina Co.]. Soon products began appearing on the marketplace listing 'soy protein' or 'vegetable protein' in their ingredient lists... This triggered a rapid growth in the plant protein industry starting in the mid-1960s... To summarize, it can be said that the first 65 years were the hardest for this new industry, but after that the progress was irresistible. Nothing is as powerful as an idea whose time has come."

A portrait photo shows Boyer, who "attended the Edison Institute of Technology before serving as Manager of the Soybean and Chemurgic Laboratory, Ford Motor Co. from 1931 to 1943. He spent the next six years as Director of Research for Drackett Co. Boyer worked as a Protein Consultant for the next 13 years with such companies as Swift and Co., Unilever Ltd., Worthington Foods Inc., Nabisco, General Mills and Ralston Purina. In 1962 he joined Ralston Purina as Protein Scientist. He served in this capacity until his retirement in 1971, at which time he assumed his present position." Address: Protein Consultant, Miles Laboratories, Inc., Elkhart, Indiana, 46514.

667. Portrait photograph of Robert Boyer in his later years. 1976. Undated.

• **Summary:** Negative number: 0.19429 (see next page).

Source: From the collections of Henry Ford Museum & Greenfield Village. Reprinted with permission.

668. Lehnert, Dick. 1976. New plant produces edible soys. *Michigan Farmer (Duluth, Minnesota)*. Sept. p. 48.

• **Summary:** A new company named INARI, Ltd. (for International Nutrition and Resources, Inc.) is processing edible soybeans (Corsoy variety) for a market fast growing beyond the health food stores. An open house was held recently at the new facility. The company's "pilot sized" plant produces about 2,200 lb (1 metric ton) of deep-friend soybeans per [8-hour] day. It is located in Dansville, Michigan, on Diehlfields, the farm owned by Dave Diehl (Michigan Agricultural Commissioner) and his sons and sons-in-law. Dorn Diehl, now head of the state's Agricultural Stabilization and Conservation Service, also comes from this farm. The Diehls only connection with the plant is that they provide the Corsoy soybeans for the roasters. Dorn Diehl enthusiastically points out that this is the first new industry in Dansville (population 483) in 30 years.

The corporation INARI, headed by Leonard M. Stuttman of Lansing, Michigan, has ten stockholders and a capital investment of \$60,000. The plant is run by Jeff Stuttman, Leonard's son. Leonard has a colorful history in the Lansing

area, once hosting a TV show about world travel, running a nature center, and most recently working for the American Soybean Association—where he became enthusiastic about using soybeans for direct human consumption. The company presently makes only one product, peanut-like whole fried soybeans named Solar Soya (sold whole, chopped, or ground) a crunchy snack food fried in a mixture of 90% palm oil and 10% soybean oil.

INARI sells its product to health food stores and Spartan Foods. Miller's Ice Cream in the Lansing area offers the product in its Butter Soya Crunch ice cream. Near Kalamazoo, Wesley Quaker Maid is testing it as Natural Caramel Crunch.

Dorn Diehl looks at the new soybean plant as a good omen. In the granary next to the new plant, he showed visitors old timbers taken from mills owned by Henry Ford and torn down after he died. Ford used these mills to grind soybeans, from which he made plastics that went into an all-plastic car body in 1939. "What might the car industry—and agriculture—have been like if that idea had flown? Now right next to those old timbers, there's a new soybean idea about which Diehls and INARI are enthusiastic."

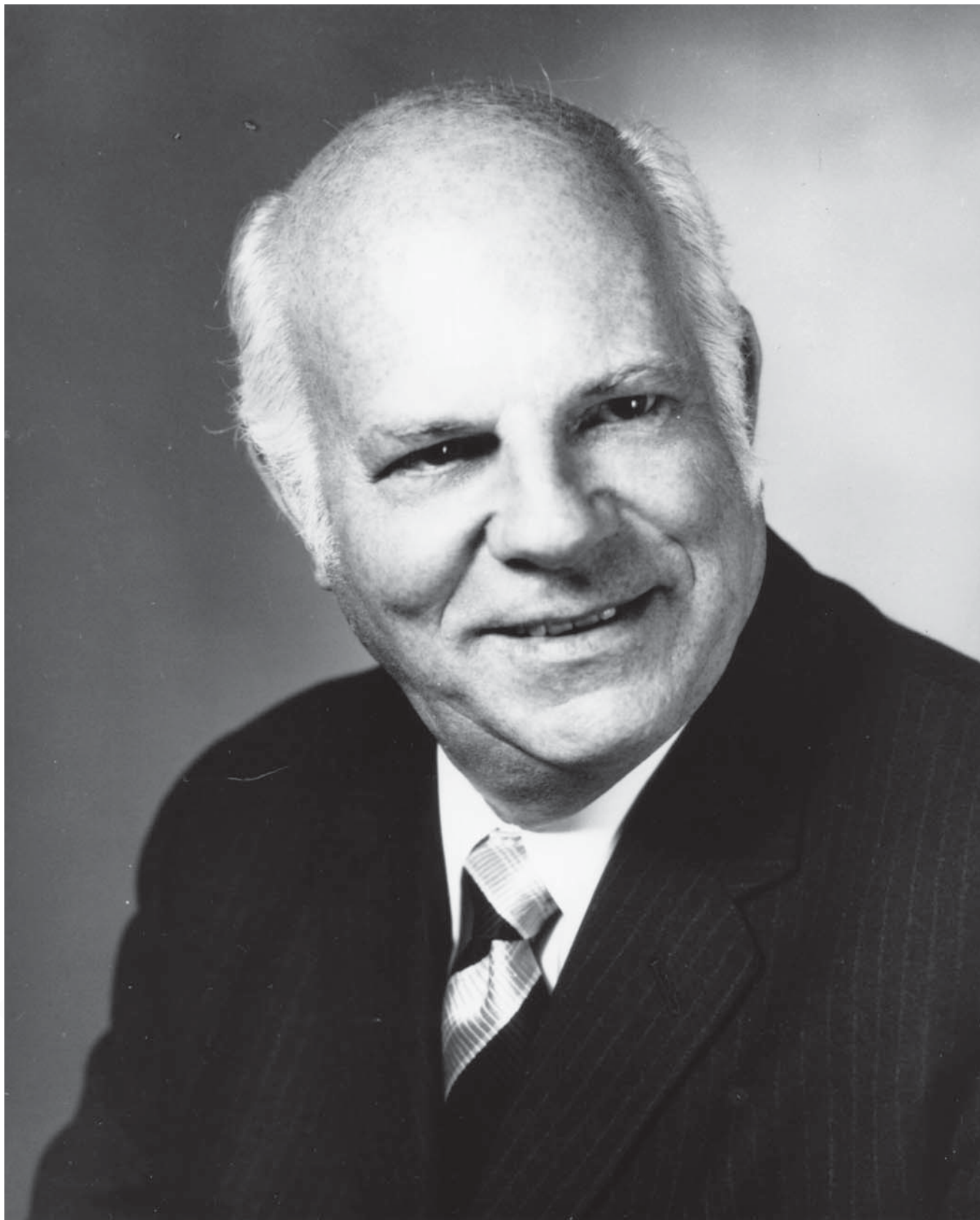
Photos show: (1) Leonard Stuttman and Dorn Diehl talking. (2) Small packets of Solar Soya. (3) A tag showing the many possible uses for Solar Soya.

669. Meyer, Paul A.; Diaz, Enrique; Sarnecki, Christopher. 1976. Weller's. Saline, Michigan. 24 p. Dec. Unpublished typescript. 28 cm. [8 ref]

• **Summary:** An excellent, in-depth history of this Greek-revival style building conducted as part of the Saline Historic Preservation Survey. Contains 20 photos of the building taken over a span of many years during its 131-year life. "The premise used for this study is that a potential developer is interested in investigating the property for possible redevelopment... The authors wish to sincerely thank Mr. and Mrs. Carl J. Weller, Jr., owners of Weller's Mill, for their complete cooperation during the research for this study.

"The city of Saline was first settled in the 1820s at the point where the Chicago Road, paralleling the old Indian Great Sauk Trail, crossed the Saline River. The first commercial buildings in the area were mills which harnessed the power of the river to provide settlers first with sawn lumber and later with floured grain.

"In 1845, Schuyler Haywood built and began operating a flour and a saw mill immediately west of the crossing of the Chicago Road and the Saline River. A small industrial settlement grew around Schuyler's mills... Haywood named this settlement Barnegat after his hometown in New Jersey." The mill was used to best advantage under Mr. Haywood, who produced 25 barrels of flour a day not including custom flour milling work. A romantic recount of "Barnegat in 1855" was published in the *Saline Observer* in 1909; it noted that "a great hill separated the town of Barnegat from Saline." [Note:



In 1993 it was about ½ mile from the mill to the center of downtown Saline.] The Schuyler mill was sold in 1855 to Jacob Sherman, and then again in 1857 to W.H. Paetison. "In 1866 the mill and surrounding property were bought by John A. Klein," who operated it until 1881. John produced 3 grades of flour with the patent flour; it found a ready market in Detroit, and some was also sold in Ann Arbor. Then John's son, Adam, operated the mill for some years and built his home across the street. Then Adam's son, Orris, began operation of the mill and continued until 1927. Thus three generations of the Klein family operated the mill for the next 61 years. They updated the mill with an Excelsion Turbine waterwheel and a patented Eureka machine. "But as Saline prospered, Barnegat died. During the later years of this period many of the buildings of Barnegat were abandoned and rapidly deteriorated. The mill stopped operating about 1925. Joseph Schmidt purchased it in 1927 and sold it to Henry Ford in 1937." [Note: Ford Motor Co. 1944, and Rusty Davis, 1983, both say that Ford purchased the mill in 1934 and began operating it in 1938].

"The acquisition of the property by Henry Ford was part of his 'village industries' plan, a great experiment of industrial decentralization. His factory-farm philosophy envisioned dotting many American rivers with small water-driven auto parts factories which would offer employment to farmers and stop their migration to the urban centers. The city, according to Ford, had been a mistake. It meant overcrowding, high land costs, high taxes, poor housing, and congested transportation, while the country was an area of hope. Ford declared that 'factory and farm should have been organized as adjuncts of one another, not as competitors.' 'With one foot in industry and one foot in agriculture, America is safe,' he said."

"Ford acquired extensive land holdings along the Saline River in Barnegat, reconstructed the millpond, and cleared the property of many ramshackle buildings including the saw mill. He shifted the flour mill about 30 feet south of its original location in order to have more room on the highway side. It is not certain if the entire building was dismantled and reassembled, but it is known that the building was substantially restored and improved, the milling equipment was replaced by large soybean handling machinery, and the chimney was rebuilt at the end of the building instead of the center. Ford also added a characteristic glass-enclosed room at the east end to house generators powered by water turbines in the millrace below. At the same time he built an extraction plant (in a 19th Century style) to complete his industrial complex which would mill soybeans to produce oil for use in making plastic parts and paint for automobiles [sic, the plastic parts were made from soy protein]. Subsequently Ford also added a storage shed of cement block at the west end of the building. During the war [World War II], the mill was converted to produce aluminum bearings for aircraft.

"After Henry Ford's retirement in 1945, the effort to

encourage village industries came to a halt without really having accomplished what it had set out to do. The Ford Motor Company began to divest itself of its mill properties. Soybrands Incorporated, a local firm, acquired the Schuyler Mill to produce soybean animal feed, but the operation was short-lived because the machinery was found to be obsolete. In 1947 the mill was sold to the Valley Chemical Company, a rendering firm based in Mount Pleasant, Michigan."

"From 1951 to 1952 Barbara Hamel [the niece of one of the owners of Valley Chemical Co.] producer [manager] of the Saline Mill Theater, turned the extraction building into a playhouse. The main mill building was used for sleeping quarters for the members of her summer stock company.

"About the late 1950s, the mill became semi-abandoned and changed owners several times. In 1962, it was turned into an antique shop and general store known as the Sauk Trail Inn. Attempts were made to develop it as commercial shops or apartments; all were unsuccessful.

"In 1967 the property was purchased by the Carl Weller family, who converted the mill into a furniture store and a group of quaint shops. Efforts to renovate and improve the building and grounds have been made and are continuing to be made by the Weller family. By August 1969 the mill was named Weller's Sauk Train Inn. No longer generating its own electricity, it had a Detroit Edison Company service connection. By June 1971 new signs [that read 'Weller's'] had been added and the split rail fence was removed." Photos show the mill building in summer 1974 and Jan. 1975. It is located at 555 W. Michigan Ave. It has 3 floors plus a basement. Address: Saline, Michigan.

670. Lewis, David L. 1976. The public image of Henry Ford: An American folk hero and his company. Detroit, Michigan: Wayne State University Press. 598 p. Illust. Index. 26 cm. [56 ref]

• **Summary:** This outstanding book, together with the author's 1972 article titled "A Bushel in Every Car" (*Ford Life*, May/June, p. 14-24) comprise the best summary seen to date of Henry Ford's work with soybeans. The research, writing style, and interpretation are excellent, and the book contains an extensive, original bibliography. "Ford's interest in relating scientific technology to agriculture, which led to his extensive soybean experimentation and research into plastics, was keyed to his lifelong efforts to improve the lot of the farmer. As early as 1907 the industrialist experimented with an 'automobile plow,' hoping to ease the farmer's burden. During the 'teens and 'twenties he designed and built the Fordson [tractor].

"In early 1928, Ford became interested in a new agricultural concept, farm chemurgy; that is, putting chemistry and allied sciences to work for agriculture. The industrialist was chiefly interested in finding new industrial uses for farm crops, although he also hoped to find new ways to use crops for food." Footnote 22 (p. 529) cites an

article dated 15 Dec. 1931 from the *Chambersburg Opinion* (Pennsylvania) in which Wheeler McMillen, a leader of the farm chemurgic movement, states that he “first discussed the idea of new uses for farm products, and new crops, with him [Ford] early in 1928.” However Lewis notes (p. 529): “There are no articles in the Ford clipbooks concerning Ford’s interest in the chemurgic concept prior to 1931.”

“In 1929 he [Ford] established a laboratory in Dearborn and began experiments to determine which plants or legumes offered the most promise. After extensive research, he decided in 1931 to focus attention on the soybean, rich in versatile oil, high in protein content, and with a residual fiber amenable to many uses.

“Ford planted 300 varieties of the soybean on some 8,000 acres of his farms in 1932 and 1933. He also urged Michigan farmers to plant the beans with the assurance that the Ford Company would provide a market for them. By 1933 his experimentation, which cost \$1,250,000, had been rewarded with the discovery of a soybean oil which made a superior enamel for painting automobiles and for oiling casting molds, plus a soybean meal which was molded into the horn button. The discoveries excited Ford. ‘By now,’ *Fortune* reported in late 1933, ‘he is as much interested in the soya bean as he is in the V-8.’ Two years later, a bushel of soybeans went into the paint, horn button, gearshift knob, door handles, accelerator pedal, and timing gears of every Ford car. Numerous other small parts of the Ford car eventually were made of soybean-derived materials.”

There are good summaries of Robert Boyer, the development of soybean plastics and the “plastic car,” Henry Ford’s demonstration of striking the trunk lid of one such car with an ax, development of soybean fiber and wool from which was made a necktie and suit of clothes, development of soybean foods, encouragement of chemurgy, and the Chicago World’s Fair. The author sums up Henry Ford’s contributions related to soybeans as follows: “Although Ford’s free-ranging predictions were often wide of the mark, his frequent assertion that ‘soybeans will make millions of dollars of added income for farmers... and provide industry with materials to make needed things nobody even knows about now’ was proved correct by the passage of time. In addition to their uses in cooking, soybeans are used in plastics, in varnishes and enamels, in adhesives, coatings, and sizings, as additives in lubricants, and as industrial resins. By 1959, American soybean production—only 1,000,000 bushels in 1920—had grown to 538,000,000 bushels, making it fifth in importance of all our crops. By 1973 American farmers were devoting one acre in seven to soybean cultivation, growing \$1.5 billion bushels of beans, and converting the legume into the country’s No. 2 cash crop, which sold for \$8.8 billion. Soybeans outpaced jet aircraft, computers, and all other products and crops to become the nation’s most valuable export in the early 1970s. Treasury Secretary George P. Shultz facetiously suggested at a businessmen’s conference

in 1973 that soybeans might replace gold as a standard of international wealth if its price (\$0.45 per bushel in the 1930s, \$2.60 in the mid-1960s and \$12.12 in 1973) continued to climb. ‘When the price of soybeans reaches the price of gold, we’ll be set,’ said Shultz. ‘We could go over to the soybean standard.’

“Through his experimentation, and the publicity he gave it, Henry Ford made a substantial contribution to the increased utilization of the soybean. His work in this field, started when he was in his late sixties and carried forward until he was eighty years of age, is perhaps the outstanding achievement of his declining years. Of all of Ford’s accomplishments, it is possible that none pleased him more than in helping to prove that there was industrial magic in a beanstalk.

“Ford’s farm-related activities—unlike his attitudes toward government and organized labor—were generally enlightened, progressive, and sometimes far ahead of his times. He helped to set in motion the whole chemurgic movement, not only by the example of his laboratories, but by playing host to 300 leading agriculturists, scientists, and industrialists who met in Dearborn to organize the National Farm Chemurgic Council in 1935. Twenty-seven years later, Wheeler McMillen, ex-chairman of the council, regarded Ford’s invitation to the charter members of the organization as ‘the outstanding single thing Mr. Ford did in behalf of chemurgy.’ The council and other groups subsequently induced the government to establish four large regional crop-utilization laboratories [including the Northern Regional Research Laboratory at Peoria, Illinois, which continues to do very important work with soybean utilization]. By 1961 more than 8,000 new processes and scores of entirely new industries had resulted from their efforts” (p. 287).

The chapter titled “Folk Hero” includes a discussion of Henry Ford’s strong feelings about diet and health. Page 229 notes his active opposition to drinking alcohol (he even checked his workers while Prohibition laws were in effect prior to 1933), and adds that his “well publicized dietary fancies varied almost from year to year.” In 1922 he claimed that “chicken is fit only for hawks.” In 1926 he regarded carrots as a cure-all, and “during the 1930s he advocated soybeans as a panacea, ate meals consisting of only soybean derivatives, and developed a vile-tasting soybean biscuit which he pressed upon his friends; during the 1940s, wheat became the ‘divine food,’ containing everything a man needed to remain healthy and live long... Ford frequently predicted that he would live to be 100 years old... His prescription for longevity included exercise, and his photograph appeared frequently in the newspapers as he jogged along on foot or pedaled a bicycle. Ford challenged scores of people, particularly reporters, to footraces, and only the most fleet-footed could stay with him over 100 yards. The manufacturer was still racing when he was eighty years old.”

For more from this book, see the several accompanying

"document part" records, including one located at 1941 titled "Henry Ford's plastic car." Pages 484-85 contain an interesting map of Dearborn titled "Ford Country," with important Ford-related places numbered and explained. Note: Prof. David Lewis is probably the greatest Ford historian alive today. He is at the University of Michigan at Ann Arbor. Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan.

671. Lewis, David L. 1976. Henry Ford's "plastic car": Comments by the U.S. print media and subsequent use of plastic in automobiles (Document part). In: David L. Lewis. 1976. *The Public Image of Henry Ford*. Detroit, Michigan: Wayne State University Press. 598 p. See p. 282-85. [14 ref]

• **Summary:** "Carrying his dream a step further, on August 13, 1941, at the climax of Dearborn's annual community festival, [Henry] Ford dramatically unveiled a handmade car with a complete plastic body. This event occurred at a time when Americans were just becoming aware of plastics. Moreover, the nation was being alerted to a metal shortage. The new car generated great publicity and stirred the imagination of editorial writers as had few other Ford-related events for some years. Many newspapers regarded the experimental Ford vehicle as revolutionary. The *New York Times* thought it 'may have a great influence on the automobile industry'; the *Wheeling Intelligencer* (West Virginia) predicted it 'will revolutionize the automobile industry'; and the *San Diego Union* [California] said that it 'may well bring about something in the nature of a highly desirable and peaceful agricultural revolution'; while the *Indianapolis Star* looked upon it as 'outstanding industrial achievement... an artistic triumph, no matter what the future may bring.' Other newspapers, noting that William S. Knudsen, of the National Defense Advisory Committee, had expressed 'intense interest' in the vehicle, emphasized the possibility that Ford's plastic might be substituted for steel and other metals used in cars. 'Obviously,' stated the *Decatur Herald Review* (Illinois), 'here is something an America on wheels has been waiting for. Please hurry it, Mr. Ford, hurry, hurry!' The *Saginaw News* (Michigan) dismissed Ford's statement that the car was 'purely experimental.' 'Shucks,' it drawled, 'who doubts that our motorists, or some of them at least, will soon be riding around in plastic car bodies.'

"Observing that Ford's plastic was molded from several common crops (including, in addition to soybeans, wheat, hemp, flax, and ramie—and that other commodities could also be used to make plastics), dozens of newspapers speculated on what large-scale plastic production could mean to the economy of their sections... A few papers regrettably had to pass on the depressing news that their areas could contribute little to the cars of the future. 'It is hard to get soybeans to mature here,' mourned the *Cheboygan News* (Michigan). 'Planting earlier might prove the solution.'

"A few newspapers were less interested in growing the ingredients for Ford's plastic than in putting the new

substance to better use than motor cars. The *Bristol Press* (Connecticut), noting that the plastic was 'dent resistant,' suggested that it might be used for battleship armor, while the *Spartanburg Herald* (South Carolina) suggested that Ford 'might find greater profit in the manufacture of coffins than in automobile bodies.' 'Plastic coffins,' the paper declared, 'would be lighter, more durable and as attractive as the present metal things, and they could be made at far less cost.'

"A humorous vein, most of it related to the vegetable content in the Ford car, appeared in many editorials. The *Cleveland Press* wondered why Ford didn't strengthen this plastic by adding spinach; the *Cedar Rapids Gazette* [Iowa] suggested that the auto slogan of the future might be 'ask the man who grows one'; and the *St. Louis Globe-Democrat* stated that the new vehicle, 'part salad and part automobile,' marked the triumph of the vegetable over the steel industry. Jokes about edible cars sprang up on all sides. PM [New York] printed a few of them:...

"Farmer Cornassel: What crops ye growing this year, Zeke—Fords or Chryslers?" "The new car would not need gas. Just sprinkle a little salt, pepper, and vinegar on it and it would go to beat hell; a man need not buy a new car every year; he could have last year's car warmed over; a man could eat his car and have it too; ad infinitum. In 1943, several of these jokes were dusted off when a goat actually ate an Illinois license plate made of a soybean-derived fiberboard." [In 1944 Montana issued a soybean-based license plate.]

"Henry Ford was heavily praised for his vision and achievement in building a 'plastic' car. The unveiling of the vehicle was one of the last occasions on which concerted praise would be heaped upon him by the nation's press. Many newspapers compared his research into plastics favorably to his past achievements. The *San Diego Union* regarded Ford's intention to convert farm products to industrial uses as 'more revolutionary than that which gave birth to the flivver,' while the *Detroit Legal Courier* felt that 'when history is written and the achievements of Henry Ford are chronicled, the Soy Bean victory will stand out as his foremost contribution to mankind.' 'While it may seem funny to say "let's take a ride in our new vegetable car," summed up the *Arkansas City Tribune* (Kansas), 'the world has only admiration and respect for Henry Ford, who like Edison, will leave so many testimonies of greatness and gifts to the masses by having put within their reach pleasures that otherwise would have been denied them.'

"The outbreak of World War II and the suspension of automobile production forced Ford to abandon his efforts to mass produce plastic car bodies. Until 1943, however, he maintained that he would build them as soon as the war was over. In any event, others carried forward his work, and in 1953 the first mass-produced car with a plastic body [albeit fiberglass-reinforced plastic], the Corvette, was introduced by Chevrolet. A second mass-produced car with a plastic body, Studebaker's Avanti, made its appearance in 1962. By 1962 the Ford Company was using as average of 29 pounds of

plastic in its cars, by 1968, 50 pounds, by 1972, 120 pounds; and the firm expects to use an average of 200 pounds of plastic per car by 1980.

Note 1. By 1991 some 258 pounds of plastic were being used per Ford car. Note 2. Lewis states in footnote 29, p. 529: "The fiber glass reinforced plastic bodies of the Corvette and Avanti are rust and corrosion proof and weigh about half as much as a steel body of comparable size. Although the soybean has not been an ingredient of the Corvette or Avanti body, it is used in many plastics."

Note 3. Clipbook 121 at the Henry Ford Museum in Dearborn, Michigan, contains scores of editorials and hundreds of news stories on Henry Ford's plastic car (p. 529). Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan. Phone: 313-764-9540.

672. Lewis, David L. 1976. Ford Motor Co. profits, Henry Ford's waning interest in his company, and his growing involvement in outside activities or "hobbies," 1926-1941 (Document part). In: David L. Lewis. 1976. *The Public Image of Henry Ford*. Detroit, Michigan: Wayne State University Press. 598 p. See p. 205, 207, 233, 237, 246, 276-82. [14 ref]

• **Summary:** Because the Ford Motor Co. was privately owned until early 1956, yearly profit and loss statistics after 1921 are hard to find. (For statistics from 1903 to 1921 see Nevins and Hill 1954, Appendixes II-VIII.) This book is one of the best sources of such statistics. They both reflect and help explain Henry Ford's growing interest in his "hobbies" (including soybeans, see below) and his declining interest in the Ford Motor Co. The Model T, launched in 1908, was Ford's first big money maker. It led the automotive field until 1926. In early 1928 it was replaced by the Model A—which some auto historians and many old-car enthusiasts believe was—"pound for pound, dollar for dollar—the best car ever built." But during the years of transition between these two models—1927 and 1928—the company lost \$101 million. However the Model A sold so well (it passed its chief rival, the Chevrolet, by 400,000 units in 1929) that in 1929 and 1930 Ford's profits (after taxes) exceeded \$131 million. Ford fared better than most auto makers following the great stock market crash on 29 October 1929. In 1930 alone, the first year of the depression, Ford's after-tax profits were \$40 million. In 1931, however, the depression caught up with the Ford Company. Only half as many Model As were sold that year as in 1930, and Ford lost \$31.181 million. During 1932-1933 the company lost another \$88 million, with losses for 1933 alone being \$7.89 million after taxes. By 1934 the company was again making money, a modest \$21.4 million for the year. Yet "after the mid-1930s the Ford Company took a declining share of the auto market and consistently ran behind the Chrysler Corporation, as well as General Motors, in unit sales." In fact, between 1933 and 1941 Ford earned an estimated profit of only \$32 million. Its assets in 1941 were \$23 million less than in 1927, as the company drifted to third

rank in the U.S. auto industry.

"Henry Ford's career after 1932 was anticlimactic... The break in the manufacturer's forward momentum can be attributed to at least two factors. One was his age; in 1933 he was seventy, albeit a very active seventy. Of more importance, however, was the depression, which not only checked the flow of Ford's profits, but also ruled out any opportunity to expand his organization. Indeed, the company's heavy losses during the early 1930s led to a severe retrenchment in 1933 which included mass layoffs of hourly and salaried personnel, discontinuance of all product advertising for almost a year, and divestiture of the Airplane division and other properties... General Motors assumed sales leadership in 1931, a position it has never relinquished..."

"Ford's drive and his attitude—very probably affected by his age, the depression, and his loss of sales supremacy—also changed appreciably during 1932-33. After building his 'last mechanical triumph,' the V-8, in late 1931 and early 1932, the industrialist's interest in the company's products and in its day-to-day affairs gradually abated. His 1933 statement, 'The Rouge is no fun any more,' was indicative of his attitude toward the business in general. On the other hand his 'hobbies'—the Edison Institute (Greenfield Village and the Henry Ford Museum), the 'village industries,' soybean and plastics experimentation [plus the Chemurgic movement], the Ford schools, and tractor development—increasingly absorbed him. These projects, though not unimportant, fell far short of the numerous bold and exciting ventures in which Ford had been engaged during the previous decade." Yet "Henry Ford's vitality during this period was extraordinary, despite a mild stroke which he suffered in 1938 at age seventy-five."

"Each of the magnate's hobbies was well publicized, and the Edison Institute—for years commonly called 'Greenfield Village'—was the best publicized of all. Of all Ford's outside activities, Greenfield Village was the closest to his heart. It memorialized his most treasured friend, Edison, and it symbolized much of what Ford valued most in life. He spent freely on it—more than \$30,000,000." Today it contains the world's largest collection of Americana. The "out-door" museum contains more than 100 historic buildings on a 200-acre site.

Ford's interest in soybeans is described in other records related to this outstanding book. Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan. Phone: 313-764-9540.

673. Lewis, David L. 1976. Henry Ford: Legend and legacy (Document part). In: David L. Lewis. 1976. *The Public Image of Henry Ford*. Detroit, Michigan: Wayne State University Press. 598 p. See p. 413, 480-83, 488-89. [14 ref]

• **Summary:** Note: The fact that Henry Ford, a man who was widely known and greatly admired, was also America's best-known advocate of soybeans from about 1932 to 1950,

is of considerable importance in understanding the rapid rise of interest in and production of the crop during that period. In fact, if we plot U.S. production of soybeans (for beans) on a semi-log graph—the kind most useful in showing rates of growth and changes in those rates—we see that the rise in this production was most rapid from 1926 (5.2 million bushels) to 1942 (187.6 million bu), when the crop increased 36-fold in only 16 years! This represented an average annual compound growth of slightly more than 25% a year; during this 16-year period soybean production doubled, on average, every 2.8 years! The single period of fastest growth was from 1933 (13.5 million bu) to 1935 (48.9 million bu), at exactly the time when Ford's promotion of soybeans and of chemurgy was most active.

"Although far past his prime during 1942-45, Ford was one of the country's best publicized businessmen during the war years" [World War II]. Among businessmen, only Eric A. Johnston (president of the Chamber of Commerce of the United States) and shipbuilder Henry J. Kaiser were more publicized than Ford during the war.

"Ford's reputation, although on the decline since the early 1930s, was more durable than his newsworthiness... In the spring of 1942, when *Fortune* asked a representative sample of Americans which of eleven prominent figures they 'would like to see given an important position in Roosevelt's war administration,' 30.9 percent named Ford. In this study the auto maker was outpolled only by General Douglas A. MacArthur... and Wendell L. Wilkie."

"In the fall of 1942, the nation's newspaper editors, surveyed by Pearl S. Buck, president of the Eat and West Association, rated Ford second among 'Americans, now living or alive since 1900, who [are] typical of our best' and about whom the peoples of Asia should know more."

"Idolized by many Americans during his lifetime, Henry Ford remains a folk hero, his name constantly paraded before the public." Ford's reputation would probably have been enhanced if he had died earlier. "Had he passed on in late 1914, with his moving assembly lines humming, his Model T running away with the market, and his Selden patent fight, five-dollar day, and price cuts behind him, his star might now be brighter... Ford's reputation similarly would have been better served had he retired in 1929, at age sixty-six... But rather than move offstage and permit Edsel [Ford, his son], Sorensen, and others to run the company, he hung on until 1945... progressively falling out of step with the times and acquiring a 'Model T' image."

Note: Concerning the Selden patent—George B. Selden (1846-1933) was a lawyer and inventor who was issued the first patent for an automobile, which he invented in 1877. Inspired by the gigantic internal combustion engine invented by George Brayton displayed at the Centennial Exposition in Philadelphia in 1876, Selden began working on a smaller lighter version. He succeeded by 1878 in producing a one cylinder 400 pound version which featured an enclosed

crankshaft. He filed for a patent on 8 May 1879; it included both the engine and its use in a four-wheel car. He then filed a series of amendments to his application. On 5 Nov. 1895, after 16 years, he was issued U.S. patent No. 549,160. In 1889 he sold his patent rights to William C. Whitney, an attorney. Together they negotiated a royalty of 0.75% on all cars sold by the Association of Licensed Automobile Manufacturers. However Henry Ford (owner of the Ford Motor Co., founded in Detroit in 1903) and four other U.S. car makers, decided to content the patent infringement suit against them filed by Selden and Whitney. The legal fight lasted for 8 years and was highly publicized and very costly. Selden won the first round, but Ford appealed. On 10 Jan. 1911 Ford won the case using the argument that the engine used in automobiles at that time was not based on George Brayton's engine, the Brayton engine which Selden had improved, but on the Otto engine, based on a 4-stroke cycle developed by the German engineer Nicolaus Otto in 1876. It was a stunning victory for Ford.

"Still Henry Ford maintains a reputation for greatness. In 1967 a nationwide sample of business executives, when asked by the University of Michigan to name the greatest businessmen in American history, rated Ford first, followed by Andrew Carnegie and Thomas A. Edison. In 1971, readers of *Nation's Business*, published by the Chamber of Commerce of the United States, ranked Ford as the greatest businessman in American history, followed by Alexander Graham Bell and Thomas A. Edison."

Henry Ford "was the first to find a mass market for what we would not call a 'big-ticket' item. All over the world his name came to stand for the ability of industrial capitalism to lift workers and consumers to higher levels of prosperity."

Of the Ford Motor Company's "worldwide properties, the River Rouge plant, built by Henry Ford during the 'teens and 1920s, remains the most impressive. To this day the factory has been challenged in size only by the Volkswagen Works in Wolfsburg, Germany. Much of Henry Ford's older and second largest industrial complex, the Highland Park plant, remains standing." His third great factory, the Willow Run bomber plant, is intact, and used by General Motors as a manufacturing facility.

"General Motors' great inventor, Charles F. Kettering, observed in 1943 that 'a thousand years from now, when the Churchills and the Roosevelts are but footnotes in history, Henry Ford will loom as the most significant figure of our age.'" Lewis concludes: "The best remembered fact of his life will be his great achievement. By preaching high-volume production, low prices, and universal consumption, he became the key figure in a far-reaching revolution" (p. 488-89). Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan. Phone: 313-764-9540.

674. Walsh, E.J. 1976? Preliminary evaluation of soybeans under Irish conditions—1974. *University College, Dublin, Faculty of General Agriculture, Research Report* For the year

1974-75. See p. 80-82. Undated.

• **Summary:** This article appears in the section on crop breeding. In 1974, 129 soybean varieties were grown at Lyons [near Dublin, at 54° 48.7' north latitude] in the Irish Republic. These soybeans were collected from breeders in five countries as follows: USA (48 varieties), Bulgaria (42), Poland (31), Japan (7), and Sweden (1 variety, Fiskeby V). "The objective of this study was to determine which, if any, of these varieties had potential for improving plant protein production in Ireland." A single plot (1-2 rows about 6 feet in length) of each variety was planted on 14 May 1974. On October 12, approximately 150 days after planting, all varieties were examined and pod development noted. Table 54 (p. 81) gives a summary of the results. Only 19 varieties produced flowers and only 12 varieties produced pods. Of those 12 varieties, 8 were from Poland, two from Japan (Okura I and Tenpoku wase), and one each from Sweden (Fiskeby V) and the USA (Pando). The number of days from planting to flowering, if detected, ranged from 91 to 102.

Conclusions: "(a) No variety worthy of serious consideration exists within the broad array of varieties evaluated. (b) The twelve varieties which produced pods may have potential as parents in a breeding programme geared towards the development of adapted varieties."

Note 1. These soybeans were tested near Dublin which is about 100 miles (1.5°) north of Cork.

Note 2. Will soybeans grow in Ireland? Probably! Southern Ireland (e.g. Cork) is at about 52° north latitude and the northern tip of Ireland is at 55° 20 min. The Kalmar-Oland region of Sweden, where the Fiskeby varieties of soybeans were grown commercially, is at 56°-57° north latitude, though it enjoys a longer frost-free season than many soybean growing areas in Hokkaido. A large number of strains ripen in Sweden as far north as Norrköping, 58°30' north latitude. Starting in 1934, fairly large areas of soybeans were grown on Henry Ford's Fordson Estate at Boreham, Essex, England, which is about 35 miles northeast of central London, at 51°45.4' north latitude, i.e. at about the same latitude as southern Ireland. Address: M.Agr.Sc., PhD, Dep. of Farm Management, University College, Dublin, Irish Republic.

675. *J. of the American Oil Chemists' Society*. 1977. Continuous solvent extraction... The early beginnings of a giant industry. 54(3):202A-204A. March.

• **Summary:** The origins of solvent extraction: On 13 Nov. 1855 a patent to extract fat from bones and wool using carbon bisulphide was issued in France to E. Deiss. On 3 Dec. 1856 additional patents were issued to the same inventor covering extraction of oil from oil-bearing seeds.

In the USA a batch solvent extraction plant at Southport Mills, New Orleans, Louisiana, ran in 1917-1919 on aviation-type gasoline and later on benzene to remove oil from cottonseed cake, copra, palm kernel, and other oleaginous

material. The experiment ended when business conditions returned to normal in the USA after World War I.

The origins of continuous solvent extraction are integrally linked with soybeans, largely because soybeans contain less oil than most oilseeds. "The end of World War I left Germany with a shortage of fats and oils as well as animal feedstuffs. The Germans began to seek better ways to get the most out of their imported Manchurian soybeans. Two continuous solvent extractors using countercurrent principles were developed. The Bollman [Bollmann], or basket, extractor, was patented in Germany in 1919 and 1920; the Hildebrandt, or U-tube, extractor, was patented in 1934.

"Solvent extraction also was being tried in the United States. In Monticello, Illinois, the Piatt County Soybean Cooperative Company operated a batch plant in 1923-24; Eastern Cotton Oil Company operated a Bollman extractor from Germany, at Norfolk, Virginia, in 1924-25. Both ventures proved unprofitable."

"Presco Oil Co. in Norfolk, Virginia, ran a solvent extraction operation for several years in the 1920s. A relatively small quantity of soybeans was processed. "Most early efforts at solvent extraction failed at least partially because of a lack of sufficient volume of soybeans.

"The best publicized effort in the United States was part of Henry Ford's soybean research plant at the Edison Institute (see accompanying article). Ford perceived farmers as his prime customers for his Model T automobile and decided if he wanted farmers for customers, he would have to find a new way for industry to become a customer for farmers.

"ADM and Glidden initiated large-scale solvent extraction of soybeans (in the United States) in 1934; John Cowan recently wrote in an introduction for a forthcoming volume on soybean oil. 'By importing equipment from Germany for the manufacture of oil, meal, and phosphatides. The plants processed 100 tons a day.'

"The ADM and Glidden plants were both in Chicago and both utilized Hildebrandt, or U-tube, extractors, with a petroleum of the hexane-type as a solvent. The ADM plant went on stream in March 1934, A.E. MacGee says [in a 1947 article for *Oil Mill Gazetteer*], with the Glidden plant following about November 1934.

"On Oct. 7, 1935, the Glidden plant at 1845 N. Laramie Ave. reopened after being shut down for five weeks. At 11:40 that morning the plant was destroyed in an explosion that shattered windows as far as a mile away and rained bricks on nearby structures. Eleven persons died and 43 were injured... The explosion apparently was triggered by a solvent leak... Cowan says the plant was immediately rebuilt at double its original capacity.

"In those early 1930s while Ford was looking for industrial uses for soybeans and the first large-scale plants were rising in Chicago, Proctor & Gamble in Cincinnati had set Norman F. Kruse to work on soybean oil research. P&G was examining soybean oil for use in Crisco [shortening]

and salad oils. In January 1933, P&G shifted a recent Purdue graduate, R.P. Hutchins, to the project as Kruse's assistant. Kruse and Hutchins became friends, a friendship that would endure corporate animosity more than a decade later when each was with a different firm.

"Kruse was a wonderful man," Hutchins recalls. "He set about to teach me everything he knew. He was completely unselfish." Kruse directed lab work with Hutchins, letting Hutchins write the reports so Kruse could spend more time working with the pilot plant crew.

"In September 1936, Kruse left P&G for Central Soya and Hutchins became head of P&G's soybean research efforts. Hutchins says Kruse left because he wanted to work on soybean oil extraction on a larger scale. If so, Kruse went to the right place. In 1936, the two-year-old Central Soya firm sent Kruse and Harry C. Offutt to Germany to study continuous extractors. Kruse and Offutt recommended that Central Soya buy a Bollman (basket) extractor." In Jan. 1937, during a trans-Atlantic phone call, Dale W. McMillen, Central Soya's founder, told them to buy the largest extractor available.

Years later, in 1966, Harold W. McMillen, Dale's son, told a dinner audience in Indiana that this decision came in the midst of the Great Depression, when solvent extraction was a new process, "and the future of the soybean was still regarded with skepticism by many."

In Nov. 1937 the plant went on stream in a five-story structure beside a cluster of tall (110 feet) silos that increased Central Soya storage capacity by 1 million bushels. With a capacity of 275 tons/day of soybeans, the plant was the largest of its time in the USA.

In the fall of 1936 Honeyamead Products Co. of Cedar Rapids, Iowa, opened a plant, based on the German process, with a capacity of 100 tons/day of soybeans.

"Kruse's former employer, Proctor & Gamble, had a subsidiary firm in Louisville [Kentucky] that produced cottonseed oil for P&G products, Hutchins says. Cotton acreage around Louisville was declining, soybean acreage was increasing. P&G decided to buy a Bollman extractor for a new plant in Louisville.

"In September 1939 with ground broken and foundations started in Louisville, and the extractor sitting on the Hamburg docks for imminent shipment to the United States, England declared war on Germany and a blockade of her ports. Hutchins recalls the German manufacturer said the extractor could be delivered via overland routes to Italy, still neutral at the time, for shipment to the United States. P&G, perhaps mindful that its English operations depended on government allocation of scarce raw materials, decided not to try to circumvent the English blockade. Instead, P&G turned to Piqua, Ohio where French Oil Mill's C.B. Upton recently had hired Harry Robinson as solvent plant superintendent. Robinson had been with Central Soya when the Decatur, Indiana, plant was built, but apparently he and Kruse had clashed. Robinson left and brought his know-how to French

Oil.

"French Oil told P&G it could produce a virtual copy of the Hansa-Muhle V. Bollman unit stranded on the Hamburg docks. Allis-Chalmers preparation equipment was to be used, but the extractor was the first one to be built in the United States by French Oil. The extractor based on Central Soya's unit, went into operation during February 1941." Continued.

676. *J. of the American Oil Chemists' Society*. 1977. Henry Ford & the soybean. 54(3):207A. March.

• **Summary:** When Robert Boyer was 14 and Henry Ford was about 60, they met ice skating in the winter on the frozen pond behind the Wayside Inn in Sudbury, Massachusetts. Ford owned the Inn and Boyer's father was the manager. Skating and talking over 3 winters, they became friends. As Boyer's high school graduation approached, Ford asked the young man about his plans. Boyer said he was going to Dartmouth college but didn't know what he was going to study. As Boyer recalls, Ford then said: "Tell you what, Bob. Why don't you come out to the (Michigan) plant, spend some time in each of our divisions until you decide what you want to do and then go to college."

"Boyer leapt at Ford's offer to return to Michigan where Boyer's father had been office manager at Henry Ford Hospital, Detroit, before moving to Sudbury. Boyer's return to Michigan was the start of a partnership that would produce the most publicized of the early efforts in solvent extraction of soybeans."

In 1929, a few years after Boyer's return to Michigan, Ford founded the Edison institute, as a "school for inventors." Ford and Edison both believed that invention was 99% perspiration and 1% inspiration. Ford asked Boyer, then age 21, to be director of the institute. "The automotive giant told him, 'We'll bring the best and brightest of the (River) Rouge Trade School students over here and give you problems to get you in over your head,' Boyer recalls. If you run into something where you think you need help, we'll call down to Ann Arbor and get some professors up here as consultants."

"We should call this the 'Place for Damned Fool Experiments,'" Ford said. "We don't want you to look at anything smaller than an elephant."

When the Great Depression struck, Ford wanted to do something to aid farmers, who were among the hardest hit. "If we expect farmers to be our customers, then we (industrialists) must become the farmer's customers," Ford was quoted as saying at the time."

Surrounding farmland was planted to various crops and each day when the young men arrived at the three-story wooden building housing the institute they would find a truckload or two of some crop (such as tomatoes, potatoes, or soybeans) for them to analyze. Before long, "soybeans emerged as the best farm crop candidate for industrial use."

"By 1933, Ford had 8,000 acres planted in soybeans; by 1936 it would rise to almost 60,000 acres, the largest soybean

barony in the world at the time (as the New York Times described it)."

Henry Ford wanted a Model T type extractor. "One which an individual farmer could operate so that in the summer he could work on his farm and in the winter could run the extractor. Ford's production-line outlook was seeking a way for the farmer to use profitably all his time. The Ford extractor—which could be run by one man—was the result. The horn-angle flaker, for which Ford and Boyer received the patent, may yet be used commercially, Boyer says. The extractor could process six tons of [soy] beans a day.

"Was the experiment profitable for the automotive firm? 'The enamel base paint paid for all the research all by itself,' Boyer says. 'Before that, all finishes [body paints] were lacquer requiring several coats with hand polishing. It was a costly and time-consuming process.'"

"The Edison Institute continued its work into 1943 when war production requirements led Ford to shut it down. At its peak, the institute had 100 persons on the staff with perhaps 20 key staffers, Boyer estimates. The soybean research section was purchased by The Drackett Co. in Cincinnati [Ohio]. Boyer stayed with Drackett until heirs of the owner decided to disband the research unit.

"Ford's efforts, however, had commanded nationwide publicity, even international through World's Fairs. The continuous solvent extraction process was among the first in the United States for commercial purposes, even if it was on a limited scale by today's standards."

677. *J. of the American Oil Chemists' Society*. 1977. Continuous solvent extraction... The early beginnings of a giant industry (Continued—Document part II). 54(3):202A-204A. March.

• **Summary:** Continued from p. 204A. Blaw-Knox, during the 1930s, had decided to enter the solvent extractor field, but it was not until 1943 that they began a concerted effort. In 1936, Dr. H.B. Leslie was hired by George Karnofsky as Blaw-Knox technical director; Leslie had become interested in soybeans while working in Decatur, Illinois. In 1943, Leslie, H.B. Coats, and others visited Decatur, Indiana, to examine Central Soya's solvent plant. They returned able to construct a solvent plant based on the German concepts, but it would have been essentially identical to the one offered by French, who had lower costs. Blaw-Knox decided it had to develop new equipment and concepts that would be less costly... The first commercial plant it built for Allied Mills employed vapor desolventizing and pressure toasting. Karnofsky was assigned to develop an improved extractor. The impact of Henry Ford's work during the 1930s with small scale solvent extraction plants that could fit in farmers' barns and promotion of soybeans was still being felt. Blaw-Knox's salesmen came back from the field asking if the company could develop a small, compact, inexpensive plant.

"Under the direction of Dr. Leslie (who died in Sept. 1976), Blaw-Knox undertook fundamental laboratory and

engineering studies of solvent extraction. Karnofsky disclosed their findings in 1948 during a six-day short course at the University of Illinois. The result of the Karnofsky and Blaw-Knox work was the Rotocel. One of the first unveilings was at a 1949 AOCS short course where Karnofsky spoke on the theory and practice of solvent extraction. Dr Cowan recalls the audience gave Karnofsky a standing ovation. The Rotocel patent was applied for in 1949 but not granted until 1958 because of litigation with an English firm [perhaps Simon-Rosedowns] with a similar design.

"During World War II, materials for new construction were difficult to acquire. After the war, however, materials became available and businesses of all types began to expand. French Oil Mill, for example, had built six [solvent] extractors between 1940 and 1945; from 1946 to 1950, they built 15; and from 1951 to 1955 they built 27."

Near the end of World War II, Warren Goss, then at the Northern Regional Research Laboratory in Peoria, Illinois, traveled to Germany to inspect oil mills and plants—most of which lay in ruins. He returned with a list of ideas for investigations, but also with the observation: "In general, the German technology appears to have lagged behind ours in the past decade." The United States, which began by borrowing German technology, had surpassed its teacher."

Meanwhile, Central Soya (Decatur, Indiana) and French Oil (Piqua, Ohio) had grown closer when R.P. Hutchins became head of French Oil's solvent extraction division. Kruse and Hutchins kept up their friendship from their days at Procter & Gamble Co. Central Soya picked French Oil to build a solvent plant that could process 300 tons/day of soybeans at Gibson City, Illinois. The plant was later virtually duplicated by French for Minnesota Linseed Oil Co. (Minneapolis, Minnesota) in 1948; for Swift & Co. (Champaign, Illinois) in 1949; for Plains Co-op (Lubbock, Texas) in 1950; and for Lauhoff Grain Co. (Danville, Illinois) in 1952.

"While driving from Piqua [Ohio] to Gibson City [Illinois] one day in 1948, Hutchins says, he mentally calculated as he drove that the amount of steam required to desolventize the flakes while condensing on the meal would be almost exactly equal to the amount of water being used to humidify the meal in order to produce a toasted product. He discussed the idea with Kruse and others at lunch that day in Gibson City and recalls Kruse saying that it sounded good and paralleled some thinking Kruse had been doing. A co-worker of Kruse says in later years Kruse talked of working out calculations on the back of paper napkins.

"Central Soya agreed to have French Oil built a pilot unit for the process at the Decatur, Indiana, plant. The pilot tests were very promising; in addition, Central Soya, with its background in animal feeding, recognized superior nutritional value in the desolventizer-toaster meal over that of previous processes. In 1949, Hutchins and French Oil filed for a patent.

"In 1952, Hutchins and French Oil were dumbfounded when Central Soya received a process patent for desolventizing with steam that showed as one of the illustrations a schematic version of the desolventizer-toaster unit. The Central Soya patent application had been filed in 1950.

"The resulting patent interference dispute was settled with French Oil agreeing to pay a royalty for using the steam injection system, for which Central Soya had received the patent. French's patent on the desolventizer-toaster unit was approved in 1954.

"By the end of 1952, French had already sold more than 30 units and the desolventizer-toaster was on its way to becoming the industry standard. Further litigation was avoided, Hutchins says, in the interest of maintaining harmony in the industry. In addition to the 1952 process patent, Central Soya later obtained a product patent and two machinery patents covering the improved design. Hutchins says his friendship with Kruse continued throughout the patent dispute.

"The Rotocel patent dispute was resolved with Blaw-Knox prevailing in the United States and eventually licensing overseas manufacturing rights. Simon-Rosedowns and Krupp are among current licensees. There were to be more patent squabbles as the industry evolved."

Since the early 1950s, extractors have continued to increase in size. The Rotocel was designed partially in response to requests for a small extractor. Some Rotocel units can now process up to 3,000 tons/day of soybeans.

"No radical changes have been made in 25 years—which may mean some are due soon. Soy protein is increasingly used for human food... New uses and more soybeans may spark changes to produce a meal better suited for conversion to human foods—perhaps in new solvents, perhaps in new machinery.

"R.P. Hutchins, recently retired from French Oil Mill Machinery, says he recalls the hazards of early solvent extraction quite well. 'I used to point out during my talks in those days that most of the early patents in the field were taken out by heirs of the inventors.'

678. Howes, Charles D. 1977. Re: The influence of Dr. John Harvey Kellogg on substitute foods and their developers in the USA. Letter to Mr. Stephen H. McNamara, Associate Chief Counsel for Food, U.S. Food and Drug Administration, Washington, DC., July 15. 2 p. Typed, with signature on letterhead. [1 ref]

• **Summary:** "Your paper in *Food Engineering*, June 1977 was read with interest. I do not intend to dispute any of the points made in it here, but would like to share with you a historical perspective of the development of substitute foods. A brighter future may be assured if we remind ourselves of the progress of the past.

"John Harvey Kellogg, M. D. promoted a simple

vegetarian diet at the Battle Creek Sanitarium in Michigan which he headed during most of his 67 years at the medical institution (beginning in 1875/76). During this period he developed a unique program of diet, hydrotherapy and expert surgery which attracted people from around the country and the world. Patients included a number of leading people such as William Howard Taft, William Jennings Bryan, Roald Amundsen, Lowell Thomas, Alfred DuPont, John D. Rockefeller, Jr., J.C. Penney, Montgomery Ward, S.S. Kresge, etc., etc.

"As might be guessed, Kellogg's views on diet and health were widely spread throughout America and the world. In order to provide a satisfactory vegetarian breakfast Kellogg developed the breakfast cereal and Battle Creek became the prepared-cereal capital of the world. The breakfast cereal was a substitute for ham & eggs and other high meat breakfasts.

"Kellogg also invented vegetable protein foods which he served as substitutes for meat. This was the beginning; of the meat analogue industry.

"Henry Ford II [sic, Henry Ford] was a patient of Dr. Kellogg and Kellogg was a man who liked to share his ideas with anyone who would listen intelligently. Exactly what was shared we do not know, but back in Detroit Ford established a soy research team. The soy research team invented soy plastic (which was used in Ford automobile steering wheels for several years), soy fabric, and soy fiber. When the research team was broken up the leading members joined the food industry and with additional developments produced vegetable fiber suitable for food products. This was the beginning of textured vegetable protein fiber.

"In order to promote his ideas more fully and leave a more lasting impression on the health of the world, Kellogg founded a medical school in connection With the Battle Creek Sanitarium. The American Medical Missionary College was granted a charter in 1895 and had two campuses—Battle Creek & Chicago. Much of the support for the medical school came from the food business. The school gave an excellent education and was soon fully accredited. Into this situation came Harry W. Miller, a medical student from Ohio. Harry Miller started working as a guide in the cereal factory to help support himself as a medical student. He became interested in the food business and became such an expert guide that Kellogg developed an interest in him. Miller was instructed by Kellogg in the area of food processing and read into food development as well as studied medicine. He became well-versed in both areas.

"When Miller graduated he married and soon sailed for China as a medical missionary. He noted malnutrition among infants and a high death rate among them. He also noted that soymilk was made by the people, but only the old people (no doubt those without teeth) drank it. In time Miller applied his knowledge of food processing methods to taking soymilk production out of the kitchen and making it on a large scale in a formulation suitable for infants. In the late 1930's China

was invaded by the Japanese and the soymilk plant was bombed. After several adventures he was able to return to the U.S. and founded the first American soymilk plant.

"Thus a 'Whole Picture' of substitute foods may be outlined in perspective thus:" A diagram shows John Harvey Kellogg, M.D. on the top line. Arrows point downward from him to those he influenced on the 2nd line: (1) Henry Ford II and the Soy Research Group. (2) Vegetable Protein Foods. (3) Breakfast Cereal. (4) Harry W. Miller, M.D. Arrows point downward to the 3rd row showing that: (1) Ford and the Soy Research Group developed Vegetable Protein Fiber. (2) Dr. Miller developed Soymilk & Soycheese. Arrows point downward to the 4th row showing that both Vegetable Protein Fiber and Vegetable Protein Foods led to the [commercial] development of Textured Vegetable Protein foods.

"I hope this background material will be helpful to you as you deal with the nutritional problems of engineered foods.

"Sincerely..." Address: PhD, Technical Director, Loma Linda Foods, 13246 Wooster Rd., P.O. Box 388, Mount Vernon, Ohio 43050. Phone: (614) 397-7077.

679. Ellis, Mark. 1977. Inventor's alchemy transforms lowly soybean. *Dispatch (Columbus, Ohio)*. Oct. 28. Section C. p. 1.

• **Summary:** About Bob Boyer, who lives at 5026 Wintersong Lane in Columbus, Ohio; a photo shows him holding a plate of meatless bacon. A consultant for Worthington Foods, Boyer is in the final months of a 5-year contract. Boyer has over 30 patents, some shared with Henry Ford. "Boyer developed the [his] first simulated meat in a kitchen lab after taking a year in 1950 to make a fruitful patent search. He decided to make a simulated pork chop because the meat is white and he had no food dye."

680. Deutsch, Ronald M. 1977. *The new nuts among the berries*. Palo Alto, California: Bull Publishing Co. viii + 359 p. Index. 22 cm. [260* ref]

• **Summary:** This is a follow-up to the author's 1961 work (revised in Feb. 1967) titled "The nuts among the berries: An exposé of America's food fads." The basic premise of both books is the same—That all popular books and people advocating health foods, natural foods, vegetarian or macrobiotic diets are nuts (crazy). The book is well researched but the tone is again that of an exposé of popular nutrition, one-sided and derogatory. There are two excellent bibliographies. The first, titled "Some controversial books in nutrition, contains 223 citations, listing almost every book ever published on the subjects noted above, including books such as *Diet for a Small Planet*. The second, titled "The factual resources for this book," includes 37 basic nutrition books, textbooks, and articles.

Contents: 1. The magical feast (Adelle Davis; Daisey Adelle Sieglinger). 2. Of cabbages and things (a brief history of "foodism"). 3. Mr. Graham bakes a cracker (Sylvester

Graham). 4. Little men, little women, little food (Amos Bronson Alcott, Louisa May Alcott, and vegetarianism). 5. Water, water everywhere (The naturopaths, James Caleb Jackson, Ellen G. White, Father Kneipp). 6. Snap! Crackle! Enter Dr. Kellogg! (Dr. John Harvey Kellogg). 7. The battles of Battle Creek (Michigan and Seventh-day Adventists). 8. Life along the alimentary canal (Metchnikoff). 9. The jungle, the sausage, and the law (Upton Sinclair, Harvey W. Wiley, and the formation of the FDA). 10. Chew, chew Horace (Fletcher, Chittenden). 11. The bare torso king goes public (Bernarr Macfadden, Jack La Lanne, macrobiotics). 12. How to stop your cow from drooling (selling nutrition). 13. Eating for the hull of it (raw sugar, bran, fiber, and foodist or food extremist Alfred Watterson McCann). 14. The drinks are on the Hauser (Gayelord Hauser, macrobiotics). 15. Old proteinaceous Joe or Is there sex after dinner (Lelord Kordel, protein myths, and sex). 16. Mrs. Spratt's millions or Diet is a four-letter word (fat and dieting). 17. Protomania or Richard Nixon's diet revolution (high-protein diets). 18. Swing low, sweet glucose tolerance (hypoglycemia or low blood sugar). 19. How to sell a vitamin (Linus Pauling). 20. My mother squeaked or How to write about health foods (popular health books and articles). 21. The red faced confession and other tales of food cures and law (fraudulent advertising, the FTC). 22. Quick, nurse! The bean sprouts! (unproven therapies and cures, megavitamin therapy). 23. Meanwhile, back at the organic ranch (Jerome I. Rodale). 24. Organic politics or Gloria Swanson goes to Washington (toxic chemicals in foods). 25. How the poison gets into your health food (Center for Science in the Public Interest, Gary Null, and other health promoters).

Let us examine one chapter, 13, titled "Eating for the hull of it." It was well known by the 1990s that dietary fiber was the one nutrient in shortest supply in the American diet, and that this shortage is the cause of many diseases, from simple constipation to various disorders of the digestive tract. Those advocating a natural foods diet argued that we should return to eating whole-grain bread, primarily for the dietary fiber it contains, but also for its extra vitamins and minerals lost in the process of making white flour. Instead of dealing with these important issues, the author spends most of the chapter ridiculing a "foodist" and "food extremist" named Alfred Watterson McCann (born in 1879) and a physician named Dr. William Howard Hay (who graduated in 1891 from the medical school of the University of the City of New York), and comparing the nutritional value of raw vs. white sugar. He also notes that before the Civil War, the wheat used to make most American bread was soft winter wheat. It was easily ground between stones, then "bolted" through a soft cloth to sieve out some of the larger bran particles—a process which Sylvester Graham "felt was against God's purpose." After the Civil War, Scandinavian and German emigrées moved into the virgin lands of Wisconsin, Minnesota, the Dakotas, and Iowa, bringing with them a new tough wheat—

the hard spring wheat. When the millers began to grind and bolt it, they found that much of the valuable gluten stuck to the bran. "To leave the bran in the flour meant creating a product that only a Graham or an Alcott would buy; dark coarse in texture, and hard to chew. Not surprisingly, the public rejected it." The first solution was the "middlings purifier" first installed in Minneapolis in about 1871; the purifier used a blast of air to blow away the bran. The primary solution was the Hungarian Mill, or highmilling machine—which had 6-7 sets of porcelain or chilled steel rollers. Sylvester Graham, James Caleb Jackson, and others said it was "unnatural" to take the bran out of bread. "Dr. [John Harvey] Kellogg's protests, which began about the time that the new wheat and new milling methods arrived, were based on his belief in 'auto-intoxication,' which called for bran to 'sweep out' the intestines and clear away their 'toxins.'" Address: Popular scientific and medical reporter.

681. Lewis, David L. 1978. Ford mills—The village industries. *Model "A" News* 25(2):10-11, 13-15. March/April.

• **Summary:** The Ford village industries tour begins at the old soybean processing plant in Saline. A nice photo shows the plant. Address: Prof. of Business History, Univ. Michigan, Ann Arbor, Michigan.

682. Harris, Marvin; Ross, Eric B. 1978. How beef became king. *Psychology Today*. Oct. p. 88, 91-94.

• **Summary:** Today Americans eat twice as much beef as pork (125.9 vs. 61.5 lb/capita in 1977). Beef in the form of steak is still our favorite prestige food. American steak is to meat what Cadillac is to cars.

Yet the supremacy of beef is a relatively recent phenomenon. Before 1950 Americans ate more pork than beef. Before the Civil War, whites in the South consumed 3 times as much pork as beef, and in the 1800s ham was the choice for honored guests. The good life was "living high on the hog" and "bringing home the bacon."

"One reason for the early preeminence of pork is strictly biological. Under favorable conditions, the pig converts plants into flesh far more efficiently than any other domesticated animal. Pigs transform about 35 percent of what they eat into live weight, compared with only 11 percent for cattle; they also have larger litters. Moreover, the hog is a creature that likes to root about for nuts and other tidbits buried in the forest floor... But what really made the hog king was the fact that American homesteaders produced more corn than the sparse human population could eat. At first, this surplus was most profitably converted into whiskey... When the federal government decided to make whiskey one of its principal sources of tax revenue, frontier farmers found it more profitable to turn surplus corn into meat rather than alcohol. From then on, as the corn belt moved steadily westward across the Appalachians and beyond, so did the hog belt. By 1830, the corn-hog complex had reached the Ohio

Valley, and Cincinnati, known as Porkopolis... Henry Ford is usually credited with creating the assembly line in Detroit in 1913, but the prototype of Henry Ford's assembly line was Cincinnati's pig disassembly line, operating well before the Civil War. When the corn belt moved still farther west, accompanied and spurred on by furious railroad building, Chicago replaced Cincinnati as the nation's principal meatpacking and transshipment center." The main early way of preserving pork was by salting; pork took to salting far better than beef. "These advantages kept pork the favorite American meat until physiology, geography, and technology combined forces to move beef ahead.

"Cattle have one distinct physiological advantage over swine: as ruminants, they are outfitted with a series of stomachs adapted to eating grass; pigs, for all their omnivorous tastes, cannot digest grass. Beyond the Mississippi lay great expanses of semiarid grasslands only marginally suited for corn production, where cattle rather than pigs could more efficiently convert plants into meat..." By the 1860s large numbers of cattle were being shipped from the great plains to Chicago. They still reached the Eastern consumer in the form of barreled, salted beef. "In the late 1860s, George Hammond delivered the first fresh Chicago stored on ice to the Boston market. Since Hammond's beef touched the ice, it was discolored and met with consumer resistance. A few years later, Philip Armour and Gustavus Swift, founders of the huge meat-packing companies that still bear their names, introduced refrigerator cars that chilled the meat by circulating air over ice... Beef won out over pork principally because the available grasslands made it cheaper to mass-produce fresh beef than fresh pork."

But the original bonanza of open-range cattle ranching was short lived, due to rising land prices and overgrazing in the early 1880s. More intensive methods such as the feedlot came to be used, and "more and more of the weight gain of beef cattle came to depend on alfalfa, corn, and soybeans... Our beef-eating ways now stand at odds with sound ecological and economic principles. Cattle have lost much of their cost advantage over swine and other more efficient sources of animal protein (such as poultry-farming and dairying) and America's taste for meat must sooner or later swing back to pork and dairy products, and include vegetable sources of protein as well."

Note: Between 1977 and 1982 U.S. per capita beef consumption fell by 19%, while consumption of poultry rose by 20%. Perhaps the lowly chicken will dethrone king beef. Address: Prof. Anthropology; 1. Columbia Univ.; 2. Univ. of Michigan.

683. Boyer, Robert A. 1978. Technological gaps in vegetable protein texturization. *J. of Texture Studies* 9(1/2):179-89. [14 ref]

• **Summary:** Contents: Introduction. Vegetable protein raw materials. Raw material flavor problems. Current texturizing

methods. Binders. Scientific literature gaps. Proposed new texturizing techniques. Conclusions.

"The growth of the textured vegetable protein industry has not kept pace with early predictions. High costs and marginal quality are among the factors retarding progress. Some of the technological gaps handicapping the industry are: lack of a process for preventing formation of off-flavors by enzymes while maintaining protein functionality, lack of a low cost thermosetting binder, lack of a protein suitable for spinning, and the indigestibility of certain soybean fractions."

"Two methods of texturization dominate the industry today: extrusion by screw presses and wet spinning... Extrusion accounts for a majority of the tonnage of textured vegetable protein (TVP) being produced today." The relatively inexpensive soy flour (about one-third the cost of soy protein concentrate and one-sixth the cost of soy protein isolate) can be used as the starting material. The extruded products are usually in the form of dry granules or expanded and porous chunks.

Perhaps the most serious problem confronting any process based on the use of soy flour is the lack of digestibility and frequent incidence of flatulence. Address: Miles Laboratories, Worthington, Ohio 43085.

684. Dahlinger, John Côté; Leighton, Frances Spatz. 1978. *The secret life of Henry Ford*. Indianapolis/New York: Bobbs-Merrill Company Inc. 243 p. See p. 170-77. Index. 24 cm.

• **Summary:** The author was born on 9 April 1923 at Henry Ford Hospital. His mother was Evangeline C. Dahlinger, who was married at the time to Raymond C. Dahlinger, one of Henry Ford's most trusted employees and later Manager of the Ford Farms. The author makes the case convincingly that Henry Ford was his father, making him Henry Ford's illegitimate son.

Chapter 12, titled "Quadrupeds are out" (p. 170-77) contains extensive information about Ford's work with soybeans and soyfoods. Ford believed that the world of the future would be a world without quadrupeds. "We don't need horses. We've got the tractor. We've got the automobile. We don't need cows—we can make synthetic milk. We can make meat substitutes out of soybean and coconuts—you can hardly tell the difference. We don't need sheep. We will be able to make wool out of synthetic things—it will be better than wool... Ford had good reason to distrust horses. He told me that when he was a young boy, his foot caught in the stirrup when a horse bolted. He was dragged around and could have been killed. I don't recall ever seeing him ride a horse... Ford considered the horse a very inefficient instrument. He called it a thousand-pound hay-burning motor with one-horse power.

"As Henry Ford worked toward his great vision of a world that had no need of quadrupeds, I was his guinea pig. And I wasn't the only one. Everyone had to eat the strange concoctions he was putting together and calling milk, meat,

and vegetables, depending on their color. Soybean milk was his triumph. I had to drink it while he asked me eagerly, 'Can you tell the difference? Isn't that a fine glass of milk?'

"I loved milk, but his soybean milk almost cured me. It tasted like chalk. I was perfectly satisfied with the job a cow did, and his version was simply terrible. For a time, Ford was eating so much ersatz foods he was concocting that Mrs. Ford worried about his health.

"Ford would eat soybean pie and drink the soybean milk that made even milk of magnesia taste good. Ford was working on a soybean body for an automobile. They used to say that if it didn't run, Ford could eat it.

Ford had a "car body built from the soil" with wheat straw, flax, and hemp [*Cannabis*] that proved to be so strong it was promoted in photo sessions by whacking it with an ax.

"Ford's ultimate triumph along the soybean line was the soybean dinner he himself dreamed up and had served at the time of the Ford exhibit at the Chicago Century of Progress Fair in August 1934." A list of the 16 items served is given; soy ice cream is not mentioned.

"I was about eleven [i.e. in about 1934] when Ford was at the peak of his excitement about soybeans. You had only to talk to him for five minutes and soybeans would enter the conversation. He kept bottles of soybean milk in our refrigerator in case he got thirsty and in case I weakened a little to drink a little too. I only drank it, however, under the greatest duress.

"I still have the recipe he gave to mother for making soybean milk. The formula was developed by his chemical engineers... Soak one-half pound soybeans overnight and grind to a fine powder. Add two quarts of water and heat in a double boiler for one-half hour. Strain liquid through a fine cloth and season with a dash of salt. Add one or two tablespoons of syrup to sweeten. A dash of banana oil can also be added to make it resemble cow's milk more closely. Ford was always shifting the formula around a trifle to see which sweetening syrup was best—maple or sorghum or honey—and whether a little more or less salt would improve the taste.

"Ford was evangelical about soybeans. He talked of how cooked soybeans tasted much better than lima beans did, and how soybean spread was much better for children than peanut butter. He advised me to try it in a soybean and jelly sandwich.

"Ford urged Mother to tell our cook to use a lot of soybeans in cooking and to overcome the strong flavor of the beans by adding plenty of onions. In his own household the cooks were ordered to sneak a few soybeans into every food on the table—into soup, salad, the peas or other vegetable of the day.

"Ford would now and then flash a letter around from some doctor or other who was grateful for Ford's experiments with soybean milk because babies who were allergic to cow's milk were able to use inexpensive, life-saving soybean milk.

And also those adults who were allergic to milk were able to enjoy puddings and things that they had never been able to enjoy before.

"Incidentally, Ford's son was named after the man who was in charge of food research at Ford, Doctor Edsel Ruddiman. Ruddiman worked in the engineering lab and was one of Ford's favorite people. Ford, of course, worked closely with Dr. Ruddiman in maximizing the uses of soybeans." Ford also fancied soybean cottage cheese.

"If I recall correctly, Ford at one time had twenty thousand acres of soybeans under cultivation under Dad's direction, and it was said he was spending over a million dollars a year experimenting with the plant in various ways—as food, as plastic, as animal food, as a high-protein, low-calorie diet food, and as a source of industrial oils. Ford would brag about how there was nothing in the soybean plant that was wasted; even the stalk could be made into fiber.

"As Ford saw the world of the future—and I'm sorry it didn't come to pass—every farmer would become wealthy by running his own little factory, or 'cottage industry,' as Ford called it. He would produce soybeans in his field and make at least one soybean product for sale to factories or grocery stores.

"As Ford foresaw the world, farmers wouldn't need barns. 'With no animals, there need be no buildings on a farm except the granaries,' he said. Except, of course, the little farm factories..." (p. 176).

Henry Ford grew marijuana [hemp] for experimental reasons. It was "enclosed by a large cyclone fence. The Ford people thought it had all been destroyed after Ford died, but some years ago they found it growing wild again" (p. 177).

"His campaign against the quadruped never quite ceased. He was forever sounding off against four-footed animals, especially those that provided meat. As early as 1919 or '20 he had said that the world would be better off without meat... And he further insulted the cow by calling it 'the crudest machine in the world'" (p. 177).

Ford was as trim and lean as a split rail fence. He did not smoke or drink alcohol. He was a "health nut" and for a time he preached that sugar was dangerous (p. 78). At the top of things he disliked most were Franklin Roosevelt, "monied" Jews and Judaism, Catholics and Catholicism (p. 216).

685. Sorensen, Lorin. 1978. *The Ford Road: 75th anniversary—Ford Motor Company, 1903-1978*. St. Helena, California: Silverado Publishing Co. 191 p. 22 x 28 cm.

• **Summary:** A good history of the first 75 years of the Ford Motor Co, from its founding on 16 June 1903 by Henry Ford and others. About equal space is given to photos (many old, some in color) and text. The last two pages contain a chronology. Pages 88-89 show the Ford Rotunda at the 1934 Century of Progress in Chicago. A photo shows a 1934 Ford sedan mounted on a huge ball on which the term "soy bean" (one of the raw materials) is prominently displayed. Henry

Ford died on 7 April 1947 at age 83, at his home in Dearborn.

A few highlights from the chronology: 1863 July 30—Henry Ford born at Springwells Township Farm, Wayne County, Michigan. 1888 April 11—Henry Ford married Clara J. Bryant and worked in Detroit for the Edison Illuminating Company, becoming chief engineer. 1889-90—Began experiments on internal combustion engine. 1893 Nov. 6—Son, Edsel B. Ford, born. Note: This year Henry Ford builds his first engine. 1896 June 4—Completed first car (a "horseless carriage" for himself—see photo, p. 21), the "Quadricycle," at 58 Bagley Ave., Detroit. He quit his job at Edison to build racing cars.

1903 June 16—Ford Motor Company filed Articles of Incorporation. 1903 July 23—First commercial car, two-cylinder Model A, sold. Henry Ford is one week less than 40 years old. 1904 Jan. 12—Henry Ford set the world's speed record by driving his car ("999") 91.370 miles per hour on frozen Lake St. Clair. 1906 Oct. 22—Henry Ford succeeds John S. Gray as President of Company; acquired 58½ per cent of stock. 1908 Oct. 1—Model T introduced; first production model with left side steering.

1913 April 1—Moving assembly line introduced. Mass production comes fully on stream at Highland Park plant. 1914 Jan. 5—\$5 daily wage for 8 hours work announced; replaced scale of \$2.34 for 9 hour day, thus more than doubling a worker's factory wage. 1915 Dec. 10—1,000,000th Ford car built. 1916 Oct. 25—Henry Ford Trade School opened. 1917—Fordson Farm Tractor introduced. 1919 Jan. 1—Edsel B. Ford succeeded Henry Ford as President. 1919 Sept. 17—Henry Ford, Clara, and Edsel B. Ford become sole owners of Company.

1922 Feb. 4—Lincoln Motor Co. purchased by Ford for \$8,000,000. 1923—Ford Motor Co. sets production and sales records not broken until 1955. 1924 June 24—10,000,000th Ford built. 1925 Nov. 25—First Ford Plane (airplane) completed. 1927 Dec. 2—New Model A 4-cylinder introduced. 1929 Oct. 21—50th anniversary of Edison's incandescent light. Henry Ford Museum dedicated.

1931 April 14—20,000,000th Ford built. 1932 March 9—Ford introduced the first low-cost V-8 engine. 1933 June 12—Henry Ford Museum & Greenfield Village opened to the public. 1934 May 26—Ford Exhibit (Rotunda) opened at Chicago World's Fair. 1936 May—Ford Foundation established by Edsel Ford [Note: It is the giant of foundation philanthropy].

1942 Feb. 10—World War II halted civilian car production. 1943 May 26—Edsel Ford, president of Ford Motor Co., died. 1943 June 1—Henry Ford is re-elected President of the company. 1945 Sept. 21—Henry Ford II, Henry Ford's grandson, is named president of the company. 1947 April 7—Henry Ford, at the age of 83, died at his home in Dearborn.

1953 May 7—Celebration of the company's 50th anniversary. Ford Archives dedicated at Fair Lane, Dearborn, residence of the late Henry Ford. 1956 Jan. 17—Public sale of

Company common stock began.

686. Sheridan, Margaret. 1979. Mighty bean zaps food bills, packs in protein. *Detroit News*. Feb. 28. p. E-1, E-9.

• **Summary:** A weak history of the soybean followed by recipes from the book *Barbara Farr's Super Soy* (Keats Publishing). The article begins: "Fed up with the soaring cost of meat? Dine like the cows. Eat soybeans. These homely beige beans have been nourishing livestock, peasants and dynasties for 5,000 years."

A great half-page illustration (cartoon), by John R. Clarey, shows Super Versatile Soy, a character like Superman with a bean-like body, a cape, and two thunderbolts in one hand. Address: News staff writer.

687. Davis, Melissa. 1979. The soy of cooking: Out of the field, into the kitchen. *Washington Post*. March 15. p. E1, E14, E20.

• **Summary:** Starts by discussing Henry Ford's interest in and work with soybeans. He wanted to find a way to "grow automobiles out of the soil. In 1940 he discovered that soybeans were his bumper crop."

Last week a milestone in soybean history was made on Capitol Hill [Washington, DC]. "About 500 people including senators, representatives, ambassadors, diplomats and freeloaders turned up at the International Soybean Fair.

While Chai Zemin (of the People's Republic of China) and Bob Bergland (U.S. Secretary of Agriculture) stood shaking hands, people pushed and shoved to get to the bar and to hors d'oeuvres made from every soybean product imaginable—soy flour, bean curd, textured vegetable protein (TVP), soy milk, soy sauce, etc. Also mentions tempeh and miso.

The event was largely sponsored by the Food Protein Council and its member companies. "There were a few interesting hors d'oeuvres including soy nuts and garlic smothered bean curd." Contains recipes.

688. *Ann Arbor Observer (Michigan)*. 1979. One of the few U.S. tofu manufacturers is right here in Ann Arbor: At the Soy Plant on Ann Street a collectively-run business combines political and nutritional interests to produce over 2000 pounds of soybean curd weekly. March. p. 29. [1 ref]

• **Summary:** This February morning Steve Fierling [sic, Fiering] arrives at The Soy Plant at 5 a.m. to start the day's work in the back room of the former pizza carryout at 211 East Ann St. in Ann Arbor. He turns on the lights and the boiler, then starts cooking soy milk for the first batch of tofu. Fiering is part of a nine-member collective; this week he's the cooker. The first batch of tofu should be ready by 7 a.m. Making tofu is a demanding discipline. Fiering, Sue Kalen, Chris Coon, and Al Dynak were the original founders of The Soy Plant one and a half years ago. Steve originally came from Camden, New Jersey, to the University of Michigan,

where he majored in geology and, as he puts it, "minored in extracurricular political activism." Politics led to a job as coordinator of the People's Food Co-op, and that led to helping to start The Soy Plant. The Soy Plant is one of the few places in America where people can buy fresh tofu daily. A low-cost vegetable source of protein, retails for \$0.70/lb in the consumer's tub or \$0.85 in a plastic tub.

Henry Ford was deeply interested in soybeans. He believed that "mechanized soybean production would help free the farmer from the drudgery of dealing with animals by eliminating the need for most meat... In fact his large demonstration soybean farm was near Macon, south of Saline, in Lenawee County." Tofu can become an economical vegetarian alternative to ground beef.

The company began as the Tofu Collective, a Sundays only operation at Wildflour Community Bakery around the corner on North Fourth Avenue. A few months later, in the summer of 1977, the name was changed to The Soy Plant, and the collective moved into the basement of Eden Foods, where it attempted to produce tofu to sell wholesale. Fiering recalls that the early days were *really* hard. They used to work 14-16 hours a day. But the hard work paid off. By last spring The Soy Plant had the track record and credibility to be able to raise \$10,000 in loans to purchase more efficient equipment and move into larger quarters at its present location on Ann Street near Fourth.

For each \$100 loan, supporters were compensated with an unusual but sensible kind of interest: a pound of tofu each week, which yields a 35% annual return. Backers included both typical co-op supporters and quite a few native Asians eager to find a local source of fresh tofu.

Members of the collective now earn \$3.25 an hour—a big increase over the \$50 a week that they were paid in the beginning. But that cheap labor was the capital that got the business started. Current members of the collective are Fiering, Sue Kalen, Dan Ecclestone, Anne Elder, Kurt Getman, George Hanley, Mike Mazzie, Jerry McKenna [sic, MacKinnon], and Ann Wilson.

The Soy Plant makes its tofu in 50-pound batches. Of the more than 2,000 lb of tofu it makes each week, about 350 lb are sold at The Soy Plant retail store, where soy milk, soy byproducts, and prepared soy foods like sandwich spreads, missing egg salad, soysage, and pies are also sold. Another 1,700 lb/week of tofu goes to local restaurants, retail stores (incl. Meijer's Thrifty Acres, Asian-, and natural food stores), and to Midwest Natural Foods, which distributes the tofu to as far away as Pennsylvania and West Virginia.

Soy Plant workers have strong political motivations. They believe that soy products can help to solve world food problems. Fiering, a decentralist, talks about his personal beliefs. An excellent introduction to tofu is the 15-cent pamphlet titled "What is tofu?" available at The Soy Plant. It contains ten popular recipes plus basic information. "For the truly committed, there's the encyclopaedic *Book of Tofu*:

Food for Mankind by William Shurtleff and Akiko Aoyagi.” Shurtleff “has been the tofu guru for America in the 1970s, and this book has inspired and instructed most of the country’s approximately fifty tofu shops operated by non-Asians.”

A sidebar titled “Take-out tofu treats” mentions the following made and sold at The Soy Plant: Tofu-tahini spread. Tempeh—which resembles Brie cheese in texture and flavor. Tofu tarts in several flavors: pecan cream, pumpkin cream, yam, mocha, and lemon.

Photos by Peter Yates show: (1) Anne Elder adding soy puree to boiling water in the cooking kettle to make a foamy brew that is eventually curded to become tofu. (2) Steve Fiering filling one-pound tofu retail packages (in a bathtub) with water from a hose before shipping. Address: Ann Arbor, Michigan.

689. Smith, Robert A. 1979. Delsoy Products (1943-1963) (Document part, I) (Interview). In: 1979. *The Ford Experimental Laboratory and the “Square House.”* Conducted by Donald V. Baut of Dearborn Historical Museum, May 31. 72 p. transcript. See p. 44-72.

• **Summary:** By the 1940s, many U.S. states had a fill [filled] milk law, which prevents the blending of vegetable fats (which cost about half as much as butterfat) with dairy products to make any product which simulates a milk product—such as ice cream or whipped cream. During World War II, a restriction stated that cream could not contain more than 18% butter fat, in order to conserve butter fat which was in short supply. To circumvent this law, two partners in Chicago, Illinois, Eric Russell Swanson (the production man, who owned the Swanson Dairy in Chicago) and Herbert Marshall Taylor (the promoter and salesman) formed the Russell Taylor Company and developed a whipping cream product made by adding 17% vegetable fat to cream containing 17% butterfat. It was a very successful product in the Chicago area and was eventually bought out by the Bowman Dairy Co. So they decided to come to Michigan, which didn’t have a filled milk law, and develop a similar product—which they named Devonshire Topping. It, too, was very successful, so the Michigan dairies had the state legislature pass a law to prohibit it.

Taylor had read about Henry Ford’s soybean milk through the publicity it was getting. He visited Bob Smith at the Carver Laboratory and asked if Smith could make whipping cream from soybeans. Smith had never tried this before but in a few days work at the Laboratory (using a soymilk process first developed at Moir House Lab) he had samples that Taylor was very pleased with. Taylor said he wanted to start producing the product commercially in Michigan using the Ford soybean base. Henry Ford said that he did not want to get into the business of producing soybean milk for sale, but he gave Smith permission to give Taylor small amounts to experiment with and to work with Taylor to design a plant

to produce the soy base product in Dearborn. Ford wisely warned Smith to be very careful with Taylor (who looked like a promoter) and not to get involved in any stock deals.

Starting in the spring of 1943, Smith worked in his spare time, designed all the equipment (based on the design of the equipment in the Carver Laboratory but on a larger scale), and built a plant in the old Livonia Dairy at 2001 S. Telegraph Road (at Harvard) in Dearborn. Several other people also worked on the job. The plant’s initial capacity was about 1,000 gallons per day (one shift). The equipment in Ford’s Carver Lab was designed to produce 150 gallons of soymilk per day in a small non-stop stream. The funds needed to equip and establish the plant in Dearborn came from profits made by selling Devonshire Topping in Detroit. “In the latter part of 1943 we began production [of soy-based whip topping] in the [Livonia] dairy. We had lots of problems getting the equipment because of the war and the scarcity of materials. Eventually we got the thing going. We started experimentally, selling across state lines to test the law. We advised the Agricultural Department what we were doing. We shipped to Toledo and we sold in Detroit. The product sold very well. Of course, there was no whipping cream. We just couldn’t make enough of the product to supply the demand.”

To make Delsoy they started by making soymilk from low-fat soybean meal, then added vegetable oil and liquid sugar (a blend of a small amount of corn sugar and a larger amount of sucrose from either sugar cane or sugar beets) to make about 3,000 gallons a day of the base for the topping. The protein produces the foam that makes the whipping possible. The fat produces the stabilizing that keeps it whipped. The sugar is added to give a sweet flavor.

The name Delsoy was Herbert Marshall Taylor’s idea. The filled milk product that his company had been selling previously in Detroit was named Devonshire Topping. But that name was contested by the people at Devonshire-Melba Co. and they prevailed. Taylor was going to have to change the name of his product, and at the same time he was changing it from a dairy-based product to a soy product—so he thought of “delicious soy” or “Delsoy.” In addition, the first letter was the same as the D in Devonshire, which would help in advertising the new product to former customers. The Russell Taylor Co. manufactured Delsoy for the first year or so, until the company name was changed to Delsoy Products. The company name was composed of Eric Russell Swanson’s middle name and Herbert Marshall Taylor’s last name.

Herbert Marshall Taylor “was the only son of a superintendent of the Canadian Pacific Railway. He had been raised in kind of a royal fashion. He rode around in private railroad cars and lived pretty well. He was very expert at spending money at a high rate of speed, which was one of our big problems after the company was formed. He spent money like it was going out of style and we always had trouble.”

“Harvey Whitehouse was a dairyman in Detroit and he was hired to operate the Russell Taylor plant. It was in the

Grand Trunk Terminal warehouse in Detroit [Russell-Taylor Inc., 1951 East Ferry Ave. at 3rd Ave, Detroit 11]. He didn't join us until after our plant was completed in Dearborn. When our Dearborn plant was completed, they shut down the warehouse plant in Detroit and he came out and operated the Dearborn plant. At that time I was working at Fords [the Ford Motor Co.] and I was just spending part of my time at the Delsoy product... it was somewhere in the fall of 1943 I believe... Harvey Whitehouse was hired because he was qualified to operate both refrigeration and steam equipment... He was hired from the Rosebud Dairy in Detroit to operate the equipment at the Russell Taylor warehouse on Third Avenue in Detroit. Russell Taylor had... rented an existing plant there, used it on a part-time basis, and paid for the use of the equipment on a per-gallon basis.

"Now when we started Delsoy Products, we had our refrigeration and we had hired our own people to deliver it... We never sold Delsoy out of that warehouse [on Ferry Ave. in Detroit]. All the Delsoy we sold out in the Dearborn plant. That was the Devonshire Topping that we sold out of the Ferry Avenue warehouse."

H.M. Taylor closed down Devonshire Topping because "he got in trouble with the War Food Board for using too much milk solids in his product. He used about four times his allocated amount of milk solids and was sued by the government and was found guilty. He and Swanson and the rest of the company were fined. They had to stop the operation on account of that." That was when they shut the warehouse in Detroit. At about the same time the filled milk law went into effect and they couldn't produce it any more. Delsoy had been in production for about a year before the lawsuit was settled with the government. Taylor got the larger of the two fines because he was the instigator and leader of the idea. "We were definitely anxious to get Taylor out of the company because he was definitely running us into the ground with his wild spending." Bob Smith put up the money for Taylor to keep him out of jail and in exchange took over Taylor's stock in the company—which gave Smith control of two-thirds of the company. But he decided it would be best to split the ownership among himself, Swanson, and Whitehouse. Address: Smith: 26351 Hollywood Ave., Roseville, Michigan 48066; Baut: Dearborn Historical Museum, 915 Brady St., Dearborn, Michigan 48124. Phone: Smith: 313-777-5394. Baut: 313-565-3000.

690. Smith, Robert A. 1979. Henry Ford, George Washington Carver, and the Carver Laboratory. The plastic car and Edsel Ruddiman (Document part) (Interview). In: 1979. The Ford Experimental Laboratory and the "Square House." Conducted by Donald V. Baut of Dearborn Historical Museum, May 31. 72 p. transcript. See p. 15-43.

• **Summary:** The Carver Laboratory developed because Mr. Carver had told Mr. Ford that he knew how to get rubber from domestic plants. World War II was on and Ford's main

rubber supply had been cut off by the Japanese. "Mr. Ford was interested in finding out what Carver's plants were and what the process was. He decided to entertain Carver and get him to reveal the source of his rubber." He came to Smith one day and said he would like Smith to convert the waterworks (the plant that had once been the waterworks for the city of Dearborn) into a laboratory and to have it done in one week. "George Washington Carver was coming to Dearborn for a visit and this laboratory was going to be named in his honor. We were supposed to find out through this how to make rubber out of domestic plants." With all top Ford executives, Charles Lindbergh, the newsreel, newspaper, and wire service people plus photographers in attendance, "we had the big opening and dedicated the laboratory for work on soybeans." In July 1942, with Mr. Smith in charge, they spent the next 2 weeks with Carver and never did find out how to make rubber from domestic plants. They were convinced he did not know how, but said he did just for publicity.

After the big dedication, Smith moved all his equipment from Moir House to the Carver Lab, where he had a lot more room and equipment. But Bob, with his wife and two daughters, continued to live at the Square House in Dearborn until 1952, when he moved the house to Garden City. Eventually there were 25 employees at the Carver Lab, including 3 chemists. "One of the reasons for moving to the Carver Lab was to have more room to build a [soy] milk plant. He [Mr. Ford] wanted us to build a plant that would produce 150 gallons of milk a day." Prior to that time they had produced 1-2 quarts a day, all by hand work in the lab. After about 2 months they had the soymilk plant in operation. For the next few years they produced soymilk to supply the Henry Ford Hospital in Detroit and the Ford cafeterias. "The milk wasn't as good as cow's milk as far as flavor was concerned but it made good ice cream and we made a lot of ice cream from it." When asked if they used the word "ice cream," Smith answered: "Well, it turned out there is a law against making anything that looks like ice cream if it's not made out of milk. The patent attorney said that we could probably fight it but it would be bad publicity for the company so we eventually discontinued it."

At the Carver Lab extensive research was also conducted on chlorophyll, since it is a very unique substance: (1) its chemical structure is almost identical to that of hemoglobin in the blood; and (2) it is responsible for transforming solar energy into the various nutrients that can be used by humans and animals. Mr. Ford found these facts fascinating. The Carver Lab became one of Henry Ford's favorite projects. Bob Smith worked at the Carver Lab from about July 1942 until August 1945; the main job at that time was production of soybean milk. Starting in about Sept. 1942 they made 150 gallons a day by a continuous process that worked around the clock. There were three shifts. The soymilk was made from purified [isolated] soy protein, hydrogenated soy oil, and corn sugar. Then they got involved in making ice cream for

the cafeterias, the Ford Veterans and Ford Hospital. They also began testing the value of soybean milk in rats. "We found we could raise six generations of rats with nothing but soybean milk, which was, the doctors thought, pretty unusual. There are very few foods that you can eat exclusively and survive on for very long." In Aug. 1945 he left to work full time with the Russell Taylor Company making Delsoy [a soy-based non-dairy whip topping]. Clem Glotzhober took over the Lab after Smith left. Mr. Ford got sick in January 1945 when he was in Georgia and he never recovered.

Development of the plastic car was started at the chemical plant, where a solvent extractor produced soybean oil and meal. The defatted meal, when reacted with phenol formaldehyde, produced a good plastic, and many small molded plastic parts went into Ford cars. The story of the development of the plastic car is told. Hud McCarroll was supposed to be the engineer on the project. Lowell Overly designed the first plastic car. "That car was probably 40 or 50 years ahead of its time, like a lot of things Ford did." The first step was to build a plastic rear deck for Mercury. It was pulled off the molds in about 1938 and cost \$3,500,000. Ford liked to slam this rear door with an axe that he carried in the trunk of his car. After the plastic car was demonstrated in 1941, it ended up in the basement of the Engineering Lab, covered with a piece of white cloth.

Smith (p. 25) then tells the story of how Mrs. Edsel Ruddiman wanted her husband, who was almost 80 years old, to retire. "So she spoke to Mr. Ford about getting him to retire. Instead of Ford saying, 'Edsel, I think you've worked long enough. You'd better retire,' or something like that, he just took his work away from him. He went into his laboratory one day and he said, 'I want everything cleaned out of here in the next couple of hours.' So dump trucks backed up to the door and threw everything out. Then they let Ruddiman sit there for a couple of months with nothing to do—in about 1941... He was very bitter about the way the boss was treating him." At times he cried. After a short time he quit. The Twin Lakes lab was also closed in 1941. Address: Smith: 26351 Hollywood Ave., Roseville, Michigan 48066; Baut: Dearborn Historical Museum, 915 Brady St., Dearborn, Michigan 48124. Phone: Smith: 313-777-5394. Baut: 313-565-3000.

691. Smith, Robert A. 1979. Delsoy Products (1943-1963) (Document part, II) (Interview). In: 1979. The Ford Experimental Laboratory and the "Square House." Conducted by Donald V. Baut of Dearborn Historical Museum, May 31. 72 p. transcript. See p. 44-72.

• **Summary:** Bob Smith left the Ford Motor Co. in Aug. 1945 to work full time with Delsoy Products. Taylor and Smith each owned 1/3 of the stock, Swanson owned 1/6, and various other people owned the remaining 1/6. Swanson and Taylor put in the money and Smith contributed the know-how. Delsoy Topping sold very well because no dairy whipping

cream was available. They shipped to Toledo, Ohio, and sold in Detroit, Michigan.

Taylor and Swanson were fined by the federal War Food Board for using too much milk solids in their original dairy-based whipping cream. Smith offered to pay off Taylor's \$6,000 fine to get Taylor out of the company. Taylor was a lavish spender and the source of much conflict. At one point he tried to grab a majority of the stock for himself. Taylor's interest in the company was to develop a product and then sell the stock to make money on the stock rather than on the sale of the product. Smith, Swanson, and Whitehouse ending up owning Delsoy Products.

Originally Delsoy Topping was sold in paper containers purchased from the Sutherland Paper Co. in Kalamazoo, Michigan. Delsoy bought the containers by the carload, 300,000 at a time. When Sutherland went out of business, Delsoy switched to buying containers from the Crown Cork and Seal Co. in Philadelphia. During World War II Crown Cork and Seal had developed a pressurized metal can to use for insecticide sprays by the military. Delsoy was the first to realize that the can's unique valve (produced by the Super Whip Co. in Chicago and used with nitrous oxide gas) made it suitable for whipping cream. So the company modified its formula for Delsoy Topping, put it in this pressurized can, and in 1946 or 1947 named it Presto Whip. They were the first company to ever put a topping in a pressure can and sell it. It immediately became a huge success, was widely advertised, and was soon sold by every chain store in the area. Soon Delsoy Products was working 3 shifts, making 25,000 cans a day—sold mostly in the Detroit area. Soon they were selling the products over a range of 350 miles in lower Michigan, Ohio, and parts of Indiana, Pennsylvania, and New York. By 1963 they had 23 distributors. One of their first big customers was Awrey Bakery, a prestige account, that bought 300 gallons/day, 5 days a week. They mixed equal parts of Delsoy and dairy whipped cream to get a superior product for use in cream puffs. Initially they refrigerated all products. Later they would freeze everything immediately and keep it frozen until it was distributed to the stores.

The process for making Delsoy Topping was a very technical and difficult one—even for people with much experience in making it. There was a patent application made under the name of Henry Ford and R.A. Smith but it was probably never completed or issued. Initially the soybeans were grown by Ford but after Delsoy Products began, "low temperature soybean meal" with high protein solubility and most of the fat removed was purchased from Central Soya. Being a vegetable product, it was subject to less bacterial deterioration than cream products. To further extend the shelf life, Smith adapted a machine that was developed for the sterilization of orange juice then used it to heat the product to 300 degrees for 1.5 seconds, followed by rapid cooling to produce a sterile product. Delsoy competed very favorably with similar dairy products. It was less expensive and each

can contained 40% more product (10 oz vs. 6-7 oz), and it had superior whipping qualities with much higher whipped volume. Initially the can and valve cost about \$0.11 and the product (Presto Whip) cost \$0.06. It retailed for \$0.29. At one point a chocolate flavor was introduced, but it was soon discontinued. They sold Delsoy Topping to institutions, in quarts to smaller bakeries, 5 gallon cans to larger bakeries, and 10-gallon cans to Awreys.

Zazu Pitts, a famous actress, "health addict," and close friend of Gloria Swanson got interested in the product, visited the Carver Lab to try the soybean milk, and for a while considered buying a franchise.

After Presto Whip was launched, Delsoy Products began a new company named Delsoy Distributors. The first big product they distributed was Hawaiian Punch. Later they started the Smith, Swanson, Whitehouse Brokerage Co. and distributed Good Luck Margarine, Red Star Yeast, Hawaiian Punch, etc.

In 1963 Bob Smith left the company; Harvey Whitehouse and his son David bought Bob's stock. Today Delsoy Products is named Whitehouse Products. Note: Bob Smith was born on 1 April 1913, so he was age 66 at the time of this interview.

Update: Talk with Richard B. Folsom of Canton, Michigan. 1992. Jan. 31. According to Don Baut, a curator at the Dearborn Historical Museum, Whitehouse Products was purchased in 1983 by C.J. Christoff & Sons of Lowell, Michigan.

Talk with Bob Ely at Chadalee Farms Inc. 1992. Feb. 4. The company is now called Chadalee Farms, Inc. and Christoff Gourmet Foods is one division. The only non-dairy product they still make that they acquired from Whitehouse Products is Chadalee Farms imitation sour cream. They also private label it under other brands, such as Nuggett, Pocahontas, etc. Within the past few months they have discontinued the whipped toppings and the aerosol toppings. When they bought the products from Whitehouse they changed the brand name from Whitehouse to Chadalee Farms. Whitehouse and Chadalee also packed the products under many national brands. For more details, he suggests contacting Dave Whitehouse in Dearborn, Michigan, at 313-562-0242. Dave now works for Chadalee as a salesman. Address: Smith: 26351 Hollywood Ave., Roseville, Michigan 48066; Baut: Dearborn Historical Museum, 915 Brady St., Dearborn, Michigan 48124. Phone: Smith: 313-777-5394. Baut: 313-565-3000.

692. Sullivan, Don; Smith, Robert A. 1979. The Ford Experimental Laboratory and the "Square House" (Interview). Conducted by Donald V. Baut of Dearborn Historical Museum, May 31. 72 p. transcript. See p. 1-15, 24-25. Acc. No. 79-48 & 79-48.1 in the Dearborn Historical Museum, and Acc. No. 1583 in the Henry Ford Museum. 28 cm.

• **Summary:** A very valuable document. The information

about Ford's work with soybeans is supplied by Bob Smith. Smith joined the Ford Motor Co. on 13 Dec. 1926 when he started at the Ford Trade school at age 13. He took a 4-year course there and graduated in 1930 with the last class from Highland Park. After summer vacation in 1930 he began part-time work at the Rouge Plant and worked part-time in school. As a result of that he began to do experimental work at Greenfield Village, working in the experimental greenhouse, in connection with the chemical plant, which was established by Mr. Ford to find industrial uses for farm crops. "At that time we were in the depth of a very serious depression and Mr. Ford was very interested in finding employment for farm people... The farmer was one of the Ford Motor Company's best customers and Ford was interested in finding uses for the products they produced."

"Finally after a year or so, the way I heard it, Mr. Ford came into the laboratory one night all by himself and found a book we had there on the soybean; he apparently decided that was the thing to work on. The next day he came into the greenhouse and told me to clean everything out. He said, 'I'll be back in a few hours and I want everything out of here,' which was kind of a hard thing for us to do. We had been working on these tests for months and it seemed almost sacrilegious to destroy them at that point. But he was the boss so that is what we did... He said, 'From now on I don't want you to talk or think about working on anything but soybeans. That's the thing of the future.' I guess he was right because he made it a very important part of our agriculture and industry. I think now its the second or third largest crop in the country. At that time soybeans were almost unknown."

Initially the soybeans came from Ford Farms. "I think there were at least ten thousand acres of land within the city limits of Dearborn that was the Ford farms. Later they also got soybeans from other farms. The first soybean plant was in Greenfield Village; it processed 6 tons of soybeans a day. Then they built a 24 ton-day-day plant at the Rouge, and 12 ton-a-day plants at Milan and Saline." The group was interested primarily in developing uses for soybean oil because the first product they developed (about 1 year was after starting research) was a very good paint based on soybean oil; it is still used on Ford cars and other companies are now using it too besides Ford. This paint had an advantage over lacquer, since when the latter dries it leaves little pits, which fill up with moisture and dirt and eventually cause the deterioration of the paint finish. "But with the soybean paint it dries like oxidation and finishes hard like a plate and has a more durable surface."

Ford was also a pioneer in developing equipment for extraction the oil from soybeans using a solvent (gasoline). Bob Boyer was in charge of soybean research for Ford. "Mr. Ford was always very actively interested in the work that was going on at the chemical plant and was there almost every day. Quite often he would come into the greenhouse where we were running experiments and would chin himself."

Edsel Ruddiman had his own laboratory up on one of the Twin Lakes. It was a beautiful little lab in an ideal, tranquil setting. Dr. Ruddiman was Ford's seat mate at Scotch Settlement School and also his brother-in-law because Ruddiman married Ford's sister. The lab had been his home before it was converted; he had several assistants there. Their primary job was to develop a milk to replace cow's milk. They worked with wheat, soybeans, and carrots. "He spent quite a few years trying to produce milk from various products... but it never got to a product that was satisfactory (p. 25). He was also in charge of the canning plant over on Southfield Road.

One day Henry Ford invited Bob Smith to go for a ride together in Ford's private car. "He asked me what we could do to get rid of the cow. We discussed milk and meat including manure" and composting.

From 30 July 1937 until 1952 Bob Smith lived in the Square House at the invitation of Henry Ford, who had built it himself in 1888. After about a year Ford asked him to set up a laboratory in the Moir House, which is about 1,500 feet north of the Square House. "He told me he wanted me to start a laboratory to get rid of the cow. He said, 'We got rid of the horse. Now we're going to get rid of the cow. I'd like you to work on soybeans and milk back here.'" Smith worked at the Moir House lab from about 1938 until the Carver Lab was opened in 1942. The only electricity in the lab was produced by a windmill. "That was probably the reason we were so successful so quickly." Ruddiman and other Ford researchers used their 110 volt current and modern conveniences such as electrical grinders to grind the soybeans. Smith was forced to take a different approach. He tried to dissolve the protein out of soybean meal instead of grinding it. Within 3-4 months he had a milk that Ford liked quite a bit. It looked and tasted quite a bit like milk. "He was so pleased he came in one day and asked for a sample of milk and we [Bob and his co-workers] gave it to him. He sat there drinking his milk and asked for some bread. Of course we baked bread there every day... So he sat there drinking his soybean milk and eating his rye bread. I was watching and I thought, 'Boy, here's the world's richest man eating plain bread with no butter and drinking this soybean milk and he thinks it's really good.' He said it was the best milk he ever tasted. In fact he wrote in this little black notebook that he carried all the time, 'First good milk. No cow.'" After he had written it, he showed it to me." Later Mr. Ford asked Smith to try drum-drying and spray-drying the milk. Smith took the soymilk to a co-op spray drying plant in Adrian, Michigan, and had it spray dried. It turned out "pretty good." So at Ford's request Smith built a very small-scale (half-gallon) hand-powered spray drier at Moir House. It would dry about 1 ounce of soymilk a day.

At first Bob Smith worked at Moir House alone. Eventually he was joined by Clem Glotzhober, Don Jones and Ed Lang. Then Mr. Ford brought over Paul Foster, his Fair Lane cook. Whenever Ford travelled by train, Foster went

with him as cook. When Ford wasn't out of town, Foster was at the Moir House, and later at the Carver Lab. "We baked bread for Mr. Ford every day, soybean bread naturally. He gave us orders to have food there all the time in case he wanted to eat."

They also made so-called soybean sandwiches (also called "grass sandwiches") for him there in April and May. They were a mixture of soybeans and various edible weeds such as dandelion, curly dock, etc. that they collected. "We would make a blend of them and grind them up together and make sandwiches out of soybean bread; Mr. Ford would often pick them up... We made two different kinds of sandwiches, one for Mrs. Ford and one for Mr. Ford." Address: Baut: Curator of Research, Dearborn Historical Museum, 915 Brady St., Dearborn, Michigan 48124. Phone: 313-565-3000.

693. Curtis, Austin W., Jr. 1979. Memoirs of his life and work with Dr. George Washington Carver and Henry Ford (Interview). Conducted by Dave Glick and Doug Bakken of Ford Archives & Tannahill Library, July 23. 24 p. transcript. Acc. 1600 in the Ford Archives and Research Library, The Edison Institute.

• **Summary:** Dr. Curtis was born at Institute, West Virginia, on 28 July 1911. His father was Director of Agriculture at West Virginia State College, a negro college located at Institute, West Virginia. Both his parents were teachers. His father was very interested in soybeans, which he used as a legume to improve the condition of the soil in West Virginia. His father retired in about 1944.

After 2 years at West Virginia State College, A.W. Curtis, Jr. went to Cornell University, where he majored in plant physiology. Upon graduation in 1932 he went to A&T (Agricultural and Technical) College in Greensboro, North Carolina, where he became an instructor. His father had been the first graduate of that college. From there he received a fellowship (provided by the General Education Board, established by the Rockefeller family in New York) to be assistant to Dr. George Washington Carver at Tuskegee, Alabama. He arrived at Tuskegee in Sept. 1935 and began to work as Dr. Carver's laboratory assistant, conducting research on peanuts and sweet potatoes. Soon he gained Dr. Carver's trust and affection. The Carver Foundation was Curtis's idea; Dr. Carver, "a man free of any ego and of any self-aggrandizement, eventually accepted it. Curtis also started the Carver Museum on the 3rd floor of the Library at the Tuskegee Institute.

Dr. Carver and Henry Ford first met at the Chemurgic Conference at the Dearborn Inn in Dearborn in 1936. Curtis was with Dr. Carver then and at all of Carver's subsequent meetings with Henry Ford. They met again in 1939 when Dr. Carver came to Star Commonwealth. On 11 March 1938 Henry Ford made his first visit to Tuskegee. Then in March 1940 they met again in Ways, Georgia, for the dedication of the Carver School there. In March 1941 Ford,

travelling in his private railroad car, Fairlane, stopped at Tuskegee to visit Carver on his way home from Georgia; at that time the Carver Museum was dedicated. In July 1942 Dr. Carver visited Dearborn to dedicate the Carver Cabin (he was born in a log cabin in Diamond Grove, Missouri) in Greenfield village, and the Carver Laboratory, which was over on Michigan Avenue, the former Dearborn Waterworks Building.

Henry Ford and Dr. Carver were kindred spirits and they greatly enjoy each other's company. They would sit facing each other with their knees touching and talk about all kinds of things, including soybeans and peanuts. "Mr. Ford has this tremendous interest in the farm, and how the lives of farmers could be made more profitable.

In the summer of 1940 Curtis did research in Dearborn at the Carver Laboratory, working with Robert Boyer.

After Dr. Carver's death in Jan. 1943, Curtis succeeded his mentor as director of research at Tuskegee. But in 1944 he left Tuskegee and came to work briefly for the Ford Motor Co. in Dearborn. He left for two main reasons: (1) "I fell into disfavor with the president of the school because Dr. Carver had signed a contract with the Doubleday Company granting me a royalty on the book on his life. The president didn't feel that I was entitled to it, so he told me that if I didn't relinquish my rights to it, he's have to ask for my resignation. And my reply was that I wouldn't, that he would have to fire me... and he proceeded to do it"; (2) He tried unsuccessfully to interest Tuskegee in commercializing potentially promising ideas to provide income and jobs for black people.

In 1945 Curtis started his own company, A.W. Curtis Laboratories, in Detroit. This business is still in operation. One of their key products is a rubbing oil, based on peanut oil, for the relief of pain from arthritis and rheumatism. This is one of the products on which Curtis and Dr. Carver did a great deal of research together. The product is not patented but a photo of Dr. Carver appears on its trademark. Address: Detroit, Michigan.

694. Hartwig, Edgar E. 1979. Soybean varietal development 1928-1978. In: R.W. Judd, ed. 1979. 50 Years with Soybeans. Urbana, IL: National Soybean Crop Improvement Council. 86 p. See p. 2-7.

• **Summary:** "Interest in soybeans had become great enough by 1907 for the U.S. Department of Agriculture to hire a man to spend most of his time on soybean research. Along with his work with soybeans, W.J. Morse had responsibilities for cowpeas, mung beans, and several other annual legumes. In addition to his own plantings in the Washington [DC] area and on a farm near Monetta, South Carolina, W.J. Morse distributed seed of new introductions to anyone expressing an interest in soybeans. This program served to get many of our older varieties established. Among his closest contacts at the State Experiment Stations were C.B. Williams in North Carolina and W.L. Burlison at Illinois.

"All varieties grown in 1928 to be harvested for seed, were to a great extent the result of someone primarily involved in some other activity planting soybean seed that was sent to them by W.J. Morse... About 1928, the U.S. Department of Agriculture employed a second man to do research with soybeans. However, J.L. Cartter's role was primarily to evaluate the many soybean introductions from eastern Asia for their composition of oil and protein. At this time soybeans were a forage crop...

"A cooperative program for the Southern States was initiated in 1943 with research located at Stoneville, Mississippi and Raleigh, North Carolina... By 1954 U.S. soybean acreage harvested for beans had reached 17 million with an average yield of 20 bushels per acre. At that time there were six people employed by the U.S. Department of Agriculture as soybean breeders. It was another 10 years before any State Experiment Station had an employee giving full time to soybean breeding research.

"The Coker Pedigreed Seed Company of Hartsville, South Carolina has given some attention to soybean selection and breeding for about 50 years [i.e. since about 1929]. They have had a full-time breeding program with soybeans since the mid-fifties. For many years Coker's were the only commercial seed company actively engaged in soybean breeding." After establishment of the Plant Variety Protection Act in 1971, "many commercial companies became interested in soybean varietal development. The number of federal, state, and private plant breeders is now approximately 75. However the 29.5 bushels per acre average on over 63 million acres harvested in 1978 was made with varieties developed by the 12 to 15 breeders on the job in the mid-1960s."

Morse and Cartter, in 1939, described 108 varieties of soybeans. All were introductions from Asia, selections from introductions, or natural crosses that had occurred among introductions. Of the 108 varieties described, 37 were considered to be seed producing types. Only 14 of these were grown on any appreciable acreage. Dunfield, Illini, Macoupin, Manchu, Mandarin, Mandel, Mukden, Richland, and Scioto were the principal varieties grown in the North Central States for seed production. Arksoy, Haberlandt, Mammoth Yellow, Tokyo, and Woods Yellow were the major varieties planted for seed harvest in the South. Several of these varieties are in the parentage of varieties now in production.

"Since 1942 one hundred twenty-four soybean varieties have been registered by the Crop Science Society of America. Of these number five of the older varieties were selections from introductions. All other were selections from segregating populations resulting from planned crosses.

"Introductions from the northeastern providences of China were the source for varieties such as Dunfield, Illini, and Mukden which were some of the more widely grown varieties in the north central region. A major step in varietal improvement was made with the release of Lincoln in 1944. Lincoln resulted from a cross made by Woodworth at Illinois

and selected jointly by Williams and Woodworth. Lincoln had a 4-year average yield 17% greater than the mean for Dunfield and Illini, the varieties it replaced. Lincoln was also superior to these two varieties in resistance to lodging and in oil content of the seed. Another variety having a major impact on production was Hawkeye, released in 1948. Hawkeye was earlier in maturity than Lincoln. It remained a major variety for approximately 20 years.

"In addition to the impact Lincoln had on soybean production, it also played an important role as a parent. Leonard Williams crossed Lincoln with Richland and then backcrossed to Lincoln. Four major varieties came out of this material—Clark of maturity group IV, Chippewa of maturity group I, and Ford and Shelby of maturity group III. In 1965 these four varieties were estimated to be grown on approximately 30% of the U. S. acreage. Lincoln parentage is very evident in the highly productive and widely grown variety Williams.

"In the South, the first variety to have a major impact on production was Ogden, released from the Tennessee Agricultural Experiment Station about 1943... Lee released in 1954 had an even greater impact on production in the South... For several years Lee was grown on about 85% of the soybean acreage in the South." Address: ARS, SEA, USDA, Delta Branch Exp. Station, Stoneville, Mississippi 38776.

695. Smith, Keith J. 1979. American Soybean Association (1920-1979). In: R.W. Judd, ed. 1979. 50 Years with Soybeans. Urbana, IL: National Soybean Crop Improvement Council. 86 p. See p. 75-80.

• **Summary:** "In the 1940 annual meeting of the Association held at Dearborn, Michigan, two suggestions were approved by the board of directors: the Association employ an executive secretary, and a soybean periodical be published as an official organ of the Association. Shortly thereafter, George M. Strayer, a seedsman from Hudson, Iowa, was hired as the executive secretary, and the *Soybean Digest* became part of the American Soybean Association...

"The problems dealt with have gradually shifted from those connected with production to selling and marketing the crop, and to relations with government... One of the most effective Association activities has been government relations.

"In 1940, the Association adopted a resolution pledging 'support and active cooperation in seeking the repeal of all federal and state laws imposing unnecessary and unfair restrictions upon the sale of oleomargarine made of domestic fats and oils.' Federal and state restrictive legislation has been repealed and margarine is now as common as the 'other' spread.

"In the fall of 1949, it was announced there would be acreage controls on 1950-crop soybeans. A delegation of ASA directors conferred with the USDA officials and with Secretary of Agriculture Brannan, and convinced them that no acreage controls were needed in 1950 for soybeans. No

controls were imposed...

"In 1953, another service was added for Association members when publication began of a newsletter to bring the latest available information on soybean crops and markets. Today 20,000 ASA members receive the weekly *Soybean Update*, a market newsletter...

"After several years of organizational contact work by members and officials of ASA, a joint committee was appointed from ASA and NSPA, in August 1955, to work on proposed articles of incorporation and bylaws for a joint industrywide organization of the soybean industry. On June 5, 1956, the Soybean Council of America, Inc. was born... [It] was a nationwide nonprofit commodity group for the soybean industry. Its basic purpose was to further expand the markets for soybeans and soybean products and keep soybeans out of a surplus position through the efforts of the producers, handlers, processors and others...

"With increased emphasis of soybean imports, came a decision to phase out the Soybean Council of America offices and establish ASA offices in key locations. The establishment of ASA offices was aided by the passage of self-help grower investment checkoff programs in several states...

"The aggressive market development program has been one of the main factors responsible for the tremendous growth in the soybean export market.

"The American Soybean Association Research Foundation (ASARF) was formally incorporated in November 1965. Early Foundation objectives were in part to 'secure all available funds by any legal means in order to conduct and finance scientific research for the benefit of the soybean industry including production, processing, marketing and utilization throughout the world.'

"During the first five years, agribusiness contributions totaled \$31,600. Eight grants were provided to initiate research on basic soybean production problems.

"In August, 1971, at the annual convention in Hot Springs, Arkansas, the ASA board recommended an all-out effort be made to revitalize the Foundation to serve as a funding agency clearing house for soybean research.

"To assure some equity in funding, the ASA board of directors in 1972 approved a resolution urging each state with a grower investment program to support the ASARF at the level of one-half cent per acre of soybeans harvested. This guideline was later increased to one cent per acre in 1978. Several states are now funding the Foundation at this level.

"Since 1972 there has been rapid growth and expansion of Foundation activities. In FY80, we anticipate support from all 20 states with grower investment programs and several agribusiness firms. The Foundation's investment in soybean research will total approximately one-half million dollars.

"In 1978, a domestic soy oil market development program was established. The objective of this program is to increase the awareness and improve the image of soy oil among the food industry and consumers. This program is responsible for

the publication and promotion of the competitive aspects of soy oil.

"In [Dec.] 1978, ASA moved its world headquarters from Hudson, Iowa to St. Louis, Missouri."

ASA members receive the *Soybean Update* market newsletter 50 times a year. *Soybean Digest* is published nine times a year with a circulation of 110,000. "And, *Soya Digest Bluebook* serves as an annual international directory of the soybean industry."

ASA's current organization is then described in detail. "The 42 growers elected to the ASA board of directors set policies for the entire organization. Some 168 voting delegates meet annually to adopt resolutions that guide the Association."

"The ASA Market Development Foundation [ASAMDF] serves as the funding agency for market development and education programs." These programs are "reviewed by 28 growers who are elected from each of the 20 states that currently have grower investment checkoff programs. The Foundation contracts with ASA to carry out these activities."

"Nine soybean growers, appointed by the ASA board of directors, serve as directors of the ASA Research Foundation [ASARF]. Address: Director of Research, American Soybean Assoc., St. Louis, Missouri.

696. Upward, Geoffrey C. 1979. *Home for our heritage: The building and growth of Greenfield Village and Henry Ford Museum, 1929-1979*. Dearborn, Michigan: Henry Ford Museum Press. xi + 180 p. Illust. Index. 28 cm.

• **Summary:** This is the best book seen on the history of the Edison Institute, Greenfield Village, and the Henry Ford Museum. It contains many excellent photos of Henry Ford, his close friends and associates, the village and the museum. The conception and construction of this huge project brought Henry Ford a great deal of pleasure in his later years, and he gave it a great deal of his time and attention. Interestingly, the Chemical Laboratory (later called Soybean Laboratory, where Henry Ford's pioneering and very influential research on soybeans was conducted) is not mentioned.

Greenfield Village is a collection of more than 100 American buildings designed to show Americans "how our forefathers lived and to bring to mind what kind of people they were." Many of these buildings are historically important: Thomas Edison's complete Menlo Park Compound from New Jersey, the Abraham Lincoln Courthouse from Illinois, Luther Burbank's garden office from California, etc. The Village and all of its relics "have one thing in common: Ford's obsession with the common man, the material culture of the middling sort, not the arts of the elite."

In preparation for his pioneering project, Henry Ford had started collecting relics associated with Thomas Edison in 1905, and he began his collection of McGuffey Readers in 1914. In 1919 he restored his family home 200 feet east of its

original farm site. In 1934 the barn across Ford Road traveled to the Chicago World's Fair (to house a soybean exhibit), and then to Greenfield Village (p. 9). In 1923 Ford purchased and restored the Wayside Inn in South Sudbury, Massachusetts; it was made famous since the publication of Longfellow's *Tales* in 1863. Ford selected the Wayside Inn as a showcase and working model for the much bigger living-history museum at Dearborn. In March 1928, Henry Ford decided to restore Thomas Edison's Menlo Park, New Jersey, "invention factory" in Greenfield Village. That foretold a huge undertaking. At age 28, young Henry Ford had worked as an engineer for the Edison Illuminating Company of Detroit. At nights he had worked on his "horseless carriage" greatly encouraged by Thomas A. Edison; in 1896 this became his first car, the "Quadricycle" (see photo 121).

The Edison Institute was first dedicated by Thomas Edison, who came to Dearborn on 27 Sept. 1928. He started an engine and dedicated the cornerstone of the museum. After this, the village construction program jumped into full gear. Construction of the 14-acre museum began in April 1929; a replica of Independence Hall in Philadelphia was located at the center of the museum's front. The museum and village were officially dedicated as The Edison Institute (in honor of Thomas Alva Edison) on 21 Oct. 1929, the 50th anniversary of Edison's invention of the incandescent lamp. They were officially opened in June 1933. During 1934, the first full year of operation, 234,295 people visited the village. In 1960 attendance first passed the 1 million mark, at 1,006,664, and in 1976, the record year, 1,751,126 people attended. The 40 millionth visitor arrived in 1978. Address: Museum Editor, Dearborn, Michigan.

697. Boyer, Robert A. 1980. *Work with Henry Ford and soybeans. I (Interview)*. Conducted by William Shurtleff of Soyfoods Center, Oct. 18. 2 p. transcript.

• **Summary:** The Henry Ford Trade School was not the same as the Edison Institute of Technology. Boyer attended the Trade School.

In the mid- to late-1930s Henry Ford held several luncheons where the press and other famous or influential people were invited. He served a complete meal from soup to nuts. Out of these events came a 19-page booklet published in about 1936 by the Edison Institute and titled "Recipes for Soy Bean Foods." The purpose of these meals was to popularize soybeans and thereby to help farmers. But Ford was most interested in finding industrial uses for farm crops. He was deeply interested in the fact that soy had been used in the Orient for so long by millions of people as a key source of protein in the diet. But he had been interested in health before he got interested in soybeans. Still, he was very involved personally with soybeans as foods; he used them a lot in his own diet.

Ford grew his own soybeans on over 10,000 acres he bought in southern Michigan. The idea was not to help

farmers by buying their beans but to encourage farmers to grow soybeans then process them in small-scale solvent extractors on their own farms. Eventually this village industry concept proved to be uneconomical so it was abandoned.

In about 1932 Ford set up his first solvent extractor near the River Rouge plant. About a year later he set up a plant to make soy protein isolates from the meal produced by the solvent extractor. In about the mid-1930s Ford built a soymilk plant in Greenfield Village. It was just a demonstration plant that made several hundred gallons of soymilk a day. The plant was part of the larger research effort; none of the milk was sold commercially. With the arrival of World War II, the process was taken by Bob Smith, one of the fellows who developed it, and used as the basis for a private plant [Delsoy Products] in Dearborn where he sold a lot of soymilk for use in whipped toppings, baked goods and frostings. It was quite successful. A big bakery in Detroit used a lot of the topping. As a result of that, the Rich Products Co. in Buffalo, New York, started making the same type of product and became very big. One of Bob Smith's workers [Holton "Rex" Diamond] went to Rich Products and made a big success of it. Rich is very well known; they also make coffee creamers.

Henry Ford was not a vegetarian. He ate like most Americans at the time, and he ate many steaks—even though he knew meat was not the best thing for you. Mrs. Ford suffered from arthritis and he sought diets to help her.

World War II killed the idea of the plastic car. The company would have needed to spend lots on dies to make it commercial. Also each plastic body took too long to produce; it had to cure for 3 minutes in the die. Young Henry Ford II threw out everything [not directly related to automobiles] that his grandfather was interested in. General Motors was actually the first company to make a commercial car with a plastic body—the Corvette, whose body was made of fiberglass.

Edsel Ruddiman was the man who got Ford interested in the food side of soybeans. Ruddiman was quite old. He had his own lab (which he got in about 1930-31) and was a very good scientist. He and Boyer worked closely together since their labs were nearby.

Ford grew 10,000 acres of soybeans in southern Michigan. Ford set up his first solvent extraction plant in about 1932 and his soy protein isolate plant a year later. Ford was personally very involved with soyfoods. He used them a lot in his own diet. He built a soymilk plant in Greenfield Village in the mid-1930s as part of his research efforts. He made several hundred gallons a day. The milk was not sold commercially. After the start of World War II the process was taken over by Bob Smith, one of the fellows working on it. Smith built a private plant in Dearborn where he made the milk into frostings for use in baked goods. It was quite successful. A big bakery in Detroit used a lot of it. As a result of that, Rich Product Corp. in Buffalo, New York, got interested

and eventually became very successful. One of Bob Smith's workers, Rex Diamond, went to work for Rich. They also made non-dairy coffee creamers and milk.

Boyer was director of research for The Drackett Co. from 1943-1949.

Ralston Purina's edible soy isolate plant was in Louisville, Kentucky. It was hard at the beginning to get people to use isolates. Mead Johnson started using an isolate in their infant formula. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

698. Boyer, Robert A. 1980. Re: Additional information about his work with Henry Ford and soybeans. Letter to William Shurtleff at Soyfoods Center, Oct. 22. 1 p. Handwritten, with signature on letterhead.

• **Summary:** "Dear Mr. Shurtleff. Here is some further information which I trust will be useful to you.

"I will appreciate your returning it to me when you are finished with it.

"Sincerely, Robert A. Boyer." Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

699. Boyer, Robert A. 1980. Work with Henry Ford and soybeans. II (Interview). Conducted by William Shurtleff of Soyfoods Center, Oct. 30. 2 p. transcript.

• **Summary:** It seems very possible that soyfoods were being sold in the Ford stores in 1923—though Boyer has no firsthand knowledge of this. Dr. Edsel Ruddiman started his research on food uses of soybeans in the late 1920s, about 2 years before Boyer started his work with soybeans. Ford converted an old residence into a lab for Ruddiman, his boyhood pal.

Boyer attended the Henry Ford Trade School, located at the Rouge Plant, from 1927 to 1929. It was a work-study program and he spent one month in each of the major departments at the plant. Then he went to the Edison Institute of Technology Lab. It was both a school and a research lab. Boyer was part of the first class of students. The idea was to learn by doing. It was a "school for inventors." Over the door was a sign that read "Place for Damn Fool Experiments." Consultants were sometimes brought in to help with research projects and answer questions. "In 1930 we started building the soybean laboratory." Boyer knew John Harvey Kellogg, but he does not think Henry Ford knew him.

Boyer uses some meat analogs in his daily diet but he is disappointed in the quality so they are not a regular part of his diet. Manufacturers have to make compromises in equipment and to keep costs down. He can make a much better flavor and texture in the laboratory, but it takes time and hand work. One major problem is that all isolates are made from defatted soybean meal which already has a strong beany flavor. There is no way to control the off-flavors that far back in the process. Boyer prefers the meat analogs made by Worthington to those made by Loma Linda. Boyer uses both

tofu and Bacon Bits quite a bit in his daily meals.

Concerning the plastic car: The importance of soy decreased as the researchers got farther into the project since they could not make soy 100% waterproof no matter how much resin they mixed with it. So in the 1941 car body, soy was only a very minor component—but the popular notion that it was a major component persisted; that was a distortion. Soy was, however, a major component in non-structural car parts. The real importance of the soybean was as a renewable resource. When the “plastic car” made its debut in 1941, an all-soy luncheon was served.

When Ford struck the trunk of his car with an axe, he used the back/blunt side of the axe, and it was covered with a plastic guard to help cushion the blow. Once Walter Chrysler hit the body with an ax and fractured it slightly. Boyer drove the plastic car. The whole white body of the car was plastic, but it contained little soy.

The idea of using spun soybean fibers in food occurred to Boyer while he was working for Ford in about 1942. He left Ford in 1943 and applied for his first spinning patent in 1949. It was allowed in 1951. He abandoned this first application since everyone realized it was a much broader patent. So the 1954 patent application was the best and most important one that everyone worked under. “No one can use a man-made fiber in a food without violating that claim.”

The industry that makes spun soy protein fibers for food use reached a plateau starting in early 1979. He is now aware that there are 2 companies in Europe very actively spinning soy fibers and advertising their products. Two are Dutch and one is in Belgium. The patents are now public property. Dawson Mills bought General Mills’ soy protein fiber spinning equipment. In an article in the *Journal of Textural Studies* Boyer explained why the spinning part of the program has now grown as much as expected. “This is still a product whose time has not yet arrived. It was mushroom when meat prices become 10-20% high than soy. The danger is that some of the techniques we’ve developed in the past 2-3 years for improving texture and flavor might get lost if they are not actively pursued. Worthington is in a state of change and Bayer may try to sell it. All the work is secret.” Boyer may someday write a book about it, but his eyes are very bad now.

Boyer felt Ford was a great man, great to work with and for. He knew how to judge men and he always picked the right men for the job. Ford would drive the 4-5 miles up from the Rouge Plant and be in Boyer’s office by about 8:00 every morning for years and years. He was always very generous money and essentially gave Boyer a blank check to pursue any research project he wanted. But he could be pretty tough with some guys, especially if they did not produce results. Ford was a real thinker, always trying to find the basic reasons behind what was going on.

Worthington bought the patent rights for the health food industry. Loma Linda started spinning soy protein fibers after Boyer’s patents expired. He did not know that Loma Linda

made soy meat analogs; he thought they used only gluten.

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term “spinning soy protein fibers.” Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

700. Boyer, Robert A. 1980. Work with Henry Ford and soybeans. III (Interview). Conducted by William Shurtleff of Soyfoods Center, Nov. 3. 3 p. transcript.

• **Summary:** Floyd Radford was head of Ford’s soy farms. At the Chicago World’s Fair the Ford exposition was producing soybean oil by solvent extraction of soybeans. The soybean oil was the sole fuel used to power a diesel engine, which ran an electric generator, which produced all of the electricity for the exhibit. It was very neat.

Boyer developed the first plant protein fiber in about 1938. That year the Ford Motor Co. had a machine to spin soy protein fibers at the World’s Fair in New York. He was aware of work in Italy spinning casein into fibers from reading technical journals prior to 1936. He used the term “spinning” because the textile industry uses that term to describe how rayon is produced. In both cases, a more correct term would be “extruding,” since the dope is extruded through spinnerettes.

Ford’s soybean fiber spinning pilot plant had a capacity of 1,000 pounds of fiber a day, but they probably produced less than that. They would send the fiber to the mill, where 1 part of soy fiber would be blended with 3 parts wool to make sidewall (not seat) upholstery, which got less wear and wouldn’t mark like cotton.

When making soy protein isolates, the fiber (insoluble cellulose) is removed during clarification by centrifugation; no one had ever been successful in removing it by filtration, which would be better. After dissolving the soybean meal in alkali, it is clarified by centrifugation, then precipitated. Practically the same process is still used to make soy protein isolates.

Just a few plastic trunk lids were ever made, and they were used only on demonstration or experimental cars; they were never part of commercial Ford vehicles.

When Boyer left Ford Motor Co. he went to work for The Drackett Co., which bought Ford’s soy protein operations. Mr. Drackett sold [actually shut down] his soy fiber spinning operation in 1949. Drackett later sold all its soybean operations to ADM. After Boyer left Drackett in 1949 he filed for his first edible soy fiber spinning patent the same year; it may have been granted in 1951. He applied for a new, expanded patent, with much broader claims to a food product manufactured from man-made protein fibers, in 1951; it was granted in 1954.

In Aug. or Sept. 1949 Boyer paid his first visit to Worthington Foods. Worthington was the first company to whom he disclosed what he was doing, and showed a sample of a prototype product (pork chops) made from spun soy

protein fiber. He did not go to Swift initially because he had been advised to keep away from meat companies, which might buy then bury his patents. If Worthington hadn't been interested in his spinning process when he first visited them, he might have just given up then. He wasn't sure if it was a screwball idea or not. Moreover, he had been out on his own for almost a year and was running out of money. Worthington was excited with Boyer's idea but they needed a source of fiber.

So Boyer went to the Virginia Carolina Chemical Co. (VCCC) in Taftville, Connecticut. They were spinning fibers for cloth and they allowed him to use their spinning pilot plant in 1949 to produce the first edible spun soy protein fibers for research purposes and prototypes; he was not employed by them. VCCC was interested enough to call in Corn Products Corp. (CPC), which was interested—but they said they wanted to use corn gluten instead of soy protein. Boyer said “Fine.” After the first successful run, using the VCCC pilot plant, CPC got very interested. Fibers were spun from casein, corn gluten, and soy. CPC bought the first license to his soy fiber spinning process for food use in 1949. They took an exclusive option on the license for 9 months. The first sale of edible protein fiber was made by CPC to Worthington Foods; the fiber was made of corn gluten. After working for a year with CPC, everyone in the project realized that the flavor of corn gluten was so horrible that it would never work in foods. So CPC converted to a non-exclusive license. Boyer, now a bit desperate and against the advice he had been given, decided to approach a meat company. He chose Swift & Co., which took an option immediately; they were the second company to license his patent and from 1950 to 1954 they retained exclusive rights to his patent. In about 1955 Swift converted to a non-exclusive, and Boyer immediately went back to Worthington to see if they were interested in a license yet. They were.

So after having waited 7 years, Worthington finally purchased a spinning license in 1956. At that time, Boyer began to spend 50% of his time at Worthington for a year after they took the license. Initially Worthington did not spin their own soy fibers since it was too expensive for them and they did not have much money at the time. Ralston Purina was well equipped to make these fibers for them. It was not until the mid-1960s that Worthington started to spin their own fibers.

By 1977 seven large food companies had licenses on the patent: Swift & Co., Unilever/Lever Brothers in England, General Foods, Nabisco, General Mills, Ralston Purina, and Worthington.

The original Bac*O's were made from spun soy protein fibers. Today he thinks they are made from textured extruded soy flour. General Mills took a license from Boyer. They got 25% of his consulting time, Ralston Purina got 25% and Worthington got 50%. Bac*O's came on the market in about 1965 and were a real sensation. It was the biggest thing that

had happened with Boyer's idea to date.

Loma Linda is now spinning soy protein fibers, as is some company in Japan—or at least they used to be.

How big is the market for foods made from spun soy protein fibers? Boyer would guess at least \$30 million a year. Worthington's total sales was \$20 million including gluten. Miles got Worthington a new plant shortly after they bought Worthington. Now Bayer owns Miles and Worthington. The Morningstar Farms line is not making the profits they would like it to make.

Note: This is the earliest English-language document seen (Dec. 2004) that uses the term “spin soy protein fibers.” Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

701. Shurtleff, William; Aoyagi, Akiko. 1980. Henry Ford and Robert Boyer: History of work with soya. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 25 p. Nov. 3. Unpublished typescript.

• **Summary:** A comprehensive history of the subject. Contents: Introduction: Ford. Early research with soybean oil and meal: 1928 chemurgic movement (joining of farm and industry), setting up Edison Lab, Dec. 1931 soybean chosen as most promising crop for use in industry and as a food, 1931 encouragement of farmers to grow soy, biographical sketches of Boyer and Ruddiman, soy oil (used in car paints and pioneer work in solvent extraction), meal, isolates, molded parts, plastic pilot plant, cottage industries, barn solvent mills, 1934 World's Fair. Ford, Ruddiman, and soyfoods: Soyfoods press luncheons (not all were impressed), 50 recipe cookbook, soymilk (commercial and personal), personal interest in soyfoods, Greenfield Village (soy flour and green vegetable soybeans), Ford's views on health. Development of the plastic car: Glidden first commercial plant for industrial soy protein isolates (1935), Ralston's food use plant in 1960, Ford built 3 small oil plants 1937-39, grew own soybeans, connection with American Soybean Association, soybean plastic car (trunk lid unharmed when hit by ax), jokes, soy a minor element in later structural plastics, idea lost in files, General Motors' plastic Corvette introduced 1953, lots of plastic by 1980 (but not from renewable resources like soy). Boyer's soybean wool and edible protein fibers: Soybean wool and history of fibers, wool pilot plant, how to make edible soy fibers, discovery of food protein idea. Henry Ford's passing: Death in 1947, his contribution (quotes), actually not much soy used in Ford's auto and tractor factories. Boyer's development of meat analogs: Drackett purchase of Ford protein spinning operation, first visit to Worthington (Sept. 1949), Corn Products Company purchase of first license on edible protein fiber patent, Swift purchase of exclusive rights from 1950-54, 1951-52 Unilever license for production outside U.S., Worthington purchase of license 1956, advantages and limitations, licenses after Worthington, royalties and

consulting, Boyer's quality evaluation, the future. Address: Lafayette, California. Phone: 415-283-2991.

702. Allred, Paul. 1980. Re: Work with soymilk and Loma Linda Foods. Letter to William Shurtleff at Soyfoods Center, Dec. 2 p.

• **Summary:** "I became interested in the soybean potential at the World's Fair in Chicago in 1934 when Henry Ford displayed all of the parts that he made from the soybean. They... made gear shift knobs to sell. This made quite an impression on me and I bought one of the knobs. Later around 1940 I learned of the work Harry Miller was doing and followed his work through the years and became personally acquainted with him. I began to experiment with soy milk as early as 1940 and at present am with Loma Linda Foods still experimenting." Address: California.

703. Billoni, Mike. 1980. Thirty years below zero. Buffalo, New York: Rich Products Corp. 149 p. Unpublished manuscript. 28 cm.

• **Summary:** A colorful history of Bob Rich and Rich Products. Contents: 1. Introduction. 2. Early years. 3. Early athlete (football). 4. Coach. 5. Marriage (to Janet). 6. Wilber Farms Dairy. 7. War Food Administration (and Henry Ford's work with soy). 8. Growth of [soy-based] whip topping. 9. The institutional customer. 10. Aerosol cans. 11. Eclairs. 12. Bobby (Robert Edward Rich Jr.). 13. Jones-Rich (in 1960 Rich and Wilber Farms Dairy acquired the R.W. Jones Dairy; the combination was the largest dairy in Buffalo, New York). 14. Coffee Rich (and Rex Diamond, including the reason that Bob Rich felt he had no choice, in 1964, to terminate Rex Diamond. The U.S. Food and Drug Administration had ruled that sodium caseinate was not a dairy product, "even though it originally may have been derived from skim milk solids." Coffee Rich was the "first non-dairy frozen coffee creamer in the world"), 15. Ellis Arnall (fighting lawsuits by the dairy industry against Rich's dairylike products and winning every one!). 16. Acquisitions.

"Ford believed the cow should be replaced and set up the George Washington Carver laboratory for experiments with the soybean.

"These experiments resulted in a soybean milk which was supplied to Ford Hospital. The purchasing agent invited Rich to visit the laboratory and he readily accepted. It was in the laboratory where he met the laboratory manager, Holton 'Rex' Diamond, who showed Rich the continuous soybean extraction system the Ford Company patented.

"When Rich told Diamond of his interest in manufacturing a soybean cream, with emulsifiers added, that could be whipped, Diamond suggested he contact the Ford Motor Company to obtain the rights to their continuous extraction system.

"Diamond told Rich that Mr. Ford was not interested in seeing the use of soybean milk products expanded but that

Ford Motor Company would grant him the rights to their 'Rube McNutt' [sic, Rube Goldberg or Boob McNutt] system for \$1.

"When Rich returned to Buffalo that weekend, he visited with his friend, Dr. Alexander Schwarcman, who was director of research at the Spencer Kellogg Company. Dr. Schwarcman was most enthusiastic about the idea of a whipping cream from an all-vegetable source.

"Rich continued working as the Milk Market administrator for the state of Michigan but on his return to Buffalo every weekend, he spent more time overseeing the development of his soybean cream project than he did on his Wilbur Farms Dairy operation.

"When we realized we had something here I wrote the Ford Motor Company asking for the patent rights, which I had been told were readily available, but I did not receive an answer," Rich recalled."

Ford's general consul told Rich that Ford did not want to be responsible for creating competition for America's dairy farmers. Rich took that news to Howard Faust in Buffalo; Faust told Rich that he thought they could extract the protein from the soybean using a batch system—which meant (if it worked) he would not need the Ford patent.

The system designed by Faust extracted 68% of the protein from the soy flakes, whereas Ford's continuous process extracted only 32%—a huge improvement.

"Realizing he was on to something big, Bob Rich Sr. incorporated Rich Products in November 1944. His 12-truck garage behind the Wilber Farms building was converted into a laboratory and a production plant for a non-dairy whipping cream while a nearby city-owned piece of property was leased to house the trucks of the dairy.

"In January 1945, Rich Sr. resigned his position as Michigan's Milk Market administrator to return to Buffalo to devote all of his time to this new breakthrough in the dairy business."

Bob Rich's father, who had been a dairyman all of his life, thought his son's new venture was "nonsense." But Bob Rich's wife noted: "He has always had an incredible drive and a keen foresight to see a light at the end of the tunnel. He knows what he wants to achieve in everything he does. That has proven to be a real gift" (p. 7-6 to 7-8).

"The industry founded by Robert E. Rich Sr. on April 1, 1945, owes its inception to the food restrictions and government red tape imposed by World War II conditions... Sales of whipping cream were forbidden during the war. So Bob Rich Sr. went to the soybean to find a replacement."

Rich recalls: "Our first production run of whip topping was on March 30, 1945, and we sent it out to our Wilbur Farms Dairy retail customers, with a note attached. 'The miracle cream from the soybean.'" This cream was "much less expensive, would last longer, and whip better."

By the late 1940s Reddi-wip, sold in an aerosol can, had become a big competitor. By 1952 Rich products had eight

salesmen in the field. On Saturday mornings Rich would meet in his office with his Whip Topping team: Jerry Hannon, Herb Kusche, Joe Robida, Rex Diamond, and Ed Andrews (p. 10-6).

Pete Slaughter, a Rich salesman from Texas, found a remarkably simple way to demonstrate grocery store to buyers that Rich's Whip Topping superior to Sta-Wip, made by the Reddi-Wip company. He simply sprayed each onto a separate blotter. The Sta-Wip was absorbed into the blotter whereas the Whip Topping stood up in a nice mound (p. 10-8 to 10-9). Address: Buffalo, New York.

704. Miller, Dwight L. 1981. A chapter in the history of soy fiber meat analogs. *Northern Regional Research Center: Notes from the Director* No. 1473. p. 3. Aug. 21.

• **Summary:** "The concept of spinning soy protein isolates into fibers and then converting them into meat analogs has been around since at least 1954 when Robert A. Boyer first patented the idea. Subsequently, several companies licensed the process, and in the 1960's General Mills introduced a series of meat analogs made by the spinning operation. After opening a plant in 1970, General Mills closed down operations in 1976. The equipment and process were sold to Dawson Mills" and Dawson built a new plant (just east of Dawson, Minnesota) "to produce soy isolates plus meat analogs from spun isolate. Early this week, Daniel E. Hooten (President, Dawson Food Ingredients) was here for an update on our soy protein research and to discuss functional properties of various soy protein fractions with Walter J. Wolf and A.C. Eldridge (OC [Oilseed Crops Lab]). We learned that Dawson's parent company, Land O'Lakes, Inc. has recently sold the soy isolate and protein spinning plant to American [sic, Associated] Milk Products, Inc. [AMPI in Texas], a Houston-based milk cooperative. They apparently plan to use the plant to process milk products. Dawson's withdrawal leaves Miles Laboratories [Worthington Foods] as the only company that currently manufactures meat analogs from spun soy protein fibers." Address: Acting Center Director.

705. Shurtleff, William; Aoyagi, Akiko. 1981. Dr. John Harvey Kellogg and Battle Creek Foods: History of work with soyfoods. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 20 p. Sept. 29. Unpublished typescript.

• **Summary:** A comprehensive history of the subject. Contents: Introduction. Early life and teachings: Birth, work with Ellen White, medical school, thesis, in 1876 took charge of institute he renamed Battle Creek Sanitarium (new meaning for this term), its research kitchen developed America's first meat analogs, start of *Good Health*, famous people who came to sanitarium, trip to Europe to deepen medical knowledge, primitive state of medical knowledge, "Biologic Living," dynamic man, living proof of his techniques. Early health food products: Granola, peanut butter (probably America's first), cereals, rift with church,

meat substitutes (Nuttose, Protose), Harry Miller. Early writings about soyfoods: *The New Method in Diabetes* (1917), mentions to 1923, mentions in *Good Health* (1921-29), *Good Health* (1930-39), J.H. and W.K. Kellogg's speeches to American Soybean Association (1927 and 1930), Kellogg and Henry Ford, 1933 edition of *The New Method in Diabetes*, 1936 expanding interest, letters to Horvath and Admiral Byrd, 1937 speech to American Public Health Association. Development of early soyfoods: soy meal, early interest in fermented milks, Metchnikoff and Tissier, first soymilk (1930), soy acidophilus and diseases (1933), patent for soy acidophilus milk (SAM, 1934), Dionne quintuplets (1934), SAM from 1936-1950's, heyday of his work with soyfoods (1934-37). Later soyfoods developments: Correspondence with William Morse, products in Morse's office, 1937 Battle Creek Food Co. products, 1940 price list, first commercial soymilk (Soygal, 1942), Kellogg's first meat analog (Soy Protose, 1943), small price list in 1955, sale of company in 1960, Kellogg's death in 1943, his influence on others. Address: Lafayette, California. Phone: 415-283-2991.

706. Shurtleff, William; Aoyagi, Akiko. 1981. History of Worthington Foods. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 11 p. Oct. 5. Unpublished typescript.

• **Summary:** A comprehensive history of the subject. Contents: Introduction. Founding in 1939 and founders: Harding, financing and duties, first product (Proast, with soy), Numete, growth of sales, Hagle joins company, Robinson leaves, Twomley's description of Hagle: "an uncommon businessman." New Developments in the 1940's: 1945 incorporation and sales to \$500,000, Buller and Hartman, Boyer's 1949 visit. Acquisitions and analogs (1950-69): Acquisition of Dr. Harry Miller's International Nutrition Foundation in 1950, Soyamel (1954, 1961), new products introduced in 1950's, big break to go ahead with Boyer (1956) and Ralston Purina, how foods made, sales take off, 1962 first products and Soyameat, use of powdered isolates, acquisition of Battle Creek Foods and Madison Foods, Patties, Numete, spinning of soy protein fibers, praised in Stanford study. "The big time and then back home again" (1970's and 1980's): Acquired by Miles Laboratories of Elkhart, Indiana (March 1970), sales leap, expanded research, introduction of Morningstar Farms line 1972-74, rise and fall, reformulation of line and relaunching as cholesterol free, failure, growth of other products and of the "motivated" market, Bayer AG purchase of Miles in late 1977, uncertain future, "third generation" meat analogs (1976), ready-to-eat vegetarian entrees (1980), 1981 product list. Address: Lafayette, California. Phone: 415-283-2991.

707. Boyer, Robert A. 1981. Work with Henry Ford and soybeans (Interview). *SoyaScan Notes*. Oct. 11. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Floyd Radford, a secretary to Ray Dahlinger,

did a lot of farm work for Dahlinger, who was a very high assistant to Henry Ford. Radford was involved with farming in southern Michigan, not with soybean processing.

Henry Ford was probably the first American manufacturer of solvent extractors. He made them for use in his factories, including his village industries. The first one was only 6 tons, but later he made a 24-ton extractor.

Henry Ford's soybean operations were conducted in various plants. The plastic molding machines were located in the glass plant within the River Rouge plant. The soybean operations in the glass plant were set up in about 1934-35. Then he decided to build the solvent extraction plant outside in the next lot. There he built a brand new building with 4 big extractors. The soybean meal produced by these extractors went into the plastics made in the glass plant. Then in the coke oven building, constructed in about 1940, Ford built a new extraction plant. He also used this plant for forming the plastic rear trunk lid.

CPC (Corn Products Company) purchased the first license to manufacture edible spun soy protein fiber under Boyer's patent; Swift purchased the exclusive rights from 1950-54. CPC was the first company to actually sell this spun soy fiber; they did it as a legal tactic in early 1950 to establish an interstate sale allowing them rights to the name they wanted to use for the product. Worthington accommodated them, and mixed the rest of the batch in with their products to use it up.

In 1955 changed their license from an exclusive to a non-exclusive. Boyer then went to Central Soya [actually probably to Glidden] in Chicago, then Ralston Purina, then Worthington to ask them to license the patent. Ralston agreed and decided to get into edible soy protein. In 1956 they took a non-exclusive license at the same time as Worthington and General Mills.

When Boyer was working with Swift & Co., they were pushing The Glidden Co. to make a food grade isolate. Before Glidden developed this edible soy protein isolate, the only alternative was casein. In Nov. 1957 The Glidden Company announced that it was building a plant to make food-grade soy protein isolates. Their product was named Promine. In 1958 Central Soya purchased The Glidden Co. and built the world's first plant to make food-grade soy protein isolate in Chicago; their Promine D was introduced in Oct. 1959. So in 1956 when Worthington Foods purchased a license to spin soy protein fibers for the health food market, the only food-grade isolate on the market was Promine made by Central Soya—which Boyer felt had a “terrible taste.” For this reason, Boyer went to Ralston Purina and urged them to make an edible isolate.

Ralston Purina made the world's first edible spun protein fiber in a pilot plant from about 1956-1960. Boyer first started to consult with Ralston Purina in 1960, when they decided to scale up from a pilot plant to a commercial one in Louisville, Kentucky; he then joined their staff in 1962. Ralston Purina

started selling their fiber in about 1961 or 1962; they sold most of it to Worthington. Worthington and General Mills began experimenting with their own pilot spinning units to develop prototype products, but they bought their commercial fiber from Ralston Purina. Later Worthington started to spin their own fiber because of cost and quality factors; aging between the time the fiber was produced and the time it was shipped caused a decline in quality.

Today there is a lot of soy protein spun in Holland. The isolates are probably made at the Ralston Purina plant in Belgium. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

708. Boyer, Robert A. 1981. Development of meatlike products based on spun soy protein fibers. Part I (Interview). *SoyaScan Notes*. Oct. 11. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** This history is compiled from 5 interviews conducted with Robert Boyer from Oct. 1980 to Oct. 1981.

One day at the Ford plant in 1942, Boyer, while sampling fibers of his “soybean wool,” realized that these same soy protein fibers, if made tender by omitting the protein denaturation, hardening, and insolubilization, could be used as a basic ingredient in making meatlike textured soy protein foods. Already he had developed an analog for the protein fibers that grow on the *outside* of a sheep (wool), why not develop an analog for those on the *inside*, a meatless meat or meat analog?

Throughout the years of World War II, the idea of using spun soy protein fibers as the basic of human foods, in the form of meat analogs, returned to Boyer again and again. In late 1943 The Drackett Co. in Cincinnati, Ohio (which had a fairly large soybean crushing operation and also made consumer household cleaning products such as Drano and Windex), purchased the Ford Motor Company's soy protein and protein spinning operations. Boyer went with the equipment and processes to Cincinnati. Boyer, now Drackett's director of research, told the company of his interest in producing foods from soy proteins, but Drackett was only interested in industrial products at the time. In early 1949 H.R. Drackett died; the company shut down its plant that was spinning Soybean Azlon fibers, and closed part of its protein R&D laboratories. Boyer left Drackett to work on his own.

On 28 September 1949 Boyer filed for his first patent on edible protein fiber (application serial no. 118,445). It was issued in 1951, then rewritten that year in a much broader format and issued in final form in 1954 (No. 2,682,466). According to this patent (which expired in 1971 and has come to be regarded as a classic), no one can use a man-made protein fiber in a food without violating the basic claim. The patent called for the use of various proteins (including soy, casein, and peanut protein) to make edible protein fibers that could be transformed into meat analogs or extenders that are low in saturated fats and virtually free of cholesterol.

In September 1949 Boyer took his patent idea to his first company, Worthington Foods, Inc., a small company in Worthington, Ohio, operated by a group of businessmen and doctors, that produced meat analogs and vegetarian foods primarily for Seventh-day Adventists and Adventist institutions. Boyer had now been on his own for over eight months and was almost out of money. He still wasn't sure of whether the whole idea was a screwball one or not. He later commented that if Worthington had shown no interest, he probably would have just given up then and done something else. Advised to keep away from the large meat companies, who might buy up the patent and "bury" it, he went to Worthington and disclosed his concept and a pork chop prototype. Mr. Hagle, president of Worthington, was immediately very excited with the idea, but the company was reluctant to take a license until there was a source of soy protein fiber. Harrison Evans, a top Worthington employee, later recalled: "I'll never forget the day Bob Boyer came by. They brought him down with this textured protein wrapped in a piece of aluminum foil and all it looked like was rope. Just unattractive, white... It certainly did not look like real meat."

Worthington waited, so Boyer went to Virginia Carolina Chemical Company (VCCC) in Taftville, Connecticut; they were spinning fibers for textiles and Boyer hoped they would be able to produce soy fibers for Worthington. VCCC allowed Boyer to use their protein spinning pilot plant for research; he provided his own materials. Here he made the world's first edible protein fibers, which were used to make meat analog prototypes. Incorporating egg albumen binder plus vegetable fats and flavorings into the spun fibers, he fabricated the first man-made meatless pork chops and then made hams from soy protein. After the first successful run, nearby Corn Products Company (CPC) got very interested and ended up buying the first license on Boyer's patent (an exclusive option), which gave Boyer his first income from the project. Boyer then consulted for CPC for 9 months. The first sale of commercial edible protein fiber (produced from corn gluten) was made by CPC to Worthington. Eventually, however, it was realized that corn gluten would not work well in foods because of its unpleasant and dominant flavor. The project was dropped. Continued. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

709. Boyer, Robert A. 1981. Development of meatlike products based on spun soy protein fibers. Part II (Interview). *SoyaScan Notes*. Oct. 11. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Now somewhat desperate, Boyer decided to try a meat company anyway. He went to Swift & Co. in Chicago, Illinois, in 1950 and they immediately liked these ideas and bought exclusive rights to the patent from 1950-1954 (in 1955 they converted to nonexclusive). In 1950, the war scarcity psychology still prevailed. American consumers and

food producers had watched in astonishment during the war as meats became so scarce and expensive that only a few could afford them. Thus it was easy to sell the notion that even after the war, as world population continued to rise, plant proteins would play an increasingly important role in diets throughout the world. Boyer worked with Swift for five years, but in considerable secrecy. Swift told him that if their Livestock Relations Department found out that Swift was doing research on meat analogs, "all hell would break loose." Eventually Swift made and test marketed new soy protein products. However in 1952-53 livestock producers in America were in such bad shape economically that they marched on Washington, DC, demanding a better price for their products. Swift, fearing the possibility that the media might get word of their new project and come out with headlines reading "Swift Making Synthetic Meats from Soy Protein," decided to shut down the project. None of the products was ever marketed commercially.

In 1951-52 Unilever bought a license from Boyer for spun protein isolate production throughout the rest of the world. Boyer went to England and worked with Unilever in their peanut protein isolate plant and research labs near Liverpool. Here, for the first time, his process was used in the making of sausages containing fibers of peanut protein isolate.

In 1956 Boyer returned to America and went immediately to Worthington, who had now been thinking about taking a license on Boyer's spinning patent for seven years. The first food-grade soy protein isolates were just becoming available, so the company bought the patent rights for the health food industry and asked Boyer to work with them as a consultant. Worthington eventually did more with Boyer's discovery than any company in America.

After Worthington purchased Boyer's license (for the health food trade), other large food companies followed suit: Ralston Purina, General Mills, and Nabisco. General Foods developed their own related process. In 1962 Boyer joined the research staff of Ralston Purina as a Protein Scientist; he worked there until his retirement in 1971, at which time he became a Protein Consultant for Miles/Worthington.

After General Mills took a license on Boyer's product, they built a commercial-sized fiber spinning plant at Cedar Rapids, Iowa, and developed their Bontrae line which featured Bac-O's, a spun fiber analog resembling cooked bacon bits and launched in 1965. The venture was impressive in scope and the product was a real sensation, the biggest thing that had happened to Boyer's idea to date. (The product is now made with extruded soy flour.) The whole venture had a profound effect on the thinking of other large food producing companies concerning soy protein foods. Boyer was now spending 50% of his time with Worthington and 25% each with General Mills and Ralston.

Boyer's years of research eventually began to pay off in terms of handsome royalties from his patents, of which he now had more than thirty, some shared with Ford. These

lasted until the patent expired in 1971. Now any company can use the protein spinning process without having to buy a license or pay fees. In 1981 the main American companies using spun protein fibers in foods were Worthington Foods, Dawson Mills in Minnesota (which bought General Mills' equipment), Loma Linda Foods in California, and Ralston Purina. In Europe there are two companies in the Netherlands, one in Denmark (Nutana), and one in Belgium using food-grade spun protein fibers. In Japan, Nisshin Oil Mills Ltd. built the first plant to spin edible soy protein fibers in 1968. In 1976 Fuji Purina Protein Ltd., a subsidiary of Fuji Oil Co. and Ralston Purina, introduced Fujipur SP-90 spun soy protein fibers.

Most manufacturers of meat analogs in the U.S. agree that the general market has been disappointing, but that the idea is simply ahead of its time, which will inevitably come as meat prices continue their rapid rise. The vegetarian or "motivated" market (and especially the Seventh-day Adventist sector) showed a steady increase each year. No sales figures are available on the total market size.

When asked in 1980 how he liked the newest generation of meat analogs, Boyer replied that he found the quality disappointing, since the producers have to make compromises in equipment and processing to keep costs down. A researcher can get much better textures and flavors in his lab working by hand. Another problem is the subtle beany flavors that result from isolates and from typical defatted soy meal rather than specially defatted soy meal that can be made to contain almost no beany flavor. Boyer eats store-bought meat analogs (including bacon bits) from time to time but not as a regular part of his diet. He prefers Worthington products to Loma Linda. He likes meat, too, and also uses tofu quite a bit.

How about the future? Harkening back to the years of his work with Ford, Boyer said in 1981, "We're at the Model T stage right now with analogs. I'm impatient to get to the Lincoln Continental stage." He feels that the products still have a very bright future, and that when the price of meats rises to 10 or 20% above those of the analogs, sales will start a period of steady growth. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

710. Strayer, George M. 1981. Re: Pioneers in introducing and producing soybeans in America, and in starting the American Soybean Association. Letter to William Shurtleff at Soyfoods Center, Nov. 5. 2 p.

• **Summary:** Concerning Iowa: The first work was done by H.D. Hughes, who was the head of the Department of Farm Crops and Soils. He was assisted by F. Scott Wilkins and E.S. Dyas, both of whom were extension agronomists. Martin G. Weiss came on the scene in Iowa at the same time that Probst started in Indiana and Williams started in Illinois, all of them part-time USDA and part-time local experiment station employees specializing in soybean breeding work. "Martin

Weiss is a highly skilled plant breeder, a geneticist and a mathematician. He is responsible for the development of the cross-pollination and back-crossing techniques which have become the basis of practically all soybean breeding being done in the United States, and practically every soybean variety which has been developed since about 1940 has been developed through the techniques developed by Weiss...

"There are a number of theories on why so many men gave so generously of their time and effort to support the introduction of soybeans into the United States, and to support ASA. Certainly W.J. Morse was a part of the reason. Many changes were taking place in agriculture, and the people in the land grant colleges were looking for new crops and new uses for crops. The whole face of agriculture was changing from the use of horses and the large consumption of oats, corn and hay by those horses to the use of tractors and other petroleum fueled mechanical units. This meant we had to find new crops to grow on the acreages no longer needed for oat and hay production.

"For some reason the soybean crop always had a kind of halo around it, placed there by men such as Henry Ford, W.K. Kellogg, I.C. Bradley, W.J. Morse, 'Soybean' Johnson and others who had access to the news media and who used it. This was an era when farmers were still expanding acreage, looking for new crops and new uses for those crops and the publicity given to soybeans was being well received by farmers.

"This was also an era when the farmer was leaving the typified hayseed status and becoming a businessman. Extension work through Farm Bureau and the local extension offices was becoming an important factor in decision-making among farmers. Extension agronomists and other persons were listened to. Farm cooperatives, farmers elevators, and other organizations of farmers were coming into prominence. It was an era of growth in information and growth in knowledge in the field of agriculture, and soybeans lent themselves to the enchantry of the period.

"You're having a tough time getting anyone to do comparable work for the Soycrafters Association because you are dealing with an entirely different type of people. Most of them are small entrepreneurs who have come out of an era when it was every man for himself and the Devil take the hinder-most. The farmers whom we were considering were looking for ways to cooperate and work with their neighbors. When someone got sick the neighbors did the field work. When a new barn was to be built there was a barn-raising held. Contrast this with the people in the cities, where most of your tofu plants are located, and where no one stepped in to help his neighbor. This is still pretty much true. You are talking about people with two very different philosophies, two quite different backgrounds. When a farmer gets sick, even today, his neighbors do his chores for him. When a small business operator gets sick he closes the doors and no one particularly cares." Address: President, Agricultural

Exports, Inc., P.O. Box 266, Hudson, Iowa 50643. Phone: 319-988-4593.

711. *Parade* (*Washington Post, Sunday ed.*). 1981. Henry Ford's Soybean fixation. Dec. 13. p. 24.

• **Summary:** Henry Ford "worshipped the soybean with a feeling akin to reverence. To him it was the cure for all of mankind's woes, as rich in manufacturing applications as in dietary value... At the peak of Ford's soybean mania, his company was growing more than 300 varieties of the plant on 8,000 acres and buying an additional 500,000 bushels yearly from Michigan farmers... No meal was served in his home without soybeans or their derivatives on the table, and a pitcher of cold soybean milk was always in the refrigerator for parched guests. Once Ford appeared at a convention dressed in a suit and matching tie woven of soy-derived fabric. At the 1934 Century of Progress Fair in Chicago, his company served a 16-course soybean dinner." Address: Washington, DC.

712. McMurtry, Linda O. 1981. *George Washington Carver: Scientist and symbol*. Oxford (England), New York, Toronto, Melbourne: Oxford University Press. x + 367 p. Index. 20 cm. [697* footnotes]

• **Summary:** An excellent, scholarly biography that separates the man from his myth. Carver emerges as "a gifted teacher, a gentle spirit, a keen intelligence and loving friend." His work with peanuts and his friendship with Henry Ford are discussed. In the index (which is poorly done), no mention is made of Carver's work with soybeans. However p. 91 states: "Soybeans and alfalfa were only two of several crops tested by Carver, often in cooperation with the USDA. Strangely, he failed in his attempt to cultivate kudzu, but he was especially delighted with the soybean results because the crop provided abundant forage 'of the nicest possible kind.' His interest was increased by the visit of a northern agriculturist to inspect Tuskegee's soybean work, and he was intrigued by the growing interest in soybeans as a source of vegetable oil. In 1914 he expanded his soybean experiments in cooperation with a New Jersey paint company and tested five varieties to determine the tonnage of forage, number of bushels of beans, quantity of oil, and fertilization properties each variety yielded." Of the 3 footnotes, one relates only to kudzu, and the others two are only in the Booker T. Washington Papers (edited by Louis R. Harlan); they are not on the microfilm of the George Washington Carver papers owned by the Library of Congress.

Booker T. Washington died on 14 Nov. 1914. "His death marked the end of an era both in race relations and in the career of George Washington Carver. During the next year a series of events brought Carver out of the shadows and into a place of national prominence that rivaled Washington's." After giving half a year's salary to the Booker T. Washington Memorial Fund, Carver dejectedly wrote Washington's

secretary, Emmett Scott, "I am sure Mr. Washington never knew how much I loved him and the cause for which he gave his life." Robert Russa Moton, who took Washington's place as principal of Tuskegee brought brighter days for Carver. In the fall of 1915 Carver received two remarkable invitations and honors: One to serve on the advisory board of the National Agricultural Society, followed by one to become a fellow of the Royal Society for the Arts in Britain. In 1919 Moton gave Carver (now addressed with the prestigious title of "professor") an unsolicited increase in salary, Carver's first in 20 years. After 1916 Carver, now very busy and often traveling, gradually discontinued his classroom teaching, and by 1925 finished his plot work at the experiment station. He was becoming a "creative chemist." In Dec. 1916, in his continued quest for commercial success, Carver submitted to Emmett J. Scott a list of 15 products "now ready for the market." A rubber substitute derived from sweet potato and various wood stains seemed promising; soybeans were also on the list. But by 1919 he wished to remain unentangled in the "business end" of his discoveries.

Prior to 1919 Carver focused his research attention on sweet potatoes and seemed well on his way to becoming the "Sweet Potato Man." But in Sept. 1919 he discovered peanut milk—"a discovery that ultimately shaped the course of his career... The creation of the Peanut Man began with the discovery of peanut milk, and Carver had great hopes for its commercial success. He envisioned it not as a substitute for cow's milk, but as a 'distinct product in the diet of the human family' with unique qualities and uses... Carver also believed that peanut milk provided a cheap source of protein, for a pint could be made from only a '3 ounce glassful of peanuts.' Indeed he claimed his method of making milk was more efficient than that of a cow... Others seemed to agree that peanut milk was a viable commercial item, but Carver's dreams of finally providing a practical product were dashed when he learned that an Englishman had already patented a process for making peanut milk in 1917... In 1921 Carver considered taking 'out a patent over his by proving my process is superior in many ways,' but he never did, and the Englishman was unable to exploit the patent profitably, possibly because he demanded \$150,000 and a 3 percent royalty."

In June 1923 Carver won the prestigious Spingarn Medal of the NAACP. (The NAACP had been organized in 1909 during the heyday of Jim Crow legislation as an alternative to Booker T. Washington's accommodationist program; by 1923 the NAACP was winning the battle for leadership.) In 1928 Carver received an honorary doctor of science degree from Simpson College in Iowa, which he had attended from Sept. 1890 to 1891 mainly to study art. This honorary degree was especially appreciated, since questions about the title "Doctor" had previously embarrassed Carver.

In 1933 Henry A. Wallace became Secretary of Agriculture under Franklin D. Roosevelt and served from

1933-1945, later becoming Vice President of the United States. A renowned plant breeder from Iowa State College, he had been a boy there when Carver was a student and he later credited Carver with giving him his first and lifelong interest in plants. He called Carver the "kindliest, most patient teacher I ever knew." An innovative leader, Wallace sought ways to help hard-hit farmers out of the Depression. He shifted USDA's policy away from increasing agricultural production toward decreasing production and increasing demand by finding new uses for crops. "Although utilization research had never been completely ignored by the USDA, the Depression marked a turning point, with more emphasis on the kind of research that Carver had focused on for forty years. But when the USDA turned serious attention to this field, it did so with a level of funding that quickly made Carver's work obsolete. Section 202 of the Agricultural Adjustment Act of 1938 provided for four regional research laboratories 'devoted primarily to those farm commodities in which there are regular or seasonal surpluses, and their products and by products.' Its enactment was a major victory for the chemurgic movement, which recognized Carver as a patron saint... Thus 1938 marked the end of one phase of Carver's career. His [declining] health and limited funds prevented any significant new research. More and more he came to see himself as a trailblazer who had shown the way and was now ready to step aside and let others follow his path."

In 1935 Austin W. Curtis, Jr. had come to Tuskegee and soon been accepted by Carver as his assistant. The year 1937 marked the beginning of what became a deluge of awards—thanks in part to help from Tuskegee and Curtis. That year Carver was invited to speak at a chemurgic conference hosted by Henry Ford in Dearborn, Michigan. His speech was well received. He was invited to the main banquet but, because of his feels concerning segregation, he made a point of sitting outside the hall until everyone had eaten, "even though Henry Ford considered him one of the most honored guests." "Ford's interest in the chemurgic movement drew him to Carver, and after they finally met at the Dearborn conference they corresponded and visited each other regularly. They shared eccentric genius and an enormous mutual respect." Carver admired Ford's policy of hiring blacks for both skilled and unskilled jobs in his automobile plants.

On 10 Feb. 1940 the George Washington Carver Foundation was officially incorporated—again with key help from Austin Curtis. As early as July 1937 a flyer soliciting contributions had been distributed, but it was mostly funded by Carver's life savings of \$32,374. A museum became one of the foundation's main activities.

A photo (p. 288) shows Carver and Ford standing together. Carver was also a close friend of Henry A. Wallace.

In 1939 Carver, though his health had begun to decline rapidly, traveled to Ways, Georgia, for the dedication of the George Washington Carver School, established by Henry

Ford on his Ways plantation. Carver spent the entire day with Ford. In 1942 extensive press coverage attended a "tribute by Henry Ford, who erected a Carver memorial cabin at Greenfield Village and established a nutritional laboratory in Carver's honor at Dearborn. Carver went to Michigan for several weeks..." Address: Assoc. Prof. of History, North Carolina State Univ.

713. Windish, Leo G. 1981. *The soybean pioneers: Trailblazers, crusaders, missionaries*. Galva, Illinois: Published by the author. viii + 239 p. Illust. No index. 26 cm.

• **Summary:** Contains many interesting biographies, often based on the author's first-hand knowledge. Contents: Section I: 1. A time to pause and reflect. 2. Dr. W.B. Morse. 3. The Cinderella crop of this century and some orchids long overdue. 4. First soybean crushing plant. 5. George M. Strayer (Contains a good history of the American Soybean Association and Strayer's role in it). 6. Ersel Walley. 7. Dr. Harry Miller. 8. Henry Ford. 9. Northern Regional Research Laboratory. 10. Dr. Reid Milner. 11. Soybeans in China. 12. The first combine harvesters, the western migration, and the passing of an era (a good history of combines in the USA from the 1850s to the present). 13. Prof. W. Ralph Nave (agricultural engineer, specializing in improving combine design for harvesting soybeans). 14. Soybean harvesting equipment.

Section II: 15. August Eugene Staley, Sr. 16. Eugene D. Funk, Sr. (and the Peoria Plan, p. 74). 17. Dale W. McMillen [of Central Soya]. 18. Jacob Hartz, Sr. 19. Archer-Daniels-Midland Company, Inc. 20. Jay Courtland Hackleman. 21. Dr. Robert W. Howell. 22. Dr. W.O. Scott. 23. Program. 24. Crop improvement associations. 25. Illinois Crop Improvement Association. 26. Professor Emeritus Alvin L. Lang. 27. Morrow Plots.

Section III: 28. Dr. Clyde Melvin Woodworth. 29. Dr. R.L. Bernard. 30. Theodore Hymowitz. 31. A reluctance to accept change or progress. 32. Episodes. 33. Russian Tour. 34. South Farm buildings. 35. Soybeans again assert their value. 36. Taylor Fouts. 37. Excerpts from the Mumford Files. 38. Excerpts from the Hackleman Files. 39. Soybean variety and inoculation demonstrations. 40. The frosted green soybean dilemma. 41. Soybeans in the Deep South. 42. Mr. H.G. [sic, George Heartsill] Banks. 43. Dr. E.E. Hartwig. 44. U.S. soybean production. 45. Aquaculture... the world's untapped resource (From 1974 to 1979 the harvest from aquaculture more than doubled to nearly 7 million metric tons). 46. Almost a century of progress. About the author (autobiographical): Leo Gilbert Windish was born in 1909. A retired seedsman, he attended the University of Illinois in 1927 and 1928. He was close friends with Hackleman, and wrote this book in fulfillment of a promise he made to Hackleman, whom he described as "the soybean's greatest missionary." Windish also knew Burlison (the first to promote soybeans heavily) and Woodworth (the first soybean

geneticist).

Note: Most of the chapters about people contain a portrait photo of the person on the first page. Address: 101 Exchange St., Galva, Illinois 61434.

714. Windish, Leo G. 1981. Henry Ford: The industrial giant was among the soybean's strongest supporters. At the 1933-34 Century of Progress he promoted the soybean and its versatility and use, heavily (Document part). In: Leo Windish. 1981. The Soybean Pioneers: Trailblazers, Crusaders, Missionaries. Galva, Illinois: Published by the author. viii + 239 p. See p. 31-35. Chap. 8.

• **Summary:** Ford "envisioned an immense future potential for soybeans, but in industry rather than in food or feed."

"Ford Motor Company still uses soybean oil in paint manufacturing, particularly for frame paints and engine enamels," notes Dr. J.D. Norstrom, manager of polymer research at the company's Mt. Clemens (Michigan) Paint Plant. "Mr. Ford's interest spurred the evolution of auto paint and plastic technology and the development of more car paint finishes."

"Lowell E. Overly, 73, was a Ford manufacturing engineer who designed the company's—and the country's—first experimental plastic car body, which was displayed in August, 1941. Although many people believed this one-of-a-kind car was made of soybeans, it actually used other agricultural products such as hemp for 'filling' the plastic.

"Mr. Ford thought agricultural plastics might become his most significant contribution to society," Mr. Overly recalls. "While the famous plastic car was lightweight and could withstand ten times more shock than steel, it just wasn't practical. The plastic took a long time to cure and its brittleness made it difficult to mold on a car frame. Plastic was more expensive than sheet metal, and the formaldehyde used in plastic production made the car smell like a mortuary."

"If a complete plastic car wasn't practical for mass production, plastic parts were—and still are. More than 160 pounds of various kinds of plastic are used today on each of Ford Motor Company's cars. Robert M. Gerrity, general manager of Ford's Plastics, Paint and Vinyl Division, predicts a doubling in plastics use in just the next eight years. "To help reduce vehicle weight, increase fuel economy, improve corrosion resistance and conserve energy, by 1985 Ford will use well over one billion pounds of plastic materials annually in its cars and trucks," Mr. Gerrity says." Address: 101 Exchange St., Galva, Illinois 61434.

715. Bryan, Ford R. 1982. A guide to research material on George Washington Carver. Dearborn, Michigan: Ford Archives & Research Library, the Edison Institute. 13 p. Unpublished manuscript. Courtesy of Henry Ford Museum & Greenfield Village Archives (Dearborn, Michigan). [200+ ref]

• **Summary:** Describes archival and graphic materials concerning the relationship between Henry Ford and George Washington Carver. The location in the Ford Archives is given for each document. Lists at least 13 documents related to soybeans. Address: Dearborn, Michigan.

716. Schock, Shirley. comp. 1982. Town of Camden: Our sesquicentennial memoir, 1832-1982. Flora, Indiana: Printed by Loudon Printing Co., Inc. 80 p., unnumbered. 28 cm.

• **Summary:** The text on the cover reads: "The town of Camden: Our first 150 years. A historical and pictorial souvenir booklet." A large photo (on about p. 43) shows the Soy Seed Co. [named Soyland Seeds until about 1928] buildings (with a large sign on one side) next to a railroad siding. Roy Caldwell, dressed in overalls, is standing in the foreground. The caption states: "Roy M. Caldwell and Chester Joyce—owners—grew Reids Yellow—Dent corn and soybeans on their own farms. Soybeans was a new crop—buying and selling for seed purposes. Sold many carloads to Henry Ford and the Ford Motor Co. for using in making oil paint for their automobiles during the 1930's for their line of Model 'A' Fords. 1944—Became a specialist in the production of hybrid seed corn. 1982 location—Camden Hog Market—East edge of Camden, Indiana, at the railroad crossing on 218."

Talk with Bill Fouts of Galveston (Cass Co.), Indiana. 1999. May 14. Bill is the grandson of Finis Fouts. The Soy Seed Company is now owned by Select Seeds in Camden; they are still in business.

Talk with Dolores, wife of Arthur Eggerling, owner of Select Seeds Hybrids, Inc., P.O. Box 54, Camden, Indiana 46917. Phone: 219-686-2743. 1999. May 18. In 1973 the Eggerlings bought the company from Virgil Joyce and his brother. Today they breed and sell only corn—no soybeans. They have no early documents. The Fouts name no longer survives as a brand or division within the company.

Talk with Linda Parrot of the Carroll County Records Office. 1999. Oct. 7. She thinks that the Fouts brothers sold Soyland Seeds to Chester Joyce. By 1928 it was renamed Soy Seed Co. and owned by Roy M. Caldwell and Chester Joyce, both of whom are now deceased. Address: Local Librarian, Camden, Indiana.

717. Lewis, David L. 1983. Down by the old millstream: A 100-mile, four-country tour of Henry Ford's village industries. Ann Arbor, Michigan. 5 p. Undated. Incl. map. Unpublished typescript.

• **Summary:** Hop into your Ford Model "A" and hang onto your hat. This tour starts at Saline and gives a brief history and description of each of Ford's village industries along the way. From Saline (which processed soybeans from 1938-1946) the tour proceeds to Manchester, Sharon Hollow, Brooklyn, Tecumseh (used after 1935 for the cleaning and sacking of soybeans), Macon (once the "capital" of Ford's rural empire), Dundee, Milan (built in 1938 and processed

soybeans until 1946), Ypsilanti-Rawsonville, Dearborn, and Detroit.

Note from David L. Lewis. 1993. Aug. 1. This unpublished typescript was prepared by him in Ann Arbor in July 1983. Address: Prof. of Business History, Univ. Michigan, Ann Arbor, Michigan.

718. Photographs (color) of Bob Smith and Dick Folsom in Roseville, Michigan, Aug. 15. 1983.



• **Summary:** (1) Bob Smith seated in an armchair. (2) Bob Smith (left) and Dick Folsom seated outdoors next to a round white table. (3) Bob Smith astride his "cycle."

Note: These photos were sent to Soyfoods Center, with permission to use in this book, by Dick Folsom in Feb. 1992.



719. Smith, Robert Archer. 1983. Work with and recollections of Henry Ford (Interview). Conducted by Richard B. Folsom of Canton Township, Michigan. Aug. 15. 37 p. typed transcript.

• **Summary:** Robert A. Smith was born in Detroit, Michigan, on 1 April 1913. He spent much of his childhood in Detroit. In 1926 he entered the Ford Trade School and graduated as valedictorian of his class in 1930 at age 17. In 1931 he was placed in charge of the Greenfield Village Experimental Greenhouse, trying to find out how waste materials from farms could be used as plant fertilizers. Henry Ford would come in and chin himself on a beam in the Greenhouse. Bob Boyer, who was in charge of the chemical plant, was Smith's boss. Beginning in late 1933, Bob began to work under the personal direction and guidance of Henry Ford on many unique projects. Henry Ford was so impressed with Bob that in the spring of 1937, he invited Bob and his wife (Roberta) to move into the "Square House," which Ford had built himself in 1888. The Smiths moved into the house on Henry Ford's 74th birthday—July 30, 1937. Also in 1937, Henry Ford ordered a laboratory built for Bob in another former Ford residence, the "Moir House." Bob worked in the "Moir House" until 1942 when he was ordered by Henry Ford to move into the new Carver Laboratory, which was formerly the Dearborn Waterworks. In 1943 Bob co-founded Delsoy Products Corp. (with Henry Ford's complete approval) to develop, produce, and market soy-related foods. Bob ended his career with the Ford Motor Co. in Aug. 1945, when it

became apparent to him that Henry Ford would soon retire. The two men had worked very closely together for 12 years. Bob chose not to continue to work without the guidance, inspiration, and genius of Henry Ford. Bob retired from Delsoy in 1963.

In early 1937 Henry Ford drove Smith over to Moir House and on the way told Smith about how he would like to get rid of cows. Ford asked Smith to work at Moir house to develop a milk that made no use of cows. The Moir House lab was very simple, with the only electricity generated by a windmill. Nearby, Dr. Edsel Ruddiman had a modern lab with fancy equipment and electricity. Nevertheless, Smith's approach was to isolate the various components of the soybean (protein, fats, etc.), then re-blend those that were desired. He blended isolated soy protein (from soybean meal) with hydrogenated soy bean oil and in a few months had a product that looked and tasted quite a bit like milk. Ford came by every day to see how things were going and to offer encouragement and suggestions. The day this new product was ready, Ford liked it a lot. He wrote in his little book: "First... Good Milk... No Cow!", then he showed Smith the notebook. This was in about mid-1938. Henry came to the Moir House lab to relax and get away from the pressures of work. He was a good teller of stories and jokes when only a few people were around.

After Henry's son, Edsel, died in about 1943, Henry's health began to decline. He never seemed to be the same again. The sparkle went out of his eyes and his energy declined.

Smith regrets that he never visited Henry Ford at Fair Lane during his last years when he was sick in bed. "I think he would have liked to have known what I was doing with the soybean milk project. You know we had made it a commercial success [through Delsoy Products]." Mr. Smith greatly enjoyed his association with Henry Ford. Next to his wife, Ford was the most important person in his life.

David L. Lewis (1976, p. 486) says of the square house: "In addition to Fair Lane, four dwellings in which the Fords lived remain. The 'square house' or 'honeymoon house,' which Clara designed and for which Henry cut the timber and helped build, was the couple's home from 1889-91. Ford always kept a watchful eye on the place, and in 1937 installed a young company chemist, Robert Smith, and his family in it. When the structure was threatened by highway expansion in 1952, the Smiths removed it a few miles west to 29835 Beechwood, Garden City." Address: Smith: 26351 Hollywood Ave., Roseville, Michigan 48066; Folsom: 46000 Geddes Rd., Canton Township, Michigan (near Dearborn). Phone: Smith: 313-777-5394. Folsom: 313-495-1379.

720. Bryan, Ford R. 1983. Dearborn's Chemical Park. III. The Carver Food Laboratory. *Dearborn Historian (The)* No. 3. p. 90-97. Summer. [23 ref]

• **Summary:** A good overview of Henry Ford's work with

soybeans starting in about 1930 when Robert Boyer was brought to Dearborn to work at Greenfield Village and put in charge of the Chemical Plant. Ford's stated objective was to "find industrial uses for farm products." "Mr. Boyer's summary of the first year accomplishments describes work extracting oils from orange peels and furfural from garbage, as well as work on wheat, soybeans, and carrots. Boyer's 1931 summary report [i.e. report of work conducted during the year 1931, written in Jan. 1932] was sent to Mr. Ford at Fort Myers, Florida... In a separate building near the Engineering Laboratory in Dearborn, Dr. Edsel Ruddiman, Henry's boyhood schoolmate, was working with wheat, soybeans, carrots and tomatoes to 'make milk without a cow'.

"In 1932 [sic, Dec. 1931] Mr. Ford issued orders to concentrate on the soybean. His tractors began to plant and harvest thousands of acres. In a 25-acre field on Greenfield Village property some 500 experimental varieties of soybeans were grown. In Sept. 1932 Dr. Ruddiman and Mr. Boyer attended the American Soybean Association convention in Washington, DC. That year the Village Chemical Plant was extracting 6 tons per day of soybean oil. The Rouge plant started with 24 tons a day, followed by the Milan and Saline plants. These industries utilized the oil in making paints and plastics. The small Village Plant led the parade, however, with soybean milk, bread, ice cream, and an experimental plastic car (chassis excluded). The soybean foods became standard fare at the Ford plant cafeterias and at Ford Hospital. The ice cream—most delicious—was for years sold as Del(icious) Soy(bean) Topping" [i.e. Delsoy Topping; actually it was a soy-based whipped topping, not an ice cream].

Ford had known of the work of Dr. George Washington Carver since about 1910 but they probably first met in 1936 at the Second Dearborn Conference of the National Farm Chemurgic Council. Both were vegetarians with similar interests, and firm believers in natural foods. Dr. Carver's assistant, Mr. [Austin W.] Curtis, spent the summer (ca. 1940) working with Robert Boyer in The Soybean Laboratory.

In July 1942 Dr. Carver came to Dearborn and dedicated the "Nutritional Laboratory" of the Ford Motor Co. It was in the old Water Works building. Soon the laboratory, with its eventual 25 people under Mr. Robert A. Smith, went into volume production of soybean milk and ice cream. On 5 Jan. 1943 Dr. Carver died in Tuskegee, Alabama. The Nutritional Laboratory, soon better known as the Carver Laboratory, operated for at least a while after 1945, when Robert Smith left to go into business for himself, and Clem Glotzhober took charge. After Mr. Ford died on 7 April 1947, the building was again essentially abandoned. Address: Dearborn, Michigan.

721. Bryan, Ford R. 1983. Dearborn's Chemical Park. III. The Carver Food Laboratory. *Dearborn Historian (The)* No. 3. p. 90-97. Summer. [23 ref]

• **Summary:** A good overview of Henry Ford's work with soybeans starting in about 1930 when Robert Boyer was

brought to Dearborn to work at Greenfield Village and put in charge of the Chemical Plant. Ford's stated objective was to "find industrial uses for farm products." "Mr. Boyer's summary of the first year accomplishments describes work extracting oils from orange peels and furfural from garbage, as well as work on wheat, soybeans, and carrots. Boyer's 1931 summary report [i.e. report of work conducted during the year 1931, written in Jan. 1932] was sent to Mr. Ford at Fort Myers, Florida... In a separate building near the Engineering Laboratory in Dearborn, Dr. Edsel Ruddiman, Henry's boyhood schoolmate, was working with wheat, soybeans, carrots and tomatoes to 'make milk without a cow'.

"In 1932 [sic, Dec. 1931] Mr. Ford issued orders to concentrate on the soybean. His tractors began to plant and harvest thousands of acres. In a 25-acre field on Greenfield Village property some 500 experimental varieties of soybeans were grown. In Sept. 1932 Dr. Ruddiman and Mr. Boyer attended the American Soybean Association convention in Washington, DC. That year the Village Chemical Plant was extracting 6 tons per day of soybean oil. The Rouge plant started with 24 tons a day, followed by the Milan and Saline plants. These industries utilized the oil in making paints and plastics. The small Village Plant led the parade, however, with soybean milk, bread, ice cream, and an experimental plastic car (chassis excluded). The soybean foods became standard fare at the Ford plant cafeterias and at Ford Hospital. The ice cream—most delicious—was for years sold as Del(icious) Soy(bean) Topping" [i.e. Delsoy Topping; actually it was a soy-based whipped topping, not an ice cream].

Ford had known of the work of Dr. George Washington Carver since about 1910 but they probably first met in 1936 at the Second Dearborn Conference of the National Farm Chemurgic Council. Both were vegetarians with similar interests, and firm believers in natural foods. Dr. Carver's assistant, Mr. [Austin W.] Curtis, spent the summer (ca. 1940) working with Robert Boyer in The Soybean Laboratory.

In July 1942 Dr. Carver came to Dearborn and dedicated the "Nutritional Laboratory" of the Ford Motor Co. It was in the old Water Works building. Soon the laboratory, with its eventual 25 people under Mr. Robert A. Smith, went into volume production of soybean milk and ice cream. On 5 Jan. 1943 Dr. Carver died in Tuskegee, Alabama. The Nutritional Laboratory, soon better known as the Carver Laboratory, operated for at least a while after 1945, when Robert Smith left to go into business for himself, and Clem Glotzhober took charge. After Mr. Ford died on 7 April 1947, the building was again essentially abandoned. Address: Dearborn, Michigan.

722. Davis, Rusty. 1983. Ford Motor Company village industries. I and II. *V-8 Times* 20(4):24-29. July/Aug; 20(5):28-34. Sept/Oct.

• **Summary:** Discusses 18 of the 24 village industries developed by Henry Ford to keep farmers profitably on their farms. A man would be able to farm in the summer and work

in a factory in the winter. The first village industry to start production, Northville, began on 20 March 1920. The village industries connected with soybeans include Tecumseh/Hayden Mills (started 1935; cleaned and stored soybeans), Saline (started early 1938; soybean extraction), and Milan (started April 1938; soybean extraction, ignition coils, ammeters). Page 24 shows a 1942 map of all these industries in Michigan. At least one photo is given of each site as it currently appears. Many of the sites were originally grist mills; Ford installed a waterwheel and hydroelectric power was used to run the factories.

The site at Saline, located near the headwaters of the Saline River, had supported a grist mill for years prior to Ford's purchase of the plant in 1934; it was his eleventh Village Industry. A complete renovation was executed, a waterwheel capable of producing 80 h.p. installed, and a new building was constructed behind the original structure. Soybean extraction equipment from the Rouge was then installed...

"The extraction equipment was installed in the newly constructed building and was capable of handling 1,000 pounds of beans per hour... The oil was recovered from the solvent by evaporation. Ten tons of soybeans yielded 500 gallons of oil as well as 15,000 pounds of soy flakes. The oil, which is 18% of the flake, was sent to the Rouge for various uses. The flakes, reduced to meal, were used in the Rouge foundry as a casting core binder. Any excess meal was sold through feed and grain dealers for livestock feed.

"In 1940, Ford began to experiment with soybean water paint. After the development of a successful formula, Ford started regular production. This was not the soybean-derived paint used in automotive finishes, but was sold and used for painting buildings, etc.

"Ford usually employed an average of 19 employees at Saline and they all had the opportunity to farm Ford part-time gardens outside the plant. After production ceased in 1946, the property was sold. The original grist mill building is currently being used for a furniture store. The extraction building, with its beautiful natural pine interior, is owned by the same people and is rented out wedding receptions and parties." Photos show: (1) The original 3-story building at Saline with the word "Weller's" written in large letters across the front and side. "This building was used to store and clean soybeans. Also, equipment for soybean water paint was housed here." (2) The extraction building, located behind the original building. "This is where oil was extracted from the soybeans."

At Milan, "as at Saline, the beans were cleaned and flaked in the renovated grist mill and the [solvent] extraction was done in a specially constructed building."

Note: Talk with Ron Roller of American Soy Products (formerly of Eden Foods) in Saline, Michigan. 1991. Nov. 27. Henry Ford's soybean oil extraction plant in Saline is now called Weller's. Carl Weller, who bought the building in the

mid-1960s, has some knowledge of the history of the place. Originally it was a flour mill, built in the 1840s. Henry Ford bought it, built a new foundation, moved the building onto it, refurbished everything, and improved the millrace. Carl got rid of the remaining solvent extraction equipment. It is now an antique shop and a restaurant; people have parties there. For the last 4-5 years, Ron's company has had their Christmas party in the very place where the old oil extraction used to be located, in the carriage house. Address: 418 Borgess, Monroe, Michigan 48161. Phone: 313-241-7759.

723. Rueter, Anne; Hunt, Mary. 1983. Henry Ford's village industries: A tour of nearby village industry sites. *Ann Arbor Observer (Michigan)*. July/Aug. p. 33, 35-41.

• **Summary:** A tour with many photos based on research by Prof. David Lewis. Includes a detailed description of Saline. "David Lewis believes the village industries' operations were self-sustaining until UAW (United Auto Workers) work rules in the Forties made it increasingly difficult for the company to run the plants with the old personnel structure."

"The basic notion that agricultural products could be used in industry was perhaps Ford's most significant contribution during his last twenty years, Lewis believes."

724. *Herald and Review (Decatur, Illinois)*. 1983. Inventor sees use for TVP. Oct. 7.

• **Summary:** William T. Atkinson, the inventor of TVP, retired in 1976 as "senior research chemist for the Decatur-based Archer Daniels Midland Co. At age 72, he is a consultant to ADM. In 1970, he patented the TVP process... He later assigned the patent to ADM. Many companies, including A.E. Staley Mfg. Co., Cargill and Ralston-Purina, have purchased rights to use the process. The first products using the TVP process were sold in the early 1960s. They did not become common in grocery stores until the 1970s... Since about 1950, Atkinson had been researching ways to convert soybeans into food for human consumption..."

"In 1935, the Detroit native went to work for Henry Ford. He and other researchers in Ford's Greenfield Village developed a soybean-based fiber which was used for such products as automobile upholstery, clothing and, during World War II, felt... The soybean operation, and Atkinson's services along with it, were sold in 1943 to The Drackett Co. and moved to that company's Cincinnati, Ohio, facility. Atkinson began working for ADM in 1957 when it purchased Drackett's agricultural division. He moved to Decatur in 1969. Drackett shifted its soybean research efforts to food applications in about 1950. This was because of the development of new synthetic fibers which were superior to soybean-based fiber in making clothing and other non-food products. As a result, Atkinson's research effort shifted." A photo shows Atkinson. Address: 852 Karen Dr., Decatur, Illinois 62526. Phone: 217-877-9048.

725. Owen, David. 1983. Freezer shock. *CalToday*. Oct. 23. p. 13-16.

• **Summary:** About Rich Products' Freeze Flo, which allows (for example) frozen strawberries to be soft and sweet and firm at temperatures far below freezing. "When Bob Rich graduated from the University of Buffalo, his father gave him \$5,000. Bob used the money to make a down payment on a dairy. He disliked the milk business as intensely as his father did, but he wanted to assert his independence."

"During World War II, Rich worked for the War Production Board and was appointed milk administrator for the state of Michigan. His job was to divert excess milk supplies to thirsty American soldiers. One day he paid a visit to the George Washington Carver Laboratory, a research institution endowed by Henry Ford. The laboratory's principal activity was supplying Detroit's Ford Hospital with a product Rich had never seen before: milk made from soybeans."

"In a certain sense, Henry Ford's career can be viewed as a plot to eradicate large domestic animals. Having rendered the horse obsolete with his automobile, he had now set out to eliminate the cow. Carver scientists spent their days striving to realize their benefactor's vision of a cattle-free society. Periodically Ford threw parties for journalists at which he served nothing but milk, ice cream, hamburgers, cheese and other foods made from soybeans. He even built a soybean car."

"Ford's antagonism toward cows struck a chord in Robert E. Rich. Bob Rich, after all, was a second-generation hater of the dairy business."

"I'd always said that the cow was the most inefficient manufacturing plant in America," he explains. "Its product is 87 percent water, and it's high in bacteria, and it has to be pasteurized..."

"In November 1944, he founded Rich Products Corp. to manufacture his invention, converting his dairy's garage into the production plant for the world's first non-dairy whipped topping. Its name: Whip Topping."

"At first, Rich distributed Whip Topping to the customers on his milk routes, billing it variously as 'the Miracle Cream from the soybean' and 'Gold from the Soil.' The early months were not a fabulous success. 'We were not chemists,' an employee later admitted. But gradually Rich refined his formula, and in 1946 he was invited to make a sales presentation to a refrigerated-food distributor on Long Island. He packed some samples in dry ice and newspaper and took the overnight train to New York."

"The following morning, while 50 salesmen looked on, Rich took out his samples and discovered with horror that they had frozen solid. He began to perspire. Cow's cream, he knew, would not whip after freezing. 'I thought briefly about telling them I had brought them all together to unveil a great way to keep newspapers cold.' He stalled for as long as he could, then borrowed a knife and hacked nervously at

his frozen soybean cream until he could fit the pieces into a mixing bowl. He held his breath. 'It whipped to perfection.'

"No one was more surprised than Bob Rich. But he had the presence of mind to realize that he had done more than escape from a potentially embarrassing situation: He had invented the world's first frozen non-dairy whipped topping. That meant that his market was no longer limited to Buffalo. Now he could sell Whip Topping anywhere in the world. Quite by accident, Rich Products Corp. had entered the age of frozen food."

726. Atkinson, William T. 1983. History of work with soybeans and soyfoods, and the invention of TVP (Interview). Conducted by William Shurtleff of Soyfoods Center, Nov. 26. 6 p. transcript.

• **Summary:** In 1935 he began to work on soybeans with Robert Boyer under Henry Ford. He isolated proteins from the soybean and attempted to manufacture Azlon, an artificial wool, from spun soy protein fibers. Atkinson did the developmental work and spun the original soy protein fibers. Boyer's work was to maintain the research lab and staff for Henry Ford, who made his office in the building. Henry Ford at that time was chairman of the board and had a lot of time to devote to agricultural research. His son, Edsel, was president of the company.

From 1935 to 1949 he worked with soy protein fibers to make fabrics, and developed molded industrial plastics. In 1949 he made a major switch to developing foods made from soy protein. Starting in 1949 he developed a food grade isolated soy protein in powdered form at Drackett. He thought it was an excellent product with potential applications in products such as Gerber's Baby Food, malted milks, etc. This was the original food-grade isolated soy protein. After a lot of market research they found that nobody was interested in a food grade soy protein, even if it tasted good, and was the right color and price.

Atkinson began to work at ADM in 1957 when ADM purchased Drackett's Agricultural Division. In 1958-59 ADM started selling this soy isolate to Consolidated Foods in Texas; it was quite satisfactory and practical. In about 1959 ADM made the mistake of selling about 25 pounds of it to some company that was working with Pillsbury to incorporate soy protein isolate granules into a chili product for Pillsbury. One year later they received notification from Swift and Ralston Purina that the product could no longer be patented because a year had elapsed since it was first sold. Discouraged, they began research on other ways of making foods from defatted soy flakes.

In 1961 he started extruding his isolated soy protein into plexilamellar material. Initially he used a rubber extruder, then changed to a plastics extruder. But ADM failed to patent the extruded isolates since they were basically a commodities company with little knowledge in this patent area. No patent attorney or department was connected with the research

group until about 1963.

Work on extrusion of defatted soy flakes started in about 1961.

Note: As of May 1991 William Atkinson was still alive but he had Alzheimer's disease and was unable to talk. Address: 852 Karen Dr., Decatur, Illinois 62526. Phone: 217-877-9048.

727. Bryan, Ford R. 1983. A prized friendship: Henry Ford and George Washington Carver. *Greenfield Village Herald (Dearborn, Michigan)* 12(2):90-95.

• **Summary:** "Beginning in 1937 and continuing until Carver's death in 1943, the two men maintained a correspondence on a variety of subjects." Their letters are now in the Ford Archives and Research Library in Dearborn, Michigan. In 1896 Carver became the first black person to graduate from Iowa State University. His thesis was titled "Plants as Modified by Man." The Tuskegee Institute in Alabama was organized in 1881 by Booker T. Washington to offer practical education for black students. As head of the Tuskegee Research and Experiment Station at the Tuskegee Institute, Carver revolutionized Southern agriculture while earning a worldwide reputation. In 1906, when the boll weevil struck the cotton crop, Carver recommended peanuts as a replacement crop.

"Meanwhile Ford, having gone on to increasing success as an industrialist, became fearful that the automobile which he had helped spread far and wide had destroyed many of the traditional values to which he was committed. He therefore started on the course that in 1929 led to the establishment of The Edison Institute, comprising Henry Ford Museum and Greenfield Village. Within the village grounds, he built a chemical laboratory and a greenhouse with the objective of finding 'industrial uses for farm products.' Robert Boyer was put in charge of what was called the Chemical Plant. In his account of the plant's first year of operation in 1931, Boyer mentioned the extraction of oils from orange peels, and furfural—a liquid aldehyde—from garbage, as well as experiments with wheat, soybeans, and carrots.

"... in a building near the Engineering Laboratory in Dearborn, Dr. Edsel Ruddiman, Ford's boyhood schoolmate, was experimenting with wheat, soybeans, carrots, and tomatoes in an effort to 'make milk without a cow.'

"In early 1932, Ford issued orders to concentrate on the soybean. His tractors began to plant thousands of acres. In a 25-acre field on Greenfield Village property, some 500 experimental varieties of soybeans were grown. That year the village chemical plant extracted six tons per day of soybean oil, using it to produce soybean bread, milk, butter, ice cream, and an experimental plastic car (chassis excluded)." Carver's extremely competent research assistant was Austin W. Curtis, Jr.

In 1937 Ford and Carver first met; Carver spoke at the meeting of the National Farm Chemurgic Council in Dearborn. In March 1938 Ford made his first of several

visits to Tuskegee. After the Fords visited Carver in March 1940, Carver wrote Mrs. Ford and sent her samples of some meatless soy-based gravies he had developed. "I made this same gravy substituting the soy beans. I ground them up very fine and made a very rich milk, and to one pint of this milk I used a tablespoon of soy bean oil. This was cooked down until it creamed, became thick like the richest creamed chicken gravy.

"I hope you and Mr. Ford will try these gravies. They are so rich in protein and other food nutrients and the meat can be greatly reduced, and with some other of Mr. Ford's fine soy bean products, can be left off altogether." Ford and Carver were in complete agreement that plants, not animals, were the solution to human problems. In about 1940 Austin Curtis spent a summer in Dearborn working with Robert Boyer in the Soybean Laboratory.

"The Fords traveled to Tuskegee in early March 1941, to dedicate the George Washington Carver Museum there, inscribing their names in the cement and donating soybeans and a variety of soybean plastic car parts to be placed in the cornerstone."

In the summer of 1942 Ford had a log cabin replica of Carver's birthplace constructed in Greenfield Village and converted the abandoned Dearborn Water Works building into the "Nutritional Laboratory" of the Ford Motor Company. Carver came to Dearborn to dedicate the new laboratory and log cabin in July 1942. The laboratory, under the direction of Robert Smith, soon began producing soybean milk and ice cream. "The soybean foods became standard fare at the Ford plant cafeteria and at Henry Ford Hospital in Detroit. The ice cream—most delicious—was later marketed independently by Robert Smith, a Ford Laboratory manager, as Del(icious) Soy(bean) Topping." Note after talk with Ford Bryan (3 Dec. 1992): Delsoy Topping was a soy-based whipped topping, like whipped cream. It was not an ice cream and Robert Smith never commercialized a soy-based ice cream.

Shortly after Carver died on 5 Jan. 1943, Ford said, in a public statement, "Dr. Carver had the brain of a scientist and the heart of a saint." Address: Dearborn, Michigan.

728. Calvert, Francis E. 1984. Work with Ford and Drackett on soybeans (Interview). Conducted by William Shurtleff of Soyfoods Center, Feb. 19. 3 p. transcript.

• **Summary:** Francis (Frank) Calvert was first introduced to soybeans after he went to Detroit. In about 1931, Ford arrived at the Chemical Plant in Greenfield Village (also a lab and a pilot plant), with a 20 pound sack of soybeans. He threw them on the workbench and said, "More people eat these than anything else. There must be something awfully good about them. Why don't you fellows find out what it is." They were already doing research on agricultural wastes and chemurgy, on almost every crop you could think of.

Their first problem was getting soybeans. There were none

available. Within the next year or two they planted thousands of acres themselves. Ford plowed up a big field and planted quarter acre plots with different varieties. It was an enormous quantity. Even though they didn't know what to do with them, it was Ford's style. He did nothing small. They raised hundreds of quarter acre plots, testing different varieties.

Dr. Edsel Ruddiman, after whom Edsel Ford was named, was a nutritionist and pharmacologist. He ran the food laboratory and made lots of the foods served in the Ford cafeteria to Ford employees. They were first sold as samples, but didn't sell well because of the flavor. From about 1932-33, the products included soy milk, soy cheeses, and soy ice cream and sherbets. Soynuts were also made in a counter-current fryer in rectangular buckets on a chain. The employees ate most of the products and tourists consumed some. Food was also served from the kitchen at the Wayside Inn in the village. Products were provided as a snack, but most were given as samples, and a few were sold.

Both Atkinson and Calvert, research chemists, reported to Boyer. Calvert left Ford in 1938 and went to Drackett. Boyer and Atkinson left later to do work on soy-based plastics.

ADM bought The Drackett soybean crushing plant in about 1957. Calvert went with ADM for about 5 years, until 1960-61. From 1962-74, he worked for Ralston Purina. In December 1958 Ralston purchased Procter & Gamble's plant in Louisville, Kentucky, and were already somewhat involved with isolates; they began working with foods after 1962.

Ralston went into dietary products and infant formulas in about 1963-64, supplying soy protein isolates to most of the infant formula manufacturers such as Miles and Wyeth Labs. Ralston, Loma Linda and Worthington were the biggest suppliers of infant formula from 1962-74.

Don Walker, Vice President of Ralston Purina, took a strong interest in soy protein. Ralston took the lead primarily because of the strong interest and leadership of Hal Dean, then Chairman of the Board and CEO. Dean was the key motivating force from the early 1960s. He firmly believed in and supported soy protein development.

Ford was the father of the soybean industry in the U.S. He had an impact just through his interest in soybeans. He planted soybeans and promoted and merchandised them in the same way he promoted the industrial barn at the World's Fair in Chicago. Ford set up an extraction plant and actually extracted oil and molded gearshift balls at the Industrial Barn at the Fair. People couldn't believe their eyes! Ford was the single largest soybean grower in the U.S. at that time.

Note: Frank Calvert passed away in about 1986. Address: 1513 Northlin, Kirkwood, Missouri 63122. Phone: 314-822-3187.

729. Shurtleff, William; Aoyagi, Akiko. 1984. History of soy protein concentrates, isolates, and textured soy protein products. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 25 p. March 4. Unpublished typescript.

• **Summary:** A comprehensive history of the subject.

Contents: Definition of types of products. Part I: History of modern soy protein products from origin to 1964. Soy protein isolate: Tofu, Nagel in New York 1903, Beltzer in 1911, Ajinomoto in 1919, Cone and Brown patent in 1928, Glidden (first plant in U.S. for production of industrial grade soy protein isolate) in 1935, first study of use of soy isolates in food (Woodruff at University of Illinois, 1938), Glidden first company in the West to produce a soy protein isolate for use in food (1939, enzyme-modified), Glidden first with large-scale production of non-enzyme modified isolates (1957), Worthington Foods introduced Soyamel in 1952 (first soymilk based on isolate). Soy protein concentrates: First developed and introduced in Germany in 1925, first commercial food-grade concentrates and first patent from Griffith Laboratories in 1959. Textured soy protein products: Developed in China 1,000 years ago, made from tofu or yuba, earliest Western meat analogs developed by John Harvey Kellogg about 1896 (without soy), first synthetic industrial protein fiber (Lanital, made from casein) introduced in Italy 1936, first industrial (non-food) soy protein fibers in 1938 from Robert Boyer of Ford Motor Co. (used for upholstery), Boyer got patent for use in food (1951), rights purchased by Worthington, Dr. Harry Miller's soya loaf in 1939, Worthington first to produce a meat analog based on spun soy protein fibers in 1960, textured soy flour (TSP or TVP) introduced as food ingredient in U.S. in 1964.

Part II: History of modern soy protein products in the U.S. from 1965 to 1981. 1964 Belden report from Harvard Business School *Protein Paradox*. Commercial Protein Foods Studies Program of the U.S. Agency for International Development (AID) encouraged U.S. firms to develop protein foods for the Third World in 1967. General Mills Bac-O's test marketed 1966. Producers. February 1971 breakthrough when USDA authorized use of TVP in school lunch programs. 1972 *Soybeans. Chemistry and Technology*, edited by Smith and Circle, contained all the research on nutrition and processing up to that time. 1973 high beef prices led to beef-soy retail blends. Appearance of TSP cookbooks, starting in 1971. First World Soy Protein Conference held in Munich, Germany, in 1973. In 1974 Miles Laboratories/Worthington Foods introduced Morningstar Farms meat analogs, the first soy protein meat analog entrees marketed to mainstream America. Textured soy concentrates and other concentrate developments. New developments with isolates. New flavorings. New textured soy flour development. 1978 Keystone Conference on soy protein and human nutrition sponsored by Ralston Purina. Problems with government regulation.

Part III: History of modern soy protein products outside the U.S. and Europe (1960-1981): Japan. China. Other Asia: Philippines, India, Sri Lanka. Latin America: Colombia, Mexico. Address: Lafayette, California. Phone: 415-283-2991.

730. Chandler, Michele. 1984. Soybeans had an early friend in Henry Ford. *Detroit Free Press*. Nov. 22. p. 2A. Wayne Central.

• **Summary:** Four decades before Tofutti and other types of "soybean ice cream became the latest fashionable East Coast rage, auto magnate Henry Ford was dishing it up to his blue collar Rouge Plant workers. Ford, who rarely ate meat and had an interest in ways to promote more healthful foods, wasn't just a wizard when it came to designing cars.

"During his experiments with soybeans in the 1940s, when he was in his 70s, he devised whole meals made with the beans, which still grow on 350 acres of Ford property on Dearborn, just north of the Ford Motor Co.'s World Headquarters. Lester Twork, a Dearborn resident who taught job skills to residents at Ford's apprentice school after World War II, well remembers Ford's soybean lunches. 'Mr. Ford would make a point of saying we were having a soybean meal that day. Everything would be made out of soybeans—soybean milk, soybean whipped cream, soybean ice cream, soybean biscuits, a soybean mixture fried like hamburger,' said Twork, now a volunteer at the Henry Ford Estate—Fair Lane.

"I remember that once, Henry Ford was in line just ahead of me when people were being served cafeteria-style, with large, stainless steel trays with many compartments. He picked up some of the biscuits and turned around and told me they were quite good. I just nodded..."

"Soybeans were planted on 350 acres of Ford Motor Land Development Co.-owned land near the intersection of Ford Road and the Southfield Expressway... The current soybean farmer is none other than Mickey Redmond, the former Detroit Red Wings hockey player who now broadcasts hockey games for the Canadian Broadcasting Co."

731. Perkins, David S. 1984. The history of Drackett. Cincinnati, Ohio. 18 p. (Unnumbered). 21 cm.

• **Summary:** This interesting history, containing many photos, was written for in-house use to update the company's history and to commemorate the company's 75th anniversary in 1985. "Another new venture begun in the 1930's was soybean extraction. The Company's goal was to provide raw materials from which other products could be developed. At the pilot plant, built in 1937, research led to the development of industrial proteins [probably 'alysol'] which could be used for manufacturing paints, adhesives, emulsifiers, and shoe polish. Scientists in the Nutrition Laboratory experimented with soybean products as animal feed.

"In 1940, Drackett completed building a soybean extraction plant and storage silos in Sharonville, several miles north of the Spring Grove Avenue headquarters. A year later the plant was operating round the clock producing soybean oil, and soybean meal for cattle feed. By 1945 Drackett was one of the largest soybean processors in the Midwest.

"In 1946 Drackett began using soybean products to make molding powder and plastic preforms for the molding

industry. During this time Drackett research also developed a textile fabric, Drackett Soybean Azlon, which could be blended with rayon and either wool or cotton.

"Another soybean product Drackett marketed was Charge Dog Candy [Charge Candy for Dogs, launched in about 1949 and first mentioned in the 1949 annual report]. Its ingredients included soybeans and bone meal, and the product was to be used as a reward for training, as a special treat, and as a supplement to a dog's regular diet [Apparently dog's dated it.]

"As in other industries, World War II strongly affected Drackett. The business suffered from limited raw materials, manpower, and equipment... The Company did supply soybean fats, oils, and protein food materials to the Department of Agriculture... Once the war was over, the company quickly grew. It nearly doubled in size—from 225 employees in 1942 to 522 in 1945. More growth resulted from public financing in 1944, which provided funds for additional equipment and research."

"Although soybean extraction had helped the Company through World War II, post war conditions began to make the operation less profitable. In 1957 management decided to sell the Sharonville plant in order to concentrate Company efforts on researching, manufacturing, and marketing household cleaning products."

A page of photos shows: (1) The Sharonville soybean processing plant with its new silos. "By 1945 Drackett was the largest soybean processor in Ohio." (2) A sack of Ortho Protein, which had many industrial uses, including as a component for manufacturing shoe polish, paint, and adhesives. (3) A case of Charge Dessert for Dogs. (3) During World War II there was a shortage of cloth. Roger Drackett (left), his father Harry, Robert Boyer, and one other employee are shown "examining socks and a blanket made with Drackett Soybean Azlon. After World War II, the development of other synthetics made it less profitable to use soybean fibers for manufacturing cloth."

In 1948 Roger Drackett became president and an era of expansion began. In 1948 The Drackett Company of Canada, Ltd. was established as a subsidiary to produce and sell Drano and Windex in Canada. In 1957 and 1958 Drackett made its first bid for the night time television audience with sponsorship of two of America's favorite programs, "Wagon Train" and "Maverick." By 1963 Drackett also had branches in West Germany, England, and Australia. In 1964 Drackett stock, which had been public since 1944, was first listed on the New York Stock Exchange. In that year sales were \$58,476,246 and net profits were \$5,053,679. In 1965 Bristol-Myers acquired Drackett. In 1968 marketing for Metrecal and Nutrament was transferred to Drackett from another Bristol-Myers division. In 1972 Roger Drackett retired. As of 1984, Drackett products that are first in their category include: Windex glass cleaner, Drano drain cleaner, Vanish bowl cleaners, Renuzit air fresheners, O-Cedar mops and brooms,

Endust dust and cleaning aid, Nutrament fitness and energy food, and Twinkle, a paste cleaner for silver or copper-clad kitchen utensils. Address: Director, Public Relations, The Drackett Co., 201 East Fourth St., Cincinnati, Ohio 45202-4178. Phone: 513-632-1500.

732. Boyer, Robert A. 1985. Henry Ford, soymilk, soy ice cream, Bob Smith, Rex Diamond, and Rich Products (Interview). *SoyaScan Notes*. Jan. 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Soymilk and soy ice cream: "We made soy ice creams in the early 1930s, as a sort of by-product of our work with soymilk. We actually built quite a nice little production unit for making soymilk. It was a natural evolution to make soymilk from ice cream; we didn't learn the idea or the process from anyone. To make the ice cream, we coagulated the soymilk to make a curd, like fresh tofu, which we then dispersed (without drying it) in a colloid mill. We found we got a better product from the curd than from the soymilk itself. So you could call the final product a sort of tofu ice cream. The ice creams were made in the laboratories at Greenfield Village in Dearborn. We had 2-3 labs there. Henry Ford used to call it the Engineering Laboratory. The ice creams were served to special visitors. Mr. Ford would put on special press luncheons for journalists, food editors, etc. and soy ice cream was always on the menu. It was also served in the VIP lounge. It remained an experimental item that we and Mr. Ford would serve to impress people with the good taste and versatility of soy. We served it in the basic favorite American flavors: Chocolate, strawberry, and vanilla. I don't recall whether or not it was served at the 1934 World's Fair in Chicago [probably not], or whether it was served after the start of World War II.

"Later at Ralston Purina we made soy ice cream prototypes from soy protein isolates in order to show the potential and versatility of isolates. We served the ice creams to potential customers. I started to work with Purina in 1960 and our team (headed by Ralph Hoer and soon joined by Frank Calvert) started building an isolate plant in St. Louis, Missouri, shortly after that, so the first ice creams at Purina were probably made in about 1962-63.

"When I joined Ralston Purina, the company already had a commercial isolate plant in Louisville, Kentucky, that made industrial isolates for paper coatings. It was only after I arrived that Purina became involved in edible food-grade soy protein isolates, and these isolates are now a major, rapidly growing product line—which trace their origin back to Henry Ford.

Rich Products Corp. in Buffalo, New York got interested in soy via Rex Diamond, who worked for Henry Ford as Bob Smith's assistant. "Rex Diamond was the original spark plug for Rich. I'm not sure who had the original idea for whip toppings, coffee creamers, etc. Rex finally became the research director for Rich Products Corp. and that company

developed the first good whipped topping and coffee whitener.

“When Bob Smith went out on his own to put out his own soymilk [sic, Delsoy whip topping], Rex went with him [though several years later]. After that, Rex left Bob Smith and eventually went with Rich Products. Later there were some hard feelings between Rich Products and Rex, but I don’t know what that was all about. I once visited Rex in Buffalo, New York.” Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

733. Bourne, Dick. 1985. Rich Products Corp., Presto Foods, Rex Diamond, and the National Association for Advanced Foods (Interview). Conducted by William Shurtleff of Soyfoods Center, Feb. 12. 1 p. transcript.

• **Summary:** RGB Labs is a sister company of Presto Food Products, 1602 Forest St., Kansas City, Missouri 64108. Presto Food Products did early work using isolated soy proteins in non-dairy products. Founded in June 1936 by Melvin S. Morse in Kansas City, Missouri, the company acquired a franchise from the Instant Whip Company in Columbus, Ohio, to make Instant Whip, an aerosol dairy whipped cream. For details, see Shurtleff & Aoyagi. 1985. *Tofutti and Other Soy Ice Creams*. Address: RGB Labs, 1531 Charlotte St., Kansas City, Missouri 64108. Phone: 816-474-3342.

734. Johnson, Dale W. 1985. Work with The Glidden Company and Central Soya (Interview). Conducted by William Shurtleff of Soyfoods Center, Feb. 27. 5 p. transcript.

• **Summary:** Dale went to work for Glidden in 1948. The following people worked at Glidden: Walter Bain, Sidney Circle (who now has Parkinson’s disease), Andy Engstrom, Art Levinson (who was with Spencer Kellogg & Sons in the 1920s and 1930s before coming to Glidden), Willard C. Lighter, Ed Meyer, Joseph Rakosky. People who worked at Central Soya before Central shut down their food labs in early 1949: Louis Sair who went to Griffith Laboratories, Ken Gunther who founded Gunther Products, and E.B. Oberg who went to Glidden and then Carnation.

Industrial soy protein isolates really started commercially in about 1934. They were originally used mainly as coatings for paper, but some were used in paints, shoe polish, and other miscellaneous uses. Procter & Gamble started making industrial soy protein isolates in the late 1930s or early 1940s; they made an isolate that went into Spic and Span, a wall cleanser. The isolate served both as a good detergent and to give a coating to a painted wall to make it easier to clean the second time.

Also discusses Promine D, Amisoy, Ralston Purina, Pillsbury’s work with soy isolates, Picot Laboratory in Mexico, General Foods, Pillsbury, Morel, Sidney Circle’s move to Anderson Clayton in 1967, why Central Soya sold its isolate business to ADM, the story of how Glidden developed soy protein concentrate (first commercialized as

Promosoy by Central Soya in the early 1960s), first big sale of Promosoy in the early 1960s to Mead Johnson for use in their Metrecal Wafer (it was not used in liquid Metrecal), Central Soya’s concentrate plant at Gibson City, Illinois, Henry Ford’s researchers who did the pioneering work in whipped toppings, especially Rex Diamond who eventually went to Rich Products and ended up committing suicide, and Bob Smith who went to Delsoy, Bob Boyer and Francis Calvert went to Ralston Purina, Bill Atkinson went to ADM, Jim Liggett at Central Soya developed Rich Freeze (a soy ice cream). Address: Food Ingredients (Minnesota), Inc., 2121 Toledo Ave. No., Golden Valley, Minnesota 55422. Phone: 612-588-9456.

735. Boyer, Robert A. 1985. *Reminiscences: Automotive design—Oral history project*. Dearborn, Michigan: Henry Ford Museum and Greenfield Village. 130 p. Accession #1673.

• **Summary:** This is the transcript of an interviews conducted by Dave Crippen of the Henry Ford Museum on 7 Feb. 1985 at Mr. Boyer’s home in Dunedin, Florida. It covers all aspects of Boyer’s work with soybeans at the Ford Motor Co., including: Growing up in Royal Oak, Michigan; his father worked in the accounting department of the Ford Motor Co. at Highland Park, Michigan (p. 1). Boyer’s first meeting with Frank Campsall (p. 2). Growing up at the Wayside Inn (the oldest hotel in America, in South Sudbury, Massachusetts, p. 1-6). Attending high school in Framingham, Massachusetts (p. 6). First meeting with Henry Ford when the two ice skated together on the mill pond behind the Wayside Inn (p. 7). Moving to Dearborn in Sept. 1927 to attend Ford’s Trade School (p. 7-11). Early work at the chemical plant (quarter-size model of Iron Mountain plant) in Greenfield Village (p. 12-13). Ford’s trip to Germany [Peace Ship to Europe, in 1915 during World War I?] crystallized a lot of his thinking. The Great Depression and the origins of his chemurgic thinking. In 1934 the first National Chemurgic Conference was held at Dearborn Inn; Boyer was in charge of the program. Mr. Irene DuPont attended and Mr. Ford spent a lot of time with him. Before that, the DuPonts and the big banks did not trust Ford. (p. 14). Opening of Greenfield Village in late 1929 on the 50th anniversary of Edison’s first successful light bulb (p. 15). Chemical experiments on truckloads of farm crops using a retort; Frank Calvert (p. 16-19).

Experiments starting in about 1933 using hexane as a solvent to extract the oil from soybeans; the Ford Extractor (p. 20-23). Boyer’s group wanted to get pure protein from soybeans. So “in the lab we developed our own process for extracting the oil... We used hexane solvent, like dry cleaning. We’d flake the beans and run them through a pipe that was full of hexane on an angle with a screw in it.” Hexane solvent is “distilled out of petroleum. It has a very narrow boiling point—66° centigrade. The Ford extractor... got quite a lot of attention. We built it across the street from the chemical

plant. It was about 150 feet away. Mounted it all by itself because everybody was afraid of fire." A roof was built over it but no walls. It was probably built in about 1933.

In 1933 at the World's Fair [sic, the Ford Exposition of Progress] in New York City, Boyer's group had a glass model (on a table) of this extractor that used hexane solvent.

Note: Ford boycotted Chicago's A Century of Progress Exposition which opened in 1933, in part to call attention to the company's 30th anniversary; he held his own "industrial fair," first in Detroit and then in New York, in late 1933. *Business Week* described it as "the greatest industrial show ever held." Some 2.3 million people attended the two-week show in New York.

A working model of the Ford extractor, using hexane solvent, was at the Chicago World's Fair, starting in mid-1934, in the Ford Industrial Barn. "They would never let you do that today. Too dangerous."

Research on purified soy protein and soy plastics with formaldehyde; Bakelite (p. 24-25). Use of soy oil for foundry core binders for casting the Ford V-8 engine block; thus, the soy experiments are now commercialized. Building a 50 ton/day extractor (p. 26-27). Spinning soy protein fiber like rayon, based on spinning milk protein in Italy. Using the fibers to make wrinkle resistant synthetic wool, a suit of clothes for Henry Ford and others, overcoats, neckties, felt hats. "We also found that these fibers blended in very well with rabbit fur for making men's felt hats. So the Hat Corporation of America took all the fiber we could make. It wasn't very much and they would blend it in with rabbit fur. And they actually had them [the men's felt hats] on the market." Rabbit fur is very expensive (p. 29-36). Ford's suit of clothes contained 65% wool and 35% soy fiber. Boyer leaves Ford Motor Co. in 1943. Problem with fiber was tensile strength, especially wet strength. Ford's interest in this fiber work, and his fitness at age 75 (p. 37-38). Ford "was not a true vegetarian but he was pretty close" (p. 38). Edsel Ruddiman's work with foods (p. 39-47). Boyer and Ruddiman attend American Soybean Assoc. soybean conference in Washington, DC [in Sept. 1932] where they saw "leather-like products that the Chinese make" [yuba]. Boyer tried unsuccessfully to use the idea to make "synthetic leather." USDA's experimental farm in Holgate, Ohio, where many soybeans sent back by W.J. Morse were tested (p. 40-42). Work with soybean milk (p. 43-46). The executive dining room in the Engineering Laboratory. Henry Ford invited Boyer to lunch there about 6 times (p. 45). Development of soy ice cream; lipoxidase enzyme inactivation (p. 45-46).

Visits to Battle Creek, Michigan and Dr. John Harvey Kellogg (p. 47). Boyer's work was with industrial products; the plastic car and structural plastics with hemp, flax, and phenol formaldehyde (soya protein Bakelite resin) (p. 47-64, 70). Making trunk lids using a hydraulic press (p. 50). Ford's famous axe demonstration on a trunk lid (p. 50-52). Lowell Overly and Joe Stewart (p. 53-56, 61, 78-79). Boyer drives

the plastic car home (p. 63). Ford's aim with the plastic car: to provide industrial markets for farmers (p. 65). World War II stops plastic car development (p. 65-66). Contract to build an airplane wing of plastic (p. 66-70). The plastic lid and car contain little or no soy (p. 70). Fiberglass and the Chevrolet Corvette (p. 71). Plexiglas and the B-24 bomber made at Willow Run (p. 72). Edsel Ford's death of stomach cancer in the spring of 1943 and its effect on his father, Henry (p. 73-74). Ending work with soy fiber (p. 74).

Boyer leaves Ford in 1943 and goes to work for Drackett Co. in Cincinnati, Ohio. Wife needs to leave Detroit. After 1943 Boyer's career really takes off. Dr. Gangloff (p. 75-77). Use of soy fiber by Drackett in felt hats. "We sold them a lot of fiber and we decided to build a bigger plant." Building a protein plant and a fiber plant in Cincinnati big enough to supply the hat company's demands and larger "than we needed just to supply our fiber operation." They also had a big operation in Cincinnati for high-impact (not structural) plastic (p. 78-80). Drackett's marketing people knew how to market Windex and Drano "but they had no feeling for the soybean operation. So when Mr. Drackett died, they sold the whole soybean plant to Archer-Daniels-Midland (ADM, p. 81-83). Before Mr. Drackett died, Boyer's division had developed commercial soy products, and Drackett was making money on the plastic (phenol formaldehyde plus hemp) and the fiber (p. 81). Use of soy protein as a paper coating (p. 83). ADM finally closes the old Drackett protein plant and sells it to Central Soya, which used the million bushel elevator capacity for storage (p. 83-84).

Shortly after Mr. Drackett died, Boyer left Drackett to work on his edible soy fiber, where he owned patents. "If we can make a fiber from soy protein that resembles the outside of a sheep, why not make a fiber that will resemble the inside (p. 84-86). Idea of building an edible soy protein plant is in Cincinnati, with Mr. Drackett's approval (p. 87). Boyer tries to find companies to license rights to his landmark patent: Virginia Carolina Chemical (Taftville, Connecticut, p. 88); Swift & Co. (p. 89-92); Unilever, which was interested in peanut protein in Africa and at Port Sunlight near Liverpool (p. 92-94, 112-13); General Foods and Nabisco (Fairmont, New Jersey research lab) (p. 94, 99). Unilever and Swift pay licensing fees of \$20,000 a year plus consulting fees. General Mills and Ralston Purina (p. 94-95). Why Swift dropped its interest (p. 95-96). General Mills and Bacos (p. 96). Patent expires in 1971 after 17 years (p. 96). Worthington Foods (p. 97). Ralston Purina was getting into protein. In about 1956-58 they "had bought Procter & Gamble's protein plant in Louisville [Kentucky], which was making industrial protein for paper coating" (p. 98). Worthington Foods was too small to make their own soy protein fibers, so Ralston Purina made it for them (p. 78-80). Ralston Purina's great success with edible soy protein and their small conflict: pet food vs. human food (p. 100-01). From 1961 to 1971 Boyer was receiving licensing fees / patent royalties from Ralston

Purina, Worthington, and General Mills (p. 102). General Mills and Bacos (p. 103-04). Ralston Purina's patent lawsuit against Far-Mar-Co. Ralston won \$8 million. Boyer testified as an expert witness (p. 104-05).

Boyer remarries and retires in 1971 (p. 102, 105, 107). Subsequent work with Miles and Worthington; the Morningstar Farms line (p. 105-08). Companies now spinning soy protein fiber (two in the Netherlands, one in Japan, one in Australia). Ford Foundation was not interested in his work with soy protein for Third World nations (p. 110). Central Soya bought the ADM plant that was located in Chicago (p. 113-14). Kellogg's Corn Soya breakfast cereal (p. 114-15). Worthington's Soyloin Steaks; all early Kellogg and Worthington vegetarian products based on wheat gluten (p. 119). When Worthington bought Battle Creek they got their lady research director; she worked at Worthington until she was quite elderly. Boyer visited her in her lab at Battle Creek several times (p. 119-20. Note: Josephine F. Williams was in charge of the lab and product development at Battle Creek, where she worked closely with Dr. John H. Kellogg. She kept similar positions at Worthington Foods, according to Ron McDermott). Henry Ford as a soybean pioneer and visionary. The soybean is now America's No. 2 cash crop and also our second largest earner of foreign exchange. "That really started from Ford. When we first started in 1931, hardly anybody ever heard of the soybean, and Henry Ford's penchant for publicity publicized the soybean... He certainly made it popular and made people become aware of it. Today it's darned important." He should be remembered as the "Father of the Soybean." "I always thought it would be nice if they would rebuild the [Soybean] laboratory [in Greenfield Village] or restore it like it was when we were doing the soybean work and give it the real credit that it deserves..." (p. 120). After Henry Ford died in 1947 his family wanted no part of any of his pet projects. They completely eradicated the old Ford company (p. 121). Henry Ford was deeply interested in the welfare of American farmers. His tractors and Model T were of great use to them (p. 121). Origins of Ford's interest in chemurgy; William Hale and Dow Chemical Co. in Midland, Michigan; the first three chemurgic conferences in Dearborn, Michigan, in May 1935, 1936, and 1937 (p. 122-27). Ford and Ruddiman establish a complete canning line for good-tasting green soybeans on the outskirts of the Ford estate. The equipment was quite expensive. When World War II threatened, Ford gave it to Michigan State University to teach canning to students. (p. 129-30). Boyer's personal impressions of Henry Ford (p. 128-30). Address: 632 Edgewater Dr. #731, Dunedin, Florida 33528.

736. MacDonald, Sandy. 1985. Designer beans: Soybeans aren't stuck down on the farm anymore. High-protein, low-calorie soyfoods have gone gourmet. *New Age Journal* (Boston, Massachusetts). Feb. p. 53-59. [2 ref]

• **Summary:** An excellent introduction to soyfoods and

soyfoods companies in America today. Photos show Chandri and Gary Barat of Legume, Akiko Aoyagi and William Shurtleff "parents of the soy boom," and Tom Timmins president of Tomsun Foods.

Note: This is the earliest document seen (April 2011) that contains the term "designer beans." Though this interesting term is used in the title of this article, it does not appear in the body of the article itself. The author appears to mean that the soybean can be made into hundreds of "ingenious" and imaginative (often delicious) foods from ice cream to lasagna, from burgers to creamy dips and dressings—and industrial products, including spun soy protein fibers invented by Robert Boyer, a Ford Motor Company employee, and first put to use in the upholstery of Ford cars; they were later used to make bacon bits and meat alternatives. Address: Brighton, Massachusetts.

737. Rich, Robert. 1985. History of Rich Products Corporation's work with soy-based dairy analogs (Two interviews). Conducted by William Shurtleff of Soyfoods Center, Feb. 8 and March 20. 12 p. transcript.

• **Summary:** Bob Rich was born on 7 July 1913 in Buffalo, New York. He was one of five children of a local ice cream manufacturer, formerly a dairyman, who had switched to the ice cream business because he didn't like selling milk. During the summers Bob acquired a working knowledge of dairy plant operation at his father's ice cream plant. In 1935 he graduated from the University of Buffalo, where he was two-time captain of the football and wrestling teams. After graduation he used a \$5,000 gift from his father to make a down payment on Wilber Farms Dairy, a small milk plant in Buffalo. He eventually developed it into one of the city's leading wholesale and retail operations. But he grew to dislike the dairy business just as his father had.

"In 1942 Bob Rich, having established a reputation as a milk plant operator, was called to Washington, DC, as a consultant in the dairy section of the War Production Board. A year later he was sent to Detroit by the War Food Administration (WFA) as milk order administrator for the state of Michigan.

"One day in 1943 the chief purchasing agent of Detroit's Ford Hospital came into Rich's office in search of additional butter ration points. Rich explained that his job was concerned solely with the diversion of non-essential civilian milk supplies into the production of dry and condensed milk for the U.S. armed forces and for Lend Lease. The purchasing agent replied that the Ford Hospital was not in need of milk. The entire supply of milk and cream was produced in Dearborn, Michigan, by Henry Ford's Carver Laboratory (named after Dr. George Washington Carver)—from soybeans!

"Those last words sparked what was to become a lifelong interest for Bob Rich. He had never heard of soymilk before, but during the war he had seen the potential for dairy-like

foods. After Ford's purchasing agent had told Rich more about soymilk and soy cream, he invited Rich to visit the Carver Laboratories at Henry Ford's Greenfield Village in Dearborn, Michigan. (Note: Dearborn and Detroit are about 350 miles by road from Buffalo.) There Rich saw the continuous process, 3-vat system that Ford's researchers had developed from as early as 1940 for extracting protein from soybean flakes. The extraction equipment resembled a Rube Goldberg contraption. The protein was used as the basis for the soymilk they made for the Ford Hospital. During his visit, Bob Rich met Rex Diamond (chief chemist there), and Diamond told Rich that if Rich was interested in using soy protein to make a soy cream, he could license the rights to Ford's patented continuous protein extraction process for \$1 a year.

"In a sense Henry Ford's career can be seen as a plot to eradicate large domestic animals. Having rendered the horse obsolete with his automobile, he now set out to eliminate the cow. Ford's unspoken antagonism toward cows struck a responsive chord in Bob Rich. Though neither the protein extraction nor the soymilk formulation operations were in operation during his visit, Rich was impressed by what he saw that day. Sales of whipping cream were forbidden during the war, so he began to dream of developing a 'soy cream' that would whip. For more than a year Rich kept thinking about his new idea."

After resigning from the WFA in Oct. 1944, Bob returned to Buffalo and engaged a leading chemists and dairy engineer to help him transform his "soy whipping cream" idea into reality. The Ford Motor Co. had backed off on its original offer to license Bob the rights to their patented method of continuous protein extraction. So Bob and his advisors developed a batch process that extracted a significantly higher percentage of isolated soy protein from soy flakes—which he obtained from the Glidden Co. The flakes were first mixed with water in 300-gallon stainless steel tanks. The pH of the flakes was raised to 9.6 to extract the protein, then lowered to near the isoelectric point (pH 4.6) to precipitate the protein. After the supernatant liquid (soy whey) was removed, the isolate curd was neutralized to pH 6.9 then centrifuged with a dairy clarifier (with the discs removed) to lower the moisture content. The wet isolate was then run through cooling tubes into stainless steel settling tanks. The original "soy cream" formulation called for (in order of predominance): water, 27% soy oil shortening, corn syrup, 1.5% isolated soy protein (slurried with water), flavoring, coloring, salt, and the stabilizer they had developed (propylene glycol monostearate). In the all stainless steel processing room, the "soy cream" was pasteurized at 185°F, homogenized at 3,500 pounds pressure, then cooled to 35°F. When the product was satisfactory, Bob Rich decided to call it Whip Topping.

In November 1944, after he was satisfied he had a good protein extraction system and a good "soy cream

formulation, Bob Rich founded and incorporated Rich Products Corporation in Buffalo, New York, to manufacture his non-dairy whipped cream. He converted his dairy's 3-car garage into the production plant. Joe Robida was production manager. Whip topping hit the market in April 1945, shortly after Delsoy was introduced. It was sold as a thick liquid in a ½ pint container the shape of a truncated cone—the same shape as Delsoy's container. Both companies chose the same unique container because the machine needed to fill it was less expensive and Pure Pak refused to give a license for use of their carton to any competitor of dairy products.

Concerning Holton W. "Rex" Diamond and "The Diamond Process": "In 1952-53 [sic, about Sept. 1956] a completely new formulation of Whip Topping was added to the Rich Products line. Containing no protein, it was made using a process called 'The Diamond Process' developed and patented by Rex Diamond (the Henry Ford researcher that Rich had met on his visit to the Carver Labs), while he was working at the American Maize Co. in Chicago [actually in Whiting, Indiana, near Chicago]. But after American Maize dropped their plan to make a powdered non-dairy topping, Rich hired Diamond in 1952 [sic, Nov. 1955] and bought the rights to the patent from American Maize for about \$2,500, the cost of the legal fees they had incurred to date on the patent application process. Diamond eventually became vice president of Rich Products... Soy oil was replaced by coconut oil, which had a better flavor. A key new ingredient (stabilizer) in the non-protein whip topping was methyl ethyl cellulose, developed by Dow Chemical."

Also includes an in-depth discussion of the history of the company and its products, including soy protein isolates, soymilk, Bob Smith, Delsoy, Chil-Zert soy ice cream, Rich's Whip Topping, Freeze-Flo, Mel Morris and Presto Foods. Address: Chairman of the Board, Rich Products Corp., P.O. Box 245 (1150 Niagara St.), Buffalo, New York. Phone: 716-878-8000.

738. Shurtleff, William; Aoyagi, Akiko. 1985. Henry Ford's work with soy ice cream and other non-dairy products (Document part). In: Shurtleff and Aoyagi. 1985. *Tofutti & Other Soy Ice Creams: The Non-Dairy Frozen Dessert Industry and Market*. Vol. 1. 145 p. See p. 17, 20, 23-24.

• **Summary:** Henry "Ford's researchers did much of the important early work with non-dairy products in America, but there was no attempt to commercialize them. In the 1930s [Robert] Boyer [plus Bob Smith] and co-workers made America's first experimental whip toppings, coffee creamer, and most other dairy analogs from soymilk. The pioneering work with whip toppings played a key role in the future development of soy ice creams. By Aug. 1935 Henry Ford was serving soy ice cream for dessert at VIP and press luncheons held at the Ford Engineering Laboratory. Until the 1940s Ford's tofu ice cream remained an experimental food, meant to demonstrate the good taste and versatility of soy. When

Ford's soybean researchers finally left the Ford Motor Co. in the early 1940s, when World War II forced Ford to abandon his soybean research, they took what they had learned to a number of pioneering companies that launched successful products. Thus Ford was the fountainhead of commercial soy ice creams in America (R. Boyer 1981, 1985; Dick Borne 1985; Bob Rich 1985, personal communications; Dahlinger 1978)."

"For a while during World War II, the Ford Motor Company, as a result of Henry Ford's interest in soybean products, sold soybean 'ice cream' in its cafeterias. All the usual milk ingredients of ice cream were replaced by soy ingredients" (M.L. Anson 1958, p. 281).

"Robert E. Rich had owned a milk retail and distribution company since 1935. During World War II he was a milk order administrator for the War Food Administration in Detroit, Michigan. One day in 1943 he heard that Henry Ford's researchers had developed a soymilk plant and were producing all the milk they needed for Henry Ford's hospital during this time of milk rationing. Rich visited the Carver Laboratory (named after Dr. George Washington Carver) at Henry Ford's Greenfield Village in Dearborn (Bob Smith and Rex Diamond were top researchers on the project), studied the soymilk process, and was impressed. Sales of whipping cream were forbidden during the war; Rich began to dream of developing a whipped cream made out of "soy cream" or soy proteins. In 1944 he founded a company named Rich Products Corporation in Buffalo, New York, to make non-dairy foods. The company's first product was Rich's Whip Topping, a non-dairy whipped cream, made from isolated soy proteins that were produced from soybean flakes at Rich's plant. It was introduced on 30 March 1945, a little more than one year after Delsoy [the first soy-based whipped topping] had been introduced... It has grown in popularity over the decades and was still a best-seller in 1985."

"In the early days, Rich's got O-U kosher certification. By about 1946-47 kosher Jewish catering services in New York City (and soon thereafter housewives) had discovered that Rich's Whip Topping, so similar to real whipped cream in texture and flavor, could be used to make a completely new type of non-dairy frozen dessert. These were America's first such desserts based on isolated soy proteins. Soon an estimated 5-10% of Rich's sales of whip topping to the foodservice market were being used by other companies to make non-dairy kosher ice creams. Rich's followed this lead and in about 1951 unveiled Chil-Zert, the world's first isolate-based commercial non-dairy frozen dessert having a registered trademark."

In short, Chil-Zert was the world's first commercial soy ice cream. Unfortunately, however, due to various problems, Chil-Zert was discontinued in 1952. But by the mid-1980s Rich Products was the world's largest manufacturer of non-dairy products, with sales of \$500 million a year. (*Quick Frozen Foods* 1955, 1975; Rich Products Corp. 1983; Robert

E. Rich and Robert Boyer 1985, personal communications).

739. Kahn, E.J., Jr. 1985. Profiles (soybeans). The staffs of life. V. The future of the planet. *New Yorker* 61:50-56, 60-66, 68-85. March 11.

• **Summary:** This wide-ranging overview of the soybean, from earliest times to the present, is well written though a little patchy and scattered. Among the topics it discusses: Soybeans as a relief food. Ted Hymowitz, Benjamin Franklin, and tofu. The Shah of Iran switching to soybean oil. The attempt by the Hunt Brothers of Texas to corner the soybean market. The Nixon soybean shock. Soybeans in Brazil and Manchuria. The origin of the soybean in China and Japan. Soymilk and Dr. Harry Miller. The dissemination of the soybean to Europe and America. How the soybean became popular in America; William Morse and the USDA. Henry Ford's work with soybeans and William Atkinson. Dwayne Andreas and ADM. "There is no question in my mind but that the soybean is the fundamental future of the planet," Dwayne Andreas says.

Also discusses amaranth, the winged bean, IBPGR, loss of genetic diversity, and water shortages. The article closes with a quotation from Monkombu Sambasivan Swaminathan, the director general of the International Rice Research Institute in the Philippines: "We live in this world as guests of green plants."

740. Meyer, Edwin W. 1985. Details on work with The Glidden Company (Interview). Conducted by William Shurtleff of Soyfoods Center, April 8. 4 p. transcript.

• **Summary:** Discusses: ADM's solvent extraction plant in Chicago, Norm Witte, Central Soya's Miracle Meal (the world's first dehulled soybean meal made with a desolventizer-toaster; launched in 1952, it revolutionized the poultry industry), Central Soya's first desolventizer-toaster started operation in Decatur in May 1950, Central Soya's soy protein concentrate plants, Robert Boyer and Frank Calvert, Norman F. Kruse [pronounced Cruze], Endre F. Sipos. Elmer B. Oberg.

Say Calumet Harbor, not Calumet River; Ed thinks they acquired the 2 country elevators on the rivers but may have added on something. Ed Wilhelm might know.

Promine was used mostly by a large sausage manufacturer in Detroit, Michigan, for its functional properties. It was looked at but never used by John Morrell & Co., Armour, Swift, or Kraft—which had an all-meat image and mentality; "they never touched it."

Glidden sold Morrell a lot of soybean grits for dog food, for years during the 1930s; Morrell had a dog food company in Iowa, which made a popular canned product.

Ed had to make a rapid exodus from the Glidden Co. on Laramie after ADM bought it. They wanted to get in quickly; he left some important documents behind.

ADM did sell their lecithin through the American

Lecithin Co. in the early days, just like Glidden. Ask Joseph Eichberg about the exact nature of the agreement.

Ed wouldn't say that Glidden soy operations Chicago was struggling, but their profits were not up to Glidden's expectations so they were considered a weak division. World War II helped a lot financially, especially since the industrial protein was requisitioned by the U.S. Navy through NFS. Toward the end of the war Glidden was supplying soy flour for the relief programs to the liberated areas, especially Italy.

Oberg is too gracious to say that Central Soya bought Glidden largely for its research team. The main reason was the price was cheap; the whole works for \$14 million, including all the elevators. Central got a great deal. Some years later they sold the Calumet Harbor elevators to Cargill for \$8 million. At that time Central Soya had only a small development group under Sipos, who is still with them. He reported to Norm Kruse, starting in 1953. True, they basically had no research team. It was of equal importance to many others.

Steroids: After 1953 they had a major contract with Charles Pfizer Co. to process steroids and to sell them an intermediate for making corticoid steroids / hormones. That was the main business. They also had a little business with Charles Strauss in Montreal, Canada. "After 1953 we toll processed for Pfizer alone (that means for a given sum you process material for a certain party) so we remained in the steroids business."

Ed was an Abbott-Glidden-Upjohn fellow at Northwestern University. Abbott Labs and Upjohn were very interested in Glidden's work; they were involved in an informal joint research operation. General Mills got into making soy sterols at their Kankakee plant. Glidden put them into the business in a way. Upjohn was buying sterols from General Mills for many years. Upjohn is still using soybeans for their corticoid hormones. General Mills sold that plant to Henkel A.G., a German company.

The forerunner of Promosoy (Central Soya's soy protein concentrate) was Protein 70 (also called Pro-70), developed by E.B. Oberg. The pilot plant was built in 1959 and the full commercial plant later at the Gibson City plant. Pro-70 was developed at Glidden by Sidney Circle. He started working on the concentrate after the soy protein isolate, in about 1953-54. Pro-70 was not commercialized until after Central Soya bought Glidden's Chemurgy Div. in 1958. It was commercialized under the name Pro-70. The term Promosoy was introduced in about 1960 [sic, 1962] with the Gibson City plant. Both were exactly the same product—a soy protein concentrated. Response, their textured soy protein concentrate, was developed later under Ed Meyer's supervision.

The first formula for Rich Freeze was developed by Jim Liggett in about 1963-64; Ed was director of research at the time. It was developed partly for the Japanese market. "We [Central Soya] had an affiliate, Dai Nippon pharmaceutical,

which was selling our granular phosphatides in Japan. Dai Nippon also had a few food ingredients, principally plant gums. They thought they might sell Rich Freeze, but they bombed out" [failed].

The Cone and Brown patent which was the basis for Alpha Protein. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

741. Oberg, E.B. 1985. Re: Activities at The Glidden Co. and Central Soya Co. 1937-1943. Letter to William Shurtleff at Soyfoods Center, May 4. 4 p. Typed, with signature. Plus 2-page follow-up letter on July 30.

• **Summary:** Dr. Oberg was with Glidden from 1937-39, with Central Soya 1939-43, then director of research at Carnation from 1943 on; he did not work much with soy a Carnation. During his 2 years at Glidden he worked primarily on industrial uses of soy protein, and obtained several patents in this field. His notebook from Glidden reads: "Alpha Protein prepared in June 1939 was 117 tons, or for 22 days it was 5 tons/day. Cost was 10 cents a pound. Half of the cost was the soybeans, \$22.50/ton."

Concerning lecithin at Glidden: "My notes show that on 11 July 1939 Glidden was making 2,000 to 2,500 lb/day of lecithin. Much of it went to Texas Co., namely about 50,000 lb/month for \$0.30-\$0.33/lb. This lecithin was used as an additive for their 'Insulated' lubricating oil. 0.1% was used in oil to prevent or reduce carbon formation in auto engines. Emil Buelens was plant production manager for Glidden's lecithin program. He now lives at 1022 Marion St., Oak Park, Illinois 60302 (Phone: 312-383-4755). He played a major role in lecithin production for Glidden and also later at Central Soya."

"I know that as of Oct. 1939 Central Soya [C.S.] was not selling any lecithin but was experimenting with its separation from oil. When I left C.S. in 1943 their production rate was about 2,000,000 lb/year. In Dec. 1939 we shipped our first lecithin, 5 barrels (2,300 lb) to W.A. Cleary Corp. The second 5 drums went to Cleary on 2 Jan. 1940. Oberg was involved in this exciting lecithin program, but Norman F. Kruse (now deceased) was the driving force behind the program. He was a graduate of Iowa State University in chemical engineering. Hydrogen peroxide was used for the single bleach plus benzoyl peroxide (purchased from the Lucidol Corp. of Buffalo, New York) for the double bleach."

Mr. Oberg was very much involved in working with Central Soya's "legal beagles," the Schley and Trask firm of Indianapolis, Indiana, in trying to obtain the Kruse patent but they were turned down repeatedly. The final "turn down" came with a note that said "and this is final." "That's when Mr. George Schley and I went to the patent office in Washington, DC, and with our samples convinced the patent examiner that our process was indeed different from that of anyone else. It was an important victory for Central Soya." This development put Central Soya in competition with American

Lecithin Co. which had long monopolized that business; they were operating under the Sorensen and Beal (ADM) patent. Mr. Kruse's right hand man was C.I. "Scotty" Finlayson.

Note: Talk with Ed Meyer of Central Soya. 1993. April 7. Ed joined Central Soya on 1 Sept. 1958, so he was not there during the period 1939-43. But he thinks that during this period Central Soya made what is known in the trade as "crude lecithin." It is not refined but it was usually bleached. It could be used for industrial applications (such as a pigment dispersant in paints) or food applications.

Oberg co-authored two patents at Central Soya, both pertaining to the isolation of sterols from soybean oil. He also co-authored some at the Glidden Co. (1937-39), but Dr. Percy L. Julian's name was first on each.

During the period 1934-1943 Central Soya made quite an effort to get various companies to use its fat-free soy flour. Working with a large bakery in Fort Wayne, Indiana, they found they could replace only about 10% of the wheat flour in bread before getting reduced loaf volume. C.S. tried to get the confectionery trade to use its Mel-K-Soy soy flour in place of non-fat milk powder. The soy flour had a higher protein content and probably lower cost.

D.W. McMillen Sr. ("Mr. Mac") was very interested in the possibility of using our fat-free flour in plastics as in phenolic or urea resins. We worked with plastic companies in Ohio and Michigan. On one occasion I went to the New York area, and especially to Brooklyn, and visited a number of moulding companies. Mr. Mac couldn't believe it when I reported to him that my results were very negative.

"At one time Mr. Mac, Kruse and I visited Henry Ford's soy processing plant at Dearborn, Michigan. Robert A. Boyer had a very extensive and interesting set-up for making soy fiber from soy protein. Once Mr. Mac gave a paper, which I wrote for him, on plastics, at a service club meeting in Fort Wayne. He and Henry Ford were both dreaming of a greater use of soy products in plastics."

"Mr. Mac was very interested in the people in his company, down to the lowest man on the totem pole. He found time for personal contact with them, for he knew they were the key to the success of many projects. Mr. Mac was a great 'pepper-upper.' At sales meetings his frequent comment was 'You have only your own record to beat,' and also 'Work is a tonic.' Total laboratory personnel in Oct. 1942 was only twenty-two!"

"My first reference to Protein 70 (later called Concentrate in the industry) reads 'Protein 70 prepared and taken to Masonite Corp. on 29 Jan. 1940.' I have complete records of that lab and pilot plant work, which continued into 1941. Protein 70 was also taken to companies like Celotex, Reilly Tar Chemical Co., and Central Paper Co. Central Soya never got into commercial production of Protein 70 while I was there" (i.e. before 1943).

In our lab preparations we used 100 gm. soybean flakes, 15 liters water, and 70 cc. of 25% sulfuric acid, plus 46 cc

of 10% formalin. The mixture was stirred, allowed to stand overnight, the whey siphoned off, and the concentrate bagged off, pressed, dried and ground. 88% of the soluble carbohydrates were removed. In other preparations no formalin was added, and the product was neutralized with alkali. So the 70% protein product [soy protein concentrate] "that we made by leaching flakes at the isoelectric point was for industrial uses and not for edible uses.

"As of October 1942 we were processing about 12,000 bushels (360 tons) of soybeans per day in our solvent plant and the same amount in our expellers."

A good contact who worked on soy flour at Central Soya was Weldon "Solly" Soldner. "He was at our lab when I arrived in 1939 and he stayed long after I left in 1943. While there, he handled the soy flour and grit research. I think he is retired and living in Decatur, Indiana."

"Although we did a fair amount of work with various enzymes while I was at Central Soya, I don't believe any of it pertained to the use of enzymes to hydrolyze soy protein so as to make it a better 'whipping' compound like egg white." Address: 11228 Village 11, Camarillo, California 93010; Also: Quincy, Illinois. Phone: 805-484-3542 or 217-224-8010.

742. Photograph of Bob Smith's Delsoy plant in Dearborn, Michigan June 19. 1985.

• **Summary:** Bob Smith developed a whipped topping while working in a laboratory for Henry Ford. Smith then built a plant in the old Livonia Dairy on Telegraph Road at Harvard in Dearborn; its initial capacity was about 1,000 gallons per day. Across the front, in large raised concrete letters, we read: "Delsoy Products Corporation" (see next page).

In April 1951 Bob Smith was President, Delsoy Products, Inc., 1847 S. Telegraph Rd., Dearborn, Michigan

Note: This photo was sent to Soyfoods Center, with permission to use in this book, by Dick Folsom in Feb. 1992.

743. Culioli, J. 1985. Les procédés de texturation des matières protéiques végétales: Aspects technologiques [The processes of texturization of vegetable protein materials: Technological aspects]. In: B. Godon, ed. 1985. Protéines Végétales [Vegetable Proteins]. Paris: Technique et Documentation-Lavoisier : APRIA. xxvi + 629 p. See p. 489-522. [99 ref. Fre]

• **Summary:** Contents: Introduction. Traditional foods based on textured soy protein: Tofu, dried-frozen tofu, yuba, sufu (fermented tofu), tempeh. The principles of protein texturization. Spinning: Historical, processes, aptitude of proteins for spinning, the texture and structure of spun proteins, the techniques of spinning derived from the Boyer process. Cooking-extrusion. Other processes for texturization of protein. Conclusion. Address: Institut National de la Recherche Agronomique, Station de Recherches sur la Viande, Theix 63110 Beaumont, France.

744. Kahn, E.J., Jr. 1985. The staffs of life. Boston,



Massachusetts: Little, Brown and Co. 310 p. See p. 251-299. Index.

• **Summary:** Most of this book originally appeared, in somewhat different form, in *The New Yorker* (1985). Contents: Preface. Author's note. 1. Corn: The golden thread. 2. Potatoes: Man is what he eats. 3. Wheat: Fiat panis. 4. Rice: Everybody's business. 5. Soybeans: The future of the planet. Ely Jacques Kahn was born in 1916.

745. Ontario Soya-Bean Growers' Marketing Board. 1985. Soybeans: Nature's miracle—teaching unit. Chatham, Ontario, Canada: OSGMB. 33 p. Undated. 28 cm.

• **Summary:** This interesting portfolio of materials is designed to teach children in Ontario, Canada, about the growth development of a soybean from seed to mature plant, soybean cultivation, soybean processing and products, the importance of soybeans to Ontario's economy, and the Ontario Soya-Bean Growers' Marketing Board.

Contents: Introduction to teacher's unit. 1. From seed to pod: A brief history of soybeans in Canada, biology of the soybean seed, its germination and seedling growth, soybean nodules and rhizobia bacteria, parts of a young soybean plant, reproductive stages from flowering to maturity, corn heat units, tillage, word scramble.

2. Soybeans—Nature's miracle: A brief history of soybean

utilization, ways that soybeans are used, soy oil, meal and soyfoods, recipes, word search. 3. Imports and exports: Importance of soybeans to the economy of Canada and Ontario, how soybeans get to market, The Ontario Soya-Bean Growers' Marketing Board.

A table on page 20 shows "Soymeal consumption by Ontario's livestock and poultry." Hogs consume 45% of the total (the total is 503,000 tonnes), poultry 34%, dairy cattle 20%, and beef cattle 1%. Page 22 notes that the bulk of Ontario's soybean exports (77%) are sold to East Asia—especially Japan, Hong Kong, Singapore, Malaysia, Indonesia, and Korea. Soyfoods are listed and discussed in a positive way, with recipes for: Bran muffins (with soy flour and soy oil). Tofamole (tofu guacamole). Tofu fruit pudding. Tofu shake.

Note: This is the earliest English-language document seen (Dec. 2003) that contains the term "Tofu shake."

The three largest farm crops in Ontario in terms of total area are hay (1,050,000 ha), grain corn (902,000 ha), and soybeans (425,000 ha). Address: Chatham, ONT, Canada.

746. *Metropolitan Detroit*. 1986. Spreading Ford's soy to the world [chef Jan Willemse]. Nov. p. 22.

• **Summary:** Jan Willemse (pronounced WIL-ems), who immigrated to the U.S. from Holland in 1919, was Henry

Ford's executive chef, and was responsible for developing and preparing many of the soy recipes that Ford served frequently during the 1930s. He remembers with fondness both Henry Ford and his work cooking with soybeans. "Willemse was unable to share his employer's enthusiasm for the product until a visit by George Washington Carver. The peanut innovator had also worked wonders with soybeans and, seeing his skill, Willemse, too, became infected with the soy fever." Today, at age 86, Willemse remains a force in Michigan's culinary affairs as a top consultant for Miesel/Sysco (pronounced MAI-zul SIS-ko) Food Service Company of Canton. Concerning Henry Ford: "The old gentleman was so far ahead of his time, it was almost unbelievable."

Note: This is the earliest document seen that mentions Jan Willemse. Cathrine Ruddiman, Edsel Ruddiman's niece, recalls that Jan worked with Edsel Ruddiman on soybean foods in the 1930s. Catherine never met Jan but his name was familiar. Robert Boyer, Henry Ford's top soybean researcher for industrial non-food uses, said in an interview on 11 April 1988 that he did not know and had never heard of Jan Willemse. Researchers at the Henry Ford Museum can find no mention of Jan Willemse prior to the 1980s; they first became aware of him in the mid-1980s. Address: Michigan.

747. Green, Harvey. 1986. *Fit for America: Health, fitness, sport, and American society*. New York, NY: Pantheon Books. xvi + 367 p. Illust. Index. 28 cm. [250+* ref]

• **Summary:** This is a serious and sympathetic study of the American quest for perfect health in the period from 1830 (a watershed year in this as in so many other aspects of American culture) to 1940. The author suggests that the pursuit of physical perfection is a way to compensate for the experience of social failure. The Strong Museum, where he works, is the only major U.S. museum devoted entirely to documenting life in Victorian America [1837-1901]. The author has MA and PhD degrees from Rutgers University, New Jersey, and is presently also an adjunct professor of history at the University of Rochester, in New York.

Contents: Preface. Acknowledgments. Part I: Millennial dreams and physical realities, 1830-1860. 1. Health, medicine, and society. 2. Spices and the social order. 3. The springs (and shocks) of life. 4. "Bad air" and the "movement cure." Part II: The price of civilization, 1860-1890. 5. The sanitation movement and the wilderness cure. 6. The new "American nervousness." 7. Electricity, energy, and vitality. 8. "Muscular Christianity" and the athletic revival. Part III: Regeneration, 1890-1940. 9. Living the strenuous life. 10. Old-time quiet in a breathless age. 11. Dietetic righteousness. Epilogue. Notes. Picture credits.

Contains many interesting photos. Address: Deputy director for interpretation, Strong Museum, Rochester, New York. Home: Palmyra, New York.

748. Lacey, Robert. 1986. *Ford—The men and the machine*.

Boston and Toronto: Little, Brown and Co. xix + 778 p. Plus 48 pages of plates. Index. 24 cm. [450* ref]

• **Summary:** Contains a chapter titled "Food for Thought" (Chap. 13, p. 220-236 + photos at end) plus extensive endnotes, a 23-page bibliography, and a good map of Dearborn and Detroit. An insightful, very well researched, and slightly irreverent overview of Ford's work with soybeans and attitudes toward diet and health.

Henry Ford had a distrust of doctors. He blamed a doctor for his mother's death and for the operation that marked the end of his wife's childbearing in the 1890s. In Nov. 1932 he was admitted, at age 69, to the Henry Ford Hospital for a hernia operation. It was the first medical operation of his life. The next morning he insisted on getting up, against doctor's orders, and sitting in a chair beside his bed. Persisting with his own therapy, a week after the operation he declared himself ready to go home. Five days later he was back at work, totally cured. To his surgeon's amazement he remained cured. "It was not long before postoperative ambulation became one of the new features of treatment at the hospital."

"Old Henry Ford had always believed that we are what we eat. Dietary reform had been one of the radical new strands of thought swirling through Michigan in his youth, thanks to the Seventh Day Adventists' Western Health Reform Institute, founded in Battle Creek in 1866."

Henry Ford was a pioneer in employing Negroes and treating them fairly. William Perry, his first black worker, was employed in 1914. "By the early 1920s there were more than 5,000 blacks working for Ford and by 1926 there were double that number—a tenth of the entire work force. The Ford Motor Company employed more blacks than all other car companies put together... But Ford never paid a man more, or less, on account of his skin. Henry Ford's black employment policy was genuinely ahead of its time."

Henry Ford had been thinking in terms of chemurgy and villages for many years. "As early as 1916 he had formed a company with Edsel, 'Henry Ford & Son Laboratories' to carry out 'mechanical, botanical and chemical research.' Henry had a notion that alcohol could be distilled from vegetable matter for use as a tractor fuel, thus making the farmer totally self-sufficient, and he hired his old school friend, Dr. Edsel Ruddiman, away from his university researches to work on this. He set Dr. Ruddiman up in a corner of the Dearborn tractor plant, and here the chemist analysed all manner of vegetable produce from the ever-growing acreage of the Henry Ford farms." One of the crops he analyzed was soybeans. Ford's interest in the soybean was not primarily in its nutritional value but rather in the potential that it held for use by industry.

Of the several Western prophets who popularised the soybean, Henry Ford was the first to try growing and harvesting the crop on a major scale, using farm machinery extensively.

"Chemurgy, a technological child of populism, sprang

from the woes of American farmers in the 1920s and 1930s. As unemployment grew, there were fewer and fewer customers to purchase the abundant crops grown by farmers. Surpluses resulted and the glut sent prices plummeting. Chemurgy was based on the “hope that modern science might be able to teach farmers to produce more than just food. If the agricultural sector was producing more than people could eat, while the industrial sector was languishing, it seemed obvious that the two should get together... the latest developments in chemistry suggested that this was where the future lay. Wood was providing the raw material for the miraculous new fibre, rayon... Both the technology and ideology meshed with the causes dearest to Henry Ford’s heart, and it turned out that he had been a chemurgical pioneer all the time without realising it, since the coil cases of the 1915 Model T had been constructed from a plastic based on wheat gluten. As the chemurgical movement gathered strength in the early 1930s, its champions found a ready audience in Dearborn, and in 1935 the Dearborn Inn became the site of America’s first chemurgical conference, under the sponsorship of Henry Ford.” The first conference, and the second, held at the same location the next year, were, “like all enterprises associated with Henry Ford, a curious blend of vision and nostalgia.”

In an attempt to maintain the chemurgic spirit, Henry Ford appeared in 1939 in a silklike soya-bean tie while wearing a soya-bean suit.* (Footnote: *The suit was more fragile than its woollike texture suggested; its tailor gave Henry Ford firm orders not to cross his legs in public.)

Lacy is an Englishman, who writes non-fiction company histories. A Ballantine Books edition (832 p., 18 cm) was published in 1987. Address: England.

749. Bohy, Ric. 1987. Detroit remembers deep ties to Carver. *Detroit News*. Feb. 1. p. 1A, 4A.

• **Summary:** Austin W. Curtis, Jr. discusses memories of George Washington Carver and Henry Ford—and of the friendship and relationship between these two great men. This is the first in a series of articles that will run in *The Detroit News* during Black History Month. “What brought the three men together was chemurgy, now an all but forgotten discipline in which the idea was to find industrial uses for farm products. Carver and Curtis were practitioners. Ford was a patron. Carver’s firsts in the field easily fill a long page of small type. He discovered nearly 300 uses for the peanut alone, and for successfully promoting it as a cash crop, he is credited with saving the South from the havoc wrought by the boll weevil on its cotton fields.

“Curtis had his own firsts but risks immodesty only in speaking of one: He was the first and only of several assistants to Carver who thrived under the great man’s perfectionism and eccentricities.”

“Mr. Ford was extremely interested in anything to help the farmers,” Curtis said. “And he was interested in utilizing

their products for plastics. At one time, Ford Motor Company was doing work with that, utilizing the soybean in molding knobs for gearshift levers. The gearshift knob came out of a conversation and correspondence between Ford and Carver.”

“The first meeting between the two men came after a long period of correspondence on chemurgic research. It was in 1937, when Carver accepted an invitation to give the keynote address at a meeting in Dearborn of the National Farm Chemurgic Council, formed two years before.”

Photos show: (1) G.W. Carver and Henry Ford at a meeting in 1937. (2) Austin W. Curtis, Jr. Address: News Staff Writer, Michigan.

750. Kahn, E.J., Jr. 1987. Profiles: The absolute beginning [Dwayne Orville Andreas and ADM]. *New Yorker* 62:41-68. Feb. 16.

• **Summary:** The best biography seen of Dwayne Andreas, with emphasis on his work with soy. Contains a nice portrait (illustration, line drawing) of Andreas on the first page. Address: New York.

751. Lease, Carol Ann. 1987. Firm’s bread and butter comes from meatless foods. *Dispatch (Columbus, Ohio)*. Feb. 18. p. 2. Neighbor news section.

• **Summary:** “The inside of the Worthington Foods plant at 900 Proprietors Rd. looks like any meat packing plant... The only difference is, there’s no meat at Worthington Foods,” now in its 48th year with about 270 employees. Discusses the company’s history and 3 product lines. “Meat rationing during World War II gave the company a shot in the arm as people turned to Choplets when they couldn’t get pork chops.

“Worthington Foods still makes some peanut-based products, but most of its no-meat meats today are made from soy protein. The work of Robert Boyer, a Michigan researcher, enabled the company to spin soy into a substance resembling muscle fiber.”

David Schwantes, manager of marketing communications, said the Morningstar Farms line is in about 70% of U.S. Supermarkets. James Remer, director of manufacturing, said Scramblers, which are made from egg whites, also is the company’s fastest-growing product. Schwantes said that “a 1985 Gallup poll turned up 6 million vegetarians in the United States. That’s a five-fold increase since the last time they asked the question in 1979.

“According to the National Institutes of Health, he added, one in four households has someone on a low-cholesterol diet, whether self-imposed or recommended by a doctor...

“The company also is to break ground this spring on a 80,000-square-foot storage facility on Sinclair Rd. and is expanding manufacturing activities into second-floor areas of its Proprietors Rd. plant that now are being used for storage. All this growth is not happening without problems. The sanitary sewer line serving the plant, for example, is at capacity. Last year, a clog in the line caused sewage to back

up in the basements of homes on E. Stafford Ave. The city has suggested that Worthington Foods put in a pumping station to pump the sewage to another line or that a new sewer line be built on Proprietors Rd. to serve Worthington Foods exclusively. The latter would cost an estimated \$525,000."

752. Photographs (color) of "Chef Jan" Willemse and Dick Folsom in Dearborn, Michigan, March 28. 1987.



• **Summary:** (1) "Chef Jan" seated in an armchair. (2) Dick Folsom (left) standing next to "Chef Jan."

Note: These photos were sent to Soyfoods Center, with permission to use in this book, by Dick Folsom in Feb. 1992.

753. Willemse, Jan. 1987. Recollections of work with soyfoods and Henry Ford (Videotape). Videotaped interview conducted by Richard B. Folsom of Dearborn, Michigan, March 28. 120 min. Color.

Address: Willemse: 130 Nightingale, Dearborn, Michigan 48128; Folsom. 46000 Geddes Rd., Bldg. 434, Canton, Michigan 48188. Phone: 313-561-4088 & 313-495-1379.

754. Hapgood, Fred. 1987. The prodigious soybean. *National Geographic* 172(1):66-91. July.

• **Summary:** Superb photos and an interesting original color painting done by artist James Gurney, in the style of Norman Rockwell, shows more than 60 products containing soybean



ingredients (both food and industrial). But, except for the first 2 pages, the text of this far-ranging article is mediocre to embarrassingly erroneous; even the *National Geographic* editors didn't like it, but Hapgood refused to correct his many errors. For example, large bold print at the top of the first page reads: "For centuries Chinese have called the Soybean 'Yellow Jewel' or 'Great Treasure.' Now this prodigious bean is seen by some as a weapon against world hunger." Note: This is the earliest English-language document seen (July 2007) that uses the term "Yellow Jewel" or "Great Treasure" to refer to the soybean.

Superb photos show: Selling tofu in China. Harvesting soybeans with combines. A tractor high over the hold of a cargo ship loaded with soybeans. Making koji at Kikkoman. 42 different colors and shapes of soybean seeds. Henry Ford on 2 Nov. 1940 wielding an ax against a car trunk lid made from a highly resilient soybean-derived plastic. Yuba drying over pans of soymilk. A Japanese woman with her dried-frozen tofu drying under the farmhouse eaves. Favorite Japanese soyfoods dishes: Dengaku, Simmering tofu, yuba, and miso dumplings. Hatcho miso in vats with stones piled high on each in an earthquake-proof pyramid shape. *Mame-maki* (bean-throwing ceremony) at Setsubun, held each February in Japan; the beans are thrown from small wooden measuring boxes (*masu*). The *hari-kuyo* ceremony for broken needles in Tokyo. A martial arts master and former Shaolin temple monk in China testing his strength by plunging his arm elbow-deep into a soybean-packed barrel. Address: Boston.

755. Ascrizzi, Lynn. 1987. The little soybean miracle [at the Kersey Children's Home in Nigeria]. *55-Plus* (Waterville, Maine). Sept. 30. p. 5.

• **Summary:** For several years the staff of the International Institute of Tropical Agriculture has worked with the Kersey Home in Ogbomosho (northeast of Ibadan) in western Nigeria, teaching women how to plant, grow, and prepare

soybeans in many practical ways. Children who come to the Kersey clinic suffer from kwashiorkor and marasmus, due to protein and calorie deficiencies. They are started on soymilk and within 12-21 days show remarkable improvement. Mothers and guardians attend weekly classes on the use of soybeans in making soups, soymilk, and other dishes. According to an article in IITA research briefs, "...mothers learn to add soy flour or paste to boiling water before adding yam flour... When the women leave the clinic and return to their villages, they continue with the soy program and also teach it to other women in the villages." IITA was started by the Ford Foundation, The Rockefeller Foundation, and the Kellogg Foundation. In recent years it has been taken over by a New York organization called the International Institute of Education.

756. Barrett, Mariclare. 1987. Soyfoods almanac. *Vegetarian Times*. Nov. p. 35-38, 40. [3 ref]

• **Summary:** An overview and introduction to tofu, tempeh, miso, soy sauce, etc. with summary of some new developments. Photos show Betsey Shipley & Gunter Pfaff, Jan Belleme, Henry Ford wielding axe against trunk of car made of soybeans.

757. *SoyaScan Notes*. 1987. New Trend: Rebirth of interest in research on industrial utilization of soybeans—based on the early concept of chemurgy (Overview). Dec. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** As early as 980 A.D. the Chinese were using soy oil, mixed with tung oil, for caulking boats. It was widely used as an illuminant in homes and temples lit with wicked oil lamps, until the 1920s, when it was replaced by kerosene. By the 1920s it was widely used in China to make soft soaps (that were known for their ability to give a good lather in hard water), lacquers, paints, printing inks, and waterproof cloths and umbrellas.

By the 1500s, soybean cake began to be widely used in China as a fertilizer, primarily as a source of nitrogen and organic matter, but also for its content of phosphorus and potassium.

The earliest document seen that mentions industrial uses of soybeans in the West appeared in 1880, when L.C. Bryan, an American, noted that soy oil could be used as a substitute for linseed oil in paints, or be burned in lamps. In 1909 soybeans were first imported in significant quantities to Europe; they were purchased solely for their oil, most of which was made into soap. The world's first use of soy oil to make soap was in 1909 in England or Sweden. Manchuria was also soon using large amounts of soy oil in soaps. In 1909 Goessel, a German, developed and patented the first rubber substitute from soy oil. That same year, Henry A. Gardner of the Paint Manufacturers Assoc. of the U.S. began extensive research on the use of soy oil to partially replace linseed oil in paints and varnishes. In 1912 Beltzer, a Frenchman,

developed a soy protein plastic, Sojalithe, which he soon produced commercially on a large scale. By 1916 the main use of soy oil in America was in soaps, where it replaced cottonseed oil. In 1917 Satow, a Japanese, published the first of many articles from that country on the use of soybean proteins to make plastics.

The heyday of interest in industrial utilization of soybeans took place in America during the 1930s and Great Depression, spurred largely by the work of Henry Ford (who began focusing on soybean research in Dec. 1931), the Farm Chemurgic Council (founded in 1935), the Chemurgic movement, and the U.S. Regional Soybean Industrial Products Laboratory (founded 1936 at the University of Illinois). The goal was to make industrial products from farm crops to help depressed farmers. The soybean was one of the great success stories of the Chemurgic movement. In 1933, the peak year percentage-wise, a remarkable 70% of all soy oil in the USA went into industrial, non-food uses—primarily paints and varnishes, followed by soaps, linoleum, and oilcloth. Large amounts of soy flour were made into plywood glue, especially by the I.F. Laucks Co. In 1936, the peak year for publications, some 59 publications on industrial uses appeared. In 1935 the Glidden Co. in Chicago built the first small plant for production of industrial grade soy protein isolate, which they called "Alpha" protein.

Active work in this field accelerated during World War II, when soybeans were used to make products that were in short supply. In 1941, after imports of tropical oils from Southeast Asia had been suddenly cut off by the Japanese military, use of soy oil in industrial products skyrocketed to its historical peak in absolute terms; 74.25 million lb were used that year. Of this, 56% was used in paint and varnish, and 33% in soap. But by 1944 industrial uses of soy oil had fallen to only 17 million lb. During the 1950s, a period of huge surpluses for most U.S. farm crops (and of predicted soybean surpluses... which never materialized), research focused on industrial products that could alleviate the surpluses. During the 1960s, as surpluses disappeared, the concern for world hunger and protein shortages grew, and petroleum came to dominate industrial utilization, research switched from utilization to production.

This focus continued until the mid-1980s, when foreign soybean competition, largely from Latin America, and huge surpluses of soy oil led to a rebirth of interest in research on soybean utilization, especially industrial utilization, that could lead to new value-added products for new markets. Promising applications included soy oil for printing inks, dust suppressants, diesel fuels, and the like.

There was little interest, however, in food utilization research (other than soy oil) in the U.S. since the total amount of soybeans used in foods was still quite small, and soybean farmers feared that the resulting products would compete with meat and dairy products, which require the use of more soybeans.

758. Williams, Robert C. 1987. *Fordson, Farmall, and Poppin' Johnny: A history of the farm tractor and its impact on America*. Urbana, Illinois: University of Illinois. ix + 232 p. Illust. Index. 24 cm.

• **Summary:** A superb, highly readable yet carefully researched and analyzed history of the tractor in America. "It is divided into two large sections. The first (chapters 1 through 6) trace the chronological development of the tractor. The second (chapters 7 through 9) describe some of the social and economic consequences of the tractor and examines its impact on the farm and the individual farmer.

"Of all the farm implements, the tractor has had the greatest impact on rural life." "In one generation between 1920 and 1950, most farms in the United States changed from dependence on draft animals to dependence on mechanical power." Clearly one of the most important machines developed in the twentieth century, the tractor played a pivotal role in the "great migration from the countryside to the cities that began in the 1920s and continued through the 1950s—a time when farm production increased despite a decrease in the supply of farm labor."

Wayne D. Rasmussen (1962) has argued that "there were two major revolutions in American Agriculture: one occurred when horses and mules replaced hand tools and human muscle, and a second one when engines replaced equine muscle."

The early tractors were powered by steam from an external fire source; thus they could be called "external combustion engines." Many were used primarily as a source of power or threshing grains. They were large and unwieldy, but by the early 1880s most were self-propelled. In about 1863, Henry Ford, at the age of 12 encountered such a steam traction engine on a road near Detroit. It changed his life—and the history of the tractor—for he was determined to improve on it.

In 1892 John Froelich built the first mechanically successful gasoline tractor; it powered a thresher and pulled the rig from the field.

Surprisingly it was World War I that sparked the rise of the farm tractor in America. The European War caused an enormous drain on America's supply of horses, mules, and farm labor. "Tractor promoters used the threat of shortages to full advantage. Beginning in May 1917, Raymond Olney, the editor of *Power Farming*, pleaded with farmers to use tractors to release men for the armed services and to provide the food the allies needed. Even non-farm journals sounded a similar plea. Tractors were good for the nation, and farmers who bought tractors helped win the war... By prodigious exertion, U.S. tractor makers rolled out 62,742 units in 1917. That same year, Henry Ford launched the Fordson tractor—the first tractor produced by automobile-style mass-production assembly line methods. He first committed to make tractors in Britain, yielding to intense diplomatic pressure from the

British government which desperately needed tractors for the wartime food effort. The Fordson's price tag of \$750 f.o.b. was far below that of the competition, and it sold well. In Jan. 1922 Ford slashed the price to an all-time low of \$395. Ford's output of tractors was impressive. In March 1918, eighty units a day were rolling off the assembly line, with production expanding toward a goal of 300 units per day by December 1918. In 1920 Ford boasted that he had sold 100,000 tractors. That number represented almost twice the number of tractors in use when the Fordson was unveiled just 3 years earlier. During the 1920s Fordsons probably accounted for more than half the tractors built in America (p. 49).

Ford's big competitor was International Harvester (IH), whose main product was tractors. Cyrus H. McCormick, grandson of Cyrus Hall McCormick (who in 1831 invented the reaper) and later president of the family's IH empire, described the two warring companies as they went to battle: "Ford was backed by the most popular commercial name of the time and by the uncounted millions earned for him by his epoch-making car; and he was trying to capture a business with which he had no previous contact. International had on its side many years of training gained from contact with farmers, less capital by far, and utter inexperience with defeat.

"The six-year fight will stand as an epic in industrial competition, but in 1927 International finally surpassed Ford in the number of tractors sold to farmers. By 1928, Ford Motor Company discontinued building the Fordson in North America, and virtually withdrew from the tractor industry. International Harvester and the implement industry won its desperate fight, but the victory came in the middle of a severe agricultural depression. It was, like most victories, the result of several strengths in the winner and several weaknesses in the loser.

"Ford's mechanical surrogate in the battle with International was the Fordson tractor. At the time of its introduction, the Fordson was a remarkable machine. Henry Ford's refusal to update his tractor—similar to his freezing of the designs of the Model T and Model A—should not be permitted to overshadow the real contribution of the automaker's little gray machine.

"In its brief lifetime, the Fordson accomplished some notable feats. It imposed its configuration upon so many tractors that the design came to be thought of as the conventional pattern for tractors. It introduced mass production into the industry for the first time, making tractors economically attractive to large numbers of farmers. And despite its ultimate failure, it accelerated the trend toward carefully designed 'automotive type' engineering. Each of these accomplishments merits explanation."

"The Fordson was the first mass-produced tractor, and all of its other attributes were really ancillaries to this fact. Mass production changed the tractor itself, it revolutionized the industry, and it made the tractor effectively available to the farmer for the first time. Even after the harrowing threat

that the Fordson gave to his company, Cyrus H. McCormick still acknowledged the credit due to the Fordson. 'It is questionable,' he wrote, 'if the business of making tractors would have become a large scale industry had it not been for Ford...In 1918, the manufacturing methods employed by all tractor manufacturers were derived from implement and not automotive standards, and they were hardly up to date in terms of manufacturing progress.' The Fordson changed that.

"Mass production and the Ford-Harvester price war lowered the price of tractors to the point where a tractor cost 'less than the price of a good team of horses.'"

"Perhaps the kindest obituary for the Fordson was written long after the heat of rivalry had cooled. It was written by one who could pensively reflect upon a noble, fallen enemy. The Fordson, McCormick wrote, 'would operate successfully in so many conditions that huge numbers were sold; but it failed in so many places that ultimately farmers would have no more of it... The Fordson was a perfect theoretical answer to an imperfect practical problem.'

"By introducing mass production, the Fordson brought down the price of the tractor to the point that a much larger number of farmers could try using tractors. But it did not issue in a perfectly adapted or even a mechanically perfected machine. Rather, it increased the capital requirements and market potential of the industry to a point that such improvements were imperative. And it intensified competition to the point that further innovation was virtually inevitable."

The early tractors were designed mostly for pulling plows; they were not designed for row crops. Address: Clarendon, Texas.

759. Henry Ford Estate: Fair Lane. 1988. Invitation to Henry Ford Soy Buffet (News release). 4901 Evergreen Rod., Dearborn, MI 48128. 2 p. Jan.

• **Summary:** "In celebration of the 125th anniversary of Henry Ford's birth, you are invited to a very special soybean buffet. Soybean research captured Mr. Ford's imagination. He felt that development of the soybean would help the farmer to become more independent. In fact, Mr. Ford considered his activities in soybean development to be one of his most significant contributions to the world.

"The buffet will recreate the meal that was served to the press at the Century of Progress Exhibition in Chicago in 1934. Mr. Jan Willemse, creator of the original menu, will cater this event and be available for press interviews. Also present will be Mr. Clem Glotzhober, Mr. Bob Smith, and Mr. Austin Curtis, soybean scientists and researchers for Mr. Ford at the Nutritional Laboratory in Dearborn, and Mrs. Peggy Campbell, grandniece of the Fords and chairman of the Henry Ford Estate Development Committee.

The buffet will be served at the Henry Ford Estate in Dearborn on February 29, 1988 at 10 a.m. to 12 p.m. Shuttle busses will be on hand to take you to the Waterworks

Restaurant—formerly Ford's Nutritional Laboratory dedicated to Ford's friend George Washington Carver. This event will kick off the many activities planned for the anniversary year. Note: From Eden Foods, Tim Redmond will go and help with the food and questions; Ron Roller may go.

Talk with Alice Cerniglia (Research and Publicity) of Ford Fair Lane Estate (313-593-5590). Dr. Ruddiman was Ford's friend from school days. Jan Willemse was brought from Massachusetts, where he was a chef, to be a baker at the Ford Motor Co. cafeterias. Mr. Ford was very impressed by him. When they closed down the cafeterias, in the 1920s or 1930s, Jan became Mr. Ford's personal baker. He didn't know anything about soybeans before he met Mr. Ford, but he experimented, developed a lot of recipes, then gave them to Robert Boyer to test in the lab and analyze their nutritional composition. Jan is still very interested in soybeans and their food uses. The purpose of this event is to introduce the estate and Henry Ford to the public. He was very pivotal in many of his enterprises. They are located in Dearborn; the Henry Ford museum and Greenfield Village are located right across the street. There will be an exhibit on Ford's work with soy.

Talk with Alice Cerniglia. 1988. April 11. "About 50 media people attended the event. The food was wonderful. It was received very well and a number of articles resulted. It was a delight for Jan. He was just thrilled. He's such a delightful man. Bob Smith talked to some reporters about his non-dairy whipped cream [Delsoy] and dispenser, and his work on America's first soy ice cream."

Talk with Robert Boyer. 1988. April 11. He does not know Jan Willemse and did know about the event. He has written 40-50 pages on his autobiography but has not yet gotten to the part about his work with soy. He recently fell and broke his hip. Address: Dearborn, Michigan.

760. Photograph of (left to right) Austin Curtis, "Chef Jan" Willemse, and Bob Smith, at Fair Lane, Dearborn, Michigan, Feb. 29. 1988.

• **Summary:** Fair Lane is the name of the estate of Ford Motor Company founder Henry Ford and his wife Clara Ford in Dearborn, Michigan. Chef Jan, dressed in a toque (the tall, round, pleated, starched white hat worn by chefs) and white chef's uniform, has prepared some food (probably from soybeans), which he is explaining to the other two men (see next page).

Note: This photo was sent to Soyfoods Center, with permission to use in this book, by Dick Folsom in Feb. 1992.

761. Henry Ford Estate. 1988. Menu of dinner served at Ford Exhibit, Century of Progress. August 17, 1934. Dearborn, Michigan. 1 p.

• **Summary:** This meal was served again by chef Jan Willemse on 29 Feb. 1988.—Tomato Juice Seasoned with Soy Bean Sauce—Salted Soy Beans—Celery Stuffed with Soy Bean Cheese—Puree of Soy Bean—Soy Bean Cracker—Soy



Bean Croquettes with Tomato Sauce–Buttered Green Soy Beans–Pineapple Ring with Soy Bean Cheese and Soy Bean Dressing–Soy Bean Bread with Soy Bean Relish–Soy Bean Macaroons–Apple Pie (Soy Bean Crust)–Cocoa with Soy Bean Milk–Soy Bean Coffee–Assorted Soy Bean Cookies–Soy Bean Cakes–Assorted Soy Bean Candy–Chef Jan Willemse, food items and preparation, courtesy of the Miesel/Sysco Food Service Company of Canton, Michigan.

Note: This menu seems to differ slightly from the original 1934 menu in that it omits one dish (Soy Bean Biscuit with Soy Bean Butter) and replaces it with another (Soy Bean Macaroons). Address: Dearborn, Michigan.

762. Stanton, James M. 1988. Use of soybean oil in coatings. In: L. McCann, ed. 1988. *Soybean Utilization Alternatives*. St. Paul, MN: Univ. of Minnesota Center for Alternative Crops and Products. vi + 429 p. See p. 281-93. [3 ref]

• **Summary:** Discusses: History: Chemistry, polymerized soybean oil, oxidized oils, maleinized oils, co-polymers, alkyd resins, urethane oils. Epoxy esters. Epoxy polyester. Water systems. Future development.

Vegetable oils and paint have been linked for centuries. We know that the Egyptians grew flax hundreds of years BC and probably used linseed oil in their decorative coatings. However, it was not until the 1930s that soybean oil became

an important factor in paint and coatings. Current sales are 41% architectural coatings, 35% product finishes, and 24% specialty. "In the early 1930s three events took place that changed the future of soybean oil in paints. First, the oil modified alkyd was developed by Kienle and Hovey of General Electric. Second, Henry Ford tried to use soybean and soybean derivatives in a number of applications, most successful was the use of soybean oil alkyds in enamels for his autos. Last, but perhaps the most important, was the development of the 'four-hour enamel' by DuPont which was based on an alkyd made from soybean oil. By far the most important application for soybean oil in the coatings industry is in alkyd resins.

During the last 35 years the one most significant trend in the U.S. paint industry has been the move toward water-based coatings. Interior flat wallpaints based on alkyds and oleoresinous varnishes were replaced by water-based paints made from synthetic polymer emulsions, first styrene-butadiene and later vinyl acetate and acrylic based. The U.S. consumption of soybean oil in protective coatings peaked at about 200 million pounds per year in the late 1950s and early 1960s. Current usage is in the area of 150 to 160 million pounds per year. Total current usage of all oils in coatings is about 500 million pounds, with linseed oil and tall oil being the other major oils. Tall oil, which comes from trees, is a

resinous by-product from the manufacture of chemical wood pulp. It is often less expensive than soy oil.

It is unlikely that current trends in the use of soybean oil in coatings will change. In fact, it is likely that vegetable oil in general will continue to lose market share to petroleum-based products. If, through genetic engineering, a soybean oil with lower linolenic and higher linoleic could be developed, soybean oil would be the preferred oil. This would also be a better edible oil, high in polyunsaturates but with better stability. Address: Experience, Inc., Minneapolis, Minnesota.

763. Thurtell, Joel. 1988. Ford birthday fete spreads on history—soybeans. *Detroit Free Press*. March 1. p. 4A.

• **Summary:** On Monday, Jan Willemse, now 87, helped reproduce the all-soybean buffet that Henry Ford picked him to cater 54 years ago at the 1934 Century of Progress Exhibition in Chicago. “The occasion at the Henry Ford estate was part of the celebration of the auto tycoon’s 125th birthday—he was born July 30, 1863.” “In 1934 Willemse was a New York and Miami Beach baker who was reluctant to move to Dearborn to bake in Ford’s Dearborn Inn.” A this feast, served on 29 Feb. 1988, the soybean brownies were found to be especially tasty; said one guest, “That is the most sinfully rich thing.” A photo shows Robert Smith and Jan Willemse. Address: Free Press staff writer.

764. Crump, Constance. 1988. Soy coffee, soy cookies: Buffet salutes virtues of Ford’s beloved bean. *Ann Arbor News (Michigan)*. March 2. p. B4.

• **Summary:** Discusses favorite recipes at the buffet. “Ford considered his work in soybean development one of his most important efforts.”

“As it turned out, soy beans were edged out in plastic production by cheaper petroleum.”

“Early this week in the kitchen of Henry and Clara Ford’s estate, Fair Lane, Willemse saluted soybeans by recreating a menu he originally wrote for the Ford exhibit at Century of Progress, the Chicago World’s Fair of 1933-34.”

“Willemse, now in his 80s, still works every weekday developing recipes for the Miesel-Sysco company.”

“The buffet was the first of several events planned in celebration of the 125th anniversary of Ford’s birth planned by Fair Lane, the estate of Henry and Clara Ford.” Fair Lane is on Evergreen Road near Michigan Avenue in Dearborn.

“Bob Smith, who directed the research lab during the Great Depression, was on hand at the buffet. Ford’s interest in soy beans came about literally overnight, Smith recalled.

“Late one evening, Ford visited the lab—where a large number of experiments were underway with different crops—and found a book on soy bean cultivation. The following morning, he told the lab staff, ‘Throw out everything. I’ll be back this afternoon and I want it empty.’”

“In 1904, George Washington Carver began to experiment with soy beans.”

“Ford’s soy bean research was directed at soy bean use in plastics. He was so enthusiastic about their potential that he told the laboratory staff, ‘I don’t want you to think about anything but soybeans,’ Smith remembers.”

“Ford reportedly owned a suit made from soy bean fibers, but it was so itchy that he wore it only for photo opportunities for the press. He was more willing to eat soy bean products than to wear them. Willemse says, Clara Ford, Henry’s chief booster, was always willing to eat the nearly endless parade of soy bean-based dishes that came from the Fair Lane kitchen.” Address: Michigan.

765. Little, Sybil. 1988. Soybeans: A food for our times. *Oakland Press (Pontiac, Michigan)*. March 16. See also p. D-3. “Soybeans bring variety and good health to the table.”

• **Summary:** Recently, a soybean buffet was held, re-creating the soybean menu served at the Ford Exhibit of the Century of Progress on Aug. 17, 1934. It was part of a celebration of the 125th anniversary of Henry Ford’s birth. Included on the menu were soybean products—cheese, crackers, croquettes, buttered green soybeans, pineapple ring with soybean cheese and dressing; bread, biscuits, soybean butter, soybean crust on an apple pie, soybean milk, soybean coffee, assorted cookies and cakes and candy. Ford’s personal baker, Jan Willemse, now in his 80s, supervised the affair.

Ford had an intense interest in agriculture; some say he did more for agriculture than he did for the automobile business. his roots were in farming and his unwritten mission was to ease the burden of the farmer’s life. His Fordson tractor revolutionized agriculture as the Model T had done for transportation. In 1932, Ford issued orders to concentrate on soybean research. George Washington Carver began studying the soybean in 1904 at the Tuskegee Institute in Tuskegee, Alabama.

766. Henry Ford Estate. 1988. Henry Ford: A landmark life. Ford the agriculturist (Leaflet). Dearborn, Michigan. 6 panels.

• **Summary:** “Henry Ford made a major commitment to soybean research in 1932-33 by investing one million dollars to conduct a comprehensive program to produce plastics... By 1961, more than 8,000 new industries had resulted from the effort of this council.”

“Through exhibitions and demonstrations such as the ‘Industrialized American Barn’ at the 1933 Chicago World’s Fair, the general public saw first hand a barn equipped with a soybean processing machine which converted a ton of beans into 400 pounds of oil and 1,600 pounds of protein meal. Here millions of visitors saw examples of farmed soybean crops converted into products such as plastic radio cabinets, table tops, buttons, ash trays, steering wheels, glycerine, enamel, soap, paint, linoleum, varnish, oleomargarine, glue and protein supplement for livestock.

“Soybean plastics were replaced by petroleum plastics

after World War II.”

“Today plastics are such an integral part of American industry that it would be hard to imagine this as the new concept that it was in the late 1930s.” The Henry Ford Estate is a national historic landmark. Address: Dearborn, Michigan.

767. Scott, Jack Denton. 1988. The bean of a thousand guises. As pervasive as sunshine and almost as beneficial, the amazing soybean is the best-kept secret in the supermarket. *Reader's Digest*. March. p. 93-96.

• **Summary:** “Today some 5.5 million gallons of tofu and soy-milk-based, nondairy frozen desserts are sold annually under 30 brand names... As our No. 2 cash crop and leading farm-commodity export, soybeans contributed over \$6,500 million to our balance of payments in 1986-87... Indeed, when one considers the versatility of the bean of a thousand guises, it is not hard to imagine that it was the soybean that Jack planted to produce his magic beanstalk.”

768. Davis, Rusty. 1988. Henry's plastic car: An interview with Mr. Lowell E. Overly. *V-8 Times* 25(2):46-51. March/April.

• **Summary:** Mr. Overly was the designer of the world's first plastic car. It was the predecessor of the Chevrolet Corvette (1953) and later the Pontiac Fiero. In 1938 Mr. Overly was transferred to the Soybean Laboratory at Greenfield Village to work with Robert Boyer, who was in charge. Henry Ford established the laboratory in 1929 to do chemical research on farm products. Henry Ford was interesting in finding new industrial uses for farm products and by 1931 he had settled on soybeans as having the most promise. Mr. Boyer developed many products from soybeans he “was even able to weave a cloth from soybean fibre and about 1937 Henry Ford often sported a necktie made from the fabric. Sometime in late 1937 or early 1938 large sheets of soybean plastic were made and Mr. Ford was so proud of it that he would jump up and down on it and brag to reporters or anybody else that happened to be around that ‘... had that been sheet metal it would have been all bent out of shape.’ Later a rear deck-lid made from the plastic was fitted to Mr. Ford's car and he delighted in hitting it with an axe [ax] that he carried in the truck. However, Mr. Overly recalls that the first time Mr. Ford struck it with an axe the deck lid cracked and the axe head went through it. Later, glass fibre was mixed into the plastic and the further precaution of a rubber boot was affixed to the sharp edge of the axe. The rebound would cause the axe to fly out of Mr. Ford's hands and travel about fifteen feet before coming to rest. Satisfied with these results Mr. Ford gave orders to develop a small car with a plastic body.”

The car had a tubular steel frame. The body panels were made of plastic composed of soybean fiber in a phenolic resin with formaldehyde used in the impregnation. “The first public exposure of the car was at the annual Dearborn

Days celebration on August 13, 1941. Later it was trucked out to the Michigan State Fairgrounds where it was on display during the fair. The publicity generated was tremendous but world events caused a nearly immediate end to the plastic car as armament work took precedence over virtually everything and the plastic car was soon forgotten.”

Photos show: A portrait of Mr. Overly. Henry Ford and Robert Boyer standing by the plastic car. “Henry Ford takes a whack at his plastic deck lid. The axe had a rubber boot over the cutting edge.” Five clay models of the car, with Mr. Overly working on one. “Ford chemist Bob Boyer holds the frame mock-up beside the finished clay model in his office in the Soybean Laboratory.” The uncovered tubular steel frame of the car with its 60 horsepower V-8 engine. Mr. Overly at the wheel of his creation. “The plastic car in front of the Soybean Laboratory.” “The Soybean Laboratory as it appears today in Greenfield Village.”

Source: Ford Museum Library, Dearborn, Michigan. Vertical file: Plastics-Soybeans-Automobiles. Address: 418 Borgess, Monroe, Michigan 48161. Phone: 313-241-7759.

769. Crippen, Dave. 1988. Henry Ford and the plastic car. John Harvey Kellogg and the Battle Creek Sanitarium (Interview). *SoyaScan Notes*. April, and May 2. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Crippen's main interest is the history of automotive design. Ford R. Bryan is a volunteer who works with him. Crippen visited Robert Boyer and taped 8 hours on the history of the plastic car. He also taped an interview with Lowell E. Overly, the man who designed the car. He died about a year ago and he was quite old at the time of the interview. [Note: Fred Hapgood, author of a 1987 *National Geographic* article on soybeans, said that Overly destroyed the car because both Henry Ford and soybeans proved embarrassing]. Neither interview has been transcribed. The 72 page interview with Bob Smith and Donald Sullivan was done by Don Baut of the Dearborn Historical Museum. Dave also has two books on the Chemurgic movement written by a chemist [William J. Hale] from the Dow Chemical Co.

He grew up in Battle Creek, Michigan. During World War II the U.S. Army took over the Battle Creek Sanitarium and renamed it Percy Jones Hospital. Jones was a hero who was a quadruple amputee, and it became a center for amputee rehabilitation. It is still a center for various U.S. governmental activities. Kellogg died almost penniless. His brother, Will Keith, who built the corn flake empire, never tried to help his brother, John Harvey, in later life.

Update on the 8 hours of interviews conducted by Dave Crippen with Robert Boyer. 1993. Sept. 26. According to Ford Bryan, these tapes have now been transcribed and added to the series of “Reminiscences” now in Acc. 60, at the Research Center of Henry Ford Museum and Greenfield Village. It is Mr. Bryan's impression that Mrs. Boyer, together with her son, plans to have a biography of her husband Robert Boyer

published in the near future. Address: Research Center, Henry Ford Museum & Greenfield Village, P.O. Box 1970, Dearborn, Michigan 48121. Phone: 313-271-1620.

770. Eden Foods, Inc. 1988. Eden Foods reformulates two flavors of Edensoy (News release). 701 Tecumseh Rd., Clinton, MI 49236. 2 p. May 5.

• **Summary:** Edensoy Original and Vanilla flavors now contain no added oil. Thus an 8.45 fluid ounce serving of Edensoy Original now contains 5 gm of fat compared with 2 gm in the vanilla. Carob still has 4.5 gm of fat. The new formulation makes the products compatible with the Diabetic Food Exchanges suggested by the American Diabetic Association. An 8.45 fl. oz serving of Original Edensoy equals 1 milk exchange plus 1.5 fat exchanges.

In May the Edensoy package design won first place in the offset printing category in an international package design competition sponsored by Tetra Pak, Inc. American Soy Products is located only 30 miles from Dearborn, Michigan, where Henry Ford started his soybean research in 1932. Address: Clinton, Michigan.

771. Smith, Robert Archer. 1988. Work with Henry Ford, soymilk, and soy ice cream (Interview). *SoyaScan Notes*. May 15. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In 1931 Bob Smith began his work with Henry Ford when he was placed in charge of the Greenfield Village Experimental Greenhouse, trying to find out how waste materials from farms could be used as plant fertilizers. He grew soybeans at that time. Smith's boss was Robert Boyer, who was in charge of the Chemical Plant, later better known as the Soybean Lab. One night in about late 1931 or 1932, Henry Ford went into the library at the Chemical plant all by himself and read a book titled *The Soybean*, by Piper and Morse. The next day he met Bob Smith at the greenhouse, "Clean out everything, get rid of all the tests. I'll be back this afternoon. I want everything out of here. Serious research on the soybean started at this time.

Later William Morse of the USDA, one of the authors of the above-mentioned book, sent Bob Smith about 500 varieties of soybeans, which Smith grew out and tested on a 25 acre experimental farm.

In early 1937 Henry Ford drove Smith over to Moir House (pronounced like "More House") and on the way told Smith about how he would like to get rid of cows. Ford asked Smith to work at Moir House to develop a milk that made no use of cows. In July 1937 Bob Smith and his wife had moved into the Square House at Henry Ford's invitation. In 1938 Bob began his work on soymilk at Moir House in Dearborn. Henry Ford had lived in Moir House when he built his honeymoon house named the Square House in 1888. Ford's father had given him 40 acres of land that had timber on it. He set up a sawmill near where Moir House and lived there while he was building the Square House. Ford had the Moir

House made into a laboratory in 1937.

Bob knew Dr. Edsel Ruddiman and was aware of his work with soyfoods and soymilk; several other people were working on soymilk too. Dr. Ruddiman had a modern lab with fancy equipment and electricity. But the problem at Moir House was that there was no electricity (except for a little generated by a windmill), and therefore no grinder to grind the soybeans. So Bob decided that instead of using a mill, he would extract the protein from defatted soybean meal that had been produced using a low-temperature extraction unit at Ford's Chemical Plant in Greenfield Village. He immersed the meal in a weak solution of sodium hydroxide to extract the protein, then precipitated the protein with a mixture of hydrochloric and citric acids to make a soy protein isolate. Finally he let the solution settle and decanted off the liquid leaving the isolate solution containing about 4% protein. [Note: The soy fiber must have been removed, probably by filtration.] He neutralized the protein solution with sodium potassium phosphate (which also added key minerals found in milk), bringing the pH up to about 6.7. Then he homogenized in lightly hydrogenated soybean oil (purchased from A.E. Staley Mfg. Co. and others), plus some cane and corn sugars, and vitamins. Within several months in 1938 or 1939, using this new technique based on soy protein isolate, Smith had a soymilk that Henry Ford thought was pretty good. One day after tasting a satisfactory batch, Ford got out the little notebook he carried with him and wrote: "First good milk. No cow." He showed the note to Smith. The Ford Hospital ran nutrition tests on this soymilk using white rats.

For the next 4 years, Bob Smith made soymilk at Moir House using a small-scale batch process that produced only about 1-3 quarts (in 1-quart batches) at a time. He made a small scale soybean dryer (the size of an oil drum) at Moir House. It took a half a day to make several ounces. It was never done on a large scale.

Bob worked in the Moir House until 1942 when Henry Ford asked him to move into the new Carver Laboratory, which was formerly the Dearborn Waterworks, and to set up a continuous-process soymilk plant. It could produce about 150 gallons a day. This soymilk was served mostly at the Ford Motor Co. cafeterias and at the Henry Ford Hospital in Detroit. Most of it was served in the form of ice cream, which was called something like "Frozen Soy Custard" since they were not allowed to call it ice cream.

This ice cream was first produced after the Carver Lab was in operation. They used a typical ice cream formula except that soy cream, made at the Carver Lab by homogenizing about 15% soy oil into the soymilk, replaced the typical dairy cream. So it was a completely non-dairy product. This chilled soy cream was shipped in 10 gallon cans to an outside facility, not a commercial ice cream plant, that made the soy ice cream in batches of about 10 gallons at a time. They made various flavors of soy ice cream, including

strawberry, chocolate, and vanilla. It was very popular at the Ford cafeterias and the Henry Ford Hospital.

Smith remembers: "I thought the ice cream was very good. One night in about 1944 or 1945 Henry Ford II had a dinner at the old rotunda and had the press over. Everything was made from soybeans. It was sort of a recreation of the original 1934 World's Fair meal. We had soybean ice cream, soybean coffee, soybean croquettes. Mr. Ford's chef, Paul Foster, used to prepare all these dishes. He worked at our Laboratory when he wasn't traveling with Mr. Ford. Henry Ford II was interested in the soybean. He surprised me by the depth of his knowledge on the subject."

Some soymilk was also used in cooking, as to make soy bread. Virtually none was served as a beverage. Smith recalls, "As far as I know, the only ones who drank it were Henry Ford and his friends. Ford drank it almost every day. We either delivered it to his house, or he stopped by Moir House of the Carver Lab and picked it up. Every day we also baked him two loaves of soybean bread, which contained about 75% wheat flour and 25% soybean flour, plus some soymilk."

Ford also liked soybean sandwiches, which were made using soybean bread and locally picked weeds, such as curly dock. Clem Glotzhober, a botanist who graduated from Michigan State College, collected the weeds for Mr. Ford. He is still in Dearborn and would remember the details of soybean sandwiches.

The production of soymilk and soy ice cream stopped after Mr. Ford had a stroke. Bob Smith left the company in August 1945. Clem Glotzhober took over the soymilk production from Bob Smith and may have continued it for 6-12 months until the Carver Lab closed at the end of 1945. Address: 26351 Hollywood Ave., Roseville, Michigan 48066. Phone: 313-777-5394.

772. Smith, Robert Archer. 1988. Work with Delsoy Products (Interview). *SoyaScan Notes*. May 15. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In 1943 Bob had co-founded Delsoy Products, Inc. (with Henry Ford's complete approval) to develop, produce, and market soy-related foods. Bob ended his career with the Ford Motor Co. in Aug. 1945, when it became apparent to him that Henry Ford would soon retire. At that time, he went to work at Delsoy Products, whose main product was Delsoy, a non-dairy whipped topping made from the soymilk that Bob Smith had developed at the Ford Motor Co. One competing product was a whipping cream made with filled milk by a company in Chicago, Illinois, on Telegraph Road and Harvard, by Michigan Ave.

Originally Delsoy Topping was sold in paper cartons. In about 1946, Delsoy Products became the first to sell a non-dairy whipped topping in pressurized cans—major innovation. The new product, named Presto Whip, was a non-dairy soy-based whipped topping very similar to Delsoy Topping except that it had a lower fat content to allow it to

be used in a pressurized can. The pressure can was developed by Crown Cork and Seal to contain DDT for U.S. troops in the Pacific. Then some company developed a valve that was suitable for cream purposes. Delsoy was the first company to use the can with the valve for any food product. They couldn't put cream in the can since there was a pro-dairy law prohibiting putting anything in a can less than 3 gallons in size. So they put their soybean topping in it. Sales of the new product increased rapidly.

Presto Whip is still sold by a company in Lowell, Michigan. [Note: Whitehouse Products was purchased in 1983 by C.J. Christoff & Sons of Lowell, Michigan. The company is now called Chadalee Farms, Inc.] After Presto Whip became available, Delsoy continued to be sold to bakers who made whipped cream products, mostly in 5- and 10-gallon cans. As long as Smith was with the company, they sold both products.

Bob is not sure how much Delsoy Topping was sold. Their company would buy 500,000 pressurized cans at a time. Sometimes they produced 25,000 cans/day. Twenty people were employed in the little plant. After World War II, sales grew steadily year after year. They kept expanding their territory. The company's first real competitor was Redi-Whip, but Presto Whip had the highest sales per store. At one point Delsoy Products was negotiating with Lever Brothers, who wanted to buy the company, but the deal never worked out. At one point, Bob Rich of Rich Products Corp. in Buffalo, New York tried to hire Bob Smith.

In 1958 Harvey Whitehouse, Bob Smith's partner, bought out Bob Smith's interest in the company, and changed its name from Delsoy Products to Whitehouse Products. Later Harvey Whitehouse sold his company to the dairy in Lowell, Michigan.

Bob retired from Delsoy Products in 1963. The company was sold to the dairy in Lowell, Michigan (as described above). Delsoy is still being made as a whipped topping in a pressurized can. It still has the same label it had in 1963. Address: 26351 Hollywood Ave., Roseville, Michigan 48066. Phone: 313-777-5394.

773. Kotzsch, Ronald E. 1988. Soyfoods; A growing industry is revolutionizing the way Americans eat. (Special Advertising Supplement). *East West*. May. p. 1A-11A. Also in *Vegetarian Times*. May. p. 49-59.

• **Summary:** A well-done "advertorial" as part of America's first Soyfoods Month. Sponsored by Nasoya, Morinaga, Legume, Simply Natural, Vitasoy USA, Westbrae Natural, and Farm Foods. Each company also ran an ad in this section. Henry Ford played a key role in introducing Americans to soyfoods as with his 16-course meal at the 1934 World's Fair. Interest remained strong through World War II, then dissipated quickly. By the time Ford died in 1947, soyfoods were all but forgotten. Interest was revived and advanced from the mid-1970s on by Shurtleff and Aoyagi of the

Soyfoods Center in California. Today through the efforts of many growing companies, the industry is booming.

774. *Jewish Press (Brooklyn, New York)*. 1988. New foods products for the health conscious [Edensoy from Eden Foods, Inc.]. Sept. 22.

• **Summary:** Edensoy Original and Vanilla flavors now contain no added oil. The American Soy Products facility opened in October, 1986. It is the first U.S. facility to introduce an enzyme invalidation process in the commercial manufacture of soy-milk. In May, 1987, the Edensoy package design won first place in the offset printing category in an international package design competition sponsored by Tetra Pak, Inc. American Soy Products is only 30 miles from the Dearborn, Michigan site where Henry Ford set up research facilities in 1932 to develop products from soybeans. Note: this soy product has a tan color and does not attempt to be a dairy/milk.

775. DeKalb-Pfizer Genetics. 1988. No one's done more with soybeans since Henry Ford's tailor (Ad). *Soybean Digest*. Aug/Sept. p. 4. Southern edition only.

• **Summary:** Henry Ford believed in the soybean. In 1932 alone, he invested more than \$1 million in soybean research. Ford scientists conducted countless experiments involving some 300 soybean varieties grown on 8,000 acres of the Ford Farms. Their efforts ultimately led to car paints made from soybean oil, window trims from soybean meal and upholstery fabrics from soy protein. But it was the upholstery cloth breakthrough that gave Ford one of his most innovative ideas. As a promotion, he had a suit tailored from soy "wool". And while his suit didn't exactly revolutionize the clothing industry, it did clearly demonstrate the bean's versatility to the nation's press. And helped introduce an important new crop to the nation's farmers.

776. Eaton, Eleanor. 1988. He cooked for Henry Ford. *Dearborn Times-Herald (Michigan)*. Nov. 23.

• **Summary:** A large photo shows Jan Willemse, who knew Henry and Clara Ford well when he was head chef at Dearborn Inn, then from 1937, at Ford's private dining room at Lovett Hall in Greenfield Village. "Ford had an obsession with soybeans said Willemse. He wanted them in everything he ate whether it be cookies, cakes, or pies. He drank soybean milk and ate soybean ice cream. And yes, he insisted soybean bread was the main ingredient for the Thanksgiving turkey stuffing. 'Mr. Ford was ahead of his time in learning the value of the soybean,' said Willemse."

Willemse arrived in the USA 69 years ago from his native Holland. In 1931 in Florida he met Edsel Ford, while taking food to sailors on Edsel's yacht. Edsel told his father, Henry, about the excellent chef in Florida, and Henry wrote Willemse asking him to come to Dearborn to be head chef at the Inn. But he didn't go, because his friend told him that

Dearborn was a small town away from the rest of the world. However in 1934 Willemse received a letter from Henry Ford that made him an offer he couldn't refuse. Willemse liked the Fords very much. They were both strict but nice. "Mr. Ford was a wonderful man who didn't mince words. He'd come right out and say what he thought. He was good to me." Willemse liked to smoke now and then but Ford was dead set against cigarettes.

After retiring from his work with the Fords in 1964, Willemse became bored and accepted a job with Miesel Sysco, the largest grocery company in the nation which sells more than 30,000 items to restaurants and hotels. Willemse, who lost his wife in 1987 after 54 years of marriage, is a young 88 and lives with his cat Muffy in the comfortable home in Dearborn. He still works 5 days a week at Miesel Sysco and he likes his job.

777. Segal, Howard. 1988. "Little plants in the country": Henry Ford's village industries and the beginning of decentralized technology in modern America. *Prospects (Paris, UNESCO)* 13:181-223. *

778. Worthington Foods, Inc. 1989. The tradition of healthy choices. 900 Proprietors Rd., Worthington, OH 43085. 29 p. 29 cm. Undated.

• **Summary:** Contents: Mission statement. A tradition of excellence. Mainstream America eats healthier. Southern fried flavor... zero cholesterol: The story of Morningstar Farms Country Crisps from soybeans to shoppers. The "heart-wise" choice. Good taste plus good nutrition (A graph shows that the number of vegetarians in the USA has increased from 1 million in 1978 to 6.2 million in 1986 a six-fold increase). The good taste of natural living (the Natural Touch line, launched in 1984). Directors and officers. A history of Worthington Foods (p. 13-27). This is the best history of the company to date.

Black-and-white photos show the following early Worthington canned products: Proast, Choplets, Choplet Burger, Worthington Veja-Links (Vegetarian, Smoke Flavor, Skinless), Miller's MC Vegetarian Main Course, Worthington Soyamel.

"The breakthrough" Spun soy fiber (p. 21): Perhaps the single most innovative development in the history of the company started the day Robert Boyer paid an unannounced visit to Worthington Foods. He walked into Buller's office, introduced himself and opened an attache case full of samples wrapped in tinfoil. Buller almost jumped out of his chair. Remembering that day, he says, 'I imagine my eyes got pretty big, because he had several products there that looked very much like meat, and I realized they weren't meat.' One looked like ham, one like beef and one like lamb. When he tore one apart, it looked like the fibers of meat. Then he put it in his mouth and chewed it. Although it had the texture of meat, it tasted 'horrible.' But Buller got excited about the

possibilities of what he was seeing and called Hagle in to have a look. After chewing a piece, Hagle asked Boyer, 'Can you make it taste like anything?' Boyer assured them that he could and that it was the alcohol used to extract the protein that had given it the horrible taste. A different extraction method could produce a different product."

"Boyer was invited to work in the Worthington laboratory with Kelly Hartman, and Worthington eventually licensed his patents and hired Boyer as a consultant. Out of this relationship, a whole new line of products developed. Worthington was too small to go into the business of crushing soybeans and disposing of the oil, or of purchasing the protein extrusion or spinning equipment. So Boyer negotiated with Ralston-Purina to set up a pilot plant to make the protein for Worthington. As it turned out, Ralston-Purina made the protein, did the spinning, and Worthington bought the output and put it into new products.

"When the new Ralston-Purina plant was operational, it had the capacity of 10,000 pounds a day. Worthington was not ready for this kind of volume, but working out these difficulties involved Jim Hagle in further negotiations with executives of a large corporation. Finally, Worthington agreed to take all the production, and sales took off. The products—White Chik, Beeflike, Prosage, Stripples, and Holiday Roast (with a plastic wishbone)—were all hits.

"Hartman remembers those days as his most exciting and challenging with the company. It was a delicate problem getting other companies, like Ralston-Purina, to do a part of the research and production cycle without stealing Worthington's thunder. Many corporations got involved and took a license because they wanted to be on the cutting edge of technology. Hartman says, 'We had vice presidents sticking out our ears, coming here trying either to buy us or get in on the know-how.'

"Almost every major university in the country was interested in what was going on. Hartman says the experimental products were called a lot of good things and a lot of bad things, too. The products were called 'phony-bologna,' 'fake steaks' and 'sham ham.' Government agencies also became interested, including the Agency for International Development and the United Children's Fund."

"The first to offer frozen meat analogs." One of Worthington's new products that contained spun soy fiber was named Wham. The company that manufactured a meat product named Spam sued Worthington for infringing on their product name. A skillful presentation by Jim Hagle before the company's officers and attorneys at their headquarters in Chicago, Illinois, led to the withdrawal of the lawsuit. "Another problem with the new line of products was that they did not can well. The products deteriorated in flavor and texture under high temperatures. Freezing was the obvious answer, but this required big changes. The company had to purchase trucks for frozen delivery. In addition, at that time many stores were not equipped for frozen foods, so

Worthington supplied these stores with food freezers. It was a costly but profitable venture because it increased sales volume tremendously. Thus Worthington Foods became the first company to offer frozen meat analogs. And in October, 1963, a series of television, radio and newspaper advertisements featuring the new frozen foods was introduced. All these developments caught the attention of a number of major food companies." Address: Worthington, Ohio. Phone: (614) 885-9511.

779. Smith, Keith J.; Thompson, James. 1989. History of industrial use of soybeans. In: L.A. Johnson, ed. 1989. *New Technologies for Value-Added Products from Protein and Co-Products: Symposium Proceedings*. Ames, Iowa: Center for Crops Utilization Research. 312 p. See p. 1-8. Unnumbered.

• **Summary:** This history starts in the 1920s and focuses on the USA, with several mentions of Japan. Discusses: Henry Ford (whose soybean suit woven of soy fibers cost an estimated \$39,000), soy fiber production in Japan (in 1939 the Japanese produced 900,000 to 1,200,000 lb of it), soybean plastics, Azlon made of soy protein fiber [by The Drackett Co., Cincinnati, Ohio], the Northern Regional Laboratory (at Peoria, Illinois), soy flour adhesives for plywood, soy adhesives used in fiberboard boxes and shotgun shells, soy oil as a drying agent in paints (especially alkyd paints) and linoleum, soy protein paper coating, soy oil in fire fighting foams, as a rubber substitute (Norepol), as an anti-foaming agent, in fuels, printing inks, as a carrier for agricultural chemicals (with probable environmental advantages over petroleum-based carriers), and for control of explosive grain dust (at reasonably cool temperatures, it doesn't readily go rancid).

One of the first major thrusts of the U.S. Regional Soybean Industrial Products Laboratory, established in 1936, was development of soybean plastics. "Isolated soybean plastic was first attempted, then abandoned. The Laboratory had difficulties increasing its water resistance. But the intractable problem was that the protein isolate plastic didn't flow well enough to allow molding in injection dies.

"So they tried plastic made from soy meal instead. But it was even less water resistant than the protein isolate plastics, and had to be expensively treated to remove sugars and salts as well as heat-treated to denature the protein...

Today over 100 million lb of epoxidized soy oil is used as a plasticizer and stabilizer for vinyl plastics. "Soy oil is an anti-foaming agent in the aerated fermentation of penicillin, streptomycin and tetracyclines. An added plus is that soy oil provides nutrients to markedly increase the yield of antibiotic... Soy oil is not nearly so good a fuel as it is an anti-foaming agent. For one thing, it is too viscous for good fuel injection. It must be converted to simple alkyl esters." But these form varnish deposits on cylinder walls and fuel inlets.

"Soy oil is coming into its own as a printing ink, relatively

cheaper than the soy protein dispersions that proved too expensive in the 1940s. Soybean oil is clear so that pigment shows through better than in petroleum based inks, and soy oil ink doesn't smudge onto your fingers like regular newsprint.

"And the use of soy ink in rural newspapers, and soy oil in agricultural chemicals and grain elevators brings an immeasurable public relations benefit to people who do business with farmers. This public relations benefit frequently offsets any additional cost of using soy oil. For instance, over 1,000 newspapers now print with slightly more expensive soy oil.

"Possibly the major factor in charting the soybean's course was the discovery of vitamin B-12 not long after World War II. No longer was animal protein needed in poultry and swine rations. It could simply be inserted into formulations of only corn and soybean meal. Demand for soybean meal skyrocketed, and became the chief soybean product." Address: American Soybean Assoc., St. Louis, Missouri. Phone: 314-432-1600.

780. *SoyaScan Notes*. 1989. Florence Diamond donates the papers of Holton W. "Rex" Diamond, her husband, to the Henry Ford Museum (Overview). June 20. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** Florence Diamond (who resides at 1112 Pawnee Trail #2, Georgetown, Kentucky 40324) donated the Holton W. Diamond papers to the Henry Ford Museum on 20 June 1989. There is about 10-15 linear feet of material. The gift was received by Judith E. Endelman. The remarks on the accession record 89.432 state: "Diamond was the inventor of a non-dairy creamer and whipped topping [Wonder Whip]. Diamond's initial work was at the Carver Laboratory in the old Dearborn Water Works. Diamond subsequently sued the Rich [Products] Co. for patent infringement. The papers include at least one lab. notebook from the Carver Lab. and papers reflecting his legal battles with Rich."

781. United States District Court—Central District of Illinois. 1989. Ralston Purina Company, a corporation, Plaintiff, v. A.E. Staley Manufacturing Company, a corporation, Defendant. Supplemental findings of fact and conclusions of law pursuant to Rule 52. Case No. 84-1378. 5 p. Decided Sept. 6, 1989. Unpublished manuscript.

• **Summary:** Ralston has sued A.E. Staley for infringement of patent number 3,940,495, which was issued from the application of Ronald Flier (the "Flier application"). The Flier application was filed initially in 1964; a continuation-in-part application was filed in 1966 and a continuation was filed in 1973. The patent was issued in 1976. Staley asserted the defense of inequitable conduct.

The ADM Dutch Patent Application No. 6506477 was a printed publication, with a publication date of 22 Nov. 1965. "A reasonable examiner would have considered it highly

material in determining whether to allow the 1966 Flier application or the 1973 Flier application issue as a patent."

The record establishes by clear and convincing evidence that Robert Brukardt, the manager of Ralston's patent department, knew of the publication date of the ADM Dutch application and knew that the ADM Dutch application constituted a statutory bar to subject matter in the 1966 and 1973 Flier applications that was not supported in the 1964 Flier application. It is clear that Brukardt knew the materiality of the ADM Dutch application and intended to conceal that information from the Examiner. "Further, the record demonstrates by clear and convincing evidence that Mr. Brukardt intended to deceive, and did deceive the Examiner as to the ADM Dutch application in 1973."

The court finds no evidence whatsoever that the Examiner considered the Dutch application. The Examiner expressly informed Ralston on three occasions that he would not consider the prior art until only the most pertinent prior art was presented as was required by the PTO rules. Ralston's submission of prior art never conformed to the required format. In addition, the ADM Dutch application is not listed among the cited art on the face of the patent. The court rules that patent no. 3,940,495 (the Flier patent) "is held to be unenforceable by virtue of inequitable conduct."

782. Vlasic, Bill. 1989. Ford's dream comes true: Soybean field flourishes in shadow of auto pioneer's empire. *Detroit News*. Sept. 25. p. D-1, col. 2.

• **Summary:** Soybeans are still grown on about 400 acres in Dearborn on fields started by Henry Ford that are now part of his 2,300 acre Fairlane Development. The green plants flourish in the shadow of his empire, near a freeway, an on the outskirts of his empire. In 1937 he said: "Almost all new cars will soon be made from such things as soybeans." Ford never did build such a car commercially, but he did build prototypes. And manufactured many plastic auto parts and enamel paint from soybeans; these were part of his commercial cars.

David Crippen discusses Ford's ideas about soybeans and chemistry. "He was convinced the soybean was the savior of mankind," recalls Crippen.

During the 1920s, Henry Ford bought more than 8,000 acres of farmland throughout the state of Michigan. In 1970 the Ford Motor Co. "created Ford Motor Land Development to manage the property, believed to be the largest single tract of metropolitan land under one ownership in the United States." About 60% of that land has now been developed. The soybeans are grown on the land that has not yet been developed—but probably will be during the next 10 years.

A sidebar contains some of Henry Ford's thoughts about soybeans: "Soybeans will make millions of dollars of added income for farmers." "No matter what we may guess as to the proportion of automobile parts that can be built from the fruit of the field, our guess will fall far short of the eventual

result.” “If we want the farmer to be our customer, we must find out how we can become his customer.” “The new era will see a great distribution of industry back to the country.” Address: News staff writer.

783. Wright, David E. 1989. Waste not, want not: The Michigan roots of the Farm Chemurgic Movement. *Michigan History* 73(5):32-38. Sept/Oct. [97 footnotes]

• **Summary:** Focuses on the life and work of William J. “Billy” Hale (1876-1955). The son of a Presbyterian minister from Ada, Ohio, he received his academic training at Miami University in Ohio (BA, MA 1897), and Harvard (BA 1898, MA 1899, PhD 1902). In 1904 he joined the faculty of the University of Michigan. In 1917, at age 41, he married one of his former students, Helen Dow, daughter of Herbert H. Dow, founder and president of the Dow Chemical Co. That same year he left the university for wartime research on mustard gas at Edgewood Arsenal. In 1918 Helen died shortly after giving birth to their daughter, Ruth. Hale never remarried, but he did remain close to the Dow Chemical Co. and the Dow family for the rest of his long life. Shortly after his wife’s death, Hale and H.H. Dow had a series of talks about the future of the chemical industry. These led to the creation of the Division of Organic Research at Dow; Hale was appointed its director—a position he held from 1919 to 1934. Address: Prof. of the History of Science, Michigan State Univ., East Lansing, MI.

784. Bryan, Ford R. 1989. The Fords of Dearborn. Revised ed. Detroit, Michigan: Harlo Press. 301 p. 1st ed. 1987. [23 ref]

• **Summary:** Chapter 19, titled “Henry Ford’s friend—Dr. Carver,” discusses Ford’s work with farming and soybeans and the Carver Laboratory at Dearborn.

“Henry Ford was intensely interested in agriculture, although he seems to have been somewhat at odds with the horse and the cow. As soon as Mr. Ford began to realize a significant profit from the manufacture of automobiles (1909), he began to buy land and operate farms in the Dearborn area. With money to spend, he immediately accelerated his experiments with a farm tractor designed to replace the horse, and with a large ultra-modern dairy farm, started experiments with milk and milk products.”

“When the Dearborn Water Works ceased pumping water in the early 1930s, Mr. Ford was concentrating on Greenfield Village. Within the Village grounds a chemical laboratory and a greenhouse were built... Robert Boyer was put in charge of the Chemical Plant. Mr. Ford’s stated objective was to ‘find industrial uses for farm products... In a separate building near the Engineering Laboratory in Dearborn, Dr. Edsel Ruddiman, Henry’s boyhood schoolmate, was working with wheat, soybeans, carrots and tomatoes to ‘make milk without a cow.’

“In 1932 [sic, Dec. 1931], Mr. Ford issued orders to concentrate on the soybean. His tractors began to plant and

harvest thousands of acres. In a 25-acre field on Greenfield Village property some 500 experimental varieties of soybeans were grown. In September, 1932, Dr. Ruddiman and Mr. Boyer attended the American Soy Bean Association Convention in Washington, D.C. That year the Village Chemical Plant was extracting six tons per day of soybean oil. The Rouge started with twenty-four tons a day, followed by Milan and Saline Plants. These industries utilized the oil in making paints and plastics. The small Village Plant led the parade, however, with soybean milk, bread, ice cream and an experimental plastic car (chassis excluded). The soybean foods became standard fare at the Ford plant cafeterias and at Ford Hospital. The ice cream—most delicious—was for years sold as Del(icious) Soy(bean) Topping.

“In May, 1935, Mr. Ford hosted the First Dearborn Conference of the National Farm Chemurgic Council. This was the charter meeting of some 300 agricultural chemists who, in Mr. Ford’s replica of Independence Hall, signed a ‘Declaration of Dependence Upon the Soil.’ Again, in 1936, the same group met in Dearborn and Dr. Carver, then the Director of Research at Tuskegee Institute, was invited to attend. Mr. Ford visited with him in his suite at the Dearborn Inn. This is perhaps the first time the two had met in person. Dr. Carver now had a very competent research assistant, Mr. Austin W. Curtis, Jr...

“Mr. Curtis spent a summer (ca. 1940) in Dearborn working with Robert Boyer in The Soybean Laboratory. During these years, reports of research being conducted in Dearborn by R.H. McCarroll, Robert Smith and Robert Boyer were being forwarded to Dr. Carver...

“The Fords traveled to Tuskegee in March, 1941, where Henry and Clara dedicated the Carver Museum, inscribing their names in the cement and donating soybeans and a variety of soybean plastic car parts to be placed in the cornerstone.”

In July 1941 Carver visited Ford in Dearborn. A log cabin replica of Carver’s birthplace was dedicated. On 21 July 1942 a laboratory building on 8.3 acres on Michigan Ave. was dedicated by Dr. Carver. Initially named the “Nutritional Laboratory” of the Ford Motor Co., it later became better known as the Carver Laboratory. Outside the building a greenhouse was added and the land beside the building was planted to corn, soybeans and potatoes. “Both Dr. Carver and Mr. Ford were firm believers in natural foods.” The Laboratory, which eventually housed a staff of 25 under Mr. Robert A. Smith, went into volume production of soybean milk and ice cream. On 5 Jan. 1943 Dr. Carver died in Tuskegee.

The Carver Laboratory operated for at least a while after 1945 when Robert Smith left to go into business for himself, and Clem Glotzhober took charge. After Mr. Ford died in 1947 the building was essentially abandoned. Address: Dearborn, Michigan.

785. Johnson, Lawrence A. 1990. 75 years of soybean utilization research. 21 p. July 31. Unpublished manuscript.
 • **Summary:** This article, which draws heavily on two bibliographies by Shurtleff and Aoyagi of Soyfoods center, was published under a different title in revised and expanded form in the March and April 1992 issues of *Inform* (JAOCs). Address: Center for Crops Utilization Research, Iowa State Univ., Ames, Iowa 50111.

786. Ontario Soybean Growers' Marketing Board. 1990. Soybeans: Food of the future (Leaflet). Chatham, Ontario, Canada. 6 panels. Aug. 22 cm.
 • **Summary:** Contains a good, brief history of soybeans in Canada. Address: Box 1199, Chatham, ONT N7M 5L8, Canada. Phone: 519-352-7730.

787. Ferrell, John. 1990. Recent developments in the field of chemurgy (Interview). *SoyaScan Notes*. Sept. 27 and Oct. 16. Conducted by William Shurtleff of Soyfoods Center.
 • **Summary:** A former archivist/researcher at National Archives, he worked at *Rain* magazine in Oregon during the 1970s and is now doing book on chemurgy. He lives 5 miles from National Archives. In March of this year a conference on chemurgy was held in Washington, D.C. with Wheeler McMillen, age 97, as the keynote speaker. The proceedings are available.

Robert Boyer passed away on 11 Nov. 1989. He did not finish writing his life story and memoirs, but his wife is thinking of finishing them.

Prof. David Wright, an history of science professor at Michigan State University, is writing a history of the farm chemurgic movement. He hopes to be done in the next 1-2 years. Prof. Wright says that at the American Heritage Center in Laramie, Wyoming is the Francis Garvan Collection and the American Chemical Foundation archives, in 357 boxes. It is chaotic. John may be moving to Oregon soon. Address: P.O. Box 66336, Washington, DC 20035. Phone: 703-841-9062 HM.

788. Boyer, Nancy. 1990. In memory of Robert Boyer (Interview). *SoyaScan Notes*. Oct. 17. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Robert Boyer, died on 11 Nov. 1989 of prostate cancer. He was Henry Ford's top man with soybeans and soyfoods, and the inventor of spun soy protein fiber. Nancy is thinking seriously of having the story of his life written. She feels that his work is not that widely known or appreciated. During his last years, Robert's eyesight failed him. He took a course in writing one's autobiography. He started writing the story of his life from his childhood, but did not get very far with it because his poor eyesight prevented him from writing very much and because he did not feel comfortable dictating on tape. She has a box of his collected publications and unpublished writings. On his 80th birthday, her daughter

did a silent video for him of his life. Dave Crippen from the Ford Archives (Henry Ford Museum, Dearborn, Michigan) interviewed Boyer in Florida for about 8 hours on tape about his life and work. These tapes are now being transcribed and should be available to her and the public in 6-8 months. Nancy has unnumbered copies of the tapes. Robert attended Worthington Foods' 50th anniversary. Soyfoods Center encourages her to hire a professional writer to work with her to write the story of her husband's life. Address: 632 Edgewater Dr. #731, Dunedin, FL 33528. Phone: 813-734-2415.

789. American Soybean Assoc.; Archer Daniels Midland Co. 1990. One in a billion: The world of soybeans (Color videotape). P.O. Box 27300, St. Louis, MO 63141; 4666 Faries Parkway, Decatur, IL 62525. 14:13 minutes.

• **Summary:** Contents: 1. History: Photos show William Morse and Henry Ford. 2. Production: It grew from 9 million bushels in 1929, to 91 million in 1939, to 2,000 million today. 61% of today's crop is crushed to yield soy oil and soybean meal, 34% is exported as whole soybeans, and 5% is used for planting, animal food, and other uses. 3. Processing: Shows the ADM crushing plant at Decatur, Illinois, which can convert 170 truckloads/day of soybeans into oil and meal. The crushing process is shown. "Oil is drawn from the crushed beans by using a special solvent." Crushing yields oil and meal.

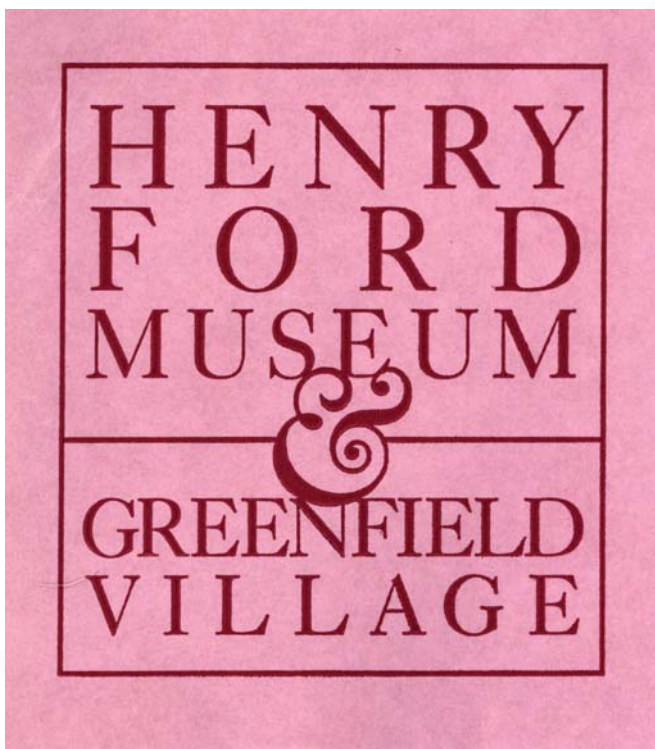
4. Health and economic benefits: States that "clearly the most important source of energy known to man is protein, the energy that fuels basic human existence. Soybeans are the most efficient and abundant source of protein in the world." This soy protein is used mainly to produce animal products, but it can also be used directly in foods. "Soy flours are also popular in developing countries because pound for pound they contain twice as much protein as cheese, three times the protein of meat and fish, and four times the protein of eggs. Soybeans are also the highest natural source of dietary fiber." John W. Erdman discusses the health benefits of soy protein isolate. "Soybeans are good for the environment and help preserve precious natural resources. No other food produces more edible protein per acre than soybeans. As a comparison, cattle, which graze on land unsuitable for soybean production, can produce 58 lb of edible protein per acre, while soybeans furnish 584 lb of edible protein from a single acre. Emphasis is placed on the health benefits of soy oil and the problems of cholesterol and saturated fats; the rest of the video is basically a promotion for soy oil. 5. The Soy Mark: Used to identify "SoyOil" to an increasingly health conscious public. 6. Industrial uses: Soy oil has been used in printing inks since 1987, and is also used to control grain dust. It can also make feed more palatable, digestible, and nutritious for the animals they feed, In fact, research shows, as a dietary supplement, each percent of soybean oil added to a hog's diet will result in a 1% improvement in daily gain

and a 2% improvement in feed efficiency.” 7. Environmental benefits: Especially from replacing the volatile organic petroleum compounds in printing inks with soy oil. 8. The Soy Seal: Used to identify industrial products containing soy oil.

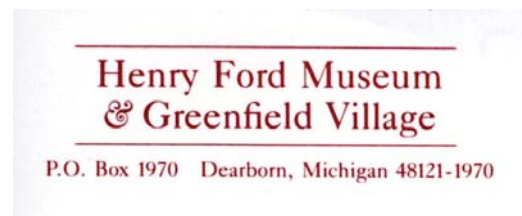
This video is directed at teachers, community groups, and consumers who may not be familiar with the soybean industry. Address: St. Louis, Missouri; Decatur, Illinois. Phone: 314-576-1770.

790. Bryan, Ford R. 1990. *Beyond the Model T: The other ventures of Henry Ford*. Detroit, Michigan: Wayne State University Press. 205 p. Illust. Index. 29 cm.

• **Summary:** Discusses the great diversity of enterprises pursued by Henry Ford during his long business career, including his work with soybeans, chemurgy, and a sustainable society. A full-page black-and-white photo opposite the title page shows Henry Ford on his 78th birthday in 1941 in a wheat field wearing a suit of soybean fabric. Includes discussions of: Ford's English estate (Fordson Estates Ltd. and Boreham House; 5,000 acres of farmland in the historic Chelmsford district of Essex, 30 miles northeast of London, England).



Waterpower (Chap. 4) and Ford's hydro-electric power plants, including those on the Saline River at Milan and Saline, which these were used for soybean processing. "As a boy, Henry Ford was intrigued by flowing water. When he went with his father to nearby Coon's Mill on the Rouge River where their corn and wheat were ground, he observed the waterwheel furnishing the power for grinding the grain.



As schoolboys, he and his friends constructed a small dam in a ditch [in front of the Miller School at Dearborn]... and ran a homemade wheel to the delight of the other children. A painting on page 46 attempts to recapture this childhood waterwheel. A map (#77015) on page 50 shows the location of Ford Village Industries in southeastern Michigan. A large photo (p. 51, taken in May 1938; #188-23330) shows the renovated old gristmill at Saline, Michigan. In the background is the original 4-story gristmill building, in the foreground is the new solvent extraction building, and running under the original building is the stone-lined mill race, with water running in it.

Chapter 12, "Ford Farms," notes: "Henry Ford was perhaps first and foremost a farmer, though with a well-recognized mechanical talent. His ancestors had been eking out an existence on a small patch of leased stony earth in Southern Ireland for generations. So Henry's father, as might be expected, soon after reaching America as a young man, exhibited a strong land-hungry appetite—accumulating more than two hundred acres of rich Dearborn soil in his own name within a span of about ten years... But in 1902, three years before his father died, Henry had bought the homestead property and evidenced his continuing interest in agriculture. Henry turned out to be infinitely more land-hungry than his father." At the peak of his holdings, Ford owned more than 3 million acres worldwide, an area about the size of Connecticut. "Near Dearborn were the fabulous Henry Ford Farms of southeastern Michigan," which Henry Ford supervised closely... Beginning in 1932 Ford chose soybeans as the ideal crop for combined farm and industrial use... During 1932-33 he is said to have spent about \$1,225,000 on soybean experiments involving 300 varieties. Nearly 7,400 acres were planted to soybeans on his farms in Lenawee County yielding more than 100,000 bushels." Varieties there included Itosan [Ito San], Manchu, Early Brown, and Black Eyebrow (p. 112-13).

In the town of Richmond Hill (17 miles south of Savannah, Georgia) Ford conducted the Richmond Hill Experiment—which turned out to be "a dramatic social and economic revolution." As part of this, he built the George Washington Carver School. Starting in 1937, agricultural research was prominent on his Georgia plantation, under the supervision of H.K. Ukkelberg (formerly one of Thomas Edison's chemists). In 1937 "about 350 varieties of soybeans (Henry's favorite crop) were grown and tested for oil content, resulting in selection of a variety yielding 22% oil, to which the name Seminole was given. Experiments with the spacing

of soybeans in rows showed how to increase yields. Use of basic slag as a soil conditioner was found to increase yields by 30 to 40 percent.” Moreover, alcohol, made from sweet potatoes and from rice, was blended with gasoline for use as a motor fuel. Tung trees, perilla, crotalaria, chia, abutilon, goldenrod (as a potential source of rubber), and many other crops were also tested. Address: Historical researcher, Henry Ford Museum and Greenfield Village, Dearborn, Michigan.

791. Henry Ford Museum & Greenfield Village. 1990. 1989 annual report. Dearborn, Michigan. 32 p. 28 cm.

• **Summary:** This report celebrates HFM&GV’s 60th anniversary as a major educational force; it was founded by Henry Ford in 1929. In 1988 the organization’s revenues were \$16.6 million plus \$3.565 million of endowment fund income. The main sources of revenues were “Admissions” 28.8%, food sales 23.0%, endowment income 19.5%, merchandise sales 12.5%, memberships and annual passes earned 7.2%, etc. Expenses were: Maintenance and utilities 19.7%, cost of food sales 18.2%, education 15.2%, cost of merchandise sales 11.1%, public information 10.8%, curatorial and conservation 10.6%, etc.

1988 assets were 112.3 million. Address: Dearborn, Michigan.

792. Shurtleff, Akiko; Shurtleff, William. comp. 1990. Map of the state of Michigan, USA, showing key sites related to Henry Ford and the Ford Motor Co. Lafayette, California. 1 p.

• **Summary:** The map shows (inside Michigan; see front of book): Detroit, Dearborn, Ann Arbor, Saline, Milan, and Mount Pleasant. Bordering Michigan, it shows: Lake Huron, Lake Erie, Ohio, and Indiana. Address: Founders and Directors, Soyfoods Center, Lafayette, California.

793. Shurtleff, Akiko; Shurtleff, William. comp. 1990. Map of Dearborn, Michigan, showing key sites related to Henry Ford. Lafayette, California. 1 p.

• **Summary:** The sites (see front of book) shown in Dearborn are (left to right): Ford Motor Co., Research & Engineering. Henry Ford Museum. Fair Lane (Henry Ford’s home). Soybean laboratory. Greenfield village. Henry Ford birth site. Ford Motor Co. Rouge Plant. Address: Founders and Directors, Soyfoods Center, Lafayette, California.

794. Shurtleff, William; Shurtleff, Akiko. comp. 1990. Semi-log graph of Ford Motor Co. total U.S. vehicle sales (cars, trucks, and tractors) 1903-1953 (Overview). Lafayette, California. 1 p.

• **Summary:** The period of most rapid Ford vehicle sales (see front of book) was from 1905 to 1923—the years when Ford’s Model T reigned supreme and the Ford Motor Co. was the No. 1 seller of motor vehicles in the United States.

Source of data: Nevins & Hill. 1963. *Ford: Decline and Rebirth 1933-1962*. Vol. 3, pages 478-479. Address: Founder

and Director, Soyfoods Center, Lafayette, California.

795. Shurtleff, William; Shurtleff, Akiko. comp. 1990.

Semi-log graph of soybean production in the United States, 1924-1990, with notations related to Henry Ford (Overview). Lafayette, California. 1 p.

• **Summary:** If we plot production of soybeans in the United States (for beans) on a semi-log graph—the kind most useful in showing rates of growth and changes in those rates—we see that the rise in this production was most rapid from 1925 to 1942, when the crop reached 190 million bushels. The period of most rapid growth in U.S. soybean production took place during the years when Henry Ford and his researchers were active promoting soybeans in the United States. While Ford was certainly not the main cause of this rapid rise in soybean production, he was definitely one important cause among many (see front of book).

After 1942 the rate of growth slowed until about 1979 when it began to slow again. Address: Founder and Director, Soyfoods Center, Lafayette, California.

796. Tanasychuk, John. 1991. Soybeans must be good for you: Henry Ford’s chef steams along at 90. *Detroit Free Press*. Jan. 27.

• **Summary:** “Willemse’s greatest achievement came in 1934 when Ford the financier, Willemse and Dr. Edsel Ruddiman, a food chemist, brought soybeans to the Chicago World’s Fair.” A color photo by Hugh Grannum shows Willemse. Address: Free Press Food Writer, Michigan.

797. Ackerman, Gretchen. 1991. Soybean power? Chef Willemse swears by the ‘little beans.’ Brave? Try some of these soybean recipes. *Press & Guide Newspapers (Dearborn, Michigan)*. Feb. 14. p. 1-B, 3B.

• **Summary:** Dearbornite and former chef to auto magnate Henry Ford, “Jan Willemse consumes soybeans daily—in soups, sandwiches and dessert. He swears by the little bean and attributes his longevity—now 90 years old and still working five days a week—to the soybean...

“Referring to Ford, he added, ‘Don’t anyone say anything against the great pioneer, who was before his time in the field of nutrition. The old gentleman was a great man.’ He began working for the Fords as a pastry chef at the Dearborn Inn and experimented with soybeans for Ford in his Soybean Laboratory. Willemse’s task was similar to that of George Washington Carver, Ford’s southern friend and peanut fancier. ‘Many people believed us to be a little crazy,’ said Willemse. ‘But I was in the right place at the right time and it has always been a good relationship...

“Willemse said his greatest achievement came in 1934. With Ford the financier and Dr. Edsel Ruddiman, a food chemist, Willemse brought soybeans to the Chicago World’s Fair. The dinner menu at Ford’s Century of Progress exhibit included soybean croquettes, soybean relish, soybean

biscuits, soybean butter and even soybean coffee.”

Recipes are given for: Mrs. Ford's mom's favorite chocolate cookies. Henry Ford's honey soy bean ice box cookies. Soy cheesecake. Chocolate chip soy cookies. Tofu cookie sandwich. A large photo shows Chef Jan in the Fair Lane pantry with his Honey soy ice box cookies, an historic delicacy and favorite of Henry Ford.

798. Johnson, Lawrence A. 1991. New horizons in utilizing Iowa's crops: New crops, products and uses. Paper presented at Seed Science Center Workshop. 28 p. Held 26 Feb. 1991 at Scheman Center, Iowa State Univ.

• **Summary:** “In this narration to a slide show containing 57 slides the author discusses the increasing price of petroleum relative to agricultural products (such as corn), the Midwest Agribusiness Trade Research and Information Center (MATRIC), the Utilization Center for Agricultural Products (UCAP; previously known as the National Center for Food and Industrial Agricultural Product Development).

Prof. Johnson represents the Center for Crops Utilization Research (CCUR), whose mission is “to expand utilization of crops grown in Iowa and the Midwest by developing new products, processes, and markets.

“The goals of the center are focused on three major areas. We develop technologies for new products and processes to improve competitiveness of American agriculture. We are striving to replace petrochemical-derived products with those derived from renewable agricultural resources. We are channeling the application of biotechnology into utilization of agricultural products.

“We are concerned about the national trend to focus biotechnology primarily on targets that will increase production and that too little biotechnology is being directed towards utilization targets. The danger is that increased production could further exacerbate our surplus situation unless we also enhance end-use value and develop new ways to use crop materials.” The next slides show examples for over 40 projects administered through the center, including a number related to soybeans. Also discusses grain amaranth, crambe oil, potential for and barriers to exporting value-added soyfoods to Japan, why some soybeans make better soyfoods than others, Henry Ford and soy plastics (“As early as the 1930's, Henry Ford made plastic automobile parts from soy protein and demonstrated their ruggedness. Unfortunately, cheap petroleum caused his effort to be abandoned in the 1950's. We are examining this opportunity using modern techniques and in more favorable economics. Soy plastics may be more environmentally-friendly”), and degradable plastics containing 6% starch. Address: Professor-in-Charge, Center for Crops Utilization Research, Iowa State Univ., Ames, IA 50011.

799. Pringle, W. 1991. Soya protein, past experience & future potential. In: F. Meuser and P. Suckow, eds. 1991.

Soja in Lebensmitteln: Vortraege 2. Hamburger Soja-Tagung. Berlin: Technische Universitaet Berlin, Institut fuer Lebensmitteltechnologie und Gaerungstechnologie-Getreidetechnologie. 171 p. See p. 153-59. [4 ref]

• **Summary:** Contents: Introduction. Potential uses of soya bean. Past product launches. Soya product as a foodstuff.

A certain Mr. Robert Whympers was probably the first person to show Europeans how the functional character of soya proteins could be exploited. He returned to England in 1923 after a trip to Japan with a suitcase full of soya beans and a head full of ideas. He carried out a series of experiments using soya flour as an ingredient of the dough in the breadmaking process. This work culminated in the granting of a British Patent in 1926. The patent described conditions of unusually vigorous dough mixing which allowed for the maximum inclusion of air. Very substantial improvements in the colour of the bread crumb and the volume and quality of the bread were observed. We now know that this bleaching and improving effect is a direct result of a coupled oxidation reaction involving the lipooxygenase enzyme present in the soya flour. The breadmaking industry of Europe now uses thousands of tonnes of enzyme-active soya flour every year as a bread improver.

“The work of Whympers and his associates continued and in the early 1930's a heat processed full fat soya flour appeared on the market.”

Henry Ford, a man of vision, initiated the next phase in the development of soya proteins for human food. In the early 1950's [sic, mid-1930s] he put together a team to work on the isolation of pure protein from soya and the subsequent spinning of this protein into a stable fibre.” After his scientific team was disbanded, the expertise was not lost, for the scientists found places in food companies and began to look at the use of isolated soya proteins in the food industry. It is now well established that isolated soya proteins have functional uses for binding and emulsification, and for improving nutritional value. “More controversial and newsworthy was the attempt by the old Ford researchers to produce textured protein products to simulate meat and other traditional protein foods. They did this by two processes: (1) The spinning of isolate into fibres, using technology from the textile industry; (2) The extrusion of soya bean meal under conditions of high temperature and pressure... Branded food products based on these textured soya proteins were launched on the market in the late 1960s and all during the decade 1970-1980.”

During the early 1970s the future looked a little bleak due to the world population explosion, the world energy crisis (precipitated by OPEC), and the world food crisis (which was more specifically a protein crisis). The first World Soy Protein Conference, held in Munich in 1973 with over 1,000 delegates, was a very important affair. “The U.S. Secretary of Agriculture, Mr. Earl L. Butz, opened the conference. Senator Hubert Humphrey made a memorable inspirational address...

I was there and I can tell you we all thought we could make a big impact on the world's on the world's problems by supplying textured soya protein."

Against this background, many such products were launched in the U.K. in the mid-1970s by major food companies. All but Kesp were based on textured soya flour: 1975 Feb.–Mince Savour by Nestle; 1975 May–Country Meadow by Brooke Bond Oxo; 1976 Jan.–Soya Choice by Cadbury; 1976 April–Economince by Spillers; 1976 Sept.–Kesp by Courtaulds (made from spun soy protein fiber).

"All of the products enjoyed real success for a period of time. In particular Cadbury's Soya Choice sold well for about three years in every area of the U.K. Sad to relate, however, all of them quietly and gradually lost sales and finally disappeared from the market. It is important to know why... People did not want a substitute food; this was a challenge to their security, a threat to the comfortable familiar world." The consumers of today have become more "green." "It is clear to me, the emotional conditioning that sees security in the consumption of traditional animal foods is being replaced by the more logical attitudes of a new generation. The young people of today want to find ways to preserve the environment and they have an increased perception of health problems that may be caused by the consumption of animal products, especially animal fat. These and other factors are making vegetarianism more attractive.

"A recent Gallup poll has shown, in the U.K., that 3% of the total population are vegetarians. A total of 8.5% are either totally vegetarian or avoid red meat, and 9.3% of children are vegetarian. Vegetarianism has moved from being a refuge of cranks to being fashionable."

A new product popular among yuppies is Quorn, a textured fungal protein, marketed by ICI and RHM via Sainsburys and other selected suppliers. Address: The British Arkady Co. Ltd., Manchester, England.

800. Saline-Brecon Friendship Guild, Ltd. 1991. Our pride: Saline, MI, USA. Saline, Michigan. 74 p. 28 cm.

• **Summary:** Brecon is Saline's sister city in Wales, UK. The color cover photo shows the Saline Mill Pond overlooking the dam towards Weller's (the building formerly occupied by Henry Ford's soybean mill); across the pond is the old Henry Ford Food schoolhouse, later the residence of Bruce Parsons.

Pages 12-36 contain a history of Saline by various authors (incl. Wayne Clements of the Saline Area Historical Society). A bird's eye view illustration of Saline in 1872 shows Schuyler Mills on the Saline River. Note: Today the mill is located 0.55 miles from Saline's downtown city square. Page 46 notes that the "Schuyler-Ford-Weller Mill at 555 W. Michigan Ave. is an historic site. Page 52 states that the Ford Motor Co. has a huge plant in Saline. Launched in April 1966, the Saline Instrument and Plastics Plant is now the "largest injection molding facility in the world under one roof." It houses 37 acres under that one roof and employs 2,425 people.

A half-page article on page 63 titled "Schuyler Mill," gives a brief history of this mill later owned by Henry Ford. For a more detailed and accurate history, see Paul A. Meyer, et al. 1976. "Wellers"—of which this history seems to be a summary. Currently the building "houses the Town and Country Antiques Mall, the Raisin River Cafe below on the back side ground level, and private apartments on the top two floors."

The population of Saline has grown from 1,533 in 1950 to about 7,000 in 1990. Address: P.O. Box 182, Saline, Michigan 48176.

801. Johnson, Lawrence A. 1991. New uses for crops: Opportunities or hype. Paper presented at Developing Alternative Uses for Crops Meeting. 23 p. Held 13 Nov. 1991 at Highlander Inn, Iowa City, Iowa.

• **Summary:** In this narration to a slide show containing 60 slides, the author discusses grain amaranth, crambe, soybeans, corn, soymilk, tofu, the Nichii Company, use of agricultural products to replace petroleum-derived products (such as ethanol, citric acid, lactic acid, lysine, and detergents), degradable plastics, Henry Ford and his plastic automobile parts ("Unfortunately, cheap petroleum caused his effort to be abandoned in the 1950's. Times have changed and many are reexamining this opportunity using modern technologies. Soy plastics may be more environmentally friendly."), biotechnology and soybeans, breeding soybeans with soil similar to canola oil. Address: Professor-in-Charge, Center for Crops Utilization Research, Iowa State Univ., Ames, IA 50011.

802. Lewis, David L. 1991. Henry Ford and the magic beanstalk. Paper presented to the Ontario Soybean Growers' Marketing Board. 8 p. Dec. 6. At annual meeting held in London, Ontario, Canada.

• **Summary:** Much of this interesting presentation are taken from the author's original and very authoritative book, *The Public Image of Henry Ford* (1976, see p. 282-85). "Henry Ford mostly is remembered for his Model T, mass production methods and the five-dollar day which doubled his workers' pay. But he should be equally remembered for his extensive soybean experimentation and research into plastics, his last great achievement and the work that delighted him more than any other.

"Ford grew up on a farm near Detroit, and had a lifelong interest in improving the lot of the farmer. As early as 1907 he experimented with a motorized tractor which he called an "automobile plow." During the 'teens and 'twenties he designed and built the Fordson tractor.

"In early 1928, Ford became interested in a new agricultural concept, farm chemurgy; that is, putting chemistry and allied sciences to work for agriculture. The auto king was chiefly interested in finding new industrial uses for farm crops, although he also hoped to find new ways to use crops for food.

"In 1929 Ford established a laboratory in Dearborn and began experiments to determine which plants or legumes offered the most promise. After extensive research, he decided in 1931—exactly 60 years ago—to focus attention on the soybean."

The author then presents an interesting and carefully documented discussion of Henry Ford's work growing soybeans and testing soybean varieties in Michigan, soybean plastics and the "plastic car," contemporary media comments on this car (see record for 1941), development of soybean fiber Ford's suit and tie made from soybeans (by 1938), Ford's unsuccessful attempts early in World War II to interest the U.S. armed forces in making uniforms out of soybean fabric, sale for the fiber fabrication process and machinery to The Drackett Company, of Cincinnati [Ohio], in Nov. 1943, work of Ford and Edsel Ruddiman with soyfoods." Ford also advanced his ideas about the soybean and chemurgy with exhibits and a film. In 1934, he planted a small plot of soybeans and exhibited soybean processing machinery in his company's exhibit area at the Chicago World's Fair. Similar exhibits were shown at various state, regional, and world's fairs during the 1930s. In 1935 the Ford Company produced and distributed *Farm of the Future*, a sound-slide film which illustrated Henry Ford's views on the importance of chemurgy.

"Ford's frequent declaration, 'soybeans will make millions of dollars of added income for farmers... and provide industry with materials to make needed things nobody even knows about now' was proved correct by the passage of time."

Today soybeans are still grown on Henry Ford's former Dearborn estate, Fair Lane. In fact, about 400 of the 2,300 Ford-owned acres surrounding Ford World Headquarters, located adjacent to the Ford estate, are devoted to soybean cultivation, a fact which amazes foreign visitors.

"Soybean cultivation does seem remarkable on property valued at hundreds of thousands of dollars per acre. But growing soybeans serves a practical purpose, according to George Anderson, manager of corporate real estate for Ford Motor Land Development Corporation. 'It creates an economic value and saves us from weed control,' he says.

"Anderson, who monitors 255 million square feet of Ford office and factory space around the world, has a sentimental attachment to the soybean fields remaining in Dearborn.

"You watch the wind gently blowing the fields, and it's like an ocean," he says. "When you see a soybean field, it's a thing of beauty..."

"As for Henry Ford, through his experimentation, and the publicity he gave it, he made a substantial contribution to the increased utilization of the soybean. His work in this field, started when he was in his late sixties and carried forward until he was 80 years of age, is the outstanding achievement of his declining years. Even at 80, Ford found boyish delight in helping to prove that there was industrial and culinary magic in a beanstalk.

"All North Americans are beneficiaries of that magic, most of all soybean growers and those allied with them. If you and your Marketing Board ever designate a patron saint, or wish to memorialize a Champion of the Soybean, may I respectfully suggest that you consider Henry Ford for the honor. Were he alive, I'm sure that no other recognition would please him more. I'm also sure that he'd come to your ceremony in a soybean-derived car, wearing a soybean suit—and expect every dish in our luncheon to be based entirely on soybeans."

Note: Prof. Lewis is now (Dec. 1992) finishing a new book on the history of the Ford Motor Co. from 1956 to the present. It is sort of a continuation of the 3-volume work by Nevins and Hill (1954-1963). Address: Prof., School of Business Administration (Room B3253), Univ. of Michigan, Ann Arbor, MI 48109-1234. Phone: 313-764-9540.

803. Boyer, Nancy. 1991. Re: Biographical sketch. Letter to Ford Bryan at Henry Ford Museum & Greenfield Village, undated. 1 p. Handwritten on Nancy Boyer letterhead.

• **Summary:** In 1931 Robert Boyer married Elizabeth Szabo of Detroit; she had been born in Hungary. They had three children: Nancy, Robert Jr., and Thomas. In Feb. 1963 Elizabeth died, and in April 1965 Robert Boyer married Nancy Ann Miller, a recent widow living in St. Louis.

Nancy was born in Ypsilanti, Michigan. In 1937 she married Harold Ory and moved with him from Ypsilanti to St. Louis, Missouri, where Harold worked for Ralston Purina Co. Harold died in 1963.

804. Mohr, Teddric J. 1991. Since 1866: Battle Creek Adventist Hospital. Battle Creek, Michigan. 15 p. Illust. 28 x 14 cm.

• **Summary:** This booklet commemorates the hospital's 125th anniversary. It opened in Battle Creek, Michigan, on 5 Sept. 1866 under the name Western Health Reform Institute in response to the foresight and urgings of Ellen G. White. It was a small 2-story frame building with a 10-bed capacity; Patients were charged \$5-7 per week for room, board, and medical care. Initially, it was under the medical leadership of Dr. Horatio Lay, an Adventist physician who specialized in hydrotherapy. James and Ellen White encouraged John Harvey Kellogg to enroll in medical school and provided financial support for his studies. In 1875, at age 23, John Harvey graduated from Bellevue Hospital Medical School, then recognized as the nation's leading medical teaching institution. He took over as head of the Institute on 1 Oct. 1876, at which time it contained only 20 patients. In 1876 Kellogg had renamed the organization Battle Creek Sanitarium. He explained that the new name, a variant of "sanitorium," would come to mean a "place where people learn to stay well."

The San reached its peak of development in 1928 with the completion of the Twin Towers addition. During this

“grand hotel” era the staff numbered 1,800 and the San could accommodate 1,500 patients with its 32 buildings located on 27.5 acres of land. Dr. Kellogg called his medical philosophy “biologic living.” Focusing on caring for the “whole person” (body, mind, and spirit), he espoused regular exercise, abstinence from smoking and drinking, plenty of fresh air and sunshine, the total elimination of meat from the diet, and the importance of whole grains—practices we consider enlightened today.

“Over the years, and especially in the ‘roaring twenties,’ the San guest list read like a virtual who’s who of medical professionals, business leaders, sports legends, and entertainers. Henry Ford, John D. Rockefeller, J.C. Penney, President William H. Taft, Thomas Edison, Will Durant, Johnny Weissmuller, William Jennings Bryan and Amelia Earhart were just a few of the rich and famous who put themselves in the capable healing hands of Dr. Kellogg and the Battle Creek Sanitarium.”

Also discusses the development of peanut butter and Granose Flakes, Lenna Cooper (one of the founders of the American Dietetic Association) and Dr. David Paulson (founder of the Hinsdale Sanitarium), W.K. Kellogg and the Sanitas Nut Food Co.

“As the principles of wholistic health care became accepted throughout the world, many new institutions arose, copying the techniques and therapies started by Dr. Kellogg and practiced at the San. The incentive for people to travel all the way to Battle Creek for treatment diminished. With the onset of the Great Depression in the ‘30s, the average number of patients fell from 1,300 to 300 and the San began to experience financial troubles.

“In 1942, after nearly a decade in receivership, the San twin tower complex was sold to the government to serve as an Army surgical and rehabilitation hospital.

“Yet the San continued to operate, moving its operations that same year into the nearby Fieldstone Building, which had been purchased by Dr. Kellogg in 1913. Though not as grand or large as the twin towers building, the facility was unique in its own right, as the largest fieldstone building in the United States. The San remained there until 1972.”

“Today, there are 568 Adventist health care facilities operating in 88 countries and the Adventist Health System includes some of the most prominent hospitals in the U.S., such as Loma Linda University Medical Center, Kettering Memorial, Florida Hospital and Hinsdale Hospital... Battle Creek Adventist Hospital, has become southwest Michigan’s leading provider of mental health and addiction treatment.” It has the capacity to treat over 150 people on an inpatient basis. Address: Battle Creek, Michigan.

805. Folsom, Richard B. 1992. Fair Lane Oral History Program (Interview). *SoyaScan Notes*. Jan. 19. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Richard is volunteer director of Henry Ford’s

Fair Lane Estate Oral History Program. He interviews old-timers who knew Mr. Ford on both audio and video tapes. The Estate transcribes the interviews and keeps copies in the Ford Archives and at Fair Lane. Starting 5-6 years ago, Fair Lane began to assemble an archives mostly of people who worked at the house and were familiar with the private lives of Henry and Clara Ford. The Ford Archives is more the business and non-personal side of Henry Ford.

Richard has interviewed Bob Smith (1983 Aug. 15, 35 pages) and Jan Willemse. Jan will be speaking to the Dearborn Historical Society on the first Thursday in Feb. 1992. He is planning to bring with him a sample of the soyfoods that he made for Mr. Ford in 1936 at the Century of Progress Fair in Chicago. Jan, who lives in Dearborn, is now 92 years old. He works 5 days a week, 8 hours a day, as the executive chef at Miesel/Sysco in Canton, Michigan. He loves to talk about Henry Ford and soybeans. Address: 46000 Geddes Rd., Canton Township, Michigan (near Dearborn). Phone: 313-495-1379.

806. Whitehouse, David; Whitehouse, Harvey. 1992. Delsoy Products, Whitehouse Products, C.J. Christoff & Sons, Chadalee Farms, and Rex Diamond (Interview). *SoyaScan Notes*. Feb. 4. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Dave’s father, Harvey Whitehouse, and Bob Smith were partners in Delsoy Products. Since Bob Smith was connected with Henry Ford, he was the one to attract the media attention and get the interviews. Neither Dave nor Bob know where the company’s early files are now kept. The *Detroit News Times* and *Detroit Free Press* may have run articles on the company. The dairy industry disliked Delsoy, so dairy magazines probably didn’t run any articles. Eric R. Swanson brought in Bob Smith (who was working for Henry Ford) for his chemical knowledge. Then in Nov. 1944 Swanson brought in Harvey Whitehouse (who had been production manager at two large dairies in Detroit—Belrose Creamery then Rosebud Creamery) as production manager for the soy milk. David entered the company in about 1961.

They have heard that at one point, when Herbert Marshall Taylor was still with Delsoy Products, Bob Rich wanted to get a franchise to manufacture Delsoy Topping. He never got it, but he was able to get a very similar formula from Rex Diamond who was working at Ford’s Carver Laboratory. Rich Products was the first to freeze a soy-based whipped topping. In about 1960, when Bob Smith began to talk about retiring, Harvey went to freezing Presto Whip, then Delsoy Topping so that he could store these products frozen and ship them nationwide—but they were never advertised as frozen. Most of the sales of Delsoy Topping were to bakers and restaurants—not to consumers.

At some point prior to 1961 the name of their frozen product, Delsoy Topping, was changed to Delwhip Topping, and a new product named Delwhip Topping Base was

introduced; it was a concentrate to which one had to add water to reconstitute it. The name of Presto Whip remained unchanged.

Harvey brought out Bob Smith in 1963, and a month or so thereafter David became president of the company. Shortly after the buyout, the company name was changed from Delsoy Products to Whitehouse Products. The brand and logo then became Whitehouse and product names were changed. Delwhip Topping became Whitehouse Whipped Topping, Delwhip Topping Base became Whitehouse Whipped Topping Base, and Presto Whip became Whitehouse Presto Whip. All continued to be made with soy protein.

At about the same time, the company began to private label their products for other companies under other brands. They continued to sell the products under their own brands as well. The company continued to make the two soy-based whipped toppings then in the late 1960s they developed an imitation sour cream; it contained no soy protein but it did contain vegetable oil. They bought the formulation from another company. About the same time they also developed a soy-based non-dairy creamer named Whitehouse Coffee Fresh.

Christoff/Chadalee Farms purchased Whitehouse Products in about 1983. At that time David was president of the company and Harvey was in the process of retiring. Again the product names were changed to Chadalee Farms Whipped Topping and Chadalee Farms Whipped Topping Base. They are now finishing a phaseout of those products, largely because they do not have any other frozen products. David is now the national accounts manager for Chadalee Farms, Inc.

Rex Diamond was never employed full time for Delsoy Products. In the early days he worked at the company for a day or two now and then in the plant doing soybean extraction—not as a consultant, but as a friend of Bob Smith's. Then Rex pulled a fast one. He left, set up his own company named Vegetable Products Corp. in Saline, Michigan (located inside Henry Ford's old soybean extraction plant there), and began to make a soy-based whipped topping named Wonder Whip (non-pressurized in a cone-shaped container), which was designed to be whipped with an egg beater. But he did not know how to run a food plant. One day Bob Smith was visiting one of his chain store accounts when the buyer told Bob that Rex Diamond was telling all the distributors that Delsoy Products had quit making their topping—so that Rex could take over the accounts. Diamond had so many problems with the quality of his product that his company never got off the ground, and in less than a year went out of business. He tried to sell his used equipment to Delsoy.

In the late 1940s and early 1950s Diamond worked for American Maize Co. in Chicago. The company wanted him to develop a dried dairy-free whipped topping. He was granted several patents, then American Maize dropped the project.

So Diamond approached Delsoy, asking if they would like to go in with him on a joint venture; after past bad experiences, they declined.

Then in Nov. 1952 Bob Rich of Rich Products hired Rex Diamond and there Diamond was successful in developing a product named Coffee Rich. Bob Rich and Rex Diamond set up a separate corporation named Coffee Rich Inc. just to manufacture and sell the Coffee Rich; it did very well financially. Diamond was in the process of building a large home in Buffalo, New York, but then he was unexpectedly fired by Bob Rich. One of the contingencies of the stock agreement between Rich and Diamond was that if either person was terminated or left the company, he had to sell his stock back to the corporation. Diamond felt he had been fired because the company (and Diamond) had made so much money; Rich had to fire Diamond to get control of the stock. Diamond, who had signed a bad contract, was very upset. The same thing happened to the sales manager for Coffee Rich. Again Diamond approached Delsoy Products, asking if he could manufacture toppings in their plant, but again they declined. Meanwhile Diamond returned to his home town in Detroit, and went to an attorney. The attorney settled with Rich Products for a much smaller sum than Diamond hoped to get. Within a year or two of his termination from Rich Products, Diamond committed suicide in Detroit.

Concerning Mitchell Foods: An East-Coast chemist named Frank S. Mitchell had worked for Rich Products. He left and started his own whipped topping company. Rich Products filed a lawsuit against Mitchell, and Mitchell lost in Sept. 1964 in New York [Civil Action No. 9597 in U.S. District Court for the Western District of New York. Trial 14-18 Dec. 1964.] The company was small and the product never became important. Address: 1100 Hillcrest Dr., Dearborn, Michigan 48124. Phone: 313-562-0242.

807. Ferrell, John. 1992. Re: The death of Wheeler McMillen. Letter to William Shurtleff at Soyfoods Center, March 11. 1 p. Typed, with signature.

• **Summary:** "Wheeler McMillen [chemurgy pioneer] died last week at age 99. His obituary was published in Washington Post (March 6). I last saw him on his 99th birthday in January. When I described the subject of my article [Chemurgy and Henry Ford's Vision of a Sustainable Future], McMillen, who knew and admired Ford, responded, "It was a good idea. It is *still* a good idea." Indeed it is.

Note: John, a former archivist and researcher at the National Archives, is writing a book on chemurgy. Address: P.O. Box 66336, Washington, DC 20035. Phone: 202-632-1178.

808. Ferrell, John. 1992. Mechanical cows and industrial soybeans: Henry Ford's vision of a sustainable future. 6 p. Unpublished manuscript. [24 footnotes]

• **Summary:** Contents: Introduction. Making the cow

obsolete. Agricultural alchemy. War on waste. A new generation of prophets. Farms and factories in a sustainable future. "Ford was a contradictory personality. Although he was not a vegetarian, he maintained that meat and milk were unnecessary. He owned a choice herd of dairy cattle, but considered dairy farming inefficient."

Later published in somewhat condensed form under the title "Forgotten legacy: Henry Ford's vision of a sustainable future—An original environmentalist." in *EarthSave*. 1992. Spring & Summer. p. 15-17. Address: P.O. Box 66336, Washington, DC 20035. Phone: 202-632-1178.

809. Johnson, Lawrence A.; Myers, D.J.; Burden, D.J. 1992. Early uses of soy protein in the Far East, U.S. *INFORM (AOCS)* 3(3):282-88, 290. March. [54 ref]

• **Summary:** A nice history of the subject based on a review of the literature. Contents: Early history in East Asia (industrial uses, chiang and miso, natto, tempeh, soymilk, tofu, shoyu). Emergence of U.S. soybeans (early soybean mills, ADM, Glidden). Chemical understanding of soybean protein (major components/fractions). First industrial applications (oil and meal). Soy protein-based plastics (Henry Ford). Chemurgic movement (U.S. Regional Soybean Industrial Products Laboratory, Northern Regional Research Center, Glidden). Soy protein adhesives (I.F. Laucks). Paper coatings and sizings (Glidden). Soy fiber spinning (Ford, Azlon, Drackett). Other industrial uses. Address: Center for Crops Utilization Research, Iowa State Univ., Ames, Iowa 50111.

810. Johnson, Lawrence A.; Meyers, D.J.; Burden, D.J. 1992. Soy protein's history, prospects in food, feed. *INFORM (AOCS)* 3(4):429-30, 432, 434, 437, 438, 440, 442-44. April. [54 ref]

• **Summary:** "This is the second part of a review that chronicles the individuals and the historical and economic factors noteworthy in the development of soy protein as food and feed ingredients." Contents: Introduction. Early Western food uses (whole and defatted soy flour, enzyme-modified isolated soy proteins as whipping agents, whipped toppings, cereal-soy blends). Soy flour and grits. Protein concentrates and isolates (Griffith Laboratories, Central Soya Co., Mead Johnson and Co., Central Soya). Dairy analogs (Dr. Harry W. Miller, Loma Linda Foods, Mull-Soy and Borden, Vitasoy, Edensoy, Worthington Foods and Soyamel, Prosobee and Mead Johnson, Rich Products and Chill-Zert, Tofutti). Spun fibers (Robert Boyer and the Ford Motor Co., Temptin, Worthington Foods, Bontrae, Bac*O's, Bac-O-Bits, Miles Laboratories, Morningstar Farms). Textured soy protein and meat analogs (W. Atkinson, ADM and TVP, General Mills and frozen Bontrae, the U.S. School Lunch Program). Nutritional advances in soy products. Today's world soybean and soy protein production (consolidation among manufacturers of modern soy protein ingredients: ADM, Cargill, Central Soya Co., Protein Technologies International,

A.E. Staley Mfg. Co.). Future of soy protein products.

Tables show: (1) Soy meal consumption in the USA by type of animal: Poultry 41.1% of total 18.9 million metric tons, swine 27.4%, beef cattle 9.0%, dairy cattle 9.0%, other livestock 9.5%, human food 3.2%, industrial 0.5%. Thus, industrial (nonfood, nonfeed) uses for soybeans presently comprise no more than 0.5% of the protein produced from soybeans grown in the United States. (3) U.S. companies supplying protein in 1948-50 versus 1990 (industrial and edible flours, concentrates, and isolates). 23 companies then vs. 5 in 1990.

Note: Talk with Ed Milligan of EMI by phone. 1992. May 5. This article contains some misleading information. It refers to an article by Ken Becker written in 1971. In 1958-59 USDA developed a laboratory prototype of flash desolventizing. In 1959 they contacted EMI corporation in Des Plaines to commercialize the flash desolventizing system for production of light-colored, edible soybean flakes, for soy flour and grits, with a maximum PDI (protein dispersibility index). At that time Ed Milligan was just a newly hired member EMI, which undertook the project. Ed designed and installed the world's first commercial flash desolventizing system for Honeymead Products Corp. in Mankato, Minnesota, in 1960. Note that this system was used to make food, rather than feed. All but 2 systems have been used exclusively to make foods. All such systems produce a flake with a very light color and controlled PDI, whereas a DT (desolventizer-toaster) produces a golden colored flake. He is leaving for India in a few weeks to commission EMI's 22nd such unit. He has designed, installed, and started every one of the 22. Address: Center for Crops Utilization Research, Iowa State Univ., Ames, Iowa 50111.

811. Ferrell, John. 1992. Forgotten legacy: Henry Ford's vision of a sustainable future—An original environmentalist. *EarthSave*. Spring/Summer. p. 15-17. [23 ref]

• **Summary:** Contents: Introduction—the 1934 World's Fair in Chicago, Illinois. Making the cow obsolete. Agricultural alchemy. War on waste. A new generation of prophets. Farms and factories in a sustainable future.

Note: For an uncondensed version of this interesting article, containing many original references, see the author's March 1992 unpublished manuscript titled "Mechanical cows and industrial soybeans: Henry Ford's vision of a sustainable future" (6 p.). Address: Washington, DC.

812. Hudson and Harsch. 1992. New industrial uses, new markets for U.S. crops: Status of technology and commercial adoption. Maumee, Ohio. 78 p.

• **Summary:** This advance issue was prepared for USDA especially for the Biobased Products Expo 92, held on 6-9 Oct. 1992 at St. Louis, Missouri. Chapter 6 (p. 22-27) is titled "Diesel from crops: 'Biodiesel' offers farmers opportunity to progressively grow more fuel—and opportunity for big cities to reduce air pollution." Soybean oil can be used as a

substitute for petroleum-based diesel fuel.

Chapter 15 (p. 62-65) is titled "Soybeans: From soy ink to soy fuels, soybeans could be a major industrial raw material." Contents: Key points. Facts: Soybeans in industry. Uses (Henry Ford, Wheeler McMillen, ANPA, soy ink, diesel fuel). Market size and potential. Production. Processing. Research and technology. Key contacts (NCAUR, ANPA, ASA). No end to the possibilities.

813. *Time*. 1992. Beyond the year 2000: What to expect in the new millennium. Special issue. Vol. 140, No. 27. Fall. 93 p.

• **Summary:** In this special issue, *Time* magazine's editorial staff named Henry Ford as one of the 20th century's ten greatest people. Ford was ranked second on the list, headed by Sigmund Freud, and followed (in order) by Mohandas Gandhi, Sir Winston Churchill, Pablo Picasso, Pope John XXIII, Franklin D. Roosevelt, Margaret Sanger (American birth-control leader), Mother Teresa, and Martin Luther King, Jr. (see foldout opposite page 27).

Note: Prof. David L. Lewis cites the above in his column "Ford Country" in *Cars & Parts* magazine. Lewis notes: "The issue also presents the 10 most famous quotes of the millennium. Henry's 'History is more or less bunk,' isn't on the list, but presumably was considered, along with 'The public can have any color of car it wants, so long as it's black.' Technological breakthroughs also were cited; among them were mass-produced Model T Fords; Lindbergh's solo flight across the Atlantic; the atom bomb; and moon landings. Henry is pictured standing beside a flivver."

814. Bryan, Ford R. 1992. Work toward restoration of Henry Ford's Chemical Plant, and other thoughts (Interview). *SoyaScan Notes*. Nov. 17. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Mr. Bryan, who is working to try to have the Chemical Plant (later often called the Soybean Lab) restored due to its historical importance related to soybeans, believes that this plant was the personal property of Henry Ford, not the Ford Motor Company. Within a month of Henry Ford's death in 1947, his wife, Clara Ford, asked to have the Chemical Plant cleaned out, having found rats and mice occupying it. Equipment was removed and much of it was sent to the Rouge Plant, some for scrap and some assigned to other laboratories. In the meantime the exterior of the Chemical Plant has been maintained in good condition, although the greenhouse has been removed. Recent conversation with the president of Henry Ford Museum and Greenfield Village (HFM&GV) indicates consideration is being given to future interior restoration for the purpose of interpreting the building in a manner properly emphasizing its historical importance.

HFM&GV is an independent, nonprofit, educational institution that is not part of or supported by the Ford Motor Company or the Ford Foundation. The museum depends on

admission fees, revenue from visitor services, income from a small endowment, and contributions from individuals, corporations, and foundations for the funding of its programs. Annual expenses are approximately \$20 million.

The Edison Institute, Greenfield Village, and the Henry Ford Museum were established in 1929 and opened officially in 1933. The Village and Institute are located side by side. The best book on the subject is titled *Home for Our Heritage*, by G.C. Uprichard (1979, Henry Ford Museum Press, 191 p.); that book, however, has nothing to say about the Soybean Laboratory.

The Edison Institute, which was founded in 1929, is still the central organization acting as an umbrella corporation owning Henry Ford Museum & Greenfield Village. The Edison Institute was at one time primarily a school, and has previously owned other properties such as the Dearborn Inn, and the Carver Laboratory. Now those other properties have been sold, and Henry Ford Museum & Greenfield Village are presumably the Edison Institute's sole business. Therefore the Edison Institute is presented to the public as Henry Ford Museum & Greenfield Village.

What used to be the Carver Laboratory is now a private restaurant named The Waterworks Restaurant. The Edison Institute sold it when the railroad cut it off from the rest of Greenfield Village.

Holton W. "Rex" Diamond definitely worked for Henry Ford, according to Clem Glotzhober of Dearborn. Both Mr. Diamond and Mr. Glotzhober worked under Bob Smith—partly at the Carver Laboratory. Diamond was sort of "low man on the totem pole." The HFM&GV has an accession contributed in mid-1989 by Mr. Diamond's wife of Georgetown, Kentucky. Mr. Diamond spent many of the last years of his life in litigation with the Rich Products Co. of Buffalo, New York, related to patents.

Mr. Bryan has never seen any early articles on Jan Willemse in the archives of the Henry Ford Museum. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

815. Willemse, Jan. 1992. Recollections of work with soyfoods and Henry Ford (Interview). *SoyaScan Notes*. Nov. 25. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Jan, now age 92, has been cooking with soybeans since 1933. His latest project is a book (partially a recipe book) he is writing about Henry Ford and soybeans. Elinor Eaton is editing it, but he has not yet found a publisher. He hopes it will be published in 1993.

In the early days, when he was developing soybean recipes for Henry Ford and for the 1934 World's Fair in Chicago, Illinois, there were no soybeans recipes available as far as he knew. So he just used his basic skills as a chef. Of the various people involved with soya, Jan worked the most closely with Dr. Edsel Ruddiman, who was quite interested in soymilk. Every recipe that Jan developed was first checked

and analyzed by Dr. Ruddiman before it was served to Henry Ford. Jan knew Robert Boyer; he last saw him about a year ago at the Ford residence. Jan liked to use soybeans most in baked goods and soups, and as a low-cost extender for tuna fish. Henry Ford liked his soybean recipes very much, but rarely gave Jan his personal comments on the recipes. Mr. Ford had a display case in his dining room where he kept Jan's latest soybean creations, such as baked goods, and he liked to show these to his friends. Henry Ford ate very little meat, though he often ate modest amounts of chicken.

"The Ford family was very, very good to me." Jan had 3 boys who were basically raised by Henry Ford. The two oldest boys are now retired. Jan says that over the years, hundreds of articles were published about his work with soy, but he has not kept a single one of them. Today Jan says: "I eat soybeans all the time, and I give them credit for my long life." Address: 130 Nightingale, Dearborn, Michigan 48128. Phone: 313-561-4088.

816. Bryan, Ford R. 1992. Personal recollections of soyfoods served at Ford Motor Co. cafeterias and dining rooms, and of Dr. Edsel Ruddiman (Interview). *SoyaScan Notes*. Dec. 3 and 10. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Mr. Bryan began to work for the Ford Motor Co. in June 1941. He had a roommate who worked for Ford in engineering and Bryan would sometimes have lunch with him in Engineering cafeteria, located in west Dearborn about 5 miles from the Rouge plant. This cafeteria, and the adjoining private dining room where Henry Ford ate, were probably the first to introduce soybean foods. There, in 1941, he recalls eating soybean bread and biscuits, and drinking soybean milk. In the cafeteria, the soymilk was lined up in glasses, and in the dining room it was served at each table. "It had a distinctly different taste—not too bad. And we drank it without question. It was the drink of the day. There was no choice." Mr. Bryan is not sure whether or not he ever tasted soy ice cream in the Ford cafeteria.

Mr. Bryan has recently been talking with a woman who is Edsel Ruddiman's niece. She is age 90, has a good memory, and now resides in Dearborn; she just moved there from Florida. She used to taste-test some of the soy products her uncle was making. She was not paid for this work. Dr. Ruddiman was in charge of the food work for Henry Ford. Ruddiman began his research in what was really Henry Ford's private dining room beside the tractor plant. It was a cute, little bungalow which Henry used to entertain guests. The dining room that later appeared in many photos with executives seated at a round table was in the Engineering Building, which was built in 1923.

Dr. Ruddiman was around Dearborn until at least 1942, at which time Mr. Bryan knew him. "I think the following story is true. Henry Ford had his way of disposing with people. He thought that Edsel Ruddiman was not making good headway on his work with soy. He had Ruddiman and Boyer and even

R.H. McCarroll competing with one another to some extent. The man who told me this story, who worked in the village, was told to get rid of Ruddiman's laboratory. He was told 'I want to see sod there the next day.' So Ruddiman's laboratory was wiped out. I don't know what Dr. Ruddiman did after that."

Mr. Bryan is a distant relative of Henry Ford. His grandmother was named Emma Ford and his first name is Ford because of that relationship. His great-great-grandfather and Henry Ford's grandfather were brothers, and they both married women who were sisters. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

817. Diamond, Florence Barbier. 1992. The life and work of Holton W. "Rex" Diamond. Part I. Early life and work to 1942 (Interview). *SoyaScan Notes*. Dec. 3. Conducted by William Shurtleff of Soyfoods Center. Followed by confirmation from a brief chronology of his life and 20 pounds of documents sent by Mrs. Diamond.

• **Summary:** Florence is the widow of Rex Diamond. Holton Whittier "Rex" Diamond was born on 15 June 1915 in Lucasville, Scioto county, Ohio, the son of Walter V. Diamond and Ethel Pigg. He was a very bright boy, chosen valedictorian of his Valley High School class and, as valedictorian, he presented "The Seniors' Farewell Message" at the graduation ceremony on 10 May 1932. After entering Wilmington College in Wilmington, Ohio, on a scholarship, the school newspaper noted that he added "to a brilliant scholastic record" by "being the first freshman to make a perfect grade in the state-wide English examination. Diamond also holds national, state, and county scholarship awards in Latin, French, chemistry and English." Another article reported that he was the first entering freshman in the 60 year history of the college to score 100% on the timed entrance exam. Upon graduation from Wilmington in 1936, he was awarded the Chi Beta Pi national honorary fraternity "annual Grand Chapter award [a gold key] for outstanding scholarship, research ability, and service to the school and chapter." While in college, he was president of the college YMCA, and a member of the varsity tennis team, college band, and yearbook staff. After graduating from Wilmington in 1936 (with a BSc and a BSc in Education degree, and a major in chemistry), he worked briefly as a surveyor in Scioto county, then for several years as a chemist for Mead Paper Co. in Chillicothe, Ohio until entering Drew Seminary Graduate School of Theology for the fall 1938–Spring 1939 school year. (This was a term in the Methodist ministry; he had been interested in YMCA and Gospel Team Work in college.) Then he moved to Detroit, lived at the YMCA in 1940, and worked as a chemist in the lab of a steel mill, then as a "soda jerk" in a soda fountain. He also attended the downtown Methodist church and often wrote poetry.

During 1942, while working in Detroit, he enrolled in night school at Wayne State University in Detroit,

taking courses in advanced organic and high polymers, dyes, biochemistry, and chemical literature—but obtained no graduate degrees. He pursued these graduate studies until 1945. Continued. Address: 1112 Pawnee Trail #2, Georgetown, Kentucky 40324. Phone: 502-863-5055.

818. Diamond, Florence Barbier. 1992. The life and work of Holton W. “Rex” Diamond. Part II. Work at Ford Motor Co. and Delsoy Products Inc., 1942-1946 (Interview). *SoyaScan Notes*. Dec. 3. Conducted by William Shurtleff of Soyfoods Center. Followed by confirmation from a brief chronology of his life and 20 pounds of documents sent by Mrs. Diamond.

• **Summary:** Continued: In about 1942, through Wayne State University, Rex Diamond obtained a position in the research department of the Ford Motor Company, in the synthetic rubber development department, supervising a project group on butadiene synthesis. More specifically, his work was at Greenfield Village on “dum-dum,” a silencing material for cars. When the entire synthetic rubber research program at Ford was abandoned, in about June 1943, he was transferred to the George Washington Carver Laboratory.

He worked under Robert A. “Bob” Smith (the chief chemist and his boss) on soybean milk, cheese, ice cream and tofu, and developed a whipped topping (his first) based on soymilk. Of these products, the found the whipped topping (which was later commercialized by 3 different companies) to be by far the most interesting.

Rex continued to work at the Carver Laboratory throughout World War II—his first research concerned chlorophyll. On 9 May 1945 Diamond and Smith applied (as assignors to the Ford Motor Co.) for a U.S. patent (No. 2,476,358) titled “Soluble compound of chlorophyll and synthesis thereof.” The patent was issued on 19 July 1949.

One day in 1945 a man named Herbert Marshall Taylor came into the Carver Laboratory with a soybean product that would whip—but it wasn’t very good and you could not rely upon it to whip every time or to whip the same way. Florence is not sure where Mr. Taylor got this product. [Note: Compare this version of events concerning Mr. Taylor and soy-based whip topping with that told by Robert A. Smith in May 1979.] Several days later, Rex analyzed the product and went to work on developing an improved and reliable whipped topping. He recorded the results of his work [starting on 24 March 1945] in his notebooks, which are now at the Henry Ford Museum at Dearborn. Prior to this time, nobody at the Carver Lab. had done research on a whipped topping. Rex discovered at some point, while working at the Carver Lab., that mono- and diglycerides played a critical role in whip toppings. Taylor was using a typical “bakery shortening” as a key ingredient in his whipped topping. It contained mono- and diglycerides, but their amounts were not carefully controlled, since these levels were not critical in typical baking applications. Later (on 12 June 1955) in a paper titled “Vegetable Fat Whips for Bakery and Household

Use,” presented to the Institute for Food Technologists, he stated: “The use of special vegetable shortening, which contain not only hydrogenated vegetable oil but also one or more surface active materials quite common in the topping business. It is well to remember in this connection that most of these shortenings are made for some other use, they may introduce variations in the properties of the topping emulsions. A shortening containing mono- and diglycerides may be controlled within tolerances which are adequate for its use in baked goods but not for its use in toppings.” Rex felt he had solved Taylor’s problem and made an important discovery related to non-dairy whipped toppings.

Florence has the impression that Mr. Taylor was a very outgoing person who inadvertently sometimes got into trouble; he did not have bad intentions, but was sometimes misguided. He was a big spender when he had the money; later he felt he had been cheated by Delsoy Products and the owners of Delsoy felt they had been cheated by him. Florence also recalls that Rex, not Bob Smith, did most of the research and development work on the soy-based whipped topping at the Carver Lab.

A photo shows the 12-member staff of the Carver Laboratory in 1945, including Rex Diamond, Clem Glotzhofer, and Florence Barbier. Bob Smith was absent. A caption notes that here “Diamond did the [sic, his] first work in developing a whipped topping.”

A W-2 form shows that during 1945 Holton W. Diamond (who lived at 1648 May Ave., Dearborn, Michigan) was employed by “Russell-Taylor Inc., 1951 E. Ferry Ave., Detroit 11, Michigan.” [Note: Diamond was working on their whip topping]. His wages totaled \$552.13 in 1945. A 1946 form shows he was paid wages \$68.25 by Russell-Taylor in the first quarter of 1946.

At about the time World War II was over (Aug. 1945), Florence Barbier, a graduate of Stephens College (Columbia, Missouri) was transferred from the Rouge Chemical Laboratory (where she had worked during the war) to the Carver Laboratory. There she first met Rex—who interviewed her for the job. She ran analyses on the soymilk that they made there frequently, worked on the development of a fermented soymilk cheese (which was never very good), and made some tofu. Soymilk was made at the Carver Lab. in 100 gallon batches approximately 2 to 3 times a week. Alberta Hardy (who now lives in Lansing, Michigan) was one of the people who helped make the soymilk. Some of this soymilk was given to any woman in the Dearborn area (not just Ford employees) who could not tolerate cow’s milk and who wanted to stop by and pick some up free of charge. It was also sent to the Henry Ford Hospital and to Henry Ford’s Greenfield Village Schools where it was served free of charge at recess each morning and afternoon. It was also served to the students for their noon meal at the Clinton Inn in Greenfield Village. Florence recalls soymilk being served in this way when she was a high school student there in

the mid-1930s. The soymilk was poured from a large metal container into glasses, which were placed in the hallways at recess times for anyone who wanted it. "Henry Ford wanted all the experimental work done at the Carver Lab. to be of benefit to the public. Even the inventions were to be made available to anyone who wanted them." Florence's father, A. Roy Barbier, had worked for Henry Ford as advertising manager for the Ford Motor Co. from 1924 to the autumn of 1941. Barbier worked closely with Edsel Ford and considered him an intelligent and very competent person—in fact one of the finest people he ever met. But Edsel was overshadowed by his famous father, Henry Ford. Barbier thought Edsel never received the credit he so richly deserved.

On 21 Feb. 1946 Rex Diamond applied (alone, and not as an assignor to the Ford Motor Co.) for a U.S. patent (No. 2,487,698) titled "Topping for salads, desserts, and similar products." The patent was issued on 8 Nov. 1949. The all-vegetable topping called for the use of about 1.5% soy bean protein, 25-35% hydrogenated soybean oil, etc.

Prior to the formation of Vegetable Products Corporation, Rex made many trips to try to procure a source of shortening (still in short supply after the war) to be used in the manufacture of the whipped topping he planned to make. On 28 Feb. 1946, on a flight to New York City, he wrote to Florence that on the plane he enjoyed "an apricot cobbler topped with what I am almost sure was Delsoy Topping"—a non-dairy whipped topping introduced in late 1943 and made by Bob Smith. (Note: Bob Smith left the Ford Motor Co. in Aug. 1945 to work full time with Delsoy Products.) While Rex was still employed at the Carver Laboratory, he did some part time evening and weekend work as a consultant for Delsoy Products, conducting experiments to try to improve Delsoy. On 13 June 1946, before he left Ford, he obtained a written release from Mr. E.C. McRae, of the Ford Motor Co. patent dept. stating: "Inasmuch as the Ford Motor Company is not in any way interested in the manufacture of soybean food products, we have no objection to your patenting any ideas you may have along this line." Again, Diamond was planning for his whipped topping.

In Aug. 1946 Rex started thinking seriously about and developing a business plan and finding sources of raw materials for starting a "soy bean dairy" to make whip topping, soy ice cream, soy cheese, and chocolate malted. With the help of attorney Arthur M. Smith, he wrote Mr. Adrian Joyce [of The Glidden Co.] on 16 Aug. 1946 to see if Joyce had any interest in his ideas and inventions. Continued. Address: 1112 Pawnee Trail #2, Georgetown, Kentucky 40324. Phone: 502-863-5055.

819. Diamond, Florence Barbier. 1992. The life and work of Holton W. "Rex" Diamond. Part III. Work at Vegetable Protein Corporation, and American Maize Products Co., 1947-1955 (Interview). *SoyaScan Notes*. Dec. 3. Conducted by William Shurtleff of Soyfoods Center. Followed by

confirmation from a brief chronology of his life and 8 pounds of documents sent by Mrs. Diamond.

• **Summary:** Continued: Rex left the Ford Motor Co. in about Nov. 1946, shortly before the Carver Laboratory was closed; his wages for 1946 were \$3,313.20. On 14 Nov. 1946 he applied to the state of Michigan for unemployment compensation. Note: It appears from the above that the Carver Laboratory closed in late 1946.

After leaving the Ford Motor Co., Rex may have done a little more part-time work with Bob Smith at Delsoy Products. On 6 July 1945 Herbert Marshall Taylor, President of Delsoy Products, Inc., at the suggestion of Mr. Bob Smith, had given Rex 12 shares of their stock and invited him to work for them on a full-time basis. But both Rex and his father-in-law, A. Roy Barbier, felt terms offered by Delsoy for Rex's services were unacceptable. Mr. Barbier felt that Rex would never get a good deal from Bob Smith, and that influenced Rex's decision. Moreover, Rex's dream was to start his own company making the whipped topping that he had pioneered at Ford. So after a short time, he stopped working with Delsoy and began work on starting a company named Vegetable Products Corporation (VPC) to produce a whipped topping named Wonder Whip, which was similar to Delsoy. There were no hard feelings after this parting and Rex remained friends over the years with both Bob Smith and Herbert Marshall Taylor—though Taylor long remained bitter over his own split with Delsoy. Florence and Rex were married on 9 Aug. 1947 in Dearborn, and they lived in Dearborn for the next year.

Rex had plenty of good ideas but no money. With considerable help from Arthur M. Smith, his patent attorney, Rex found investors and on 26 Aug. 1947 he signed an agreement that established Vegetable Products Corporation to raise money in order to get his non-dairy whipped topping on the market. There were about 5 investors, who probably contributed equal amounts of capital, totaling about \$10,000 to \$20,000—a relatively small amount, leaving the business underfinanced. The investors were John J. Hamel Jr. (a friend of Arthur M. Smith), A. Roy Barbier (Florence's father), Robert Walker, Elmer Hitt, and Joe Higgason. Rex did not invest any capital. The corporation was headquartered in Birmingham, Michigan, which was where John Hamel, the president, had his office and lived. However Hamel didn't participate much in VPC. Rex was formally the corporation's treasurer, though he did almost all of the day-to-day work. It was about 2 months after this agreement was signed that VPC began to manufacture Wonder Whip at Bodker's Dairy in Detroit. [For another view of the events related to Delsoy, see interview with David and Harvey Whitehouse, Feb. 1992.]

VPC started in the fall of 1947 inside of Chris Bodker's Dairy at 25440 Five Mile Road in Detroit, Michigan. The local dairy association did not know that Bodker was allowing a non-dairy product to be made inside his dairy. Florence's father, who was head of the advertising department

for the Ford Motor Co., chose the name Wonder Whip and also designed the logo, which contained the words "Wonder Whip" inside a diamond. Chris Bodker wanted to distribute Wonder Whip (using his trucks) to his customers, but he was told by the local dairy association that if he distributed a non-dairy product, he would be "out of business." Shortly after their marriage, and after only 2-3 months of developmental work, VPC began producing Wonder Whip at Bodker's Dairy. It was distributed by Tabor Meat Distributing Co. VPC operated out of Bodker's for only 1-2 months, then Rex moved the business out to Saline, Michigan, and into the second floor of the old Henry Ford soybean extraction plant that had been purchased by the Hamel family's Valley Chemical Company in Oct. 1947 after Henry Ford's death and still had a solvent extraction plant that produced soybean meal and soy oil. As part of a written agreement, John Hamel let VPC use the second floor of the Saline building rent free. That included use of a little laboratory and of some stainless steel equipment that Henry Ford had previously used to make white soy paints using soy protein. Rex and Florence continued to live in Dearborn, driving to work each day in Saline; after several months, they moved to Saline, thus eliminating the long drive. By late 1947 or early 1948 VPC began to make (on the second floor) and continued to sell Wonder Whip, a liquid soy-based whipped topping, packaged in a small ½-pint cardboard container shaped like a truncated cone [the same shape as the containers for Delsoy and Rich's Whipped Topping, which were similar competing products]. They first distributed their product in a jeep and small trailer to the meat distributor in Detroit (owned by Mr. Tabor, a friend of Florence's father) who continued to distribute the product. In 1948 VPC had a booth at the Michigan State Fair, where 55,000 people tasted Wonder Whip. But Rex's company was undercapitalized, had weak distribution, and local competition from 2 other non-dairy whipped toppings which were improved by technical innovations.

One major competing product was Delsoy Super Whip (apparently launched in about 1947, perhaps the first such product in a pressurized can; it was later renamed Presto Whip). The second competing product was frozen Whip Topping, introduced in late 1945 by Bob Rich of Rich Products Corp. in Buffalo, New York. This was the first frozen whip topping. As its distribution expanded into Michigan, it severely hurt sales of Wonder Whip. In April 1949 Rex tried to expand into new non-dairy products with a soy ice cream, made from basically the same ingredients as his Wonder Whip, but VPC didn't have the funds to develop and launch such a new product, so the it was never sold. Delsoy in the pressurized can was a more serious competitor in the local area, but Rich's frozen Whip Topping was more of a threat in more distant markets and as it expanded into Michigan. VPC could not survive this competition from its weak position. Moreover Rex was not an experienced businessman. So the company was forced to cease operations on 26 March 1949,

after less than 2 years in business.

In early April 1949 Bob Smith of Delsoy Products offered Rex a job any time he wanted it. Smith also expressed interest in acquiring Diamond's pending patent applications as well as the name of his company, which he thought was better than his own "Delsoy Products Inc."

In March 1949 Rex wrote several food corporations to see if they might be interested in manufacturing Wonder Whip and paying him a royalty. General Food Corp. in New York said they were not interested. Sadly, Rex was ahead of the market, for about 8 years later General Mills launched Dream Whip, and about 15 years later Whip 'n Chill, both similar products.

American Maize Products Co. in Whiting, Indiana, responded favorably, so Rex went to work as a chemist for them from the fall of 1949 to Nov. 1955, working closely with B.R. Taylor, Manager of Planning and Development. However they wanted a spray-dried product with a long shelf-life since they had no facilities for handling a refrigerated product. For the next 7 years, Rex worked closely with Nichols Engineering Company, but they were unable to successfully spray dry a high-fat vegetable cream in their very small Niro spray dryer. The same type of formulas could be easily spray dried in the next larger Niro unit. After sitting on the shelf for a while, the fat would seep out from each particle in the high-fat product causing the particles to clump together. During the summer of 1951 he studied food technology at Massachusetts Institute of Technology. On 30 March 1950 Rex applied for a patent titled "Powdered Topping and Method of Making Same" (No. 2,619,423) which was issued on 25 Nov. 1952. Then he changed the formula radically, abandoning the use of soy (and of all protein), and made a much better product whose key ingredient was methyl ethyl cellulose, used as a stabilizer. He and Eugene L. Powell applied for a patent (No. 2,863,653) on this product, titled "Salad and Dessert Topping" on 3 Dec. 1954. It was issued on 13 Jan. 1959, after Rex had assigned the rights to Rich Products Corp. upon his employment with that company in the fall of 1955. Rex did no further work with soy. When American Maize decided they were not in a position to exploit the new methyl ethyl cellulose process of making topping, Rex wanted to move on so he could be actively engaged in the commercial exploitation of this new process. Even though American Maize wanted him to sell the patent to a manufacturer and stay on with them, they parted on friendly terms, and American Maize transferred the rights to the patent to Rex before he left. Florence thinks that Rex, at his own suggestion, paid American Maize a small sum to cover the expenses of applying for the patent.

On 12 June 1955 Rex presented a 9-page paper with 9 slides on "Vegetable fats for bakery and household use" at the annual meeting of the Institute of Food Technologists. He noted that in the USA, either soy protein or non-fat milk solids was generally used as the protein dispersant.

Continued. Address: 1112 Pawnee Trail #2, Georgetown, Kentucky 40324. Phone: 502-863-5055.

820. Diamond, Florence Barbier. 1992. The life and work of Holton W. "Rex" Diamond. Part IV. Work at Rich Products Corp., 1955-1966 (Interview). *SoyaScan Notes*. Dec. 3. Conducted by William Shurtleff of Soyfoods Center. Followed by confirmation from 8 pounds of documents sent by Mrs. Diamond.

• **Summary:** Continued: On 15 Nov. 1955 Rex Diamond went to work for Robert E. "Bob" Rich, president of Rich Products in Buffalo, New York. He was in charge of the laboratory and development and research of Rich Products. From that time until at least 1959 he was the only chemist employed by the company. Rex and Florence lived at 29 Campus Dr. in East Buffalo. On 25 Nov. 1955, as part of a business agreement, Rex sold, assigned, and transferred all rights, titles, and interests to all of his patents (3 issued and 1 applied for) to Bob Rich in return for \$5,000. American Maize Products Co. was granted a royalty-free, non-exclusive license under the invention of patent application No. 473,044 titled "Salad and Dessert Topping and Method of Making Same."

In May 1956 Rich Products added a completely new formulation of Whip Topping to its line. Named "Rich's Whip Topping—The Diamond Process," it contained no protein and was made by the process developed and patented by Rex Diamond. In a letter to his brokers dated 22 Aug. 1956 Robert E. Rich expressed his enthusiasm for the new product: "In all my years in the frozen food game, and you know we are the oldest specialty packer in operation today, I have never seen a single product with the sales potential of our Rich's Diamond Process Whip Topping. We're so enthusiastic about it that we've already begun the second story on our plant just to begin to handle the increased production we know is forth coming..."

Florence recalls that Rex had a good relationship with Rich Products for the first 7-8 years he worked there and he was promoted rapidly. In Jan. 1958 Rex was chosen to be the company's vice president in charge of research. "Bob Rich was as kind and nice to Rex and me as he could be, calling us one of the family and all."

Starting in Dec. 1958, and continuing until at least late 1964, Rex began extensive participation as an expert witness in litigation, defending Rich Products in at least 7 lawsuits involving non-dairy products. He also worked very closely and extensively with Rich's attorneys to develop their legal strategy in these lawsuits. Rex worked closely with Ellis Arnall, testified frequently, and spent roughly 25% of all working days of each year out of town. In Nov. 1959 his contract was renewed for 10 years and his bonus payments were adjusted to his satisfaction. On 11 Nov. 1962 Ellis Arnall wrote him from London: "We could win our case here if you were along to be our star witness." On 28 Jan. 1963 Arnall again wrote him, this time from Atlanta, Georgia: "With each

appearance on the witness stand you grow more profound, more persuasive and more sincere. I have observed many witnesses adducing testimony, but never have I seen a witness who can develop such an atmosphere of candor, fairness and conscientiousness in the way in which you do. Hearty congratulations!"

In June 1960 Rex presented a paper titled "Continuous process data recording in the manufacture of vegetable fat whipping emulsions" at the annual meeting of the Institute of Food Technologists. On 8 March 1962 he presented a paper titled "Observations on Whippable Emulsions for Pie Toppings: Their Characteristics and Performance" to the American Society of Bakery Engineers. Extensive excerpts were published in the society's 1962 proceedings. On 4 Feb. 1963 he presented a paper on vegetable fat replacement for dairy products to the Massachusetts Dairy Technology Society. He noted that "The manufacture of vegetable fat replacements for dairy products has increased tremendously in the past few decades." He also mentioned soymilk. In April 1961 Bob Rich installed 3 officers in the new corporation Coffee Rich Inc.; he was president, Rex Diamond was vice president, and Herbert R. Kusche was secretary and treasurer.

Outside of work, in Jan. 1963 Rex and Florence moved to 300 Depew Ave. in Buffalo. In 1964 Rex was elected president of the City Club of Buffalo. In April 1964 he ran successfully for Council of the University Club. His printed brochure, which contains a nice portrait. At work, he was Vice-President in Charge of Research of the Rich Products Corporation, Vice-President of Rich Pressure Dispensers, Inc., and Vice-President of Coffee Rich, Inc. "Avocations and hobbies: Music, photography, golf, and woodworking. Current memberships: The City Club of Buffalo, The Other Office Club of Buffalo, The University Club of Buffalo, Cherry Hill Country Club; in New York City, the Chemists' Club."

Florence states that Rich Products had lost money for 3 years prior to Rex's arrival. After Rex joined the company and his new product started to be made and sold, Rich Products' sales began to increase and the company became profitable. A document (Plaintiff's Exhibit #28) from the trial of Rich Products Corp. vs. Mitchell Foods shows that Rich's sales of Whipped Topping were roughly static at \$1.5 million/year from 1952 to 1955. Rex Diamond began working for Rich Products in Nov. 1955. Thereafter sales grew to approximately \$2.0 million in 1957, \$3.0 million in 1959, \$5.0 million in 1961, and 6.9 million in 1963. Advertising and promotional expenses stayed at about 9% of sales during this period, though they reached a peak of about 11% in 1955, and fell slowly thereafter to a low of about 7% in 1963. Florence recalls that sales had reached about \$12 million by 1965.

Rex Diamond's income also rose steadily, approximating in rate the growth of the company, from \$8,500 in 1955 to \$22,000 in 1960, \$29,000 in 1961, an estimated \$37,000 in 1962, and an estimated \$45,000 in 1963. In April 1962 he was able to write Sol Golden, an attorney in Atlanta: "I am

receiving, in a sense, too much salary.” He was looking for ways to retain more after taxes.

A separate document, apparently prepared by Rex Diamond in about 1957, shows Rich Products’ Institutional Whip Topping Sales grew from \$67,435 in 1946 to a peak of \$130,931 in 1952, then fell to \$93,288 in 1955. “During 1956, the institutional Whip Topping Formula was changed to the Diamond Process with a resulting increase in sales to \$207,345. In Nov. 1957 sales for the entire year of 1957 (based on known figures for the first 11 months) were projected to be \$630,451.

By Jan. 1964 Rex was at work on a new ice cream process and product for Rich Products; it would withstand more changes in temperature than ordinary ice cream without deterioration. It was an outgrowth of his whip topping technology.

Rex and Bob Rich were on good personal terms. The Diamonds often spent summer weekends at Bob and Janet Rich’s home in Point Abino, Ontario, Canada—right across the Niagara River from Buffalo. Then, starting in about 1963, various problems and conflicts began. On 14 Dec. 1965, Rex wrote Allen Smith, an attorney in Dearborn: “My employment situation in Buffalo recently has become nearly intolerable and incredibly is becoming worse...” By Jan. 1966 Rex had finished compiling documents for a lawsuit against Rich Products. On 15 Jan. 1965 his application for a patent on improvements in making frozen dessert (ice cream) was submitted (serial no. 425,952). Bob Rich fired Rex Diamond, who left Rich Products on 15 April 1966. Continued. Address: 1112 Pawnee Trail #2, Georgetown, Kentucky 40324. Phone: 502-863-5055.

821. Mauer, Judy. 1992. Update on Rich Products Corporation, and the size of the U.S. market for non-dairy whipped toppings (Interview). *SoyaScan Notes*. Dec. 10. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Rich Products Corporation’s sales are now approaching \$850 million per year.

The non-dairy whipped topping market has 3 segments: In the retail market, 100 million lb of product generate retail sales of \$222 million per year. The top retail brands, in descending order of market share, are CoolWhip (Bird’s Eye, Div. of Kraft General Foods, Inc.), Rich-Whip (Rich Products Corp.), Presto Whip (Presto Foods, California), and La Creme (Pet).

In the foodservice market (including hospitals, institutional restaurants, school lunch programs, etc.) 75 million lb of product yield sales of about \$150 million per year. And in the bakery industry (including in-store bakeries), 92.5 million lb generate sales of \$81.4 million.

Thus, in total, 265.5 million lb of non-dairy whipped topping create sales of \$453.4 million—a huge industry! Note: This entire industry originated at the Carver Laboratory of the Ford Motor Company in the early 1940s. The first 3

companies that manufactured non-dairy whipped toppings were started by Bob Smith, Bob Rich, and Rex Diamond. Smith and Diamond were chemists at the Carver Laboratory, and Bob Rich visited the Carver Laboratory and learned about the process there from Rex Diamond. Address: Secretary to Robert Rich, Sr., Rich Products Corp., 1150 Niagara St., Buffalo, New York 14240. Phone: 716-878-8000.

822. Ruddiman, Catherine. 1992. Recollections of work with soyfoods in Dearborn, Michigan (Interview). *SoyaScan Notes*. Dec. 12. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Catherine is Dr. Edsel Ruddiman’s niece. She is age 90, has a good memory, and has never married. Her clearest recollection is that in the 1930s (probably after 1934) Dr. Ruddiman would make soy flour by grinding whole soybeans. He would take samples to her home near Dearborn and she would use the flour to bake cookies, muffins, bread, etc. She lived between Dearborn and Detroit; she was not paid for this work. Her “Uncle Ed” would taste the samples she had baked, then take the rest over to the laboratory to work on them further. After several months, when they had more or less perfected the flour and its uses, her involvement stopped. She does not recall whether or not she ever visited his lab. She is quite sure that Dr. Ruddiman worked on soymilk, and probably ice cream. She is sure that bread made with soy flour was served in one or more Ford Motor Co. restaurants or cafeterias.

She does not have any newspaper or magazine articles about her uncle’s work with soya. She does not remember when or why Dr. Ruddiman stopped working on this soy project.

She remembers a man named Jan Willemse, who worked with Dr. Ruddiman. She did not know him (though she may have met him at one time), but his name is familiar. Address: 16351 Rotunda #351, Dearborn, Michigan 48120. Phone: 313-441-9148.

823. *SoyaScan Notes*. 1992. Dr. Edsel Ruddiman’s work with soyfoods at the Ford Motor Co. (Overview). Dec. 13. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** The following is compiled mostly from interviews with Robert Boyer, but also from other published sources, as cited.

Henry Ford’s three top soybean researchers during the late 1920s and the 1930s were Dr. Edsel Ruddiman (who started his soyfoods research with Ford in about 1928), Robert Allen Boyer (head of the laboratory studying industrial applications, who started his soybean research in 1931), and Bob Smith (who began work under Boyer in about 1931, then headed his own lab at Moir House from 1938-1942).

Dr. Edsel Ruddiman, a close boyhood pal and seat mate of Ford’s at Scotch Settlement School, was also Ford’s brother-in-law because he married Ford’s sister. In 1893

Ford gave Ruddiman's first name, Edsel, to his only child (a son). Formerly dean of the School of Pharmacy at Vanderbilt University and an excellent scientist, he had started working at the Ford Motor Company in 1926. He had one lab in a building not far from Boyer's and another little lab in a building that had formerly been his home, in a beautiful, tranquil setting on one of the Twin Lakes. His primary job was to develop a milk to replace cow's milk. Ruddiman was the man who got Henry Ford interested in soyfoods. Ford soon became deeply interested in the fact that soyfoods had been used for thousands of years as a key source of high-quality, low-cost protein by millions of people in East Asia.

Henry Ford's interest in soyfoods began in the early 1930s and stemmed from the interest and work of Dr. Ruddiman. The two men's earliest soyfoods extravaganzas were the press luncheons and dinners that they developed to publicize the experimentation with soy. The first meatless menu, developed largely by Dr. Ruddiman, was served to 30 wary reporters at the Chicago Century of Progress Fair in Aug. 1934; two others were served prior to 1943. Each of the 15 courses consisted partially or wholly of soy. The following 15 dishes were served: Tomato juice seasoned with soybean sauce. Salted soybeans. Celery stuffed with soybean cheese. Purée of soybean. Soybean crackers. Soybean croquettes with tomato sauce. Buttered green soybeans. Pineapple ring with soybean cheese [tofu] and soybean dressing. Soybean bread with soybean butter. Apple pie (soybean crust). Cocoa with soybean milk. Soybean coffee. Assorted soybean cookies. Soybean cakes. Assorted soybean candy (Simonds 1938, p. 235; *Chicago Herald and Examiner* 1934, Aug. 24, p. 11). At similar luncheons served between Aug. 1934 and July 1935, soy ice cream was also served for dessert (Strother 1961).

Dr. Ruddiman also developed a soybean biscuit, which both Henry Ford and white rats apparently liked, yet one of Ford's secretaries described it with unabashed candor as "the vilest thing ever put into human mouths" (Lewis 1972).

During the 1930s in Greenfield Village, Dr. Ruddiman developed canned green soybeans (Bansei variety) and produced 590 cans in 1935 and 1,000 in 1936 (Simonds 1938).

Out of their work in developing soyfoods banquets during the mid-1930s, Ford and Dr. Ruddiman developed a 19-page soup-to-nuts booklet titled *Recipes for Soy Bean Foods*, one of the first of its kind in America. Published by the Edison Institute, it contained 58 soyfoods recipes including ones for breads, biscuits, cakes, cookies, salads, meat substitutes, soy bean milk, soy bean cheese [tofu], roasted soy beans [oil roasted soynuts], soy bean nut butter [soynut butter], and soy bean butter (made by mixing hydrogenated soy oil with salt, coloring matter and diacetyl to color and taste). Unfortunately this book was not widely distributed.

In August 1940 Ford hosted the annual ASA convention at Dearborn. Dr. Ruddiman presented a paper on "Possibilities of Soybean Milk." Dr. Ruddiman discontinued

his work for the Ford Motor Co. in 1942.

In about 1941, when Dr. Ruddiman was almost 80 years old, his wife wanted him to retire. She spoke with Henry Ford about her wish and Ford responded quickly in a way that seemed to many who knew him to be quite out of character; he essentially destroyed Dr. Ruddiman's laboratory. Ruddiman was very bitter at Ford and at times he even cried. After a short time he quit. The Twin Lakes lab was closed in 1941 (R.A. Smith 1979, p. 25).

824. Bryan, Ford R. 1992. Re: Henry Ford's work with soy ice cream. Letter (fax) to William Shurtleff at Soyfoods Center, Dec. 24. 1 p.

• **Summary:** Shurtleff reported to Mr. Bryan that the earliest document seen that mentioned Henry Ford's work with soy ice cream was by Anson in 1958, yet Strother (1961) reported that he had tasted soy ice cream at the Ford Motor Co. when Henry Ford was age 71, i.e., prior to Aug. 1935. Shurtleff asked Mr. Bryan if he could look in the Ford Archives' newspaper clipping books for an early article in about 1934-35. Mr. Bryan did so and replied:

"I have found nothing in our newspaper clipping books between August 1934, and December 1935, concerning soy ice cream."

The 1945 microfilm of Rex Diamond's lab notes shows that he was doing research on soy ice cream in early June 1945.

"Jan Willemse tells me he served vanilla and honey flavored soy ice cream to Henry Ford in his private dining room in late 1934. Dr. Ruddiman had to approve it before it could be served. He said it was not publicized because not everyone liked it as well as dairy ice cream. Jan is now 92 but is sharp." Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

825. Curtis, Austin W., Jr. 1992. His work, his father's work, and George Washington Carver's work with soybeans (Interview). *SoyaScan Notes*. Dec. 24. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Dr. Curtis, a close associate of Dr. George Washington Carver, has an honorary doctorate degree. He is now age 81. His father, Austin W. Curtis, became Director of Agriculture at West Virginia State College, a black college, in about the early 1920s. At that time he took a strong interest in soybeans as a way of enriching the soil. Dr. Curtis does not know how his father became interested in soybeans, and he does not think his father ever published anything about soybeans. Much of what his father was trying to teach farmers about soybeans wasn't understood at the time. Gradually that part of West Virginia changed from a farming to an industrial area based on gas and coal. The students gave his father the nickname "Soy Bean Curtis," but they never used it in his presence. Likewise, the students sometimes called him "Little Soy"—in his presence. His father retired

from the university in about 1944. A relative of his is now preparing a biography of his father, but it may not be ready for several years.

Dr. Curtis did research twice at the Ford Motor Company in Dearborn, Michigan. In the summer of 1940, when Dr. Carver was still alive, his focus was on soy protein for use as food and spun soy protein fiber. He worked with Robert Boyer. He did not do much work with paints based on soy oil since that research had already been completed by Ford. He did not apply what he learned about soybeans after his return to Tuskegee, but he did apply the principles he learned to peanuts—which was an extension of work they had already done on peanuts. He did not do much work with soy in Alabama because at that time not many varieties of soybeans were well adapted to the climatic conditions of the south; they were primarily a midwestern crop. In 1944 the focus of his research at Dearborn was still on foods, not only with soybeans but also wild plants. His work with soy focused on making soymilk more palatable.

Dr. Carver was most interested in the soybean for its nutritional value and possible use to make low-cost foods. Neither Dr. Curtis nor Dr. Carver did any soybean breeding.

Dr. Curtis' laboratories have focused on products made from peanut oil; they have never made any soy products. Their best selling product is Curtis Rubbing Oil, made from peanut oil, for the relief of pains from arthritis and rheumatism. It is very effective. Skin care and hair care products also sell well. In the late 1950s the company employed about 40 people including sales people; now they employ less because they use brokers. The company has not grown as much as Dr. Curtis had hoped it would. Address: A.W. Curtis Laboratories, 46 Selden, Detroit, Michigan 48201. Phone: 313-833-6979.

826. Whiteman-Jones, Michael; Shurtleff, William. 1992. The modern evolution of soyfoods. *Natural Foods Merchandiser*. Dec. Soyfoods 2000 special supplement insert. p. 4-6.

• **Summary:** A colorful overview of the history of soybeans and soyfoods from 1100 B.C. to the present, worldwide. Discusses the history of tofu, Samuel Bowen, Benjamin Franklin, T.A. Van Gundy, Madison College, Henry Ford, Seventh-day Adventists, Erewhon, Asian Americans, Kikkoman, the \$1,000 million soyfoods market in America, countries with the highest per-capita consumption of soyfoods, the future of soyfoods. Address: 1. NFM; 2. Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

827. Hamel, Elmer; Parsons, Bruce. 1993. Recollections of Soybrands in Saline, Michigan, and Rex Diamond (Interview). *SoyaScan Notes*. Jan. 8-9. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** First a little background. In 1845 Schuyler Haywood built a water-powered 4-story wooden gristmill and flour mill beside the Saline River near its headwaters.

Called "Schuyler Mill" or "Schuyler Mills," it was located just west of the town of Saline, Michigan (on what is now U.S. highway 112), 31 miles west of Dearborn and about 8 miles south of Ann Arbor. Until 1911, the mill was riven by water power, then new machinery, driven by a gasoline motor was installed. In 1927 the mill had a capacity of 60-70 barrels of flour a day. For a more detailed history of this building, see Paul A. Meyer et al. 1976 "Weller's."

In 1934 the old mill was unused and deteriorating. Henry Ford bought it that year, moved the foundations about 30 feet south, renovated it elegantly with beautiful indoor paneling and hardwood floors, added a new turbine, an 80 horsepower generator, and another building to house a solvent extraction plant about 50 feet away (solvent was dangerous since it could explode). Then he created a park-like setting of rolling lawns around the buildings. Henry Ford's first rural soybean solvent extraction plant began operation here in Aug. 1938 as part of his industrial decentralization program. It also housed a coil plant, which manufactured ignition coils encased in soy bean plastic, and a plant that made white exterior paint based on soy protein. These operations continued until the start of World War II.

In Nov. 1946 the Ford Motor Co. sold its soybean processing plant at Saline, Michigan, to Soybrands, Inc. Elmer recalls that when Robert McNamara and his group of 6 took over to make the Ford Motor Co. more efficient, the company sold off almost all unprofitable enterprises—including most or all of the village industries. Ford first sold the Saline plant to Soybrands, Inc., a corporation created by 2-3 investors to buy the plant. The main investor was Harold? Johns who ran the Park Motor Co., a very successful Lincoln-Mercury automobile dealership (Ford Motor Co. made these cars) on Woodward Ave. in Detroit. Soybrands, Inc. tried (unsuccessfully) to run the plant for a little less than a year then shut it down for several months.

On 13 Oct. 1947 Soybrands Inc. sold the plant to Valley Chemical Co. (in Mt. Pleasant, Michigan), a rendering company owned by the Hamel family (Elmer's parents and siblings) which made an livestock and poultry feed ingredient out of animal by-products (meat scraps); they sold this ingredient to feed compounders. Elmer's parents bought the company partly because they fell in love with the beautiful riverside building with its water-powered generator, and partly because the processing machinery, end products, and customers for those products are similar. The Hamels hoped to use the soybean meal to manufacture some feed (which they never did), because at the time feeds were in scarce supply and high priced. After they bought the Saline mill, the price of feeds dropped rapidly. Soybrands became a division of the Valley Chemical Co. (it was never a separate corporation or company; "Soybrands" was also used as a brand name). Elmer and his brother-in-law Bruce Parsons ran Soybrands. Bruce moved to Saline in September 1948, moving into the former Henry Ford School (located across

the street from the soybean mill); Bruce had purchased the lovely school building early in the spring of 1948 and had it remodeled. He worked at the plant every day as mill superintendent, working closely with Orville Laidgard, who was plant manager, responsible for the equipment. Orville took the place of Dan Levleit, who had worked at the plant for Henry Ford and for Soybrands, Inc. and who lived on a farm just outside Saline. Elmer, as treasurer, spent 50-75% of his working time in the office at Saline, with the rest spent in Mt. Pleasant and Detroit. John Hamel, Elmer's older brother, worked in Detroit and wasn't involved much at Saline. Soybrands used the solvent extraction equipment developed by Ford to transform the soybeans into oil and defatted meal. The crude (unrefined) soy oil was sold to a local vegetable oil refinery and to soap companies. The "44 per cent soybean oil meal" was bagged in 100-pound bags and sold at wholesale prices to local elevator around Saline and Tecumseh; they mixed it with other ingredients to make feeds for livestock, poultry, and dogs. Soybrands used the water-powered generator to produce almost all of their own electricity in the spring and fall (and they even sold a little of their surplus back to Detroit Edison), but during the winter and summer (when hydropower was unreliable due to reduced water flow) they had to buy most of their electricity from Detroit Edison Co. In winter the pond was covered with ice. The electricity was used to run the electric motors that were used to grind soybeans, run the elevators and lights, etc.

The original main mill building in the front consisted of three stories/floors and a basement. It was built into a little bank or hillside. If you entered from the uphill: In the basement were 2 boilers, a coal bin, storage space for soybean meal and the meal bagging equipment. On the ground floor was space for bagged meal storage. On the first floor was where Henry Ford had his machines for making plastic parts. On the second floor was where Henry Ford kept his stainless steel equipment for making white paint, and where Rex Diamond later made his whipped topping. The attic was used for storing soybeans. The little building 50 feet to the rear housed the solvent extraction equipment and the toaster.

Rex Diamond came to know about Soybrands through Elmer's brother, John, who died in 1991. Elmer met Rex Diamond through John, and he remembers Rex as "a very nice young man who seemed like a competent chemist without much business experience. John also liked Rex very much." Rex probably started to use the Saline building sometime in late 1947 or early 1948. (Note: His company was named Vegetable Products Corporation and his product was Wonder Whip, a soy-based non-dairy whipped topping.) Bruce's memories of Rex Diamond's work with whipped topping are quite clear; Elmer's are vague. Elmer recalls that Soybrands had a little laboratory on the second floor of the building, and Rex came in every working day and sometimes on weekends to use it. Rex also brought in some of his own laboratory equipment. Bruce recalls that Rex was making a

commercial soy-based whipped topping on the second floor of the Saline plant. Rex used the all stainless steel equipment that Henry Ford had previously used in making a white exterior house-or-barn soy paint using soy protein. Bruce recalls: "This was beautiful white paint; I painted my fence across the street many a time with it." Rex also used the steam from the plant boilers, and purchased defatted soybean meal from Soybrands and used it to extract the protein for his whipped topping. John Hamel was an investor in Vegetable Products Corp. (VPC) so VPC operated from the Hamels' Saline plant rent free. Rex had a new product and a very small company; he had stiff competition from Delsoy (a similar product made by Bob Smith), and he had sales and distribution problems. Bruce and his wife both used Rex's whipped topping at home regularly and they both remember it as an very good product. Vegetable Products Corp. used the building in Saline for a little less than 1½ years.

Valley Chemical operated the Saline plant for about 3 years, then shut it down at the very beginning of the Korean conflict in June 1950. The U.S. government established a base price to farmers for soybeans and there was no processing margin between that and the market price of the company's finished products. In July 1951 Soybrands tried unsuccessfully to sell the historic mill to the City of Saline. The plant stood idle for a quite a while (perhaps 2-5 years), but each summer from July 1953 to 1962, Elmer's niece, Barbara Hamel (his brother's daughter), came in and, with Warren Pickett, helped to run a summer theater in the round (called Dramarama) in the extraction building. The rest of the year, any losses were written off on the books of Valley Chemical Co. In 1962 Valley Chemical sold the building. In 1967 Carl and Mickey Weller purchased the mill; they had owned a furniture company in Ypsilanti. Currently the original mill building houses the Town and Country Antiques Mall, the Raisin River Cafe (a "winter breakfast house" operated by Wendy Weller, open only from January through April—the off season for the catering business, which is the family's main source of income—and then only on Saturdays and Sundays. The rest of the year it is used for catered parties and wedding receptions) below on the back side ground level, and private apartments on the top two floors. The former solvent extraction building constructed by Henry Ford is now called "Wellers' Carriage House."

Elmer recalls that there were articles about Soybrands in the *Ann Arbor News*, the weekly *Saline Reporter* (originally named the *Saline Observer*), and the *Washtenaw Post* (no longer in existence but back issues are in the Clements Library of the University of Michigan at Ann Arbor). Address: 1. 1955 Boulder Dr., Ann Arbor, Michigan 48104; 2. 807 Riverview Dr., Jekyll Island, Georgia 31527. Phone: (1) 313-677-4732; (2) 912-635-2908.

828. Wright, David E. 1993. Alcohol wrecks a marriage: The Farm Chemurgic Movement and the USDA in the alcohol

fuels campaign in the spring of 1933. *Agricultural History* 67(1):36-66. Winter. [97 footnotes]

• **Summary:** The author includes considerable background on the origins of the Farm Chemurgic Movement, describing the connections between Wallace and the chemurgists, and the political reasons behind the failure of the attempt to build a solid official connection between chemurgy and the USDA. That led the chemurgy movement to become more separate and private.

Wright attributes much of the movement's leadership in terms of ideas to William J. Hale; Wheeler McMillen figures as a fairly minor person in this article. He concludes that it was not politically possible to make chemurgy the central farm policy because power alcohol or gasohol was the main product that was going to be promoted as part of the solution to the huge surpluses in the early 1930s, but the petroleum industry strongly opposed this idea—and prevailed.

The article closes with this thought: The "Farm Chemurgic Movement persisted as a force into the mid-1950s, and as a slowly declining entity into the 1970s. Moreover, the essential features of the Chemurgic program—whether marching under the banner of Chemurgy or that of 'sustainable agriculture' or 'biotechnology'—are as scientifically resilient today as they were in the 1930s." Address: Prof. of the History of Science and Senior Advisor, Research Policy and Regulation, Michigan State Univ., East Lansing, MI.

829. Meyer, Edwin W. 1993. Development of the world's first food-grade soy protein concentrate, Dr. Sidney Circle, and textured soy flour (Interview). *SoyaScan Notes*. April 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The first two commercial food-grade soy protein concentrates were Promax and Promosoy. Promax was developed by Lou Sair at Griffith Laboratories. Promosoy was developed mainly by Sidney Circle, first noncommercially at the Glidden Co., where it was called Protein 70, since it contained 70% protein on a moisture free basis, and then commercially at Central Soya. Promax and Promosoy were made by different processes. Promax was made by the acidulated water leach process (also called water leach or aqueous acid leach), whereas Promosoy was made by the aqueous alcohol leach process (also called aqueous ethanol leach), which takes out the low molecular weight materials. The latter process, which is only used for making concentrates, was developed at the Northern Regional Research Laboratory by Dr. Allan K. Smith's group after Dr. Circle left the group. Today, virtually all concentrates are still made by one of these two processes. To the best of Ed's knowledge, Promax was on the market 6-12 months before Promosoy. Sid Circle was head of all protein research at Glidden and at Central Soya during the 1950s. Promosoy was introduced on a small commercial basis in about 1960-61; it was first made at a large pilot plant on Laramie Avenue in

Chicago, then by 1962-63 at a real food plant at Gibson City, Illinois.

Glidden's uncommercialized concentrate was always called either Protein-70 or Pro-70. That name may have also been used by Circle at Central Soya until shortly before it was commercialized as Promosoy. Circle was at Central Soya at the time the product was commercialized. At the time, Ed was director of Research at Central Soya and Circle was Assistant Director of Research in charge of all research on proteins.

Circle left Central Soya in 1967 to go to Anderson Clayton Foods in Richardson, Texas, where he was Director of Protein Research from 1967-75. Anderson Clayton recruited Dr. Circle with a very attractive offer because they wanted to get into the soy protein business; they wanted a casein replacer to make imitation cheese, but the latter never worked out largely because they could never figure out how to make soy protein melt. Kraft tried to do the same thing. In 1972 Dr. Ralph Sand went to work at Anderson Clayton on the same imitation cheese project.

But there was another reason Circle left Central Soya. Ed had hired a very brilliant and rather independent young protein chemist, Nicholas Catsimpoolas. "If you knew Sidney, you had to be with him for a while to love him. He was a guy who would take your report and dot the i's, cross the t's, and that kind of stuff. He and Nicholas did not get along too well." So Circle (who is no longer living) left of his own volition.

Concerning textured soy protein concentrate: William Atkinson at ADM had developed a good process for texturing soy flour, so Central Soya decided to try texturing their soy protein concentrate, Promosoy. This research was done under Ed's direction because in 1968, Central Soya changed the laboratory over to corporate research and Ed became director of protein research; prior to that he had been director of all research reporting to a vice president of the Chemurgy Division. L.D. Williams now became director of all research, and he reported to Dr. Windsor W. Cravens, a vice president. Promosoy was successfully texturized using a Wenger extrusion cooker and the resulting product, Response, was launched in 1975. Response went on to become one of Central Soya's two most important soy protein products—the other being textured soy flour. Ed does not feel that textured soy flour will gradually loose ground to and be replaced by textured soy protein concentrates—because of economic factors. The main market for textured soy flour now is as an extender for ground beef; it is also used in chicken products and pizza toppings. It is most widely used in places where you have to eat what you are served—such as school lunch programs and the military. It is not used in retail products.

ADM also makes a textured soy protein concentrate named Arcon T. It is used in their veggie burgers, which Ed has seen promoted on TV.

Ed talked with Walter Wolf recently and he verified that Danny Chajuss was at the NRRL in Peoria, working in Allen

Smith's group on soy protein concentrates, for about 3-4 months. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

830. Meyer, Edwin W. 1993. How Ralston Purina got into the soy protein isolate business (Interview). *SoyaScan Notes*. April 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Ralston Purina began with industrial isolates which were used for coating paper and sold under the brand name ProCote. They probably heard about Glidden's activities with food-grade isolates so they probably just went ahead and began making edible isolates. Any specialist in this field would have known how to go from industrial to edible isolates. Ed thinks (but is not sure) that Bob Boyer arrived at Ralston Purina from Ford after Ralston Purina started making edible isolates; he was instrumental in showing Ralston how to use their edible isolates to make edible spun soy protein fiber. In the late 1950s Boyer went around trying to sell interest in and licenses to his patent for making spun soy protein fibers. A number of companies took a nonexclusive license including General Mills, Worthington Foods, etc. He may have approached either Glidden or Central Soya. Finally he went to Ralston and sold them the residual exclusive. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

831. Meyer, Edwin W. 1993. Thoughts on industrial non-food uses of spun soy protein fibers (Interview). *SoyaScan Notes*. April 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Deland Myers is a black gentleman, very talented, working on making textile fiber from soy at the Center for Crops Utilization Research at Iowa State Univ. Bob Boyer's son gave his group a piece of cloth containing spun soy fiber that Henry Ford once wore. Ed has done some consulting with this group. He feels they have taken on a very difficult, technical challenge to get something that is commercially useful. Part of problem is making a soy fiber with good wet strength. "If you look at protein composition, structure, etc. you begin to get a feeling as to why the wet strength is poor. At the time that Boyer was working on this problem at the Ford Motor Co. very little was known about the basic structure of proteins. Therein lies the answer. I have never seen a soy protein fiber with good wet strength. During the mid-1950s when I was assistant director at the Central Organic Laboratory for The Glidden Company, we worked with the Virginia Carolina Chemical Company, which was trying to spin fibers from soy. Somewhat earlier, they had purchased a plant in Taftville, Connecticut that was making zein fiber from corn protein. We worked most with Herschel Jenkins, who as at their laboratories in Richmond, Virginia. We supplied them with a chemically modified industrial protein, which we called Chem-Pro. They felt that one of the proteins we supplied to them did a better job than ordinary unmodified industrial protein. The patented process

for modifying these proteins involves the use of phthalic [pronounced THAL-ik] anhydride (used mostly in making alkyd resins), and other dibasic anhydrides." Ed is one of the inventors listed on this patent. Chem-Pro was introduced commercially in about 1953-54. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

832. Meyer, Edwin W. 1993. The soy protein isolate industry and market (Interview). *SoyaScan Notes*. April 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Dr. Meyer, who has been a leading soy protein researcher for The Glidden Co. and Central Soya for about 50 years, would estimate that Protein Technologies International (PTI) manufactures about 60% of the soy protein isolates in the USA and ADM makes the remaining 40%. There are no other significant manufacturers of soy isolates in the USA.

Bob Boyer and Frank Calvert played a major role in convincing Ralston Purina to get heavily involved with soy protein isolates. Before Boyer and Calvert arrived in 1962, Central Soya was America's only manufacturer of edible isolates with their Promine—which was launched in late 1959.

In mid-1980 ADM entered the soy protein isolate business when they bought the Central Soya chemurgy plant at Chicago. They operated it for a few years, then found out that it wasn't profitable to operate in Chicago. So they moved the equipment down to Decatur, Illinois. He has heard that half the equipment was in mothballs. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

833. McDermott, Ron. 1993. The effect of the work of Henry Ford and his researchers on Worthington Foods today (Interview). *SoyaScan Notes*. April 13. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Robert Boyer, who worked for many years with Henry Ford, brought the technology for making spun soy protein fibers (SPF) to Worthington Foods. Today, as far as Ron knows [and as far as Soyfoods Center knows], Worthington is the only company in the world making SPF. They are used in about 15-20% of Worthington's meat alternatives, and they are especially useful in chicken-like products. More specifically, they are used in about 15% of their Morningstar Farms line of products (they are not used in Grillers, Breakfast Patties, and Breakfast Links), and in about 20% of their other canned and frozen meat alternatives. A new Morningstar Farms Breaded Chicken Patty, which is in expanded test market, also contains spun soy protein fiber.

In April 1992 Worthington had their first public stock offering to finance their new plant, so their financial figures are now available. The stock is traded on the open market over the counter (OTC) under the symbol WFDS for about \$9.75 per share. The company total sales for 1992 were \$76 million. Of this, meat alternatives accounted for about two-thirds of the total sales, or about \$51 million. If SPF account for 17.5% of this, then they have a retail value of about \$8.8

million.

Most of Worthington's meat alternatives are made from a combination of wheat gluten and textured soy protein concentrate. SPF work best in simulating the texture of long muscle fibers, as are found in chicken-like products, such as chicken breast or drumsticks. They also work well to simulate fish cutlets or non-ground red meat (such as roast beef), but there is not much demand for these types of products from Worthington customers. Most beeflike forms are burgers made to simulate ground beef. Moreover plain SPF has a better, more bland and less beany flavor than soy protein concentrates, and they hold and bind other added flavors better.

Why doesn't the company use more SPF? Because they are a very expensive ingredient, and Worthington's growth is in low-tech products, both from a consumer preference and a cost viewpoint.

But Ron is quick to add that SPF have had a major impact on the overall growth of Worthington Foods that is not at all adequately expressed by the present 15-20% figure. First, "the initial impact was huge." Before Bob Boyer came along and brought this technology from Henry Ford, Worthington was making mostly canned wheat gluten products for a very small and specialized denominational market. The first SPF products propelled Worthington into a new level of technology, the mainstream market including supermarkets, and into frozen foods. Second, the new SPF technology was a major factor in attracting Miles Laboratories, which purchased Worthington in March 1970s and took the company into the big leagues—in every area of business from accounting to quality control, from manufacturing to marketing. Third, when trying to deliver a full line of products to consumers, having meatless alternatives to chicken has given Worthington an important competitive advantage. Now that Americans consume more chicken than beef, this becomes increasingly important. Address: Vice President Research & Technology, Worthington Foods, 900 Proprietors Rd., Worthington, Ohio 43085-3194. Phone: 614-885-9511.

834. Perkins, Dave. 1993. Update on The Drackett Co. (Interview). *SoyaScan Notes*. April 14. Conducted by William Shurtleff of Soyfoods Center. Followed by a letter of April 16.
 • **Summary:** The Drackett Co. was organized in 1910; its founder and first president was Philip Drackett. The second president was Harry R. Drackett, who died in March 1948. His son, Philip, became the third president shortly after H.R.'s death. Drackett has a number of significant "firsts" to its credit. Drano was America's first commercially successful drain opener. Windex created the glass cleaner business. Drackett commercialized the first textile fiber (named Drackett Soybean Azlon) made from plant proteins. The Azlon Research Facility was probably closed in about 1949. In the "Notes to Financial Statements" section of the 1950

Annual Report, there is confirmation that the Azlon Research Equipment was idle for a year.

The Drackett Co. still exists in Cincinnati, Ohio (as a subsidiary of S.C. Johnson Wax) at 2 locations. The original 5020 Spring Grove Ave. location is an R&D and administrative facility. Dave is located at 201 East 4th St. in downtown Cincinnati, at executive headquarters. The company was sold to Bristol-Myers in Nov. 1965. On 31 Dec. 1992 it was sold to its present owner S.C. Johnson & Son, Inc. (Racine, Wisconsin), whose products include Johnson's Wax, Pledge furniture polish, Glade air fresheners, and Gel shaving cream. People who would know more about The Drackett Company's work with soya are Fred Wilson (who came from the Ford Motor Co., was manufacturing vice president for many years, and is now retired in Florida), and Chuck Butke (in R&D, retired in Cincinnati).

Perkins notes that one main reason that Drackett sold its agricultural operations to ADM in 1957 is that they were making a major push to advertise their consumer products (especially Windex and Drano) on television. In 1957 they sponsored a show that became Wagon Train, then after that Maverick. Some of the funds that came from their sale to ADM were invested in this TV advertising program.

The Drackett Co. has both annual reports and a periodical titled "The Drackett Dotted Line" for the period 1936-1957 during which Drackett was involved with soybeans.

Presently S.C. Johnson & Son, Inc. is shutting down all Drackett operations in Cincinnati; before the end of the summer of 1993 there won't be any Drackett people left in Cincinnati, but about 70 of those people will be "hired" by Johnson to move up to Racine. There haven't been any Drackett manufacturing operations in Cincinnati since the late 1970s or early 1980s. They had plants at Urbana, Ohio and Franklin, Kentucky—both of which are also being phased out. The name Drackett will cease to exist by about the end of 1993.

Concerning Sharonville and Evendale, Evendale became a city in 1951. When Drackett originally moved into this area in the 1940s, they moved onto property in Hamilton County that was very near Sharonville—the nearest local post office. In reality, it was probably just unincorporated property that officially became the city of Evendale in 1951. Address: Director, Public Relations, 201 East 4th St., Cincinnati, Ohio 45202-4178. Phone: 513-632-1800.

835. Butke, Charles. 1993. The Drackett Company's work with soy proteins (Interview). *SoyaScan Notes*. April 15 and May 7. Conducted by William Shurtleff of Soyfoods Center.
 • **Summary:** When the Ford Motor Co. sold its soy protein operations to The Drackett Co. in Nov. 1943, Robert Boyer, Frank Calvert, William Atkinson, and Charles Robinette went to Drackett as part of the deal. Charles (now age 71) started working for Drackett in 1946 in the R&D lab at Cincinnati as a chemist and chemical engineer; he had never worked for

the Ford Motor Co. For the first 6 months, Fred Wilson from Ford worked in the same lab with him; then Fred moved out to production. His work was to try to increase the amount of protein extracted from the defatted soybean meal.

There was a man named J.F. Johnson who was a very well educated and competent man. He was one of the first graduates of MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts]. From Procter & Gamble, he came to work for Mr. H.R. Drackett, the company's president. He designed Drackett's original soybean crushing and protein extraction plant on Spring Grove Ave. in Cincinnati. His design and process was different from that used previously by Ford. At this plant Drackett processed soybean oil meal, oil, and Drackett Soybean Lecithin (in 55 gallon drums by 1945). Johnson designed a system whereby the oil was extracted from the soybeans using hexane solvent, and the crude soy oil was run into huge tanks and allowed to settle for 7 days. The good oil was decanted off the top and the foots on the bottom were reprocessed and yielded lecithin. Johnson's good soy oil was good enough to use in home cooking; it was used in consumer sampling but it was never sold commercially.

When Ford's soy protein operations went up for sale, H.R. Drackett thought that his soybean crushing operations and Ford's technology for spinning soy proteins would make a perfect marriage.

First Drackett set up an experimental soy protein plant at Spring Grove, then they made it into a commercial plant next to their soybean extraction plant at Sharonville, Ohio, which was crushing about 55,000 bushels/day of soybeans. This plant was later said to be at Evendale (even though it never moved) either for tax purposes or because city boundaries moved.

Charles had a spiral-bound catalog titled "Drackett Proteins" (which he sent to Bob Griffin at Drackett about 6 weeks ago in response to an enquiry related to Drackett company history) that described the three types of industrial isolated soy proteins made and sold by Drackett when he arrived in 1945—Protein 110, Protein 112, and Protein 220. The first two were low-viscosity proteins of low molecular weight used in paper coatings and sizings. The Protein 220 was used very widely in water-based paints. The names of these proteins were later changed to Ortho Protein—of which there may have been different types. A man named Sam Wise (now deceased) held one of the original patents for making water-based paints. Mr. Drackett sold that patent to a big paint company so that they could get into the water-based paint business.

Drackett made and sold Soybean Azlon (spun soy protein fibers) from about 1946 to 1949. Their main customer was the American Hat Corporation (in Connecticut), which used it in felt hats. Chuck is absolutely certain that the Azlon was sold commercially because he was in charge of approving the shipments to go out. It had very good felting properties. Drackett made about 1,000 to 1,500 lb/day of Soybean Azlon,

cut the fibers into lengths of about 2½-3½ inches as desired by the hatter, tied them into loose uncovered bales with cord, and shipped them. There were also two other smaller companies that used Azlon. At the time, H.R. Drackett had suits and hats made for his sales force that contained Azlon.

Drackett also had a small operation that made plastics, and he is sure that they received 1-2 orders for these in the form of 3-foot diameter bases for large industrial fans. Not much of the plastic was sold and Butke thinks this was the only application for which it was sold commercially. He does not recall which company ordered the plastic bases.

In 1949 Drackett shut down its plant that was manufacturing Azlon, quit making isolated soy protein, and also shut down some of its soy protein research. Charles was moved out of soybean research into the laboratory doing research on soybean oil. Bob Boyer left Drackett, then rewrote the patents for making Azlon to make them suitable for production of edible soy protein fibers. When Boyer left, Frank Calvert became director of research for Drackett.

Drackett did considerable work on edible soy protein products—a fact that is not well known. Bill Atkinson's TVP grew out of this work. It started when a group of Seventh-day Adventists from Worthington Foods of Worthington, Ohio (located just north of Columbus, Ohio) came to Drackett (in Cincinnati, Ohio) and asked if Drackett could develop an edible soy protein—because they didn't eat meat. They even gave Drackett some seed money to work on the project. Bill Atkinson took charge of the project in about 1956; he worked with Ed Lankheit (pronounced LANG-kite, he is now age 76 and lives in Park Hills, Kentucky) and a lady researcher. Drackett sold granules all the time. To make these granules they took the flakes from the solvent extraction plant, ran them through an alkali extraction process to extract the protein, which is then precipitated with an acid. It is filtered and dried to make small and hard granules of isolated soy protein. They then used a hot water or steam extraction on the granules to try to get rid of their raw beany flavor—to no avail. So they mixed the granules with beans and chili sauce to mask the beany flavor. The texture of the cooked granules closely resembled that of ground meat, but the flavor was pretty poor. This product was never commercialized, but it did evolve into the TVP developed later by Atkinson at ADM.

In mid-1957 Drackett sold its soybean operations to ADM. ADM wanted Drackett's two industrial soy protein products, Atkinson's work with edible textured soy proteins, and the other people and expertise in the edible area. ADM also bought Drackett's library, laboratory notebooks, etc. Roger Drackett had hired a group from Ohio State University survey the future potential of soy proteins. They concluded that another 25 years of R&D would be needed to make the soy protein operations financially successful. Drackett took the money from the sale to ADM and invested it in TV ads for consumer products like Windex and Drano.

Charles went to ADM as part of the deal—along with about 9 other researchers, including William Atkinson. Charles worked for ADM at the plant in Evendale from 1957 to 1960. The soybean crushing and soy protein operations were continued as before except that ADM added a new Ortho Protein product—which was less expensive because it was not bleached as much with hydrogen peroxide. Bleaching was one of the most expensive steps in the process. In 1960 Charles left ADM and went back to work for Drackett at their plant in Spring Grove, where they made Windex, Drano, etc. At some point ADM moved the soybean crushing and protein equipment out of the plant in Evendale but he does not know where they took it. They sold the soybean and grain storage facilities to Central Soya, and they sold the many empty buildings to other small industries. Address: 9541 Flick Rd., Cincinnati, Ohio 45247. Phone: 513-741-4289.

836. Wilson, Fred. 1993. Work with the Ford Motor Company and The Drackett Company on soy proteins (Interview). *SoyaScan Notes*. April 16 and 28. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Fred started working for Henry Ford in 1933; he was a guide in Greenfield Village and museum, while he was in high school. In 1935 he went to work as a research chemist for Robert Boyer at the research lab. in Dearborn, Michigan. They were extracting oil on a small scale from soybeans, breaking it down into various derivatives, converting it to stearic acid, and also extracting the protein. He also did some work in the soybean fields. He worked on the “plastic car” whose body was made from phenolic resin (made from carbolic acid) plus some soy protein and fiber. In late 1941, Mr. Ford gave Boyer’s group part of an air-frame building (about 120 by 250 feet, located opposite the Ford airport) to use as a pilot plant, they expanded their work on spun soy protein fibers. Mr. Ford bought the group some Saca Lowell spinning equipment (pilot plant size), carding mills and frames, felting machines, even looms so they could make carpets and upholstery, mixing the fiber with rayon (mostly) and some cotton. Then he supervised the production of the spun soy protein fibers. Bill Atkinson, an excellent chemist, worked with him, mixed the spinning solution that was run through spinnerettes. Charles Robinette handled the spinning lines. Walter Jenks was a research chemist, who later went to Drackett. But Boyer was the man most responsible for developing the spun soy protein fibers. Ford’s main use of soybeans was for oil. Much of the remaining defatted soybean meal was sold for use in feeds, mostly to the poultry industry.

The group produced about 1,000 lb/day of soy fiber and all of it was used experimentally. Fred does not recall any of this fiber ever being used in any automobiles sold by the Ford Motor Co. But the fiber was used in “service cars” owned by the Ford Motor Co. for its own use. The soy fiber was mixed with sisal (a coarse fiber), then the mixture was formed into a pad and sprayed with latex to hold the pad’s form. This

material was used as padding under the seats of the service cars. Fred does not recall that this fiber was ever used in any type of upholstery for any cars. During World War II, the spun soy fiber was mixed with rabbit fur and made into experimental hats by some hat company. They did some work with Munsing, which blended the soy fiber with other materials to make underwear. Henry Ford and Bob Boyer each had some of this underwear.

In 1943 The Drackett Co. purchased all of Ford’s soy protein operations and Fred went to Drackett at that time. He started as technical supervisor in the soy protein plant at Sharonville (the correct city name; not Evendale) making Ortho Protein, whereas Chuck Butke and Robert Boyer worked at the lab in Cincinnati. The protein was coagulated, drum dried and oven dried, then ground to a fine powder and bagged in 100-lb bags. Some of the Ortho Protein was sold to Sherwin Williams for use in water-based paints. Eventually Fred became superintendent of the entire Sharonville facility (both solvent extraction and protein).

Fred does not recall any of the soy protein fiber (Azlon) ever being sold by Drackett for use in commercial products. Specifically he does not recall its ever being used in commercial felt hats by the Hat Company of America—but he admits that Chuck Butke (who is younger and has a better memory) may well be correct in his recollection that it was sold for use in hats. The problem with the fiber was that it had poor tensile strength, was brittle, and had no elasticity. A large amount of the soy oil that Drackett produced was sold to Procter & Gamble for use in margarine.

Concerning the plastic molding compound and preforms, they were made from phenolic resin with rayon cord plus some soybean fiber (a filler, left over after the soy protein was extracted from soybean meal) and some soybean hulls. The basic concept came from Ford.

When Drackett sold its soybean operations to ADM in 1957, Fred stayed with Drackett and worked on consumer products. ADM ran the soybean crushing plant and protein plant for about 5 years, then they shut it down; they sold the silos and grain storage facilities and cleaning or reconditioning equipment to Central Soya.

After Boyer left Drackett he and his wife, Betty [Elizabeth Szabo Boyer], continued to live in Cincinnati (on North College Hill St.). Then Betty died in Cincinnati [in Feb. 1963]. Fred thinks he remarried later [April 1965] to a lady [Nancy Ann Miller] who worked in a bank in St. Louis, Missouri.

For more information about Drackett, contact Jean Drackett (Mrs. Roger Drackett) in Naples, Florida, or Cincinnati, Ohio (Phone: 513-561-7418), or their daughter, Cecil (Phone: 513-561-2627). Address: Florida. Phone: 813-784-6560.

837. Bryan, Ford R. 1993. Robert Allen Boyer (Document part). In: Ford R. Bryan. 1993. *Henry’s Lieutenants*. Detroit, Michigan: Wayne State University Press. 321 p. See p. 44-51.

Great Lakes Series. April. [10 ref]

• **Summary:** This biographical sketch of Boyer (1909-1989), Henry Ford's top soybean man, is well researched and full of original material. Robert Boyer was born on Sept. 30, 1909 in Toledo, Ohio. In 1916 he moved with his parents to Royal Oak, Michigan, where he attended grade school while his father worked in the accounting department of the Ford Motor Co. in nearby Highland Park. When Henry Ford bought the Wayside Inn in Massachusetts in 1923, Frank Campsall suggested to Ford that Earl Boyer would be an appropriate business manager for the Inn. So the Boyers, including young Robert and his three sisters, moved into a Ford-owned house near the Inn. Robert then attended high school at Framingham, Massachusetts, where he graduated in 1927. Robert met Henry Ford while skating at the Inn. Ford suggested that he come to Dearborn for some work experience before going to college at Dartmouth as planned. So in Sept. 1927 Robert arrived in Dearborn where he was enrolled in the Henry Ford Trade School at the Rouge plant.

"Henry Ford had taken recent trips to Europe and had been impressed with the agricultural prosperity in some of those countries. Returning to Dearborn, Ford wanted to set up an experimental agricultural chemical factory to determine what products could be obtained from plants. The experimental chemical factory became a one-quarter size model of Ford's mammoth wood distillation plant at Iron Mountain, Michigan. The model was constructed at Iron Mountain and moved to Greenfield Village in late 1928. About then Ford asked, 'Bob, how would you like to supervise this model plant—to stay another year or two and live at the Sarah Jordan Boarding House in Greenfield Village?'

"Boyer had had little formal training in chemistry, but he was provided with tutors from the University of Michigan, and from 1929 to 1933 attended the Edison Institute of Technology, a school founded by Henry Ford and Thomas Edison as a school for inventors... Ford's purpose was to find industrial uses for farm crops. A farm depression was imminent. During the depression year of 1931, Robert Boyer married Elizabeth Szabo of Detroit. During the next few years they had three children...

"In 1931, soybeans became one of the plants investigated at the Chemical Laboratory... Usually the beans were pressed to obtain the oil, and the remaining 'cake' was fed to animals. The Boyer group, however, developed a solvent extraction procedure whereby soy protein as well as oil could be produced...

"By this time Henry Ford was growing rather old, approaching seventy. Design of the V-8 Ford in 1931 seems to have been his final great interest in automobile mechanics. His Edison Institute Schools, Greenfield Village, and soybean research now largely occupied his time. In 1932 he began to plant hundreds of acres of soybeans on his Dearborn farm lands and began procuring thousands more acres in

Southeastern Michigan. Several additional processing plants were located in outlying towns where he promised to buy even more soybeans from local farmers to use in automotive paints and plastics. Boyer was largely responsible for Ford's advancement in soybean technology.

"Henry's vegetarian eating habits led him to hire his old gradeschool friend, Dr. Edsel Ruddiman, an organic chemist, to devise tasty dishes containing soybean ingredients for the dining room. And Ford's executives, including Boyer, were coaxed by Ford to try them—soybean milk, soups, bread, croquets, simulated meats, butter and ice cream. Most were not very palatable, however, because of the tendency of the soy oil to be slightly rancid."

Boyer was in charge of the "Industrialized American Barn" demonstration at the 1934 Chicago World's Fair. And in May 1935 when the first chemurgy conference was held at the Dearborn Inn, Boyer was in charge of arrangements. During the second chemurgy conference in Dearborn, Boyer led the groups of participants through his Soybean Laboratory at Greenfield Village. At about this time Boyer developed soy protein fibers which were blended with wool (35% soy and 65% wool) and woven into cloth. The resulting cloth was given to Ford's own tailor, and suits of soy fiber were worn by Ford on occasion—and highly publicized. "Boyer admits that the tensile strength of soy fiber was only 85% of wool, however, behooving the wearer to avoid strenuous movements, bending down for example very cautiously.

"Boyer's fiber was ideal for felt hats, however. All of the fiber Boyer could produce was wanted by the Hat Corporation of America. The soy fiber blended well with rabbit fur, was less expensive and much cleaner to work with. To produce fiber in larger amounts and to develop fiber of higher tensile strength, a modern air-conditioned laboratory was built on Village Road in Dearborn. In this plant not only fiber producing equipment was installed but complete weaving equipment as well."

Between 1939 and 1941 Boyer worked on Ford's "plastic car" made from soybean plastic. It also drew widespread media publicity. "Boyer drove the car a few weeks before it was abandoned. (People are still wondering what became of that plastic car.) A major defect never corrected, according to Boyer, was the strong odor reminiscent of a mortuary...

"The soy protein fiber facility was operating nicely when in 1943 the U.S. Air Force demanded the air-conditioned building for precision measurement of aircraft engine parts. When his building was thus usurped, Boyer was out of a job involving soybeans. He then transferred to Ford's Willow Run Bomber Plant at Ypsilanti, Michigan, where, because of his knowledge of plastics, he was given responsibility for protecting the plastic windshields on the B-24s during assembly of the planes."

In 1943 Drackett Products Co. in Cincinnati, Ohio, purchased the Ford fiber processing equipment and Boyer

went to work for Drackett in Cincinnati—he was never again in direct contact with Henry Ford. Boyer wanted to develop edible soy protein fibers. When H.R. Drackett died in 1949, Boyer left The Drackett Co. so he could pursue his goal of receiving a pioneer patent for texturizing vegetable (soy) protein. He was granted this patent in 1949. As many as 30 corollary patents were subsequently obtained.

“Boyer had developed methods for producing soy fiber that was thoroughly washed and tasteless. In 1951 he became a consultant to several food processors who were licensed to use his patents in their operations. These firms included Worthington Foods, Swift & Company, Ralston Purina, Unilever Company of England, National Biscuit Company [Nabisco], General Foods, and General Mills. Dozens of high-volume foods were, and still are, produced using Boyer’s procedures... Robert Boyer worked full time for Ralston Purina in St. Louis, Missouri, from 1962 until 1971.

“In February 1963, Elizabeth Szabo Boyer died, and in April 1965, Boyer married Nancy Ann Miller, a recent widow living in St. Louis. Boyer retired from general consulting work in 1971 after his patents had expired in 1966, but continued consulting with Worthington Foods until 1977. In 1973, Nancy and Robert retired to downtown Dunedin, Florida.

“The Boyers did considerable traveling. But in the early 1980s Robert’s eyes began to fail, and then his chief hobby became baking, an occupation he had always enjoyed. In 1985 he dictated his oral reminiscences [8 hours on tape with David R. Crippen] as requested by the Henry Ford Archives. Boyer died in Dunedin on November 11, 1989. The body was cremated and the ashes scattered over the Gulf of Mexico.”

Photos show: A portrait of Boyer in his later years (Ford Archives photo ID No. P.0.19429). The Chemical Laboratory building at Greenfield Village at Dearborn (No. 0.6213) in 1930. Henry Ford discussing soybean work with Boyer in the Chemical Laboratory on Ford’s birthday, July 30, 1937 (No. 188.21320. Ford is seated on a stool by a lab. bench reading and Boyer has one elbow on the bench behind him.) Boyer and Ford with the “plastic car” at Dearborn in 1941 (No. 189.16352).

Talk with Ford Bryan. 1992. Nov. 12. He is now working to get Robert Boyer’s soybean research laboratory, the Chemical Plant of the Edison Institute, restored at Greenfield Village and interpreted as to its history and significance. The building is in fairly good shape; the exterior is in good shape but all the equipment has been removed from the interior. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

838. Bryan, Ford R. 1993. *Henry’s lieutenants*. Detroit, Michigan: Wayne State University Press. 321 p. April. Illust. No index. 25 cm. Great Lakes Series. [300+ ref]

• **Summary:** Henry Ford had the ability to attract and motivate people of considerable talent. Though many of them

were self-trained as he was, they worked together to “launch the largest productive enterprise in the world... Although Henry Ford gloried in the limelight of highly publicized achievement, he privately admitted, ‘I don’t do so much, I just go around lighting fires under other people.’ These other people were allowed very little public recognition by Ford.” This fine book features biographies “of 35 ‘other people’ who served Henry Ford in a variety of capacities, and nearly all of whom contributed to his fame.” For each individual, there is a black-and-white portrait photo, the years that he lived, a brief quote describing his work, a biographical sketch and career highlights, and 5-10 major references concerning his life and work. A fine photo of young Henry Ford (Ford Archives No. 0.4165.66) faces the title page.

The 35 main lieutenants, listed alphabetically, are: Clarence W. Avery, Irving R. Bacon, Harry H. Bennett, Fred L. Black, Robert A. Boyer, William J. Cameron, Frank C. Campsall, James J. Couzens, Burt J. Craig, Edward J. Cutler, Raymond C. and Evangeline C. Dahlinger, George Ebling, Eugene J. Farkas, Edsel B. Ford, Joseph A. Galamb, Carl E. Johansson, Albert Kahn, Ernest C. Kanzler, William S. Knudsen, Raymond H. Laird, Ernest G. Liebold, Clifford B. Longley, Benjamin B. Lovett, Russell H. McCarroll, Roy D. McClure, Samuel S. Marquis, Peter E. Martin, William B. Mayo, Sir Percival L. D. Perry, Frederick E. Searle, William A. Simonds, Howard W. Simpson, Roscoe M. Smith, Charles E. Sorenson, William B. Stout, Albert M. Wibel, Childe H. Willis.

The author obtained a considerable amount of the material in this book from the reminiscences of the subjects themselves. The chapter on Robert Allen Boyer is cited separately and lengthy excerpts are given. A photo shows Boyer.

In Appendix I, titled “Henry’s Sub-lieutenants” (p. 295-99), the author lists and gives a 1-2 line summary of other individuals who were also highly beneficial to Henry Ford and the Ford Motor Co.

In Appendix II, “Recollections,” he lists people who were interviewed during the 1950s, after the deaths of Henry and Clara Ford. “The reminiscences were gathered as part of a program conducted under the auspices of the Ford Motor Company. These tape-recorded oral histories have been transcribed and are now on file as Accession 65 in the Archives of the Henry Ford Museum and Greenfield Village. About 250 of the reminiscences are hard-bound copies of typed sheets; the balance are typed but not bound. As noted in the listings, the lengths of the histories vary greatly, from a very few pages to as many as 1,536 in a single history.” Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

839. Meyer, Edwin W. 1993. Historical notes on textured soy flour (Interview). *SoyaScan Notes*. May 10. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Glidden Co. sold a textured soybean meal mainly to John Morrell & Co. for use in pet (especially dog) foods—but also to some other dog food companies. Morrell was a big meat processing firm with headquarters in Chicago and a big plant in Ottumwa, Iowa. At that time all dog food was canned (no dry or semi-moist) and this textured soy flour kept a certain amount of its integrity during retorting—so the dog-food people liked it.

The solvent defatted soybean meal was run through an expeller (also called a screw press) to give it texture, then the resulting cake was broken up into bits or grits. No die was used. Glidden's early texturizing process, dating from the late 1930s, was covered by a 1939 patent issued to Arthur Levinson and James Dickinson. These two inventors never got much credit for their invention (in part because they unfortunately did not use the term "texturize") and it played no role in the subsequent technology based on extrusion. If Levinson and Dickinson had used the key term "texturize," their patent would have been "prior art" making it more difficult for people to subsequently be issued patents on extruded materials or texturizing. An expeller, which was designed to press the oil from oilseeds, is less well suited to texturization than an extruder—which has no openings along the barrel and which gives more sheer working and alignment of the protein to create that meatlike texture.

Many people think (incorrectly) that William Atkinson was the original inventor of textured soy flour, but the Atkinson patent (issued Jan. 1970; No. 3,488,770) does not dominate the industry—even though Atkinson's patent was a very early, creative, and important one, and ADM did a very good job getting TVP on the market early. Ed is quite sure that Atkinson developed his patent independently and with no knowledge of Flier's work. However the dominant U.S. patent now is the one issued to Flier (pronounced FLEER) of Ralston Purina Co. on 24 Feb. 1976 (No. 3,940,495). There was a long time between application date and issuance date for the Flier patent. The Flier patent expires in 1993.

Part of the following is based on Ed's first-hand knowledge and part on second-hand knowledge (hearsay). After the Flier patent was issued, Ralston Purina filed a lawsuit against ADM in a federal court in southern Illinois. Swift (who was also extruding soy flour) may have been included in the suit. Sometime after the filing of the suit, Ralston Purina and ADM settled out of court. Ed thinks that as part of the settlement, they cross-licensed each other (so that each could use the best parts of the other's patent). After the ADM settlement, Ralston Purina went after all others in the industry who were extruding to take licenses. If they didn't take a license, Ralston could charge them with infringement, and the cost of the infringement can be very high. So Cargill and A.E. Staley each took a license. Then Ralston Purina sued Far-Mar-Co. Wenger supported Far-Mar-Co because Wenger felt that patent would curtail the sale of their machinery. Ed was subpoenaed by Far-Mar-Co

to give testimony under oath. Far-Mar-Co people learned, via Wenger, that there was a man in Decatur, Indiana, who was using a Sprout-Waldron extruder in the early 1960s to produce mixed, extruded feeds. Ed and his coworkers (Steve Frank and Bud Campbell) examined that extruded material in their lab at Central Soya. After some time that case was decided in court and Far-Mar-Co lost it [in mid-1984].

Then Ralston Purina went after Central Soya—which had its own patent issued to Gabor Pusski in 1976. Ed Armstrong, an internal attorney, suggested that Ed Meyer and Art Konwinski (Central Soya's extrusion man), take a very close look at the process by gathering detailed data. Based on that the attorneys concluded that Central Soya was infringing on Ralston Purina's patent. So Joe Gillespe, a vice president at Central Soya, made a deal with Ralston, that Central would sell Ralston several feed operations they had in Brazil at a very attractive price, plus several patents on industrial proteins. In exchange, Central Soya got a non-exclusive royalty-free license in perpetuity.

Ed has long wondered why the patent examiner didn't cite an "interference," which applies when two inventors make claims that overlap or are on the same subject. Then the patent office must conduct an investigation to see who has priority. This story does not appear in the history books and Ed is not sure that it should be.

"Over the years I have learned to be very skeptical of what I read because so much is said in an advertising mode rather than in a definitive or factual mode." People say that their products are used in various applications when they are not—which is wishful thinking in the hope that new customers will try the product. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

840. Butke, Charles. 1993. The Drackett Company's work with 'Alysol' soy protein (Interview). *SoyaScan Notes*. May 26. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Chuck went to work for Drackett in 1946 at about the time when the Sharonville plant began operations. At about that time he recalls reading in a report that a soy protein product named "Alysol" was being made by Drackett before he arrived. The Alysol was made at the Drackett plant at 5020 Spring Grove Ave. in what was then northern Cincinnati. That was the location of Drackett's original soybean extraction plant which began operations in about 1937. At this plant the soybeans first had their hulls blow off, then they were run through cracking rolls, followed by flaking rolls. Then the flakes were put into a chamber that was very high in the air. "The flakes dribbled down through that chamber while hot hexane solvent flowed from the bottom to the top. That equipment was designed by Mr. J.F. Johnson." The protein was extracted from the soybean meal to make Alysol. It was modified with sodium hydroxide, then neutralized and precipitated with sulfuric acid to get the isolated protein.

1937 was the year of the big, devastating flood in Cincinnati. Water from the Ohio River backed up and flooded the entire Mill Creek Valley. The water rose to the base of the second floor of Drackett's buildings on Spring Grove Ave. This was Drackett's only location at the time; there they had their administrative offices, plants for making Drano and Windex, and for crushing soybeans. Drackett had 4-5 carloads of soybeans on the railroad siding by the plant. When the soybeans were soaked by the flood waters, they expanded and after the flood waters fell they heated up and basically blew the railroad cars apart. Jack Mairose (pronounced MAI-rose) wrote up this whole story, perhaps in the *Drackett Dotted Line*. Jack died about 18 months ago. The booklet by Dave Perkins, published in 1984 to commemorate Drackett's 75th anniversary, mentions the development of this early soy protein.

A Chinese man named Tien Leiue (who later invented Playdough in Cincinnati for another company) ran the original nutritional labs at plant on Spring Grove Ave. He fed soy products to rats and rabbits and studied their response. He started this work prior to 1945.

Drackett's second location was in San Leandro, California. Their third location was in Sharonville. It was only about ten years ago that Drackett moved its administrative offices to Atrium 1 at 4th and Main in downtown Cincinnati. Address: 9541 Flick Rd., Cincinnati, Ohio 45247. Phone: 513-741-4289.

841. Shurtleff, William; Aoyagi, Akiko. comps. 1993. The Drackett Company's work with soybeans and soy proteins: Bibliography and sourcebook. Lafayette, California: Soyfoods Center. 79 p. Subject/geographical index. Author/company index. Language index. Printed June 25. 28 cm. [81 ref]

• **Summary:** This is the most comprehensive bibliography ever published about The Drackett Company's work with soybeans and soy proteins. It has been compiled one record at a time over a period of 18 years, in an attempt to document the history of this subject. It is also the single most current and useful source of information on this subject available today, since 99% of all records contain a summary/abstract averaging 341 words in length.

This is one of more than 40 bibliographies on soybeans and soyfoods being compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyfoods Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features: 17 different document types, both published and unpublished, every known publication on the subject, and 10 original Soyfoods Center interviews. Thus it is a powerful tool for understanding the development of Drackett's work with soya.

The bibliographic records in this book feature (in addition to the typical author, date, title, volume and pages information) the author's address, number of references cited, original title of all non-English publications together with an

English translation, month and issue of publication, and the first author's first name (if given).

It also includes details on 7 commercial soy products, including the product name, date of introduction, manufacturer's name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as references to and summaries of advertisements, articles, patents, etc.) are also given.

Details on how to make best use of this book, a complete subject and geographical index, an author/company index, a language index, and a histogram by year are also included. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 510-283-2991.

842. Shurtleff, William; Aoyagi, Akiko. comps. 1993. Henry Ford and his researchers' work with soybeans, soyfoods, and chemurgy—Bibliography and sourcebook, 1921 to 1993: Detailed information on 439 published documents (extensively annotated bibliography), 79 unpublished archival documents, 71 original interviews (many full text) and overviews, 13 commercial soy products. Lafayette, California: Soyfoods Center. 249 p. Subject/geographical index. Author/company index. Language index. Printed May 19. 28 cm. [567 ref]

• **Summary:** This is the most comprehensive book ever published about the work of Henry Ford and his researchers with soybeans and soyfoods. It has been compiled, one record at a time over a period of 18 years, in an attempt to document the history of this subject. It is also the single most current and useful source of information on this subject, since 96% of all records contain a summary/abstract averaging 286 words in length.

This is one of more than 40 books on soybeans and soyfoods being compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyfoods Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features: 30 different document types, both published and unpublished; every known publication on the subject in every language; 66 original Soyfoods Center interviews and overviews never before published. Thus, it is a powerful tool for understanding this subject from its earliest beginnings to the present.

The bibliographic records in this book include 439 published documents and 79 unpublished archival documents. Each contains (in addition to the typical author, date, title, volume and pages information) the author's address, number of references cited, original title of all non-English publications together with an English translation of the title, month and issue of publication, and the first author's first name (if given).

The book also includes details on 13 commercial soy

products, including the product name, date of introduction, manufacturer's name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as references to and summaries of advertisements, articles, patents, etc.) are also given.

Details on how to make best use of this book, a complete subject and geographical index, an author/company index, a language index, and a bibliometric analysis of the composition of the book (by decade, document type, language, leading periodicals or patents, leading countries, states, and related subjects, plus a histogram by year) are also included. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 510-283-2991.

843. Vorih, Susan W. 1993. Re: History of Ralston Purina's and Protein Technologies International's work with industrial soy proteins. Letter to William Shurtleff at Soyfoods Center, June 17 and July 9—in reply to inquiry. 3 p. + 1 p. Typed, with signature on letterhead.

• **Summary:** "Ralston Purina became involved with isolated soy proteins through the acquisition of four soybean processing plants from Procter & Gamble (Buckeye Division) in 1958. One P&G plant, located in Louisville, Kentucky, had an industrial soy protein isolate operation built [in about 1946-47] to produce product for their 'Spic and Span' house cleaner. This was not economical for P&G and conversion was made [starting in about 1953] to produce industrial isolated soy proteins for the paper coating industry. This conversion was taking place at the time of the Ralston Purina acquisition, which was finalized on December 10, 1958. At this time, Ralston Purina only had an interest in expanding its soybean solvent extraction processing capacity, but the idle isolate manufacturing facility just acquired became of interest.

"There was no link in this acquisition with Mr. E.F. 'Soybean' Johnson of Soy Products Corp. in Louisville. Johnson, a former Ralston Purina employee, joined Soy Products Corp. in mid-1947.

"Ralston Purina decided to modify the Louisville isolate process for paper coating products; the plant began production on June 13, 1959. A series of hydrolyzed and non-hydrolyzed products under the ProCote brand name was produced and sold successfully to the paper coating industry. Under Protein Technologies International management the facilities have been modified and expanded to become the world's leading producer of Industrial Polymer Isolated Soy Protein products today.

Ralston Purina began research on food-grade isolates starting in late 1959 under the direction of Mr. Bill Brew in St. Louis. Many consultants were paid for information. Pilot plant work was also performed in St. Louis prior to first contacts with Mr. Bob Boyer. Mr. Boyer was a spun

protein specialist for products made from the Ralston-Purina developed liquid curd process. Other spray-dried products were developed from curd by the company.

Ralston Purina began more active involvement with food-grade isolated soy proteins in 1960 when the company started food-grade isolated soy protein research and pilot plant work at its headquarters in St. Louis, Missouri. A semi-works plant to produce edible soy proteins was erected in 1961 at Louisville, and both spray-dried and spun fiber proteins began to be produced and sold in October 1962. The spray-dried edible isolates, brand-named Edi-Pro A and Edi-Pro N, were sold to food processors. Mr. Bob Boyer [who began working as a full-time consultant on soy protein for Ralston Purina in early 1960 and joined the company as technical director of protein products sales, working under Donald B. Walker, vice president in charge of Ralston Purina's soybean division] was instrumental in directing soy protein spun fibers and sales.

Mr. Frank Calvert was hired in September 1963 to head up Ralston Purina's R&D work on food-grade isolated soy protein in St. Louis. Calvert received a BS degree in chemistry from the Edison Institute of Technology while working at the Ford Motor Co. in Dearborn, Michigan. In 1965 Calvert was named director of soybean research, and in 1967 director of research of the Protein Division. In 1969 Calvert was promoted to director of research, New Venture Management, and finally in 1971 vice president and research director, New Venture Management. During these years, Calvert developed new soy protein isolation processes, 70 percent soy protein concentrate products, and modified soy protein coating compositions for industrial use. Calvert is considered a visionary in soy protein research and the accomplishments of his career were honored when the Protein Technologies International plant at Memphis was dedicated to him in 1973 in recognition of his years of service and dedication to protein technology."

Ralston Purina first made and sold Supro 610 in Oct. 1966. Spun soy protein fiber production was discontinued in 1967. The special equipment was dismantled and parts were sold off for scrap metal. Production of other food-grade soy proteins, such as extruded protein, was started commercially at St. Louis and Memphis in 1973. Wet textured edible soy proteins were produced commercially in Memphis and Osaka, Japan (through a joint venture) in 1975.

"In 1970 the 'Protein Project' became part of the New Ventures Group of Ralston Purina with the Protein Project headed by Paul H. Hatfield. Included in this early business development team were Dr. D.H. Waggle, R&D; Mr. Henry T. James, Director of Engineering, now retired; and B.P. Schwartz, Manufacturing. This team, working as a multi-functional and multi-disciplined team, emphasized process reliability, superior quality and performance products, combined with a worldwide perspective of market development.

Ralston Purina “expanded food grade isolate capacity with new facilities at Memphis, Tennessee, beginning production on April 10, 1973; Pryor, Oklahoma, beginning production on December 1, 1976; and Ieper, Belgium, beginning production on August 21, 1979. This expansion easily vaulted the company into the position of world leader in food-grade isolated soy proteins by 1976.”

Note 1. Much of the above information was provided to Susan and her assistant, Jane Phelps, by Henry James, a former employee of Ralston Purina working in the area of soy proteins.

Note 2. On 1 July 1987 Ralston Purina Co. established Protein Technologies International as a wholly-owned subsidiary, with 92 researchers. The first official use of the term “Protein Technologies International” began in March 1987.

Note 3. Concerning the Buckeye Cotton Oil Co. In Nov. 1943 it had soybean processing mills in Louisville, Kentucky (large), and Memphis, Tennessee (medium-sized). By 1948 the company’s plant in Louisville was making soy flour and soy lecithin. By 1949 (and probably by 1946) the company had become a subsidiary of Procter & Gamble and its headquarters were in Ivorydale, Ohio; O.H. Alderks was involved with soybean processing in Buckeye’s technical division. Address: Communications Manager, Protein Technologies International, Checkerboard Square, St. Louis, Missouri 63164. Phone: (314) 982-1983.

844. Wilson, Melinda. 1993. Soybean fields forever? Not at Ford’s Fairlane. No room: Just 200 acres left for Henry Ford’s “dream crop.” *Detroit News*. June 20. p. 3D.

• **Summary:** For the first time in 60 years soybeans are not growing in Dearborn. Fields surrounding the Ford Motor Company’s world headquarters have produced soybeans since the 1930s, when Henry Ford began experimenting with the “dream crop.” But developments have slowly taken over the land. Address: Detroit News, Michigan.

845. Meyer, Edwin W. 1993. Buckeye Cotton Oil Co., Procter & Gamble, and soy protein isolates (Interview). *SoyaScan Notes*. June 24. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Buckeye Cotton Oil Co. had a soybean crushing plant in Louisville, Kentucky. Ed thinks that Buckeye made an industrial soy protein isolate at this plant, but he does not know how they used this isolate. Procter & Gamble purchased this plant by the mid- to late 1940s, then during the 1940s they introduced a product named Spic & Span, which contain isolated soy protein. “After you washed the wall with Spic & Span, the protein in the product left a film on the wall, which made it easier to wash again on the second washing.” The process was somewhat like sizing or coating a paper with protein to make the surface smoother and less porous. Ed doubts that the protein had any detergent effect.

Ralston Purina bought Procter & Gamble’s isolate plant in Louisville. Ed thinks that Ralston Purina began work on edible soy proteins at the time that Bob Boyer started consulting with them—and not before. Address: 1701 N. Sayre Ave., Chicago, Illinois 60635. Phone: 312-637-0936.

846. Leiss, Richard S. 1993. History of the use of spun soy protein fibers at Worthington Foods (Interview). *SoyaScan Notes*. June 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Richard (whose last name is pronounced like “lease,” as in “to lease a house”) has worked for Worthington Foods in R&D for 28 years, from Aug. 1962 to 1968, then from 1971 to the present. He thinks that small amounts of the first commercial Worthington product to contain spun soy protein fibers were probably sold by late 1962 and definitely by 1963. These meatlike products were probably frozen at first, and then canned later. The first such product may have been the Minute Entree Fried Chicken Style in frozen form. Fri-Chik, which was canned and widely sold to Seventh-day Adventist food outlets, came a little later. The next 3 products that contained spun fibers (White-Chik, Beef Like, and Prosage) were all frozen and were introduced at about the same time (by Oct. 1963), but many Adventist food outlets did not have a frozen food case in those days so Worthington had to supply them with one. Following these, some additional products were made under the Worthington label, including Smoked Beef Style, Wham.

“When I first came to Worthington in 1962 there was a small R&D lab attached to the main food processing building; we didn’t have a research facility like we have now. I recall that a new R&D building was completed in October 1964. Prior to Oct. 1964, I recall seeing a Fried Chicken Style product, containing spun fibers, being canned. After Oct. 1964 time, we began to spin our own soy protein for the first time using a pilot plant line in this building. Full-scale spinning of Worthington’s Fibroprotein soy fibers probably began in about 1965. Prior to that time my recollection is that Worthington purchased most of its spun protein from Ralston Purina Co.; it was manufactured in their Louisville [Kentucky] plant. But Worthington also purchased some spun soy fiber from General Mills; it was made at their James Ford Bell Research Center and was very experimental. I don’t recall the name of that product.

“In the early 1960s, about 95% of Worthington’s sales were through either the church or through stores in communities where there were heavy concentrations of Adventists. So it really wasn’t a very big thing. One very big thing for the company was the first IFT meeting it attended in Kansas City [Missouri] in about 1963 or 1964. It was the first time that Worthington had demonstrated products at a national convention, and there was a lot of interest in these products.

In 1974 the first 3 Morningstar Farms products were introduced: Breakfast Patties, Breakfast Links, and Breakfast

Slices. He is quite sure that initially they all contained spun soy protein fibers. However several years after they were launched, the decision was made to remove the spun soy fibers for two main reasons: (1) Making the fibers was an expensive, high-tech process which added too much to the price of each product; (2) Worthington was concerned that if, as anticipated, the Morningstar Farms line became very popular in mainstream national markets, their one spinning line would not be able to produce enough fibers to meet the demand. The “wet spun fiber” was replaced by textured soy concentrates and vital wheat gluten to give similar textures. In 1979 four more Morningstar Farms products were launched: Grillers (meatless burgers), Breakfast Strips (meatless bacon), Luncheon Slices (a new version of the 1974 Breakfast Slices), and Leanies (meatless hot dogs). None of these 4 products contained spun soy protein fibers. Thus, for most of their commercial lives, the Morningstar Farms products have not contained spun soy protein fibers.

Worthington has always had only one line for spinning soy protein fibers—located at their plant in Worthington, Ohio. This line was set it so that a second spinning table could be added to increase its capacity, but that has never been done. Even during the years when the company had a second plant at Schaumburg, Illinois (after Miles Laboratories took over Worthington in 1970), that plant never had its own spinning line.

At one point Worthington sold its Fibroprotein spun soy protein fiber to an Adventist company outside the USA. Worthington never sold it to Loma Linda Foods. Initially Loma Linda may have purchased it from Ralston Purina or General Mills; then they got their own spinning line later, in the 1970s; they bought the equipment from Dawson Mills.

Concerning the total amount of spun soy protein fiber used in Worthington food products, it increased rapidly from 1965 to about 1975, then it fell somewhat after the first three Morningstar Farms products were reformulated in the mid-1970s—but it did not fall dramatically because the 3 products were still at the introductory stage. After the amount then stabilized, and remained fairly constant until recent years when the demand for vegetarian products has increased, and with it production of spun soy protein fibers. Today, about 15-20% of Worthington's meat alternatives contain spun soy protein fibers.

In Richard's opinion, the legacy that Henry Ford and his researchers left in terms of food uses of soybeans is mainly in the areas of soy protein isolates (especially functional isolates; the work done by Frank Calvert and Bob Boyer at Ralston Purina) and textured soy flour (the work done by William Atkinson at ADM). While spinning was certainly the most novel of the technologies, spun soy protein fibers are not nearly as important commercially as food-grade isolates and textured soy flour.

Richard remembers fondly the pioneering days when Bob Boyer had a lab next to his office at Worthington Foods.

Boyer told Richard many anecdotes about the times he worked for Henry Ford and Richard wrote them down in his journal. “Bob Boyer was truly a gentleman. I really enjoyed him a lot.”

Richard does not recall any commercial product containing spun soy protein fibers that Ralston Purina launched during that time. They sold all their spun fibers as such to Worthington Foods.

“I'm kind of the keeper of the archives and unfortunately a lot of material has gotten out because during the years that Worthington was owned by Miles Laboratories past history was not considered to be very important.” Perhaps a record might have appeared in the *Chopletter* (an internal newsletter published by Worthington Foods). Address: Director, R&D, Worthington Foods, 900 Proprietors Rd., Worthington, Ohio 43085-3194. Phone: 614-885-9511.

847. Leiss, Richard S. 1993. Recollections of work at Worthington Foods (Interview). *SoyaScan Notes*. June 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Art Schultz worked as a technician with Bob Boyer at Ralston Purina. He is mentioned in some of the patent literature. Art worked for Worthington Foods from about 1970-71 until about 1980.

When Worthington Foods bought Battle Creek Food Co. in 1960, only about 4 people were transferred from that company down to Worthington. One of them was Josephine Williams. She was a nutritionist who worked in the laboratory at Battle Creek, Michigan with Dr. John Harvey Kellogg. She was a very interesting resource, with many stories about working with Dr. Kellogg. She retired in about the early 1970s and may still be living in the Battle Creek area. Address: Director, R&D, Worthington Foods, 900 Proprietors Rd., Worthington, Ohio 43085-3194. Phone: 614-885-9511.

848. Lewis, David L. 1993. Ford Country: Soybean vision valid. *Cars & Parts*. June. p. 18.

• **Summary:** “Ford Motor Co. recently switched from petroleum-based ink to soy ink, further validating Henry Ford's effort to find industrial applications for the soybean.

“Soy ink eventually will be used in more than 90 percent of the company's projects. The ink is less polluting than petroleum-based inks, releases fewer volatile organic compounds in the atmosphere during printing, and is easier to recycle because it ‘de-inks’ faster than petroleum inks.

“My great grandfather Henry Ford experimented with potential uses of soybeans throughout his life,’ said great-grandson, William Clay Ford, Jr., executive director of business strategy for the Ford Automotive Group. ‘Today, many years later, we have found still another use for soybeans, proving his vision is still valid.’ Address: Prof. of Business History, Univ. Michigan, Ann Arbor, Michigan.

849. McDermott, Ron. 1993. History of the use of spun soy protein fibers by Loma Linda Foods (Interview). *SoyaScan Notes*. July 6. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Note: In about 1968 Loma Linda Foods started making meatlike products containing spun soy protein fibers. The first products were canned meatless slices (chicken-like, beef-like, turkey-like, or luncheon-like slices).

Ron started to work for Loma Linda Foods in 1973 as Director of Quality Assurance at the company's plant in Mt. Vernon, Ohio. In 1975 he left Mt. Vernon and went to Loma Linda's plant at Riverside, California. He thinks that Loma Linda got its first spun soy protein fibers from General Mills. Robert Boyer had licensed General Mills the rights to spin soy protein fibers, and they used these primarily to make their original line of Bontrae Products. At one point after 1973 Ron thinks that Loma Linda was purchasing spun fibers from three sources: Ralston Purina, General Mills, and Miles Laboratories—but the bulk of it came from General Mills. In about 1975-77 General Mills shut down their soy fiber spinning line and sold it to Dawson Mills. During this transition period, Loma Linda purchased a large inventory of frozen, neutralized (neutral pH) fiber from General Mills. The spun soy fiber sold by Miles Laboratories (Worthington) was called "acid tow"; it was refrigerated rather than frozen and the acidic pH prevented spoilage. Loma Linda would then adjust the pH to neutral shortly before use.

In early 1984 (according to documents Ron has in front of him), Loma Linda Foods bought a soy protein fiber spinning line from Dawson Mills. In mid-1984 the equipment was transferred to Loma Linda. Loma Linda probably started spinning their own fibers in California in late 1984 or early 1985. Loma Linda continued to spin their own fibers until the company was sold to Worthington Foods in Jan. 1990. Worthington still owns that line of spinning equipment, which is now dismantled and unused in storage. It could be re-activated if Worthington had a place to put it and a need to make more spun soy protein fibers.

Note: A brief chronology of spinning by General Mills, Dawson Mills, and Ralston Purina Co. 1959—General Mills starts research on textured soy proteins. 1962 Oct.—Ralston Purina Co. begins to make Textured Edi-Pro, a spun soy protein fiber, at its plant in Louisville, Kentucky. 1963 Nov.—The first of many patents for spinning soy protein are issued to General Mills. 1965 Dec.—General Mills introduces the Bontrae line of spun soy protein fiber products, starting with Bac-O's (bacon-like bits). 1967—Ralston Purina stops spinning soy protein. 1969 June—General Mills breaks ground for major fiber spinning plant at Cedar Rapids, Iowa; It begins operation by late 1970. 1975—General Mills stops spinning, and sells its spinning technology and equipment to Dawson Mills. 1976—Central Soya now owns the Bontrae trademark, formerly owned by General Mills. 1979—Dawson Food Ingredients, a subsidiary of Dawson Mills, starts

spinning soy protein fibers; Anaprime is on the market by March 1980. Address: Vice President Research & Technology, Worthington Foods, 900 Proprietors Rd., Worthington, Ohio 43085-3194. Phone: 614-885-9511.

850. Bull, Kevin. 1993. Ford retirees take trip back through time at Saline mill. *Reporter (Saline, Michigan)*. July 7.

• **Summary:** "Saline resident Ken Rogers Sr. spoke about the soybean processing days of the past at historic Weller's Mill June 29. He addressed 280 members of the Ford Motor Company V-8 Club, a national Ford retirees association, about the soybean extraction plant that operated from 1938-46 inside the mill.

"Rogers, who was born and raised only four houses away from Saline mill, worked at the extraction plant from February 1942 at age 19 until he left for the air force in 1943.

"Since Rogers, 70, is the only living employee from the extraction plant, Weller's Mill and Raisin River Cafe co-owner Wendy Weller asked him to give a presentation about how the site was used by Henry Ford during the bygone era.

"According to Rogers, the mill and property were purchased by Ford in 1937 to be restored and to offer employment to farmers during the winter. Ford used it as an extraction plant to withdraw oil from soybeans for production of plastics."

The oil was extracted from the flakes using hexane solvent. The "bulk of the oil was shipped to Dearborn for production of plastics, like steering wheels. The rest of the oil was used at the Saline mill to make an exterior oil paint for buildings." The flakes "went through a toaster and were eventually ground into soybean meal to be bagged and shipped." A photo shows Rogers speaking at Weller's.

851. Rich, Robert. 1993. More on Rich Products Corporation's work with soy-based dairy analogs (Interview). *SoyaScan Notes*. July 13. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Rich Products does not have any documents in its archives on the various small companies (such as Delsoy Products) that were the first to make soy-based whip toppings starting in about 1944-45. However Bob remembers them well and what they did. Delsoy started with a filled cream named Devonshire Topping which they sold mostly in Detroit, Michigan. Then they came out with a soybean cream that was not frozen. The majority of their early sales were in the filled cream. Delsoy was never sold in Buffalo, New York, and thus was not a competitor to Rich's Whip Topping. Even after Whip Topping was frozen, Delsoy was never much of a competitor. Bob is not sure when Delsoy was launched, but he has the feeling that it was on the market only several months before his Whip Topping.

Concerning the article by F. Olmsted in the 16 April 1945 issue of the *Detroit News*, Bob (who worked for the War Food Administration or WFA) never heard of the WFA issuing

an order placing a 19% limit on all fats used in any dairy product. This information was probably supplied to Olmsted by Herbert Marshall Taylor, who Bob remembers as “a wild man.” Bob conjectures that maybe the reason Taylor switched to a soy-based topping was to allow him to ship the product across state lines. In those times a company could not sell a filled cream product (which was what he had) across state lines, and there were only 7 states in which filled milk products could be made and sold within the state. In fact the Milnot Company had a plant near Litchfield, Illinois, situated exactly on the state line between Illinois and Indiana. They had a filled milk processing room on each side of the line, i.e. in each state. They never made a soy-based product. At one time, Milnot started shipping its filled milk across a state line either to test the law or because they thought they could get away with it. The government seized their product and took the president to court. He was judged guilty and had to spend the weekend in jail until he could get a bail bond. He was sentenced to a year in jail but he never served time because president Franklin Roosevelt gave him a presidential pardon.

Rich Products was involved in about 40 lawsuits with various states involving its non-dairy products—and the company won them all. But if the lawsuits had taken place a few years earlier, Bob thinks Rich Products could have been beaten. The climate was changing, led by more favorable attitudes toward legalization of margarine—which replaced a dairy product. The first lawsuit against Rich Products took place in California in 1949. The charge was that Whip Topping was an imitation dairy product, and hence illegal. Arguing that the product was a replacement, not an imitation, the company won the case.

Most of the subsequent cases were against Coffee Rich (a non-dairy coffee whitener) starting in 1961. Whip Topping was not much of a threat to the dairy industry. Most milk routes used to take out 6 half pints of heavy cream (38-40% fat; housewives would use it to make whipped cream) in the morning and maybe bring back 8 in the afternoon—due to souring, etc. So heavy cream was not of much interest to milk dealers. But Coffee Rich was a real threat because much more light cream (19-20% fat; for use in coffee) and medium cream (28-30% fat; for use on cereal) was than heavy cream.

Last Wednesday (July 7) Bob celebrated his 80th birthday. He is still chairman of the board of Rich Products Corp., his son Robert Jr. is president, and Herb Kusche is executive vice president. Last year his company did \$940 million in sales. Next year, which will be the company's 50th anniversary, they expect to go over \$1,000 million. The company has a research department in Buffalo with 75 researchers, plus 6,000 employees and 26 plants worldwide. They have 7 people in their London office, 5 in the Hong Kong office, 6 in Mexico City, 2 in Singapore, 2 in Brisbane (Australia), and 2 in Tokyo—all their own people.

The Freeze Flo process has become very successful, especially in frozen fruits and in their great-tasting product

named Bettercreme—which was launched in April 1977 and which keeps fresh without bacterial growth or spoilage at room temperature without preservatives. It is sold as such to foodservice organizations and bakeries, which keep it frozen, then whip it for use on cakes and pies; the latter will go stale before the Better Cream! It is also used as the filling in Rich's Frozen Chocolate Eclair. Though the company spent a lot of money hoping to find medical applications for the Freeze Flo Process, nothing has yet been commercialized.

Rich Products does not have a good archives with documents from the early years of the company. “In those days we didn't save things, although we have nice displays in our memorabilia room here in our 250,000 square foot building which is called Rich Renaissance Niagara. Our offices and research center are in that building—but it houses no manufacturing operations.”

Bob has heard that Edsel Ford died of either ungulate fever or cancer of the intestine. If it were ungulate fever, that could be one more reason why Henry Ford was so interested in promoting the use of soymilk—as at the Henry Ford Hospital. Bob thinks they also served a soy coffee cream (soymilk thickened with propylene glycol) at the hospital.

Note from Ford Bryan, researcher at the Ford Archives, in response to an inquiry from William Shurtleff. 1993. Aug. 9. “I'm fairly certain Henry Ford disliked cows as a boy—long before Edsel's illness. We do not seem to have a copy of Edsel Ford's death certificate. As far as we know, the cause of Edsel's death was cancer of the stomach, perhaps complicated by ungulate fever.”

Talk with Herb Kusche, executive vice-president of Rich Products. 1993. July 14. “Bob Rich has a memory like an elephant; it's superb.” Address: Chairman of the Board, Rich Products Corp., P.O. Box 245 (1150 Niagara St.), Buffalo, New York. Phone: 716-878-8000.

852. Effland, Anne. 1993. Four policy ideas used or advocated to control American farm surpluses during the 1920s and 1930s (Interview). *SoyaScan Notes*. July 23. [3 ref]

• **Summary:** There were four main ideas for controlling American farm surpluses (and for raising depressed prices) during the 1920s and 1930s. (1) McNary-Haugen movement, whose main concepts were proposed in 1921 by George N. Peek and Hugh Johnson of the Moline Plow Co. The U.S. government would purchase surplus farm crops at a target/parity price, sell as much as possible at that price domestically, then try sell the rest overseas at the world price. This program, the first attempt by the U.S. federal government to find new markets, and new overseas markets for U.S. farm crops, was similar to the Export Enhancement Program of the 1980s. The legislation was first presented to congress in 1924; it was debated and failed in congress. Finally in 1928 it was presented for the fifth time, passed by both houses of congress, but vetoed by Calvin Coolidge (president, 1923-1929).

(2) The farm chemurgic movement, which had its origins in late 1926 and became a real movement in 1935, was probably the least well known and least influential of the four movements. It advocated that chemists and industrialists work together to use farm surpluses in the manufacture of industrial products such as paints, plastics, automobiles, etc. Leaders of this movement, such as Wheeler McMillen, Henry Ford, and William J. Hale, were each strongly opposed to the farm policies of Roosevelt's New Deal. This led the movement to become more separate and private, depriving it of a direct effect on the all-pervasive government public policy of the 1930s.

(3) The Agricultural Marketing Act of 1929, the Federal Farm Board, and cooperative marketing. This concept, which originated in the late 1920s, was strongly supported by the farm cooperative movement (including the growing number of agricultural cooperatives) and by Herbert Hoover (president, 1929-1933). It became U.S. farm policy during the Hoover administration. The government provided credit and loan programs, plus extensive information (the Bureau of Agricultural Economics produced situation and outlook reports) to support more cooperative efforts by farmers so that they could control their own price and production problems without federal intervention. The policy was not given much of a chance to be tested because Hoover was replaced by Roosevelt in 1933.

(4) Acreage limitation under the New Deal. This program, proposed by Henry A. Wallace (secretary of agriculture, 1933-1945) and strongly supported by Franklin D. Roosevelt (president, 1933-1945) led to the passage in 1933 of the Agricultural Adjustment Act (AAA), the first major piece of farm legislation passed under the New Deal. The program paid farmers to voluntarily limit the number of acres of cotton (some planted cotton was plowed under), tobacco, and wheat that they planted, and the number of hogs that they raised. This program was the first attempt by the U.S. federal government to limit farm production. The Domestic Allotment Program was a part of the larger program that concerned marketing agreements. Processors of these farm commodities were required to pay a "Processing Tax" to the government which funded the program. The U.S. Supreme Court found the program to be unconstitutional in the mid-1930s because of the Processing Tax. In 1938 the act was passed in a new form based on the concept of soil erosion—a major cause of the Dust Bowl during the 1930s. Farmers were paid not to grow crops on marginal lands. The program was paid for by taxes on all Americans.

Section 202 of the Agricultural Adjustment Act of 1938 provided for four regional research laboratories devoted primarily to finding new uses for those farm commodities in which there are regular or seasonal surpluses, and their products and by-products. Its enactment was a major victory for the chemurgic movement.

Prior to the 1920s the U.S. federal government had

very little direct involvement in domestic agriculture; one exception was during World War I, when a Food Board was created. Minimum prices for certain crops were guaranteed to farmers to encourage production of those crops. Address: Historian, Agricultural & Rural History Section, USDA/ERS, 1301 New York Ave., N.W. Room 928, Washington, DC, 20005. Phone: 202-219-0787.

853. Gain, Jeff. 1993. The origins and history of the New Uses Movement. Part I (Interview). *SoyaScan Notes*. Aug. 24. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Jeff was one of the founders of the "new uses movement." He grew up in the small town of Rushville, near Peoria, Illinois. His father operated a greenhouse, growing flowers and ornamental trees and shrubs. In 1949, when Jeff was 10 years old, his father sold the greenhouse to his brother and bought a farm, where he farmed for about 25 years, raising cattle, corn, and soybeans. As a boy, after crops were sometimes destroyed by flooding on the family farm's bottom land, Jeff would ask his father if there were any alternatives to corn and soybeans for farmers. His father said there are potentially many but they have just never been developed. "So that's where my interest began, and I made the commitment to myself that if I was ever in a position to do anything about it, I was going to try to shift U.S. agriculture to new crops and new uses of existing crops so it might become an industrial source of energy and renewable materials."

In 1961 Jeff earned a degree in management from the University of Illinois, College of Commerce. He studied finance, economics, and labor relations, and he had no intention of going into the field of agriculture. He worked for the Illinois Farm Bureau in 1961-62, then went into the coast guard for 3½ years, went through Officers Candidate School, and ended up in St. Louis. Then he went back to work for the Illinois Farm Bureau for about 11 more years as director of marketing programs. On 1 Aug. 1977 he went to work for the American Soybean Association (ASA) for 7 years. There he was executive director and chief of staff for Ken Bader, and he was in charge of ASA's office in Washington, DC. As a result of four American embargoes in 1973, 1974, 1975, and 1980, many farmers came under severe financial stress, export markets shrunk, and a host of crises arose.

In Aug. 1984 he left ASA and was hired by the National Corn Growers Association to be their CEO. He began by helping to set up their new office in St. Louis, Missouri. At that time he argued strongly that the organization had to look beyond traditional markets and more to industrial uses "based on the concept that you can make anything out of a bushel of corn that you can make out of a barrel of crude petroleum oil through carbohydrate chemistry. We launched an initiative broader than corn and the board of the Corn Growers Association gave me support to move ahead in search of a way to lead the charge forward for new industrial

uses of existing agricultural commodities and new crops. My idea was that we need more choices than corn, soybeans, and wheat, and more uses than food, feed, and fiber.”

Jeff had known John R. “Jack” Block of Illinois, the first secretary of agriculture (1981-86) in the Reagan administration, for many years; they grew up only 60 miles apart in Illinois. In the fall of 1984 Jeff met secretary Block at a reception in Washington, DC, and Block asked him “Jeff, if you were secretary of agriculture, what would you do?” Jeff replied, “One thing I’d do would be to try to find some alternative uses for corn and soybeans, and some markets other than the stomachs of animals and people, and some new markets here at home. Industrial uses seems to fit all those categories. So if I were you, I’d put the resources of the USDA behind looking at new options to put American agriculture back to work.” Block said, “That’s a neat idea. Let me think about it.”

As a result, on 11-12 Oct. 1984, Block convened the “Secretary’s Challenge Forum,” which was a group of about 60 people (including Jeff) who met for one day in the Williamsburg Room of the USDA administration building in Washington, DC. Orville Bentley (former dean of the College of Agriculture, Univ. of Illinois), who was Assistant Secretary for Science and Education of the USDA at the time, convened the meeting. The group recommended to secretary Block that he appoint a serious, comprehensive, long-term task force to look at the issue of new opportunities for agriculture in terms of new products and markets.

In January 1985, in Columbia, Missouri, Roger Mitchell and Jeff had the first “big” debate/discussion on the industrial uses of agricultural products. This was the period following the agricultural crisis of the late 1970s and early 1980s. The question was “Can we do something with agricultural products other than eat them or feed them to livestock and then eat them?” We needed additional non-food and non-feed uses for our excess.

On 20 June 1985 at the USDA administration building (room 104) secretary Block convened the “New Farm and Forest Products Task Force.” Jeff was a member of the executive steering committee of that group, which consisted mostly of scientists, and which met for about 2½ years. During this time there was no discussion at all of the earlier farm chemurgic movement; apparently none of the members (including Jeff) were aware of the ideas or activities of that movement. Jeff helped author the Task Force’s 55-page final report, titled “The New Farm and Forest Products: Responses to the Challenges and Opportunities Facing American Agriculture,” which was released on 25 June 1987 and submitted to the new secretary of agriculture Richard E. Lyng of California (1986-1990). It was accompanied by a separate 7-page executive summary. At the Corn Growers convention in Feb. 1988 in St. Louis, secretary Lyng told this story: “Imagine yourself in a space ship circling the plant Earth and you come over the Corn Belt and the sun is

shining over your shoulder on the Corn Belt, and you realize it’s a giant solar cell, storing the sun’s energy in the form of corn or other crops. You simply shell that corn out, put it in containers, and when you need energy just take it out and use it. When you’re through with it, it goes right back into the soil and it’s good for the environment.” It’s a good example of a major potential industrial use of agricultural crops. Of course we have to be able to compete with petroleum, but there are many hidden costs that petroleum extracts from all of us that are not reflected in its price at the pump. People are starting to realize this, which is one of the reasons the industrial uses movement is going to succeed this time, plus the technology and chemistry are so much improved compared with the days when Henry Ford, Wheeler McMillen, Billy Hale, and others were working on the same problems back in the 1920s and 1930s.

“There were several people who took hold of this idea right away: Senator Kent Conrad of North Dakota, Suzy Dittrich, on his staff, Paul O’Connell, and myself. We worked very closely behind the scenes in drafting the initial legislation. Actually in 1987 and 1988 there were about 15 members of the house and senate (mostly people from farm states, such as Virginia Smith from Nebraska, Tom Harkin, Ed Madigan, ‘Kika’ de la Garza [of Texas], etc.) who sponsored different pieces of legislation that supported the new uses concept and the recommendations of the New Farm and Forest Task Force. This was one of those rare issues that almost everyone in Congress thought was a good idea; the question was how to implement it. Those bills all died, so we did a little more groundwork to get the leadership of both the house and senate involved, and to get two primary bills that were very similar. So Ed Madigan and de la Garza co-authored a bill on new uses, and that’s where Mark Dungan got involved. What ended up in the 1990 Farm Bill was a conference report which reconciled the Conrad bill and the Madigan-de la Garza bill. We wanted it in the Farm Bill rather than as a separate bill, in part because it was non-controversial. Initially we got \$4 million, but the authorization totals about \$650 million over the 5-year life of the bill.” Continued. Address: Chairman, New Uses Council, c/o National Corn Growers Assoc., 1000 Executive Parkway #105, St. Louis, Missouri 63141. Phone: 314-275-9915.

854. Harsch, Jonathan. 1993. New industrial uses, new markets for U.S. crops: Status of technology and commercial adoption. Washington, DC: USDA Cooperative State Research Service, Office of Agricultural Materials. 80 p. Aug. 28 cm. [3 ref]

• **Summary:** This document is the finished form of one with the same title, by Hudson and Harsch, released in Oct. 1992. Contents: Foreword: Agriculture at the crossroads, by Hon. Mike Espy, Secretary of Agriculture. 1. Transforming the vision into reality: How to make it happen, by Sam Brownback, Kansas Secretary of Agriculture. 2. Castor and

lesquerella: Strategic value of unique oils. 3. Corn. 4. Crambe and industrial rapeseed. 5. Dairy products. 6. Diesel from crops: Biodiesel can reduce air pollution. 7. Ethanol from crops: The clean air fuel. 8. Forest byproducts. 9. Guayule: Rubber alternative. 10. Jojoba: Specialty oil. 11. Kenaf: Pulp and fiber. 12. Livestock byproducts. 13. Milkweed: Floss fiber. 14. Polymers from crops: Compete with petroleum-based plastics. 15. Soybeans: From soy ink to soy fuels, soybeans could become a major industrial raw material (p. 62-65). 16. Taxol and other pharmaceuticals from plants: Taxol from yew trees is a new cancer treatment. 17. Wheat. Afterword: The opportunity is now, by Alan Tracy, Wisconsin Secretary of Agriculture, Trade, and Consumer Protection. Summary table of crops and new uses (p. 36-37).

Concerning soybeans, the summary table shows (p. 36-37): The primary product used is soybean oil. Current industrial uses include newspaper printing inks, paints, coatings, and plastics. Potential new and/or higher value uses: Color and black general-use commercial printing inks, plastics, nylons, adhesives, paints, coatings. Contents of the Soybeans chapter (p. 62-65): Key points. Facts: Soybeans in industry. Uses (Henry Ford, Wheeler McMillen, ANPA, soy ink, diesel fuel). Market size and potential. Production. Processing. Research and technology. Key contacts (NCAUR, ANPA, ASA). No end to the possibilities.

Concerning biodiesel (p. 22): "Perhaps the most advanced work by commercial interests is being carried out by the giant Italian Ferruzzi-Montedison Group. Its Novamont subsidiary is testing 'Diesel-Bi Ecological Fuel,' a replacement for diesel made from transesterified soybean or rapeseed oils. Ferruzzi is completing a 17-million-gallon-per-year biodiesel plant in Italy. In October 1992, Novamont finished an initial demonstration program in Sioux Falls, South Dakota.

"Engine manufacturers agree that biodiesel has a future. They add, however, that in their view biodiesel will be restricted to serving niche markets—such as fueling bus fleets in cities with serious air pollution problems. One official insisted that 'the market for biodiesel will be there only if it is mandated.'" Address: Glenwood Springs, Colorado.

855. Willemse, Jan; Eaton, Eleanor. 1993. *Cooking for Henry: The memories and recipes of Chef Jan Willemse, former pastry chef at Dearborn Inn and personal party chef for Henry Ford*. Virginia Beach, Virginia: The Donning Company / Publishers. 160 p. Illust. Recipe index. 26 cm. Autographed by Willemse and Eaton.

• **Summary:** Contents: Foreword. 1. I'm discovered by Edsel Ford: Bread, pastries. 1. Henry Ford introduces me to the soybean: Soybean recipes. 3. I help open the Clinton Inn Restaurant to the public: Soups, salads, finger food. How you can be as healthy as Mr. Ford: Entrees, sauces, vegetables.

Mr. Willemse selected and downscaled his recipes while Mrs. Eaton wrote the biographical text and selected the photos. The book was published just after Mr. Willemse's 93rd

birthday. A photo on the cover shows Fair Lane, the last and most famous home of Henry and Clara Ford, located on the banks of the Rouge River in Dearborn, Michigan. Completed in 1915, the mansion has 56 rooms and is situated on 1,346 acres. After Mr. Ford's death, Fair Lane was given to the University of Michigan at Dearborn by the Ford Motor Co.

In the Preface, Jan's three children write: "The qualities our father and we admired most in Henry Ford were his simple manner, his genuine interest in his employees and their families, and his many kindnesses to them."

Born in Holland, Jan's training as a cook began at age 12 in his home town of Hilversum. He came to America in 1919 settling in Boston where he met and married his wife Annie. He first came in contact with the Ford family in 1931 when he was cooking at the Nautilus Hotel in Miami Beach, Florida. He took food to Edsel Ford and the crew of his yacht, which was moored at the marina. Edsel thought Jan was a good cook. Henry Ford had just opened the Dearborn Inn in Dearborn, Michigan, and Edsel thought Jan would be a good executive chef. Henry Ford wrote Jan asking if he's come to Dearborn and take the job of head chef. After a while, Jan accepted. Mr. Ford didn't want any alcohol served at the inn and he was very much against smoking. Jan soon met Edsel Ruddiman, Henry Ford's chemist. Jan never cooked at Fair Lane, the Ford's home and mansion, while the Fords lived there.

In 1934, at Mr. Ford's request, Jan started experimenting with soybeans. Dr. Ruddiman had the miller send him samples of soybean flour. He started by making soft rolls, and then began experimenting with many different foods. Whatever Jan made had to be approved by Dr. Ruddiman before he could send it to the Ford family. However, it could be served at the Dearborn Inn without his approval. He made many recipes in the next 5 or 6 months, and as far as he knows no other soy recipes were around.

While Jan researched food recipes with soybeans, Dr. Ruddiman and chemist Bob Smith experimented with making a substitute for milk and ice cream from the beans. The first products were served at the Dearborn Inn, but weren't well liked. Several other soybean researchers Jan remembers were R.H. McCarroll and Harold Joyce.

Jan worked as pastry chef at the Dearborn Inn until 1932. Then he went into Dr. Ruddiman's laboratory in Greenfield Village. "This soybean experiment was a sideline, you might say. It started small but grew to be very important to Mr. Ford. He wanted more and more food made with the soybean. Clara Ford was not as interested in the soybean as her husband, but she especially liked some soybean food such as cookies made with white chocolate chips, and soy bread. She wanted the bread sent to the mansion every day. A favorite of Mr. Ford's was a soybean cracker that he named the Model T..." A recipe for "Model T. Crackers" is given.

The section titled "Soybean Recipes" (p. 51-72) contains 42 such recipes. The main soy ingredients used in these

recipes are soybean flour (used in 18 recipes), soybean margarine (in 17 recipes), soybean milk (10), whole soybeans (cooked, 9), soybean oil (8), roasted soybeans [soy nuts] (5), soy sprouts (1), TVP (textured soy flour, 1), and canned green soybeans (1). There are also two recipes for making soybean milk (one from soybean flour and 1 from whole soybeans), and one recipe each for making roasted soybeans (salted and baked) and homemade soybean coffee.

A photo (p. 66, supplied by Willemse) shows the "Menu of Dinner Served at Ford Exhibit, Century of Progress, August 17, 1934." The names of 17 dishes, each containing soya, are listed. The text on the facing page states: "I planned this menu of all soybean food..." served at The Ford Exhibit in Chicago, Illinois.

When Henry Ford ceased to be active in the Ford Motor Co., Jan left the company and started a catering business on his own. The Clinton Inn (pictured) was the first building Henry Ford acquired for Greenfield Village in 1927. Jan helped to open it to the public. Of the various friends of Henry Ford that Jan met, the one who impressed him most was George Washington Carver. "Of all the people I met, the prince of them all was Henry Ford. He was a wonderful man. He was so interested in everything and everybody. He loved children. He helped them, and the poor too, whenever he could." Jan also thought a lot of Dr. Ruddiman, who told him many times that "you are what you eat... Well, I've eaten soybean foods ever since I started experimenting with them."

"It used to be everyone thought soybeans were just food for animals. Mr. Ford helped people realize that they are perfect food for human beings. He once said that, next to the Model T, he considered his soybean research to be his greatest work."

This book contains many fine old photos including the following: The Carver Laboratory in 1942 (p. 50). Henry Ford standing by George Washington Carver (p. 65). Austin W. Curtis Jr., Jan Willemse, and Bob Smith sampling soybean foods that Jan served at a soybean brunch at the Henry Ford Estate-Fair Lane in 1988 (p. 138). Two giant pressurized cans of Presto Whip which attracted the attention of passers-by on Telegraph Road, south of Michigan Ave. in Dearborn for many years. Stored inside the structures were soybean oil and sugar used to make the soy-based non-dairy whip topping developed by Robert Smith, food chemist, at the request of Henry Ford (p. 144). Photos on the last page, titled "About the Authors" (autobiographical) show both Willemse and Eaton. Jan still bakes soybean cookies (recipe p. 61). Address: Willsemse: 130 Nightingale, Dearborn, Michigan 48128. Phone: 313-561-4088.

856. Leiss, Richard S. 1993. Re: History of the use of spun soy protein fibers at Worthington Foods. Letter to William Shurtleff at Soyfoods Center, Dec. 16. 2 p. Typed, with signature on letterhead.

• **Summary:** Richard has just located a copy of the July 1962

issue of the *Worthington Chopletter*. The enclosed article is the earliest written reference he has been able to find on wet spun soy protein fibers and commercial retail products containing them. "The article does not specifically state which product was sold first, but certainly the Soyameat Fried Chicken Style, Minute Entrees Fried Chicken Style, and Minute Entrees Sliced Whitemeat Style were the first three.

He began to work for Worthington Foods in August 1962. At that time Worthington was not doing any commercial spinning of soy protein fibers. It is likely that at that time these wet fibers were being purchased primarily from the Ralston Purina Co. "Following the completion of the Worthington Foods research center in October 1964, a spinning line was set up in the pilot plant. This line was expanded so that commercial quantities of fiber were produced, probably beginning in 1965. This operation was continued until the construction of a larger manufacturing plant in 1970, at which time the spinning was relocated to the new building.

"During the same time period (1962-1968) some limited quantities of spun fiber were obtained from General Mills as well. It was my understanding that the GM fiber spinning line was located in the James Ford Bell Research Center, and I remember Worthington receiving fiber from General Mills for use in retail products. The fiber from each source [Ralston Purina and GM] was slightly different and had to be handled somewhat differently in production.

Richard is not aware that Worthington Foods ever sold wet spun fiber to Loma Linda Foods. "Certainly during the early years it was not a consideration by Worthington management because it did indeed give Worthington Foods a strong advantage over Loma Linda."

"I have considered it an honor to have been a part of the evolution and development of the vegetarian food business in the United States. Knowing and being able to work with pioneers such as "Kelly" Hartman, Bob Boyer, "Cal" Calvert, and Bill Atkinson have made my career something special..." Address: Director, R&D, Worthington Foods, 900 Proprietors Rd., Worthington, Ohio 43085-3194. Phone: 614-885-9511.

857. Boyle, T. Coraghessan. 1993. *The road to Wellville*. New York, NY: Viking. A div. of Penguin Books USA. xii + 476 p. Illust. 24 cm. [2 ref]

• **Summary:** Many biographical novels attempt to be true to the life of their main character. This outrageous, satirical and comic novel, which pretends to be about the life of Dr. John Harvey Kellogg, is largely untrue and more like character assassination. The dust jacket states: "The year is 1907, and the boom town of Battle Creek, Michigan, is attracting a formidable array of visitors—the rich, the preposterously rich, and the merely famous, from California, Chicago [Illinois], New York, and even Europe. What draws them to this place? And what inspires them to trade in their steaks and oysters, their martinis and champagne, for a diet of

bran and yogurt and a regimen of five enemas per day? Dr. John Harvey Kellogg, of course, inventor of the corn flake, peanut butter, and coffee substitutes that have ruined so many a bright morning, the man whose dietary wisdom is at your disposal in this comic masterpiece... [which] overflows with a Dickensian cast of characters—all in search of the magic pill to prolong their lives, or the profit to be had from manufacturing it.”

Boyle describes the rise and fall of Dr. Kellogg and his Battle Creek Sanitarium (p. 475-76). The San’s heyday was from about 1890 to 1909, “the years when all the world came to him, John Harvey Kellogg, the one man, the impeachable, the authority, the king.” “The teens gave way to the twenties, the war years [World War I] rose up and fell away like some sick red tide, women traded in their dresses and feathered hats for short skirts and cloches, ragtime segued into jazz, and the Battle Creek Sanitarium rose higher and higher on the current, unsinkable... Johnny Weissmuller stopped by to have his plumbing inspected; [Admiral] Byrd, Amundsen, Grenfel and Haliburton paid their homage; J.C. Penney, Amelia Earhart, Battling Bob La Follette, Henry Ford. In 1928 the Doctor added a fifteen-story addition, sumptuous with marble, crystal, tapestries and murals, and sat back to watch its 265 new rooms fill with the physiologically wanting.

“It never happened. The Crash came, the dyspeptic set took to dosing themselves with milk of magnesia, diet was whatever you could get. The San crashed under the burden of its debt, the glorious building... was sold at auction to the federal government and rechristened the Percy Jones General Hospital, and Dr. Kellogg retired to Florida while his enemies—and they were legion [especially C.W. Post]—lifted up their parched old heats and sniffed something new in the air.” Dr. Kellogg ate more vegetables, smoked less, drank less, slept less and exercised more than practically any man of his time...” Dr. Kellogg died on Dec. 14, 1943. The author carefully avoids telling us that he died in his sleep at the age of 93.

A review in the *USC Trojan Family* (Autumn 1993, p. 19) states that the author has been a USC (University of Southern California) faculty member since 1978; he is the founder and director of the university’s creative writing program. Boyle, who is not a vegetarian, “got the idea to write about the health food movement when a friend gave him a book called *The Nuts Among the Berries*, by Ronald Deutsch. While his protagonist is based on the life of Kellogg, Boyle admits that he exaggerated some of the cereal king’s qualities.”

A review in *Newsweek* (19 April 1993, p. 62-63) begins: “Part zealot, part rogue, Dr. John Harvey Kellogg is a satirical novelist’s dream.” His “true genius was in making people miserable in the name of nutrition.” “A funny, thoughtful, immaculately written novel, ‘The Road to Wellville’ eviscerates the gullible pilgrims and conniving hucksters who rubbed shoulders in turn-of-the-century Battle Creek,” Michigan. “But is this Kellogg as he was or as Boyle wants

him to be? Boyle is infamous for mixing fact with his own fancies... He is riffing on biographical fact to nail down one of the most influential, albeit unattractive, archetypes of our history; the puritanical, proselytizing crank.”

Soyfoods Center review: This sleazy (and to many iconoclastic) film is set at his Sanitarium in Battle Creek, Michigan. Its tone of constant ridicule, cheap sexual subplot, and foul language will embarrass most admirers of Dr. Kellogg; and it will do nothing to educate most other viewers about the life of this remarkable man. It is a caricature and a farce.

Talk with Janice Little of Del E. Webb Memorial Library, Loma Linda University, California. 2005. Sept. 29. Janice has read in book reviews that this book is a satire and the that author has written other satirical novels. However no mention (or even hint) of this is made in the book itself or on the dust jacket. This the typical reader can easily assume (incorrectly) this is an historical novel about a weird doctor.

In 1994 this novel was made into a film, which (according to one critic) portrays Dr. Kellogg “as a jerk—a well-meaning, very serious jerk.” It is a very funny movie. Dr. Kellogg is played by Anthony Hopkins. One of the subplots is slapstick conflict with one of his adopted children—done for laughs. A serious review by vegetarian Rynn Berry appears in *Satya* (1995, which see). Address: Founder and Director of Creative Writing, USC, California.

858. Bud, Robert. 1993. *The uses of life: A history of biotechnology*. Cambridge, MA; New York, NY: Cambridge University Press. xvii + 299 p. Illust. Index. 24 cm. [557 ref]

• **Summary:** Contents: List of illustrations. Foreword by M.F. Cantley (Concertation Unit for Biotechnology in Europe {CUBE}). Acknowledgements. Introduction. 1. The origins of zymotechnology: Introduction, the chemical roots of zymotechnology, from zymotechnology to organic chemistry, the biological alternative, agriculture, brewing, zymotechnics as trademark (zymotechnology, fermentation, the Zymotechnic Institute of Chicago [Illinois]). 2. From zymotechnology to biotechnology. 3. The engineering of nature. 4. Institutional reality. 5. The chemical engineering front. 6. Biotechnology—the green technology. 7. From professional to policy category. 8. The wedding with genetics. 9. The 1980s: between life and commerce. Epilogue. Notes. Sources.

Chapter 1, a fascinating history of the early days of biotechnology, discusses: Emil Christian Hansen, Berlin’s *Institut für Gaerungsgewerbe*, Louis Pasteur (p. 6-7), the German father of chemistry and Prussian court physician Georg Ernst Stahl (1659-1734), his interest in phlogiston, zymotechnics and practical teaching of brewing, in 1762 the word *zymotechnie* entered the exclusive dictionary of the Académie Française (p. 8-9), Marry Shelley and her novel *Frankenstein* (published in 1817; Frankenstein’s teacher, Professor Walden, admired the results of chemistry), the 1928

synthesis of urea by Friedrich Woehler caused the distinction between natural and chemical products to blur and almost disappear, the implications were explored by his friend, the brilliant chemist, teacher, and publicist Justus Liebig who shared Stahl's faith in practical applications, Liebig came to be increasingly identified with the chemistry of agriculture and physiology, and organic chemistry, his pupils August Hofmann and James Muspratt, Adolf Baeyer who was Liebig's successor at Munich created a school based on the study of natural products (p. 10-11), Emil Fischer, Baeyer's greatest pupil, explored the carbohydrates and proteins, competition in Germany between organic chemistry and biochemistry, German Professor Julius Wiesner and his book *Raw Materials of the Plant World (Die Rohstoffe des Pflanzenreiches)* (p. 12-13).

"In 1857, Pasteur demonstrated that lactic acid fermentation was the result of the action of live microbes. Through the next decade, he debated increasingly hotly with Liebig who insisted on the purely chemical origins of fermentation phenomena. Pasteur constructed a new scientific discipline based on his understanding of microbes, 'microb-iology'. Where chemistry was characterized by the balance, the new science had its own central instrument, the microscope" (p. 14).

The 19th century in Europe saw the rise of major cities such as Paris and London, and the expansion of the industrial revolution in Britain. "Academic leaders argued that they should play their part in helping a development of the society that would avoid the division into a declining agricultural sector and an impoverished industrial proletariat.

"The first German agricultural college was established in the year of Prussia's humiliation at the hands of the French, 1806, by a practical agriculturalist much impressed by British achievements, A.E. Thaer. His academy at Möglin was combined with the newly established University of Berlin in 1810. Largely inspired by Thaer's example, twenty agricultural colleges were founded in German-speaking lands between 1818 and 1858. The development of trades traditionally closely associated with agricultural development would also enable organic change."

"So far the emphasis was on teaching. However, all over Europe research followed.

"In France, Boussingault founded his private agricultural research laboratory at Bechelbronn in 1835, and Lawes and Gilbert established their laboratory at Rothamsted near London in 1842. These initiatives inspired, in Germany, the foundation of a research laboratory at Möckern (Moeckern), in 1851. Two years later, another followed in Chemnitz. By 1863, there were seventeen and, by 1877, fifty-nine so-called research stations in Germany. In the United States, the Morrill Act of 1863 and the Hatch Act of 1887 sustained the development of land grant colleges and associated agricultural research stations [sic, experiment stations] (p. 16-17)."

Brewing was an agricultural industry and increasingly big business in Germany and Britain, the foundation of the world's first major chemical association, the Chemical Society of London in 1841 was driven by the energies of Robert Warington, German leaders were J.J. Steinmann (1799-1833) and Carl Balling—who espoused the term *Zymotechnik* in the 4th volume of his classic text on brewing (*Account of the Progress of the Zymotechnic Arts and Sciences*). "Just as agricultural centres had moved from a purely educational role to a greater influence on research, so this process could be observed in the special case of brewing. The first great centre, established in 1872, was at the school at Weihenstephan near Munich where brewing had been taught for more than twenty years. Its formation was driven by the entrepreneurial pharmaceutical chemist Carl Lintner, who within three years of arriving at Weihenstephan in 1863 had founded his journal, *Bayerische Bierbrauer*. In the first volume, Lintner ran a series of historical articles about the life of Balling, as the first of the founders of zymotechnics 'for future cultural historians' (p. 18-19)."

Emil Christian Hansen and the damaging effects of wild yeasts, Balling identified the role of yeast in brewing before Pasteur, debate over use of the words zymotechnology vs. Pasteur's microbiologie (p. 20-21). Alfred Jorgensen popularized the word "zymotechnics," John Ewald Siebel started a journal titled *Zymotechnic Magazine* in Chicago and in 1901 he founded the Zymotechnic Institute. "Siebel was widely respected and sufficiently renowned to be the focus of a 1933 *History of Brewing in America*.

Chapter 2 (p. 48-49) discusses William J. Hale, Henry Ford, and the rise of Chemurgy in America. "Hale did not distinguish too fastidiously between the boundaries of chemistry and used his word rather as others had employed 'zymotechnology.'" A photo shows "Henry Ford demonstrating the strength of a car body made from soya bean-based plastic in 1941."

Chapter 5 (p. 106-09) discusses Japan as the dominant center of the fermentation industry by the 1960s, and the koji mold. "In Japan, the development of microbiology was closely related to agricultural development and found an institutional home in the Agricultural Chemistry Society established in 1924. So, for all the special features of Japanese culture, the concept of a microbiology harnessed to agriculture closely paralleled chemurgy in the United States. There is a strange irony in this, since the promoters of chemurgy were strongly nationalistic and particularly anti-Japanese.

In 1936, the key appointment of Kin-ichiro Sakaguchi as professor of agricultural chemistry at the University of Tokyo established the reputation of the nation's premier department of industrial microbiology."

The Danish firm of Novo Industri emerged as the world's largest enzyme manufacturer. Not until 1974 did Novo and Gist Brocades in the Netherlands develop cheap and effective

methods for using enzymes to convert the glucose in corn to fructose (glucose isomerase). Otto Röhm (Roehm) patented an enzyme preparation for washing in 1913, and his company Röhm & Haas marketed their presoak product 'Burnus' for about 50 years.

The subsection titled "Biogas and gasohol" (p. 132-33) notes that in 1974, a sugar magnate in Brazil, Urbano Stumpf, persuaded the country's president that alcohol made from sugar could by itself power all Brazil's cars, replacing petroleum. Brazil committed great resources to this program and by 1980 was seen as a model to the world. America, too, was interested in reviving what Hale had called "agri-crude" and what was coming to be called "gasohol."

The subsection on "single-cell protein" (p. 133) discusses chlorella, tempeh, soya texturized to make an artificial meat, and growing microorganisms on petroleum for food. Max Delbrueck had called yeast an "edible mushroom."

Monsanto and the Plant Variety Protection Act of 1970 (p. 195). Address: The Science Museum, London, U.K.

859. Weller, Carl; Waller, Mickey "Iris." 1994. Re: Changes at the Ford Mill in Saline, Michigan. Letter to William Shurtleff at Soyfoods Center, Jan. 28. 2 p. Handwritten.

• **Summary:** "We have all the old blueprints of machinery and buildings, old newspaper clippings as well as current news articles. The property continues to be of interest and has seen many changes since we owned it: Antiques, cider & doughnuts, small shops, furniture, and finally banquets.

"The mill has been transformed into 3 beautiful rooms, i.e. The Carriage House (which is housed in the old extraction building), the Raisin River Café (located on the basement level), and the new Henry Ford Room on the main floor of the mill... Since our retirement, our daughter, Wendy, has taken over and made many wonderful improvements—so it's an on-going project."

"P.S. The Ford Heritage Club has meetings in Dearborn, Michigan, and they still serve soy burgers. We are thinking of putting 'soy' something on our menus." Address: 222 Liliuokalani #301, Honolulu, Hawaii 96815.

860. United Soybean Board. 1994. Gaining a competitive edge globally: Value-Added Soybean Summit—executive summary. Chesterfield, Missouri: USB. 20 p. 28 cm.

• **Summary:** This Summit, sponsored by the United Soybean Board, was held on 20-21 Sept. 1993 at Washington, DC. Two basic subjects and issues were discussed: (1) Improving the quality of existing products (especially soybeans, soy oil, and soybean meal); (2) Developing new value-added products (especially non-food industrial products, such as soy-based plastics, fibers to compete with cotton or wool textile fibers, and building materials).

"As anyone familiar with Henry Ford's famous \$100,000 soybean suit can attest, soybeans offer a renewable resource as an alternative to petroleum stock for making fiber.

Soybean protein has the potential to be processed and spun into a thin strand of thread with silk-like qualities. United Soybean Board research is underway at the Georgia Institute of Technology to develop an inexpensive, self-crimping, washable, and silk-like fiber based on soybean protein.

"The current approach in manufacturing this protein fiber consists of two components including: a soy protein core and a sheath of synthetic polymer. The soybean core is placed under compression by the polyvinyl alcohol sheath, which limits the swelling of the protein. Further compression occurs during the manufacturing of the fiber, significantly improving adhesion between the core and sheath, which reduces splitting of the sheath.

"The drawback of the core/sheath geometry will be the loss of self-crimping of the fiber and the excellent dyeing property of the protein fiber. However the very thin polyvinyl alcohol sheath will provide a silk-like feel with good dyeability." The chief research scientist working on this fiber is Abraham Kotliar, School of Textile and Fiber Engineering, Georgia Institute of Technology. His goal is to capture 1% of the textile fiber market. Address: 16305 Swingley Ridge Dr. #110, Chesterfield, Missouri 63017. Phone: 1-800-989-8721.

861. Ferrell, John. 1994. Forgotten legacy: Henry Ford's vision of a sustainable future—an original environmentalist. *Ag Industrial Materials & Products (New Uses Council, Topeka, Kansas)*. March. p. 4, 13. [23* endnotes]

• **Summary:** Reprinted from EarthSave Foundation newsletter. 1992. Spring/Summer. p. 15-17. Contains 1 photo of Henry Ford sitting alone and one of Ford and Robert Boyer with the plastic car. Address: Washington, DC.

862. Shurtleff, William; Aoyagi, Akiko. comps. 1994. Non-dairy whip toppings (with or without soy protein)—Bibliography and sourcebook, 1944 to 1994: Detailed information on 115 published documents (extensively annotated bibliography), 21 commercial whip topping products, 48 original interviews (many full text) and overviews, 49 unpublished archival documents. Lafayette, California: Soyfoods Center. 135 p. Subject/geographical index. Author/company index. Printed March 1. 28 cm. [202 ref]

• **Summary:** This is the most comprehensive book ever published about non-dairy whip toppings—which resemble whipped cream. It has been compiled, one record at a time over a period of 19 years, in an attempt to document the history of this subject. Its scope includes all known information about soy-based non-dairy whip toppings, worldwide, from 1944 to the present, plus considerable information about non-dairy whip toppings that are historically related to soy-based whip toppings. It does not attempt to give comprehensive coverage of other so-called non-dairy whip toppings—most of which are based on casein, the major protein found in cow's milk, yet which nevertheless

are allowed to be labeled “non-dairy.”

This book is also the single most current and useful source of information on non-dairy whip toppings, since 99% of all records contain a summary/abstract averaging 348 words in length.

This is one of more than 40 books on soybeans and soyfoods being compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyfoods Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features: 27 different document types, both published and unpublished; every known publication on the subject in every language—including 200 in English, 2 in French, and 1 in German; 48 original Soyfoods Center interviews and overviews never before published. Thus, it is a powerful tool for understanding the development of soy-based non-dairy whip toppings and related products from their earliest beginnings to the present.

The bibliographic records in this book include 115 published documents and 49 unpublished archival documents. Each contains (in addition to the typical author, date, title, volume and pages information) the author's address, number of references cited, original title of all non-English publications together with an English translation of the title, month and issue of publication, and the first author's first name (if given).

The book also includes details on 21 commercial whip topping products, including the product name, date of introduction, manufacturer's name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as references to and summaries of advertisements, articles, patents, etc.) are also given.

Details on how to make best use of this book, a complete subject and geographical index, an author/company index, a language index, and a bibliometric analysis of the composition of the book (by decade, document type, language, leading periodicals or patents, leading countries, states, and related subjects, plus a histogram by year) are also included. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 510-283-2991.

863. Duggan, David. 1994. Problems with the Flier patent assigned to Ralston Purina (Interview). *SoyaScan Notes*. June 13. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** David is an anti-trust attorney, not a patent attorney. On 5 July 1990 the federal circuit court of appeals, which hears appeals concerning patent cases in the United States, ruled that Ralston Purina Company had procured the famous Flier patent (No. 3,940,495. Feb. 24, 1976. Application filed 17 Jan. 1973) by fraud on the patent office. The case is number 909 F.2D 1494 (Staley vs. Ralston Purina).

Price Heneveld (a law firm of patent lawyers in Grand

Rapids, Michigan) apparently represented Ralston Purina on both the original application and in subsequent litigation.

There was apparently earlier litigation involving Far-Mar-Co, Staley, Cargill, etc. The first case was apparently Ralston Purina vs. Far-Mar-Co of Kansas. He believes that Ralston Purina filed the lawsuit in Oct. 1976. The judgment was in or about 1981—showing the slow pace of federal litigation. The case was tried in the 10th federal judicial circuit (district of Kansas), which is statistically the worst, in the sense that more cases are later overturned from that circuit by the U.S. Supreme Court. He finds it interesting that Ralston chose to file its first case in that circuit. There is law to the effect that if you engage in fraud on the patent office and then use that fraud in an attempt to control or monopolize the relevant market, that is illegal, and may be the basis for a anti-trust lawsuit.

In 1976, after Ralston Purina won the case against Far-Mar-Co in Kansas, Ralston started sending demand letters to many other companies that were supposedly infringing this patent—including Staley, Cargill, Central Soya, Griffith Laboratories, Miles Laboratories, Nabisco, Anderson Clayton, General Mills, Nestle, Riceland Foods, Dawson Mills, General Foods, Grain Processing Corp., etc. Ralston was protecting its rights.

In 1985 the Far-Mar-Co case was upheld, saying that Ralston Purina indeed had the rights to the Flier patent (Case no. 772 F.2D 1570). However Far-Mar-Co did not raise the issue of fraud. So it took another 5 years for the court to reach that question—which it decided in 1990.

David's main questions are: (1) Is textured vegetable protein [actually textured soy flour] a distinct segment of some relevant market? (2) Did Ralston Purina try to exclude other competitors from that market. (3) Were there substitutes for the product on which Ralston Purina had a patent? David's firm is in the process of representing a former player in the industry, a major trading company; they may represent a consortium of companies that were effected by the Ralston Purina's “ill gotten gains.”

Update: Talk with David Duggan. 1996. April 26. His firm was representing the Lauhoff Residuary Trust in a case against Ralston Purina Co. Lauhoff is a grain company in Danville, Illinois. They were sued by Ralston, which claimed that they had infringed the patent without paying royalties. Lauhoff initially disregard the demand letter threatening a suit. Then they sold the company, but did not properly disclose to the buyers that a lawsuit was pending or had been threatened. Lauhoff then lost the case against Ralston in about 1986 or 1987. So the new owners sued the formers owners for failure to disclose. David argued that the amount paid by Lauhoff to settle the lawsuit was fraudulently paid. The case, which was very complex and convoluted, was thrown out of court by the judge because the statute of limitations had expired—they brought the case too late. Moreover, the patent was nearing its expiration date, or had

expired. David believes that there was some pretty serious frauds on the courts in litigation to enforce the patent. David tried to present a RICO (Racketeering Influenced and Corrupt Organizations) Act argument. It provides for triple damages. David tried to approach some of the smaller players like Far-Mar-Co but he did not approach ADM. The patent law was recently changed to 20 years from the point of application; formerly it was 17 years from the point of grant. Address: 321 S. Plymouth Court, Suite 800, Chicago, Illinois 60604. Phone: 312-663-0670.

864. Shurtleff, William; Aoyagi, Akiko. comps. 1995. *Industrial utilization of soybeans (non-food, non-feed)–Bibliography and sourcebook, A.D. 980 to 1994: Detailed information on 2,538 published documents (extensively annotated bibliography), 65 commercial industrial soy products, 78 original interviews (many full text) and overviews, 59 unpublished archival documents.* Lafayette, California: Soyfoods Center. 683 p. Subject/geographical index. Author/company index. Language index. Printed 18 Dec. 1994. Published Jan. 1995. 28 cm. [2720 ref]

• **Summary:** “A revolution in soybean utilization has been gaining momentum since the late 1980s in the United States. It is described by phrases such as the ‘New Uses Movement,’ ‘value-added soy products,’ or ‘industrial uses of soybeans.’ But few people alive today realize that this is the third—and probably the biggest—wave of a revolution that has taken place at least twice before. The first wave, which had no name, lasted from 1909 until the end of World War I. The second wave, called the farm Chemurgic Movement, began in 1929 (at the start of the Great Depression), reached its peak from 1936 to 1941, and subsided in the late 1940s after World War II.

“Industrial utilization of soybeans refers to uses other than for food and feed. The oil may be used, for example, as an ingredient in printing inks, diesel fuels, paints, resins, soaps, as a dust suppressant, etc. The protein may be used to make adhesives, plastics, artificial wool, paper coatings/sizings, fire fighting foams and a host of other products. Soy oil has always been more widely used in industrial products than soy protein.

“This is the most comprehensive book ever published about industrial utilization of soybeans. It has been compiled, one record at a time, over a period of 19 years, in an attempt to document the history of this subject. Its scope includes all known information about this subject, worldwide, from A.D. 980 to the present.

“This book is also the single most current and useful source of information on this subject, since 81% of all records contain a summary/abstract averaging 181 words in length.”

“A Brief History of Industrial Utilization of Soybeans—As early as 980 A.D. the Chinese were using soy oil, a semi-drying oil, mixed with tung oil, for caulking boats. It was widely burned as an illuminant in oil lamps to light homes

and temples, until the 1920s, when it was replaced by kerosene. By the 1920s it was also widely used in China to make soft soaps (that were known for their ability to give a good lather in hard water), lacquers, paints, printing inks, and waterproof cloths and umbrellas.

“By the 1500s, soybean cake began to be widely used in China as a fertilizer, primarily as a source of nitrogen and organic matter, but also for its content of phosphorus and potassium.

“The earliest known reference to industrial uses of soybeans in the West was in 1880, when Bryan, an American, noted that soy oil could be used as a substitute for linseed oil in paints, or be burned in lamps.

“The first use of the soybean for industrial purposes in the western world began in about 1909, when the price of linseed and cottonseed oils skyrocketed worldwide. Soy oil began to be used in large quantities in soaps, and experimentally in paints, first in England, then in the United States. Henry A. Gardner of the Paint Manufacturers Assoc. of the U.S. began extensive research on the use of soy oil to partially replace linseed oil in paints and varnishes. By 1916 the main use of soy oil in America was in soaps, where it replaced cottonseed oil. Manchuria also used large amounts of soy oil in soaps.

“In 1909 Goessel, a German, developed and patented the first rubber substitute from soy oil. In 1912 Beltzer, a Frenchman, developed soy protein plastic, Sojalithe, which he soon produced commercially on a large scale. In 1917 Satow, a Japanese, published the first of many articles from that country on the use of soybean proteins to make plastics.

“The heyday of interest in industrial utilization of soybeans took place in America during the 1930s and the Great Depression, spurred largely by the work of Henry Ford, the farm Chemurgic Council (founded in 1935), the Chemurgic movement, and the U.S. Regional Soybean Industrial Products Laboratory (founded in 1936 at the University of Illinois, Urbana). The goal was to make industrial products from farm crops to help depressed farmers. The soybean was one of the great success stories of the Chemurgic movement. In 1933, the peak year percentage-wise, a remarkable 70% of all soy oil in the USA went into industrial, non-food uses—primarily paints and varnishes, followed by soaps, linoleum, and oilcloth. Large amounts of soy flour were made into plywood glue, especially by the I.F. Laucks Co. In 1936, the peak year for publications, some 59 publications on industrial uses appeared. In 1935 the Glidden Co. in Chicago built the first small plant for production of industrial grade soy protein isolate, which they called ‘Alpha’ protein.

“Active work in this field accelerated during World War II, when soybeans were used to make products that were in short supply. In 1941, after imports of tropical oils from Southeast Asia had been suddenly cut off by the Japanese military, use of soy oil in industrial products skyrocketed to its historical peak in absolute terms: 74.25 million lb. were

used that year. Of this, 56% was used in paint and varnish, and 33% in soap. But by 1944 industrial uses of soy oil had fallen to only 17 million lb.

“During the 1950s, a period of huge surpluses for most U.S. farm crops (and forecasts of soybean surpluses... which never materialized), research focused on industrial products that could alleviate the surpluses. During the 1960s, as surpluses disappeared, the concern for world hunger and protein shortages grew, and petroleum came to dominate industrial utilization, soybean research switched from utilization to production.

“The mid-1980s in America saw a rebirth of interest in research on soybean utilization, especially industrial utilization. Foreign competition from Brazil and Argentina, and huge surpluses of soy oil drove U.S. farmers, led by the American Soybean Association, to develop new value-added products for new markets.

“Statistics compiled by the U.S. Dept. of Commerce, Bureau of Census, Industry Div. (Reprinted in *Soya Bluebook* '94, p. 234) show that in the year beginning Oct. 1992 (the latest statistics available), the main industrial uses of soy oil were in resins and plastics (95 million lb.), paint and varnish, fatty acids and ‘other inedible’ (163 million lb.). These nonfood uses totaled 296 million pounds in 1992/93, accounting for 2.5% of total U.S. domestic soy oil utilization. Rapidly growing new uses included printing inks, diesel fuels, and dust suppressants—to mention but a few.

“One of the shining examples of industrial uses of soybean oil in the USA is in soy inks. In 1987 the oil from 9,000 bushels of soybeans went into soy inks, but by 1993 this figure had skyrocketed to 4,000,000 bushels—a 444-fold increase in just 7 years! In 1994 about 10% of all U.S. printing inks, about 44 million pounds, were made from soy oil. About 90-95% of all daily newspapers used soy inks for color and one-fourth of the estimated 50,000 commercial printers regularly used it.” Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 510-283-2991.

865. Effland, Anne B.W. 1995. “New Riches from the Soil”: The chemurgic ideas of Wheeler McMillen. *Agricultural History* 69(2):288-97. Spring. [22 footnotes]

• **Summary:** The Spring Symposium at which this paper was presented was held in Little Rock, Arkansas. “Following a 1935 conference at Dearborn, Michigan, underwritten by Henry Ford, the National Farm Chemurgic Council was formed to continue and expand the work of the conference, primarily through public information campaigns, regular conferences and publications, and identification of promising research projects.” Address: Historian, Economic Research Service, USDA.

866. Leichtle, Kurt E. 1995. Power in the heartland: Tractor manufacturers in the Midwest. *Agricultural History* 69(2):314-25. Spring. [42 footnotes]

• **Summary:** Between 1900 and 1920 the Twin Cities of Minneapolis-St. Paul in Minnesota were the center of the search to perfect the general purpose tractor. This essay looks at four companies in the Twin Cities—Minneapolis Threshing Machine Co., Shaw-Enochs, Bill Tractor Co., and Lion Tractor Co. By 1899 one hundred companies in the USA were building gasoline engines. In 1892 John Froelich built the first successful gasoline-powered tractor. Address: Assoc. Prof. of History, Univ. of Wisconsin at River Falls.

867. Packaged Facts. 1995. The meat and dairy alternatives market. New York, NY: Packaged Facts. xii+ 162 + 42 + 6 p. May. 28 cm.

• **Summary:** In 1994 retail sales of these products reached an all-time high of \$286 million, and these sales are projected to top \$660 million in 1999. This very interesting report can be ordered from Packaged Facts, 625 Avenue of the Americas, New York, NY 10011. Phone: 212-627-3228. Price: \$2,150. The authors were Sarah and Peter Starr, though their names do not appear in the report. The product director was David Lumis.

Contents: Part I: The products. Scope of the report (Vegetarian products sold as meat or dairy alternatives, products not covered), history of the industry (an emerging market, part of the vegetarian movement, soybeans—an ancient food of Asia, soybeans arrive in the new world in the 18th century, Kellogg family starts health foods industry, makes first meat analogs, Seventh-day Adventists and others produce tofu and meat alternatives in the 1920s, Henry Ford early proponent of soybeans, meat analogs commercially developed in the United States in the 1940s, non-dairy beverages, growth of “Americanized” meat and dairy analogs booming), product definition (foods used to replace meat or dairy products, description of ingredients—tofu, tempeh, soymilk, okara, soy protein concentrates and isolates, textured vegetable protein, wheat gluten and seitan), product categories (three main categories of meat and dairy alternative products, meat alternatives, dairy alternatives, prepared meals), government regulations (the FDA and FTC, NLEA labeling considerations {went into effect in May 1994, making the USA the world’s first country to have mandatory nutrition labeling}, soy protein allowed in meat products without special labeling, bovine growth hormone), industry associations (the Soyfoods Association of America, the American Soybean Association, the Vegetarian Awareness Network).

Part II: The Market. Introduction (Retail sales of meat and dairy alternative products by category—1989-94—graph, retail sales of dairy alternatives products by segment—1989-94—graph), market size and growth (market is difficult to monitor, 1994 retail sales estimated at \$286 million, dairy alternatives surpass \$142 million, meat alternatives soar to \$132 million, prepared meals grow steadily to over \$12 million, estimated retail sales of meat and dairy alternative

products by category–1989-1994–table, growth in milk substitutes segment leveling off but still in double digits, cheese alternatives segment also experiences slight slow-down in 1994, non-dairy desserts–a slow-growth segment, estimated retail sales of dairy alternative products by segment–1989-1994–table), factors in market growth–overall market (maturing population and interest in nutrition, new dietary guidelines, medical community accepts plant-based diet, studies show vegetarian diet equals a healthier–longer life, soy might help to prevent heart disease and cancer, consumers now approve of vegetarian diets, increased demand for vegetarian foods, youth adopts meatless meals, exposure through foodservice, mass market begins to support meat and dairy alternatives, products in wider distribution, innovative new products, improved technology equals better taste, increased funding for soyfoods through foreign capital, pricing continues to limit market, image–taste and texture still a problem), factors in market growth–meat alternatives (concern about health hazards of meat, fat calories targeted by labeling law, an alternative to chicken and fish, ecological and social considerations will propel meatless meals, meatless meals difficult to handle by foodservice), factors in market growth–dairy alternatives (milk substitutes enter dairy case, awareness of lactose intolerance on the rise, taste profile limits acceptance, cheese alternatives–are they healthier?, projected retail sales of meat and dairy alternative products by category–1994-1999–graph {p. 34}, projected retail sales of dairy alternative products by segment–1994-1999–graph {p. 35}), projected market growth (overall market to reach \$662 million in 1999, meat alternatives and prepared meals to lead growth, projected retail sales of meat and dairy alternative products by category–1994-1999–table, growth of milk substitutes and other dairy alternatives expected to slow somewhat by 1999, projected retail sales of dairy alternative products by segment–1994-1999–table), market composition (meat alternatives will outsell dairy alternatives, share of sales by product category–meat and dairy alternatives–graph, soy-based ingredients most frequently used in meat-like products, protein ingredients used in meat-like products by number of products made with ingredient–1990-1992–table, bulk of dairy alternative sales from milk substitutes, share of sales by product segment–1989 vs. 1994–graph, sales by retail outlet, share of sales by retail outlet–meat and dairy alternatives–1994–graph).

Part III: The marketers. The marketers (About 30 significant marketers–most small, major companies move into the market, meat alternatives–other mass-market players, meat alternatives–natural foods players, the leaders in milk substitutes, cheese alternative market leaders, the leaders in non-dairy desserts, prepared meals market leaders, selected marketers and brands of meat and dairy alternative products–chart), market and brand shares (mass-market leader Worthington Foods challenged by ADM/Pillsbury Green Giant Harvest Burger, wholesome and hearty growing

fast, Boca Burger boogies by the Bystanders, marketer and brand shares of meat alternative products sold through supermarkets–1993 vs. 1994–table, natural foods sales of meat alternatives more fragmented, Worthington is leader in natural foods stores, White Wave and Lightlife hold second and third place, estimated marketer and brand shares of meat alternative products sold through natural foods stores–1994–table, many small regional players capture local markets, Eden Foods leads in milk substitutes, estimated marketer and brand shares of milk substitute products mass-market and natural foods stores–1994–table, Imagine Foods' Rice Dream is leading rice beverage, other vegetable beverages, Tree of Life's Soya Kaas holds leading share of cheese alternatives market, estimated marketer and brand shares of cheese alternative products sold through natural foods stores–1994–table, Tofutti holds top market share in frozen desserts, Fairmont Foods establishes lead in supermarkets, marketer and brand shares of prepared meals sold through supermarkets–1994–table, natural foods prepared meals–many brands and no one leader), competitive situation–overall market (marketers compete primarily through new product introductions, growth through mergers and acquisitions). Continued.

868. Wright, David E. 1995. Agricultural editors Wheeler McMillen and Clifford V. Gregory and the Farm Chemurgic movement. *Agricultural History* 69(2):272-87. Spring. [25 footnotes]

• **Summary:** Begins with an excellent overview of the six critical milestones in the development of the farm chemurgic movement: (1) 1926–The founding of the idea in the form of two publications, by Wheeler McMillen and William Hale. (2) 1933–New industrial solutions to the “farm problem” become a key element in Franklin Roosevelt's new farm program. The key idea is “power alcohol.” But federal legislation favoring power alcohol is stalled by powerful opposition from the petroleum and automotive industries. (3) 1934-35–Francis Patrick Garvan's wealthy Chemical Foundation adopted chemurgy as an independent research and development program. Then in May 1935 Garvan and Henry Ford sponsored the first Dearborn Conference on Agriculture, Industry, and Science followed by the creation of the National Farm Chemurgic Council. (4) 1936-37–Garvan decides to launch a research and demonstration project for power alcohol at Atchison, Kansas. Soon they were selling “Agrol” at some one thousand service stations in 17-18 states. (5) 1937-38–Francis Patrick Garvan died in Nov. 1937 and Charles Holmes Hertty died in July 1938. The Chemical Foundation's income began to diminish rapidly, and with increasing opposition from the petroleum industry, the power alcohol demonstration project in Kansas collapsed. “It was in this dispiriting atmosphere that Wheeler McMillen succeeded Garvan as the president of the National Farm Chemurgic Council.” (6) 1941–During and after World

War II, chemurgy underwent major changes. Through the Regional Laboratories, the USDA “had adopted a substantial portion of the chemurgists’ research agenda. In November 1946, when he published *New Riches from the Soil: The Progress of Chemurgy*, McMillen surveyed a chemurgic program that was already well established in the nation’s agricultural infrastructure.”

Wright then examines in detail the central roles played in the chemurgic movement by these two agricultural editors, McMillen and Gregory. Address: Dep. of Resource Development, Michigan State Univ.

869. Lewis, David L. 1995. Henry Ford and the magic beanstalk. *Michigan History*. May/June. p. 10-16.

• **Summary:** Much of this interesting presentation is taken from a paper by the same title presented by the author on 6 Dec. 1991 to the Ontario Soybean Growers’ Marketing Board. This, in turn, is based the author’s original and very authoritative book, *The Public Image of Henry Ford* (1976, see p. 282-85). On the first page, the author writes in a sidebar: “Henry Ford is most remembered for the Model T, mass production, and the five-dollar day, which doubled his workers’ pay. But he should equally be remembered for his extensive soybean experimentation and research into plastics—his last great achievement and the work that delighted him most.”

Contains 8 good photos related to Ford’s work with soybeans. The caption accompanying the famous photo of Ford taking an axe to the back of a black car reads: “Henry Ford takes an axe—only a blur in this photo—to the dent-resistant plastic trunk lid of his personal 1940 Ford. Keeping his axe in the trunk of his car, the magnate routinely swung on the lid to impress guests. He hit it one too many times when showing off before Walter P. Chrysler and caused a fracture in the lid similar to the splintering of a piece of green wood. Unfazed, Ford praised the ability of the lid to absorb as much impact as it had.” Address: Prof. of Business History, Univ. of Michigan, Ann Arbor, MI 48109-1234. Phone: 313-764-9540.

870. Johnson, Lawrence A.; Myers, Deland J. 1995. Industrial uses for soybeans. In: D.R. Erickson, ed. 1995. *Practical Handbook of Soybean Processing and Utilization*. Champaign, Illinois: American Oil Chemists’ Society Press; St. Louis, Missouri: United Soybean Board. viii + 584 p. See p. 380-427. Chap. 21. [129 ref]

• **Summary:** Contents: Introduction: Early industrial uses in the Orient, early industrial uses in the West (Early industrial uses for soybean oil, early industrial uses for soybean protein). The chemurgic movement. Industrial uses for soybean protein: Wood adhesives (history and background, performance properties, technology, markets, current interest. Note: These subcategories are repeated for each application), plastics, textiles fibers, paper coatings,

other industrial uses for soy protein (paper and textile sizing, building materials, wallpaper, miscellaneous adhesives {shotgun shell casings, charcoal briquets}, water-thinned paints, powder and paste paints, resin-oil emulsion and latex paints, printing ink, fire-fighting foams, other miscellaneous industrial uses for soy protein {soy meal in mixed fertilizers, sticker and spreader in agricultural sprays—Spraysoy, fermentation media, honeybee diets}).

Industrial uses of soybean oil: Paints, coatings, and varnishes, plasticizers, drying oil products (linoleum, oil cloth, sealing and caulking compounds, rubberlike materials, core oils), lubricants and fluids (bar chain oils for chainsaws, irrigation well lubricants, hydraulic fluids, slip or release agents for concrete and asphalt), oleochemicals (dimer acids, trimer acids, diacids, alcohols, amines, amides, esters, polyamide resins, soaps, detergents, and surfactants), diesel fuel, printing ink, other industrial uses for soybean oil (dust suppressants, herbicide and insecticide carriers), miscellaneous uses (antifoam agent in aerated fermentations such as production of penicillin, streptomycin, and tetracycline; soybean oil also significantly increases antibiotic yields, probably by providing nutrients; material to delay onset of blooms on fruit trees, thus reducing susceptibility to frost damage).

Soybean hulls in industrial products. Potential for increased usage of soybean products in industrial products.

Tables: 1. Basic soybean adhesive formulation. 2. Utilization of soybean oil and all fats and oils in the United States for industrial products (million lb, 1955-1990; the largest uses for soybean oil in 1990 were in resins and plastics {106}, and paints and varnishes {50}). 3. Comparative properties of diesel and soy diesel fuels. 4. Emissions for diesel engines operating on different fuels and engine configurations.

Photos show: 1. Henry Ford slamming an ax into a 1940 automobile trunk lid made of plastic based on soy protein. 2. Newly developed plastics (plate, spoon, golf tee) containing soy protein, corn starch, and other food-grade ingredients. 3. Henry Ford in 1941 wearing a soy protein suit, sitting on a haystack looking at his straw hat. 4. Wood- and granite-like building materials produced with soy flour and recycled newspapers by Phenix Co., Mankato, Minnesota.

Other figures: 21.5. Chemicals used in converting soybean oil into alkyd resins. 21.6. Chemical reactions involved in epoxidation of soybean oil and stabilization of polyvinylchloride (PVC). 21.7. Oleochemical derivation pathways. 21.8. Structures and reactions of common oleochemicals. 21.9. Prices and price ratios between petroleum and soybeans and soybean products. Address: 1. Center for Crops Utilization Research; 2. Dep. of Food Science and Human Nutrition. Both: Iowa State Univ., Ames, Iowa.

871. United Soybean Board. 1995. Soybeans: How a little

bean becomes an ingredient in thousands of products from margarine to tofu to chicken feed (Brochure). Chesterfield, Missouri: USB. 12 panels + poster. 23 cm.

• **Summary:** This attractive color publication is folded so that the first 12 panels are a brochure. However when fully unfolded, a large color poster appears. The brochure notes: In 1992/93 the USA produced 51% of the world's soybeans. An early history of the soybean in the USA [full of errors]. America livestock (including poultry) consume about 22.5 million tons of soybean meal a year. How soybeans are grown. Composition of the soybean. Foods made from soybeans: Edamame, miso, natto, soy milk, soy sauce, tempeh, tofu or soybean curd, full fat flour. Photos (each incorrect) in the brochure show: "1904: The famous American chemist George Washington Carver discovers that soybeans are a valuable source of protein and oil. 1920s: Combines first used to harvest soybeans. 1922: First U.S. soybean processing plant opens. 1929: Soybean pioneer William J. Morse spends two years in China, gathering more than 10,000 soybean varieties for U.S. researchers to study. 1940: Henry Ford takes an ax to a Ford car body to demonstrate the strength of the soybean plastic he has developed."

The color poster (16 by 27 inches) is a cartoon showing how soybeans are processed into various products, including full fat flakes, crude and degummed soybean oil, soy concentrates, soy isolates, soy flours, and defatted soy flakes. A soybean utilization/processing diagram at the bottom of the poster shows 137 different products that can be made from the soybean, including 33 whole soybean products ("Traditional soyfoods" incl. tofu, soymilk, miso, tempeh, soy sauce, natto), 33 soybean meal products (26 edible uses + 7 feed uses), and 71 soy oil products (13 edible uses, 19 industrial uses, and 18 applications for lecithin). The seven types of lecithin applications are: Emulsifying agent (4 applications), nutritional (medical use, dietary use), anti-spattering agent (in margarine manufacture), stabilizing agent (in shortening), anti-foam agent (yeast manufacture, alcohol manufacture), dispersing agent (in paint, ink, and rubber manufacture, and in insecticides), and wetting agent (in cosmetics, paint pigments, and calf milk replacers).

Accompanying the brochure/poster is a note pad with the same slogan across the top of each sheet: "Soybeans—Designed for life." Across the bottom is written: "United Soybean Board—Investing check-off dollars." Address: P.O. Box 419200, St. Louis, Missouri 63141-9200.

872. Meikle, Jeffrey L. 1995. *American plastic: A cultural history*. New Brunswick, New Jersey: Rutgers University Press. xiv + 403 p. See p. 155-57. Illust. (some color). Index. 27 cm. [775* endnotes]

• **Summary:** A history of plastics in America from 19th century celluloid to the first wholly synthetic bakelite, through to a proliferation of compounds and on to recent

ecological concerns. Emphasis is on the social and cultural side of plastic use, rather than a technical approach.

Contents: List of illustrations. Preface. Introduction: A matter of definition. 1. Celluloid: From imitation to innovation. 2. Bakelite: Defining an artificial material. 3. Vision and reality in the plastic age. 4. An industry takes shape. 5. Nylon: Domesticating a new synthetic. 6. Growing pains: The conversion to postwar [post World War II]. 7. Design in plastic: From durable to disposable. 8. Material doubts and plastic fallout. 9. Beyond plastic: The culture of synthesis. Acknowledgments. Abbreviations and sources. Notes.

Includes a discussion of Henry Ford's work with plastics made from soybeans. Illustration 6-1 (p. 156) shows Henry Ford swinging an ax into a phenolic plastic trunk panel, 1940 (From the collections of the Henry Ford Museum and Greenfield Village).

Page 76 states: "Cast phenolic was so successful that *Modern Plastics* feared popular jewelry—and the material from which it was made—was being 'ford-ized.'"

Jeffrey L. Meickle was born in 1949. Address: Prof. of American Studies and Art History, Univ. of Texas at Austin.

873. Callanan, Bob. 1996. *Soya Bluebook: Celebrating 50 years of service to the soybean industry* (Ad). *Soya Bluebook Plus* 1997. p. 13-21.

• **Summary:** On the top two-thirds of each page is a brief history of the soybean in America from 1900 to the present, with emphasis on the work of the American Soybean Association, which was founded on 3 Sept. 1920 as the National Soybean Growers' Association by more than 1,000 people who attended the first "Cornbelt Soybean Conference" on a farm owned by the three Fouts brothers near Camden, Indiana. It was renamed the American Soybean Association in 1929.

To the left and right of this story on each page are two reproductions of full-page advertisements from existing companies that appeared in the Bluebook. The first four ads are from Anderson International (1947), Archer Daniels Midland Co. (1947), French Oil Mill Machinery Co. (1947), and Ross & Rowe, Inc. (1947, now ADM Lecithin).

The story contains many photos related to the ASA and soybean production and trade. For example: (1) A farmer on a horse-drawn cultivator in a soybean field from the early 1900s. (2) The front of the ASA offices in Hudson, Iowa. (3) Henry Ford in 1940 testing the strength of a soy-based plastic trunk lid on a Ford car by swinging an ax against it. (4) Mr. & Mrs. George Strayer in Oct. 1955 leaving for Japan by air from Waterloo, Iowa. (5) The floor of the Chicago Board of Trade in Oct. 1936 as the new soybean futures market opens. (6) An oceangoing freighter in the 1940s docked next to Central Soya Company's elevators in Chicago. (7) W.L. Burlison and C.M. Woodworth inspecting soybean variety demonstration plots at the University of Illinois.

Accompanying this history, on the bottom one-third of each page is a chronology from 1900 to 1997 that highlights major events of the companies that advertise in the *Soya Bluebook Plus*—even though those events may be of relatively little importance in soybean history. For example: 1905—H.R. Williams Mill Supply Inc., Kansas City, Missouri is founded by Harry Richard Williams. 1914—Universal Oil Products Co. (UOP), Des Plaines, Illinois, is established. Address: Communications Director, American Soybean Assoc. Phone: 314-576-1770.

874. Gerstner, Patsy. 1996. The temple of health: A pictorial history of the Battle Creek Sanitarium. *Caduceus (Southern Illinois University School of Medicine)* 12(2):1-99. Autumn. Special issue. [101* endnotes]

• **Summary:** This special issue, a nicely bound book with a color illustration on the cover, offers a remarkable look at the Battle Creek Sanitarium, including 115 photos, illustrations and other graphics, and a well-written text and balanced appraisal.

Contents: Acknowledgments. 1. From gentle obscurity to worldly fame, 1866-1902. 2. The temple rises from the ashes. 3. The treatment. 4. Never enough space. 5. A moment of glory, 1928 and after. 6. The Battle Creek Sanitarium: An appraisal. 7. Further reading and notes. Picture credits. About the author (and Garth "Duff" Stoltz's remarkable collection of Sanitarium memorabilia). "Certainly the Sanitarium was one of the grandest experiments in health care in the nineteenth and twentieth centuries" (p. 99).

Soy acidophilus milk contained a bacillus similar to the one in yogurt that created lactic acid. Intended "to suppress the putrefactive bacteria in the colon and replace them with 'good' bacteria," this soy-based milk "became a standard item on the Sanitarium menu after 1915" (p. 43).

"Among his [Dr. Kellogg's] most successful efforts were Sanitarium exhibits at the World's Columbian Exposition, the great fair held in Chicago [Illinois] in 1893, and the Louisiana Purchase Exposition, the 1904 world's fair held in St. Louis [Missouri]... Kellogg and others began to refer to the Sanitarium as a 'University of Health'" (p. 81).

"Kellogg recognized the importance of endorsements from well-known personalities... Henry Ford was not only a frequent visitor but the first guest in the 1928 Towers addition. Other famous visitors were presidents William Howard Taft and Warren G. Harding,... arctic explorer Roald Amundsen, industrialist John D. Rockefeller, grape juice manufacturer Edgar Welch, author Upton Sinclair, educator Booker T. Washington, aviatrix Amelia Earhart, and merchandisers J.C. Penney, Montgomery Ward,... First Lady Eleanor Roosevelt was among the noted visitors, but not as a patient" (p. 81).

Figures (Photos unless otherwise stated): (1) People in the grand parlor, Battle Creek Sanitarium (the San), 1880s. (2) Ad for the Health Reform Institute in Battle Creek (1870s),

forerunner of the San. (3) Illustration of John Harvey Kellogg, in his early 20s, shortly after he became superintendent of the Western Health Reform Institute. (4) Illust. Dansville, New York, water-cure facility. (5) Exterior of the Western Health Reform Inst. in 1866. (8) Illust. "Women and men share a workout in the gymnasium, 1888." (9) Woman at the punching bag, 1910. (10) The Sewing Department, ca. 1915. (11) Exterior of the 1878 building—5 stories. (12) Diagram of the first floor. (13) Audience in Grand Parlor awaits a lecture; inset illust. shows a doctor interviewing a patient. (14) Illust. Typical San guest room, 1888. (15) Rate card from 1888, showing all basic costs / expenses. (16) The Sanitarium Hospital, completed in 1888. (17) By 1895, the San had been enlarged by a 5th story plus two additions. (18) Menu for dinner, July 15, 1888. (19) Leaflet promoting Sanitarium Training School of Nurses. It opened in 1883 with a six-month program. It grew to a full two-year course. (20). The front of an urban vegetarian restaurant and "Battle Creek Sanitarium Treatment Rooms," location unknown. (21) The dispensary of the Chicago Mission. The sign reads: "American Medical Missionary College: Dispensary." Constructed 1887. (22) Dr. John Harvey Kellogg poses ca. 1895 seated outdoors with some members of the medical and nursing staff. (23) The fire of 18-19 Feb. 1902; it burned the main San building and the hospital to the ground. Only one patient died in the fire. San losses were valued as high as \$400,000 and the loss of guests' personal property as high as \$500,000. (24) A group of San employees by the ruins. (25). Laying of the cornerstone for the new San on 4 May 1902. (26) Aerial view of the huge new San from the rear, showing the gymnasium and two treatment wings. (27) Entrance to the San. (28) The loggia. (29) A patient wearing the blanket / robe designed by Dr. Kellogg. (30) A Porte-air directing fresh air to the head of a patient in bed. (31) The Grand Lobby, with a "Ladies Corner" at center back. (32) Guests in the Grand Parlor. (33) A guest room being prepared for a new arrival. (34) The San switchboard, 1903. (35) Guests at the roof promenade. (36) The San kitchen. (37) Diagrams of the grounds and buildings of the Battle Creek Sanitarium. (38-39) Scenes from the San laundry, ca. 1910. (40) The annual ice caravan (pulled by horses) makes its way to the San. (41) Many patients being led in outdoor breathing exercises. (42-45) San patients receiving a thorough medical examination. Note: Between 1890 and 1898 Dr. Kellogg adopted the theory of "auto-intoxication" (mainly from the colon) as the most important cause of disease. (46) A laboratory; an important aspect of diagnosing auto-intoxication was laboratory analysis of body wastes. (47) Menu of special dietaries. (48) The food booth, located just outside the Palm Garden. (49) Local Rotarians having dinner in one of Dr. Kellogg's dairy barns as a demonstration of its cleanliness. (50) Label of a box of Kellogg's Bran, marketed as a cure for constipation. (51) Labels of Paramels, Ssylla, and Kaba, bulk-producing products developed at the San and sold by the Battle Creek

Food Co. (52) A sign that reads "Fletcherize" is prominently displayed in the San's dining room. (53) Program / schedule for the day on a typical day, 22 Feb. 1915, printed on the back of the day's menu. Everyone was expected to participate in the activities listed and each guest also received a personal schedule of treatments. (54) The gymnasium in 1903; round the upper level is a running track. (55) Kellogg's Universal Dynamometer measured the strength of all major muscle groups. (58-64) The Mechanical Movement Room, ca. 1890; incl. vibrating belts and chairs, a mechanical horse and an abdomen-bending machine. (65) A walking party in front of the San. (66) Members of an exercise class pose with Indian clubs on the front terrace. (67) Improved posture and mental and physical dexterity were the goals of sloyd [Scandinavian exercises], ca. 1903. (68) A bedridden patient engaged in approved exercises. (69). (69) An electrotherapy device in 1888 with San helpers. (70) Electrostatic generator, which Kellogg claimed was the largest ever made. (71) A man standing inside a wire cage of coils; the rapidly oscillating electric field within this coil generated a high-frequency electrical treatment. (72) Electrotherapy in a bath tub. (73) Laboratory of Experimental Hydrotherapy (1800s). (74-78) Hydrotherapy treatments. (79) The outdoor sand bath in a huge sand box. (80) The air bath was usually used to cool the body after a heat bath. (81-82) Three versions of the light bath. (83) In diathermy, a high-frequency alternating current delivered penetrating warmth to a specific part of the body. (84) Kellogg standing in white suit presides at a dinner in the Annex dining room. The average patient stayed a month at the San. (85) Exterior view of the Annex. (86) The new hospital building—formerly the Sanitas Food Co. factory, 1914. (87) An operating room. (88) Horseback riding party in front of the Annex. (89) Illust. of the 1928 Twin Towers addition to the Battle Creek San. (90) Map of San grounds showing new addition. (91) The luxurious lobby. (92) The men's parlor. (93) The elegant Towers dining room. (94) The pre-dinner rooftop Grand March. (95) Towers accommodations (bedroom). (96) Miami Battle Creek [Florida], 1931. (97) In "1942 both the 1903 building and the towers addition were sold to the federal government for \$2.25" million. Kellogg relocated San activities to the Annex and a building on the former campus of Battle Creek College. (98) The Annex in the 1940s. (99) The fountain, now part of the Battle Creek Federal Center. (100) A view of Battle Creek from the San sun roof. (101) Advertisement for the Sanitas Nut Food Co. (102) Page from a Kellogg recipe book shows how Malted Nuts might be used. (103) Ad for Sanitarium Health Food Co. (Battle Creek). (104) Eddie Cantor on the San's golf course. (105) Eleanor Roosevelt at the San. (106) Certificate awarded the San in 1919 by the American College of Surgeons. (107) Ella Kellogg at home. Married in 1879, the Kelloggs adopted 42 children. (108) Menu for Christmas Dinner, 1930. (109). Dr. Kellogg tending orchids in his lush tropical palm garden. (110) People in an

early horseless carriage, ready for an excursion in the fresh air. (111) Outdoor exercise class at entrance to 1903 building. (112) Hollyhocks in bloom around the 1903 San. (113) The colonnade. (114) Guests checking into the San. (115) Two people in a horse-drawn sleigh in front of the San in winter's snow. Address: Chief Curator, Dittrick Medical History Center.

875. Fenichell, Stephen. 1996. *Plastic: The making of a synthetic century*. New York, NY: HarperBusiness. 356 p. See p. 175-80. Illust. 24 cm.

• **Summary:** Chapter 7, titled "The vinyl solution" includes a discussion of Henry Ford's work with plastics made from soybeans. By the 1930s Henry Ford was in his 70s. "Publication of his paranoid theories of a worldwide Jewish conspiracy in the *Dearborn Reporter* had led to a total Jewish boycott of Ford products." He came to be known for his battles with organized labor, his strong opposition of both President Roosevelt and his New Deal, and his outspoken opposition to American involvement in the war against Hitler [and Germany; World War II]. There was the widespread view that Henry Ford was in steep decline and was taking the Ford Motor Company down with him. Then in November 1940, at age 70, he invited the press to Greenfield village, to witness the all new plastic Ford.

A photo shows Henry Ford striking the rear trunk lid of a black Ford car with an axe. Address: Freelance writer, New York City.

876. Bryan, Ford R. 1997. Update on work toward restoration of Henry Ford's Chemical Plant (Interview). *SoyaScan Notes*. March 27. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Mr. Bryan is still working to try to have the Chemical Plant (later often called the Soybean Lab) restored due to its historical importance related to soybeans. A meeting has been planned for April 7-8 in Dearborn. Three officers from the Iowa Soybean Association and two from the Michigan Soybean Association will attend to examine the building and consider partial funding of the restoration project. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

877. Bryan, Ford R. 1997. Re: Update #2 on work toward restoration of Henry Ford's Chemical Plant. Letter (fax) to William Shurtleff at Soyfoods Center, April 10. 1 p. Typed, with signature on letterhead.

• **Summary:** Three people from the Iowa Soybean Association (Kirk Leeds {Executive Director}, Chuck Stewart, and Jo Patterson) and two from the Michigan Soybean Association (Keith Reinholt {Executive Director} and Anita Stuever) were at Greenfield Village on April 8-9. Note: Henry Ford died on April 7, 1947, almost exactly 50 years ago.

On the afternoon of April 8th, they examined the soybean

building with the curator of agriculture, Leo Larkin, and Ford Bryan. On April 9th, they met with Mr. Steven K. Hamp (President of the Henry Ford Museum) in the forenoon and had a luncheon with Hamp, Larkin, Christian Overland (Programs Manager), and Ford Bryan.

"Their conclusion was that there were great possibilities. The direction being taken by the Village these days in toward 'Education.' The 'Academy' being started this year with an initial gift by the Ford Motor Company of \$5 million, together with State and Federal funds, points to the soybean building possibly being used to portray the history of agricultural chemistry. The possibility of classes being conducted in the building was discussed."

Talk with Check Stewart. 1997. May 9. One idea that is of interest to the soybean people is to have foods made from soybeans at the Soybean Lab. and sold at an adjoining restaurant. These could include ice cream, cookies, burgers, shakes, and hot dogs. Shurtleff suggests that back-illuminated color photos on the wall could show several steps in the process plus the end product. The next phase will be a 4-page "vision statement" from the Henry Ford Museum. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

878. Ferrell, John S. 1997. Henry Ford: An original environmentalist. *Bay Area Vegetarian* 8:54-56. [23 ref]

• **Summary:** Henry Ford's fascination with the versatile soybean led to many ideas for industrial products. Address: Oregon.

879. Bryan, Ford R. 1997. Update #3 on work toward restoration of Henry Ford's Chemical Plant / Soybean Lab. (Interview). *SoyaScan Notes*. Aug. 29. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Iowa Soybean Association and the Michigan Soybean Association have each donated \$20,000 toward a feasibility study. The presidents of both organizations seem very interest in the project and Mr. Bryan feels there is a good chance it will move forward. The building is in good shape structurally. There are plans to sell foods in the renovated lab and perhaps have a classroom. In October, there will be a national meeting in Washington, DC, to evaluate where things stand. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

880. *Life*. 1997. The millennium—Special double issue: Henry Ford (Document part). Fall. 174 p.

• **Summary:** In part one of this issue, a team of expert historians ranks the 100 most important events and discoveries of the last 1,000 years. In part two, they rank the 100 most important people. Henry Ford (1863-1947) appears in both parts.

In part one (p. 112), the 17th most important event of the millennium is titled "1908—Ford rolls out the Model T." The automotive age began in 1908 when Henry Ford unveiled

his "car for the great multitude." The Model T (also called Tin Lizzie), which cost only \$850 in 1908, was the first car that many Americans could afford. The price fell still further after Ford introduced a revolutionary new system of mass production—the moving assembly line. Eventually a Model T rolled off the line every 24 seconds. By mid-1927 some 15.5 million Model Ts had come off the assembly line. As other auto manufacturers adopted Ford's methods, cars altered the lives of most people worldwide. A black-and-white photo shows a Model T on an assembly line. Note: *Life* considers the five most important events of the millennium to be: 1. Gutenberg prints the Bible, 1455. 2. Columbus discovers America, 1492. 3. Martin Luther nails his 95 theses to the door in Wittenberg, Germany, 1517. 4. The industrial revolution begins when James Watt patents a steam engine, 1769. 5. Galileo sees the moons of Jupiter (1610) adding support to the theory that the Earth is not the center of the universe—or of the solar system.

In part two (p. 148), Henry Ford is regarded as the 15th most important person of the Millennium. Ahead of Ford, in descending order of importance, are: 1. Thomas Edison. 2. Christopher Columbus. 3. Martin Luther. 4. Galileo Galilei. 5. Leonardo da Vinci. 6. Isaac Newton. 7. Ferdinand Magellan. 8. Louis Pasteur. 9. Charles Darwin. 10. Thomas Jefferson. 11. William Shakespeare. 12. Napoleon Bonaparte. 13. Adolf Hitler. 14. Zheng He (1371-1435, Chinese admiral and diplomat).

In 1903 Henry Ford set up his first auto shop in Detroit, Michigan. For 19 years he sold only one kind of car—the Model T, but he sold 15.5 million of them—half the automobile output of the world. His revolutionary assembly line enabled him to sell his cars at a price the average American family could afford. In the process, he doubled his workers' wages and reduced their working hours. "What had been a toy of the rich fast became a necessity of life, spawning gas stations, superhighways, and traffic jams around the world." A portrait photo shows Henry Ford.

Note: 1903 July 23—Ford's first car, a two-cylinder Model A, was sold. 1908 Oct. 1—The Model T was introduced, and it alone was produced until 1927. 1913 April 1—The moving assembly line was introduced. 1914 Jan. 5—\$5 daily wage for 8 hours work was announced; it replaced \$2.34 for a 9-hour day. 1927 Dec. 2—New Model A 4-cylinder was introduced.

881. Imhoff, Dan. 1998. Rounding up biotech soybeans: Part one of a two-part story on soy-based inks. *Eco* 7(2):113-15. Jan/Feb. [8 ref]

• **Summary:** An excellent article, full of new and useful facts and statistics about soy inks. When Henry Ford was asked how he would improve America's newspapers, he replied that he would find a way to reclaim the ink so that both ink and paper could be used again.

As the oil embargoes of 1973 and 1979 threatened ink shortages, the American Newspaper Publishers Association

(ANPA) began to search for alternatives. They finally singled out soy oil from 2,000 plant-oil formulations. It was quite inexpensive, and its clarity allowed pigments to show through with more sharpness and brilliancy than in petroleum-based inks. Use of soy inks reduces environmentally harmful volatile organic compounds (VOCs) during printing.

In 1987, six U.S. daily newspapers began printing with the first generation of soy-based inks. Ten years later, nearly one-third (3,000) of America's newspapers had followed suit. Today over 100 U.S. ink makers offer at least one soy-based product, and soy inks account for 15-20% of the total market. Although soy oil costs at least 25% more than petroleum, it is easier to clean up and seems to go a bit further on the press. Henry Ford's great grandson, William Clay Ford Jr., likes to proclaim that the Ford motor company has switched to printing with soy-based inks from petroleum-based, in an effort to benefit the environment and American farmers.

A sidebar, based on statistics from the Soy Ink Information Center, gives the following statistics: (1) Black news ink: Of the 375 million lbs. total ink volume, more than 15% is soy-based. (2) Color news ink: Of the 95 million lbs. total ink volume, more than 90% is soy-based. (3) Sheet-fed ink: Of the 110 million lbs. total ink volume, 40-50% is soy-based. (4) Heat-set ink: Of the 290 million lbs. total ink volume, less than 5% is soy based. (5) Cold set ink: Included in new inks categories.

There follows a section critical of Monsanto's Roundup Ready soybeans. What would Henry Ford have thought of Monsanto?

Most soybeans are eaten, by either animals or humans; the rest are made into industrial products. Address: Freelance writer, Philo, California.

882. Bryan, Ford R. 1998. Undocumented story that Henry Ford traded his soy-based auto body paint for Chrysler's hydraulic brake system (Interview). *SoyaScan Notes*. Oct. 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Ford Bryan has worked for the Ford Motor Company in various capacities for most of his life. Many years ago (back in the late 1940s or 1950s) he heard the following story from several employees of the Ford Motor Co., but he has not yet been able to document it. He has not heard the story again in the last 10-15 years. It is a well know fact that Henry Ford developed and patented an auto body paint which used soybean oil as a major ingredient. It is said that he traded the use of that paint to Chrysler for use of the advanced hydraulic brake systems that Chrysler had developed. Ford's paints were primarily black in color, and they were extremely durable. Chrysler showed an interest in using them, and perhaps even making them or licensing the patent rights. Bryan does not think that Ford sold any paints to Chrysler. At that time, Ford was behind in their braking system. The engineers had an awful time trying to convince Henry Ford that hydraulic brakes were safe, that the tubes

wouldn't burst. Chrysler had very good hydraulic brakes, and they must have been patented. Bryan has heard that there was some kind of a trade of Ford's paints for Chrysler's hydraulic braking system.

Ford did not use hydraulic brakes until after 1937. We also need to know more about Ford's paints that contained soybean oil. Ford's main paint factory was at Highland Park, which was north of Detroit, about 10 miles from the Rouge (which was west of Detroit). Bryan has seen photos of temporary wooden buildings at the Rouge that he didn't know existed. They looked like pilot plant operations, where they were extracting oil from soybeans. Perhaps that was the source of oil for Ford's paints. There was another building facing Miller Road that Bryan never visited; called the Soy Bean Plant, it was very conspicuous and attractive, made mainly of glass and steel. Bryan thinks it was for plastics; he does not know whether or not any work related to paints was done there. Ford had solvent extractors used for extracting soybean oil in several buildings associated with the Glass Plant, which was in the middle of the Rouge. He almost certainly used oil extracted on the premises in the auto body paints he manufactured. Bryan knows a man who was in charge at the Soy Bean Plant; he will try to find out more about what was done in the building. Address: Research Center, Henry Ford Museum, Dearborn, Michigan.

883. Stewart, Chuck. 1998. Update on work toward restoration of Henry Ford's chemical plant and soybean laboratory—and new ideas (Interview). *SoyaScan Notes*. Oct. 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Iowa Soybean Association and the Michigan Soybean Association contributed \$80,000 to fund a feasibility study on refurbishing Henry Ford's Soybean Lab. Then they put together a proposal, that has now been presented to the Central States Soybean Group—which consists of the major soybean producing states, of which Iowa and Illinois are the top two. They had a second meeting with Steven J. Hamp, president of the Henry Ford Museum. They are now talking about going beyond the Soybean Lab and presenting the "big picture of agriculture through the lens of the soybean." The Soybean Lab would be the historical component, the "look back." Part of the new picture would be the big idea of moving from a carbon-based society to a carbohydrate-based society.

Note: In a week or so, Chuck Stewart and representatives of the Illinois and Iowa Soybean Associations will meet with representatives (including Martin Andreas of ADM) to discuss funding. Address: Chuck Stewart & Associates, 4949 Pleasant St., Suite 204, West Des Moines, Iowa 50266. Phone: 515-226-0358.

884. Wright, David E. 1999. The farm chemurgic movement and its influence on the modern world, including laying the foundation for current biotechnology research (Interview).

SoyaScan Notes. April 14. Conducted by William Shurtleff of Soyfoods Center. [25 footnotes]

• **Summary:** Discusses: Eugene Gressley, cowboy entrepreneur who buys archival collections for the University of Wyoming and maneuvers to raise money to get a new building to house his collections. David's 1986 visits to and research in these archives which were housed in a Quonset hut outside of Laramie. Francis P. Garvan, chemurgist with great social influence. Buffum, CEO who worked for Garvan. Harry E. Bernard. Billy Hale, who married Herbert Henry Dow's daughter and wrote his first article on chemurgy in 1926 in Henry Ford's *Dearborn Independent*.

Note: Herbert H. Dow (lived 1866-1930) was an American chemist and manufacturer. Born in Belleville, Ontario, Canada, he founded the Dow Chemical Co. in 1897 near Midland, Michigan, and developed and patented over 100 chemical processes. Midland, Michigan, is slightly more than 100 miles northwest of Dearborn, Michigan—home of the Ford Motor Co. When Herbert Dow died in 1930, his son, Willard H. Dow, became head of the company. Willard was active in the National Farm Chemurgic Council during the 1930s and 1940s.

Leo Christensen. Edward J. Muhs—the Chemical Foundation's historian, how power alcohol destroyed the Chemical Foundation the important book *Industrial Fermentations*, by L.A. Underkofler and Richard J. Hickey (1954, New York: Chemical Publishing Co.). How Hale and Garvan laid the foundation of modern biotechnology research by creating a triad between university researchers, business, and government. Address: Asst. Vice President for Research, Michigan State Univ., Room 246 Administration Bldg., East Lansing, Michigan 48824. Phone: 517-355-2180.

885. Beyers, Jim. 1999. Work with ADM and Westward Industries, Inc. making textured soy protein (Interview). *SoyaScan Notes*. May 3. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In 1969, when Jim graduated from Southern Illinois University, he was hired by ADM to work on extruding soy protein. He worked with Bill Atkinson, who was using an old vintage extruder to make TVP, which was used primarily for pet food. Jim was hired to do research on adding value to the pet food by making it fit for human consumption, and to diversify the product catalog to include meat analogs. They soon were testing beef, ham, and chicken flavors in different sizes, shapes, and colors. Before long they were experimenting with some "wild and crazy things" such as fruit replacements, vegetable replacement, and nut replacements—all with TVP. At the beginning, only Beyers and Atkinson were working on this project. This was before the settlement of the big patent dispute between ADM and Ralston Purina in 1970. That dispute grew out of the fact that Atkinson and Robert Boyer (both of whom once worked together for Henry Ford) both came up with the

idea of extrusion at about the same time. Bill Atkinson was extruding 50% protein soy flour and Ralston apparently said they were extruding soy flour. Atkinson fortunately kept the little desktop extruder that he used to make his first trials; it made a little rope of TVP about the size of an ink pen refill [about one-eighth inch in diameter]. "We reenacted those early experiments of his time and time again for the courts—to the point where we had miles of this little bitty TVP rope piled up." Each company thought that it had invented the extrusion process first. "So they went to war with each other. They spent at least several hundred thousand dollars on attorney's fees, until they finally resolved it out of court. Swift and Staley were just standing on the side lines in the last half of the battle waiting for the judge to tell them who to pay the royalty checks to. Finally, the process patent was awarded to Ralston Purina and the product patent to ADM—which is kind of ludicrous. How can you have a process without a product, or a product without a process." Ralston Purina went out to everyone they could find who was extruding a 50% soy protein product (for pet food or human food) and asked them to buy a license on the process; the license fees were quite high, because the life of the patent was half gone, so they decided to charge twice what they would have ordinarily charged. Ralston Purina made a great deal of money from PMS Foods in Hutchinson, Kansas. Swift paid the fees for a while, then stopped making the product. Cargill was a big manufacturer of a TVP-type product; they have a plant in Cedar Rapids, Iowa. Jim does not know anything about the fees they paid. Ralston Purina itself never made much extruded soy using its patented process. Ralston had two extrusion lines in Memphis, Tennessee, for several years, making mostly human foods—but they were never price competitive and the quality was not very good. ADM could have done the same thing, but they didn't. Jim does not know why ADM didn't pursue this.

Today ADM is by far the world's biggest manufacturer of extruded, textured soy flour. "ADM has an extrusion capacity to generate the entire world's supply of TVP. I know that for a fact because I put those extruders in place myself." ADM runs on high volume and low margins. They won't enter a field unless they can generate enough capacity to dominate. They streamline and automate the process until they are the low-cost producer. This has long been the philosophy of Jim Randall, the retired president. He was the engineer for ADM for many, many years. "The commodity mind-set has always been trainloads, truckloads, and shiploads. When I was at ADM we made one type of bacon bit, packed it in 50-pound boxes with ADM's labels on it, sold it at 20,000 pounds minimum order. That was it." Jim's present company works on smaller volumes and higher margins. "We don't want to compete with the commodity processors. We have a nice little specialty niche that ADM and Cargill can't mess with. Generic bacon bits are becoming a commodity, but it is private labeling that keeps some of them in the specialty field.

The big processors won't put in a label room for 70 different private labels."

Jim worked for ADM in R&D for about ten years. He worked very closely with Bill Atkinson, a very bright man and an excellent inventor, but he also came on like a raging bull—a cantankerous man. "But he and I got along great! I never knew for sure why. I used to enjoy listening to him talking about Henry Ford and his years of work there with soy. At once time Ford thought people were being gouged [paying too much] for eye glasses. So he set of a bank of grinding machines, to crank out glasses for a nickel each." Ford and ADM both liked to operate on the principle of high volume, low margin. In his Later years, Atkinson began to suffer from Alzheimer's disease. But until just before he retired, his memory was crystal clear, with 100% total recall. In Jan. 1979 he left ADM and went to work for Westward Industries, where for the next 18 years he made bacon bits. Ken Towers was the original owner of Westward Industries; he and his researchers developed a lot of new technology for flavoring systems in-house. When he went to and helped to start Westward Industries, it would take any order from 50 cases on up, and put the but the customer's label on it if so desired. Initially Westward bought its TVP from ADM, then added its own flavoring system. Later, they bought a license to produce the TVP-type base then added their own unique flavors by their own system.

In Jan. 1979 Westward Industries started making standard textured soy protein products in Kansas at 1819 S. Meridian, Wichita. Westward didn't sell any products under its own brand; it was either sold in bulk to foodservice or private labeled for all the glass-packers in the country like John R. Sexton, Durkee Foods, R.T. French, McCormick, Safeway, CFS-Continental, Ponderosa Steak Houses, Pizza Hut—any company that sold bacon-bits in jars. "We were the largest processor of imitation bacon bits in North America, probably for about ten years." The company still makes and sells these products. At one point, they got rid of the extruders and made rice crispies for 15 years.

In about 1984 or 1985 Westward introduced the Soft and Chewy concept, with many of the old flavors, but a few new ones—such as Bacums. In late 1997 he bought Westward from its founder, Ken Towers, renamed it to Westwind Industries, and started his own production. He did not buy the corporate charter from Ken; rather he filed his own corporate charter, which required a new name. Westward Industries still exists, and Jim's manufacturing plant is at a new location. The company makes two types of textured soy flour (crisp texture, and Soft and Chewy) and a line of nut replacements (Terra Nuts, which are pressure cooked, then dry roasted, and used to replace pecans and walnuts).

Greg Caton is an interesting guy. He's exuberant, energetic, and very innovative. He needs to stop, settle down for about ten minutes, and think things through just a little bit. Jim think's Greg will take his business worldwide "when

he finally gets his focus on what he's doing. This non-GMO is really a big thing in Europe these days; it'll never make a splash here in the States. Greg believes that's where his new-found wealth will be." Jim believes that GMO foods will not become widely accepted in the USA during our lifetime. "World-wide it's really catching on, and I think later on it may be somewhat important. What's more important now with soy is if you can process it hexane-free. Even though the residual hexane is in the parts per billion, there are enough folks around here that say 'A little bit's too much.' I think that'll get more mileage than whether it's Roundup Ready or not. Anyway, those are foreign markets that Greg is looking at." Address: Owner, Westwind Industries, Inc., 3930 W. 29th St. South, Suite 55, Wichita, Kansas 67217. Phone: 316-943-3212.

886. *Business Week*. 1999. 100 years of innovation: A photographic journey. Henry Ford. Summer. p. 30, 34, 14. Collector's edition.

• **Summary:** As a young man in the machine shops of Detroit, Henry Ford first saw an internal combustion engine. It soon became his dream to build a "farm locomotive," a machine that would ease the labor of farmers like his father. In 1907 he built his first tractor prototype, which later led to the Fordson tractor; it was a hit in both the USA and Russia. In 1908 he introduced the Model T, which he called a "motor car for the great multitude." It would be "large enough for the family, but small enough for the individual to run and care for... so low in price that no man making a good salary [would] be unable to own one." The Model T became an object of mass consumption after 1910, and nearly 17 million had been sold worldwide by 1927—when it was discontinued (p. 34).

In 1913 Ford introduced the first moving assembly line at his Model T plant in Highland, Michigan. A photo (p. 14) shows the line, which was designed for efficiency, speed, and a mass market. Various conveyor systems carried parts or subcomponents to the main assembly line in a finely orchestrated manner. Before starting the moving assembly line, a Model T took more than 12 hours to manufacture and it retailed for \$950. But by 1927, after numerous improvements, it took less than half that time and sold for only \$250.

Ford was not the first to tinker with "horseless carriages." In 1890 the German Karl Benz introduced the first four-wheeled cars. But Ford's cars were much less expensive than others, and he was a genius at marketing them. As a man, Ford was complicated; he was at once a pacifist, a populist, and an autocrat. In 1918 he ran for the Senate—unsuccessfully, and he contemplated a run for the presidency a few years later.

What were his major contributions? Inventing the assembly line and envisioning the mass market. A photo shows Ford sitting on a grassy hillside.

887. Imhoff, Dan; Warshall, Peter. 1999. Soybean of happiness: A 3,000 year history of our most modern oilseed. *Whole Earth (San Rafael, California)* No. 97. Summer. p. 75-79.

• **Summary:** Contents: Introduction. Soy industrialism. The industrial products. Global soy fights. The most recent incarnation: Spliced soy. Contains six illustrations from *The Book of Tofu*, by Shurtleff and Aoyagi. Address: Editor, Whole Earth, California. Phone: 415/256-2800.

888. Demos, Steve. 1999. White Wave and Dean Foods: The inside story and future plans (Interview). *SoyaScan Notes*. Aug. 27. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** White Wave now has its Silk soymilk in 6,000 supermarkets and chain stores—not counting natural foods chains like Whole Foods Market. White Wave's goal is 10K by 2K = 10,000 stores by the year 2000. In most cases Silk is in the refrigerated dairy case, but in a few cases it is in specialty food or soft drink refrigerated cases. Fred Meyer has Silk in the health food section, but White Wave is battling for the dairy case. But at Ralph's in Los Angeles it is next to Lactaid in the dairy case.

White Wave has already won the footrace in the USA with SoyaWorld and Dairyworld. From now on it's a question of who has the most money to stimulate consumers to try their brand. That's the last face of the mountain to climb. Dean Foods brings to the alliance the fact that they distribute to 17,500 stores (mainly supermarkets and chains), and they have the national brokerage and delivery trucks and 70 factories that support that system. They own two ESL plants today (in Florida and Kentucky) and they have several more on the books (one in California). White Wave also has two coming in, and they now work with Western Quality Foods in Utah (Dairy Farmers of America and Sinton Dairy out of Colorado).

Dean Foods is a superfactory for Nestle. Nestle has three or four superfactories: H.P. Hood, Dean Foods in Kentucky, and Ador in Los Angeles. Dairy Gold in Seattle, Washington, may be a fourth. Nestle Quick, the chocolate milk, is a billion dollar brand. That warrants tremendous investments in systems and efficiencies, which leads to co-pack opportunities for things that are beyond our dreams. Deans was the inventor of The Chug—a single-serve chocolate milk in a disposable plastic bottle, with a screw cap, that looks like an old-fashioned milk bottle; this made it possible to sell single-serve chocolate milk from convenience stores, and per-capita consumption of chocolate milk jumped. The Chug was a \$600 million a year innovation. Also are headed toward the aseptic single serving, Dean Foods is definitely endorsing soy as a concept.

In the dairy business, per-capita consumption of fluid white milk has been decreasing for the past 50 years. The "Got Milk?" and "Milk Mustache" ad campaigns have only

slowed the rate of decline from 4% down to 2% a year—but these ads are costing the dairy industry more than \$100 million a year. Part of the problem is that milk has never been considered a pleasure beverage; it's just a commodity.

How did White Wave contact Dean Foods? "It's kind of like fishing. You put out your hook with the bait, seen who bites, then let them come after you." Indeed, Steve went after them and convinced them that this is a concept and category worth paying attention to. Suiza Foods Corp., because they have been associated for a year with Horizon Organic in Boulder, was not a potential partner. Suiza has already invested \$10 million in Horizon. Notice that the plant in Gustine, California, where TAN Industries packaged soymilk, is owned by Morningstar, which is a Suiza division—you can figure out in a hurry where this war is going to be fought. The rumor that Suiza will get into soymilk through its alliance with Horizon will soon be confirmed. The Gustine facility turned down business from Lactaid, which wanted to introduce a soymilk because White Wave is making such a dent in their sales. The people at Gustine told Lactaid that they did not want to start a project that they would have to stop in Jan. 2000, when they planned to introduce their own brand of soymilk.

"It's now a whole new game for White Wave. There's no time to take a breath." The deal with Dean Foods was a very unusual one in that everyone seemed to come out winning. White Wave got everything that they wanted, plus a huge vote of confidence. Steve anticipated their future desires and he accommodated those in the agreement by certain opportunities as time goes on. "I think the biggest accomplishment was we get to ride this thing for a while."

The news release was picked up as a blurb in the back of the Wall Street Journal last Tuesday, but the announcement has been getting a lot of national play. The news release and the recent (Aug. 3) *Wall Street Journal* article on Silk have been reinforcing one another, and creating a new round of interest in White Wave and its products, which is translating sales. The local papers and trade journals also picked up the news release. *Natural Foods Merchandiser*, *Prepared Foods*, and *Dairy Foods* all plan to do stories. The story appeared in 3-4 national TV announcements. It's very exciting for people throughout the company. For example, the advertising and marketing people are now interviewing full agencies—which were previously unaffordable. "The ability to be whimsical, be creative, and be a little bit off center with things has been a key driving force which we hope not to lose. Nothing that happens, to be quite honest, could influence me enough to take my hands off the throat of this thing. Not until I'm gone. When I sit in meetings today I say, 'If you thought I was a pain in the ass before, watch this!'" Susan Holden and Holden McClure have done White Wave's PR for the past 7 years. Before that, White Wave had no PR firm.

White Wave has big plans in the dairy alternatives market—for every product you can imagine. Silk Creamer,

based on organic Silk soymilk and non-hydrogenated oils, was introduced at Anaheim in March of this year; after only six months, its sales have surpassed its first year projections—and supermarkets are major buyers. Its a huge category. Dean Foods is the No. 1 producer of non-dairy creamers in the USA, but they make powders and Silk is a liquid. Some new flavors are planned for the near future. The Silk brand represents dairy alternatives and the White Wave brand represents tofu. “Silk” is the word that the public is saying. It’s a cool word, and “Smooth as...” There’s lot of room for play and fun: “Silk boxers in every carton.” White Wave has dabbled and played with non-dairy frozen desserts in the past; now they could go big time—pretty fast. But the company will not step outside the dairy alternatives category with things like energy bars or power drinks; it will keep tightly focused on dairy-like non-dairy products.

“It’s very important to conduct your mission with some levity and fun—otherwise it never works. Business is an excuse to have parties. We need to pursue that philosophy for as long as possible. We just scheduled our next party; I rented a theater in Boulder for the middle of October.” On using the Silk carton for advertising: “Serve people’s intelligence and needs and you give them two products instead of one. Once you have the consumer’s attention and focus, you can spoon feed them a lot of very wholesome, beneficial things. Our job now is to gain their trust and attention. We have always been say that we deliver more than food; we deliver a little bit of entertainment, and a bunch of information. We want you to think of the package as part of the product.” On the red half-gallon Silk, James Terman has put the story of Henry Ford’s work with soy. “At least 25-33% of our packages will always be used for some additional information other than ‘Buy my stuff.’” The carton of Silk, along with breakfast cereal, is one of the few packages that gets onto the breakfast table or dining table. Steve learned this lesson when he heard from dairy people about all the complaints they received about pictures of missing children on milk cartons. That meant people were reading the cartons; it’s the perfect captive market. Quotations from Suzuki roshi and Yogi Berra appeared together on one of the Silk cartons. “In the beginner’s mind there are many possibilities; in the expert’s mind there are few”—said Roshi. “You can’t think and hit at the same time”—said Berra. “James Terman and I went into stitches when we put the two of those together. It was such great juxtaposition—so enlightening—just way out there.” Address: President, White Wave Inc., 1990 North 57th Court, Boulder, Colorado 80301.

889. Stewart, Chuck. 1999. Update on work toward restoration of Henry Ford’s chemical plant and soybean laboratory—and new ideas (Interview). *SoyaScan Notes*. Dec. 1. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Iowa Soybean Association (ISA) is still interested in this renovation project but little progress has been made during the past year. On 21 Jan. 2000

representatives of ISA have an appointment to meet with Steven Hamp, president of the Henry Ford Museum, and their fund-raising department, to talk about the major players and prospective donors. About \$2 million is needed to complete the project as it is now envisioned—concept study titled “Feasibility Study for a Soybean Research Laboratory Experience at Henry Ford Museum (HFM) in Greenfield Village,” by Christian Overland (director of public and school programs, HFM), dated 8 May 1998 (30-40 pages, incl. drawings). The Iowa and Michigan soybean associations put up the funds and HFM provided the staff to develop the feasibility study. It discusses: Objective, market feasibility, structural feasibility, program feasibility, and budget. ISA has committed to some funding, but the amount has not been determined. ADM showed no interest. One question is alternative projects that are less expensive. Chuck thinks some type of project will eventually happen; the questions are when and on what scale.

The Henry Ford people are not very interested in having any food served in the Soybean Lab; it would be more like going into a museum than going into a restaurant. They already have several other restaurants and bookstores in Greenfield Village; they might be willing to add a soyfoods menu to an existing restaurant. Serving food causes a lot of complications and hassle. It’s too much trouble. The Henry Ford people, at a minimum, want to do something with the Soybean Lab—at least fix up the building, which is now unused and unattractive. They want to give some recognition that it was a Soybean Lab and that Henry Ford was actively interested in soybeans and soyfoods. If the funding can be found, they might get interested in a fairly large soy project. Address: Chuck Stewart & Associates, 4949 Pleasant St., Suite 204, West Des Moines, Iowa 50266. Phone: 515-226-0358.

890. *SoyaScan Notes*. 1999. Chronology of soy protein isolates for food use. Dec. 9. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** 1939—The Glidden Company in Chicago, Illinois, becomes the world’s first company to manufacture a soy protein isolate for use in food. Named Albusoy and called “soy albumen,” it is an enzyme-modified isolate used as a whipping agent to replace egg whites. 1950—Gunther Products of Galesburg, Illinois, introduces an enzyme-modified soy protein isolate. By 1967 roughly 1 million lb/year of enzyme-modified soy protein isolates were being made in the USA.

1957—The Glidden Company in Chicago becomes the world’s first company to start large-scale production of today’s regular (non-enzyme modified) food grade soy protein isolate. Their \$4 million plant at Indianapolis, Indiana, makes Promine brand isolated soy protein.

1957 July—ADM purchases The Drackett Company (Evendale, Ohio), which makes commercial industrial soy protein isolates and is experimenting with edible isolates.

1958–The Glidden isolate plant at Indianapolis is purchased by Central Soya—which now enters the isolate business.

1958–1959–ADM starts to sell small amounts edible isolates to Consolidated Foods in Texas. William Atkinson developed the product, which was quite satisfactory and practical. But the patent was about to expire, so ADM turned its attention elsewhere.

1959 Oct.–Central Soya opens a huge new plant to produce their Promine brand of soy protein isolate. By 1966 Central Soya is making 30 million lb/year of soy protein isolates.

1962 Oct.–Ralston Purina starts making food grade soy protein isolates in Louisville, Kentucky, under the Edi-Pro brand, using technology largely developed by Frank Calvert and Robert Boyer when they worked as researchers for Henry Ford. Anderson Clayton and Carnation started to make soy protein isolates soon thereafter.

1964–The USDA allows the use of soy protein isolates in meat sausages at the 2% level by weight.

1965 Oct. Skippy Peanut Butter with Smoky Crisps introduced. The “Smoky Crisps” are bacon-like bits made by General Mills from spun soy protein fiber.

1965 Dec.–General Mills introduces Bac*O’s, meatless fried bacon bits made from spun soy protein fiber in several test markets.

1966 May–General Mills introduces its Bontrae line of meat analogs based on spun soy protein fibers, including Ground Beef Analog, Diced Ham Analog, and Diced Poultry Analog.

1969 Dec.–Bac*Os, meatless bacon bits, are now available nationwide.

1970 Dec.–Bontrae spun soy protein fiber starts to be made at General Mills’ new plant in Cedar Rapids, Iowa.

1973 March–Hamburger prices reach all-time highs. Hamburger extended with 25% Bontrae (spun soy protein fiber) goes on sales at Red Owl Stores in Minnesota.

1973 summer–Grain Processing Corp. of Muscatine, Iowa, starts making soy protein isolates under the Pro-Fam brand.

1974 Oct.–General Mills introduces meatless Country Cuts, made from spun soy protein fiber, in ham or chicken flavors.

1976–Ralston Purina has become the world’s leading manufacturer of edible soy protein isolates. Their flagship plant is still in Louisville. 1977 May–Dawson Foods buys (for about \$10 million) the Bontrae spinning line, plus exclusive rights to General Mills’ soy isolate and patented spinning technology, equipment, and frozen spun products marketed to food processors and institutional customers. Dawson moved the equipment to Minnesota, and broke ground for a new plant in Feb. 1978

1979 March 31–Dawson Mills’ soy protein isolate plant opens 1½ miles east of Dawson, Minnesota, on a 220-acre

site.

1980 May–Dawson Mills introduces its Anaprime line of meat analogs based on spun soy protein fibers and technology purchased from General Mills; they are very similar to the Bontrae line.

1980 Aug.–Central Soya sells all of its soy protein isolate operations to Archer Daniels Midland Co. With this purchase, ADM enters the edible isolate business, and Central Soya gets out. ADM names its first four edible isolates Ardex D, Ardex DHV, Ardex F, and Ardex SP-6—simply replacing Central Soya’s brand “Promine” by the brand “Ardex.”

1985–ADM moves its soy isolate plant from Chicago to Decatur, Illinois.

1986–ADM doubles the size of its soy isolate plant in Decatur.

1987–1988–ADM builds a second isolate plant in Decatur.

1988 June 23–ADM buys from Grain Processing Corp. (GPC) their soy protein isolate technology, brand names (Pro-Fam), and customers—but not their equipment. ADM soon begins to produce the Pro-Fam line of isolates in Decatur, Illinois.

1988–The price of imported casein rises above the price of soy isolates—and stays there due to loss of subsidies by foreign governments.

1988–ADM starts to make industrial soy protein isolates in Decatur.

1995–ADM builds a third edible isolate plant in Decatur, adjacent to its other two plants.

1997–ADM sells its industrial isolate business in Decatur to PTI (Protein Technologies International).

1997 June–ADM starts producing soy protein isolates at its plant in Europoort, Netherlands.

891. Product Name: Silk (Soymilk Sold Refrigerated in Quart or Half Gallon Pure-Pak / Gable Top Cartons) [Vanilla].

Manufacturer’s Name: White Wave, Inc. (Product Developer-Distributor).

Manufacturer’s Address: 6123 E. Arapahoe Rd., Boulder, CO 80303. Phone: 303-443-3470.

Date of Introduction: 2000. January.

Wt/Vol., Packaging, Price: Quart or half gallon Pure-Pak Carton.

How Stored: Refrigerated.

New Product–Documentation: Quart and half-gallon cartons with Labels sent by James Terman. 2000. May 11. 2.75 by 2.75 by 8¼ inches. Tetra Rex package. “Organic–Third party certified. Calcium enriched. Low 1% fat & vitamin enriched.” Talk with James Terman of White Wave. 2001. May 29. When Silk was first introduced in Jan. 1996 it was flavored with vanilla and sweetened, but it was not called “Vanilla” until “Plain” was introduced in quarts in July 1998. In Jan. 2000 the panel about Henry Ford first appeared on a Silk cartons—on all flavors and sizes. The best-seller at that

time was vanilla half-gallons. It reads as follows: "Henry Ford: A man who used his bean. Soybeans originally travelled to the United States [Province of Georgia, North America] by ship when Samuel Bowen smuggled them from China in 1765. But it was Henry Ford who put them in cars. When the Great Depression hit, it hit farmers especially hard. Huge farm surpluses meant low crop prices and dwindling income. All of a sudden, Henry Ford's best customers—American farmers—could no longer afford his cars, trucks and tractors. Ford knew that 'If we want the farmer to be our customer, we must find a way to be his.' Figure out a way to use agricultural products in industrial manufacturing, and everyone would benefit. He put his chemists to work determining what products could be developed from plants. After testing numerous crop plants, they narrowed their focus to soybeans. Experimentation was soon rewarded with the discovery of soybean oil which made a superior auto body enamel. Soybean meal was converted to plastic used to make over 20 parts including horn buttons and gearshift knobs. By 1936, Ford was using a bushel of soybean in every car that rolled off the line. But Henry Ford didn't stop there. While his chefs developed a variety of tasty and nutritious American-style foods (including ice cream) from soy Henry invented soybean 'wool,' a fiber half the cost of sheep's wool. Soon a fabric containing 25% soybean wool was being used to upholster many Ford autos. And on special media occasions Mr. Ford would sport a suit made of soybean fiber."

892. American Health and Nutrition, Inc. 2000. The Organic Garden (Portfolio). Ann Arbor, Michigan. Ten inserts.

• **Summary:** On the cover of this white portfolio is The Organic Garden logo of a lady kneeling in an idyllic garden. Contains the following inserts: (1) The Organic Garden—The easy and delicious way to add soy to your diet: Soy foods grown without chemicals for a healthier world (Glossy color leaflet). (2) Business card of Cindy Maynard, director of marketing and public relations. (3) Soy sales simplified: A delicious breakfast breakthrough in a bowl! (Glossy color leaflet, two-sided). (4) The Organic Garden: Growing a healthier world (Black and white leaflet, single sided). (4) Soy sales simplified: Get your share of soy's 30% annual growth rate (Glossy color leaflet, two-sided). (5) Henry Ford invented—SoyNutty Crunchies (Press release, 2 p.). (6) New product announcement—SoyNutty Crunchies (Black and white leaflet, single sided). (6) Soy Energy—Breakfast breakthrough in a bowl (Black and white leaflet, two sided). (7) New product announcement—Soy-N-Ergy (Black and white leaflet, single sided). (8) Ten great tastes to fill the day. Excerpt from *USA Today*, 2 May 2000. Phil Lempert said that people who don't want to buy genetically modified products, should by organic ones. He picked his top ten favorite new soy products, incl. SoyNutty Crunchies, and Soy-n-Energy cereal. (9) A boy and his dog, by Anne Bulford, excerpted from the newsletter of the Ohio Food and Farming

Association.

Talk with Cindy Maynard. 2003. May 28. This company was started in 1981 by Dennis and David Singsank, twin brothers. Initially they sold commodities, especially grains, beans, and seeds. They gradually added ingredients to their line—under the Organic Harvest brand. Address: 3990 Varsity Dr., Ann Arbor, Michigan 48108. Phone: 734-677-5570.

893. Schwarz, Richard W. 2000. From Battle Creek to Battle Creek: A tale of vegetarian meat analogs. *Adventist Review*. Dec. 7. p. 12-16. [68 ref]

• **Summary:** Discusses Dr. John Harvey Kellogg, meat alternatives, Madison Foods, Loma Linda Foods, Worthington Foods, Robert Boyer, spun soy protein fiber, Miles Laboratories, Morningstar Farms, the Kellogg Co. Contains many excellent photos of early meat alternatives, many made by Worthington Foods.

894. Smith, Keith J. 2001. Collecting a full set of soybean license plates on e-Bay (Interview). *SoyaScan Notes*. July 30. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Soy-based license plates were issued by the state of Illinois from 1943 to 1948. Keith has collected the full set using the Internet auction site e-Bay. Address: Keith Smith and Associates, 357 Ridge Meadow Drive, St. Louis, Missouri 63017-3031. Phone: 314-434-3219.

895. Funk, Linda. 2001. The Soyfoods Council (Interview). *SoyaScan Notes*. Oct. 9. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Soyfoods Council was created by the Iowa Soybean Association. Linda began work on 24 Sept. 2000 and she is managing the "edible budget" of the Iowa Soybean Promotion Board (the one with checkoff funds). The "edible budget" comes under the Marketing Committee. She reported to them every time they meet.

Her first soy event was when the Wisconsin Soybean Association asked her to do a foodservice training event, in June or July of this year. She had Toni Sakaguchi come out from Culinary Institute of America (CIA) in St. Helena, California; they have refined the presentation since then. People absolutely love Toni; she is warm, she knows the products and the principles of cooking, and she is a real professional. She is credible and chefs really like learning from her. She had some wonderful beef dishes and fish dishes. She can answer all their questions. "She's been fabulous."

Linda has finished her mission statement, objectives, etc. and is about ready to send out membership letters. When she has members, mostly soy processors and soyfoods manufacturers, then she will figure out how to structure the new organization.

She gets some funding from the Iowa Board and some from the Iowa Economic Development Group—which is

interested in adding value to Iowa commodities. Linda has worked with Midwest Harvest (Tom Lacina and the Soy Sisters). One of her missions is to find ways to introduce soyfoods to mainstream America. She hopes to use specific, fun ways, that don't make the foods weird or strange or scary. "Plunking a pound of tofu in front of a soybean farmer won't get you anywhere. We have to find ways to introduce soyfoods by combing them with foods that people know and love. It doesn't have to be vegetarian. It can be a 'combo,' such as tofu and cream cheese; it doesn't have to be 'all or nothing.' For the farmers who are the Iowa Board, I've started making desserts. They have to be believers before they will approve and fund new projects. We've done some very interesting, fun stuff and people are starting to go 'Wow. This can taste good.'" But a few farmers on the board have told her that what she's doing is all fine and cute, but "Don't you dare take the meat off the center of the plate!"

Linda plans to do a seminar at the CIA in St. Helena on December 3-5. Thirty hand-picked chefs from across the USA will attend, and the Soyfoods Institute will pay all their expenses. United Soybean Board will fund that program. Linda has to raise the funds for each event; she had never been a fund-raiser before she accepted this job.

Linda has a two-pronged approach: (1) Mainstream consumers—Figuring out how to help them start introducing soy into their diets. (2) The foodservice channel—including restaurants, onsite (such as corporate dining rooms). She will start by working with the "fine dining chefs," the ones that people look up to for trends and ideas. Then have it be a trickle-down effect. She believes that getting the foodservice industry involved with help in introducing soyfoods to mainstream Americans.

The most recent seminar was at Kendall College in Evanston, Illinois, near Chicago. Toni Sakaguchi of the CIA did a great job. She demonstrated fun ways to start adding soy flour to recipes chefs were already using—to batters and breads, for example. Toni also used tofu in various recipes. The CIA has developed what they call their "flavor principle package" which enables you to apply flavor principles to whatever recipes you are developing.

Linda is well aware of edamamé; she talked about it this morning on a radio show. She believes in serving edamamé in the Midwest mixed with familiar foods. She served edamamé in the pods to a farmer's group and "they were fascinated by it and thought it was quite delicious." But they are not going to use it as a new type of snack.

Linda grew up on a farm in Wisconsin. Her dad is a farmer. She understands the mentality of farmers. She worked on Wisconsin Cheese for many years. She started with the Wisconsin Milk Marketing Board in 1988 and headed up the foodservice area. One of her main projects was to get American chefs and mainstream Americans to believe that Wisconsin cheese-makers could make specialty cheese that were as good as their imported counterparts.

One discussion with chefs is "Do you scream it on your menu or do you soft-sell it?" Linda strongly favors the soft-sell approach—until people are really comfortable with it. Many people she talks to, from consumers to food professionals, still turn up their nose at soy. If you start probing as to why they think this way, many of them go back to soy in a school lunch program or with hippies.

Linda has been writing a column for the *Iowa Soybean Review*, a publication of the Iowa Soybean Association. She includes recipes, and advises cooks not to tell their family what they are doing until they say "Wow, was this good!" Then you can tell them.

Linda eats Harmony cereal each morning, and finds that many others also like it. Her favorite recipes: (1) Molasses glazed pork tenderloin, with edamame. (2) A combo tofu cheesecake or dessert, with about half cream cheese; it is lower in calories, saturated fat, and cholesterol plus other soy health benefits. (3) Pizza with edamame in the topping; she is working with a commercial frozen pizza company on this. (4) A seven-layer bar with TVP layered and baked (like a granola bar, developed by the Soy Sisters).

Linda has to dispel those preconceptions. Anderson-Erickson in Des Moines came out with the first dairy yogurt that contains soy protein; it's wonderful! The woman who is president of this family-owned business, Merriam Erickson-Brown, is very forward thinking. Linda has done a lot of press on her. The product has been very successful. *Cooking Light* magazine (Birmingham, Alabama) has published many excellent articles and recipes on soy—especially tofu. Jill Melton, their senior food editor, is Linda's friend, and they talk a lot about introducing people to soy. They had a chocolate mousse on the cover of a recent issue. One issue is taking soy out of the "Asian only" category and introducing it into French or Mexican recipes—without making it appear weird or contrived.

A year ago Linda never ate soy; she came from the dairy industry and it was the arch-enemy. She now tells the dairy industry that these two industries can and should work together.

Marv Wilson, who is a fine actor, does an impersonation of Henry Ford, focusing on Ford's work with soybeans. He does this for soybeans farmers, and anyone who asks him. "It's fascinating." Address: Des Moines, Iowa.

896. Schwartz, Randy K. 2002. Henry Ford cranks up the soy industry. *Repast: Quarterly Newsletter of the Culinary Historians of Ann Arbor (Michigan)* 18(3):8-9. Summer. [23 ref]

• **Summary:** A good overview, with some new information. "Chinese immigration to the Midwest also spurred the use of soyfoods there. When anti-Chinese sentiment erupted in California in 1875, groups of Chinese immigrants began fleeing to cities like St. Louis [Missouri], and Chicago [Illinois]. By 1891, there was a community of some 500

Chinese living on South Clark Street in Chicago. In 1911, the Chinese community there moved to 22nd Place and became the anchor of a Chicago Chinatown that still exists. That same year the Chino-American Publishing Co. in Chicago came out with one of the first Chinese cookbooks in the U.S., Jessie Louis Nolton's *Chinese Cookery in the Home Kitchen* (the book was actually published in Detroit)."

A photo (taken in 1998 by Randy Schwartz) shows the main building of the Ford Soybean Mill in Saline, Michigan. "In 1937, Ford dammed the Saline River and built his water powered mill there. Soybeans, purchased from hundreds of local farms, were cleaned and stored in this building, which featured two large hydroturbines. The beans were processed into meal in an adjacent one-story plant. After U.S. entry into World War II, the property was refurbished to produce aircraft bearings. Following the war, the company sold the property and it was run by Soybrands, Inc. Today it is a restaurant called Weller's Carriage House, at 555 W. Michigan Ave."

897. Stevens, Eugene S. 2002. *Green plastics: An introduction to the new science of biodegradable plastics*. Princeton, New Jersey: Princeton University Press. ix + 238 p. Illust. Author index. Subject index. 25 cm. [30 + 91 endnotes]

• **Summary:** Plastics are everywhere, yet most of us know almost nothing about them. In this engaging book, written by an expert in the field, E.S. Stevens tells us everything we have always wanted to know about this celebrated but much maligned material. All plastics are polymers. Traditional (petroleum-based) plastics represent a huge environmental problem; they take ages to decompose. But the new generation of bioplastics / biopolymers, which are derived mostly from renewable raw materials, are biodegradable, compostable and recyclable. After describing the various ways in which they decompose, the author acquaints us with emerging technologies, their commercial viability and their likely futures. "A fun, readable, interesting book"—Les Sperling, Lehigh Univ.

Contents: Preface. Acknowledgements. Part I: Plastics. 1. The age of plastics. 2. Plastics as materials. 3. Plastics and the environment. 4. The chemical nature of plastics. 5. Plastics degradation.

Part II: Bioplastics. 6. Biopolymers. 7. The reemergence of bioplastics. 8. Factors affecting growth. 9. Prospects for the future. Appendix: Make your own. Glossary (excellent, incl. ASTM—American Society for Testing and Materials—definitions. Example: "biodegradable plastic: a degradable plastic in which the degradation results from the action of naturally occurring microorganisms such as bacteria, fungi, and algae").

Henry Ford was a pioneer in green plastics, starting in the 1930s. He used soy protein to make auto body parts, auto upholstery, and eventually (in 1941) an entire plastic car body (a photo shows it). This "soy-plastic car did not survive,

and its remains have been lost. Since then the use of plastic in automobiles has become common, but the use of plastics from renewable resources got sidetracked." "In general the resin core was made of soy meal reacted with formaldehyde to produce cross-linked protein (reminiscent of casein plastics and animal horn), but for added strength and resistance to moisture, phenol or urea was cocondensed with the protein. The resulting resin was part phenol formaldehyde (or urea formaldehyde) and part cross-linked soy protein; the soy meal was not merely a filler." Ford used soy oil to make automobile enamels and paints, in the production of glycerol for shock absorbers, in rubber substitutes, and in foundry cores. But his innovations and momentum were stopped short by the start of World War II (p. 114-15).

"Past ages of human society have been called the Stone, Bronze, Copper, Iron, and Steel ages, according to the material most used to fabricate objects. Today the total volume of plastics produced worldwide has surpassed that of steel and continues to increase" (p. 5).

An abundant class of biomolecule that is used as a feedstock for polymer resins are the triacylglycerols, commonly called triglycerides. These are oils and fats, such as soybean oil—which accounts for about 80% of the annual seed oils produced in the USA and 30% of the world's production of vegetable oil. About 600 million lb/year are used in the USA in nonfood industrial applications (p. 98). Worldwide, 75% of seed oil production is used for edible oil, but the rest is used for nonfood "applications such as surfactants, coatings (paints, enamels, etc.), lubricants, adhesives, drying agents, cosmetics, printing inks, emulsifiers, and plasticizers."

Under "Polymers of triglycerides"—"Soy-oil resins with glass fiber reinforcement" (p. 131). Also: Biodegradable mulch is kraft paper with a polyester made from a reaction product of epoxidized soybean oil and citric acid (p. 133). Starch is the least expensive extracted raw material (p. 136). Green accounting includes all costs, such as the depletion of natural resources, the costs of guaranteeing petroleum supplies, and the environmental burden of waste management (p. 144). Biotechnology will soon give rise to new types of improved biopolymers for nonfood uses (p. 147).

Glossary includes: aerobic degradation (produces carbon dioxide), algae, anaerobic degradation (produces methane), ASTM, atomic weight, bacteria ("typical shapes are spherical, rodlike, spiral, or filamentous"), biobased industrial products, biochemical oxygen demand (BOD), biodegradable ("capable of being broken down into simpler compounds by the action of naturally occurring microorganisms..."), biogeochemical cycle, biomass, bioplastics ("biodegradable plastics whose components are derived entirely or almost entirely from renewable raw materials"), biopolymer, carbon cycle, CEN, chemical compound, compost, compostable plastic, composting, compression molding, cross linking, cure (a polymeric system), degradable plastic, degradation, DIN,

dioxin, earthworm test, ecology ("the interrelation of animals, plants, microorganisms with each other and the nonliving portions of their environment"), ecosystem, element, enzyme, feedstock, filler, fossil fuels ("fuels derived from ancient organic remains, e.g., peat, petroleum (crude oil), natural gas, and coal"), fungus / fungi ("aerobic and nonphotosynthetic (i.e., lack chlorophyll), incl. molds, mildews, mushrooms, yeasts, and others"), garbage, glass temperature, greenhouse effect, homopolymer, humus, hydrolysis, incineration, industrial ecology, injection molding, inorganic, ISO, landfill, litter, microorganisms, mold test, molecular weight, monomer, organic, oxidation, petroleum, photodegradable plastic, photosynthesis, plasticizer, plastic, polyester, polymer, polymerization, postconsumer recycling, protein, pyrolysis, recycle / reuse, recycling, refuse (noun), reinforced plastic, release agent, resin, rubber, rubbish, sanitary landfill, soil test, solid waste, source reduction, stabilized, stabilizer, Sturm test, surfactant ("a substance that reduces the surface tension of liquids"), sustainable, sustainable development, thermophilic phase (of composting), thermoplastic, thermoset, trash (same as garbage, rubbish, refuse), virgin plastic, viscose, vulcanization, waste, waste stream, yard waste. Address: Prof. of Chemistry, State Univ. of New York-Binghamton.

898. Bryan, Ford R. 2003. The birth of Ford Motor Company. *Dearborn Historian (The)* 43(1):7-25. Winter.

• **Summary:** The complex, winding, and fascinating story of how the Ford Motor Company came into being—told by an expert on the subject.

Henry Ford was born on July 30, 1863, and grew up on his family's prosperous farm in Springwells Township about seven miles west of Detroit. He attended school from the sixth grade and in 1879 at age 16, without his father's consent, walked into Detroit and obtained work at the Michigan Car Company works where streetcars were built. But because Henry did not stick to his work, he was fired from the job after only six days. Henry's father then arranged for Henry to become an apprentice machinist at the James Flower & Brothers Machine Shop. In 1881 Henry was working for the Detroit Dry Dock Company where he learned a great deal about heavy industry, but by 1882 he was back on the farm operating a small steam traction engine for a neighboring farmer, and soon after that was repairing such engines manufactured by the Westinghouse Company. While home on the farm he met Clara Bryant and the two were married on April 11, 1888. They set up housekeeping on an 80-acre farm given to Henry by his father.

"Henry had no intentions of farming the land as his father would have expected. Instead, Henry spent the next two years using steam engine to cut wood off his land and that of his neighbors. After having built a 'honeymoon' cottage on their farm, it was rather shocking to Clara who liked living in the country to find Henry, in September 1891, wanting to move into Detroit to accept a position as night operating engineer

at a substation of the Edison Illuminating Company at \$40 a month. The position at Edison Illuminating appealed to Henry because he would be learning electrical engineering as well as steam engineering. By October of 1892, Henry was called upon to take charge of maintenance of steam engines in the main downtown Edison Illuminating Power Plant at \$75 per month."

Contains much detail and many early photos, such as: (1) "Henry Ford's first successful gasoline engine known as the 'Sink Engine' that was operated in Clara Ford's kitchen at 58 Bagley Avenue in December 1903."

(2) "The woodshed at 58 Bagley in which Henry Ford assembled the 'Quadricycle' in June of 1896, and then had to widen the door to get the rig out of the building."

(3) "Henry Ford on his somewhat improved Quadricycle in October 1896. Since his first trial in June he had boxed in the engine on the rear of the vehicle... The quiet boulevard is devoid of all other traffic. This vehicle he sold to a friend for \$200, and later bought it back from a third party for \$60." Address: Author, Dearborn, Michigan.

899. Iowa Soybean Promotion Board. 2003. Tune in: The Naturally Soy Show. Clean living... bean healthy! (Ad). *Iowa Soybean Review (Iowa Soybean Association, Urbandale, Iowa)* 14(5):11. Feb.

• **Summary:** An illustration shows a large TV set with the title of this new TV show on the screen. This show premieres (on RFD-TV, Mediacom, Dish Network Channel 9409, and DirecTV Channel 379) Monday night, 24 Feb. 2003 at 7 pm. Repeat showings every 6 hours on Tuesday, Feb. 25 at 1 am, 7 am, and 1 pm. You'll get answers to questions such as these: 1. Does eating soy foods clean your heart? 2. Does soy biodiesel smell like french fries? 3. Did Henry Ford make cars from soybeans? 4. Do soy candles improve your breathing? 5. Are you bean healthy? Address: West Des Moines, Iowa.

900. Sieloff, Harold T. 2003. Ford Motor Co.—100 years of history. *Dearborn Historian (The)* 43(1):3-6. Winter.

• **Summary:** The article begins: "July 16, 2003, will mark Ford Motor Company's 100th year of building automobiles." "The story of Henry Ford and the Ford is indeed one of ultimate success, but like many success stories one with roots in humble origins. Henry Ford grew up on a farm, and his love for rural values and the outdoors could have easily persuaded him to stay in agriculture. Fortunately, he also had an overwhelming interest in mechanics and machinery. His inquisitive nature about how things worked and the possibility of harnessing that knowledge in new ways moved him to a career in engineering. By the 1890s Henry Ford had become an engineer with the Edison Illuminating Company. During that period he continued to experiment with automotive engineering, and in 1896 he built his first vehicle, the Quadricycle.

"In 1901 Henry Ford entered a race and drove a car of



Ford Motor Company 1903 Logo

his own design. He competed against Alexander Winton, the head of the country's largest auto manufacturing company. Winton also happened to be the racing champion of the day. Ford, to the astonishment of onlookers, won that race.... Ford gained the respect and support needed to start an auto manufacturing business, and on June 16, 1903, he and eleven original investors signed incorporation papers for what became Ford Motor Company. It was Ford's third attempt to start an auto manufacturing company.

"The first car offered by the company was the Model A, and the first sale was made to Dr. E. Pfennig of Chicago just one month after the company's incorporation. Between 1903 and 1908 Ford created models A through S... But Ford had a dream. He said: "I will build a motor car for the multitude. It will be low in price... that no man will be unable to own one.

"On October 1, 1908, Ford introduced the first Model T." Address: Writer, producer, consultant, Northville, Michigan.

901. Smith, Keith. 2003. Soybeans—History and future: Soybean meal information center fact sheet (Brochure). Missouri: United Soybean Board. 4 p. 28 cm. [7 ref]

• **Summary:** Contains a fairly accurate chronology of the soybean from 1765 to the present. Much of it is based on the publications of Prof. Theodore Hymowitz of the Univ. of Illinois. Address: Keith Smith and Associates, 15 Winchester Road, Farmington, Missouri 63640.

902. *Iowa Soybean Review* (Iowa Soybean Association, Urbandale, Iowa). 2003. Ford's long history with soybeans: Recycled in new eco-friendly concept vehicle. 14(8):12. Summer.

• **Summary:** Across the top of the article: "Investing checkoff dollars." Henry Ford was a pioneer in using renewable soy products in his cars before World War II. However, the trend toward the use of petrochemicals after the war stifled the growth of industrial uses of soy products. Now,

during its centennial, the Ford Motor Co. has introduced the new Model U. Dubbed the "Model T of the 21st Century," it is a "concept vehicle" that includes many "green" features, including 2 soy-based components: (1) Soy-based polyurethane foams (made with SoyOyl) are used in cushioning the seats. (2) A soy-based resin, reinforced with fiberglass, is used in the vehicle's panels. Two color photos show different views of the Model U.

903. Fong, Mei. 2004. Soy underwear? China targets eco-friendly clothes market. *Wall Street Journal*. Dec. 17. p. B1, B4.

• **Summary:** Li Guangqi invented a soybean fiber in 1999. Today "thousands of urban Chinese are sporting soft, silky underwear spun out of" this fiber. Touted as a more ecologically sound alternative to traditional cloth, this cloth is starting to hit U.S. and European markets. Address: Staff Reporter.

904. **Product Name:** Silk (Soymilk Sold Refrigerated in Half Gallon Pure-Pak / Gable Top Cartons) [Fortified for Kids].

Manufacturer's Name: White Wave, Inc.

Manufacturer's Address: 6123 E. Arapahoe Rd., Boulder, CO 80303.

Date of Introduction: 2004. December.

Wt/Vol., Packaging, Price: Half-gallon Pure-Pak Carton. Retail for \$4.29 (2004/12, Lafayette, California).

How Stored: Refrigerated.

New Product—Documentation: Product with Label purchased at Safeway supermarket in Lafayette, California. 2004. Dec. 28. A description of Henry Ford's work with soybeans is on one side of some of the cartons.

905. Iacobbo, Karen; Iacobbo, Michael. 2004. *Vegetarian America: A history*. Westport, Connecticut, and London: Praeger Publishers. xvi + 267 p. Illust. Index. 25 cm. [447 ref]

• **Summary:** An excellent history of the vegetarian movement in the United States from the late 1700s to the present—extremely well researched, well documented, and original. There have been three major waves of interest in vegetarianism, each beginning about 70 years apart. The first was in the 1830s and 1840s, and included Sylvester Graham and William Alcott. The second was from about 1900 to 1930. And the third and current period began in about 1970.

Contents: 1. Seeds are sown: Native Americans, Benjamin Franklin, Johann Conrad Biessel (1691-1768; founded Seventh-Day Baptists, Ephrata Cloister in Pennsylvania), vegetarian Dunkers, William Dorrell and The Dorrellites (Leyden, Vermont), John Wollman (Quaker) and his journal, Herman Daggett, L. Du Pre, Johnny Appleseed (John Chapman, follower of teachings of 18th century Christian mystic and vegetarian Emmanuel Swedenborg), Joshua Evans. 2. Abstinence from fleshfoods: Christian vegetarians, and the English connection: Percy Bysshe Shelley, George

Nicholson, Joseph Ritson, Rev. William Cowherd and the Bible Christian Church of Salford, William Metcalfe comes to the Philadelphia 1817 and establishes the Bible-Christian Church.

3. Sylvester Graham, Grahamism, and the Grahamites: Cholera epidemic, Graham's preventive medicine, why vegetarian?, Jacksonian era dining habits, Graham bread, Jacksonian era medicine, Isaac Jennings, Asenath Hatch Nicholson, Dr. John Burdell, Graham in the press, William Andrus Alcott and *The Moral Reformer*, American Physiological Society (APS) in Boston, founded in 1837, Mary Gove Nichols, *The Graham Journal of Health and Longevity*, the vegetable diet, Dr. Luther V. Bell and his prize-winning essay, Dr. Milo L. North, Asa Mahan and Charles Finney of Oberlin College [Ohio], Dr. Reuben Mussey, Grahamites and anti-Grahamites, J.J. Flournoy, abolitionists and transcendentalists, A. Bronson Alcott (father of Louisa May) of Concord, Massachusetts, nonviolence and Thoreau, James Pierpont Freaves, Ham Common, Alcott House, William Lambe and the Physiological and Health Association, Fruitlands, abolitionist-vegetarians, Orson S. Murray, Horace Greeley and Mary Youngs Cheney (his wife), Graham's teachings on physiology and anatomy, William Metcalfe's book *Bible Testimony on Abstinence from the Flesh of Animals as Food...* (June 1840), Larkin B. Coles.

4. The American Vegetarian Society (AVS, organized in 1850 by William Metcalfe): First convention on 15 May 1850 in New York City, the society's periodical *The American Vegetarian and Health Journal* (Nov. 1850–Oct. 1854), Joel Shew and water cure / hydropathy, John Grimes and the first Vegetarian Festival in New York City (Christmas, 1851), feminism, Anne Denton, Charles Lane, death of Sylvester Graham, Dr. Russell Trall, Graham's legacy, front-page headlines in 1853 at the Vegetarian Festival (guests incl. Trall, Greeley, James Caleb Jackson, Frances Dana Gage, Lucy Stone, Susan B. Anthony, and Emilia Bloomer), New York Vegetarian Society (est. 1852), decline of AVS, Henry Stephen Clubb, Fowler & Wells, *The Water Cure Journal*, Quaker Jeremiah Hacker, Thomas Low Nichols.

5. The water cures, Seventh-day Adventists, and the Civil War: Henry Clubb, Octagon Settlement in Kansas (1856), Dr. James E. Spencer and the Harmonial Vegetarian Society in Arkansas (1857), James Caleb Jackson, Our Home on the Hillside, Dr. Harriet N. Austin, Seventh-day Adventists, Millerites, Ellen G. White, drugless medicine, Dr. Russell Thacher Trall, end of AVS with the death of Wm. Metcalfe.

6. The Civil War to the end of the century: Dr. Mussey, Rev. Henry Ward Beecher, Henry Clubb keeps vegetarianism alive in America (though it lacks a national organization), John Harvey Kellogg, Isaac and Susan Rumford and Joyful News, California, Victoria Woodhull, Clubb founds the Vegetarian Society of America (VSA) in 1886, the VSA cookbook, and its periodical *Food, Home and Garden*, Chicago Vegetarian Society, Rev. A.T. De Learsey, Annie

Besant, the New Thought movement, Charles and Myrtle Fillmore found the Unity School of Christianity in Missouri, Ralph Waldo Trine, Chicago World Exposition of 1892 (Illinois), William Axon is secretary of the Vegetarian Federal Union, vegetarian society formed in Washington, DC, vegetarian lectures at the Chicago World Expo, Alice Stockham, Dr. Susana Way Dodds, Dr. Martin Luther Holbrook, *The Herald of Health* magazine (Trall), vegetarianism and Christianity, J. Howard Moore, Lawrence Grunland, Henry Perky and his New Era Cooking School, 1895 gathering of vegetarians to celebrate Thanksgiving at University of Chicago, the animal question and ethical vegetarianism, antivivisection movement.

7. The Progressive Era and the rise of vegetarianism: It followed the Gilded Age and the Victorian Era, women's suffrage and vegetarianism, refrigeration expands food choices, vegetarian foods developed at the Battle Creek Sanitarium and Sanitas Nut Food Co. (Michigan), peanuts and meat substitutes, Dr. John Harvey Kellogg, Lena Francis Cooper, vegetarianism in the media, George Bernard Shaw, Sarah Bernhardt, General William Booth and the Salvation Army, athletes and showmen, Eustace Miles, Karl Mann, walking and cycling, Bernarr Macfadden and his *Physical Culture*, his chain of vegetarian restaurants in New York City, scientific evidence in favor of vegetarianism, M.E. Jaffa, Dabney, E.V. McCollum, Russell H. Chittenden of Yale, Nicola Tesla, Kellogg's *Good Health* magazine, Upton Sinclair and *The Jungle*, passage of the 1906 Pure Food and Drug Act and the Meat Inspection Act, Hereward Carrington, Ernest H. Crosby, glamorous socialite Mrs. Maude R.L. Hammer Sharpe, the Millennium Guild (1912), M.R.L. Freshel, Benedict Lust and naturopathy, Kellogg battles the meat industry, the *Vegetarian Magazine*.

8. The Depression to the sixties: The lean years: Eat more meat, the soybean, Jethro Kloss, Henry Ford, World War II, Symon Gould, John Maxwell, Dr. Christopher Gian-Cursio, Herbert Shelton and natural hygiene, Dr. Jesse Mercer Gehman, *Recovery of Culture*, by Henry Bailey Stevens, the American Vegetarian Party found in 1948 by Symon Gould, its first presidential candidate was John Maxwell, Dr. Mervyn G. Hardinge, H. Jay and Freya Dinshah, American Vegan Society.

7. Peace, love, and vegetarianism: The counterculture of the 1960s and 1970s: Socialites Pageen and Ed Fitzgerald, the California scene, Gypsy Boots, drugless doctor Pietro Rotundi, Los Angeles Vegetarian Society, Bianca Leonardo, Woodstock, Hog Farm commune of New Mexico, Wavy Gravy, Lewis B. Marvin, Lisa Laws, Yogi Bhaijan, Golden Temple restaurant, Haight-Ashbury, hippies, The Farm and Stephen Gaskin in Tennessee, the soy dairy, *The Book of Tofu*, by Shurtleff & Aoyagi, Helen & Scott Nearing, *Diet for a Small Planet*, Nellie Shriver and Connie Salamone, *Vegetarian Times*, PETA, Isaac Bashevis Singer, North American Vegetarian Society, the press, William Blanchard

and *Vegetarian World*, McGovern Report.

10. Vegetarianism has arrived: Animal rights, popular vegetarian cookbooks, vegetarianism and the environment, John Robbins and *Diet for a New America*, new scientific evidence, Dr. Neal Barnard and PCRM, Suzanne Havala, Howard Lyman, the movies and television, new vegetarian foods, the Internet, the Atkins Diet attack.

Photos show: (1) William Metcalfe. (2) Sylvester Graham (illust.). (3) William Alcott. (4) Front page of *Graham Journal of Health and Longevity* (16 Feb. 1839). (5) Reuben Mussey, M.D. (6) A. Bronson Alcott in top hat and cape. (6) Henry S. Clubb. (7) James Caleb Jackson. (8) Ellen G. White. (9) Russell T. Trall. (10) John Harvey Kellogg, M.D., dressed in white, riding a bicycle. (11) Menu cover of The First Vegetarian Restaurant, Carl Rasmussen, proprietor. (12) Battle Creek Sanitarium. (13) Bernarr MacFadden on the cover of *Physical Culture* magazine (Sept. 1902). (13) Cover of *Good Health* magazine (Aug. 1898). (14) M.R.L. Freshel. (15) Cover of *The Vegetarian Magazine* (July 1924). (16) Constantina "Connie" Salamone. (17) Ingrid Newkirk of PETA. (18) PETA poster "Does your food have a face? Go vegetarian." (19) Neal Barnard, M.D. of PCRM. (20) Suzanne Havala Hobbs. (21) Howard Lyman. (22) VivaVeggie's Penelo Pea Pod. (23) Two PETA spokeswomen with signs outside Rhode Island State House. (24) Bruce Friedrich of PETA.

Note: This book has several weak points: (1) The authors repeatedly confuse a vegetarian diet with a "plant-based" (vegan) diet. (2) The history focuses too much on the story of individuals and not enough on the great historical forces by which those individuals are shaped. Address: 1. Journalist, researcher, and Adjunct Prof. of English at Johnson and Wales, Univ., Rhode Island; 2. Journalist who has worked for the Associated Press, the Providence Phoenix, and other publications.

906. Brooks, M.M. 2005. Soya bean protein fibres—past, present and future. In: Richard S. Blackburn, ed. 2005. *Biodegradable and Sustainable Fibres*. Abington, Cambridge, England: Woodhead Publishing Ltd. xii + 456 p. See p. 398-440. Illust. Index. 24 cm. [107 ref]

• **Summary:** An excellent, original work and review of the literature. The best seen to date. Contents: Introduction. The soya bean plant. Naming regenerated protein fibres. The need for new fibre sources: The context for mid-twentieth century research into alternative fibre sources, the context for mid-twentieth century research into soya bean fibres. Generalised method for producing soya bean fibre in the mid-twentieth century: Producing the soya bean protein curd, producing the spinning solution, extruding and insolubilising the fibres, orientation of the fibres through tensioning, washing, drying and crimping, dyeing, manufacturing requirements: spinning, blending and weaving, after care. Contemporary research into alternative protein fibre sources. Contemporary methods for producing fibres from soya bean protein:

Generalised methods for producing SPF, contemporary commercial availability. Fibre characteristics: Mid-century soya bean protein fibres, contemporary soya bean protein fibres. Identifying soya bean protein fibres: Mid-twentieth century fibres, late twentieth and early twenty-first century fibres. Degradation behaviour: Mid-twentieth century fibres, late twentieth and early twenty-first century fibres. A truly biodegradable and ecological fibre? Conclusion. Acknowledgements.

Tables show: (1) Amino acid content (%) in soya bean protein compared with that of wool and silk. (2) (p. 406-12) Selected patents from various countries (China, France, Germany, Great Britain, USA) for regenerated protein fibres using soya bean protein. (3) Tensile strength of soya fibre compared with wool of the same grade (wet and dry) (1946). (4) Characteristics of soya bean fibre in comparison with other fibres (casein, wool, silk {degummed}, Nylon) (1947). (5) Stain tests (1941).

Photos show: (1) Soya bean fibres made by the Ford Motor Co., early 1940s. (2) Blended regenerated protein fibres. This is an upholstery fabric containing soya bean fibre. (3) Henry Ford wearing his suit made from fabric containing soya bean protein, circa 1941. He is seated among shocks of grain with his inverted straw hat in the foreground. (4) Robert Boyer and H.R. Drackett standing by a metal vat with soya bean fibre tow. (5) H.R. Drackett inspecting a batch of soya bean fibre as it emerges from the spinnerets, 1944. (6) Soya beans and soya bean fibre. Harvester SPF Textile Co., Ltd. (7) Bleached soya bean fibre top. Harvester SPF Textile Co., Ltd. (8) Soya bean protein fibre yarns. Meedoo Textile Co. Ltd. (9) Soya bean protein fabric. Meedoo Textile Co., Ltd. (10) Molecule of polyvinyl alcohol (PVA). (11) Tee-shirt in 'Luxury Soy', 55% soy, 40% cotton, 5% Lycra (R). Colorado Trading and Clothing. (12) Longitudinal and cross-sectional views of mid-20th century soya bean protein fibre (1954). (13) Longitudinal and cross-sectional scanning electron microscope (SEM) views of contemporary soya bean fibre. (14) Comparative ATR spectra of soya bean protein fibres and natural and synthetic fibres.

Note: Richard S. Blackburn is a Senior Lecturer in Textile and Colour Chemistry at the University of Leeds. Address: Univ. of Southampton, UK.

907. Associated Press (AP). 2007. Ford to use soybean-based foam in Mustang seats. *Los Angeles Times*. July 13. p. C2.

• **Summary:** Most automakers use petroleum-based foam, with 30 pounds (on average) going into each vehicle. Ford's foam will be 40% soy oil based and 60% petroleum based.

Note 1. An article in the Oct. 2007 issue of *Iowa Soybean Review* (p. 10-11) states that "soy-based polyurethane foam will be used in seating applications for the 2008 Ford Mustang. Ford's breakthrough follows seven years of work by the auto company's team of researchers in the biomaterials department." "The move by Ford to replace petroleum in auto

interiors with soybean oil is revolutionary.” The soy-based flexible foam uses a 5% soy-based polyol. Starting in Jan. 2004, the soybean checkoff started to pay soybean checkoff funds to the Ford Motor Co. to help fund research and development of soy foam in auto seats. The contract expired in March 2007.

Note 2. These articles fail to answer two key questions.

(1) How many pounds of soybean oil will be used in a typical 2008 Ford Mustang? (2) How much checkoff money did the United Soybean Board pay to Ford to assist their research and development of this foam?

908. Lyddon, Chris. 2007. Industrial uses for grain: Polylactic acid derived from corn has helped expand the market for plastics, lubricants and other products. *World Grain* 25(8):36-37, 40, 42-43. Aug.

• **Summary:** Industry is taking the lead in making renewable, environmentally friendly, bio-based products. Wal-Mart, the U.S. retail giant, has switched to using corn-based clamshell plastic containers, made of polylactic acid (PLA), for storing fresh produce—instead PVC. Dupont Tate & Lyle Bio Products, LLC, an equally owned joint venture of those two huge companies, recently constructed a facility in Loudon, Tennessee, that produces its Bio-PDO product made from corn sugar.

A photo shows Richard Larock, a chemistry professor at Iowa State University (Ames), holding up plastics that he has developed from corn and soybean oils, that will be used to build hog feeders. Polyurethane plastics are an exciting new area for using soy. With the world price of petroleum so high, the main advantage of soy-based plastics is now their price. Of course, soy plastics are nothing new. Henry Ford was making auto parts from soy in 1933. Address: European editor.

909. Mahr, Krista. 2007. Why some countries feast and others famine. *Time (Asia)*. Sept. 27.

• **Summary:** In the 1930s Henry Ford used to wear a suit made from soybean fiber. He became extremely interested in the many possible uses of the soybean. He served gala dinners in which all the dishes contained soy, and he made great efforts to incorporate soy products into Ford cars, using it for things such as upholstery fabric and experimental panels. The potential that Ford saw in soybeans has today become a reality.

In his new book *Stuffed and Starved*, Raj Patel takes a sweeping look at the international food system in which 800 million people are malnourished, while over a billion eat so much that a high percentage become overweight or obese. Patel has a good sense of world food history. He includes a story of how Ellen G. White, long head of the Seventh-Day Adventist church, had a vision showing that a vegetarian diet was the key to longevity. Thus Seventh-day Adventists were “the first white people in the United States to make tofu.”

910. Crown Iron Works. 2008. A crowning achievement: 130 years of innovation, perseverance, and trust. Minneapolis, Minnesota: Published by Crown. [vii] + 119 p. Illust. Index. 28 x 24 cm.

• **Summary:** This is a very handsome history (by Carol Pine) of Crown Iron Works, filled with fine photos and many sidebars: Contents: 1. Opportunity, grit and craftsmanship (1878-1945): Tackling tough assignments, organic growth—the “slow, hard way,” every kind of building imaginable, steel posts by the millions, the roar before the rout, standing tall in World War II, getting their act together, a near-death experience. 2. Re-engineer... or disappear (1946-1969): Inspiration from Henry Ford, a far cry from forging, hail the “monarch of Manchuria” [the soybean], Crown’s next near-death experience, nurturing ideas, teamwork for “curious dummies,” more cause for reinvention, no ducking the facts, duck boats and Minnie’s makeover. Soybeans supplant steel (1970-1982): Another Mr. Wizard, a heavy metal medley, telling it like it is, selling the “bigs,” young and restless, can we do it?, a day in the life of “Sam Soybean” (diagram), aging aircraft and blind transport, a pivotal choice, pillorying paper, German engineering, Yankee ingenuity, Crown timeline. 4. Crown joins the “global village” (1983-1989): The new Crown circa 1984, the man behind the anvil, the globe trotting begins, inflation beyond imagination, extractors in Europe, consorting with Krupp, geopolitical pistachios, in China patience, from Chicago a good fit, a breach and a bond, a handshake is a deal, pairing with Pisces, home runs for crown. 5. An old company with new tricks (1990-1999): The dehulling gamble, taking it on faith, keep it simple, extraction traction, on the road again, initiative pays, good faith rewards, from bulbs to beer, Crown’s global voices, from Indonesia to Mexico, doing business in Russia’s wild west, birthday greetings, business a la barbecue, from detergent to diesel fuel, a genuine win-win equation, “urning” confidence. 6. Feeding and fueling the world (2000-2008): Gazillion gallons, learning from Europe, wired and willing, all points east, whose process is it?, nothing ventured, Jesse [Ventura] see, Jesse do, the road to refining, a reluctant farewell, busy, busy, busy, the “pack rats” prevail, when last seen, a day in the life of “Sam Soybean” today (color diagram), into the old carbon dioxide, locally grown food and fuel, what makes us proud. In closing. Appendixes: In closing. Employees. Management team. Office locations. Trademarks and brands. Acknowledgments. Photo credits.

Photos show: August Malmsten, John Hernlund, Andrew Nelson, Eli Anderson, Minneapolis Star and Tribune Building (Crown had a big part in the building of Minneapolis), barbed wire screw posts, A Nilson tractor, Eli and Clifford H. Anderson, Crown Iron soy bean plant, Dawson Mills’ plant, Bill Kratochwill, a home coal stoker, Minneapolis structural steel projects, Clifford I. and George Anderson, Jeff Scott, Heinz Schumacher, Crown employees 1937, Clifford H.

Anderson, Crown employees 1972, Crown extractor, Clifford I. Anderson, Hubert Humphrey Metrodome, a 4,000 Series Crown Extractor, a carbon dioxide press using the HIPLEX process, A Crown Friendship Engineering plant in Wuhan, China, Crown employees at 125th anniversary in 2003. Crown's new office and warehouse on Broadway and Johnson streets. George Anderson. Archimedes screw pump, Crown Model III extractor, Crown / Schumacher Counterflow DTDC (DT = desolventizer-toaster), overseas installations (Brunswick, Georgia; Caramura, Brazil; Philippines); by the late 1980s Crown plants were computerized, Kin Kong Yee of Pisces, inside a Crown Jet Dryer, inventors Darcy Moses and Bill Stevenson, Crown Jet Dryers, new headquarters in northeast Minneapolis, Model IV extractor for the pharmaceutical industry, Clifford Anderson in China, Jeff Scott in China, Valentin Zaletkin and Boris Solovyov in Moscow, Hernan Paredes, biodiesel decanters, computer generated image inside a Crown biodiesel plant, Jesse Ventura and George Anderson, huge Crown extractor in Argentina, welded heat exchanger coils, Harburger-Freudenberger HIPLEX Press (using carbon dioxide), Cliff Anderson who retired in 2008, Crown employees in 2007, Crown management team in Aug. 2007. Address: Minneapolis, Minnesota.

911. *Biobased Solutions (United Soybean Board-Web)*.2010. Ford expands successful use of soy. 12(6):1. Sept. www. soynewuses. com. BiobasedSolutions.

• **Summary:** "Ford Motor Company has used soy-based foam for seat cushions, seatbacks and vehicle headliners for several years and today more than 2 million Ford, Lincoln and Mercury vehicles contain biobased foam content. The soy foam seating came about due in part to a partnership with the United Soybean Board (USB), and now Ford expands its use of soy-based products to rubber as well.

"By using renewable soybean oil as a 25 percent replacement for petroleum oil, Ford researchers more than doubled rubber's stretchability and reduced its environmental impact. Soy-based rubber parts such as radiator deflector shields, air baffles or deflectors, cup holder inserts and floor mats may be installed in future Ford vehicles.

"The scope of Ford's recent rubber research, which was funded in part by USB, included the use of soy fillers, such as soy flour and soybean meal, as well as soybean oil.

"Ford is focused on finding innovative ways to make our vehicles more eco-friendly," says Cynthia Flanigan, Ford technical leader in elastomeric polymers. "Soy-based rubber provides superior stretchability and serves as a renewable resource that helps reduce carbon dioxide emissions from raw materials."

"It doesn't matter if it's a green product if it doesn't work," says USPS Resource Conservation Specialist Ronald Robbins, whose efforts have been helping the USPS win CTC awards since the award's first year in 1995. "We didn't go out looking

for a soy-based mastic remover; we looked for a mastic remover that works. And the soy-based product works."

"Ford researchers found that soy fillers could provide an inexpensive and environmentally friendly partial replacement of carbon black, a petroleum-based material traditionally used to reinforce rubber. Used together, soybean oil and soy fillers could replace up to 26 percent of the petroleum-based content in automotive rubber applications.

"According to the International Rubber Study Group, the automotive sector accounts for more than 50 percent of worldwide rubber consumption, which exceeded 22 million metric tons in 2008. Analysts expect automotive rubber usage to rise more than 4 percent through 2013. To read learn more about Ford's soy-based products, visit www.ford.com.

"To learn more about soy-based products, visit www.soynewuses.org."

912. *SoyaScan Notes*.2011. The best libraries and centers for doing research on Henry Ford's work with soybeans and soyfoods (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** (1) By far the best library is located at the Henry Ford Museum & Greenfield Village at Dearborn, Michigan. Within the Museum is the Research Center, which is divided into two parts: (A) The Archives (all Henry Ford's automotive, soy-related, and other material) and (B) The Library (all other American history). In the Museum's collection are more than 500,000 photographic images. All archives are open to the public.

(2) The Detroit Public Library has the Automotive History Collection and the excellent Burton Historical Collection.

(3) The University of Michigan at Ann Arbor, which has at least three good collections on the early development and history of the automotive industry.

(4) The Dearborn Public Library. The public library acquired the back issues of many old Detroit newspapers as they went out of business.

(5) National Archives in Washington, DC. The thousands of films produced by the Ford Motion Picture Laboratories were donated by the Ford Motor Co. to the National Archives. Each film has a National Archives number, such as 200FC 1187. Copies of these films may be obtained from: The Ford Film Collection, Motion Picture and Sound Recording Branch, National Archives, Washington, DC. The National Archives sells a catalog of these films for a few dollars.

(6) The Dearborn Historical Museum, 915 Brady St. in Dearborn.

(7) The Detroit News, the largest newspaper in Detroit, has a good library and archives; all of the significant articles in its back issues are indexed and can be ordered for a fee.

913. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soybeans--then and now: Played

a leading role in transforming the soybean from a minor to a major American farm crop (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** During the 1800s and early 1900s the soybean was such a minor crop in America that the government didn't bother to measure its size. It wasn't until 1910 that the first statistics on soybean production were collected. This was done as part of the 13th U.S. census. The results, published in 1913, showed that in 1909 an estimated 16,835 bushels of soybeans were produced on 1,629 acres in the USA. They were worth \$20,577.

In May 1918 the U.S. Department of Agriculture published its first statistics on U.S. soybean acreage and production. In 1917 some 531,000 acres were planted (56% of these were interplanted with other crops) and only 17% of these were harvested for grain/seed, yielding 1.186 million bushels. Most soybeans were grown for hay or forage.

In 1931 in America 17.260 million bushels of soybeans were produced on 1,141,000 acres. That same year, Henry Ford planted his first soybeans—about 500 acres near Dearborn and by 1932 he was growing 8,200 acres of soybeans in Michigan. By 1933 Henry Ford was growing soybeans on 12,000 acres of his own land in Michigan. This made him the single largest soybean grower in America and in the Western World, and (from 1933) in the United Kingdom. He also urged Michigan farmers to plant soybeans with the assurance that the Ford Motor Co. would buy them.

Henry Ford was active in promoting soybeans from 1931 to 1943. He was certainly not the only soybean promoter during this period, but he was probably the most influential—with the possible exception of the U.S. Department of Agriculture (largely through the work of William Morse). *Fortune* magazine reported of Ford in late 1933, 'He is as much interested in the soya bean as he is in the V-8.' Ford's great prestige—he was by now a true American 'folk hero'—and his strong, unswerving belief in the future of the soybean, made Americans everywhere take notice.

The Ford Motor Co. was also a major soybean user. On October 21, 1935 *Time* magazine (p.34), in an article on soybeans, noted: 'This year Ford will use the crop from 61,500 soy-bean acres.' That year a bushel of soybeans was used in the manufacture of every Ford car. On October 12, 1936 *Time* magazine (p.76, 78, 80) ran another long article on soybeans, noting that in 1935 soybeans had put \$35 million into the pockets of U.S. farmers, outranking in value rye and barley. Soybean trading had grown so active that the Chicago Board of Trade in Illinois had just started trading soybean futures. But their greatest praise was reserved for Ford: 'The number 1 U.S. soybean man is Henry Ford.' A portrait photo showed Ford with the caption, 'Motormaker Ford. A bean's best friend.'

The soybean has unquestionably been the most successful American farm crop of the 20th century. A graph of harvested acreage of the major U.S. crops from 1924 to the

present, shows that while the total acreage off all other crops was decreasing, soybean acreage was skyrocketing—and taking their place. Soybean acreage passed that of barley in 1940, cotton in 1956, oats in 1961, wheat in 1977, hay in 1978, and corn (harvested for grain) in 1979.

914. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soybeans—then and now: The great communicator introduced soybeans to mainstream America (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** If you had asked a sampling of Americans nationwide during the period 1935–1950 which person they thought of first when they heard the word "soybeans," Henry Ford would have certainly been the name most frequently mentioned. Ford was among the first to predict a major role for soybeans in America agriculture—and this visionary prediction proved very accurate and important. A master at generating publicity and the head of one of the world's most effective publicity machines, he promoted the soybean at every opportunity. Soybeans were a major part of the Ford Motor Company's exposition in 1934 at the Chicago Century of Progress World's Fair (which was viewed by an estimated 25 million people). Many people were attracted to the Ford Exposition Building, which was the largest single building at the Fair. Henry Ford even held a gala press luncheon during the fair in which every dish was made from soybeans. This, too, received extensive media coverage—some of it quite humorous.

Ford also exhibited his automotive products made from soybeans at major state fairs, sometimes attended by roughly half a million people.

In August 1941 when Ford launched the "plastic car," whose lightweight body was made from farm crops (including soybeans), the story was carried by every major newspaper in America—and soybeans were usually featured.

The Ford Motor Company produced the *ten* earliest known films on soybeans and their uses, from 1930 to 1941.

915. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soybeans—then and now: Played a leading role in the farm chemurgic movement and industrial utilization of soybeans (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** By the mid-1920s huge farm surpluses were threatening the livelihood of America's farmers. A new idea arose at this time for an innovative solution to the problem using free-market forces and the rapidly advancing new science of organic chemistry: Surplus farm crops could be transformed into non-food, non-feed industrial products—such as automobile parts. Two of the foremost early proponents of this new idea (which later came to be called Farm Chemurgy) were the highly respected chemist Dr. William J. Hale (Chairman of the Division of Chemistry

and Chemical Technology, National Research Council) and Wheeler McMillen, publisher of the popular magazine *Farm & Fireside*.

In Jan. 1927 McMillen wrote an article titled “Wanted: Machines to Eat up Our Crop Surplus,” which is widely credited with having started what soon became the farm chemurgic movement. He argued that American chemists and industrialists should work together to find new ways to convert farm crops into industrial products. In early 1928 McMillen discussed his ideas on new industrial uses for farm products, and new crops, with Henry Ford.

In 1928 Henry Ford decided to set up an experimental agricultural chemical factory to determine what products could be obtained from plants. He had a quarter-sized model of his mammoth wood distillation plant at Iron Mountain, Michigan constructed, and in late 1928 moved it to Greenfield Village in Dearborn, Michigan. Ford asked Robert Boyer to supervise this new plant, which became known as the Chemical Plant.

By 1931 Boyer and his young crew of 12-15 permanent helpers were destructively distilling and analyzing a great variety of vegetables and other crop plants. By August 1931 they had tested soybeans, and in December 1931 Henry Ford told them to stop work on other crop plants and concentrate on soybeans.

In March of 1930, in an interview with the *New York Times*, Ford first publicly expressed his interest in and support for the new concept of farm chemurgy. “He advocated full production of all crops by farmers and said the scientist and chemist will take care of the surplus, pointing out that new uses have been discovered for corn and cotton.” He did not believe that politicians could bring relief to farmers through government programs to reduce crop production.

Following the stock market crash in Oct. 1929 and the start of the Great Depression, the financial problems of America’s farmers grew steadily worse. This directly effected the Ford Motor Co. since farmers were among the best customers for his Ford cars and Fordson tractors. In 1931 Ford lost \$31 million; during 1932-33 the company lost an additional \$88 million.

As the Depression deepened, Ford’s interest and active involvement in the chemurgic movement grew. In March 1933 he was quoted in *Ford News* as saying: “I see the time soon coming when the farmer will not only raise raw materials for industry but will do the initial processing on his farm. He will stand on both his feet—one foot on the soil for his livelihood, and the other foot in industry for the cash he needs. He will have a double security. Agriculture suffers from a lack of market for its product, industry suffers from a lack of employment for its surplus men. Bringing them together heals the ailments of both. That is my conviction and that is what I am working for.” Ford believed that “industry and agriculture are natural partners” and that “If we want

the farmer to be our customer, we must find a way to be his customer.”

On May 7-8, 1935, at the joint invitation of Henry Ford and Francis P. Garvan (president of the Chemical Foundation in New York City) the first chemurgic meeting was held in Dearborn, Michigan, near the Ford Motor Co. headquarters. Some 300 industrialists, scientists, and farmers met to organize the National Farm Chemurgic Council. Ford hosted this key initial event which launched the chemurgic movement. The published proceedings of this conference were the world’s earliest “Conference Proceedings” seen in which soybeans were discussed. The next two annual meetings of this prestigious group, in 1936 and 1937, were also held in Dearborn, hosted by Henry Ford. In 1962 McMillen wrote: “The outstanding single thing Mr. Ford did in behalf of chemurgy was to lend his name to the call for the first national conference on the subject and to ask that it be held in Dearborn, Michigan. With his name as one of the sponsors, the attendance was excellent and of high order. This launched the Chemurgic Council quite effectively.” Ford ended up using large amounts of soy oil in the enamel paints on his cars and small amounts of soy protein in small plastic parts in the cars.

The work of Ford and the farm chemurgic movement led to the establishment of the U.S. Regional Soybean Industrial Products Laboratory (Urbana, Illinois) in the spring of 1936. It led further in 1938 to the Congressional Agricultural Adjustment Act, which called for the establishment of 4 federally-run regional research centers to develop new uses and new markets for farm crops. Of these, the Northern Regional Research Laboratory in Peoria, Illinois (which opened in the summer of 1940), became one of America’s leading centers of research on soybean utilization. In July 1942 work related to industrial uses of soya was moved from Urbana to Peoria.

In about 1987 a rebirth of interest began in the USA in research on industrial utilization of farm crops, including soybeans—based on the early concept of chemurgy. Known as the “new use” or “value added” movement, it has grown steadily ever since, with conferences, new products, and many scientific publications. Several states have established special centers for research on new uses of soybeans—such as the Center for Crops Utilization Research at Iowa State University. The New Uses Council has been a leader of this movement.

916. *SoyaScan Notes*. 2011. The visionary work of Henry Ford and his researchers with soybeans—then and now: Pioneered solvent extraction of soybeans and the use of hexane solvent (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** By September 1934 Henry Ford’s researchers had developed a relatively small and inexpensive, continuous-process, counter-current, solvent extractor which was

displayed at the “Industrialized Barn” portion of the massive Ford exhibit at the Chicago World’s Fair—where it was viewed by millions. Ford hoped that American farmers would build similar extractors in their own barns and use them to process soybeans grown on their own farms as an additional source of income during the non-farming months. This was the first solvent extractor ever built in America. It used high-test aviation gasoline as a solvent. The extractor was a piece of 12-inch diameter steel pipe, 30 feet in length, set at an angle of 10 degrees to the horizontal. The flaked soybeans were moved against the current of solvent by use of a screw conveyor.

In the summer of 1935 Ford spent \$5 million to construct a soybean mill with solvent extraction units in his huge River Rouge automobile plant. *Newsweek* magazine (April 1936) reported that in 1935 the soybean provided oil for the enamel on 1 million Ford cars, 540,000 gallons of the oil went into glycerine for shock absorbers, and 200,000 gallons were used to bind sand cores in the Ford foundries. The soybean meal was reacted with formaldehyde to produce a thermoplastic resin, which was used to make numerous small automotive parts, such as gear-shift knobs, window frames, distributor caps, horn buttons, etc. for Ford cars.

In 1937 and 1938, as part of his village industries program, Ford installed and operated similar solvent extraction plants at his mills in Saline and Milan, Michigan.

In 1950 in America the solvent extractor passed the screw press to become the leading method of crushing soybeans to obtain oil and meal. It remains so to this day, worldwide, and hexane remains the leading solvent.

Ford was one of the pioneers in the use of hexane as a solvent for extracting soybeans. In 1933 Ford began experiments using hexane solvent for extraction of soybean oil (Boyer, R. 1985. *Reminiscences*, p. 20-23). That year, at the Ford Exposition of Progress in New York City, Ford had a glass model of this extractor that used hexane solvent. In March 1934, the Archer-Daniels-Midland Co. in Chicago became the first company in America to use hexane solvent commercially in an extractor with soybeans. By April 1935 researchers at Ford’s Edison Institute were testing the use of hexane as a solvent for extracting soybeans and by April 1936 Ford had switched to using hexane in his extractors at the River Rouge plant.

917. *SoyaScan Notes*. 2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Popularized the use of soybeans as foods in America (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** Before Henry Ford began his pioneering work with soybeans in the early 1930s, most American consumers and farmers thought their only use was as feed for animals. Ford and his researchers and chefs played a major role in developing a remarkable variety of tasty and nutritious American-style foods from soybeans, and in publicizing these

foods and their health benefits nationwide.

Prior to 1934 (according to records in the SoyaScan database) only about 188 commercial soyfood products had been introduced in America. Of these, 78 had been launched in the Hawaiian Islands, so only 110 had been introduced on the American mainland. Of these 110, at least 46 were made by Asian-American companies primarily for Asian-Americans (such as Chinese-Americans, Japanese-Americans, etc.). Thus only 70 products were made by Caucasian-American companies, and, of these, 27 products were made by Seventh-day Adventist companies and sold mostly to other Seventh-day Adventists. In short, between 1766-1767 (When Samuel Bowen launched America’s first two commercial soy products—Soy-based Vermicelli Noodles and Bowen’s Patent Soy [Sauce]) and 1934, only 43 commercial soy products had been introduced by Caucasian-American companies, not including Seventh-day Adventists.

Henry Ford’s ideas about introducing American-style soyfoods took their first clear form on August 13, 1934, when he presented an all-soy gala dinner banquet for the American media at the immensely popular Ford Exhibit in the Century of Progress World’s Fair in Chicago, Illinois. Note first that he chose a world-class event to introduce the little-known Cinderella crop. Now listen to the names of dishes on the menu: “Tomato juice seasoned with soy bean sauce. Salted soy beans. Celery stuffed with soy bean cheese [tofu]. Puree of soy bean. Soy bean cracker. Soy bean croquettes with tomato sauce. Buttered green soy beans. Pineapple ring with soy bean cheese [tofu] and soy bean dressing. Soy bean bread with soy bean relish. Soy bean biscuit with soy bean butter. Apple pie (soy bean crust). Cocoa with soy bean milk. Soy bean coffee. Assorted soy bean cookies. Soy bean cakes. Assorted soy bean candy.”

This menu represented a fresh, new vision of soyfoods in America! Note the creative use of tofu in a pineapple ring and as a celery stuffing, and of soymilk with cocoa.

But this was just the beginning. By Aug. 1935 Ford was serving soy ice cream for dessert at VIP and press luncheons held at the Ford Engineering Laboratory. In about 1936 Ford’s Edison Institute published a 19-page booklet titled “Recipes for Soy Bean Foods,” which contained 58 innovative American-style preparations including: Soy bran bread. Cinnamon buns. Muffins (for diabetic patients). Waffles (with soy flour). Scalloped green soy beans. Omelette (with tofu). Salad soy bean sprouts. Gingerbread. Honey soy bean ice box cookies. Macaroons. Coconut balls (with chopped soynuts). Lady fingers. Soy bean chocolate bars. Apple sauce cake. Doughnuts. Soy bean custard (with soymilk).

In 1938, when Ford researcher Bob Smith invented a new and greatly improved type of soymilk (based on soy protein isolates), Ford and his researchers focused on developing new dairylike products based on this soymilk, including a non-dairy whipped cream, and an improved soy ice cream. The soymilk itself was widely served at Ford institutions in and

around Dearborn, Michigan.

Indeed a strong case can be made that Henry Ford and his coworkers played the leading pioneer role in developing American-style soyfoods and introducing them in a big way to America. In so doing, they set the stage for the rapid rise of soyfoods consumption among typical Americans that began in a small way during World War II, and in a big way starting in the 1970s and continuing into the 1990s.

918. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Pioneered soy protein isolates (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** Robert Boyer and Bob Smith did extensive, pioneering work on developing soy protein isolates at the Ford Motor Co. Both started research in 1938. Boyer used his isolates to make industrial products, such as spun soy protein fibers and water-based paints. The soy fibers were produced in a pilot-plant with a capacity of 1,000 pounds per day of soybean “wool” and soon a fabric containing 25% soybean wool and 75% sheep’s wool was used in the sidewall upholstery of many Ford cars. Bob Smith used his isolates to make a good-tasting soymilk, that was served in Ford cafeterias and schools, and at the Henry Ford Hospital, and was also used as the base for most of the early commercial soy-based whipped toppings—starting with Delsoy. In Nov. 1943 The Drackett Co. bought Ford’s soybean fiber spinning operations; Boyer, Francis (Frank) Calvert, and William Atkinson went to Drackett from Ford as part of the deal. Drackett made and sold their fibers, Soybean Azlon, spun from soy protein isolates, from 2 Dec. 1943 to 1949. They were used mainly in felt hats by the American Hat Corporation. Drackett also commercialized other industrial soy proteins, such as Protein 110, 112, and 220, Ortho Protein, and plastic molding compounds. Boyer left Drackett in 1949 when they shut down their Azlon fiber spinning plant; he focused all his energy on developing food uses of edible products made from spun soy isolates. In mid-1957 ADM (Archer Daniels Midland Co.) purchased Drackett’s soy protein business. Bob Boyer began to work as a full-time consultant for Ralston Purina in the field of soy proteins starting in early 1960. Since 13 June 1959 Ralston Purina had been manufacturing industrial soy protein isolates (for use in paper coatings) at a plant in Louisville, Kentucky, which they purchased from Procter & Gamble in December 1958. In 1960, after starting consultation with Boyer, Ralston Purina began its first work with edible soy proteins by establishing a research and pilot plant at company headquarters in St. Louis, Missouri. In about September 1962 Boyer was named technical director of protein products sales in the soybean division of the Ralston Purina Co.; he worked for Ralston until his retirement in 1971. Frank Calvert, Boyer’s coworker from the Ford Motor Co. was hired in November 1962 to head up Ralston Purina’s R&D work on food-grade isolated

soy protein in St. Louis. In 1965 Calvert was named director of soybean research, and in 1967 director of research of the Protein Division. In 1969 Calvert was promoted to director of research, New Venture Management, and finally in 1971 vice president and research director, New Venture Management. During these years, Calvert developed new soy protein isolation processes, 70 percent soy protein concentrate products, and modified soy protein coating compositions for industrial use. Calvert is considered a visionary in soy protein research and the accomplishments of his career were honored in 1973 when the Ralston Purina plant at Memphis, Tennessee, was dedicated to him in recognition of his years of service and dedication to protein technology.

In Oct. 1962 Ralston Purina began to introduce a line of edible soy protein isolate products made at their plant in Louisville: The first three were Edi-Pro A and Edi-Pro N (spray-dried isoelectric and neutral isolated soy proteins respectively) and Textured Edi Pro (an edible spun soy protein fiber). Supro 610 was launched in October 1966. As sales of these products increased, Ralston Purina soon found itself a leader in this new field—along with the pioneer, Central Soya, which had launched Promine in Oct. 1959. Ralston Purina expanded food grade isolate capacity with new facilities at Memphis, Tennessee, beginning production on April 10, 1973; Pryor, Oklahoma, beginning production on December 1, 1976. By late 1975 the company was making about 75 million pounds per year of isolates from its three plants, and was starting to advertise its isolates in a big way, with full-page color ads. This expansion easily vaulted Ralston Purina into the position of world leader in food-grade isolated soy proteins by 1976. On 21 August 1979 the company began producing soy protein isolates at its first plant located outside the United States, in Leper, Belgium. On 1 July 1987 Ralston Purina established Protein Technologies International (PTI) as a wholly owned subsidiary focused on manufacturing soy protein and fiber products. In 1993 PTI was by far the world’s leading producer of soy protein isolates, controlling about 60% of the U.S. market. PTI’s sales of consumer soy protein products rose from \$221.6 million in 1989 to a record \$288.1 million in 1992.

919. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Pioneered textured soy flour and TVP (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** The world’s most popular textured soy protein product among consumers is TVP; the name is a registered trademark of ADM, The Archer Daniels Midland Co. of Decatur, Illinois. One of the two main developers of textured soy flour was William Atkinson, a researcher at the Ford Motor Co. since 1935. After doing early work on industrial soy protein fibers, he went to The Drackett Co., then to ADM when Drackett sold their agricultural operations to ADM in 1957. “TVP Textured Vegetable Protein” was launched

commercially in April 1966, and Atkinson was issued a key patent on the product in Jan. 1970 (No. 3,488,770). The product described in this patent has probably had “the greatest impact in bringing the low-cost, textured vegetable products into commercialization.” A major breakthrough came on 22 Feb. 1971 when USDA’s Food and Nutrition Service authorized the use of textured vegetable proteins (which, in practice meant TVP) as an extender for meat, poultry, or fish in National School Lunch Programs and Special Food Service Programs for children. Up to 30% on a hydrated basis could be used. By 1975 some 75 to 100 million pounds were being used in these programs alone. Starting in March 1973 TVP became a popular retail item as an extender for ground beef—whose price had skyrocketed. By 1976 approximately 60% of the soy flour and grit texturizing capacity in the U.S. was licensed under this Atkinson patent. It dominated the industry from 1970 to 1976 when it, in turn, came to be dominated by the Flier patent assigned to Ralston Purina Co. Wolf (1984) estimated that in 1982 approximately 95 million lb of textured soy flour, worth about \$13.8 million at the wholesale level, were produced in the USA. It continues to be widely used in foods for both people and pets.

920. *SoyaScan Notes*. 2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Developed spun soy protein fibers to replace wool and fur in auto upholstery, felt hats, and other non-food industrial products (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** The first textile filament spun from a protein derived from a plant/vegetable source (specifically from soybeans) was developed by Ryohei Inouye of Japan. On 5 March 1938 he received the Fuji prize award for his discovery. At about this same time, the same product was being developed by Robert Boyer and William T. Atkinson at the Ford Motor Co. In April 1938 Boyer displayed his first soy fiber (for use in auto upholstery) at the Fourth Annual Conference of the Farm Chemurgic Council, in Omaha, Nebraska. The earliest article seen on Boyer’s soy fiber appeared in *Science News Letter* on 7 May 1938. Boyer and Atkinson applied for the first U.S. patent for industrial (non-edible) spun soy protein fibers in June 1941; it was issued in June 1945 (No. 2,377,854).

In early 1942 the Ford Motor Co. began operation of a pilot plant at Highland Park, Michigan, that produced 1,000 pounds per day of soybean “wool,” a synthetic fiber, at less than half the cost of sheep’s wool. Soon a fabric containing 25% soybean wool and 75% sheep’s wool was used in the sidewall of some cars used by Ford company employees. And Henry Ford began sporting a suit made of soybean fiber on special media occasions.

In November 1943, under pressure to produce machinery for World War II, Ford sold its entire soy protein and soybean fiber spinning operations to The Drackett Co. of Cincinnati,

Ohio. On 2 Dec. 1943 Drackett began commercial production of Soybean Azlon, the world’s first commercial fiber made from plant proteins. The fibers were used mainly in felt hats by the American Hat Corporation.

921. *SoyaScan Notes*. 2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Invented meat alternatives based on spun soy protein fibers (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** One day in 1942 at the Ford plant, Robert Boyer, while sampling fibers of his “soybean wool,” realized that these same soy protein fibers, if made tender by omitting the protein denaturation, hardening, and insolubilization, could be used as a basic ingredient in making meatlike textured soy protein foods. He had already developed an analog for the protein fibers that grow on the *outside* of a sheep (wool), why not develop an analog for those on the *inside*, a meatless meat or meat analog? In 1949 Boyer left his job at The Drackett Co.

He devoted all his energy to developing food uses of edible products made from spun soy isolates. His first patent for edible soy fibers was applied for in 1949; It was rewritten and applied for in May 1952 and issued in June 1954 (No. 2,682,466). In 1956 Worthington Foods purchased a license from Boyer and began to develop the world’s first meatlike meatless products based on these soy protein fibers. In Oct. 1962 Ralston Purina Co. began to produce the world’s first food-grade spun soy protein fibers—named Textured Edi Pro—at its plant in Louisville, Kentucky. Worthington Foods purchased these fibers and used them as key ingredients in a new generation of meatlike products. The first of these were on the market by 1963, with names like Worthington Soyameat—Fried Chicken Style, Chicken Style Roll, Prosage (like pork sausage), White-Chik, Soya Meat—Beef Like; The Soyameat—Fried Chicken style was canned whereas the other products were frozen. The flavor and texture were better than any meatlike product ever made in America. Initially these products were sold in health food stores but in late 1965 they started to be sold in supermarkets. In 1966 Worthington started to spin its own soy fibers, and the next year Ralston Purina stopped spinning.

Other companies also licensed the rights to spin soy protein fibers from Robert Boyer. In December 1965 General Mills introduced its Bontrae line of spun soy protein fiber products, starting with Bac-O’s (imitation bacon bits). By May 1966 General Mills was making analogs for ground beef, diced ham, and diced poultry—all from spun soy protein fibers. So successful were these products (they also won several prizes) that in June 1969 General Mills broke ground for a multi-million dollar state-of-the-art fiber spinning plant at Cedar Rapids, Iowa. It began making Bontrae products in later 1970. By 1975 Cortaulds in England had launched Kesp, based on spun soy protein.

Today about 15-20% of Worthington’s meat alternatives

contain spun soy protein fibers. These products have a retail value of about \$8.8 million. Worthington's Morningstar Farms line of meat alternatives, some of which contain spun soy protein fibers, is sold in the frozen foods section of about 95% of all supermarkets and grocery stores in America.

922. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Pioneered soy-based non-dairy whip toppings (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** The entire non-dairy whip topping industry traces its roots back to Henry Ford's George Washington Carver Laboratory. There the initial research work was done by chemists Robert Smith and Holton W. "Rex" Diamond, based on soymilk made from soy protein isolates that Smith had begun to develop in 1938. During World War II the U.S. government prohibited the sale of whipping cream. Therefore a number of soy-based whipped toppings hit the market—and each manufacturer learned how to make the product at Henry Ford's Carver Lab: Delsoy (Aug. 1944, Russell-Taylor Inc./Delsoy Products Inc., Dearborn, Michigan; Started by Herbert Marshall Taylor, and run by Bob Smith, Eric Russell Swanson, and Harvey Whitehouse); Whip Topping (March 1945; Rich Products Corp., Buffalo, New York; Run by Bob Rich); Presto Whip or Delsoy Super Whip (1947, Delsoy Products; in a pressurized can); Wonder Whip (Sept. 1947, Vegetable Products Corp., Saline, Michigan; Run by Rex Diamond). Scotch Topping (1949, Mitchell Foods, Inc., Fredonia, New York; Run by Frank S. Mitchell) was only indirectly influenced by Henry Ford's work; Mitchell, an employee of Spencer Kellogg & Sons, Inc., in Buffalo, initially played an important part in developing the non-dairy whip topping made by Rich Products Corp., then he left and started his own company.

Rich Products Corp. transformed this product concept into a national best-seller. In May 1956 Rich's Whip Topping began to be made by the superior Diamond Process (developed and patented by Rex Diamond) which used no protein. Today about 265 million lb of non-dairy whip toppings worth \$453.4 million dollars are sold each year to the retail, foodservice, and bakery trades. Sales of all food products made by Rich Products Corp. are expected to top \$1,000 million for the first time in 1994, the company's 50th anniversary.

923. *SoyaScan Notes*.2011. The visionary work of Henry Ford and his researchers with soyfoods—then and now: Pioneered soymilk in America (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** Henry Ford and his researchers pioneered soymilk in America. As early as Feb. 1921, in an interview with *The New York Tribune*, Ford predicted that "The milk and meat from cows will be replaced by man-made products." He explained that his laboratories had already made an

experimental "milk which is superior to the natural article and much cleaner... not subject to tuberculosis."

Starting in about 1928 Dr. Edsel Ruddiman, working for Henry Ford at Dearborn, Michigan, did research and development work on soymilk made from whole soybeans.

At the 1934 Chicago World's Fair, Henry Ford served soymilk in various dishes, such as Cocoa with Soy Bean Milk, at his gala banquet for the media, and exhibited soymilk and other soyfoods in the Ford Barn. Millions of people saw this exhibit and read the media coverage. In about 1936 Ford's Edison Institute published a 19-page booklet titled "Recipes for Soy Bean Foods," which contained a recipe for making soymilk at home plus various recipes for using this soymilk, such as Soy Bean Custard.

In 1938 Bob Smith developed a completely new type of soymilk based on isolated soy protein. Henry Ford liked the taste very much and said he preferred it to cow's milk. He often kept a supply in his soymilk, which he enjoyed drinking, in his home refrigerator. In about September 1942, this new type of soymilk started to be made at the rate of 150 gallons a day from isolated soy protein, hydrogenated soy oil, and corn sugar at Ford's George Washington Carver Laboratory in Dearborn; the goal—to replace cow's milk. Tests conducted by the Henry Ford Hospital showed that rats could live and reproduce for five generations on nothing but this soymilk. It was served at the Henry Ford Hospital in Detroit, and at Ford cafeterias and schools. During World War II, in about 1943 the Ford News Bureau wrote a 3-page background paper on "Ford soy milk" stating that it could play a major role worldwide in supplementing the diets of millions of people who faced a shortage of cow's milk due to wartime conditions. Ford's soymilk was first used commercially to make Delsoy, a non-dairy whipped topping introduced in the mid-1940s.

Since the early 1980s there has been a boom in soymilk consumption worldwide—as well as in the USA. Since the mid-1980s, soymilk has been the fastest growing basic soyfood product in America. In 1992 an estimated 995,750 gallons (3,768,910 liters) of soymilk (not including infant formulas), worth about \$75,000,000 at the retail level, were sold in the USA. The market is estimated to be growing at the rate of about 12% a year. Soymilk, packaged in aseptic cartons that do not require refrigeration, is one of the most popular products in natural- and health food stores nationwide. By 1993 at least 234 brands of soymilk / soy beverages had been introduced in the USA and another 152 had been introduced in Europe. By a remarkable coincidence, America's leading soymilk manufacturer (American Soy Products, Inc., maker of Edensoy) is located in Saline, Michigan, the same small, rural town where Henry Ford established one of his "village industries" that processed soybeans from August 1938 until the start of World War II.

924. *SoyaScan Notes*.2011. The visionary work of Henry Ford

and his researchers with soyfoods—then and now: Pioneered soy ice cream (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** Starting in the mid-1970s, soy ice cream has become quite popular and widely available in America. Ice Bean, made by The Farm Food Co. in San Rafael, California, was launched in 1976, soon achieved nationwide distribution at natural- and health food stores, and is still on the market. Tofutti—the best-selling soy ice cream of all time—was introduced by David Mintz at his Kosher Jewish Deli, Mintz's Buffet, in 1981. By 1982 it was sold throughout New York City, and in 1983 Mintz established a corporation named Tofu Time Inc. to sell stock to the public and market Tofutti nationwide. Sales of Tofutti skyrocketed to \$9 million in 1984, then to a record \$17.1 million in 1985. By the summer of 1985 at least 26 brands of soy ice cream (many with "Tofu" on the label) were on the market in America. Today soy ice creams are sold throughout America at virtually all natural- and health food stores and at many supermarkets. By early 1993 at least 208 commercial soy ice cream products had been launched worldwide, including 127 in the USA. Henry Ford was a pioneer in developing soy ice cream. In the early 1930s Ford researchers Robert Boyer and Edsel Ruddiman developed an experimental soy ice cream at Greenfield Village. It was based on fresh tofu curds and soy protein isolates. Chef Jan Willemse claimed (in 1992) to have served vanilla and honey flavored soy ice cream to Henry Ford in his private dining room in late 1934. By Aug. 1935 Ford was serving soy ice cream for dessert at VIP and press luncheons held at the Ford Engineering Laboratory. By Sept. 1942 a soymilk plant at Ford's George Washington Carver Laboratory in Dearborn was producing 150 gallons of soymilk a day. Soon part of this soymilk was being used to make soy ice cream, which was served at the Ford cafeterias and the Henry Ford Hospital in Detroit, Michigan. In 1951 Bob Rich of Rich Products in Buffalo, New York, launched Chil-Zert, America's first commercial soy ice cream. He got the idea from Henry Ford's Carver Laboratory and, like the Lab, made his ice cream from isolated soy proteins.

925. *SoyaScan Notes*. 2011. Definition of whip toppings (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** Most American shoppers are familiar with non-dairy whip toppings—alternatives to whipped cream or whipping cream. The top retail brands are CoolWhip (launched in April 1966 by the Birds Eye Division of General Foods, Inc.), RichWhip (Rich Products Corp), Presto Whip, and La Creme; they generate retail sales of about \$222 million per year.

But few realize that this food category was a child of World War II (in November 1942 the government's War Food Administration issued an order outlawing the sale of whipping cream in America during the war) and that all

of the earliest non-dairy whip toppings were based on soy protein and had their roots in the work of Henry Ford and his researchers.

The first commercial soy-based whip topping was Delsoy, launched in about August 1944 in Dearborn, Michigan. By 1949 four similar products were on the market; all contained soy protein (derived from soymilk) and none of them contained dairy products.

However an unusual government law, which is now more than 50 years old, allows food manufacturers to use casein (the major protein in cow's milk) or a casein derivative (such as sodium caseinate) in a food product and still label this product "non-dairy." Because of this outdated and misleading law, all of the major brands of so-called "non-dairy whip toppings" contain casein. If the law were changed, many new opportunities would arise for true non-dairy products that based on soy protein and containing no casein or other animal products. Address: Soyfoods Center.

926. *SoyaScan Notes*. 2011. Chronology of green vegetable soybeans and edamamé (incl. maodou) worldwide—A.D. 1275 to 1939. Part I. Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** First a few basic definitions: (1) "Vegetable-type soybeans" refers to certain large-seeded soybean varieties developed for use as a vegetable crop. (2) "Green vegetable soybeans" refers to vegetable-type soybeans harvested at the green stage for use as a vegetable. The beans can be cooked and served in or out of the pods. (3) "Edamamé" is the Japanese term for green vegetable soybeans cooked and served in the pods, often as a snack—like peanuts in the shell. The green beans are popped out of the pods directly into the mouth of the person eating them.

Before 7th century BC—The *Shijing* (*Book of Odes*) is China's earliest classic and the earliest document seen worldwide that mentions the soybean, which it calls *shu*. It does not mention green vegetable soybeans. Zheng Xuan (Wade-Giles: Chêng Hsüan), the most important commentator of the 2nd century AD, confirms that *shu* refers to the soybean and that soybean leaves, called *huo*, can be pickled—presumably when green, then presumably eaten.

AD 100—The term *Sheng dadou* [Chinese characters: raw / fresh + large + bean] appears in both *Shennong bencao jing* (*Classical pharmacopoeia of Shen Nung*) and later (about AD 450-500) in the *Mingyi bielu* (*A critical record of famous doctors. A materia medica*). However a careful analysis of the context by a Chinese scholar who is an expert in the history of Chinese foods and of soybeans (H.T. Huang, PhD) indicates that this term refers to raw soybeans rather than fresh green soybeans. Therefore, surprisingly, we know of no early reference to green vegetable soybeans in China.

1275 July 26—The word "edamamé" first appears in Japan when the well-known Buddhist saint Nichiren Shōnin writes a note thanking a parishioner for the edamamé he left at the

temple. In: In: *Nichiren Shonin Gosho Zenshu (The Collected Writings of Saint Nichiren)*.

1406–The Ming dynasty famine herbal titled *Jihuang bencao*, by Zhu Xiao is the earliest Chinese document seen that describes: (1) eating the tender leaves of soybean seedlings (*doumiao*); (2) eating the whole pods of young soybeans, (3) eating green vegetable soybeans; (4) or grinding the green beans for use with flour. The last three uses are recommended for times of famine only.

1620–*Maodou* (Chinese characters: hairy + bean) are first mentioned in the *Runan pushi [An account of the vegetable gardens at Runan]*, by Zhou Wenhua. “*Maodou* has green, hairy pods. It is also called *qingdou* (‘green beans’). It is mentioned in the *Bencao* [materia medica] literature [we are not told which book], which states that it has a sweet flavor, is neutral, and nontoxic. It can be used medicinally mainly to ‘kill bad / evil chi.’ It stops bodily pain, eliminates water [reduces edema], dispels heat in the stomach, reduces bad blood, and is an antidote to poisonous drugs... Boil the beans in the pods until done, then remove the beans from the pods and eat them. The flavor will be sweet and fresh. Or you can remove the beans from the pods before cooking, then cook the beans in lightly salted water. Or the beans can be placed on a metal screen over a charcoal fire to roast or dry them... They can be served with tea or fruits, as a snack.” This is also the earliest document seen that gives medicinal uses for green vegetable soybeans.

1855 April 12–T.V. Peticolas of Mount Carmel, Ohio, is the first Westerner to mention green vegetable soybeans. In an article on soybeans in the *Country Gentleman* (p. 12) he writes: “They are inconvenient to use green, being so difficult to hull.”

1856–Only a year later, at least two Americans have apparently figured out how to shell them with ease, and to enjoy them. Thomas Maslin of Virginia writes: “They are fine for table use, either green or dry...” Abram Weaver of Bloomfield, Iowa, praises them in the *Report of the Commissioner of Patents, Agriculture* (p. 256-57). “I had some of them cooked, while green, at their largest size, and found them delicious.”

1890 Dec.–The first large-seeded vegetable-type soybean variety arrives in America. Named Edamame, it was introduced from Japan by Charles C. Georgeson, who had been a professor of agriculture in Japan. Other early large-seeded varieties included Easycook (introduced in 1894 from Shandong Province, China) and Hahto (1915, from Wakamatsu, Japan).

1915 Jan.–William J. Morse (of USDA’s Office of Forage Crop Investigations), the man most responsible for introducing green vegetable soybeans and vegetable type soybeans to the United States, mentions them for the first time in a USDA special publication titled “Soy beans in the cotton belt”: “The green bean when three-fourths to full grown has been found to compare favorably with the butter

or Lima bean.”

1917–During World War I, USDA researchers conduct cooking tests on many soybean varieties in search of an inexpensive source of protein that lacks the typical unpleasant beany flavor and will cook quickly. Only two such varieties are found–Hahto and Easy Cook; both are large-seeded. Some progress is made in convincing Americans to eat these varieties–but only as whole dry soybeans.

1923 March–*The Soybean*, by Charles V. Piper and William J. Morse, published by McGraw-Hill (329 p.), is the first major book written about this plant in the United States. It contains a long section titled “Immature or Green Soybeans” (p. 221-22) that includes a description, nutritional analysis, recipe ideas. It also includes the first photograph in a U.S. publication of green vegetable soybeans, showing many cooked, open pods on a white plate. The caption reads: “Seeds and pods of the Hahto variety of soybeans, the seeds being especially valuable as a green vegetable.” Between 1915 and 1929 Morse mentioned green vegetable soybeans in more than 20 publications.

1929-32–During the USDA sponsored Dorsett-Morse Expedition to East Asia, William J. Morse (now a soybean expert) and P.H. Dorsett were surprised to learn that: (1) Soybeans are widely “used as a green vegetable” or as “green vegetable beans,” served in the pods. (2) The seeds for these soybean varieties are sold by horticultural seed companies, are listed with the garden beans in their seed catalogs, and are larger and sweeter than regular soybeans. On 24 April 1929, while in Tokyo, Dorsett made the first edamamé purchases, seven varieties with “Edamame” in the varietal name from T. Sakata & Co. They eventually collected more than 100 varieties of large-seeded vegetable-type soybeans (other suppliers included Yamato Seed Co. in Tokyo) and had them grown for a year at USDA’s Arlington Farm in Virginia. (3) Edamamé account for less than 1% (actually 0.8%) of all the soybeans used in Japan. (4) Green soybeans are salt-pickled in the pod in Hokkaido, the northernmost main island. (5) The soybean seeds are planted at intervals of several weeks in the same field, then, when ready, the plants are uprooted and sold in bundles. On 15 July 1929 Morse wrote: “Saw many plantings of soybeans from just coming up to ready to pull for market. It is extremely interesting to note how they are planted for succession. We saw many plantings of beans ready for pulling for market with rows interplanted as seedlings or transplants just coming into bloom.” Near Tokyo, three crops of vegetable soybeans are grown during the season–early, medium and late season. The 8,000-page typewritten report is interspersed with many photos of green vegetable soybeans at various stages from the farm to the table.

1929 July 20–A letter from William Morse in Tokyo is read before the attendees at the Tenth Annual Meeting of the American Soybean Association in Guelph, Ontario, Canada, and later published in the *Proceedings of the American Soybean Assoc.* (Vol. 2., p. 50-52). It is the first publication in

which Morse describes his many new discoveries concerning vegetable soybeans.

1931 Jan. 3—Morse writes in his log in Tokyo: “At one of the department stores, in the vegetable market section, we found small bundles of soybean sprouts and also some bundles of green vegetable soybean plants.” This is the earliest document seen that contains the term “green vegetable soybean(s).”

1934—Vegetable-type soybean varieties that yielded well at Arlington Farm are sent to many state agricultural experiment stations for further trials. In addition, extensive investigations of the cooking qualities and composition of the green shelled and dry edible soybeans are conducted at various departments of home economics. The green beans are found to be one of the most nutritious vegetables ever analyzed.

1935 Dec.—Dr. John Harvey Kellogg of Battle Creek, Michigan, is the first person on record to can green vegetable soybeans, or to consider harvesting them mechanically. In a letter dated Dec. 9 he writes to William Morse at USDA. “We have been doing some experimenting this year with growing and canning shell soy beans. I am having a couple of cans sent you so you can see what our product is like. We think it is very fine. The few thousand cans we put up went off like hot cakes... One of the difficulties in the way of the soy shell bean business is the expense of picking from the vines and shelling the pods. Do you know of any machinery that is used for either of these purposes?”

1935 Aug.—Rokusun, the first vegetable-type soybean is mentioned in a U.S. publication—followed in March 1936 by Bansei, and Chusei. These soybeans are now publicly available in the U.S.

1936 April—A 2-page leaflet titled “Soybean introductions named in January 1936” is published by the USDA, Bureau of Plant Industry, Div. of Forage Crops and Diseases. It is the first official publication in which varietal names are given to the new vegetable type soybeans introduced by Dorsett and Morse from Japan and tested at USDA’s Arlington Farm. Twenty varieties suitable for use as a “green vegetable” are listed, together with their seed color, days to maturity, and region of the USA best suited for production. This is the earliest English-language document seen that mentions the following vegetable-type varieties—all with Japanese names: Chame, Fuji, Goku, Hakote, Higan, Hiro, Hokkaido, Jogun, Kanro (in USA), Kura, Nanda, Osaya, Sato, Shiro, Sousei, Suru, Toku, and Waseda. It is also the earliest document seen in which soybeans are classified by use as “green vegetable” or “dry edible bean” or both.

1936 July—Green Shelled Soy Beans (canned) are first sold in the USA by Dr. John Harvey Kellogg’s Battle Creek Food Co. in Battle Creek, Michigan. This is the earliest known commercial green vegetable soybean product in the USA.

1936 Oct. 30—A long article titled “Canning green soy beans,” by Corinne Loskowske, appears in the *Herald*,

published by the students of Henry Ford’s Edison Institute. They have mechanized the canning process. They canned and sold 500 cans in 1935 and 1,000 cans in 1936. Similar canned green soybean products soon follow: 1939—Mother’s Choice Brand Green Vegetable Soybeans (Canned), by the Fox Valley Canning Co. of Hortonville, Wisconsin.

1939 March—“Eighteen Varieties of Edible Soybeans,” by J.W. Lloyd and W.L. Burlison is published at the *University of Illinois Agricultural Experiment Station, Bulletin No. 453*. The 58-page report is the most detailed and interesting to date, being based in part on comments received from 1935 to 1938 from more than 685 home gardeners, market gardeners, and canners in Illinois. The university offered to send free seed and growing instructions to any gardener who would test the green soybeans and submit frank comments in writing. The new way of growing and eating soybeans got rave reviews. For example: “Fresh soybeans had a satisfying flavor... They were delicious... We like them better than peas or beans... I served soybeans to all guests this summer and most everyone liked them... Everyone who tried them said they were splendid... We have never eaten beans as good... The beans were delicious to eat and were universally liked by my family and guests. In fact it took persuasion to leave any for seed.”

During the 1930s William Morse and the University of Illinois took the lead in popularizing both green-vegetable soybeans and vegetable-type soybeans in the USA. Continued. Address: Lafayette, California. Phone: 925-283-2991.

An asterisk (*) at the end of the record means that SOYFOODS CENTER does not own that document.

A plus after eng (eng+) means that SOYFOODS CENTER has done a partial or complete translation into English of that document.

An asterisk in a listing of number of references [23* ref] means that most of these references are not about soybeans or soyfoods.

SUBJECT/GEOGRAPHICAL INDEX BY RECORD NUMBERS

ADM Agri-Industries Ltd. (Windsor, Ontario, Canada). Formerly named Maple Leaf Monarch, and before that Maple Leaf Mills Ltd. (Including Maple Leaf Milling). Toronto Elevators Ltd. Merged with Maple Leaf Milling in 1962. 128

Aburagé. *See* Tofu, Fried

Acid-base balance in diet and health. *See* Nutrition–Acid-Base Balance

Acidophilus soymilk or soy acidophilus milk. *See* Soymilk, Fermented

Adhesives or Glues for Plywood, Other Woods, Wallpaper, Building Materials, Etc.–Industrial Uses of Soy Proteins (Including Soy Flour). 2, 34, 86, 89, 118, 119, 123, 128, 133, 136, 140, 141, 144, 152, 158, 162, 213, 228, 259, 277, 289, 295, 303, 424, 442, 450, 459, 462, 470, 480, 498, 520, 523, 528, 529, 537, 538, 574, 633, 639, 731, 757, 779, 809, 864, 870

Adhesives, Asphalt Preservation Agents, Caulking Compounds, Artificial Leather, Polyols, and Other Minor or General–Industrial Uses of Soy Oil as a Drying Oil. 90, 158, 757, 864, 870, 911

Adjuvants, Carriers, and Surfactants for Pesticides, Herbicides, and Other Agricultural Chemicals–Industrial Uses of Soy Oil as a Non-Drying Oil. 86, 213, 779, 870

ADM. *See* Archer Daniels Midland Co

Adventists, Seventh-day. *See* Seventh-day Adventists

Africa (General). 180, 562, 735

Africa–Congo (formerly Zaire). Officially Democratic Republic of the Congo (DRC). Also known as Congo-Kinshasa. Named Zaire from Oct. 1971 to May 1997. Named Congo Free State from 1855-1908, Belgian Congo (*Congo Belge* in French) from 1908-1960, Republic of the Congo from 1960 to 1964, then Democratic Republic of the Congo from 1964-1971. 369, 414

Africa–Egypt. Named United Arab Republic (UAR) from 1958-1971. 42, 470

Africa–Morocco, Kingdom of (Including Western Sahara. Divided into French Morocco and Spanish Morocco from 1912-1956). 487

Africa–Nigeria, Federal Republic of. 755

Africa–South Africa, Republic of (Including four former Homelands–Bophuthatswana, Transkei, Venda, and Ciskei). Named Union of South Africa from May 1910 to May 1961. 159, 208

Africa–Tanzania, United Republic of (Formed the Bulk of German East Africa 1895-1946. Tanganyika existed 1920-1961. Created in 1964 by Merger of Tanganyika and Zanzibar). 487

Africa–Tunisia. 413

Agricultural Adjustment Administration (AAA). *See* United States Department of Agriculture (USDA)–Agricultural Adjustment Administration

Agricultural Chemistry and Engineering, Bureau. *See* United States Department of Agriculture (USDA)–Bureau of Agricultural and Industrial Chemistry

Agricultural Economics, Bureau of. *See* United States Department of Agriculture (USDA)–Bureau of Agricultural Economics

Agricultural Experiment Stations in the United States. 12, 64, 71, 91, 104, 130, 136, 139, 141, 213, 214, 372, 385, 414, 524, 558, 694, 710, 712, 727, 858, 926

Agricultural Research Service of USDA. *See* United States Department of Agriculture (USDA)–Agricultural Research Service (ARS)

Agricultural Service of USDA. *See* United States Department of Agriculture (USDA)–Agricultural Cooperative Service. Including Farmer Cooperative Service (1926)

Agricultural colleges and universities, state. *See* Land-Grant Colleges and Universities

Agronomy, soybean. *See* Cultural Practices, Soybean Production

Ajinomoto Co. Inc. (Tokyo, Japan). 537, 729

Alcott House (Formerly Concordium), at Ham Common (Near London), Richmond, Surrey, England. Named after A. Bronson Alcott (1799-1888) of Massachusetts. Pioneer Vegetarian Community in England (1838-1848). Founded in July 1838 by James Pierrepont Greaves. 905

Alcott, Amos Bronson (1799-1888). Vegetarian Pioneer in the United States. Also His Daughter Louisa May Alcott (1832-1888), and Fruitlands. 579, 613, 680

Alcott, William Andrus (M.D., 1798-1859). Vegetarian Pioneer in the United States. 579

Alfalfa or Lucerne / Lucern (*Medicago sativa*)—Other Uses for Human Food or Drink, Including Tea, Flour, Tablets, and Leaf Protein Concentrate (LPC). See Also Alfalfa Sprouts. 562

Alfalfa or Lucerne / Lucern (*Medicago sativa*). 397, 682, 712

Alkaline food, ash, reaction, or balance in diet and health. See Nutrition—Acid-Base Balance

Allergies. See Nutrition—Biologically Active Phytochemicals—Allergens

Allied Mills, Inc. Including (by July 1929) American Milling Co. (Peoria, Illinois) and Wayne Feed Mills (Chicago, Peoria, or Taylorville, Illinois). 123, 371, 424, 498, 507, 539, 615, 710

Allis-Chalmers Manufacturing Co. (Milwaukee, Wisconsin). Made Farm Equipment (Tractors, Combines) and Soybean Processing Equipment (Driers, Rolling and Flaking Mills, Solvent Extraction Units). 299, 307, 445, 524, 648, 662, 675

Almond Milk and Cream. See also: Almonds Used to Flavor Soymilk, Rice Milk, etc. 599

Alternative medicine. See Medicine—Alternative

Amaranth, Grown for Grain / Seed (*Amaranthus hypochondriacus*, *A. caudatus*, and *A. cruentus*. Genus formerly spelled *Amarantus*). 739, 798, 801

Amazake. See Rice Milk (Non-Dairy)

American Lecithin Corp. (Incorporated 1930), American Lecithin Company (Re-incorporated 1934-35), and Joseph Eichberg, President of Both. 158, 539, 741

American Milling Co. See Allied Mills, Inc.

American Natural Snacks (St. Augustine, Florida). 867

American Philosophical Society (Philadelphia). See Franklin, Benjamin

American Soy Products (Michigan). See Natural Foods Distributors and Manufacturers in the USA—Eden Foods

American Soy Products (Saline, Michigan). Started Nov. 1986. 770, 774

American Soybean Association (ASA)—Activities in the

United States and Canada, and General Information (Headquarters in St. Louis, Missouri. Established 3 Sept. 1920. Named National Soybean Growers' Association until 1925). 64, 98, 158, 226, 253, 254, 255, 270, 510, 517, 591, 631, 634, 668, 695, 701, 705, 710, 713, 735, 779, 789, 864, 873, 901

American Soybean Association (ASA)—Activities, Offices, and Influence Worldwide (General). 713, 873

American Soybean Association (ASA)—Activities, Offices, and Influence in Asia. 873

American Soybean Association (ASA)—Checkoff Programs (Legislated / Mandatory Funding. State Programs Starting in North Carolina in Sept. 1966, National Programs Starting in 1989-1991), and State Promotion Boards (Research & Promotion Councils). 695, 895, 902

American Soybean Association (ASA)—Funding and Fundraising Before Checkoff Program or 1971. Voluntary or from USDA (FAS or ARS). 634

American Soybean Association (ASA)—Honorary Life Members. 597

American Soybean Association (ASA)—Legislative Activities. 695, 853

American Soybean Association (ASA)—Meetings / Conventions (Annual) and Meeting Sites. 7, 255, 256, 260, 270, 439, 473, 510, 591, 634, 644, 720, 721

American Soybean Association (ASA)—Members and Membership Statistics. 695

American Soybean Association (ASA)—Officers, Directors (Board), and Special Committees. 439, 510

American Soybean Association (ASA)—Periodicals, Including Soybean Digest, Proceedings of the American Soybean Assoc., Soybean Blue Book, Soya Bluebook, Late News, etc. 7, 510, 603, 695

American Soybean Association (ASA)—Soybean Council of America (June 1956-1969). Replaced by American Soybean Institute (Est. 11 July 1969). 634, 695

American Soybean Association (ASA)—State Soybean Associations and Boards (Starting with Minnesota in 1962). 876, 877, 879, 882, 883, 889, 895, 899

American Soybean Association (ASA)—State Soybean Associations and United Soybean Board—Activities Related to Food Uses of Soybeans / Soyfoods, or Soy Nutrition, in the

United States (Not Including Soy Oil or Edible Oil Products). 64, 158, 255, 257, 270, 385, 473, 644, 789, 871, 876, 877, 879, 882, 883, 889, 895, 899

American Soybean Association (ASA)–Strayer. *See* Strayer Family of Iowa

American Soybean Association (ASA)–United Soybean Board (USB, Established 1991, Chesterfield, Missouri). 860, 871, 895

American Soybean Association–Research Foundation (ASARF, 1965-1980), Market Development Foundation (ASAMDF, ASMDF, 1977-1980), and American Soybean Development Foundation (ASDF, Dec. 1980--1991). 695

American Vegetarian Society. *See* Vegetarianism–Vegetarian Societies in North America–American Vegetarian Society (1850-1862?)

Amino Acids and Amino Acid Composition and Content. *See also* Nutrition–Protein Quality; Soy Sauce, HVP Type. 224, 344, 403, 562, 801

Anatomy, soybean. *See* Soybean–Morphology, Structure, and Anatomy

Anderson International Corp. (Cleveland, Ohio). Manufacturer of Expellers for Soybean Crushing and Extrusion Cooking Equipment. Formerly V.D. Anderson Co. and Anderson IBEC. 104, 122, 445, 873

Andreas Family of Minnesota and Iowa–Incl. Reuben Peter Andreas, and his sons Albert, Glenn, Dwayne (1918-), and Lowell Andreas (1922-). 739, 750, 883

Animal welfare. *See* Vivisection

Antioxidants and Antioxidant Activity (Especially in Soybeans and Soyfoods). 64, 119, 128, 213, 445

Appliances. *See* Blender

Aquaculture. *See* Fish or Crustaceans (e.g. Shrimp) Fed Soybean Meal Using Aquaculture or Mariculture

Archer Daniels Midland Co. (ADM) (Decatur, Illinois; Minneapolis, Minnesota until 1969). 6, 34, 104, 122, 123, 128, 133, 144, 158, 162, 192, 259, 263, 264, 299, 371, 408, 424, 468, 473, 498, 507, 524, 539, 586, 599, 610, 611, 620, 624, 628, 629, 630, 641, 642, 655, 656, 658, 659, 665, 675, 700, 713, 724, 726, 728, 734, 735, 739, 740, 741, 744, 750, 781, 789, 799, 809, 810, 829, 832, 834, 835, 836, 839, 842, 846, 863, 867, 873, 883, 885, 889, 890, 916, 918, 919

Argentina. *See* Latin America, South America–Argentina

Arkady, British. *See* British Arkady Co. Ltd.

Arkansas Grain Corp. *See* Riceland Foods

Arlington Experimental Farm. *See* United States Department of Agriculture (USDA)–Arlington Experimental Farm

Asia, East (General). 211, 611, 659, 694, 809, 870

Asia, East–China (People's Republic of China; Including Tibet. *Zhonghua Renmin Gonghe Guo*). 34, 71, 82, 90, 147, 152, 158, 161, 180, 205, 213, 224, 246, 299, 371, 390, 408, 410, 443, 462, 487, 500, 563, 631, 644, 694, 713, 729, 754, 757, 864, 903, 926

Asia, East–China–Shennong / Shên Nung / Shen Nung–The Heavenly Husbandman and Mythical Early Emperor of China. 40, 70, 82, 93, 147, 161, 371, 397, 453, 631

Asia, East–China–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 180

Asia, East–Hong Kong Special Administrative Region (British Colony until 1 July 1997, then returned to China). 745, 851

Asia, East–Japan (Nihon or Nippon). 73, 117, 159, 180, 190, 193, 194, 195, 200, 203, 207, 246, 247, 249, 295, 298, 303, 443, 446, 458, 462, 473, 514, 523, 537, 587, 592, 644, 663, 674, 709, 729, 745, 754, 757, 779, 798, 799, 843, 851, 858, 864, 873, 920, 926

Asia, East–Korea (North and South; Formerly Also Spelled Korea and Called “Chosen” by the Japanese [1907-1945]). 180, 246, 745

Asia, East–Manchuria (Called Manchukuo by Japanese 1932-45; The Provinces of Heilongjiang [Heilungkiang], Jilin [Kirin], and Liaoning Were Called Northeast China after 1950). 6, 65, 73, 89, 107, 117, 159, 180, 205, 207, 213, 235, 246, 299, 371, 408, 443, 446, 459, 461, 462, 523, 739, 757, 864

Asia, East–Manchuria–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 180

Asia, East–Taiwan (Republic of China. Widely called by its Portuguese name, Formosa, from the 1870s until about 1945). 73

Asia, East. *See* Chinese Overseas, Especially Work with Soya (Including Chinese from Taiwan, Hong Kong, Singapore, etc.), Japanese Overseas, Especially Work with Soya

Asia, Middle East–Iran, Islamic Republic of (Jomhori-e-Islami-e-Irân; Persia before 1935). 739

Asia, Middle East–Lebanon (al-Jumhouriya al-Lubnaniya). 649

Asia, South–Bangladesh, People's Republic of (East Bengal [See India] from 1700s-1947, and East Pakistan [See Pakistan] from 1947-1971). 649

Asia, South–Bhutan, Kingdom of. 341

Asia, South–India (Bharat, Including Sikkim, and Andaman and Nicobar Islands). 158, 159, 176, 180, 341, 487, 579, 661, 729, 813

Asia, South–India, Northeast / North-East. The Contiguous Seven Sister States and Sikkim–Which are Ethnically Distinct. The States are Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. 341

Asia, South–Introduction of Soybeans to. Earliest document seen concerning soybeans or soyfoods in connection with (but not yet in) a certain Southeast Asian country. 649

Asia, South–Nepal, Kingdom of. 341

Asia, South–Pakistan, Islamic Republic of (Part of British India until 1947. Divided into West Pakistan and East Pakistan 1947-1971, when East Pakistan Became Independent as Bangladesh). 341

Asia, South–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 341

Asia, South–Sri Lanka, Democratic Socialist Republic of (Ceylon before 22 May 1972. Serendib was the ancient Arabic name). 729, 754

Asia, Southeast (General). 211, 757, 864

Asia, Southeast–Indonesia (Netherland(s) Indies, Netherlands East Indies, or Dutch East Indies before 1945) (Including Islands of Java, Borneo, Celebes, Lesser Sunda, Moluccas, New Guinea [West Irian], and Sumatra). 73, 180, 211, 487, 640, 910

Asia, Southeast–Indonesia–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 180

Asia, Southeast–Malaysia, Federation of (Including East Malaysia Composed of Sarawak and Sabah. British Borneo or North Borneo from about 1881 to 1963). Federation of

Malaya before 1963. 397, 432, 745

Asia, Southeast–Philippines, Republic of the. 215, 431, 729, 910

Asia, Southeast–Singapore (Part of the Straits Settlements [British] from 1826 to 1946). 745, 851

Aspergillus oryzae. See Koji, Miso, or Soy Sauce

Atlantic Ocean islands. See Oceania

Australia. See Oceania–Australia

Bacon or bacon bits, meatless. See Meat Alternatives–Meatless Bacon, Ham, and Other Pork-related Products

Bacteria in intestines–beneficial. See Intestinal Flora / Bacteria

Barges used to transport soybeans. See Transportation of Mature Soybeans to Market

Barricini Foods (Mountain Lakes, New Jersey)–Soy Ice Cream Company. Acquired Farm Foods and Ice Bean on 31 May 1985. Sold Farm Foods to 21st Century in 1993. 773

Battle Creek Food Co. See Kellogg, John Harvey (M.D.)

Bean curd skin. See Yuba

Bean curd. See Tofu

Bean paste. See Miso

Bees, Honeybees (*Apis mellifera*), and Apiculture–Making Honey from Nectar in Soybean Flowers and Pollinating the Flowers. 388

Benni, Benne, Benniseed. See Sesame Seed

Benzene / Benzine / Benzol solvents for extraction. See Solvents

Berczeller, Laszlo. 34, 158, 341, 615

Bible Christian Church in England and the USA, Including Rev. William Cowherd (1763-1816), Joseph Brotherton (1783-1857), William Harvey (1787-1870), Martha Harvey (1783-1861), and James Simpson (1812-1859)–all of Salford, England; and Rev. William Metcalfe (1788-1862) and Rev. Henry S. Clubb (1827-1921) of Philadelphia, Pennsylvania. 579

Bibliographies and / or Reviews of the Literature (Contains More Than 50 References or Citations). 73, 180, 213, 371, 405, 408, 445, 523, 537, 562, 566, 630, 648, 661, 670, 743, 809, 810, 841, 842, 862, 864

Biloxi soybean variety. *See* Soybean Varieties USA–Biloxi

Binder for Sand Foundry Cores–Industrial Uses of Soy Oil as a Drying Oil. 44, 64, 82, 86, 103, 108, 112, 113, 115, 118, 119, 132, 133, 140, 141, 144, 194, 202, 213, 223, 238, 333, 441, 442, 480, 488, 539, 722, 735, 870

Biographies, Biographical Sketches, and Autobiographies–*See also*: Obituaries. 109, 218, 288, 296, 340, 387, 414, 511, 597, 599, 634, 673, 684, 712, 713, 719, 727, 735, 750, 759, 803, 837, 838, 855

Biotechnology applied to soybeans. *See* Genetic Engineering, Biotechnology (Biotech), and Transgenic Plants

Black soybeans. *See* Soybean Seeds–Black

Black-eyed pea. *See* Cowpea–*Vigna unguiculata*

Blaw-Knox Co. (Pittsburgh, Pennsylvania). Maker of Soybean Crushing Equipment, Especially the Rotocel. 524, 677

Blender, Electric (Kitchen Appliance)–Including Liquefier, Liquidizer, Liquifier, Osterizer, Waring Blender, Waring Blendor, Waring Mixer, Whiz-Mix, Vitamix–Early Records Only. 459, 636

Boca Burger Inc. Founded 1993. Acquired Feb. 2000 by Kraft Foods Inc. 867

Boca Burger. *See* Kraft Foods Inc.

Boone Valley Cooperative Processing Association (Eagle Grove, Iowa). 498, 507

Borden, Inc. (Columbus, Ohio; New York City, New York; Waterloo, Iowa; Elgin and Kankakee, Illinois). 466, 467, 471, 498, 507, 810

Botany–Soybean. 180, 211, 461, 487

Bowen, Samuel (1732-1777)–He Introduced the Soybean to North America in 1765. *See also*: (1) His Ancestors and Descendants. (2) James Flint. 826, 891

Boyer, Robert. *See* Ford, Henry

Bragg, Paul Chappius (1895-1975) Author and Health Foods Advocate. 10

Bran, soy. *See* Fiber, Soy

Brassica napus (L.) var. napus. *See* Canola

Brazil. *See* Latin America, South America–Brazil

Breeding of Soybeans and Classical Genetics. 480, 597, 694, 858

Breeding of soybeans. *See* Genetic Engineering, Biotechnology (Biotech), and Transgenic Plants, Variety Development and Breeding

Breeding or Evaluation of Soybeans for Seed Quality, such as Low in Trypsin Inhibitors, Lipoxygenase, Linolenic Acid, etc. 762

Brew flakes, soybean. *See* Soy Flour or Flakes–Use in Brewing

Briggs, George M. (1884-1970, Univ. of Wisconsin). 372, 439, 510, 631

British Arkady Company Ltd. and British Arkady Holdings Ltd. (Manchester, England). Subsidiary of ADM of the USA. Including the Haldane Foods Group. 799

British Columbia. *See* Canadian Provinces and Territories–British Columbia

Brown rice. *See* Rice, Brown

Brown soybeans. *See* Soybean Seeds–Brown

Buckeye Cotton Oil Co. *See* Procter & Gamble Co.

Building materials. *See* Adhesives or Glues for Plywood, Other Woods, Wallpaper, or Building Materials

Bunge Corp. (White Plains, New York). Including Lauhoff Grain Co. (Danville, Illinois) since 1979. 863

Burgers, meatless. *See* Meat Alternatives–Meatless Burgers and Patties

Burke, Armand. *See* Soya Corporation of America and Dr. Armand Burke

Burlison, William Leonidas (1882-1958, Univ. of Illinois). 91, 123, 141, 371, 439, 510, 566, 631, 694, 713, 873, 926

Butter made from nuts or seeds. *See* Nut Butters

Butter-beans. *See* Lima Bean

Cake or meal, soybean. *See* Soybean Meal

Calf, Lamb, or Pig Milk Replacers. 871

California. *See* United States–States–California

Canada–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 73, 122, 745

Canada–Soybean crushers, early. *See* Soybean Crushers (Canada), Early (Before 1941)

Canada. 73, 79, 80, 106, 107, 111, 117, 121, 122, 125, 126, 128, 129, 131, 141, 154, 157, 158, 159, 221, 228, 439, 448, 459, 460, 468, 487, 503, 517, 526, 551, 553, 580, 593, 599, 605, 609, 648, 689, 691, 731, 740, 745, 758, 786, 802, 869, 884, 926

Canada. *See* Ontario Soybean Growers (Marketing Board)

Canadian Provinces and Territories–Alberta. 73, 125, 448

Canadian Provinces and Territories–British Columbia. 125

Canadian Provinces and Territories–Manitoba. 73, 117, 120, 125, 159, 228

Canadian Provinces and Territories–Nova Scotia. 125, 129

Canadian Provinces and Territories–Ontario. 73, 111, 117, 122, 125, 126, 128, 131, 154, 228, 439, 448, 468, 517, 599, 648, 745, 786, 869, 884, 926

Canadian Provinces and Territories–Québec (Quebec). 73, 80, 122, 125, 128, 129, 460, 740

Canadian Provinces and Territories–Saskatchewan. 73, 125

Canadian soybean varieties. *See* Soybean Varieties Canada

Candles, Crayons, and Soybean Wax–Industrial Uses of Soy Oil as an Hydrogenated Oil. 144, 432, 899

Cannabis sativa. *See* Hemp

Canola (*Brassica napus* (L.) var. *napus*)–An Improved Variety of the Rape Plant or Rapeseed Having Seeds with Little or No Erucic Acid. 801

Carbohydrates–Dietary Fiber (Including Complex Carbohydrates, Bran, Water-Soluble and Water-Insoluble Fiber). 680, 789

Cargill, Inc. (Minneapolis, Minneapolis). 498, 507, 724, 740,

750, 810, 839, 863, 885

Caribbean. *See* Latin America–Caribbean

Cartoons or Cartoon Characters. 138, 205, 410, 643, 686, 871

Carver, George Washington (ca. 1864–1943, Tuskegee Inst., Alabama)–Work with Soybeans, Soyfoods, Peanuts, or Chemurgy, and the Carver Laboratory in Dearborn, Michigan. 4, 138, 139, 167, 340, 346, 358, 360, 361, 363, 364, 366, 368, 370, 375, 376, 377, 378, 380, 381, 382, 383, 387, 392, 393, 394, 395, 396, 400, 401, 409, 411, 412, 414, 428, 440, 458, 469, 516, 522, 535, 599, 626, 643, 690, 692, 693, 712, 715, 719, 720, 721, 727, 737, 738, 746, 749, 759, 765, 784, 790, 821, 825, 842, 855, 871, 901, 922, 923, 924

Casein or Caseinates–Problems in So-Called Non-Dairy Products. 862, 925

Catering. *See* Foodservice and Institutional Feeding or Catering

Central Soya Co. (Fort Wayne, Indiana; Acquired in Oct. 1987 by the Ferruzzi Group in Ravenna, Italy. In 1991 became part of CSY Agri-Processing, Inc. [a holding company], operating as a member of the Eridania / Beghin-Say agro-industrial group, within Ferruzzi-Montedison). Acquired in Oct. 2002 by Bunge. 6, 251, 299, 371, 408, 424, 445, 465, 468, 471, 498, 507, 524, 562, 566, 604, 611, 612, 666, 675, 677, 689, 691, 707, 713, 734, 735, 740, 741, 810, 829, 832, 835, 836, 839, 849, 863, 873, 890

Cereol. *See* Ferruzzi-Montedison (Italy)

Certification of soybean seeds. *See* Seed Certification (Soybeans)

Ceylon. *See* Asia, South–Sri Lanka

Checkoff programs (state and national). *See* American Soybean Association (ASA)–Checkoff Programs

Cheese–Non-Soy Non-Dairy Cheeses Made from Plants (Such as Peanut / Groundnut Cheese, Almond Cheese, etc.). 4

Cheese, cream. *See* Soy Cream Cheese

Cheese. *See* Soy Cheese, Soy Cheese or Cheese Alternatives

Cheesecake or cream pie. *See* Soy Cheesecake or Cream Pie

Chemical / Nutritional Composition or Analysis (Of Seeds, Plants, Foods, Feeds, Nutritional Components, for Animals

(Incl. Humans)). 141, 211, 228, 445, 449, 461, 649

Chemistry and Soils, Bureau. *See* United States Department of Agriculture (USDA)–Bureau of Agricultural and Industrial Chemistry

Chemurgy, the Farm Chemurgic Movement, and the Farm Chemurgic Council (USA, 1930s to 1950s, Including Wheeler McMillen, William J. Hale, and Francis P. Garvan). 9, 13, 21, 24, 39, 46, 55, 63, 70, 72, 75, 82, 83, 87, 88, 89, 90, 98, 102, 109, 123, 124, 125, 131, 137, 140, 142, 163, 167, 168, 174, 181, 182, 183, 186, 189, 191, 192, 194, 197, 210, 218, 220, 226, 233, 243, 255, 260, 270, 281, 347, 389, 406, 414, 423, 426, 433, 444, 458, 459, 460, 480, 488, 522, 525, 526, 534, 535, 539, 566, 584, 616, 617, 626, 643, 645, 666, 670, 672, 673, 692, 693, 701, 712, 720, 721, 722, 727, 728, 735, 740, 748, 749, 757, 769, 777, 782, 783, 784, 787, 790, 802, 807, 808, 809, 811, 812, 828, 837, 842, 852, 853, 854, 858, 864, 865, 868, 869, 870, 884, 915

Chicago Board of Trade (CBOT, organized in April 1848). 137, 144, 289, 873, 913

Chicago Heights Oil Co. (Chicago Heights, Illinois; Started by I.C. Bradley and George Brett). 6, 34, 104, 566

Chicago Vegetarian Society. *See* Vegetarianism–Vegetarian Societies in North America–Chicago Vegetarian Society (1895 -)

Chicken, meatless. *See* Meat Alternatives–Meatless Chicken, Goose, Duck, and Related Poultry Products. *See also* Meatless Turkey

Chickens (esp. Layers & Broilers) Fed Soybeans, Soybean Forage, or Soybean Cake or Meal as Feed. 158, 871

China. *See* Asia, East–China

Chinese Overseas, Especially Work with Soya (Including Chinese from Taiwan, Hong Kong, Singapore, etc.). 272, 462, 840, 917

Chocolate substitute made from roasted peanuts. *See* Peanut Chocolate

Chocolate substitute made from roasted soybeans. *See* Soy Chocolate

Chronology / Timeline. 2, 371, 384, 407, 685, 873, 890, 926

Civil War in USA (1861–1865). 41, 109, 167, 538, 680, 682, 905

Cleaning soybean seeds. *See* Seed Cleaning–Especially for

Food or Seed Uses

Climate change. *See* Global Warming / Climate Change as Environmental Issues

Coconut Milk and Cream. Or Coconuts Used to Flavor Soymilk, Rice Milk, etc. 556

Coffee–Problems with or Prohibitions against the Consumption of Coffee, Initially Because it Was Considered a Stimulant, Later Because of the Harmful Effects of Caffeine. 13, 554, 579, 637

Coffee Creamer, Whitener or Lightener (Non-Dairy–Usually Contains Soy). 456, 467, 595, 601, 605, 627, 697, 703, 732, 738, 780, 806, 820, 851, 888

Coffee Creamer, Whitener or Lightener–Etymology of These Terms and Their Cognates / Relatives in Various Languages. 467, 601

Coffee Substitutes or Adulterants, Non-Soy–Usually Made from Roasted Cereals, Chicory, and / or Other Legumes. 4, 608

Coffee, soy. *See* Soy Coffee

Coker Pedigreed Seed Co. (Hartsville, South Carolina). 600, 694

Color of soybean seeds. *See* Seed Color (Soybeans)–Specific Varieties), Soybean Seeds (of different colors)

Combines. Also called the Combined Harvester–Thresher in the 1920s and 1930s (Combine). 38, 118, 231, 242, 368, 378, 381, 510, 550, 553, 634, 648, 713, 754

Commercial Soy Products–New Products, Mostly Foods. 67, 80, 154, 402, 420, 421, 422, 440, 492, 494, 496, 551, 570, 571, 573, 575, 585, 590, 610, 627, 891, 904

Commercial soy products–earliest. *See* Historical–Earliest Commercial Product

Composition of soybeans, soyfoods, or feeds. *See* Chemical / Nutritional Composition or Analysis

Concordium (Pioneer vegetarian community in England). *See* Alcott House (Concordium), on Ham Common (Near London), Richmond, Surrey, England

Conservation of soils. *See* Soil Science–Soil Conservation or Soil Erosion

- ContiGroup Companies, Inc. Named Continental Grain Co. until 1999 (New York, New York). 507
- Continental Grain Co. *See* ContiGroup Companies, Inc.
- Cookery, Cookbooks, and Recipes—Mostly Using Soy, Mostly Vegetarian. *See also*: the Subcategories—Vegetarian Cookbooks, Vegan Cookbooks. 58, 59, 111, 158, 180, 216, 222, 236, 385, 459, 497, 591, 638, 643, 686, 687, 745, 746, 797, 855, 874, 905
- Cooperative Enterprises, Ventures, Research, or Experiments, and Cooperatives / Co-ops, Worldwide. *See also*: Soybean Crushers (USA)—Cooperative Crushers. 64, 73, 122, 128, 130, 529, 566, 677, 688, 692, 694, 710, 735, 839, 852, 885
- Cooperative soybean crushers. *See* Soybean Crushers (USA), Cooperative
- Cooperatives. *See* United States Department of Agriculture (USDA)—Agricultural Cooperative Service
- Corn / Maize (*Zea mays* L. subsp. *mays*)—Including Corn Oil, Corn Germ Oil, Meal, Starch, and Gluten. 5, 6, 8, 12, 13, 23, 81, 82, 130, 174, 202, 277, 319, 327, 333, 334, 351, 354, 382, 401, 403, 406, 428, 459, 470, 492, 502, 511, 513, 522, 536, 537, 611, 658, 689, 690, 701, 707, 708, 710, 716, 735, 737, 744, 769, 771, 779, 784, 798, 801, 831, 854, 857, 870, 908, 915, 923
- Cornell University (Ithaca, New York), and New York State Agric. Experiment Station (Geneva, NY)—Soyfoods Research & Development. 591, 618, 631
- Cottage cheese. *See* Dairylike Non-dairy Soy-based Products
- Cotton Cloth, Fabric, Textile, Fibers or Raw Cotton in Bales, All from the Boll of the Cotton Plant (*Gossypium* sp. L.). 64, 133, 225, 237, 268, 273, 339, 343, 365, 401, 419, 425, 437, 489, 663, 700, 731, 836, 860
- Cotton Plant and Crop (*Gossypium* sp. L.). *See also* Cottonseed Oil, Cake, and Meal. 557
- Cottonseed Meal and Cake (Defatted). Previously Spelled Cotton-Seed Cake. 73, 562, 675
- Cottonseed Oil. Previously Spelled Cotton-Seed Oil or Cotton Oil. 2, 6, 64, 104, 105, 130, 299, 371, 424, 531, 532, 539, 565, 675, 757, 843, 845, 864
- Cottonseeds / Cottonseed. Previously Spelled Cotton Seeds / Seed. 498, 537
- Cover Crop, Use of Soybeans as. *See also*: Intercropping. 41, 336
- Cowherd, William (Rev.) (1763-1816). Vegetarian Pioneer in England. 579
- Cowpea or Black-Eyed Pea. *Vigna unguiculata* (L.) Walp. Formerly spelled Cow Pea. Also called Blackeye Pea, Pea Bean, Yardlong Cowpea. Chinese: Jiangdou. Previous scientific names: *Vigna sinensis* (L.) (1890s-1970s), *Vigna catjang* (1898-1920), *Vigna Katiang* (1889). 53, 414, 694
- Crayons. *See* Candles, Crayons, and Soybean Wax
- Cream Cheese. *See* Soy Cream Cheese
- Cream, sour, alternative. *See* Sour Cream Alternatives
- Creamer or soy cream for coffee. *See* Coffee Creamer / Whitener
- Crop Rotation Using Soybean Plants for Soil Improvement. 140, 459
- Cropping Systems: Intercropping, Interplanting, or Mixed Cropping (Often Planted in Alternating Rows with Some Other Crop). 79, 341, 913
- Crown Iron Works Co. (Minneapolis, Minnesota). Maker of Soybean Processing Equipment. Acquired by CPM (Formerly California Pellet Mill, Waterloo, Iowa) on 16 Aug. 2007. 910
- Crushing, soybean—equipment manufacturers. *See* Allis-Chalmers, Anderson International Corp., Blaw-Knox Co. and Rotocel, Crown Iron Works Co., French Oil Mill Machinery Co.
- CSY Agri-Processing, Inc. *See* Central Soya Co. (Fort Wayne, Indiana)
- Cultural Practices, Cultivation & Agronomy (Including Crop Management, Erosion, Planting, Seedbed Preparation, Water Management / Irrigation). 12, 22, 33, 53, 73, 79, 114, 117, 118, 121, 157, 158, 180, 208, 487
- Culture Media / Medium (for Growing Microorganisms)—Industrial Uses of Soybeans, as in Antibiotic / Antibiotics Industry. 864
- Cultures of nitrogen fixing bacteria for soybeans. *See* Nitrogen Fixing Cultures
- Curds Made from Soymilk (Unpressed Tofu) as an End Product or Food Ingredient (Oboro, Tofu-hwa, Doufu-hwa, Daufu-fa, Tow-foo-fah). 732, 924

Dairy alternatives (soy based). *See* Coffee Creamer / Whitener or Cream Alternative, Sour Cream Alternatives, Soy Cheese–Fermented, Soy Cheese or Cheese Alternatives, Soy Cheesecake or Cream Pie, Soy Cream Cheese, Soy Puddings, Custards, Parfaits, or Mousses, Soymilk, Soymilk, Fermented, Tofu (Soy Cheese), Whip Topping

Dairylike Non-dairy Soy-based Products, Other (Cottage Cheese, Sour Cream, and Icing). *See also* Non-dairy Whip Topping, Soy Ice Cream, Soy Yogurt, Soy Cheese, Cream Cheese or Cheesecakes, Coffee Creamer / Whitener or Cream, and Sour Cream. 472, 595, 684, 703

Dannen Mills (St. Joseph, Missouri). Sold (Oct. 1963) to Farmers Union Cooperative Marketing Assoc. (CMA) in Kansas City. 424, 498, 507

Davis, Adelle (1904-1974). Author and Health Foods Advocate. 680

Dawson Mills (Dawson, Minnesota) (Tri-County Soy Bean Co-operative Association until 1969) and Dawson Food Ingredients (from 1974)–Cooperative. 699, 704, 709, 846, 849, 863, 890

DeKalb Genetics. Including DeKalb-Pfizer Genetics (DeKalb, Illinois) from 1982 to 1990. 775

Death certificates. *See* Obituaries, Eulogies, Death Certificates, and Wills

Deceptive or misleading labeling or products. *See* Unfair Practices–Including Possible Deceptive / Misleading Labeling, Advertising, etc. *See also*: Adulteration

Delphos Grain & Soya Products Co. (Delphos, Ohio). 507, 510

Delsoy Products, Inc. (Dearborn, Michigan). Soy Protein Company. Renamed Whitehouse Products in 1963. Purchased by C.J. Christoff & Sons in 1983 (Lowell, Michigan). Renamed Chadalee Farms, Inc. 440, 448, 452, 455, 494, 496, 504, 516, 518, 527, 543, 570, 571, 573, 590, 627, 689, 690, 691, 697, 719, 720, 721, 727, 732, 734, 737, 759, 772, 806, 817, 818, 819, 827, 851, 862, 918, 922, 923, 925

Demos, Steve. *See* White Wave, Inc. (Boulder, Colorado)

Detection of soy proteins. *See* Soy Proteins–Detection

Detergents or soaps made from soy oil. *See* Soaps or Detergents

Developing nations. *See* Third World

Development, sustainable. *See* World Problems–Sustainable Development and Growth

Diabetes and Diabetic Diets. 37, 79, 86, 89, 141, 144, 158, 162, 180, 208, 233, 397, 459, 461, 705, 770, 917

Diamond, Holton W. “Rex”. 440, 447, 452, 456, 465, 467, 471, 472, 491, 492, 497, 499, 501, 502, 504, 505, 506, 509, 513, 518, 527, 531, 532, 542, 543, 544, 545, 546, 547, 551, 555, 556, 565, 575, 581, 595, 596, 606, 607, 616, 697, 703, 732, 733, 734, 737, 738, 780, 806, 814, 817, 818, 819, 820, 821, 827, 862, 922

Dies, Edward Jerome (1891-1979). 123, 130, 192, 371, 372, 408, 445, 468, 511, 631

Diesel Fuel, SoyDiesel, Biodiesel, or Artificial Petroleum (Made from Methyl Esters of Soybean Oil). 123, 213, 386, 700, 757, 812, 854, 864, 870, 899

Directories–Soybean Processors (Including Soyfoods Manufacturers), Researchers, Conference Attendees, and Other Names and Addresses Related to Soyfoods, Vegetarianism, Macrobiotics, etc. *See also* Directories–Japanese American in USA. 104, 158, 372, 468

Diseases of Soybeans (Bacterial, Fungal, and Viral / Virus). *See also*: Nematode Disease Control. 73, 180, 414, 459, 487

Diseases, pests, and other types of injury, plant protection from. *See* Plant Protection from Diseases, Pests and Other Types of Injury (General)

District of Columbia. *See* United States–States–District of Columbia

Documents with More Than 20 Keywords. 2, 6, 34, 38, 64, 73, 79, 86, 104, 117, 118, 122, 123, 125, 128, 130, 133, 136, 141, 144, 158, 159, 162, 180, 205, 211, 213, 216, 228, 263, 299, 371, 372, 408, 414, 424, 439, 445, 449, 459, 461, 462, 467, 468, 487, 498, 507, 510, 523, 524, 537, 539, 562, 566, 579, 591, 595, 599, 611, 613, 615, 631, 634, 643, 644, 659, 675, 680, 684, 694, 697, 700, 701, 705, 709, 712, 713, 728, 729, 734, 735, 739, 740, 741, 745, 750, 754, 757, 779, 789, 790, 809, 810, 835, 837, 843, 846, 851, 855, 858, 863, 864, 867, 870, 871, 873, 885, 890, 905, 918, 926

Dogs, Cats, and Other Pets / Companion Animals Fed Soybeans, Soybean Forage, or Soybean Cake or Meal as Feed / Pet Food / Petfood. 628

Domestication of the soybean. *See* Origin, Domestication, and Dissemination of the Soybean (General)

Drackett Co. (The) (Cincinnati and Sharonville [or Evendale], Ohio). 371, 402, 403, 415, 418, 419, 423, 424, 425, 429, 430, 437, 438, 468, 473, 480, 484, 488, 489, 495, 498, 514, 523, 526, 528, 529, 530, 537, 541, 567, 583, 586, 620, 629, 643, 659, 666, 676, 697, 700, 701, 708, 724, 726, 728, 731, 735, 779, 802, 809, 834, 835, 836, 837, 840, 841, 842, 869, 890, 918, 919, 920, 921

Dried-frozen tofu. *See* Tofu, Frozen or Dried-Frozen

Drying of soybeans. *See* Storage of Seeds

DuPont (E.I. Du Pont de Nemours & Co., Inc.) and DuPont Agricultural Enterprise / Products (Wilmington, Delaware). Formerly spelled Du Pont. 133, 262, 299, 354, 514, 524, 525, 663, 735, 762

Dust Suppressants and Dust Control–Industrial Uses of Soy Oil as a Non-Drying Oil. 757, 779, 789, 864, 870

Earliest articles on soy in major magazines and newspapers. *See* Media–Earliest Articles on Soy

Earliest commercial soy products. *See* Historical–Earliest Commercial Product

Earliest document seen... *See* Historical–Earliest Document Seen

Ecology (“The Mother of All the Sciences”) and Ecosystems. 650, 682, 854, 867, 872, 897, 903, 906

Economic Research Service of USDA. *See* United States Department of Agriculture (USDA)–Economic Research Service (ERS)

Economics of soybean production and hedging. *See* Marketing Soybeans

Edamamé. *See* Green Vegetable Soybeans, Green Vegetable Soybeans–Edamamé

Eden Foods, Inc. (Clinton, Michigan; Founded 4 Nov. 1969) and American Soy Products (Saline, Michigan; Founded Aug. 1986). 688, 759, 770, 774, 867

Edible or food-grade soybeans. *See* Green Vegetable Soybeans–Vegetable-Type, Garden-Type, or Edible Soybeans

Edmondson, J.B. “Ben” (1846-1929). Soybean Pioneer in Indiana, and in Hendricks County, Indiana. 439, 631

Efficiency of animals in converting feeds into human foods. *See* Feeds–Efficiency

Efficiency of plants vs. animals in producing food. *See* Vegetarianism–Efficiency of Plants... in Producing Food

Egypt. *See* Africa–Egypt

Ehret, Arnold (1866-1922). Pioneer in Fasting and Vegetarianism in Germany, Switzerland, and the United States (Los Angeles). 10

Eichberg, Joseph. *See* American Lecithin Corp.

El Molino Mills (Los Angeles Area. Founded by Edward Allen Vandercook. Began Operations on 1 March 1926 in Alhambra, California). 638

Elizabeth City Oil and Fertilizer Co. (Elizabeth City, North Carolina; 1915). 6, 104, 371

Embargoes, tariffs, duties. *See* Trade Policies (International) Concerning Soybeans, Soy Products, or Soyfoods–Tariffs, Duties, Embargoes, Moratoriums

Energy, renewable, from soybeans. *See* Diesel Fuel, SoyDiesel, Biodiesel, or Artificial Petroleum

England. *See* Europe, Western–United Kingdom

Environmental issues, concerns, and protection. *See* Water Use, Misuse, and Scarcity

Enzyme active soy flour. *See* Soy Flour, Grits, and Flakes–Enzyme Active

Enzymes–Commercial Enzyme Preparations Used in Making Soyfoods by Hydrolyzing or Modifying Soy Protein, Carbohydrates, or Lipids (Including Phosphatides). 683, 729, 741, 810

Enzymes in Soybean Seeds–Lipoxygenase (Formerly Called Lipoxidase) and Its Inactivation. 34, 615, 735, 799

Enzymes in Soybean Seeds–Other. 173, 445, 774

Equipment for soybean crushing–manufacturers. *See* Anderson International Corp., Blaw-Knox Co. and Rotocel, Crown Iron Works Co., French Oil Mill Machinery Co.

Erewhon (Boston, Massachusetts). Founded April 1966 by Aveline and Michio Kushi in Boston. Merged with U.S. Mills in 1986. 826

Erosion of soils. *See* Soil Science–Soil Conservation or Soil Erosion

Estrogens (in Plants–Phytoestrogens, Especially in Soybeans and Soyfoods), Including Isoflavones (Including Genistein, Daidzein, Glycetein, Coumestrol, Genistin, and Daidzin). 445

Ethanol (ethyl alcohol). *See* Solvents

Etymology of the Word “Soy” and its Cognates / Relatives in English. 615

Etymology of the Word “Soyfoods” and its Cognates / Relatives in Various Languages. 114

Etymology of the Words “Soya,” “Soy,” and “Soybean” and their Cognates / Relatives in Various Languages. 159, 211, 224, 341, 414, 459

Etymology. *See* the specific product concerned (e.g. soybeans, tofu, soybean meal, etc.)

Europe, Eastern–Bulgaria. 36, 369, 393, 487, 674

Europe, Eastern–Czechoslovakia (From 1918 until 1 Jan. 1993; then divided into The Czech Republic [formerly Bohemia and Moravia], and Slovakia [officially “The Slovak Republic”]). 211, 487

Europe, Eastern–Hungary (Magyar Köztársaság). 487, 680, 803

Europe, Eastern–Poland. 487, 674

Europe, Eastern–Romania (Including Moldavia and Bessarabia until 1940-44). Also spelled Rumania. 369, 487

Europe, Eastern–Russia (Russian Federation; Formerly Russian SFSR, a Soviet Republic from 1917 to Dec. 1991). 71, 180, 213, 235, 713, 886

Europe, Eastern–Slovakia (Slovak Republic, or Slovensko; Eastern Part of Czechoslovakia from 1918 until 1 Jan. 1993). 211

Europe, Eastern–USSR (Union of Soviet Socialist Republics or Soviet Union; called Russia before 1917. Ceased to exist in Dec. 1991). 71, 180, 213, 235, 459, 487, 564, 713, 750, 886

Europe, Eastern–Yugoslavia. Composed of Serbia and Montenegro from 17 April 1992 to 13 March 2002. From 1918-1991 included the 6 Republics of Serbia / Servia, Croatia, Bosnia and Herzegovina, Slovenia, Macedonia, and Montenegro. Included Carnaro, Fiume / Rijeka / Rieka 1947-1992; Formerly Also Spelled Yugoslavia. *See* also Serbia and Montenegro. 487, 503

Europe, Western–Austria (Österreich). 34, 180, 487

Europe, Western–Belgium, Kingdom of. 295, 303, 369, 459, 487, 520, 699, 707, 709, 843, 918

Europe, Western–Denmark (Danmark; Including the Province of Greenland [Kalaallit Nunaat]). 34, 64, 73, 133, 180, 228, 459, 709, 858

Europe, Western–France (République Française). 92, 117, 180, 193, 195, 203, 208, 211, 241, 246, 295, 303, 373, 413, 453, 462, 487, 743, 858, 906

Europe, Western–Germany (Deutschland; Including East and West Germany, Oct. 1949–July 1990). 2, 6, 34, 63, 64, 65, 73, 79, 87, 93, 107, 117, 129, 133, 135, 136, 159, 180, 190, 200, 203, 207, 211, 218, 233, 235, 253, 269, 299, 307, 336, 341, 369, 384, 410, 459, 473, 487, 520, 524, 534, 538, 631, 675, 677, 729, 735, 740, 799, 858, 875, 880, 886, 906

Europe, Western–Greece (Hellenic Republic–Elliniki Dimokratia–Hellas. Including Crete, Krite, Kriti, or Creta, and Epirus or Epeiros). 459, 487

Europe, Western–Introduction of Soybeans to. This document contains the earliest date seen for soybeans in a certain Western European country. 117

Europe, Western–Introduction of Soybeans to. This document contains the earliest date seen for the cultivation of soybeans in a certain Western European country. 117, 221

Europe, Western–Ireland, Republic of (Éire; Also Called Irish Republic). 153, 221, 662, 674

Europe, Western–Italy (Repubblica Italiana). 73, 180, 190, 200, 203, 207, 269, 459, 514, 520, 638, 663, 700, 729, 854

Europe, Western–Netherlands, Kingdom of the (Koninkrijk der Nederlanden), Including Holland. 73, 180, 269, 459, 487, 699, 707, 709, 735, 746, 776, 781, 855, 858, 890

Europe, Western–Norway, Kingdom of (Kongeriket Norge). 180, 459

Europe, Western–Scotland (Part of United Kingdom). 117, 158, 169, 514, 592

Europe, Western–Spain, Kingdom of (Reino de España). 459, 750

Europe, Western–Sweden, Kingdom of (Konungariket Sverige). 73, 459, 674, 757

Europe, Western–Switzerland (Swiss Confederation). 211, 630

Europe, Western–United Kingdom of Great Britain and Northern Ireland (UK–Including England, Scotland, Wales, Channel Islands, Isle of Man, Gibraltar). 27, 63, 65, 66, 73, 79, 84, 94, 100, 107, 114, 117, 120, 122, 126, 128, 157, 158, 159, 169, 180, 203, 208, 228, 234, 237, 341, 386, 432, 437, 446, 459, 487, 503, 514, 537, 567, 587, 592, 615, 630, 648, 663, 700, 709, 731, 748, 757, 758, 790, 799, 837, 851, 858, 864, 906, 913, 921

Europe, Western–Vatican City (Officially The Holy See). 813

Europe, Western. 42, 147, 161, 235, 268, 320, 583, 639, 739, 923

Evans Seed Co. (West Branch, Ogemaw County, Michigan) and Mr. Edward Ellsworth Evans (1864-1928). 117

Exercise. *See* Physical Fitness, Physical Culture, and Exercise

Expellers. *See* Soybean Crushing–Equipment–Screw Presses and Expellers

Experiment Stations, Office of. *See* United States Department of Agriculture (USDA)–Office of Experiment Stations

Experiment stations (state) in USA. *See* Agricultural Experiment Stations in the United States

Explosions or fires. *See* Soybean Crushing–Explosions and/or Fires in Soybean Solvent Extraction Plants

Explosives Made from Glycerine–Industrial Uses of Soy Oil as a Non-Drying Oil. 38, 144, 205, 277, 432, 480, 574

Exports. *See* Trade of Soybeans, Oil & Meal, or *see* Individual Soyfoods Exported

Extru-Tech, Inc. *See* Extruder / Extrusion Cooker Manufacturers–Wenger International, Inc.

Extruder / Extrusion Cooker Manufacturers–Wenger International, Inc. (Kansas City, Missouri; Sabetha, Kansas), Incl. Extru-Tech, Inc. 628, 829, 839

Extruders, Extrusion Cooking, and Extrusion Cookers. *See* also Low Cost Extrusion Cookers (LECs). 610, 624, 628, 630, 647, 658, 665, 683, 700, 709, 726, 743, 799, 843

FAO. *See* United Nations (Including UNICEF, FAO, UNDP, UNESCO, and UNRRA) Work with Soy

Fairchild, David (1869-1954). In 1897 founded Section of Foreign Seed and Plant Introduction. After March 1901, Renamed Office of Foreign Seed and Plant Introduction, then Office of Foreign Plant Introduction, then Division of Foreign Plant Introduction. 41, 462

Family history. *See* Genealogy and Family History

Far-Mar-Co, Inc. (A Cooperative; Hutchinson, Kansas). Created on 1 June 1968 by the merger of four regional grain cooperatives including Farmers Union Cooperative Marketing Assn., which had owned the former Dannen soybean crushing plant in St. Joseph, Missouri, since Sept. 1963. Parts later sold to PMS Foods, Inc. 735, 839, 863, 885

Farm Food Co. (San Rafael, then San Francisco, California), Farm Foods, and Farm Soy Dairy (Summertown, Tennessee). Div. of Hain Food Group (Uniondale, New York). Merged with Barricini Foods on 31 May 1985. Acquired by 21st Century Foods from Barricini Foods in mid-1993. 773, 924

Farm Machinery–Etymology of Related Terms and Their Cognates. 588

Farm machinery. *See* Tractors

Farmers Union Grain Terminal Association (GTA). Established in 1938 in St. Paul, Minnesota. 750

Farmland Industries, Inc. Named Consumers Cooperative Association from 1934 to 1 Sept. 1966. Declared Bankruptcy in May 2002. 498, 507

Fasting pioneers. *See* Ehret, Arnold

Fatty Acids for Non-Drying or Drying Applications (As in Hot-Melt Glues or the Curing Component of Epoxy Glues)–Industrial Uses of Soy Oil. 118, 213, 399, 538, 864

Fearn, Dr. Charles E. (-1949), and Fearn Soya Foods / Fearn Natural Foods. 34, 79, 158

Feeds–Efficiency of Animals in Converting Feeds into Human Foods. 789

Feeds–Soybeans, soybean forage, or soy products fed to various types of animals. *See* The type of animal–chickens, pigs, cows, horses, etc.

Feeds / Forage from Soybean Plants–Hay (Whole Dried Soybean Plants, Foliage and Immature Seed Included). 413

Feeds / Forage from Soybean Plants–Pasture, Grazing or Foraging. 41, 73, 413

Feeds / Forage from Soybean Plants–Silage / Ensilage Made in a Silo. 44, 73, 413, 574

Feeds / Forage from Soybean Plants–Soilage and Soiling (Green Crops Cut for Feeding Confined Animals). 73

Feeds / Forage from Soybean Plants–Straw (Stems of Whole Dried Soybean Plants). Also Fertilizing Value, Other Uses, Yields, and Chemical Composition. 73, 79, 145, 413

Feeds / Forage from Soybean Plants or Full-Fat Seeds (Including Forage, Fodder {Green Plants}, or Ground Seeds). 41, 53, 104, 140, 159, 180, 208, 373, 461

Feeds Made from Soybean Meal (Defatted). 141, 294, 299, 682, 750, 779

Fermented black beans (dow see). *See* Soy Nuggets

Fermented tofu. *See* Tofu, Fermented

Fermented whole soybeans. *See* Natto, Dawa-dawa, Kinema, Thua-nao

Ferruzzi-Montedison (Italy). Purchased Central Soya Co. (USA) in Oct. 1987. European crushing operations renamed Cereol on 1 Jan. 1990. Cereol acquired by Bunge in April 2003. 854

Fertilizer, soybean meal used as. *See* Soybean Meal / Cake, Fiber (as from Okara), or Shoyu Presscake as a Fertilizer or Manure for the Soil

Fertilizers / Fertilizer (Incl. Foliar Sprays), Fertilization, Plant Nutrition, Mineral Needs, and Nutritional / Physiological Disorders of Soybeans (Including Chlorosis). 79, 597

Fiber–Okara or Soy Pulp, from Making Soymilk or Tofu. 688, 867

Fiber–Seventh-day Adventist Writings or Products (Especially Early) Related to Dietary Fiber. 680

Fiber, Soy–Bran (Pulverized Soybean Hulls / Seed Coats) and Other Uses of Soybean Hulls. 836, 870, 917

Fiber, Soy–General, for Food Use (Specific Type Unknown). 358

Fiber. *See* Carbohydrates–Dietary Fiber

Fibers (Artificial Wool or Textiles Made from Spun Soy Protein Fiber, Including Azlon, Soyilon, and Soy Silk /

Soy silk)–Industrial Uses of Soy Proteins. 63, 169, 190, 193, 194, 195, 199, 200, 202, 207, 219, 225, 229, 237, 241, 247, 248, 249, 251, 259, 263, 268, 269, 271, 273, 274, 277, 288, 291, 295, 296, 297, 298, 303, 306, 340, 343, 344, 346, 347, 348, 349, 350, 354, 355, 356, 357, 358, 362, 365, 367, 368, 374, 378, 381, 386, 388, 389, 391, 398, 400, 401, 402, 403, 407, 410, 415, 417, 419, 423, 425, 429, 430, 431, 432, 437, 438, 442, 450, 451, 458, 473, 480, 484, 488, 489, 495, 512, 514, 520, 523, 525, 526, 527, 528, 530, 537, 567, 592, 620, 629, 634, 643, 659, 663, 684, 697, 699, 700, 701, 707, 708, 711, 724, 726, 729, 731, 735, 741, 748, 764, 768, 775, 779, 790, 799, 802, 809, 825, 831, 834, 835, 836, 837, 841, 842, 860, 864, 869, 870, 903, 906, 918, 919, 920, 921

Fires or explosions. *See* Soybean Crushing–Explosions and/or Fires in Soybean Solvent Extraction Plants

Fish or Crustaceans (e.g., Shrimp) Fed Soybean Meal or Oil as Feed Using Aquaculture or Mariculture. 713

Fish, meatless. *See* Meat Alternatives–Meatless Fish, Shellfish, and Other Seafood-like Products

Fitness. *See* Physical Fitness, Physical Culture, and Exercise

Flatulence or Intestinal Gas–Caused by Complex Sugars (As the Oligosaccharides Raffinose and Stachyose in Soybeans), by Fiber, or by Lactose in Milk. 618, 683

Flavor Problems and Ways of Solving Them (Especially Beany Off-Flavors in Soy Oil, Soymilk, Tofu, Whole Dry Soybeans, or Soy Protein Products, and Ways of Masking or Eliminating Them). 34, 86, 151, 224, 428, 468, 473, 683, 699, 709, 833, 835, 926

Flax plant or flaxseed. *See* Linseed Oil, Linseed Cake / Meal, or the Flax / Flaxseed Plant

Flour, soy–Imports, Exports. *See* Soy Flour–Imports, Exports, International Trade

Flour, soy. *See* Soy Flour

Foams for Fighting Fires–Industrial Uses of Soy Proteins (Foam, Foaming Agents). 2, 442, 470, 480, 522, 523, 779, 864, 870

Fodder, soybean. *See* Feeds / Forage from Soybean Plants or Full-Fat Seeds

Food Production and Distribution Administration of USDA. *See* United States Department of Agriculture (USDA)–War Food Administration (WFA)

Food and Drug Administration (FDA, U.S. Dept. of Health

and Human Services). 579, 613, 619, 680, 867, 905

Food and Nutrition Service of USDA. *See* United States Department of Agriculture (USDA)–Food and Nutrition Service (FNS)

Foodservice and Institutional Feeding or Catering, Including Quantity or Bulk Recipes. 551, 738, 851, 867, 885, 895, 922

Foodservice and institutional feeding or catering. *See* School Lunch Program

Forage, soybean. *See* Feeds / Forage from Soybean Plants, Feeds / Forage from Soybean Plants or Full-Fat Seeds

Ford, Henry (1863-1947), and His Researchers–Work with Soy–Robert Boyer, Frank Calvert, William Atkinson, Edsel Ruddiman, Bob Smith, Holton W. “Rex” Diamond, and Jan Willemse. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491,

492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926

Foreign Agricultural Service of USDA. *See* United States Department of Agriculture (USDA)–Foreign Agricultural Service (FAS)

Foundry cores, binder. *See* Binder for Sand Foundry Cores

Fouts Family of Indiana–Incl. Taylor Fouts (1880-1952), His Brothers Noah Fouts (1864-1938) and Finis Fouts (1866-1943), Their Soyland Farm (1918-1928), and Their Father Solomon Fouts (1826-1907). 439, 459, 510, 631, 713, 716, 873

France. *See* Europe, Western–France

Frankfurters, hot dogs, or wieners–meatless. *See* Meat Alternatives–Meatless Sausages

Franklin, Benjamin (1706-1790; American Statesman and Philosopher), Charles Thomson, and the American Philosophical Society (APS–Philadelphia, Pennsylvania). 462,

739, 826, 905

French Oil Mill Machinery Co. (Piqua, Ohio). Maker of Soybean Crushing Equipment. Also Named French Oil Machinery Co. 2, 307, 445, 643, 675, 677, 873

Frozen desserts, non-dairy. *See* Soy Ice Cream

Frozen tofu. *See* Tofu, Frozen or Dried-Frozen

Fruitlands community. *See* Alcott, Amos Bronson and Louisa May

Fuji Oil Co., Ltd. (Osaka, Japan), Incl. Fuji Purina Protein Ltd. 709

Funk Brothers Seed Co. (Bloomington, Illinois). Founded in 1901 by Eugene D. Funk, Sr. (1867-1944). Started selling soybeans in 1903. Started Crushing Soybeans in 1924. Renamed Funk Seeds International by 1983. 6, 82, 104, 123, 133, 158, 372, 424, 498, 539, 566, 713

Gandhi, Mohandas K. ("Mahatma") (1869-1948). Vegetarian Pioneer Worldwide, and in India and England. 176, 180, 813

Ganmodoki. *See* Tofu, Fried

Gardner, Henry A. *See* Paint Manufacturers' Association of the U.S.

Gas, intestinal. *See* Flatulence or Intestinal Gas

Genealogy and Family History. *See Also*: Obituaries, Biographies. 82, 109, 189, 211, 218, 288, 296, 340, 387, 409, 414, 488, 572, 597, 599, 634, 648, 673, 684, 712, 713, 719, 727, 750, 759, 788, 807, 837, 838, 855

General Mills, Inc. (Minneapolis, Minneapolis). 468, 473, 498, 507, 538, 539, 602, 604, 611, 614, 619, 625, 630, 635, 660, 666, 699, 700, 704, 707, 708, 709, 729, 735, 740, 810, 819, 830, 837, 846, 849, 856, 863, 890, 921

Genetic Engineering, Biotechnology (Biotech), and Transgenic Plants. 762, 858, 881, 887

Genetics, soybean. *See* Breeding of Soybeans and Classical Genetics

Georgeson, Charles Christian (1851-1931) of Kansas and Alaska. 462

Germany. *See* Europe, Western-Germany

Glidden Co. (The) (Chicago, Illinois, and Cleveland, Ohio).

See also: Julian, Percy. 6, 76, 91, 93, 95, 97, 123, 133, 140, 141, 148, 237, 251, 269, 274, 299, 344, 354, 371, 408, 424, 442, 459, 468, 471, 472, 474, 498, 507, 520, 522, 523, 524, 537, 539, 562, 566, 591, 615, 675, 701, 707, 729, 734, 737, 740, 741, 757, 809, 818, 829, 830, 831, 839, 864, 885, 890

Global Warming / Climate Change as Environmental Issues. 897

Gluten. *See* Wheat Gluten

Glycerine, explosives made from. *See* Explosives Made from Glycerine

Goats Fed Soybeans, Soybean Forage, or Soybean Cake or Meal as Feed. 308

Goitrogens / Goitrogenic Substances (Which Can Affect Thyroid Function and Cause Goiter). 188, 230

Government policies and programs effecting soybeans. *See* Policies and programs

Grades and grading of soybeans. *See* Seed Quality of Soybeans-Condition, Grading, and Grades (Moisture, Foreign Material, Damage, etc.)

Graham, Sylvester (1794-1851). American Health Reformer and Vegetarian (New York). 579, 613, 680

Grain Farmers of Ontario (GFO). *See* Ontario Soybean Growers (Canada)

Grain Processing Corporation (GPC-Muscatine, Iowa). 863

Granose Foods Ltd. (Newport Pagnell, Buckinghamshire [Bucks.], England). Founded in 1899 under the name The International Health Association Ltd. Renamed Granose Foods Ltd. in 1926. Acquired by Haldane Foods Group in Jan. 1991. 599

Grazing green soybean plants. *See* Feeds / Forage from Soybean Plants-Pasture, Grazing or Foraging

Green Manure, Use of Soybeans as, by Plowing / Turning In / Under a Crop of Immature / Green Soybean Plants for Soil Improvement. 73

Green Vegetable Soybeans (Edamamé)-Machinery or Equipment Used for Harvesting or Picking, Sorting, Cleaning, and / or Shelling, Threshing, or Depodding. 145, 926

Green Vegetable Soybeans-Etymology of This Term and Its

Cognates / Relatives in Various Languages. 372

Green Vegetable Soybeans–Horticulture–How to Grow as a Garden Vegetable or Commercially. 372, 568

Green Vegetable Soybeans–Large-Seeded Vegetable-Type or Edible Soybeans, General Information About, Not Including Use As Green Vegetable Soybeans. 278, 358, 488, 566

Green Vegetable Soybeans–Leaves of the Soybean Plant Used as Food or Medicine. Called *Huo* in Chinese. 926

Green Vegetable Soybeans–Soybean Seedlings or Their Leaves Served as a Tender Vegetable. Called *Doumiao* or *Tou Miao* in Chinese. 926

Green Vegetable Soybeans–The Word Edamame (Japanese-Style, in the Pods), Usually Grown Using Vegetable-Type Soybeans–Appearance in European-Language Documents. 871, 895, 926

Green Vegetable Soybeans–Vegetable-Type, Garden-Type, or Edible of Food-Grade Soybeans, General Information About, Including Use As Green Vegetable Soybeans. 226, 371, 372, 568, 926

Green Vegetable Soybeans Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 145, 215, 263

Green Vegetable Soybeans, Usually Grown Using Vegetable-Type Soybeans. 61, 62, 73, 79, 86, 145, 158, 211, 215, 216, 226, 250, 263, 289, 371, 372, 385, 408, 416, 459, 554, 568, 577, 591, 659, 684, 701, 761, 763, 823, 855, 871, 895, 896, 917, 926

Green soybeans. *See* Soybean Seeds–Green

Griffith Laboratories (Chicago and Alsip, Illinois). 729, 734, 810, 829, 863

Groundnuts. *See* Peanut, Peanuts

Gunther Products, Inc. (Galesburg, Illinois. Founded by J.K. Gunter in 1949. Started in 1950. Acquired in April 1995 by Quest International, a Unit of Unilever). 465, 468, 734, 890

HVP type soy sauce. *See* Soy Sauce, HVP Type (Non-Fermented or Semi-Fermented)

Haberlandt soybean variety. *See* Soybean Varieties USA–Haberlandt

Haberlandt, Friedrich J. (1826-1878, *Hochschule fuer Bodenkultur*, Vienna, Austria). 487

Hackleman, Jay C. (1888-1970, Extension Agronomist, Univ. of Illinois). 371, 439, 510, 631, 713

Hain Celestial Group, Inc. (Uniondale, New York). Hain Food Group, Inc. before 30 May 2000. Hain Pure Food Co. since Nov. 1931. Founded in Oct. 1926 by Harold Hain as Hain Health Foods. 924

Haldane Foods Group Ltd. (Newport Pagnell, Buckinghamshire, England). Including Regular Tofu Co., Realeat Foods, Direct Foods, Haldane Foods, Vegetarian Feasts, Vegetarian Cuisine, Genice, Unisoy, and Granose Foods Ltd. Acquired by The Hain Celestial Group in fall 2006. 599

Hamanatto. *See* Soy Nuggets

Hansa Muehle AG. *See* Oelmuehle Hamburg AG (Hamburg, Germany)

Hartz (Jacob) Seed Co. (Stuttgart, Arkansas). Founded by Jacob Hartz, Sr. (1888-1963) in 1942. Continued by Jake Hartz, Jr. (1920-). Acquired by Monsanto in April 1983. Headquarters at Des Moines, Iowa, since Jan. 1998. 439, 713

Harvesting and Threshing Soybeans (Including Use of Chemical Defoliation and Defoliants to Facilitate Harvesting). 19, 38, 73, 79, 106, 118, 204, 228, 231, 368, 378, 381, 449, 459, 487, 648, 748, 754, 784

Hauser, Gayelord (1895-1984). Health foods pioneer, author, and lecturer in Los Angeles, California. 579, 613, 680

Hawaii. *See* United States–States–Hawaii

Hay, soybean. *See* Feeds / Forage from Soybean Plants–Hay

Hayes Ashdod Ltd. (renamed Solbar Hatzor Ltd. in April 1987) and Hayes General Technology (Israel). 829

Healing arts, alternative. *See* Medicine–Alternative

Health Foods–Manufacturers. 30, 158, 459, 579, 613

Health Foods Movement and Industry in the United States–General (Started in the 1890s by Seventh-day Adventists). 460, 579, 613, 680, 747

Health Foods Restaurants, Cafeterias, and Cafés / Cafes (1890s to 1960s). 30

Health Foods Stores / Shops (mostly USA)–Early (1877 to 1970s). 158, 459, 589, 591, 705

Health and Dietary / Food Reform Movements, especially from 1830 to the 1930s. 165, 579, 599, 613, 637, 680, 705, 747

Health foods manufacturers. *See* El Molino Mills

Health foods movement in Los Angeles, California. *See* Bragg, Paul Chappius, Davis, Adelle, El Molino Mills, Hauser, Gayelord

Hemp (*Cannabis sativa*)—Used as a Source of Fiber for Textiles or Paper, Protein (Edestin), or Seeds (*Asanomi*). Includes Marijuana / Marihuana. *See Also* Hemp Oil or Hempseed Oil. Does NOT include Wild Hemp (*Sesbania macrocarpa*) or Sunn Hemp (*Crotalaria juncea*) or Manila hemp (*Musa textilis*, a species of plantain). 169, 218, 268, 321, 339, 671, 684, 714, 735

Herbicides. *See* Weeds—Control and Herbicide Use

Hexane. *See* Solvents

Historical—Documents on Soybeans or Soyfoods Published from 1900 to 1923. 2, 6

Historical—Earliest Commercial Product Seen of a Particular Type or Made in a Particular Geographic Area. 80, 440

Historical—Earliest Document Seen Containing a Particular Word, Term, or Phrase. 63, 70, 73, 113, 130, 158, 167, 169, 215, 220, 224, 225, 228, 235, 237, 269, 294, 410, 459, 467, 536, 549, 588, 601, 604, 736

Historical—Earliest Document Seen of a Particular Type. 205, 515

Historical—Earliest Document Seen on a Particular Subject. 7, 9, 20, 23, 34, 38, 60, 77, 86, 97, 123, 145, 205, 247, 424, 447, 456, 467, 498, 507, 536

Historical—Earliest Document Seen on a Particular Subject. 21, 38, 43, 65, 194, 204, 332, 371, 416, 429, 468, 558

Historically Important Events, Trends, or Publications. 83, 260, 408, 414, 468, 517, 562, 628, 757, 779

History—Chronology. *See* Chronology / Timeline

History of the Soybean—Myths and Early Errors Concerning Its History. 70, 82, 97, 371, 397, 500, 631

History. *See also* Historical—Earliest..., Biography, Chronology / Timeline, and Obituaries. 2, 6, 19, 41, 79, 106, 117, 124, 141, 157, 159, 180, 189, 211, 218, 233, 234, 276, 277, 299, 341, 371, 384, 387, 407, 408, 409, 414, 439, 447, 449, 453,

455, 459, 461, 467, 480, 487, 488, 510, 511, 515, 517, 521, 522, 524, 528, 529, 530, 534, 535, 538, 539, 550, 556, 566, 572, 576, 584, 588, 597, 605, 606, 615, 620, 631, 633, 634, 643, 644, 647, 648, 650, 653, 654, 659, 660, 664, 666, 670, 671, 672, 673, 675, 677, 680, 684, 685, 689, 690, 691, 692, 695, 696, 697, 701, 703, 704, 705, 706, 710, 712, 713, 714, 719, 725, 726, 727, 729, 731, 735, 737, 738, 739, 740, 741, 745, 748, 753, 757, 758, 762, 763, 768, 769, 771, 772, 778, 779, 783, 784, 785, 786, 788, 789, 790, 791, 794, 795, 803, 804, 805, 807, 809, 810, 815, 816, 817, 822, 826, 827, 828, 834, 835, 837, 838, 839, 840, 841, 842, 843, 846, 847, 848, 849, 851, 852, 853, 855, 856, 858, 862, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 880, 884, 887, 890, 898, 900, 901, 902, 905, 906, 910, 912, 915, 916, 917, 918, 919, 922, 923, 924, 926

Holland. *See* Europe, Western—Netherlands

Holmberg, Sven A. (1894-1982, Fiskeby, Norrköping, Sweden). Soybean Breeder for the Far North. 674

Home Economics, Bureau of. *See* United States Department of Agriculture (USDA)—Bureau of Human Nutrition and Home Economics

Honeybees. *See* Bees

Honeymead (Mankato, Minnesota)—Cooperative. 750, 810

Honeymead Products Co. (Cedar Rapids, Spencer, and Washington, Iowa, 1938-1945. Then Mankato, Minnesota, 1948-1960). *See also* Andreas Family. 424, 498, 507, 524, 750

Hong Kong. *See* Asia, East—Hong Kong

Hormones from soybeans. *See* Sterols or Steroid Hormones

Horvath, Artemy / Arthemey Alexis (1886-1979) and Horvath Laboratories. *See also* Soya Corporation of America and Dr. Armand Burke. 30, 34, 64, 71, 74, 111, 123, 136, 146, 151, 158, 213, 214, 217, 459, 498, 705

Hulls, soybean, uses. *See* Fiber, Soy

Human Nutrition—Clinical Trials. 755

Hunger, Malnutrition, Famine, Food Shortages, and Mortality Worldwide. 443, 739, 755, 909

Hydraulic presses. *See* Soybean Crushing—Equipment—Hydraulic Presses

Hydrogenated Products (Margarine, Shortening, Soy Oil) Industry and Market Statistics, Trends, and Analyses—By Geographical Region. 136, 144, 160, 162, 220, 228, 474, 539

- Hydrogenation–General, Early History, and the Process. Soy is Not Mentioned. 542
- Hydrogenation of Soybean Oil, Soy Fatty Acids, or Soy Lecithin. 74, 89, 158, 213, 216, 351, 405, 428, 445, 447, 459, 509, 531, 690, 771, 823
- Hydrogenation. *See* Margarine, Shortening, Trans Fatty Acids, Vanaspati, also Margarine and Shortening
- Ice cream, non-soy, non-dairy. *See* Soy Ice Cream–Non-Soy Non-Dairy Relatives
- Ice cream, soy. *See* Soy Ice Cream
- IITA (Nigeria). *See* International Institute of Tropical Agriculture (IITA) (Ibadan, Nigeria)
- Illinois, University of (Urbana-Champaign, Illinois). Soyfoods Research & Development. 713, 729, 789
- Illinois. *See* United States–States–Illinois
- Illumination or Lighting by Burning Soy Oil in Wicked Oil Lamps Like Kerosene–Industrial Uses of Soy Oil as a Non-Drying Oil. 86, 147, 161, 757, 864
- Illustrations Published after 1923. *See also* Photographs. 39, 51, 138, 205, 244, 307, 371, 410, 440, 445, 448, 494, 511, 524, 590, 617, 628, 643, 648, 677, 686, 750, 800, 806, 819, 858, 871, 872, 874, 887, 892, 899
- Illustrations, Not About Soy, Published after 1923. *See also* Photos. 8, 48
- Illustrations, Not About Soy, Published before 1924. *See also* Photos. 4
- Imagine Foods, Inc. (Palo Alto & San Carlos, California). Rice Dream / Beverage Manufactured by California Natural Products (CNP, Manteca, California). 867
- Implements, agricultural. *See* Machinery (Agricultural), Implements, Equipment and Mechanization
- Important Documents #1–The Very Most Important. 7, 9, 18, 20, 23, 34, 38, 60, 63, 73, 77, 82, 83, 86, 90, 97, 118, 122, 123, 145, 153, 164, 205, 215, 221, 237, 240, 247, 371, 408, 416, 424, 425, 445, 447, 456, 459, 467, 468, 487, 498, 507, 522, 536, 549, 558, 566, 589, 643, 670, 694, 736, 868, 881, 884
- Important Documents #2–The Next Most Important. 21, 79, 110, 113, 125, 130, 136, 141, 144, 158, 159, 169, 180, 220, 224, 225, 228, 235, 269, 341, 359, 397, 410, 429, 449, 458, 461, 480, 514, 523, 562, 563, 588, 601, 608, 648, 659, 661, 674, 692, 709, 724, 750, 754, 757, 779, 809, 810, 842, 862, 864
- Imports. *See* Trade of Soybeans, Oil & Meal, or *see* Individual Soyfoods Imported
- INARI, Ltd. *See* Sycamore Creek Co.
- India. *See* Asia, South–India
- Indiana Soy Pioneers. *See* Central Soya Co., Fouts Family, Meharry
- Indiana. *See* United States–States–Indiana
- Indonesia. *See* Asia, Southeast–Indonesia
- Indonesian-style soy sauce. *See* Soy Sauce, Indonesian Style or from the Dutch East Indies (Kecap, Kécap, Kechap, Ketjap, Kétjap) Ketchup / Catsup
- Industrial Uses of Soy Oil (General). 74, 77, 92, 103, 104, 121, 132, 136, 146, 147, 155, 156, 159, 161, 178, 239, 263, 275, 288, 294, 359, 373, 417, 461, 809, 864, 897, 907
- Industrial Uses of Soy Proteins–Etymology of This Term and Its Cognates / Relatives in Various Languages. 169, 190, 194, 248, 398
- Industrial Uses of Soy Proteins–General and Minor Uses–Galalith, Sojalith, Cosmetics (Lotions and Soaps), Rubber Substitutes, Insecticides, etc. *See also* Culture Media as for Antibiotics Industry. 92, 96, 110, 116, 136, 148, 158, 173, 194, 210, 287, 373, 397, 402, 444, 449, 458, 461, 528, 537, 541, 633, 713, 741, 840, 841, 845, 864
- Industrial Uses of Soybeans (General Non-Food, Non-Feed). 23, 99, 100, 106, 173, 211, 244, 279, 427, 445, 466, 482, 540, 554, 564, 566, 576, 664, 676, 765, 767, 779, 785, 809, 810, 854, 864, 870, 878, 887, 908
- Industrial Uses of Soybeans (Non-Food, Non-Feed)–Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 83, 123, 126, 130, 133, 136, 160, 168, 190, 470, 520, 523, 535, 537, 539, 626, 757, 762, 779, 864, 870, 881
- Industrial Uses of Soybeans (Non-Food, Non-Feed)–Industry and Market Statistics, Trends, and Analyses–Larger Companies (Ford Motor Co., I.F. Laucks, O'Brien Varnish Co., The Drackett Co., ADM, General Mills, etc.). 43, 54, 70, 82, 99, 108, 110, 112, 113, 115, 119, 123, 124, 126, 137, 138, 140, 147, 152, 160, 161, 194, 200, 202, 203, 204, 210, 214, 219, 223, 235, 237, 241, 248, 275, 291, 319, 324, 333, 343, 349, 355,

356, 357, 417, 430, 432, 441, 442, 458, 459, 462, 484, 488, 523, 539, 567, 588, 643, 645, 671, 685, 700, 707, 720, 721, 722, 766, 775, 790, 835, 836, 854, 864

Industrial uses of soy oil as a drying oil. *See* Adhesives, Asphalt Preservation Agents, Caulking Compounds, Artificial Leather, and Other Minor or General Uses, Ink for Printing, Paints, Varnishes, Enamels, Lacquers, and Other Protective / Decorative Coatings, Rubber Substitutes or Artificial / Synthetic Rubber (Factice)

Industrial uses of soy oil as a non-drying oil. *See* Dust Suppressants and Dust Control, Lubricants, Lubricating Agents, and Axle Grease for Carts

Industrial uses of soy oil. *See* Fatty Acids for Non-Drying or Drying Applications (As in Hot-Melt Glues or the Curing Component of Epoxy Glues), Steroids, Steroid Hormones, and Sterols

Industrial uses of soy proteins (including soy flour). *See* Adhesives or Glues for Plywood, Other Woods, Wallpaper, or Building Materials

Industrial uses of soy proteins. *See* Fibers (Artificial Wool or Textiles Made from Spun Soy Protein Fibers, Including Azlon, Soylon, and Soy Silk / Soysilk), Foams for Fighting Fires, Paints (Especially Water-Based Latex Paints), Paper Coatings or Sizings, or Textile Sizing, Plastics (Including Molded Plastic Parts, Plastic Film, Disposable Eating Utensils and Tableware—From Spoons to Plates, and Packaging Materials)

Industrial uses of soybeans or soy products. *See* Culture Media / Medium (for Growing Microorganisms)

Industrial uses of soybeans. *See* Chemurgy, the Farm Chemurgic Movement, and the Farm Chemurgic Council (USA, 1930s to 1950s) Including, Lecithin, Soy–Industrial Uses, New Uses Movement (USA, starting 1987), Successor to the Farm Chemurgic Movement (1930s to 1950s), Soybean Meal / Cake, Fiber (as from Okara), or Shoyu Presscake as a Fertilizer or Manure for the Soil

Industry and Market Analyses and Statistics–Market Studies. 520, 867

Infant Foods and Infant Feeding, Soy-based. *See* Also Infant Formulas, Soy-based. 37, 141, 257, 263, 414, 599

Infant Formula / Formulas, Soy-based, Including Effects on Infant Health (Alternatives to Milk. Usually Fortified and Regulated. Since 1963 Usually Made from Soy Protein Isolates). 111, 158, 428, 608, 612, 615, 684, 697, 728

Information, computerized. *See* Websites or Information on the World Wide Web or Internet

Information. *See* Libraries with a Significant Interest in Soy

Ink for Printing–Industrial Uses of Soy Oil as a Drying Oil. 34, 38, 89, 118, 133, 136, 141, 144, 162, 182, 205, 449, 757, 779, 789, 812, 848, 854, 864, 870, 881

Inoculum / inocula of nitrogen fixing bacteria for soybeans. *See* Nitrogen Fixing Cultures

Insects–Pest Control. *See* also: Integrated Pest Management. 180, 459, 487, 727, 749

Institutional feeding. *See* Foodservice and Institutional Feeding or Catering

Intercropping–use of soybeans in. *See* Cropping Systems: Intercropping, Interplanting, or Mixed Cropping

International Institute of Agriculture (IIA) (Rome). 180, 369

International Institute of Tropical Agriculture (IITA) (Ibadan, Nigeria). 755

International Nutrition Laboratory. *See* Miller, Harry W. (M.D.) (1879-1977)

International Vegetarian Union (IVU. Founded 1908; and its British Predecessor the Vegetarian Federal Union, founded 1889), and Other International Vegetarian Societies, Conferences, Congresses, and Unions. 905

International soybean programs. *See* International Institute of Agriculture (IIA) (Rome), International Institute of Tropical Agriculture (IITA) (Ibadan, Nigeria), United Nations (Including UNICEF, FAO, UNDP, UNESCO, and UNRRA) Work with Soy

Internet. *See* Websites or Information on the World Wide Web

Intestinal Flora / Bacteria and Toxemia–Incl. Changing and Reforming (*L. Acidophilus*, *Bifidus*, *L. Bulgaricus* etc.). 107, 165, 166, 579, 613, 680, 705

Introduction of Soybeans (as to a Nation, State, or Region, with P.I. Numbers for the USA) and Selection. 41, 157, 278, 414, 487, 560, 674

Introduction of foreign plants to the USA. *See* United States Department of Agriculture (USDA)–Section of Foreign Seed

and Plant Introduction

Iodine number. *See* Soy Oil Constants–Iodine Number

Iowa State University / College (Ames, Iowa), and Univ. of Iowa (Iowa City). 64, 104, 299, 345, 524, 785, 798, 801, 809, 810

Iowa. *See* United States–States–Iowa

Isoflavones in soybeans and soyfoods. *See* Estrogens, Incl. Genistein, Daidzein, etc.

Isolated soy proteins. *See* Soy Proteins–Isolates

Ito San soybean variety. *See* Soybean Varieties USA–Ito San

Jackson, James Caleb (1811-1881). American Health Reformer and Vegetarian (New York). 579, 613, 680

Japan. *See* Asia, East–Japan

Japanese Overseas, Especially Work with Soy. 773, 917

Johnson Family of Stryker, Williams County, Ohio. Including (1) Edward Franklin “E.F. Soybean” Johnson (1889-1961) of Johnson Seed Farms (Stryker, Ohio), Delphos Grain and Soya Processing Co. (Ohio), and Ralston Purina Company (Missouri); (2) Elmer Solomon Johnson (1879-1920); (3) Perhaps E.C. Johnson and Hon. Solomon Johnson (1850-1918). 123, 510, 631, 710, 843

Julian, Percy (African-American Organic Chemist). *See* also Glidden Company. 522, 740, 741

Kaempfer, Engelbert (1651-1716)–German physician and traveler. 631

Kecap, Kechap, Ketjap, Ketchup. *See* Soy Sauce, Indonesian Style or from the Dutch East Indies (Kecap, Kécap, Kechap, Ketjap, Kétjap)

Kellogg Co. (breakfast cereals; Battle Creek, Michigan). *See* Kellogg, Will Keith,... Kellogg Company

Kellogg, John Harvey (M.D.), Sanitas Nut Food Co. and Battle Creek Food Co. (Battle Creek, Michigan). Battle Creek Foods Was Acquired by Worthington Foods in 1960. 42, 100, 107, 146, 158, 165, 166, 176, 579, 599, 608, 613, 630, 636, 637, 644, 666, 678, 680, 699, 705, 706, 710, 729, 735, 747, 755, 769, 804, 847, 857, 867, 874, 893, 905, 926

Kellogg, Will Keith, Kellogg’s Toasted Corn Flake Co. Later Kellogg Company (of breakfast cereal fame; Battle Creek,

Michigan). 705, 710, 735, 769, 804, 893

Kesp. *See* Meat Alternatives–Kesp (Based on Spun Soy Protein Fibers)

Kibun. *See* Soymilk Companies (Asia)

Kikkoman Corporation (Tokyo, Walworth, Wisconsin; and Worldwide). Incl. Noda Shoyu Co. and Kikkoman International Inc., and Kikkoman Shoyu Co. 754, 826

Kinako. *See* Roasted Whole Soy Flour (Kinako–Dark Roasted, Full-Fat)

Kloss, Jethro (1863-1946) and his Book *Back to Eden*. 158, 905

Kloss, Jethro. *See* Seventh-day Adventists–Cookbooks and Their Authors

Koji (Cereal Grains {Especially Rice or Barley} and / or Soybeans Fermented with a Mold, Especially *Aspergillus oryzae*). 211, 754, 858

Korea. *See* Asia, East–Korea

Kosher / Kashrus, Pareve / Parve / Parevine–Regulations or Laws. *See* also: Kosher Products (Commercial). 738, 924

Kosher Products (Commercial). 575

Kraft Foods Inc. (Work with Soy). Including Anderson Clayton, Boca Burger, and Balance Bar. 821, 829

Kudzu or Kuzu (*Pueraria montana* var. *lobata*. Formerly *Pueraria lobata*, *Pueraria thunbergiana*, *Pachyrhizus thunbergianus*, *Dolichos lobatus*). For Rhodesian Kudzu Vine see *Neonotonia wightii*. *See* also Tropical Kudzu or Puero (*Pueraria phaseoloides*). 712

Kuzu. *See* Kudzu or Kuzu (*Pueraria*...)

La Sierra Industries (La Sierra, California). *See* Van Gundy, Theodore A., and La Sierra Industries

Lactose Intolerance or Lactase Deficiency. 867

Lager, Mildred (Los Angeles, California). 459, 460, 591

Land O’Lakes, Inc. 704

Land-Grant Colleges and Universities, and Their Origin with the Land Grant Act of 1862 (the so-called Morrill Act). 511, 661, 710, 858

Large-seeded soybeans. *See* Green Vegetable Soybeans–Large-Seeded Vegetable-Type or Edible Soybeans

Latin America (General). 757

Latin America–Caribbean–Bermuda (A British Dependent Territory). 475

Latin America–Caribbean–Cuba. 127, 162, 173

Latin America–Central America–Mexico. 459, 729, 734, 851

Latin America–South America–Argentina (Argentine Republic). 29, 639, 864, 910

Latin America–South America–Argentina–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 639

Latin America–South America–Brazil, Federative Republic of. 461, 635, 739, 750, 839, 858, 864, 910

Latin America–South America–Chile (Including Easter Island). 218

Latin America–South America–Colombia. 729

Latin America–South America–Guyana (British Guiana before 1966). 635

Latin America–South America–Suriname (Also Surinam before 1978; Dutch Guiana before 1975). 487

Latin America–South America–Venezuela. 121

Laucks (I.F.) Co. (Seattle, Washington). 34, 123, 133, 141, 158, 424, 442, 459, 462, 470, 480, 498, 520, 523, 537, 538, 566, 633, 639, 757, 809, 864

Lauhoff Grain Co. *See* Bunge Corp. (White Plains, New York)

Lauhoff Grain Co. (Danville, Illinois). Affiliate of Bunge Corp. since June 1979. 863

Lea & Perrins. *See* Worcestershire Sauce

Leaves of the soybean plant used as food. *See* Green Vegetable Soybeans–Leaves of the Soybean Plant Used as Food or Medicine

Lecithin Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 34

Lecithin Industry and Market Statistics, Trends, and Analyses–Individual Companies. 741

Lecithin companies. *See* American Lecithin Corp., Ross & Rowe (Yelkin Lecithin, New York City)

Lecithin, Soy–Industrial Uses. 64, 119, 133, 136, 213, 247, 295, 303, 459, 741, 864, 871

Lecithin, Soy. 34, 79, 93, 111, 133, 141, 158, 164, 173, 213, 215, 216, 299, 373, 389, 390, 405, 445, 446, 459, 507, 522, 524, 539, 658, 675, 740, 741, 835, 843, 873

Legislative activities. *See* American Soybean Association (ASA)–Legislative Activities

Legume, Inc. (Fairfield, New Jersey). 736, 773

Lend-Lease (Program and Administration). U.S. Program to Send Key Supplies to Overseas Allies During World War II. 432, 459, 737

Lens culinaris or L. esculenta. *See* Lentils

Lentils. *Lens culinaris*. Formerly: *Lens esculenta* and *Ervum lens*. 224, 410

Lever Brothers Co. *See* Unilever Corp.

Leviton, Richard. *See* Soyfoods Association of North America (SANA)

Libraries with a Significant Interest in Soy. 912

Lighting by burning soy oil. *See* Illumination or Lighting by Burning Soy Oil in Wicked Oil Lamps Like Kerosene

Lightlife Foods, Inc. (Turners Falls, Massachusetts). The Tempeh Works then Tempehworks before April 1987. Founded by Michael Cohen. 867

Lima Bean or Limas. *Phaseolus limensis*. Formerly: *Phaseolus lunatus*. Also called Butter Bean. 79, 86, 145, 216, 226, 372, 684, 926

Linolenic Acid and Linolenate Content of Soybeans and Soybean Products. *See also* Omega-3 Fatty Acids. 762

Linoleum, Floor Coverings, Oilcloth, and Waterproof Goods–Industrial Uses of Soy Oil as a Drying Oil. 34, 38, 41, 64, 86, 89, 118, 126, 130, 133, 136, 144, 147, 161, 182, 205, 220, 228, 432, 449, 480, 539, 757, 766, 779, 864, 870

Linseed Oil, Linseed Cake / Meal, or the Flax / Flaxseed Plant

(*Linum usitatissimum* L.). 6, 29, 34, 41, 44, 64, 73, 76, 81, 122, 128, 132, 137, 140, 228, 277, 299, 321, 333, 339, 351, 537, 539, 671, 684, 735, 757, 762, 864

Lipid and Fatty Acid Composition of Soybeans (Seeds or Plant), or Soybean Products (Including Soy Oil). 649

Lipids. *See* Linolenic Acid and Linolenate

Lipolytic enzymes in the soybean. *See* Enzymes in the Soybean–Lipoxygenase and Its Inactivation

Lipoxygenase. *See* Enzymes in the Soybean–Lipoxygenase and Its Inactivation

Loma Linda Foods (Riverside, California). Named La Loma Foods from Feb. 1989 to Jan. 1990. Acquired by Worthington Foods in Jan. 1990. 459, 619, 638, 678, 702, 709, 728, 810, 846, 849, 856

Loma Linda University (Loma Linda, California). Including Loma Linda Hospital (Formerly named Loma Linda Sanitarium and College of Medical Evangelists). 804

Los Angeles–City and County–Work with Soyfoods, Natural / Health Foods, and / or Vegetarianism. 10, 888

Lubricants, Lubricating Agents, and Axle Grease for Carts–Industrial Uses of Soy Oil as a Non-Drying Oil. 56, 86, 133, 670, 870

Lucerne / lucern. *See* Alfalfa or Lucerne

Lust, Benedict (1872-1945), Louise Stroebel Lust (1868-1925; his wife) and Louis Lust. Pioneers in Naturopathy in the United States (New York City; “Yungborn,” Butler, New Jersey; Tangerine, Florida). 579, 905

MSG (Monosodium Glutamate, the Sodium Salt of Glutamic Acid). 473, 537, 538

Machinery (Agricultural), Implements, Equipment, and Mechanization (Binders, Cultivators, Cutters, Harvesters, Mowers, Pickers, Planters, Reapers, Separators, Thrashers, or Threshers). *See also*: Combines and Tractors. 204, 588, 659, 748

Machinery, farm. *See* Combines

Macrobiotics. *See also*: George Ohsawa, Michio and Aveline Kushi, Herman and Cornelia Aihara. 680, 774

Madison Foods and Madison College (Madison, Tennessee). Madison Foods (Then a Subsidiary of Nutritional Corp.) Was

Acquired by Worthington Foods in Aug. 1964. 30, 37, 158, 336, 458, 459, 500, 608, 644, 706, 826, 893

Maize. *See* Corn / Maize

Malnutrition, hunger, famine, and food shortages. *See* Hunger, Malnutrition, Famine, Food Shortages, and Mortality

Mammoth Yellow soybean variety. *See* Soybean Varieties USA–Mammoth Yellow

Manchu soybean variety. *See* Soybean Varieties USA–Manchu

Manchuria. *See* Asia, East–Manchuria

Map / Maps. 134, 359, 371, 561, 580, 598, 600, 670, 717, 722, 748, 790

Maple Leaf Monarch or Maple Leaf Mills. *See* ADM Agri-Industries Ltd. (Windsor, Ontario, Canada)

Margarine Made with Soy Oil. 9, 64, 86, 133, 228, 260

Margarine. 34, 62, 79, 118, 136, 137, 141, 144, 162, 164, 215, 216, 220, 263, 405, 432, 445, 449, 455, 458, 459, 467, 474, 500, 539, 656, 695, 765, 766, 797, 823, 836, 851, 855, 871

Market statistics on soybean production. *See* Soybean Production and Trade–Industry and Market Statistics,

Market statistics. *See* the specific product concerned, e.g. Tofu Industry and Market Statistics

Market studies. *See* Industry and Market Analyses

Marketing–Soyfoods and Soyfood Products. 520

Marketing Association, Soybean. *See* Soybean Marketing Association (1929-1932)

Marketing Soybeans, Market Development, and Economics (Including Futures Markets, Hedging, and Mathematical Models). 137, 144, 162, 163, 289, 466, 517, 534, 739, 789, 852, 853

Marketing of soyfoods. *See* Individual foods, e.g., Tofu–Marketing of

Marketing soybeans. *See* Chicago Board of Trade

Markets and Crop Estimates, Bureau of. *See* United States Department of Agriculture (USDA)–Bureau of Agricultural Economics

- Marusan-Ai. *See* Soy milk Companies (Asia)
- Massachusetts. *See* United States–States–Massachusetts
- Maturity groups. *See* Soybean–Physiology and Biochemistry–Maturity Groups
- McCay, Clive M. and Jeanette (Cornell Univ.). 460, 591
- Meal or cake, soybean. *See* Soybean Meal
- Meals, vegetarian or vegan, served at institutions. *See* Vegetarianism–Vegetarian or Vegan Meals Served at Institutions
- Meat Alternatives–Documents About (Meatlike Meatless Meat, Poultry, or Fish / Seafood Analogs. *See Also* Meat Extenders). 3, 222, 459, 549, 552, 614, 618, 628, 684, 701, 705, 706
- Meat Alternatives–General and Other Meatless Meatlike Products. *See Also* Meat Extenders. 628
- Meat Alternatives–Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 867
- Meat Alternatives–Industry and Market Statistics, Trends, and Analyses–Individual Companies. 751, 778, 833
- Meat Alternatives–Kesp (Based on Spun Soy Protein Fibers). *See Also* Meat Extenders. 663, 799, 921
- Meat Alternatives–Meatless Bacon, Bacon Bits, Ham, and Other Pork-related Products. *See also* Meatless Sausages. 536, 589, 611, 619, 629, 646, 651, 708, 729, 736, 751, 778, 846, 849, 921
- Meat Alternatives–Meatless Burgers and Patties. *See Also* Meat Extenders. 289, 404, 500, 656, 725, 730, 736, 778, 833, 846, 859
- Meat Alternatives–Meatless Chicken, Goose, Duck, and Related Poultry Products. *See also* Meatless Turkey. 205, 414, 589, 608, 778, 846, 849, 867, 921
- Meat Alternatives–Meatless Fish, Shellfish, and Other Seafood-like Products. 205, 599, 867
- Meat Alternatives–Meatless Sausages (Including Frankfurters, Hot Dogs, Wieners, Salami, Pepperoni, etc.). *See Also* Meat Extenders. 432, 651, 656, 688, 778, 846, 921
- Meat Alternatives–Meatless Turkey. 611, 849
- Meat Alternatives–Quorn (Based on Mycoprotein). *See Also* Meat Extenders. 799
- Meat Alternatives or Substitutes, Meatless or Meatlike Products–Etymology of This Term and Its Cognates / Relatives in Various Languages. 536, 549
- Meat Products Extended with Soy Protein, or Meat Extenders (Marketed as Such). 125, 128, 410, 610, 611, 618, 655, 660, 709, 829, 919
- Media–Earliest Articles on Soy in Major Magazines and Newspapers. 97, 113, 330
- Media, Popular Articles on Soyfoods in the USA, Canada, or Related to North Americans in Asia. 137, 144, 162, 265, 431, 688, 711, 736, 754, 767
- Medical aspects of soybeans. *See* Diabetes and Diabetic Diets
- Medicine–Alternative–Incl. Acupuncture, Chiropractic, Drugless Doctors, Herbal Therapy, Holistic / Wholistic Medicine, Homeopathy, Natural Hygiene, Natural Medicine, Naturopathy, Preventive / Preventative Medicine,. 680, 804
- Meharry, Charles Leo (1885-1937), the A.P. Meharry Farms (One Near Tolono, Champaign County, Illinois, and Three in Indiana), and William E. Riegel, Meharry Farm Manager and Independent Soybean Grower in Tolono, Illinois. 439, 510, 631
- Mei Dou Za / Mei-Tou-Cha / Meitauza. *See* Tempeh, Okara
- Mesoamerica. *See* Latin America–Central America
- Metcalf, William (1788-1862). Vegetarian Pioneer in England and Philadelphia, USA. 579
- Mexico. *See* Latin America, Central America–Mexico
- Meyer, Frank N. (1875-1918). USDA Plant Explorer in Asia. 41, 462
- Michigan. *See* United States–States–Michigan
- MicroSoy Corporation (Jefferson, Iowa; Osaka, Japan). Formerly Nichii Co. and MYCAL Corp. 801
- Microalgae. *See* Single Cell Proteins (Non-Photosynthetic)
- Microbial Proteins (Non-Photosynthetic Single-Cell Proteins, Including Fungi [Mycoproteins such as Quorn], Yeast, and Bacteria). 799

Microbiology and Bacteriology—History of Early Discoveries. 858

Microscopic analysis and microscopy. *See* Soybean—Morphology, Structure, and Anatomy of the Plant and Its Seeds as Determined by Microscopy or Microscopic Examination

Midwest Natural Foods Distributors, Inc. (Ann Arbor, Michigan). 688

Miles Laboratories. *See* Worthington Foods, Inc. (Worthington, Ohio)

Milk, Non-Dairy, Non-Soy Milks and Creams Made from Nuts, Grains, Seeds, or Legumes, Such as Brazil Nuts, Cashews, Coconuts, Filberts, Hazelnuts, Hemp Seeds, Pecans, Pine Nuts, Pumpkin Seeds, Sunflower Seeds, Walnuts, etc. *See also:* Almond Milk, Amazake / Rice Milk, Peanut / Groundnut Milk, Sesame Milk. 4, 414, 456, 712

Milk, almond. *See* Almond Milk and Cream. Also—Almonds Used to Flavor Soymilk, Rice Milk, etc.

Milk, coconut / cocoanut. *See* Coconut Milk and Cream

Milk, peanut. *See* Peanut Milk

Milk, rice. *See* Rice Milk (Non-Dairy)

Milk, soy. *See* Soymilk

Miller, Harry W. (M.D.) (1879-1977) and International Nutrition Laboratory (Mt. Vernon, Ohio). 371, 408, 459, 591, 635, 644, 678, 702, 705, 706, 713, 729, 739, 778, 810, 926

Minnesota. *See* United States—States—Minnesota

Miso (Japanese-style Soybean Paste). *See also:* Jiang—for Chinese-style Miso. Jang—for Korean-style Miso. And Taicho, Tauceo, Tau Chiow, Taoco, Tao-Tjo, Taotjo, Taocho, or Taoetjo for Indonesian-style Miso (Soybean Chiang, or Jiang [pinyin]). 158, 180, 211, 373, 461, 615, 644, 687, 736, 754, 756, 809, 871, 887

Miso Soup—Mainly Japanese. 644

Missouri Farmers Association (MFA), Mexico and Columbia, Missouri—Cooperative Soybean Crushers. 498

Missouri. *See* United States—States—Missouri

Mitchell Foods, Inc. (Fredonia, New York; and North

Abington, Massachusetts). 516, 806, 862, 922

Mitsui & Co., Ltd. (Mitsui Bussan Kaisha, Japanese Trading Co., founded 1876). 180

Monosodium glutamate. *See* MSG

Monsanto Co. (St. Louis, Missouri) and its HybriTech Seed International subsidiary. Acquired Jacob Hartz Seed Co. in April 1983. Acquired Asgrow in April Feb. 1997. Merged with Pharmacia & Upjohn on 31 March 2000 and was renamed Pharmacia Corp. 858, 881, 885

Monticello Co-operative Soybean Products Co. (Monticello, Piatt Co., Illinois). Later also called Piatt County Soybean Cooperative Co., and Viobin (Maker of Wheat Germ Oil). 6, 299, 675

Moorman Manufacturing Co. *See* Quincy Soybean Products Co. (Quincy, Illinois)

Morinaga Nutritional Foods, Inc., and Morinaga Nyûgyô (Torrance, California, and Tokyo, Japan). 773

Morphology, soybean. *See* Soybean—Morphology, Structure, Anatomy, Soybean—Morphology, Structure, and Anatomy

Morrill Act. *See* Land-Grant Colleges and Universities, and Their Origin with the Land

Morse, William J. (1884-1959, USDA Soybean Expert). 7, 71, 79, 158, 159, 253, 289, 371, 372, 397, 408, 439, 460, 462, 510, 511, 591, 626, 631, 694, 705, 710, 713, 735, 739, 771, 789, 871, 913, 926

Motion Pictures or References to Motion Pictures. Also called Movies, Films, or Documentaries. 17, 32, 102, 103, 155, 156, 178, 212, 276, 281, 353, 637, 857, 912

Movies or films. *See* Motion Pictures

Mucuna pruriens. *See* Velvet Bean

Mull-Soy. *See* Borden Inc.

Mung Bean / Mungbean and Mung Bean Sprouts. *Vigna radiata* L. Formerly *Phaseolus aureus*. Also called Green Gram. Chinese—Lüdou. Japanese—Moyashi. Indonesian: Kacang / katjang + hijau / ijo / hidjau. German—Buschbohne. French—Haricot Mungo. 680, 694

Mycoprotein used in meal alternatives. *See* Meat Alternatives—Quorn (Based on Mycoprotein)

Myths of soybean history—debunking / dispelling. *See* History of the Soybean—Myths and Early Errors Concerning Its History

Names for soybeans—Fanciful. *See* Soybean Terminology and Nomenclature—Fanciful Terms and Names

Naphtha solvents for extraction. *See* Solvents

Nasoya Foods, Inc. (Leominster, Massachusetts). Subsidiary of Vitasoy Since Aug. 1990. 773

National Center for Agricultural Utilization Research (NCAUR) (USDA-ARS) (Peoria, Illinois). Named Northern Regional Research Laboratory prior to July 1976. Named Northern Regional Research Center prior to 28 Dec. 1991. 277, 371, 408, 424, 426, 445, 449, 454, 468, 470, 473, 480, 498, 535, 537, 539, 562, 563, 623, 633, 670, 704, 712, 713, 779, 785, 809, 812, 829, 854, 868, 915

National Oilseed Processors Assoc. (NOPA) (National Soybean Oil Manufacturers Association from May 1930 to 1935; National Soybean Processors Assoc. [NSPA] from June 1936 to Aug. 1989. Washington, DC. Including Soy Flour Assoc. [1936-1949], Soya Food Research Council [1936], and Soybean Nutritional Research Council [1937]). 34, 123, 130, 192, 220, 270, 371, 408, 445, 459, 468, 507, 511, 566, 631, 695

Natto (Whole Soybeans Fermented with *Bacillus natto*). 180, 373, 615, 745, 809, 871, 887

Natural / Vegetarian Food Products Companies. *See* American Natural Snacks, Boca Burger, Fantastic Foods, Gardenburger

Natural Foods Distributors and Master Distributors (USA). *See* Eden Foods, Inc. (Clinton, Michigan). Founded 4 Nov. 1969, Erewhon (Boston, Massachusetts), Midwest Natural Foods (Ann Arbor, Michigan), Tree of Life (St. Augustine, Florida), Westbrae Natural Foods, Inc. (Berkeley, California)

Natural and Health Foods Retail Chains or Supermarkets: Bread & Circus (Tony Harnett, MA), Frazier Farms (Bill Frazier, Southern Calif.), Fresh Fields (Rockville, MD), GNC = General Nutrition Corp. (Pittsburgh, PA), Mrs. Gooch's (Los Angeles, CA), Nature Foods Centres (Wilmington, MA; Ronald Rossetti), Trader Joe's, Whole Foods Market (Austin, TX), Wild Oats. 888

Naturopathic pioneers. *See* Ehret, Arnold

Naturopathy pioneers. *See* Lust, Benedict (1872-1947)

Near East. *See* Asia, Middle East

Nestlé (Nestlé—The World's Biggest Food Group). 180, 799, 863, 888

Netherlands. *See* Europe, Western—Netherlands

New England Soy Dairy. *See* Tomsun Foods, Inc.

New Uses Movement (USA, starting 1987)—Industrial Uses of Soybeans. Successor to the Farm Chemurgic Movement (1930s to 1950s). And Value-Added Industrial Applications. *See also*: Research & Development Centers—USDA-ARS National Center for Agricultural Utilization Research (Peoria, Illinois). 757, 787, 798, 801, 807, 812, 828, 853, 854, 860, 861, 864, 870, 915

New York State Agric. Experiment Station (Geneva, NY). *See* Cornell University (Ithaca, New York)

New York Vegetarian Society. *See* Vegetarianism—Vegetarian Societies in North America—New York Vegetarian Society (1852+)

New York. *See* United States—States—New York

New Zealand. *See* Oceania—New Zealand

Nichii Company. *See* Whole Dry Soybean Flakes

Nigeria. *See* Africa—Nigeria

Nisshin Oil Mills, Ltd. (Tokyo, Japan). 709

Nitrogen Fixation, Inoculum, Inoculation, and Nodulation by Rhizobium Bacteria. 53, 79, 117, 118, 137, 153, 159, 180, 221, 228, 413, 459, 461, 487, 634, 713, 745

Nitrogen Fixing Cultures / Inoculants (Commercial and Noncommercial from government), of Rhizobium Bacteria for Soybeans (Culture / Inoculant / Inoculum / Inocula). 487

Nodulation. *See* Nitrogen Fixation, Inoculum, Inoculation, and Nodulation by Rhizobium Bacteria

Non-dairy products (so-called) made from casein or caseinates. *See* Casein or Caseinates—Problems in So-Called Non-Dairy Products

Non-dairy, non-soy milk. *See* Milk, Non-Dairy, Non-Soy Milks and Creams Made from Nuts, Grains, Seeds, or Legumes

Nordquist, Ted. *See* WholeSoy & Co. (subsidiary of TAN Industries, Inc., California)

North America. *See* United States of America, and Canada. For Mexico, *see* Latin America, Central America

North Carolina. *See* United States–States–North Carolina

North Iowa Cooperative Processing Association, (Manly, Iowa). Opened Sept. 1944. Renamed North Iowa Soybean Cooperative in 1962. *See also* Glenn Pogeler. 498, 507

Northeast India. *See* Asia, South–India, Northeast / North-East. The Contiguous Seven Sister States and Sikkim

Northern Regional Research Center (NRRC) (Peoria, Illinois). *See* National Center for Agricultural Utilization Research (NCAUR) (USDA-ARS)

Nuclear Power, Weapons, War, Fallout, or Radioactivity Worldwide. 813

Nut Butters, Non-Soy. Including Butter Made from Nuts or Seeds, Such as Brazil Nuts, Cashews, Coconuts, Filberts, Hazelnuts, Hickory Nuts, Hemp Seeds, Macadamia Nuts, Pecans, Pignolias, Pine Nuts, Pistachios, Pumpkin Seeds, Sunflower Seeds, Walnuts, etc. *See also*: Almond Butter, Peanut Butter, Sesame Butter, Soynut Butter. 599

Nut milk or cream. *See* Milk–Non-Dairy Milks and Creams Made from Nuts

Nutrition (General). 158, 180, 390, 579, 613, 754

Nutrition–Acid-Base Balance in Diet and Health, or Individual Foods, or Acid-Alkaline Ash in Diet, or Acid-Forming and Base-Forming Elements in Foods. 459

Nutrition–Biologically Active Phytochemicals–Allergens, Allergies, and Allergic Reactions Caused (or Remedied) by Soybeans, Soyfoods, Peanuts, or Animal Milks. 616, 684

Nutrition–Biologically active phytochemicals. *See* Antioxidants, Saponins

Nutrition–Biologically active substances. *See* Goitrogens and Thyroid Function

Nutrition–Lipids. *See* Linolenic Acid and Linolenate, Sterols or Steroid Hormones

Nutrition–Medical Aspects. *See* Diabetes and Diabetic Diets

Nutrition–Protein. *See* Amino Acids and Amino Acid Composition and Content

Nutrition, human, USDA bureau of. *See* United States Department of Agriculture (USDA)–Bureau of Human Nutrition and Home Economics

Nutrition. *See* Carbohydrates–Dietary Fiber, Chemical / Nutritional Composition or Analysis, Flatulence or Intestinal Gas, Human Nutrition–Clinical Trials, Intestinal Flora / Bacteria, Lactose Intolerance, Lipid and Fatty Acid Composition of Soy, Protein Quality, and Supplementation, Toxins and Toxicity in Foods and Feeds–Trichloroethylene Solvent and the Duren / Dueren Disease or Poisoning of Cattle / Ruminants, Vitamins (General), Vitamins B-12 (Cyanocobalamin, Cobalamins), Vitamins K (Coagulant)

Nutritional aspects of vegetarian diets. *See* Vegetarian and Vegan Diets–Nutrition / Nutritional Aspects

Nuts made from roasted soybeans. *See* Soynuts

Obituaries, Eulogies, Death Certificates, and Wills. *See Also*: Biographies, Biographical Sketches and Autobiographies. 189, 218, 409, 488, 788, 807

Oceania–Atlantic Ocean Islands that are Part of the United Kingdom–Ascension (in south Atlantic), British Antarctic Territory (Including South Shetland Islands and South Orkney Islands in south Atlantic), Channel Islands (in English Channel), Falkland Islands {or *Islas Malvinas*} and Dependencies (in south Atlantic), Isle of Man (in Irish Sea), South Georgia Islands (in South Atlantic), St. Helena (1,200 miles off the west coast of Africa). 117

Oceania–Australia, Commonwealth of (Including Tasmania, Cocos (Keeling) Islands, Christmas Island, Coral Sea Islands Territory, Norfolk Island, Territory of Ashmore and Cartier Islands, and Australian Antarctic Territory). 53, 176, 180, 205, 234, 553, 648, 735, 851

Oceania–New Zealand–Including Stewart Island, Chatham Islands, Snares Islands, Bounty Islands, and Tokelau (formerly Union Islands). 206, 228

Oelmuehle Hamburg AG (Hamburg, Germany). Founded in 1965 by incorporating Stettiner Oelwerke AG (founded 1910), Toepffer's Oelwerke GmbH (founded 1915), and Hansa-Muehle AG (founded 1916 as Hanseatische Muehlenwerke AG). 2, 6, 104, 299, 445, 524, 675

Off flavors. *See* Flavor Problems

Ohio Valley Soybean Cooperative (Henderson, Kentucky). Started June 1941. 424, 498, 507

Ohio. *See* United States–States–Ohio

Oil, soy–industrial uses of, as a drying oil. *See* Binder for Sand Foundry Cores, Industrial Uses of Soy Oil, Linoleum, Floor Coverings, Oilcloth, and Waterproof Goods, Resins, Plastics, and Plasticizers (Such as Epoxidized Soy Oil–ESO), Rubber Substitutes or Artificial / Synthetic Rubber (Factice)

Oil, soy–industrial uses of, as a hydrogenated oil. *See* Candles, Crayons, and Soybean Wax

Oil, soy–industrial uses of, as a non-drying oil. *See* Adjuvants, Carriers, and Surfactants for Pesticides, Herbicides, and Other Agricultural Chemicals, Diesel Fuel, SoyDiesel, Biodiesel or Artificial Petroleum, Dust Suppressants and Dust Control, Explosives Made from Glycerine, Illumination or Lighting by Burning Soy Oil in Wicked Oil Lamps Like Kerosene, Lubricants, Lubricating Agents, and Axle Grease for Carts, Release or Curing Agents for Concrete or Asphalt, Industrial Solvents, Hydraulic Fluids, and Other Minor or General Uses, Soaps or Detergents

Oil, soy–industrial uses of. *See* Industrial Uses of Soy Oil, Paint Manufacturers' Association of the U.S., Incl. Henry A. Gardner, L.P. Nemzek and Industrial Uses of Soybeans, Steroids, Steroid Hormones, and Sterols

Oil, soy–industrial uses. *See* Industrial Uses of Soy Oil

Oil, soy, constants. *See* Soy Oil Constants

Oil, soy, industrial uses of, as a drying oil. *See* Industrial Uses of Soy Oil

Oil, soy. *See* Soy Oil

Okara tempeh. *See* Tempeh, Okara

Okara. *See* Fiber–Okara or Soy Pulp

Olive / Olives (*Olea europea*). *See* also Olive Oil. 151

Ontario Soybean Growers (Canada: Name Changes–Ontario Soybean Growers Association, Nov. 1946 to 1949. Ontario Soya-Bean Growers' Marketing Board, 1949 to 1989. Ontario Soybean Growers' Marketing Board, 1989 to 1 Dec. 1999). Merged into Grain Farmers of Ontario 2010 Jan 1. 517, 745, 786, 869

Ontario. *See* Canadian Provinces and Territories–Ontario

Oriental Show-You Company. Purchased in 1963 by Beatrice / La Choy. 158

Origin, Evolution, Domestication, and Dissemination of the

Soybean (General). 462

Origins, Evolution, Domestication, and Dissemination of Soybeans (General). 414

Ostrander, Ward A. (1888–1953, Purdue Univ., Indiana). 439, 631

P.I. numbers of soybeans. *See* Introduction of Soybeans (as to a Nation, State, or Region, with P.I. Numbers for the USA) and Selection

PMS Foods, Inc. *See* Far-Mar-Co., Inc.

Paint Manufacturers' Association of the U.S., Incl. Henry A. Gardner, L.P. Nemzek and Industrial Uses of Soybeans. 123

Paints (Especially Water-Based Latex Paints)–Industrial Uses of Soy Proteins. 2, 86, 118, 136, 152, 194, 237, 259, 262, 346, 358, 401, 429, 442, 450, 459, 470, 520, 523, 528, 722, 731, 734, 819, 827, 835, 836, 864, 918

Paints, Varnishes, Enamels, Lacquers, and Other Protective / Decorative Coatings–Industrial Uses of Soy Oil as a Drying Oil. 9, 28, 29, 31, 32, 34, 38, 41, 42, 44, 46, 49, 52, 54, 56, 57, 58, 59, 60, 64, 68, 69, 71, 72, 73, 76, 77, 81, 82, 86, 87, 88, 89, 90, 91, 95, 97, 101, 108, 110, 111, 112, 113, 115, 118, 119, 121, 123, 124, 126, 128, 130, 132, 133, 136, 137, 138, 140, 141, 144, 151, 158, 160, 162, 177, 183, 194, 199, 202, 205, 210, 213, 220, 223, 225, 228, 233, 235, 238, 251, 270, 277, 289, 296, 300, 301, 333, 356, 371, 389, 397, 410, 423, 432, 441, 449, 459, 469, 474, 478, 480, 481, 488, 515, 525, 526, 538, 539, 574, 643, 652, 669, 670, 676, 692, 701, 712, 714, 716, 720, 721, 741, 757, 762, 766, 775, 779, 782, 784, 825, 837, 842, 850, 854, 864, 870, 871, 882, 897, 915, 916

Pakistan. *See* Asia, South–Pakistan

Paper Coatings or Sizings, or Textile Sizing–Industrial Uses of Soy Proteins. 2, 128, 136, 213, 218, 237, 251, 259, 346, 442, 459, 470, 520, 522, 523, 528, 537, 539, 541, 615, 670, 732, 734, 735, 779, 809, 830, 835, 843, 845, 864, 870, 918

Pasture from green soybean plants. *See* Feeds / Forage from Soybean Plants–Pasture, Grazing or Foraging

Patents–References to a Patent in Non-Patent Documents. 2, 87, 104, 132, 190, 194, 203, 207, 369, 467, 472, 491, 496, 504, 512, 513, 514, 516, 522, 524, 525, 528, 529, 534, 543, 545, 547, 551, 553, 575, 583, 585, 595, 599, 604, 608, 610, 611, 614, 625, 629, 630, 641, 642, 648, 651, 656, 662, 663, 664, 673, 675, 676, 679, 690, 691, 693, 699, 700, 701, 705, 707, 708, 709, 712, 724, 726, 729, 735, 737, 740, 741, 757, 780, 781, 799, 806, 814, 818, 819, 820, 830, 831, 835, 837, 839, 841, 842, 847, 849, 858, 862,

863, 864, 882, 884, 885, 919, 920, 921, 922

Patents. 169, 193, 195, 244, 247, 249, 298, 450, 451, 506, 509, 531, 532, 536, 548, 549, 552, 565, 609, 624, 628, 658, 665

Patties, meatless. *See* Meat Alternatives–Meatless Burgers and Patties

Peanut / Peanuts (*Arachis hypogaea* or *A. hypogaea*)–Also Called Groundnut, Earthnut, Monkey Nut, Goober / Gouber Pea, Ground Pea, or Pindar Pea / Pindars. 4, 73, 111, 125, 130, 138, 139, 167, 169, 277, 340, 341, 346, 360, 361, 364, 370, 383, 406, 414, 456, 458, 469, 470, 484, 514, 522, 534, 536, 537, 562, 579, 592, 599, 604, 608, 611, 613, 663, 684, 693, 705, 708, 709, 712, 727, 735, 746, 749, 751, 797, 804, 825, 857, 905, 926

Peanut Butter–Seventh-day Adventist Writings or Products (Especially Early) Related to Peanut Butter. 579, 599, 705, 804

Peanut Butter. 579, 599, 604, 608, 611, 613, 684, 705, 804, 857

Peanut Chocolate (Roasted Ground Peanuts Used as a Chocolate Substitute). 4

Peanut Meal or Cake (Defatted). 562

Peanut Milk. 4, 414, 456, 712

Peanut Oil. 73, 130, 361, 693, 825

Peking / Pekin soybean variety. *See* Soybean Varieties USA–Mammoth Yellow

Peoria Plan of 1928–29 for Growing, Selling, and Processing Soybeans. Initiated in Illinois by American Milling Co., Funk Bros. Co., and Grange League Federation (GLF) Exchange, New York. 150, 566, 713

Periodicals–American Soybean Association. *See* American Soybean Association (ASA)–Periodicals

Pesticide carriers and adjuvants. *See* Adjuvants, Carriers, and Surfactants for Pesticides, Herbicides, and Other Agricultural Chemicals

Pet food. *See* Dogs, Cats, and Other Pets / Companion Animals Fed Soy

Pfizer, Inc. Including DeKalb–Pfizer Genetics (DeKalb, Illinois) from 1982 to 1990. 775

Phaseolus limensis or *P. lunatus*. *See* Lima Bean

Philippines. *See* Asia, Southeast–Philippines

Photographs Published after 1923. *See also* Illustrations. 1, 12, 15, 16, 26, 34, 38, 43, 44, 45, 46, 47, 55, 61, 65, 68, 69, 70, 79, 89, 90, 101, 104, 111, 112, 119, 123, 144, 145, 147, 159, 164, 167, 170, 171, 172, 181, 204, 208, 223, 229, 231, 232, 233, 239, 240, 242, 245, 248, 258, 259, 261, 263, 264, 265, 267, 270, 273, 282, 283, 285, 286, 287, 288, 289, 290, 297, 299, 302, 306, 307, 314, 315, 332, 340, 342, 352, 365, 368, 376, 377, 378, 379, 380, 381, 382, 385, 388, 398, 410, 411, 412, 414, 417, 418, 425, 426, 427, 429, 430, 438, 440, 441, 442, 445, 448, 455, 462, 467, 470, 474, 484, 487, 488, 489, 492, 494, 495, 499, 503, 508, 510, 511, 514, 522, 543, 547, 558, 559, 560, 561, 566, 576, 585, 589, 597, 604, 605, 606, 612, 614, 615, 620, 625, 626, 629, 632, 634, 643, 645, 646, 651, 662, 666, 667, 668, 669, 670, 679, 681, 684, 685, 688, 693, 696, 712, 713, 716, 718, 722, 723, 724, 731, 736, 742, 748, 749, 752, 754, 756, 760, 763, 764, 768, 776, 778, 789, 790, 796, 797, 800, 816, 818, 837, 838, 850, 855, 858, 861, 869, 870, 871, 873, 874, 875, 877, 880, 882, 893, 896, 897, 902, 905, 906, 908, 910, 926

Photographs, Not About Soy, Published after 1923. *See also* Illustrations. 409, 551, 555, 575, 747, 813, 886

Photographs, Not About Soy, Published before 1924. *See also* Illustrations. 3

Photoperiodism. *See* Soybean–Physiology and Biochemistry

Physical Fitness, Physical Culture, Exercise, Endurance, Athletics, and Bodybuilding. 11, 747, 874, 905

Phytoestrogens in soybeans and soyfoods. *See* Estrogens

Piatt County Soybean Cooperative Co. *See* Monticello Cooperative Soybean Products Co.

Piima. *See* Soymilk, Fermented

Pillsbury Feed Mills and Pillsbury Co. (Minneapolis, Minnesota). 726, 734, 867

Piper, Charles Vancouver (1867–1926, USDA). 79, 159, 371, 626, 631, 771

Plant Industry, Bureau of. *See* United States Department of Agriculture (USDA)–Bureau of Plant Industry

Plant Protection from Diseases, Pests and Other Types of Injury (General). 750

Plastics (Including Molded Plastic Parts, Plastic Film, Disposable Eating Utensils and Tableware–From Spoons to Plates, and Packaging Materials)–Industrial Uses of Soy Proteins. 38, 43, 44, 46, 47, 49, 50, 52, 54, 55, 60, 63, 66, 69,

70, 71, 77, 82, 85, 86, 89, 90, 93, 95, 97, 108, 112, 113, 115, 118, 119, 123, 124, 125, 128, 130, 132, 133, 135, 136, 140, 141, 144, 147, 149, 151, 152, 156, 160, 161, 162, 164, 179, 182, 184, 186, 187, 194, 197, 199, 202, 203, 204, 208, 209, 210, 212, 213, 214, 215, 217, 219, 220, 223, 226, 228, 231, 233, 235, 237, 241, 245, 246, 251, 254, 259, 261, 262, 265, 266, 267, 268, 279, 280, 281, 282, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 296, 297, 300, 301, 302, 304, 305, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 339, 342, 346, 352, 353, 359, 368, 373, 378, 381, 383, 384, 389, 397, 401, 406, 407, 410, 426, 429, 432, 433, 442, 458, 459, 462, 474, 480, 488, 495, 515, 520, 521, 523, 525, 526, 529, 538, 574, 593, 629, 632, 634, 643, 645, 647, 652, 653, 659, 668, 669, 670, 671, 672, 684, 690, 697, 699, 700, 701, 702, 707, 714, 726, 727, 728, 731, 735, 741, 749, 754, 757, 764, 766, 768, 769, 779, 782, 784, 798, 801, 802, 809, 827, 835, 836, 837, 841, 842, 854, 858, 860, 861, 864, 869, 870, 871, 872, 873, 875, 891, 897, 904, 915, 918

Plastics, plasticizers and resins. *See* Resins, Plastics, and Plasticizers (Such as Epoxidized Soy Oil–ESO)

Pogeler, Glenn Henry (1915–1995). Soybean Pioneer. Iowa Cooperatives, Soybean Council of America (SCA), National Soybean Processors Association (NSPA). 507

Policies and Programs, Government, Effecting Soybean Production, Marketing, Prices, Subsidies, Support Prices, or Trade. 534, 712, 852

Pollination, Soybean (Self-Pollination, Cross-Pollination, etc.). 710

Population Growth (Human) and Related Problems (Including Poverty) Worldwide. 813

Pork, meatless. *See* Meat Alternatives–Meatless Bacon, Ham, and Other Pork-related Products

Poultry fed soybeans. *See* Chickens, or Turkeys, or Geese & Ducks

Poultry, meatless. *See* Meat Alternatives-- Meatless Chicken, Goose, Duck, and Related Poultry Products. *See also* Meatless Turkey

Poverty, world. *See* Population Growth (Human) and Related Problems (Including Poverty)

Prices of Soybeans, Soybean Products, and Soybean Seeds. 566

Problems, urban, worldwide. *See* Urban Problems Worldwide

Procter & Gamble Co. (Cincinnati, Ohio). Including the Buckeye Cotton Oil Co. 2, 133, 216, 371, 424, 456, 468, 498, 507, 539, 557, 566, 675, 677, 728, 734, 735, 835, 836, 843, 845, 918

Production of soybeans. *See* Soybean Production

Products, soy, commercial (mostly foods). *See* Commercial Soy Products–New Products

Protection of soybeans from diseases. *See* Diseases of soybeans

Protection of soybeans. *See* Insects–Pest Control. *See also*: Integrated Pest Management

Protein Quality, and Supplementation / Complementarity to Increase Protein Quality of Mixed Foods or Feeds. *See also* Nutrition–Protein Amino Acids and Amino Acid Composition. 562

Protein Technologies International (PTI) (St. Louis, Missouri). Established on 1 July 1987 as a Wholly-Owned Subsidiary of Ralston Purina Co.) Sold to DuPont on 3 Dec. 1997. 810, 832, 843, 890, 918

Protein products, soy. *See* Soy Protein Products

Protein sources, alternative, from plants. *See* Amaranth, Microbial Proteins (Non-Photosynthetic), Peanut & Peanut Butter, Peanuts & Peanut Butter, Single Cell Proteins (Non-Photosynthetic), Sunflower Seeds, Wheat Gluten & Seitan, Winged Bean

Protein supplementation / complementarity to increase protein quality. *See* Nutrition–Protein Quality

Psophocarpus tetragonolobus. *See* Winged Bean

Puddings. *See* Soy Puddings, Custards, Parfaits, or Mousses (Usually made from Soymilk)

Pueraria. *See* Kudzu or Kuzu

Pure Food Movement–USA (1870s to ca. 1906. Championed by Dr. Harvey Wiley). 511, 579, 613

Quality and grades of soybean seed. *See* Seed Quality of Soybeans–Condition, Grading, and Grades (Moisture, Foreign Material, Damage, etc.)

Quincy Soybean Products Co. (Quincy, Illinois). Purchased by Moorman Manufacturing Co. in 1961 and Renamed Quincy Soybean Company. Purchased by ADM in 1998. 424,

507

Quorn. *See* Meat Alternatives–Quorn (Based on Mycoprotein)

Québec. *See* Canadian Provinces and Territories–Québec

Railroad / railway / rail used to transport soybeans. *See* Transportation of Soybeans or Soy Products to Market by Railroad

Railroads / Railways and Special Trains Used to Promote Soybeans and Soybean Production. 174, 175, 260, 270, 459, 480, 634

Ralston Purina Co. (St. Louis, Missouri). Including Protein Technologies International, a Wholly Owned Subsidiary from 1 July 1987 to 3 Dec. 1997. 2, 123, 133, 158, 192, 254, 371, 408, 424, 498, 507, 557, 566, 582, 583, 585, 586, 589, 604, 609, 611, 612, 614, 619, 621, 622, 623, 628, 629, 630, 632, 635, 641, 642, 659, 665, 666, 697, 700, 701, 706, 707, 708, 709, 724, 726, 728, 729, 732, 734, 735, 740, 778, 781, 803, 810, 830, 832, 837, 839, 842, 843, 845, 846, 847, 849, 856, 863, 885, 890, 918, 919, 921

Rapeseed Meal. 562

Rapeseed Oil. 130, 854

Rapeseed or the rape plant. *See* Canola

Recipes. *See* Cookery

Regional Soybean Industrial Products Laboratory (Urbana, Illinois). *See* U.S. Regional Soybean Industrial Products Laboratory (Urbana, Illinois). Founded April 1936)

Regulations or Laws Concerning Foods (Use, Processing, or Labeling), Especially Soyfoods and Food Uses of Soybeans. 729

Regulations or laws concerning foods (Use, processing, or labeling). *See* Kosher / Kashrus, Pareve / Parve / Parevine Regulations Products (Commercial), Kosher Products (Commercial)

Release or Curing Agents for Concrete or Asphalt, Industrial Solvents, Hydraulic Fluids, Asphalt Sealants, and Other Minor or General–Industrial Uses of Soy Oil as a Non-Drying Oil. 144, 162, 432, 870

Religious aspects of vegetarianism. *See* Vegetarianism–Religious Aspects

Republic of China (ROC). *See* Asia, East–Taiwan

Research & Development Centers. *See* Cornell University (Ithaca, New York), and New York State Agric. Exp. Station, Illinois, University of (Urbana-Champaign, Illinois). Soyfoods, Iowa State University / College (Ames, Iowa), and Univ. of Iowa (Iowa City), National Center for Agricultural Utilization Research (NCAUR) (USDA-ARS) (Peoria, Illinois), U.S. Regional Soybean Industrial Products Laboratory (Urbana, Illinois). Founded April 1936)

Research on Soybeans. 130

Resins, Plastics, and Plasticizers (Such as Epoxidized Soy Oil–ESO)–Industrial Uses of Soy Oil as a Drying Oil. 38, 57, 64, 82, 85, 90, 132, 213, 525, 538, 643, 762, 779, 864, 870, 897

Restaurants or cafeterias, vegetarian or vegan. *See* Vegetarian or Vegan Restaurants

Restaurants, cafeterias, and cafés, health food. *See* Health Foods Restaurants, Cafeterias, and Cafés / Cafes (1890s to 1960s)

Reviews of the literature. *See* Bibliographies and / or Reviews of the Literature

Rhizobium bacteria. *See* Soybean Production–Nitrogen Fixation

Rice Milk (Non-Dairy)–Made with Commercial Enzymes, or a Mixture of Commercial Enzymes and Rice Koji. 867

Rice koji. *See* Koji

Rice, Brown. Also Called Whole Grain Rice or Hulled But Unpolished Rice. 644

Riceland Foods (Named Arkansas Grain Corp. before Sept. 1970). 863

Rich Products Corporation (Buffalo, New York). 455, 467, 471, 475, 504, 509, 516, 531, 532, 542, 544, 545, 546, 547, 551, 555, 556, 565, 575, 581, 595, 596, 601, 605, 606, 607, 697, 703, 725, 732, 733, 734, 737, 738, 772, 780, 806, 810, 814, 817, 818, 819, 820, 821, 842, 851, 862, 922, 924, 925

Riegel, William E. *See* Meharry, Charles Leo (1885-1937)

Roads or highways used to transport soybeans. *See* Transportation of Soybeans or Soy Products to Market by Roads or Highways

Roasted Whole Soy Flour (Kinako–Dark Roasted with Dry

- Heat, Full-Fat). 158, 180, 363, 459, 591, 615
- Roberts, F.G. *See* Soy Products of Australia Pty. Ltd.
- Rodale Press (Emmaus, Pennsylvania). 680
- Ross & Rowe (Yelkin Lecithin, New York City). 873
- Royal Wessanen NV Co. *See* Tree of Life (St. Augustine, Florida)
- Rubber Substitutes or Artificial / Synthetic Rubber (Factice)–Industrial Uses of Soy Oil as a Drying Oil. 38, 86, 89, 126, 133, 141, 144, 162, 182, 205, 213, 397, 399, 400, 432, 458, 459, 574, 712, 757, 779, 864, 870, 897
- Russia. *See* Europe, Eastern–Russia
- Sandoz AG (Basel, Switzerland). Merged with Ciba-Geigy in March 1996 to Become Novartis. 630
- Saponins (Bitter Carbohydrates / Glucosides That Cause Foaming). 445
- Sausages, meatless. *See* Meat Alternatives–Meatless Sausages
- School Lunch Program. 628, 655, 729, 730, 810, 821, 829, 919
- Scotland. *See* Europe, Western–Scotland (Part of United Kingdom)
- Screw presses. *See* Soybean Crushing–Equipment–Screw Presses and Expellers
- Seafood, meatless. *See* Meat Alternatives–Meatless Fish, Shellfish, and Other Seafood-like Products
- Seed Certification and Certified Seeds (Soybeans). 558
- Seed Cleaning–Especially for Food or Seed Planting Uses. 145, 204, 215, 722
- Seed Color (Soybeans)–Gives the Color of Seed (and Often Hilum) for Various Specific Varieties. *See also*: Soybean Seeds of Different Colors. 926
- Seed Companies and Seedsmen, Early Soybean, Worldwide (Especially Before 1925)–Including Siebold & Co., Vilmorin-Andrieux, Wood & Sons, Haage & Schmidt, Dammann & Co., Peter Henderson, Thorburn & Co., Mark W. Johnson, Johnson & Stokes, Harry N. Hammond, Burpee, E.E. Evans, Funk Bros. Seed Co. 117, 159, 167, 566, 695
- Seed Quality of Soybeans–Condition, Grading, and Grades (Moisture, Foreign Material, Damage, etc.). 445, 449, 459, 631
- Seed and plant introduction to the USA. *See* United States Department of Agriculture (USDA)–United States Department of Agriculture (USDA)–Section of Foreign Seed and Plant Introduction
- Seed companies, soybean. *See* Coker Pedigreed Seed Co. (Hartsville, South Carolina), DeKalb Genetics. Including DeKalb-Pfizer Genetics (DeKalb, Illinois), DuPont (E.I. Du Pont de Nemours & Co., Inc.) (Wilmington, Delaware), Evans Seed Co. (West Branch, Ogemaw County, Michigan) and Mr. Edward Ellsworth Evans (1864-1928), Funk Brothers Seed Co. (Bloomington, Illinois), Hartz (Jacob) Seed Co. (Stuttgart, Arkansas), Monsanto Co. (St. Louis, Missouri), Wing Seed Co. (Mechanicsburg, Champaign County, Ohio)
- Seed quality development in soybeans. *See* Breeding or Evaluation of Soybeans for Seed Quality, such as Low in Trypsin Inhibitors, Lipoxxygenase, Linolenic Acid, etc.
- Seedlings, soybean. *See* Green Vegetable Soybeans–Soybean Seedlings or Their Leaves Served as a Tender Vegetable. Called *Doumiao* in Chinese
- Seeds, soybean–Variety development and breeding of soybeans. *See* Variety Development and Breeding
- Seitan. *See* Wheat Gluten Made into Seitan
- Sesame Butter, Tahini / Tahina / Tahin, Sesame Halva / Halwa, or Sesame Paste. 688
- Sesame Meal or Cake (Defatted). 562
- Sesame Oil. 406
- Sesame Seed (*Sesamum indicum*, formerly *Sesamum orientale*). (Also Called Ajonjoli, Benne, Benni, Benniseed, Gingelly, Gingely, Gingelie, Jinjili, Sesamum, Simsim, Teel, Til). Including Sesame as an Oilseed, Sesame Flour, and Sesame Salt / Gomashio. *See also* Sesame Butter / Tahini, Sesame Cake or Meal, Sesame Milk, and Sesame Oil. 130
- Sesamum indicum*. *See* Sesame Seed
- Seventh-day Adventist work with vegetarianism. *See* Vegetarianism–Seventh-day Adventist Work with
- Seventh-day Adventist writings or products (especially early related to dietary fiber. *See* Fiber–Seventh-day Adventist Writings or Products
- Seventh-day Adventist writings or products (especially early)

related to peanut butter. *See* Peanut Butter–Seventh-day Adventist Writings or Products

Seventh-day Adventists–Cookbooks and Their Authors, Dietitians and Nutritionists–Ella E.A. Kellogg (1852-1920), Anna L. Colcord (1860?-1940?), Jethro Kloss (1863-1946), Almeda Lambert (1864-1921), Lenna Frances Cooper (1875-1961), Julius G. White (1878-1955), Frances Dittes (1891-1979), Edyth Cottrell (1900-1995), Dorothea Van Gundy Jones (1903-1979), Philip S. Chen (1903-1978), Frank & Rosalie Hurd (1936-), etc. 459, 591, 804

Seventh-day Adventists–General and Historical. 748, 917

Seventh-day Adventists–Overseas Companies Making Soyfoods (Europe). *See* Granose Foods Ltd. (Bucks., England)

Seventh-day Adventists–Overseas Companies Making Soyfoods (Europe, Asia, and Latin America). Other, Including Alimentos Colpac, Nutana, Saniku / San-iku Foods, Spicer Memorial College, Superbom. 176, 644, 709

Seventh-day Adventists. *See* Kellogg, John Harvey (M.D.), Sanitas Nut Food Co. and Battle Creek Food Co., Kellogg, Will Keith,... Kellogg Co., Kloss, Jethro (1863-1946) and his Book *Back to Eden*, Loma Linda Foods (Riverside, California), Loma Linda University (Loma Linda, California), Madison Foods and Madison College (Madison, Tennessee), Miller, Harry W. (M.D.) (1879-1977), Van Gundy, Theodore A., and La Sierra Industries (La Sierra, California), White, Ellen G (1827-1915), Worthington Foods, Inc. (Worthington, Ohio)

Shakes–Made with Soymilk, Tofu, Amazake, Soy Protein, etc.–Etymology of These Terms and Their Cognates / Relatives in Various Languages. 745

Shakes–Made with Soymilk, Tofu, Amazake, Soy Protein, etc. Usually non-dairy. 459, 745

Shellabarger Grain Co. / Shellabarger Soybean Mills (Decatur, Illinois). 158, 371, 507, 539, 615

Shennong / Shen Nung. *See* Asia, East–China–Shennong / Shên Nung / Shen Nung

Shortening. 2, 9, 64, 86, 89, 95, 118, 128, 136, 137, 141, 144, 160, 162, 216, 228, 263, 405, 445, 449, 474, 515, 539, 542, 599, 675, 737, 871

Showa Sangyo Co. Ltd. (Tokyo, Japan). 190, 194, 247, 249, 295, 298, 303

Shoyu. *See* Soy Sauce

Shurtleff, William. *See* Soyinfo Center (Lafayette, California)

Silage, soybean. *See* Feeds / Forage from Soybean Plants–Forage Used for Silage / Ensilage

Simply Natural, Inc. (Philadelphia, Pennsylvania). 773

Sinaiko Family of Madison, Wisconsin–Incl. Joe Sinaiko of Iowa Milling Co. and Decatur Soy Products Co. (1891-1988), His Brother Ike Sinaiko of Illinois Soy Products Co. (1897-1977), and His Brothers-in-Law Max Albert of Galesburg Soy Products Co. (1893-1966) and Irving Rosen of Quincy Soybean Products Co. (1907-1964). 371, 424, 498, 507, 524

Single Cell Proteins (Photosynthetic, Including Algae / Microalgae Such as Spirulina, Chlorella, and Scenedesmus). 858

Single cell proteins. *See* Microbial Proteins (Non-Photosynthetic)

Sizings for paper or textiles. *See* Paper Coatings or Sizings, or Textile Sizing

Smoked tofu. *See* Tofu, Smoked

Soaps or Detergents–Industrial Uses of Soy Oil as a Non-Drying Oil. 2, 9, 34, 38, 44, 64, 69, 73, 86, 89, 111, 113, 118, 126, 133, 136, 137, 141, 144, 158, 162, 205, 208, 213, 223, 228, 361, 432, 449, 480, 539, 757, 766, 827, 864, 870

Soil Science–Soil Erosion and Soil Conservation. 852

Soilage, soybean. *See* Feeds / Forage from Soybean Plants–Soilage and Soiling

Solbar Hatzor Ltd. (Israel). *See* Hayes Ashdod Ltd. (renamed Solbar Hatzor Ltd. in April 1987) and Hayes General Technology (Israel)

Solvent extraction equipment. *See* Soybean Crushing–Equipment–Solvent extraction

Solvents–Ethanol (Ethyl Alcohol)–Used for Soy Oil Extraction, or Washing / Purification of Soy Products (Protein, Lecithin, Saponins, etc.). 299, 397, 524, 829

Solvents–Hexane–Used Mainly for Soy Oil Extraction. 6, 77, 97, 119, 134, 214, 274, 338, 362, 373, 428, 456, 473, 675, 735, 835, 840, 850, 885, 916

Solvents–Trichloroethylene (Trichlorethylene, Trichlor). 104, 299, 338, 345, 445, 524

Solvents Used for Extraction of the Oil from Soybeans (General, Type of Solvent, Unspecified, or Other). See also Ethanol, Hexane, and Trichloroethylene Solvents. 2, 34, 69, 79, 80, 82, 110, 122, 128, 129, 141, 142, 154, 155, 177, 307, 405, 508, 526, 628, 839

Solvents Used for Extraction of the Oil from Soybeans: Benzene / Benzine / Benzol / Benzin. 6

Solvents Used for Extraction of the Oil from Soybeans: Naphtha / Naphthas. Also spelled Naptha / Napthas. 67, 70, 77, 523, 524

Solvents, industrial. See Release or Curing Agents for Concrete or Asphalt, Industrial Solvents, Hydraulic Fluids, and Other Minor or General Uses

Solvents. See Soybean Crushing–Solvents

Soup, miso. See Miso Soup

Sour Cream Alternatives (Non-Dairy–Usually Contains Soy). 691, 806

Sour cream. See Dairylike Non-dairy Soy-based Products

South Africa. See Africa–South Africa

South America. See Latin America–South America

Soy Cheese–Etymology of This Term and Its Cognates / Relatives in Various Languages. 404, 447, 456

Soy Cheese–Fermented, Western Style, That Melts. May Contain Casein (Cow's Milk Protein). 404, 447, 456, 616, 818

Soy Cheese Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 867

Soy Cheese or Cheese Alternatives–General, Western Style, That Melts. Often Contains Casein (Cow's Milk Protein). 471, 728, 829, 867

Soy Cheesecake or Cream Pie, Usually Made with Tofu. 797, 895

Soy Chocolate (Toasted Soy Flour) (Also includes use of non-roasted Soy Flour or Soymilk in Making Chocolate). 125, 141, 208

Soy Coffee–Made from Roasted Soy Flour or Ground Roasted Soybeans. 59, 60, 62, 79, 86, 126, 138, 158, 167, 205, 211, 215, 233, 263, 270, 373, 404, 414, 416, 458, 459, 500, 577,

591, 684, 761, 764, 765, 771, 797, 823, 855

Soy Cream Cheese–Etymology of This Term and Its Cognates / Relatives in Various Languages. 455

Soy Cream Cheese, Usually Made of Tofu or Soy Yogurt. 455, 456, 472, 502

Soy Flour–Imports, Exports, International Trade. 129

Soy Flour–Whole or Full-fat. 79, 121, 122, 128, 136, 158, 173, 180, 208, 213, 341, 591, 799, 871

Soy Flour or Defatted Soybean Meal in Cereal-Soy Blends, with Emphasis on Dry Products Used in Third World Countries (such as CSM, WSB, etc.). 250, 810

Soy Flour, Grits and Flakes (Usually Defatted)–Etymology of These Terms and Their Cognates / Relatives in Various Languages. 459

Soy Flour, Grits, Meal, Powder, or Flakes–For Food Use (Usually Defatted or Low-Fat). See also Soy Flour–Whole or Full-fat. 9, 34, 37, 38, 42, 64, 69, 71, 73, 79, 80, 95, 104, 111, 121, 122, 125, 126, 129, 138, 141, 147, 152, 154, 157, 158, 163, 164, 180, 182, 188, 205, 211, 215, 216, 222, 230, 233, 236, 253, 263, 270, 277, 289, 300, 341, 371, 373, 389, 390, 392, 393, 394, 395, 396, 397, 405, 408, 410, 414, 431, 432, 445, 459, 460, 473, 500, 521, 523, 554, 562, 563, 566, 574, 577, 615, 621, 635, 636, 638, 643, 683, 684, 687, 701, 740, 741, 745, 755, 761, 771, 789, 810, 822, 843, 855, 871, 885, 892, 895, 917

Soy Flour, Grits, and Flakes–Enzyme Active (Whole / Full-Fat, Unheated). 34, 615

Soy Flour, Grits, and Flakes–Use in Brewing Beer, Such as ADM Pro-zyne Flakes and Soybean Brew Flakes. 289

Soy Flour, Textured (Including TVP, Textured Vegetable Protein). 610, 620, 624, 628, 630, 638, 641, 642, 655, 656, 665, 683, 700, 709, 724, 726, 729, 750, 781, 799, 810, 829, 835, 839, 843, 846, 855, 863, 885, 919

Soy Ice Cream (General–Usually Non-Dairy). 62, 89, 125, 133, 141, 215, 263, 416, 447, 448, 455, 456, 459, 467, 471, 472, 473, 502, 504, 513, 531, 562, 563, 577, 587, 591, 595, 611, 633, 659, 690, 720, 721, 725, 727, 728, 730, 732, 733, 734, 735, 737, 738, 759, 767, 771, 776, 784, 810, 816, 817, 818, 819, 822, 823, 824, 837, 855, 867, 877, 888, 924

Soy Ice Cream–Etymology of This Term and Its Cognates / Relatives in Various Languages. 416, 448, 455, 459, 467

Soy Ice Cream–Non-Soy Non-Dairy Relatives (As Made from

Amazake, Fruit Juices, Peanuts, Field Peas, etc.). 4, 414

Soy Ice Cream Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 767, 867

Soy Nuggets–Whole Soybeans Fermented with Salt–Also called Fermented Black Beans, Salted Black Beans, Salty Black Beans, Black Fermented Beans, Black Beans, Black Bean Sauce, Black Bean and Ginger Sauce, Chinese Black Beans, or Preserved Black Beans. In Chinese (Mandarin): Shi, Doushi, or Douchi (pinyin), Tou-shih, Toushih, or Tou-ch'ih (Wade-Giles). Cantonese: Dow see, Dow si, Dow-si, Dowsi, or Do shih. In the Philippines: Tausi or Taosi / Tao-si. In Malaysia or Thailand: Tao si. In Indonesia: Tao dji, Tao-dji, or Tao-djie. In Japan: Hamanatto, Daitokuji Natto, Shiokara Natto, and Tera Natto. 180

Soy Oil–Etymology of This Term and Its Cognates / Relatives in Various Languages. 76, 228

Soy Oil Constants–Iodine Number / Value. 137, 445, 507

Soy Oil Constants. Includes Index of Refraction, Refractive Index, Solidification Point (*Erstarrungspunkt*), Specific Gravity. See also Iodine Number. 445

Soy Oil as a Commodity, Product, or Ingredient for Food Use (in Cookery or Foods). Its Manufacture, Refining, Trade, and Use. See Also: Industrial Uses of Soy Oil, and Nutrition: Lipids. 2, 6, 7, 9, 34, 50, 64, 66, 67, 73, 74, 79, 80, 85, 86, 101, 104, 110, 111, 122, 128, 137, 140, 141, 145, 154, 155, 158, 159, 173, 180, 205, 208, 211, 228, 231, 246, 263, 264, 270, 274, 275, 294, 299, 338, 362, 368, 371, 378, 381, 397, 408, 414, 418, 420, 421, 422, 424, 429, 430, 431, 445, 449, 459, 461, 468, 493, 498, 507, 510, 524, 562, 675, 677, 720, 721, 727, 728, 745, 784, 789, 827, 841, 871

Soy Plant (The) (Ann Arbor, Michigan). See Tofu International Ltd.

Soy Products of Australia Pty. Ltd. (Bayswater, Victoria, Australia). Formerly F.G. Roberts Health Food Products (Melbourne). 205

Soy Protein Concentrates, Textured. 729, 740, 833, 846

Soy Protein Council (Food Protein Council from 1971 to Dec. 1981). 687

Soy Protein Isolates, Concentrates, or Textured Soy Protein Products–Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 618, 635, 729, 832, 833, 843, 867, 890, 918, 919

Soy Protein Isolates, Concentrates, or Textured Soy Protein Products–Industry and Market Statistics, Trends, and Analyses–Individual Companies. 605, 611, 625, 706, 778, 843, 918, 921

Soy Protein Isolates, Textured (For Food Use Only, Including Spun Soy Protein Fibers or Soy Isolate Gels). See also: Industrial Uses of Soy Proteins–Fibers (Artificial Wool Made from Spun Soy Protein Fibers). 512, 536, 548, 549, 552, 583, 585, 589, 602, 604, 608, 609, 611, 612, 614, 615, 619, 623, 625, 629, 630, 635, 638, 646, 651, 656, 659, 660, 683, 699, 700, 701, 704, 706, 707, 708, 709, 729, 735, 736, 743, 751, 778, 788, 799, 810, 830, 833, 837, 843, 846, 849, 856, 890, 918, 921

Soy Protein Products (General, or Modern Products). See also: Nutrition–Protein, Protein Quality, and Amino Acid Composition. 213, 374, 397, 404, 405, 532, 562, 587, 605, 633, 635, 666, 843

Soy Proteins–Concentrates. 615, 618, 635, 659, 683, 729, 734, 740, 741, 810, 829, 843, 867, 871, 918

Soy Proteins–Detection When Added to Other Food Products (Such as Meat or Dairy Products, Wheat Flour or Baked Goods). 73

Soy Proteins–Isolates–Enzyme-Modified Soy Protein with Whipping / Foaming Properties Used to Replace Egg Albumen, and Early Related Whipping / Aerating Agents or Products. 459, 468, 523, 590, 615, 627, 729, 890

Soy Proteins–Isolates–Etymology of These Terms and Their Cognates / Relatives in Various Languages. 237, 459

Soy Proteins–Isolates, for Food Use. See also: Isolates, for Industrial (Non-Food) Use. 428, 465, 471, 475, 492, 509, 531, 537, 562, 563, 583, 586, 591, 618, 659, 683, 690, 701, 703, 706, 707, 719, 725, 726, 728, 729, 732, 733, 734, 737, 738, 740, 771, 789, 810, 830, 832, 843, 845, 846, 867, 871, 890, 917, 918, 921, 922, 923, 924

Soy Proteins–Isolates, for Industrial (Non-Food) Use. See also: Isolates, for Food Use. 2, 237, 402, 495, 523, 537, 701, 726, 728, 729, 732, 734, 757, 779, 830, 835, 845, 864, 918, 920, 921

Soy Proteins–Properties (Including Types {Globulins, Glycinin, Beta- and Gamma-Conglycinin} Protein Fractions and Subunits, Sedimentation Coefficients, Nitrogen Solubility, and Rheology). 169, 810

Soy Proteins–Textured Isolates–Etymology of These Terms and Their Cognates / Relatives in Various Languages. 536, 549, 589, 608, 651, 699, 700

Soy Proteins—Used as an Ingredient in or for Early Second Generation Commercial Food or Beverage Products. 492, 585

Soy Proteins, Textured (General). 619, 630, 635, 658, 743, 839, 885

Soy Puddings, Custards, Parfaits, or Mousses (Usually made from Soymilk or Tofu). See also Soy Yogurt—Not Fermented. 158, 216, 257, 416, 459, 492, 684, 745, 917, 923

Soy Sauce (Including Shoyu). See Also Tamari, Teriyaki Sauce, and Traditional Worcestershire Sauce. 37, 62, 73, 79, 86, 126, 137, 141, 158, 180, 208, 211, 263, 373, 397, 459, 461, 462, 591, 615, 686, 754, 756, 761, 809, 871

Soy Sauce, HVP Type (Non-Fermented or Semi-Fermented, Made with Acid-Hydrolyzed Vegetable Protein; an Amino Acid Seasoning Solution Rich in Glutamic Acid). Also Called Pejoratively Chemical Soy Sauce. 136

Soy Sauce, Indonesian Style or from the Dutch East Indies (Kecap, Kécap, Kechap, Ketjap, Kétjap). See also Ketchup / Catsup. 211

Soy Sauce, Non-Soy Relatives. 4

Soy Sprouts (Sprouted or Germinated Soybeans) for Food Use. 69, 79, 141, 158, 164, 180, 211, 216, 263, 364, 366, 373, 416, 435, 459, 500, 591, 855, 917

Soy Sprouts—Etymology of This Term and Its Cognates / Relatives in Various Languages. 158

Soy fiber. See Fiber

Soy flour companies (Europe). See Spillers Premier Products Ltd. (Puckeridge, Ware, Hertfordshire, England)

Soy flour companies (Oceania). See Soy Products of Australia Pty. Ltd

Soy ice cream companies (USA). See Barricini Foods (Mountain Lakes, New Jersey), Tofutti Brands, Inc. (Cranford, New Jersey)

Soy infant formula. See Infant Formula, Soy-based

Soy is NOT Mentioned in the Document. 1, 3, 4, 5, 8, 10, 11, 13, 14, 21, 48, 375, 387, 409, 506, 544, 551, 553, 555, 565, 572, 575, 598, 637, 747, 791, 804, 813, 820, 821, 857, 866, 886

Soy lecithin. See Lecithin, Soy

Soy oil—industry and market statistics. See Soybean Crushing

Soy protein companies (Israel). See Hayes Ashdod Ltd. and Hayes General Technology

Soy protein companies (USA). See Borden, Inc., Delsoy Products, Inc., Drackett Co. (The), Glidden Co. (The), Grain Processing Corporation, Griffith Laboratories, Gunther Products, Inc., Laucks (I.F.) Co., Mitchell Foods, Inc., Protein Technologies International (PTI), Rich Products Corporation

Soy sauce companies (international). See Kikkoman Corporation (Tokyo, Walworth, Wisconsin; and Worldwide)

Soy sauce companies or brands (USA). See Oriental Show-You Co

Soy sauce used in Worcestershire sauce. See Worcestershire Sauce—With Soy Sauce Used as an Ingredient

Soy sauce. See Worcestershire Sauce

Soy whip topping. See Whip Topping

Soy, etymology of the word. See Etymology of the Word “Soy” and its Cognates / Relatives in English

Soya—Soybean Production and Soy Products. 211

Soya Corporation of America and Dr. Armand Burke. See Also Dr. Artemy A. Horvath. 498

Soya Foods Ltd [Named Soya Flour Manufacturing Co. Ltd. (1929-42), and Soya Foods Ltd. (1933)]. See Spillers Premier Products Ltd.

Soya Kaas Inc. See Swan Gardens Inc. and Soya Kaas Inc.

SoyaWorld, Inc. (Near Vancouver, British Columbia, Canada). Started 1997. Acquired in 2002 by Sanitarium Foods of Australia. 888

Soybean—Morphology, Structure, and Anatomy of the Plant and Its Seeds as Determined by Microscopy or Microscopic Examination. 403, 484, 548

Soybean—Morphology, Structure, and Anatomy of the Plant and Its Seeds. 449, 487

Soybean—Physiology and Biochemistry (Including Photoperiodism, Photosynthesis, Translocation, Plant Water Relations, Respiration, Photorespiration). 487, 597, 649

Soybean—Physiology and Biochemistry—Maturity Groups.

694

Soybean–Terminology and Nomenclature–Fanciful Terms and Names. 130, 300, 397, 459, 754

Soybean–origin and domestication. *See* Origin, Domestication, and Dissemination of the Soybean (General)

Soybean Council of America. *See* American Soybean Association (ASA)–Soybean Council of America

Soybean Crushers (Canada), Early (Started Before 1941)–Milton Oil Refineries Ltd. (Milton, Ontario; March 1930–Renamed Canadian Soyabeans Ltd. by March 1935), Dominion Linseed Oil Co. (Baden, ONT; 1932), Soy Bean Oil and Meal Co-operative Company of Canada, Ltd. (Chatham, ONT; 1932), Dominion Soya Industries / Dominion Soya Products Co. (Montreal, Quebec; spring 1935), Soya Mills Limited (Stratford, ONT; Jan. 1936), Edgar Soya Products (Belle River, Ontario; 1936), Toronto Elevators Ltd. (Toronto, ONT; 1938). 73, 80, 122, 128, 129, 154

Soybean Crushers (Europe). *See* Unilever Corp., Lever Brothers Co., Unimills B.V. (Netherlands)

Soybean Crushers (USA), Cooperative–General and Other. 422, 498

Soybean Crushers (USA), Early–Pacific Oil Mills and Albers Brothers Milling Co. (Seattle, Washington; 1911), Elizabeth City Oil and Fertilizer Co. (Elizabeth City, North Carolina; 1915. By 1917 six other North Carolina oil mills were crushing soybeans), Chicago Heights Oil Mfg. Co. (Chicago Heights, Illinois; 1920), A.E. Staley Mfg. Co. (Decatur, Illinois; 1922), Piatt County Cooperative Soy Bean Co. (Monticello, Illinois; 1923–batch solvent), Blish Milling Co. (Seymour and Crothersville, Indiana; 1923), Eastern Cotton Oil Co. (Norfolk, Virginia; 1924–continuous solvent). 6, 104, 299, 371, 408, 424, 445, 498, 675

Soybean Crushers (USA), Small Crushers–Arkansas Grain Corp. (Helena & Stuttgart, Arkansas), Hemphill Soy Products (Kennett, Missouri), Old Fort Mills (Marion, Ohio), Sioux Soya Mills (Sioux City, Iowa), Soy Bean Processing Co. (Waterloo, Iowa), Soybean Products, Inc. (Cedar Rapids, Iowa), Southern Soya Corp. (Cameron, South Carolina), Soy-Rich Products (Wichita, Kansas), Toledo Soybean Products (Toledo, Ohio) Western Soybean Mills (Sioux Falls, South Dakota), etc. 6, 201, 371, 424, 498

Soybean Crushers (USA). *See* Seed Companies, Soybean–Funk Brothers Seed Co. (Bloomington, Illinois)–After 1924, Sinaiko Family and Iowa Milling Co. (Cedar Rapids, Iowa)

Soybean Crushing (General: Soy / Soybean Oil and Soybean Meal). 44, 68, 69, 70, 97, 105, 106, 116, 119, 129, 131, 134, 142, 179, 202, 204, 213, 214, 215, 244, 259, 277, 296, 307, 345, 359, 405, 425, 442, 454, 456, 466, 508, 515, 517, 526, 534, 539, 566, 593, 595, 631, 654, 669, 676, 684, 690, 697, 731, 735, 741, 754, 771, 790, 840

Soybean Crushing–Equipment–Hydraulic Presses. 6, 34, 79, 104, 122, 134, 140, 141, 177, 213, 405, 445, 539

Soybean Crushing–Equipment–Screw Presses and Expellers (Continuous, Mechanical). 2, 6, 34, 104, 122, 128, 134, 140, 141, 177, 213, 299, 371, 424, 445, 473, 507, 539, 566, 741, 873, 916

Soybean Crushing–Equipment–Solvent Extraction. 2, 6, 77, 119, 134, 299, 524, 675, 735, 835, 840

Soybean Crushing–Explosions and/or Fires in Soybean Solvent Extraction Plants (Making Soy Oil and Soybean Meal). 95, 97, 134, 299, 338, 524, 539, 566, 675

Soybean Crushing–New Soybean Crusher. 67, 80, 154, 420, 421, 422

Soybean Crushing, Including Production and Trade of Soybean Oil, Meal or Cake, Margarine, or Shortening–Industry and Market Statistics, Trends, and Analyses -. 76, 91, 97, 134, 136, 140, 144, 160, 162, 168, 228, 299, 371, 405, 408, 445, 523, 741, 757

Soybean Marketing Association (1929-1932). Organized at Decatur, Illinois on 16 Oct. 1929. 566

Soybean Meal (SBM) (Defatted). Formerly Called Bean Cake, Beancake, Soybean Cake, Oilmeal, or Presscake. 6, 9, 33, 64, 67, 73, 77, 79, 80, 85, 97, 104, 113, 115, 122, 124, 130, 140, 141, 144, 154, 160, 162, 173, 177, 180, 186, 190, 192, 205, 208, 211, 220, 233, 246, 263, 264, 273, 275, 294, 299, 361, 371, 395, 396, 408, 413, 418, 420, 421, 422, 424, 428, 431, 434, 441, 445, 449, 461, 477, 479, 488, 493, 498, 524, 557, 562, 566, 621, 675, 682, 689, 691, 692, 722, 740, 745, 750, 779, 789, 827, 837, 841, 850, 901, 916

Soybean Meal–Etymology of This Term and Its Cognates / Relatives in Various Languages. 73

Soybean Meal / Cake, Fiber (as from Okara), or Shoyu Presscake as a Fertilizer or Manure for the Soil–Industrial Uses. 73, 79, 141, 259, 757, 864

Soybean Production–General, and Amount Produced. 7, 23, 27, 34, 36, 38, 43, 44, 55, 82, 84, 97, 98, 99, 108, 112, 113, 118, 119, 130, 160, 191, 202, 204, 228, 263, 300, 335, 341, 371, 408,

410, 446, 464, 466, 485, 515, 539, 568, 593, 639, 640, 661, 676, 711, 720, 721, 745, 771, 782, 789, 790, 802, 869, 913

Soybean Production–Industry and Market Statistics, Trends, and Analyses. 711, 767

Soybean Seeds–Black in Color. Food Use is Not Mentioned. 41, 73, 117, 157, 510, 790, 926

Soybean Seeds–Brown in Color. Especially Early Records. 33, 73, 117, 159, 228, 790

Soybean Seeds–Green in Color. Food Use is Not Mentioned. Early Named Varieties Include Aoda, Columbia, Giant Green, Guelph or Medium Green, Medium Early Green, Medium Green, Samarow, Sonoma, and Tashing. 473, 500, 510, 636

Soybean Seeds–Yellow in Color. Including Yellowish White, Cream Colored, and Pale (*Pallida*). Especially Early Records. See also: Soybean Seeds–White. 73, 206, 228, 234, 371, 560, 694

Soybean Varieties Canada–Harosoy. 580, 594, 600

Soybean Varieties Canada–O.A.C. 211–Early Development. 73, 228

Soybean Varieties Canada–Quebec No. 537–Early Development. 73

Soybean Varieties Canada–Quebec No. 92–Early Development. 73

Soybean Varieties USA–A.K.–Early Introduction. 228, 510

Soybean Varieties USA–Agate–Large-Seeded and / or Vegetable-Type. 372

Soybean Varieties USA–Aoda–Large-Seeded and / or Vegetable-Type. 372

Soybean Varieties USA–Auburn–Early Selection (1907). 228

Soybean Varieties USA–Bansei–Large-Seeded and / or Vegetable-Type. 372, 566, 568, 823, 926

Soybean Varieties USA–Biloxi–Early Introduction. 228

Soybean Varieties USA–Black Eyebrow–Early Introduction. 228, 510, 790

Soybean Varieties USA–Chame–Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Chernie–Early Introduction. 228

Soybean Varieties USA–Chusei–Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Dunfield–Early Introduction. 118, 694

Soybean Varieties USA–Early Brown–Early Introduction. 33, 73, 228, 790

Soybean Varieties USA–Early Yellow–Early Introduction. Renamed Ito San by about 1902. 73, 206, 228

Soybean Varieties USA–Easycook / Easy Cook–Early Introduction. Large-Seeded and/or Vegetable-Type. 926

Soybean Varieties USA–Ebony–Early Introduction. 228

Soybean Varieties USA–Elton–Early Introduction. 510

Soybean Varieties USA–Emperor–Large-Seeded and / or Vegetable-Type. 372

Soybean Varieties USA–Fuji–Large-Seeded and / or Vegetable-Type. 372, 926

Soybean Varieties USA–Funk Delicious–Large-Seeded and / or Vegetable-Type. 372

Soybean Varieties USA–Giant Green–Large-Seeded and / or Vegetable-Type. 566

Soybean Varieties USA–Goku–Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Haberlandt–Early Introduction. 694

Soybean Varieties USA–Hahto–Early Introduction. Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Hakote–Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Higan–Large-Seeded and / or Vegetable-Type. 372, 926

Soybean Varieties USA–Hiro–Large-Seeded and / or Vegetable-Type. 926

Soybean Varieties USA–Hokkaido–Large-Seeded and / or Vegetable-Type. 372, 566, 926

Soybean Varieties USA–Hollybrook–Early Introduction. 228

- Soybean Varieties USA–Illington–Large-Seeded and / or Vegetable-Type. 372
- Soybean Varieties USA–Imperial–Large-Seeded and / or Vegetable-Type. 372
- Soybean Varieties USA–Ito San–Early Introduction. Synonyms–Medium Early Yellow, Early White, Early Yellow, Kaiyuski Daizu, Kiyusuki Daidzu, Kysuki, Yellow Eda Mame, Dwarf Early Yellow, Early, Eda Mame, Coffee Berry. 118, 510, 634, 790
- Soybean Varieties USA–Jackson–Large-Seeded and / or Vegetable-Type. 580, 594, 600
- Soybean Varieties USA–Jogun–Large-Seeded and / or Vegetable-Type. 372, 926
- Soybean Varieties USA–Kanro–Large-Seeded and / or Vegetable-Type. 372, 926
- Soybean Varieties USA–Kingston–Early Introduction. 117
- Soybean Varieties USA–Kura–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Laredo–Early Introduction. 228
- Soybean Varieties USA–Mammoth–Early Introduction. 413
- Soybean Varieties USA–Mammoth Yellow–Early Introduction. 228, 234, 371, 408, 694
- Soybean Varieties USA–Manchu–Early Introduction. 33, 38, 73, 90, 118, 145, 206, 228, 510, 566, 694, 790
- Soybean Varieties USA–Mandarin–Early Introduction. 73, 118, 125, 206, 228, 398, 490, 517, 580, 594, 600, 694
- Soybean Varieties USA–Medium Green–Early Introduction. 510
- Soybean Varieties USA–Mikado–Early Development. 228, 634
- Soybean Varieties USA–Mongol–Early Introduction. 634
- Soybean Varieties USA–Morse–Early Introduction. 228
- Soybean Varieties USA–Nanda–Large-Seeded and / or Vegetable-Type. 372, 926
- Soybean Varieties USA–Ogemaw / Ogema–Early Development. Synonym–Dwarf Brown (Morse 1948). 117, 159, 228
- Soybean Varieties USA–Osaya–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Peking / Pekin–Early Selection (1907). 228, 510
- Soybean Varieties USA–Rokusun–Large-Seeded and / or Vegetable-Type. 216, 372, 926
- Soybean Varieties USA–Sato–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Seminole–Large-Seeded and / or Vegetable-Type. 372, 790
- Soybean Varieties USA–Shiro–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Sioux–Large-Seeded and / or Vegetable-Type. 372
- Soybean Varieties USA–Sousei–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Suru–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Tashing–Early Introduction. 228
- Soybean Varieties USA–Toku–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Tokyo / Tokio–Early Introduction. 228, 694
- Soybean Varieties USA–Virginia–Early Selection (1907). 228
- Soybean Varieties USA–Waseda–Large-Seeded and / or Vegetable-Type. 926
- Soybean Varieties USA–Willomi–Large-Seeded and / or Vegetable-Type. 216, 358, 370, 372
- Soybean Varieties USA–Wilson–Early Introduction. 41
- Soybean Varieties USA–Wisconsin Black–Early Introduction. 73, 228
- Soybean Variety Development and Breeding–New Soybean Varieties in the USA. 278, 560

Soybean crushers (Asia). *See* Ajinomoto Co. Inc. (Tokyo, Japan), Fuji Oil Co., Ltd. (Osaka, Japan), Incl. Fuji Purina Protein Ltd., Nisshin Oil Mills, Ltd. (Tokyo, Japan), Showa Sangyo Co. Ltd. (Tokyo, Japan)

Soybean crushers (Canada). *See* ADM Agri-Industries Ltd. (Windsor, Ontario, Canada)

Soybean crushers (Europe). *See* Ferruzzi-Montedison (Italy), Oelmuehle Hamburg AG (Hamburg, Germany)

Soybean crushers (USA), Cooperative. *See* Boone Valley Cooperative Processing Association (Eagle Grove, Iowa), Dawson Mills (Dawson, Minnesota), Far-Mar-Co, Inc., Farmers Union Grain Terminal Association (GTA), Farmland Industries, Inc., Honeymead (Mankato, Minnesota), Land O'Lakes, Inc., Missouri Farmers Association (MFA), Monticello Co-operative Soybean Products Co. (Monticello, Piatt Co., Illinois), North Iowa Cooperative Processing Association, (Manly, Iowa), Ohio Valley Soybean Cooperative (Henderson, Kentucky), Riceland Foods (Named Arkansas Grain Corp. before Sept. 1970)

Soybean crushers (USA), Early. *See* Elizabeth City Oil and Fertilizer Co. (Elizabeth City, North Carolina; 1915)

Soybean crushers (USA). *See* Allied Mills, Inc., Archer Daniels Midland Co. (ADM) (Decatur, Illinois), Bunge Corp. (White Plains, New York), Cargill, Inc. (Minneapolis, Minneapolis), Central Soya Co. (Fort Wayne, Indiana), Chicago Heights Oil Co. (Chicago Heights, Illinois), Continental Grain Co. (New York, New York), Dannen Mills (St. Joseph, Missouri), Delphos Grain & Soya Products Co. (Delphos, Ohio), Honeymead Products Co., Lauhoff Grain Co. (Danville, Illinois), Pillsbury Feed Mills and Pillsbury Co. (Minneapolis, Minnesota), Procter & Gamble Co. (Cincinnati, Ohio). Including the Buckeye Cotton Oil Co., Quincy Soybean Products Co. (Quincy, Illinois), Ralston Purina Co. (St. Louis, Missouri), Shellabarger Grain Co. / Shellabarger Soybean Mills (Decatur, Illinois), Spencer Kellogg & Sons, Inc. (Buffalo, New York), Staley (A.E.) Manufacturing Co. (Decatur,, Swift & Co. (Illinois)

Soybean crushing-solvents. *See* Solvents

Soybean oil constants. *See* Soy Oil Constants

Soybean oil. *See* Soy Oil

Soybean paste. *See* Miso

Soybean processing. *See* Soybean Crushing

Soybean production-Farm Machinery. *See* Tractors

Soybean production-Farm equipment. *See* Machinery (Agricultural), Implements, Equipment, and Mechanization

Soybean production-Farm machinery. *See* Combines, Farm Machinery-Etymology

Soybean production-Marketing. *See* Chicago Board of Trade (CBOT), Marketing Soybeans, Railroads / Railways and Special Trains Used to Promote Soybeans and Soybean Production, Soybean Marketing Association (1929-1932)

Soybean production-Plant protection. *See* Diseases (Bacterial, Fungal, and Viral / Virus), Insects-Pest Control. *See also*: Integrated Pest Management, Weeds-Control and Herbicide Use

Soybean production-Research. *See* Research on Soybeans

Soybean production. *See*-Fertilizers and Plant Nutrition, Cover Crop, Use of Soybean as. *See also*: Intercropping, Crop Rotation of Soybean Plants for Soil Improvement, Cropping Systems: Intercropping, Interplanting, or Mixed Cropping, Cultural Practices, Green Manure, Harvesting and Threshing, Peoria Plan of 1928-29 for Growing, Selling, and Processing Soybeans, Plant Protection from Diseases, Pests and Other Types of Injury (General), Policies and Programs, Government, Prices of Soybeans, Soybean Products, and Soybean Seeds, Soybean Variety Development and Breeding-New Soybean Varieties in the USA, Yield Statistics, Soybean

Soybeans, ground (used as food). *See* Whole Dry Soybeans

Soybeans, whole dry (used unprocessed as food). *See* Whole Dry Soybeans

Soyfood products, commercial. *See* Commercial Soy Products-New Products

Soyfoods (General Food Uses of Soybeans). 36, 163, 736

Soyfoods Association of North America (SANA). Founded 29 June 1978. 710, 773

Soyfoods Center. *See* Soyinfo Center (Lafayette, California)

Soyfoods Movement in North America (USA & Canada, General). 739, 744, 773

Soyfoods companies (Europe). *See* British Arkady Company Ltd. (Manchester, England), Haldane Foods Group Ltd. (Newport Pagnell, Buckinghamshire, England)

Soyfoods companies (USA). *See* Farm Food Co. (San Rafael,

then San Francisco, California), Farm Foods, and Farm Soy Dairy, Hain Celestial Group, Inc. (Uniondale, New York), Lightlife Foods, Inc. (Turners Falls, Massachusetts), White Wave, Inc. (Boulder, Colorado)

Soyfoods movement. *See* Rodale Press (Emmaus, Pennsylvania), Soyfoods Association of North America (SANA)

Soyinfo Center (Lafayette, California). Named Soyfoods Center until 1 Jan. 2007. 688, 701, 705, 706, 729, 736, 744, 754, 756, 767, 773, 785, 824, 826, 841, 842, 862, 864, 887, 890, 925

Soyland Farm. *See* Fouts Family of Indiana

Soymilk—Etymology of This Term and Its Cognates / Relatives in Various Languages. 228, 467

Soymilk Companies (Asia)—Kibun, Marusan-Ai, Mitsubishi, Meiji, and Saniku Shokuhin in Japan. 644

Soymilk Curds. *See* Curds Made from Soy milk

Soymilk Equipment Companies (Europe). *See* Tetra Pak International (Lund, Sweden)

Soymilk Industry and Market Statistics, Trends, and Analyses—By Geographical Region. 867, 888

Soymilk Industry and Market Statistics, Trends, and Analyses—Larger Companies. 689, 691, 888

Soymilk companies (Canada). *See* SoyaWorld, Inc. (Near Vancouver, British Columbia, Canada)

Soymilk companies (USA). *See* American Soy Products (Saline, Michigan), Vitasoy, WholeSoy & Co. (subsidiary of TAN Industries, Inc., California)

Soymilk shakes. *See* Shakes

Soymilk, Fermented—Unusual Fermented Dairy Products (Such as Viili or Piima) that Can Also Be Made from Soy milk. *See also:* Soy Yogurt—Fermented and Soy Cheese—Fermented. 613

Soymilk, Fermented, in Liquid or Viscous Form (Basic Research, Acidophilus Soy milk or Soy Acidophilus Milk, Soy Viili, Buttermilk, Koumiss, Lassi, Piima, etc.). *See also:* Soy Yogurt, Soy Cheese, and Soy Kefir. 107, 111, 165, 166, 599, 705, 874

Soymilk, Soy Drinks / Beverages, Soy-Based Infant Formulas,

and Nogs (Liquid, Non-Fermented). *Note—For Soy milk Products See* Tofu, Yuba, Shakes, Soy Ice Cream, Soy Yogurt, and Soy Cheese or Cheese Alternatives. 3, 37, 58, 59, 60, 62, 69, 79, 107, 114, 121, 126, 138, 141, 144, 151, 152, 158, 162, 163, 164, 176, 180, 205, 211, 215, 216, 224, 228, 233, 255, 257, 263, 270, 300, 336, 346, 351, 371, 373, 385, 393, 404, 407, 408, 410, 414, 416, 428, 435, 436, 447, 448, 455, 456, 458, 459, 461, 467, 473, 488, 500, 516, 521, 527, 554, 577, 587, 588, 591, 595, 599, 611, 612, 616, 635, 636, 638, 644, 659, 684, 686, 687, 688, 689, 690, 691, 692, 697, 701, 702, 711, 719, 720, 721, 725, 727, 728, 730, 732, 735, 737, 738, 739, 745, 750, 755, 756, 761, 765, 770, 771, 772, 773, 774, 776, 784, 801, 806, 808, 809, 810, 815, 816, 817, 818, 819, 822, 823, 825, 837, 842, 851, 855, 867, 871, 888, 891, 904, 917, 918, 923

Soy milk, Spray-Dried or Powdered. 692

Soy milk, Used as an Ingredient in Non-Beverage Commercial Products Such as Ice Creams, Yogurts, Cheeses, Desserts, or Entrees. 440, 494, 496, 570, 571, 573, 590, 627

Soy milk. *See* Calf, Lamb, or Pig Milk Replacers

Soy nut Butter (Soy nuts / Roasted Soybeans Ground to a Paste Resembling Peanut Butter; May Also Be Made from Soy Flour Mixed with a Little Oil). 216, 270, 385, 459, 591, 599, 684, 823

Soy nut Butter—Etymology of This Term and Its Cognates / Relatives in Various Languages. 216

Soy nut companies (USA). *See* Sycamore Creek Co. (Mason, Michigan). Before 1993, INARI, Ltd.

Soy nuts (Oil Roasted or Dry Roasted / Toasted), Incl. *Irimame* Used at Setsubun (Lunar New Year) in Japan and Parched Soybeans. 58, 59, 62, 86, 88, 101, 111, 158, 211, 215, 216, 265, 270, 300, 390, 459, 500, 638, 668, 684, 687, 697, 728, 736, 754, 761, 765, 823, 855, 892

Soy nuts—Etymology of This Term and Its Cognates / Relatives in Various Languages. 215

Spencer Kellogg & Sons, Inc. (Buffalo, New York). 104, 371, 424, 468, 498, 507, 516, 539, 581, 734, 922

Spillers Premier Products Ltd. (Puckeridge, Ware, Hertfordshire, England). Including Soya Foods Ltd [Named Soya Flour Manufacturing Co. Ltd. (1929-42), and Soya Foods Ltd. (1933)]. And incorporating British Soya Products (1932). 34, 79, 141, 157, 158, 180, 208, 799

Sprouts. *See* Soy Sprouts

- Spun soy protein fibers used in meat alternatives. *See* Meat Alternatives–Kesp (Spun Soy Protein Fibers)
- Spun soy protein fibers. *See* Soy Proteins–Textured Soy Protein Isolates
- Sri Lanka. *See* Asia, South–Sri Lanka
- Staley (A.E.) Manufacturing Co. (Decatur, Illinois; Acquired by Tate & Lyle PLC in June 1988). 6, 34, 104, 133, 150, 158, 233, 344, 371, 408, 424, 449, 454, 468, 471, 473, 498, 539, 566, 615, 634, 665, 713, 724, 750, 771, 781, 810, 839, 863, 885
- Standards, Applied to Soybeans or Soy Products. 507
- Statistics on soybean production, area and stocks. *See* individual geographic regions (such as Asia, Europe, Latin America, United States, etc.) and nations within each region
- Statistics on soybean production. *See* Soybean Production and Trade–Industry and Market Statistics,
- Statistics on soybean yields. *See* Yield Statistics, Soybean
- Statistics. *See* Industry and Market Analyses and Statistics, the specific product concerned, e.g. Tofu Industry and Market Statistics
- Steroids, Steroid Hormones, and Sterols–Industrial Uses of Soy Oil. 522, 539, 740, 741
- Sterols or Steroid Hormones in Soybeans (Phytosterols–Including Beta-Sitosterol, Campesterol, and Stigmasterol from Which Steroids Such as Progesterone, Hydrocortisone, and Cortisone Can Be Made). 445, 522, 539, 740, 741
- Storage of Seeds, Viability and Life-Span During Storage or Storability, and Drying of Soybeans. 79, 118, 204, 228, 487
- Straw, soybean. *See* Feeds / Forage from Soybean Plants–Straw
- Strayer Family of Iowa–Incl. George Strayer (1910-1981; executive officer of the American Soybean Association 1940-1967), His Father Bert Strayer (1880-1941), and His Nephew Dennis Strayer (born 1938). 260, 439, 459, 510, 517, 603, 634, 695, 710, 713, 873
- Sufu. *See* Tofu, Fermented
- Sunflower Oil / Sunflowerseed Oil / Sunoil. 562
- Sunflower Seeds and Sunflowers (*Helianthus annuus*)–Including Sunflowerseed Oil, Cake, and Meal. Once called the Heliotrope, Heliotropion, and Heliotropium. 20, 34, 38, 459, 537
- Sustainable Development and Growth, Including Low-Input Sustainable Agriculture (LISA), Renewable Energy Resources (Solar, Wind), Steady State Economics, and Voluntary Simplicity Worldwide. 790, 807, 808, 811, 828
- Swan Gardens Inc. and Soya Kaas Inc. (Atlanta, Georgia). 867
- Swedenborg, Emanuel (1688-1772). Swedish Scientist, Philosopher, Religious Writer and Vegetarian for 20 Years. 905
- Swift & Co. (Chicago, Champaign, and Oak Brook, Illinois). 235, 371, 424, 468, 498, 507, 548, 549, 552, 566, 614, 619, 628, 629, 630, 635, 641, 642, 666, 682, 700, 701, 707, 708, 709, 726, 735, 837, 839, 885
- Sycamore Creek Co. (Mason, Michigan). Before 1993, INARI, Ltd.–International Nutrition and Resources Inc. Purchased by W.G. Thompson & Sons Ltd. of Canada, Jan. 1999. 668
- Tahini or tahina or tahin. *See* Sesame Butter
- Taiwan. *See* Asia, East–Taiwan
- Tariffs, duties, embargoes. *See* Trade Policies (International) Concerning Soybeans, Soy Products, or Soyfoods–Tariffs, Duties, Embargoes, Moratoriums, and Other Trade Barriers or Subsidies
- Tempeh (Spelled *Těmpé* in Malay-Indonesian). 615, 687, 688, 736, 743, 756, 809, 858, 867, 871
- Tempeh, Okara (Okara Tempeh), Incl. Mei Dou Za, Mei-Tou-Cha, Meitauza from China, and Tempe Gembus (from Central and Eastern Java). 462
- Tempehworks. *See* Lightlife Foods, Inc.
- Terminology for soybeans–Fanciful. *See* Soybean–Terminology and Nomenclature–Fanciful Terms and Names
- Tetra Pak International (Lund, Sweden). 774
- Textiles made from spun soy protein fibers. *See* Fibers (Artificial Wool or Textiles Made from Spun Soy Protein Fibers, Including Azlon, Soylon, and Soy Silk / Soysilk)
- Textured soy flours. *See* Soy Flours, Textured (Including TVP, Textured Vegetable Protein)
- Textured soy protein concentrates. *See* Soy Protein

Concentrates, Textured

Textured soy protein isolates. *See* Soy Protein Isolates, Textured (For Food Use Only). Including Spun Fibers

Textured soy proteins. *See* Soy Proteins, Textured

Third World / Developing Nations. 149, 729

Thyroid function. *See* Goitrogens and Thyroid Function

Timeline. *See* Chronology / Timeline

Tofu (Also Called Soybean Curd or Bean Curd until about 1975-1985). *See also* Tofu–Fermented, Soy Ice Creams, Soy Yogurts, and Cheesecake, Which Often Use Tofu as a Major Ingredient. 30, 58, 59, 61, 62, 69, 73, 86, 121, 126, 138, 152, 158, 180, 205, 211, 215, 216, 222, 227, 233, 263, 272, 373, 385, 397, 448, 459, 461, 462, 500, 562, 563, 587, 591, 615, 636, 643, 644, 666, 684, 686, 687, 688, 699, 728, 729, 743, 745, 754, 756, 761, 763, 765, 767, 773, 797, 801, 809, 817, 818, 819, 823, 826, 871, 887, 895, 896, 905, 909, 917

Tofu–Etymology of This Term and Its Cognates / Relatives in Various Languages. 205

Tofu–Marketing of. 773

Tofu Industry and Market Statistics, Trends, and Analyses–By Geographical Region. 867

Tofu Industry and Market Statistics, Trends, and Analyses–Larger Companies. 867

Tofu International Ltd. and Rosewood Products Inc. (Ann Arbor, Michigan) (The Soy Plant before 1987). 688

Tofu companies (USA). *See* Legume, Inc. (Fairfield, New Jersey), Morinaga Nutritional Foods, Inc., and Morinaga Nyūgyō (Torrance, California, and Tokyo, Japan), Nasoya Foods, Inc. (Leominster, Massachusetts). Subsidiary of Vitasoy, Simply Natural, Inc. (Philadelphia, Pennsylvania), Swan Gardens Inc. and Soya Kaas Inc. (Atlanta, Georgia), Tofu International Ltd. and Rosewood Products Inc. (Ann Arbor, Michigan), Tomsun Foods, Inc. (Greenfield, Massachusetts; Port Washington, New York

Tofu in Second Generation Products, Documents About. 736

Tofu, Fermented (Also Called *Doufu-ru*, *Toufu-ru*, *Furu*, *Fuyu*, *Tahuri*, *Tahuli*, *Tajure*, *Tao-hu-yi*, or *Sufu*). *See also* *Tofu-yo*. 86, 158, 233, 462, 743

Tofu, Fermented–Etymology of This Term and Its Cognates /

Relatives in Various Languages. 462

Tofu, Fried (Especially Pouches, Puffs, Cutlets, or Burgers; *Agé* or *Aburagé*, *Atsu-agé* or *Nama-agé*, *Ganmodoki* or *Ganmo*). 644

Tofu, Frozen, Dried-frozen, or Dried Whole (Not Powdered). 180, 743, 754

Tofu, Smoked. 233

Tofutti Brands, Inc. (Cranford, New Jersey)–Soy Ice Cream Company. *Mintz's Buffet* Until Jan. 1982. 730, 767, 810, 867, 924

Tomsun Foods, Inc. (Greenfield, Massachusetts; Port Washington, New York. Named New England Soy Dairy from 1978-1983). 736

Toxins and Toxicity in Foods and Feeds–Trichloroethylene Solvent and the Duren / Dueren Disease or Poisoning of Cattle / Ruminants. 675

Tractors. 3, 5, 8, 12, 19, 38, 45, 46, 79, 123, 258, 277, 286, 662, 758, 866

Trade (International–Imports, Exports) of Soybeans, Soy Oil, and / or Soybean Meal. *See also* Trade–Tariffs and Duties. 6, 41, 73, 79, 114, 121, 122, 126, 141, 158, 159, 180, 208, 235, 371, 408, 461, 517, 523, 754, 757, 767, 789

Trade Policies (International) Concerning Soybeans, Soy Products, or Soyfoods–Tariffs, Duties, Embargoes, Moratoriums, and Other Trade Barriers or Subsidies. 79, 98, 122, 130, 341, 414, 534, 853

Trade of Soyfoods (Import and Export, not Including Soy Oil or Soybean Meal, but Including Lecithin and Margarine) or Soyfoods Manufacturing Equipment. *See also*: Soy Sauce–Imports, Exports. Miso–Imports, Exports. 34

Trains used to transport soybeans. *See* Transportation of Mature Soybeans to Market

Trains, special. *See* Railroads / Railways and Special Trains Used to Promote Soybeans and Soybean Production

Transportation of Mature Soybeans to Market within a Particular Country or Region–General and Other. 507

Transportation of Soybeans or Soy Products to Market by Railroad / Railway / Rail within a Particular Country or Region. *See also* Railroads / Railways and Special Trains Used to Promote Soybeans and Soybean Production. 122, 202, 445,

479, 480, 495, 526, 716, 840

Transportation of Soybeans or Soy Products to Market by Roads or Highways Using Trucks, Carts, etc. within a Particular Country or Region. 79, 479, 526

Tree of Life (St. Augustine, Florida). Purchased in Dec. 1985 by Netherlands-based Royal Wessanen NV Co. 867

Tri-County Soy Bean Co-operative Association. *See* Dawson Mills

Trichloroethylene. *See* Solvents–Trichloroethylene, Toxins and Toxicity in Foods and Feeds–Trichloroethylene Solvent and the Duren / Dueren Disease

Trucks or Carts used to transport soybeans. *See* Transportation of Soybeans or Soy Products to Market by Roads or Highways

Turkey, meatless. *See* Meat Alternatives–Meatless Turkey

Turkeys Fed Soybeans, Soybean Forage, or Soybean Cake or Meal as Feed. 158

TVP. *See* Soy Flours, Textured (Including TVP, Textured Vegetable Protein)

Unfair Practices–Including Possible Deceptive / Misleading Labeling, Advertising, etc. *See also*: Adulteration. 656, 680, 781, 863

Unilever Corp., Lever Brothers Co., Unimills B.V. (Netherlands), and Margarine Union. 467, 468, 566, 611, 614, 630, 666, 700, 701, 709, 735, 772, 837

United Kingdom. *See* Europe, Western–United Kingdom

United Nations (Including UNICEF, FAO, UNDP, UNESCO, and UNRRA) Work with Soy. 777

United Soybean Board. *See* American Soybean Association (ASA)–United Soybean Board

United States–States–Alabama. 4, 138, 139, 167, 340, 358, 360, 361, 363, 364, 366, 370, 375, 383, 387, 392, 393, 394, 395, 400, 409, 414, 458, 498, 690, 693, 712, 715, 720, 721, 727, 749, 825, 895

United States–States–Alaska. 475

United States–States–Arkansas. 2, 64, 105, 192, 260, 424, 439, 498, 695, 713, 865, 905

United States–States–California. 10, 140, 424, 426, 459, 460, 498, 507, 512, 534, 538, 553, 588, 591, 643, 644, 648, 650, 701, 702, 705, 706, 709, 729, 773, 821, 826, 840, 849, 851, 857, 862, 864, 881, 887, 888, 895, 896, 905, 926

United States–States–Colorado. 854, 888, 891, 904, 906

United States–States–Connecticut. 133, 158, 218, 514, 539, 604, 700, 708, 735, 831, 835, 905

United States–States–Delaware. 64, 71, 74, 123, 133, 136, 213, 214, 244, 451, 498, 606, 663

United States–States–District of Columbia (Washington, DC). 123, 158, 159, 259, 263, 264, 270, 272, 439, 448, 460, 462, 631, 661, 687, 694, 720, 721, 735, 737, 787, 807, 808, 811, 852, 853, 860, 879, 905, 912

United States–States–Florida. 13, 462, 498, 626, 651, 657, 664, 697, 699, 700, 707, 708, 709, 720, 721, 732, 735, 763, 776, 837, 857, 874

United States–States–Georgia. 2, 158, 292, 336, 435, 498, 557, 595, 690, 693, 712, 790, 820, 827, 860, 910

United States–States–Hawaii. 459, 475, 917

United States–States–Illinois. 6, 10, 37, 49, 50, 51, 52, 54, 55, 58, 59, 60, 61, 67, 68, 69, 70, 73, 76, 82, 87, 88, 90, 91, 95, 97, 104, 106, 110, 116, 122, 123, 125, 128, 130, 132, 133, 134, 136, 137, 141, 143, 144, 150, 158, 162, 182, 192, 215, 219, 220, 237, 241, 246, 251, 259, 260, 263, 264, 274, 289, 299, 307, 322, 338, 344, 354, 371, 372, 405, 406, 408, 410, 424, 426, 439, 445, 448, 449, 454, 459, 460, 468, 470, 473, 498, 507, 508, 510, 514, 523, 524, 537, 538, 539, 548, 549, 552, 558, 565, 566, 576, 591, 597, 610, 611, 631, 633, 634, 635, 636, 640, 641, 642, 647, 648, 657, 658, 661, 662, 665, 666, 670, 671, 672, 675, 677, 682, 684, 685, 689, 690, 691, 694, 696, 702, 709, 710, 713, 724, 726, 728, 729, 734, 735, 737, 738, 740, 741, 750, 757, 759, 763, 764, 766, 772, 778, 779, 781, 789, 796, 797, 802, 811, 815, 823, 829, 832, 837, 846, 851, 853, 855, 857, 858, 863, 864, 869, 873, 874, 883, 885, 890, 894, 895, 896, 901, 905, 913, 914, 915, 916, 917, 919, 923, 926

United States–States–Indiana. 6, 34, 86, 98, 104, 134, 158, 192, 204, 220, 251, 260, 299, 371, 372, 424, 439, 459, 460, 465, 468, 498, 507, 510, 513, 524, 529, 531, 532, 547, 565, 566, 595, 597, 603, 631, 634, 640, 651, 666, 675, 677, 706, 710, 713, 716, 740, 741, 819, 839, 851, 873, 890

United States–States–Iowa. 19, 64, 98, 101, 104, 134, 192, 220, 260, 299, 345, 371, 372, 385, 387, 414, 422, 424, 439, 459, 460, 498, 507, 510, 524, 534, 538, 539, 558, 559, 561, 569, 625, 631, 648, 660, 662, 675, 695, 709, 710, 712, 727, 740, 785, 798, 801,

809, 810, 831, 839, 849, 870, 873, 876, 877, 879, 882, 883, 885, 889, 890, 895, 899, 902, 908, 915, 921, 926

United States–States–Kansas. 327, 387, 424, 462, 498, 507, 595, 610, 662, 854, 863, 868, 885, 905

United States–States–Kentucky. 2, 424, 498, 507, 557, 585, 666, 675, 697, 707, 728, 732, 735, 780, 817, 834, 835, 843, 845, 846, 849, 890, 918, 921

United States–States–Louisiana. 12, 192, 439, 445, 498, 539, 562, 595, 644, 675

United States–States–Maine. 755

United States–States–Maryland. 150, 158, 460, 498, 507, 569

United States–States–Massachusetts. 58, 60, 158, 203, 218, 277, 367, 507, 529, 563, 601, 659, 664, 676, 735, 736, 837, 905

United States–States–Michigan. 1, 2, 3, 5, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 38, 39, 40, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 59, 60, 61, 62, 63, 67, 68, 69, 70, 72, 75, 77, 78, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 92, 96, 99, 100, 102, 103, 104, 105, 107, 108, 109, 110, 112, 113, 114, 115, 116, 117, 118, 119, 121, 122, 123, 124, 125, 126, 131, 133, 134, 138, 139, 140, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 154, 155, 156, 158, 160, 161, 162, 163, 164, 165, 166, 167, 168, 170, 171, 172, 174, 175, 176, 177, 178, 179, 181, 183, 184, 185, 186, 187, 189, 190, 192, 194, 196, 197, 198, 199, 201, 202, 204, 210, 212, 215, 216, 217, 220, 222, 223, 225, 229, 230, 231, 232, 233, 236, 238, 239, 240, 242, 243, 244, 245, 248, 250, 252, 253, 254, 255, 256, 257, 258, 260, 261, 262, 265, 266, 267, 268, 269, 270, 271, 273, 274, 275, 276, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 290, 291, 292, 293, 294, 296, 297, 299, 301, 302, 304, 305, 306, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 339, 340, 342, 343, 344, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 365, 367, 368, 371, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 387, 391, 392, 393, 394, 395, 396, 398, 399, 400, 401, 404, 406, 407, 409, 411, 412, 415, 416, 417, 419, 420, 421, 422, 423, 424, 426, 427, 428, 430, 434, 436, 437, 439, 440, 441, 444, 445, 446, 447, 448, 450, 451, 452, 455, 456, 457, 458, 460, 463, 464, 465, 467, 469, 471, 472, 476, 477, 478, 479, 481, 482, 483, 485, 486, 488, 489, 490, 491, 492, 493, 494, 496, 497, 498, 499, 501, 502, 504, 505, 506, 507, 508, 509, 510, 515, 516, 518, 519, 521, 525, 526, 527, 528, 529, 532, 533, 534, 535, 536, 538, 539, 540, 543, 548, 549, 553, 554, 556, 558, 560, 561, 564, 566, 568, 570, 571, 572, 573, 574, 576, 577, 578, 579, 581, 584, 588, 590, 593, 595, 598, 599, 601, 603, 606, 607, 608, 612, 613, 616, 617, 622, 627, 632, 634, 637, 643, 644, 645, 650, 652, 653, 654, 659, 662, 664, 666, 667, 668, 669, 670, 671, 672, 673,

676, 678, 680, 681, 683, 684, 685, 686, 688, 689, 690, 691, 692, 693, 695, 696, 697, 698, 699, 700, 701, 705, 707, 708, 709, 711, 712, 714, 715, 717, 718, 719, 720, 721, 722, 723, 724, 725, 727, 728, 730, 732, 735, 737, 738, 740, 742, 746, 748, 749, 752, 753, 758, 759, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 774, 775, 776, 777, 780, 782, 783, 784, 787, 788, 790, 791, 792, 793, 794, 796, 797, 800, 802, 803, 804, 805, 806, 808, 811, 814, 815, 816, 817, 818, 819, 822, 823, 824, 825, 827, 828, 836, 837, 838, 842, 843, 844, 847, 848, 850, 851, 855, 857, 858, 859, 861, 865, 866, 868, 869, 872, 874, 875, 876, 877, 878, 879, 880, 882, 883, 884, 886, 889, 892, 893, 896, 898, 900, 902, 905, 907, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926

United States–States–Minnesota. 104, 192, 424, 460, 498, 507, 538, 602, 604, 610, 614, 624, 625, 628, 640, 655, 656, 660, 662, 677, 680, 704, 709, 734, 762, 810, 866, 870, 890, 910

United States–States–Mississippi. 2, 439, 498, 507, 539, 557, 694

United States–States–Missouri. 2, 123, 133, 158, 167, 192, 254, 371, 387, 414, 424, 433, 439, 473, 498, 507, 557, 582, 583, 585, 586, 589, 597, 622, 623, 629, 642, 659, 661, 664, 665, 695, 728, 732, 733, 779, 781, 789, 803, 812, 836, 837, 843, 853, 860, 863, 871, 873, 874, 894, 896, 901, 905, 918

United States–States–Montana. 671

United States–States–Nebraska. 191, 192, 194, 424, 425, 498, 507, 535, 558, 560, 656, 853, 920, 921

United States–States–New Jersey. 34, 71, 104, 133, 158, 174, 213, 528, 579, 669, 688, 696, 712, 735

United States–States–New Mexico. 905

United States–States–New York. 45, 47, 48, 70, 77, 104, 123, 158, 168, 192, 218, 231, 237, 243, 269, 299, 368, 378, 381, 403, 410, 424, 452, 455, 462, 466, 467, 469, 475, 484, 498, 507, 516, 518, 540, 544, 545, 546, 547, 551, 554, 555, 556, 565, 566, 575, 579, 581, 591, 593, 595, 596, 599, 601, 605, 606, 607, 618, 625, 629, 631, 643, 671, 697, 700, 703, 707, 725, 729, 731, 732, 733, 735, 737, 738, 739, 741, 744, 747, 750, 763, 772, 814, 819, 820, 821, 851, 874, 897, 905, 916, 922, 924

United States–States–North Carolina. 2, 6, 34, 104, 260, 371, 408, 439, 462, 498, 507, 557, 631, 638, 693, 694, 712

United States–States–North Dakota. 498, 853

United States–States–Ohio. 2, 19, 93, 133, 134, 148, 158, 192, 202, 204, 220, 226, 237, 253, 254, 260, 344, 357, 371, 372, 402, 403, 415, 418, 419, 423, 424, 425, 429, 430, 437, 438, 439, 473,

489, 495, 498, 507, 510, 514, 526, 528, 529, 530, 536, 541, 548, 557, 567, 583, 586, 589, 608, 612, 629, 631, 634, 636, 643, 646, 651, 662, 664, 675, 676, 677, 678, 679, 682, 683, 689, 691, 706, 708, 710, 724, 731, 733, 735, 751, 778, 783, 802, 817, 833, 834, 835, 836, 837, 840, 841, 843, 846, 847, 849, 856, 869, 905, 920, 926

United States–States–Oklahoma. 498, 843, 918

United States–States–Oregon. 534, 550, 601, 787, 878

United States–States–Pennsylvania. 30, 34, 38, 104, 133, 158, 174, 213, 260, 270, 371, 424, 468, 498, 507, 539, 651, 905

United States–States–Rhode Island. 905

United States–States–South Carolina. 498, 507, 511, 694

United States–States–South Dakota. 498, 507, 558, 854

United States–States–Tennessee. 2, 30, 37, 106, 158, 336, 424, 458, 459, 498, 500, 507, 557, 608, 644, 694, 843, 885, 905, 918

United States–States–Texas. 139, 344, 498, 507, 511, 538, 677, 704, 739, 758, 829, 853, 890

United States–States–Utah. 538, 888

United States–States–Vermont. 101, 905

United States–States–Virginia. 6, 133, 192, 299, 371, 372, 424, 498, 507, 514, 592, 595, 675, 831, 926

United States–States–Washington state. 6, 34, 133, 140, 158, 371, 408, 442, 595, 888

United States–States–West Virginia. 572, 601, 693, 825

United States–States–Wisconsin. 34, 104, 122, 123, 133, 158, 228, 260, 372, 424, 439, 467, 498, 507, 510, 539, 595, 601, 631, 662, 866, 895, 926

United States–States–Wyoming. 218, 787, 884

United States Department of Agriculture (USDA)–Agricultural Adjustment Administration (AAA, 1933-1942) and Agricultural Adjustment Agency (1942-1945). 60, 137, 277, 534, 852

United States Department of Agriculture (USDA)–Agricultural Cooperative Service. Including Farmer Cooperative Service (FCS, 1926). 854

United States Department of Agriculture (USDA)–

Agricultural Research Service (ARS, Established 1953). Including Agricultural Research Administration (1942-1953). 561, 569, 623, 694

United States Department of Agriculture (USDA)–Arlington Experimental Farm at Arlington, Virginia (1900-1942). 372, 926

United States Department of Agriculture (USDA)–Bureau of Agricultural Economics (1922-1953). Including Bureau of Markets and Crop Estimates (1921-1922), Bureau of Markets (1913-1921), and Office of Farm Management and Farm Economics (1905-1922). Transferred in 1953 to USDA's Economic Research Service. 520, 852

United States Department of Agriculture (USDA)–Bureau of Agricultural and Industrial Chemistry (1943-1953). Including Bureau of Agricultural Chemistry and Engineering (1938-1943), Bureau of Chemistry and Soils (1927-1938), and Bureau of Chemistry (1901-1927). Transferred to the Agricultural Research Service (ARS) in 1953. 130, 158, 182, 405, 424, 449, 454, 473, 498, 520

United States Department of Agriculture (USDA)–Bureau of Human Nutrition and Home Economics (1943-1953). Including Bureau of Home Economics (1923-1943), Office of Home Economics (1915-1923), and Nutrition and Home Economics Work in the Office of Experiment Stations (1894-1915). Transferred to the Agricultural Research Service in 1953. 459

United States Department of Agriculture (USDA)–Bureau of Plant Industry, Soils, and Agricultural Engineering (1943-1953). Including Bureau of Plant Industry (1901-1943), Office of Plant Industry (1900-1901), and Division of Agrostology (1895-1901). Transferred to Agricultural Research Service in 1953. 7, 41, 71, 158, 159, 289, 371, 397, 408, 462, 510, 591, 631, 694, 710, 713, 735, 739, 771, 913, 926

United States Department of Agriculture (USDA)–Economic Research Service (ERS). 852, 865

United States Department of Agriculture (USDA)–Food and Nutrition Service (FNS). 656, 919

United States Department of Agriculture (USDA)–Foreign Agricultural Service (FAS, Est. 1953) Including Office of Foreign Agricultural Relations (1939-1953). Foreign Agricultural Service (1938-1939). 634

United States Department of Agriculture (USDA)–Office of Experiment Stations (1888-1955). Transferred to the Cooperative State Experiment Station Service in 1961. 511

United States Department of Agriculture (USDA)–Section of Foreign Seed and Plant Introduction (Established 1898 within the USDA with David Fairchild in Charge). Transferred to Bureau of Plant Industry (1 July 1901). Later Referred to as the Office of Foreign Seed and Plant Introduction and then the Office of Foreign Plant Introduction. 41, 462

United States Department of Agriculture (USDA)–War Food Administration (WFA), Including the Food Production and Distribution Administration. 448, 455, 516, 703, 725, 737, 738, 851, 925

United States Department of Agriculture (USDA; Including Federal Grain Inspection Service [FGIS], and War Food Administration [WFA]). See also: Agricultural Marketing Service, Agricultural Research Service (ARS), Bureau of Plant Industry, Economic Research Service, Food and Nutrition Service, Foreign Agricultural Service, and Section of Foreign Seed and Plant Introduction. 7, 158, 251, 270, 289, 356, 387, 414, 445, 510, 512, 534, 535, 562, 566, 599, 611, 631, 633, 661, 662, 695, 710, 712, 713, 729, 731, 799, 810, 812, 828, 853, 890

United States of America (USA). 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 112, 113, 115, 116, 117, 118, 119, 123, 124, 126, 128, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 170, 171, 172, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 194, 196, 197, 198, 199, 201, 202, 203, 204, 205, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 444, 445, 447, 448, 449,

450, 451, 452, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 744, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926

United States of America–Activities and Influence Overseas / Abroad. 122, 154, 159, 446, 517, 674, 799

United States of America–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 34, 41, 55, 70, 97, 110, 144, 162, 180, 204, 223, 371, 397, 593, 643, 676, 795

United States of America, soyfoods movement in. *See* Soyfoods Movement in North America

Urban Problems Worldwide, Including Tangible Problems (Urbanization, Scarce Jobs, Money, Housing, Poor Schools, Welfare Abuse, Drugs, Gangs, and Crime) and Values Problems (Racism, Despair, Poor Work Habits, Lower Class Problems) Worldwide. 37

U.S. Regional Soybean Industrial Products Laboratory

(Urbana, Illinois). Founded April 1936. 123, 125, 130, 133, 182, 192, 219, 241, 251, 260, 289, 299, 307, 338, 371, 389, 405, 408, 459, 473, 507, 539, 558, 597, 633, 647, 694, 757, 779, 809, 864

USA. *See* United States of America

USDA. *See* United States Department of Agriculture

USSR. *See* Europe, Eastern–USSR

Van Gundy, Dorothea. *See* Seventh-day Adventists–Cookbooks and Their Authors

Van Gundy, Theodore A., and La Sierra Industries (La Sierra, California). 591, 826

Varieties, soybean. *See* Soybean Varieties, Soybean Varieties USA–Large-Seeded Vegetable-Type

Variety Development and Breeding of Soybeans (General, Including Varieties and Seeds). 22, 33, 38, 40, 65, 79, 82, 94, 110, 115, 118, 122, 125, 153, 159, 196, 221, 234, 371, 408, 459, 461, 503, 539, 558, 559, 561, 569, 580, 588, 594, 600, 643, 670, 711, 712, 713, 720, 721, 727, 728, 771, 790

Variety development of soybeans. *See* Breeding of Soybeans and Classical Genetics, Breeding or Evaluation of Soybeans for Seed Quality, such as Low in Trypsin Inhibitors, Lipoxxygenase, Linolenic Acid, etc., Introduction of Soybeans (as to a Nation, State, or Region, with P.I. Numbers for the USA) and Selection

Vegetable oils. *See* Specific Oilseeds such as Peanut Oil, Sesame Oil, Sunflower Oil, etc

Vegetable soybeans. *See* Green Vegetable Soybeans

Vegetable-type or edible soybeans. *See* Green Vegetable Soybeans–Large-Seeded Vegetable-Type or Edible Soybeans, General Information About, Not Including Use As Green Vegetable Soybeans

Vegetable-type soybeans. *See* Green Vegetable Soybeans–Vegetable-Type, Garden-Type, or Edible or Food-Grade Soybeans

Vegetarian / Natural Foods Products Companies. *See* Imagine Foods, Inc. (California)

Vegetarian Diets–Nutrition / Nutritional Aspects–Vitamins. 144, 459

Vegetarian Federal Union (Britain). *See* Vegetarianism–

International Vegetarian Union (IVU. Founded 1908; and its British Predecessor the Vegetarian Federal Union

Vegetarian Society of America. *See* Vegetarianism–Vegetarian Societies in North America–Vegetarian Society of America (June 1886–1905)

Vegetarian or Vegan Restaurants or Cafeterias. 30, 905

Vegetarian pioneers. *See* Alcott, Amos Bronson and Louisa May, Alcott, William Andrus (1798–1859), Cowherd, William (Rev.) (1763–1816), Gandhi, Mohandas K. (“Mahatma”) (1869–1948), Graham, Sylvester (1794–1851), Jackson, James Caleb (1811–1881), Metcalfe, William (1788–1862), Seventh-day Adventists–White, Ellen G. (1827–1915)

Vegetarianism–Concerning a Diet and Lifestyle Free of Flesh Foods, But Which May Include Dairy Products or Eggs. *See* also: Veganism. 42, 144, 162, 176, 233, 386, 459, 500, 579, 591, 599, 608, 612, 613, 644, 656, 678, 680, 697, 706, 708, 709, 720, 721, 751, 837, 874, 905

Vegetarianism–Efficiency of Plants Much Greater Than Animals in Producing Food from a Given Input of Energy, Land, or Water. Also Called Political Economy. 636

Vegetarianism–International Vegetarian Union. *See* Vegetarianism–International Vegetarian Union (IVU. Founded 1908; and its British Predecessor the Vegetarian Federal Union

Vegetarianism–Religious Aspects–Judeo-Christian Tradition (Including Trappists, Mormons). *See* also: Seventh-Day Adventists. 579, 747

Vegetarianism–Seventh-day Adventist Work with. 30, 42, 176, 459, 500, 579, 591, 599, 608, 612, 613, 644, 678, 680, 706, 708, 709, 747, 751, 778, 837

Vegetarianism–Statistics and Analyses on the Number of Vegetarians or the Size of the Vegetarian Products Market. 778, 799

Vegetarianism–Vegetarian Societies in North America–American Vegetarian Society (1850–1862?). 579, 905

Vegetarianism–Vegetarian Societies in North America–Chicago Vegetarian Society (Dec. 1895–). 905

Vegetarianism–Vegetarian Societies in North America–New York Vegetarian Society (Oct. 1852+). 905

Vegetarianism–Vegetarian Societies in North America–Vegetarian Society of America (June 1886–1905). 905

Vegetarianism–Vegetarian or Vegan Meals Served at Institutions (Colleges, Main-Stream Restaurants, Cafeterias, Fast Food Outlets, Hospitals, etc.). See also Vegetarian Restaurants. 30

Vegetarianism, Athletics / Sports, and Athletes. 747, 905

Vegetarianism. See Bible Christian Church in England and the USA

Vegetarianism: Meat / Flesh Food Consumption–Statistics, Problems (Such as Diseases in or Caused by Flesh Foods), or Trends in Documents Not About Vegetarianism. See Also: Vegetarianism–Spongiform Encephalopathies /Diseases. 682

Velvet Bean. *Mucuna pruriens* (L.) DC. Formerly: *Mucuna utilis*. Formerly called Banana Bean (Rarely) or Velvetbean. 414

Vestro Foods, Inc. See Westbrae Natural Foods

Viability and life-span of soybean seeds. See Storage of Seeds

Videotapes or References to Video Tapes. 753, 788, 789, 805

Vigna unguiculata or V. sinensis. See Cowpea or Black-Eyed Pea

Viili. See Soymilk, Fermented

Vitamins (General). 144, 162, 445, 459

Vitamins B-12 (Cyanocobalamin, Cobalamins). 779

Vitamins K (Coagulant, Needed for Normal Clotting of the Blood; Fat Soluble). 458

Vitamins in a vegetarian diet. See Vegetarian Diets–Nutrition / Nutritional Aspects–Vitamins

Vitasoy International Holdings Ltd. (Hong Kong Soya Bean Products Co. Ltd. before 24 Sept. 1990), and Vitasoy (USA) Inc., (Brisbane, California–south of San Francisco). Including Nasoya Foods (from Aug. 1990) and Azumaya Inc. (from May 1993). Founded by K.S. Lo (Lived 1910 to 1995), in Hong Kong. Started in March 1940. 635, 773, 810

Vivisection. 905

War Food Administration of USDA. See United States Department of Agriculture (USDA)–War Food Administration (WFA)

War, Civil, USA. See Civil War in USA (1861-1865)

War, world. See World War I–Soybeans and Soyfoods, World War II–Soybeans and Soyfoods

Waste Management, Treatment, and Disposal. See also: Environmental Issues and Concerns. 124, 361

Water Use, Misuse, and Scarcity–Environmental Issues. 739

Waterproof goods or cloth. See Linoleum, Floor Coverings, Oilcloth, and Waterproof Goods

Websites or Information on the World Wide Web or Internet. 894, 905

Weeds–Control and Herbicide Use. 870

Wenger International Inc. See Extruder / Extrusion Cooker Manufacturers–Wenger International Inc.

Westbrae Natural Foods, Inc. (Berkeley, California). Founded in Feb. 1971 by Bob Gerner. Later in Carson. Subsidiary of Vestro Foods, Inc. Acquired by the Hain Food Group of Uniondale, New York, 14 Oct. 1997. 773

Wheat Gluten Made into Seitan (Including Wheatmeal, Tan Pops, and Tan Pops). 867

Wheat Gluten. 141, 459, 525, 536, 537, 538, 599, 612, 644, 666, 680, 699, 700, 708, 735, 748, 833, 846

Whip Topping (Non-Dairy–Resembles Whipped Cream but Contains No Soy Protein). 467, 542, 544, 545, 546, 551, 556, 565, 575, 581, 595, 596, 703, 733, 737, 780, 806, 820, 821, 862, 925

Whip Topping (Non-Dairy–Resembles Whipped Cream or Whipping Cream and Contains Soy Protein). 440, 447, 448, 452, 455, 456, 465, 467, 471, 472, 475, 491, 492, 494, 496, 497, 499, 501, 502, 504, 505, 509, 513, 516, 518, 527, 532, 542, 543, 545, 546, 547, 556, 570, 571, 573, 581, 590, 595, 596, 605, 615, 689, 690, 691, 697, 703, 719, 720, 721, 725, 727, 730, 732, 734, 737, 738, 759, 772, 780, 784, 806, 810, 817, 818, 819, 827, 842, 851, 855, 862, 917, 918, 922, 925

Whipping or foaming in soy proteins. See Soy Proteins–Isolates–Enzyme-Modified Soy Protein Isolates with Whipping / Foaming Properties Used to Replace Egg Albumen

White Wave, Inc. (Boulder, Colorado). Including Soyfoods Unlimited. Owned by Dean Foods Co. since 8 May 2002. 867, 888, 891, 904

White, Ellen G. (1827-1915). Co-Founder of Seventh-day Adventist Church. 579, 613, 637, 680, 705, 804

Whitehouse Products, Inc. See Delsoy Products, Inc.

Whole Dry Soybean Flakes. See Microsoy Corp., Formerly Nichii Company

Whole Dry Soybeans (Used Unprocessed as Food). 58, 59, 79, 164, 216, 222, 263, 358, 370, 373, 394, 397, 416, 459, 643, 684, 761, 815, 855

Whole Dry Soybeans, Ground or Mashed to a Paste After Boiling, or Ground Raw with Water to a Fresh Puree or Slurry (Including Japanese Gô). 62, 638, 755

WholeSoy & Co. (subsidiary of TAN Industries, Inc.), Modesto WholeSoy Co. (California), and Aros Sojaprodukter (Örnsundbro, then Enköping, Sweden; Founded by Ted Nordquist. Started Feb. 1981). 888

Wiley, Harvey Washington (1884-1930). Father of the Pure Food and Drug Act and the Meat Inspection Act (1906) and of the U.S. Food and Drug Administration. 511, 579, 613, 680

Wilson soybean variety. See Soybean Varieties USA–Mammoth Yellow

Wing Seed Co. (Mechanicsburg, Champaign County, Ohio). Founded 1909. Including Joseph Elwyn Wing (1861-1915), Charles Bullard Wing (1878-1949), and David Grant Wing (1896-1984). 439, 634

Winged Bean (*Psophocarpus tetragonolobus*) (Also Called Four-Angled Bean, Goa Bean, Goabean, Asparagus Bean, Asparagus Pea, Segidilla, Seguidilla or Seguidillas Bean, Square Podded Pea, Square Podded Crimson Pea, Botor tetragonoloba, Dolichos-, or Lotus tetragonolobus, Pois Carré, Kecipir or Ketjeper, Calamismis or Kalamismis). 739

Woodworth, C.M. (1888-1960, Plant Breeder, Univ. of Illinois). 631, 713

Worcestershire Sauce (Soy Sauce Was the Main Ingredient before the 1940s). Including Lea & Perrins. 79, 121, 126, 136, 208

Worcestershire Sauce–With Soy Sauce Used as an Ingredient. 79, 126, 233

World–Soybean Production, Area and Stocks–Statistics, Trends, and Analyses. 180

World War I–Soybeans and Soyfoods. Also known as the “First World War” and “The Great War”. 63, 79, 147, 218, 233, 470, 522, 572, 579, 588, 637, 648, 675, 735, 758, 783, 852, 857, 864, 926

World War II–Soybeans and Soyfoods. Also Called the “Second World War”. 2, 235, 253, 262, 268, 269, 310, 320, 336, 341, 353, 356, 362, 367, 372, 384, 391, 397, 398, 401, 406, 415, 416, 425, 427, 428, 429, 432, 442, 448, 455, 458, 459, 460, 467, 470, 473, 480, 488, 495, 514, 516, 523, 525, 526, 528, 529, 534, 537, 553, 563, 574, 576, 577, 581, 587, 593, 595, 615, 629, 643, 644, 648, 653, 662, 664, 669, 671, 673, 675, 676, 677, 685, 689, 690, 691, 697, 703, 708, 709, 724, 725, 731, 732, 735, 737, 738, 740, 751, 757, 766, 769, 772, 773, 779, 802, 818, 827, 836, 851, 864, 868, 875, 896, 897, 905, 910, 917, 920, 922, 923, 925

World problems. See Hunger, Malnutrition, Famine, Food Shortages, and Mortality, Nuclear Power, Weapons, War, Fallout, or Radioactivity, Population Growth (Human) and Related Problems (Including Poverty), Sustainable Development and Growth

World. 369, 461, 739, 754, 880, 901

Worthington Foods, Inc. (Worthington, Ohio). Including Battle Creek Foods (Michigan) from 1960, and Madison Foods (Tennessee) from 1964. A subsidiary of Miles Laboratories from March 1970 to Oct. 1982. Including Loma Linda Foods from Jan. 1990. 536, 585, 589, 608, 611, 612, 614, 615, 619, 629, 630, 635, 646, 651, 655, 657, 666, 679, 683, 699, 700, 701, 706, 707, 708, 709, 728, 729, 735, 751, 778, 788, 810, 830, 833, 835, 837, 842, 846, 847, 849, 856, 863, 867, 893, 921

Yellow soybeans. See Soybean Seeds–Yellow

Yield Statistics, Soybean. 33, 44, 46, 70, 73, 117, 118, 120, 125, 206, 221, 228, 341, 473, 515, 558, 560, 561, 639, 694, 790

Yuba (The Film That Forms Atop Soymilk When It Is Heated). In Chinese (Mandarin): Doufu Pi (“Tofu Skin”) or Doufu Yi (“Tofu Robes,” pinyin), Toufu P’i or Toufu I (Wade-Giles). English-Language Chinese Cookbooks and Restaurants: “Bean Curd Skin”. 180, 205, 211, 473, 615, 729, 735, 743, 754

Yugoslavia. See Europe, Eastern–Serbia and Montenegro

Zaire. See Africa–Congo (formerly Zaire). Officially Democratic Republic of the Congo. Also known as Congo-Kinshasa

Zea may. See Corn / Maize