USDA OILSEED PROCESSING AND UTILIZATION RESEARCH

Dr. Peter B. Johnsen
USDA, Agricultural Research Service
National Center for Agricultural Utilization Research

IUPAC - AOCS Workshop on Fats, Oils and Oilseeds
December 8, 2004
Tunis, Tunisia

Today's Presentation

- USDA historic contributions
- Examples of current research
- Learning more about USDA research

National Ag Lab

270 FTE research staff

120 Ph.D. scientists

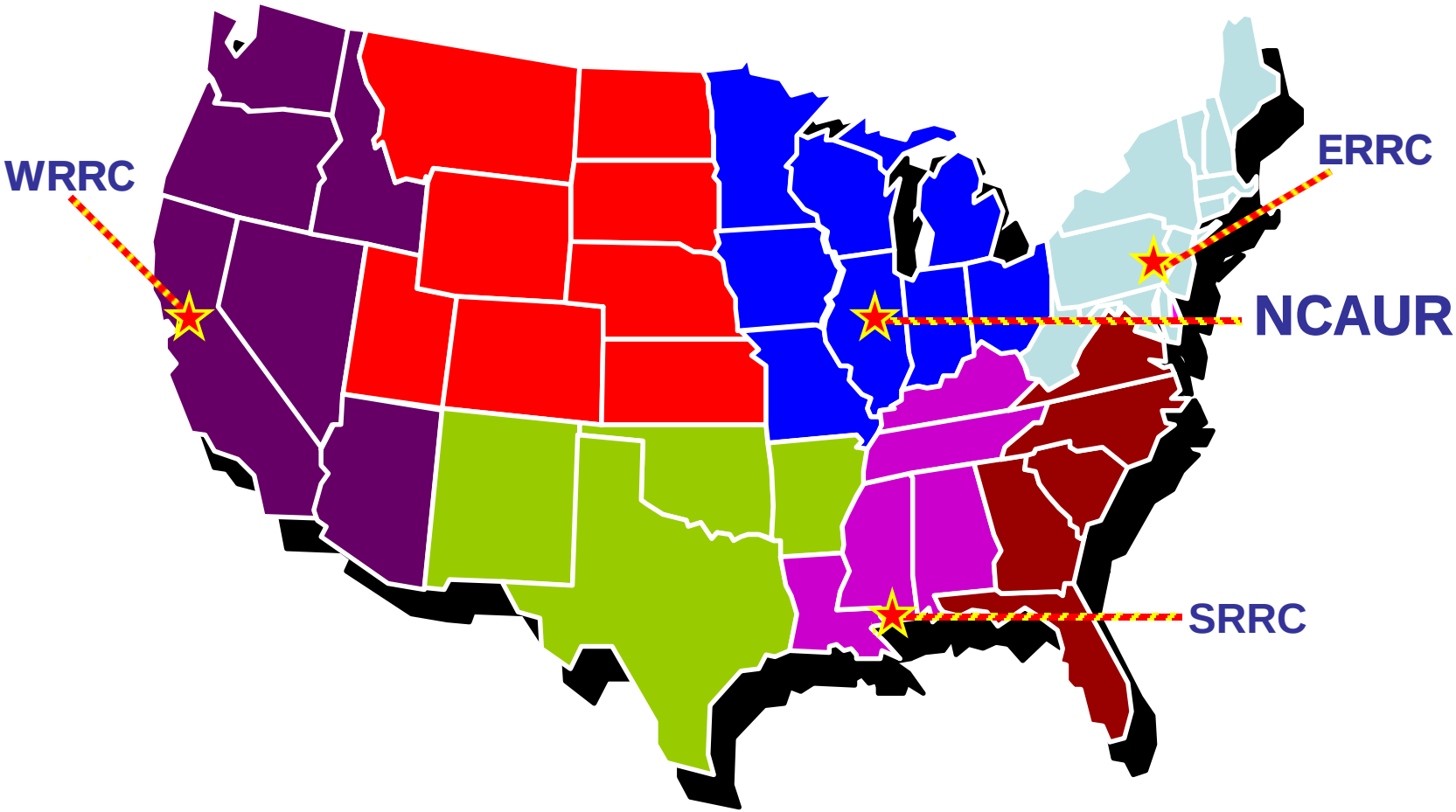
35 Research projects

140+ patents since 1980

$30 Million Federal Budget

NCAUR
Where the future is Created

USDA Agricultural Research Service Utilization Labs



Penicillin: The Miracle Drug

2442141

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas ANDREW J. MOYER, of Peoria, Illinois, assignor to UNITED STATES OF AMERICA AS REPRESENTED BY THE SECRETARY OF AGRICULTURE,

PRESENTED TO THE Commissioner of Patents A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL IMPROVEMENT IN

METHODS FOR PRODUCTION OF PENICILLIN,

A DESCRIPTION OF WHICH INVENTION IS CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HERETO ANNEXED AND MADE A PART HEREOF, AND COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANT is ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

NOW THEREFORE THESE Letters Patent ARE TO GRANT UNTO THE SAID

United States of America as represented by the Secretary of Agriculture

FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT

THE EXCLUSIVE RIGHT TO MAKE, USE AND VEND THE SAID INVENTION THROUGHOUT THE UNITED STATES AND THE TERRITORIES THEREOF.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this twenty-fifth day of May, in the year of our Lord one thousand nine hundred and forty-eight, and of the Independence of the United States of America the one hundred and seventy-second.

Attest:

Law Examiner.

Commissioner of Patents.

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Soybean Utilization

Early Soy Oil Quality Research

- Standard methods for quality assessment
- Development of deodorizers and bleaching
- Hydrogenation for margarine
- Modification in fatty acid content for oxidative stability

Analytical Methods for Research

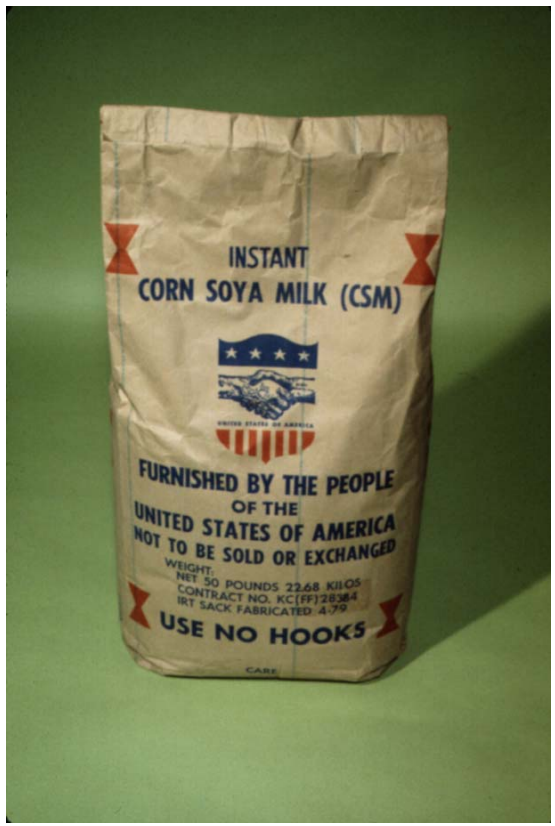
- Fatty acid composition and performance
- Human metabolism studies
- Labeled lipids
- Minor constituents
- No or low trans fatty acid margarines

Healthy Foods

- Phytosterols that lower cholesterol
- Phospholipids for improving cognitive function
- Anti-cancer chemicals
- Mid-oleic sunflower
- GM seed oil spreads

Soybean Protein Foods

- “Food for Peace” CSM
- Children and mothers
- Refugee programs
- New Product
  - Short cook time
  - Complete nutrition
  - Shelf-life improvement



Protein Fortified Baked Goods

- Soy protein isolates
- Enhances nutrition
- Improves texture
- Low-cost benefit

Soy Adhesives

- United Soybean Board project to use soy proteins in extruded foam plywood glues
- Replaces phenol-formaldehyde resins
- Rapid adoption by industry

Printing Inks

- USDA 100% soy based
- Vivid colors
- Low VOC
- Biodegradability
- Low rub-off
- 80% daily papers

Soybean Oil Industrial Fluids

- Greases
- Lubricants
- Metal working fluids

Hydraulic Fluids

Soy Plastics and Foams

- Soy polyol foams
- Solid free-form fabrication using soy oil, fiber and gelling agent
- Computer controlled prototyping

Soy biodiesel

- Cold flow properties
- Fuel additives
  - Lubricity
  - Combustion enhancers
- Combustion and emission chemistry
- Glycerol utilization
  - Aircraft de-icer
  - Fermentation feedstock

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Where the future is Created

Bioprocessing

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Metabolic Engineering

- Organism discovery
- Enzyme discovery
- Gene sequencing
- Transformation
- Pathway manipulation
- Strain optimization

Fantesk™

- Novel starch-oil composite made by jet-cooking
- Stable emulsion, lipid micro-spheres within starch
- Licensed commercial applications
  - Low-fat food applications
  - Oil drilling mud lubricant
  - Cosmetics and skin care applications
  - Seed coatings
  - Medical drug delivery systems


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National Programs

Research Themes

National Programs

ARS Research is organized into 22 National Programs. These programs serve to bring coordination, communication and empowerment to the more than 1200 research projects carried out by ARS. The National Programs focus on the relevance, impact, and quality of ARS research.

ARS National Program Cycle

Nutrition, Food Safety/Quality	Animal Production and Protection	Natural Resources and Sustainable Agricultural Systems	Crop Production and Protection
Human Nutrition (107)	Food Animal Production (101)	Water Quality and Management	Plant, Microbial, and Insect
Food Safety (animal and plant			
Quality and Utilization of Agricultural Products (306)			

Quality and Utilization of Agricultural Products (306)

About the Programs

- 2002 & 2003 Performance Plan
- The Big Picture of ARS Research
- ARS Strategic Plan

Related Information

- News
- Calendar
- Search
- ARS Research in Biobased Products & BioEnergy
- Booklet for FAIR 2002: Food Animal Integrated Research - an agenda for research and education
- Summary of the USDA Stakeholder Workshop for Animal Agriculture,

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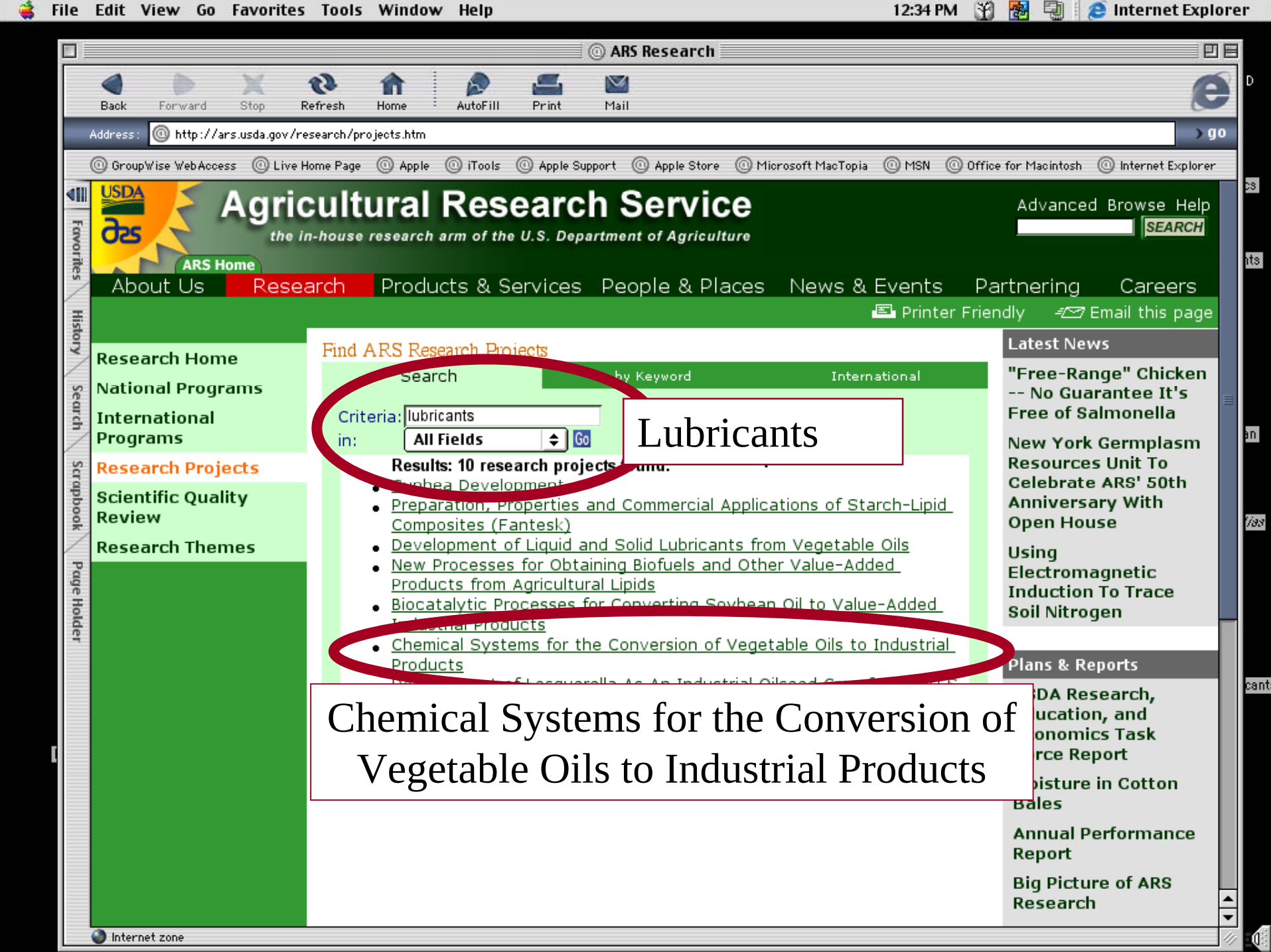
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Preparation, Properties and Commercial Applications of Starch-Lipid Composites (Fantesk)
Development of Liquid and Solid Lubricants from Vegetable Oils
New Processes for Obtaining Biofuels and Other Value-Added Products from Agricultural Lipids
Chemical Systems for the Conversion of Vegetable Oils to Industrial Products
Chemical Systems for the Conversion of Vegetable Oils to Industrial Products
Latest News
"Free-Range" Chicken -- No Guarantee It's Free of Salmonella
New York Germplasm Resources Unit To Celebrate ARS' 50th Anniversary With Open House
Using Electromagnetic Induction To Trace Soil Nitrogen
Plans & Reports
Annual Performance Report
Big Picture of ARS Research
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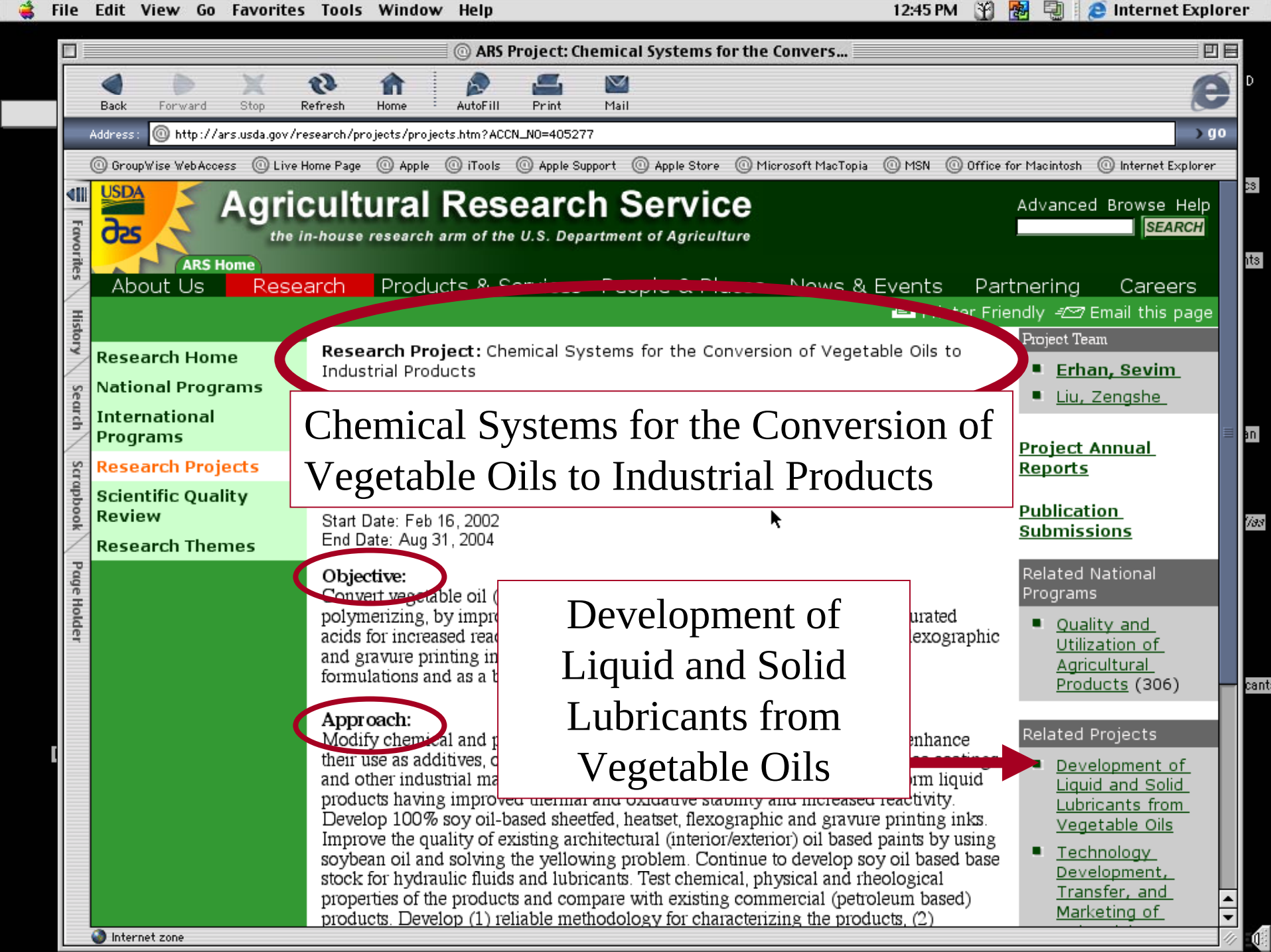
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Research Project: Chemical Systems for the Conversion of Vegetable Oils to Industrial Products
Chemical Systems for the Conversion of Vegetable Oils to Industrial Products
Start Date: Feb 16, 2002
End Date: Aug 31, 2004
Objective:
Approach:
Development of Liquid and Solid Lubricants from Vegetable Oils
Project Team
Erhan, Sevim
Liu, Zengshe
Project Annual Reports
Publication Submissions
Related National Programs
Quality and Utilization of Agricultural Products (306)
Related Projects
Development of Liquid and Solid Lubricants from Vegetable Oils
Technology Development, Transfer, and Marketing of
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Research Project: Chemical Systen table Oils to Industrial Products
Location: FOOD AND INDUSTRIAL O
Project Number: 3620-41000-101-00
Project Type: Appropriated
Start Date: Feb 16, 2002
End Date: Aug 31, 2004
Objective:
Convert vegetable oil (emphasizing soy s by polymerizing, by improving the oxidative stability and by derivatizing unsaturated acids for increased reactivity. Utilize these compounds in sheetfed, heatset, flexographic and gravure printing ink formulations, in interior/exterior architectural paint formulations and as a base stock in hydraulic fluids and lubricants.
Approach:
Modify chemical and physical properties of soybean oil or its fatty acids to enhance their use as additives, or major components of lubricants, plastics, inks, surface coatings and other industrial materials. Use isomerization and addition reactions to form liquid products having improved thermal and oxidative stability and increased reactivity. Develop 100% soy oil-based sheetfed, heatset, flexographic and gravure printing inks. Improve the quality of existing architectural (interior/exterior) oil based paints by using soybean oil and solving the yellowing problem. Continue to develop soy oil based base stock for hydraulic fluids and lubricants. Test chemical, physical and rheological properties of the products and compare with existing commercial (petroleum based) products. Develop (1) reliable methodology for characterizing the products, (2)
Project Annual Reports
Publication Submissions
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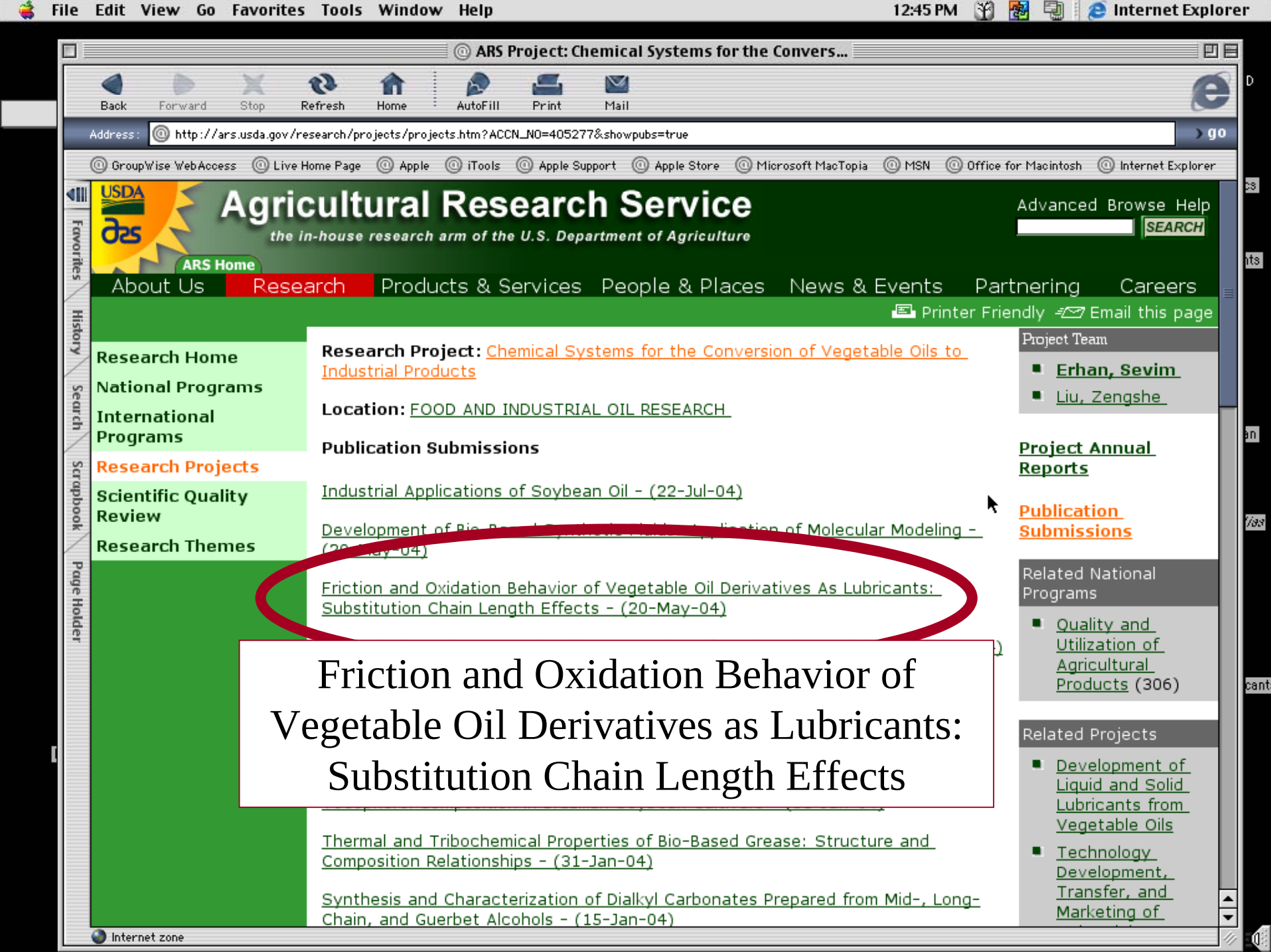
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Research Project: Chemical Systems for the Conversion of Vegetable Oils to Industrial Products
Location: FOOD AND INDUSTRIAL OIL RESEARCH
Publication Submissions
Industrial Applications of Soybean Oil - (22-Jul-04)
Development of Bio-Based Synthetic Fluids and Application of Molecular Modeling - (28-May-04)
Friction and Oxidation Behavior of Vegetable Oil Derivatives As Lubricants: Substitution Chain Length Effects - (20-May-04)
Thermal and Tribochemical Properties of Bio-Based Grease: Structure and Composition Relationships - (31-Jan-04)
Synthesis and Characterization of Dialkyl Carbonates Prepared from Mid-, Long-Chain, and Guerbet Alcohols - (15-Jan-04)
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