

BULLETIN

IOWA STATE
UNIVERSITY

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Iowa State president Gregory Geoffroy cutting the ribbon with a combine.

Iowa State dedicates BioCentury Research Farm

Ed Adcock, Agricultural Communications Service

Iowa State University dedicated the newly constructed BioCentury Research Farm on September 22. Over 400 people attended the dedication to listen to presenters, tour the facilities and learn about future research projects.

Wendy Wintersteen, dean of the College of Agriculture and Life Sciences, began the program with remarks and acted as master of ceremonies. Dedication speakers included Gregory Geoffroy, Iowa State University president; Patty Judge, Iowa's lieutenant governor; Roya Stanley, director of the Iowa Office of Energy Independence; Bill Niebur, vice president, DuPont Crop Genetics Research and Development; Robert Brown, director of Iowa State's Bioeconomy Institute; and Larry Johnson, BioCentury Research Farm director and Center for Crops Utilization Research director.

Self-guided tours enabled visitors to view equipment to be used in field research at the farm, the bioprocessing facility's three processing areas and the building where harvest, storage and transportation research will be conducted.

The Farm will study biomass feedstock

production; harvesting, storing and transporting of feedstocks; changes in land use arising from harvesting corn stover and other plants; new ways to process a variety of feedstocks into bioproducts; and the socioeconomic impacts on Iowa agriculture. It is the first fully integrated biomass production farm and processing facility where Iowa State faculty and industry can partner to develop advanced biorenewable fuels, biobased products and industrial chemicals from grain, agricultural residues and cellulosic crops.



Aerial view of the BioCentury Research Farm.

Iowa State team selected to receive R&D 100 Award

A team of scientists led by Hans van Leeuwen, CCUR affiliate and professor of Civil, Construction, and Environmental Engineering has been selected to receive a 2009 R&D 100 Award. The myco-diesel technology was chosen by an independent judging panel and editors of R&D Magazine. This award recognizes the 100 most technologically significant products introduced the past year.

A new process pioneered at Iowa State University and being commercialized by MycoInnovations, Ames, Iowa, is based on the leftovers from crop processing or on ammonia delignified lignocellulosic material coupled with two fungi fermentations and catalytic ultrasonication.

Research results have shown that a naturally occurring fungus *Mucor circinelloides* can turn a wide variety of leftover organic waste products into oil. In its simplest application, the Mycofuel process involves cultivation of *Mucor circinelloides* in high-strength organic co-products streams from biofuel production or food production and using the lipids



2009 R&D 100 Award Team. Front row: Priyanka Chand, Melissa Montalbo-Lombay, Debjani Mitra, and Venkat Chintareddy. Back row: David Grewell, Sam Beattie, Hans van Leeuwen, John Verkade, and Tae Hyun Kim.

produced as a raw material to produce biodiesel, or more specifically, Mycofuel. Both thin stillage, a left-over product from the dry-grind corn-to-ethanol process, and soy whey from soy protein isolate production are good substrates.

Iowa State helps Iowa companies adopt grain quality measurement systems

Charles Hurburgh and Glen Rippke, Iowa State University Grain Quality Lab and Connie Hardy, Iowa State Extension Value Added Agriculture Program held a half-day training program for staff from Asoyia, an Iowa-based specialty soybean company, and Cargill in Iowa and Wisconsin. As part of their quality control system, Asoyia is using near infrared (NIR) whole-grain analyzers to screen inbound soybeans intended for Asoyia's specialty soybean oil products. Data from these analyzers will help grain elevators and processors identify soybeans that meet the quality criteria for Asoyia's program. Growers for Asoyia's program use soybean germplasm developed at Iowa State by Walter Fehr, Agronomy, which expresses ultra-low levels of linolenic acid in the oil, thus naturally creating soybean oil that is more shelf-stable, has fresher flavor, and contains no trans fats.

Well-calibrated NIR whole grain analyzers are capable of measuring soybean nutritive components such as protein, oil, and fiber as well as linolenic acid and total saturates. Standardization of NIR analyzers within a trading and processing system is



Rippke (center) shows an Asoyia employee how to use the NIR whole grain analyzer. Other Asoyia employees are trying out the NIR analyzers in the lab.

also critical to maintaining the finished product's value. Development of measurement systems for grain handlers and processors is partially funded by the Iowa Grain Quality Initiative, a Center for Crops Utilization Research program.

CCUR affiliate receives Grow Iowa Values Fund grant

Mike Krapfl, News Service

The State Board of Regents approved \$679,663 in competitive grants from the state's Grow Iowa Values Fund for seven new Iowa State research projects. The goal of the grants is to support development of technologies with commercial potential and to support the growth of companies using those technologies.

Iowa lawmakers agreed in 2005 to appropriate \$5 million per year for 10 years to support economic development programs and research projects at Iowa's Regent universities. This is the fifth time

Iowa State has awarded competitive grants from the state fund. This year's grants range from \$31,426 to \$146,610.

This year, CCUR affiliate David Grewell, Agricultural and Biosystems Engineering, received a Grow Iowa Values Fund grant for \$31,426. He's working with Grain Processing Corp. of Muscatine and Emerson Electric Corp. of Danbury, Conn., to characterize, demonstrate and scale-up the use of high-powered ultrasonics to make new starch-based food products.

Registration open for the 2009 Bio eConference

The 2009 Bio eConference — “Growing the Bioeconomy: Solutions for Sustainability”— is a 12-state alliance of simultaneous state conferences. These co-host sites will be sharing content through high-speed communication systems to promote agriculturally-based sustainable solutions to global climate change and energy supply. The conference will tackle the sustainability challenge by:

- exploring a systems perspective on biorenewables
- offering solutions to current questions regarding grain ethanol
- examining the potential role of biochar as an

agent for carbon sequestration

- discussing the implementation of new ideas for land stewardship with biofuels agriculture
- James E. Lovelock, Ph.D., will give the keynote address. One of the world's most renowned thinkers on global environmental science, Dr. Lovelock has called upon farmers to convert agricultural residues to biochar for incorporation into the soil as the only solution to global climate change.

The Center for Crops Utilization Research is a conference sponsor. Register for the conference at www.bioeconomyconference.org.

IGQI hosts Agricultural and Food Traceability Conference

Charlie Hurburgh, Agricultural and Biosystems Engineering and IGQI

The Iowa State University Iowa Grain Quality Initiative (IGQI), Beef Industry Center and Value-Added Agriculture Program co-hosted a conference on Agricultural and Food Traceability in June. The conference was held in Des Moines, Iowa, in conjunction with a workshop sponsored by the European Union Tracing Food Commodities in Europe (TRACE) group. Forty-six people from 10 states and five countries attended the conference.

Since 2003, Iowa State has had a USDA-CSREES project focused on developing and implementing effective traceability systems in the bulk grain, meat and milk supply chains. The conference was organized to share the results of this project with business, regulatory, policy and academic professionals. Conference participants discussed the state-of-the-art in traceability systems for bulk agricultural commodity goods. The

conference addressed four major questions for the food industry:

1. Why adopt traceability?
2. What are the risks and rewards of traceability?
3. What factors will affect the development of a traceability system for my business?
4. What management and other tools are available to assist me in implementation of a traceability system?

The conference set the framework on how traceability systems could function with bulk agricultural commodities. It also illustrated significant knowledge gaps that need to be filled for successful implementation of a comprehensive traceability system in the United States. The conference concluded the Food Chain Economic Analysis project. IGQI is a Center for Crops Utilization Research program.

Anex contributes to journal series on corn ethanol

A set of articles on the carbon impacts of corn grain ethanol have recently been published in the *Journal of Industrial Ecology*. The series includes a scientific debate involving an alternate method of measuring greenhouse gases from fuel use developed at the University of Nebraska. It estimates about 50 percent lower greenhouse gas emissions for corn ethanol than gasoline - a larger reduction than reported in some previous studies.

The scientific debate is put in context by an editorial

co-written by Rob Anex, agricultural and biosystems engineering and Center for Crops Utilization Research affiliate, who is associate editor of the journal. The articles are available [online](#).



Rob Anex

Biodiesel from yeast — and Iowa State research

Laura Sternweis, Extension Communications and External Relations

Biodiesel production from traditional oil-rich crops is limited by land availability, climate, and environmental and social issues regarding the use of feed and food crops for fuel. But there's another way to produce biodiesel that is green and sustainable and doesn't compete with food crops. All it takes is some yeast — and research from Iowa State University.

Well, it's not quite that simple, said Sam Beattie, an ISU Extension food safety specialist, Center for Crops Utilization Research affiliate, and the yeast expert on the ISU research team. And in a complicated research paper Hans van Leeuwen, a professor in the Department of Civil, Construction and Environmental Engineering and CCUR affiliate, Beattie and other ISU researchers explain how they took lignocellulosic biomass — corn stover — treated it with ammonia and various wood rot fungi, then mixed it with yeast. The end results include yeast oil (which may be made into biodiesel), protein-rich animal feed and several usable co-products including lignin and gum.

The research won van Leeuwen, Beattie and their team the Grand Prize for University Research from the American Academy of Environmental Engineers. They received the award in Washington, D.C., earlier this year.

But to take this research from the laboratory to large-scale production requires an integrated bio-oil refinery, van Leeuwen said. What otherwise would be waste, in an integrated refinery can be recycled and converted into additional products.

“Our approach is to break down lignocellulosic materials to sugars using ammonia pretreatment and in-situ produced fungal enzymes, and convert these to oil using oleaginous yeasts,” Beattie said.



Sam Beattie (left) and Hans van Leeuwen

“An integrated refinery will use virtually every part of the cellulosic biomass feedstock, resulting in a primary product of biodiesel, plus animal feed and co-products,” van Leeuwen said.

The ISU researchers ran a cost analysis assuming the use of 1,000 tons per day of corn stover or switchgrass to produce 35,000 tons of yeast oil per year.

“The conversion of lignocellulosic material to lipids and yeast biomass is highly economical with a payback period of 2.5 years,” van Leeuwen said. “The facility in this cost analysis could produce 70 million pounds of oil annually, equivalent to the oil extracted from more than 7 million bushels of soybeans (9.8 pounds of oil per bushel), which is equivalent to 143,000 acres or 223 square miles of soybean crop (at 50 bushels per acre).”

van Leeuwen added, “The concept is therefore very green and sustainable and not competitive with food crops. The process itself is non-polluting and carbon negative when allowing for the carbon dioxide recycled into new crops.”

James Bushnell named Iowa State's first Cargill Endowed Chair in Energy Economics

Mike Krapfl, News Service

James Bushnell has been named Iowa State's first Cargill Endowed Chair in Energy Economics. The position also makes him the director of Iowa State's Biobased Industry Center (BIC), part of Iowa State's Bioeconomy Institute. The center was established in 2008 to support interdisciplinary research of the biorenewables industry and its economic, policy, business and social issues.

Bushnell comes to Iowa State after 16 years with the University of California Energy Institute (UCEI) in Berkeley. For the past 11 years, he has been the institute's research director. Bushnell earned a bachelor's degree in industrial engineering from the University of Wisconsin-Madison in 1989,

a master's degree in operations research from the University of California, Berkeley in 1990 and a doctorate in industrial engineering and operations research from California, Berkeley in 1993.

Cargill pledged \$1.5 million in 2008 to establish the Cargill Endowed Chair in Energy Economics.



James Bushnell

Iowa State students' FruitSoylicious® beverage finishes second in national competition

Mike Ferlazzo, News Service

Tony Haun admits that a fruit/soy beverage may not sound that tasty. But Haun – a member of the Iowa State University Food Science & Human Nutrition Product Development Team that created FruitSoylicious® – reports that, yes, most people who have sampled it have found it to be delicious.



Breanna Wetzler, Food Science and Human Nutrition.

2009 Iowa State Product Development Team. Kneeling front: Charlwit Kulchaiyawat. Front row: Megan Wiley, Zara Nazareth, Yanjun Liu, Devin Dutilly, Candace Ilg, Janelle Brewer, and Huey Shin (Rachel) Gan. Back row: Mark Love (faculty advisor) and Tony Haun.

In a taste test by 110 Iowa State subjects this past spring, 86 percent of panelists who don't usually consume soy products indicated that they would purchase the beverage. And 92 percent of the entire panel said they would purchase FruitSoylicious®.

More importantly, judges at the national Institute of Food Technologists (IFT) Product Development Competition held June 6-9 in Anaheim, California liked it earlier this month -- enough that the Iowa State team finished second for FruitSoylicious®. What's more, two companies scouting potential new products at the competition have offered to produce the beverage.

"That is exciting to have companies come up to you and say, 'We'd like to produce the product,'" said Haun, a junior food science major originally from Dubuque, Iowa. "One company talked to our advisor (Mark Love, associate professor of food science) extensively about that and what we have to do to make that happen.

"We knew we had a good product. We knew we had a refreshing product," he continued. "We found out that consumers considered it to be a refreshing product too."

In addition to Haun, Iowa State's team members

Product Development Team

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Solar Decathlon team finishes 12th

Iowa State University's Solar Decathlon team finished in 12th place in the 2009 U.S. Department of Energy Solar Decathlon competition that took place on the National Mall in Washington, D.C., October 9-13 and 15-18. Team Germany took first place, followed by the University of Illinois and Team California. Twenty collegiate teams from the United States, Canada and Europe competed.

In individual competitions, Iowa State had strong showings in Market Viability (3rd place), Communications (4th place), Engineering (5th place) and Net Metering (producing more energy than it consumed, 6th place).

Center for Crops Utilization Research (CCUR) affiliates Mikesch Muecke, Architecture; David

Grewell, Agricultural and Biosystems Engineering; and Darren Jarboe, CCUR, tested biopolymers and biocomposites for use in the project. One of the biopolymers made from corn protein was used in lamp shades for the house.

The house will be dismantled and transported back to Iowa.



Jim Tetro Photography, Courtesy DOE

The Iowa State University Interlock House on the National Mall in Washington, D.C.



Stefano Paltera, US Dept. of Energy Solar Decathlon
Iowa State student Timothy Lentz works on the roof of the Interlock House.



Stefano Paltera, US Dept. of Energy Solar Decathlon
Iowa State student Michael Garcia uses hay bails to decorate the Interlock House.



Stefano Paltera, US Dept. of Energy Solar Decathlon
Iowa State student Thomas Dillman shows visitors the adjustable window louvers used to prevent direct heat gain.



Stefano Paltera, US Dept. of Energy Solar Decathlon
Students from Iowa State demonstrate an ADA-Compliant hide-away bed that can be stored to save space.



A lamp in the Interlock House. The lamp shade is made from corn protein-based polymers.

Iowa State food safety specialist earns reputation as innovative, dedicated

Michelle Rydell, College of Human Sciences Communications

On any given day, you can find Sam Beattie on his back underneath a conveyor belt in one of Iowa's 350 food processing plants. Looking for pest and rodent infestations is one of his favorite parts of working as Iowa State University's Extension food safety specialist, he'll cheerfully tell you, though it is a decidedly unglamorous task.

Beattie, who returned to his alma mater six years ago to work in Extension, as an assistant professor of food science and human nutrition, and CCUR affiliate, spends 75 percent of his time in Extension and 25 percent in research. He works side-by-side with consumers and food processors, teaching them about risks associated with foods and how to reduce those risks.

Developing food safety programs in food processing plants is crucial to their success in the larger marketplace and in their collaboration with regulatory authorities. Through Beattie's food safety programs, processing plants not only produce safer food, but also reach larger markets, which in turn stimulate Iowa's economy.

Many of his clients go on to market their products to national corporations. In Iowa City, Beattie set up a food safety program for Bochner Chocolates, which now sells truffles to Target. It's just one part of his job that reminds him that his work has an important purpose that reaches beyond the state level.

"Food safety is not just hand washing and proper cooking," Beattie said. "When we get into food processing, food safety becomes a complex and vital part of the mission of any processor who wishes to expand."

But Beattie has not only earned a reputation as an Extension specialist with a knack for understanding complex problems and offering practical solutions. His research conducted at CCUR has also earned national attention, notably from R&D magazine, which touted his research in their annual "Top 100 Innovations of the Year" in 2009.

Beattie's research has a history that is rooted decades ago in the basement of the Dairy Industries Building (now Food Sciences Building) at Iowa State, the same building he works in today.

It started when his undergraduate adviser, Earl Hammond, discovered oleaginous yeast in the Iowa State cheese plant drain in the 1970s. Beattie



Laura Dillavou, College of Human Sciences

Beattie uses a small propeller to circulate yeast and liquids in a pot in the Food Sciences building. Beattie is conducting research concerning oleaginous yeast, which could have a big impact for Iowa industries and the national energy crisis.

latched onto Hammond's unusual yeast findings during his graduate studies. Today, he works closely with emeritus professor Hammond, exploring the possibilities of *Cryptococcus curvatus*, or obese yeast.

The yeast, which converts sugar to oil, could have

Food safety specialist

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Johnson selected AACC International Fellow

Larry Johnson, director, Center for Crops Utilization Research; director, BioCentury Research Farm; and professor, Food Science and Human Nutrition; was selected and approved as the only Fellow of 2009 for AACC International.

The Fellows program was established in 1985 to honor association members who have made distinguished contributions to the field of cereal science and technology in research, industrial achievement, leadership, education, administration, communication or regulatory affairs. The organization was previously known as the American Association of Cereal Chemists.

Wilson receives Regents Award for Faculty Excellence

Lester Wilson, University Professor, Food Science and Human Nutrition and CCUR affiliate, received the Regents Award for Faculty Excellence. Wilson, an internationally recognized expert on food processing, established an exemplary record of teaching, advising and mentoring with students and colleagues. His research on the impact of processing and storage on food chemistry, quality and safety strengthened food industries in Iowa and attracted new industries to the state. His reputation for research excellence resulted in his selection as a USDA National Research Initiative panelist five times. He has published more than 50 refereed journal articles and made 70 invited presentations throughout the United States and in several other

nations. He is a fellow of the Institute of Food Technologists and was a NASA Visiting Fellow from 2003 to 2006. The award recognizes a faculty member who is an outstanding university citizen and who has rendered significant service to Iowa State and/or the state of Iowa. A \$1,000 award is granted.



Lester Wilson

Product Development Team

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included Megan Wiley (sophomore, Adel, Iowa), Zara Nazareth (grad student, Mumbai, Maharashtra, India), Yanjun Liu (grad student, Chengdu, Sichuan, People's Republic of China), Devin Dutilly (grad student, Glendale, Wis.), Candace Ilg (senior, DeWitt, Iowa), Janelle Brewer (senior, Des Moines, Iowa), Huey Shin (Rachel) Gan (senior, Petaling Jaya, Malaysia) and Charliwit Kulchaiyawat (grad student, Des Moines, Iowa).

Teams in the competition develop an idea for a new food and carry the concept through the production and marketing of a brand-new product, much like the process of a commercial product development team.

Iowa State team members worked several hours a week during the academic year on FruitSoylicious® – a strawberry-flavored drink with 100 calories per serving, containing 10 percent fruit juice, 10 percent strawberries and no added sugar.

The initial product development work was carried out in the CCUR test kitchen.

“After deciding on a beverage, we did a survey in some general education classes and determined what they would want in a beverage, with our target market being 17 to 25-year-old college students,” Haun said. “They indicated that they would like to have a beverage that was low in cost, low in calories and nutritious. (The top three reasons were flavor, calorie content and cost.)

“We also asked what flavors they would like and

they said ‘vanilla, chocolate and strawberry,’” he said. “The group decided to go with strawberry and came up with the pink color for our beverage.”

Haun says the group wanted to incorporate soy because of its nutritional value, promoting Iowa's agriculture in the process.

“We're known for corn, we're known for hogs and we're known for soybeans,” Haun said.

Six teams were chosen as finalists for the competition. Teams were required to submit a final written report on the product to judges by the end of May. They then had to create a poster board, make a 10-minute oral presentation before the judges and answer questions for 10 minutes at the IFT national meeting.

The Iowa State team was bested by North Carolina State University and its creation, “Shivers,” an instant smoothie beverage.



Iowa State Product Development Team's final product, FruitSoylicious®.

van Leeuwen receives Iowa State University Award for Outstanding Achievement in Research

Hans van Leeuwen, professor, Civil, Construction and Environmental Engineering; professor, Agricultural and Biosystems Engineering; professor of Food Science and Human Nutrition; and CCUR affiliate, received the Iowa State University Award for Outstanding Achievement in Research. van Leeuwen is a leader in multidisciplinary environmental and biological engineering, with significant contributions in biofuels, environmental protection, resource recovery and process development in water and air pollution control.

He has published nearly 200 articles in prominent journals, book chapters and papers; and directed 11 doctoral and 49 master's students to completion of their degrees. He has eight United States and 15 international patents or patents pending, and among his many recognitions are consecutive Grand Prize for University Research awards from the American Academy of Environmental Engineers (2007, 2008, 2009), and consecutive R&D 100 Awards (2008, 2009). He also was one of five finalists for R&D



Bob Elbert, University Relations

van Leeuwen in the CCUR Fermentation Facility.

Magazine's Innovator of the Year Award.

The Iowa State award recognizes a faculty member who has a national or international reputation for contributions in research, and who has influenced the research activities of students. A \$1,500 award is granted.

Food safety specialist

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a big impact for Iowa industries and the national energy crisis. It has the potential to be used as a feed supplement in dairy cows, which would result in dairy products high in heart-healthy fats.

The yeast could also be used to develop a renewable energy source. Beattie's research suggests that existing ethanol-producing plants could be modified to make cellulosic oil instead of cellulosic ethanol, creating highly renewable, low-cost oil.

Hammond said as a researcher, Beattie is constantly interested in the "frontier of knowledge and technology" with a zest for new ideas. His work in Extension has shown that he is a problem-solver with "unusual enthusiasm," capable of tackling problems with experience and creativity.

Beattie says his stints at other universities showed him the importance of being able to share inspiration with others in his field. His years at Iowa State have helped him exchange ideas and conduct research that could have a lasting impact worldwide.

"Being able to walk out of my office and have world-class food scientists just down the hall is

pretty rewarding," Beattie said. "And being at a top research institution makes doing my work much easier than anywhere else. I have been able to do things here that I wouldn't have been able to do at other schools."

BULLETIN

Bulletin is the newsletter of the Center for Crops Utilization Research (CCUR). Bulletin is published quarterly by CCUR at Iowa State University, 1041 Food Sciences Building, Ames, Iowa 50011, 515-294-0160

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College of Engineering appoints Cox assistant dean for economic development

The Iowa State University College of Engineering has announced that Ron Cox has been named the college's assistant dean for economic development. Cox, the director of the ISU Extension Center for Industrial Research and Service (CIRAS), will retain his position at CIRAS, with a partial appointment in the engineering college. As a member of the college's leadership team, Cox will build and manage relationships between the college, Iowa State Extension, industry and state agencies.

Cox will develop a liaison between the college and the Iowa Department of Economic Development, Iowa Workforce Development, Iowa Business Council, Office of Energy Independence and other stakeholders. In addition, he will support specific

aspects of the college's industrial relations, including distance education, research opportunities and student design projects.

The Center for Crops Utilization Research works closely with CIRAS on technical assistance projects for Iowa manufacturers.



Ron Cox

Contracts and Grants

Iowa Alliance for Cooperative Business Development, USDA Rural Development, \$200,000, R. Ginder and D. Jarboe.

Biotechnology Test Production - Advanced Corn Biorefineries, USDA-CSREES, \$300,196, C. Glatz, L. Johnson, and K. Wang.

Soy protein plastics formulation development for enhanced mechanical strength and reduced water solubility, United Soybean Board, 61,887, D. Grewell.

Naturally controlled gelatinization of corn starch, Grow Iowa Values Fund, 31,426, D. Grewell.

Naturally controlled gelatinization of corn starch, Grain Processing Corporation, 5,000, D. Grewell.

Uniformity in near infrared measurements of soybean quality, United Soybean Board, 64,555, C. Hurburgh.

Development of GEM Line Starch to Improve Nutritional Value and Biofuel Production, USDA-ARS, \$22,439, J. Jane.

Enzyme Digestibility of Starch in Animal Feed, Nugenplasm Company, \$98,473, J. Jane.

Preparation of Samples of Resistant Starch. Iowa State University Research Foundation, \$3,000, J. Jane.

BioCentury Research Farm, USDA- CSREES, \$262,905, L. Johnson, J. Colletti, T. Wang, and H. Wang.

Protein Utilization: Advanced Soybean Refineries - Year 2, USDA-CSREES, \$546,320, L. Johnson, P. Murphy, C. Glatz, S. Jung, and T. Wang.

Development of advanced bioconversion process for cellulosic feedstocks using soaking in aqueous ammonia pretreatment, USDA ARS-ERRC, 10,000, T.H. Kim.

Midwest Dairy Association Equipment Reimbursement for Pasteurizer for CCUR Pilot Plant, Midwest Dairy Association, \$30,000, R. MacDonald.

Pilot-scale R&D on the MycoMax fungal process to lower the energy needs of ethanol production, Iowa Energy Center, 135,317, H. van Leeuwen and L. Johnson

Transgenic Maize Seeds with Enhanced Starch Property for Bio-Processing, Nugenplasm Company, \$1,206,815, K. Wang and J. Jane.

Evaluating Strategies for Clean Fractionation of Algae Oil, Protein, and Cell Wall Components, ConocoPhillips, \$121,331, T. Wang, L. Johnson, B. Lamsal, S. Jung, and S. Beattie.

Frying Performance of Low-Linolenate and Mid-Oleate Soybean Oils, Asoyia, \$2,242, P. White.