Faculty give presentation on alternative fuels to the Iowa Legislature

On Thursday, January 12, a group of faculty experts from the Regents’ institutions conducted a seminar on renewable motor fuels for the Iowa General Assembly in the House Chamber of the Iowa State Capitol.

The Iowa Legislature requested the presentation to provide members with science-based information on ethanol, biodiesel and other biobased alternative fuels. Issues addressed by the faculty -- from Iowa State University, University of Iowa and University of Northern Iowa -- included energy balance, performance, tax incentives and mandates and sustainability. Following the presentation, the faculty met with the House Commerce Committee to continue the discussion. Robert Brown, Larry Johnson, John Miranowski and Joe Colletti represented Iowa State.

The link below leads to the Regents’ presentation on renewable fuels. Contact information for the presenters is listed on the last page of the presentation.

http://www2.iowaccess.org/regents/News/regentsrenewablefuelsjan2006.pdf

2006 Biobased Industry Outlook Conference

Krysta Nibe, Office of Biorenewables Programs

Iowa State University will host the 2006 Biobased Industry Outlook Conference on August 28 and 29. CCUR is a co-sponsor for the event. During the past few years, this event has established a reputation for being the Midwestern conference where industry and community leaders, academicians, and government agencies gather to learn and share information about manufacturing, distributing, and marketing biobased products. In 2005, the two-day event attracted over 420 people.

This year’s conference will feature sessions that focus on the financial, scientific, equipment, and educational investments needed in order for U.S. agriculture to supply a significant portion of U.S. energy needs, while maintaining production of food, feed, and fiber. Speakers include James Woolsey, former director of the CIA; Lee Lynd, professor of engineering at Dartmouth College; Vinod Khosla, founding CEO of Sun Microsystems; and Bob Egerton, commercial agribusiness division manager at Co-Bank.

Breakout sessions will focus on new and promising bioprocessing discoveries and market incentives for biobased products, while specialized tours will feature various aspects of the bioeconomy. Participants will also have the opportunity to experiment with I-FARM, a computer-based system that analyzes how harvesting energy crops and residues can impact soil fertility and conservation.


Sponsorship opportunity

Be a sponsor at the 2006 Biobased Industry Outlook Conference. There are several levels of sponsorship with great premiums. For more information, download the sponsorship flyer at http://www.bioeconomyconference.org/Documents/2pageSpons.pdf
Grewell team supported by Grow Iowa Values Fund

David Grewell, Agricultural and Biosystems Engineering; Samir Khanal and Hans van Leeuwen, both from Civil, Construction and Environmental Engineering received funding of $73,535 from the Grow Iowa Values Fund for Retooling Ethanol Industries: Integrating Ultrasonics into Dry Corn Milling to Enhance Ethanol Yield.

One strategy to improve ethanol production is to integrate a high-power ultrasound into existing dry milling ethanol plants. The ultrasound pretreatment will create shear forces that expose more surface area to enzymes, enhancing enzymatic activity. A 10% increase in ethanol yield would generate nearly $190 million of revenue annually in Iowa. Such an improvement would have a significant impact on the long-term sustainability of the ethanol industry.

The project is a partnership with Midwest Grain Processors (MGP), Lakota, Iowa, Lincolnway Energy (LE), Nevada, Iowa, and Branson, Inc., an ultrasound equipment supplier. MGP and LE will provide corn and corn product samples for bench testing and LE will be involved in pilot-scale testing. Branson, Inc. will provide an ultrasonic unit and technical expertise for laboratory and field-testing.

ISU students complete courses, tour Ghent

In January, five Iowa State University graduate students completed an Intensive Program in Ghent, Belgium. The students, all enrolled in the Biorenewable Resources and Technology graduate program, attended courses, participated in excursions and practical exercises, and did some sightseeing in the area.

The students traveled as part of the International Exchange Program on Renewable Resources and Clean Technology. This program is sponsored through a grant from the Fund for the Improvement of Postsecondary Education (FIPSE) of the U.S. Department of Education. The program provides international educational opportunities for students and professors from Iowa State University, the University of Arkansas and the University of Washington along with three European universities: the University of Ghent in Belgium, the University of Graz in Austria and the National Polytechnic Institute of Toulouse in France.

The Intensive Program, the second offered to Iowa State students and professors, provided overviews of the sustainable driven production of biomaterials and analyses of the production chain from primary production as well as the transformation and technology of the bioresources into environmentally friendly consumer products or industrial products. PhD candidates representing Iowa State were Kerry Campbell, Mike Huisenga, Sarah Hruby and Sara Kaplan. Scott Bents, a Master's student, also attended the program.

“The Intensive Program allowed me the opportunity to meet students from other schools and countries,” Bents said. “I was able to learn about what topics are being researched at other universities and to have discussions with students who have similar research interests to mine.”

Courses taught by experts from around the globe included topics such as green processing options, economic issues of feedstocks, biotechnology of plant oils, wood modification, rice hull utilization, and biodegradability of agromaterials. Iowa State University sponsored five professors who taught seminars during the Intensive Program.

Professor of Biochemistry, Biophysics and Molecular Biology Basil Nikolau presented a seminar entitled, “Biotechnology of Plant Oils: Opportunities for Biorenewable Industrial Feedstocks.” University professor of Chemistry and director of the Center
The two molds each have their own advantages.

White-rots are better able to free the cellulose from the lignin. This makes the process of fermenting the cellulose into ethanol much easier. However, the brown-rots may be a better option as they incubate and optimize cellulase and hemicellulase activity. The enzymes eventually liquefy these polysaccharides which leaves essentially a pool of sugars. These six carbon sugars are then ready to be transformed into ethanol.

The team has recently submitted a USDA proposal which, if funded, will help Pometto, van Leeuwen, and Khanal move the brown-rot process from the laboratory to a commercial scale situation. “We have interest from companies for this process. However, one company reports that corn fiber does not have

Faculty profile: Anthony Pometto

Krysta Nibe

Food Science and Human Nutrition Professor Anthony Pometto conducts research in a number of areas. Two of his major projects are centered around biorenewable resources, while another is looking to enhance the food industry. Add to that his recent directorship for the NASA Food Technology Commercial Space Center and his current appointment as the associate director of the Institute for Food Safety and Security, and it's apparent that he is working to better several industries.

Two of Pometto’s research projects are conducted with Professor Hans van Leeuwen and Research Assistant Professor Samir Khanal. Both of these collaborators are in the Department of Civil, Construction, and Environmental Engineering. “We have a great team. We have been able to team up industrial microbiologists and environmental engineers to get better results,” Pometto said.

For the first project, the team has determined that a fungal-based process for conversion of lignocellulosic co-products from corn milling plants to sugars, which then results in ethanol, may be easier than current methods. White-rot molds are used first, followed by brown-rot molds for sequential fermentation of corn residues such as corn fiber.
Faculty profile: Robert Brown

Krysta Nibe

Robert Brown, Bergles Professor of Thermal Sciences in the Department of Mechanical Engineering and affiliated with CCUR, is not only leading several research projects, but is also the Director of the Office of Biorenewables Programs (OBP). These responsibilities, along with his numerous faculty appointments across campus, have put Brown in the spotlight for emerging research and technologies in biorenewable resources.

Brown’s research projects focus on biomass gasification, production of bio-oils by fast pyrolysis, syngas fermentation, and hydrogen production.

One specific project is aimed at producing a nitrogen rich char from corn stover that can be applied to soils as a substitute for anhydrous ammonia as well as serve as a carbon sequestration agent. To support this research, Brown was recently awarded 1.9 million dollars through the Biomass Research and Development Initiative, a joint program of the USDA and the U.S. Department of Energy.

The inspiration for this project is the Terra Preta soils of the Amazon Basin, which were produced by pre-Columbian people by mixing charcoal and manure into the soil. That mixture resulted in “dark earth” of unusually high fertility compared to the surrounding highly oxidized soils. Today’s version of this soil mixing employs fast pyrolysis to convert corn stover into bio-oil (a high energy, liquid biomass), charcoal, and a flammable gas. The bio-oil is used in place of natural gas to produce anhydrous ammonia, which is reacted with the gas product to yield ammonia bicarbonate, which is precipitated into the pores of the charcoal product. By providing corn stover as the energy source in the production of fertilizer, the net cost to farmers could be reduced as much as 50 percent. Additionally, the current prices at which sequestered carbon credits are being traded in Europe under the Kyoto Accord mean that farmers might annually earn as much as $100 per acre for the carbon sequestered in their fields.

The corn stover pyrolysis project has been in the spotlight during the past year; however, Brown has also been leading several projects that involve the gasification of biomass, including switchgrass, corn stover, and distillers’ dried grains. Switchgrass has been used to generate a flammable gas that can be injected into coal-fired boilers to reduce emissions of nitric oxide, a precursor to acid rain. In this application, the switchgrass-derived gas is injected just downstream of the point where coal is burned. The fuel-rich conditions convert the nitrogen oxides into molecular nitrogen, with efficiencies exceeding 80 percent. This research has been funded by the Department of Energy.

Corn stover, on the other hand, is being gasified to produce a substitute for natural gas in ethanol plants. While some companies are moving toward less expensive coal to replace natural gas, Brown is working with Frontline Bioenergy, a small start-up company in Iowa, to use readily available corn stover to generate process heat in an ethanol plant. A

Graduate research assistantship available

There is an opening for a graduate research assistant interested in pursuing an MS degree in Food Science & Human Nutrition with specialization in grain processing. The student will develop new processing methods for plant-made recombinant therapeutic proteins from corn for pharmaceutical applications.

Strong chemistry and food engineering background is desired. Experience working in a processing pilot-plant is desired as the research will involve processing trials.

Information about the Iowa State community and graduate admissions can be found at http://www.iastate.edu. Additional information about this opportunity for graduate study in Food Science & Human Nutrition at Iowa State is available at http://www.fshn.hs.iastate.edu/.

Send curriculum vitae, copies of transcripts, and contact information for two references to: Dr. Lawrence Johnson, Director, Center for Crops Utilization Research, Iowa State University, 1041 Food Sciences Building, Ames, IA, USA 50011-1061. Telephone: 515-294-4365, Fax: 515-294-6261, and email: ljjohnson@iastate.edu.
The NASA Food Technology Commercial Space Center (FTCSC) at Iowa State University closed on Dec. 30 with several successes in its six years of work.

“We have experienced a great number of accomplishments in this center,” Anthony Pometto, center director and Iowa State food science professor said. “Our faculty, partners and collaborating centers have really made the FTCSC successful and developed amazing new technologies for space. We at FTCSC are saddened by this news, but we have been working to make the transition a positive one for everyone involved in the Center.”

The center, directed by Dennis Olson until 2000 and most recently by Pometto, was recognized for a variety of achievements including building numerous partnerships with academia, industry and the public.

The FTCSC worked with 30 commercial partners, which were recognized for their contributions to space food and space food technology. Two companies recently developed foods for space.

Triple “F” Inc., an Iowa-based company, developed a soy-based dehydrated chili that was accepted by NASA and added to the Johnson Space Center flight list. Another commercial partner, Arla Foods amba of Denmark, worked with the Center to produce a powdered milk drink and thermostabilized yogurt, which have been approved by NASA.

At its closing, there were 57 affiliated faculty members who represented 16 American universities, one federal research laboratory and two international institutes. Faculty members, such as Lester Wilson of Iowa State, were recognized for their work with the Center. Wilson was named a NASA Faculty Fellow three consecutive years. Through this fellowship, he spent three summers at the Johnson Space Center working with NASA scientists.

Six collaborating centers also worked with FTCSC. Four of those centers, the Center for Designing Foods to Improve Nutrition, the Center for Crops Utilization Research, the Food Safety Consortium and the Center for Advanced Technology Development, are located at Iowa State. The remaining two centers, the Israeli Aerospace Medicine Institute and the Korea Atomic Energy Research Institute, are international institutes.

During its tenure, the center worked with educators and students to provide information about space food and space-related topics. Through FTCSC’s Web site (http://www.ag.iastate.edu/centers/ftcsc/), educators can download lesson plans and other supporting materials for classroom discussions about space topics.

Cheryll Reitmeier, education mission specialist for FTCSC and Iowa State food science professor, spent much of her time speaking to a variety of groups about foods for space travel and other space-related topics. She won a Higher Education Challenge Grant that she used to design and implement effective college-level educational programs about food systems for space travel.

Ed Adcock
Brown talks to Senate about biofuels

Mike Krapfl, News Service

Making ethanol from corn shouldn’t be the ultimate goal of the country’s renewable fuels industry, Robert C. Brown will tell a U.S. Senate committee next week.

Brown, Iowa State’s Bergles Professor in Thermal Science and the director of Iowa State’s Office of Biorenewables Programs, has been invited to testify before the Senate’s Committee on Agriculture, Nutrition and Forestry. Brown’s testimony will be part of a committee hearing on the state of the biofuels industry.

The hearing will be 10 a.m. Wednesday, April 26, in Room SR-328A of the Russell Senate Office Building in Washington, D.C. Brown’s testimony will be posted to the Iowa State Web site at that time.

Brown said he’ll tell senators that corn and soybeans alone won’t be able to produce enough renewable fuels to displace a significant fraction of imported petroleum. That will require development of new technologies able to convert switchgrass, corn stalks and other fibrous plant material into fuels and chemicals.

An acre of switchgrass could produce almost twice as much fuel as an acre of corn, Brown said. And an acre of switchgrass with its high yield of biomass could produce as much protein as an acre of soybeans.

“We need to understand that converting corn to ethanol is not the goal,” Brown said. “It is a pathway, and possibly a transitory one, to the larger goals of reduced dependence on imported petroleum and improved environmental quality.”

In addition to attending courses, the students also had the opportunity to tour a Ghent biodiesel plant owned by Oleon. This plant is one of the biggest fatty acids plants in the world. The excursion allowed the students to apply information from the courses to the real world.

“I am really pleased with the results of this Intensive Program,” Johnson said. “The students who attended thoroughly enjoyed their time in Ghent. They learned about the global aspects of biorenewable resources and technology, not only in the classroom but also during the excursions and their free time. Our professors who attended represented Iowa State University and Iowa very well and provided interesting and informative lectures. We are looking forward to the next Intensive Program on biorenewables.”

For more information regarding the International Exchange Program on Renewable Resources and Clean Technology, please visit http://www.crrct.iastate.edu/.

Faculty and students that participated in the two-week intensive course in Ghent.
Pometto holds a culture flask for his nisin production project which is supported by the USDA through the Iowa Biotechnology Byproducts Consortium.

Pometto shows a jar containing the solid state fermentation used for the bioconversion of corn fiber into ethanol.

much lignin,” Pometto said. “If that is the case, we would not employ a white-rot pretreatment.”

The second project that Pometto, van Leeuwen, and Khanal are working on involves companies such as ADM and Proctor and Gamble. They are researching methods of turning waste streams into fungal biomass. The companies will then take that fungal biomass and use it for various purposes. Right now, the team is looking at two approaches to this research. The first is to grow the fungus on wastewater using a bioreactor design developed in Pometto's research laboratory. This growth reduces the chemical oxidation and leaves the wastewater more environmentally friendly. The other method is to employ disinfectants to control wastes and keep the bacteria population down.

The wastewater project has been sponsored by ADM, Proctor and Gamble, and the USDA through the Biotechnology Byproducts Consortium. “This process could eventually expand out to other companies,” Pometto said. “There is definitely a benefit to the process and we are seeing industry gaining more interest along the way.”

In addition to these and other projects Pometto is leading in the laboratory, he is also helping Director Manjit Misra lead the Institute for Food Safety and Security at Iowa State. This organization was established to help combine and coordinate the activities of seven major facets of food safety at the university. Faculty affiliated with the Institute are conducting research which will help protect Iowa’s and the nation's interests in food safety and security. “We really have a lot of exciting research and activities going on with the Institute,” Pometto said. “Food safety and national security are very important topics right now.”

Awards and Honors

Earl Hammond has been awarded the Supelco/Nicholas Pelick Award, one of the top awards of the American Oil Chemists Society (AOCS). This award is sponsored by Supelco, Inc., a division of Sigma-Aldrich in Bellefonte, Pennsylvania, and Nicholas Pelick, a longtime member and past president of AOCS. It recognizes outstanding original research in fats, oils, lipid chemistry or biochemistry and will be awarded to Dr. Hammond in St. Louis, Missouri, in May.

Larry Johnson has been named a fellow of the American Oil Chemists Society. He will be recognized at the 97th AOCS Annual Meeting & Expo held April 30-May 3, 2006, in St. Louis, Missouri.

Lester Wilson has been selected as a Faculty Fellow for the 2006 NASA Faculty Fellowship Program at the NASA Johnson Space Center, Houston, Texas, this summer.
Iowa State student participates in new venture competition

Agronomy graduate student Colin Shepard was selected to compete in the Big 12 Venture Capital competition in Dallas, Texas. Shepard is currently working on a CCUR project. AimsBio is Shepard’s startup biotechnology company that proposed to market a technology that increases valuable protein production level in maize seeds. AimsBio’s technology can increase production of enzymes, nutraceuticals and biopharmaceuticals in maize kernels by 25 percent compared to current methods. Shepard competed through the first round of the event.
Ott named BIOWA executive director

Michael Ott will play a crucial role to biotechnology companies and their partners within the State of Iowa in his new role as executive director of the BIOWA Development Association. Ott starts with the association on October 31.

As part of his new position, Ott is helping BIOWA reach their current goals of creating at least ten regional biorefineries across the state by the year 2020, building five biobusinesses or expanding those in existence each year beginning in 2005, and providing investment opportunities for Iowans in these refineries and businesses.

Ott will be responsible for helping biotechnology companies partner with banks and venture capitalists to establish biorefineries in Iowa. He will also work to recruit existing biotechnology businesses, as well as help create new ones, by connecting entrepreneurs with producers, lawyers, or accountants as needed.

“One example of a partnership I hope to help companies establish is of a biotechnology company that uses egg shells to produce collagen, which can be used for lip enhancement injections or in cosmetics and pharmaceuticals,” Ott explained. “This company recycles the egg shells that another company would previously have paid a substantial amount of money to dispose. It’s an example of how one company’s trash can be turned into a high-value product by another company,” he said.

Ott is also charged with the goal of establishing ethanol and biodiesel biorefineries in Iowa. A biorefinery, as defined by BIOWA’s Web site, http://www.biowa.us, is a synergistic cluster of biobased industries producing chemicals, fuels, power, products and materials.

BIOWA members can benefit from the partnerships that Ott is helping create, and increased membership in the organization will allow for more partnerships and, potentially, new job markets.

BIOWA also serves members by establishing common healthcare and retirement packages so small companies can work together to secure preferential treatment usually reserved for larger companies.

“I chose to accept the position with BIOWA because it provides me a great opportunity to work with the State of Iowa from Iowa City,” Ott said.

Postdoctoral research associate position available

A postdoctoral research associate position is available immediately to join a multi-disciplinary team of researchers working on enzyme-assisted aqueous processing of soybeans. The research program explores and develops technologies to process and extract oil from soybeans using water and employing enzymes. The research will identify mechanical treatments (i.e. flaking, grinding extrusion) that enhance oil release by enzymes and the mechanical and enzymatic treatments that will de-emulsify skin fluid and cream to recover free oil. The laboratory and pilot-plant facilities are well-equipped and instrumentation is excellent. More information about the Center for Crops Utilization Research is available at http://www.ccur.info.

A PhD in food science, chemical engineering or related discipline is required. Experience in food or grain processing and/or use of enzymes is a plus. Excellent communication skills are important to the success of this collaborative effort.

Competitive salary/stipend and benefits are available and will be commensurate with experience.

Send curriculum vitae and contact information for two references to: Dr. Lawrence Johnson, Director, Center for Crops Utilization Research, Iowa State University, 1041 Food Sciences Building, Ames, IA, USA 50011-1061. Telephone: 515-294-4365, Fax: 515-294-6261, and email: ljjohnson@iastate.edu.
Grants and Contracts


Retooling Ethanol Industries: Integrating Ultrasonics into Dry Corn Milling to Enhance Ethanol Yield, Grow Iowa Values Fund, $73,535, D. Grewell, S. Khanal, and J. van Leeuwen.

Food Chain Economic Analysis, Part III, USDA, $387,988, C. Hurburgh and J. Lawrence.

Uniformity in Near Infrared Measurements of Soybean Quality, American Oil Chemists Society, $54,647, C. Hurburgh.

Use of Isoamylase and Glucoamylase in the Production of Glucose from Starch, ISU Center for Catalysis, $45,000, J. Jane.

Production of Soy/Starch Polymer Films, University of Southern Mississippi, $13,965, J. Jane and P. Mungara.

Postdoctoral Research Associate and Graduate Student Travel to the Corn Utilization and Technology Conference, Iowa Corn Promotion Board, $10,000, L. Johnson.

Stage-gate Proposal for Commercializing Soy Protein Fractionation, ISU Agricultural Experiment Station, $25,000, L. Johnson and N. Deak.

Use of Industrial Enzymes to Enhance Soybean Use, USDA, $750,977, L. Johnson, P. Murphy, D. Myers, C. Glatz, T. Stahly, S. Jung, and C. Reitmeier.

Increase Efficiency, Expand Product Line and Enhance the Profitability of the West Central Cooperative’s Soy Biorefinery in Ralston, Grow Iowa Values Fund, Iowa Department of Economic Development, $140,000, G. Kraus and J. Verkade.

Engineering Carbohydrate Polymers for Value-Added Products from Agricultural Feedstocks, Petroleum Research Fund, American Chemical Society, $40,000, N. Pohl.

Design of Nanostructured Organic-Inorganic Hybrid Catalysts for Biorenewable Conversion, National Science Foundation, $305,000, B. Shanks.


Functionality of Egg Yolk Lecithin and Protein and Functionality Enhancement of Protein by Hydrothermal Cooking, Midwest Advanced Food Manufacturing Alliance, $22,638, T. Wang, L. Johnson, and D. Myers.