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College of Engineering

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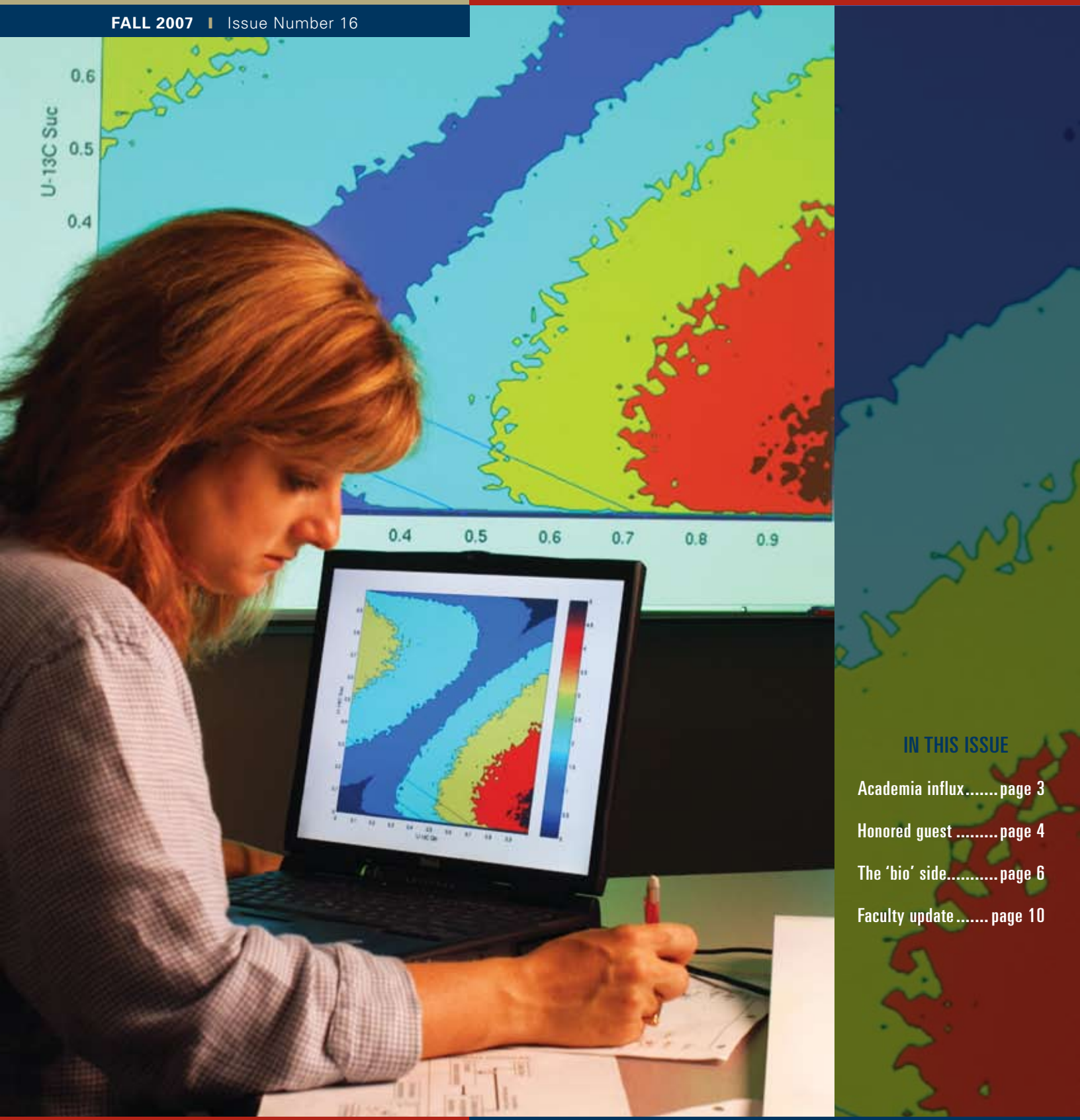


IN THIS ISSUE

Letter *from the Chair*

Here are a few highlights of the past year:

Learning, research, and service. The pillars of the educational enterprise here continue to get stronger. Members of the faculty have been winning well-deserved teaching awards, research productivity remains high (especially in polymers, biomaterials, bioprocessing and biorenewables, chemical reaction engineering, surface science, computational chemical engineering, and other areas), and the department has been active in professional and technical activities beyond the walls of the university. Our students are still among the best, as you can tell from the list of awards they have received!

ABET. The Accreditation Board for Engineering and Technology recently re-accredited the chemical engineering curriculum at Iowa State. Thanks to Associate Professor Dennis Vigil for leading the preparations for the accreditation effort.

Enrollment, salaries, demand. Demand for chemical engineering graduates is soaring again and so are BS salaries, which are the highest in engineering; Iowa State averaged $60,000 last year. At this fall's engineering career fair, more than 100 companies were looking for ChE students. Our undergraduate enrollment is now over 400 students (40% women) and that of graduate students and post-docs more than 60.

Promotions. Congratulations to Professors Balaji Narasimhan, Derrick Rollins, and Brent Shanks for their promotions to full professor, and also to staff members Jody Danielson and Linda Edson, who were promoted to program coordinator and program assistant, respectively. Unfortunately for us, Professor Narasimhan was promoted to the dean's office, but we are still his faculty home.

Faculty Awards. Congratulations to Professors Brent Shanks, Rodney Fox, Surya Mallapragada, Derrick Rollins, and Chuck Glatz for winning faculty awards at the college and university convocations this fall. We always knew that we had a winning team!

Twins. There are now five faculty members in the department who are parents of twins (Reilly, Hill, Loveland, Mallapragada, and Narasimhan), although two are double-counted. Congratulations to Surya and Balaji for supporting this tradition!

Faculty search. With the departure last year of Professors Schrader and Porter, and this year of Professor Narasimhan, we are carrying out searches for their replacements. Professor Rodney Fox chairs the committee and will welcome nominations of outstanding candidates.

Honorary degrees. It was great to host Professor R. Byron Bird (University of Wisconsin) who received his 10th honorary doctorate here in May. During his visit we kept him busy autographing his books.

Student Lounge. Thanks to the initiative of the department chair's student advisory committee and a lead donation from Professors Jackie and Brent Shanks, the undergraduate students now have a refurbished, decorated, and furnished lounge in the basement of 1964 Sweeney.

Unique facilities. The CBE department has been acquiring expertise and resources that are unique: (1) The LEAP (local electrode atom probe) is the highest resolution microscopy technique available and only the 4th at a U.S. university; it is invaluable for materials research (faculty are Hillier and Narasimhan); (2) The flow diagnostics laboratory with stereo PIV, high-speed PIV, reactive PLIF, and LDV provides an alphabet-soup set of laser diagnostics for measurements of mixing and transport in fluid flow systems. The experimental facilities plus complementary capabilities for computer modeling and simulation are unique to Iowa State (faculty are Olsen, Fox, Vigil, and Hill); (3) Participation in the Iowa State high-performance computer initiatives (an Opteron cluster and BlueGeneL in the same room!!) plus membership in the NSF petascale-grant-winning Great Lakes Computing Consortium provide state-of-the-art computing capabilities for molecular dynamics, polymer science, chemical reaction engineering, multiphase CFD and turbulence modeling, and the prediction of molecular structure (faculty are Cochran, Lamm, Fox, Reilly, Vigil, and Hill). These capabilities help to make Iowa State *the* place for performing high-impact research.

Advisory council. We regret the loss of advisory council members whose terms have expired—Gayle Roberts (who has gone on to become president of Stanley Consultants), Diane Milianta, and Bart Waters. But we are fortunate to have added new members—Mary Jane Hagenson (VP research, Chevron Phillips) and Leigh Thompson (R&D tech leader, Dow) have joined chair Jim Katzer (NAE, retired manager, ExxonMobil), Umit Ozkan (former associate dean, Ohio State), Gary Griswold (president, 3M Innovative Properties), and David Morgan (retired manager, P&G); they will be joined by Peter Hemken (VP, DuPont) and Bob Lane (VP, Shell). They are not only interested in improving the quality of our programs but also in development efforts and in our program rankings.

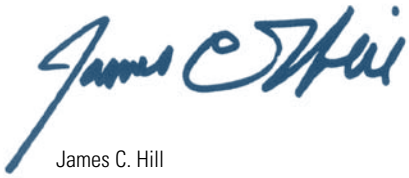
Development. We've all heard the expression that we stand on the shoulders of giants, but we've also walked the paths that others have made, learned from the books that others have written, and studied in the buildings that others have built. Many of us also benefited from the generous scholarships and fellowships provided by others. With declining state support to the universities, we at Iowa State need to rely more and more on the generosity of alumni in order to carry out our mission of preparing our graduates and creating knowledge and to achieve our vision of pre-eminence of our undergraduate and graduate programs. For this assistance we seek your support.

Our needs are great—we are running out of suitable space for research and teaching programs, startup costs for new faculty members are huge (the national average startup cost for ChE faculty was over $600,000 two years ago, and our department share must come from outside the university), we are way behind other schools in offering endowed faculty positions to attract new senior faculty members and retain current ones ($500,000 for professorships, $1.5 million for endowed chairs), and other funds are still needed for fellowships, scholarships, and for many normal operations. With the announcement of Iowa State's capital campaign, we hope that you see fit to contribute to this effort.

For those of you who are eligible, there is still time (through December 2007) to take advantage of the PPA 2006 (IRA Charitable Rollover). Let us know if you would like details.

Please keep in touch. We'd like to hear from you—about your accomplishments as well as to receive your suggestions. Please stop by to visit us if you are in the area. If you would like a visit by one or more faculty members during their travels or would like to host an alumni event, please let us know. And please check our Web page periodically for the latest news at www.cbe.iastate.edu.

Have a great year!



James C. Hill
University Professor and Chair

On the cover:

Professor Jacqueline V. Shanks brings plant science into engineering prominence through metabolic flux analysis.

Research environment, mentoring influence push PhDs into academia

That a PhD program is the pathway to a career in academia is nothing unusual, but lately it's been more like the CBE expressway.

Nine recent PhD graduates in chemical and biological engineering have gone on to faculty positions. For a program that has averaged eight PhDs per year for the past three years, that's a strong representation.

While the motivation to pursue a career in academia is often a personal one, other factors have come into play. Programs offered by the university, such as Preparing Future Faculty, provide guidance and support. And the collegial spirit of a research-oriented department with outstanding faculty exerts no small influence on graduate students who are considering their career options.

Following are the stories of two PhD graduates who have chosen academia.

Jorge Almodóver and Matt Kipper

Captured by academic culture

When **Matt Kipper** chose academia, he did so by turning down a more immediate opportunity.

"I was offered a job with a petrochemical company that I had done a co-op with, but a career in academia was my number-one choice," Kipper says. "I gave up a signing bonus and a nice salary to be a CBE grad student because I liked it so much."

Kipper finished his PhD in 2004 and is now, after a brief stint at a government laboratory, an assistant professor at Colorado State University. Even though he always felt strongly about an academic career, he still credits the influence of people and programs. "I had outstanding role models as teachers, research advisers, and mentors," he says. "And all of the teaching in the department was excellent."

Kipper names Professor **Balaji Narasimhan**, Professor **Brent Shanks**, and Anson Marston Distinguished Professor Emeritus **Richard Seagrave** as three standout mentors, and he also notes the contributions of **Donna Kienzler**, assistant director of the Preparing Future Faculty program offered through the Center for Excellence in Learning and Teaching.

Although Kipper's current research in polymeric biomaterials at the nanometer length scale is not directly related to his work at Iowa State, he finds that the environment at Colorado State is similar to what he had experienced.

"The research culture at Iowa State is very similar to the culture here department-wide and university-wide as far as collegiality among faculty and cooperation in research," Kipper says.

Of course, Kipper's role includes teaching, which he does in the lab as well as in the classroom, and it generates one of the rewards of academic life.

"I enjoy interacting with students," he says. "My experience is that students have a lot of energy and excitement, and they learn an incredible amount of information in a short time. That's just an exciting world to be a part of."

Now Kipper is the positive influence, and as such he is completing a circle of sorts: one of his PhD students is **Jorge Almodóvar**, who earned a BS in chemical engineering at Iowa State this year. How does Kipper feel about possibly contributing to the next generation of faculty?

"It's humbling," he says. "I feel like I'm just along for the ride. The students are doing a lot of great work, and I want to give them all the resources they need to excel. That's a spirit I inherited from Balaji."

Infused with student enthusiasm

As a graduate student, **Greg Rutkowski** found the idea of an academic career to be interesting. Then one particular semester made it compelling.

Rutkowski held a teaching assistantship that was bolstered by funding from a fellowship program, which allowed him to spend more time with the students in a thermodynamics class taught by Professor **Surya Mallapragada**.

"That experience got me even more excited about going into academia," Rutkowski says. "Working with the students day by day, I got to see the realization on their faces when they learned new material. I really appreciated that aspect of the job."

Today, as an assistant professor at the University of Minnesota–Duluth, Rutkowski (PhDChE'99) is once again in a position to generate, and experience, the enthusiasm of undergraduates. The 10,000-student campus includes a chemical engineering department of about 100, which means smaller class sizes and more attention to students—all of whom are undergraduates. Rutkowski uses his research in tissue engineering as a hands-on tool.

"I look at my research as a teaching opportunity for students," he says. "Through the research I can give them a depth that they might not be able to get in a course. Since they are chemical engineers in training, I am able to relate the research to what they are learning in classes such as mass transfer, kinetics, and bioprocess engineering."

Looking back at his Iowa State experience, Rutkowski also sees how research influenced his choices. "There were so many excellent researchers and so many resources within the department and the university as a whole that allowed me to do the research that I wanted to do," he says. "Being able to interact with faculty and take on some responsibilities in the classroom gave me a good idea of what it meant to work in academia."

Those ties with Iowa State are still intact. A former student of Rutkowski's, **Senja Lopac**, is now an Iowa State CBE grad student. "Since we don't have a graduate program here, I'm cognizant of what opportunities are out there," Rutkowski says. "If someone wants to stay local, I do suggest Iowa State."

Commencement speaker visits department

Professor **R. Byron Bird**, the author of a classic text and an intellectual icon in the field of chemical engineering, visited the Department of Chemical and Biological Engineering in May to present a seminar a day before serving as the Iowa State University undergraduate commencement speaker. He also received his 10th honorary doctorate degree.

The famous book that Bird co-authored in 1960, *Transport Phenomena*, is a common fixture on the shelves of chemical engineers, faculty, and students, and he gladly signed copies that were brought to him during his departmental visit. The book had gone through 64 printings before a second edition was published in 2002. Bird's engaging seminar was titled "Who Was Who in Transport Phenomena" and included a demonstration of a diabolo.

Bird spent most of his childhood in Fort Dodge, Iowa. His early work at the University of Wisconsin, where he became a faculty member in 1953, contributed to the growing influence of transport phenomena in chemical engineering, with a resulting de-emphasis on unit operations. His impact is still felt in chemical and petroleum industries, materials science, food processing, the space program, and biomedical research.

A career of significant contributions has resulted in Bird's election to three national academies: the National Academy of Engineering, National Academy of Science, and American Academy of Arts and Sciences. In 1987, he received the U.S. Presidential Medal of Science. In 1983, the American Institute of Chemical Engineers named him one of the 25 most influential chemical engineers.

Iowa State President Gregory Geoffroy welcomes commencement speaker Dr. R. Byron Bird before his speech during the spring graduation ceremony at Hilton Coliseum.

Photo by Nirmalendu Majumdar, *The Ames Tribune*

Narasimhan is new associate dean

Balaji Narasimhan, a professor in the chemical and biological engineering department, has been appointed associate dean for research and economic development in the College of Engineering. Narasimhan has stepped down as director of the Institute for Combinatorial Discovery and given up his teaching duties to take on the associate dean position, which officially began on August 8. He plans to continue his own research, which currently involves seven graduate students.

CBE program gains in rankings

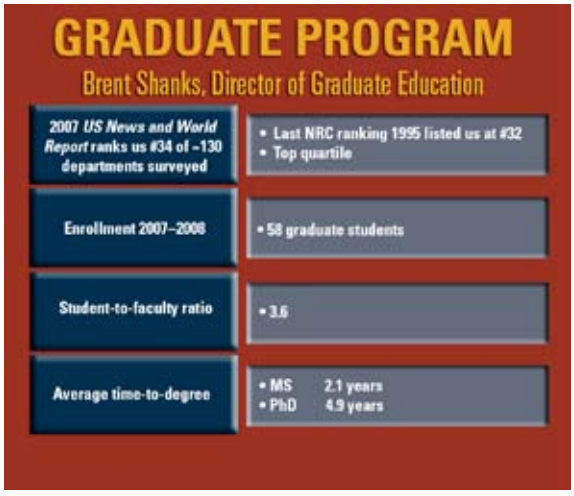
U.S. News and World Report recently ranked Iowa State's chemical engineering program 14th among public institutions and 23rd overall in the 2008 "America's Best Colleges" annual rankings.

"We are pleased that our engineering programs are being recognized for their quality and international impact," says Dean of the College of Engineering **Mark J. Kushner**. "I expect that as our programs become more widely recognized, our rankings will continue to rise."

Iowa State's overall engineering program was ranked 37th in the nation among programs accredited by the Accreditation Board for Engineering and Technology. Among public universities' engineering schools whose highest degree is a doctorate, Iowa State is tied for 22nd.

Recent CBE PhD graduates who have gone on to academia

Matt Kipper . . . . . .assistant professor, Colorado State University
Greg Rutkowski . . . . . assistant professor, University of Minnesota–Duluth
Ganesh Sriram. . . . . .assistant professor, University of Maryland
Venkatramanan Raman . . . . . .assistant professor, University of Texas–Austin
Erin Jablonski . . . . . .assistant professor, Bucknell University
Todd Menkhaus. . . . . assistant professor, South Dakota School of Mines and Technology
Cheryl Miller (biomedical engineering). . . . . .assistant professor, St. Louis University
Russell Gorga . . . . . .assistant professor, North Carolina State University
Alain Laederach . . . . . .Rensselaer Polytechnic Institute



Scholarship honors family's ties to education

Having grown up in a three-generation household, **Edyth Schoenrich** developed a deep appreciation for the influence of family on her life. Now long into a career as a professor of public health, she has begun to honor that influence by establishing scholarships at schools with family ties.

One of those is Iowa State University. The Edwin J. Hull Endowed Scholarship, established in May, is named for Schoenrich's father, who was one of two students in Iowa State's first graduating class of chemical engineers in 1914. The scholarship, to be awarded for the first time in 2008, will go to a CBE student who demonstrates a combination of academic merit and financial need.

"I see how students struggle desperately to support themselves, and I am just very sympathetic," says Schoenrich. She sees plenty of examples at the Johns Hopkins Bloomberg School of Public Health, where she is a professor and director of part-time professional programs. "I do know how difficult it is for students to gather enough tuition to pay for their education."

The examples from Schoenrich's own family illustrate perseverance and a pioneering spirit toward advanced education: her maternal grandfather parlayed his college credentials into a successful seed business; her aunt became an accomplished pianist through formal music study; and her mother became the first woman in her family to attend college.

Schoenrich is creating scholarships in each of their names, just as she has for her father, whose story took him from a farm family in Iowa, to college at Iowa State, then—as so many of his generation—into the army at the time of the First World War. Stationed in Cleveland, Ohio, he worked with a physiologist at what is now Case Western Reserve University, designing gas masks for soldiers in Europe. After the war, he joined Kelly Company, the seed business of Schoenrich's grandfather.

Schoenrich's college path—BA from Duke University, MD from the University of Chicago, MPH from Johns Hopkins—is evidence enough of her personal commitment to education, but she hopes that the scholarships will extend the spirit of that commitment into future generations.

"I just think that one of the most important resources for any nation," she says, "is its young people, who have the intelligence and the capability of making contributions to the society in which they live. I think of our students as our future, and that's where we should put our attention."

James Hill kicks off the opening of the 9th Larson-Ruth Symposium.

Ninth Larson-Ruth Symposium held

The 2007 biennial Larson-Ruth Symposium was held on April 26 in the Alliant Energy-Lee Liu Auditorium of Howe Hall on the Iowa State campus. Created by former Iowa State chemical engineering faculty member **Maurice A. Larson** in honor of former professor **B. F. Ruth**, this symposium was the ninth in the series dating from 1977. The symposium was designed to showcase the research being conducted by the department faculty and graduate students.

The invited keynote lecturer for this year's symposium was **Michael F. Doherty**, a professor in the Department of Chemical Engineering at the University of California at Santa Barbara, who gave a presentation titled "Evolution of Crystal Shape during Growth and Dissolution."

Doherty's research centers on the area of process synthesis and the conceptual design of chemical process systems, including combining reactions and separations, crystallization of organic materials, and systems with complex chemistries, with an emphasis on specialty chemicals and pharmaceuticals.

In addition to Professor Doherty's presentation, CBE Associate Professor **R. Dennis Vigil** spoke on the "Simulation of Nanoparticle Aggregation via Population Balances and Brownian Dynamics: Some Current Challenges," and CBE doctoral candidate **Maria del Pilar Torres** discussed her work on "Novel Amphiphilic Polyanhydrides for Vaccine Delivery."

Organized by Assistant Professor **Monica H. Lamm**, the symposium attracted approximately 70 people and concluded with a poster session in the lower atrium of Howe Hall.

Advisory council chair named affiliate professor

Advisory council chair Dr. **James R. Katzer** has been named affiliate professor in the chemical and biological engineering department at Iowa State University. Katzer began this position November 1, 2006.

Katzer received a BS in chemical engineering from Iowa State in 1964 and a PhD in chemical engineering from MIT in 1969. He is a visiting scholar at MIT in the Laboratory for Energy and the Environment where he is executive director of a special project on the Future of Coal in a Greenhouse Constrained World.

As a professor of chemical engineering at the University of Delaware, Katzer established the Center for Catalytic Science and Technology. His extensive work experience in the oil, gas, coal, alternative energy, and hydrogen industries stems from his work as the manager of strategic planning and performance analysis for ExxonMobil.

In 2001, Katzer became the recipient of the 63rd Marston Medal, the highest recognition of outstanding achievement in engineering from the College of Engineering at Iowa State. Katzer is active in the American Institute of Chemical Engineers and the American Chemical Society and was elected to the National Academy of Engineering in 1998.

Opportunities flourish as biorenewables expands

When **Robert C. Brown** summarizes the past several months, he does so from a brand new office that, stacked with unpacked boxes, already is merely a transition to a planned multimillion-dollar facility on the Iowa State campus.

Such is the state of biorenewables research: constant changes, and lots of them, with the pace expected only to quicken.

Since the ConocoPhillips announcement of its partnership with Iowa State in April (see accompanying story), lines of biorenewables research have traced their way even more extensively throughout campus, including into CBE. Brown, in his roles as Iowa Farm Bureau Director, Office of Biorenewables Programs (OBP), and Bergles Professor in Thermal Science, sees these developments from a strategic, as well as departmental, perspective.

"ConocoPhillips came particularly interested in working in thermochemical technologies, but they also said they are interested in plant science and microbial science," Brown says, expressing the interdisciplinary nature of the research.

More than 10 faculty from around campus are already engaged in work related to various ConocoPhillips initiatives, with CBE providing some key resources. Professor **Brent Shanks** has played a prominent role from the start, investigating catalytic processes to improve the stability of bio-oils, and Herbert L. Stiles Professor **Rodney Fox** is joining the team to apply his computational expertise to modeling the hydrodynamics of fluidized beds.

"We do have proposals in from other faculty members in chemical engineering for 2008," Brown says. The process, he explains, is more like a corporate funding model than an academic one. OBP, which includes 145 faculty members with ties to 18 academic departments, compiles a catalog of research abstracts from affiliated faculty. ConocoPhillips then selects areas of interest and asks to meet with faculty to hear more about the ideas.

"At that point they're simply exploring," Brown says. "They're trying to find out exactly what the faculty could contribute in those areas."

From there, ConocoPhillips narrows the field even further and chooses projects to fund on an annual basis.

Some of the ongoing ConocoPhillips projects include the following: Pyrolysis tar and charcoal: "They are very interested in understanding how operating conditions and feedstock properties determine how much tar is released during pyrolysis," Brown says, "and how much charcoal would remain at the end of the process." Two graduate students, with Shanks as a collaborator, are developing analytical methods to determine those quantities and building a miniature reactor system to validate some of the data that will be generated.

Fluidized beds for fast pyrolysis: "We've used them for years to produce biofuels, and it's been real attractive technology," Brown says, "but it can also be a more expensive technology. They've asked us to down-select alternative technologies that might be less expensive to build and operate." In response, miniature reactor systems are being built to evaluate two concepts: an augur reactor and an entrained flow reactor.

Technoeconomic analysis: Two graduate students are examining the costs to build and operate gasification and pyrolysis systems. "This actually has been a very exciting development in that ConocoPhillips has some of its own scientists and engineers doing this work," Brown says, "and they have brought in the National Renewable Energy Laboratory as a partner, so all three organizations can work together on this."

Within a few years, much of the work may be taking place in a new facility. Details about the proposed Agricultural and Biosystems Engineering/Office of Biorenewables Programs complex—a $99-million group of three buildings north of Howe Hall—were presented by College of Engineering Dean **Mark J. Kushner** at the fall convocation in August.

"We're spread all over campus, so we can't wait for this new building to get built," Brown says. "We want a place that becomes the front door of the Office of Biorenewables Programs.

Brown's new offices in Marston Hall—offices he calls OBP's "swing space" as the new facility is planned and built—"already give us better visibility," he says. "It makes it easier for me to interact with the college and with CBE and mechanical engineering."

The new facility, Brown points out, is also intended to be a place of multidisciplinary research that focuses on laboratory work that is inclusive, not exclusive. "They're fairly generic labs at this point because we do not want a lab dedicated to just one faculty's interests," he says.

That spirit reflects OBP's commitment "to make sure this is not about a single department or a single college," Brown says. "We want a well-balanced program that appeals to faculty in many disciplines and tackles all the important issues."

ConocoPhillips establishes $22.5-million biofuels research program

ConocoPhillips announced in April that it was establishing an eight-year, $22.5-million research program at Iowa State University dedicated to developing technologies that produce biorenewable fuels. The grant is part of ConocoPhillips' plan to create joint research programs with major universities to produce viable solutions to diversify America's energy sources.

ConocoPhillips made an initial $1.5-million grant in 2007 to support Iowa State researchers, with additional grants of $3 million per year for seven years.

"We believe the key to a secure energy future is the efficient and effective use of a diverse mix of energy sources," says **Jim Mulva**, chairman and chief executive officer of ConocoPhillips. "ConocoPhillips is developing long-term relationships with respected academic institutions such as Iowa State to research extensions of traditional energy sources that ultimately will benefit consumers."

Robert C. Brown, the Iowa Farm Bureau Director of Iowa State's Office of Biorenewables Programs and Bergles Professor in Thermal Science, says ConocoPhillips is especially interested in converting biomass to fuel through fast pyrolysis, a process that uses heat in the absence of oxygen to decompose biomass into a liquid product. This so-called bio-oil can be used as a heating oil or can be converted into transportation fuel at petroleum refineries.

There from the start

Biofuels research has become such a consistent headliner in the popular media that the story of its rapid rise to prominence is no longer news. But the irony of such visibility is not lost on researchers who have long known of the potential of biofuels and worked to develop that potential along specialized lines of pursuit.

Three researchers in chemical and biological engineering find themselves in the midst of all the attention and action being generated by alternative sources of energy, each of them having arrived by different paths of scientific interest. Yet a similar theme—providing a piece of the biofuels puzzle by performing basic research for the benefit of those who choose to apply it—resonates through their individual stories. Catalysis, metabolic flux analysis, and cellulase research are not the stuff of familiar news reports, but no biofuels breakthrough is likely to take place without them.

Filling a catalysis gap

When **Brent Shanks** came to academia from the petrochemical industry, he wanted to put his catalysis expertise to a use that made sense for his new career. He did so by filling a gap that he perceived between the approaches used by chemists and chemical engineers. Today Professor Shanks is searching for the midpoint on another spectrum, with direct implications for biorenewables research.

Essentially, Shanks saw that chemical engineers adeptly correlated the reaction testing and characterization of catalysts but were not comfortable using that information to make adjustments to catalyst chemistry. In contrast, chemists were comfortable with chemistry modifications, but less so with correlation to reaction testing. "I wanted to use the information from reactions to make new catalysts," he says.

That approach now has the potential to play a prominent role in biofuels research. Shanks is applying it to the fundamental problem of oxygen's role in two different types of catalytic reactions. Molecules of crude oil, he explains, contain very little oxygen, whereas biological feedstocks contain too much. "It's really a different paradigm for catalysis to say, 'Let's start with this molecule that has a lot of oxygen in it that has to be removed,'" he says. "It's a difficult problem to selectively remove functionality."

Trying to do so is a matter of "rational trial and error," Shanks says, with some inspiration being taken from enzymes. "We're looking at trying to incorporate organic acids and bases as catalytic moieties," he says—much different than the metal centers often applied to chemical catalysis. "We think there's great opportunity there because enzymes are known to convert these types of biological feedstocks. These are the kinds of tools that they have in their tool chests, so we feel that we should be able to develop them."

Shanks acknowledges that his academic work may have begun in a research niche, but in recent years "the niche has exploded." Still, he sees a distinct role for his group. "We definitely have to create an area that we feel we can contribute in," he says. "What you hope is that the information you put out in the literature inspires folks to come up with materials that could become viable processes to make chemicals and fuels. Our goal is to develop the intellectual infrastructure to support that."

Seeing a place for cellulase

Anson Marston Distinguished Professor **Peter J. Reilly**'s roots in biorenewables research were planted in analyzing the stillage from ethanol processing fifteen years ago. His research today with cellulases may also have the flavor of niche work, but he offers a distinctly straightforward assessment of the work's challenges.

The process of making ethanol from corn, he explains, is cheap and simple, but the problem is that corn is expensive and getting more expensive. The problem with cellulose breakdown, he says, is that cellulose is cheap but the process to do it with enzymes is expensive because "cellulose is what makes trees stand up. Rotting a log is tough."

Reilly's group is collaborating with biochemists to determine the three-dimensional structure of the cellulases of glycoside hydrolase Family 44, which is "of high scientific interest," he says. A novel approach in the standard process was to synthesize the gene rather than cloning it. "Since the organism that we're working with has the cellulase gene but does not produce the enzyme, we're the first to see it," Reilly says.

Although the industrial value of this particular cellulase family has yet to be determined, Reilly's work does contribute to a body of knowledge that advances the overall biorenewables effort.

"You would hope as you learn more about the different cellulases—how they act and how they are constructed—that you could learn more about how to change them by genetic engineering and protein engineering to make them work better," he says. "It's like putting a brick in the wall. You put it in there for the world to see, and you hope that people will be interested in it and use it."

Putting plants on the map

Looking back at a year that was "kind of crazy" because of all the developments in biorenewables, Professor **Jacqueline V. Shanks** sees clear connections leading from her academic training to the present, and she's helping to develop a carbon road map that will guide the way to future energy production.

"It's funny because this is something I've known about for a long time," she says, recalling the emphasis on renewable energy during the 1970s as gas prices rose and supplies fell. "My whole PhD was about making products from biological feedstocks."

Today, Shanks applies metabolic flux analysis to part of her investigation of soybean composition, a project funded through the Plant Sciences Institute at Iowa State. One goal is to come up with a higher yielding soybean for oil that could be used to produce biodiesel.

"I'm with the systems biology part of it, which is basically coming up with a carbon road map of how a soybean takes sucrose in and partitions it into starch, protein, and oil," she explains. "Understanding that partitioning is a really complex problem."

The same flux technique is being applied to other projects, including a collaborative effort focused on *E. coli*'s ability to convert 5- and 6-carbon sugars, and it's one that few other chemical engineers are using.

"It's a pretty unique skill," Shanks says. "We apply material balances to the reactions in the plant cell, so we can write those balances and then solve the system of equations to come up with rates and fluxes. The idea is to apply chemical engineering training to a plant system."

The approach is drawing more interest, though, and Shanks is well positioned to leverage it. During the summer, she edited—and contributed a paper to—a special issue of *Phytochemistry* devoted to plant metabolic networks. And for the first time, the annual AIChE conference is devoting part of a session to plants. "You can see the development of this interest on a timeline," says Shanks, who points to workshops and journals on biorenewables that occurred before the topic was so popular. "People are recognizing that these tools are critical to a lot of biorenewable problems."

Accelerating the discovery of new materials

An update on the Keck Lab

As the W. M. Keck Laboratory for High Throughput and Atom-Scale Analysis receives its final piece of equipment this fall, a combinatorial sputtering system, all the equipment will be in place and the lab will be "open for business." Scientists from across campus, the state of Iowa, and the nation are invited to make use of the lab's combinatorial technology, says **Andrew Hillier**, CBE associate professor and principal investigator for the lab.

The new sputtering system allows researchers to control how materials are deposited on a sample. It can be used to create complex materials or libraries of materials with many combinations of components. The goal for this instrument, says Hillier, is to help in discovering "hot spots" or regions of improved performance for various materials.

Fittingly, this acquisition comes several months after the dedication of the local electrode atom probe—the centerpiece of the Keck lab and the instrument that can help look for those hotspots, as well as provide atom-scale information about a material at the highest possible structural and compositional resolution. It can produce an image with tens to hundreds of millions of atoms in a computer-generated three-dimensional picture.

"Ultimately, in terms of designing materials from an atomic level, it gives you a picture of that material that you can't get any other way," says Hillier. "Once the lab is open this fall, our hope is that groups from all over campus will use the lab to help solve their research problems."

The Keck lab has already been put to good use by the four co-principal investigators, each of whom brings a different expertise to the lab. The co-PIs are:

- Hillier, who is looking at inexpensive catalysts for low-temperature fuel cells and organic thin films
- CBE professor and newly appointed associate dean (see p. 4) **Balaji Narasimhan**, who is developing biomaterials compatible with humans to deliver vaccines
- **Sriram Sundararajan**, assistant professor in mechanical engineering, who is looking for coatings for machining titanium, an important aspect of the aerospace industry
- **Krishna Rajan**, professor of materials science and engineering, who uses informatics to extract patterns from reams of data by applying well-established principles of mathematics and physics in novel ways

"One of our primary objectives, and that of the Institute for Combinatorial Discovery in which we are all involved, was to bring these various instruments together in one place where you could exploit these high throughput, rapid discovery methods to discover and analyze materials, whether they're catalysts, drug delivery materials, high-performance coatings, or anything else you are interested in," says Hillier.

Sundararajan's use of the lab illustrates the spirit of multidisciplinary research that is becoming more pervasive throughout the university. The addition of the sputtering system, for example, will expedite his research on coatings. He used to order material samples from labs off campus. There was a control and a time factor, and a risk for contamination. Now, he can make samples as fast as he wants and analysis is done right in the lab, keeping contamination risks low.

President Gregory Geoffroy (left) joins the four co-principal investigators and former associate dean Ted Okiishi in opening the lab

"With this particular instrument now we can deposit combinations of coatings fairly quickly," says Sundararajan. "We can mix two coating materials and see what ratio works best."

"On the atomic scale, that's where the action really happens," Sundararajan adds. "When you put a coating on a material, it has to sit on the material quite well. There are interactions between the coating and the material, and the strength of the interface is important. This equipment allows us to look at that interface on an atomic level."

Sundararajan's work will have a great impact on the aerospace industry. For example, airplane frames are made of titanium due to its great strength and lightness. He expects the coatings he discovers to make the machining of titanium five times faster.

Keck Lab: Additional instrumentation

Chemical Printer—Much like an inkjet printer, this printer delivers droplets of liquid to a surface, only instead of ink, it prints various chemicals.

Gradient Coater—Using robotics, this coater allows precise compositional gradients of polymers, proteins, and other soft materials, some discrete, some continuous.

Scanning Electro-Chemical Microscope (SECM)—This imaging instrument uses electrochemical reactions to measure chemistry and modify properties of surfaces.

Atom Force Microscope/Scanning Tunneling Microscope (AFM/STM)—With the use of a sharp tip, like a needle on an old record player, this instrument makes contact with the sample to image it. It can also do force measurements of a sample, scratch it, poke a hole in it, or see how sticky it is.

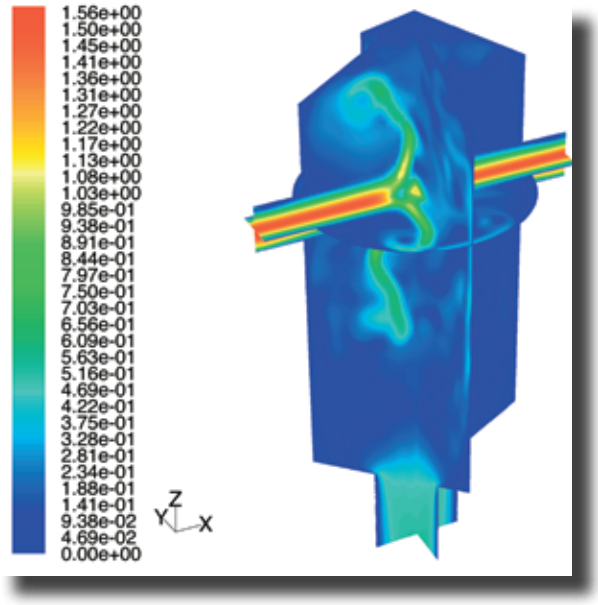
Infrared Microscope—This instrument gives a snapshot of chemistry on a surface. It will show, for example, if chemical reactions on the surface have created specific chemical signatures.

Computational capacity benefits CBE researchers

As computational tools become more prominent and sophisticated in chemical and biological research, access to advanced computational resources constitutes a basic necessity.

Iowa State's long history of leadership in this area has paralleled advances in computational fluid dynamics (CFD), combinatorial science, molecular dynamics, and other areas with extreme processing requirements. Researchers in chemical and biological engineering continue to benefit from on-campus resources that have the capacity to facilitate complex projects.

"We've been very lucky at Iowa State in that we've always had a lot of computational power here all the way back to Project Vincent," says Distinguished Professor **Peter J. Reilly**, referring to the campuswide computer network (named for John Vincent Atanasoff) that became operative in 1990. "We've been way ahead of a lot of other places."



A software-generated computational fluid dynamics image.

From desktop workstations to the IBM BlueGene/L supercomputer on campus, faculty and graduate students have access to a variety of computational resources. They include the high-performance computing (HPC) machines in Durham Hall and the Scalable Computing Lab, used mostly for computational chemistry calculations, at Ames Laboratory.

Reilly's own computational work encompasses the analysis of amino acid sequences of the same enzyme produced by different organisms and of three-dimensional enzyme structures obtained by crystallography. By using a suite of automated docking tools known as AutoDock, Reilly's research group has been able to expand knowledge of specific enzymes, including the identification of catalytic amino acids that could not be identified by determining the three-dimensional structure.

Manipulating a commercially available software with such creative approaches is just one example of how computational resources contribute to chemical and biological research. While established codes such as LAMMPS (molecular dynamics) and FLUENT (fluid dynamics) are used to sift through data and generate simulations, some work requires unnamed code that is developed for a particular purpose.

Herbert L. Stiles Professor of Chemical Engineering **Rodney Fox** often produces such "development" code for his CFD projects, including his recent work with quadrature methods to represent moments of a distribution function—thus, velocity distribution rather than size distribution in the case of sprays.

"At Iowa State, because of the equipment we have for experimental work to see if we're getting the right types of models, we can measure what we couldn't measure before," Fox says.

"In a spray there are different levels of approximation," Fox continues. "You can look at individual droplets and how they evaporate, which takes a big machine because you've got to follow all those droplets. Or you can try to do an average and spread everything out in one dimension. The methods that we're developing make use of more detail, and the more details there are, the less empiricism that's involved, so it's predictive."

Even as the National Science Foundation (NSF) funds a push to develop petascale computing, the complications posed by such capacity can make it less useful, at least in the short term, than on-campus resources.

"To use the big machines you have to prove that your code is parallel, so to be efficient you have to do a lot of work on your code," says Fox. "The bottom line is that no one will pay us to spend time to make the code parallel, but they will pay us to solve problems they are interested in."

Such problems—for example, the determination of fluid velocity inside of microreactors by means of particle image velocimetry—are well-suited to equipment such as the 94-node cluster HPC "Lightning" often used by CBE graduate students.

"That machine has enough processors for us to do time-dependent realistic simulations, which allows us to stay at the leading edge of where we need to be to get funding," Fox says. "We can do three-dimensional flow instead of making assumptions that limit what we can do."

Fox is also a collaborator with **James C. Hill**, university professor and CBE chair, on a project involving large-eddy simulation of mixing in turbulent flows in a model reactor. The research, funded primarily through two NSF grants, makes consistent use of HPC capacity as Fox, Hill, and other research partners work to develop mathematical models to describe what is happening in turbulent flows for use in CFD codes.

Rodney Fox

CBE Faculty Update

Professor **Robert Brown** is the principal investigator on a new partnership between Iowa State University and ConocoPhillips. This seven-year partnership will explore the conversion of biomass into transportation fuels with special emphasis on thermochemical pathways.

The past year has been another "play hard, work hard" experience in retirement for Distinguished Professor Emeritus **George Burnet**. His time in Sweeney Hall has been devoted to development, alumni relations, and honors and awards activities. He and his wife, **Agatha**, live in a townhouse in Green Hills Retirement Community where he serves on the board of directors and on a Master Plan Committee for a $40-million expansion. The fun side of life includes travel, programs on campus, Canadian fishing trips, and family times together.

This past summer, **Aaron Clapp** (assistant professor) served on two NSF panels, mentored an REU student, and was busy setting up a new optical tweezers microscopy system. This fall he will chair a session at the Materials Research Society Meeting on "Toxicity of and Sensing with Biocompatible Nanoparticles." He has recently completed an invited review article for the *International Journal of Nanomedicine* entitled "Potential clinical applications of quantum dots."

Professor **Eric Cochran** has spent much of the last year teaching computational methods to sophomores and juniors in the department using the MATLAB environment. He is excited about opportunities that are arising from his research in the area of block copolymeric nanocomposites. His one-year-old daughter, **Dillan**, has helped to ensure that he does not get bored while he is not engaged in more scholarly pursuits.

Distinguished Professor Emeritus **L. K. Doraiswamy** is currently writing the history of the National Chemical Laboratory of India. He is also publishing a chapter in Professor **Lyle Albright**'s *Albright's Handbook of Chemical Engineering*, a completely new handbook, and perhaps the first such effort after *Perry's Chemical Engineering Handbook*, which has been in use for decades. His chapter (with **J. B. Joshi** of the ChE department of Mumbai University Institute of Chemical Technology) is titled "Chemical reaction engineering" and is about 240 printed pages. The book is expected to be published early next year by Taylor and Francis Publishers.

Professor **Rodney Fox** was invited professor at the Ecole Centrale in Paris, France, in May and June of 2006 and was also invited to present four lectures on turbulent mixing at a summer school in Corsica, France, in August. In addition, he has two new collaborative research projects funded by the National Science Foundation—one led by his former PhD student, **Venkat Raman**, at UT–Austin on nanoparticle formation in flames and the second with **Michael Olsen** on modeling microreactors used for nanoparticle synthesis.

Professor **Chuck Glatz** was on faculty leave last year spending time with research colleagues and giving the occasional lecture in New Zealand, New York, and Colorado. He is co-chair and organizer of the next Recovery of Biological Products Meeting that will take place June 2008 in Quebec City. He finished off his professional year away from Ames with some family travel, going to Mongolia with his daughter, Rebecca. Chuck is also the equity College of Engineering adviser for the ADVANCE NSF program to improve the climate for women faculty members.

Adjunct Associate Professor and director of the Engineering Career Services office **Larry Hanneman** was recognized with a Distinguished Lecture, "Why Do Engineering Experiential Education Students Have Significantly Better Outcomes at Graduation," at the 2007 American Society for Engineering Education Annual Conference and Exposition. Additionally, Hanneman was an invited speaker and panelist at the National Aeronautics and Space Administration's STS-118 Pre-Launch Education Conference: "Innovative Strategies for Cultivating the STEM Workforce."

Professor **Kurt Hebert** is actively engaged in teaching transport courses, in his duties as associate chair, and in his research on electrochemical materials science. Specifically, his research focuses on the fundamental surface chemistry processes controlling degradation and corrosion of metal structures and on the formation of self-ordered nanoporous metal oxide layers. In addition, he climbed a 20,000-foot mountain in India this past summer.

University Professor and Chair **Jim Hill** still remains active with AIChE. He is the 2007 chair of AIChE's Chemical Engineering Technology Operating Council, which is the arm of the board of directors that oversees all technical activities of the institute. Last fall he was an invited keynote speaker at the 7th National Chemical Engineering Congress in Turkey.

In July 2007, *Analytical Chemistry* featured Associate Professor **Andrew Hillier** and his graduate student **Bipin Singh**'s work on the cover and in a research profile.

Professor **Ken Jolls** has continued developing and making use of software-based methods in his courses. He continues to take students on inspection trips to the Ames Power Plant, and, with the help of Cargill, he initiated "Separations Day," a Saturday visit by students in ChE 358 to a Cargill plant in Eddyville, Iowa. Jolls taught in the Foreign Study Program in Oviedo, Spain, for the sixth time and, while there, gave his own music concert this past summer in the Oviedo Conservatorio along with three local Spanish musicians.

Assistant Professor **Monica Lamm** hosted the 2007 Midwest Thermodynamics and Statistical Mechanics Conference, June 6–8, 2007, on the Iowa State campus. This conference provides a forum for researchers in all aspects of thermodynamics and statistical mechanics, theoretical and experimental, chemical and biomolecular engineering, chemistry, and physics.

Lecturer **Stephanie Loveland** continues to teach the chemical engineering lab courses. She is the mother of two-year-old twin boys and has a five-month-old baby girl.

Professor **Surya Mallapragada** was awarded a Big 12 Rising Star Award and the Iowa State University Research Foundation Mid-Career Research Excellence Award. She and her husband, **Balaji Narasimhan**, are also the proud parents of twins this year.

Professor **Balaji Narasimhan** was part of a four-member team from chemical and biological engineering, materials science and engineering, and mechanical engineering (all at Iowa State) that won a $1.6-million grant from the W. M. Keck Foundation to establish the W. M. Keck Laboratory for High Throughput Atom Scale Analysis. The funds were used to purchase a local electrode atom probe microscope, making Iowa State the third university in North America to acquire this microscope. Narasimhan was also appointed associate dean of research and economic development in the College of Engineering at Iowa State.

Michael Olsen, an associate professor in mechanical engineering, began a courtesy appointment with CBE on February 1, 2007. Olsen is collaborating with Professor **Rodney Fox** on a project to make measurements of fluid dynamics inside microreactors. The project is funded by a three-year National Science Foundation grant that was awarded in September 2007.

Professor **Pete Reilly** recently received a U.S. Department of Agriculture grant for his proposal titled "Computational investigation of cellulase and xylanase mechanisms."

Professor **Derrick Rollins** received several awards over the past year, including a CBE student vote award called "Come on in—It's not my office hours," the Iowa State Engineering Student Council Leadership Award for significant and lasting contributions to the success of Iowa State engineering students, and the Iowa State Louis Thompson Distinguished Undergraduate Teaching Award.

Emeritus Professor **Glenn Schrader** is serving as chair of the chemical and environmental engineering department at the University of Arizona in Tucson.

Brent Shanks is a member of a research consortium, which includes the University of Wisconsin, New Mexico University, and the University of Virginia, that was recently awarded an NSF Partnership in International Research and Education grant for a project entitled "PIRE—Molecular engineering for conversion of biomass-derived reactants to fuels, chemicals, and materials." As part of the grant, graduate and undergraduate students will have opportunities to perform research at our European partners, the Fritz Haber Institute of the Max Planck Society (Berlin) and the Technical University of Denmark (Lyngby).

Professor **Jackie Shanks** is enjoying teaching a great class of sophomores in ChE 210. In addition to homework problems from Felder and Rousseau, the students are working on and evaluating new problems from BioEngr Education Materials Bank (BioEMB) as bioethanol production from corn flour and 1,3 propane-diol production from *E. coli* fermentation. Shanks is on the advisory board for BioEMB: Putting Life into Chemical Engineering Education, an NSF-sponsored project.

Cory Stiehl continues to serve as lecturer in the department, teaching Engineering 160 and ChE undergraduate courses. Cory also serves as the department's chemical hygiene officer.

Emeritus Professor **Dean Ulrichson** is enjoying his retirement. He stays busy attending Iowa State football games and playing bridge, and he recently built a clubhouse for his grandchildren. He has just completed a year as chair of the Iowa State Retiree Association and enjoyed a cruise from St. Petersburg to Moscow.

Associate Professor **Dennis Vigil** and **Rodney Fox** were co-authors of the most cited paper in *Chemical Engineering Science* during 2003–2006, "Implementation of the quadrature method of moments in CFD codes for aggregation-breakage problems." He also led the department's preparations for ABET accreditation this year.

Although a member of the emeritus faculty, **Tom Wheelock** continues to guide research supported by the USDOE for the development of a new material for use in producing hydrogen. He also continues to write and review papers for technical journals. Wheelock and his wife, Edra, recently celebrated 55 years of marriage with a family reunion in Estes Park, Colorado.

Emeritus Professor **Gordon Youngquist** stays busy in retirement. This year he attended a week-long course at the Mayo Clinic on alternative medicine, went on a cruise off the coast of Norway, and traveled the Grand Canyon in the Southwest. He recently attended his granddaughter's high school graduation in Massachusetts and traveled to see family and friends in upstate New York.

Awards, Patents, and Promotions

Awards

Rodney Fox
Iowa State University Award for Outstanding Achievement in Research

Rodney Fox and Dennis Vigil
Most Cited Paper 2003–2006 ("Implementation of the quadrature method of moments in CFD codes for aggregation-breakage problems," *Chemical Engineering Science* 58(15): 3337–3351 [2003])

Charles Glatz
Regents Award for Faculty Excellence

Surya Mallapragada
Iowa State University Award for Mid-Career Achievement in Research

Derrick Rollins
Louis Thompson Distinguished Undergraduate Teaching Award, Iowa State University

Brent Shanks
Superior Engineering Teacher Award, College of Engineering

Patent

Surya Mallapragada and Brian Anderson
pH-sensitive methacrylic copolymer gels and the production thereof. U.S. Patent 7,271,776.

Promotions

Balaji Narasimhan
Professor

Derrick Rollins
Professor

Brent Shanks
Professor

Jody Danielson
Program Coordinator II

Linda Edson
Program Assistant II

Student space

A new undergraduate lounge in Sweeney Hall now offers students a quiet place to read, study, or visit with other students. The lounge was made possible through donations of unrestricted gift funds.

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Positive exchange: International students return after Iowa State experience

Nacú Hernández

Just as Iowa State students are encouraged to study abroad, exchange students typically compose part of Iowa State's student body. But what motivates an exchange student to return for the long-term commitment of graduate school?

Nacú Hernández, a PhD student in chemical engineering, and **Luis Petersen**, a PhD student in chemical engineering with an emphasis in biochemistry, are two students from Tec de Monterrey in Monterrey, Mexico, who returned to Iowa State following their experiences as exchange students.

"I decided to pursue my doctorate at Iowa State because I enjoyed what I was doing," says Hernández. "The work I was doing didn't seem hard because I liked it. The people I worked with were really nice, too."

Both Hernández and Petersen attended Iowa State through the double degree program, which Distinguished Professor **Peter J. Reilly** was instrumental in creating.

"In the double degree program, undergraduate students come to Iowa State for one year and start their graduate research," explains Reilly. "They then go back to Tec de Monterrey for one semester in order to graduate and then return to Iowa State in order to continue their graduate research."

Tec de Monterrey students can also attend Iowa State through the ISU-Tec/ITESM exchange program and return as a graduate student, or through a summer program called Research Experiences for Undergraduates. This program, led by Professor and Associate Dean for Research and Economic Development **Balaji Narasimhan**, allows a few undergraduate students from Tec de Monterrey to spend the summer conducting research at Iowa State.

Reilly, who occasionally lectures and teaches courses at Tec de Monterrey, also interviews potential students for the exchange program. He met Hernández during one of those interviews.

"I was all set to study in Germany when Professor Reilly interviewed me," explains Hernández, who was required to study abroad as part of his international chemical engineering program. "He convinced me to study at Iowa State."

Hernández first attended Iowa State in fall 2006. His colleague Luis Petersen arrived at Iowa State in August 2005.

Petersen was going to study at Oregon State University because research opportunities are limited at Tec de Monterrey. "The coordinator for chemical engineering sent out an e-mail about the double degree program to those who would be studying in the U.S.," Petersen says. "I had one weekend to decide whether I was going to do it."

Upon their arrival at Iowa State, Hernández and Petersen both noticed differences between the two campuses. Tec de Monterrey, a private university, is gated while Iowa State has an open campus. Hernández also noticed that there are more nationalities represented at Iowa State.

Petersen met students of different nationalities by living on the international floor in Linden Residence Hall. He was also involved with international clubs, where he met many of his friends.

Class trip teaches workplace experiences

Professor **Kenneth Jolls** wanted students from his ChE 358 *Separations* class to be exposed to an engineering experience in which they could see what really happens in the separations processes they were studying. During a spring semester trip to the Cargill plant in Eddyville, Iowa, a group of his students got that and more.

Jolls wanted to give his students a more hands-on job experience than they could get in the classroom, which led him to the idea of the Cargill trip. "I wanted this to be more than a lecture; I wanted it to be a real-world engineering experience," Jolls says.

With the help of some Cargill staff who are Iowa State alumni, Jolls was not only able to provide such an opportunity but also allowed to watch former students at work. **Rod Fisher** (BS'81/MS'84/PhD'87) and **Dianne Milianta** (BS'85) helped Jolls facilitate and plan the trip, and **Joe Timmerman** (BS'06) led a part of the class tour of the plant. "I had Joe in several courses here, and he was a top-notch student," Jolls says. **Chris Wilt**, a chemical engineering intern, also helped arrange the visit.

Teams of students were taken through the three principal areas of the plant: ethanol production, acidulants, and the mill and refinery. "We were right there where all the action was happening, particularly with distillation," Jolls says. "It was wonderful. The students were out there and they got to put their hands on actual operating equipment."

A question-and-answer session at the end of the day offered even more insights as Cargill employees discussed what they had learned on the job, including the sorts of surprises that typically fill the gap between formal education and practical experience. "The students came away experiencing both the lecture and the real-life version," Jolls says. "This is something they can't learn in an ordinary class."

Advisory council member seeks to be a difference maker

Imbued with a midwestern work ethic that found academic expression at Iowa State and has underpinned a flourishing professional career, **Mary Jane Hagenson** doesn't just hope that some of today's students will follow her path—she's doing something about it.

The stakes, after all, are of national significance.

"It's been a sincere joy to be able to participate at the college level and now at the department level."

"The competitiveness of the U.S. is predicated on innovation," Hagenson says, "and in my mind, the quality of life we enjoy right now and in the future is based on continued innovation in science and engineering."

Helping to create the next generation of innovators is just part of Hagenson's motivation for serving on the Department of Chemical and Biological Engineering's Industrial Advisory Council. Her ties to Iowa State and to the department—with a BS in physics and mathematics and MS and PhD degrees in biomedical engineering—are clear enough, and her family farm days in rural Thompson, Iowa, left "no question" that she was committed to Iowa State.

"Coming from a farming background, living with modest means, we really see the value of a good education," Hagenson says. "We want to be sure that children who grow up with limited financial resources are able to go to college and follow in our footsteps."

Contributing to strategic policy at a departmental level, though, is where Hagenson hopes to make another lasting difference. As the vice president of research and technology at Chevron Phillips Chemical Company, she knows the value of forming a long-range plan and setting it into motion. And having served on the college-level advisory council, she has already cultivated a sense of ownership when it comes to engineering initiatives.

"It's been a sincere joy to be able to participate at the college level and now at the department level," she says. "I've enjoyed the relationships with people who share a passion for Iowa State and helping any way they could."

Now that a major capital campaign is underway, Hagenson wants to help by making sure that CBE makes a clear case to "get our fair share of the pie," she says. "I think it's really time for CBE to put into place an aggressive agenda for the future, and I look forward to working with the department to fulfill that."

In fact, family ties to Iowa State complete the circle of Hagenson's involvement: her husband, **Randy**, holds three engineering degrees, including a PhD in nuclear engineering; her daughter, **Leigh Hagnenson Thompson**, received her BS and PhD in chemical engineering (and also serves on the advisory council); and daughter **Lara Hagenson Niles** just earned a PhD from the College of Education—all from Iowa State.

Hagenson and her husband have also expressed their commitment to Iowa State through philanthropy. The Skogen-Hagenson Scholarship Fund in Chemical Engineering, which supports about 10 students per year, gives special consideration to students who are performing well but facing challenging circumstances. Students can continue to receive the scholarship if they commit to improving their academic performance by seeking tutoring or mentoring.

Like mother, like daughter—and probably like nowhere else

Of all the possibilities for mother-daughter pairings, being members of the industrial advisory council for an engineering department at a major university is probably not high on the list.

Except for this case, it may not even be on the list. Maybe that shows how fortunate it is for CBE to have just such a circumstance.

Leigh Hagenson Thompson may accurately be introduced as the daughter of Mary Jane Hagenson, vice president of a major company and fellow member of the CBE Industrial Advisory Council. But she may also be introduced as Leigh Hagenson Thompson, PhD, global R&D technology leader for the Dow Chemical Company, and in that role she develops and implements novel technologies for business growth.

"I hope my skills from industry, building relationships and connections, will help shape the department's strategy for the future," Thompson says. "In any company, you have to build relationships to reach goals. In the case of CBE, that means working together with other departments, alumni, and the foundation to create a more vibrant department."

And enjoying the process, considering the family dynamic.

"It's fun," Thompson says. "My mom has a tremendous amount of experience and expertise, and this opportunity allows me to watch my lifelong mentor in action.

An alum remembers: Historical recollections of Harold Carl Kaufman

Harold Carl Kaufman, a chemical engineering student from the 1940s and 1950s, recently offered some impressions about his experiences at what was then Iowa State College. While he acknowledges that his thoughts may be "more of an insight into personalities than into history," the material offers a valuable look into the past of an illustrious department.

Kaufman began his studies at Iowa State in January 1948—later than planned because his "small-town Iowa" high school didn't offer the required level of mathematics. He fulfilled the requirement by taking a correspondence course. In December 1951, Kaufman graduated with a BS in chemical engineering. From January 1952 to June 1953, he worked as a process engineer for Texaco's Lockport, Illinois, refinery, which was followed by a stint in the Army. He returned to Iowa State in March 1955 to pursue an MS in chemical engineering, which he received in June 1956. Kaufman then returned to Texaco, from which he retired in 1994.

Kaufman's notes include the following edited excerpts:

"I first met Dr. Orland R. Sweeney in the spring of 1948. I think it was his last year at Iowa State College (ISC). Dr. Sweeney invited chemical engineering freshmen to his home at the beginning of the quarter. I was impressed with his engaging, enthusiastic personality and hospitality. He was truly an inspiration to me and I came to admire him even more as I heard his lectures on chemical engineering."

"My uncle, Miles McCorkle, PhD in chemistry from ISC in 1938, had Dr. Gilman as his idol and mentor, and encouraged me to attend ISC. Dr. McCorkle started out in chemical engineering, and then switched to chemistry, so I started out in chemical engineering. However, thanks to Dr. Sweeney, I never switched to chemistry. I've never regretted staying with chemical engineering."

"Dr. B. F. Ruth taught Unit Operations. He was a tough-sounding, stern teacher, but a great teacher of chemical engineering. I have always looked back and thanked him for his emphasis on the unit equation and other basic principles that set apart ISC chemical engineers from those from other schools. Dr. Ruth lived in a house on Welch Ave., and his working room was directly across from my room next door in a boarding house. As I worked late into the night on his homework assignments, I would get inspiration from the light still on in his window. When his light went out, I also went to bed."

"Dr. Dave Boylan taught Chemical Engineering Design when I was an undergrad, and later was my graduate advisor. For a thesis, he encouraged me to research di-calcium phosphate fertilizer continuous manufacture in a pilot plant. I designed, built, and operated a two-stage continuous reactor/drier pilot plant. Its loud, noisy grinding annoyed chemical engineers while I operated it and for several years after I left, I heard. The irony was that Dr. Boylan convinced me to research di-calcium phosphate, and then very vigorously challenged me to defend it to the committee to qualify the thesis. Dr. Boylan not only had a good sense of duty but a good sense of humor."

Where are they now?

Justinus Satrio stays plenty busy as the program manager for Iowa State's Center for Sustainable Environmental Technologies. During a recent count, he was involved with no fewer than 13 research projects at the center, with topics ranging from bio-oil, to coal-to-ethanol conversion, to the production of bio-oil from city garbage.

Satrio works primarily for **Robert C. Brown,** who directs the center and is the Iowa Farm Bureau Director, Office of Biorenewables Programs, and Bergles Professor in Thermal Science. Satrio earned a BS in 1991 and an MS in 1993 from Iowa State's chemical engineering program. After that, he worked in Kansas City and Indonesia before returning to Iowa State to earn his PhD in reaction engineering and catalysis.

(For the full text of this story, see www.iastate.edu/Inside/2007/0824/satrio.shtml.)

As a system engineer for General Mills in Cedar Rapids, Iowa, **Mark Hindman** provides production engineering support for the cereal manufacturing systems. He also teaches courses in cereal manufacturing at the company's research and development center in Minneapolis.

Hindman earned his BS in chemical engineering from Iowa State in 1998, then in 2005 completed an MESE from Iowa State and an MBA from the University of Iowa through an executive dual-degree program.

Cory Berkland (BSChE'98), assistant professor of chemical and petroleum engineering and assistant professor of pharmaceutical chemistry, was selected by a faculty committee at the University of Kansas to receive the Miller Professional Development Award for Research from the School of Engineering.

Berkland's research program in drug delivery includes four postdoctoral research associates, six graduate research assistants, and several undergraduate students.

Justinus Satrio

The Miller Professional Development Award for Research provides $4,000 for the recipient.

Stanley Consultants recently announced that **Gayle (Goldsmith) Roberts** had been elected president and chief operating officer. Roberts, who earned her BS in chemical engineering in 1981, has been with the company for 25 years, most recently as senior vice president and business leader of the company's Education, Healthcare and Industry Business unit.

Roberts is a licensed professional engineer in seven states and Puerto Rico.

Past, present . . . future?

From the original Sweeney Hall to the "new" addition, now known as "Old Sweeney," to the Sweeney Hall completed in 1964 that today is home to the chemical and biological engineering department, change has always been part of the picture. The real question is, what will that picture look like 5, or 10, or 20 years from now? As science advances and disciplines evolve, and as the search for talented faculty and students intensifies, the department will need to adapt. Alumni, as always, will play a key role in defining the look of the future.

A packed column inside original Sweeney Hall

The first Sweeney Hall addition

Sweeney Hall today

Sweeney Hall in 1927

Please stay in touch at 515 294-7642 or cbe@iastate.edu.

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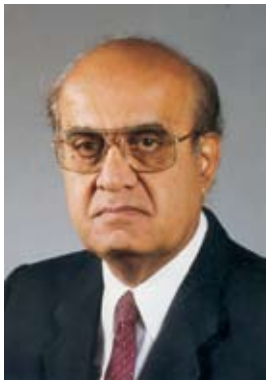
AIChE honors distinguished professor

Distinguished Professor Emeritus **L. K. Doraiswamy** will be honored during two sessions at the 2007 American Institute of Chemical Engineers annual meeting in Salt Lake City, Utah, in November. "Frontiers in Chemical Reaction Engineering and Catalysis: In Honor of 50 Years of Contributions of L. K. Doraiswamy" was scheduled for Tuesday, November 6.

Acknowledged as one of the founding fathers of modern chemical engineering in India, Doraiswamy joined the CBE faculty at Iowa State in 1989. He earned a BS in chemical engineering from the University of Madras in India in 1946 and a PhD in chemical engineering from the University of Wisconsin–Madison in 1952. Doraiswamy joined India's National Chemical Laboratory in 1954 and retired in 1989 as the first non-chemist director before coming to Iowa State. His research centers on theoretical and experimental studies in catalytic reactions and reactors, modeling gas-solid reactions, and sonochemical reaction engineering.

Doraiswamy is the recipient of numerous awards, including the Padma Bhusham (India's highest state award), the Jawaharlal Nehru Award for lifetime achievement in engineering and technology, and the AIChE Richard H. Whilhelm Award for Chemical Reaction Engineering.



A CBE department reception was held for area alums and friends, annual meeting attendees, and special guests on Monday, November 5.