ChemE NEWS
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Chemical Engineering ■ Kansas State University

# Rezac leads NSF IGERT program on sustainable biorefining

K-State recently received a five-year grant entitled *Crops to Commuting: Integrating the Social, Technological and Agricultural Aspects of Renewable and Sustainable Biorefining* to train students in the innovative technologies being developed for sustainable energy. The $3.2 million grant is one of 26 *Integrative Graduate Education and Research Traineeship (IGERT)* grants the National Science Foundation awarded in 2009, is K-State's first IGERT grant, and is only the second ever awarded in the state of Kansas. Mary Rezac, the ConocoPhillips Professor of Sustainable Energy and professor of chemical engineering, is the project's principle investigator. Co-principal investigators include Peter Pfromm, chemical engineering, Jeffrey Peterson, agricultural economics, and Kyle Douglas-Mankin, biological and agricultural engineering.


Rezac

The IGERT goal is to educate future leaders in all important aspects of biomass-derived fuels and chemicals, not just the technological, but economic and societal requirements as well. These leaders will seek new and innovative solutions to one of the world's grand challenges: sustainable energy to meet the needs of a growing world population in ways that protect the environment and are economically feasible. They must not only have an in-depth expertise in their chosen discipline, but must also have a substantial appreciation for the relationships that exist between agriculture, technology and society.

All K-State IGERT graduates will have "hands-on" experiences with processing agricultural biomass, experiencing the physical environment of industrial-scale biomass processing with all its limitations and opportunities, and meeting people that actually perform the work to produce renewable energy in the communities where they live.

According to Mary Rezac, "The IGERT program is an innovative educational and training program that recognizes certain realities. Ph.D. graduates, including the IGERT trainees—are likely to work, at least early in their careers, within the existing infrastructure of research that has disciplinary origins. University colleges and departments, and publishing outlets, for example, most easily recognize and reward achievements within specific disciplinary boundaries. Yet, the most pressing problems of society are complex and require combinations of disciplinary, interdisciplinary and cross-disciplinary thinking. It is into this world that IGERT trainees will lead and transform the next generation of research scholars."

To achieve the key element of multiple vantage points, each core team will consist of IGERT trainees working collaboratively with faculty mentors and other researchers from a variety of disciplines—socioeconomic, technical and agricultural. The groups will address essential questions in the utilization of biomass for the

**Continued on page 4**


IGERT trainee Jason Fewell (right) and Kosuke Shibako (graduate student from the University of Tokyo) in front of fermentation tanks at East Kansas Agri-Energy.

## In this issue



Editor
**Keith Hohn**

# Message from the department head

## *Pleasant surprises*

I like pleasant surprises. Like when an average student has the best score of anyone on a test. Or when a student writes something new and different in his or her unit operations laboratory report. Or when a graduate student knocks on my office door and says excitedly, "Dr. Edgar, you have to have a look at the results from my latest experiment!"

I've had a number of pleasant surprises over the past year in my new position as department head. With the responsibilities of this position, I've interacted with the constituents of the department in ways that are new for me, and I've come to appreciate K-State more than I had before.

From my vantage point in the main office, I've observed a genuine affection between the students and the office staff. The staff is really great at calming a student's anxieties, and guiding him or her to the right place or to finding the right solution to a problem. The candy dish at the front desk has helped a huge number of students make it through their tough weeks.

I've been pleased by the faculty's dedication to improving the department and its students. Kudos are especially due to Drs. Fan, Walawender and Hohn for helping with the unit operations laboratory in the spring semester at the last minute. Dr. Walawender really stood out. Considering he was retiring at the end of that semester, his efforts on behalf of the students with the AIChE chapter, design class and unit operations laboratory were much more than I expected.

***"Many [students] had spent an extraordinary amount of time outside the classroom promoting the department."***

Seeing first-hand the support of alumni for the department has also been really great. Their individual and corporate support, including their donations to the department, advice through the external advisory board, and the promotion of K-State students for scholarships, summer internships and initial hirings at their companies, has enhanced the students' experiences, the quality of our graduates and the reputation of the department.

The undergraduate students have amazed me with the many hours they put into extracurricular activities supporting the department: ChemE car, Open House and AIChE activities such as picnics, intramural sports and other social activities that welcome new students and help them to make connections with each other that will last their lifetime.

Lastly, my pride was renewed in our students, especially at spring graduation. Seven who received their degrees were recognized for academic excellence. Others made it through the program despite significant personal challenges. Many had spent an extraordinary amount of time outside the classroom promoting the department. I must have had the biggest grin as I congratulated them as they walked across the stage to get their diplomas, as my face literally hurt afterwards. It was a great experience. Despite their difficulties finding jobs in the present economy, they were amazingly optimistic about the future. Clearly, they are bound for great achievements. I look forward to the surprising things they'll tell us about in a few years.

Best wishes,

James W. Edgar

James H. Edgar



# Improved facilities promote ChE research

Research in the chemical engineering department at Kansas State University spans a variety of areas: materials, biochemical engineering, biofuels, catalysis, nanobiotechnology and separations are all being studied. But no matter the area, one thing is sure: high-quality research can be conducted only if the appropriate equipment is available. Recently, ChE faculty have aggressively sought funding to purchase needed equipment to conduct cutting-edge research, resulting in the purchase of a field-emission scanning electron microscope, gravimetric analyzer, and an x-ray diffractometer. The faculty who raised the funds to purchase this equipment describe how they will enhance the research program at Kansas State.

Field-emission scanning electron microscope.

*Field-emission scanning electron microscopy – Vikas Berry*

A field-emission scanning electron microscope (FESEM) system was purchased through funding from the National Science Foundation via the Major Research Instrumentation Program. This state-of-the-art microscope, costing approximately $675,000, has an ultra-high image resolution of 1.2 nm. The instrument employs electrons generated from field-emission, gun-to-scan sample surfaces and detects backscattered or secondary electrons produced from the sample. The instrument can also perform (a) elemental analysis and mapping at high resolution (2 nm), (b) electron-beam lithography for designing nano-circuits and (c) high-pressure imaging for sensitive samples. Since all material properties evolve from their structure at nanoscale, this instrument constitutes an important part of the research being conducted in chemical engineering. For example, Vikas Berry, Jim Edgar and Keith Hohn are using this instrument to study graphene-nanostructures, semiconductor-crystals and catalytic nanoparticles, respectively. Further, the FESEM supports other research areas across K-State, including cancer diagnostics and treatment, electronic and optoelectronic device fabrication, nano-assemblies, materials synthesis and energy storage. The FESEM will be used by 15 faculty and more than 40 students across campus.

*Gravimetric analyzer – Jennifer Anthony*

An intelligent gravimetric analyzer (IGA-001) by Hiden was purchased through funding from M2 Technologies, Inc. as part of a collaborative project sponsored by the U.S. Marine Corps Foundation. The gravimetric microbalance is used to measure the adsorption of gases and vapors onto various adsorbents. The microbalance is capable of measuring adsorption and desorption isotherms in three pressure

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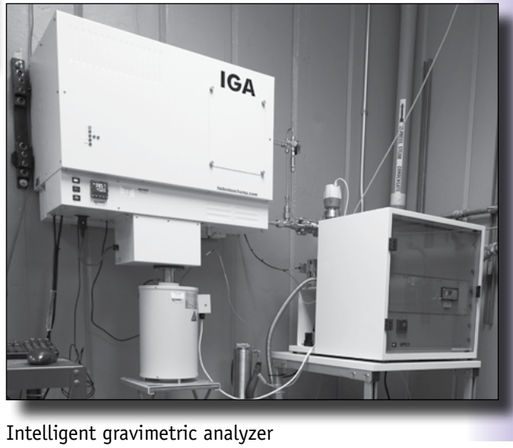
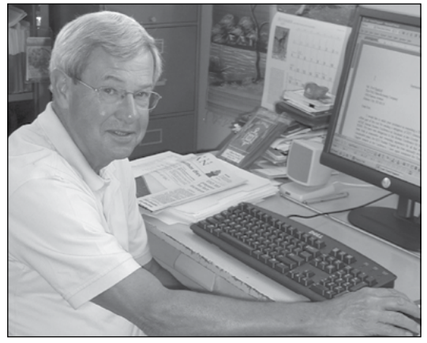



Intelligent gravimetric analyzer

# Walawender retires

After 41 years of service, Walter P. Walawender has retired from the chemical engineering department. Walawender joined the department as an assistant professor in 1969, right after receiving his PhD in chemical engineering from Syracuse University. He had previously earned a bachelor's degree in chemistry and math from Utica College of Syracuse University. Prior to starting at K-State, Walawender had never been in Kansas, but was convinced to join the department by L.T. Fan. The fit between K-State and Walawender turned out to be a good one, and he chose to spend his entire career here.



Walawender

Walawender's research interests were in the area of biomass conversion, activated carbon and reaction modeling. He was a leader in the fields of gasification and pyrolysis when these fields became important during the energy crisis in the late 1970s. This research culminated with the construction of a pilot plant where a fluidized-bed gasifier and a downdraft gasifier were studied.

As an educator, most students would probably think of the design courses that he has been primarily responsible for during most of his 41 years at K-State. He has taught Design II for the past 35 years, grading countless design reports. Students would also immediately think of the dedication Walawender has had for student organizations. He has been the faculty advisor for the student chapter of AIChE for 34 years and for Omega Chi Epsilon for 34 years. His leadership has primarily been responsible for the department's current string of 15 years as an Outstanding AIChE Chapter. In OXE, Walawender served not only locally, but also in the national organization, serving as a national officer, vice-president, treasurer and acting executive secretary. Walawender was awarded the Charles H. Scholer Award from K-State in 2009 in recognition of his efforts in educating students outside the classroom. He served as Open House advisor for the department for 14 consecutive years and was named an honorary member of Steel Ring in 2007.

Walawender's favorite memories of K-State have been "all of the student chapter successes; including the outstanding chapter awards, national car competition placing, national poster presentation placing and host of excellent national workshops."

He looks forward to visiting grandchildren in the K.C. area, going on cruises with his wife, Paula, and continuing to act as advisor for the student organizations. Walawender's contributions to the department over his 41 years of service have been extensive, and he will be missed.

# Rezac leads NSF IGERT program

**Continued from page 1**

production of fuels and chemicals. The initial team projects have evolved from ongoing research at K-State and address areas of feedstock production, harvesting and transport, the conversion of cellulosic materials to chemicals, and the upgrading of these conversion products to consumer-ready fuels or chemicals. Issues of economics and social impacts are of great importance in these studies.

Currently, 13 faculty members from seven departments are members of the IGERT advisory team. Chemical engineering faculty who actively support the IGERT program include Keith Hohn, catalytic conversion of biomass; Peter Pfromm, separations and product recovery; and Mary Rezac, separations and product recover. Each member of the IGERT faculty team has been selected not only for his or her research capabilities but also for their proven track record of training and mentoring doctoral students and actively participating in the educational mission of Kansas State.


IGERT affiliate Ronald Michalsky presents research results on the production of ammonia using solar energy at K-State's annual Center for Sustainable Energy graduate student research symposium.

Five IGERT trainees have started the program in the initial year—one graduate student from agronomy, two from agricultural economics, one from grain science and industry, and one from chemical engineering.

Additional Ph.D. students will be added to the IGERT group over the next several years. Students interested in learning more about IGERT can visit *www.igert.ksu.edu.*



# Alumni notes

- **Brian** (B.S. 2002) and **Kaila** (B.S. 2002) **Lindsay** welcomed a new addition to their household, Jacob Matthew Lindsay, born June 5, 2009. He joins big brother Nathan.

Jacob Matthew Lindsay

- **Cannon Clifton** (B.S. 1996) completed an anesthesiology residence in June 2009. He started a private practice as a doctor of anesthesiology in July 2009 in San Antonio, Texas.

- **Mark Howe** (B.S. 2002), after working as a process engineer with Burns and McDonnell Engineering in Kansas City, decided to take the master's-level class through K-State in personal financial planning. He completed the curriculum, passed the certified financial planner exam and has been part of a financial planning team for two years. He does a lot of analysis, spreadsheets and simulations.

- **Warren Kennedy** (B.S. 1990) was awarded the K-State College of Engineering Professional Progress Award in recognition of his professional accomplishments at Burns and McDonnell.

- **Tom McMillen** (B.S. 1971), after 32 years with Chevron, the last 25 in a variety of technology management positions in reservoir engineering, enhanced recovery and reservoir modeling, retired on May 31, 2008, to take on the (volunteer) presidency of Corazón, Inc., a non-profit that does community and family development, education and home building in several poor communities in northern Baja California, Mexico. He had been vice-president of Corazón for the previous 12 years and a director for 14. Corazón has five full-time paid staff directing the work of about 3,000 U.S.-based volunteers each year and working with about 2,000 Mexican volunteers/recipients. The economy has been rough on non-profits like Corazón, but they are surviving and hoping for a turn around in the near future so they can go back to growing and thriving.

- **Raymond Richards** (B.S. 1958) is working on certification for Microsoft 2000 servers.

# ChE Alumni visit campus

Clockwise from top left: Lyn and Jerri Boyer; Warren Kennedy; Larry Erickson and Robert Boecker; Jim Edgar and John Kerr; Marc Ramsdale and Wayne Harms; Yinlun Huang; and Tanner Callender, Allison Peterson and Steve Jansen.

# ChE Academy members July 1, 2009 – June 30, 2010

## Individuals

### Academy Associate

*$250 - $499*

Mark and Terrie Boguski
Scott and Stephanie Coatney
Cyrus and Maria Elting
Bei Liu and Mingfu Wu
Ross and Lise Ostenberg
Steve and Linda Utterback

### Partner

*$500 - $999*

Bryan and Celia Anderson
Jack and Alberta Bailie
Jeffrey and Trixie Bone
Te-Yu and Shu-Chen Chen
Matthew and Lynn Dassow
Lewis Ho
Robert and Betty Meyer
Randy and Julie Newcomer
Ann and Donald Schaechtel
Larry and Barbara Schulte
Christine Steichen
Norman and Donna Tetlow
Walter and Paula Walawender
Patrick and Carolyn Wilburn

### Fellow

*$1000 - $2499*

Lyn and Jerri Boyer
Kent Buster and Gitta Banks
Tom and Denise Carlisle
Ed and Ming Hsu
Warren and Gisela Kennedy
Larry Kraus
Dana and Liz Mathes
Dennis Rogalsky
Bob and Peggy Smith
Fred and Lois Stoller
Larry and Martha Stover
Rachit Yadav

### Executive Member

*$2500+*

Larry and Laurel Erickson
Judith Fan and Robert Reay
L T and Eva Fan
Gordon and Joyce Goering
Wayne and Barbara Harms
Art and Georganne Hiser
Scott and Karen Love
Robert Reay and Judith Fan
Tim and Sharon Taylor
Spencer and Susan Tholstrup
Kerry and Donna Williams

### Founder

*$25,000+ Lifetime Giving*

Terrie and Arnold Allemang
Marilyn Barrett
Dick and Mary Elizabeth Corbin
Larry and Laurel Erickson
Judith Fan and Robert Reay
L T and Eva Fan
Gordon and Joyce Goering
Charlotte Gollobin
Wayne and Barbara Harms
Art and Georganne Hiser
Virginia Honstead
Ed and Ming Hsu
Joe and Louise Hyer
Scott and Karen Love
Ken Martin
Don and Barb Riedl
Bob and Peggy Smith
Keith Steyer
Fred and Lois Stoller
Tim and Sharon Taylor
Norman and Donna Tetlow
Charles Tillotson
Kerry and Donna Williams

## Corporations

### Academy Associate

*$250 – $499*

The Williams Companies Inc
Amgen Foundation
Pfizer Foundation

### Partner

*$500 – $999*

The Dow Chemical Company
The Proctor & Gamble Mfg Company

### Fellow

*$1000 – $2499*

Cargill Inc
Shell Oil Company Foundation
Occidental Chemical Corporation

### Executive Member

*$2500+*

Chevron Phillips Chemical Company LP
ConocoPhillips
ExxonMobil Foundation
II-VI Foundation
The Dow Chemical Foundation

### Founder

*$25,000+ Lifetime Giving*

Chevron Phillips Chemical Company LP
ConocoPhillips
Cosmo Ec Co Ltd
E I Du Pont De Nemours and Company
ExxonMobil Foundation
II-VI Foundation
KUBOTA Corporation
Mobil Foundation Inc
Monsanto Company
Nisshin Flour Milling Co, Ltd
The Dow Chemical Company
The Dow Chemical Foundation
The Procter & Gamble Mfg Company

Rezac

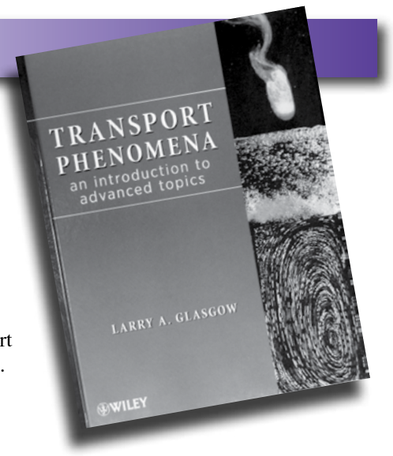
## Rezac named ConocoPhillips Professor of Sustainable Energy

K-State Provost April Mason named Professor Mary Rezac as the ConocoPhillips Professor of Sustainable Energy at Kansas State University. The professorship provides support for Rezac to support sustainable energy research at K-State. Over the past several years, she has directed sustainable energy research and educational activities on campus including serving as principle investigator on a National Science Foundation-funded IGERT project (see article on page 1), a USDA Higher Ed Challenge Grant to develop a graduate certificate in bioenergy, and a DOE-funded project to support thermochemical conversion research and educational activities.

## Glasgow pens new book

Glasgow

ChE Professor Larry Glasgow's new book, ***Transport Phenomena: An Introduction to Advanced Topics***, was published by John Wiley & Sons in June 2010. The book is intended for first-year graduate students and advanced undergraduates. It will be used in the course sequence ChE 862-867 beginning in the fall of 2010. The text emphasizes physical understanding and problem-solving capability, and many of the problems are contextualized. The book is the result of Prof. Glasgow's 32 years of teaching the principles of transport phenomena to both graduate and undergraduate students.



# Chemical engineering M.S. and Ph.D. graduates

## May 2010

**Cruz, Juan**, Ph.D. – (Pfromm and Rezac) post-doctoral associate, John Hopkins University

## August 2010

**Schroeder, Matthew**, M.S. – (Glasgow) seeking
**Gao, Wei**, M.S. – (Edgar) seeking

# Chemical engineering B.S. graduates

## December 2009

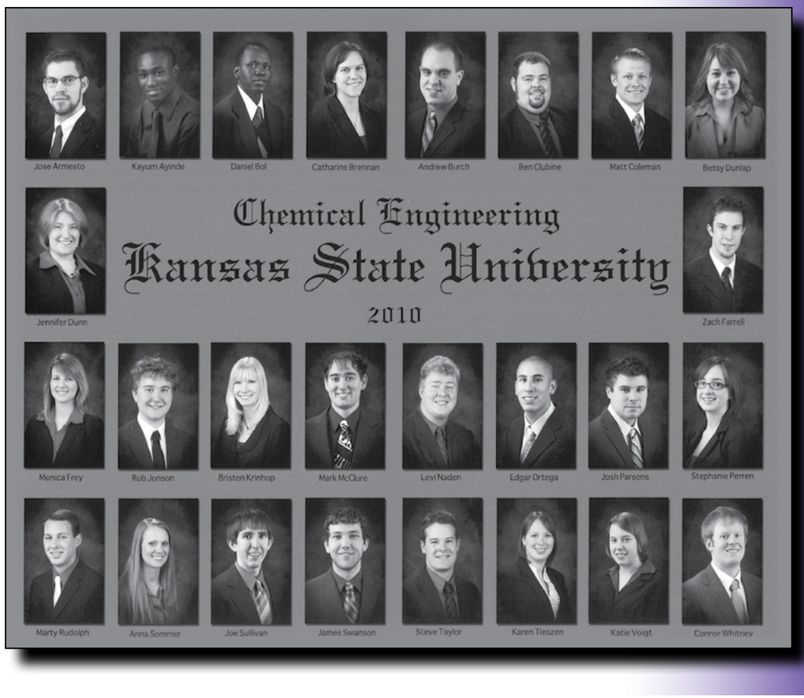
**Gigstad, Danae** – Cargill
**Holter, Travis** – seeking
**Sullivan, Jared** – Exxon Mobil
**Toloza, Alan** – Cargill

## May 2010

**Armesto, Jose** – seeking
**Brennan, Catherine** – Hill's Pet Nutrition
**Burch, Andrew** – Burns and McDonnell
**Clubine, Ben** – Kansas State University, ChE graduate student
**Coleman, Matthew** – Colgate Palmolive
**Dunn, Jennifer** – Kansas State University, food science graduate student
**Farrell, Zachary** – University of Virginia, ChE graduate student
**Jonson, Rob** – University of Notre Dame, ChE graduate student
**Krinhop, Bristen** – Honeywell
**Naden, Levi** – graduate school
**Ortega, Edgar** – Chevron Phillips
**Perren, Stephanie** – Occidental Chemical Corporation
**Persson, Casey** – seeking
**Retta, Nathan** – seeking
**Rudolph, Marty** – U. S. Navy
**Sommer, Anna** – UMKC, law school
**Sullivan, Joseph** – seeking
**Swanson, James** –University of Oklahoma, medical school
**Taylor, Steven** – FM Global
**Tieszen, Karen** – seeking
**Voigt, Katerina** – University of Colorado-Boulder, ChE graduate student
**Whitney, Connor** – seeking

## August 2010

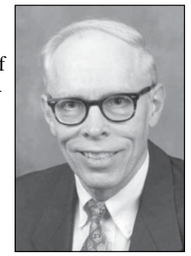
**Frey, Monica** – University of Texas, biomedical engineering graduate student
**Parsons, Joshua** – seeking






# Faculty and staff notes

■ Larry Erickson received the International Phytotechnologies Society Milton Gordon Award in recognition of research and leadership in the development of phytotechnologies through the Great Plains/Rocky Mountain Hazardous Substance Research Center.


Erickson

■ Walter Walawender received the Charles H. Scholer Faculty Award in recognition of his unique and innovative contributions to student learning beyond the classroom and laboratory, particularly for his support of student extracurricular activities.


Walawender

■ Mary Rezac was elected to the board of directors of the North American Membrane Society in 2008 and has served as vice-president and president-elect during the past year. She assumed the presidential role at the end of the national meeting in Washington, D.C., in July 2010. She also received the Professorial Performance Award and the 2010 College of Engineering Frankenhoff Research Award from Kansas State University. Rezac is also serving on the external advisory board for the department of chemical engineering at Clemson University.


Rezac

■ Vikas Berry received the Sigma Xi Outstanding Junior Scientist Award from the Kansas State University chapter of the Sigma Xi Scientific Honorary Society. He also received the Big XII Faculty Fellowship to collaborate with researchers at the University of Texas at Austin. Berry was invited to give a lecture at the Recent Advances in Graphene and Related Materials Conference in Singapore in August 2010.


Berry

■ Stephanie Fox has been hired as a Public Service Administrator I. She has 11 years experience at Kansas State University including working in payroll and employee data for the Division of Human Resources and accounting/office manager for the Department of Kinesiology and Community Health Institute. She joined chemical engineering in November 2009. Her primary responsibilities include financial and personnel management.


Fox

■ Keith Hohn was promoted from associate to full professor. He joined K-State in 1999 after receiving his B.S. in chemical engineering from the University of Kansas and Ph.D., also in chemical engineering, from the University of Minnesota.


Hohn

# Durland 1029 becomes a high-tech classroom

For 33 years, chemical engineering students have been attending class in Durland 1029, sitting in its orange and yellow chairs and following lectures written in chalk on the enormous chalkboards on the west side of the room. A student who graduated in 1979 would have felt right at home walking into the main chemical engineering classroom, even in 2009. That is no longer the case. Over the winter break, Durland 1029 was changed from the familiar and bit-dated classroom generations of students have passed through to a modern classroom equipped with the newest technology.

Original yellow and orange chairs

"We really needed to modernize Durland 1029 so that faculty lectures could be enhanced by all the electronic resources readily available today. We hope that the renovated classroom will provide an outstanding learning environment for our students," said ChE Professor Keith Hohn.

The primary change to Durland 1029 was to incorporate a digital projector, a Panasonic F300 XGA, into the ceiling. This projector receives images from either a computer that stays in the room, a laptop brought by the presenter, a document camera (ELMO) or another external video source and projects them onto a projection screen at the front of the room. The room is equipped with speakers to project sound from either videos played in the DVD drive of the computer or from any device plugged into the system through a USB cable. The technology was chosen to be the same as used in all technology classrooms throughout K-State so that anyone trained to use a technology classroom would easily be able to use the equipment in Durland 1029.

Control station for operating new technology

Layout of the room has also been changed significantly. In the redesigned classroom, the front of the room is south, a shift of 90º from the original arrangement. This means that the rows of tables are wider than previously, but the back row is now closer to the front of the room. The chalkboards have been replaced by whiteboards which span nearly the entire south wall. The space between tables, at the front of the room and in the aisles, has been increased to improve handicap accessibility. The room has been outfitted with all new furniture. Students now sit on purple-upholstered chairs with wheels and take notes on laminate tables.

Lighting design for Durland 1029 was carefully considered to provide a well-lit room that uses energy efficiently. Two architecture engineering graduate students, supervised by architectural engineering Professor Fred Hasler, designed the lighting system with these features in mind. The system has three rows of lights. The front row illuminates the whiteboard and is turned off whenever the projector is used. The back two rows can be dimmed or turned off as desired.

ChE Professor Walter Walewender has greatly enjoyed using the new technology, particularly the ELMO. He said that it is like "teaching an old dog new tricks."

"What I like about it is that I can do what I would normally do on the chalkboard, and then can immediately put the copy on K-State Online so the students can see the exact same thing they saw in class."

Durland 1029 with digital projector, Panasonic F300 XGA, incorporated into the ceiling



# Student notes

- Andrew Satterlee was recognized as an honorable mention selection for the Goldwater Scholarship. He also received the K-State Terry C. Johnson Center for Basic Cancer Research Award.
- Katie Voigt received honorable mention for the National Science Foundation Graduate Fellowship.
- Karen Tieszen received first place in the fuels and petrochemicals division student poster contest at the 2009 national AIChE meeting for her poster "Production of 2,3-butanediol and its derivatives from biomass." It described her research conducted at K-State as part of the Sustainable Energy Research Experience for Undergraduates program.
- Ronald Michalsky, Ph.D. student, received second place in the sustainable energy research poster session hosted by the Center for Sustainable Energy. The $300 award was sponsored by ConocoPhillips. During the Kansas State Research Forum, he was also awarded $100 and selected to present at the Capitol Graduate Research Summit in Topeka.
- K-State chemical engineering students received the national Outstanding Chapter Award for the 15th consecutive year at the AIChE Annual Meeting held in Nashville, Tenn.
- The K-State ChemE car team placed sixth for accuracy in distance at the national AIChE meeting in November, the sixth time in the last eight years that the team has finished in the top 10 in the national competition.
- Chikezi Ehie, Stephen Zuiss, Lucas Hartman, Caitlin Moses, Megan Battig and Danielle Quigley were named Dow Scholars.
- Danielle Quigley was named a ConocoPhillips Spirit Scholar.
- Besty Dunlap was named St. Patricia at the 2010 K-State Engineering Open House, while Andrew Burch was a finalist in the St. Patrick competition.

Besty Dunlap and Andrew Burch

# Improved facilities promote ChE research

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ranges: 0 – 100 mbar, 0 – 1 bar and 0 – 20 bar. Samples can be heat-treated under vacuum in situ prior to the adsorption measurements. Jennifer Anthony and Keith Hohn and graduate student Tyler Selbe have been using this equipment to study the adsorption of chemical warfare agent simulants onto microporous and mesoporous sorbents that have the potential to be incorporated as the recognition element in sensing devices.

*X-ray diffractometer – Jennifer Anthony*

A Miniflex II powder x-ray diffractometer (XRD) by Rigaku was purchased though funding from a National Science Foundation IGERT grant. This bench-top-size diffractometer is being used by several research groups to analyze the crystal structures of a variety of materials. Jennifer Anthony and her students use the diffractometer to characterize the zeolite materials they are synthesizing using ionic liquids as alternative solvents as part of a project sponsored by the National Science Foundation. Peter Pfromm and graduate student Ronnie Michalsky characterize their metal-nitride particles by XRD in studying the solar thermochemical processing of ammonia for obtaining industrial fertilizer from sunlight, air, carbon and water.

Miniflex II powder x-ray diffractometer (XRD)

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# Let us know what you've been up to!

We would like to feature alumni news in future issues of *ChemE News*. Please fill out the section below and mail it to Keith Hohn, Department of Chemical Engineering, Kansas State University, Manhattan, KS 66506-5102; e-mail to hohn@ksu.edu; or fax to 785-532-7372. Thank you.

Name_____ Degree/year_____

Title_____ Company name_____

Business address_____ Phone_____

Home address_____ Phone_____

News/accomplishments_____

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