

THE BOND

DEPARTMENT OF CHEMICAL ENGINEERING & MATERIALS SCIENCE

Looking to the Future: Battery Technology Merges with Nanotechnology

What is CAESRT?

The newly created Center for Alternative Energy Storage Research and Technology (CAESRT) will conduct innovative, high-impact fundamental and applied research in materials and technology for storing energy. The center will achieve this goal through the synthesis, design, and validation of energy storage devices and systems. Research at CAESRT will be coupled with efficient and effective technology transfer to industry and government. Initial funding for the center is coming from the U.S. Army.

Pop the hood on your car. It shouldn't take you long to find the battery—it's big, may have a black cover, and it's heavy. That's a lead acid battery. These batteries have been the traditional battery option for vehicles and other uses over a long period of time. Now a movement for alternative energy sources is spurring research on new energy storage devices and systems. "We are looking for efficient alternatives to lead acid batteries that are inexpensive, have large capacities, but take up a small amount of space and don't weigh much," says Lawrence Drzal, University Distinguished Professor of chemical engineering and materials science and director of MSU's Composite Materials and Structures Center. In addition, these new energy storage devices need to be reliable and durable. That's a tall order.

There is an increased interest in alternative energy generation, such as wind and solar energy. "But you have to have a way to store the energy created," says Drzal. "You need the ability to collect, store, and reuse. The primary option is batteries." This new generation of batteries could potentially be used at the personal level, as in laptops, or

a stack of them could be used in cars, trucks, and buses. They also could have uses in factories and houses as stationary batteries.

Drzal and a team of faculty colleagues, primarily from the MSU College of Engineering, recently received funding of more than \$1.5 million from the U.S. Army. "In the short term, the Army has pressing needs that will be answered by results from this project," says Drzal. "But there will be long-

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Lawrence Drzal, University Distinguished Professor of chemical engineering and materials science, and other researchers, received new funding to pursue research on batteries.

DOE to Establish Energy Frontier Research Center at MSU



Donald Morelli

Thermoelectric energy conversion projects being developed by an interdisciplinary team, primarily from the College of Engineering, received a big boost when the U.S. Department of Energy (DOE) tapped Michigan State University to lead a new Energy Frontier Research Center (EFRC), one of 46 to be established nationwide. The announcement was made in April by the White House in conjunction with a speech delivered by President Barack Obama at the annual meeting of the National Academy of Sciences.

This five-year initiative, which the DOE plans to fund at the level of \$12.5 million, will involve six MSU scientists as well as researchers from Northwestern University, The Ohio State University, UCLA, the University of Michigan, Wayne State University, and Oak Ridge National Laboratory.

The EFRCs, which will pursue advanced scientific research on energy, are being established by the U.S. Department of Energy Office of Science at universities, national laboratories, nonprofit organizations, and private firms across the nation.

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from the Chair

MARTIN HAWLEY

These are tough economic times as our nation struggles through a recession. The headlines tell us that graduates are having a difficult time finding jobs. However, we in the CHEMS department are proud of our graduating seniors who received diplomas this spring and have found positions in the workforce. These grads will be involved in developing and implementing the technology needed to lead the country—and the world—into prosperity. The CHEMS faculty and staff strive to help students obtain the knowledge and skills needed for the 21st-century workforce. We believe the demand for CHEMS graduates will remain high in the decade ahead.

We are also seeing students continue their educations after securing a BS degree. This is an excellent opportunity to build skills and help with the research needed for a new era.

The department's research efforts have been given a significant boost by recent funding. Lawrence Drzal, University Distinguished Professor of chemical engineering and materials science, along with an interdisciplinary research team, recently received funding of more than \$1.5 million from the U.S. Army. This project will look at efficient alternatives to lead acid batteries that are inexpensive, have large capacities but take up a small amount of space, and don't weigh much. By meeting the Army's needs, the research can eventually be applied to consumer projects.

In addition, the U.S. Department of Energy tapped MSU to lead a new Energy Frontier Research Center (EFRC), one of only 46 to be established nationwide. The center is led by our own Professor Donald Morelli, who joined the faculty in 2007 after many years in research with Delphi and General Motors. Eldon Case and Jeff Sakamoto are two other key members of the research team from our department. The main focus will be on thermoelectric energy conversion projects. An interdisciplinary team here in the college has worked on thermoelectric projects for many years. This funding, as well as recent funding for the University Research Corridor, will help to move these projects to practical applications.

The summer sessions are underway and many of us are making plans for the start of the 2009-2010 academic year. There will be budget challenges for our department, but I am confident that we can work together to accomplish our goals. Meanwhile, I hope you have a great summer. ♻️

Energy Frontier Research Center (continued from page 1)

"MSU's EFRC is a large, concerted effort to advance our fundamental scientific understanding of the thermoelectric energy conversion process, and thus could lead to more efficient utilization of our energy resources," says principal investigator Donald Morelli, MSU professor of chemical engineering and materials science and adjunct professor in physics and astronomy.

In addition to Morelli, MSU researchers involved in the center are Eldon Case, CHEMS professor; Jeff Sakamoto, CHEMS assistant professor; Tim Hogan, CHEMS and ECE associate professor; Harold Schock, professor of mechanical engineering; and Subhendra D. Mahanti, professor of physics and astronomy.

"MSU's thermoelectric power generation research group is one of the most advanced in the world," says Satish Udpa, dean of MSU's College of Engineering. "It is fitting that these first-rate engineers and scientists would be selected to help address the critical energy-related issues facing our world today."

While energy strategy in the long term should focus on developing new, sustainable, and carbon-free energy sources, in the short term, according to Morelli, there must be a continued reliance on traditional sources of energy, since no technologically and economically viable energy alternatives exist today. "Even if new sources of energy are found and developed in the near future, we do not have the infrastructure necessary to utilize them on a global scale," says Morelli.

"Thermoelectric solid state energy conversion offers a means of increasing the efficiency of the utilization of these energy sources by converting some of the energy lost as heat into electricity," says Morelli. "In some sense, the energy we generate but lose as heat is our greatest untapped source of 'new' energy."

EFRC researchers across the nation will take advantage of new capabilities in nanotechnology, high-intensity light sources, neutron scattering sources, supercomputing, and other advanced instrumentation—much of it developed with DOE Office of Science support over the past decade—in an effort to lay the scientific groundwork for fundamental advances in solar energy, biofuels, transportation, energy efficiency, electricity storage and transmission, clean coal and carbon capture and sequestration, and nuclear energy.

"This new energy initiative is particularly exciting for us as researchers, because it supports basic science," says Ian Gray, MSU's vice president for research and graduate studies. "This is an opportunity to explore better solutions to known problems, build the theoretical foundation for new discoveries and, ultimately, change the way we approach energy utilization. MSU is proud to join with our colleagues in these other institutions in leading the way."

The EFRCs were selected from a pool of some 260 applications received in response to a solicitation issued in 2008 by the DOE Office of Science. The selection process was based on a rigorous merit review that utilized outside panels composed of scientific experts. Of the 46 EFRCs, 31 are led by universities, 12 by DOE National Laboratories, two by nonprofit organizations, and one by a corporate research laboratory.

Battery Technology (continued from page 1)

term benefits for the manufacturing sector and for consumers as well." In order to accomplish the research needed by the Army and for future projects, the Center for Alternative Energy Storage Research and Technology (CAESRT) has been created at MSU and will be led by Drzal. The focus of this research is to merge battery technology with nanotechnology, so batteries will perform better, store more energy, and be less expensive.

"The Army is trying to equip 21st-century fighters," says Drzal. "Soldiers carry 80 pounds plus of batteries. What the army needs is lighter, energy-dense storage for personal and vehicular use, as well as at remote base camps." For example, lightweight, high-energy, high-power storage batteries could be used by soldiers for computing and communications systems. They also are needed for vehicles, in particular for hybrid electric vehicles and unmanned air, ground, and sea vehicles, reducing the amount of fuel that needs to be trucked to a particular location. Base camps could also use high-energy storage devices for both electrical load management and as emergency protection.

New developments in battery technology will require batteries or energy storage devices to perform under more extreme temperature and environmental conditions with longer lifetimes, greater reliability, lower cost and weight, and with a high degree of safety. To help with this phase of the project, there will be an industrial consortium of companies to participate and sponsor part of the CAESRT research and to be the recipients of the technology developed. This close industrial collaboration is critical to focus the research on solutions that can have a large impact and to evaluate and refine developments in industrial test beds. Drzal hopes that this will inspire Michigan-based companies to become involved in battery technology and be at the forefront of manufacturing these high-energy devices within the state.

The research team would like to produce useful results in one to two years with additional long-term funding possibly coming from other government agencies. "One person cannot do this," says Drzal. "We have a team of faculty to address all of the issues involved in this activity from the molecular to the systems level." ❁

– Jane L. DePriest

Core Faculty Group

CAESRT is a collaborative effort that includes faculty members from various departments in the College of Engineering as well as colleagues from other MSU colleges. The initial group of faculty researchers and their expertise includes:

Gregory L. Baker, professor, MSU Department of Chemistry. His area of expertise includes electrolyte membranes for batteries and fuel cells, and controlled polymerization from surfaces.

Lawrence T. Drzal, University Distinguished Professor of chemical engineering and materials science (CHEMS). Drzal is the senior faculty member on the project; his expertise includes graphene nanoplatelets and nanometal clusters for energy storage and catalysis.

Martin Hawley, professor and chair of the CHEMS department. His expertise is in carbon nanotube synthesis, chemical kinetics, transport phenomena, plasma reactions, and electromagnetic processing of materials.

Timothy Hogan, associate professor, Department of Electrical and Computer Engineering (ECE) and CHEMS department. Hogan's research includes charge transport measurements, pulse laser deposition of new electronic materials, and nanowires.

Fang Zheng Peng, professor, ECE department. Power electronics, motor drives, hybrid electric vehicles, and renewable energy interface systems are his areas of expertise.

Jeffrey Sakamoto, assistant professor, CHEMS department. His research focuses on materials for energy and medical technology, including thermoelectric materials, device fabrication and testing, aerogel-based thermal insulation, lithium-ion battery research, and nerve repair technology.

Elias Strangas, associate professor, ECE department. His expertise includes electrical machines and drives, and electromechanical systems.

Greg Swain, professor, MSU Department of Chemistry. His research focuses on advanced carbonaceous electrocatalyst support materials for batteries and fuel cells.

2009 Johansen-Crosby Lecture



Robert J. Davis, professor and chair of the Department of Chemical Engineering at the University of Virginia, delivered the annual Johansen-Crosby guest lecture on April 23. Davis addressed the audience in the Engineering Building on the subject of "Catalytic Conversion of Biorenewable Molecules to Fuels and Chemicals." Davis is director of the Laboratory for Research in Heterogeneous Catalysis at the university.

In his presentation, Davis explored solid bases derived from hydrotalcites as heterogeneous catalysts in the transesterification of tributyrin with methanol, a model reaction for biodiesel synthesis. The influence of interlayer anions and water on the activity and stability of the catalysts were presented. The selective oxidation of glycerol to glyceric acid over supported Au catalysts and the selective hydrogenolysis of glycerol to glycols over supported Ru and Pt catalysts were also discussed. The work illuminates specific research issues related to the use of heterogeneous catalysis in the conversion of biorenewable molecules.

The Johansen-Crosby lectureship was instituted to honor the parents of Professor Edwin Johansen Crosby, an alumnus of Michigan State University. His parents, Edwin Rallard Crosby and Thora Anne Johansen Crosby were both residents of Flint, Mich., and contributed greatly to the community. ❁

Faculty and Staff Bond

2009 Withrow Award



Jeffrey S. Sakamoto, CHEMS assistant professor, received the Withrow Teaching Excellence Award at the college's annual awards luncheon in March.

Sakamoto is a dedicated and enthusiastic teacher who brings a wealth of experience to the classroom. Students praise his ability to relate material to real-world applications and current events, and they are impressed by his knowledge of cutting-edge technology. His lectures incorporate interesting examples from the areas of energy, medicine, and his NASA-related thermoelectric research.

Comments from students illustrate how a professor can inspire students to find purpose and passion in their academic and professional lives: "I've had the opportunity to work for Dr. Sakamoto for the past year [and] . . . I have decided to attend graduate school and continue researching materials for energy technology." "Dr. Sakamoto has enabled me to research technology that links to my future and has expanded my understanding of the current research in medicine." One student sums it all up: "Dr. Sakamoto rocks! He worked for NASA."

Funding for Clean Technology



EcoSynthetix, founded by **Ramani Narayan**, University Distinguished Professor of chemical engineering and materials science, has been selected as one of two

companies for initial investment for the Invest Michigan state funds. EcoSynthetix is a Lansing-based clean technology producer of biobased replacements for petroleum-based chemicals. The Invest Michigan program is funded by \$300 million in state pension funds. The idea is to grow the state's pension funds by investing in new businesses in emerging sectors and encouraging companies in established industries to innovate and expand.

Biofuel Carbon Footprint



Bruce Dale, CHEMS professor and associate director of the MSU Office of Biobased Technologies, has been invited by the Geneva-based International Centre for

Trade and Sustainable Development to join the group's steering committee as it creates a series of white papers on climate change, agriculture, and trade. Accredited by the United Nations and World Trade Organization, the ICTSD consults for and participates in many conferences and other activities sponsored by those organizations.

"I'm the only technical person on the steering committee," says Dale. "It's a very diverse, very international group. The ICTSD invited me to be a member because of my expertise in second-generation biofuels, biofuel life cycle analysis, and the carbon consequences of new agricultural practices to produce biofuel raw materials."

According to Ricardo Meléndez-Ortiz, chief executive of the ICTSD, the steering committee will examine and recommend agriculture and trade policy options intended to promote climate change mitigation and adaptation, while strengthening food security and contributing to economic development. "I'm looking forward to participating," Dale says. "It gives me a chance to share MSU research with the world and show how MSU's biofuel research has global implications."

For more information on Michigan State University's biofuel and bioenergy research, visit www.bioeconomy.msu.edu.

New Appointment



Melissa Baumann, associate professor in the CHEMS department, has joined the Honors College as associate dean. Her research interests include biomedical materials,

bone tissue engineering, novel implant materials, and nanoceramics.

Salt Substitute a Success in Ketchup



A salt substitute patented by Michigan State University is being used in an improved version of Heinz no-salt-added ketchup that's hitting store shelves just in time for the

summer barbecue season.

Created by **Kris Berglund**, University Distinguished Professor of chemical engineering and materials science and forestry, and Hasan Alizadeh, former MSU research associate, the product—sold commercially as AlsoSalt—was patented in 1999 and is produced by Diversified Natural Products in Scottville, Mich.

"There's no sodium in AlsoSalt," Berglund explained. "It's made from lysine, which is fermented from corn starch. It's an example of the other bioproducts that can be made from some of the same processes that produce ethanol."

Joan Watsabaugh, whose company markets and distributes AlsoSalt, was responsible for working with the research and development team at Heinz. She characterized the flavor of the new ketchup as excellent. "We are proud to be co-branding with Heinz to make ketchup that has only 5 milligrams of sodium per serving. Using AlsoSalt, Heinz removed the added salt while retaining the delicious flavor people expect from Heinz ketchup."

According to Berglund, the 10-year period between the patent date and new product isn't unusual. "It takes time to successfully commercialize a product," he said.

"AlsoSalt production is another example of biorefining that can produce a full complement of biobased chemicals, fuels, and other products," Berglund said. "This approach creates a diversified operation that isn't subject to the ups and downs of a single market or product." ❁

Alumni Bond

2009 Red Cedar Circle Award



Rick Berquist with his wife, Joan.

Alton “Rick” Berquist, (BS '61, Chemical Engineering) received the 2009 Red Cedar Circle Award at the annual college of Engineering Alumni Awards

Banquet in May. The award recognizes MSU chemical engineering and materials science alumni for their distinguished service to the profession and outstanding commitment to the community.

Berquist was raised in Carney, Mich., a small town of 250 people in the Upper Peninsula. He hails from a family with an entrepreneurial spirit, and when his parents started a propane distribution company, they made sure that the entire family was involved. They were all MSU fans as well. Consequently, Rick and his brother, Barry, both decided to attend Michigan State University. After completing his undergraduate degree at

MSU, Rick obtained his MS ('63) at the Colorado School of Mines and then did PhD studies at Georgia Institute of Technology.

Berquist spent the majority of his career as the co-founder, CEO, and chairman of Marmen Computing, Inc. in Menominee, Mich. Here he developed and ran the Michigan Product Information Exchange (MiPIE) and the Nationwide Database for SBA (PASS).

He was also the founder, CEO, and chairman of Silvan Industries, Inc., a pressure vessel manufacturer in Marinette, Wisc., which he brought out of bankruptcy. He started the company with 2 employees; within two weeks, he had 14 people on the payroll. Building a great team led to the success of the company. He says the biggest asset was his management team's strength in accounting and finance. When he sold the company in 2005, it was serving the entire United States as well as Japan and Europe. It had 330 employees and \$33 million in revenues. His nephew, Barry, also an MSU graduate, was in upper management with the firm at that time; he now heads the company, which has about 600 employees and earns approximately \$100 million in revenue.

Berquist has also been involved in numerous

political and philanthropic activities. He was nominated by former Governor John Engler to be on the Board of Control at Michigan Technological University and served in that capacity for more than 10 years. He was also a trustee on the Michigan Tech Fund. In addition, he headed the campaign for a \$1.2 million expansion at his church in Menominee, Mich., and started the foundation for a \$2.6 million oncology center at the Bay Area Medical Center in Marinette, Wisc.

He and his wife, Joan, live in West Palm Beach, Fla. They have three children—Alton, Derek, and Melissa. Alton and his wife, Cyd, graduated from MSU in food science. Derek became a computer scientist at Embry-Riddle in Daytona Beach, Fla., and is still involved with Marmen Computing. His wife, Jenny, is earning her master's in education and teaches pre-kindergarten. Melissa graduated from MSU's James Madison College, then earned her master's in international business and an MBA from Thunderbird School of Global Management, Glendale, Ariz. She is project manager for EPIC, a computer software company located in Madison, Wisc. Her husband, Bruce Schlee, is in marketing for Silvan Industries. 🌸

2009 Erickson Distinguished Alumnus Award



Richard Pisarczyk with his wife, Mary.

Richard V. Pisarczyk, (BS '68, Chemical Engineering) was honored with the Claud R. Erickson Distinguished Alumnus Award at the annual College of

Engineering Alumni Awards Banquet in May. This award was established in 1982. Claud Erickson, for whom the award was named, was the first recipient. Since then, it has been given annually to a College of Engineering graduate with a minimum of 15 years' professional experience who has attained the highest level of professional accomplishment and has provided distinguished and meritorious service to the College of Engineering

and the engineering profession.

Pisarczyk has been president of ExxonMobil Research and Engineering Company—the world's largest integrated oil company—since 2005. He first joined Mobil Oil Corporation, Downstream, in 1968, advancing through positions in manufacturing, planning, and supply, and in 1984 became manager of Mobil's Ferndale Refinery in Washington. In 1994 he was appointed chairman and managing director of Mobil Oil Australia and relocated to Melbourne, Australia, for several years.

In 1997, he was named vice president, East/Gulf Coast Business, North America Marketing & Refining for Mobil Oil Corporation. As a result of the merger between Exxon and Mobil in 1999, he became regional director, Americas, of ExxonMobil Chemical. In 2001 he was named senior vice president, Basic Chemicals and two years later was named senior vice president, Basic Chemicals and Intermediates.

ExxonMobil has been an MSU donor for more than 25 years, providing matching gifts at a ratio of 3:1. Pisarczyk makes a personal visit to campus each year to deliver ExxonMobil's matching gift check. He and his wife, Mary, also established the Richard V. Pisarczyk Endowed Discretionary Fund in 2002 in recognition of his "rich and rewarding undergraduate experience at MSU, to be used to support any number of programs, with the goal of encouraging progress and excellence within the Department of Chemical Engineering and Materials Science."

He and his wife currently reside in McLean, Virginia, where he has been a sponsor of programs that encourage middle school students to explore careers in science and mathematics. Their son, Michael, and his wife, Jennifer, live in Midland, Mich.; they have three children. 🌸

Student Bond

Spring 2009 Capstone Projects

This spring, students in Chemical Engineering 434, the senior capstone course, participated in the college-wide Design Day, held in May at the MSU Union. This semester, students in the capstone course had to address the problem of butanol production via fermentation. The purpose of this problem is to synthesize a process, size, cost, and optimize a plant to produce butanol by fermentation for use as a biofuel. "We try to have contemporary problems that are germane to what these students may be asked to do when they are a part of the workforce," says Martin Hawley, chair of the department and the instructor for the course.

From the class of 45 students, 13 teams of two and 19 individuals completed this project. Of these, four teams and four individuals were chosen to present their designs via a

poster presentation at Design Day. From the final group, two teams and two individuals were chosen to compete in the 2009 National Design Problem, sponsored by the American Institute of Chemical Engineers.

The best individual presentation at Design Day was by **Shaun Kleiber**; **Alexander Nelson** was the runner-up. The best team was **Andrew Kraus** and **Michael Dittmer**; the runner-up team was **Chad Rogers** and **Michelle Marinich**. "The MSU chemical engineering department has one of the best records for winning in this national competition each year," says Hawley. Results of the national competition will be announced later this year. **Susan Farhat** was the teaching assistant for this course.

This was also the first time that students in the MSE 466 capstone course participated in Design Day. As with other capstone



Thomas Santini (right) talks to a visitor about his MSE 466 capstone project.

courses, the major objective of MSE 466 is to have students apply their course-learned background and skills in materials science to real-life design changes.

Failures are the major motivating force for generating innovative designs or design changes. A failure analysis investigation provides an opportunity to systematically design and solve a real-world problem. Spring semester there were five 4-5 member teams working on five real engineering failures.

The team projects included: Fracture of a Main Drive Gear; Failure of a Salisbury Differential Front Output Shaft; Cracking of a Ni-based Alloy Bushing; Bolt Fracture Used in a 240-ton Mechanical Press; and Fracture of a Ni-Alloy/C-22 Chlorine Compressor Shaft. All five teams presented posters summarizing their findings at Design Day.

"The most significant feedback from the student participants was that the course and the presentations were a wonderful and rewarding experience," says Professor James P. Lucas, the instructor for the course. "In addition, the interest showed by patrons for the MSE 466 topics was remarkably high. One team said that over a 2-1/2 hour period, they presented their work at least 15 times." **Sarah Longanbach**, a second-year graduate student in materials science engineering, was the teaching assistant.



Students in the MSE 466 capstone course showed off their projects at Design Day.



Students in ChE 434 competed at Design Day for a chance to represent the department in the 2009 National Design Problem, sponsored by the American Institute of Chemical Engineers.

2009 Academic Awards

Congratulations to the following students from the Department of Chemical Engineering and Materials Science who were recognized at a College of Engineering reception in March for academic excellence and service to the community.

Outstanding Graduate Student Awards



Derek Baars, materials science engineering. Baars, who is working on his PhD dissertation, is researching the complex issues related to dislocation generation and interactions in BCC metal. He has acquired considerable skill as an experimentalist and has transferred these skills unselfishly to many other graduate students. Baars also has written a number of short papers that have been published in physics-based journals that serve the superconducting materials community. Thomas Bieler is his faculty adviser.



Joseph Gredell, chemical engineering. Gredell also received second place in the 2009 Fitch Beach Outstanding Graduate Research Awards. His research is focused on improving the function of short, interfering RNAs, a new class of therapeutics. The Fitch Beach Awards are determined on the basis of a technical presentation and outstanding research in a PhD program in the MSU College of Engineering. The MSU Engineering Research and Graduate Studies Committee determines the winners of this award. Patrick Walton is Gredell's faculty adviser.

Service Award: Michael Dittmer, Manindra Joshi, and Andrew Kraus in chemical engineering; **Robert Friederichs** in materials science engineering.

Undergraduate Academic Achievement Awards for Chemical Engineering: Justin Biega, Thomas Fielitz, Jennifer Hall,

Nathanie McIntee-Chmielewski, Dante Pertusi, and Maria Tenoria-Bernal.

Undergraduate Academic Achievement Awards for Materials Science

Engineering: Chelsea House, Derek Miller, and Kendell Pawelee.

Society of Women Engineers Award



Lauren Kloock, a chemical engineering senior, received an outstanding senior award at the Society of Women Engineer (SWE) awards banquet in February. The award is based on extracurricular and community involvement and academic excellence. The Chemical Engineering Award is sponsored by Toyota Motor Engineering & Manufacturing, North America.

Kloock has been an active member of SWE since her freshman year, and was involved in many SWE activities, including serving as vice president of the student chapter this year. She graduated in May and is working at BP as a process engineer at the Whiting refinery in Hammond, Ind., located just outside of Chicago.

"The best advice that I could give to women majoring in engineering is to get involved in as many activities as possible," says Kloock. "For me, I found that being actively involved in SWE provided me with a huge support system and friendships. It also ensured that I was well aware of the activities and offerings of my professional organization associated with my major. This provided many social and networking opportunities." She also points out that it is important to diversify your activities and spend some time doing non-engineering-related activities. "And it is very important to speak up for yourself and don't be afraid to ask questions."

Kloock is from Shelby Township, Mich. Her parents are Gary and Elizabeth Kloock.

Senior Class Council Outstanding Senior



Robert J. Friederichs, from West Branch, Mich., was named an Outstanding Senior by the MSU Senior Class Council. Friederichs graduated this spring with a BS in

materials science engineering. He was named a Goldwater Scholar in 2007 and most recently was a finalist in the Gates Cambridge Scholarship. In the fall he will attend Churchill College at the University of Cambridge in England. "My ambitions are to research cutting-edge topics in biomaterials science, such as targeted drug delivery from nanostructured microspheres," says Friederichs, who hopes to obtain a master's of philosophy. His longer-term plan is to get a PhD and end up in a leadership position either in industry or at a research institution.

2009 Mickey Leland Energy Fellowship



Sara Longanbach, a graduate student working on a PhD in materials science engineering, received a summer internship in the Mickey Leland Energy Fellowship

(MLEF) Program and is completing a 10-week internship at the National Energy Technology Laboratory in Albany, Ore. This is Longanbach's second internship with the program. "For my project this year, I will be melting, casting, and processing a high-temperature super alloy," says Longanbach. "After my internship, I will bring all of the samples I've made of the alloy back to MSU to perform mechanical testing and microstructural characterization." She is enthused about the opportunity to work in a national lab again. "Last year's program was one of the best things I've ever done. I experienced what working in a national lab was like and I learned more in 10 weeks than I ever thought possible," says Longanbach. This year, she will be doing research for the lab, as well as for her thesis. 🌱

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2009 Homer Higbee International Education Award

Mamud Dako (BS '08) was honored at the 2009 International Awards Ceremony this spring for contributions to international studies at MSU. Dako received one of six Homer Higbee International Education Awards, cited for his "amazing record as an engaged student leader" and his "impressive success in the classroom." He is a first-year graduate student in MSU's Department of Packaging and is president of the International Students Association. Under his leadership, the ISA has continued as a powerful student organization. Dako is also an assistant residence hall director, a graduate research assistant, and a regular volunteer with international student orientations. ♻️



From left: Peter Briggs, director of the Office for International Students and Scholars; Mamud Dako, Homer Higbee International Education Award recipient; and Amber Arashiro, program coordinator for the Office of International Students and Scholars.