IOWA STATE UNIVERSITY
COLLEGE OF ENGINEERING
ME UPDATE
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Ellen Brockmann, a 2004 graduate, test-drives cars for General Motors as part of her job as a handling test engineer.

ME grads—All about problem-solving

Ellen Brockmann test-drives cars at General Motors (GM). **Ryan Christenson** will soon be preaching from the pulpit at Asbury United Methodist Church in Webster City.

Strange as it may seem, both earned BS degrees in mechanical engineering at Iowa State, and both credit their engineering education for helping them do a job they love.

In the driver's seat

Cars and motorcycles have always fascinated Brockmann. She drove motorcycles in high school and was on constant lookout for new and unusual cars. While Brockmann's job as a handling test engineer at GM is a perfect match for someone who loves cars and driving, she actually chose ME because it offered options in career paths.

Through internships and coursework, Brockmann explored different areas of ME. She did an internship with Cargill, Inc., in Gainesville, Georgia, where she learned about the process of crushing soybeans to produce oil, and she participated in a continuous internship program with GM. It was the last of her three GM internships, this one at the Milford Proving Grounds with its 100 miles of testing track, that clinched the deal for her in the summer of 2003.

Her job as a handling test engineer has been everything Brockmann thought it would be. She prepares vehicles for testing; for example, she might add ballast or change to different tires, and she hooks up instrumentation to gather data while she drives the car on the test track. Driving the cars and gathering good data require a lot of skill and practice. Brockmann is still being trained on some of the more advanced techniques. "Once you demonstrate that you can handle a car at its limit," she explains, "you receive certification to perform advanced tests."

Desk to pulpit

Christenson, meanwhile, focused on a different kind of driving. Starting out as an aerospace engineering major, he soon switched to ME because of the program's strong connection to the Virtual Reality Applications Center (VRAC). While working as an undergraduate research assistant at VRAC, Christenson became intrigued by the field of vehicle dynamics simulation and virtual reality. He also worked as a technical animator for Engineering Animation, Inc., now called Demonstratives, Inc., creating computer models and producing animations of car crashes, medical malpractices, and product liabilities.

"I found the work fascinating," Christenson says. "We spent long hours working on big-budget projects. My colleagues were dedicated individuals who combined technical expertise with a creative spirit that really challenged me to grow."

The transition in careers occurred as Christenson became increasingly involved in service projects around Ames and a home-repair ministry for low-income families in Kentucky and Tennessee. Following his 2002 graduation from Iowa State, Christenson began a three-year Masters of Divinity Program at Duke University in Durham, North Carolina. In June 2005, he began serving as associate pastor at Asbury United Methodist Church in Webster City.

Skills in collaboration, leadership, and project development that Christenson developed as an ME student apply to his life in pastoral ministry. Both the analytical training and technical skills transfer amazingly well to sermon preparation, theological development, and pastoral care and counseling.

Christenson's background also connects him to the people he serves in unique ways. One member of a congregation in a Detroit suburb, for example, took Christenson out to see the new-model car he had helped engineer. "As we looked into the mechanical marvel of the engine," Christenson says, "I became aware of how wonderful it was to be able to relate to him in this way."

On page 4 read about how some other recent ME grads are applying the skills and knowledge they gained at Iowa State to accomplish their own career goals.

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News about people

Faculty

Atul Kelkar has been promoted to professor. Joining the faculty in 2001, Kelkar has major research grants with NASA and the National Science Foundation. His research focuses on control systems and developing technologies and devices that can reduce noise in an enclosed environment.

A faculty member since 1999, **Francine Battaglia** has been promoted to associate professor with tenure. Battaglia's research and teaching interests include computational fluid dynamics and thermodynamics. She serves as director of the College of Engineering Center for Building Energy Research.

Mark Bryden, associate professor, has been named ME associate chair for undergraduate programs. A faculty member since 1998, Bryden received the 2004 College of Engineering Superior Teacher Award.

Students

Kathleen Spees, a May 2005 graduate with degrees in ME and physics, has been awarded a prestigious National Science Foundation Graduate Fellowship. Spees will enroll in the MS+PhD program at Carnegie Mellon University. Her research will be within the Carnegie Electricity Industry Center in power transmission and grid distribution.

Sarah Walter, an ME senior, is one of eight students nationwide selected to participate in the 2005 Washington Internships for Students of Engineering (WISE) program. WISE gives future engineering leaders a firsthand view of how government officials make decisions on complex technological issues and how they can contribute to legislative and regulatory public policy decisions. In recognition of her exemplary leadership activities, Walter was awarded the 2005 College of Engineering Dean's Leadership Award.

In memory

Eugene S. Ferguson, a former ME faculty member with a worldwide reputation for his pioneering work in the history of technology and engineering, died in 2004. Ferguson earned his MS at Iowa State in 1955. He initiated the teaching of the history of technology, and he was instrumental in the start of Iowa State's first PhD program in the humanities, in the history of technology and science, according to **David Wilson**, professor of ME and history.

The Society for the History of Technology (SHOT) will present the first Eugene S. Ferguson Prize at its annual meeting in November. The prize, a plaque and $2,500 cash award, recognizes the tradition of scholarly excellence established by Ferguson as a museum curator, editor, annotator, university professor, scholar, and a founding member, pioneering bibliographer, and past president of SHOT.

Cars primed for success

Iowa State's formula car raced to its best finish ever at the 2005 Formula SAE competition at the Silverdome in Pontiac, Michigan. The ethanol-fueled car placed 18th in the field of 122 from around the world. The racer goes from 0 to 60 mph in under four seconds and tops out at 110 mph. This is the second year the Iowa State team has used an engine that burns E-85 fuel as a way of promoting alternative fuels. The team will race the 2005 car at various events this summer and use it for testing and driver training next year. Work has already begun on the 2006 car. ***For more information, visit sae.stuorg.iastate.edu/formula/.***

Iowa State's solar car easily passed its final tests to qualify for the North American Solar Car Challenge. The 2,500-mile race begins in Austin, Texas, on July 17 and ends in Calgary, Canada, July 27. **Justin Steinlage**, an ME senior and project director, says the car performed up to the team's expectations. The team, comprised of 40–50 students from majors all across campus, has worked on the car since the end of the 2003 challenge. They reshaped the body to improve the aerodynamics and made the vehicle much lighter. Named Fusion, Iowa State's solar car cost $350,000 to build. Follow Fusion's progress at ***www.iastate.edu.***

Another Iowa State team is also in action this summer. The Mini Baja team is participating in the SAE Midwest Mini Baja competition in Troy, Ohio, in June. ***For more information, visit sae.stuorg.iastate.edu/baja/.***

This year's solar car, unveiled and ready for 2005.

It's show and tell time...

When **Ted Heindel's** students say, "We're watching bread rise," he gets excited. They're generating images that will help demonstrate one of the unique capabilities of the massive new x-ray flow visualization (XFloViz) facility housed in his lab.

Heindel calls the XFloViz facility a lead tree house. Located 12 feet above the floor, it's equipped with two x-ray systems surrounded by nine tons of lead. A Plexiglas column, stands nearly 20 feet high in the middle of the facility. With the ability to record images of liquids, solids, and gases as they flow through the transparent column, the instrument will enable researchers to see and better understand multiphase flows.

Heindel recently used the facility to scan a loaf of bread while it was rising. "The loaf of bread, although it doesn't specifically illustrate multiphase flow, shows the volume we can do in one scan," says Heindel, the **William and Virginia Binger Associate Professor of Mechanical Engineering**. "And, with our software, we can section the bread and see what's inside." This summer Heindel and his undergraduate interns are experimenting to see what they can do with the instrument, and how they might visualize the features on the lab's Web site—*www.me.iastate.edu/heindel/researchXFV.html.*

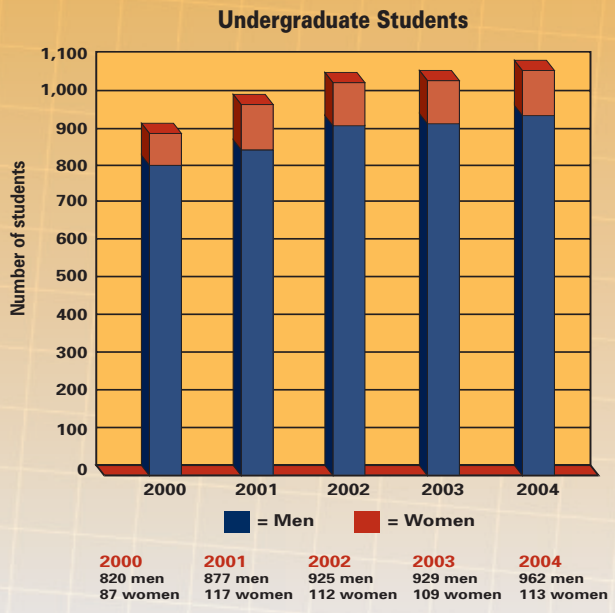
Ted Heindel's work with Iowa State University's new X-ray flow visualization facility has potential applications in industry and academic research.

Heindel collaborated with **Joe Gray** and **Terry Jensen**, scientists from the Center for Nondestructive Evaluation, to design and build the instrument. They are continuing to develop its special capabilities. "With the two cameras, we can take simultaneous images from different orientations," Heindel explains. "But we're still developing the software to reconstruct a three-dimensional object from those two images."

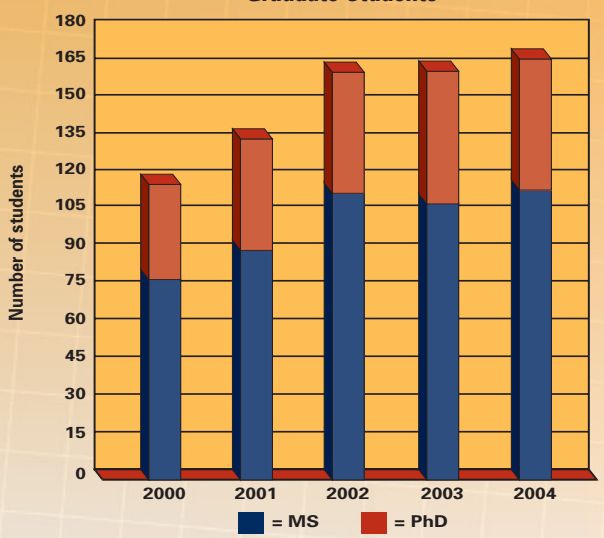
And when that's done, Heindel has more ideas on ways to enhance what researchers in academia and industry can learn about multiphase flows.

Funding for the $640,145 instrument came from the National Science Foundation's Major Research Instrumentation Program and Iowa State University. ***News articles about the XFloViz facility are available at www.me.iastate.edu/ or you can contact Heindel at theindel@iastate.edu.***

Enrollment continues to grow



2000	2001	2002	2003	2004
820 men 87 women	877 men 117 women	925 men 112 women	929 men 109 women	962 men 113 women



2000	2001	2002	2003	2004
80 MS 36 PhD	91 MS 44 PhD	115 MS 47 PhD	110 MS 53 PhD	120 MS 51 PhD

ME Grads continued from page 1

ME to MD

When he entered Iowa State in 1998, **Nick Mohr** had every intention of a lifelong career as a mechanical engineer. And while his career goals changed dramatically during his undergraduate studies—Mohr just completed his third year of medical school at the University of Iowa—he says his bachelor's degree has been great preparation for medicine.

"Engineering education is truly training in the discipline of problem solving," Mohr explains. "Engineering transcends physics and mechanics, and it embraces the dichotomy between unabated creativity and a rigorous adherence to logical thought. This type of preparation is invaluable in any field where one genuinely hopes to be able to approach problems in a fresh way."

Mohr observed doctors doing just that his freshman year when his brother became seriously ill. "They were forced to think in that same intersection, at the crossroads of possibility and practicality," Mohr says. Fortunately the doctors arrived at a successful solution, and his brother recovered. The experience prompted Mohr to look at medicine as an opportunity to apply his technical/scientific skills to solve problems and, at the same time, help relieve human suffering.

Becoming a person who wants to tackle new problems and figure out innovative ways to solve them requires experience. Mohr credits working on the solar car project as one of the most valuable activities of his undergraduate education. "We had the 'freedom to fail,'" he explains. "That freedom doesn't assure success, but it does guarantee that we develop our skills in managing new and unsolved problems."

Robots—fast and precise

Brian Swanson sums up his decision to study mechanical engineering in one word—robotics. "I always had a fascination with robots," says Swanson, who now programs robots and trouble shoots robotic work cells as a manufacturing engineer at John Deere in Waterloo.

Swanson tailored his tech electives to courses that applied to robotics and also took several computer science courses. Completing his BS in 1999, he had some basic theoretical robotics background but lacked the knowledge and practical experience he needed. He decided to go to graduate school.

"Without a doubt, the most interesting and challenging time I had was working in the Laboratory for Advanced Robotics and Computer Control (LARCC) for **Greg Luecke**, ME associate professor and LARCC director," Swanson says. "We put in a lot of hours, but I worked with a great group of people, and we had fun doing it. The only drawback was that we were 10 years ahead of our time. The technology used in the manufacturing environment lags significantly behind the research that we were doing."

Swanson, who completed his MS in 2000, started in the Electro-Hydraulics Control Systems group at John Deere's Product Engineering Center. He moved to the tractor assembly plant two years ago. As a supervisor and production engineer on the robotic weld line that produces cab frames, his position involved resolving production issues and creating designs to improve quality and decrease downtime.

"The precision of robots can create problems," Swanson says. "They're set up to weld in exactly the same spot, but since the parts have variations we have to make adjustments so the weld is in the right place." While Swanson still supports the line as needed, his focus now is on several new robotic weld cells and designing a robotic adhesive application cell for a new cab series that's coming to the plant.

In general, Swanson observes, robotics isn't as prevalent in manufacturing as one might expect. "With robots, overhead goes down and productivity goes up," he says, "but the initial investment is high, so companies aren't implementing them as much as they could." Swanson is hopeful though, that with cutting-edge research such as that happening at Iowa State, robotics will become a routine part of manufacturing.

Floats to power plants

Since 5th grade, **Megan Mohrfeld** helped her dad design and build floats for the Fort Madison holiday parade. Not just small floats mind you, massive ones like an Eiffel Tower and a riverboat complete with moving parts and thousands of miniature lights. Mohrfeld loved turning a picture into a 3-D structure, and, in her mind, that's what engineers did.

Arriving at Iowa State in 1999, Mohrfeld was a member of the first ME learning community. As they took their classes together, the students developed a lasting camaraderie. For the freshman design course, they designed and built an attachment to a wheelchair for Gene, a man who was severely disabled. The goal was for Gene to be able to water plants indoors and outdoors.

"We spent a lot of time figuring out a design, finding materials, coming up with a way to attach the device, and then teaching Gene how to use it," says Mohrfeld. "The project really

motivated me. It was fun working as a team, and we helped make a person's life better. It reminded me what I enjoy about engineering, the satisfaction of successfully seeing a project through from beginning to end."

Now, a year after graduating, Mohrfeld is a business development engineer with Burns & McDonnell, a worldwide engineering and environmental consulting firm with headquarters in Kansas City. Mohrfeld wanted a position in the energy division of a company where she would have a variety of tasks and be able to learn about the entire industry.

Burns & McDonnell has given Mohrfeld the opportunity to learn as well as apply what she learned in school. She puts together proposals for power plants including performance expectations and cost estimates. She also does technology assessments to determine the feasibility of different sources of power—for example, biorenewables, solar, wind, coal, or gas.

Drilling and pumping

Kent Wedeking loves big things with lots of horsepower. The 2004 alumnus from Clarkesville, Iowa, got what he wanted when he accepted an engineering position with Schlumberger, a leading oilfield services provider, last spring. "The equipment we take on location is so big it has to be hauled in by semi-trailer," he says. "We have high-pressure pumps worth at least $750,000, and the engines alone are often over 7 feet tall."

When companies decide to drill an oil or gas well, they contract the work out to companies like Schlumberger to do the work in the oilfields. Heavy equipment and know-how are needed to drill the wells and pump the natural gas or oil out of the rock. "Schlumberger looks for engineers who have leadership skills and are fairly organized," says Wedeking, "and then they train us for their jobs. I had the equivalent of a semester of graduate-level petroleum engineering classes before going out in the field."

Living in the wide-open spaces of southwestern Wyoming, Wedeking's workday starts at 3 a.m. with getting paperwork lined up and equipment ready. Once at the well site, which could be as far as 150 miles from the yard, he gets the equipment rigged up for drilling and pumping.

"You quickly learn to solve problems in creative ways, because we have to keep the job site working. That means helping solve problems ranging from equipment fixes to materials acquisition to personal issues," Wedeking says. "Everyone watches out for each other, because all you've really got is the guy next to you."

Although Wedeking enjoyed the challenges of working in the oilfields, he recently moved back to Iowa to work for Fisher Controls in Marshalltown, where he had completed an internship. "I'll be working in the lab but will still have to rig up and rig down everyday," Wedeking says. "The advantage is this is a lot closer to home."

Across the ocean

"Bonjour, ca va?" That's the greeting **Jesse Bernstein** uses every morning as she stops and shakes the hands of each of her colleagues at Schneider-Electric, an international leader in electricity and automation management. It's one of the many customs she's adopted since starting her job in Grenoble, France.

Learning the routines and technical jargon of any new employer can be a challenge. Add in a foreign culture and language, and some new graduates might be deterred. Not Bernstein. Although this 2004 alumna had taken years of French, she was eager to show her new co-workers and neighbors that France was now her home. Bernstein focused on thinking and speaking only in French. Her goal is to be able to communicate on a personal and technical level with whomever she meets.

Bernstein's efforts have paid off. She started as a design engineer. After she became familiar with the enterprise, she was given little projects designing new components using software only known to Schneider employees. As her understanding of French and the company grew, Bernstein received head responsibility of the internal arc testing.

"I'm now in the process of organizing the tests with the laboratory and have been modifying components of the standard switchgear equipment to meet the needs of new clients," Bernstein explains. She's in continuous contact with clients, suppliers, employees who assemble the prototypes, as well as Schneider's purchasing and marketing departments. She also travels. "I've been to cities throughout France," Bernstein says. "I present the ideas behind the cubicles, display the final product, and discuss any new concerns our clients may have."

Read about another ME alumnus, William Binger, who graduated in 1949, on page 6.

William Binger—Life in the oil business

William Binger has a world of experience to back his advice for today's ME students. "You need the ability to think, and you have to know how to work with people," says the 1949 Iowa State alumnus and retired project manager for Shell Oil Company.

A native of Sioux City, Binger came to Iowa State on the GI bill. A tour of duty in the Navy as a radio/radar technician plus hands-on experience helping his dad, who was an auto mechanic, led him to engineering. While Binger was leaning toward electrical engineering, an aptitude test convinced him that ME was the place for him.

Binger's successful career could be credited in part to **Henry Black**, ME department head from 1946 to 1972. "Henry took care of us," Binger says. "He encouraged us to be active outside the classroom. I enjoyed the interaction. I chaired the ME open house and was active in several other groups. I didn't realize it then, but it was good training for working with people and figuring out how to get them to work as a team."

Following graduation in March 1949, Binger joined Shell Oil Company in Houston. He wasn't too familiar with the oil business but took the job because he and his wife, Virginia, thought Texas would be a good place to live. It turned out the Lone Star State was just the starting point. During 16 months of field training, the family moved 14 times in Texas, Louisiana, and Oklahoma, as Binger got a firsthand look at all aspects of the oil business.

With the exception of two years in an Army Engineering Construction Battalion during the Korean War, Binger spent his entire career with Shell. He and his family lived in New York, California, and many states in between, as well as Venezuela, Wales, and Denmark. Here are some of the highlights.

In 1958, Shell approved Binger's request for an assignment in Venezuela. He was project engineer for Shell's Lake Maracaibo crude oil pipeline, deepwater port, and tank farm projects. Designed to handle six tankers at once, it was, at the time, the largest crude oil export port in South America. Binger was one of only three American engineers on the four-year project. "We worked with engineers from all over the world," he recalls. "Each country has its own way of doing things. It was quite a learning experience, but we got the job done."

Ten years later Binger was on another international assignment—this one in Wales, where he headed the design and construction of a single-point mooring (SPM) port and tank farm. This floating receiving station was an innovative concept designed to allow the use of very large super tankers, which require deep water and ample space to maneuver. The oil is pumped out as the tanker swings around a single point, the SPM, with the tide. Pipelines carry the oil to storage tanks on land and from there to refineries.

In 1977, Shell joined with four other companies to build a similar offshore mooring in the Gulf of Mexico. Binger was selected as vice president of engineering and construction for the Louisiana Offshore Oil Port (LOOP). The project took four years to complete at a cost of $750 million. "Ten percent of the foreign crude oil used in the U.S. comes in through LOOP," says Binger. "From LOOP's storage area, crude oil is transported by pipelines throughout the Gulf Coast and the Midwest."

The American Society of Civil Engineers named LOOP the Outstanding Civil Engineering Project of 1981, and the National Society of Professional Engineers selected it as one of the ten outstanding engineering achievements in the United States in 1982. In addition, the Iowa State College of Engineering presented Binger the Professional Achievement Citation in Engineering in 1983 for superior technical and professional accomplishment.

Binger reconnected with the ME department and Iowa State in the late 70s when Henry Black caught up with him in New Orleans and asked him to present a seminar at Iowa State. Since then, Binger has served on the department's advisory board and in 1989 was elected an ISU Foundation governor and served as a Foundation director for six years.

In tribute to the department and Black, Binger and his wife established the William and Virginia Binger Associate Professor in Mechanical Engineering in 1999 to provide a young faculty member with extra resources for getting his or her career off to a good start. And the Bingers, who count up to 50 moves since their wedding in 1944, are now happily settled in Ames.

Alumni request

If you would like to share information about your career and how your ME education prepared you for it, please send contact information to mglanvil@iastate.edu. Read more about ME alumni at www.me.iastate.edu/.

Fund sends ME students to cultural events

Alice Redington Black used to chide her husband, ME Department Head **Henry Black**, that engineers needed more culture. She didn't just talk about it though; in 1979, she set up an endowed fund to support the performing arts. Since her death in 1982, the fund has provided money to purchase two tickets to each event in the Season at Stephens. As a performance draws close, ME students are notified so they can put their names in a drawing to win two tickets.

"Alice and my father really enjoyed going to plays and concerts and wanted students to have that enjoyment too," says **Bernice Durand**, a generous contributor to the fund set up by her stepmother. "I think Alice felt people should have balance in their lives. Those in the social sciences needed a good background in biology and the physical sciences, and those in engineering needed a background in music and art."

While Redington and Black had been college sweethearts in the 1920s, they had gone separate ways. She worked for the Federal Communications Commission in Puerto Rico, and he went on to become ME department head at Iowa State. Some years later, Black, whose wife passed away in 1961, learned that Redington was back in Iowa and working as a reference librarian. He contacted her, and they renewed their friendship and eventually married.

Thanks to the Blacks' love of the arts, many ME students have been able to attend performances over the years. For 2005–2006, 18 performances ranging from Miss Saigon to the Munich Symphony Orchestra to the Trinity Irish Dance Company are scheduled. Unfortunately the rising cost of tickets has put the program in jeopardy. To ensure that the program continues, Durand has pledged a matching grant.

"I'm a physics professor myself. I think engineering students should have every opportunity to be well rounded and to enjoy the arts," says Durand, who is also associate vice chancellor at the University of Wisconsin-Madison. "This fund allows students, who may not be able to afford it, to attend wonderful events. I was really pleased when Alice set up the fund, and I am happy now to do a matching grant to raise funds to continue the program."

C.Y. Stephens auditorium features a variety of outstanding professional performances each year as part of the Season at Stephens.

For more information on giving to the Alice Redington Black Fund for the Performing Arts or other ways you can support the Department of Mechanical Engineering, please contact Jodi Reinhart at 515 294-1431 or Sallie-Grace Tate, senior director of development, at 515 294-0934, or use the form below.

Your support makes a difference

Generous gifts from ISU ME alums, industry, and others enable our department to continue our tradition of academic excellence. Your contributions are used for

- Scholarships and fellowships
- Start-up funds to attract top-notch new faculty
- Seed money for development of new projects
- Laboratory equipment

In 1980, **Henry Black**, department head from 1946 to 1972, joined with **Hollis "Pete" Hilstrom**, ME'34, to invite alumni to contribute to the Black-Hilstrom Mechanical Engineering Development Fund. Since then, the endowment has grown to more than $2 million with gifts from more than 475 alumni.

Please use this form to contribute or call us at (515) 294-1423 to learn about other ways you can support ISU ME.

The Black-Hilstrom Fund

An Endowment for Mechanical Engineering

☐ I enclose $_____ by check made payable to the ISU Foundation and designated to the Black-Hilstrom Fund.

☐ I enclose $_____ by check made payable to the ISU Foundation and designated to the Alice Redington Black Fund for Performing Arts.

☐ I pledge $_____ to be paid in ___ installments over ____ years. Please remind me each year in _____ (month). Enclosed is my first check for $_____ made payable to the ISU Foundation and designated to the Black-Hilstrom Fund.

☐ I am interested in information on establishing scholarships.

☐ I would like information on planned giving.

☐ I have included the College of Engineering in my estate plan.

Name_____ Date _____

Degree(s)_____ Year(s) granted _____

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My gift ☐ does ☐ does not qualify for a company matching gift.

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We appreciate your support!

Class is global in every way

Executives from Cargill, Inc., Deere & Company, and Rockwell Collins came. So did professors of anthropology, economics, philosophy, and political science. And that's just a sampling of the 24 guest speakers who presented lectures about challenges and opportunities facing businesses and nations as part of "Technology, Globalization, and Culture, a new course offered for the first time this past spring.

Jim Bernard, Anson Marston Distinguished Professor of Engineering in ME, and **Mark Rectanus**, professor of German studies in the Department of Foreign Languages and Literature, developed the class, made possible through grants from Deere & Company and Cargill, Inc. Taught on campus and through Engineering Distance Education, the course offered a cross-disciplinary examination of the impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. In addition to the lectures, the students did extensive reading on global issues and presented a final team project.

David Asuzu, a senior in ME, says the course exceeded his expectations. "Not only did I hear different perspectives on globalization, I talked with leaders in various industries and learned how they run their corporations," he says. Knowledge he gained on such topics as pollution and global warming helped Asuzu get an internship this summer with the Iowa Department of Natural Resources.

Robert W. Lane, CEO, Deere & Company, visits with ME seniors Tracy Fendrick (middle) and Britt Swanson prior to his guest lecture, "Globalization, Technology, and Culture for John Deere."

For more information about the course, visit www.me.iastate.edu/me484/.

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