

A man wearing a red and white plaid shirt and safety glasses is working on a robotic assembly line. He is focused on a metal component being processed by a robotic arm. The background shows a factory setting with various machinery and equipment.

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PARTNER IN \$48 MILLION
DARPA PROJECT

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IMSE faculty and staff met in August 2012 for a retreat at Iowa State's Reiman Gardens.

Front row from left:
Mike Renze, Lizhi Wang.
Second row: Carolyn Heising,
Siggi Olafsson, Janis Terpenny,
Donna Cerka, Lori Bushore,
Guiping Hu, Krista Briley,
Alex Rausch, Leslie Potter.
Third row: Stephen Gilbert,
Matt Frank, Jeff Eichorn,
Frank Peters, Jo Min,
Doug Gemmill, Max Morris,
John Jackman, Rick Stone,
Sarah Ryan.
Back row: Paul Componation,
Dave Sly, Steve Vardeman,
Iris Rivero.
Faculty and staff missing from
photo: Kelsey Smyth, Devna
Popejoy-Sheriff, Michael Dorneich.

Greetings from IMSE!

It is my delight to provide my welcome and greetings from the entire IMSE department. In this edition of the newsletter you will find there have been many new exciting projects, renovations, new faculty and staff, awards, fun events, and points of pride for the department and our alumni.

I cannot overstate how very proud I am (we all are) of the department. Our undergraduate students are in high demand and growing in numbers, now just over 400! Student chapters of IIE and Alpha Pi Mu are big contributors to service in the community, winning awards, and provide invaluable support for educating others about what industrial engineering is and how to succeed. Our graduate students and faculty are engaged in research and advances for practice that are contributing to important national and global challenges in design, manufacturing, energy, healthcare, management, and more. We are very lucky to have a staff that is at the heart of enabling all of our successes and continued growth!

Inside this edition, you will learn more about the 3 faculty and 2 staff who joined the IMSE family this fall semester. They bring much experience and strength to the team. You can read about major funding that has been granted to manufacturing faculty as they collaborate

in a \$48 million dollar DARPA project focused on streamlining design and manufacture of U.S. Department of Defense equipment and another collaborative grant (\$4.1 million from the Department of Energy) focused on off-shore wind energy. You'll also learn about the Center for e-Design and our leadership of this national multi-university industry cooperative research center funded by the National Science Foundation (NSF). Read further and you will find stories of awards that have been bestowed to faculty, staff, undergraduates, graduates and alumni. There is much to report and to be proud of!

We hope you'll keep in touch and stay abreast of the latest news and happenings. Check us out on the web at www.imse.iastate.edu.

We want to hear from you! For alumni - please keep in touch and share your news. For colleagues and friends - we would be delighted to explore opportunities to collaborate and share. How can we help you? Please let us know!

All the best,
Janis Terpenny
Joseph Walkup Professor and Department Chair

On the cover

IMSE graduate student **Ashish Joshi** works on the 4-axis FADAL CNC milling machine in the Rapid Manufacturing and Prototyping Laboratory.

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Wind energy minor launched

Inter-disciplinary approach trains students for wind energy careers

As part of the Wind Energy Initiative, Iowa State University has launched an inter-disciplinary minor designed to prepare its students for a career in one of the most rapidly growing technology sectors, wind energy.

A collaboration among of the university's College of Agriculture and Life Sciences, College of Engineering, and the College of Liberal Arts and Sciences, the 15-credit minor encompasses the wind energy industry's many disciplines— aerodynamics, materials science, mechanics and meteorology, as well as civil and construction, electrical, and industrial engineering.

"We felt that for Iowa State graduates to be more marketable, and to demonstrate that the university is serious about wind energy, we needed to offer this minor," said **Frank Peters**, associate professor in Industrial and Manufacturing Systems Engineering and chair of the Wind Energy Minor Committee.

The wind energy curriculum is a natural fit for Iowa State's prestige reputation in science and engineering education, and for Iowa, which leads the nation in wind energy jobs with as many as 7,000 employees, according to the American Wind Energy Association's U.S. Wind Industry 2011 Market Report. Iowa is also listed as second in the nation in total wind energy capacity behind only Texas, according to the U. S. Department of Energy.

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Team led by Frank & Peters chosen as partner for \$48 million DARPA project

A team from industrial and manufacturing systems engineering at Iowa State University has secured a partnership in a research project aimed at streamlining the design and manufacture of U.S. Department of Defense equipment, including vehicles, weapons, and other complex systems.

The team, led by PI **Matt Frank** and **Frank Peters**, both associate professors in IMSE, will develop manufacturability analysis software and rapid manufacturing systems with the goal of reducing the design-to-build timeframe by a factor of five; a daunting challenge.

The \$48 million, 3-year contract was awarded by the Defense Advanced Research Projects Agency's (DARPA) "Instant Foundry Adaptive through Bits" (iFAB) program, which is part of the agency's Adaptive Vehicle Make (AVM) portfolio. Penn State University's Applied Research Laboratory (ARL) is leading the project in collaboration with several commercial, military, and academic partners, with Iowa State adding rapid manufacturing expertise to the group. The Iowa State team has been contracted for \$2.5 million of the original \$48 million program.

Over the past decade, the Rapid Manufacturing and Prototyping Laboratory (RMPL) at Iowa State has been developing rapid technologies for creating parts at the push of a button. One such technology called CNC-RP is a rapid machining process that can accept a 3D CAD model of a component, and within minutes and no human input, have a computer-controlled milling machine begin creating the part from scratch. This technology attracted the interest of the Penn State ARL team, as rapid design-to-manufacturing is a key topic in the iFAB program.

"The work at RMPL has always focused on time reduction in manufacturing, which made us very well suited to this current challenge put forth by DARPA," explained Frank. The team will also develop manufacturability analysis tools for metal castings, which also builds on previous research by the investigators.

The iFAB program will be supporting another AVM program at DARPA called FANG (Fast, Adaptable, Next-Generation Ground Vehicle). FANG will run a series of national design challenges related to military ground vehicle technologies that will see teams of manufacturing, logistics, and research partners creating a vehicle from the design stage through the manufacturing stage. The iFAB project will provide near-instantaneous manufacturability feedback to designers to ensure the designs can be manufactured, and most importantly, within a timely manner.

The entire process utilized in FANG represents a new, more flexible way to build complex systems and could revolutionize the way defense equipment is developed in the future.

Frank and Peters' team will consist of a minimum of three graduate students, a post-doctoral researcher, and a number of undergraduates from Iowa State. They have also sub-contracted with research teams at both Bradley University and the University of Alabama at Birmingham.

The team has already begun prototyping Design for Manufacturability (DfM) analysis software, which will be used for design participant feedback as part of the FANG challenge. In addition, the team is ramping up efforts to deploy the CNC-RP rapid machining system at two sites, Penn State's ARL and Rock Island Arsenal, to support the actual manufacturing of the vehicle in the final year of the project.

"For us, the exciting aspect of this program is that in three years an actual working military vehicle will emerge from an assembly bay at Rock Island Arsenal, and we'll be part of the team that makes that happen," said Frank.



Frank



Peters

Contributed by ECR



Four Haas CNC vertical milling machines are used to teach CNC programming and machining in several classes, including IE 248: Engineering System Design, Manufacturing Processes and Specifications, shown above. One of the machines is equipped with a Renishaw probing and tool setting system, and an optional 4th axis of control.

IMSE and ME collaborate on manufacturing laboratory upgrades

Since 1999, IMSE and ME have shared several manufacturing teaching laboratories in Black Engineering Building. While both departments have their own classes, the laboratories are scheduled in different weeks allowing both departments to utilize more equipment and space. In 2012, the sharing arrangement was revisited; this was spurred by the need to accommodate growth of record-high undergraduate student numbers and improve the quality of undergraduate education. Support was provided by the Provost Office, College of Engineering, CIRAS and the two departments. The changes resulted in higher utilization of the spaces, more equipment and more modern equipment available to each department, improved safety and appearance, as well as freeing up space for new research laboratories.

The following are some specific highlights:

- The CNC Machining Laboratory is now shared with ME and located in Black Engineering Building. The new laboratory has four new Haas milling machines and an adjoining sixteen seat computer laboratory with four Haas machine simulators to develop and prove out machining code.
- A Satec tensile tester (circa 1960) was replaced with two Shimadzu 300kn tensile testing machines and an Instron servohydraulic fatigue testing machine. Older hardness testers were replaced with three Leco Rockwell Hardness testers.
- The Metrology Laboratory is now shared with ME which gives IMSE access to another CMM and a Zygo optical profilometer.
- In the Welding Laboratory, a Branson ultrasonic welder for joining polymers, a Lincoln Electric and Fancuc robotic welding cell, and a new MIG welder that can be accessed and controlled via a smartphone were added.
- The Metalcasting Laboratory received a dedicated ventilation system. All of the laboratories received a thorough cleaning and reorganization as well as new eyewash stations to improve safety.



Above: New material testing & forming equipment includes (clockwise, from top) three Rockwell hardness testers, a laboratory rolling mill, and two Shimadzu tensile testing machines.



Above: Students in IE348: Solidification Processes work on the new Branson ultrasonic welder for polymer joining.

Below: The Computer Aided Manufacturing Laboratory is dedicated to support advanced manufacturing classes. Four HAAS CNC machining simulators (shown) are used to prove out the machining code before actually producing the part.



Iowa State introduces new engineering management graduate program

A new master's program in engineering management will soon be offered at Iowa State. The master's degree, which was recently approved by the Iowa Board of Regents, consists of 30 credits, split evenly between courses from the College of Engineering and the College of Business.

"Creating the program was initially motivated by our engineering alumni in industry," explained Gary Mirka, associate dean for undergraduate and graduate education and John Ryder Professor of Engineering. "We've found a lot of our alumni who have passed entry-level positions and moved into management are interested in getting more formal training."

In the past, a popular option for alumni has been to enroll in the master's of business administration program that is housed in the College of Business, giving them insight into management and other business-related concepts. But many engineers want a more direct connection between their education and their profession. And so, the engineering management master's degree was developed.

The curriculum offers the engineering perspective behind management by providing skills in project management, production systems management, and technology management. It will be open to all qualifying students with an engineering degree.

"We are in the process of delivering all these courses through distance education so we can provide sessions online over a period of years to engineers already in industry, located all over the world," Mirka said.

Doug Gemmill, associate professor of industrial and manufacturing systems engineering (IMSE), was a strong advocate in the creation of the curriculum. His heavy involvement in the systems engineering master's degree gave him insight into how to develop and run a distance education program.

"Doug really influenced the program in identifying the initial interest through his interactions with industry as well as pinpointing courses that were already offered in both the College of Engineering and College of Business that could meet the needs of the students," explained Mirka.

An important part of the approval process involved reaching out to the state's regent institutions to ensure there was no overlap in similar programs.

"Their support indicates that this is a new opportunity for the state of Iowa," Mirka said. "It gives us a good idea of the success we will see."

Mirka anticipates being able to officially offer the master's degree in January 2013. He says the college expects an average of 20 students will enroll in the first year, growing to around 100 within the first five years.

"Although fairly far down the road, this program may open doors for future growth in engineering management," said Mirka. "A couple things that may come from this is the development of an engineering management minor or a graduate certificate, but for now we are focusing on getting the master's degree established and making a name for ourselves in engineering management."



Mirka



Gemmill

Continued: Wind energy minor launched

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Peters said currently fourteen companies with wind energy interests recruit on campus including manufacturers, wind farm developers and owners, maintenance providers, meteorology, utilities and national laboratories.

"For the student, the minor gets them to see wind energy as truly interdisciplinary, in that the wind resource, machinery, transmission, quality control, economics, construction, and manufacturing all need to be considered to make wind energy a competitive energy resource in the long run. For the industry, the minor makes the graduate's training and qualifications more identifiable."

The minor is available to any student at Iowa State with the necessary math and physics prerequisites. Two core courses, Engr 340X Introduction to Wind Energy: System Design and Delivery, and Aero E 381 Introduction to Wind Energy, are required. The remaining nine credits can be selected from 22 elective courses in engineering and meteorology.

"In this way, a meteorology student, an industrial engineering student, and an electrical engineering student will have the same foundation in the wind energy minor," said Peters, "but their remaining classes will be more closely associated with their discipline."

The Wind Energy Initiative (WEI) at Iowa State University aims to facilitate the nation's achievement of 20 percent of energy from wind by 2030. It would strategically drive heavy wind energy growth in Iowa and the United States through leadership in research, education and outreach. Find out more about the Wind Energy Initiative at Iowa State University at www.engineering.iastate.edu/wei/.

Componation excited about growing graduate programs

Systems engineer **Paul Componation** joined Iowa State's industrial manufacturing and systems engineering faculty this fall with plans to use his 15 years of academic experience to help grow several engineering graduate programs.



Growing up in West Virginia, Componation spent his teen years building and fixing various things at home with his family. So it wasn't a big surprise that industrial engineering seemed like the most natural route for him when he began his undergraduate studies at West Virginia University (WVU).

He received his bachelor's degree from WVU in 1981 and then joined the Air Force, spending the next four years in Europe working as an engineering officer. During his time overseas, he attended Troy State University in Heidelberg, Germany, where he obtained a master's degree in science and management.

"The master's program had a lot of engineers from all the North Atlantic Treaty Organization (NATO) countries, which helped me learn about how different people approach problems in their countries and the cultural influence on the way they solve things," Componation explains.

After returning from Europe, Componation spent a few years in the manufacturing industry before returning to WVU to get his doctorate in 1995. He then went to the University of Alabama (UA) where he has since been working in the defense and aerospace departments.

He taught several system engineering and management courses at UA, focusing on how multidisciplinary teams are organized and managed, and integrating those ideas into building and designing complex systems.

"It is hard to make these complex systems work efficiently if you are only focusing on one area of engineering," says Componation. "I like systems engineering because it takes bits and pieces from all the disciplines and puts them together, giving you a more comprehensive result."

During Componation's appointment at UA, he was commissioned by NASA to support the "return to flight" effort after the Space Shuttle Columbia disaster in 2001. He and a large team of researchers from diverse backgrounds were brought together to devise a solution for preventing ice build-up on the shuttles' external tanks.

Although it was difficult to balance the views of so many people from different disciplines, Componation regards the NASA project as his favorite thus far.

"I worked with a lot of talented people in a high-pressure environment," he explains. "But it was fun taking on such a tough, technical problem, especially since NASA turned us loose to find a solution."

Motivated by challenges, Componation is excited to begin his career at Iowa State, which will start with him teaching an engineering economy course, a topic he feels will be extremely valuable to the future of his students.

"People will always want to know if every idea you devise is affordable," says Componation. "Even if it is the perfect solution, if it's not affordable, no one will allow it."

Componation will also be very involved in graduate programs. He hopes to build the systems engineering graduate program by developing two classes that focus on decision analysis and system life cycle costs. In addition, he looks forward to supporting a new, recently proposed IMSE graduate program.

These sorts of opportunities are why Componation is so enthused about joining the faculty.

"Iowa State has a lot of strong engineering and science programs, and systems engineering is about integrating all those programs together," he says.

In memoriam

David B. Speer (BSIE'73), chairman and chief executive officer of Illinois Tool Works, passed away after an illness in 2012.

During high school, Speer moved with his family moved to northwest suburban Barrington, where he met his future wife, Barbara. The couple married in 1974 and later had two children.

Speer went on to study at Vanderbilt University for two years before transferring to Iowa State University in Ames to be closer to Barbara, who attended college in Des Moines. He graduated in 1973 with a bachelor's degree in industrial engineering.

Before landing a job at Illinois Tool Works in 1978, Mr. Speer worked for Precision Paper in Wheeling and earned his master's from Northwestern University's Kellogg School of Business in 1977, his family said.



At Illinois Tool Works, Mr. Speer began working as a marketing manager. Over the years, he rose through the ranks and held different positions before he was named the Glenview-based company's CEO in 2005 and chairman the following year.

Instilled with a sense of community service, Mr. Speer also served on the boards of various organizations and entities, including Northwestern University, the Museum of Science and Industry and United Way of Metro Chicago. He also was chairman of the Economic Club of Chicago.

Speer also is survived by his wife; a daughter, Sarah Walter; his mother, Mary; sisters Diana Kesler, Debbie Ruthhart, DeeDee Williams, Daphne Turner and Deane Price; and one grandson.

Contributed by ECR

Contributed by Chicago Tribune

Rivero plans collaboration with both engineering and medical researchers

Iris Rivero has made her way around North America throughout her education and career. In her latest move, Rivero trekked from Lubbock, Texas, to Ames, where she joined the Iowa State faculty as an associate professor in the Department of Industrial and Manufacturing Systems Engineering (IMSE).



When Rivero, a native of Puerto Rico, began her education as an undergraduate at Penn State University, she thought mechanical engineering was the field for her, as she had always been intrigued by the ways in which cars and planes were fabricated and operated.

She eventually decided the industrial and manufacturing engineering program was a better fit – it offered her more flexibility in a variety of fields, as well as the option to explore the business side and the manufacturing aspects of any industry.

Rivero earned both her bachelor's and master's degrees from Penn State while conducting research that focused on production planning.

She then took on a different research concentration during her doctoral studies at PSU, working on materials and manufacturing engineering. Incorporating her fascination for aerospace engineering, Rivero explored the use of non-destructive testing techniques to evaluate the fatigue life of ball bearings used in jet engines.

While earning her PhD, Rivero completed three summer internships with Honeywell Engines & Systems in Phoenix, where she performed tool wear analyses, worked on materials selection for jet engines, and evaluated the performance of manufacturing operations for aerospace gears.

Rivero then moved to Texas Tech University, where she has worked for the past 10 years as an associate professor. During her time there, she participated in a summer faculty program at NASA's Marshall Space Flight Center in Huntsville, Alabama, developing bulk manufacturing processes for the fabrication of nanocomposites to be used for extended-stay habitat structures on the moon.

Her research has since shifted to investigating biomedical materials, integrating her passion for sports with her professional interests.

She is currently exploring the fabrication of wound dressing materials to inhibit and eliminate the formation of bacteria. Rivero has also developed a scalable approach for fabricating artificial cartilage. She plans to continue both areas of study at Iowa State.

"The biomedical field intrigues me, and I expect to continue collaborating with researchers in the medical field as well as the engineering field. I am excited that at Iowa State I will have the opportunity to begin exploring my research interests with faculty from the veterinary program," says Rivero. "With all of the great campus faculty and facilities, I think it will fit well with what I am doing."

This fall, Rivero will teach a research and professional development seminar for graduate students, and then she will lead a new biomedical manufacturing course that will be added to the IMSE curriculum for the spring semester.

Rivero says she is eager the move to Ames with her husband, who will also begin working for the university as an associate professor in the English department in the College of Liberal Arts and Sciences.

Contributed by ECR

IMSE alum finds success in healthcare industry

Dan Varnum didn't know when he started in Iowa State's industrial engineering program more than 30 years ago that he'd end up in the healthcare field. The journey that would take him there started during a co-op as an undergraduate and recently landed him in the position of chief executive officer at Mercy Medical Center – North Iowa.

Varnum, a 1985 IE alum, has always had a strong interest in math, science, and analytical processes. After he graduated from Roland-Story City High School, he immediately set his sights on Iowa State. Having learned about engineering from his older brother who was in the university's mechanical engineering program, Varnum knew Iowa State was the place for him.

While at the University, he was a member of Delta Chi Fraternity as well as other engineering student groups. He also took advantage of multiple co-op opportunities over the course of three years, spending time working in Des Moines for Iowa Methodist Medical Center. These experiences are something he says played an instrumental role in preparing him for his future career.

"I did a couple co-ops, working for a semester, going to school for a semester and the following summer, and then working at the co-op again," Varnum explains. "It was the co-op program that got me excited and interested about healthcare and the opportunities for an engineer to be involved in the health services industry."

After graduation, Varnum went to work for the same hospital he had connected with through the co-op program. He also earned a master's degree in business administration from Drake University, graduating from the program four years later.



Over the past 29 years, he has continually grown in his career.

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Dorneich brings industry experience to IMSE



After working in a collaborative environment for 13 years, new industrial manufacturing and systems engineering (IMSE) faculty member **Michael Dorneich** is looking forward to sharing his expertise with Iowa State students and colleagues.

Dorneich attended college at the University of Illinois

at Urbana-Champaign, where he received his bachelor's in 1990 and master's in 1995, both in electrical engineering. While working toward a PhD in electrical engineering, he was intrigued by a professor who combined engineering and psychology. As a result, he switched his focus to industrial engineering and human factors.

After finishing his doctorate in 1999, Dorneich began a career as a principal research scientist at Honeywell International in Minneapolis, where he has been involved in several NASA-, FAA-, and DARPA-sponsored projects. Several prominent projects gained him notoriety in the science and engineering community, and technologies he has developed have earned him eight patents with 20 more in progress.

One such project involves creating advanced displays and controls for the Orion Crew Exploration Vehicle, NASA's space shuttle replacement.

Another was a DARPA-funded program that focused on augmented cognition, generating a real-time measure of a person's workload using biomedical sensors. With this information, he and his colleagues were able to develop a responsive system that could sense worker overload and take over one or more of a person's tasks to help lower workload.

"This project spawned an entire research thrust at Honeywell in neurotechnology and the use of biosensors to detect cognitive states, as well as revitalized the adaptive systems research area to create automation and systems that respond to humans rather than the other way around," explains Dorneich.

Ready for a career shift, Dorneich is enthused by the possibilities that await him in academia.

"As a student, I always appreciated professors who had real-world experience," he says. "So my plan has always been to get some practical experience and then return to academia, but I liked the research so much I ended up staying longer than planned."

Nonetheless, Dorneich is confident the extra years spent in industry will benefit him as a professor. He has experience in research, writing proposals, publishing papers, and working collaboratively with other engineers; all skills he plans to use at Iowa State.

He hopes to continue his work in adaptive systems and create guidelines and principals to help others establish these types of systems.

And while his career has been focused much on research, he is looking forward to the opportunity to teach for the first time since graduate school, starting with I E 572: Design and Evaluation of Human-Computer Interaction during the spring semester.

Dorneich also looks forward to establishing an effective research program that has a tradition of preparing students for their careers as well as developing a strong set of core classes he will teach in coordination with his IMSE colleagues.

"I'm very much someone who likes to work with others, so it was really Iowa State's quality of faculty, resources, and partnerships with outside organizations that attracted me to this position," explains Dorneich.

"I'd really like to build a strong program that allows me to collaborate with my fellow faculty."

Contributed by ECR

Continued: IMSE alum finds success in healthcare industry

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He served as the chief operating officer for a primary care physician group in Des Moines for ten years, followed by three years working for Wellmark, where he became highly involved in advancing the company's process improvements.

For the past nine years, Varnum has been with Mercy Medical Center in Des Moines, serving as a member of the center's executive team and again leading process improvement efforts.

Recently, he was presented with the chance to serve Mercy Medical Center – North Iowa as the chief executive officer. Varnum began his appointment on October 29, 2012.

"Mercy Medical Center – North Iowa is an exceptional organization with great physicians, staff, and a long history of being an innovative healthcare organization, so I'm just excited to be a part of their continued journey to improve healthcare as we head into some potentially challenging times for healthcare organizations nationwide," he says.

Varnum will move to Mason City with his wife, Denise. They have three adult children, two who live in Ankeny and one who is a freshman at Simpson College in Indianola.

Varnum has season tickets to both ISU football and basketball games, and he says he enjoys an excuse to regularly get back to campus and be a part of the university.

"My experience at Iowa State was outstanding and gave me a foundation of learning that has helped prepare me to do what I'm doing today," says Varnum. "My advice for students would be to take every opportunity they can, whether that be internships, co-op programs, or any chance to work in a professional environment where they can get hands-on experience that relates their learning in the College of Engineering."

Contributed by ECR

Terpenny named 2012 ASME fellow

Janis Terpenny, industrial and manufacturing systems engineering department (IMSE) chair and Joseph Walkup Professor, has been named a 2012 ASME Fellow. Her selection as Fellow follows an impressive career wherein Terpenny is known nationally as a leader in engineering design education, research, and practice.

ASME Fellows are nominated by their peers and have had ten or more years of active practice in engineering and continuous membership in the organization. The ASME Board of Governors awards the Fellow grade of membership to worthy candidates in recognition of their outstanding engineering achievements. Only 3% of ASME members are Fellows.

"When the news came that I was selected, I was honored and delighted," said Terpenny. "I am humbled to join the ranks of other ASME Fellows, who are leaders, pioneers, and often very humble and gracious people."

A long-term member, Terpenny has made it a priority to participate in several ASME activities, including serving as an associate editor for the *Journal of Mechanical Design* and chair of the Design Engineering Division (DED) Committee for Broadening Participation of Women and Minorities, both since 2008.

She has also been active in the annual International Design Engineering Technical Conferences (IDETC) for many years, authoring and presenting papers, and serving as review coordinator as well as session moderator.

Terpenny's selection was based on years of contributions to both education and research in the engineering design field. In her work, she focuses specifically on processes and methods of early design; knowledge and information in design; product families and platforms; obsolescence in products and systems; and complexity of products and systems.

She is most widely recognized for co-founding and directing the Center for e-Design, a National Science Foundation (NSF) industry and university cooperative research center.

"Over the years, the center has seen considerable success, growing from the initial two universities and ten company members to now seven universities and nearly 40 companies. An additional two universities are in the process of joining the consortium," she explained.

She has also made a name for herself among many prominent organizations in engineering. Besides her role as keynote speaker at several venues, she has served on the organizing committee of two Harvey Mudd Workshops in 2009 and 2011, and the 2010 National Capstone Design Conference. Additionally, Terpenny has served as the co-editor of special issues for the *International Journal of Engineering Education (IJEE)*. She is also a Fellow of IIE, the Institute of Industrial Engineers.

Terpenny previously served as a program director in the Division of Undergraduate Education (DUE) at NSF for TUES, MSP, STEP, and S-STEM programs. In this role, she delivered seminars and workshops nationally, made funding recommendations, and managed grants. She says she did these things with the intent of mentoring the engineering education community, inspiring and promoting systems thinking and integrated approaches in design education that are grounded in sound research methods.

Terpenny's career as a teacher and scholar has led to her managing over \$7 million in sponsored research and authoring 140 peer-reviewed publications.

Her 2011 appointment as chair of IMSE at Iowa State has fostered departmental growth in several areas, including a sharp up-turn in research productivity; increased collaboration across departments and colleges in research and teaching; and setting up the Iowa State site of the NSF Center for e-Design.

"It has been an exciting and fast-paced year for me," Terpenny explained. "My first year with IMSE has included much activity and optimism in the department and for me personally. I am quite proud of the many accomplishments we have seen in such a short period of time."



Contributed by ECR

New faces

Angela Stone

Administrative Specialist, Center for e-Design



Angela is responsible for the fiscal management of the Center for e-Design, event planning and management, and PR and marketing. Angela received a B.S. in Business Management and a B.A. in Art and Design from Iowa State, and she is completing an M.P.A. in Public Administration from Iowa State. Before working for the Center for e-Design, Angela worked as the part-time Administrative Specialist for the University Museums and as the part-time Women with Initiative Coordinator of United Way of Story County.

Holly Twedt

Program Assistant, Systems Engineering



Holly assists the Director of Graduate Education by coordinating services and activities within the Systems Engineering & Engineering Management Programs. She works with the admissions process, supports program-related activities and tracks student curriculum requirements. Holly is an ISU graduate, and prior to joining IMSE, she worked in the ISU Human Resources Department coordinating the ISU Student & Scholar Insurance Program.

Wind Energy Manufacturing Laboratory heads out to sea

Engineering professors at Iowa State University are part of an international, collaborative research team recently awarded \$4.1 million from the Department of Energy (DOE). The team, led by Sandia National Laboratories, also includes researchers from the University of Maine (UMaine), TPI Composites, and Delft University of Technology (TU Delft).

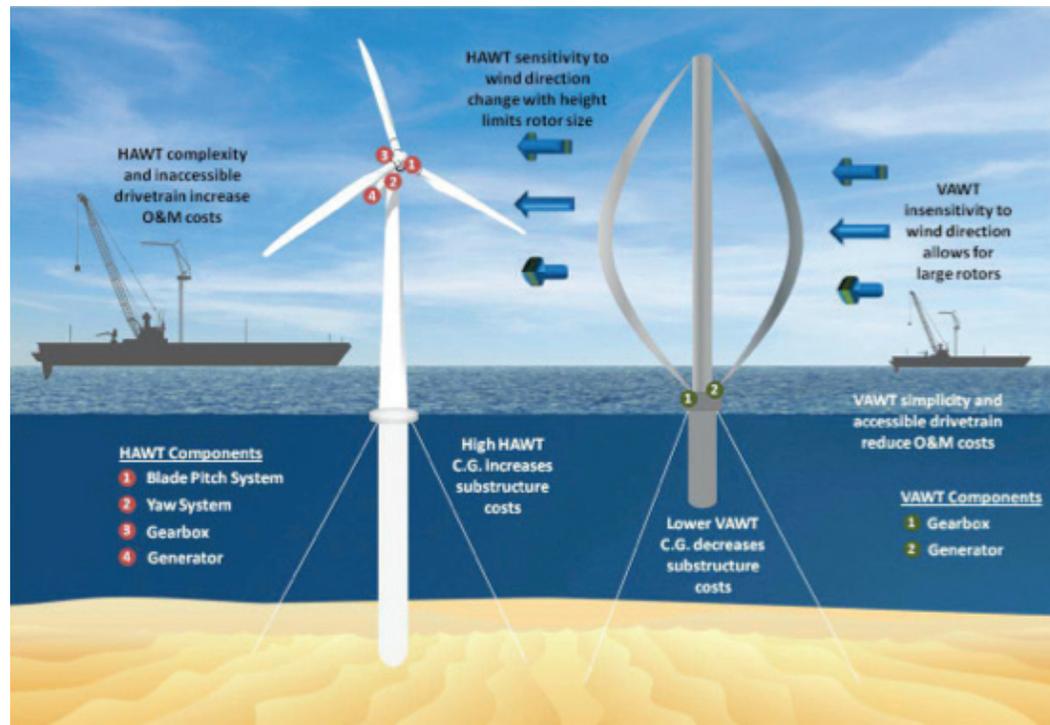
Iowa State's researchers, who will receive \$1 million of the funding, include **Matt Frank, Frank Peters, and John Jackman**, associate professors of IMSE; Vinay Dayal and Hui Hu, associate professors of aerospace engineering; and Partha Sarkar, professor of aerospace engineering.

Their project, "Innovative Offshore Vertical Axis Wind Turbine (VAWT) Rotors," will investigate creating offshore turbines with production capacities of up to 15 megawatts of power and blade lengths over 150 meters, compared to typical onshore turbines with 40 meter blades and the capacity of 1.5 megawatts. The team will not be applying these modifications to the typical turbine design, though.

"The U.S. has considerable wind resources off our coasts; however, much of that is in very deep water," explained Frank, PI for the project. "Putting up traditional towers will not work due to maintenance issues."

In traditional towers, or horizontal-axis wind turbines (HAWT), the blade pitch system, yaw system, gearbox, and generator are all located near the top of the tower. If placed in deep waters, not only will a HAWT increase structure costs through an additional submerged base, it will also increase maintenance and operation analysis costs because large equipment would be needed to reach the top of the turbine.

Instead, the team will be looking at creating a floating wind turbine that is anchored to the ocean floor and has a VAWT rotor. Using a VAWT, the gearbox and generator can be located just above the surface of the water for easy access. In addition, the insensitivity to wind direction will allow the group to create larger rotors.



The figure above is a comparison of HAWT and VAWT Machines for Offshore Deployment.

Given the capabilities of the contributors and the international aspect of the team, the group will tackle a range of tasks, including developing a new rotor design (directed by lead researchers from Sandia and TU Delft); understanding the best manufacturing processes (with insight from Iowa State and TPI); and testing designs in the wind tunnels at Iowa State and the wind-wave test pool at UMaine.

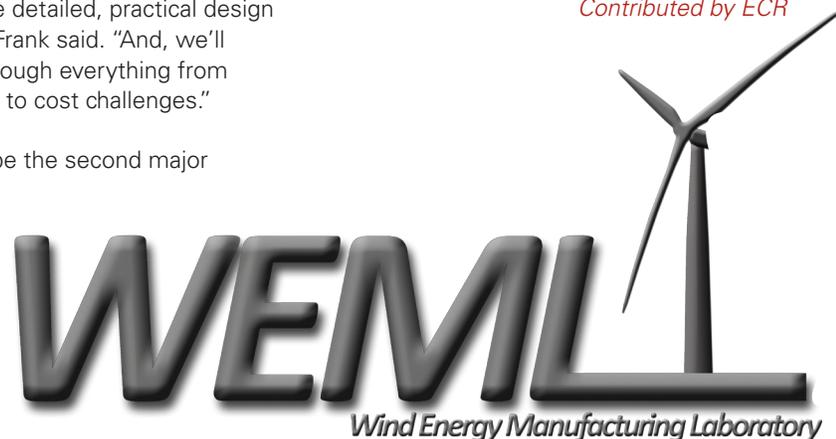
"Combining resources from a national laboratory, academic institutions, and an industrial partner will enable our team to quickly move from innovative, early concepts to more detailed, practical design considerations," Frank said. "And, we'll be able to run through everything from manufacturability to cost challenges."

This project will be the second major initiative for the Wind Energy Manufacturing Laboratory (WEMML) that is led by the

IMSE department. Frank, Peters, Jackman, and Dayal, in collaboration with Sandia and TPI, are currently working on another, \$6.3 million project, "The Advanced Manufacturing Innovation Initiative," aimed at developing better methods to manufacture and inspect HAWT rotor blades.

"The addition of this new project offers WEMML the opportunity to expand its national and international research, as well as contribute to the advancement of the wind energy industry," Frank said.

Contributed by ECR



Faculty and staff honors

Administrative specialist **Jeff Eichorn** received the Dean's Staff Excellence Award from the College of Engineering in recognition of his service to IMSE and the college.



Eichorn

Associate professor **Frank Peters** received the Superior Engineering Teaching Award from the College of Engineering for excellence in teaching.



Peters

Associate professor **Iris Rivero** received the Woman of the Year Award in the Education category from the Hispanic Association of Women (HAW). The mission of HAW is to organize the efforts of Hispanic women since 1983 by promoting education, defining issues of concern, forming coalitions, resolving problems, developing leadership skills and empowering women and youth.



Rivero

Kirpes named 2012 Tau Beta Pi Laureate

Carl Kirpes, senior in mechanical engineering and industrial and manufacturing systems engineering, was selected as one of five 2012 Tau Beta Pi Laureates, an honor bestowed on only 83 students since 1982.

Tau Beta Pi looks among its members each year for outstanding students with talents outside the field of engineering – including the arts, athletics, diverse achievements, and service – to apply for the Laureate Award. Kirpes received the award for diverse achievements.



Kirpes completed his coursework in August 2012, earning degrees in both mechanical engineering and industrial and manufacturing systems engineering, while also graduating in the top two percent of his engineering class.

Entering the College of Engineering in Fall 2008 while enrolled in the University Honors Program, Kirpes immediately took advantage of the many opportunities the university had to offer. As a member of the ISU football team, Kirpes says he enjoyed his time playing under coach Paul Rhodes for two seasons before a surgery prevented him from continuing.

"It was a great experience for me," says Kirpes. "I learned a lot about being all-in and achieving goals both on and off the field."

In addition to athletics, Kirpes participated in many organizations, and was often honored for his hard work and success.

He participated in the Engineering Leadership Program, served as vice-president of Order of the Rose and Chessman, was president of both the Cardinal Key and Alpha Lambda Delta/Phi Eta Sigma honor societies, and was a member of the Motor Board, Golden Key International, and Phi Kappa Phi honor societies. Kirpes has also been recognized as an All-Cyclone Team Captain, as well as with the High Scholar Athlete Award, University Honors Program Outstanding Student Award, and Wallace E. Barron All-University Senior Award, just to name a few.

While earning his degrees, Kirpes was a part of several undergraduate research opportunities. As a freshman, he worked with ME professor and new Senior Vice President and Provost, Jonathan Wickert, assisting with research on the lateral vibration in magnetic tape transport. Kirpes later began working with assistant professor of industrial and manufacturing systems engineering (IMSE), Lizhi Wang, studying the future impact hybrid vehicles will have on the electricity market.

Kirpes spent his junior year working with Joseph and Elizabeth Anderlik Professor of Engineering Judy Vance in the Virtual Reality Applications Center. There, he performed an analysis of a single-wall versus multi-wall immersive environment on shopping experiences for consumers. The study led to a published research paper that was presented by Vance at the ASME 2011 World Conference on Innovative Virtual Reality.

With help from Dave Sly, IMSE senior lecturer and president of a company called Proplanner, he went to work at the company and assisted with implementing industrial engineering systems-based software in manufacturing companies and helped install and teach the software at colleges and universities.

Upon graduation, Kirpes plans to move to Kansas City, Missouri, where he will begin work for GENESYS Systems Integrator.

"I'm fortunate to be able to take the knowledge and experience I gained during my time at Proplanner and apply it at GENESYS Systems Integrator," Kirpes explains.

Kirpes will rotate through the different departments at GENESYS, learning more about the company and eventually moving into an engineering sales position. He will have the opportunity to work in management and explore the potential of building of a new department centered on Proplanner software.

Pursuing a master's degree in systems engineering is also on his agenda. He started taking distance education graduate courses this fall at Iowa State, to help him stay connected with the institution he feels has given much to him over the past four years.

"All the people here in the Iowa State community who have mentored me and helped me along the way have contributed significantly to my success," says Kirpes.

"From the professors I have done research with, to my current boss, to the advisers of the organizations I have been a part of—working with and learning from each one of them has been a stepping-stone toward the next opportunity. Everyone here is striving to help students achieve, and I am very appreciative of that."

Kirpes was recognized for his achievement with a plaque and \$2,500 at the 107th annual Tau Beta Pi Association Convention in September in Lexington, Kentucky.



Industrial members, researchers, and students attended the Center for e-Design Industry Advisory Board met October 9-11, 2012 in Niagara Falls, NY.

Iowa State leads NSF Center for e-Design

Iowa State University, known for teaming up with industry in its research endeavors, is now taking that partnership approach to a new level as the lead institution in the Center for e-Design.

The Center for e-Design is a collaborative research partnership organized and funded under the National Science Foundation's Industry/University Cooperative Research Centers Program (I/UCRC). Iowa State assumed lead institution status for the center in October, part of seven universities and over forty companies with the goal of finding innovative solutions to engineering challenges in industry.

The center was first formed in 2003. Janis Terpenny, who joined Iowa State in August of 2011 as the Joseph Walkup Professor and chair of the Industrial and Manufacturing Systems Engineering Department, is the center's director. She co-founded the research center while on the faculty of the University of Massachusetts, brought Virginia Tech into the consortium while on the faculty there, and has worked closely with a team of faculty across several departments and colleges for the now successful addition of Iowa State. Judy Vance, the Joseph C. and Elizabeth A. Anderlik Professor of Engineering and professor in the Mechanical Engineering Department, is the site director for the Center for e-Design at Iowa State.

"There are so many wonderful things going on at Iowa State that are pushing the boundaries of how products and systems are designed and built, as well as how students are educated and trained to be innovators and take on these challenges. To my delight, some of the collaborators I have worked with for years were already in place here," said Terpenny. "Part of my recruitment to this appointment was the support and enthusiasm for bringing the Center for e-Design to Iowa State."

The Center for e-Design focuses on the design and realization of products and systems, with industry and academia working collaboratively.

"The question is, how can we do things faster, smarter, and at less cost?" says Terpenny. "In academia we are increasingly interested in advances that cross domains and are widely applicable. This consortium addresses this. Whether the challenge is related to the design of aerospace or farm equipment or automotive manufacturing, many of the same strategies or solutions would benefit all of them."

Involvement in the research coalition pays big dividends not only to higher education, but also to the companies who fund the projects through their membership.

"At the university it's a wonderful way to bridge research and practice," says Terpenny. "Faculty and students are solving fundamental problems, but they are also informed about what those problems truly are and develop proof of concept solutions. They get a lot of very valuable feedback from industry as they make progress."

In turn, explains Terpenny, the companies involved have access and rights to the scholarly publications and inventions that come out of the consortium agreement.

"For a modest investment they have access to all the research, and all the projects in the center across all the universities. They are actually benefiting quite a bit more than if they had just a single directed project with a single university," says Terpenny. "In addition, many companies enjoy working with, and in many cases hiring, our very best students."

Vance's leadership has been key to building the team at Iowa State that includes collaborations involving 34 faculty members in the College of Engineering, the College of Design, the College of Business and eight industry partners

"Being able to present potential research projects to industry representatives is one of the benefits for faculty involved in the center," said Vance. "Often times it can be hard to get access to the right industry contacts. With the center organization, faculty have access to industry leaders who have already demonstrated their interest in Iowa State and research by joining the center."

Vance said the Center for e-Design has launched three projects: one with a goal of improving supply chain performance through inclusion of warehouse logistics; a second with a goal of improving and expanding an educational program to identify high school students with aptitude for engineering; and a third that is focused on product design strategies and support for decision-making that help to predict and avoid negative impacts from product obsolescence.

More projects will follow, said Vance, with additional opportunities for networking and funding.

"It's all about building a community on campus that has complimentary skills and design capabilities," she said. "The more tightly we are able to work as faculty, the more we're exposed to each other's ideas and to the challenges of industry, the bigger opportunities and funding we'll find."

Learn more about the Center for e-Design at its website: www.center4edesign.org

Alumni updates



The board of directors of Bravo Greater Des Moines, the Iowa Region's Art Council, elected **Sharon Krause (BSIE'90)** to be its new president for a one-year term.

Sharon Krause graduated from Iowa State with a B.S. degree in industrial engineering and a minor in Spanish. She then went on to receive an Executive Master of Business Administration from The University of Iowa.

Bravo Greater Des Moines - The Region's Arts Council is a nonprofit organization committed to strengthening the metro area's arts and cultural community as a key element of a world-class quality of life.

The ISU Alumni Association honored **Warren (BSIE'61)** and **Beverly Madden and Rudolf Herrmann (BSIE'73)** with the Alumni Medal. The award recognizes ISU alumni for long loyal service to the university through alumni-related activities.

For four decades, Rudy Herrmann has displayed consistent devotion to Iowa State University and given countless gifts back to the institution he admires. He has been a true friend to ISU in every sense of the word.

An ISU Foundation governor and member of the Foundation's board of directors, he chaired the College of Engineering's national volunteer team for Campaign Iowa State:

With Pride and Purpose, which raised its goal of \$135 million to support engineering students, programs, and facilities. In 2010, the Foundation presented Herrmann with its prestigious Cardinal & Gold Award.

Herrmann has been a loyal friend of the College of Engineering through his involvement with the Dean's Advisory Council, the Industrial and Manufacturing Systems Engineering Industrial Advisory Committee, and the search committees for both the College of Engineering dean (2009) and university president (2011). In 1997, he proudly served as the first "executive in residence" for the department of industrial and manufacturing systems engineering. In 1998 the College of Engineering presented him with its Professional Achievement Citation, and he also received the college's 1990 Professional Progress in Engineering Award.

The retired president and CEO of Dover Resources, Inc., in Tulsa, Okla., Herrmann is a fellow of the Institute of Industrial Engineers and served as a member of its board of trustees from 1990-1992. In addition to his involvement at Iowa State, he remains very active in his professional and local communities, including service to Goodwill Industries of Tulsa, the Oklahoma Chapter of the Nature Conservancy, the Oklahoma Water Resources Board, and Oklahoma State University.

Herrmann, who earned an MBA from Harvard Business School in 1975, is an ISU Alumni Association life member and a member of both the Order of the Knoll W.M. Beardshear Society and Campanile Society. He and his wife, Deborah, live in Tulsa.



ISU President Steven Leath presents the Alumni Medal to Rudolf Herrmann.

For more than half a century, Warren and Beverly Madden have epitomized service to Iowa State University: through their professional careers, through their volunteerism, through their philanthropy, and through their service to the Ames community.

Warren has served as the university's senior vice president for business and finance since 1984, and Beverly is a retired College of Human Sciences faculty member who directed the university's career services office. To list all the boards, committees, and university activities with which the Maddens have been involved would be impossible. Warren has served in university administration with five presidents and several interim presidents. Beverly touched the lives of countless students as a teacher, mentor, and advisor. Together they raised two sons who are also ISU alumni.

In 2009, the ISU Foundation presented the Maddens with the Order of the Knoll Faculty and Staff Award, and they have both received numerous other honors from professional, community, and university organizations. Beverly has served on the ISU Foundation Board of Governors, the College of Human Sciences' Dean's Advisory Council, and the college's national campaign committee. Warren is also a member of the Foundation Board of Governors and has served as treasurer of the Alumni Association for 40 years.

The Maddens have been extensively involved in the community. Warren is the United Way of Story County's former president, twice campaign chair in 1975 and 2004, and he received the agency's 2003 leadership award. Beverly is a former co-chair of the United Way's Women with Initiative group. In 2011, she received the Ames YWCA's annual Woman of Achievement Award.

The Maddens are ISU Alumni Association life members and sustaining life donors, Cyclone Club members, and Order of the Knoll W. M. Beardshear Society members. They have two sons: Walter R. Madden ('84 computer engr) and William M. Madden ('87 computer engr).



Warren and Beverly Madden on the ISU campus.

2012: A LOOK BACK



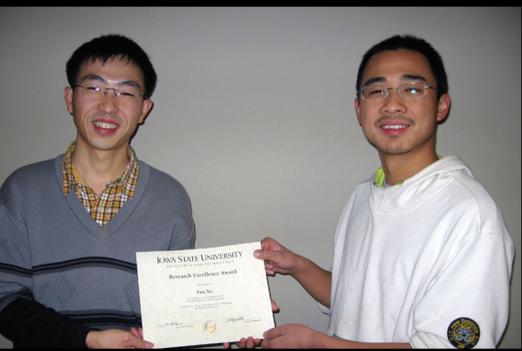
Above: IMSE students were recognized with honors, awards, and scholarships at the Spring 2012 IMSE Awards Banquet in the Howe Hall Atrium.
Below: Carolyn Heising, Paul Compton, Stephen Gilbert, Janis Terpenny, Nina Orfi, Liyu Zheng, and Iris Rivero attended the IIE Annual IE Conference & Expo in May 2012 in Orlando, FL.



Above: Sarah Ryan presents Shan Jin with an ISU Research Excellence Award.
Below: Lizhi Wang presents Pan Xu with an ISU Research Excellence Award.
Far below: Leslie Potter presents Bill Rowcliffe with an ISU Teaching Excellence Award.



Above: The Annual Deming Institute Conference was held on the ISU campus October 5-7, 2012. Students, faculty and industry professionals attended the conference hosted by The Deming Institute, a nonprofit organization that strives to promote an understanding of the Deming System of Profound Knowledge to advance commerce, prosperity, and peace. Pictured: Janis Terpenny, Gary Mirka, Carolyn Heising, and Dave Sly.



Right: The annual fall picnic provides IMSE students, faculty, and staff the chance to meet and chat outside the classroom. The picnic is held on the ground floor in Black Engineering, with a grill set up in the courtyard. Pictured: Siqi Zhu, Kuntal Barhate, Huiyi Zhang, and Ashish Joshi.

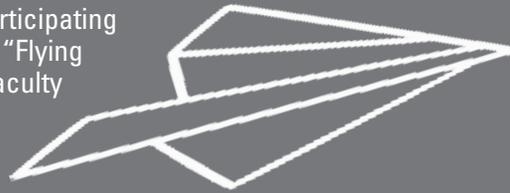




Clockwise from left: Guiqing Hu and her team really get excited about the competition; Rick Stone works intently on the project; Dave Sly and his students have a fun time making paper airplanes.

FLYING WITH FACULTY

IMSE faculty members and first-year students spent an evening in Howe Hall participating in a fun dinner and activity called "Flying with Faculty." The students and faculty members had to work together in teams to optimize the process of making paper airplanes.



Clockwise from left: Students rush to get materials; Department Chair Janis Terpenny throws a plane during the competition; Frank Peters works with his team of students; Doug Gemmill and a student prepare a plan of attack.



**Department of Industrial & Manufacturing
Systems Engineering**

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