IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Department of Mechanical Engineering

Vol. 8, No. 2

ME update

Fall 1998

Re-engineering Engineering Education

Last spring, the students in ME 410 proved that *re-engineering engineering education* is more than just a catchy phrase.

Working in teams, they designed, built, and demonstrated nearly a dozen different projects including an automobile anti-theft device, a satellite dish positioning system, a computerized cappuccino maker, and a fully automated compact disk player. Each group of students developed its project using three "tools" not generally found in an ME lab: sensors for measuring outside phenomenon, microprocessors for computational manipulation of data, and actuators for influencing the outside world.

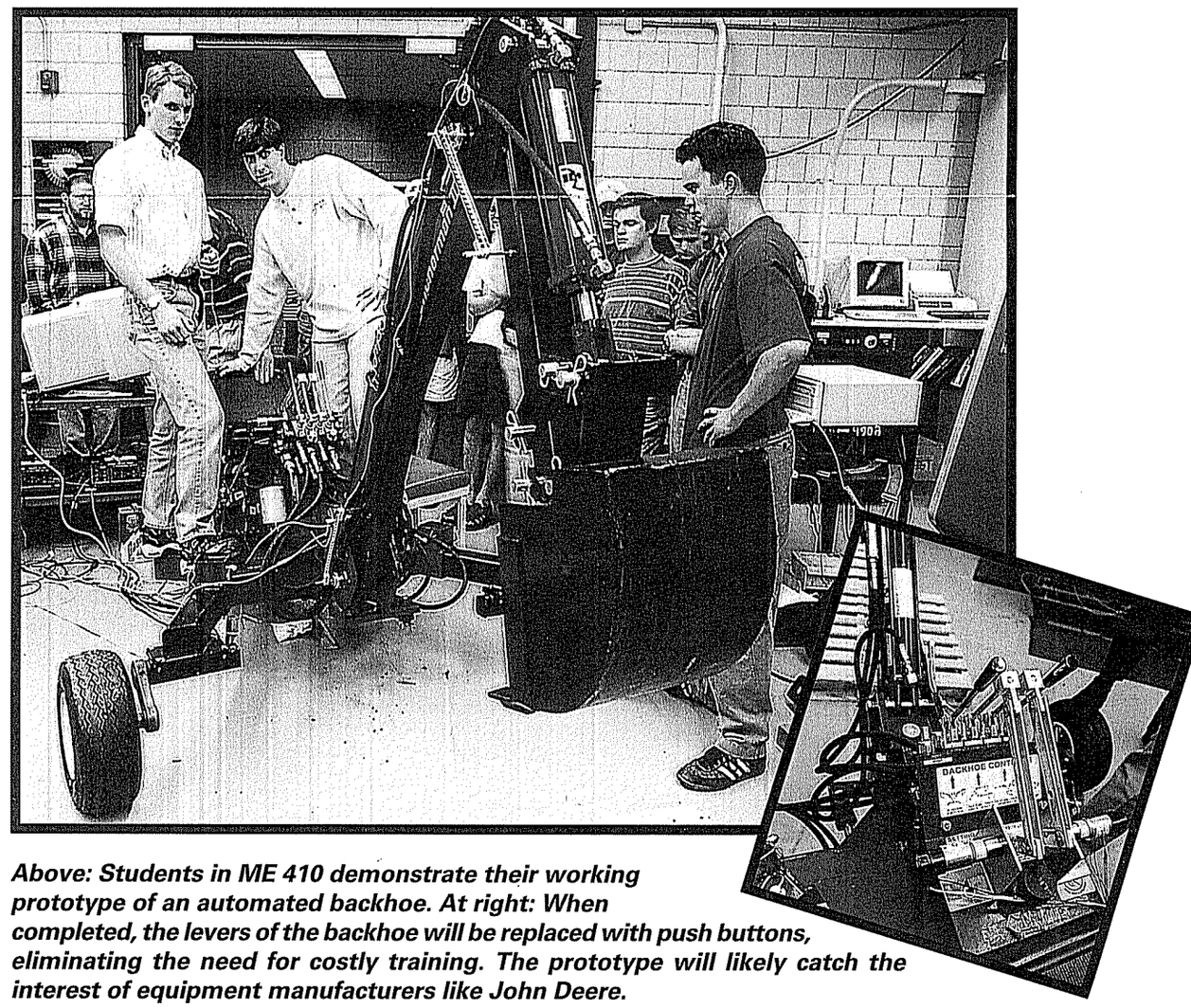
"The work in this class serves as a bridge between electronics and mechanics," explains Associate Professor Greg Luecke, who teaches ME 410. "It's our approach to re-engineering engineering education: present the theory for each of these categories and then provide hands-on opportunities for students to apply the theory to a project."

The combined study of mechanical and electronic systems is called mechatronics. According to Luecke, the term was coined about 10 years ago by the Japanese but it's gained popularity recently as microprocessors become more prevalent in commonplace objects like cell phones, children's toys, TV remote controls, and dishwashers.

"Ten years ago, a product like a bread machine would have been designed by two engineers - one with a background in electronics who knew about temperature sensors and timers, and one with a background in mechanical systems who knew about motors and heating elements," says Luecke. "But in this age of so-called 'lean manufacturing,' it's a good idea to have an engineer who knows about the mechanical and electronic components of a product.

"Bottom line? Hopefully, products that work better and cost less."

Some of the projects designed by Luecke's students extend beyond the classroom. Last spring, seven students demonstrated their work on an automated backhoe. The students computerized the hydraulics of the machine, replacing levers with push buttons. Work on that project continues; students are completing a prototype of a machine that will likely catch the interest of equipment manufacturers like John Deere.



Above: Students in ME 410 demonstrate their working prototype of an automated backhoe. At right: When completed, the levers of the backhoe will be replaced with push buttons, eliminating the need for costly training. The prototype will likely catch the interest of equipment manufacturers like John Deere.

"Right now, the person who pushes the levers plays the role of the computer," says Luecke. "If the hydraulics are automated, the operator can concentrate on other aspects of the job. Additionally, automation will eliminate the need for expensive operator training."

Eventually, computers also might be used to automate the machine's repetitive motions, compensate for changing load conditions, and recognize when a scoop or bucket is full.

Japanese engineers have automated some of the functions of the equipment produced in their country - levers are coordinated so that they move in only one direction - but the prototype that grew from Luecke's mechatronics class is a first step towards producing a backhoe with a fully automated hydraulics system.

Mechatronics isn't just for mechanical engineers. In fact, the new mechatronics lab in Black is a collaborative effort between mechanical and agricultural engineering. The work done there will help ME students recognize ABE problems, and help ABE students learn to use the tools available to them as they seek solutions to their own challenges. ME

The diversity of the projects developed by the ME 410 students was impressive. In addition to the projects described, the students designed:

- A laundry alert system for apartment dwellers and students living in college dormitories. A signal is activated when the washer and/or dryer completes its final cycle.
- A remote car starter with a built-in theft deterrent system. This device lets drivers start their cars from the comfort of their homes or offices.
- An automated CD player that opens for loading when a new disk is pulled from the rack.

Notes from the Chair

This fall's undergraduate enrollment in mechanical engineering is 800, our retention numbers are improving, and 60 of our students are women. The job market for mechanical engineers remains strong. A milestone was reached with the Spring 1998 commencement, when the total number of mechanical and nuclear engineering Bachelor of Science degrees awarded by the Department since 1891 exceeded 6500. Several of these degrees are due to a family tradition of graduating from Iowa State's Mechanical Engineering Department that goes back for generations; something I hope will continue. Another milestone was reached on May 15, 1998, when URT-10, the second reactor for teaching and research on a university campus in the US, ceased operations after nearly 40 years. This reactor and the Nuclear Engineering faculty who used it produced many distinguished alumni who are leaders in industry and academia today. One of these alums, Dr. Edward Walsh, MSNE'63, is the founding president, now president- emeritus, of the University of Limerick and a recipient of the 1998 Professional Achievement Citation in Engineering. We are working on a special feature for *MEInsight* on Nuclear Engineering at ISU. So if you are a graduate of the program or have story lines to contribute, please let us know.

Another milestone you will read more about in this issue is the Engel Professorship in Mechanical Systems. I want to thank Mrs. Kathryn Engel and her son Dale Johnson (BSME'60, MSME'63) for this additional vote of confidence in the Department. I say additional, because the Raymond A. Engel Manufacturing Lab endowed by a similar gift in 1984, is an outstanding facility for education and research, and plays a key role in recruiting students. We are in the process of recruiting a person for the Engel Professorship which we see as a position of national leadership in mechanical systems, complementing the Bergles Professorship in Thermal Systems.

At the end of the Fall '98 semester, Professor Alfred Joensen retires after 39 years of service to the Department and Iowa State University. He is an expert on fossil-fueled power plant design and his courses, while never characterized as easy, are lauded for integrating the theory and practice of engineering in a way very close to industrial practice. Al is nationally recognized as an expert on solid waste incinerator operations and design. Because of his knowledge in this field, from 1990-96 he chaired the ASME's Performance Test Code Committee 45 – Emissions from Municipal Waste, which develops the *de facto* national standards for incinerator emissions.

Finally, on the outside chance that you haven't been able to keep up with Cyclone football, bragging rights in the state of Iowa belong to ISU this year. And Todd Bandhauer, the quarterback, will soon join the over 6500 alumni of the Department, and he will do it with an outstanding academic record. As graduates of the department you know the commitment to be an ME, you may also know the time commitment required of a college athlete, but being a scholar-athlete is truly an accomplishment!

Warren R. DeVries

Two Join ME Advisory Council

The Mechanical Engineering Advisory Council welcomes two new members, Charles Culp and Charles Wu.

Charles H. Culp is Director of Research at Fisher Controls International, Inc., in Marshalltown, where he also makes his home. He received his undergraduate degree in physics in1970 from New Mexico Institute of Mining and Technology and his doctoral degree in physics in1979 from ISU.

After earning his Ph.D., Culp worked for Interand Corp. and Honeywell, Inc. From 1990-1993, he was an adjunct faculty member at Harper College, Palatine, Illinois, teaching all courses in the calculus-physics series. He joined Fisher Controls in 1994 as Deputy Director of the Emerson Advanced Materials Center, Columbus, Ohio. He was Director of Engineering at Alco Controls from 1995-1997, and Director of Emerson HVAC/R Advanced Development Center from 1995-1997.

Culp is a senior member of the Association of Energy Engineers and a member of the American Society of Distinguished Patent Holders. An active member of the Marshalltown community, he has worked with schools in his area to raise interest in technology and has served as a Boy Scout Explorer advisor.

Charles Wu has been a member of the Ford Research Laboratory for 23 years. During the early phase of his career at Ford, he was involved in research and development on engine systems and manufacturing technology. Since 1992, he has held various management positions, including Manager of Manufacturing Systems, Manager of Engine and Processes, and currently Director of the Manufacturing and Vehicle Design Research Laboratory. His work includes research in manufacturing systems, material engineering applications, vehicle safety research, and computer-aided engineering technologies.

Wu has led a variety of advanced research programs, including the development of in-process and end-of-line engine diagnostics technology, machinery noise abatement, machine tool technology, manufacturing system control, advanced CAD/CAM, and rapid prototyping. He has participated in several studies in design and manufacturing sponsored by the National Science Foundation.

During his career at Ford, Wu received several awards for his contributions in advanced state-of-the-art manufacturing control to ensure production access quality. He has spoken at dozens of universities, is active on many university advisory boards, and is a member of many engineering organizations.

Wu received his undergraduate and doctoral degrees in mechanical engineering from the University of London.

The ME Advisory Council is comprised of members from business and industry who serve three-year terms. The group meets twice a year to advise members of the ME department on issues dealing with industry, changing technology, educational programs, and research directions.

FIRST team prepares for robotics competition

A team of Iowa State engineering students, Ames High School students, and John Deere Des Moines Works engineers are gearing up for their third robotics competition. The national event will be held next spring in Florida

The team has a plan to walk away with top honors: Some of the Ames high school students who competed last year are now freshman students at Iowa State, giving the group additional experience and a competitive edge over other participants.

The purpose of the FIRST (For Inspiration and Recognition of Science and Technology) competition is to show students that careers in science are exciting and rewarding. The group has six weeks to design, build, test, and ship a robot that can compete in basketball-type drills. A kick-off workshop will be held in January. Each group will be given two tubs of parts – including a 12-volt battery, a programmable controller, and motors – to use in constructing the robot. The finished product has to fit in a shipping crate that is 30 inches wide, 36 inches long, and 48 inches high.

"This is an outstanding experience for everyone on the team to work towards a goal under real-world time constraints," said Don Flugrad, associate professor of mechanical engineering who is also involved in the competition. "It's a great way for students to see what engineering is all about."

Last year, time constraints hampered the group's efforts. Flugrad said, "We had a good mechanical design but we had problems getting our controls working properly." The group wants to accelerate the schedule this year with the bulk of the work being done in January.

Each year the competition is held in Orlando, Florida, at EPCOT Center. Last year,the Iowa group included five engineers from John Deere Des Moines Works, seven Iowa State students, and 18 Ames High School students. Flugrad hopes to have at least the same number of people involved this year. The group works from a $30,000 budget provided by their sponsors, including John Deere, Fisher Controls, Sauer-Sundstrand Company, Fridgidaire, Pella Corp., and Engineering Student Council.

Department Dynamics

PWSE honors Flugrad

Associate Professor Don Flugrad received the 1997-1998 Anna Pate Mentoring Award. His award was presented at the Program for Women in Science and Engineering banquet in September, recognizing his efforts at promoting the interests of young girls, women, and other underrepresented groups in science and engineering.

Vance is invited

Associate Professor Judy Vance was invited to attend the National Research Council's First German-American Frontiers of Engineering Symposium in Dresden, Germany. She was one of the first participants to receive the invitation. She was also the recipient of the the 1998 College of Engineering Superior Teacher Award.

Engel Professorship

Kathryn A. Engel established the Engel Professorship in Mechanical Systems with a $500,000 gift in memory of her late husband, Raymond Engel. Mr. Engel, who was Vice President in Charge of Engineering for Fisher Conrols of Marshalltown, Iowa, was well known in the engineering profession for his contributions to modern control valve design.

Faculty honors

Professor James Bernard received the 1998 Tire Science and Technology Superior Paper Award. Associate Professor Gregory Maxwell was named the 1998 Outstanding Mechanical Engineering Professor by the Engineering Student Council and the 1998 Professor of the Year by Pi Tau Sigma.

ME Assistant Professor Ivan Maldonado received a MIND Award at the ASEE national meeting in Seattle. Shown here are, left to right: Daniel Davis, Chair of the ASEE Minorities in Engineering Division; Maldonado; Kenneth Roberts, North Carolina AT&T; Helena Solo-Gabriele, University of Miami; and John Chen, the division's awards officer.

Luecke honored

Greg Luecke was promoted to associate professor with tenure effective last spring. He was also the recipient of an SAE Faculty advisor award for his service and dedication in working with SAE and promoting student activities.

Shapiro is vice provost

Howard N. Shapiro, a faculty member in mechanical engineering since 1975, became Iowa State's first vice provost for undergraduate programs in August. This new position was created to bring increased institutional focus to enhancing the academic experience of undergraduate students. The undergraduate programs that report to the vice provost include University Career Services, Honors Program, Instructional Technology Center, International Programs, Student Outcomes Assessment, Center for Teaching Excellence, University Studies, and the Program for Women in Science and Engineering.

Award for Okiishi

Associate Dean and Professor Ted Okiishi received the 1998 Melville Award from the ASME. This is the top literature award from the society and Okiishi was the recipient for an unprecedented second time.

Garimella and Pham join ME faculty

The Mechanical Engineering department has two new faculty members.

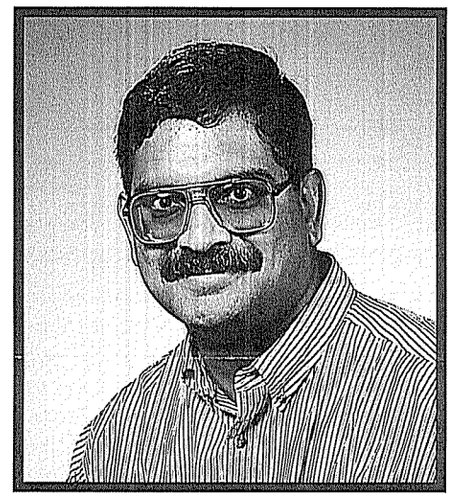
Srinivas Garimella joined the faculty in August as an associate professor of mechanical engineering. He came to Iowa State from Western Michigan University, where he had been a faculty member since 1994. Garimella was also a research specialist at Ohio State University, an engineer with General Motors, and a scientist at Battelle Memorial Institute in Columbus, Ohio.

Garimella received his undergraduate degree in mechanical engineering from the Indian Institute of Technology, and his master's and doctoral degrees in nuclear engineering at Ohio State. An expert in micro heat exchanger design and heat transfer, his research has global implications. His work on absorption heat pumps could mitigate global warming and ozone depletion.

At Iowa State, Garimella will teach courses in the thermal sciences. He has also established the Advanced Thermal Systems Laboratory for research and teaching activities.

Although he's been on campus less than four months, Garimella has formed some strong initial impressions of the college and its students.

"This is an incredible place," he said. "I have been impressed and pleased with the research and teaching atmosphere here. My colleagues are very knowledgeable people and the students are quite enthusiastic about their studies. This is a good fit for me."



Srinivas Garimella

Hung Pham

Garimella's wife Bina will join him later this fall when she completes her graduate work in neuro-immunology at Western Michigan. Garimella is an avid music fan with an extensive collection of blues and jazz CDs. He also collects fountain pens.

To strengthen the department's control and mechatronics activity, Hung Pham has joined the faculty as assistant professor of mechanical engineering. He completed his Ph.D. in 1996 at the University of California-Berkeley and did a year of postdoctoral work at the Partnership for Advanced Transportation and Highways, also in Berkeley.

Pham's research interest is autonomous vehicles. He has worked on passenger cars that drive themselves using machine vision and lasers for guidance. This past summer, he worked on a driverless commercial truck. He is also interested in collision warning and avoidance.

Pham received his undergraduate degree in general engineering in 1991 from Harvey Mudd College; he earned his master's in 1995 from UC-Berkeley. A newcomer to the Midwest, Pham says the supportive, positive nature of his colleagues and students is impressive. MP

ME Faculty and Staff

We can't believe it! All members of the Mechanical Engineering faculty and staff were on hand for this photo. Many of these faces will be familiar to you; there are some newcomers, however. For a complete listing of who's who, look for this photo and a detailed caption on our website. The address is: www.eng.iastate.edu/me.

Nodean recognized

In a special luncheon August 25 in the Cardinal Room of the Memorial Union, alumnus Walter Nodean was recognized for his years of dedication and loyalty to Iowa State.

Nodean earned his Ph.D. from ISU in 1969, and he has been working at Alliant, formerly IES Utilities, in Cedar Rapids since the 1970s.

"[Nodean] has been very instrumental in the department's dealings with his company," said G. Ivan Maldonado, assistant professor of mechanical engineering. "He has been involved in research collaborations between the college of engineering and Alliant."

Among those in attendance were Ted Okiishi, associate dean of engineering, Warren DeVries, chair of mechanical engineering, and Dick McGaughey, former vice president of Alliant.

Visit us on the Web!
http://www.eng.iastate.edu/me

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Generous gifts from Iowa State Mechanical Engineering alumni, industry partners, and others enable our department to continue our tradition of academic excellence. Our ongoing success is linked closely to your contributions which are used for the following.

- Scholarships and fellowships
- Start-up funds to attract top-notch new faculty
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- Laboratory equipment

The Black-Hilstrom Mechanical Engineering Development Fund grew out of a fund started more than 30 years ago by Hollis "Pete" Hilstrom, ME'34. In 1980, Henry Black, department head from 1946 to 1972, joined with Hilstrom to invite other alumni to contribute to the fund. Since then, the endowment has grown to nearly $3 million with generous gifts and support from more than 475 alumni.

You can participate in the Black-Hilstrom Fund using the form included here. Or call us at (515) 294-1423 to learn about other ways you can support ISU ME.

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We appreciate your support!

Going the distance for John Deere

John Deere employees now have an opportunity to earn a master's degree from Iowa State University without ever leaving their workplace.

John Deere and ISU's College of Engineering started a distance education program this fall that lets employees work toward a master's degree in mechanical engineering while continuing full-time employment.

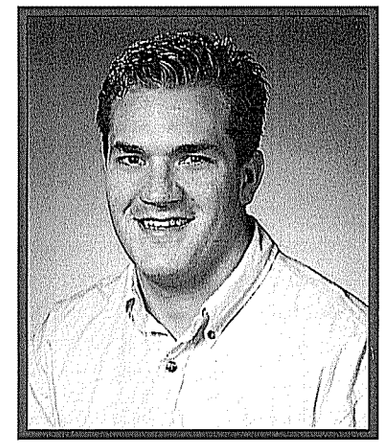
Two engineering classes are currently offered; two additional courses will be offered during the spring semester. Thirty-four students are enrolled in the fall program. Video conferencing technology is used to deliver instruction.

The program is only being offered to John Deere workers in Waterloo and Dubuque. Future plans include expanding the program to the Quad Cities site and later to all John Deere locations. At the rate of one course at a time, it will take each participant about five years to complete the master's program. The advanced degree will help enhance employees' career opportunities.

Fifteen years ago, Iowa State and John Deere tried a distance education program with less than terrific results. Professors had to drive to the sites to teach and the program structure was too rigid for full-time employees to handle, said Jon Van Gerpen, ME associate professor. Many changes have been made to make the current program more flexible, he added. For example, participants who miss a class because of work demands can review a video of the session. ME

Openshaw named advisor

Graduate student Scott Openshaw was named an academic advisor for the mechanical engineering department this fall. To keep pace with the increase in ME students, his position was added to the team of three advisors currently in the department. His major responsibilities include advising undergraduate students on their class schedules and teaching a seminar course in mechanical engineering.



Openshaw is also working with experimental learning communities. The learning communities consist of three groups of 15 students taking courses together and then interacting in a seminar class to explain how their classes inter-relate.

"A goal of the learning communities is improved student retention," he said. "This particular structure helps students make and maintain connections with other students in their program."

Openshaw received his undergraduate degree in human biology at Brigham Young University. The focus of his graduate work at Iowa State is biomedical engineering. ME

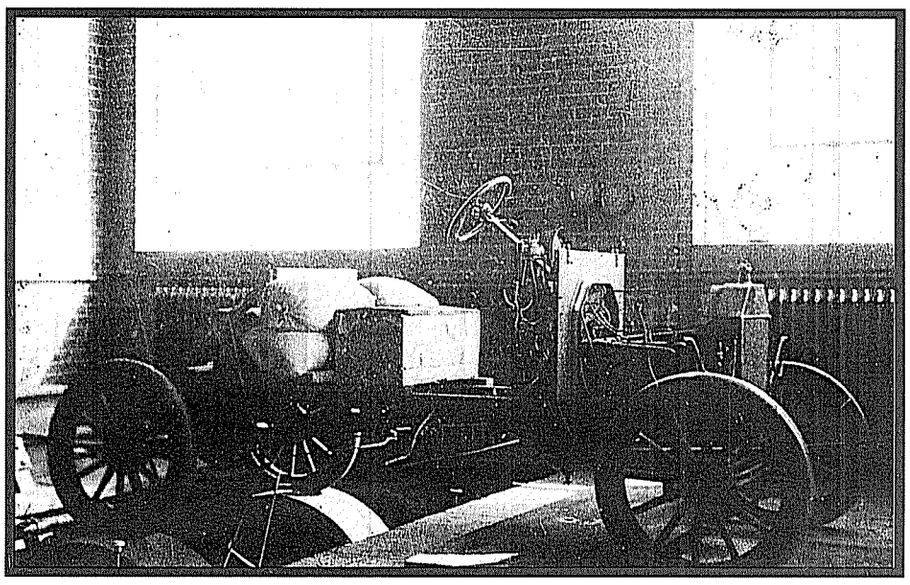
Celanese scholarship

Scholarships to help deserving students pursue their education and career goals are presented annually at a spring Excellence Award banquet by the Celanese Corporation.

Various scholarships are awarded to more than 40 ME undergraduates each academic year. ME

Left to right: Mark Bly, award recipient; Gloria Starnes, ME advisor; Warren DeVries, ME chair; Alicia Coles, scholarship recipient; Jon Van Gerpen, ME Associate Professor.

From the past...

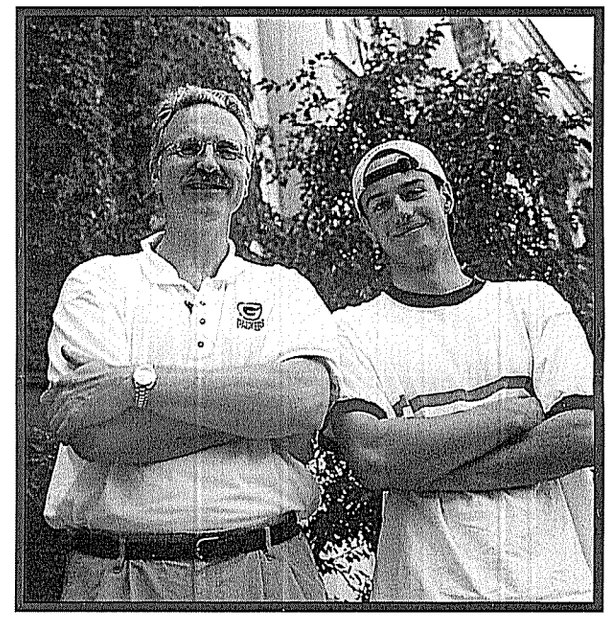


Ford auto on Steam and Gas Laboratory Dynamometer, circa 1916.

4th generation ME student

When Ian Liggett stepped onto campus this fall, he became the fourth generation of Liggetts to study engineering at Iowa State.

His great-grandfather, John T. Liggett graduated in 1917, his grandfather John R. Liggett in 1942, and his father John M. Liggett in 1969 - all in mechanical engineering. Ian's father and grandfather are sales engineers in a family-owned business. His great-grandfather died in 1988.



John M. Liggett, left and son Ian.

Ian, a National Merit Scholar who is undecided about which department to study, said, "There's a new field called mechatronics, which is a blend of mechanical engineering and electronics engineering. So I'll probably take a good mix of those two fields."

Ian attended the Rutgers Preparatory School in Somerset, New Jersey, where he played varsity soccer, basketball, and tennis. He speaks Japanese and spent six weeks in Japan with a family as an international exchange student. He has also performed community service for the homeless and has done volunteer work with the neurologically impaired.

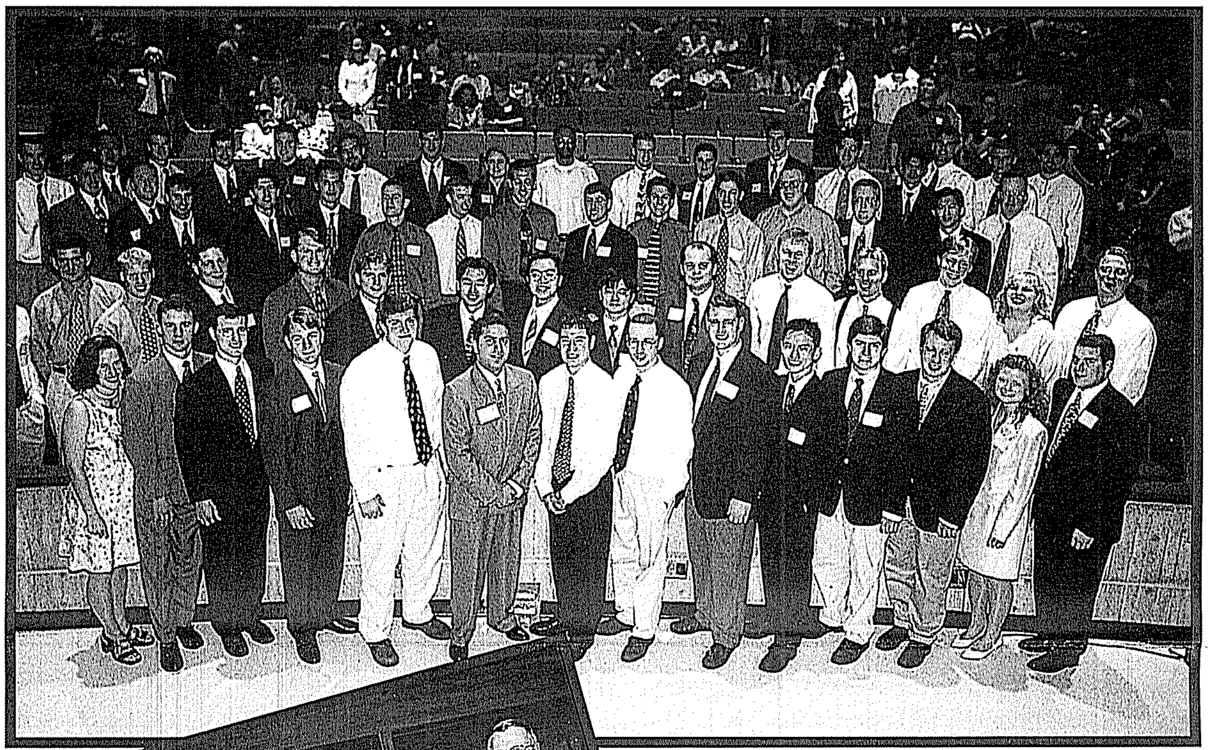
According to university records, Ian most likely has the strongest legacy ties to Iowa State. Other families have three and four generations of Iowa State graduates but it appears that the Liggetts are the first to send four generations through the same program. ME

Commencement reception

Members of the most recent class of mechanical engineering graduates were honored at a reception last May. The event was held at Scheman. Many of the graduates and several of their family members were able to attend the event.

The newest ME graduates are: Krista Alsleben, Bryan Aulner,,Peter J. Battey, Paul Biestek, Todd Brunia, Kit Cartwright, Matthew Christensen, Donald Chwojko, Brian D. Clark, Judd Clark, Francis Cleary, Daniel W. DeKruif, Matthew DiBona, Raza M. Durrani, Matthew Emht, Wiggo Eriksen, Brett Errthum, Matthew Ferguson, Patrick Forinash, Kevin Galloway, Nathan B. Gerber, Joseph Godbersen, Sarah Haug, Troy A. Haworth, Wade Helfer, Travis Henderson, Gregory Hendrickson, Eric Hillary, Jahmy J. Hindman, Wen-Yu Ho, Aaron Hopkins, Brian Howard, Peter Hrejsa, Matthew Imig, Timothy Jungers, Jacob Kerber, Steven W. Kistner, Matthew Knier, James Konrad, Jason Kopp, Andy Kotten, Peter Kramer, Chinhan Kwan, Arnt Lauen, Larry Laverty Jr., Kwong-Seng Lee, Tang-Hyok Lim, and Thomas Lopez-Villar.

Also: Jonathan McKnight, Mark McLaughlin , Daniel E. Montgomery , Benjamin Moore, Jason Morgan, Melissa Pope Niesen, Kevin Nimke, Timothy Olmsted, Thaddeus W. Olson, Jeff Osterchill, Rodney Paplow, Gerald Parle, Todd Petersen, Marc Pflum, Ronald Puhl, Chad A. Reickard, John Renko, Christopher Rettig, Jeremy Rhyan, Zachary Roberts, George Roehr, Jeremy Rubens, Kristi Rude, Michael Saskowski, Mark Schoessler, Patrick Schroeder, Kevin Schwain, Brent D. Sinclair, Matthew Sitzmann, Noah Swanson, Wen Thye Tang, Riko Tantra, Wei-Keong Tay, Nathan Thomas, Brian Trego, Jared Van Middlesworth, Austin Voorhes, Peter Werner, Simon Winata, Kenneth Woestman, and Charles Womack Jr. ME



Spring ME graduates were honored at a special reception that was attended by many friends and family members.

ME update Fall 1998

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