

Spring 2000

Dimensions Spring 2000

Iowa State University Department of Mechanical Engineering

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Recommended Citation

Iowa State University Department of Mechanical Engineering, "Dimensions Spring 2000" (2000).
Dimensions. 9.

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UPDATE

Mechanical Engineering

SPRING 2000 • VOLUME 10, NUMBER 1 IOWA STATE UNIVERSITY

Student leader recruits women engineers



Kim Tholen enjoys giving back to engineering as much as she has received from the program, and Iowa State is all the better for her efforts.

A senior in ME, Tholen is president of the Society of Women Engineers (SWE) at Iowa State. She recruits women to study engineering and sees nothing unusual about the effort. After all, she saw nothing unusual about being such a student herself.

“It didn’t even cross my mind,” she said. “There have been classes where I’ve been the only girl out of 20 people. I have never felt discriminated against and never felt intimidated. The type of people in engineering, and the professors, never make you feel like a minority.”

Not that Tholen would have been deterred. She came to Iowa State with engineering on her mind. But finding out about SWE did prove helpful.

“One of the first SWE meetings I went to was the resume writing workshop. That showed me they cared, and it sparked my interest,” she said.

Tholen, who isn’t happy without “a million things on my plate,” gladly added SWE to her schedule, working her way from general membership to president.

“I think getting involved with something like SWE helps,” she said, “because you find out there are other women in engineering. You realize you’re not the only one and you can rely on the others for support.”

While Tholen is best known for her strong leadership role in SWE, she has also been an active member of other organizations. She has served as vice president of Pi Tau Sigma, the mechanical engineering honor society. She has been a peer mentor, student director for outreach and recruitment, and a member of The Engineering Ambassador/Mentoring (TEAM) program. She is a recipient of the

Kim Tholen, right, and Amy Huebner examine an engine in the John Deere Engines Lab.

continued on page 3: Student leader

Attracting women is priority

Is it nature, nurture, or the name?

For whatever reason, mechanical engineering at Iowa State doesn’t draw as many women students as the other engineering disciplines. While it’s true that engineering in general has remained a male-dominated field, few people believe that ME must remain 91 percent male.

“We think it’s a problem of perception,” said **Gloria Starns**, advising center coordinator for ME. “Just the phrase itself—mechanical engineering—makes people think we only work on engines. But that’s only part of what we do.”

The traditional ME track is expanding to include fields such as energy, environment, virtual reality, and biomedical—fields that generate interest among some women, and other students.

continued on page 3: Women

ME Associate Professor Judy Vance and students Sara Stolmeier and Bekah Gable discuss the working parts of a sewing machine.



Notes from the Chair

In the last issue of *ME Update*, we had an article titled “ME Prepares for ABET Review,” and by the time the next issue comes out, it will be a fact. The Accreditation Board for Engineering and Technology (ABET) is an internationally recognized stamp of approval for engineering programs, and there has been an industry-driven change that is reflected in what is known as Engineering Criteria 2000—EC 2000 for short. Broad and active participation of constituents and stakeholders in providing and acting on feedback for continuous improvement is a key part of EC 2000. We have been working diligently to set up the process and I believe that we are ready. But who is “we?” “We” are the faculty: Don Flugrad, our associate department chair, leads, cajoles, and exhorts all of us; the ME curriculum committees for the past few years have defined objectives and assessment plans for feedback and implementation of change; all of the faculty who are engaged in redesign and assessment of their courses; and **Bill Cook** and **Jim Bernard**—both are trained ABET EC 2000 evaluators who have provided feedback from that perspective.

“We” also includes students. Students participate in the feedback assessment process for courses in our curriculum. But direct student feedback is provided on program objectives and assessment methods by student members on the ME Curriculum Committee and the ME Student Advisory Board. My observation is that students take this responsibility very seriously; they want a quality program that prepares them for successful careers.



A very important part of “we” is the alumni and industry professionals on our ME Advisory Council. **Susan Oltrogge, BSME’86**, highlighted in this issue, is one of our most recent members, but she is only one of 15 active members. At our April meeting, I believe we will have a first for MEAC membership. **Mike Mack, Jr., BSME’79**, of John Deere, will join the group as his father, Mike Mack, Sr., the retired director of Deere’s Product Engineering Center, becomes an emeritus member of the council. For the past five years, the MEAC has been actively engaged in curriculum discussions and letting us know what’s needed to be a successful professional. This year a number of the MEAC members have given of their time to serve on an assessment panel for our design courses, something new for all of us.

All of this preparation, the involvement and effort of “we,” and the goal of continuous improvement to become the best make me feel confident that we’re ready.

A few last-minute items that I think you will want to know. First is that **Gaylord Scandrett**, known to many of you because he helped you in lab, will be retiring after 21 years of service at Iowa State. **Arv Eide** also began his retirement in January 2000, after a distinguished career at Iowa State that included a pivotal role in establishing the best advising center in the College of Engineering. On our active distinguished faculty, **Jim Bernard** was named Anson Marston Distinguished Professor this year. **Shyam Bahadur** received double kudos from the American Society for Testing and Materials as a recipient of their top award, the Award of Merit, and election as ASTM Fellow. Last time, I told you about the Binger Professorship and now I’m pleased to tell you that the first person to hold this position is **Dr. Srinivas Garimella**, who is now the William and Virginia Binger Associate Professor of Mechanical Engineering. And our students continue to be known for their engineering and leadership abilities. For the past two years, ME students have received top awards from the College—the Dean’s Leadership Award was presented to **Kim Tholen, BSME’00**, this year and **Mark Meacham, BSME’99**, last year. The ISU Alumni Association Wallace E. Barron Outstanding Student Award for this year went to Kim Tholen and last year to **Kristi Rude Christiansen, BSME’99**. And while people seem to be retiring faster than we can recruit them, I’m pleased to let you know we will have two fine new faculty members joining us in August. **Dr. Michael Olsen** will join us as assistant professor after completing his postdoctoral work on microfluidics at the University of Illinois’ Beckman Institute. **Ms. Li Cao** is completing her Ph.D. research in micro-electromechanical systems at the University of Minnesota and will also be joining us as assistant professor in the fall.

Warren R. DeVin

2000 Dean's Leadership Award presented annually for demonstrated leadership in college, university, community, and professional organizations. She will also receive the Iowa State Alumni Association's Wallace E. Barron All-University Senior Award.

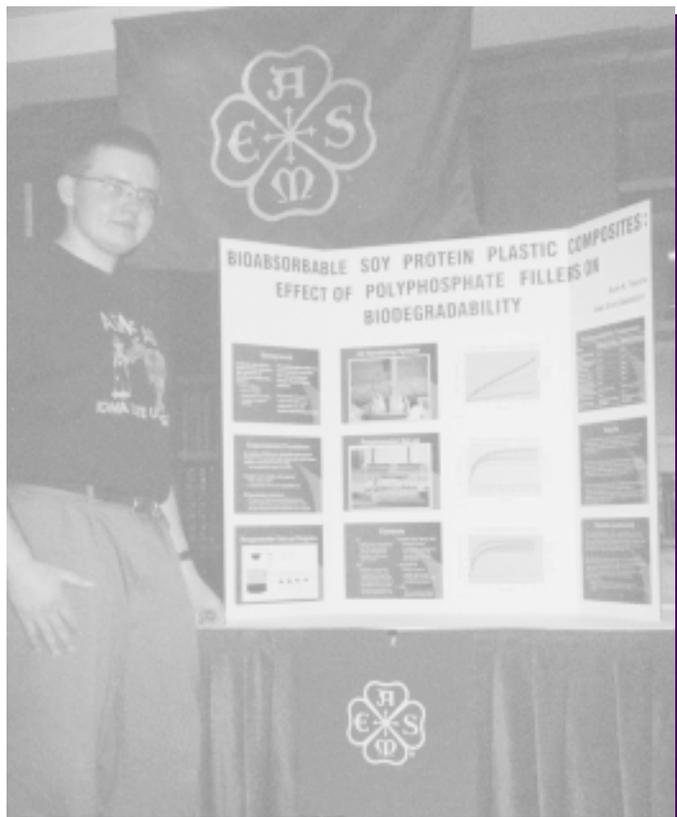
One of the more successful SWE events is the annual senior sleepover, during which high school girls come to Iowa State to learn about the engineering programs and meet college-age mentors. In January, 41 seniors attended.

"Last year, there were 39 girls at the sleepover and 34 came to Iowa State to study engineering," Tholen said. "I'm guessing we'll see similar numbers next year. It's encouraging to see girls from last year's sleepover who are very involved in SWE this year."

Tholen and SWE are also publishing a resume book for potential employers, hosting a leadership conference in February, and scheduling dinners for students to meet deans and faculty.

"I know I'll keep in touch," said Tholen, who graduates in May and will work as a system design engineer in Chicago. "I'm already on the national SWE outreach committee and I'd like to do recruiting when I begin my job."

Iowa State can only hope. 



Alan Tkaczyk, ceramic engineering, won third-place honors at the 2000 ASME Region VII Student Conference in Kansas City for his poster in the "Old Guard Oral Competition."

"One of the things we are trying to do is build strong relationships with freshman women," Starns said. "We're getting them involved with faculty and upper-division students early."

The object of such efforts is to increase the comfort level of women as they begin their degree track.

"There's an uneasiness being in a room full of people different than you," Starns said. "When you're in a new place, you want to seek out people like yourself. When you've got 9 percent women scattered over four years, it's difficult to do that."

Still, the cultural factors don't affect everyone. **Judy Vance**, an associate professor of ME who works in the Virtual Reality Applications Center, wasn't exactly raised with a tool belt around her waist.

"People think that you shouldn't go into mechanical engineering unless you have grown up working with machines," Vance said. "I was always interested in how machines work and mechanical engineering gave me the opportunity to figure these things out. When I was going to school I didn't know the difference between a cap screw and a machine screw. But I learned."

Vance suggested that math and chemistry draw more college women because they are subjects covered in high school, so they sound familiar.

"If physics teachers would point out to students that a lot of the physics curriculum involves mechanical concepts, such as beams, springs, forces, and accelerations, then we'd have a foot in the door," Vance said.

In the meantime, role models in college may be an effective way to open the engineering door to women. Vance sets a good example. In addition to an active teaching and research schedule, she maintains close ties with the Society of Women Engineers (SWE), serving on the national nominating committee of the group.

"When all of your teachers are male, you begin to wonder if a female can be an authority on engineering topics," said Vance. "It's important to have women in front of the class talking engineering."

Women who do study mechanical engineering are successful as students and professionals. **Kim Tholen, BSME'00**, has received college and university honors for her leadership work (see related story on page 1) and **Susan Oltrogge, BSME'86**, has been named the first woman and youngest partner of the 104-year old Des Moines architectural engineering firm of Brooks Borg Skiles (see page 4). 

ME graduate makes history



They say a teacher's influence can be far-reaching. For **Susan Oltrogge, BSME'86**, it has led her into groundbreaking territory. Oltrogge is the first woman and youngest partner of the 104-year-old Des Moines architectural engineering firm of Brooks Borg Skiles.

Oltrogge, a Clear Lake, Iowa, native, also has a master's degree in business administration from the University of Iowa.

Oltrogge recalls that the decision to take science and math in high school was because of teachers who encouraged her into a path of action. "I often think that if my high school math and physics teachers hadn't cornered me in the hallway one day and insisted I study engineering, that it would never have occurred to me."

As an engineering consultant, Oltrogge has designed mechanical systems for the National Swine Research Center at Iowa State and prisons in Newton and Fort Dodge. She has also designed special laboratories that require careful planning of compressed air, vacuum, refrigeration, and pressurization systems.

While studying engineering at Iowa State, Oltrogge acknowledges her own tenacity and perseverance that saw her through rigorous training. "I was not the best nor the brightest student in

my engineering classes, but an interest in the program and support from faculty, staff, and my classmates kept me on track," she said.

After graduating from Iowa State, Oltrogge went on to earn an M.B.A. at the University of Iowa.

Oltrogge's historic accomplishment at Brooks Borg Skiles, early influences notwithstanding, serves to highlight yet a more powerful influence—this time of her own making. Oltrogge is deeply conscious of a sense of responsibility and the importance of strong interpersonal skills required on the job.

"I take very seriously the responsibility given to me to spend sometimes millions of dollars in the best way possible," she said.

A spokesperson for the field of mechanical engineering, Oltrogge is convinced that "everything you touch every day has been touched by a mechanical engineer." She feels that the engineering profession as a whole needs to be very vocal about its existence and purpose, if it seeks to reach a wider audience. 

VRAC gets gift from Boeing

The Boeing Company has presented a check for \$150,000 to the College of Engineering's Virtual Reality Applications Center (VRAC) for the construction of C6, the next generation, six-sided synthetic environment facility.

Jack McGuire, director of structural engineering at Boeing, said his company made the donation to support research that's applicable to the aircraft industry. Along with other projects, C6 will be used in immersive analysis of aircraft maintenance tasks, such as pre-flight and post-flight inspections and engine changes. The six-sided nature of the virtual environment will allow 360-degree display of realistic backgrounds. C6 will also aid in facilities planning, analysis, and validation for dimensions, clearances, and work usage paths of rooms, large tools, and buildings used for aircraft maintenance.

C6, under construction in the four-story atrium of Howe Hall and scheduled for completion in June, will be a room designed to enable interactions between engineers and computer simulations. Users will be completely surrounded by three-dimensional audio and real-time images on all four

walls, floor, and ceiling. C6 will be the only facility of its kind in the world.

The existing C2 virtual reality facility in Black Engineering will be linked by dedicated fiber enabling C2/C6-based research collaboration across geographically separated systems. 



C6 is on schedule for completion in June.

Your support makes a difference

Generous gifts from ISU ME alums, industry, 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
- Seed money for development of new projects
- 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 more than \$2 million with gifts 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!



Iowa State was well represented at the 2000 ASME Region VII Student Conference in Kansas City by: Kory Menke, Jason Schmid, Tom Karre, ME Chair Warren DeVries, J. Parker, Matt Dunker, Bret Winterle, Joe Hynek, Francine Battaglia, Yeow-Sing Kua, and Alan Tkaczyk

Faculty, staff, students honored

Members of Engineering Student Council honored ME faculty, staff, and students at the group's recent Leadership Awards banquet. Assistant Professor **Mark Bryden** was named Outstanding ME Faculty; **Angelo Cordero** was voted Outstanding ME Staff Member. Also recognized was ASME president **Bret Winterle** and **Allan Tkaczyk**, Outstanding ASME Member.

The awards banquet was held as part of the college's observance of National Engineers Week 2000. 

Department Dynamics

Abhijit Chandra joins ME faculty



The ME department welcomes Abhijit Chandra, who joined the faculty this spring as the Engel Professor of Mechanical Systems.

An American Society of Mechanical Engineers Fellow and recipient of the National Science Foundation's Young Investigator Award in 1987, Chandra has a doctorate in theoretical and applied mechanics

from Cornell University. He joins Iowa State from Michigan Technological University, Houghton, where he was a tenured professor for five years.

Understanding the fundamental mechanics of manufacturing processes and using those insights for design improvements, said Chandra, is the focus of his research, which finds application in both the automotive and microelectronic industries.

Collaborative opportunities in virtual reality, thermal science, and boundary elements research through the aerospace and engineering mechanics department attracted Chandra to Iowa State.

"Investigation of a manufacturing process requires interdisciplinary expertise," said Chandra.

Interesting projects in the works include vibration-assisted finishing of hard and brittle materials and nanoscale planarization of wafers used in integrated circuits fabrication, a project funded by NSF.

He is also testing the durability and strength of sheet metal composites for vehicles. The principal goal of this project is to design aluminum car exteriors that withstand crash worthiness tests, as well as meet standards of energy efficiency.

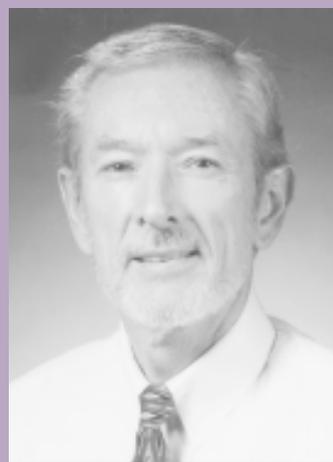
Chandra is currently teaching a materials and manufacturing course. His NSF-sponsored grant also involves undergraduate students in research projects. Chandra enjoys swimming and tennis and lives in Ames with his wife and two children. 

Big gains for small structures

A \$450,000, three-year National Science Foundation grant has been awarded to ME Professor **Pal Molian** to develop nanoscale structures by combining ultrafast lasers and nonlinear optics. Molian will use femtosecond (1×10^{-15} second) laser pulses to develop micro-scale materials that can be used to improve medical devices, such as catheters in drug delivery systems, and microelectronics. The work is being done in collaboration with Lawrence Livermore National Laboratories (California) and Clark-MXR, Inc., Dexter, Michigan

"Nanometer-sized holes will be fabricated in micropumps to precisely pump drugs into the body or even to allow the drugs to crawl around the bloodstream repairing damaged tissue," Molian said. Other medical uses include allowing for precise measurement of blood in catheters, accurate monitoring of a patient's condition through biosensors, and controlled passes of gas or liquid in membranes.

In the microelectronics industry, Molian sees ways to improve micro-electromechanical (MEM) systems developing new methods to remove polymer layers in silicon wafers. Normally, these layers are removed chemically, which poses disposal problems. The laser technique, according to Molian, will allow step-by-step release of individual components from a single layer, eliminating the use of chemicals and speeding up the process. 

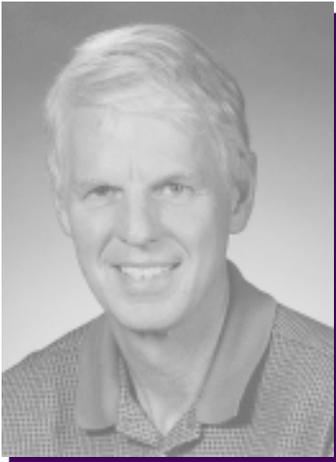


Eide retires

ME Professor **Arvid Eide** has retired after 35 years at Iowa State. He started as an instructor in 1964 and worked his way up the academic ladder serving as the college's Associate Dean for Instruction and Student Affairs. His research interests included using computer and communication technology as a way to enhance

engineering education and develop better methods of providing quality engineering education for distance learners.

Eide earned his B.S. and M.S. degrees in mechanical engineering at Iowa State. He also earned a Ph.D. in higher education and engineering here. An active member of the American Society for Engineering Education, he was recently named a Fellow of the society. He has received several other honors from the society, including the prestigious Centennial Medallion. 



Bernard is Anson Marston Professor

Jim Bernard has been named Anson Marston Distinguished Professor of Engineering. The only active faculty member in ME to hold this title, Bernard was honored at the Spring Awards Convocation held in March at the Memorial Union.

Bernard is recognized nationally and internationally as a leading authority in advanced synthetic environments. In 1990, he founded the Iowa Center for Emerging Manufacturing Technology at Iowa State, currently known as the Virtual Reality Applications Center (VRAC). Under his direction, the center has become a leader in the application of virtual reality technology to challenges in engineering and science. He served as the chair of the American Society of Mechanical Engineers' Committee on Engineering Education, leading the development and acceptance of Engineering Criteria 2000 by the mechanical engineering profession, providing its greatest opportunity for innovation in engineering education in the last 50 years.

A former DEO, Bernard is a co-founder of Engineering Animation, an Ames-based computer company specializing in Internet-enabled products. He joined the Iowa State faculty in 1983. 

Grad students receive grants

Todd Bandhauer and **J. Mark Meacham**, graduate students in mechanical engineering, have been awarded the prestigious graduate student Grants-in-Aid by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers. Both students are ISU graduates, and started graduate school in January 2000. **John W. Coleman**, a Ph.D. student in the department, also received this award last year. Only about 20 such awards are given each year from among several highly qualified applicants from across the country and international institutions. Each award carries a grant in the amount of \$7,500 for expenditures such as living expenses, tuition, travel, and equipment. In addition, a \$1,500 honorarium is given to each student who presents a technical paper from his/her research at an ASHRAE conference. All three students are working with ME Associate Professor **Srinivas Garimella** in the Advanced Thermal Systems Laboratory.

Bandhauer and Coleman are conducting research on condensation flow phenomena, heat transfer, and pressure drop in microchannel heat exchangers. This research will assist the development of compact and highly efficient automotive air-conditioning systems. Their potential use in residential space-conditioning is also being investigated. Meacham is investigating absorption heat and mass transfer for the development of absorption heat pumps, which are environmentally sound and energy-efficient alternatives to CFC-based ozone-depleting space-conditioning systems. 

Service recognized



ME Professor **Shyam Bahadur** was recently honored by the American Society for Testing and Materials (ASTM) with its Award of Merit for distinguished service and outstanding participation in ASTM committee activities.

The award, established in 1949, is the highest society award granted to an individual member. Recipients also receive the title of Fellow.

Bahadur was recognized for his contributions and leadership on the ASTM wear and erosion committee in the areas of tribology and materials engineering. Under his leadership, a number of new ASTM standards were developed. He organized two international symposia, a workshop, and an international meeting.

Bahadur, who joined the ME faculty in 1970, was instrumental in establishing a tribology research lab in the department. Internationally recognized for his work on friction and wear behaviors of polymers, composites, metals, and ceramics, he has published extensively in refereed journals and presented the keynote address at many conferences. He became a Fellow of the American Society of Mechanical Engineers in 1998. 

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Published twice each year by the Department of Mechanical Engineering at Iowa State University. Prepared for the department by Engineering Communications and Marketing, College of Engineering, Iowa State University.

ISU-ERI-Ames-00307

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Members of the last class of the 20th century were honored at a pre-commencement reception held December 18, 1999, at the Scheman Building, Iowa State Center. Many of the graduates and several of their family members attended the event. The reception was also attended by ME faculty and staff. The ceremony included a presentation by ME Chair Warren DeVries. The department hosts two commencement receptions annually. The event is always a highlight for students and their families.

Following is a list of the most recent ME graduates:

Todd Matthew Bandhauer*
Gary David Borgerding
Brian Patrick Burns
Chad Mitchell Chapman
Kok-Chuan Chong
John Clifford Denson*
David Michael Eckert
Travis M. Eisenbarth
Christopher Todd Erixon*
Lee James Girard
William J. Graham
Andrew Joseph Hageman
Daniel Edward Hotchkiss
Jeremiah Michael Johnson
Shane Lee Kaalberg*
Kelly N. Kleemeier*

Mathew Taorid Kolawole, Jr.
Yeow-Seng Kua
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Justin Edward Thurm*
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Sony Wangsa-Putra*
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