

Benefits of biodiesel spark interest

Biodiesel is a hot topic as an alternative fuel these days, and potential entrepreneurs are calling Iowa State University to get more information. ISU is a prime resource because of work focused on the commercial development of biodiesel fuels. **Jon Van Gerpen**, ME professor and interim chair, is leading the research and development effort.

A number of factors make biodiesel an attractive business opportunity. "People perceive it as an up and coming fuel option that is relatively easy to produce and doesn't need a huge investment because it doesn't require a lot of infrastructure changes," Van Gerpen stresses. "That's what stops a lot of other alternative fuels, for example, hydrogen, which is still 20 years down the road. Biodiesel can be used now to replace or add to diesel fuel so no vehicle change is required, and it doesn't require changes in fuel storage or transportation."

Several positive performance characteristics add to its marketing potential. "Biodiesel burns cleaner in the engine and offers better lubrication than diesel," explains Van Gerpen, a 10-year veteran in biodiesel research who oversees operation of a biodiesel pilot plant located at the Iowa Energy Center's Biomass Energy Conversion Center (BECON). "It biodegrades very quickly so if there is a fuel spill, it's not an environmental hazard. And, while we don't recommend drinking it, it's not toxic like petroleum fuels."

Biodiesel production is of particular interest in Iowa because it provides a new market for such commodities as soybean oil, animal fat, and used restaurant oil. As a result, farmer-owned coops and rendering companies are among those exploring production possibilities. The biggest challenge as more people produce it, says Van Gerpen, is to insure product quality.

In a project sponsored by the National Renewable Energy Laboratory in Golden, Colorado, Van Gerpen coordinated development of an educational program for biodiesel producers. Collaborators include **Rudy Pruszko**, field engineer with CIRAS; **Davis Clements**, president, Renewable Products Development Laboratories, Inc., Lincoln, Nebraska; **Brent Shanks**, associate professor, ISU chemical engineering; and **Gerhard Knothe**, research chemist, National Center for Agriculture Utilization Research, Peoria, Illinois.

"We designed it," Van Gerpen explains, "to cover all of the things producers need to know in order to produce a quality product." The program is presented in a series of three workshops that include labs held at the BECON facility.

The first workshop focuses on business management—legal and regulatory issues as well as financial options and basic product background. The second





Jon Van Gerpen (right) and Kirk Menges, ME graduate student, stand by the biodiesel pilot plant at the BECON facility where they convert agricultural products into biodiesel fuel.



Enrollment figures for the last 5 years

Van Gerpen serves as interim chair



P rofessor **Jon Van Gerpen** is serving as interim chair of the Department of Mechanical Engineering for the 2002–2003 academic year. The College of Engineering is conducting a national search for the new ME chair and hopes to have the position filled by August 2003. Van Gerpen replaced Warren DeVries, who served as chair from 1996 to 2002. DeVries is on faculty development leave at the National Science Foundation.

A member of the ISU faculty since 1984, Van Gerpen earned his B.S. and M.S. degrees at Iowa State and his Ph.D. at the University of Wisconsin, Madison. Originally from Cedar Falls, Iowa, Van Gerpen worked on John Deere's engine design team while on faculty development leave from Iowa State in the early 90s.

In addition to his responsibilities as departmental chair, Van Gerpen directed a series of workshops dedicated to developing and promoting diesel fuel made from renewable agricultural resources. His research includes investigations of biodiesel-fueled engine emissions, fuel composition effects, thermal and oxidative stability, and contaminant effects.

ME—Poised for prominence

With the single largest academic program in the College of Engineering, the ME department is a crucial component as the college focuses on a bold, new initiative, "Reach for the Top." Announced by Dean **James L. Melsa** last fall, the initiative is aimed at attaining a top-20 ranking among engineering programs. "The department is on the right track," asserts **Jon Van Gerpen**, ME professor and interim chair. "We have the pieces in place to move upward and to be ranked among the top 20 ME programs."

Van Gerpen credits a very good and very strong faculty and support staff for his optimism. "We have a very collegial faculty—we work well together," he explains. "That doesn't mean we always agree, but we talk and discuss issues."

It is also a youthful faculty who provide energy and enthusiasm. "We have eight or nine relatively new faculty members who aren't tenured," Van Gerpen points out. "They see the goals as an opportunity as well as a challenge."

Senior faculty members, meanwhile, serve as role models and provide a stability that is already focusing national attention on the department. This year the department has brought in a record \$10 million in external funding. A portion of that can be attributed to two very successful centers—the Virtual Reality Applications Center (VRAC) and the Center for Sustainable Environmental Technologies (CSET).

Good students are attracted to the department because of its reputation as a challenging program, according to Van Gerpen. The number of undergraduates has increased steadily, reaching 1,037 this past fall. The number of graduate students has nearly doubled, from 88 to 166, since 1998.

In addition, the department is starting to see the results of the off-campus graduate program that uses video conferencing technology to deliver instruction in Waterloo and Dubuque. Offered in cooperation with John Deere, the program facilitates full-time employees taking one course a semester and earning their master's degree over a fiveyear period.

Combine these assets with new facilities in Hoover Hall, which is nearing completion, and the department is in good shape, says Van Gerpen. "We are well positioned to continue to make progress toward national and international prominence."

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one features analytical methods and what producers can do to determine if they have a quality product. The third session focuses on biodiesel production technology—how to make the fuel from a variety of feedstocks.

Offered for the first time last fall, the workshops are in high demand with participants coming from as far away as Europe, India, and Australia. Many countries are looking for ways to reduce dependence on oil imports, and since they have significant sources of vegetable oil or animal fat, biodiesel provides a solution. "In Europe, it's actually a lowcost option, because they don't tax fuel that comes from agricultural products," Van Gerpen says. As a result, they use 100 percent biodiesel.

U.S. legislation is likely to play a critical role in how quickly the industry grows. Tax benefits currently being negotiated in Congress would make biodiesel production a profitable option for the large grain processing companies, according to Van Gerpen. Nevertheless, he says there is definitely a niche for small-scale operations using local feedstocks and producing a quality product.

New Boyd lab will offer students first-rate experience



James and Gayle Boyd

Iowa State engineering students will get state-of-the-art, handson experience and an edge in the job market, thanks to **James** and **Gayle Boyd**. Last fall, the Marshalltown couple made a gift to Iowa State to create the Boyd Product Realization Laboratory in the Gary and Donna Hoover Hall, now under construction.

Beginning spring semester 2004, the laboratory and its equipment will allow students to visualize product design and

manufacturing methods and develop techniques to improve them. "We want the laboratory to offer hands-on experience to students," said Jim Boyd, BSME'38. "Top-notch jobs require at least a basic level of experience with such equipment."

"ISU engineering students will utilize the multidisciplinary experiences and knowledge they gain in this lab throughout their careers," said **Donald Flugrad**, associate professor of mechanical engineering and chair of a committee that is establishing the Boyd laboratory. "The lab will make our program a model for hands-on, learning-based education in product realization."

"We want this laboratory to give Iowa State another essential tool in bringing students to the university and to mechanical engineering," Boyd said.

At 2,900 square feet (net), the Boyd laboratory will be the largest laboratory in Hoover Hall. When completed in 2003, the \$20million, 51,000 square-foot (net) Hoover Hall will provide enhanced engineering education with high-tech classrooms and laboratories. Hoover Hall is phase II of Iowa State's Engineering Teaching and Research Complex and will complement Howe Hall (phase I).

The Boyd laboratory will feature four learning-based instructional centers that will focus on product development:

- a classroom designed for collaborative interaction among students and faculty
- an analysis center equipped with integrated software tools and computer workstations
- six high-tech meeting rooms where student teams can brainstorm, analyze, and propose solutions to design projects and problems
- a fabrication center where students can make products from computer-aided design drawings and gain hands-on experiences with mechanical processes

After Jim Boyd graduated from Iowa State, he was employed by Fisher Controls in Marshalltown. He rose in the company to positions in design and administration, retiring as senior vice president in 1988. He and Gayle have three sons, all of whom graduated from Iowa State, as did a granddaughter.

Jim Boyd is past president and member of the Iowa State Alumni Association's board and recipient of the ISU Alumni Medal.

The couple has requested that the amount of their gift, made through the ISU Foundation, not be disclosed. The Iowa State University Foundation is a private, non-profit corporation dedicated to securing and managing gifts and grants that benefit Iowa State University.

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When he isn't studying the intricacies of computational fluid dynamics or working at VRAC as a research assistant, chances are you'll find Hynek behind a video camera or at a computer editing materials for his on-line entertainment company, Cactusjo.com. "My site glorifies the common man," he says. "I'm going to videotape people in their greatest moments—and then create an interactive game to go with the videos." The site is directed at college students and people working in cubicle type settings who could play the game during a five-minute break or over their lunch hour."

The name Cactusjo is symbolic, Hynek explains. "I chose the cactus because the people I plan to interview are survivors, and the cactus is one of the best examples of a survivor that I know."

Hynek promotes his comprehensive business plan with such conviction that he won the \$5,000 first-place award in the Pappajohn Center Competition for new entrepreneurs held last fall. "We sat down with Mr. Pappajohn and his Equity Dynamics staff for 15 minutes and discussed our business plans," Hynek says. "Their biggest concern was my marketing strategy because I have to get people hooked in order for it to succeed. I have a plan for marketing to college students, but they didn't think students would pay for the service. Mr. Pappajohn said it could be really big if I find the right niche."

While Hynek has a challenging road ahead in order to launch Cactusjo this summer, there's really no doubt that the people and their stories will keep him smiling. And if the joy does go away, he says, "I'll know I need to step back and reevaluate."

December 31, 2002—The end of an era



Forty-four years after beginning his teaching career at Iowa State, **Delmar Van Meter**, an ME associate professor, has put away the chalk. Raised in Missouri, he earned his bachelor's degree at the University of Missouri. After spending the next two years

Delmar and Melba Van Meter

stationed in Colorado as an officer in the U.S. Army, he returned to the University of Missouri to earn his master's degree.

A job offer from Iowa State College brought him to Ames in 1958, and Van Meter has made teaching his lifelong career. He taught thousands of students in thermodynamics, fluid mechanics, measurement and instrumentation, mechanical engineering laboratory, and internal combustion engines. "Even though the material was repetitive, the students were always new and almost always eager to learn, which presented a pleasant challenge," he says.

One of the big changes that occurred was the number of women in engineering classes. "I don't recall any female students until somewhere in the 60s, and they were still very rare until the 80s," Van Meter observes. Another significant change involved the tools students and faculty use. "We started with slide rules, went to handheld calculators, and now computers," he explains. This transition presented a learning curve for faculty members as well as students.

Van Meter and his wife **Melba** have three sons and a daughter. All three sons graduated from ISU—two in ME, while the daughter graduated from that "other" school in Iowa City.

Van Meter's retirement plans include some travel and catching up on a variety of jobs around home. It wasn't just teaching that kept him busy though, he also served many years in the U.S. Army Reserves, retiring at the rank of Lt. Colonel. That role has contributed to his intense interest in world events as reserve units from across the country are called into active duty.



It was September 1953, when **William J. Cook** first moved to the Iowa State campus as a freshman in mechanical engineering. Little did he realize that nearly 50 years later he would retire from this same institution, but that's exactly what happened.

William and Laura Cook

Upon completion of his undergraduate degree in 1957, Cook accepted a Westinghouse Fellowship and went on to earn his M.S. degree in 1959. The department offered him a faculty position, and, as he observes, "I've been here ever since." He completed his Ph.D. in 1964.

The highlight of his career has been the interaction with literally thousands of ME students. Cook taught juniors, seniors, and graduate students in fluid dynamics, fluid mechanics, and compressible fluid flow. In addition, during what he calls the early years, he advised many new students. "We didn't have professional advisors then so faculty members were assigned 20–30 freshmen a year," he explains.

During Cook's lengthy tenure on the ISU campus, there was a continuous development of ideas, tools, and environment. Each change had specific challenges, but soon adaptations were made; for example, Cook cites the changeover from quarters to semesters. "Going through it once was enough. It took about a two-year period because we had to make a lot of substitutions and adjustments. But looking back, it was just a blip on the screen."

Cook and his wife **Laura** have two children, **Sharon** of Naperville, Illinois, and **Donald** of Lynnwood, Washington. Both are ISU graduates—Sharon in chemical engineering and Donald in ME.

Professor Cook, who has been on phased retirement for five years, had his last official day December 31. His retirement plans include his hobbies—antique rifles and hunting, travel, volunteer work, and, of course, fixing things around the house.

Oliver—Fitting ME into the big picture

James Oliver has an important message to share with engineering students—if you're able to take a technical concept and cast it in terms that matter to the business, you can have a much broader impact on the success of the company than other engineers. It's a message that Oliver has learned from his experience in business, industry, and academia.

In the four sections of Introduction to Mechanical Design offered fall semester, Oliver, an ME associate professor, and his colleagues put the final project into a real-world context with students developing a government contract proposal. "We asked the students to propose an 'appropriate technology' product for emerging economies. It really gave them an appreciation for where an ME fits into the big picture," Oliver emphasizes. The winning proposal, selected by the faculty, was for a brick maker in Pondicherry, India. "We had some

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James Oliver

amazing designs and products," he notes. "Three of the eight groups have applied for patents on their inventions."

Oliver earned his Ph.D. at Michigan State University in 1986 and began his career developing commercial software and consulting in product development

process enhancement for several major automotive manufacturers. He then joined the faculty of SUNY, Buffalo, and, in 1991, Iowa State recruited him to help build what has become the Virtual Reality Applications Center (VRAC).

Throughout his career—Oliver spent seven years at ISU, worked in business/industry for four years, and returned to ISU in 2001—he has focused on emerging technologies and how they can impact industrial productivity. "As the technical leader for e-Vis, an Internetbased visual collaboration solution, I interacted with many manufacturers, exploring how emerging information technologies could improve their product development processes," he says. "I also worked closely with IT leaders, which deepened my understanding of the complex infrastructure needed to power today's manufacturing enterprises."

His goal now is for Iowa State to become one of the leading universities in helping business and industry embrace computer and information technologies. ISU's human computer interaction initiative is a major step, and Oliver is heading the search committee to hire three people for it. "As the rate of technological advancement continues to increase, we feel that computer and network technologies will impact all aspects of our lives—much faster than we expect," he observes. "It's a very exciting time with some really interesting research opportunities!"

Department Dynamics

Robert Brown named first Bergles Professor



Dean James Melsa presents Robert brown with the 2002 Boylan Eminent Facilty award.

Robert C. Brown has been named the first Bergles Professor in the Department of Mechanical Engineering. A professor with joint appointments in the mechanical engineering and chemical engineering departments and director of the Center for Sustainable Environmental Technologies (CSET), Brown has a record of exceptional engineering achievements and contributions to the engineering profession. Last spring, he was named a Fellow of the American Society of Mechanical Engineers, and last fall he received the Boylan Eminent Faculty award from the College of Engineering.

The Bergles Professorship was created with a \$500,000 endowment by Arthur Bergles, who served as department chair from 1972 to 1983. The professorship was set up to provide leadership and mentoring in developing faculty, curricula, and programs in the thermal sciences as well as to pursue interdisciplinary thermal science opportunities and promote Iowa State's leadership in this area.

During his tenure at Iowa State, Bergles, an Anson Marston Distinguished Professor, started and served as director of the department's Heat Transfer Lab and played an instrumental role

in the funding and construction of the Black Engineering building. A member of the National Academy of Engineering, Bergles was named Clark and Crossan Professor of Engineering and director of the Heat Transfer Lab at Rensselaer Polytechnic Institute in 1986. He served as engineering dean at Rensselaer from 1989 until 1992.

Bergles initiated the contact that brought Brown to ISU in 1983, which gives this appointment special significance to Brown. "I have very high regard for Art Bergles. He was an excellent mentor to young faculty," he notes. "I am very flattered to be selected for this position."

Brown's professional accomplishments include his early advancement of the theoretical understanding of ionization processes in hydrocarbon flames and the development of innovative techniques to study combustion and fluid dynamics in fluidized beds. He has eight patents, one of which—a carbon-in-ash monitor—won an R&D 100 Award in 1997. Another patent, a latent heat-ballasted gasifier, has received national and international attention for its potential to expand the use of biomass resources. During his career at ISU, Brown has served as principal or co-principal investigator on grants and contracts worth over \$7 million. He has published extensively in the areas of combustion, gasification, and pyrolysis, which are thermal processes employed in the production of heat and power from fossil and biomass fuels. He also coordinated the establishment of a new multi-disciplinary graduate program in biorenewable resources and technology that was started last fall.

Bernard named ASME Fellow



James E. Bernard, Anson Marston Distinguished Professor of Engineering and director of the Virtual Reality Applications Center (VRAC), has been named a Fellow of the American Society of Mechanical Engineers (ASME) International. This prestigious honor is bestowed upon ASME International members with at least 10 years of active engineering practice and who have

made significant contributions to the field. Less than 2 percent of ASME's membership receives the honor.

A leading authority in vehicle dynamics, vehicle simulation, and virtual reality applications, Bernard was founding director of the Iowa Center for Emerging Manufacturing Technology at Iowa State, now known as VRAC. VRAC is recognized internationally for its leadership in the application of virtual reality technology to the challenges of science and engineering. It has attracted more than \$10 million in ongoing research contracts in virtual reality applications, supporting the work of more than 30 faculty and over 100 student researchers.

An active member of ASME, Bernard also recently received the ASME Distinguished Service Award. He was co-founder of Engineering Animation Inc, now part of EDS, which provided internet-based tools for engineering communication.

Bernard earned his bachelor's, master's, and doctoral degrees in engineering mechanics from the University of Michigan. He began his professional career there in 1971 at the Highway Safety Research Institute, where he led a team that wrote pioneering computer simulations of heavy trucks. He started his faculty career at Michigan State University where he was the founding director of the Case Center for Computer-Aided Design. He joined the ISU mechanical engineering faculty as department chair in 1983, and in the ensuing years, he has earned several honors for teaching.

New faculty learn the art of juggling teaching and research



Sriram Sundararajan

Even on the most blustery of winter days, ME's two newest assistant professors— Sriram Sundararajan and Shankar Subramaniam—radiate exuberance as they talk about making the transition to Iowa and getting established as researchers and teachers at Iowa State University.

Sundararajan joined the ISU faculty in January 2002 right after completing his Ph.D. at Ohio State University. It's a perfect fit for him because he longed to both teach and do research. "I love teaching!" he notes. And students have responded to his enthusiasm. Now in his third semester of teaching ME 325, Basic Design Principles, the class size has grown from 39 to 57 students.

He has plans to develop a course in tribology (friction, wear, and lubrication), but for now he's working to get his research program established.

"I'm focusing on several issues related to MEMS (MicroElectro Mechanical Systems) and nanodevices. Primarily, mechanical behavior of materials on the nanoscale and nanofabrication techniques involving scanning probe microscopy," he explains. The overall goal is to tailor materials for better friction and wear at the nanotechnology levels and thereby improve reliability. The college initiative to become one of the top engineering programs in the country presents challenges and opportunities, according to Sundararajan. "It means we're striving to be better so we're poised to try new things," he explains.

Handling teaching, research, and other faculty responsibilities is a juggling act that takes up most of his time, but Sundararajan, an avid football fan, still had time to enjoy the success of his alma mater's national championship year. It led to some friendly jiving amongst his ISU colleagues.

Sundararajan also recently resumed his sketching and drawing. His wife Sumana, whom he met while an undergraduate at the Birla Institute of Technology and Science in Pilani, India, requested some artwork for their home. And, some days, his neighbors on the third floor of Black Engineering may hear the soft sounds of Indian music coming from the keyboard in the corner of his office.

One of those neighbors is fellow newcomer Shankar Subramaniam. Subramaniam came to Iowa State last fall after three years teaching at Rutgers University. The decision to move to the Midwest was driven by his wife who had been offered a faculty position in English literature at Grinnell College.

In exploring his options, Subramaniam had an ISU contact—Rodney Fox, a professor in chemical engineering. "We first met when I was a doctoral student at Cornell University, and he was a visiting scientist," Subramaniam explains. "Rodney told me all of the exciting things going on at Iowa State, so I was very pleased to have the opportunity to come here."

Through gatherings for new faculty members, Subramaniam has gotten to know colleagues from across campus, developing both research and social networks. "That's what is really wonderful about Iowa State," he asserts, "the spirit of collaboration truly does happen."



Shankar Subramaniam

A Special Research Initiation Grant (SPRIG) and funding from the Department of Energy's Early Career Principal Investigator Program have helped get his research program started. It focuses on theoretical and computational approaches to understanding the properties of turbulent, reactive multiphase flow. One specific area of interest is modeling of sprays affecting automotive engines.

"We hope that in three or four years we can develop improvements to current computational techniques used in auto design labs. When they're working on a new engine design, they could simulate it and get a very good estimate of what its emissions would be," he explains. "They could then modify the design to improve it."

Subramaniam, who did his undergraduate work in aeronautical engineering at the Indian Institute of Technology in Bombay and his master's work at the University of Notre Dame, says he really likes how Iowa State students approach their classes. "They're very engaged," he observes. "They know they want to get something out of their education." Subramaniam teaches classes in fluid mechanics, heat transfer, and turbulence.

When he finds some spare time, Subramaniam enjoys a vigorous game of squash with the other new guy on the block—Sundararajan.



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Determination pays off for student entrepreneur



Talk with **Joe Hynek** for just a few minutes, and you're captivated. This ME graduate student is a dynamic, personable guy who likes to meet and learn about new people and loves to tell stories. He's also a singer, a songwriter, and an award-winning photographer. Hynek has a techie side, too, though. It was that side that led him to undergraduate degrees in agricultural engineering and computer engineering and now has him hard at work on his master's degree.

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