UPDATE
Mechanical Engineering
Winter 2002 • VOLUME 11, NUMBER 2 IOWA STATE UNIVERSITY

Meeting special needs

First-year mechanical engineering students in **Scott Openshaw's** design class and seniors in **Jess Comer's** design class are getting practical experience by serving customers with some special needs.

Their clients are the physically challenged residents of Ames-area facilities and their families.

Openshaw, instructor and graduate student in mechanical engineering, and Comer, temporary assistant professor of mechanical engineering, teach the two courses that have produced over 20 projects to help serve the physically challenged. Comer's older students help Openshaw's freshmen get their projects completed on time and according to specifications.

The two classes have brought from client to blueprint to reality a number of projects, including a tricycle for a physically disabled child and an automated plant-watering system for an assisted living facility, and adapted cooking equipment, electronic toys, and home and recreational spaces for special-needs individuals.

"Students have the creativity and the ideas, but they don't necessarily have the tools to bring them together," says Openshaw. His class formally introduces students to tools like CAD software and concepts like reverse engineering. Where traditional engineering design courses rely on robots and fixed components for students to accomplish a pre-determined task, this course expects students to invent parts and then design, build, and implement solutions for their projects.

The course imparts engineering skills that are multi-faceted, from understanding fundamental concepts to tackling budgeting and resource management issues. Group work, moreover, provides valuable lessons in the need for effective communication, building trust, and nurturing a spirit of cooperation.

To begin the process, those in need of help submit a paragraph describing their specific needs. The student groups choose their projects from the submissions. So far, area social service organizations have kept students stocked with projects, but Openshaw and Comer are looking into alternative funding sources to maintain a steady stream of projects.

Rob Heidel, sophomore mechanical engineering student from Oneida, Wisconsin, worked in a group that last year engineered a support structure to attach a mobile to both a wheelchair and a hospital bed.

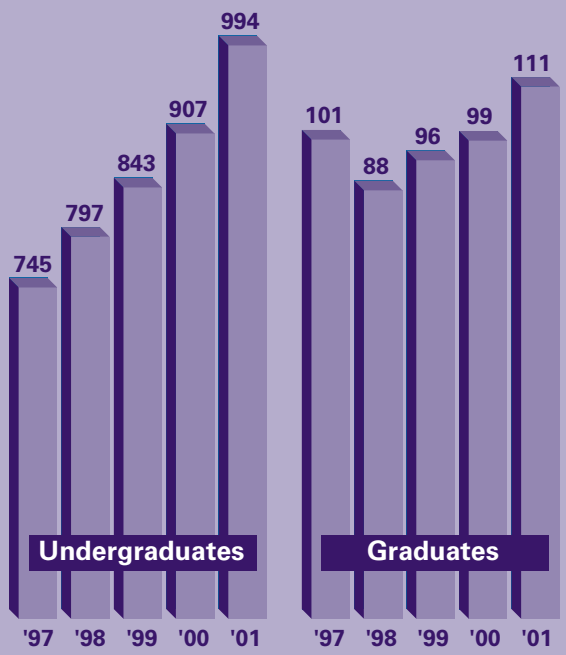
"The project opened my eyes that you have to take into consideration the users of your product in the engineering process," Heidel said.

That, too, is one of Openshaw's goals.

"Many students have not been exposed to people with physical or mental disabilities before taking this class," he said. "Once they're handed the responsibility, they're more apt to get the project done because they know that someone needs to use it." ME

Scott Openshaw, right, teaches a course that gives students real-world design experience.

Enrollment figures for the last 5 years



Notes from the Chair

As much as anything in this job, when I look at all the things our alumni, students, staff, and faculty do, I'm astounded at the sheer variety and vitality of our ME family. Just a casual glance through the contents of this issue of the *Update* will clue you into what I'm talking about—if you didn't know already. And a closer look will tell you why my job has to be one of the best on campus: even when resources are tight, ME people know how to produce.

If people "vote with their feet," then a glance at that enrollment chart on the front of this issue gives you a pretty clear indication of just how the "vote" is going: people want what we have to offer. And is it any wonder? Just look at our alumni! If past results are the best indicator of future promise, then our department has to look attractive to any entering freshman.

Certainly the best thing about our alumni is the consistency of high-caliber people we generate, year-in, year-out. The stories in this issue cover alums from the '50s all the way to the present. Richard Stanley (BSME '55) recently was awarded ASME's Hoover Medal (p. 6), in the words of the award committee, given to "an engineer whose professional achievements and personal endeavors have advanced the well-being of humankind." We know that most of what we do as engineers "advances the well-being of humankind," but the Hoover Medal recognizes people who really go above and beyond the call of engineering to embrace an even larger calling, and we're grateful for any small part we may have played in forming the character of a humanitarian such as Stanley.

Maybe one day they'll name a medal after Gary Hoover (BSME '61) as well. We're delighted, though, to name something after Gary and wife Donna that we hope will be just as lasting, and even more instrumental in helping to form the kind of people the Hoover Medal recognizes. Through Gary and Donna's generosity, we broke ground this past fall on Hoover Hall, which will expand facilities and opportunities for a number of engineering disciplines, not least ME (p. 4). As I write this the backhoes, trucks, and other heavy equipment are busy beneath the shadow of Marston Tower, erecting a lasting legacy in the name of yet another ME success story.

Fast forward to the '70s and say congratulations to Robert Bernhard (BSME '73), who was recently announced as one of four recipients of the Professional Achievement Citation in Engineering (PACE) awards. While the Stanley Foundation works to make a difference internationally, Bernhard strives to make one locally as he couples a distinguished research record with his tireless efforts for diversity and in behalf of underrepresented groups at Purdue.

Finally, the successes of more recent alums such as Chris Clover (PhDME '96) and Sergei Volkov (BSME '00) convince me that we're on the right track and continue to produce the kinds of graduates that bring honor to Iowa State and the profession.

People like this don't grow on trees—we grow them right here in the College of Engineering. When you consider programs like the one on the cover that gets ME undergraduates busy assisting disabled Iowans, it's not hard to see a future in which other ME grads will endow buildings to educate future generations, or establish foundations to foster international understanding. Check back here in 40 or 50 years—I promise you that young man or woman building a tricycle for a disabled child today will be doing something nearly as great tomorrow.

Warren R. DeVries

ME alum turns passion for high-tech into business; projects include C6

For **Chris Clover, PhDME'96**, a passion for video and computer technology while growing up has proved fortuitous in an occupation devoted to engineering bigger and better visual feats. Clover is founder and CEO of Mechdyne Corporation, internationally recognized as a leader in the world of computer visualization and large-scale virtual reality systems.

Headquartered in Marshalltown, Iowa, Mechdyne specializes in interactive, customized virtual reality systems providing solutions for clients in a wide range of businesses, including aerospace, automotive design, consumer electronics, and oil drilling. Clover's success both here and abroad was recently recognized with the 2001 Iowa/Nebraska Entrepreneur of the Year Award as one of the top 10 entrepreneurs from both states.

As a doctoral student in the ME department, Clover found an ideal opportunity to research mechanical systems and visualization techniques. A NASA project with ME professor **James Bernard** and IMSE professor **Carolina Cruz-Neira** opened avenues to explore the complex mechanics and computational challenges of immersive visualization technology. "I was always interested in a combination of visualization and simulation, which ultimately became a big part of my dissertation," recalls Clover.

The first full-scale project Mechdyne took on as a company was with the U.S. Naval Research Laboratory. "The Navy was initially interested in building a large-scale visualization system for simulating on-board ship firefighting as part of training exercises," said Clover. It was a large project and expensive to deliver. "To carry out the project, we had to borrow more than twice the money you'd borrow for a house," recalls Clover. Much of the money was invested in buying hardware that included projection equipment, computers, mirrors, and video distribution systems.

The success of Mechdyne's first project with the Navy led to other projects for Fortune 500 companies like GM, Rockwell, Boeing, and BP; university research facilities; and international companies interested in harnessing the power of large-scale visualization to enhance their capabilities.

To date, Mechdyne has developed several one-of-a-kind systems that improve the efficiency and accuracy of tasks ranging from oil-drilling operations to automotive design and engineering. The company designed and built the C6 at Iowa State University, North America's first six-sided virtual reality research facility, and created the first-ever commercially available re-configurable surround-screen system. Other projects have included collaborative work with the telecommunication industry and clients overseas. Mechdyne has installed a large-scale virtual reality system for Chevron Nigeria Limited, a computer-based visualization system for a national aquarium in Taiwan that simulates ocean marine life, and a unique product called MD Wall for an oil and gas service company in Perth, Australia that performs visualization and interpretation of seismic data.

As varied and complex as these projects may be, Clover continues to anticipate limitless opportunities in the world of large-scale visualization. "In the future, the lines between reality and virtual reality will become even more blurred," he speculates. Meanwhile, his immediate focus lies in conceptualizing and delivering real solutions to clients with diverse visualization needs. ME

'GET YOUR KICKS'—THEN GET BACK TO WORK: THE AMERICAN SOLAR CHALLENGE IS SERIOUS BUSINESS

Streaking down Route 66 at 70 miles an hour, a sleek and sexy silhouette powered by the sun, an idea flashing through the mind and over a desert highway, perhaps a mirage.

You should be this cool, right?

Well, get your kicks, but then get back to work: this is serious business, only masquerading as fun.

And you can forget the American myth of the loner blazing solo down some lost highway to glory: no fewer than 19 Cyclone undergraduates made up Team PrISUm, with nearly as many parents, teachers, and others bringing up the rear.

This wasn't some flash-in-the-oil-pan cultural fantasy, but instead the American Solar Challenge. Sponsored by the U.S. Department of Energy, the Challenge was a 2,300-mile marathon pitting 30 teams from some of North America's leading engineering programs in a race to develop a technology still in its infancy.

continued on page 7: Solar car

Ceremonial groundbreaking for Hoover Hall held in September

Gary and Donna Hoover gave the leadership gift for ETRC, Phase II.

The second major piece of Iowa State's vision for the future of engineering got its "jump start" from a mechanical engineering alum. **Gary Hoover, BSME'61**, and his wife Donna provided a $3-million leadership gift for the project. A ceremonial groundbreaking for Gary and Donna Hoover Hall, Phase II of the Engineering Teaching and Research Complex, was held September 8. Construction will be started next spring and when completed in late 2003, the 100,000-net-square-foot building will complement Howe Hall (Phase I) and bolster engineering education at Iowa State.

"I am pleased to team with my alma mater and bring a new level of education opportunities to bright young men and women who will be the leaders of tomorrow," said Hoover. "The engineering fundamentals that I learned at Iowa State are the most important factors in my professional career. I have always stayed closely connected with the ME department. It's very heartwarming to see a university moving the way that Iowa State is."

After graduating from Iowa State, Gary spent nearly 20 years in leadership positions as an engineer with Westinghouse. He retired in 1995 as vice president of Tenaska, Inc., a company that he co-founded in 1987 to design, develop, construct, and operate large-scale power plants. Donna was also part of the start-up team, providing critical administrative and clerical skills in the company's early years. The Hoovers reside in Rio Verde, Arizona.

Hoover Hall will be located directly across Bissell Road from Howe Hall on the west side of campus, and between ME's location in Black and the Nuclear Engineering Lab. The building will fill the space between Bissell and the Marston water tower and will be connected by a skywalk to Howe Hall. It's features include multi-disciplinary labs that ME students will benefit from, including a product realization lab where students will be able to build prototypes of their engineering designs; a mechatronics lab, which combines electronics with mechanical engineering; and a team design cluster with a larger room to facilitate the meetings of several design teams. It also will include a 400-seat auditorium and four large classrooms (all for general university use), and will be home to the materials science and engineering department and the Office of Engineering Computing Support Services.

The $63.3-million ETRC is the largest capital project in Iowa State history. The project has been funded by a mix of private gifts ($29.9 million), state funding ($31.9 million), and a federal grant ($1.5 million). ME

PACE Award for ME alum

The college recently honored several alumni for superior technical or professional accomplishments, including a graduate of the mechanical engineering program. **Robert Bernhard, BSME'73**, was one of four recipients of the 2001 Professional Achievement Citation in Engineering.

Bernhard is currently professor of mechanical engineering at Purdue University and the Director of the Ray W. Herrick Laboratories, an outstanding model for industry-university collaborations. He has a distinguished record of research contributions, including more than 50 refereed journal papers, nearly 100 technical reports, numerous lectures, and more than 70 grants totaling more than $6.5 million. His behind-the-scenes work includes mentoring young faculty and under-represented groups. He is also one of the driving forces behind specific actions and policies to enhance diversity at Purdue.

Bernhard also earned an M.S. degree in mechanical engineering in 1976 at the University of Maryland and a doctoral degree in engineering mechanics in 1982 at Iowa State University. ME

Volkov shares silver screen with Hollywood stars

An Iowa State graduate is sharing the big screen with megastars Julia Roberts and John Cusack in their recent work, America's Sweethearts. ME graduate **Sergei Volkov** doesn't appear in the movie but his name is included in the credits, about five minutes after the names of the Hollywood stars scroll by. But in the "big picture," five minutes isn't a lot.

Thanks in part to his work with ISU's Virtual Reality Applications Center (VRAC), Volkov, an August 2000 ME graduate, had the opportunity to do some graphics work for the romantic comedy. For his part, he developed a computer–based tool that essentially creates a flexible backdrop for computer-generated scenes. According to Volkov, computer graphics had a part in nearly half of the movie's scenes.

While at ISU, Volkov worked with professors **Judy Vance** and **Carolina Cruz-Neira** at VRAC, representing mechanical systems in an interactive 3-D virtual environment. "The VRAC at ISU has the most advanced facility in the field of computer graphics," Volkov said. He credited it with training him in the fundamentals of virtual reality applications in mechanical engineering, which involved learning the computer techniques that allow mechanical systems to be reproduced in a 3-D virtual world. So the move from mechanical engineering to computer-based special effects was not a big leap.

Will Volkov be gracing the silver screen again any time soon? "I am working on several different projects right now," he said, notably computer techniques that have been or will be used in Harry Potter, Spiderman, and Stuart Little 2. All in all, he said, he was pleased to have had what he called "a unique chance to contribute to a project that will be seen by millions of people."

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.

The Black-Hilstrom Fund

An Endowment for Mechanical Engineering

☐ To provide support for the Department of Mechanical Engineering, I enclose $_____ by check made payable to the ISU Achievement Foundation and designated to the Black-Hilstrom Fund.

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

☐ I am interested in learning about other ways I can help the Department of Mechanical Engineering.

Name_____ Date _____

Degree(s)_____ Year(s) granted _____

Address _____

City_____ State_____ Zip _____

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

Please return to: The ISU Foundation, Alumni Suite, Memorial Union, 2229 Lincoln Way, Ames, Iowa 50010-7164.

We appreciate your support!

The newest mechanical engineering graduates were honored in May at a pre-commencement reception hosted by the department. Following are the members of the Class of 2001; an asterisk (*) indicates that the student graduated with honors.

Paul Thomas Ackerson
Paul David Anderson *
Todd D. Anhalt
Adam Joseph Binderup *
Mark J. Bly *
Eli Aaron Brown
John Van Cao *
Chee Wai Chen
Chun Cheong Chong
David James Cook *
Luke Joseph Cummings *
Jason Paul Dale
Christopher John DeHaan
Scott Jeffrey Eitreim
Paul D. Fisher
Aron Wesley Fleischmann *
Vernon K. Gambleton
Ross Anthony Gill
Josh C. Heitsman *
Kenneth Joseph Herold
Chad Michael Holst *
Christopher John House *
Jeffrey Alan Huntington
Kevin Ross Jagodzinski
Kamel Abdelmeguid Kamel
Alan Leonard Kastengren *
Daniel G. Kiekhaefer
Taejin Kim
Robert Wesley Klingaman
David Andrew Kowalczyk
Kevin J. Kruck *
Scott Michael Larson *
Kevin Dwayne Madsen
John Howard Mammoser
Jason Aric Mason
Lee A. McInroy
John Edmond McMartin
Benjamin Kurt Nimmergut
Bret M. Olson *
Brian R. Perlberg
Patrick Alvin Peterson
Paul D. Peterson
Dan C. Pilney
Kyle Jay Punt *
Craig Christopher Riedel
James P. Rieke
Matt David Romig *
David E. Rossman
Robin Michelle Sauser *
Brad J. Schmidgall *
Conan Ray Schwartz
Kyle D. Seibold *
David Michael Sims
Robert J. Stech
Sara Ann Stolmeier
Andrew G. Strohm
Michael Allen Taylor *
James Byron Thomas
Daniel Peter Travis
Peter D. Vinck
Luke D. Wadsley *
Paul Wang
Jason Allen Whitford
Bryan J. Willson *
Matthew John Wiske

Department Dynamics

Prestigious honor for ME graduate Richard Stanley

What do former U.S. presidents Herbert Hoover, Dwight David Eisenhower, and Jimmy Carter, and **Richard Stanley, BSME/BSEE'55** have in common? As of November of this year, they've all been recipients of the Hoover Medal.

The Hoover Medal Board of Award, which consists of members of five national engineering societies, recognizes one individual annually for unselfish, non-technical humanitarian service. The venue for this year's presentation was the ASME Honors Assembly in New York City.

Stanley, the 2001 Hoover Medal award winner, is currently the chair of The Stanley Group (the largest engineering firm in Iowa) and chair and president of The Stanley Foundation, both located in Muscatine, Iowa. The foundation's stated mission is to "secure peace with freedom and justice." It began as an experiment to get global education into Muscatine's secondary schools and currently produces both a weekly half-hour radio program (Common Ground) that is carried on 110 radio stations and a monthly news magazine with a circulation of around 55,000. The Stanley Foundation does programming in four areas: global governance, U.S. foreign policy, global education, and media. One of Stanley's nominators referred to The Stanley Foundation as "an invaluable partner to the United Nations."

Stanley has also been active in local human service institutions, among them Eastern Iowa Community College and Unity Healthcare.

As one of his nominator's put it, Stanley's "leadership efforts to promote thought and encourage dialogue about world affairs serve multiple constituencies—ranging from diplomats, scholars, and political and business leaders to pre-teen youth in rural Iowa."

There have been 59 Hoover Medal recipients since its inception in 1929, and the list is impressive. In addition to the three presidents mentioned above, count a presidential advisor, a former governor of Puerto Rico, an ambassador to France, and engineers for both the Panama and Suez canals—and now Richard Stanley. ME

New MEAC members

The Mechanical Engineering Advisory Council recently added four new members. More detailed information on the new members will appear in a future issue of *ME Update*. For now, here's a quick introduction:

Tim Deutsch works for John Deere Des Moines Works in Ankeny, Iowa, where he is manager of its worldwide product development for cotton harvesting products. He attended Iowa State in 1977 and graduated with a B.S. in engineering in 1978 from the University of Illinois. **Cynthia Lord, BSME'82**, is plant manager of Alliant Energy's Ottumwa generating station. Prior to joining Alliant Energy, she worked at Consolidated Edison of New York. She received an M.B.A. from Baruch College, New York, in 1998.

Sue Mantell is an associate professor of mechanical engineering at the University of Minnesota. Prior to this position, she worked for seven years in GTE and CTI Cryogenics as a mechanical engineer. Mantell received her bachelor's and doctorate from Stanford University and a master's from Northeastern University, all in mechanical engineering. She joins the advisory council as an academic member. **Richard Pettibone** is the director of product design engineering at Maytag and Admiral Products in Newton, Iowa. Previously, he was with NACCO Materials Handling Group, Portland, Oregon, and Clark Materials Handling Company, Lexington, Kentucky. He received his bachelor's degree in agricultural engineering from Washington State University. ME

Heindel improving recycling

The pulp and paper industry holds many examples where a gas, liquid, and fiber mixture occur simultaneously, such as in paper recycling and fiber bleaching. With support from a recent $120,000 grant from the U.S. Department of Agriculture, ME Associate Professor **Ted Heindel** is studying gas flows in these complex slurries to identify factors that control the gas holdup or volumetric gas fraction in air-water-cellulose fiber systems. The results from his research will improve paper recycling and fiber bleaching operations.

Current literature, according to Heindel, suggests that higher gas holdup values can enhance various processes, including contaminant removal in paper recycling operations as well as fiber bleaching and slurry heating in pulp production operations. "Identifying conditions that increase gas holdup in gas-liquid-fiber systems will improve paper recycling and fiber bleaching and enhance fiber utilization," said Heindel.

To this end, he is designing and building a four-meter tall bubble column that will allow for the study of gas flows in fiber slurries. Heindel will collect gas holdup data using different fiber types, fiber mass fractions, and flow conditions in an effort to maximize gas holdup in the system and to develop gas holdup correlations that can be used for process control. Additional applications of this research, according to Heindel, exist in other process industries, such as fuel gasification, chemical production, wastewater treatment, pharmaceutical production, and biological organism production.

Solar car: continued from page 3

OK, so it wasn't all work. If the image of a black-leather-jacketed loner streaking down Route 66 isn't quite accurate, neither is the notion of a bunch of white-lab-jacketed techies with clipboards and calculators, poring over their logarithms.

"It's absolutely fun to drive that car!" enthused **Katie Strachan**, a junior AST major and one of three drivers for this year's effort. (Team PrISUm was formed entirely of students from drivers to designers, but participation extended well beyond the College of Engineering to include volunteers, such as Strachan, from a host of majors.)

PrISUm Odyssey was the latest in a series of student-developed and student-driven solar cars at ISU dating back to 1989, when current Team PrISUm faculty advisor **Jim Hill** led the first class of student engineers in a two-year project. The effort was handed off for several years to Tau Beta Pi, the ISU engineering honor society, before taking its current form as a university-wide effort.

But while ISU solar car projects have been around for a while, the American Solar Challenge is new: never before had ISU solar car teams undertaken an effort of this scope, and Team PrISUm faced formidable obstacles almost from the start of the race.

After a promising start July 16 and 17, Team PrISUm encountered problems, first with the solar array, then with the car's suspension. According to a report filed by project director **Nick Mohr**, an ME senior, "Odyssey was not charging correctly and was in need of some energy to make it to Neosho, Missouri."

However, the Challenge's spirit of competition was matched by an equally powerful spirit of collegiality among the teams. "While watching our team have problems," Mohr continued, "MIT provided us with several trackers to use."

Yet PrISUm's problems were far from over. Shortly after leaving Edmond, Oklahoma, on the fifth day of competition, the aging roads of old Route 66 took their toll on Odyssey's suspension, forcing the team to replace key parts and order backups from a supplier in Amarillo, Texas.

Between these problems and the earlier delays caused by failure of the solar array, Team PrISUm found itself at the back of the pack by the time they got to Albuquerque. And if the team were made up of anyone other than ISU student engineers and their allies, perhaps they would have stayed there. But more than a contest for first place, the American Solar Challenge 2001 had as one of its primary purposes the development of its participants as team members in tackling and overcoming the inevitable problems associated with such a grueling race. In this respect, Team PrISUm proved true champions.

"I was proud to be a part of our team," said Team PrISUm assistant director **Ben Nimmergut**, **BSME'01**. "The group worked very well with each other, and other teams complimented us on this. We actually received the award for best teamwork during the second stage of the race."

Mohr agreed, adding that the award was given for the team's efforts from Rolla to Barstow, precisely the stretch when Odyssey encountered its greatest mechanical problems. When the going got tough, there was no doubt in anyone's mind just who the tough were or where they were going, as ISU's teamwork was strong enough to overcome these early setbacks and vault Odyssey from 29th to 16th place by the end of the race.

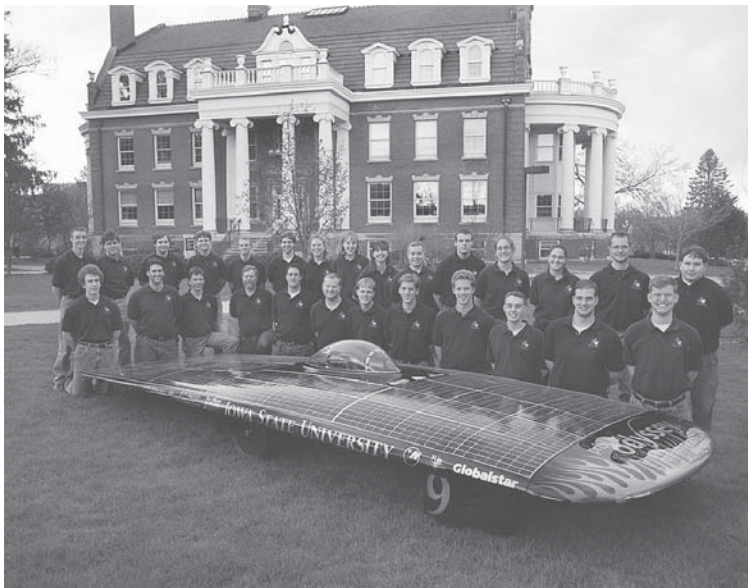
Not only did Team PrISUm members work well together, but the effort also benefited from the support of friends, families, alumni, and the university itself. "ISU's solar car team has some of the best support in the country," said Nimmergut. "Some of us have visited other teams' facilities, and Team PrISUm's are among the best. We get a large amount of support from the College of Engineering and ISU as well."

Team members hope to parlay this year's success and the ongoing support of the college and others into an even stronger showing for 2003.

"We're going to build a brand new car," said **Valerie Sandefur**, a sophomore in mechanical engineering and director-designate for ISU's 2003 solar car project." It's going to be smaller, with a smaller solar array and motors. We plan to have more testing on a car that's more affordable and more efficient."

And, one hopes, even more kicks than the last.

Members of Team PrISUm pose with their solar car, the Odyssey.



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ME Update@your.leisure

Historically, the Department of Mechanical Engineering has published and mailed *ME Update* twice annually. However, reduced state funding is forcing the department to re-evaluate all of its expenditures, including publications. In the future, we may be limited to printing one annual issue and perhaps offering a second issue online.

We'd like to know how you'd like to receive your alumni newsletter, by mail or on-line. Please send your preference to our editor, Pam Reinig, at preinig@iastate.edu. You can also reach her by phone (515-294-0261), fax (515-294-3528), or U.S. mail, (212 Marston Hall, Iowa State University, Ames, IA 50011). As always, general comments on the newsletter are welcome, too.

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