



University of Delaware Summer 2008

Mechanical Engineering News

Distinguished Careers



Inside this issue:





Cheers from the Chair

I have had the privilege of leading the Department of Mechanical Engineering for the past four years. In that time our department has undergone tremendous growth in many areas, including undergraduate enrollment, incoming student SAT scores, faculty research expenditures, and number of women faculty. ME at UD is a strong and vibrant department with prospects for a very bright future.

It is also a fun place to be. Our students are doing great things and our graduates are going on to be successful engineers and leaders.

In this issue of *Mechanical Engineering News* you will hear about our most recent ME Alumni Career Celebration (ACC). This is our fourth ACC and each one has gotten bigger and better. It provides a chance for us to hear about the successes of our former students and to honor a select few. This is a great day as our current students get a chance to see what their education can accomplish and our faculty get to see the fruit of their work and our alumni get a chance to re-connect with old friends.

Our guest speaker this year was Patrick Harker. Dr. Harker is the new president of the University of Delaware and has a PhD in engineering. He is an amazingly accomplished man, having been chairman of an engineering department of the University of Pennsylvania and then going on to be the dean of Penn's Wharton School of Business.

President Harker has come to Delaware with a vision of making UD a world-class institution and the Department of Mechanical Engineering is pleased to be able to play a strong role in that. UD's Path to Prominence, as outlined by President Harker, will include renewed efforts in green energy, graduate programs, and globalization—a script that could have been written by describing our department's work. We look forward to providing leadership to UD as the university moves forward on these initiatives.

Please read over highlights of the talks from our 2008 ME Alumni Career Celebration and consider joining us next year to see what is happening at the University of Delaware!

Thomas S. Buchanan

Chair of Mechanical Engineering

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ME News

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Editor's Notes:

At some point early this year in the planning process for the April 25th Alumni Career Celebration it occurred to us that this event/process— now four years old – should not be named an “Alumni Career Celebration”, but simply a “Career Celebration”. We realized this when we got some feedback from students, that some thought this was just for alumni! Seems kind of obvious now, but not only does the shift in emphasis avoid future misconception, but it makes sense to think of it as not only celebrating the current and past careers of alumni, but also the future careers of current students.

I hope you can see in this issue that students learn a lot by attending this event, and having a chance to hear about career experiences, and in general, interact with alums and faculty (see especially the stories on page 4, 13-14). Please plan to join us next year on May 1, 2009, and among other benefits, participate in this process which supports and broadens the efforts of the Mechanical Engineering Department to get young men and women engineers started on successful careers.

An abridged program (the afternoon's events and abstracts and speaker's bios) is added at the end of this newsletter to provide more detail on the April 25 event for those who did not attend.

Faculty & Staff Highlights

Dr. Suresh Advani, George W.



Laird Professor of Mechanical Engineering, was honored at the University's Hooding Ceremony on May 30 with an Outstanding

Doctoral Graduate Student Advising and Mentoring Award.

Two Senior Design teams advised by Prof. Jim Glancey have been invited to make presentations at the annual ASME Design Conference in August. Each will receive at least \$1,000 and as much as \$2,000 if selected as a winner. Team CNH (Case-New Holland America LLC) developed a moveable support structure and mechanism for hydraulic hoses and electric cables on round balers. Team B&D (Black and Decker) developed electronic heat sinks for a new product line of lithium ion battery powered tools.

Dr. Jill Higginson was recently



awarded a new NIH R01 grant to study muscle morphology, strength, and compensatory strategies during walking following

stroke. This collaborative project involves mechanical engineering (Higginson and Tom Buchanan) and physical therapy (Darcy Reisman and Stuart Binder-Macleod) and will use open source simulation tools made available by the National Center for Biomedical Computing at Stanford University.

Dr. Ajay Prasad gave an invited



talk at the University of South Carolina's NSF-I/UCRC for Fuel Cells on "Transport Processes in Fuel Cells" on February 29, 2008. He was

also a speaker and panelist at the UD Energy Symposium in Clayton Hall on March 17, 2008. His topic was "Fuel Cells: Challenges and Opportunities." In addition, Prasad was a speaker and panelist at the Panel on Alternative Energy during the first UD Forum on May 10, 2008. On April 10, 2008, he gave a presentation on the UD fuel cell bus program at the "Power-Up Gambia" event at Hagley Museum.

Dr. Kausik Sarker gave invited talks



on contrast microbubbles and cell mechanics at the University of Washington—St. Louis and the University of Maryland—Baltimore

County. He gave a talk on viscoelastic computations at the Idaho National Laboratory and has been invited to organize a mini-symposium on Interfacial Rheology at International Rheology Congress 2008, to be held from August 3-8, in Monterey, California.

Dr. Lian-Ping Wang worked as a Visiting Scientist at the Institute of Mechanics, Chinese Academy of Sciences in Beijing, China, from May 25 to June 13. He continued to collaborate with Professor Guowei on turbulent



collision of inertial particles using various computational approaches. On June 2, 2008, he delivered an invited talk, "Direct

Numerical Simulations of Particle-Laden Turbulent Flow," at the International Conference on Applied Mathematics: Modeling, Analysis and Computation at City University of Hong Kong. Dr. Wang was recently offered a joint appointment in Physical Ocean Science and Engineering at UD's College of Earth and Marine Studies and also invited to serve as an affiliated faculty member of UD's Center for Critical Zone Research.

The UD fuel cell bus was demonstrated during the City of Newark's Wine and Dine event on March 29, 2008, and at Hagley Museum on April 10, 2008. It was also part of the parade on Main Street to celebrate the City of Newark's 250th anniversary on April 12, 2008.

College Honored for Safety Program

The College of Engineering was honored as "Department" of the Month by the UD Office of Occupational Health and Safety in January 2008. The College was cited for its efforts toward overall laser safety. Roger Stahl and his colleagues specifically received kudos for providing significant support in terms of not only safety but also experimental design. The featured article may be viewed at www.udel.edu/ohs/engineeringdom0108.pdf.

Department News

Advani Participates in Engineering Program for Teachers

By Diane Kukich

Suresh Advani, George W. Laird Professor of Mechanical Engineering, is one of seven faculty members hosting high school math and science teachers in a unique summer immersion program called “Nature InSpired Engineering” (NISE).

Led by Ken Barner, Professor in the Department of Electrical and Computer Engineering, NISE is funded through the National Science Foundation’s Research Experiences for Teachers (RET) program. RET grants support the active involvement of K-12 teachers and community college faculty in engineering research.

According to Kathy Werrell, Assistant Dean and Director of Engineering Outreach, the program is aimed at fostering technological innovation in the classroom, facilitating the establishment of long-term collaborative partnerships, and providing teachers with an intellectually invigorating experience.

The fourteen teachers participating in

the first year of the NISE program range from students who are just completing degrees in math and science education to individuals with more than two decades in the classroom.

Year 1 projects are addressing materials for natural energy capture, natural fiber composites, environmental engineering, and nature-inspired drug delivery, while projects in the second year will focus on bio-imaging, sensors for disease management, biomimetic flying robots, and biomedical tissue engineering. The third-year program will focus on the four areas that were deemed the most successful in the first two years.

Advani is working with Bob McDowell and Peter Yonko of Newark High School in Delaware on a project entitled “Manufacturing of Composite Materials with Jute Fabrics.” The two teachers hope to gain a better understanding of the physics and chemistry of materials processing through the program.

“I want to instill an appreciation for the use of a science base in a manufacturing process that is usually approached by trial and error,” Advani says. “The use of jute fabrics as the reinforcement in composites would increase the use of recyclable and biodegradable materials for various applications, reducing the need for more

landfills and crude oil.” Yonko hopes to come away from his six-week summer experience with a template for how to plan and conduct a good laboratory experiment that he can implement in his science classes.

Online tools, including a wiki platform and video conferencing, will enable the interactions among the faculty and teachers to be continued during the school year and will also facilitate international collaborations. “We want the benefits and the relationships to go far beyond the six-week summer program,” Barner says.

“This is a wonderful program,” says Michael Chajes, Dean of Engineering, “and it meshes perfectly with the milestones identified as part of UD’s recent strategic planning initiative—in particular, the goal to ‘strengthen public education in Delaware and beyond’ as part of *The Engaged University* milestone.”

“In addition,” he continues, “individual projects within the NISE program are addressing issues associated with other strategic milestones—for example, our energy, materials, and environmental engineering projects are all congruent with *The Initiative for the Planet*. And we’re very pleased to have faculty participants from all five of our engineering departments as well as teachers from three states.”

Prof. Buchanan Honored with Trabant Award for Women’s Equity

Prof. Tom Buchanan has been awarded the E.A. Trabant Award for Women’s Equity. The award was established in recognition of UD President Emeritus E. Arthur Trabant’s support for women’s equity and is given by the President’s Commission on the Status of Women (PCSW) each year to an individual, department, administrative unit or committee that has contributed to the equity of women at UD.

As head of the Department of Mechanical Engineering, Buchanan has played a key role in the increase in tenure/tenure-track women faculty

in the College of Engineering, as well as improving the climate for female faculty and students. Since he became chairperson, the proportion of women faculty in his department has increased to 19 percent—third highest among the top 50 mechanical engineering departments in the country, PCSW noted.

Besides taking a lead in hiring, mentoring and retaining women faculty in the department, Buchanan also has engaged his female colleagues in collaborative research. Last year, UD was awarded an \$11 million National Institutes of Health (NIH) grant for osteoarthritis research. Buchanan serves as the primary investigator, and women faculty are leading the five major research projects for this grant, coming from three different departments and two different colleges.

“Dr. Buchanan has served as an important and active role model, which has led to a healthy work environment

for all faculty, and he has significantly improved the climate for women faculty and students,” PCSW noted in announcing the award.

UD President Patrick Harker and Trabant made the award presentation during a luncheon on May 13.

Editor’s Note: This article was adapted from an article that appeared in UDaily on June 5, 2008.



Fourth ME Business and Careers Conference a Success

The Fourth Annual ME Alumni Career Celebration attracted 184 alumni, students, faculty, and staff members for an afternoon of technical talks, career advice, networking, and student presentations. Attendees included five previous DCAs—Don Cohee, David Bach, Bill Mavity, Pat Reynolds, and John Thackrah.

Highlights of the event included a keynote address by UD President Patrick Harker and presentation of Distinguished Career Awards (DCA) to five alumni. Following the awards ceremony, the DCA recipients shared their career and life experiences in a panel discussion.



The dual-track format offered attendees the opportunity to choose the sessions most relevant to them, and the consensus was that this year's format was "just right."

"The feedback I got from alumni, students, and guests was that the breakout sessions had the right blend of technical information and career planning ideas and that the presentations were interesting and entertaining," says Pat Reynolds (BME1967).

"In planning the first conference, we asked ourselves, what do MEs do? Since then, we've learned that they do just about anything they want."

Bill Wagamon (1962)

"I think the event provides a great opportunity for alumni to catch up with each other and with what's going on at the University," says Alumni Coordinator Nate Cloud (BME1965). "And for students, it's a chance to gain valuable insights from some very distinguished alumni from the 1960s, 70s, and 80s."

"At the same time," he continues, "the regular sessions offer them the chance to hear from some more-recent alumni whose careers were launched within the last decade."

Research talks by current faculty focused on work in two areas with biomedical applications: the use of robotics for training and neuro-rehabilitation by Prof. Sunil Agrawal and the biomechanics of knee arthritis by Prof. Jill Higginson.

Two students provided highlights of Senior Design projects. Marykate Wioncek (BME2008) provided highlights of her team's Vibration Fatigue Tester for Southco's Compression Latches, while Julianne Twomey (BME2008) described her team's project to remove heat from a new Black&Decker Drill.

Alumni shared insights gained over their many years in the business world. Shawn and Dina Riley (both BME1998)



addressed the workplace from the viewpoint of an episode of "Survivor," and Pat Reynolds (BME1967) and Jim Hutchison (BME1978) talked about business practices in a global economy. Steve Andersen (BME1990) covered research at the University of Delaware Center for Composite Materials.

During the panel discussion, moderated by Prof. Mike Santare, the five Distinguished



"Undergraduate enrollment is high, graduate student quality is high, and faculty hires are excellent. In the future, we plan to hire more faculty, expand our NIH program, and establish new space for undergraduate research. We're going to end the practice of UD being a well-kept secret. We're going to recruit excellent students and honor outstanding alumni."

Tom Buchanan, Chair, Department of Mechanical Engineering

Career Alumni fielded a number of questions from the audience regarding such issues as career transitions and maintaining balance in life.

In his keynote address, President Harker said that the future will demand a blending of business, economics, and engineering. "Engineers will be at the heart of it," he said, "using creativity to produce new things and solve problems."



Images from
**A Business, Technology
& Careers Conference**

Friday, April 27, 2008



Panel Discussion Yields Valuable Insights

The audience at the ME Conference had access to the collective wisdom of 150 years in the workplace when the 2008 Distinguished Career Alumni came together after the awards ceremony for a panel discussion led by Prof. Mike Santare. The following summarizes their insights by topic.

How do you navigate career transitions?

Martha Meaney Murray (1987)



began by talking about her move from engineering to medicine. “I fell in love with a particular problem,” she said. “I wanted to know why the ACL doesn’t heal, and I realized I needed to be an MD to

gain the tools to address this problem.”

“I found that the transition was relatively easy,” she continued. “Med schools are delighted to have engineers.”

For **Ray Feehery** (1974), a senior



course in gait analysis sent him along the path to becoming a DPM. “You have to stay open-minded,” he said, “because you don’t know what class or what professor is going to

stimulate an interest.”

“Because I was really into running, I chose to pursue a medical degree rather than a Ph.D. I felt I could help patients after I was too old to motivate students,” he added.



Jim Gitney (1978) admitted that he has

never worked as an engineer. “I’m a trouble-shooter,” he said. “Engineers can do anything they want because they know how to think.”



For **David Meyers** (1981), decisions about career change migrate from the brain down to the gut. “Don’t overthink it,” he said. “Try something; if it doesn’t work, you can always

change later.”

How do you maintain balance in life?

“Whenever anyone offers help, take it,” said Meaney Murray. “There is no magic answer—you just do what you can to do your best doing what you want to do.”

For **Oren Phillips**, the answer lies in “feeding your passion.”



“That’s what keeps me energized,” he said. “As engineers, we’re not constrained.” Phillips assembled a team to assess

the Challenger Shuttle accident of 1986.

“When we look at the room, we see the crack. That’s why no one likes us.”

David Meyers (1981)

“The undergraduate experience I gained here made me believe that I could do just about anything. It prepared me to solve problems.”
Martha Meaney Murray (1987)

“We pulled in people from all over the country,” he said. “All of them, even the ones working as CFOs and lawyers, had engineering degrees. Their passions took them in other directions.”

What would you do differently if you went back?

Gitney wishes he had taken courses in marketing and sales. “Even if you work as an engineer,” he said, “you’ll be selling your projects.”

Meyers would work more on communicating his projects to be better prepared to do that in the workplace. “I would have been more well rounded if I had done that,” he added.

“Communication doesn’t come naturally to all of us.”

Meaney Murray regrets not “buckling down earlier.”

Phillips recommends getting involved in as many extracurricular activities as possible. “They prepared me for life as much as my classes did,” he said.

Feehery urged students to “get grounded as quickly as possible and figure out what path you want to follow.”

How can we encourage students to find value in breadth requirements?

“The best course I ever took was an art history class,” Phillips said. “It introduced me to a whole new world of design aesthetics and became a way



for me to visualize some of the things I wanted to accomplish in engineering.”

Meaney Murray pointed out that psychology classes can provide valuable preparation for the workplace.

For Meyers, taking Chinese history was a great experience. “I did a paper on art in the Mung Dynasty, and people always wonder how I know about that. Those kinds of things allow you to think more globally and make better decisions.”

“An engineering degree can only prepare you so much,” said Gitney. “Learn as much as you can because you won’t ever have the opportunity again to study something that today you consider trivial or esoteric.”

Feehery took a course in U.S. immigration, a subject in which he still

has a great deal of interest. “Do things to broaden your view now because you’ll find that you become more isolated as your career progresses.”

Do engineers have a special responsibility to be agents of change for issues such as energy, climate change, and world hunger?

“The one thing that is not being done,” said Phillips, “is collecting sufficient global data to predict trends. We need measurements, and engineers can take today’s technology to collect data and use it to make predictions. This is one important way we can use our engineering skills to address change.”

“If each of us as an individual picks

just one problem that is important to us to focus on, we can move forward collectively,” said Meaney Murray.

Feehery sees that question as more pertinent to young engineers “because they will have to deal with problems in a more active way than we did,” he said. “There’s more pressure on the next generation of engineers.”

“You have to ask yourself every day, ‘Am I looking forward to getting up and going to work tomorrow?’ If the answer is no, you need to consider doing something else.”

Jim Gitney (1978)

Best Advice from the 2008 Distinguished Career Alumni

- *Stay a student, keep learning, and you’ll find your passion.*

Raymond Feehery (1974)

- *Your education here is just one leg of a three-legged stool—the others are what you learned from your family and what you’ll learn in your career.*

James Gitney (1978)

- *You’re known by the company you keep.*

David Meyers (1981)

- *Learn the language of the people you’re interacting with.*

Martha Meaney Murray (1987)

- *The three most important things you need to succeed are perseverance, curiosity, and ethics.*

Oren Phillips (1968)



UD-CCM Composites Research: A Model for Knowledge-Based Partnerships

Stephen Andersen (BME1990, MME1997), one of three assistant directors at the Center, shared some insights into CCM’s path from research to applications with attendees at the ME Conference in April.

The new era of knowledge-based university/industry partnerships at CCM is underpinned by a focus

on entrepreneurship, economic development, and international collaborations, Andersen said.

The Composites Center, which has been the site of six NSF/DOD centers of excellence since 1985, has close ties with end users in industry and the military, allowing rapid insertion of technology and an understanding of needs and technology gaps.

Andersen attributes CCM’s technology transfer capabilities in the area of lightweight multifunctional composites to the Center’s unique approach and facilities. Industrial consortium members provide an opportunity to establish beta sites

where basic and applied research funded by DOD can be reduced to practice.

Center researchers carry out multi-scale modeling and adopt a building-block approach to the development of materials for improved soldier protection. “We take a ‘materials-by-design’ approach to damage-tolerant materials insertion, enabling the development of next-generation high-performance lightweight armor,” Andersen said.

UD President Details Path to Prominence



For those leading the University of Delaware Center for Composite Materials, UD President Pat Harker’s emphasis on knowledge-based partnerships has been a welcome—and familiar—message.

Trained as a civil engineer, UD President Patrick Harker says that he always tells faculty never to underestimate the impact they can have on young people’s lives. When a series of injuries closed out his college football career, Harker worked as an RA and a TA for a structural engineering professor at the University of Pennsylvania. “By the end of the year, I had published a paper and won an ASCE student paper contest. I was hooked,” he said.

His career in a structural engineering firm came to a sudden end when a proposal that he had worked on was rejected even though it was clearly a good plan. “I decided then that I didn’t want a job where I couldn’t say what I thought,” he said.

Although his academic career has

CCM’s current vision is to establish a collaborative research and development partnership with industry and government to promote research and innovation and accelerate technology transition in advanced materials.

According to Andersen, achieving this vision will involve co-location of scientists and engineers, establishment of interdisciplinary teams and incubator space, and incorporation of a business strategy and State support to foster entrepreneurship among students,

had more of a business focus, Harker, former Dean of the Wharton School at Penn, said that his engineering experience led him to do what he’s doing today.

“I realized I was much more entrepreneurial than I had originally thought,” he said. He finds it a good fit because “young engineers are getting excited about innovation and creativity.”

Although Harker is now UD’s highest level administrator, he sees himself first and foremost as a faculty member. “It’s important to be in the game,” he said. “And it’s important to listen. We have to recognize our own biases; we think we’re the smartest people in the world and we want to tell people how to solve a problem rather than leading them to solve it. The goal is to get something done—not to prove that you’re the smartest person in the room.”

For Harker, getting something done at UD has started with a strategic plan. With that in place, the “hard work begins,” he said. “We as engineers know it’s all fluff until you make it real. We have to determine where we are and where we want to be and then lay out a path to get there.”

Harker emphasized the increasing need for more education to advance in various careers. “We need to educate the other side of the brain,” he said. “It’s not just about science and technology but also about culture.”

Guiding principles behind the recently developed “Path to Prominence” comprise five core values: Delaware First, Diversity, Partnership, Engagement, and Impact.

“Six strategic milestones will advance the University of Delaware on our path to national and international prominence,” Harker said. These include a diverse and stimulating undergraduate academic environment,

faculty, and staff.

The end result will be new Delaware businesses, new products, and new jobs, Andersen said.

As Assistant Director for Military Programs at CCM, Andersen works with affiliated researchers to identify the most promising materials, processes, and software products and apply those technologies to programs in which the Center is already involved with industry and the military.

“UD is on the cusp of international prominence. The phrase I hate to hear is that UD is a ‘hidden gem.’ We’re missing an important opportunity to have a real impact because people don’t know what we’re doing here. We want the world to know what we’re doing. We need to brag about it. We need alumni to be ambassadors, to tell our story. PR at the national level is great, but nothing beats the personal approach.”

Pat Harker, UD President

a premier research and graduate university, excellence in professional education, the initiative for the planet, the global initiative, and the engaged university.

Harker elaborated on a couple of these points. “Diversity is essential,” he said. “We need to be comfortable moving around in different cultures or we won’t be able to have an impact.”

“Reducing our carbon footprint here at the University is critical too,” he said. “We can’t be a leader in environmental policy if we don’t practice what we preach.”

“This college and this department are crucial in the plan,” Harker emphasized.

“You can have great dreams, but you also need the fuel,” he concluded. “If you have a clear strategy and bring your resources to bear in it, then you can make a real substantial difference in a decade. We have to make investments, but there’s already so much here that we can get a jump on it now. We have to build a brand for the University of Delaware.”

Survivor Engineering: Young Grads Share Tips for “Staying Alive” in the Workplace

In sharing their workplace experiences, Shawn and Dina Riley (BME1998) chose the theme of the popular TV show “Survivor” because, according to Shawn, “starting a career can feel like a trip to a foreign island.”

“You need new tools and skills, the ability to form alliances, and leadership qualities,” he said. “Participants in Survivor have to figure out how to meet their basic needs—for fire, shelter, and potable water. In a career, you use the things you’ve already learned but in a new way.”

Now working in the semiconductor industry, Shawn uses the Six Sigma methodology to quantifiably improve processes in the business. “This approach lets us put our efforts where the numbers are highest,” he said. “Six Sigma enables us to reduce hundreds of variables down to the critical few that have a high likelihood of impacting key customer variables.”

Shawn urged new graduates to take advantage of all available tools to help in solving problems. “When you hear something new, learn about it and ask questions,” he said. “Training is viewed as a reward in the workplace; it’s a sign that the organization wants



to invest in you. Take advantage of it, have realistic expectations, and apply what you learn.”

Dina, who now holds a management position with Agilent Technologies, emphasized the importance of forming alliances. “It’s important to know how to read people and decide whether you can trust them,” she said. “Successful networking with the right people will help catapult you to success. Communication—whether by email, IM, or face-to-face—is key to working effectively with other people.

Dina also addressed the issue of making meetings effective. “Improved dialogue, better decisions, and effective actions will yield better results,” she said.



In preparing for a meeting, it’s important to get the right people: determine who is impacted, who has the expertise, who has to agree, and how many people is it worth involving? At the actual meeting, critical issues include keeping people on track, tailoring the message to the audience, actively listening, and taking notes. The

Closing Thoughts from the Rileys

- Get the job done. Get results and meet your commitments.
- Make people happy that you’re on the team. Work for other’s success and build relationships.
- Prioritize. Get critical things done and done well.
- Continue to learn and network. Gain new experiences, meet new people, and develop new skills. Get feedback on your performance and impact.
- Manage up as well as down.
- Drive and embrace change.
- Have fun!
- And an added suggestion from a Jim Gitney, a DCA in the audience: Don’t be afraid to ask for help.

bottom line: Start with your last slide. That may be all it takes to convince the people who need to be convinced.

Post-meeting elements include assigning tasks to specific people, spelling out deliverables, setting a deadline, and following up.

According to Dina, good leadership entails understanding how people behave, learning how to influence people, and building credibility. “Learn how to integrate directive and supportive behavior,” she said. “There is no best leadership style—only what works in a given situation for a specific person.”

Keeping your torch lit requires direction, discovery, and destiny. “Build a strong base of experiences to help you advance in your career,” Dina said.

Researchers Highlight Progress in Robotics and Biomechanics

UD-ME has become well known for several research areas, including robotics and biomechanics. Two of the speakers at the Conference described ongoing work in these areas.

Prof. Sunil Agrawal addressed two applications of robotics: (1) gait retraining of stroke survivors using a novel motorized exoskeleton known as ALEX, and (2) mobility training of infants from 4–8 months old using “Baby Robots” to impact learning and cognition of special-needs children.

Prof. Jill Higginson spoke on the biomechanics of osteoarthritis, describing her work in analyzing knee forces and functions.

A demonstration of Agrawal’s work with infant mobility training drew a big crowd—one of his pint-sized research subjects actually drove a specialized robot around the lobby of Clayton Hall.

“Bill Gates has compared the robotics revolution of today to the computer revolution of the 1970s,” Agrawal said in his talk. “We may someday see a

robot in every home.”

With the babies, the robot is used as a tool to develop visual awareness, posture, social interaction, and emotional development. Pilot studies are underway to assess whether the little vehicles can be used to create behaviors that the babies would not otherwise manifest.

“We’ve had huge interest in the work from the community, from parents, from physical therapists, and from doctors since the work was first publicized,” Agrawal said. “People want to know where they can get one, but there’s a lot more to it than that. We need clinical data.”

“When you combine medicine and engineering, a lot goes on in each camp,” he said. “In terms of front-end design, we’ve found that communicating with the medical community early in the process helps us bridge the gap.”

In the gait retraining area, Agrawal is focusing on helping stroke patients overcome the functional disability that results from hemiparesis, or paralysis that affects only one side of the body. “There are 700 million people suffering from the effects of stroke,” Agrawal said, “and 700,000 new cases each year.”

His research group has achieved good results in gait retraining using a active leg exoskeleton affectionately nicknamed “ALEX.”

“We’ve found that we retrain functional movement using robotics as a training tool,” Agrawal said. “Here, too, bringing in physical therapy expertise in the design stage has enabled us to make the robot more effective for the application.”

Higginson is part of a large multidisciplinary team investigating the mechanisms of osteoarthritis prevention, progression, and treatment with support from the National Institutes of Health. The number of Americans with OA, a degenerative joint disease involving cartilage deterioration, is expected to reach 67 million by 2030 as the population ages.

Higginson and her research group are using simulations to estimate muscle and joint contact forces, predict muscle coordination patterns, and highlight muscle compensatory strategies.

They have found that OA knees display abnormal loading patterns and cartilage geometry. Knee forces and functions depend on muscle coordination and have implications for other joints as well.

A longitudinal study of OA progression will address such questions as the following: Do abnormal forces lead to abnormal cartilage geometry? Are compensatory strategies beneficial or detrimental to OA progression? Do OA copers and non-copers exist? Can non-surgical interventions help?

Osteoarthritis Research



Testing knee performance

Exoskeleton Research



Testing ALEX

Student News

Awards*

All awards are based on faculty nominations and may depend on academic excellence, financial need, and/or other accomplishments.

ME Undergrads

W. Francis Lindell Mechanical Engineering Award to the Distinguished Senior

For the extraordinary senior ME student who has demonstrated creativity, academic accomplishment and achievement as determined by the faculty of the department.

JESSICA A. DIBELKA
DANIEL J. GEMPESAW

Mary and George Nowinski Award for Excellence in Undergraduate Research

An award given to a ME major whose senior research project is considered, by the faculty, the most interesting in the current academic year. The award honors Mary Nowinski, beloved wife, and Dr. Jerzy (George) Nowinski, Professor Emeritus, longtime friend and academic leader in the ME department.

BENJAMIN I. BINDER-MACLEOD
(2008)

Outstanding Senior Design Final Project Presentations

For the outstanding senior-design final project presentation(s) as chosen by a panel of engineers (including ASME DE Section member(s)) who viewed the final presentations and with the concurrence of the senior-design faculty. The award is funded by the Delaware Section of the ASME.

Team Air Products

RYAN W. CAREY,
IAN H. ENTERLINE,
JONATHAN L. LEVY,
JASON A. McLAUGHLIN

Team Case New Holland

SEAN M. COLLINS,
DOUGLAS E. ERICKSON,
SARAH E. MABEL,
DANIEL R. SHANNON

W. Francis Lindell Mechanical Engineering Award to the Distinguished Junior

For the extraordinary junior ME student who has demonstrated creativity, academic accomplishment and achievement as determined by the faculty of the department.

ANNE E. MARTIN
THOMAS E. MINTEL

W. Francis Lindell Mechanical Engineering Achievement Award

For the junior ME student in recognition of scholarship and creativity in engineering as recommended by the faculty of the department.

JOHN J. GANGLOFF
SARAH L. O'NEILL

W. J. Renton Award for Outstanding Sophomore

A monetary award for the sophomore student in recognition of outstanding academic achievement as recommended by the faculty of the department.

BRENDAN D. McCracken

Robert T. Bosworth Scholarship

A scholarship to a ME student on the basis of academic performance.

RICHARD D. LORT

Redden Mechanical Engineering Scholarship

A scholarship to a student majoring in ME with outstanding academic performance.

PETER J. BOCCHINI
JESSE A. WHITLEY

American Society of Mechanical Engineers Student Section Award

A certificate to an outstanding member of the ASME student section for good academic standing and valuable contribution to the chapter.

JULIANNE D. TWOMEY

Delaware Section of the American Society of Mechanical Engineers Outstanding Student Award

A monetary award to an outstanding member of the ASME student section for good academic standing and valuable contribution to the chapter.

MARY CAROLINE WIONCEK

Newman Fund Scholarship

A scholarship from the Ralph M. Newman Jr. and Sarah Joe Newman Fund awarded to a deserving returning undergraduate student as chosen by the faculty of the Department of Mechanical Engineering.

RONIT LILU

* University of Delaware Honor's Day, May 9, 2008

Students See Conference as Lifelong Learning Opportunity

The Fourth annual Alumni Business and Careers Conference not only provided students with the opportunity to learn from alumni but also gave faculty the chance to assess what the participating students had learned in the context of ABET outcomes.

“Many of the outcomes are relatively simple to assess quantitatively through coursework,” says Alumni Coordinator Nate Cloud, “for example, the ability to apply knowledge of mathematics, science and engineering or the ability to identify, formulate, and solve engineering problems. Others, however, require



innovative ways to ‘teach’ in the engineering curricula.”

Four outcomes, in particular, can be difficult to measure: an understanding of professional and ethical responsibility, an understanding of the impact of engineering solutions in a global and societal context, a recognition of the need for and an ability to engage in lifelong learning, and a knowledge of contemporary issues.

To that end, Prof. Lian-Ping asked students in the junior class to attend the event and specifically to listen to the lecture given by alums Shawn and Dina Riley (*Survivor: Engineering*; see related story on p. 11), attend the Distinguished Career Alumni Panel Discussion, and dialogue with alums during the networking sessions.

He then administered a quiz covering some of the highlights from the event to see what lessons the students had taken away from it. While some of the questions directly tested the students’ understanding of the content presented by the Rileys—for example, leadership styles and strategies for acquiring new skills—others tapped into broader messages gained from the DCA panel.

The students found the panelists to be very open about the weaknesses of engineers, including difficulty in communicating with and relating to non-engineers in the workplace, overspecialization, and a tendency to think too analytically.

They also gave a wide range of responses to the question “What is your

own take-home message from your experience on Friday?” In particular, they noted the need to develop new skills, communicate effectively, and work in teams.

“Learning doesn’t end at graduation,” wrote one student. “Hard work can take you a long way. But you need to be able to network effectively and create strong contact with other people and companies,” responded another. “Mechanical engineering can take you anywhere,” said a third.

But perhaps the best answer, at least from the viewpoint of the conference planning committee, was “The ME alumni event is a good way to grow as an engineer.”

“I was quite pleased to see that the students learned a lot from this half-day event,” Wang says. “The goal was to have them realize that there are lifelong learning opportunities during the Alumni event to which they would not normally be exposed. Their answers clearly showed that our goal was met. Due to the wonderful program we had this year, each student attended the event got his or her own take-home message.”

Wang shared the compiled answers by email with the entire class. “I believe they saw what their peers got out of the event,” he says, “which further reinforced this unique lifelong learning experience. Discussions such as ‘the weaknesses of an engineer’ really let the students think about themselves in the real-world setting and will have a long-term positive impact.”

Survivor Engineering Quiz

These sample questions covered some of the highlights at the UD ME alumni event on April 25, 2008.

What are some of methods that our alumni used to acquire new skills?

Responses from students:

- They take classes, ask questions. Attending training sessions was emphasized by Shawn.
- Company sponsored courses
- Work in areas they otherwise never considered gaining experience in.
- Society membership, gain on-the-job training when available and attend continuing education seminars
- Ask questions, talking to people who knew new information

- Industrial training programs, reading.
- Being open to opportunities and positions, being coached by management.
- Always being open to new things
- By asking to be moved to different positions in the company every few years.
- Pay attention to what is going on in the world around you (new innovations etc) and indulge your curiosity.
- Communication, learning, networking
- Continuing education
- Training seminars – looked at as a privilege that companies want to invest in you.
- They asked around, if they didn’t know how to finish certain assignment, they found someone who did it and asked questions
- Going to graduate school
- From friends with people at other companies

- Go to trainings green belt in six sigma
- Dina went back to get her MBA
- Ask others about their success with various methods. Spend time learning new skills and instantly apply & use new skills at work.
- Continued their education, got experience in industry

Situational Leadership II stresses variable leadership styles. Name some of the different leadership styles and how they are applied.

Responses:

- Directive, supportive
- Coaching – encourage and guide, try to include in decision making
- Directing – closely follow, provide a lot of guidance, use when interest is high but skills are weak
- Directive/subjective – Dave stand up, Encouraging/developing – “good job Dina,

- keep up the good work!'
- Supportive – offer support, tell how good someone is doing
- Directive – give orders to people to get things done
- Leadership should combine both methods to be effective
- Dina discussed how you need to manage up as well as manage down. She discussed how some of her colleagues needed to be coached, she spent more time on them, while others did not need as much coaching, she did not spend as much time working with them. She stated that she wished she could spend more time working with the brighter colleagues.
- Delegating – assigning tasks, Instructing – teaching
- Supportive for those with high competence and low drive
- Complement colleagues, encourage colleagues
- Coaching, observing, mentoring, motivating
- Directive -Tells someone what to do and how to do it, Encouraging – reinforces self esteem while asking for a job to be done
- Directive and supportive – different combinations of this should be applied based on the worker's competency and motivation
- Coaching – for competent employees that need guidance, don't remember the other three

Can you recall some of the weaknesses of an engineer, noted during the panel discussions?

Responses:

- Narrow view, no celebrating solution – just move to the next problem, do not relate to non-engineers
- They want to go straight from problem to solution, they can be poor communicator of their ideas.
- Being behind on new technology
- Don't always listen, can be arrogant
- Communication skills
- They think they have all the answers
- Not getting involved early on (education wise), Always think that they are the smartest in the room
- Being able to understand what the client wants, being well rounded
- Being head strong, not a team player
- A weakness was that once you go into your field at your job, you become specialized in that field and don't usually get a well roundedness in other topics.
- Problems communicating with non

- engineers
- Lack at social skills
- The US changing to the SI system(metric)
- Think too analytically and detailed sometimes
- Shawn noted that engineers tend to want to work by themselves and give long presentations when they are not needed

What is your own take-home message from your experience on Friday?

Responses:

- Take advantage of learning opportunities presented and don't be afraid to talk to alumni (They're nice)
- Work hard and in a motivated manner at all times and be sure that I have a good relationship with my peers and those who are above me from Dina Riley
- Mechanical engineering can take you anywhere
- In a good job do your best, don't be afraid to ask for help, don't be a know it all, you need to work collectively with other, and sometimes its only the last slide (outcome) that people care about
- When you see or hear something related to engineering from TV or friends that interests you, you should be sure to research it and find out more about it because you may use it someday.
- In order to advance in a career its necessary to continuously try to improve yourself and the company. Also I learned its ok to ask for help from a boss if stuck in a problem you don't know how to handle.
- A degree in mechanical eng is a very powerful tool to gain success in any career you choose
- Learning doesn't end at graduation
- Networking
- Follow your passion when you find it. It may take a lot of searching, moving from job to job, but its okay to try something new to try and find what you really like
- Prioritize tasks and develop trust and accreditation by performing well.
- Work hard, always take opportunities to continue learning mingle try to be friendly in what you do , because new opportunities may interest you more than you expect.
- Do engineering that you enjoy everyday. Don't have a job that you dread going to.
- Hard work can take you a long way. But you need to be able to network effectively and create strong contact with other people and companies
- My career as an engineer will be very rewarding

- Even after getting a degree it is important to take the time to view current research
- One of the most important things mentioned was from a question asked to Dina. Dina mentioned that when she was put into a leadership position, even though the people she was in charge of were older, she had to make firm decision and make sure they knew she was competent for being in the leader position.
- Learning still needs to take place in the workplace after college, through courses, six sigma, planning effective meeting, leading, and learning how to make concise presentations
- Engineers have lots of options for career and even if you don't end up doing pure engineering work your degree will still be valuable and you can be successful.
- Engineers can do many occupations after graduating
- My take home message from Friday was to develop new skills constantly to build a base for four pyramid of success as well as alliances to keep your success moving.
- Engineering is fun and UD is great place for it
- Don't be afraid to ask for help when you need it
- Always think about not wasting people's time in meetings.
- Make yourself credible in the work force, don't be afraid to manage above, below and left to right. If you don't know how to do something, ask questions/
- Engineering work involves lots of teamwork. Leadership is a critical skill required in most of the cooperative works.
- When in a meeting don't digress, get to the point and get there fast.
- Learn how to communicate better
- Be aware of surroundings, co-workers, impressions being made on others and strategize based on these and objectives to meet goals
- In the end, I may not be a career engineer but these skill will help me in whatever career I choose
- You will be successful if you learn to communicate with everyone around you in the company, managers, peers, and those under you.
- The ME alumni event is a good way to grow as an engineer.
- The most interesting thing I learned was the importance of making alliances and having good people skills, as opposed to individual intelligence

Next three pages...

An excerpt from the program of the Business, Technology and Careers Conference.

Business, Technology & Careers Conference

Friday, April 25, 2007 at the Clayton Hall Conference Center
at the University of Delaware

Agenda

12:00	Sign-in, Refreshments, Technology Displays	2:45	Networking Break-including Refreshments and Technology Displays	4:15	Distinguished Career Alumni Presentations
1:00	Seminars (Track A or Track B)	3:00	Seminars (Track A or Track B)	4:45	Panel Discussion with all Distinguished Career Alumni
1:45	Networking Break including Refreshments, Technology Displays	3:45	Networking Break- including Refreshments and Technology Displays	5:30	Keynote Address- Patrick Harker, President, University of Delaware
2:00	Seminars (Track A or Track B)	4:00	Welcome-Tom Buchanan, Chair, Department of Mechanical Engineering	6:15	Social/Networking/ Buffet Dinner
				7:30	Adjourn

See Abstracts and Speaker Bios next two pages

Business, Careers and Technology Conference Presentations

Survivor: Engineering

How to Outplay, Outwit, and Outlast in your Career

Shawn Riley, '98; Dina Riley, '98

Product Engineer; Procurement/ Engineering Manager

Abstract: Making the transition from college to career can be a daunting task, especially for engineers. No matter how

prepared you are from an academic perspective, you are likely to encounter pitfalls and challenges that will test your skills as well as your mental strength. Using relatable themes from the reality show Survivor, two former UD Mechanical Engineering graduates will share insights and observations, useful for both new college graduates and experienced professionals, as they continue to forge their own career paths.

Bios: Shawn Riley, '98



received his bachelor's degree in Mechanical Engineering in 1998 and his master's degree in Mechanical Engineering in 2001, both from the University of Delaware. Since

then, he has taken a winding road through many different work experiences including biomechanics, solar energy, and semiconductor materials. His success in each area demonstrates the fundamental nature of Mechanical Engineering as the "Liberal Arts of Engineering." Shawn has focused primarily on process design and qualification both in the US and Taiwan since leaving the University of Delaware. However, he begins a new role in 2008 with Rohm and Haas as a Product Engineer responsible for managing customer performance issues and seeking sound issue resolution using Six Sigma tools with the company's worldwide semiconductor customers.

Dina Riley, '98 received her bachelor's Degree in Mechanical Engineering in 1998 and her master's of Business



Administration degree in 2003, both from the University of Delaware. She has been employed by Agilent Technologies, Inc. for the past ten years, supporting the Inbound Supply

Chain activities of their Life Sciences and Chemical Analysis businesses. Dina's career path has significantly veered from a traditional engineering one, but she credits the foundation she received through UD's engineering program to develop her into a successful contributor. Dina currently manages a team of sourcing and engineering professionals responsible for the global product development and manufacturing sustainment activities at Agilent.

UD-CCM Composites Research

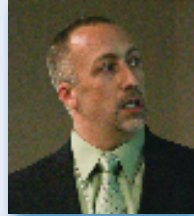
From Research to Applications: A Model for Knowledge-Based Partnerships

Stephen Andersen '90

Associate Scientist, Center for Composite Materials

Abstract: As basic and applied research budgets have grown smaller over the years, government and industry have begun to demand "quick application" of the material and technology results of their funded research. The University of Delaware Center for Composite Materials (UD-CCM) has been at the forefront of research in advanced composite materials for over 34 years. The center's unique ability to perform research from basic material synthesis and process and material modeling all the way through prototyping allows the Center to "bridge the gap" between research and applications, providing rapid insertion of new technologies and allowing rapid return on the investment in basic and applied research. This talk will provide an overview of CCM's research and technology transfer initiatives and give examples of the transition of materials and technologies into products as a model of "knowledge-based partnerships" in practice.

Bio: Stephen Andersen is Assistant Director for Military Programs at CCM, where he currently leads programs in the area of lightweight materials development for military vehicles and serves as Co-



PI on nearly \$20M in composites research. Andersen has an extensive background in the design, development, manufacturing and testing of composite structures and armor.

Along with bachelor's and master's degrees in mechanical engineering from the University of Delaware, he has over 16 years of industrial experience in the application of CAD/CAM/FEA techniques to composite and metallic structures and products in military and aerospace structures, commercial products, wind turbines, and medical/X-ray devices. Mr. Andersen is a licensed Professional Engineer in the State of Delaware, holds 3 US patents, has 5 US patents pending, and has co-authored over 20 technical publications and presentations.

Robotics: Training and Neuro-Rehabilitation

Exoskeletons, Baby Robots

Dr. Sunil Agrawal

Professor, Mechanical Engineering

Abstract: Robotics is emerging as a promising tool for training of human functional movement. This talk will describe novel results obtained using robotics in two different areas: (1) Gait retraining of stroke survivors using a novel motorized exoskeleton known as ALEX, and (2) mobility training of infants from 4-8 month old using "Baby Robots," with the goal to impact learning and cognition of special-needs children.

Bio: Sunil K. Agrawal received



a Ph.D. degree in Mechanical Engineering from Stanford University in 1990. He is currently the Director of Mechanical Systems Laboratory at the University of Delaware. He has

published close to 250 journal and conference papers and two books in the areas of controlled mechanical systems, dynamic optimization, and robotics. Dr. Agrawal is a Fellow of the ASME; his other honors include a Presidential Faculty Fellowship from the White House in 1994, a Bessel Prize from Germany in 2003, and a

Humboldt US Senior Scientist Award in 2007. He has served on the editorial boards of prestigious journals published by ASME and IEEE. His research is described on the website <http://mechs4.me.udel.edu/>.

Senior Design Projects

Product and Process Design Challenges from Black&Decker and Southco

Abstract: *Removing Heat from Newly Designed Drills.* Team Black & Decker was challenged with removing heat from a MOSFET junction in a newly designed drill to protect the internal electronics and maintain a safe drill handle temperature. The team went through a number of iterations to find the best heat-removal device for the company. In doing so, they also created a design process and a testing procedure that the company can use in designing future heat removers in other electronic products.

Abstract: *Vibration fatigue tester for compression latches.* Team Southco was asked to design and build a vibration fatigue tester to simulate off-highway service conditions for the company's compression latches. The result was a working machine that was put into use at Southco's Concordville, PA, facility.

Bio: The 2007 senior design program comprised 65 students, divided into 16 teams. Each team worked for a company solving a real-world product or process design problem. Team Southco (John Armitage, Doug DeVoto, Brian



Polkowski, and Marykate Wioncek) and Team Black&Decker (Mark Steimer, Jessica Dibelka, Laura Traub, and Julianne Twomey) will be presenting their projects in this session.

Biomechanics of Osteoarthritis

Analyzing knee forces and functions

Dr. Jill Higginson

Assistant Professor, Mechanical Engineering

Abstract: Osteoarthritis (OA) affects more than 20 million Americans and impacts the performance of activities of daily living. Although the etiology of knee OA is unclear, it is likely that biomechanical factors contribute to abnormal loading on the affected cartilage and bone. Effective non-surgical interventions are limited and may include strengthening, exercise, and use of a cane or orthotic, but muscle activity may be the most significant modifiable factor. Our current studies are designed to investigate muscle forces and coordination strategies during walking in individuals with age-related osteoarthritis of the knee through a combination of MRI, gait analysis, electromyography, and biomechanical modeling and simulation. This talk will discuss the novel approach being taken in this research, present some preliminary results, and highlight the scope of osteoarthritis research being conducted across the University of Delaware.

Bio: Dr. Jill Higginson is an Assistant Professor in the Department of Mechanical



Engineering at the University of Delaware. She trained at Cornell University (BS '96), Penn State University (MS '98), and Stanford University (PhD '05). Her research

applies experimental and computational techniques to study muscle coordination during walking in healthy and impaired populations. As part of an interdisciplinary study funded by the

National Institutes of Health, Dr. Higginson has been studying the relationship between joint loading and cartilage geometry during the progression of knee osteoarthritis.

The Flat World for Smaller Businesses

Two Case Studies of Global Practices

Jim Hutchison '78;

Pat Reynolds '67

CEO StudioJaed; President, PoolPak

Abstract: The new "Flat World" has created the opportunity for small- and medium-sized businesses to develop and thrive using outsourced and offshore business alliances and supply chains and to trade on increasing demand from rapidly developing world economies. Two case studies of UD Mechanical Engineering alumni taking their business global will be presented. PoolPak has thrived in a specialized HVAC market in the U.S. since the 1980s by building high-quality specialized dehumidification equipment for swimming pools. The "Flat World" has allowed PoolPak to expand its presence into China and other parts of the world. Pat Reynolds will focus on PoolPak's strategies for recruiting, training, and supervising the overseas PoolPak sales force; increasing market share among international markets; and promoting the PoolPak brand abroad. StudioJAED is a small engineering and architectural consulting firm involved primarily with building design in the Mid-Atlantic and New England areas. New broadband communications capabilities and software created for collaborative design projects among far-flung alliances have opened the door for StudioJAED to utilize production team members from India and other emerging technological economies. Far from a maneuver to downsize, global collaboration allows for compressed time schedule design production and better-compensated, local value-added staff on an economical basis. Technological and cultural constraints and solutions to global and regional collaboration will be reviewed and discussed.

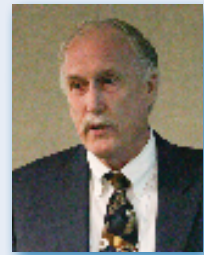
Bios: Jim Hutchison '78, is CEO of StudioJAED, Architects, Engineers and



Facility Solutions of Wilmington, DE. StudioJAED provides building design services primarily in the education and institutional market sectors in the Mid-Atlantic / New England geographic area and facility

evaluations and planning on a national basis. 2008 marks StudioJAED's 30th year in business from its start as a two-person engineering consulting business started by Hutchison and his father. Hutchison earned his BME in 1978 at UD and followed that with a UD MBA in 1981. He is active in numerous trade and professional organizations and is a frequent national presenter on topics related to school planning, assessment, design and construction delivery. Hutchison balances his active professional life with support of wife, kids and athletics and is himself a frequent participant in endurance events.

Pat Reynolds '67, is co-founder,



President, and CEO of PoolPak Technologies Corporation in York, PA, a company that makes indoor pool dehumidification systems. His primary responsibilities include sales, marketing, and financial management. From its establishment

in 1986 to 2001, the company grew from just under \$250,000 in sales to over \$17 million. After earning his BME at UD in 1968, Reynolds took additional courses in materials science and business administration. In his spare time, Reynolds is involved in ASHRAE, crisis intervention assisting teens and college kids deal with emotional and drug-related problems, and tutoring underprivileged inner-city children. He has traveled extensively within the U.S. and around the world.

Alumni Feedback

Jenn Buckley, BME2001, received her PhD last year from UC Berkley in Mechanical Engineering. She is currently running a lab in the department of Othopaedic Surgery at U.C. San Francisco. "Thanks to all the

wonderful instructors I had at UD for helping me achieve my career goals."

William S. Patterson BME1958, MME 1964, Chairman Buchanan, faculty and students are to be

commended. UD and the state of Delaware should partner with Bluewater and others to make the development, manufacture and deployment of wind turbines in Delaware a reality.

Feedback Form

Do you have any feedback (comments, questions)? Or let us know any current events or info not covered by the data sheet below.

Information form for the department's records

Name _____
First Middle Last Maiden

Delaware Degree BME Date _____ MME Date _____ Ph.D. Date _____

Spouse's Name _____ DE Alum? _____

Mailing Address _____

Home Phone _____ E-mail _____

Company _____ Your Position _____

Mailing Address _____ Business Phone _____ Fax _____

E-mail _____ Web Address _____

Please identify if your company is an affiliate or subsidiary of a larger company

Return this form to: Nate Cloud, 126 Spencer Lab, University of Delaware, Newark DE 19716 and/or contact me at cloud@me.udel.edu or 302-737-4111

We wish to thank the many ME friends and alumni who have made generous contributions over the past year. Your gifts are used for many worthwhile purposes, including support of our research and educational programs. To make a donation, please fill out the form below and return it with your check made payable to the University of Delaware. If you want your donation to go to the Department of Mechanical Engineering, please indicate that on the form and in the memo line on your check.

Yes I would like to make a donation to the Department of Mechanical Engineering with a contribution of

\$1,000 \$500 \$100 \$50 Other \$ _____

Name _____

Address _____

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