FALL 2008

METRICS

MECHANICAL ENGINEERING
A. JAMES CLARK SCHOOL *of* ENGINEERING

A NEWSLETTER FOR ALUMNI AND FRIENDS OF THE DEPARTMENT OF MECHANICAL ENGINEERING AT THE A. JAMES CLARK SCHOOL OF ENGINEERING, UNIVERSITY OF MARYLAND.

2007-2008 Year in Review

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CHAIR'S MESSAGE

YEAR IN REVIEW

2007-2008 ANNUAL REPORT

and Annual Report

www.enme.umd.edu

chair's MESSAGE

BAR-COHEN

Dear Friends,

The past academic year, 2007-2008, has been one of great activity and achievement for the Department of Mechanical Engineering. In this issue of our fall newsletter, we look back on the year and the accomplishments of our faculty, students and department, and we are excited to share a few highlights and "metrics" with you, our readers.

These are busy days in our department, and while we cannot share all of the news that we would like with this year in review issue, I do hope you will visit our web site, **www.enme.umd.edu**, for a complete update on what's happening in our department.

However, I would like to take a moment to share with you a special event that occurred this past spring, our student awards celebration. For the first time, mechanical engineering faculty, staff and students gathered together to recognize student recipients of awards, scholarships and fellowships. This event grew out of a smaller annual event held in the past by Professor Mohammad Modarres for his reliability engineering students. It was a very satisfying experience to acknowledge the accomplishments of our talented students. I look forward to continuing this new tradition.

With the new semester off to a great start, we now turn our attention towards the upcoming year and eagerly anticipate what it might hold for us. The future looks even brighter with the recent news that *U.S. News & World Report* 2009 edition of "America's Best Colleges" ranks the Clark School's undergraduate program 21st in the nation. This is four spots up from last year's ranking. The Clark School ranks 8th in the nation among public engineering programs. *U.S. News & World Report* has also ranked the Clark School 17th in the nation and 11th among public universities in its listing of top graduate engineering schools in the U.S. for 2009. Our own department was ranked 20th in the nation, up from 24th last year, and is 14th among public institutions. It is news such as this that we look forward to sharing with you in newsletters to come.

But, for now, we hope you enjoy joining us as we pause for a moment of reflection. For the Department of Mechanical Engineering, it was a very good year indeed.

Avi

Dr. Avram Bar-Cohen
Chair and Distinguished University Professor
Mechanical Engineering

STUDENTS AND ALUM RACE TO WINNER'S CIRCLE

Students, past and present, from the Department of Mechanical Engineering know how to win. This was all the more evident recently with both students and an alum making an appearance in the winner's circle. The Terps Racing team won the Formula SAE (Society of Automotive Engineers) West 2008 earlier this summer. And, Roy McCauley, who graduated from the program with a bachelor's degree in 1992, was the crew chief of Ryan Newsman's winning Daytona 500 NASCAR Spring Cup Series auto race last February.

"We take great pride in the accomplishments of both our Terps Racing team and our alumnus Roy McCauley," says Avram Bar-Cohen, department chair.

The Terps Racing team, racing at the California Speedway in June, placed first over all out of 83 teams from around the world in the Formula SAE West car contest. Formula SAE is a student design competition organized by SAE International. This was the racing team's first first-place finish since the program was re-instated at the university in the fall of 2004. The original university program began

in 1986, with the last first-place finish in 1987 before the program was shelved to focus on future car and truck hybrid competitions.

At the four-day competition, judges rated the cars in seven categories, with the combined score comprising a team's overall place. The Terps Racing car had the following results: 1st in acceleration, 3rd in skidpan, 4th in autocross, 4th in endurance/fuel economy, 6th in cost, 9th in presentation and 10th (tied) in design. Teams from universities and colleges from such countries as Japan, Sweden, Brazil, China, Mexico, Canada and Venezuela competed at California Speedway, as well as several dozen from across the United States.

"This was a great year for us," says Greg Schultz, adjunct associate faculty member and advisor for the Terps Racing team. "Each year we have learned from the year before. We build on that, and we're getting better at passing on the knowledge from one group and one year to another. This year it certainly paid off."

According to Schultz, the competition is tough on the circuit, which includes three races a year. "This has become almost like semi-professional racing," he says. And as the stakes get higher, the learning experience is more intense. "The students participating in this are getting a chance to apply what they have learned in the classroom, some for the first time. They are building something real that will be competing in a real race. And, they are learning what it takes to be a winner."

For McCauley it was a rather historic event, winning in the 50th running of the Daytona 500. The win was McCauley's second career Cup victory as a crew chief, and first with driver Ryan Newman.

McCauley, who grew up in Davidsonville, Md., joined Penske Racing South in 2002 as chief engineer. He made his crew chief debut in 2004 overseeing Penske's driver development program. In 2005, McCauley oversaw a nine-race NASCAR Busch Series schedule where the team emerged with six victories.

McCauley participated in the SAE student group while here at Maryland.

JEONG H. KIM IS KEYNOTE SPEAKER AT DEPARTMENT'S RESEARCH REVIEW DAY

The Department of Mechanical Engineering held its third annual Research Review Day this past spring. The theme was innovation and entrepreneurship. The intent of Research Review Day, says Avram Bar-Cohen, department chair, "was to update our friends and alumni on the wide range of pioneering research conducted in the department."

Events included a panel discussion on innovation and entrepreneurship, tours of the department's major research labs, including Fuel Cells, Medical Robotics, CALCE, Combustion Engineering, MEMS and Mcirofluidics, and a showcase of research project posters. Recent patents granted to faculty and technical disclosures by faculty and staff were also on display.

Jeong H. Kim, for which the Jeong H. Kim Engineering Building is named, was the keynote speaker. Kim received the first Ph.D. in reliability engineering from the Department of Mechanical Engineering in 1991 and is a Professor of Practice in the Clark School of Engineering. He is currently president of Bell Laboratories.

"I cannot think of a better example of innovation and entrepreneurship than the accomplishments of Jeong Kim," says Bar-Cohen.

In 2005, shortly after being appointed president of Lucent's Bell Labs unit, Kim was named one of the Top 10 Most Influential Asian Americans in Business. He has been inducted into the National Academy of Engineering and sits on a number of corporate, university and non-profit boards.

JEONG KIM

An entrepreneur as well as an engineer, Kim founded Yurie Systems, where he pioneered the development of a revolutionary asynchronous transfer mode (ATM) switch for wireless applications. The ATM switch became a pivotal key in the modernization of telecommunications systems for today's digital market. In 2004, he was inducted into the Clark School's Innovation Hall of Fame.

Other speakers included Rear Admiral Millard S. Firebaugh, Minta Martin Professor of Practice, and Patrick Hearn of Ballard Power Systems who is also a visiting researcher with the university's Center for Environmental Energy Engineering or CEEE.

FACULTY

During the past year several faculty garnered honors from numerous organizations for their scholarly and research work. "We have a vibrant and talented group of faculty members that bring much to our department," says Avram Bar-Cohen, department chair.

Sarah Bergbreiter, assistant professor, received a 2008 Young Faculty Award from the Defense Advanced Research Project Agency or DARPA. The award, now in its second year, recognizes 39 rising stars in university microsystems research. Bergbreiter's research, titled "Silicon/Elastomer Components for Autonomous Jumping Microrobots," will develop the mechanisms necessary to build a robust autonomous jumping microrobot. Jumping offers numerous benefits to millimeter-size robots. As the robot's size shrinks, obstacles around the robot grow comparatively larger and jumping provides a relatively simple mechanical means of dealing with those obstacles.

BERGBREITER

Professor **Ashwani K. Gupta**, has been appointed Distinguished University Professor by University President C. D. (Dan) Mote, Jr., effective this past January 1. This title is the highest academic honor the university bestows on members of the faculty and is reserved for a very small number of exceptionally distinguished scholars. Gupta was recognized for his work in combustion science and technology which has earned him national and international acclaim.

GUPTA

Miao Yu, an assistant professor, received the Air Force Office of Scientific Research Young Investigator Program Award. Yu was chosen for the award for her research proposal to study the development of fly ear-inspired sensors on a micro-opto-electro-mechanical systems platform for use in micro-air-vehicles. As a part of this research, a novel bio-inspired localization scheme with adaptive capabilities will be studied by using a single sensor with autonomous position control. The total award amounts to $380,000 for three years and is intended to further support Yu's research on bio-inspired small-scale sensors.

YU

Avram Bar-Cohen, chair of the Department of Mechanical Engineering and Distinguished University Professor, was elected as an Honorary Member of the American Society of Mechanical Engineers. Bar-Cohen was selected for development of the scientific foundation for thermal management of electronic components and systems, specifically for buoyant flows in channels, heat sink optimization and pool boiling of dielectric liquids; and for seminal contributions and leadership in research, practice and education in the thermal management of micro and nanoelectronic systems.

The Department of Mechanical Engineering welcomed two distinguished faculty members this past year. **Millard S. Firebaugh** was appointed the Minta Martin Professor of Practice and **James Short** was named as a Visiting Professor of Mechanical Engineering. Firebaugh and Short will contribute to the development of the energetics graduate program efforts in the Center for Energetic Concepts Development (CECD) and in the Energetics Technology Center of Southern Maryland.

And, in 2007–2008, the department added three new assistant professors, **Byeng Youn**, **Nikhil Chopra** and **Sarah Bergbreiter**. Chopra and Bergbreiter also hold joint appointments with the Institute for Systems Research.

YOUN

CHOPRA

Additional faculty awards are listed in the Annual Report.

For more information about or outstanding, innovative faculty, please visit: **www.enme.umd.edu**.

FACULTY MEMBER LINDA SCHMIDT RECEIVES ASEE FRED MERRYFIELD DESIGN AWARD

When the American Society for Engineering Education gave its 2008 American Society for Engineering Education or ASEE Fred Merryfield Design Award to Linda Schmidt, an associate professor of mechanical engineering, the announcement did not surprise George Dieter, professor emeritus of mechanical engineering and former dean of the Clark School.

She's a great teacher and a great person," says Dieter, who nominated Schmidt for the award and recently co-authored with her, *Engineering Design, 4th Edition*, an update of the textbook for senior design courses. "I've taught several classes with her. She inspires enthusiasm and gets good responses from her students." Adds Avram Bar-Cohen, chair of the department, "There is no one more committed to excellence in design education than Professor Linda Schmidt."

"What I think is amazing about it is that it's a recognition of the academic pursuit of excellence of design and engineering," says Schmidt. "It shows the research I have done has had a broad appeal to the entire engineering community."

SCHMIDT

Schmidt says she tries to share her enthusiasm for design and push her students to look at the openness and enormity of the field, which she describes as the "science of the artificial."

Schmidt called the honor a "rejuvenating accolade." "It's very rewarding when you get recognized by your peers," she says. "You never know when what you're doing gets beyond the classroom to your peers. You realize that every little drop of work you do has a broader effect."

Schmidt currently teaches the capstone course in design, as she has for the past several semesters. This fall she is teaching a graduate course on design methodology, ENME 600: Engineering Design Methods, which she says looks at the processes and best practices for mechanical design. In 2003, Schmidt was given the Clark School Service Award and she is a former DReAM division leader.

"HER COMMITMENT TO ETHICS, VALUES AND A SOCIETAL GOOD IS NOT JUST SOMETHING SHE INTEGRATES INTO HER TEACHING – IT IS PART OF WHO SHE IS." —NOMINATION LETTER

In addition to a rationale on why the candidate should receive the honor, the nomination requires several letters of recommendation. The letters, from peers and former students of Schmidt, speak glowingly of her qualifications for the award.

"People are drawn to her and her warm leadership style helps give those around her the confidence to teach and design better products in more effective ways," one letter from a colleague in the field reads. "Her commitment to ethics, values and a societal good is not just something she integrates into her teaching – it is part of who she is." Another, from a former student, includes a glowing account of her teaching style. "She developed examples of ethical and professional dilemmas to present to the students in an open forum to discuss the proper courses of action," the former student writes. "She takes great pride in bringing in other professors to co-teach the course so that the information and projects always stay fresh."

The international consulting firm CH2M Hill founded the award in 1981 in memory of Fred Merryfield, a former professor at Oregon State University. It "recognizes an engineering educator for excellence in teaching of engineering design and acknowledges other significant contributions related to engineering design teaching," according to the ASEE. The award includes a $2,500 honorarium, a $500 travel stipend to attend the ASEE conference and a commemorative plaque for Schmidt. The mechanical engineering department also receives $500.

STUDENTS

From being honored with prestigious scholarships to travelling abroad and immersing themselves in a different country and culture, "our students remain a continuous source of pride for this department," says Avram Bar-Cohen, department chair.

Five **graduate students**, plus a teaching assistant, traveled to South Korea to take a two-week course taught by mechanical engineering professor Reinhard Radermacher at Pusan National University (PNU). The class combined the graduate students with 12 students from PNU. However their education extended beyond the classroom. The PNU students were more than glad to show the graduate students around Pusan, making for a complete, well-rounded educational experience. "We were there long enough and immersed long enough that we saw a side of South Korea we would have never seen," says one student. Adding, "It was a once in a lifetime experience."

[redacted], an undergraduate student, earned a 2008-2009 Goldwater Scholarship. The prestigious honor is awarded based on academic merit. [redacted] is the only recipient on the College Park campus. The number of scholarships awarded is related to the number of Congressional districts in the student's state of permanent residence. [redacted] is a resident of Virginia. [redacted]'s current research interest is in developing the next generation of space suits, and she is working in the university's Space Systems Laboratory. [redacted] participated in the NASA summer academy at the Goddard Space Flight Center last summer on a project related to the James Webb Space Telescope. There she won first place in the poster competition. [redacted]

[redacted]

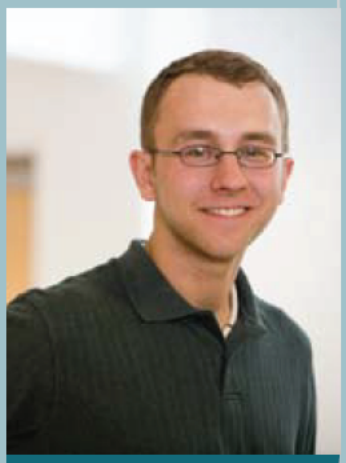
who plans to pursue a Ph.D. in aerospace engineering, has also interned with NASA.

The university's entry in the 2007 Solar Decathlon won the BP Solar People's Choice Award and took second place at the conclusion of the competition in Washington, D.C. **Several mechanical engineering** students participated in the project.

While students in the mechanical engineering program are frequently honored for their accomplishments, **student members of Pi Tau Sigma** recently turned the tables honoring **Tien Mo Shih**, an associate professor, **Munther Hassouneh**, lecturer, and graduate student **Nikolas Beratlis**. Pi Tau Sigma cited Shih with an award granted each year to a professor who offers a challenging course from which students benefit. Shih received the Camshaft Award for teaching ENME 271: Introduction to Matlab. The group commended Hassouneh for teaching ENME 350: Electronics and Instrumentation I and ENME 351: Electronics and Instrumentation II. Members cited his excellent teaching ability and the rigor with which he taught the material as factors in their selection. And, as a teaching assistant for ENME 331: Fluid Mechanics, Pi Tau Sigma noted Beratlis' willingness to help students with availability beyond office hours and dedication of a considerable amount of his time as reasons for his award.

THE DEPARTMENT OF MECHANICAL ENGINEERING HOSTED ITS FIRST ME DESIGN DAY IN MAY. THE EVENT WAS HELD IN CONJUNCTION WITH THE FINAL PRESENTATIONS OF THE UNDERGRADUATE CAPSTONE DESIGN CLASS, ENME 472. THE ME DESIGN DAY PROJECT FAIR SHOWCASED DESIGNS FROM 16 CAPSTONE TEAMS. PROJECTS RANGED FROM A WASHER-DRYER COMBO TO A LOCKING SYSTEM FOR A CAMPUS BIKE RENTAL PROGRAM.

STUDENT IS COMMITTED TO USING ENGINEERING SKILLS TO CREATE A BETTER WORLD



HANNAM

This past spring Phillip Hannam, now a senior mechanical engineering major, was a recipient of the prestigious Truman Scholarship. One of only 65 students chosen from colleges and universities across the nation, Hannam was selected by the Harry S. Truman Scholarship Foundation for his leadership potential, intellectual ability and likelihood of making a difference. "To be selected amongst some of the finest aspiring public servants in the country is an immense honor," he says.

While he is thrilled to be a Truman Scholar, it is not the only recognition he has received of late. Among others was a song and a dance performed in his honor this summer by African villagers thanking him and his team of Engineers Without Borders (EWB) participants for bringing water to their community. In many ways, that act of gratitude meant the most to him.

"You're using the skills that you have to improve the lives of others," he says of his EWB work. "I can't imagine anything more rewarding than that."

Hannam sees himself as a global citizen and hopes to make an impact in the world around him as an engineer. In pursuing that path, he has been an active member of the university's chapter of EWB since his first year at Maryland and is currently the chapter president. He was the student project leader when EWB recently travelled to Dissin, Burkina Faso in Africa to assist two villages by constructing a solar-powered water pump and a storage tank for easy access to the water. The project began in the summer of 2007 and was completed this past summer, enabling villagers to irrigate subsistence gardens around the wells in the dry season. "This simple engineering feat helps the communities prevent malnutrition in the face of frequent droughts across Burkina Faso," Hannam explains.

As a show of thanks for EWB's work, the women of one village sang, "For a long time, we were thirsty. Then people came, and they dug a well. But we were still thirsty. And then you came and gave us the water we needed and knowledge to keep it."

"It was a moment I'll never forget," says Hannam, who along with other EWB project members, including a faculty advisor, undergraduate and graduate students and practicing engineers, received as thank you gifts a ram, two chickens and two pigeons.

"That last day there we brought the entire community together at the project site, all the village chiefs, all the major stakeholders in the project," says Hannam. "It was a very heartfelt occasion that made all of us students realize that the time and energy we put into this project was well worth it."

As a freshman, Hannam participated in a university study abroad program, travelling to China, Vietnam and Cambodia. At that time, he discovered the world and how he wanted to contribute to it. "Of course going to that part of the world, you see the developmental explosion going on there," he recalls. "It's having a massive impact on the environment, cultural preservation and global economics. It drove me to understand these problems at a greater depth. In many ways it has driven my academic career since."

Hannam became interested in such issues as climate change and energy development and has worked to raise awareness of these issues on campus, helping start a university climate change awareness student group and serving as a member of the university's Climate Action Workgroup. "I'm helping to make the university a greener place," he says.

But, he wanted practical hands-on experience, as well. "EWB was the perfect vehicle for doing that," says Hannam, who has also travelled to such countries as Brazil, Germany, the Netherlands, Mali, Senegal, Guinea, Morocco and others as part of a university program or on his own. "The EWB work was an affirmation of what I wanted to do, using engineering and policy to address sustainable development and environmental issues," he says.

"Anything you want to do is possible here at Maryland," says Hannam, who is also a participant in the Gemstone Program, a selective four-year research program for undergraduate honors students. "I have been so influenced by my experiences as a student here. My education inside and outside of the classroom has been extremely rewarding. I've had the opportunity to learn through coursework and with EWB in the field, and also to directly apply what I have learned to help others. "

It is that commitment that makes him a perfect fit for the Truman Scholarship. The $30,000 merit-based scholarship is presented each year to college juniors who wish to attend graduate school in preparation for careers in government or public service.

Hannam plans on pursuing a dual master's degree in mechanical engineering and public policy, "eventually working with international environmental policy and sustainable development," he says. Adding, "We as engineers shouldn't limit ourselves."

After all there is much to be done and many who will benefit from it.

ALUMNI

"Our students are the very reason we are here, and we as a department work diligently to offer them courses, projects and experiences in and outside of the classroom that will prepare them well for their future careers," says Avram Bar-Cohen, department chair. Some of those former students have now gone on to join university faculty from across the nation.

Andrew J. Dick, Ph.D. '07, joined the Micro-Electro-Mechanical Systems or MEMS department at Rice University as an assistant professor.

Leila Ladani, M.S. '05 and Ph.D. '07, joined the mechanical and aerospace engineering department at Utah State University as an assistant professor.

Nathan Sniadecki, M.S. /Ph.D. '03, joined the mechanical engineering department at the University of Washington in Seattle as an assistant professor.

And, **Nathan Williams** joined the Washington State University School of Architecture and Construction Management in Pullman as a tenure-track assistant professor. He successfully defended his Ph.D. dissertation in November 2007.

For our latest news stories, please visit: **www.enme.umd.edu**.

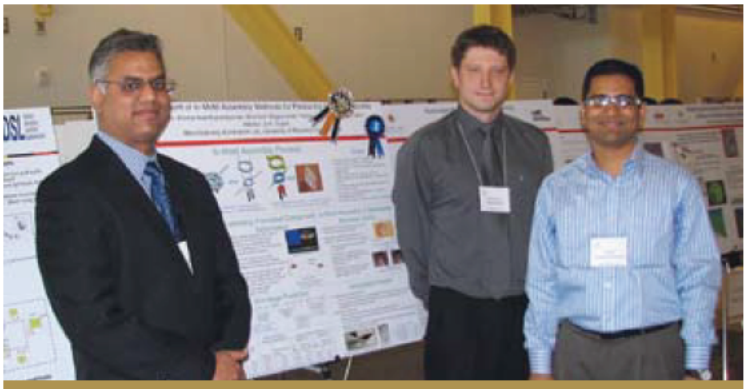
SCHOLARSHIPS

The Department of Mechanical Engineering has been fortunate enough to receive gifts during the past year that have resulted in the establishment of various scholarships. "These scholarships prove invaluable to us in offering opportunities to our students," says Avram Bar-Cohen, department chair.

The family of Mickey Dale created a four-year scholarship in her memory to help recruit talented first-year students majoring in mechanical engineering, bioengineering, electrical engineering or computer engineering. Dale was a University of Maryland University College employee and the wife of a Clark School alumnus.

The Salzberg Family Foundation has established the Ruth and Sam Salzberg Family Endowment to provide annual scholarships to mechanical engineering students who intend to pursue construction-related engineering - focusing on plumbing, heating and air conditioning, etc. - as a career. Sam Salzberg was a mechanical engineer who established a family business in heating, air conditioning and plumbing.

Irina Krayterman, wife of former engineering professor Boris Krayterman, established the Professor Boris L. Krayterman Memorial Scholarship Endowment in his honor. The scholarship will be used to support full-time juniors, seniors or master's degree candidates in mechanical engineering.



PROFESSOR S.K. GUPTA AND STUDENTS WOJCIECH BEJGEROWSKI & ARVIND ANANTHANARAYANAN

MARK YOUR CALENDARS! THE DEPARTMENT OF MECHANICAL ENGINEERING WILL BE HOSTING ITS **4TH ANNUAL RESEARCH REVIEW DAY ON MARCH 13, 2009**. THIS EVENT ALLOWS THE DEPARTMENT TO SHOWCASE ITS RESEARCH EFFORTS. COME VISIT US AND LEARN ABOUT THE FASCINATING AND GROUND BREAKING RESEARCH TAKING PLACE WITHIN THE DEPARTMENT OF MECHANICAL ENGINEERING. YOU MAY ALSO PREVIEW SOME OF THAT RESEARCH IN OUR UPCOMING WINTER ISSUE, WHICH WILL BE DEDICATED TO THE THEME OF RESEARCH WITHIN OUR DEPARTMENT.

BUG-INSPIRED ENGINEERING FOR BETTER SENSORS

Security, health and safety sensors in coal mines, buildings or underground public transit areas where air or water does not readily flow may one day be improved by research on young mayflies. Mechanical engineers **Ken Kiger** and **Elias Balaras** and entomologist **Jeffrey Shultz** have identified a biological mechanism in the young mayflies that could enable sensors in stagnant environments to make air or water flow past them so they can detect harmful substances.

Young aquatic mayflies, or "nymphs," enhance their respiration using gills. They do this by creating a flow of fresh water with the help of seven pairs of nearby gill plates that flap like a Venetian blind. The flow of fresh water is generated by the plate's motion, directing water to the mayfly's gills as efficiently as possible.

MAYFLY NYMPH

DAVE FUNK, STROUD WATER RESEARCH CENTER

"By duplicating the action of the mayfly gill plates in a tiny robotic device, we hope to create a flow of air or water to sensors in stagnant environments, so they can operate more effectively," says Kiger.

Working with the University's Department of Entomology, Kiger, an associate professor of mechanical engineering, is exploring how the mayfly's gill plates work, and how to create a robotic version. The researchers are currently duplicating and measuring the gill plate movement in a virtual computer model.

The researchers are also taking a closer look into something that scientists have known for a long time: at a sufficiently small size, an object is less affected by inertia than it is by the thickness (viscosity) of the water it is travelling through.

For example, consider a canoe in comparison to a mayfly. As it travels through the water, the canoe produces a current, which will continue to ripple through the water for some time after the canoe moves on. This is an effect of the water's inertia.

The opposite is true for the tiny mayfly nymph, which is so small that the thickness (viscosity) of the water stops such a current almost as soon as the gill plates stop. Once the mayfly grows to a certain size though, it is capable of creating an inertial effect, or ripples, of its own. Its gills respond accordingly, which is a trait the researchers hope to replicate in their sensors.

"Mayfly sizes are right at the point where issues of viscosity and inertia switch in importance," says Kiger. "Depending on whether the weight or the thickness of the water is influencing its movement, the mayfly switches the way it pumps water to its gills."

The current trend in sensor technology is to strive for smaller and more compact devices to enhance their portability and reduce power consumption. As a result of this trend, traditional technology sensors will run into the same difficulty as experienced by the mayfly as the sensors reach smaller and smaller sizes: eventually a transition will occur where inertial flow mechanisms will become ineffective. Studying how the mayfly deals with this transition can provide insight into how to better develop equivalent engineered sensors.

"BY DUPLICATING THE ACTION OF THE MAYFLY GILL PLATES IN A TINY ROBOTIC DEVICE, WE HOPE TO CREATE A FLOW OF AIR OR WATER TO SENSORS IN STAGNANT ENVIRONMENTS, SO THEY CAN OPERATE MORE EFFECTIVELY." — ASSOCIATE PROFESSOR KEN KIGER.

The next step will be to construct a tiny artificial microrobot that can reproduce the switchable gill action of the mayfly nymph. Such a mechanism could be installed in sensors intended to detect unhealthy air in otherwise stagnant areas, such as in subway stations or mines. If a miniature set of robotic mayfly gill plates can move air over a sensor, potentially harmful substances can be detected faster – and no canaries would be harmed in the process.

This work was funded by the National Science Foundation. Entomology graduate student Andrew Sensenig also contributed to this research.

KEN KIGER

MECHANICAL ENGINEERING MISSION

The mission of the Department of Mechanical Engineering at the University of Maryland is to provide an outstanding education, conduct innovative, ground breaking research, address the needs of citizens, industry and government, and provide related service to the campus community and the community at large.

The mission shall be guided by a commitment to continuous improvement in the overall quality of teaching, research, and service. Providing engineering education with sufficient scope to include the basic and specialized engineering training necessary for the current and emerging needs of society is a major focus of this Department. The Department has a related responsibility to contribute to the advancement of knowledge by conducting research at the cutting edge of science and technology. Given the rapid advances in science and technology, the department also has a professional responsibility to provide continuing education to the practicing engineer.

The Department faculty and administration also see as part of this mission, an obligation to serve the needs of the campus community and the community at large in the spirit of collegial cooperation.

By staying focused on the Strategic Plan and achieving its quantitative and qualitative goals, we aspire to place and sustain the Department of Mechanical Engineering at the University of Maryland among the nation's top 15 mechanical engineering programs among all universities –public and private – and top 10 among the publicly supported research universities, by 2011.

DEGREE PROGRAMS

Mechanical Engineering: B.S., M.E., M.S., Ph.D.
Reliability Engineering: G.C.E.N., M.E., M.S., Ph.D.
Professional Master of
Engineering & Public Policy

MAJOR RESEARCH CENTERS

Center for Advanced Life Cycle Engineering (CALCE)
Center for Energetic Concepts Development (CECD)
Center for Environmental Energy Engineering (CEEE)
Center for Nano Manufacturing and Metrology
Center for Risk and Reliability
Smart Materials & Structures Research Center (SMSRC)

INSTRUCTIONAL DIVISIONS

Design and Reliability of Systems
· Design · Information Sciences
· Risk and Reliability · Manufacturing

Electronic Products and Systems
· Physics of Failure & Reliability
· Supply Chain Engineering
· Competitive Systems

Mechanics and Materials
· Solid Mechanics · Materials
· Dynamics and Control · MEMS/NEMS

Thermal, Fluids and Energy Sciences
· Energy Systems · Fluid Mechanics
· Thermal Sciences · Reacting Flows

2007 STATISTICS FROM THE FACULTY ACTIVITY REPORT

47	Tenured & Tenure-Track Faculty
8	Research Scientists/Professors & Lecturers
75	Professional Society Fellow Memberships
8	National Academy of Engineering Members
11	Journal & Book Series Editors
30	Journal Associate Editors
8	Published Books (edited, authored or co-authored)
19	Published Book Chapters (edited, authored or co-authored)
163	Published Journal Articles
344	Proceeding Papers & Presentations
31	Plenary, Invited & Keynote Speakers

Based on 2007 statistics from the Faculty Activity Report and includes: Tenured/Tenure-Track Faculty, Research Scientists, Lecturers & select Affiliated & Emeriti Faculty.

2007-2008 ACADEMIC CALENDAR STATISTICS

602	Undergraduate Enrolled (Fall 2007)
1280/1430	SAT 25/75 Percentile of Entering Freshman
12	% of Women Undergraduates
25	% of Minority Undergraduates
25	% of Undergraduates in Honors Programs
289	Graduate Students Enrolled (Fall 2007)
170	B.S. Degrees Awarded
34	M.S. Degrees Awarded (ENME, ENRE, ENPM)
29	Ph.D. Degrees Awarded (ENME, ENRE)

GRADUATE PROGRAM


BALACHANDRAN

Dr. Balakumar Balachandran
Director of Graduate Studies
Professor and Associate Chair

Enrollment

In the 2007-2008 academic year the Department of Mechanical Engineering had 289 graduate students enrolled. Of these, 85 were master's students and 204 were doctoral students. Of these students, 47 were female and 37 were minority students.

Degrees

The department granted 34 master's degrees and 29 doctorates. Dissertation titles and the names of doctoral and M.S. students are listed later in the report.

Recruitment and Support

420 students applied to the graduate program for admission in 2007-2008. Of these applicants 80 were admitted and 60 enrolled, most with financial assistance. Overall, the department supported 33 students through teaching assistantships and 130 through research assistantships. In addition, 46 of our students have been awarded fellowships.

Student Credentials

The students who enrolled in our program in 2007-2008 had an average GRE score of 511 Verbal, 760 Quantitative, a 4.23 Analytic score.

B.S./M.S. Program

The B.S./M.S. program continues to provide students with the opportunity to earn both a B.S.M.E. and an M.S.M.E. following five years of study. In 2007-2008, the department enrolled 17 new students and had a total of 21 enrolled in this program. In 2007-2008 there were 11 B.S./M.S. students who advanced into the graduate portion of the program, with 10 completing their M.S.

Comments from Dr. Balakumar Balachandran

"Graduate students are drawn to our program as a result of our location, close to the D.C. area with its many national institutes, centers and laboratories. And, students are also drawn to our program because of the individual reputation of our researchers within the department.

We also offer support in terms of fellowships and assistantships. This is a successful tool in attracting strong students to the program. Finally, in recent years more and more students are becoming interested in pursuing faculty positions, and we offer a very popular Future Faculty Program here. It's another way to offer graduate students different options in their professional pursuits."

UNDERGRADUATE PROGRAM


AINANE

Dr. Sami Ainane
Director of Student Services

Enrollment

Enrollment in the undergraduate program during the 2007-2008 academic year reached 602 students. 25% of these were minority students and 12% were female, and 198 were in the University Honors Program. The entering freshmen class of 2007 had a math and reading SAT of 75th percentile of 1430, and 25th percentile of 1283 and an average high school GPA of 4.055. Last year, we awarded 170 bachelor's degrees.

Our program features design throughout the undergraduate curriculum and unique teaching methods, including a practical classroom design experience in a course supported by Black & Decker, tailored to students participating in the competition projects and cutting-edge electives.

Career Paths

Several areas of concentration are suggested to the student in their senior year. These areas of focus, such as Computer-Aided Design and Manufacturing; Controls, Sensors and Electronic Packaging; Energy and the Environment; Engineering Management; General Mechanical Engineering; and MEMS and Microfabrication Technologies enable students to study in unique courses in their areas of interest and to better prepare themselves for professional careers of their choice.

Honors Program

The departmental Honors Program, now in its eighth year, consists of three levels of involvement available to students. The university has a general honors program primarily for freshmen and sophomores, the school of engineering has an honors program primarily for juniors and seniors, and the Department of Mechanical Engineering has an honors program for students at all levels. It is possible for students to participate in any combination, including all three of the honors programs. The program currently has about 150 participants and has been highly successful in attracting talented students to the department.

QUEST & Gemstone Programs

The QUEST Program, offered jointly with the Smith School of Business, places students in the workplace to research and develop quality enhancement recommendations for corporate partners. The Gemstone Program focuses students from diverse majors on research that addresses technological and social issues.

Comments from Dr. Ainane

"I have been here at the university since I started my graduate studies in 1981. When I compare the state of our engineering school and our mechanical engineering department now to then, there is no comparison. Back then, a top engineering student's choice was MIT or Berkley. Maryland never made the list. Now, we are often a student's first choice. We have definitely come a very long way."

2007-2008 PH.D. GRADUATES

Graduate name followed by title of dissertation and faculty advisor

Summer 2007

Richard James Deigan (ENME) Modeling and Experimental Investigations of the Shock Response of Viscoelastic Foams
Amz Baz

Yuliang Deng (ENME) Carbon Fiber Electronic Interconnects
Michael Pecht

Andrew James Dick (ENME) Advantageous Utilization of Nonlinear Phenomena in Micro-Structures and Macro-Structures: Applications to Micro-Resonators and Atomic Force Microscopy
Balachandran Balakumar, C.D. Mote

Genzi Li (ENME) Online and Offline Approximations for Population Based Multi-Objective Optimization
Azarm Shapour

Zahra Mohaghegh-Ahmadabadi (ENRE) On the Theoretical Foundations and Principles of Organizational Safety Risk Analysis
Ali Mosleh

Mario Gustavo Urdaneta Padron (ENME) Design of a Dielectrophoretic Cell Loading Device
Elisabeth Smela

Xuezheng Wang (ENME) Understanding Actuation Mechanisms of Conjugated Polymer Actuators: Ion Transport
Elisabeth Smela

Yi Zhou (ENME) Microfluidics Interfacing to Mass Spectrometry
Don DeVoe

Fall 2007

Mohammadreza Azarkhail (ENRE) Agent Autonomy Approach to Physics-Based Reliability Modeling of Structures and Mechanical Systems
Mohammad Modarres

Anupam Choubey (ENME) Microstructural Changes Under Isothermal Aging and Their Influence on Thermal Fatigue Reliability for Tin-Lead and Lead-Free Solder Joints, Including Microstructural Changes under Isothermal Aging in Mixed Solder Joints
Michael Pecht

Johnathan Stuart Coursey (ENME) Enhancement of Spray Cooling Heat Transfer Using Extended Surfaces and Nanofluids
Jungho Kim

Vivek Gautam (ENME) Flow and Atomization Characteristics of Cryogenic Fluid from a Coaxial Rocket Injector
Ashwani Gupta

Bahman Habibzadeh (ENME) Understanding Co-Oxidation in SOFC'S Using Nickel Patterned Anode
Gregory Jackson

Dae Whan Kim (ENME) Convection and Flow Boling in Microgaps and Porous Foam Coolers
Avam Bar-Cohen, Bongtae Han

Mian Li (ENME) Robust Optimization and Sensitivity Analysis with Multi-Objective Genetic Algorithms: Single- and Multi-Disciplinary
Shapour Azarm

Seyed Hamed Nejad-Hosseinian (ENRE) Automatic Generation of Generalized Event Sequence Diagrams for Guiding Simulation Based Dynamic Probabilistic Risk Assessment of Complex Systems
Ali Mosleh

Jin Qin (ENRE) A New Physics-of-Failure Based VLSI Circuits Reliability Simulation and Prediction Methodology
Joseph Berstein

Senthilkumaran Radhakrishnan Large-Eddy Simulation of High Reynolds Number Flows in Complex Geometries
Ugo Piomelli

Joseph Varghese (ENME) Effect of Dynamic Flexural Loading on the Durability and Failure Site of Solder Inteconnects in Printed Wiring Assemblies
Abhijit Dasgupta

Chengdong Wang (ENRE) Hybrid Casual Logic Methodology for Risk Assessment
Ali Mosleh

Peng Wang (ENME) On-Chip Thermoelectric Cooling of Semiconductor Hot Spot
Avam Bar-Cohen

Nathan Williams (ENME) Strategic Product Design for Retail Channel Acceptance under Uncertainty and Competition
Shapour Azarm

Gregory Young (ENME) Metallic Nanoparticles as Fuel Additives in Airbreathing Combustion
Kenneth Yu (Fire Protection Engineering)

Spring 2008

Parisa Foroughi (ENME) Design and Characterization of an Electrohydrodynamic (EHD) Micropump for Cryogenic Spot Cooling Applications
Michael Ohadi

Jason Brian Hall (ENRE) Methodology for Evaluating Reliability Growth Programs of Discrete Systems
Ali Mosleh, Paul Ellner

Richard Heine (ENME) Role of On-Board Sensors in Remaining Life Prognostic Algorithm Development for Selected Assemblies as Input to a Health and Usage Monitoring System for Military Ground Vehicles
Donald Barker

Arun Kumar Kota (ENME) Processing-Structure-Microstructure-Property Relationships in Polymer Nanocomposites
Hugh Bruck

Chia-Wen Tsao (ENME) Interfacing Microfluidic Bioanalysis with High Sensitivity Mass Spectrometry
Donald DeVoe

Xudong Wang (ENME) Performance Investigation of Two-Stage Heat Pump System with Vapor-Injected Scroll Compressor
Reinhard Radermacher

2007-2008 M.S. GRADUATES

Graduate name followed by faculty advisor name

Summer 2007

Christopher Joseph Bachmann (ENME)
Avram Bar-Cohen

Joseph Anthony Currano (ENME)
Jungho Kim

Aaron Joseph Johnson (ENME)
Donald Barker

Philip Leland Knowles (ENME)
Ken Keiger

Dennis D. Leber (ENME)
Jeffrey Herrmann

Timothy Walter McMillin (ENME)
Michael Ohadi

David C. Morgan (ENME)
Linda Schmidt

Silas Carl Nesson (ENME)
Miao Yu

Brian Adam Tuchband (ENME)
Michael Pecht

Fall 2007

Thomas Buchanan Baummer (ENME)
Michael Ohadi

Damien Carl Bretall (ENME)
William Fourney

Sergio Anthony Briceno (ENRE)
Michel Cukier

Benjamin Kane Earl (ENRE)
Ali Mosleh

Jason Brian Hall (ENRE)
Ali Mosleh

Christopher Stephen Jackson (ENRE)
Ali Mosleh

Rupal Jain (ENME)
Patrick McCluskey

Cara Sanderson Martin (ENME)
Reinhard Radermacher

Shahrzad Salemi (ENRE)
Joseph Bernstein

Calvin Homayoon Shirazi (ENRE)
Ali Mosleh

Nathan Andrew Vickey (ENME)
Bongtae Han

Alan Tien Yu (ENME)
Donald Barker

Spring 2008

Kevin Anthony Coyne (ENRE)
Ali Mosleh

James Daniel Diorio (ENME)
James Duncan

Kiri Lee Feldman (ENME)
Peter Sandborn

Ashley Lynn Grenier (ENME)
Linda Schmidt

Katrina Marie Groth (ENRE)
Ali Mosleh

Saifa Hasin (ENME)
Donald Barker

Rifat Jafreen (ENME)
Peter Sandborn

Sravya Kosaraju (ENME)
Bala Balachandran

Richard Scott Morrison (ENRE)
Ali Mosleh

Christie Lynn Nelson (ENRE)
Ali Mosleh

Leah Pike (ENME)
Patrick McCluskey

Gustavo Alberto Plaza (ENME)
Michael Pecht

Alvin Garwai Yew (ENME)
Adam Hsieh

PROFESSIONAL MASTER OF ENGINEERING PROGRAM

CECD Program Advisor:
Professor Davinder Anand

Mechanical Program Advisor:
Dr. Sami Ainane

Relibility Program Advisor:
Professor Ali Mosleh

Summer 2007

Susan Bathalon (ENME)
Frank Pappano (ENRE)

Fall 2008

James Agbormbai (ENME)
Ralph Bridge (CECD)
Jose Galvis (ENME)
Mark Hanna (ENME)
Giuseppe Iorio (ENME)
Eric Lindquist (ENME)
Namkyu Park (ENME)

Spring 2008

Thomas Barron (ENME)
Donald Boone (ENME)
Ryan Hayleck (ENME)
Dale Huang (ENME)
Michelle Lewis (ENME)
Michael McCarthy (ENME)
Samuel Negash (ENME)
Catherine Nolan (ENME)
Marta Owens (ENME)
Saliou Telly (ENME)
Ryan Reisman (ENRE)

(ENME) - Mechanical Engineering (ENRE) - Reliability Engineering (CECD) - Center for Energetic Concepts Development

STUDENT AWARDS

Undergraduate students from the Department of Mechanical Engineering received recognition at the A. James Clark School of Engineering's 2008 Honors and Awards ceremony this past April. Those honored from the department include:

A. James Clark School of Engineering Dean's Award
Rachel Kerzner

Dinah Berman Memorial Award
Bradley Eisenberg

Kim A. Borsavage and Pamela J. Stone Student Award for Outstanding Service
Heather Bradshaw

Department of Mechanical Engineering Chair's Award
Stephanie Karpovich, Rachel Kerzner

Department of Mechanical Engineering Academic Achievement Award
Bradley Eisenberg

Keystone Design Challenge Award-Fall 2007
Erick Alves de Sa, Jeffrey Jones

The Department of Mechanical Engineering came together this past spring to recognize student recipients of awards, scholarships and fellowships from the past year. This was the department's inaugural ceremony. Those honored include:

American Society of Mechanical Engineers Senior Award
Robert Newby

Best Dissertation Award
Mian Li

Best Thesis Award
Silas Nesson

Department of Mechanical Engineering Service Award
Mark Bellingham, Jonathan Chung, Marisa Cicale

Pi Tau Sigma Memorial Award
Catherine Wienke

Pi Tau Sigma Outstanding Service Award
Kevin Brilhart

Pi Tau Sigma Outstanding Sophomore Award
Erick Alves De Sa, Ethan Schaler

Pi Tau Sigma Outstanding Teaching Assistant Award-Fall 07
Philip Knowles

Pi Tau Sigma Outstanding Teaching Assistant Award-Spring 08
Nikolas Beratlis

2008 Goldwater Scholar
Heather Bradshaw

2008 Truman Scholar
Phillip Hannam

A. James Clark Scholarship
Omar Abdelaziz, Timothy Fitzgerald, Suvajoti Guha, Chao Hu, Weiwei Hu, Headley Jacobus, Rebecca Kokes, Hynseok Oh, Chenren Shao, Jessica Sheehan, Atul Thakur, Marcello Valdez, Charles Wright, Zhao Zhang

Alfred P. Sloan Fellowship
Pedro Quintero

Amelia Earhart Fellowship
Gayatri Cuddalorepatta

Ann G. Wylie Dissertation Fellowship
Ahmed A. Abdelhafez, Yuxiang Liu, Ying Shi

ARCS Fellowship
James Diorio

ASHRE Scholarship
Ebrahim Al-Hajri, Mohamed Al-Shehhi

C. Raymond Knight Endowed Scholarship
Pingfeng Wang

C. Raymond Knight/ARINC Scholarship
Robin Berthier

Charles Hutchins Educational Grant
Gayatri Cuddalorepatta

Fischell Fellowship in Biomedical Engineering
Marc Dandin

Future Faculty Program Fellow
Omar Abdelaziz, Arvind Ananthanarayanan, Edvin Cetegen, Gayatri Cuddalorepatta, Payam Delgoshaei, Timothy Fitzgerald, Reza Kazemi-Tabriz, Yuxiang Liu, Eric A. Maxeiner, Vincent Nguyen, Masoud Rabiei, Danial Shahmirzadi

Hoffman Scholarship
Sarah Grice

Hulka Energy Fellowship
Elnaz Kermani

Keystone Design Challenge Award
Erick Alves De Sa, Emily Friend, Jeffrey Jones

Leon D. & Virginia M. Hoffman Scholarship
Mahdi Eydgahi

Litton Fellowship
Steven DeCaluwe

NSF Bridge Fellowship
Sophoria Westmoreland

NSF Graduate Research Fellowship
Rebecca Kokes, Jessica Sheehan

Student of the Year Award (DOT/FAA)
Katrina Groth

Suez Energy Fellowship
Kyle Gluesenkamp, Vrun Singh

Willie Webb Award
Ying Shi, Danielle Shrun

FACULTY AWARDS

Young Faculty Awards

Professor Sarah Bergbreiter
2008 Young Faculty Award, Defense Advanced Research Projects Agency (DARPA)

Professor Teng Li
Ralph E. Powe Junior Faculty Enhancement Award

Professor Miao Yu
Young Investigator Program (YIP) Award, Air Force Office of Scientific Research (AFOSR)

University Appointments & Promotions

Dr. Donald (Don) DeVoe
Associate Professor to Professor

Dr. Satyandra (S.K.) Gupta
Associate Professor to Professor

Dr. Jungho Kim
Associate Professor to Professor

Dr. Michel Cukier
Assistant Professor to Associate Professor

Professor Ashwani Gupta, Distinguished University Professor, University of Maryland

Dr. Jan Sengers, Distinguished International Service Award, University of Maryland

Professional Society Awards

Professor Shapour Azarm, Automation Award, ASME Design Automation Committee

Professor Mohammad Modarres, 2008 International Research Leadership Award

Professor Michael Pecht, Lifetime Achievement Award, IEEE Reliability Society

Professor Linda Schmidt, Merryfield Award, ASEE

Publication Awards

Professor Michael Pecht, Dr. Michael Osterman, Dr. Dignata Das, Dr. Sony Matthew (R. Ferebee, J. Clayton), "Virtual Remaining Life Assessment of Electronic Hardware Subjected to Shock and Random Vibration Life Cycle Loads," Institute of Environmental Sciences and Technology 2008 Maurice Simpson Technical Editors Award

Professional Society Members & Fellows

Professor Avram Bar-Cohen, Honorary Member, ASME

Professor Ashwani Gupta, Elected Fellow, SAE

Professor S.K. Gupta, Elected Fellow, ASME

Professor Bongtae Han, Elected Fellow, ASME

Patents

Professor Michael Pecht (J. Swift, S. Wallace, Y. Deng), "Electromechanical Device Having a Plurality of Bundles of Fibers for Interconnecting Two Planar Surfaces," (U.S. Patent 7,220,131; 5/22/07)

Professor Bala Balachandran, Professor Mao Yu, and **Dr. Moustafa Al-Bassyiouni**, "Fiber Tip Based Sensor Systems for Measurements of Pressure Gradient, Air Particle Velocity and Acoustic Intensity," (U.S. Patent 7,224,465; 5/29/07)

Professor Bongtae Han (& Dr. C.W. Han), "Shadow Moir Using Non-Zero Talbot Distance," (U.S. Patent 7,230,722; 6/12/07)

Professor Elizabeth Smela (W. Lu, P. Adams, G. Zuccarello, B. Mattes). "Solid-in-hollow Polymer Fiber Electrochemical Devices," (U.S. Patent 7,288,871; 10/30/07)

Professor Avram Bar-Cohen and **Professor Bao Yang,** "Novel Configuration of Thermoelectric Coolers to Cool High-Heat-Flux Hot Spots," (U.S. Patent 7,290,596; 11/6/07)

Professor Jungho Kim (S. Moghaddam, J. Lawler), "Heat-flux Based Emissivity/Absorptivity Measurement," (U.S. Patent 7,318,671; 1/15/08)

Invention Awards

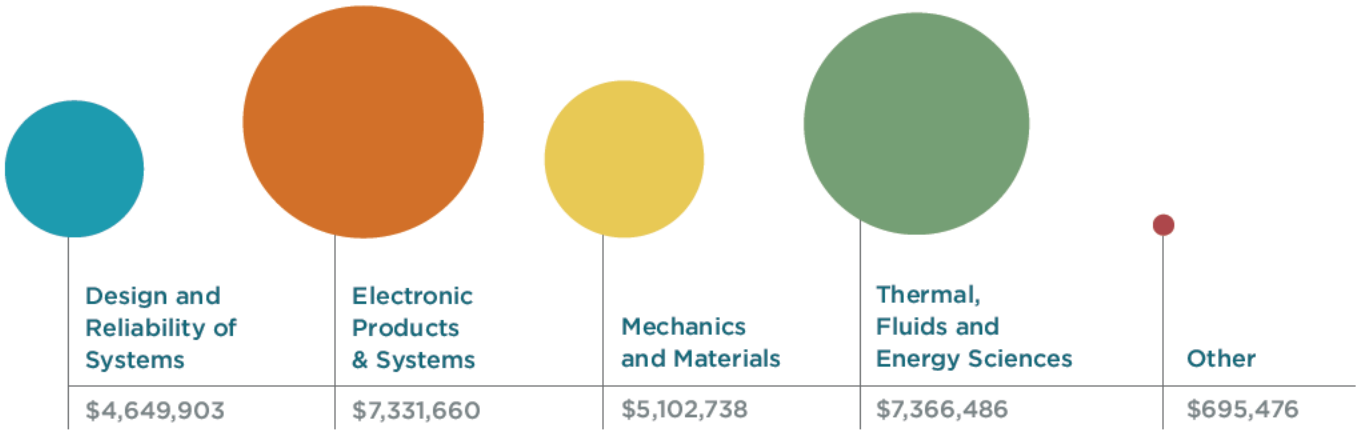
Professor Jaydev Desai and **Professor S.K. Gupta** (Marc Simard, Rao Gullapalli, Nicholas Pappafotis, Wojciech Bejgerowski), Winner-Invention of the Year-Physical Science, University of Maryland, "Minimally Invasive Neurosurgical Intracranial Robot"

Professor S.K. Gupta (Antonio Cardone, Maxim Schwartz), Invention of the Year-Information Science, University of Maryland, "Geometry Based Search Software" (runner-up)

RESEARCH EXPENDITURES

FY '08 fiscal expenditures, shown by research area in the chart below, indicate that 31% of the expenditures were from the electronic products & systems domain, 20% in mechanics and materials, 31% in the thermal, fluids and energy sciences division and 15% in design and reliability of systems.

FY '08 RESEARCH EXPENDITURES BY DIVISION



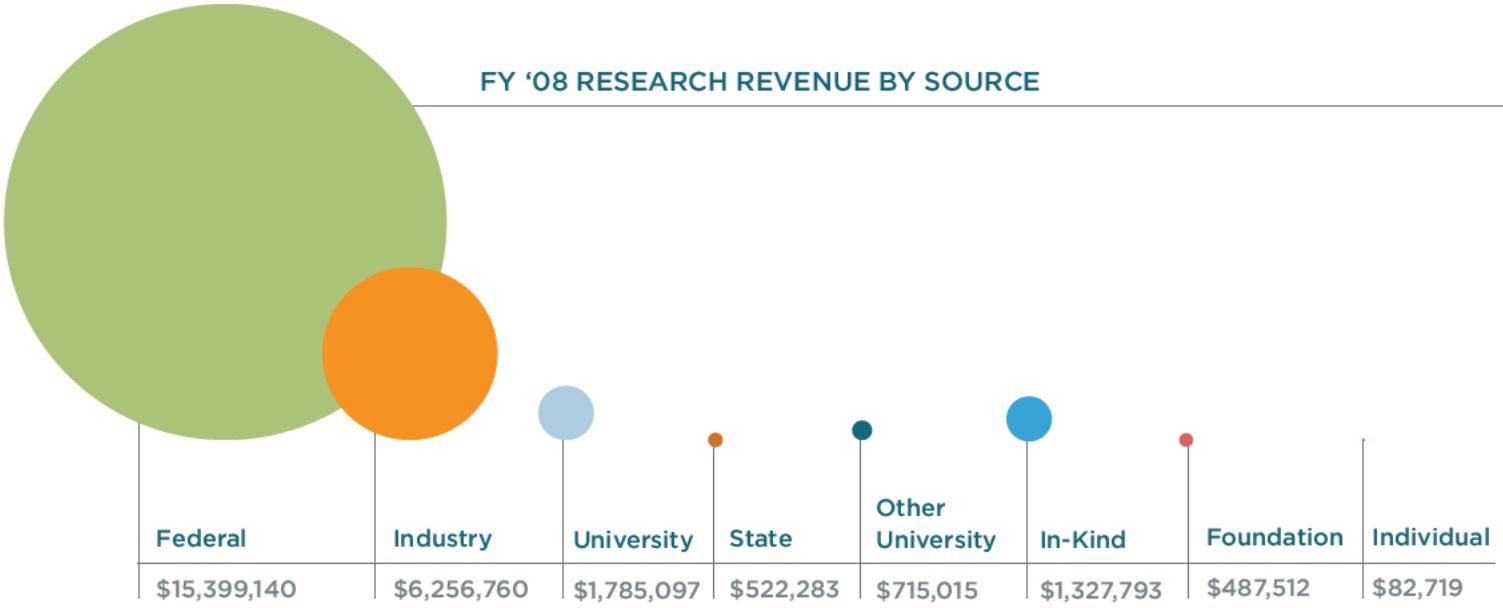
$25,146,263 **Total Department Expenditures**

190 **Research Grants**

AR7

In FY '08, ME faculty have participated in a wide variety of research efforts in varous field of mechanical engineering, obtaining support from many federal and corprate contracts as well as the private sector.

FY '08 RESEARCH REVENUE BY SOURCE



$26,576,319 **Total Research Revenue**

RAINMAKERS

Fourteen faculty from the department were among the top "rainmakers" in FY '08, bringing in $500,000 or more in research funding:

Dr. Davinder Anand
Professor Emeritus of Mechanical Engineering
Director, Center for Energetic Concepts Development (CECD)

Dr. Balakumar Balachandran
Professor and Associate Chair of Mechanical Engineering
Director of Graduate Studies

Dr. Amr Baz
Professor of Mechanical Engineering
Director, Smart Materials and Structures Research Center (SMSRC)

Dr. Joseph Bernstein
Associate Professor of Reliability Engineering

Dr. James Duncan
Professor of Mechanical Engineering
Keystone: Clark School Academy of Distinguished Professors

Dr. Gregory Jackson
Associate Professor of Mechanical Engineering

Dr. Ashwani K. Gupta
Distinguished University Professor of Mechanical Engineering

Dr. Satyandra Gupta
Professor of Mechanical Engineering

Dr. F. Patrick McCluskey
Associate Professor of Mechanical Engineering

Dr. Michael Pecht
George E. Dieter Professor of Mechanical Engineering
Director, Center for Advanced Life Cycle Engineering (CALCE)

Dr. Reinhard Radermacher
Professor of Mechanical Engineering
Director, Center for Environmental Energy Engineering (CEEE)

Dr. Elisabeth Smela
Associate Professor of Mechanical Engineering

Dr. Byeng Dong Youn
Associate Professor of Mechanical Engineering

Dr. Michael Zachariah
Professor of Mechanical Engineering and Chemistry
Director, Center for Nano Manufacturing and Metrology

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GIVING

The Department of Mechanical Engineering would like to thank those who made contributions to our program. Your generosity is much appreciated.

Mrs. Ellen S. Exelbert
The Ruth and Sam Salzberg Family Endowment

Mrs. Anne Dodson Gould
Charles R. Dodson Endowed Scholarship Fund

Dick & Priscilla Hoffman
Leon D. Hoffman, Jr. & Virginia M. Hofman Scholarship in Mechanical Engineering

Ms. Cynthia Knight
C. Raymond Knight Award for Best Paper in Reliability Engineering

Mrs. Irina Krayterman
Professor Boris L. Krayterman Memorial Scholarship Endowment

Mr. and Mrs. Aris Mardirossian
Aris and Marianne Mardirossian Endowed Scholarship in Mechanical Engineering

Mr. and Mrs. Aris Mardirossian
Arsen Mardirossian Scholarship Fund

Mr. and Mrs. Gerald Shapiro
Shapiro & Duncan Endowed Scholarship

Mr. Sheldon Shapiro
Shapiro & Duncan Endowed Scholarship

ME VISITING COMMITTEE

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Intel Corporation

Dr. Arthur Bergles
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Rensselaer Polytechnic Institute

Mr. Aris Cleanthous
Engineering Manager
DeWalt Power Tools

Dr. George Dieter
Emeritus Professor of Mechanical Engineering
University of Maryland

Dr. Howard Harary
Deputy Director, Manufacturing & Engineering Lab
National Institute of Standards and Technology (NIST)

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Florida Atlantic University

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Mr. Edward Warfield
Chief, Plant Design Engineering
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Eugene C. Gwaltney, Jr. School Chair Emeritus
School of Mechanical Engineering
Georgia Tech University

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NASA Goddard
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NAVAIR
nCode International, Inc.
New Mexico Tech
NIH
NIST
Nokia Siemens Network
Northrop Grumman Corporation
NRC
NSA
NSF
NSWC
Oakridge
ONR
Penn State University
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Raytheon
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Yale University

greatEXPECTATIONS

Contribute to the department through the University of Maryland's Great Expectations campaign and support our mission to transform lives through exceptional educational and research opportunities. Your contributions can support mechanical engineering initiatives such as graduate fellowships, undergraduate scholarships and named professorships. Please visit www.greatexpectations.umd.edu to learn more.

Gifts may be made by check to "University of Maryland College Park Foundation (UMCPF)." Please designate "The Department of Mechanical Engineering" in the memo line, and mail to:

Avram Bar-Cohen, Professor and Chair
Department of Mechanical Engineering
2181 Glenn L. Martin Hall
University of Maryland,
College Park, MD 20742

You can help make a difference with a gift of any amount!

METRICS is published for alumni and friends of the Department of Mechanical Engineering at the A. James Clark School of Engineering.

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Writer/Editor: Lisa Gregory
Designer: Jennifer Paul
Portraits: John Consoli

Cover: Engineers without Borders in Africa, Faculty Recognition Reception, Terps Racing, ME Grad Student Rishi Raj, ME Staff (F. Stephenson, F. Walker, S. Wicker, I. Brown) Below: Dr. M. Ohadi and recent graduate Parisa Foroughi.

WE WANT TO HEAR FROM YOU, OUR ALUMNI!

METRICS is designed to keep our readers informed about the activities and accomplishments of the Department of Mechanical Engineering. We would also like for you, our alumni, to keep us informed about your activities and accomplishments so that we may share them with our readers in METRICS. Please send your alumni news to me communications@umd.edu. Or, visit our website at **www.enme.umd.edu.**

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University of Maryland
College Park, MD 20742

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