The UMass Amherst Supermileage Team from the Mechanical and Industrial Engineering Department finished a very respectable eighth in the national supermileage competition by logging an impressive 828 mpg. The faculty advisor was David Schmidt (fourth from right).

In order to be good stewards of the gifts you have given, and in support of our campus-wide effort to encourage sustainability and recycling practices, the UMass Amherst College of Engineering will now publish its Honor Roll of Donors online at engineering.umass.edu/donorlist. This electronic publication recognizes those who have given generously to the college in fiscal year 2010. Check it out on the college’s brand new website at engineering.umass.edu.

DONOR REPORT

In order to be good stewards of the gifts you have given, and in support of our campus-wide effort to encourage sustainability and recycling practices, the UMass Amherst College of Engineering will now publish its Honor Roll of Donors online at engineering.umass.edu/donorlist. This electronic publication recognizes those who have given generously to the college in fiscal year 2010. Check it out on the college’s brand new website at engineering.umass.edu.

Contents

Peaking at Just the Right Time: Senior “Capstone” Courses.................. 1
Che/Biochem 590A: Biotechnology Process Engineering Laboratory ...... 2
MIE 497: Senior Design Project............................................. 3
ECE 416: Senior Design Project ........................................... 4
CEE 486: Civil and Environmental Engineering Design Project......... 5
News Around the Quad........................................................................ 6
The Numbers.......................................................................................... 8

Peaking at Just the Right Time: Senior “Capstone” Courses

OLYMPIC ATHLETES KNOW exactly what “peaking” means. To reach that zenith, athletes
must take years of hard work, practice, conditioning, technique, training, learning, and
couching and make it all converge into a perfect storm of peak performance.

Every senior in all four departments at the College of Engineering (COE) knows precisely what
peaking means, too. Except that here, instead of the Olympics, we call our peak experience the
senior capstone courses.

To our seniors, completing a capstone course must feel a bit like the thrill that Michelangelo felt
while putting the finishing touches on the Sistine Chapel ceiling in 1512, or like the high that Sir
Edmund Hillary and Tenzing Norgay experienced when they reached the top of Mount Everest in
1953. That’s about as “peak” as anything gets.

The Chemical Engineering Department (ChE) characterized its capstone course as a means “to
bring all the knowledge seniors have accumulated in the curriculum and apply it.” In the Mechani-
cal and Industrial Engineering Department (MIE), its course was “the culminating experience” in
its curriculum. The Electrical and Computer Engineering Department (ECE) billed its capstone this
way: “as close as we can get to duplicating what these students will be doing in their professional
lives.” The Civil and Environmental Engineering Department (CEE) capstone amounted to “an
upper-level, integrative experience about what it’s like to be a professional engineer.”

Capstone courses are all that and more. This year, the courses climaxed in late April or early
May with four Olympian events, one for each department, in which the team projects for all our
seniors were presented. Those events brought the four-year learning curve for the Class of 2010
to an apex, from which our seniors will be launched into the glide path for their new engineering
careers.
the MIE department’s Class-E (for Class-Exploratorium) project, a 2,500-square-foot space in the ELab building. The COE is currently raising $100,000 in private support to create the project, which will feature an upgraded computer lab, teleconferencing hardware and software, several reconfigurable meeting spaces, a lecture room for guest speakers, and a place for all the MIE students to call home. “We want the Exploratorium to be an incubator for collaboration and innovation that is impossible now, given our current space constraints,” said MIE Department Head Don Fisher.

The Exploratorium support has been led by the RDK Engineers, Hal Burman (MS ’77), and Edwin Thomas (BS ’69). Private support helped set up a similar facility, called MS, in the ECE department two years ago.

Individual donors are not the only ones making a difference either, because corporate donors, too, are stepping up to help our students (Cont. on pg. 3).

ChE/Biochem 590A: Biotechnology Process Engineering Laboratory

Something truly amazing happened this year on the way to Commencement. In ChE/Biochem 590A, 27 students collectively came up with an important breakthrough in the production process for a key enzyme called human protein phosphatase I, used for anti-cancer and anti-HIV treatments.

“It’s a very relevant protein,” explained ChE Professor Susan Roberts, who teaches the interdisciplinary course with her husband, Dr. Louis Roberts of the Biochemistry and Molecular Biology Department. “But before this year it couldn’t be produced in a form that can be readily purified.”

The problem with mass-producing pure phosphatase I had been that the enzyme was not functional if modified to simplify purification. The first step in overcoming this obstacle is “tagging” the protein so that, when you get to the purification stage after production, you can directly pull it out of solution. Researchers have been studying this issue for years, but before ChE/Biochem 590A, the tagged protein wasn’t functional when purified. “But in our class we have been working on a new system to tag the protein in an appropriate way,” said Susan Roberts, beamingly proudly. “And in this year’s lab we did that, and for the first time came out with a functional protein after it was scaled up and purified.”

The Roberts modeled their lab after the pharmaceutical industry and how it would produce a protein product. As fitting as it seems, the ChE department’s capstone course amounted to a chemical transfer of knowledge applied to experiments dealing with reaction engineering, separations, and process design, and other chemical functions.

“The students understand these core unit operations, because they have studied the concepts in the classroom,” explained Susan Roberts. “But we thought we would create a new opportunity for them to expand their repertoire and start applying some of the chemical engineering principles specifically to biotechnology and bioengineering.”

New opportunity, indeed! The Roberts’ students seized that opportunity, in true carpe diem style, to make a little bioengineering history.

MIE 497: Senior Design Project

Dr. Sundar Krishnamurty, who teaches MIE’s capstone course, is in the business of solving problems. He gets his problems from a range of sources, including the manufacturing companies that he deals with on a regular basis. Then he dishes out those problems to teams of his seniors in MIE 497, so they can do a little wonder-working.

Here’s one good example. Dr. Krishnamurty is an integral part of the new Precision Manufacturing Regional Alliance Project, funded by a $600,000 National Science Foundation grant and designed to develop ways in which UMass Amherst can help area manufacturers create better products, processes, and materials. One of the organizations in the alliance, Hoppe Tool Inc., came to Krishnamurty with a heavy-duty problem: how to mount a 300-pound infrared camera from the back of a truck with a telescoping lifting device that could handle the 300-pound payload and raise it three feet in 12 seconds.

In response to this request, teammates Jesse Clauson, Todd Currier, and Dan Larson came up with a Telescoping Tube Lifting Mechanism that won first place at the MIE presentation contest on May 3. “They had the most complete prototype,” explained Dr. Krishnamurty, “and they had a solid engineering analysis to back up their design.”

But that project was only the tip of the peak experience. The second-place team designed a Rainwater Harvesting and SODIS Purification System for use in post-disaster scenarios, when diseases such as typhoid and diarrhea often break out because of contaminated water supplies. The rainwater harvester and solar water disinfection apparatus conceived by Tasnim Ahmed, Adaze Amua, and Justin Marmaras consisted of a portable canvas funnel catchment device, which collects untreated rainwater in a 50-gallon water barrel and then purifies it through a U.V. filter. Other creative projects for the course included a plasma cutter jig for the MIE machine shop, indoor planting systems for low-income families, and various solar barbecue systems.

“We were very impressed with their vision, their passion,” said Dr. Krishnamurty. “More than half of the projects were related to idealistic causes. The seniors wanted to contribute to society in one way or another with their engineering knowledge and skills. And they did this in a very cutting-edge, state-of-the-art way.”

A new scholarship created by the Conserva- tion Services Group (CSG) of Westborough, Massachu- setts, and the SunPower Foundation of San Jose, Cali- fornia, supports students whose education is directly related to energy efficiency, clean energy, and/or environmental protection. Sandhya Sundara ragavan of the MIE department was the CCOE recipient of the scholarship.

“A year from now,” she said about the impact of the scholarship. “I see myself as a successful energy analyst in the energy/utilities sector. I hope to contribute to the ongoing research, technol- ogy, and competitive trends in the global power industry that will help in building a clean green economy.”

Even recent graduates of the college want to draw the circle of support by giving back to the capstone experiences that got them where they are. This year, four 2009 grads from our ECE department collabor- ated with their employer, Cisco Systems, Inc., to fund the ECE Senior Design Project that had such a critical (Cont. on pg. 4).
ECE 416: Senior Design Project

"The Senior Design Project is not only the culminating project in the ECE curriculum," said T. Baird Soules, the department's undergraduate program director, "but it is also where students broaden their skill base by making presentations, working in teams, and staying within their budgets."

All that was displayed on April 23, when the 20th annual ECE Senior Design Project Day unveiled 13 clever, creative, and useful electronic inventions produced by seniors in ECE 416. The event was a high-tech floorshow for electronic wizardry.

According to voting by faculty, Team Ganz (Blind Assistive Technology Bill Reading Device) and Team Wolf (Stuff Tracker) finished in a first-place tie for the best projects. "These projects are really terrific, and some have a real sense of social conscience that would ring well with the public," said ECE Department Head Christopher Hollett.

The goal of Team Ganz was to develop a small, inexpensive optical reader that will audibly identify different denominations of U.S. paper currency for visually impaired individuals. There was no such product in existence until the team working with advisor Dr. Aura Ganz – Erick Drummond, Ian McAlister, Chris Neyland, and Colin Smith – invented its prototype. "One thing this course does is try to teach these seniors the esoteric nuances about the business of engineering," said Dr. Lutenegger. "It's our chance to give them a realistic idea about what it means to be a professional engineer.""The Senior Design Project is not only the culminating project in the ECE curriculum," said T. Baird Soules, the department's undergraduate program director, "but it is also where students broaden their skill base by making presentations, working in teams, and staying within their budgets." All that was displayed on April 23, when the 20th annual ECE Senior Design Project Day unveiled 13 clever, creative, and useful electronic inventions produced by seniors in ECE 416. The event was a high-tech floorshow for electronic wizardry.

According to voting by faculty, Team Ganz (Blind Assistive Technology Bill Reading Device) and Team Wolf (Stuff Tracker) finished in a first-place tie for the best projects. "These projects are really terrific, and some have a real sense of social conscience that would ring well with the public," said ECE Department Head Christopher Hollett.

The goal of Team Ganz was to develop a small, inexpensive optical reader that will audibly identify different denominations of U.S. paper currency for visually impaired individuals. There was no such product in existence until the team working with advisor Dr. Aura Ganz – Erick Drummond, Ian McAlister, Chris Neyland, and Colin Smith – invented its prototype. "One thing this course does is try to teach these seniors the esoteric nuances about the business of engineering," said Dr. Lutenegger. "It's our chance to give them a realistic idea about what it means to be a professional engineer."
Busch Vaults onto the Scene

Junior Sean Busch of the ECE department won the 2010 UMass Amherst Winter Male Scholar-Athlete Award by posting a GPA of 3.75, setting the university’s record for the indoor pole vault at 15’9”, and winning the A-10 Championship in that event. The A-10 Conference also named Busch to its Academic All-Conference Team for his strong performance during the indoor track & field season, combined with his stellar academic performance in the classroom.

Gao Chosen as IEEE Fellow

Dr. Lixin Gao of the ECE department has received the honorary title of Fellow from the Institute of Electrical and Electronics Engineers “for contributions to inter-domain internet protocol network routing.” Professor Gao is the eighth IEEE Fellow on our current COE faculty.

Goldstein Named Fellow of Microscopy Society

Dr. Joseph Goldstein, a distinguished professor in the MIE department and former dean of the COE, has been named as a Fellow in the Microscopy Society of America. He is also a Fellow of the American Society of Metals and even has an asteroid named after him, “Joegoldstein,” a heavenly body in the asteroid belt between the orbits of Mars and Jupiter.

NOx NO MORE Knocks Noxious Emissions

A web-based teaching game developed by Assistant Professor of Transportation Engineering Song Gao of our CEE department and two Northeastern University faculty members has won a 21st Century Learning Lab Award of $150,000 from the MacArthur Foundation. The game, NOx NO MORE, uses GPS data to teach students about the environmental impact of their family’s transportation choices. NOx NO MORE was one of 10 projects chosen for awards out of more than 800 international submissions to the innovative digital media and learning projects competition.

Zeroing in on the Nature of Tumors

An in vitro three-dimensional model of tumor tissue, or “cyldroid,” invented by Neil Forbes, the key tool used for research in an article published in Nature Nano-technology. The journal is part of the prestigious Nature Publishing Group, a spinoff of Nature, the leading international scientific journal, founded in 1869. The paper, published in April, was entitled “Tuning payload delivery in tumor cyldroids using gold nanoparticles.”

Conner Garners Fulbright Fellowship

Dr. William Curtis Conner of the ChE department was chosen as the Fulbright Distinguished Chair in Alternative Energy Technology at Chalmers University of Technology in Sweden. As the Fulbright Chair, he will teach and develop research collaborations on that campus throughout 2010 and 2011. The appointment is the most prestigious and selective of all Fulbright Fellowships.

CEE Team Wins “Traffic Bowl”

Our student chapter of the Institute of Transportation Engineers from the CEE department took home the top prize at the 2010 Northeastern District I Traffic Bowl. The Jeopardy-style competition was held at the Transportation Student Research Symposium. UMass Amherst was represented by transportation engineering graduate students Steven Tupper, Deanna Peabody, and Samuel Gregorio, as well as alternates Katrina Hecimovic and Radha Gomez.

Technology Review Applauds Two ChE Researchers

Technology Review, the prestigious publication from the Massachusetts Institute of Technology, recently sang the praises of two ChE researchers. One was nationally recognized “green gasoline” researcher George Huber, the John and Elizabeth Armstrong Professional Development Professor. The article focused on Huber’s startup company, Anellotech. The other ChE researcher was Paul Dauenhauer, who has developed a special method of “gasification” for converting biomass feedstock into sustainable fuel. The magazine noted that his method could have a “profound” effect on the chemical industry.

“Blueprint Brigade” Installs Historic Well in Kenya

The campus chapter of Engineers Without Borders, a national group dubbed “The Blueprint Brigade” by Time magazine, has reached an historic landmark in its six-year-old Kenya Water Project by drilling a new well, for which the student organization has raised $15,000 since 2006. The deep-bore well, installed at the Machakka Polytechnic School in Kenya, will help clean drinking water for several thousand people in the Western Province in Kenya.

NOx NO MORE Knocks Noxious Emissions

A web-based teaching game developed by Assistant Professor of Transportation Engineering Song Gao of our CEE department and two Northeastern University faculty members has won a 21st Century Learning Lab Award of $150,000 from the MacArthur Foundation. The game, NOx NO MORE, uses GPS data to teach students about the environmental impact of their family’s transportation choices. NOx NO MORE was one of 10 projects chosen for awards out of more than 800 international submissions to the innovative digital media and learning projects competition.

Zeroing in on the Nature of Tumors

An in vitro three-dimensional model of tumor tissue, or “cyldroid,” invented by Neil Forbes, the key tool used for research in an article published in Nature Nano-technology. The journal is part of the prestigious Nature Publishing Group, a spinoff of Nature, the leading international scientific journal, founded in 1869. The paper, published in April, was entitled “Tuning payload delivery in tumor cyldroids using gold nanoparticles.”

Conner Garners Fulbright Fellowship

Dr. William Curtis Conner of the ChE department was chosen as the Fulbright Distinguished Chair in Alternative Energy Technology at Chalmers University of Technology in Sweden. As the Fulbright Chair, he will teach and develop research collaborations on that campus throughout 2010 and 2011. The appointment is the most prestigious and selective of all Fulbright Fellowships.
The Numbers

FY10 College Numbers

Faculty ..................... 95
Undergraduate Enrollment ........ 1,421
Graduate Enrollment .............. 434
B.S. Degrees ................. 278
M.S. Degrees .............. 77
Ph.D. Degrees ........ 29

FY10 Research Expenditures by Department

CHE ...................... 5,869,271
CEE ..................... 5,555,525
ECE .................... 10,145,183
MIE .................... 4,758,629
DEAN .................. 169,656

FUNDING SOURCES (26.5M)
RESEARCH EXPENDITURES FY10

Federal 58%
Industrial 17%
State & Local 13%
Other 12%

TOTAL COLLEGE REVENUE SOURCES FY10 (45.6M)

Current Gifts 3%
Fee Income/Misc. Revenue 3%
Industry/Private/Other Grants 17%
State General Operating Funds 36%
Federal/State/Local Grants 42%

TOTAL COLLEGE EXPENDITURES FY10 (45.6M)

Information Technology 1%
Equipment/Leases 3%
Supplies/Maintenance 4%
Admin/TvI/Postage 4.5%
Scholarships/Fellowships 4.5%
Overhead 13%
Student Support 13.5%
Salaries/Fringe 56.5%

The student team of Lam Nguyen, Monish Lillaney, Sergio Sian, and Seth Roda produced this fully interactive robotic explorer, codenamed FireBall, for its Electrical and Computer Engineering Department Senior Design Project. FireBall is designed to be released into a potentially dangerous and hostile environment in order to avoid human casualties. The faculty advisor was Christopher Salthouse (second from right).