A MESSAGE FROM THE DEAN

ABET, the Accreditation Board for Engineering and Technology, will be back on campus this year to conduct the site visits that occur every six years in order for our programs to retain accreditation. One ABET criterion calls for engineering departments to regularly assess student outcomes and systematically use the evaluations for the “continuous improvement” of their educational programs.

Believe me, “continuous improvement” would remain a priority at the Hajim School even if we didn’t seek ABET accreditation. As I note in our recent state of the school message, we must continue to make the Hajim School ever better in ways that set us apart from our peers. That is why we have set goals to achieve a truly representative 50 percent female undergraduate enrollment, for example, and why we are striving to give at least 25 percent of our students a chance to study abroad.

This is not about institutional bragging rights; this is about serving our students—and, ultimately, society at large. Surely society is better served when talented people of both genders and all walks of life can join the community of engineers who tackle our great challenges. Especially when those engineers bring with them a global perspective.

Student opportunities and achievements are the major focus of our spring Full Spectrum newsletter. In this issue, for example, we look at how students benefit from the unique way music intersects with engineering at the University of Rochester. This includes but is certainly not limited to studying and performing under talented Eastman School faculty and in River Campus ensembles. Music underlies our new audio and music engineering major, which is preparing students for careers in the booming fields of audio and media engineering. The relationships our faculty have established with counterparts in the famed Eastman School have spawned exciting collaborative opportunities, such as the app some of our computer science students developed to provide instant feedback to Eastman vocal students as they perfect their vowel sounds.

Similarly, the proximity of biomedical engineering, the Institute of Optics, the Center for Visual Studies, and the Flausm Eye Institute has led to significant achievements and ongoing collaborative opportunities in biomedical optics. Here, too, students benefit. For example, Daniel Savage is pursuing a PhD in optics and an MD—a first for our University and an opportunity he likely wouldn’t find anywhere else.

And what an exciting time for our students in computer science, a department that has greatly expanded its undergraduate offerings in recent years and stands poised to play a key role in the University’s data science initiative. Sandhya Dwarkadas, recently appointed department chair after Henry Kautz became director of the Institute for Data Science, shares her thoughts on where the department is headed.

Chemical engineering celebrates its 100th anniversary this year. You are invited to join the celebration. And please join me in congratulating our faculty members whose achievements are also described herein.

Meliora!

Rob Clark

CHEM E CELEBRATES ITS
100TH ANNIVERSARY

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When the University launched its chemical engineering program in 1915, the campus was on Prince Street, tuition was $90 a year, and the ChemE curriculum was very different from what it is today.

Freshmen took rhetoric, German or French (used by the most prestigious scientific journals at that time), math, chemistry, drawing, woodshop, foundry, forge, and physical training during an academic year that was split into three terms.

The first class of 10 students was taught by two faculty members, Millard C. Ernsberger and Victor Chambers—not neither of whom was trained in chemical engineering!

The Department of Chemical Engineering is celebrating the program’s 100th anniversary this year by honoring its past, showcasing how far it has come, and looking to the future.

The celebration will culminate during Melora Weekend in October with an open house, guest speakers, and other activities.

For updates, go to www.che.rochester.edu/about/100th_anniversary.html.

In the meantime, monthly “snapshots” from ChemE’s history are appearing on the department’s homepage.
Computer Science extends its reach with new programs, collaborations

The University has committed to hiring 20 artificial intelligence and computer systems. The department intends to continue that 40-year tradition. Dwarkadas, chair of the department, accepted the position after previous chair Henry Kautz became director of the Institute for Data Science last summer.

"Computing is a lot more ubiquitous. Times are changing," says Sandhya Dwarkadas. "People are using computing devices and learning about computer science in many diverse areas of computer science, for instance—to "get a sense of what computer science is about." The result: increasing numbers of these students either switch to computer science or take it as a minor or double major to increase their marketability upon graduation. More than 50 percent of computer science students double major or minor.

The department is well poised to increase that percentage as more females are drawn to a field where graduates are in high demand.

Sandhya Dwarkadas
Undergraduate enrollment in the Department of Computer Science is at a record high. Five new faculty members have been hired in the last two years. New bachelor’s and master’s programs in data science are awaiting state approval, as is a new master’s in computational linguistics.

"The University implements a data science initiative that is kicking into high gear, Dwarkadas notes. "For someone interested in core computer science work, that certainly can still be their focus, but the department is also attracting students with a more interdisciplinary bent of mind," Dwarkadas says.

The long-standing collaboration between the computer science department’s systems group and the Department of Electrical and Computer Engineering has been bolstered with the recent hiring of assistant professor Thomas Howard, who, like Engin Ipek, has a joint appointment with the two departments.

New bachelor’s and master’s degrees were established in 1974 with a focus on pure research, the department initially offered only a PhD degree. Bachelor’s and master’s degrees were offered starting in the mid-1990s; the department now also offers courses in as many as nine clusters through the University’s “cluster” system.

This allows students in other majors—in the humanities and social sciences, for instance—to “get a sense of what computer science is about.” The result: increasing numbers of these students either switch to computer science or take it as a minor or double major to increase their marketability upon graduation. More than 50 percent of computer science students double major or minor.

DATA SCIENCE MAJORS

The new data science majors awaiting state approval will likely attract even more of these students, combining basics of computer science and statistics with an emphasis on interdisciplinary applications. Other new interdisciplinary majors with a strong base in computation likely will evolve as the University’s data science initiative kicks into high gear, Dwarkadas notes.

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RECENT FACULTY ADDITIONS

The department is well poised to increase that percentage as more females are drawn to a field where graduates are in high demand.

It recently secured funding from the BRAID initiative (Building Recruiting and Inclusion for Diversity) to cover travel costs for its female students to attend the annual Grace Hopper Celebration of Women in Computing Conference. With its networking opportunities, distinguished speakers and seminars, the conference “is a great eye opener to what is possible in computer science and a great way to get students inspired. It is also thrilling for these young women to see thousands of other women in the many diverse areas of computer science,” Dwarkadas says. The department sent 14 of its students to this past fall’s conference in Phoenix; one of them, Alyson Grealish ’16, described it as “the most meaningful experience for me in terms of my career” after successfully interviewing with Apple for a summer internship.

In addition, the department’s peer-led team learning workshops, used in many CSC classes, “select students with leadership skills and mastery of course content to serve as workshop leaders. Many of these students are now female, serving as excellent mentors and role models for their more junior colleagues,” says Dwarkadas. "We hope this will help attract—and retain—more female students.

Dwarkadas, who grew up in India, completed her bachelor’s degree in technology at the Indian Institute of Technology in Madras and received her MS and PhD degrees from Rice University. One of her goals as chair is to foster interdisciplinary research in a collaborative, collegial, and inclusive environment, something that the department has historically excelled at. That’s what attracted her to join the department, she says. "Our close-knit environment really fosters the research and retention of our faculty. And the camaraderie you see among our students plays a great part in their success; it keeps them well rounded. When they interview for a job, they come across as someone who can not only dive into the details of the narrow focus of their own research but also engage in a discourse in many other areas of computer science."
When chemical engineering major Erik Laurin ’15 isn’t figuring out ways to optimize the use of heat exchangers to minimize energy consumption, he’s likely taking lessons on his double bass at the Eastman School of Music or performing with the University of Rochester Symphony Orchestra (URSO).

Laurin plans a career in chemical engineering. But he also expects his passion for music to remain a lifetime hobby.

“That’s one of the major reasons Laurin chose to attend the University of Rochester. ‘When I was accepted, it was an obvious choice that I had to come here because of the Eastman School’—one of the nation’s top-ranked music schools.

Laurin, who won the River Campus Concerto Competition for non-Eastman students in November, will perform the first movement of Antonio Capuzi’s Concerto for Double Bass and Orchestra with the University of Rochester Chamber Orchestra on April 28.

Music and engineering intersect in multiple ways for Hajim School students—most obviously in the opportunities they have to take lessons from Eastman faculty members, to participate in 10 River Campus music ensembles, and even to climb into a tiny loft high up in the Rush Rhees tower to create rich tones on the Hopeman Memorial Carillon. “I’ve never seen.” She is one of the student carillonneurs who study under instrument I’ve ever seen.” She is one of the student carillonneurs who study under

Yina Jin, a PhD student in computer science, who plays the Hopeman Memorial Carillon. “Roger body movements, like using arms and legs—all at the same time—make it as much a physical exercise as just a performance.”

“I have absolutely never been so excited for my classes and just the possibilities in general—it’s always a fun time to find something you really enjoy! The interaction of music and engineering has also led to some fascinating interdisciplinary projects and research studies. A team of five students in assistant professor Ethan Hoque’s human-computer interaction class, for example, worked with Eastman voice professor Katherine Ciesinski and her students on a computer app to help singers learn their vowel sounds. Since 2008, three collaborations involving Hajim and Eastman faculty members have received Provost Multidisciplinary Awards (now called University Research Awards) to investigate topics ranging from the importance of haptics in organ performance, pedagogy, and scholarship to perception of music and language through auditory interference.

One of the more intriguing student collaborations is the Laptop Orchestra that David Heid, a master’s student in electrical and computer engineering, assembled to perform at last fall’s Rochester Fringe Festival. (See photo at far right.) Heid, who has undergraduate degrees in electrical and computer engineering (from the Hajim School) and in music education (from the Eastman School), says he wanted to show how art, science, and technology could be blended in creative ways.

“There is not a typical student at the University of Rochester,” he adds. “You don’t have students who just major in biomedical engineering. They’re also in an a cappella group, or they’re ballet dancers, or presidents of five different clubs at the same time.”
MORE THAN A DEPARTMENT, MORE THAN A CENTER...  

Biomedical optics: a University-wide collaboration

As a PhD student at the University of Rochester, Daniel Savage has been involved in research “that is not only exciting for me personally but also has the potential to be high impact, positively affecting the lives of countless individuals.”

The project, a collaboration between Wayne Knox, professor of optics, of physics, and in the Center for Visual Science (CVS), and Krystel Huising, professor of ophthalmology, of neurobiology and anatomy, of brain and cognitive sciences, and in the Center for Visual Science, explores a novel application of femtosecond laser beams that could correct vision problems noninvasively, without the cutting involved in LASIK surgery.

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Savage, for example is now undertaking a PhD at the Institute of Optics and an MD from the School of Medicine in the medical school’s dual degree MD-PhD program.

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The project, a collaboration between Wayne Knox, professor of optics, of physics, and in the Center for Visual Science (CVS); and Ashley Proctor, lab technician acting as patient, demonstrate the use of a hemodynamic optical device with a handheld probe as a noninvasive way to monitor breast cancer therapy. The device combines diffuse correlation spectroscopy (DCS) and diffuse optical spectroscopy (DOS). DCS is a near-infrared optical method that quantifies deep-tissue microvascular blood flow, and DOS provides total hemoglobin concentration and blood oxygen saturation. These hemodynamic parameters are significantly different between tumor and normal tissues, and their changes indicate the effectiveness of cancer therapies.

Regine Choe, assistant professor of biomedical engineering; Stadie Zimbiki, a senior in biomedical engineering (standing in foreground); and Ashley Proctor, lab technician acting as patient, demonstrate the use of a hemodynamic optical device with a handheld probe as a noninvasive way to monitor breast cancer therapy. The device combines diffuse correlation spectroscopy (DCS) and diffuse optical spectroscopy (DOS). DCS is a near-infrared optical method that quantifies deep-tissue microvascular blood flow, and DOS provides total hemoglobin concentration and blood oxygen saturation. These hemodynamic parameters are significantly different between tumor and normal tissues, and their changes indicate the effectiveness of cancer therapies.

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EDMUND HAJIM IS RECIPIENT OF HORATIO ALGER AWARD

In the PhD dissertation he completed at the University in 1994, Xiangdong Cao gratefully acknowledged the “unconditional support” he received from his parents and grandparents in “my pursuit of a scientific career.”

In recognition of that, the chairman of the University’s Board of Trustees and the Hajim School’s chief benefactor is among this year’s recipients of the Horatio Alger Award.

The award, bestowed annually by the Horatio Alger Association of Distinguished Americans, honors renowned leaders who have succeeded despite adversity and are committed to both philanthropy and higher education.

Cao, who is president of Diker Management LLC, grew up amid the Depression and World War II. His parents divorced when he was three years old. His father took custody of him but was away at sea in the Merchant Marine much of the time. Hajim spent most of his childhood in foster homes and orphanages. Despite all of that, he was an excellent student, qualifying for an NROTC scholarship that enabled him to attend the University of Rochester.

“His $30 million gift to the Hajim School in 2008, the largest in the University’s history, supports scholarships for students with significant financial need as well as the school’s endowment.

“My emphasis over the last 25 or 30 years has been scholarships. And the main thrust of Horatio Alger is taking people with austerity in their backgrounds and giving them scholarships,” Hajim says. “This changed my life, and in many respects, our interests are totally aligned.”

Cao is now CEO of Wuhan Hongtuo New Technology, which specializes in femtosecond laser equipment, dispersion analyzers, and dispersion compensation modules. He continues to talk often with Agrawal—and he counts his lucky stars that he was at the right place at the right time to benefit from an outstanding mentor. “There’s nobody else who understands fiber optics like Govind does,” Cao says.

Similar optics fellowships have been established recently with gifts in the names of professors Stephen D. Jacobs, Duncan Moore, and Nicholas George. “We are focusing on increasing the number of endowed funds (scholarship, fellowship, and professorship) with the institute,” says Xi-Cheng Zhang, director and M. Parker Givens Professor of Optics. “Xiangdong Cao’s gift is a fine example of how our alumni and friends are helping the institute, the Hajim School, and the University of Rochester become ever better. We are extremely grateful to Xiangdong and all of our supporters.”

To learn more about supporting Hajim School students, faculty, or research, contact Eric Brandt at ebrandt@alumni.rochester.edu or go to www.hajim.rochester.edu/giving.html.

Hani Awad, professor of biomedical engineering and of orthopaedics, was inducted as a fellow of the American Institute for Medical and Biological Engineering (AIMBE).

Danielle Benoit, assistant professor of biomedical engineering and of chemical engineering, received a Faculty Early Career Development (CAREER) award from the National Science Foundation.

Julie Bentley, associate professor of optics, was one of three recipients of the University’s 2014 Goergen Awards for Excellence in Undergraduate Teaching.

Robert Boyd, professor of optics and of physics, was one of three recipients of the University’s Eastman Medal for co-inventing the Blue Noise Mask.

Christophe Dorrer, senior scientist at the Laboratory for Laser Energetics, was elected a fellow of the Optical Society (OSA).

Greg Gdowski, associate professor of biomedical engineering and executive director of the Center for Medical Technology & Innovation, was presented a Region 1 Technical Excellence Award from IEEE.

Stephen Jacobs, professor of optics and of chemical engineering and a senior scientist at the Laboratory for Laser Energetics, received the 2014 Education Award from the Rochester Regional Photonics Cluster/New York Photonics.

Qiang Lin, assistant professor of electrical and computer engineering and of optics, was the first recipient of the Leonard Mandel Faculty Fellow Award from the Department of Physics and Astronomy.

James McGrath, professor of biomedical engineering, was inducted as a fellow of the American Institute for Medical and Biological Engineering (AIMBE).

Kevin Parker, William F. May Professor of Engineering and dean emeritus, received the University’s Eastman Medal for co-inventing the Blue Noise Mask.

Ching Tang, professor of chemical engineering, was named one of 26 Citation Laureates for 2014 by Thomson Reuters and was also named the 2014 recipient of the University’s Board of Trustees and the Hajim School’s chief benefactor is among this year’s recipients of the Horatio Alger Award.

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Robert Goergen ’60 (physics), who contributed a lead gift to create the Robert B. Goergen Hall for Biomedical Engineering and Optics—in addition to many other University projects—received the Horatio Alger award last year. He is a current member and past chair of the University Board of Trustees.

GRATEFUL ALUMNUS ENDOWS FELLOWSHIP IN MENTOR’S NAME

Later he earned a master’s in business administration at the Harvard Business School, as he pursued his passion to understand how organizations work and to help people accomplish more than they thought possible. He enjoyed early success in investment management and created winning teams at both E. F. Hutton and Lehman Brothers.

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Thanks to Cao’s recent gift—endowing a fellowship to support graduate students at the Institute for his rights—a current student will have the same opportunity.

Cao’s fellowship is in the name of someone else he acknowledged in his dissertation—Govind Agrawal, the James C. Wyant Professor of Optics. Agrawal, though not Cao’s PhD advisor, was instrumental in helping Cao complete his thesis on the “Propagation of ultra-short Optical Pulses in Nonlinear Media and Their Applications.”

Specifically, Agrawal introduced Cao to nonlinear fiber optics. “We published papers together. He gave me his software to do simulations,” Cao relates. “He led me into the world of fiber optics.”

That changed everything for Cao. Though his PhD was in mechanical engineering, Cao switched his interest to fiber optics. And Agrawal continued to play an important role in Cao’s career. When Cao founded Qtera—using long distance dense wave division multiplexing equipment to boost the amount of data carried on optical fibers—Agrawal served as his technical advisor. Qtera went from a startup to a multinational company in 10 months and was acquired by Nortel.

Cao is now CEO of Wuhan Hongtuo New Technology, which specializes in femtosecond laser equipment, dispersion analyzers, and dispersion compensation modules. He continues to talk often with Agrawal—and he counts his lucky stars that he was at the right place at the right time to benefit from an outstanding mentor. “There’s nobody else who understands fiber optics like Govind does,” Cao says.

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FAST FACTS

- The Hajim School’s undergraduate enrollment has more than doubled since 2008–09, exceeding—by a factor of 10—President Obama’s challenge of increasing engineering enrollments nationally by 10 percent.

- The number of master’s students enrolled in the Hajim School increased from 61 in fall 2004 to 262 in fall 2014.

- Twenty-nine percent of the Hajim School’s undergraduate students are female. The Department of Biomedical Engineering leads with 43 percent female enrollment.

- The percentage of Hajim School students studying abroad is 16 percent.