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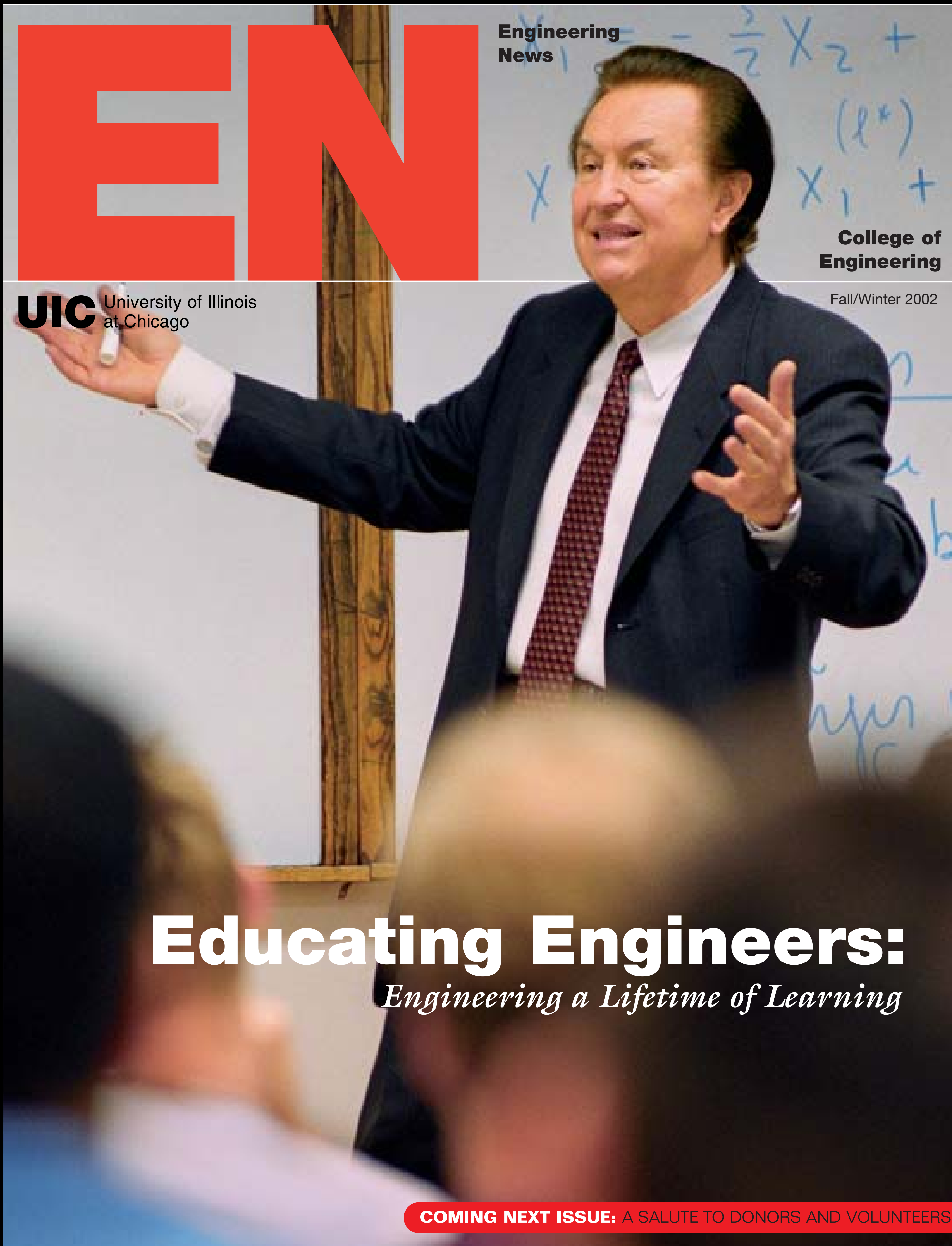


Educating Engineers:

Engineering a Lifetime of Learning

COMING NEXT ISSUE: A SALUTE TO DONORS AND VOLUNTEERS

Engineering a Lifetime of Learning

What does it take to educate an engineer in the technology-rich, extreme-performance environment of the 21st century, where engineering principles can be applied to everything from a sub-micron particle to forensic structural analysis? At UIC, the largest educator of engineers in Chicago and second largest in Illinois, it takes an uncommon commitment to education, featuring a curriculum that emphasizes engineering fundamentals while linking lessons to the latest developments in the field. It takes professors dedicated to the University's three-pronged mission of teaching, research and service to their profession. It takes a warmly outstretched hand to minority and female students, traditionally underrepresented in engineering. It takes the formation of rock-solid alliances with industrial and government partners, providing students with invaluable access to cutting-edge research and potential employers. It takes knowledge of diverse disciplines, reflecting the complex world of the workplace. It even takes reaching out to middle and high school students, preparing them for the rigorous demands of a rich science and math-based curriculum.

"Education is our primary mission. It begins the day a student matriculates and continues throughout a lifetime as an engineer," says Dean and Professor of Mechanical and Industrial Engineering Lawrence A. Kennedy. "As an institution in the heart of a thriving industrial, commercial and service city, we hold another responsibility, and that is to make our college accessible to all through collaboration with educational systems, governments, industry, science, and entrepreneurs. Each engineer we graduate helps us accomplish that goal by being a UIC engineer."

What follows is a dialogue among faculty that shows how the College of Engineering is fully prepared and more than up to its most important task: turning more than 400 undergraduates and almost 300 graduate students each year into practical, knowledgeable, forward-thinking engineers who are well aware that their years at UIC are a brief but important prelude to a dynamic career that demands a lifetime of learning. First, meet Professor W.J. Minkowycz, who is, as many attest, 'a great teacher'—one who has been introducing students to the laws of thermodynamics since the early days of the Chicago Circle campus.

What Makes a Great Teacher?

When the greats in engineering education are cited, it's safe to assume Professor W.J. Minkowycz will be among them. He is the winner of multiple teaching awards—the Harold Simon College of Engineering Award, six all-university Silver Circle Awards for Teaching Excellence, the UIC Excellence in Teaching Award, the Outstanding Teacher Award from the State of Illinois, the national Ralph Coats Roe Award from the American Society of Engineering Education and the national Heat Transfer Memorial Award for lifetime achievements in teaching, research and service from the American Society of Mechanical Engineers. His unabashed enthusiasm for subjects some would consider dry—thermodynamics and heat transfer—has swept many a student into his energetic orbit. Using a blend of acting skills during his lectures—enunciation, eye contact, dramatic pauses, striding across the room, raising and lowering his voice—he describes teaching as "a high" that he hasn't come down from in over 36 years.

> ***"Never too busy for a student"***

Robert Fovell, now an associate professor at UCLA, still remembers well his thermodynamics class from 1980. "Professor Minkowycz was enthusiastic and energetic, weaving in anecdotes to make the subject more interesting. He was very good at explaining things and I never went away from his lectures confused or frustrated. His gift is that he made thermodynamics into an interesting story. I wanted to hear more."

Professor Minkowycz's office door intentionally posts no office hours, because he wants to be available to students on their timetable, not his. "In engineering, students always have questions, so being available at any time is very important," he says. "If I'm here, my door is always open. If a student asks 'are you busy?' I always reply, 'Never too busy for a student.'"

And students are likely to find him in his office long past the regular school day, as 60-70-hour work weeks are the norm for Professor Minkowycz, who contends it's the only way he can fulfill his ambitious commitment to teaching, research and service. Preparing for each of his lectures requires a significant investment of time, as he works to incorporate real-world examples and updates lectures based on newly published articles to make the lessons relevant and intriguing. "Just writing equations is very boring, so I try and make students see that thermodynamics, the science of energy and its transformation, is everywhere…even the electricity in the classroom comes from converting water to steam to electricity." The professor even takes the time to add some humor, culled from his carefully compiled list of "engineering humor."

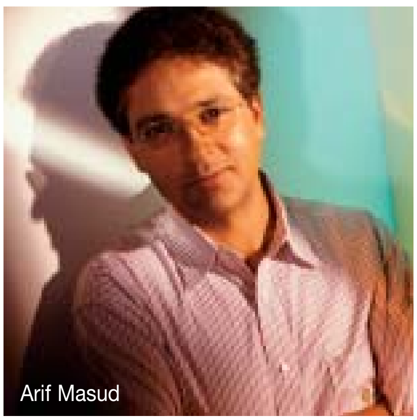
But jokes are never made at the expense of his students. He exhibits an old-world, almost courtly politeness with his students. "No matter what question they ask, I keep my thoughts to myself, and answer everyone with the utmost respect."

So clearly committed is he to teaching his subject, that it's the students who beg his pardon when they receive a bad grade. "There's no better compliment I can get, and several times students have come to me to apologize for the low grade I've given them, because they felt it was their fault they did badly in my class."

"Teaching is an art, and there are no rigid rules," he says sitting back in his office chair, gesticulating broadly. "But you know you're doing it right when students come back 20 years later and say 'you're the best professor I've ever had.'"

"I worked very hard in Professor Minkowycz's class, the best I've ever done," remembers his Ph.D. student Shek-se Peter Ip (B.S. 1978; M.S. 1979; Ph.D. 1985 Mechanical Engineering), who became a heat transfer specialist at Rockwell International Corporation. "Other students shared my feeling that his class was special and they all performed at their peak. The courses taught by Professor Minkowycz provided me with insights needed for my research and with the enthusiasm to actually carry out the research."

That enthusiasm and passion for both subject and students is shared by many other educators in the College of Engineering. Many have their own theories on the attributes of a 'great teacher'—ideas that focus on methodology and style, and first-hand experiences on how to transform an ordinary classroom experience into one that produces inquisitive and knowledgeable engineers. Associate Professor Arif Masud, Civil and Materials Engineering, describes his gauge for teaching professionalism: "If a student wants to get up during a lecture and say, 'I understand this totally and I can finish the next five minutes myself', then you know the person in the front of the room is a great teacher." Masud also imbues his students with a sense of long-term achievement. "I tell my students that a class is an opportunity to stretch ones flight of imagination and open up new doors, not just get a grade. They must train themselves to compete with graduates from prestigious schools all over the country."


Arif Masud

Challenging students to think on their own is key, agrees Professor Isabel Cruz, Computer Science, who won teaching awards before joining the College of Engineering faculty last fall. "I pose questions that require students to analyze and compare concepts… doing this gains that extra measure of patience to think beyond what's presented to them."

The greatest student motivator is a good professor, according to Professor John Regalbuto, Chemical Engineering: "It's when students know you really care that they are learning the materials—a good professor is always aware of both teaching and learning."

The Tenure Triad: a Professorial Conundrum

Professors on the tenure track must wear three hats with equal proficiency: teaching the next generation of engineers, spearheading high-profile research, and publishing research and editing scholarly papers and journals. Striking a balance between demanding, often-conflicting roles can be extraordinarily difficult. Just consider the time committed by Professor Minkowycz, a seminal authority in his field, to serve as the editor of three world class journals—the *International Journal of Heat and Mass Transfer*, *Numerical Heat Transfer*, and *Communications in Heat and Mass Transfer*—continue as the founder and series editor of *Series in Computational and Physical Processes in Mechanical and Thermal Sciences*, which has thus far encompassed 21 books, and the editor of a serial *Advances in Heat Transfer and Handbook of Numerical Heat Transfer*, now working on its second edition. Or the time necessary for UIC Distinguished Professor Tadao Murata, Computer Science, one of the world's leading experts on Petri net (a tool used to study computer systems that work concurrently) to serve as visiting professor at numerous universities, edit the *Journal of Circuits, Systems and Computers*, write more than 200 papers, give 150 invited presentations and publish two books on the subject. These intellectual tasks, reflecting personal stature earned in the research community, are performed in the name of service to the profession, and as Minkowycz says, brings enormous prestige to UIC.

They are not alone in this accomplishment. All publications, memberships, presentations, and editorships result in advantages for UIC: a higher profile for the College of Engineering, government and private industry dollars for research, and a competitive edge for students and faculty alike.

Non-tenure track professors, or lecturers, need only concentrate on teaching, "A distinction of enormous significance," points out Minkowycz, noting that while some awards for excellence in teaching include lecturers, others do not. That's why the Council for Excellence in Teaching and Learning (CETL) at UIC provides a forum to address this historic tension, recognizing faculty who invest a lot of their energies in classroom teaching in addition to their other roles. "Traditionally professors are recognized for bringing in research dollars, but you cannot have a strong research component without good teachers," explains Masud, who received the CETL award this year. Three Mechanical and Industrial Engineering professors recently received CETL Curriculum and Instructional grants. Brianno Coller winning for his project *Hands-on Automotive Engineering*, Houshang Darabi for *Creating a New Course-Manufacturing Information Systems*, and David He for *Web-based Simulation Portfolio for Teaching Simulation*—all of which demonstrate how research strongly advances education.

Teaching is the number one priority in the triad, but so essential is research to a good education that the UIC website features the slogan: "Welcome to the public research university in the great city of Chicago."


Tadao Murata

Says Masud, whose research currently focuses on development of computer software for analysis of engineering structures: "I have to be very efficient and balance my time and not compromise one at the expense of another. Doing good research helps me become a better teacher because I become more knowledgeable and more conscious of what students need to learn to be good engineers."

Research is an instructional tool, too, notes Tom Theis, director of the Institute for Environmental Science and Policy and professor of Civil and Materials Engineering: "Research is valuable in its own right because it teaches students to define a problem, gather historical or basic information about the problem, derive and define systems as to how a problem behaves, conduct experiments, and propose solutions."

Research can expose students to areas exploding with potential, such as nano-engineering, which addresses electrical, optical and mechanical properties of nano-structures to apply to practical problems in engineering. Associate Professors Alan Feinerman and Vitali Metlushko, Electrical and Computer Engineering, offer engineering students a chance to work directly in this exciting new field with the Microfabrication Applications Lab, or MAL, a facility for researchers to develop, prototype and manufacture a wide range of devices with critical dimensions in the sub-micron region. "A vigorous scientific investigation in a research university setting is only effective with a synergistic blend of research and teaching activities," explains Feinerman. "This is especially true for a young and dynamic field such as nanoscience, for which there are no established general-purpose textbooks, since the foundations of the field are being established by active researchers


Alan Feinerman

working at the intersecting boundaries of several disciplines." At MAL, students work side by side with well-established researchers from faculty, national laboratories such as Argonne National Laboratory, and high tech industry. Currently, this unique facility numbers 31 industrial users, "one of the best programs in the Midwest," says Metlushko proudly. "Students receive job offers as a result of working at MAL, and often return as research scientists to use our facility once employed in industry."

Being exposed to research at a very early stage in their education also puts students way ahead of the game, observes Professor Constantine Megaridis, Mechanical and Industrial Engineering, who runs a NASA-sponsored research lab used by undergraduate and graduate students, and even some high school students. "Students who perform hands-on research or participate in experiments are more likely to get better jobs or go on to graduate school. They receive awards or become professors at a young age," he says. "Sometimes the information exchange is two-way," adds Cruz, observing that students are part of a dynamic exchange in the classroom and the lab. "My undergraduate students have developed their own new research ideas, and made an enormous intellectual contribution to our work."

Research is certainly the prime motivator of students to pursue more advanced studies, confirms Assistant Professor Sue McCormick, Bioengineering. Her research, which applies engineering principles to molecular and cellular functions of the cardiovascular system, has intrigued the students in her lab. "They are a lot more excited about their schoolwork because they can see the application in research, and they'll do more reading about it. Research also helps them decide what type of career they want to pursue—academic or industrial."

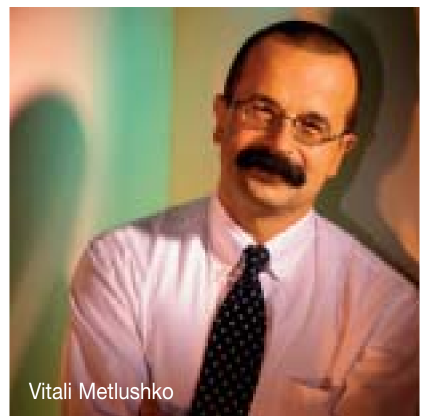
"Not surprisingly," adds Kennedy, "enterprising, focused high school seniors will select a college like UIC based on the potential for research participation."

Expert Teaching Always a Class Act

As might be expected, teaching styles are as varied as educational philosophies. The tried and true method of lecturing and writing notes on a white or black board is what works best for Professor Minkowycz, as it gives students time to copy their notes and think about them. Students give their pens a real workout in his classes; by the end, that white board is filled from top to bottom. At the other end of the academic experience, Professor Murata distributes bound lecture notes early each term to elevate discussion as he guides his graduate students to become independent researchers, according to Ph.D. student Hosung Leo Kim.

Regalbuto, recipient of the Harold A. Simon Award in 1990, the UIC Award for Excellence in Teaching in 1996 and the CETL award for teaching from 1996 to 1999, is constantly refining his teaching methods. Because research has shown that the first 20 minutes of a lecture is what students retain best, Regalbuto tries whenever possible to lecture first, break for a hands-on demonstration, and then continue his lecture. He also tries to address the different learning needs of students—word or visually oriented, or learning in a sequential progressive manner versus seeing the big picture first. Since hands-on, experiential learning can be the best method for visually oriented engineers, he brings in actual experiments to enliven his sophomore course in thermodynamics, such as showing how a microwave oven could be used to make steam. At the end of the course, second-year chemical engineering students have amassed enough basic knowledge to design a virtual urban power plant.

Linking course materials and underlying theories to recent discoveries is a method many professors use to engage their students. Professor of Bioengineering and Electrical and Computer Engineering Michael Stroscio, recruited for his international reputation in nanotechnology and photonics, discusses how power amplifiers are used to study neurons and how electrical signals are conducted in the human body. In her elective courses, Cruz covers the newest programming languages and concepts—in the early '90s, that was JAVA, in the late '90s, XML, and now Semantic Web. "It makes students sit up and pay attention," she says. And it even helped one stu-


Vitali Metlushko

dent land a much sought after job. "The interviewers at Microsoft were extremely surprised that my student had learned such an advanced new technology, and offered her a position. It's a competitive market and employers prefer talented people who have had exposure to the latest trends," says Cruz.

Harnessing the latest technology is an inherent way to teach the ever-evolving subject of engineering, and a reason a research university is such a valuable environment for educating undergraduates. Cruz would like to explore a futuristic electronic classroom with interactive lessons that capture the students' attention. "Students can enter answers to quizzes right at their own workstations, or play with algorithms," she explains, in addition to classroom exchanges and research opportunities.

Taking technology further, to Internet-based distance learning, is an area UIC is carefully exploring, one click at a time. Professor George Uslenghi, Electrical and Computer Engineering, who heads the successful and growing Master of

Engineering on-line program, says: "Distance learning is best applied to engineers in geographically remote areas, or to those limited by work schedule or disability, enabling them to upgrade their professional knowledge, or to master's level students who are sufficiently mature not to need the intangible components of campus life that undergraduates need. Part of an undergraduate's education is learning to become a full-fledged adult through activities in organizations, living in dorms and gaining leadership skills in engineering societies. For them, distance learning can only serve as a supplement to their education."

Dean Lawrence A. Kennedy looks toward a different use for distance learning in encouraging younger students to pursue engineering—an initiative currently being explored through a gift pledged by 1974 Bioengineering alumnus Richard Hill and Novellus Systems, Inc. This,


John Bell

the college will use to produce and distribute introductory pre-engineering and physics courses to public high schools in Chicago.

There may, at first, seem a world of difference from one engineering field to another, but there is little difference in engineering education across the globe. UIC students can study in Italy, Sweden, Germany, Spain and Austria through the Student Transatlantic Engineering Program (STEP). European engineering students enhance their skills here, defending a research thesis. It's not surprising that Ph.D. students travel the Atlantic in both directions and that all students in STEP take advantage of internships, university and industry research laboratories and language, business, and cultural experiences. "In a global economy, engineers need to be prepared to work anywhere, and many find themselves working a tour of duty abroad," finds Professor Ishwar Puri, Mechanical and Industrial Engineering, who coordinates STEP for the U.S. colleges in that consortium. "We offer our undergraduates the opportunity to minor in international studies. They are unique among engineering graduates." UIC also partners with the Politecnico di Milano and Politecnico di Torino, Italy, offering graduate degrees in computer science, electrical and computer engineering, and mechanical engineering to students at those institutions. Uslenghi, who negotiated many of these institutional agreements, lauds the social, political and scientific dialogue that arises when UIC engineering students interact with European engineering students—those coming to UIC are among the brightest.

Changing Marketplace, Changing Curriculum?

How does an engineering curriculum evolve in a constantly changing world? Should the demands of the marketplace reconstruct educational curriculum? Should students 'shop' for programs touting state-of the-art training or focus on the fundamentals of engineering?

Meeting the demands of the marketplace or trying to reflect the latest trends can be tricky, leading most professors to opt for constant, traditional core courses—discussing essential theory and current uses in the classroom, testing them in the lab, but in most cases, not actually altering the course basics. Lecturer John Bell, Computer Science, who actively works in virtual reality under National Science Foundation grants, is admittedly leery of changing his curriculum because of the lightning quick pace of the field in which he lives and breathes. "It's more important to learn the foundational concepts of programming—branching, convergence, algorithms—than the syntax," he maintains. Agrees Associate Professor Wei Chen, associate director of graduate studies, Mechanical and Industrial Engineering: "The programming languages students encounter during school may not be the same as the ones they'll use in the workplace just three years later." That's why she says: "Basic courses remain the same, serving as the root of the engineering education, while elective courses reflect trends in the marketplace." Like her colleague Isabel Cruz, Chen does just that with elective courses teaching computing techniques that help people bring their programs together, because integrated systems design is a popular industry trend with vital efficiency and economic consequences that graduates can put to immediate use.

Stroscio sees the life-long applications of what is first learned in the classroom: "That's why it's important to have a broad education. Science and technology change so fast that future engineers need to retrain themselves several times over the course of their careers. As educators, we must give students a diverse underpinning so that when they're on their own, they'll be accustomed to analytical thinking and be capable of applying what they've learned to current challenges. The abilities to anticipate changing trends and to answer the challenge of marketplace problems are enhanced by a strong theoretical foundation mastered in the classroom."

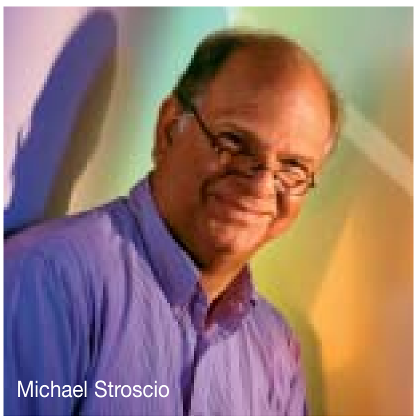
Predicting which engineering disciplines will be in demand is equally difficult. "Basic sciences are in vogue again because of nanotechnology and the need to understand molecular processes," says Megaridis. "In the past decade, it was computer


Wei Chen

science, and 15 years ago, material sciences led." Prior to that remembers Minkowycz, aerospace had the greatest need for engineers, but that need plummeted sharply when government slashed funding for the space program. Now, wireless communications is hot, but other areas will be in even greater demand in the future, such as biomedical signal and image processing.

Making the situation even more complex is the increasingly blurred boundaries between engineering disciplines. "Future engineers will face more intricate problems, and hard and fast boundaries will not exist for them," says Masud. To this end, says Chen: "There are increasing numbers of courses that are not as discipline-specific. For instance, micro-MEMS courses relate to mechanical and computer engineering, as well as physics and chemistry, and can be selected by students from all these departments." Interdisciplinary education is becoming important and no doubt will impact departmental curriculum choices agrees Professor David Boyce, Civil and Materials Engineering. The economics or optimization courses that Boyce observes that graduate civil engineers need may be found in the other colleges of the University, just as freshmen and sophomores learn mathematics and basic sciences—calculus, physics, chemistry or biology—in the College of Liberal Arts and Sciences. Undergraduates, he notes, would benefit from early exposure to these fields.

A case in point is the recently established Institute for Environmental Science and Policy, organized within the Office of the Vice Chancellor for Research, which draws on disciplines throughout the university. "The best solutions to environmental problems need to be science-based and interdisciplinary," says director Theis. His mission: to promote collaborative efforts, since virtually all disciplines have some role to play in addressing complex environmental issues. "The more we can expose our students to team-based work, the better we can prepare them for the workplace."


Michael Stroscio

One extraordinary example of cross-disciplinary teaching and research is the recent hiring of Professor Urmila Diwekar with her joint appointment to the Chemical Engineering faculty and the Institute for Environmental Science and Policy where many chemical engineering graduate students and post-doctoral fellows find a research home. One area of her expertise, applied optimization, provides a sound foundation for research and real-world experience, and she has applied her specialty not only to chemical and green engineering and public policy development, but also to the financial markets, naturally of interest to students and faculty in other colleges on campus.

Becoming an Engineer – It is Fundamental

Dealing with real-world issues helps prepare students for the workplace, but first undergraduates must overcome that initial hurdle on the road to becoming an engineer: succeeding in those science, mathematics, and basic engineering courses required during the first years. Professor Robert Becker, Electrical and Computer Engineering, popular lecturer also with a wide-open door policy and winner of four Silver Circle teaching awards, his latest in 2002, tries hard to keep interest in introductory engineering courses keen. "These are the courses where they learn what it's all about," he says. "You have to stress fundamentals and you've got to work with students until those fundamentals become second nature."

For many faculty there is a shared observation about the link between classroom instruction on fundamentals, research applications and being a good teacher: While the students won't see the research applications of theories at first, good teachers must make this connection so students are motivated and take classes seriously.

Does it matter whether those teaching these courses are on the tenure track or lecturers? Not all departments use lecturers, but the fast growing, high-demand programs such as Computer Science and Electrical and Computer Engineering are more likely to hire lecturers. There, it is not surprising to find that lecturers are both on the forefront of industrial knowledge, challenging students with research examples that they use to enliven and deepen their lectures like tenure track faculty, and are well-respected and appreciated by students for their accessibility. As a lecturer, Bell puts it simply: for him, 'students first' is a matter of priority, just as teaching the fundamentals is a priority.

A successful engineer needs other fundamentals. Undergraduates, according to Chen, need basic skills such as teamwork, communication and open-ended problem solving. Juniors and seniors absorb discipline-related knowledge and design skills like those demonstrated annually in the senior design courses and Senior Design Engineering EXPO. "By junior year," adds McCormick, "students need to start applying principles learned and think as engineer would. And that means that unlike previous class work, a problem may not have a set solution."

It's why the real challenge for undergraduates is not only the technical education, but also "the ability to learn and teach oneself," says Bell, who thrives on teaching. "At the upper levels, we tell students what they need to accomplish, but not how to do it, so they'll learn how to do it themselves. You can't learn to program by reading about code, you must do it and get the bugs out yourself."

Learning to communicate effectively is a critical area for undergraduates. "We are responsible for teaching students how to express themselves verbally and in written form," says Boyce. "In fact, our alumni have identified communications as the one course they wish they had taken as undergraduates." Communications and technical report writing are now embedded in the curriculum. The college makes it a point to reinforce these messages, says Dean Kennedy. "First year students hear it in *Engineering 100*. In our informal *Lunch with an Engineer* and the new, for-credit *Engineering for Success* course led by alumni at the top of their fields, who come from around the U.S. to share their experiences, our upper-level undergraduates continue to hear of the need to communicate well as they move upward in the engineering corporate environment."


David Boyce

By the time the graduate level is reached, research is a main focus. The ability to solve problems independently is mandatory. Kennedy, an active researcher and journal editor who heads the Energy Systems Laboratory and currently funds six graduate students, knows communication skills are vital: "Graduate students must translate the intellectual ability to conduct far-reaching research into the practical ability to defend their findings in publications, before audiences, and eventually in front of the classes they will teach themselves, or to future clients."

Addressing ethical issues has become a vital component of engineering education, reflecting the unique problems that result from technological advances. In Professor Dale Reed's Computer Science ethics course, he challenges students to think about the ramifications of copying copyrighted software, and why their individual actions make a real difference. "I tell them a story about a village where everyone raised goats. The pasture grew just enough grass to support the goats if every villager limited himself to one allotted feeding per week. One day, a family decided to let their goats graze longer. Though no one noticed the difference at first, over time, all the grass disappeared, and everyone's goats died. This is arguably the same effect as copying software. Whether a field engineer or a manager dealing with vendors or a professional engineer approving drawings, we want students to make mature, ethical choices, confident of their integrity."

Drive for Diversity

The face of the UIC College of Engineering is the face of ethnic and gender diversity, and it is a point of pride that the college remains in the forefront in graduating minority and women engineers. It is deeply committed to initiatives to educate both underrepresented ethnic students and women, still a distinct minority in many engineering fields. Digging deep to discover the reasons why so few women pursue engineering careers and stand the age-old trend on its ear, the University has established the aptly titled WISE (Women in Science and Engineering) program. Behind WISE stand far-reaching campus-wide goals to increase the number of women science, technology, engineering and math (STEM) students and faculty. Creating an enabling environment for women in STEM improves the intellectual and institutional climate, fosters women's leadership, and provides all-important female role models, says Dr. Claudia Morrissey, associate director, Center for Research on Women and Gender. "Entering nontraditional fields can be very isolating for women students, both because they find themselves in the distinct minority, and because system norms and processes in these fields are still not gender-neutral. The WISE program aims to create opportunities for networking and validation that will result in increased retention of female students and faculty."

"As women see more females teaching these subjects, the situation will change dramatically," asserts Cruz. "My mother is a mathematician, so when I was growing up, academic subjects like that had no gender, and it was natural for me to pursue a career in engineering." McCormick was raised in a similar barrier-free environment. "I grew up with three brothers and two sisters, and there was never a clear division between what boys and girls could do. Most girls don't have this opportunity."

The College of Engineering will expand that opportunity by offering space and support to the WISE Center to provide exceptional programs designed to encourage undergraduate and graduate women in their chosen fields. Says Kennedy, "These programs are neither remedial nor are they empowering at the expense of others. Lectures by prominent women faculty, as an example, are open to all. It is a matter of warming our scholarly climate, and challenging the women to pursue academic careers. Here, in the College of Engineering, where the positive impact of WISE will be felt most intensely, its success will undoubtedly aid the departments in recruiting both new junior faculty and established women researchers whose academic reputation will be of great significance."


Susan McCormick

Providing equal opportunities for all that attend has always been an underlying tenet of the College of Engineering according to Kennedy. In fact, one third of the 2002 freshman class comes from immigrant families. Says lecturer Reed, raised in part in Mexico and Ecuador: "One of the things I love most about UIC is that many of our engineering students are on the cusp of historical change in their families. I see graduates whose parents speak English haltingly, if at all. When their children walk across the podium and graduate, they see the fulfillment of their vision. UIC is changing the future for entire families and communities."

Roots of Learning

Although engineers are made at UIC, they're born long before they enter school. "If a child has certain skills like taking things apart and putting them back together that others don't have, they can be well suited for engineering," says Megaridis. "But these skills go away fast if they're not stimulated at the early stages."

Adds Uslenghi: "Early exposure to scientific concepts—by fifth grade—is necessary if we are to meet our national demand for future engineers. At that point, they are starting with pre-algebra, and without mathematics, there is no engineering. They are precluded from choosing it as a career."

So while programs exist for pre-college students already interested in science or engineering and facing career choices, the larger problem of providing academic opportunities that will foster future engineers still remains. "If this is not accomplished," agrees Kennedy, "the country will not maintain the technical workforce that it needs for its continued success. Our faculty continually demonstrates the importance of stimulating and challenging instruction. Through their research, they bring in the newest ideas to an ever-enriching curriculum to form the foundation of future products and enhance intellectual and professional growth. Through their genuine concern for students to succeed, they stimulate student performance. Our goal is an intellectual learning environment where each and every student maximizes his or her career potential. Their education is both a starting point and a launching point."

"While an education in engineering can't start early enough, it also has no stopping point. We must educate students who can adapt to a changing environment and have a lifetime learning attitude," concludes Murata. "What they learn in school is only applicable for a few years, and after that, they'll have to keep up with all the new developments themselves."

That's why the faculty feel their mission to educate engineers is a lifelong one. Minkowycz, for one, continues to "read, research and revise my concepts." And he speaks for all in saying "Education occurs in the classroom, but also in the labs, writing journal articles, presenting papers. Teaching—and learning—about engineering never ends."

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