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McCormick

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Eureka!

McCormick research solves a sticky problem

McCormick is published by the Robert R. McCormick School of Engineering and Applied Science, Northwestern University, for its alumni and friends.

On the cover
When developing a new type of adhesive, Phil Messersmith was inspired by two classic natural adhesion models: gecko and mussel.

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Greetings from McCormick

The transformation of McCormick continues. We are initiating new undergraduate and graduate curricular options, and supporting increased faculty cross-departmental and cross-school collaboration that is resulting in groundbreaking faculty research.

On the cover of this magazine is an image from Phil Messersmith's research in biomaterials that also appeared on the cover of *Nature* in July. That cover is among the more than 70 high-impact journal covers that we have framed in two hallways of the Technological Institute (see photo at left) — evidence that our faculty is publishing in more prestigious research journals than ever, and one of many indicators we use to measure our progress as an institution.

Faculty hiring is another sign of progress. I am pleased to report that we have had considerable success in that area over the past two years. The importance of hiring the right faculty cannot be overstated. Hiring is a very competitive process among top universities, and the success we have seen signifies that McCormick continues to be a top destination for talented faculty. About 80 percent of McCormick's offers to new faculty were accepted last year, and the acceptance rate is 93 percent this year. With these new hires, McCormick will have seen a 16 percent change in faculty over the past two years — a process that is accelerating the transformation of the school. Significantly, these new hires are not all junior faculty members; many are distinguished researchers who are well known in their fields.

I am also pleased to report that we have seen a considerable increase in media coverage. Our national and international print, web, and broadcast coverage has spanned a range of topics, including several stories featured in this issue of *McCormick* magazine. From Vadim Backman's pioneering work in detecting pancreatic cancer to Peter Voorhees's research in space, our faculty members continue to be featured for their innovative research.

The nation's most prestigious science award, the National Medal of Science, was recently given to Jan Achenbach and Tobin Marks at the White House. They are Northwestern's first recipients of the award, and Jan is one of few individuals who have been honored with both the National Medal of Technology and the National Medal of Science.

McCormick continues to be a destination for top students, such as the two profiled in this issue. Alex Yee, a sophomore in computer science, recently made headlines for setting a new record for computing a mathematical constant. Megan Greenfield, a graduate student in chemical and biological engineering, was cocreator of a new organization to improve the University's graduate student community. These are excellent examples of the tremendous talent found in our undergraduate and graduate programs.

After two years of rapidly developing and implementing new initiatives to take McCormick to the next level of excellence, we are now focusing on keeping our momentum and institutionalizing change. The support of McCormick alumni and friends is critical to this process, and I'm pleased to be able to take this opportunity to thank the many donors to the McCormick School in this issue (see "Giving Report," pages 22–29).

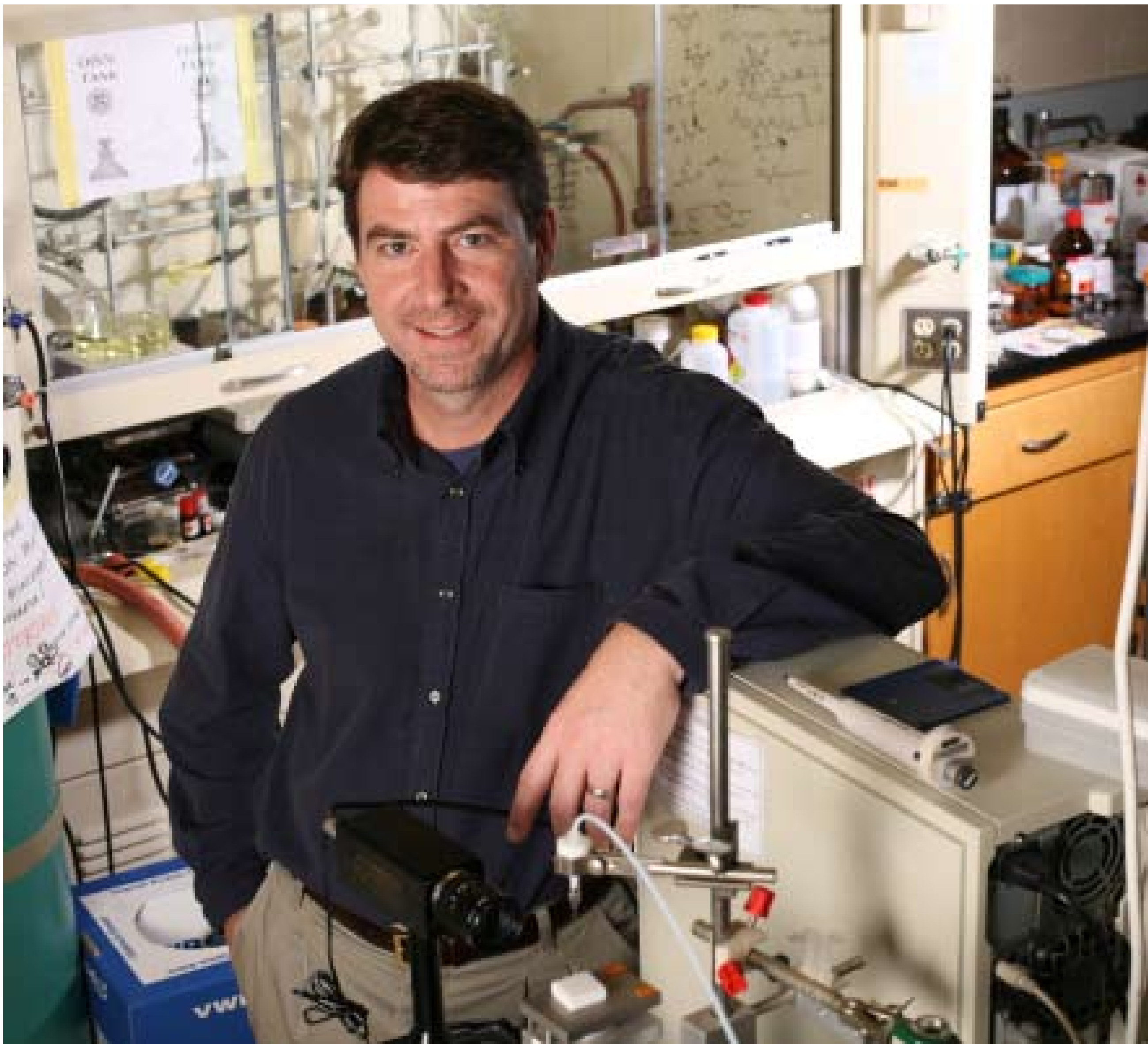
I hope you enjoy this issue of McCormick magazine. It's an exciting time to be part of the McCormick community, and I'm pleased to share our progress with you.

Julio M. Ottino, Dean | November 2007

Eureka!

Phil Messersmith's lab solves a sticky problem

Anyone who has taken a swim while wearing an adhesive bandage knows that however tightly such a dressing may cling when dry, it performs poorly when wet. Coating it with a waterproof adhesive might solve the problem, but it would make it excruciating, if not impossible, to remove. Imagine, then, the advantages of an adhesive material that is easy to remove and reapply and that stays put, even underwater.



Far left **Phil Messersmith**
Near left **When developing a new type of adhesive, Phil Messersmith was inspired by two classic natural adhesion models: gecko and mussel.**

Phil Messersmith, professor of biomedical engineering, imagined just such a material — with potential applications extending far beyond the everyday adhesive patch. His idea was to mimic and unite the adhesive properties of two different species: geckos and mussels. To transform his idea into reality Messersmith sought help from a few members of the diverse crew of postdoctoral fellows and graduate students that forms his research group. The result, achieved in a little less than two years, was "geckel," a revolutionary biomimetic material that caught the attention of the international press and won a spot on the cover of the July 19 issue of the journal *Nature.*

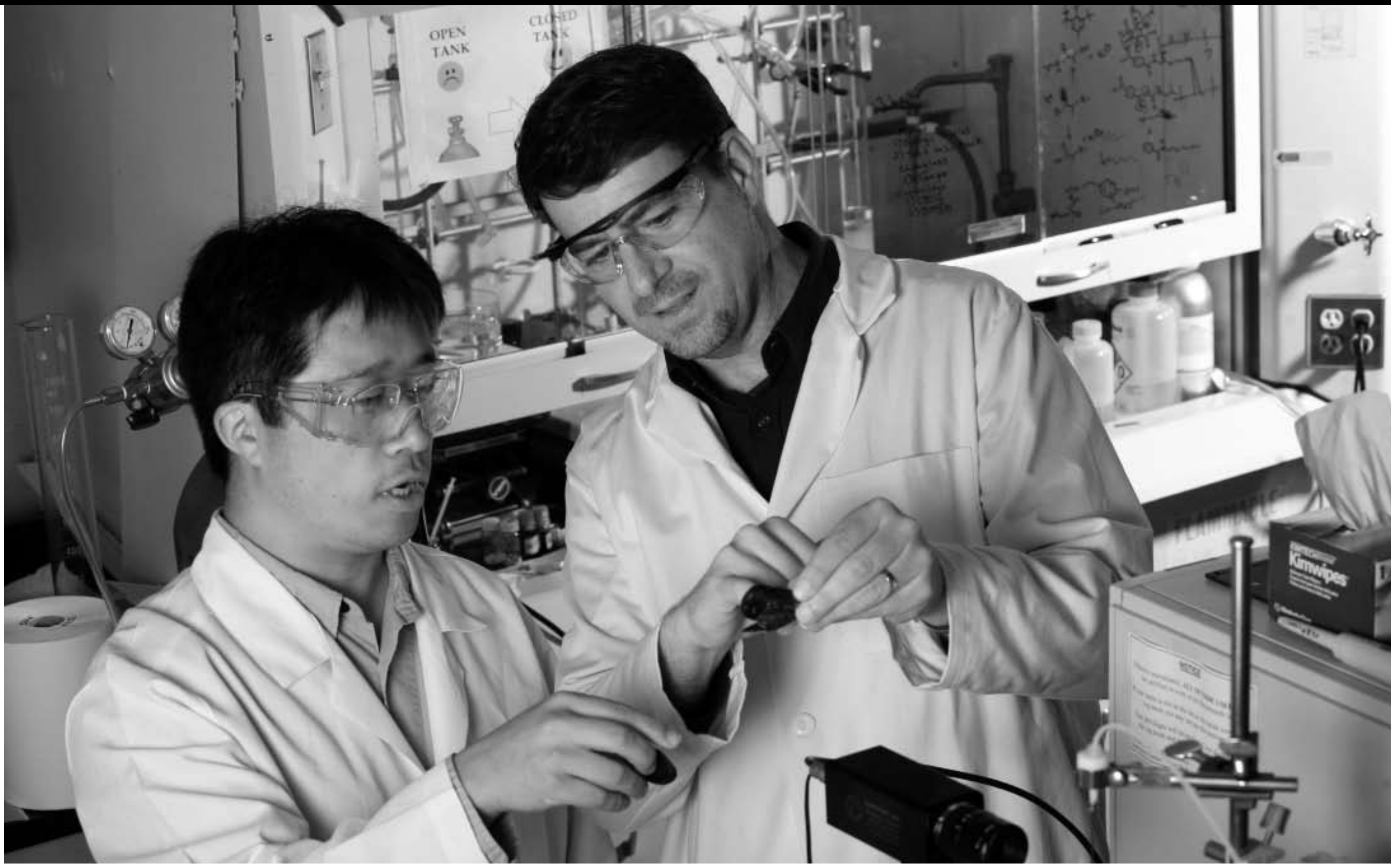
Not every brilliant idea enjoys such relatively quick success. Messersmith, who joined the Northwestern faculty in 1997, says, "In my career, for every 10 ideas, maybe one works well." The success of geckel might not be the norm, but the discovery process that Messersmith's lab undertook to create geckel is replicated every day in every lab around the world: Researchers dream up ideas, test them, learn from mistakes, and arrive at solutions.

What if...

How do researchers come up with ideas? "I like to move in the fringes of established fields, where totally different fields interact," says Messersmith. "That's where the opportunities are."

Messersmith's background — an undergraduate degree in life sciences, a master's degree in bioengineering, and a PhD in materials science — allows him to travel comfortably from one discipline to another and seize those opportunities. "I tell my students that I'm not particularly interested in being mainstream. I'd like to do something different from everyone else."

The reality of research, however, is that you have to have funding, says Messersmith, whose geckel work was funded by the National Institutes of Health (NIH) and NASA. "To write a grant, you usually have an application in mind. But a grant is not a contract. It allows us to pursue things we don't necessarily propose. If all we do in my lab is accomplish what we say in the proposal, I consider it a failure. You find new things, you recognize opportunities — perhaps even in a failed experiment — and generate a new idea from that." For example, says Messersmith, "Geckel wasn't even on the radar when



I wrote the proposal [to the NIH for mimicking mussel adhesive proteins]. The word 'gecko' didn't appear once."

What happened was that in the midst of his lab's research on mussel adhesive proteins, Messersmith read a scientific paper that quantitatively compared gecko adhesion in air and water. "Always survey the literature," Messersmith tells his students. "You can't know your place in the research world without the knowledge of what everybody else is doing."

On land, geckos can cling to almost any surface, even skittering upside down across a ceiling. This remarkable ability to adhere to a surface and, just as easily, detach from it derives from a mechanical principle known as contact splitting. The pad of a gecko's foot is densely packed with very fine hairs split at the ends into spatulae — filaments as small as 200 nanometers in diameter. Each of those clings to a surface by means of weak attractive forces such as capillary and van der Waals forces. Multiplied across millions of hairs, those forces increase significantly. Flies, bees, and other insects use this strategy; geckos are the largest creatures to do so.

The paper Messersmith read noted a dramatic drop in adhesion for geckos in water, something that had been long observed and was now measured. That, he says, really got him thinking: "Geckos are the classic model for scientists studying dry adhesion in nature, whereas mussels are the classic model for wet adhesion" — a phenomenon apparent to anyone who has tried to pry a mussel from a wet rock. Messersmith's lab was already studying mussel adhesives, focusing on the proteins excreted by the common blue mussel. Other labs had tried to replicate the holding power of geckos' spatulae by fabricating polymers and multiwalled carbon nanotubes, although their efforts had not worked for more than a few contact cycles and had not been tested underwater. Messersmith wondered if there might be a way to combine the adhesive properties of both the gecko and the mussel.

Making it happen

To test his idea Messersmith approached one of his graduate students, Haeshin Lee, whom Messersmith describes as an exceptional student capable of managing several projects simultaneously. Messersmith says he made a couple of sketches and asked Lee, "Wouldn't it be neat if we could do this?"

"It took me only a couple minutes to realize that Phil was talking about an excellent idea," says Lee. "I was also happy to study a totally different field during my PhD work," he adds, sounding a little like his mentor. Since completing his undergraduate degree in biological sciences in his native South Korea in 1997, Lee had studied drug delivery systems and wanted "to study something different but related to proteins." He had also learned how to measure the binding force of proteins at the single-molecule level, a skill that would prove essential to his work on geckel.

Lee, who will complete his PhD work by early spring, says that when he joined Messersmith's lab in 2003 he was pleasantly surprised by the amount of freedom his research adviser gave him. "Instead of telling me what to do, he guides me in the right direction," says Lee, who found plenty of help available. "Phil's input is everywhere, and I am surrounded by very talented postdocs and graduate students who have answers for my questions almost all the time."

Lee gives Messersmith full credit for the idea of an adhesive based on geckos and mussels — "It would never have occurred to me," he says — while Messersmith credits Lee with implementing it. "It's one thing for me to tell a student what to do," says Messersmith. "It's another for me to just plant a seed and watch him transform it. Until you do the experiment, you can never tell how good an idea is." This is a lesson Messersmith learned during his own graduate work: "I was handed a project that was loosely defined. I failed for a couple years, and then I got it to work in a new form. It was valuable experience."

The work on geckel proceeded with relatively few setbacks. The first step was to fabricate an array of nanoscale pillars to mimic the split hairs on the pads of geckos' feet. To do this, the researchers used electron-beam lithography to create a pattern of holes on a thin film of acrylic supported on a silicon wafer; this would serve as a mold, with a liquid polymer cast into the holes. Once the polymer cured, it was lifted from the mold to reveal something resembling the bristles on a nanoscale brush. After fabricating arrays with pillars ranging from 200 to 600 nanometers in diameter and from 600 to 700 nanometers in height, the team tested the adhesion of pillars 400 nanometers in diameter and 600 nanometers high.

The next step was to coat the pillars — the gecko part of the hybrid — with a synthetic polymer that mimics the proteins excreted by mussels. Here the team was able to build on earlier work in which Messersmith's research group had created mussel-mimetic polymers. Because the "glue" proteins of mussels have a high concentration of a catecholic amino acid — 3,4-L-dihydroxyphenylalanine (DOPA) — the project required a polymer with a high DOPA content as well as low water solubility. That polymer was synthesized by Bruce P. Lee, a former graduate student of Messersmith's and senior scientist at Nerites Corporation, a biotechnology company in Madison, Wisconsin, where Messersmith serves as chief scientific adviser. The arrays were then dip coated to deposit a thin film, less than 20 nanometers, over the pillars.

The result was a one-square-centimeter patch of material that, says Messersmith, "you might mistake for a piece of flat tape." In their Nature article Haeshin Lee, Bruce Lee, and Messersmith write, "We refer to the resulting flexible organic nanoadhesive as 'geckel,' reflecting the inspiration from both gecko and mussel."

Testing, testing

Testing of the fabricated material came at several stages: the adhesion of the uncoated and the coated pillar arrays was measured both in air and underwater. Measurement at the nanoscale level meant using an atomic force microscope to determine the force of adhesion — gauged not by how tightly a material sticks to something but rather by how much force is needed to pull it away from an object. In the case of geckel, researchers used a tipless cantilever to make contact with an array of pillars and then retracted it, measuring the force versus distance needed to separate the cantilever from the array.

The results were dramatic: the pillar arrays coated with the mussel-mimetic polymer improved wet adhesion 15 times over the uncoated pillar arrays. Furthermore, after 1,100 contact cycles the wet- and dry-adhesion power of the geckel patch was only slightly diminished. Previously, other gecko-mimetic adhesives had stayed sticky for only a few contact cycles, and none had been shown to work underwater.

It was in the measurement of the adhesion forces that Haeshin Lee says he experienced a true "Eureka!" moment: "The data showed simultaneous loading and detachment of up to six geckel nanopillars. I made a short video clip because it looks cool — you can download it from the *Nature* web site. It is the adhesion force measurement with the highest resolution ever."

What does geckel feel like on human skin? "As you would expect, it is sticky," says Lee, who confesses that he tested a sample on his own skin, an experiment he won't repeat because it would exclude the sample from further experiments. Messersmith and Lee are currently experimenting with changing the shape of the tips of the pillars for maximum contact area. "In a gecko the ends are shaped like a spatula," says Messersmith. "The closest we can fabricate is a mushroom shape."

As tightly as geckel adheres, it is also easy to detach. Messersmith and Lee accomplished this by controlling the composition of the polymer. Messersmith compares removal to peeling away a sticky note: "As you pull it away from a surface, the closest points of connection are under the highest stress. You literally pull away the bonds, one by one."

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>
> —Phil Messersmith

Taking it to the next level

This detachability makes geckel a promising candidate for medical uses: to replace sutures for wound closure or to enable follow-up surgery; for drug-delivery patches; or for everyday bandages that would allow patients to bathe. Military and industrial uses might include creating an unmanned vehicle capable of crawling on the ocean floor. The researchers have applied for a patent on the new material.

How quickly these potential applications are realized may depend on the involvement of industry. "We've demonstrated a concept," says Messersmith, "but it will be necessary to develop a patterning approach that works on a large scale so that geckel can be mass produced in a cost-effective way."

Meanwhile Messersmith's lab is engaged in six or seven lines of research. The group's latest success, published in *Science,* is another mussel-inspired project: a two-step, room-temperature method that allows a coating to be applied to material of any size, shape, or type, including traditionally difficult-to-clad materials such as Teflon®. For this work Haeshin Lee and Messersmith collaborated with William Miller, professor of chemical and biological engineering, and graduate student Shara Dellatore. "It's an astonishingly simple and versatile approach to functional surface modification of materials," says Messersmith. "The ability to form self-assembled monolayers on nonmetal surfaces is the biggest part of this."

What research project will be next for Messersmith? "Who knows?" he asks. "I wasn't doing gecko research two years ago."

—Leanne Star

Achenbach and Marks receive National Medal of Science

Two McCormick faculty members — Jan Achenbach and Tobin Marks — were awarded the 2005 National Medal of Science at a July 2007 ceremony at the White House. Marks and Achenbach are the first Northwestern recipients of the nation's highest award for lifetime achievement in fields of scientific research.

The National Medal of Science honors individuals for pioneering scientific research in a range of fields — including physical, biological, mathematical, social, behavioral, and engineering sciences — that enhances our understanding of the world and leads to innovations and technologies that give the United States its global economic edge. The National Science Foundation administers the award, which was established by Congress in 1959.

"Jan Achenbach and Tobin Marks exemplify the best that McCormick has to offer: pioneers who have made strong contributions to their field and to our world. We are proud to count them as members of our faculty," says Dean Julio M. Ottino.

Jan Achenbach, Walter P. Murphy Professor and Distinguished McCormick School Professor of the Departments of Mechanical Engineering, Civil and Environmental Engineering, and Engineering Sciences and Applied Mathematics, was honored for his seminal contributions to engineering research and education in the area of wave propagation in solids and for pioneering the field of quantitative nondestructive evaluation.

"Applied science is the lifeblood of modern society. I have found it very rewarding to work at the interface of science and engineering and to use known and new science in technological applications," says Achenbach.

Achenbach joined Northwestern in 1963. He is a preeminent researcher in solid mechanics and quantitative nondestructive evaluation and has made major contributions in the field of propagation of mechanical disturbances in solids.

Achenbach's work has been both analytical and experimental. He has achieved important results in quantitative nondestructive evaluation of materials, damage mechanisms in composites, and vibrations of complex structures and has developed methods for flaw detection and characterization by ultrasonic scattering methods. He also has achieved valuable results on earthquake mechanisms, the mechanical behavior of composite materials under dynamic loading conditions, and the vibrations of solid propellant rockets.

Achenbach is the founder of Northwestern's Center for Quality Engineering and Failure Prevention, a state-of-the-art laboratory for quality control in structural mechanics that has had a profound impact on the aircraft industry, particularly the monitoring of aging aircraft.

Achenbach was awarded the 2003 National Medal of Technology, the nation's highest honor for technological innovation. He was elected to the National Academy of Engineering in 1982, the National Academy of Sciences in 1992, and the American Academy of Arts and Sciences in 1994. In

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—Dean Julio M. Ottino

Above Jan Achenbach, Tobin Marks, University President Henry S. Bienen, and Patrick G. Ryan, chair of the Northwestern University Board of Trustees
Right Jan Achenbach and President George W. Bush (White House photo by Eric Draper)

1999 he was made a corresponding member of the Royal Dutch Academy of Sciences. He is also an honorary member of the American Society of Mechanical Engineers and a fellow of the American Society of Mechanical Engineers, Acoustical Society of America, Society of Engineering Science, American Academy of Mechanics, and the American Association for the Advancement of Science. His awards include the Timoshenko Medal and the William Prager Medal.

Tobin Marks, professor of materials science and engineering at McCormick and Vladimir N. Ipatieff Research Professor of Chemistry in the Weinberg College of Arts and Sciences, was honored for his pioneering research in the areas of homogeneous and heterogeneous catalysis, organo-f-element chemistry, new electronic and photonic materials, and diverse areas of coordination and solid-state chemistry.

“I’m fascinated by the knowledge-based design of striking new substances to perform heretofore impossible functions that ultimately improve the quality of human life. To my students and me, scientific research is an exciting adventure,” says Marks.

Marks’s research focuses on the design, synthesis, and in-depth characterization of new substances having important chemical, physical, and/or biological properties. His work is credited with having major impact on contemporary catalysis, with seminal research in the areas of organo-f-element homogeneous catalysis, metal-ligand bonding energetics, supported organometallic catalysis, and metallocene polymerization catalysis.

Marks, who joined Northwestern in 1970, is a leader in the development and understanding of single-site olefin polymerization catalysis (now a multibillion dollar industry) as well the study of new materials having remarkable electrical, mechanical, interfacial, and photonic properties. He designed a cocatalyst that led to what is now a standard process for producing better polyolefins, including polyethylene and polypropylene. Found in everything from sandwich wrap to long underwear, these versatile and inexpensive plastics are lighter in weight and more recyclable than previous plastics.

In his molecular optoelectronics work Marks designs arrays of “smart” molecules that self-assemble into, or spontaneously form, structures that can conduct electricity, switch a light on and off, detect light, and turn sunlight into electricity. These structures could lead to the world’s most versatile and stable light-emitting diodes (LEDs) and to flexible “plastic” transistors.

During his career Marks has received numerous awards, including some of the most prestigious national and international awards in the fields of inorganic, catalytic, materials, and organometallic chemistry. Recent honors include the American Institute of Chemists Gold Medal, the John C. Bailar Medal from the University of Illinois at Urbana-Champaign, the Sir Edward Frankland Prize Lectureship of the British Royal Society of Chemistry, and the Karl Ziegler Prize of the German Chemical Society.

Marks also is recipient of three American Chemical Society national awards and the ACS Chicago Section’s 2001 Josiah Willard Gibbs Medal, regarded by many as the highest award given to chemists next to the Nobel Prize. He was elected to the National Academy of Sciences and the American Academy of Arts and Sciences in 1993.

—Gina Myerson

X-ray specs

McCormick students and faculty tackle health care challenge in the developing world

Imagine breaking your arm in an accident and running to the nearest health clinic. Dizzy with pain, you know your arm is broken, but getting it put back in place may be harder than it seems. Without an X-ray to visualize the break, your doctor promises to give it her "best shot" at setting it properly.

As unsettling as this may sound, it's the situation that many patients in developing countries face when dealing with an injury. It's estimated by the World Health Organization (WHO) that two-thirds of the world's population lacks access to conventional X-ray equipment. And for those who do have access, getting those X-rays developed and interpreted can be a long and difficult process. It's a problem that students and faculty in the McCormick School and the Feinberg School of Medicine and across the University, along with a host of other collaborators, are teaming up to solve.

Mike Hoaglin (biomedical engineering and electrical engineering '06) saw the problem firsthand as a student on Northwestern's Global Health Technologies study abroad program in 2006.

"We saw a guy who had tried to open a bottle with his teeth and had a bottle cap lodged in his throat," Hoaglin says. "Once he had been x-rayed, he had to take his films and travel several miles on a bumpy road in order to find a radiologist who could interpret the films and determine how the bottle cap should be extracted."

Hoaglin describes another clinic with limited storage, causing staff to throw out X-rays after less than a year, despite laws that require clinics keep them for three to five years. Other clinics had defunct X-ray machines covered in cobwebs and locked in closets, and those that were functional were running at minimal capacity due to the cost of film and developing chemicals.

"There's a great need in the developing world for X-rays that's simply not being met," says Matt Glucksberg, professor and chair of biomedical engineering and adviser for Hoaglin's project. "Many rural clinics don't have anything. X-rays are basic technology needed for trauma and tuberculosis, but they're just not available."

From final report to first steps

As part of a senior design project, Hoaglin and fellow student Aaron Eifler (biomedical engineering '06) studied the problem and determined that a low-cost digital system would be the best solution for expanding the availability of X-rays. They focused on modifying an existing low-cost system, the World Health Imaging System–Radiology (WHIS-RAD), developed by WHO. Their client for the project was John Vanden Brink, an assistant district governor for Rotary International who has been leading a group of Rotarians in an effort to deploy WHIS-RAD systems. Nongovernmental organizations, including Rotary clubs, have deployed about 1,500 of these machines throughout the world, but there are issues with the sustainable use of the system — particularly with the recurring costs associated with film and chemicals.

Hoaglin and Eifler developed an in-depth report, which served as the beginning of a new partnership. After circulating the report among his peers, Dave Kelso, professor of biomedical engineering and chair of the Center for Innovation in Global Health Technologies, called a meeting to determine how to take Hoaglin and Eifler's work to the next level. He joined forces with contacts at the University of Cape Town, Northwestern's Feinberg School of Medicine, Rotary clubs, the Kellogg School of Management, and others to create the World Health Imaging Alliance (WHIA). The group is now a certified nonprofit organization in the state of Illinois, dedicated to bringing X-ray technology to the areas of the world that need it most.

Michael Diamond, an adjunct professor in the global health program at the Judd A. and Marjorie Weinberg College of Arts and

Left Mike Hoaglin, Matt Glucksberg, David Channin, and Michael Diamond
Below WHIA team members examine imaging equipment

> **How do you choose between cost and performance and justify the ethics?**
>
> —Matt Glucksberg

Sciences, serves as WHIA's executive director. He hopes that by creating lower-cost equipment, the group can better serve areas of the world that are of less interest to high-end corporate manufacturers. "Our view is that by partnering with manufacturers, we're expanding their options and creating a higher level of demand," Diamond says. "We believe there is a very large market because the economics are so different for a low-cost machine, and these machines will increase economic productivity by restoring people to health more rapidly and with less burden of recurring health problems."

WHIA is trying to ensure that all of the components work in accordance with the standards established by the WHO and that they are easy to use with interoperable parts. With so many systems on the market, the group will determine how these combined low-cost systems will meet these standards, which is a tricky task. "How do you choose between cost and performance and justify the ethics?" Glucksberg asks. "If you can provide an X-ray machine that will work well enough for tuberculosis and broken bones but won't pick up tumors, is that a problem?"

In addition to designing a system whose initial cost is low, WHIA is keenly aware of the issues of maintenance and recurring costs. "The big question is how to implement these systems into an existing infrastructure and ensure that it's a sustainable model," Diamond says. "We've seen far too many examples of donated equipment that's broken and been tossed aside."

Combining expertise

In order to adequately handle the variety of expertise needed to address needs assessment, research and development, funding, and deployment, WHIA is drawing on a wide array of experts. Students and faculty at Kellogg will research the market, economics students in Weinberg College will study the economic impact of better X-ray technology on improving health and productivity, and students and faculty from the Feinberg School of Medicine will work on training and medical informatics issues.

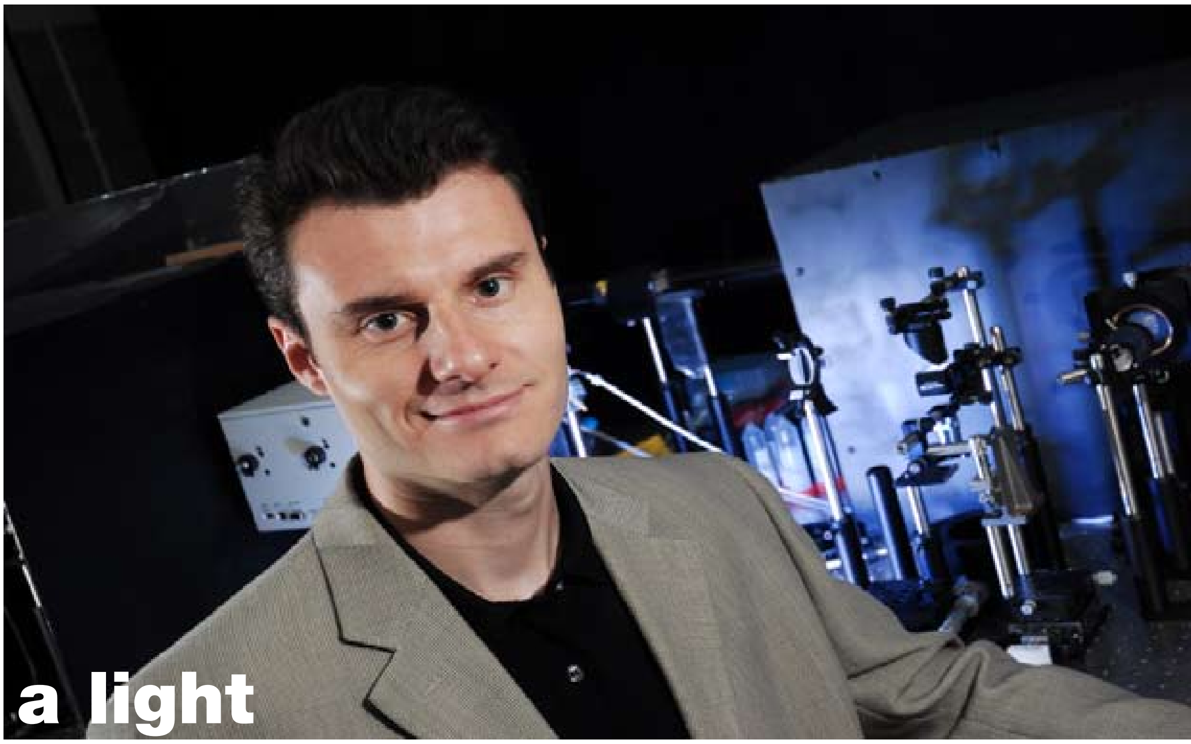
Leading the effort at Feinberg is David Channin, associate professor of radiology. A specialist in imaging informatics, Channin was the principal technical architect behind the filmless imaging environment at Northwestern Memorial Hospital. Working under an entirely different set of user needs, Channin and his team hope to create a robust system with lower built-in costs. "The software used in digital systems is a large component of the overall cost," he says. "In addition to providing lower-cost software, we can also simplify the device and provide functionality that commercial systems wouldn't have."

A prototype is being built and tested at Northwestern using donated imaging equipment from SEDECAL and a computed radiography system from Carestream-Kodak, and the group hopes to deploy up to five of the systems for field testing within two years. Graduate students in the Department of Biomedical Engineering's new master's degree program with a focus in global health technology will work on the prototype before spending two quarters in South Africa to conduct field research. (The program recently received a grant from the National Collegiate Inventors and Innovators Alliance Sustainable Vision Grant Program funded by the Lemelson Foundation.)

Building the X-ray system and software is only the first step; the group must also determine how patient files should be handled, how they can be viewed without purchasing extensive digital equipment, and how health care workers can be trained to use the system. Despite the many challenges that lie ahead, the group is confident they will meet the challenge.

"It's not inventing new technology," says Glucksberg. "It's designing a system. There's a difference between invention and design: The components are there, but we need to put them together in a smart way, deploy them in a smart way, with a sustainable business model. We can come up with a product made from existing components that will provide digital X-rays at a reasonable cost. In essence, what we think we're doing is bringing engineering and design sensibility to the problem."

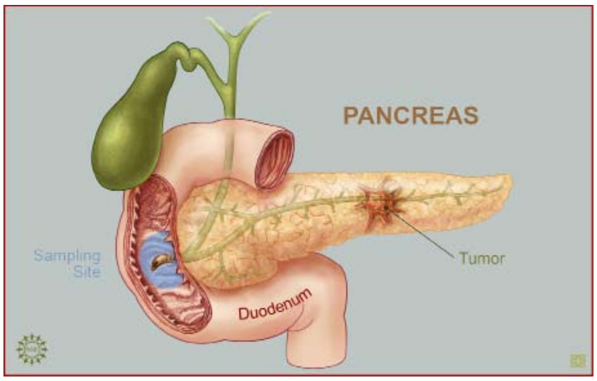
—Kyle Delaney



Shining a light on pancreatic cancer

Pancreatic cancer is a silent killer, difficult to detect and difficult to treat. It rarely causes symptoms until it's too late, and only 5 percent of those diagnosed with it live beyond five years — and most die within the first two. It killed 33,000 Americans last year alone and was the cause of death for Dizzy Gillespie, Count Basie, Billy Carter, M. Scott Peck, Joseph Cardinal Bernadin, and Luciano Pavarotti. Though pancreatic cancer is the 10th most prevalent cancer among American men and women, it is the fourth leading cause of cancer deaths.

One major reason for the grim survival rates is the lack of an effective diagnostic tool for early-stage pancreatic cancers. Patients don't become symptomatic until they develop advanced stages of the disease, and the pancreas is vulnerable to a variety of complications when examined. Now optical technology — developed by Vadim Backman, professor of biomedical engineering, and tested in collaboration with doctors at Evanston Northwestern Healthcare — shows promise for identifying pancreatic cancer using minimally invasive techniques.



There is currently no effective screening method for pancreatic cancer. Most cancers in the pancreas originate from the main pancreatic duct, a 10-centimeter-long duct that perforates the duodenum, the first and shortest part of the small intestine. Examining the pancreatic duct is a difficult and risky procedure, with a 20 percent chance of serious complications. And, since the pancreas produces several vital enzymes and hormones, including insulin, removal of the organ is not a viable option.

Field effect

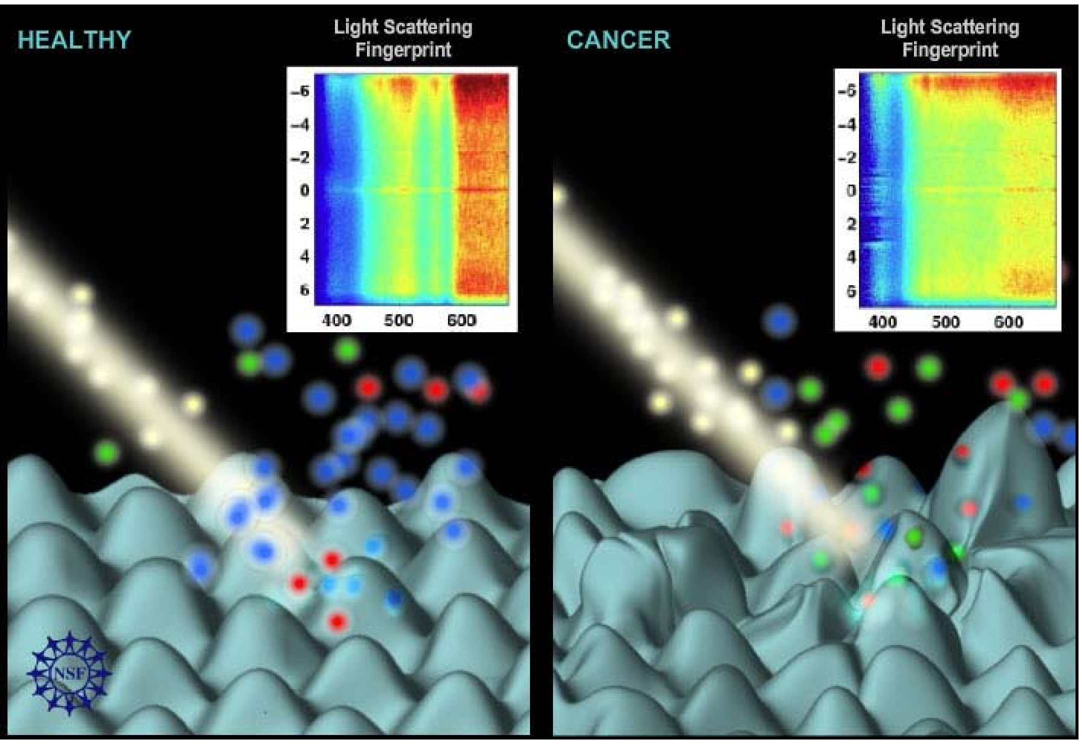
Using the same optical technology that has been proven successful in detecting early-stage colon cancer (see spring 2006 *By Design*), Backman's research team has detected nanoscale cellular changes in the duodenum that indicate the presence of pancreatic cancer.

"We can take measurements safely in the duodenum and use a biological phenomenon called the 'field effect' to our advantage," Backman says. "If you have a precancerous or cancerous lesion in the pancreas, even tissue that looks normal and is away from the lesion will have molecular and other kinds of abnormal changes. No one can detect these changes earlier than we can."

The field effect is a phenomenon Backman first used in developing optical techniques to detect colon cancer. The basic premise is that cancerous cells make bad neighbors: Their presence causes submicroscopic changes in all of their surrounding cells. In the case of colon cancer, Backman's research team has shown the ability to detect cancer by taking measurements at the base of the colon in the rectum. Their new work in pancreatic cancer differs in that it takes measurements in a neighboring organ.

"In many regards, this initial effort was somewhat of a fishing expedition," Backman says. "When we began this research, there was no scientific evidence that cells in the duodenum would indicate the presence of pancreatic cancer."

Even without previous studies to help establish a proof of concept, the National Science Foundation saw the potential in the research. "We were so encouraged by the successes with colon cancer



Far left Vadim Backman
Left Researchers can look at how light bounces off human tissue to detect subtle changes potentially caused by cancer. The spectral image that results is like a fingerprint for disease. Illustrations by Zina Deretsky and Nicolle Rager Fuller, National Science Foundation.

research that we decided to drive the research in a different direction," says Leon Esterowitz, the NSF program officer who funded the initial research. "For pancreatic cancer, it's not only critical to detect it early, or even before it becomes cancerous, but in many cases it is really the only hope."

In order to develop the clinical trial of the technology, which was also funded by the National Institutes of Health, Backman and graduate student Yang Liu teamed with Randall Brand, a gastroenterologist with Evanston Northwestern Healthcare who specializes in pancreatic cancer and an associate professor of medicine at Northwestern's Feinberg School of Medicine, and Hemant Roy, director of research for the section of gastroenterology at Evanston Northwestern Healthcare and associate professor of medicine at the Feinberg School. The team took biopsies from the duodena of 51 patients — 19 already diagnosed with pancreatic cancer and 32 without the disease. The biopsies were taken using standard low-risk endoscopic techniques. While all of the biopsies appeared normal using traditional microscopy, optical tests detected differences between normal and cancerous tissue.

Early-stage success

During the optical testing, a xenon lamp shines intense white light through a series of filters and lenses onto the tissue. The light refracts through the outermost layer of the tissue and scatters into a spectrograph, which separates the light into its component wavelengths and measures them. Another sensor then captures the results for analysis by a computer.

In the trial, the researchers were able to use the same optical markers used in their colon cancer research to differentiate cancerous and normal biopsies with nearly 100 percent accuracy. The clearest results came from patients with early-stage cancer.

"We also found that the diagnostic performance of the technique is not compromised by risk factors in the patients," says Liu, who is now a senior scientist at Johnson & Johnson Consumer and Personal Products Worldwide. "The markers don't depend on age. They do not change if the patient is a smoker, and they do not change with the location, stage, or size of the tumor in the pancreas."

While the survival rate for patients diagnosed with late-stage cancers is low, treatment options are much better for early-stage cancers. If detected early, when a tumor can be removed, the survival rate is anywhere from 50 to 100 percent.

Clinical use of the technology is at least three to five years away, and further trials need to be conducted. "Besides improving upon the technology, we need to determine whether other medical conditions — including other cancer types or diseases of the pancreas, such as chronic pancreatitis or acute pancreatitis — can be distinguished with our technology from pancreatic cancer," says Brand. "It is also important for us to validate our prediction rule on a larger number of pancreatic cancer cases as well as on different control groups."

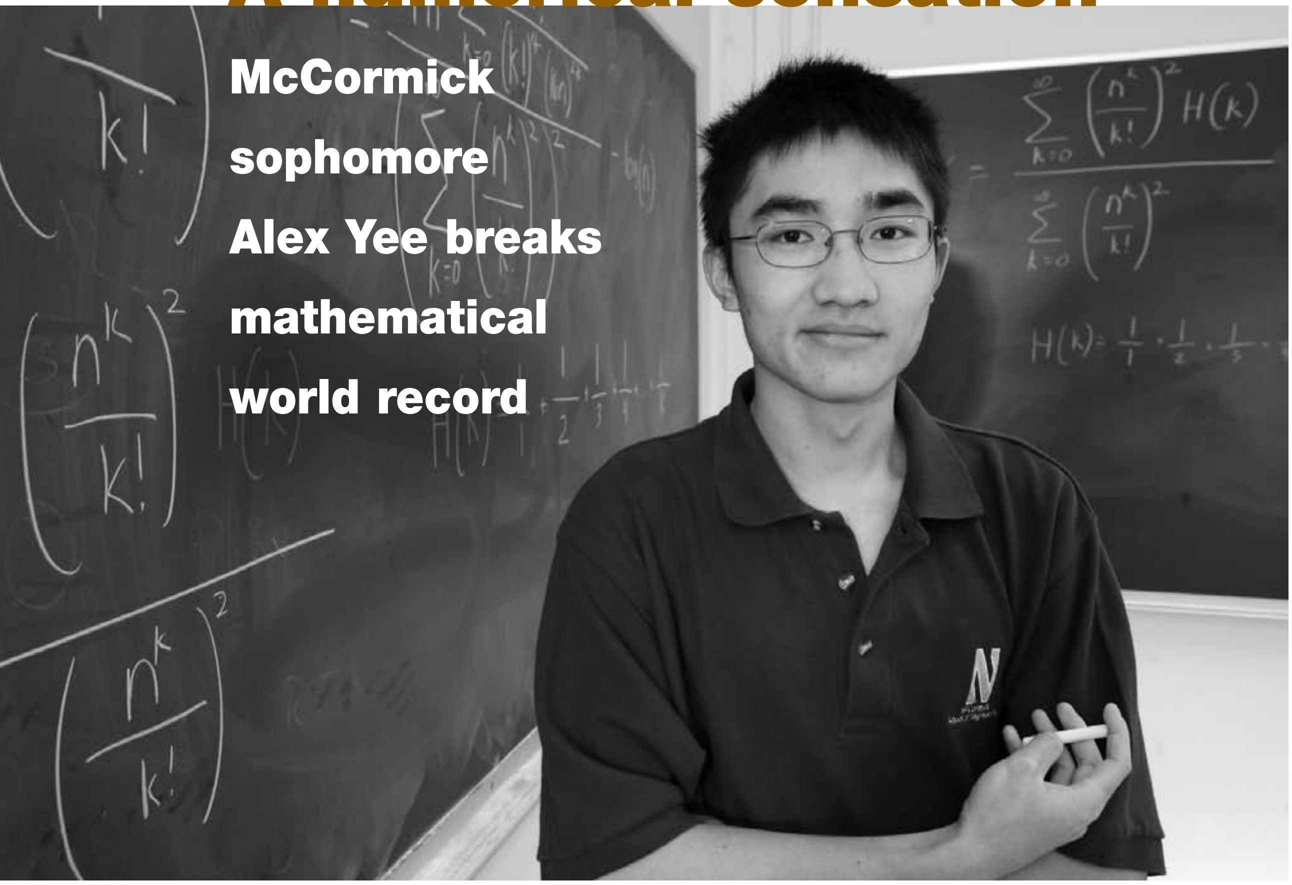
The results of the first clinical trial were published in the journal *Clinical Cancer Research* in August. Larger clinical trials involving approximately 200 patients are under way at Evanston Northwestern Hospital, and addition clinical trials for the colon cancer work are ongoing. Backman has also founded a company, American BioOptics Inc., to fully develop the technology for commercialization.

Backman and his research team are also studying whether their biophotonic approach can be used to detect other types of cancer, such as lung and breast cancer. "Our hope is that biophotonics will change the way we screen for cancer and allow for early detection and improved treatment options," Backman says.

If Backman and his team are successful, a simple ray of light will become a powerful tool that will save thousands of lives.

—Kyle Delaney

A numerical sensation



McCormick sophomore Alex Yee breaks mathematical world record

Most students find finals week to be one of the most stressful times of the year. They spend late-night hours cramming for exams and finishing up projects, looking forward to the end of the quarter. But the stresses of finals didn't stop Alex Yee, a sophomore majoring in computer science, from finishing a project he'd been working on since high school — and breaking a world record in the process.

Yee made headlines around the country early this year by calculating the Euler-Mascheroni constant to more than 116 million digits, easily surpassing the previous record of 108 million set in 1999. The achievement was the summation of a project Yee started as a senior at Palo Alto High School in California. The assignment for his AP computer science class was to create a program that would add, subtract, multiply, and divide large numbers. Yee completed the assignment, but that was only the beginning of his work.

"After the homework was due, I carried on with the project to the point that I could do everything that a graphing calculator could do, except much faster and with much larger numbers," Yee says. "At some point I put in the capability of computing constants, and then I started running down the list of constants."

Around October of 2006, Yee found that his program could compute the Euler-Mascheroni constant with unusual speed. The constant is considered to be the third most famous constant, behind pi and e. While the calculation may be beyond the comprehension of most people, it is commonly used in numbers theory and high-level mathematics. "I saw that my program could compute it about as fast as some of the commercial products available, and I knew that I could make it faster," he says. "I realized that the record of 108 million was beatable."

Yee spent all of his free time between October and December refining the program to better calculate the constant. Once finals week came around, Yee didn't need his laptop for classes and could devote the four days needed for the program to calculate the constant.

After 38 hours of computation and 48 hours of verification, Yee determined that he had broken the record. "I just stood there in disbelief," he says. "Finally I picked up the phone to call my dad and told him that I had done it."

If it wasn't impressive enough for Yee to break the record as a college freshman, he also did it on an ordinary laptop — and not a supercomputer or server typically required for this kind of work. "My program is a lot faster and more efficient than other existing programs for laptops," he says.

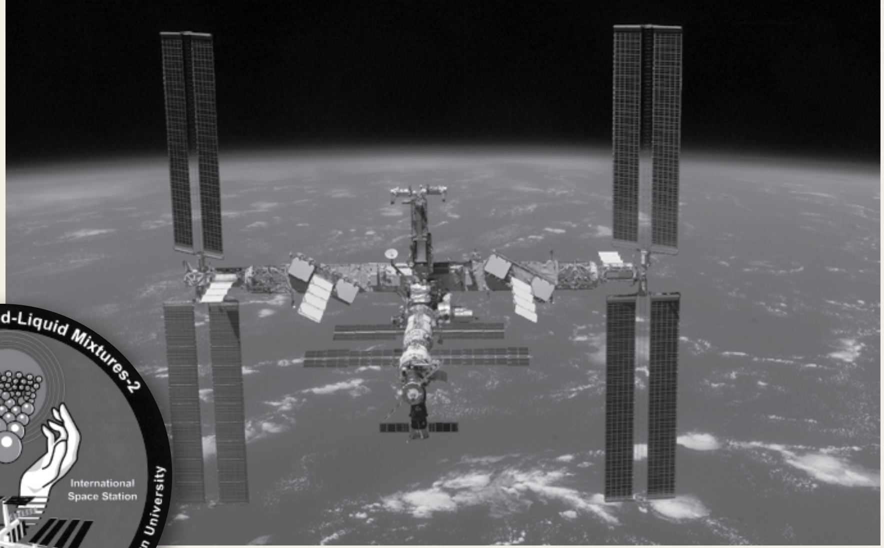
"The result itself doesn't have great practical use, but the method he used to compute it is what's really interesting," says Robert Dick, assistant professor of electrical engineering and computer science. "The program and the methods he used to calculate this are a real contribution."

In the months since Yee's achievement became public, other mathematicians have already claimed to have broken his record. That doesn't bother Yee — in fact, he anticipated it. "At the time I broke the record it had been standing for seven years, but I knew that it could probably be broken again soon," he says. "But I'm not sure that anyone has broken it using a laptop. It would most likely be done on a really fast computer."

Yee hasn't spent his time defending his record but has moved on to something he describes as "more practical" — research on compression algorithms with Robert Dick.

—Kyle Delaney

Preventing gravity from keeping research down



"Our two greatest problems are gravity and paperwork," Wernher von Braun, one of the key figures in the space race, is credited as saying. "We can lick gravity, but sometimes the paperwork is overwhelming."

Peter Voorhees, professor and chair of materials science and engineering, understands that sentiment better than most. Voorhees has spent more than 20 years working on a materials science experiment with NASA — one he started as a postdoctoral researcher in 1984. After creating quite a bit of paperwork documenting every nut, bolt, and screw back to its original source, he has seen his experiment defy gravity and make its way to the International Space Station.

Voorhees is the principal investigator on one of the two experiments that NASA's Glenn Research Center sent on the space shuttle Endeavor's August launch. The experiment, which NASA named Coarsening in Solid-Liquid Mixtures-2, is designed to learn more about the fundamental science that drives the coarsening process. Understanding that process is key to the science of making stronger, more predictable alloys.

Coarsening occurs in nearly every material composed of two crystals, and Voorhees points to Italian salad dressing as a classic demonstration of the process: After shaking the bottle of dressing, droplets of oil merge into larger droplets and eventually separate into a layer separate from the vinegar. The total surface area of two droplets is greater than one larger droplet, causing the droplets to continue to merge until they reach their lowest possible surface area. Coarsening of raindrops can occur in clouds and takes place in a wide variety of materials, such as the high-temperature alloys used in jet engine turbine blades and aluminum alloys used in bicycles. "Coarsening is used to tailor the mechanical properties of materials, but no one understands exactly how fast the process occurs," says Voorhees. "From a materials standpoint, we want to know how fast this process occurs so that we can predict what's going to happen to a product, which is especially important for products like a turbine blade."

While coarsening occurs in a wide variety of materials, solid-liquid systems are ideal from an experimental standpoint. Unfortunately, when using these systems researchers have run into a key limitation on Earth: gravity. Just like ice in a glass of water, the solid particles float to the top of the sample. Working in the low-gravity conditions available in the International Space Station, researchers are able to study how the process works when the particles are evenly distributed throughout the liquid.

"We're trying to study the fundamental forces that drive coarsening — the actual interactions between the particles," says Amber Genau, a graduate student in Voorhees's lab. "We want to get rid of all possible confounding factors, and gravity is the biggest one. Conducting this experiment in space allows us to better identify those driving factors."

Genau and Voorhees prepared 20 samples of a lead-tin mixture to send on the shuttle Endeavor. Once the samples reached the International Space Station, astronauts placed furnaces holding the samples into the glove box of the station. The furnaces were specifically designed for this experiment and are isothermal to less than a hundredth of a degree. Once the lead-tin mixture melts, the remaining spherical tin particles are allowed to coarsen for a set amount of time before the samples are flushed with water to dramatically slow the coarsening process. In all, astronauts ran five cycles of the experiment to study the process over different lengths of time.

Another NASA shuttle will retrieve the samples from the International Space Station in February. The samples will be quickly returned to Voorhees' lab for analysis. Using a serial sectioning process, researchers will remove thin layers from each sample and take digital images to create a series of images representing each layer of the sample. Researchers will use this data make a three-dimensional representation to compare to representations formed using coarsening theories.

Peter Voorhees and Amber Genau

"Once we analyze information about how fast the coarsening process occurs in space, we can test our theories and refine our models to make them more predictive," Voorhees says. "This could help us in designing all kinds of materials — from steels to aluminum alloys."

—Kyle Delaney

The beginning of an excellent CAREER

Four assistant professors in the McCormick School's Department of Electrical Engineering and Computer Science (EECS) — Fabian Bustamante, Dongning Guo, Russell Joseph, and Bryan Pardo — have received 2007 Faculty Early Career Development (CAREER) awards from the National Science Foundation.

The CAREER program offers the NSF's most prestigious awards for new faculty members. It recognizes and supports the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century. CAREER awardees are selected on the basis of creative career-development plans that effectively integrate research and education within the context of the mission of their institution. The minimum CAREER award is $400,000 over a five-year period.

Five McCormick faculty members also received CAREER awards in 2006: Hooman Mohseni and Seda Memik, both assistant professors of EECS; Guillermo Ameer, assistant professor of biomedical engineering; Bartosz Grzybowski, assistant professor of chemical engineering; and Pablo Durango Cohen, assistant professor of civil and environmental engineering.

For the EECS department, the high concentration of recent CAREER award winners is a strong indicator of future success. "This level of achievement for young faculty is indicative of the exciting progress that the department has made over the past two years," says Dean Julio M. Ottino. "The CAREER award recognizes outstanding teaching and research, and is an important recognition for junior faculty."

—Kyle Delaney

Fabian Bustamante

Fabian Bustamante researches the design, deployment, and evaluation of large-scale distributed systems in both wide-area and mobile networks. His primary focus is globally distributed services designed following a cooperative, self-organizing model. Examples of such systems include peer-to-peer data storage, group communication infrastructures, and multiplayer games. Cooperative data storage services, for example, aggregate the often underutilized disk space and network bandwidth of existing desktop computers to provide a self-scaling, universally accessible storage system.

"Most large-scale systems — such as sets of hundreds, thousands, or even a million interconnected computers — are designed to regularly and independently measure their environment for adaptation," says Bustamante. "As these systems grow in popularity, redundant measurements will result in an unsustainable degree of monitoring and restrict the variety, number, and span of these services. I believe that any solution to systems problems in this context must be carefully crafted so as not to impose unbearable demands on the environment or the systems administrators at risk of curtailing further growth."

Bustamante will use his CAREER award to define and explore a new model, called "3R," for the design and implementation of distributed systems. 3R focuses on reducing aggregated control and administrative overhead by strategically reusing and recycling environmental information gathered by ubiquitous services such as content distribution networks and some peer-to-peer systems.

Russell Joseph

Russ Joseph's research focuses on computer architecture and power-aware computer systems, including techniques for monitoring, characterizing, and optimizing performance and power consumption. techniques for monitoring, characterizing, and optimizing performance and power consumption. Making the best use of components such as transistors, logic gates, and memory elements, his group works to develop next-generation processors that will allow for improved computing performance without overheating, wasting energy resources, or failing during critical computations.

Joseph will use his CAREER award to develop microarchitectural and system software models as well as methodology and enhancements to improve the power, performance, and reliability of multicore microprocessors. He aims to identify ways to overcome two important obstacles to future microprocessor implementation: manufacturing defects and variations that prevent silicon from being produced as intended; and in-field degradation and failure, which causes parts of the processor to stop working shortly after production.

Joseph calls this a "new paradigm" of probabilistic architectures, which proposes hardware and software support that enable the design and management of these high-level microprocessors. "We are investigating techniques that allow us to overcome these challenges by modeling and designing resilient hardware and software that monitors, makes a diagnosis, and adapts the processor to recover from variation, degradation, and potential failure," he says. "This is a rather ambitious goal, and this award allows us to examine this topic in some detail over a five year period."

Four EECS faculty members receive prestigious National Science Foundation awards

Dongning Guo

When the One Laptop Per Child program distributes low-cost laptops to children in the developing world, users will find an interesting approach to networking. Each laptop is constantly in communication with others around it, despite a lack of central infrastructure. This connectivity allows users to chat and share files and networks without being directly connected to the Internet.

The connections create a mobile ad hoc network, an area studied by Dongning Guo. His work concerns the fundamental capacity of communication systems and the design of practical systems for achieving that capacity. Guo's CAREER award will allow him to explore the relationships between information theory and estimation theory and their application to wireless networks.

"The current state of the art for mobile ad-hoc networks is rudimentary, providing a data rate that is orders of magnitude worse than networks with infrastructure," Guo says. "It's important to improve these networks because they are critical for the military and for other applications, such as disaster relief."

"Our work is unique in that it bridges the engineering and fundamental science of information transmission," Guo says. "We hope to unveil the boundary between what is physically possible and impossible given all constraints and assuming the best design of a communications network."

One major project in Guo's research group is a joint effort with six other research institutions aimed at an overall theoretical foundation for mobile ad-hoc networks. These networks allow wireless terminals — such as laptops or phones — to communicate and self-organize into efficient Internet-like networks without preexisting infrastructure.

Bryan Pardo

As digital music databases continue to grow exponentially, finding ways to automatically index, label, and access multimedia content in meaningful ways is of paramount importance. For instance, online consumers may struggle to identify a song heard on the radio if they don't know the name of the artist or song. Finding other methods of identifying the music — perhaps by melody or timing — could improve the way consumers, performers, and academics utilize the growing archives of digital music.

Bryan Pardo develops new ways to search for and identify digital content by applying machine learning, probabilistic natural language processing, and database search techniques to auditory user interfaces for human-computer interaction. He takes a broad view of natural language, including timbre and prosody (timing, pitch contour, loudness), with an emphasis on music and speech prosody, and hopes to — per the title of his award proposal — make "Music Documents Accessible in Musical Terms." Pardo will use his CAREER award to develop source separation and score alignment, two key technologies required to automatically find, label, and manipulate important musical structures in audio recordings of music.

"For scholars, musicians, and even casual listeners, the music document is only the beginning, a tool to initiate the task at hand. Musicians may be interested in remixing a musical recording, scholars may wish to analyze the harmonies in a piece, and others may want to remove the sound of an unwanted cell phone ring from a recording of their daughter's flute recital." Pardo says. "Systems able to reliably access audio features, annotate the audio with new information, and integrate the annotated audio with lyrics and musical scores would represent a fundamental improvement in our ability to access and manipulate music documents, allowing a number of new musical applications and interactions for the expert and novice alike."

Lightwaves, lattes, and Xboxes

Tingye Li: Lightwave pioneer

While most people are happy to ease into a comfortable retirement by age 76, Tingye Li would find a traditional retirement anything but comforting. Instead, the renowned scientist continues to work long hours — often until 2 or 3 in the morning, particularly when tackling a compelling book project or absorbed in some new endeavor.

Now an independent consultant in the field of lightwave communications, Li worked for Bell Laboratories/AT&T for 41 years before retiring in December 1998. Since the late 1960s he has been engaged in pioneering research on lightwave technologies and systems. During the 1990s he led the work on amplified wavelength-division-multiplexed (WDM) transmission systems, which he and his colleagues innovated, and he advocated for a massive (and cost-effective) upgrade of the transmission capacity of telecommunications networks. Optical fiber (lightwave) WDM systems are now deployed worldwide. In short, Li's work has had a revolutionary impact on lightwave communications, which continues to meet the growing demands of the information society.

Li is a member of the National Academy of Engineering and has garnered many awards for his various contributions, including the 1981 Northwestern Alumni Merit Award.

"This is a field of never-ending interest," says Li. "It involves fundamental science, it involves high tech, and it involves the innovation to turn fundamental science into technology that can be used to benefit society and humankind."

To that end Li serves on the boards of several optical component and systems companies and as a volunteer for many professional societies, as well as pursuing a zealous dedication to higher education.

The son of a diplomat, Li was born and raised in China until age 11. His mother, who died last year at the age of 105, was a "foremost feminist and very much ahead of the movement, " Li says. A scholarship in her name has been established at her alma mater in China. Li himself earned an undergraduate degree at the University of Witwatersrand in Johannesburg, South Africa, where, he says, rigorous training in mathematics, science, and engineering served him well. In 1958 he earned a PhD in electrical engineering from the McCormick School.

Li has been involved in education in China, having been named an honorary professor at 12 of the country's major universities. He travels to China regularly to give seminars and to meet with professors and students; he is not shy about speaking his mind — as, for example, on the direction of research, the processes of funding research, curricula that lead to specialization too soon, issues of ethical behavior, and other matters.

Another of Li's concerns is the state of higher education in science and technology here in the United States. "If we don't pay close attention, we will lag behind," he says. "The politicians worry about jobs going overseas now, but I worry about jobs coming back in the future should we ever become a provider of cheap labor. The source of innovation in my field has been in the United States, but as time goes on this will migrate elsewhere as developing countries progress rapidly and as the smarter students in this country go into financial fields where the rewards are better."

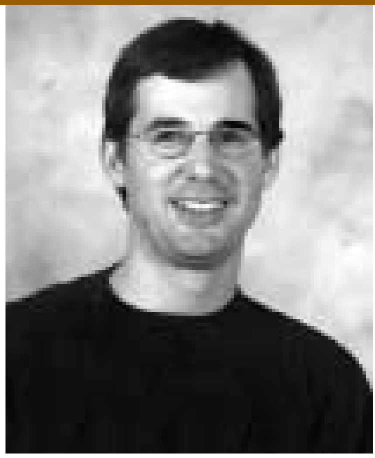
Li believes that the U.S. government needs to better support higher education, encourage bright young students toward science and technology fields, and fund innovative research. "We need to press this point very hard, and unfortunately there is only a minority of politicians speaking out on these issues," he says.

His commitment to education is reflected in the generous charitable gift annuity he and his wife, Edith Wu Li, established earlier this year to support an endowed fund for graduate fellowships at McCormick. "I think Northwestern is doing the right things, as most outstanding universities here are," Li says.

His ties to Northwestern are exceptionally strong, and Li is quick to give credit to his professors here. His wife's connection to Northwestern runs equally deep: Not only did she earn an undergraduate business degree from what was then known as the School of Commerce, but she and her sister came to Northwestern at the suggestion of Colonel Robert R. McCormick, who served as their guardian while they were in school and who was a good friend of their father, a prominent Chinese politician who served as a mayor of Shanghai and later as a governor of Taiwan.

While Li hopes to help draw attention to the issues of higher education and advanced technology, he continues to work and stay abreast of the latest research in the pursuit of innovation. "It has been a very exciting career, and it will never end until I finally close my eyes and leave the world. As long as I can use my brain, I will keep pursuing what intellectually stimulates and challenges me."

—Susan White



Brian and Emily Muly Schmidt: Traversing disciplines

Brian and Emily Muly Schmidt of Bellevue, Washington, can honestly say their workdays consist of coffee and video games. Brian has made a career composing music and advancing the quality of audio in the gaming industry. Emily is currently a technical project leader for Starbucks Coffee Company. Though they can't say that engineering brought them together (they met during Emily's sophomore year at a fraternity dance where Brian's band was playing), they do credit the McCormick School with establishing the foundation for their careers.

Brian entered Northwestern as a tuba major and soon shifted his focus to music theory and composition. He also had a strong interest in computer science. "I could have received a liberal arts degree in music and computer studies," he says. "But I really wanted an engineering degree — to go deeper and master the fundamentals of technology and the processes behind them."

"I really wanted an engineering degree — to go deeper and master the fundamentals of technology and the processes behind them."

—Brian Schmidt

Because he was attending Northwestern, which has excellent engineering and music schools, Brian was able to merge his passions, create a new interdisciplinary program, and pursue dual degrees in music and technology. He says his courses in material science, chemistry, and physics taught him to think like an engineer and understand the concepts of process and control. He was also inspired to combine music and computer science by the work of Gary Kendall, now associate professor of music technology, who at the time was creating the curriculum and building a studio for a new computer music program. "I really feel like I got the best from both schools," says Brian. "Seeing how the professors from both schools worked together on my behalf was really huge."

Brian earned bachelor's degrees in music composition and computer science in 1985 and went on to get a master of science degree in computer applications in music in 1988. As the program manager for Xbox and Windows game audio and media for Microsoft, where he has worked since 1998, Brian uses his unique blend of hands-on composition, sound design experience, and deep technical knowledge to further the state of the industry. He worked as a freelance consultant with such interactive entertainment companies as Sega and Sony before joining Microsoft and has composed music for more than 120 interactive games, including John Madden Football, Jurassic Park, and the Star Wars Trilogy. He also successfully helped lobby to make video game music eligible for a Grammy award; in 2000 games were added to the film/TV category.

Emily participated in Northwestern's National High School Institute (the summer Cherub program) and says the experience completely sold her on both the McCormick school and Northwestern. "It provided the ideal atmosphere for learning and exposure to the kinds of things I could be studying." Emily says her McCormick course work gave her a solid education in math and science and exposure to subjects like civil engineering and thermodynamics. At the same time, she wanted more than a strictly technical experience.

"I loved that I had friends who were radio/TV/film program and journalism majors," she says. "Looking back, I can say you can't underestimate the value of seeing people doing other things and how it can relate to your field."

When she received her bachelor's degree in computer science in 1991, Emily joined her father, Emil (electrical and computer engineering '58, PhD '62), and mother, Faye Ochsenhirt Muly (chemical engineering '61), as McCormick alums. In fact, Emily and her mother were the first mother and daughter to both earn engineering degrees from McCormick.

As she began her career, Emily discovered the value of combining her engineering training with broader experience, and she understood that McCormick had been an ideal place to foster cross-disciplinary study. The most rewarding part of her position at Starbucks is, she says, "being able to apply technology to business and helping people understand the technology. It is really satisfying."

While their workdays may be filled with coffee and video games, these two McCormick graduates have clearly wasted no time in turning their passions into productive careers.

—Michele Hogan and Lina Sawyer

EDC students design new multimedia center/library

Principal's dream realized

When Rosalie Musiala, principal of Evanston's Pope John XXIII School, called Fuko Tsuruta, Chris Wong, and Giovanni Wuisan to her office in August 2006, they went quickly and gladly. The McCormick seniors were eager to see what Musiala, their former client, wanted to show them at the school, about a mile south of Northwestern. The multimedia center/library that the Northwestern students had designed for the school as freshmen in 2004 was now a reality.

"We were in awe that it actually happened," says Wong. "To see a room — something you can walk into, sit in, and read in — that is of your own design and creation was great."

The school's old library was in an annex, not in the school's main building, and it was too small: There was only enough room for books used by students from kindergarten through fifth grade. Now students from kindergarten through eighth grade take advantage of the bright and spacious new library — reading alone, checking out books, studying, listening to stories, or learning in an honors algebra class. The library has 8,800 volumes — twice as many as the old one — and 20 laptop computers with wireless Internet connections. And it is located in the school's main building.

"This has been my dream, and we are very proud of it," says Musiala, who is in her 10th year as principal of Pope John XXIII. "I'm a big proponent of reading, and books are integral to an elementary school. The library needed to be where the kids are."

An inspiring client

After conceiving the idea of a new multimedia center/library five years ago, Musiala approached the McCormick School with her project. She signed on as a client for the school's Engineering Design and Communication (EDC) program, required of all engineering students. Each spring EDC teams work to solve nearly 100 real-world design problems brought to them by individuals, not-for-profit organizations, entrepreneurs, and industry. This was not Musiala's first time as an EDC client. A few years ago EDC students designed a safe traffic-flow pattern that is still used during student pick-up and drop-off times at Pope John XXIII. And last spring another EDC team planned a renovation of the school's science laboratories that was completed in time for the new school year. But the multimedia center/library has been the biggest project at the school.

"I'm a big fan of Northwestern," says Musiala, who has two sons who are alumni of the University. "I am always impressed with Northwestern students. They are intelligent, thorough, ask the right questions, and do their research. The student teams we've worked with have been excellent."

Tsuruta, Wong, and Wuisan — who met during their first day of classes at Northwestern and became friends — chose to work together on Musiala's project during the spring quarter of their freshman year. That was in 2004. At the time, no one knew if money would be available to build Musiala's library. She told the team not to worry about a specific budget; she wanted their best ideas — as long as they were practical.

While tackling the design issues of the multimedia center/library, Tsuruta, Wong, and Wuisan also learned how to become more effective communicators. The three first-year students spent 10 weeks acting like engineers in industry: They conducted user interviews with students and teachers, brainstormed ideas, wrote memos and proposals, revised their designs, built prototypes, and made a final oral presentation to their client, Musiala, along with three teachers.

"This was a good way of introducing the engineering design concept to freshmen," says Wong, who graduated in June 2007 with a BS/MS in materials science and engineering and is now working for Dow Corning. "Mrs. Musiala was so happy to help during the process that the project went very smoothly."

"We wanted to do our best to meet the requirements of our client, not just get a passing grade in the class," says Tsuruta, a fifth-year senior studying civil engineering and music performance. "The good relationship we had with Mrs. Musiala helped us cultivate this attitude. In this way, EDC taught us something that no other required class did but that is essential for any engineer: how to work closely with a client. There's no greater satisfaction than the pride we have in the good work we did and its effect on others — in this case, students and teachers of Pope John XXIII."

Wuisan, who is studying mechanical engineering and economics, is also is a fifth-year senior. Both he and Tsuruta are participating in McCormick's Walter P. Murphy Cooperative Engineering Education Program.

Left Fuko Tsutura, Chris Wong, and Giovanni Wuisan

Above A model of the multimedia center/library produced by the EDC students (top) and the real thing (bottom).

Understanding the requirements

The McCormick students first set out to understand the requirements for the school's multimedia center/library. The school wanted a flexible space with half designed for younger students and half for older students; unobstructed views for the librarian; space for computers; a screen and whiteboards for classes and presentations; the ability to conduct two classes or meetings at one time; and space for twice as many books as the old library.

Tsuruta, Wong, and Wuisan then proposed a number of designs to Musiala and got her feedback. They combined all of this information into a new design and identified the best location for the library: two unused rooms on the second floor of the school. In addition to room layout, the students had to consider any potential structural problems. Because the blueprint of the school building could not be located, the students were unable to determine if the wall separating the two rooms — which, according to their plan, would have to come down — was load bearing or non–load bearing. They provided an estimate and plans for both alternatives. The team also talked to the Evanston Fire Department to learn of any potential hazards with construction.

For their final 20-minute oral presentation to Musiala and three teachers, Tsuruta, Wong, and Wuisan built a large, detailed scale model of the proposed multimedia center/library out of cardboard, colored paper, and wire. Musiala and her team gathered around to discuss their opinions of the design. Musiala then took the model and placed it in the school's lobby so all students, teachers, and parents could see it.

The next challenge was Musiala's — finding the funds to make the plan a reality. Thanks to $100,000 in seed money from J. Howard and Helen M. Reed and part of a $1 million bequest from Marion Chase, the J. Howard and Helen M. Reed Multimedia Center is now in its second school year of operation.

"When I was down, thinking the new library might never happen, I bought sculptures," says Musiala. "I packed them away — a wish box for when the library was finished."

Those pieces of art, of different styles and sizes, now are scattered on shelves across the multimedia center/library, nestled among and above the fiction, nonfiction, and picture books — Musiala's personal stamp on her dream come true.

For more information on participating as an EDC client, visit www.segal.northwestern.edu/edc.

—Megan Fellman

Chaired professorships

Justine Cassell, AT&T Research Professor
Katherine Faber, Walter P. Murphy Professor of Materials Science
Lincoln Lauhon, Morris E. Fine Junior Professor in Materials and Manufacturing
Paul Leonardi, Allen K. and Johnnie Cordell Breed Junior Professor of Design
Hani Mahmassani, William A. Patterson Distinguished Professor of Transportation
Marco Nie, Louis Berger Junior Professor
Don Norman, Allen K. and Johnnie Cordell Breed Senior Professor in Design

Faculty honors

Jan D. Achenbach, Walter P. Murphy Professor and Distinguished McCormick School Professor of the Departments of Mechanical Engineering, Civil and Environmental Engineering and Engineering Sciences, and Applied Mathematics, received the 2005 National Medal of Science.
Vadim Backman, professor of biomedical engineering, presented a plenary lecture at the American Association for Cancer Research Conference.
Zdeněk Bažant, Walter P. Murphy Professor of Civil and Environmental Engineering and professor of materials science and engineering, was elected an honorary member of the American Society of Civil Engineers.
Ted Belytschko, Walter P. Murphy Professor of Mechanical Engineering, presented plenary lectures at the European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS) Thematic Conference on Modeling of Heterogeneous Materials with Applications in Construction and Biomedical Engineering in Prague and at the Army Solid Mechanics Conference in Baltimore.
Fabian Bustamante, assistant professor of electrical engineering and computer science, was invited to serve on the advisory board of Neokast, a start-up company that focuses on supporting cooperative live video streaming.
Yan Chen, assistant professor of electrical engineering and computer science, won the Air Force Office of Sponsored Research Young Investigator Award.
Robert Dick, assistant professor of electrical engineering and computer science, won a 2007 *Computerworld* Horizon Award.
Peter Dinda, associate professor of electrical engineering and computer science, participated in the National Academy of Engineering's U.S. Frontiers of Engineering Symposium, held in September at Microsoft Research in Redmond, Washington.
David Dunand, James N. and Margie M. Krebs Professor in Materials Science and Engineering, was elected a fellow of the ASM International.
Katherine Faber, Walter P. Murphy Professor of Materials Science and Engineering, received a Faculty Award from Northwestern's Women's Center as part of a celebration of the center's 20th anniversary.
Bartosz Gryzbowski, associate professor of chemical and biological engineering, received a 2007 Camille Dreyfus Teacher-Scholar Award.
Mark Hersam, professor of materials science and engineering, received the 2007

New EECS chair

Professor Alok Choudhary is the new chair of the Department of Electrical Engineering and Computer Science. From 1989 to 1996 he was on the electrical and computer engineering faculty at Syracuse University, where he received a Presidential Young Investigator Award form the National Science Foundation. He has also received an IEEE Engineering Foundation Award and was among the first recipients of the Excellence in Research, Teaching, and Service Award from McCormick.

His research interests are in high-performance computing, data-intensive computing, scalable data mining, computer architecture, high-performance

I/O systems and software and their applications, and scientific computing. Choudhary has published more than 300 papers as well as a book and several book chapters.

He was the founding director of the Center for Ultra-scale Computing and Information Security and is a member of the Center for Genetic Medicine at Northwestern. He was cofounder and vice president of technology of Accelchip Inc., which was eventually acquired by Xilinx.

Choudhary teaches marketing and technology industry management at the Kellogg School of Management and is the academic director of the Executive Program on Managing Customer Relationships for Profit in Kellogg's Executive Education Program.

Young Alumni Achievement Award from the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign.

Dean Ho, assistant professor of biomedical engineering and mechanical engineering, was invited to be a visiting professor at Peking University.

Russ Joseph, assistant professor of electrical engineering and computer science, received a CAREER award from the National Science Foundation.

Aggelos Katsaggelos, Ameritech Professor of Information Technology, gave distinguished lectures at Hong Kong Baptist University, Hong Kong Polytechnic University, and the Universidad Carlos III de Madrid in June.

Aleksandar Kuzmanovic, assistant professor of electrical engineering and computer science, received a Cisco University Research Program Grant.

Rob Linsenmeier, professor of biomedical engineering, received the 2007 Theo C. Pilkington Outstanding Educator Award from the Bioengineering Division of the American Society for Engineering Education.

Wing Kam Liu, Walter P. Murphy Professor of Mechanical Engineering, received the John von Neumann Medal from the U.S. Association for Computational Mechanics and the Robert Henry Thurston Lecture Award from American Society of Mechanical Engineers.

Kevin Lynch, associate professor of mechanical engineering, was named a Charles Deering McCormick Professor of Teaching Excellence at Northwestern and was selected to take part in the Defense Science Study Group.

Tobin Marks, professor of materials science and engineering and Vladimir N. Ipatieff Research Professor of Chemistry in the Weinberg College of Arts and Sciences, received the American Chemical Society Award for Distinguished Service in the Advancement of Inorganic Chemistry and the 2005 National Medal of Science.

Thomas Mason, professor of materials science and engineering, received the Edward C. Henry Award for best paper published in the *Journal of the American Ceramic Society* in 2006.

Phil Messersmith, associate professor of biomedical engineering and of materials science and engineering, gave invited talks in Switzerland at the Symposium for Regenerative Medicine at the University Hospital Zurich, the Institute of Bioengineering, Ecole Polytechnic de Fédérale de Lausanne, the Centre Suisse d'Electronique et de Microtechnique in Neuchatel, the Robert Mathys Foundation in Bettlach, the EMPA Research Institute in St. Gallen, and the Ciba Lecture Series at Ciba Specialty Chemicals in Basel. He also participated in the Physics-Chemistry Kolloquium at the University of Mainz and Max-Planck Institute for Polymerforschung in Mainz, Germany.

Hooman Mohseni, assistant professor of electrical engineering and computer science, is one of 24 rising stars in microsystems research to receive a Young Faculty Award from the Defense Advanced Research Projects Agency.

Brian Moran, chair and professor of civil and environmental engineering and professor of mechanical engineering, was elected to the board of directors of the Society of Engineering Science.

Justin Notestein, assistant professor of chemical and biological engineering, received a 2007 Camille and Henry Dreyfus Foundation New Faculty Award.

Greg Olson, Wilson-Cook Professor of Engineering Design, presented a plenary lecture at the International Conference on Metal Coatings and Thin Films.

Monica Olvera de la Cruz, professor of materials science and engineering and of chemical and biological engineering, was appointed to the National Research Council Committee on Research Forefronts in the Physical and Life Sciences.

Aaron Packman, associate professor of civil and environmental engineering and of mechanical engineering, presented a keynote lecture at the Sixth International Symposium on Ecohydraulics in Christchurch, New Zealand.

Neelesh Patankar, associate professor of mechanical engineering, presented a keynote lecture at the International Conference on Multiphase Flow in Leipzig, Germany.

John Rudnicki, professor of civil and environmental engineering and of mechanical engineering, presented a plenary lecture at the ECCOMAS Thematic Conference on Modeling of Heterogeneous Materials with Applications in Construction and Biomedical Engineering in Prague.

David Seidman, Walter P. Murphy Professor of Materials Science and Engineering, presented a plenary lecture at the Israel Society for Microscopy meeting at the Weizmann Institute of Science, Rehovot, Israel.

Surendra Shah, Walter P. Murphy Professor of Civil and Environmental Engineering, was named one of the 10 most influential persons in the concrete industry by *Concrete Construction.* He also presented the Della Roy Lecture at the 109th Annual Meeting of the American Ceramic Society in Detroit.

Randy Snurr, professor of chemical and biological engineering, presented a plenary lecture at the Ninth International Conference on Fundamentals of Adsorption in Giardini Naxos, Sicily, Italy.

Allen Taflove, professor of electrical engineering and computer science, presented a keynote lecture at the Photonics North 2007 Symposium in Ottawa, Canada.

John Torkelson, Walter P. Murphy Professor of Chemical and Biological Engineering and of Materials Science and Engineering, was elected to the board of directors of the Engineering Properties and Structure Division of the Society of Plastics Engineers.

Dear McCormick alumni and friends,

On behalf of the Walter P. Murphy Society, I would like to thank you for your support of the Robert R. McCormick School of Engineering and Applied Science during academic year 2006–07. We are grateful for the contributions of and partnership with the more than 400 members of the Murphy Society and hundreds of other donors whose names are listed on the following pages. To those who are not currently Murphy Society members or donors, please consider joining us and making a gift to the McCormick Annual Fund this year.

As you know, the Murphy Society honors the legacy of Walter P. Murphy, the benefactor whose gifts supported the construction of Northwestern's Technological Institute. Murphy Society members make annual gifts of $1,000 or more and have a unique opportunity to assist the dean in making decisions to fund faculty and student projects through Murphy Society grants. In past years the Murphy Society has encouraged the support of curriculum enhancements such as Engineering First®, projects such as Biomedical Engineering Design for Global Healthcare, and initiatives from our outstanding student organizations like McCormick's Society for Women Engineers.

Once again, Murphy Society members in 2007–08 will also be recognized as members of the Northwestern University Leadership Circle, a pan-university giving society composed of Northwestern's most loyal friends and alumni.

Please know how much your gifts to McCormick are appreciated, and best wishes for the coming year.

Sincerely,

David A. Eckert '77
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Andrew Horn (mechanical engineering, ’99), project manager, Evanston, Illinois

On his career: As a project manager with the Rise Group, Horn provides program and project management services in the construction industry.

Why McCormick: It was one of the top engineering schools in the country, the director of the minority engineering program made him feel welcome, and Northwestern offered the best financial aid among the schools Horn was considering.

How McCormick helped his career: Horn says working in engineering teams and study groups was very helpful. “In one class, our team created a plastic injection-molded key ring. This experience provided a hands-on, collaborative opportunity to problem solve. This is now especially beneficial for me as I work on teams with many different personality types.”

His connection to McCormick: As a freshman Horn worked in the Engineering Records Office. He also represented McCormick at the National Society of Black Engineers conferences as a member and delegate. As an alumnus he serves on a panel that assists postgraduate students with their careers in engineering. “I also represent the Rise Group at the Society for Women Engineers’ Industry Day and attend the yearly EXCEL picnic. My main involvement as an alum, however, is with ReJOYce in Jesus Campus Fellowship at Northwestern.”

Why continued involvement is important: “I’m very interested in being a part of the process to help future leaders excel.”

Words of advice: Horn encourages students to stay as connected to McCormick as they can. “Alumni always have something to give to current students: their experience. I believe I have a responsibility to mentor students in the same way that I was mentored."

—Lina Sawyer

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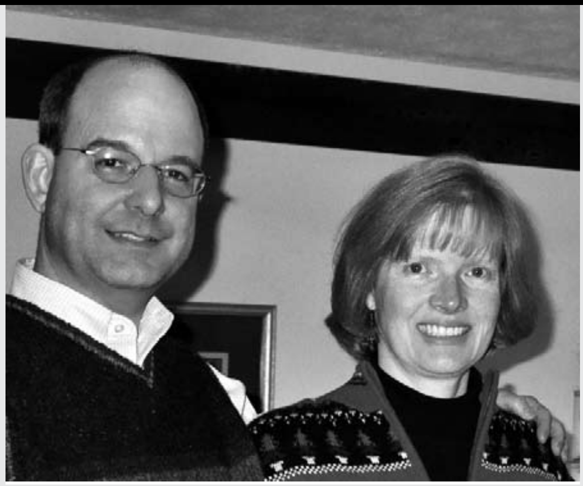
Bryan Taylor Mills and
Alexis Marie Kuncel
Joanna Mirecki
Millunchick
Craig Minbiole and
Barbara J. Minbiole
Mary Ellan Minbiole
Carol J. Mizuno
James Mobed
Ronald L. Moeller
Lee R. Moffitt
Sean A. Mollohan
Jonathan S. Montgomery
Mark A. Moore
Emre Ilkay Motan
Larry G. Mugler
John E. Muhlner
Michael J. Muilenburg
Joseph F. Murphy
Thomas Murray
Gina M. Myerson and
Roger B. Myerson

Dora Ke Nathanson
Barbara Nazzaro
Hilton Ladd Neal
Gregg Marshall Nelson
Louis G. Neudorff II
Charles J. Neuhauser
Donald W. Neukranz
Randall C. Newman
Kim Nee Newton
Michael Niecestro and
Karen Niecestro
Ralph Niemann
Frank M. Nigh and
Valerie Swett Nigh
Janie Jefferson Nneji
Stephen M. Nolan and
Marie Zack Nolan
Thomas A. Nowicki
Peter J. Nowobilski
Daniel R. Noyd
John Robert Nuckols
Robert P. Nupp and
Molly M. Nupp
Timothy A. Nustad and
Deborah D. Nustad
Carl Nutzman and
Louise F. Nutzman
Robert B. O'Rourke
Dennis M.
O'Shaughnessy
Gary A. Obst and
Alice F. Obst
Robert L. Oetting
David G. Olson
Craig M. Ono and
Claire Watanabe Ono
Lucien G. Osborne
Jonathan H. Owen and
Susan Hesse Owen
E. James Owens
Devan V. Padmanabhan
and Suchita
Padmanabhan
Thomas C. Paisley
Andrea A. Pappajohn
V. R. (Sivan)
Parameswaran
and Thangam
Parameswaran
Martin M. Parker and
Carole J. Parker
Charles S. Parmele
Luis D. Pascual
Paul V. Pastorek Jr.
David E. Patchen and
Nancy Hardy Patchen
Benjamin L. Paterson
Timothy J. Patronik and
Mary Scott Patronik
Gaige R. Paulsen
Stephen M. Pawlowicz
Vartan Paylan
David J. Pedrazzani
Kevin A. Pendleton and
Michelle Riley
Pendleton
Anthony Pennington and
Heather Pennington
Michael R. Perlewitz

Joseph J. Perona
Steven P. Perrin
Rudolph J. Pesut Jr.
Louis J. Petrovic and
Judith A. Petrovic
Jaspere A. Petrucci
Charles W. Pfingsten
Richard A. Phelan and
Edith Phelan
David R. Phillips III
Eshe N. Pickett
Charles J. Pieper
Nicholas R. Platta
Joseph David Plunkett
Marianne Pniewski
Edward Poa and
Christine Lim Poa
Stanley J. Polcyn
Geralyn Allen Polk
Steven N. Polydoris and
Tina Vulgaris
Polydoris
Susan E. Pommer
Marie-Noelle A. Pons
Robert O. Posniak
Mark S. Potter and
Nancy E. Potter
Anthony R. Powell
Malcolm M. Preston and
Susan R. Preston
Bradford R. L. Price
Mark D. Price and
Stephanie Larson
Price
Eric W. Prosnitz and
Gabrielle C. Prosnitz
Maurice C. Prottengeier
Vera Lee Quinn
Ronaldo Racinez and
Sheila Jo Racinez
Marshall Rafal
John Ragalis
Dilip Rajagopalan and
Lini S. Rajagopalan
Alan F. Raphael
Mark Warren Rasmussen
Roger F. Rasmussen
Carl E. Rathmann
Prashanth Ravi-Shankar
Christine D. Raymo
Michael J. Reddy
Michael T. Reeves
John G. Reinke Jr. and
Nancy Kollman
Reinke
Adam S. Rentschler
Benjamin P. Richardson
Roger A. Rieckman
Kim Bald Riley
David Joel Rink and
Susan J. Rink
Marshall Alan Robers
Allen J. Robertson
Quentin K. Robinson
Richard T. Roche
Charles G. Rogalske
Charles L. Rogers
John J. Rohr
Paul R. Rom

Elysia Root
Gregory E. Rose
Geoffrey Brian Rosenthal
Chip Ross and Carol
Want Ross
Robert L. Rothman
Robert V. Rouse and
Bichtien Rouse
Brad H. Rovin
Robert E. Rozak
Paul Rula and
Stephanie Rula
John E. Rumel
Whitney Charles Sagan
Tetsunosuke Sakurada
Jennifer Coon Salem
Andrew E. Samuels
Paul George Sanders
and Jennifer Louise
Sanders
Julius Saslow
Kurt L. Sauer
Jovica Savic
Mark H. Scheibe and
Margaret R. Scheibe
Thomas Mark Scheiber
Elmer L. Scheuerman
Don B. Schiewetz
Fred Schindler and
Mary A. Schindler
William H. Schlosberg
Peter J. Schmidt
John K. Scholvin
William P. Schonberg
Steven M. Schorr and
Joy Schorr
Linus Schrage
Dean Schraufnagel
and Mary Nissen
Schraufnagel
Jeffrey Schriesheim
Donald J. Schroeder
Anne Sampson Schuerger
William E. Schultz
David L. Schwartzbard
and Michelle R.
Schwartzbard
Joseph Elmer Seitz and
Holly K. Seitz
Joseph E. Shipley
Charles E. Silverblatt and
Ellen A. Silverblatt
Brian James Skelton
Ronald Skoglund
Stephen H. Slabach
Arthur O. Smith III
Howard W. Smith
Kerry M. Smith
Randall W. Smith
Dennis M. Smithyman
and Rosemary Porter
Smithyman
Carol Kramer Smorch
Alex Sorton
Gino Sovran
Hans C. Sowa
Ronald A. Spanke and
Jutta W. Spanke
Steven M. Spar

Nagaraja R. Srivatsan and Shanthi Ganeshan
Chester A. Stanley
Mark Stavropoulos and Laurie R. Hernandez
Michael V. Stein
George F. Steiner and Ruth Emery Steiner
Timothy J. Stelly
Peter W. Stemwedel
Leonard I. Stiel
Richard H. Stiller
Laurence O. Stine
Julie M. Stoltz
Bruce Stone and Susan Stone
Douglas A. Stone
Marcel Strebel
Ann Leslie Stuart
James L. Sues
Daniel D. Sullivan
Stephen T. Sutton
Olgerts J. Svilans and Valentina T. Svilans
David G. Swanson Jr.
John Charles Swarts
Ross F. Sweeny Jr.
Irwin S. Sylvan
Jennifer S. Taff
Gazel Manette Tan
John C. Tanaka and Joan M. Tanaka
Richard S. Tankin
Dieter E. A. Tannenberg and Ruth Tannenberg
Rodney D. Tansimore
David R. Tapley
Ronald R. Tarica
Christopher Victor Tartaglia
Russell P. Taub
Stephen L. Taylor
Gustavo E. Tellez
Cyril B. Tellis
Matthew J. Ter Molen and Jennifer D. Ter Molen
Bimal V. Thakkar
Ethan P. Theis and Megan Theis
David J. Theobald and Jeanne F. Theobald
Scott W. Therrien
Charles Thomas
Allan G. Thompson Jr. and Corinne Sir Thompson
John Denton Throckmorton
Gerald Thurer and Diane Thurer
Norman R. Tiedemann and Mary Irene Buckett
Matthew V. Tirrell III and Pamela Anne Lavigne
Benedict Tiseo
Jean Y. Togikawa
Jennifer Kimiko Toguri
James Edward Tollar
Gregory K. Tomita
Bruce E. Tonn and Diana K. Tonn
Eric Edward Torgersen
K. Tibor Toth and Jennifer Cushing Toth
Alan R. Traut
William J. Tronsen
Benjamin I. Truck
Catherine Gwynn Trueblood
Brian P. Tumpowsky
Mark Harold Turner
Robert A. Turner
Amy Sato Tylock
Bruce R. Ukockis
Dennis B. Ulrich
Ahmad Z. Usmani
Stephen F. Utley Jr.
James M. Utterback and Margaret Utterback
Alex Vaillancourt
Michel Varrin
Semyon Vaynman and Dora Vaynman
James Michael Venetos
Enrique R. Venta
Dick Verduin
Davis P. Viprakasit
Richard A. Volz and Mary J. Volz
John G. Vornbrock
Paul J. Wade
Mark E. Wadrzyk
John R. Wagner
Richard B. Wagner
Ronald J. Waicukauski and Karla Yale
Donald T. Waldoch Jr.
Caroline R. Walton
Francis D. Wambi-Buesso
Paul Wangenstein and Kathleen Wangenstein
Chris D. Wanha
Charles E. W. Ward and Ann L. Ward
Gene Charles Warman
H. Lee Watson Jr.
Kalvin W. Watson
Theodore R. Watson and Emma Ann McGraw Watson
Kyle Steven Weber
Stephen E. Weber
Steven John Weber and Sharon H. Weber
Theodore R. Wedell
Andrew T. Wedepohl
Ted C. Wedepohl and Carolyn J. Wedepohl
Johannes Weertman and Julia R. Weertman
Roland George Weiss
William B. Weissbard
Stuart H. Wemple
Jack L. Wert
Donna H. West
M. Clem West and Dolores Morvice West
John David Westwood
Randall J. Whalen
Tsung-Chuan Whang and Lai Yu-Fen Whang
Yong Whang
Dan W. Wheeler
Allen P. White
Robert C. White and Irene Ledesma White
Jon B. Whitehurst
Michael James Wickmann
James H. Wilkinson and Dorothy A. Wilkinson
Bruce T. Williams
John L. Williams
Roger J. Williams and Tara F. Williams
Dudley R. Willis and Janese Ray Willis
Richard M. Wilson
Frank T. Wimmer
Eric Frank Winakur
Jeffrey G. Witwer
Richard B. Wodnik
Gregory A. Wojcicki
Donald K.O. Wong
Thomas T.Y. Wong
Paul H. Woodhouse
Benjamin Y. Wu
Peter C. Wu
Patsy Ann Wylie
Eric Y. T. Yang and Shirley Chou Yang
James M. Yeakley
Harold Y. Yin and Susie Hsieh Yin
Jeff K. Yoon
Andrew B. Youel
Jeanne Marcotte Young
Lawanda Young
Suzanne Unger Young
Daniel Young-Dixon and Nancy Young-Dixon
Cynthia L. Yuen
James R. Zagel
Alan I. Zagoria
Howard I. Zauberman
William J. Ziegler and Paula J. Ziegler
Craig A. Zimmerman
Louis Zitnay
David S. Zuby



Sara Staab (applied mathematics, ’83), and Jeff Staab (chemical engineering, ’83), Phoenixville, Pennsylvania

On their careers: After graduating from McCormick, Sara worked as a programmer for a firm that produced automation software for fabricators of concrete-reinforcing steel. Jeff is an associate professor of psychiatry in the departments of psychiatry, otorhinolaryngology (ear, nose, and throat), family medicine, and community health at the University of Pennsylvania School of Medicine in Philadelphia. In spring 2008 he will move to the Mayo Clinic to expand his work on chronic dizziness and psychosomatic medicine.

How McCormick helped their careers: Sara cites her applied mathematics major as being helpful in her job as a programmer, where she used matrix algebra to manipulate data tables in a tag-printing program. Jeff’s research into medical and psychiatric causes of chronic dizziness and imbalance has made it clear to him that engineering and behavior coincide. “The brain solves the inverted pendulum problem every moment that humans are upright,” he says, “while simultaneously managing eye precision. The psychiatric component of this is threat detection and response systems (fear and vigilance) and how it is integrated with balance and eye-movement control. Balance is essentially an engineering challenge.”

Their connection to McCormick: The Staabs contribute to the Walter P. Murphy Society because of its immediate benefits for engineering education at McCormick, particularly through annual grants to faculty. As a professor, Jeff understands the difficulty of advancing human knowledge while seeking funding. “The Murphy Society provides a yearly infusion of venture capital for innovative faculty projects,” he says.

Words of advice: “The future of Northwestern and McCormick is in our hands as alumni,” says Sara. “We’ve been fortunate to allow our children to attend the universities of their choice without direct support from their institutions. Not all McCormick students have this opportunity, so it is essential that we give so that the University’s endowment will grow to offset future expenses and assist the next generation of students.”

—Lina Sawyer

1940s

Maurice C. Prottengeier ('44) retired from his work as an administrator in the Pontiac, Michigan, School District in 1986. He and his wife, Marian, have traveled through Europe and visited friends in Great Britain.

1950s

David S. Urey ('58) retired after more than 40 years in the field of patent and licensing law. He and his wife, Donna, enjoy golf, skiing, participating in local government, and visiting their two grandsons.

1960s

Robert Kersten ('61) dean and professor emeritus at the University of Central Florida, was named an honorary member of the American Society of Civil Engineers, the society's highest accolade.

1970s

Dennis Adkesson ('70), a process engineer with Tate & Lyle NA/A. E. Staley Manufacturing Company, in Decatur, Illinois, was named one of the 22 Heroes of Chemistry at the 2007 American Chemical Society national meeting in Boston for his role in developing DuPont's environmentally friendly polyester production process.

Richard Brenner ('72) has been running Consumers Supply, his family's wholesale plumbing and heating supply business, for 33 years. He and his wife, Suzi, have been married 31 years. They have two children, Kenny and Corey.

Thomas J. Riordan ('78) became president and chief operating officer of Terex Corporation in Westport, Connecticut, in January.

1980s

Karla Middlebrooks ('80) was promoted to vice president for product, procurement, and cost-management finance at Chrysler LLC.

Joseph J. Rencis (MS '82), professor and chair of mechanical engineering at the University of Arkansas in Fayetteville, was the first recipient of the 21st-Century Leadership Chair in Engineering. He also received the 2007–08 Cambridge Who's Who Professional of the Year in Mechanical Engineering award.

Peter C. Nelson (MS '86, PhD '88), professor and head of the computer science department at the University of Illinois at Chicago, has been appointed interim dean of the College of Engineering.

1990s

Robert Abboud (MS '90), mayor of Barrington Hills, Illinois, and owner of nuclear component and development company RGA Labs Inc., has announced his candidacy for Congress.

John J. Frieders ('90) is sales and operations manager for lighting and plumbing at Turner Construction.

Yusuf Pisan ('92, PhD '98) is taking a sabbatical from Worcester Polytechnic Institute.

Joseph Barr ('95) is deputy director of policy, technology, and management for New York City's Department of Transportation and is project manager for the city's Bus Rapid Transit project.

Aminuddin Khan ('95, '96) is president of AKCOMPLISH, an independent computer-consulting firm. He created PCRunLog software for runners and is currently consulting at Siemens in Princeton.

Eric Steffe ('95) is a director with the corporate services group of Grubb & Ellis Co.

Andrew Liteplo ('96) is an attending physician in the emergency department of Massachusetts General Hospital.

2000s

Matthew Fortney ('01) joined the law office of Quarles & Brady in the real estate practice group.

Jesse Hercules ('01) graduated summa cum laude from the University of Mississippi School of Law in May 2006 and was admitted to practice law in Tennessee. He also passed the patent law bar in November 2006 and will specialize in both patent law and aviation law.

William Hightower ('01) was an intern at Evanston Northwestern Healthcare and began an anesthesiology residency at Stanford University.

Michael Korcuska (MS '02) is executive director of the Sakai Foundation, a consortium for technology in higher education.

Matthew Weber ('02) is a doctoral student at the Annenberg School of Communication at the University of Southern California, where he is researching organizational communication and new communication technology.

Polina Liberman ('03), an engineer in training, was promoted at Woodard & Curran's Cheshire, Connecticut, office in January. She specializes in municipal water and wastewater projects. She is earning a master's degree in engineering and applied science at Yale University.

David Fang ('04) is attending the University of Michigan Medical School.

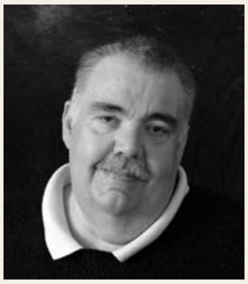
Aaron Gooze ('04) is corporate pricing manager with Pacific Continental Shippers, a transportation brokerage company in Everett, Washington.

Jeffrey Schell ('04) participated in an exchange program at University College Dublin, where he studied European Union intellectual property and international trade law. He returned to the United States to participate in the Harvard College China–India Development and Relations Symposium.

In memoriam

James B. Wilkie, ’34
Douglas R. Byth, ’36
Robert A. McCord, ’42
Edwin M. Monsell Jr., ’43
James M. Murphy, ’44
Norbert E. Pentz, ’44
Russell G. Attridge Jr., ’45
Jack R. Halvorsen, ’45
Bruce G. Pollock, ’45
Earl P. Whitson, ’45
Thomas H. Burke, ’46
Merton E. Hill, ’46
Robert L. Young, ’46, ’48, ’53
Leonard R. Fergin, ’48
Robert E. Brach Jr., ’49
Gordon S. Browne Jr., ’49
Donald W. Dooley, ’49
William D. Badger Jr., ’50
Kenneth B. Cox, ’51
Endrik Noges, ’54, ’56, ’59
Joel Marvil, ’57
Cedric E. Leer, ’58
Kenneth E. Houtz. ’59
Vernon A. Reisenleiter Jr., ’60
Kenneth J. DeWitt, ’62, ’65
Fredrick E. Johnson, ’62, ’64
Michael F. Elliott, ’63
David A. Lennert, ’63
Anthony Sances Jr., ’64
Daniel E. Benson, ’66
Glenn A. Ousterhout, ’73
Bruce I. Terman, ’74
Thomas P. Kisala, ’80
William J. Spyhalski, ’85
Eric M. Kos, ’01

Joel D. Marvil, 72, a McCormick graduate and life member of the McCormick Advisory Council, died November 20, 2006. Born in La Grange, Illinois, Marvil received his BS in chemical engineering in 1957, attending Northwestern on an ROTC scholarship. After graduation he was commissioned as an ensign in the U.S. Navy and served as a line officer on destroyers. In 1960 he joined Ames Rubber Corporation in Hamburg, New Jersey, as a project engineer and worked his way up to become president, chief executive officer, and chairman of the board. In 1993 Ames received the Malcolm Baldridge National Quality Award for Small Business, considered America’s highest honor for business excellence. In presenting the award, President Bill Clinton noted that “at Ames, it’s not unusual to find second- and third-generation employees with the company. The atmosphere is like a family and like a team. Workers even call each other teammates. … Joel Marvil has made his company a model in applying quality management.” He remained chairman of Ames after retiring in 2000. Marvil received of the 2003 Alumni Merit Award from the Northwestern Alumni Association. He is survived by his wife, Bonnie Ellis Marvil; a son, Timothy D. Marvil, and his wife, Meg; a brother, Richard A. Marvil; and three grandchildren.



David F. Schulz, 58, founding executive director of the Infrastructure Technology Institute (ITI) and adjunct professor of civil and environmental engineering at the McCormick School, died October 7 after an extended illness.

“Dave Schulz was central to Northwestern’s world-class work in transportation,” said McCormick School Dean Julio Ottino.

Schulz received his undergraduate degree in civil engineering from Purdue University and earned an MBA in public management from Northwestern’s Kellogg School of Management while he pursued graduate studies in transportation engineering at Northwestern. A transportation engineer and planner, Schulz joined Northwestern in 1992 as the first director of ITI.

“Dave brought faculty and staff together to make a broad impact on the field of continuous remote monitoring of civil infrastructure systems,” added Joseph L. Schofer, professor of civil and environmental engineering and associate dean for strategy and communications. “Through his leadership of ITI he facilitated its people, giving them the freedom to discover, achieve, and excel. He was a devoted teacher, an expert on transportation and public management, and an articulate spokesman for civil engineering and infrastructure. Dave was the expert that the media turned to first for a clear and informed understanding of contemporary transportation and infrastructure issues.”

Schulz was elected Milwaukee County executive in a landslide April 5, 1988, after previously serving as Parks Department director in Milwaukee. He also served on transportation planning agencies in southeastern Wisconsin and northeastern Illinois. Schulz also served as deputy public works commissioner and budget director of the city of Chicago. He is survived by his wife, Joann, and a son, Robert.

Megan Greenfield
works to connect graduate students across McCormick and Northwestern

While Megan Greenfield is a graduate student in the Department of Chemical and Biological Engineering, her advisers, Monica Olvera de la Cruz and Samuel Stupp, are professors in the Department of Materials Science and Engineering. She collaborates with students and faculty across the sciences — and is working to build a graduate student network at Northwestern.

As cofounder of the McCormick Graduate Leadership Council (MGLC), Greenfield has helped create an organization whose goal is to build the graduate student community at McCormick. She now serves as president of Northwestern's Graduate Student Association, which connects graduate students across the campus. She also works extensively with the Women's Center at Northwestern, which has honored her for her efforts in encouraging and mentoring women at the University.

What's your current research?

I study the self-assembly of small molecules into materials that can be used in regenerative medicine. Specifically, I study the role of electrostatic interactions in peptide amphiphile self-assembly with the aim of exploiting these interactions to make nanofiber networks that can direct cell behavior and faceted vesicles that can be used as drug-delivery vehicles. I spend a lot of my time in the Biological Imaging Facility — their equipment is perfect for my work. I'm their biggest fan!

Why McCormick?

I decided to come to Northwestern because of the many opportunities to collaborate across departmental and even school lines on biomaterials research. Once I was here, I saw Monica Olvera de la Cruz give a very passionate talk about the role of electrostatics, and once we figured out how to set up an experimental collaboration with Samuel Stupp, I was sold. I enjoy being part of two research groups because you have plenty of opportunities to learn about areas outside of your primary focus, and we have a lot of collaborations.

Tell us about MGLC.

Last spring Dean Ottino held a reception for graduate students that very few people attended. It was there that I met Binoy Shah (a graduate student in mechanical engineering), and together we discussed how we could improve graduate student life in McCormick. Over the course of the next few months we worked with Bruce Lindvall [assistant dean for graduate studies] and Gina Myerson [assistant dean and director of marketing] to put MGLC together. Previously, most events were department specific, and graduate students rarely interacted with students outside their departments. We wanted to change that, so we organized a group that plans academic, professional, and social events for all McCormick graduate students.

The group consists of two cochairs and two representatives from each department. This year Binoy and I are no longer cochairs, which I think is our crowning achievement. It's exciting to see people step up and take over the leadership of the organization. This fall 150 students showed up for our first event — quite a change from last year!

What are your other activities?

I'm president of the Graduate Student Association, which represents all the students in the Graduate School and advocates for improved health care and child care, protection of student rights, and better housing resources. We also hold financial seminars and social events, like the recent GSA 5K Run/Walk. This year we are rolling out a comprehensive department representative program to increase our communication with students, especially those in smaller programs.

My longest-standing involvement at Northwestern has been with the Women's Center. I help plan Northwestern's extensive Take Your Daughter to Work Day program; each year I strive to add more math, science, and engineering sessions to encourage the girls to become engineers. I'm also involved in intramural sports and just finished my first triathlon as part of the Leukemia and Lymphoma Society's Team in Training program to raise money in support of two of my friends who are battling blood cancer.

McCormick products are available online.

See the entire line of McCormick products at

http://northwestern.bkstore.com.

You can find the McCormick products

in the Campus Shop section of the site.

Fuko Tsuruta and Nicholas Sze, students in the Walter P. Murphy Cooperative Engineering Education Program, work for the Rise Group in Chicago's financial district. Learn more about Tsuruta's engineering design and communications project for the design of a library in an Evanston grade school on page 18.

NORTHWESTERN UNIVERSITY

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