LEFT TO THEIR
OWN DEVICES
Institute of Technology alumni bring life to medical device innovations >>

ALSO INSIDE:
IT students build wind turbine to help village in Nicaragua >>
Faculty expertise is key resource for Minnesota businesses >>
U of M civil engineering professor Heinz Stefan and other researchers at the University’s St. Anthony Falls Laboratory say their simulations show that cold-water fish (trout and cisco) would see their habitat reduced by 80 to 90 percent, while cool-water fish (walleye and northern pike) and warm-water fish (bass) would likely experience improved growth conditions.
Left to Their Own Devices • 8
Innovative IT alumni bolster Minnesota’s role as medical device mecca
BY KERMIT PATTISON

Winds of Change • 15
Institute of Technology students, high schoolers and local companies work together on building a wind turbine to help a village in Nicaragua
BY RICHARD BRODERICK

Our Business is Your Business • 18
Expertise of IT faculty and students provides critical resources for businesses near and far
BY SILVA YOUNG

Computing Success for a New Generation • 28
The inception of the Department of Computer Science and Engineering can be traced back to the early years of computing
BY ROBYN WHITE
U’s innovation is key to better state, world

In 2008, MINNESOTA WILL CELEBRATE its 150th year of statehood. Hundreds of events throughout the state will commemorate our past and celebrate who we are today. One of the themes of the yearlong celebration is innovation.

No other educational institution has a history of innovation that is as deeply intertwined with the state’s history as the University of Minnesota. For example, the state’s booming medical device industry got its start in Minnesota primarily because of technology developed on this campus. Institute of Technology alumnus Earl Bakken worked with University doctors to develop the first battery-operated pacemaker and went on to start Medtronic. The computing industry’s presence in Minnesota also can be traced directly to several University engineering alumni, including computing pioneer Seymour Cray who founded Cray Research.

Today, that spirit of innovation continues. An Institute of Technology survey conducted three years ago shows that our IT alumni have founded 2,600 active Minnesota companies that employ 175,000 people and generate $46 billion in annual revenue. That reach is even greater worldwide with IT alumni founding 4,150 active companies that employ 551,000 people and generate $90 billion in annual revenue.

Partnerships between the government, industry, and Institute of Technology alumni, faculty, and students extend throughout the state and beyond as clearly evidenced in this issue of Inventing Tomorrow.

In our cover story, “Left to Their Own Devices,” we profile three Institute of Technology alumni who have started their own companies in the medical device industry. They are part of the $25 billion medical device industry in Minnesota that employs many of our graduates and makes Minnesota a high-tech leader.

Last summer, the University also stepped up its efforts by launching a new Medical Devices Center aimed at strengthening interdisciplinary research, forging ties with industry and government agencies, and educating the next generation of innovators. The center is part of the new Institute for Engineering in Medicine, a joint initiative of the University’s Institute of Technology and the Medical School to foster collaboration between the biosciences, engineering, and physical sciences.

Our Institute of Technology students and faculty continue to play an important role for business in a variety of areas. In the last five years, research by Institute of Technology faculty has generated 324 intellectual property disclosures, 80 patents, and five startup companies.

In our story, “Our Business is Your Business,” we highlight how the University’s students, faculty, and resources have led to the building of a new Twin Cities facility for a Virginia-based company, new employees for a Denmark-based company relocating its U.S. headquarters to Minneapolis, and the start up of a new medical device company.

Our reach also extends worldwide. In the story “Winds of Change,” Institute of Technology students are working with local high school students and companies to build a wind turbine to help bring water to a small village in Nicaragua.

In the story, “Computing Success for a New Generation,” we show how the computer industry’s history parallels the growth of the University’s Department of Computer Science and Engineering. Today, the U continues to be a leader in digital technology research.

Our Donor Report in this issue highlights our support from business and private donations. This support has allowed us to continue to attract the best faculty and students who keep the Institute of Technology a center for new ideas to improve people’s lives.

With this continued support, I am confident the University will remain strong and continue to unlock the potential for innovation in our state, nation, and world.
Dear Inventing Tomorrow,

Thank you for the story in your last issue of Inventing Tomorrow about chemistry professor Wayland Noland. When I was a sophomore chemistry major at the U of M, he made room for me in his research group in 1959–1960.

During my senior year, he stopped by in the lab and asked, “Where are we sending you to graduate school?” Professor Noland then recommended two friends at other universities who could serve as a mentor. As a result of his question, I completed a Ph.D. in organic chemistry in 1967 and went on to work as a scientist at Zocon.

When reading the story, I was also reminded of another professor of the same era—the late physicist George Freier. He taught the IT primary physics course for chemistry majors. Noland made significant contributions to science and the economy, especially Minnesota’s economy, and because of these contributions he earned a reputation of scientific credibility. So I was dismayed to read the article in the Spring/Summer 2007 issue entitled “Energy Alternatives,” which calls into question the scientific integrity of your publication, and by extension IT.

The article states, “And, now, the latest report from the IPCC has confirmed what almost everyone has already accepted: human activity—in particular the creation of greenhouse gases through the burning of fossil fuel—is playing the lead role in potentially catastrophic global warming.”

Please allow me to deconstruct this claim, which represents an egregious error on the part of Inventing Tomorrow’s editors in allowing this into print.

• Reference to IPCC—IPCC is a UN policy body, not a scientific body. What the latest report from IPCC has confirmed is that the IPCC has wildly changed their predictions on global warming.

• “what almost everyone has already accepted as true”—This is not true! There are no tallies that I am aware of that note how many scientists support this theory and how many are “deniers” (in the words of Al Gore, a “D” science student at Harvard), nor should there be. Science is not determined by consensus. At one time almost everyone accepted that the sun revolved around the earth, but of course, majority rules is not science.

• “human activity is playing the lead role”—Human activity represents about 5 percent of atmospheric CO2. CO2 represents 15 to 20 percent of greenhouse gases, the lead role in greenhouse gases being played by water (80 percent of effect).

• “potentially catastrophic global warming”—About 30 to 40 years ago, “everyone” accepted global cooling as true, and that the earth would be “over populated.” This was not true then or now, and global warming is not a catastrophe. The earth has been warmer than it is now in many cycles throughout history. This natural fluctuation between relatively cold and warm temperatures has not caused catastrophes, and warming has been good for humans.

The science supporting global warming is flawed and corrupted because of the enormous amount of money involved for university research, politics [big ecology gives nine times more funding to congressional candidates than big oil], and big business [business, like GE wind turbines, will benefit the most from government mandated energy restrictions].

I recommend Inventing Tomorrow publish a future story on U of M research that debunks the consensus science of global warming and demonstrates how good science can protect public policy from money-driven alarmism.

Martin Willard [ChemE ’84]
Inventing Tomorrow

U.S. Department of Energy to fund new $45.6 million lab

The School of Physics and Astronomy has been awarded a $45.6 million, four-year co-operative agreement from the U.S. Department of Energy Office of Science to build a new international physics laboratory near the Ash River, about 40 miles southeast of International Falls, Minn.

Building the lab is the first step in an estimated $250 million project to be funded by the Department of Energy to further study neutrinos, fundamental building blocks of matter that can help researchers discover how the Universe was formed and how it will develop in the future.

The proposed laboratory, named the NuMI Off-Axis Electron Neutrino Appearance (NDvA) Detector Facility at Ash River Site, will be constructed on a 90-acre site about one mile south of Voyageurs National Park and will be operated by an international group of scientists known as the NDvA Collaboration.

This new laboratory expands the University’s international reputation as a leader in cutting-edge research on neutrinos. The University of Minnesota currently runs the Soudan Underground Science Laboratory near Tower, Minn., the only laboratory of its kind in the United States. The Department of Energy also provides funding for this laboratory.

“The planning for the NDvA Facility has been years in the making, and we’re very pleased that it will soon become a reality,” said U of M physics professor Marvin Marshak, a lead faculty member on the project. “This project will provide tremendous opportunities for our faculty and students to work with experts around the world on important research that could unlock clues to the formation of our Universe.”

When the new neutrino laboratory is completed, the University of Minnesota will collaborate with approximately 200 scientists and engineers from 33 institutions in seven countries to build a 15,000-ton neutrino detector and install this device in the laboratory. This neutrino detector will cost about $150 million. The Department of Energy is expected to provide most of these funds.

Computer researchers reveal new findings about Wikipedia

An ongoing study by University computer science researchers has revealed that only one-tenth of 1 percent of Wikipedia editors account for nearly half the content value of the free online encyclopedia, as measured by readership. In addition, the computer science and engineering faculty and students have discovered that few edits inflict damage on the content, and damage is typically fixed quickly.

The results of their study are reported in the academic research paper titled “Creating, Destroying and Restoring Value in Wikipedia.” The paper was published in the Association for Computing Machinery (ACM) Group 2007 Conference proceedings this fall.

The University of Minnesota study estimated a probability of less than one-half percent (0.0037) that the typical viewing of a Wikipedia article would find it in a damaged state. However, the researchers found that the chances of encountering vandalism on a typical page view increased over time, although the authors identified a break in the trend around June 2006, late in the study period. They attributed this to increased use of anti-vandalism bots.

University researchers involved in the study of Wikipedia include computer science and engineering professors John Riedl and Loren Terveen and Ph.D. students Reid Priedhorsky (project lead), Jilin Chen, Tony Lamm, and Katie Panciera.

“Our research suggests vandalism on Wikipedia is a relatively small problem today,” Terveen said, “but continued research is needed to contain that damage in the future.”
U of M astronomers discover ‘gaping hole’ in Universe devoid of all matter

**U of M astronomers discover ‘gaping hole’ in Universe devoid of all matter**

UNIVERSITY OF MINNESOTA ASTRONOMERS have found an enormous hole in the Universe, nearly a billion light-years across, empty of both normal matter such as stars, galaxies and gas, as well as the mysterious, unseen “dark matter.”

While earlier studies have shown holes, or voids, in the large-scale structure of the Universe, this new discovery dwarfs them all.

“Not only has no one ever found a void this big, but we never even expected to find one this size,” said astronomy professor Lawrence Rudnick. Rudnick, along with grad student Shea Brown and associate professor Liliya Williams, reported the findings in a paper accepted for publication in the *Astrophysical Journal*.

Astronomers have known for years that, on large scales, the Universe has voids largely empty of matter. However, most of these voids are much smaller than the one found by Rudnick and his colleagues. In addition, the number of discovered voids decreases as the size increases.

“What we’ve found is not normal, based on either observational studies or on computer simulations of the large-scale evolution of the Universe,” Williams said.

The astronomers drew their conclusion by studying data from the NRAO VLA Sky Survey (NVSS), a project that imaged the entire sky visible to the Very Large Array (VLA) radio telescope, part of the National Science Foundation’s National Radio Astronomy Observatory (NRAO). Their study of the NVSS data showed a remarkable drop in the number of galaxies in a region of sky in the constellation Eridanus, southwest of Orion.

A group of University structural engineering experts has begun an academic examination of the tragic I-35W bridge collapse. Civil engineering faculty Taichiro Okazaki, Roberto Ballarini, Ted Galambos and Arturo Schultz received a small grant from the National Science Foundation (NSF) for their research.

Another team of civil engineering faculty, including Henry Liu and David Levinson, received a small NSF grant to research traffic patterns after the bridge collapse.

**U of M astronomers discover ‘gaping hole’ in Universe devoid of all matter**

**IT math faculty win visualization award**

UNIVERSITY OF MINNESOTA MATHEMATICS professor Doug Arnold and assistant professor Jonathan Rogness received an honorable mention award in the 2007 International Science and Engineering Visualization Challenge for their video “Möbius Transformations Revealed.”

Set to classical music, the video demonstrates the beauty of complex mathematical functions. The video was featured along with the other winning entries this fall in the journal *Science*.

The competition, sponsored jointly by *Science* and the National Science Foundation (NSF), highlights exciting visual elements of science and engineering. More than 200 entries were received for the 2007 competition from 34 states and 23 countries representing every continent except Antarctica. The other two winning entries in the noninteractive media category were created by a professional science film production company and a 16-person NASA production team.

Möbius transformations are mathematical functions that send each point on such a plane to a corresponding point somewhere else on the plane, either by rotation, translation, inversion, or dilation. It may sound confusing, but after watching the simple and elegant explanation of Möbius transformations created by Arnold and Rogness, everything becomes clear.

The video demonstrates the transformations in two dimensions but then backs away and adds a third—placing a sphere above the plane and shining light through it. As the sphere moves and rotates above the plane, suddenly all the transformations become linked in a way that conveys visually in minutes what would otherwise take “pages of algebraic manipulations” to explain, Rogness said.

First released on YouTube in June 2007, “Möbius Transformations Revealed” has been viewed online more than 800,000 times.
Assistant professors Alptekin Aksan (mechanical engineering) and Yiannis Koutoulis (electronics engineering and materials science) have been named recipients of the Presidential Early Career Award for Scientists and Engineers (PECASE). Aksan was nominated for his work in the design and development of advanced composite materials for aerospace applications, while Koutoulis was recognized for his contributions to the field of nanotechnology.

Professor Massoud Amin (electrical and computer engineering) has been elected as a Fellow of the Institute for Infrastructure and Information Assurance. Amin was recognized for his contributions to the field of information security and his role in developing innovative solutions for the protection of critical infrastructure systems.

Associate professor Edgar Arriaga (chemistry) has been awarded the 2007-2008 University of Minnesota Feinberg-Lampert Award for excellence in teaching. Arriaga was recognized for his innovative teaching methods and his commitment to student success.

Professor Frank Bates, head of the Department of Chemical Engineering and Materials Science, has been named a Regents Professor, the University's highest faculty honor. Bates was recognized for his pioneering achievements in polymer science.

Professor Saif Benjaafar (mechanical engineering) has been elected as a Fellow of the Institute of Industrial Engineers (IIE). Benjaafar was recognized for his contributions to the field of operations research and management science.

Professor Jane Davidson (mechanical engineering) received the 2007 American Society for Engineering Education (ASEE) Charles B. Reed Award, which recognizes outstanding contributions to engineering education.

Professor Max Donath (mechanical engineering) received the 2007 George W. Taylor/IT Alumni Society Award for Distinguished Service.

Professor Bin He (biomedical engineering) was elected as the president of the Institute of Electrical and Electronics Engineers in Medicine and Biology (IEEE-EMBS) for 2008, and will serve in that position for the 2009-2010 term. He was recognized for his leadership and contributions to the field of biomedical engineering.

Professor Kenneth Heller (physics and astronomy) has been awarded an IEEE Distinguished Professorship.

Associate professor Marc Hillmyer (chemical engineering) has been awarded a George W. Taylor Award for excellence in teaching. Hillmyer was recognized for his outstanding teaching and mentorship of students.

Professor Saikat Mitra (computer science and engineering) has been elected as a Fellow of the Institute for Infrastructure and Information Assurance.

Professor C. N. R. Rao (chemistry) has been awarded the 2007 Alfred Bader Award in Geochemistry. Rao was recognized for his contributions to the field of geochemistry and his work on the development of new technologies for the extraction of rare metals.

Professor Yiannis Koutoulis (electronics engineering) has been awarded the 2007 American Chemical Society Award for Outstanding Contribution to Green Chemistry. Koutoulis was recognized for his work on the development of new technologies for the production of sustainable materials.

Professor Thomas H. Stüwe (chemistry) has been awarded an NSF CAREER Award for his research on the development of new technologies for the production of sustainable materials.

Professor Frank Bates (mechanical engineering) has been named a Regents Professor, the University's highest faculty honor. Bates was recognized for his pioneering achievements in polymer science.

Professor Saif Benjaafar (mechanical engineering) has been elected as a Fellow of the Institute of Industrial Engineers (IIE). Benjaafar was recognized for his contributions to the field of operations research and management science.

Professor Jane Davidson (mechanical engineering) received the 2007 American Society for Engineering Education (ASEE) Charles B. Reed Award, which recognizes outstanding contributions to engineering education.

Professor Max Donath (mechanical engineering) received the 2007 George W. Taylor/IT Alumni Society Award for Distinguished Service.

Professor Bin He (biomedical engineering) was elected as the president of the Institute of Electrical and Electronics Engineers in Medicine and Biology (IEEE-EMBS) for 2008, and will serve in that position for the 2009-2010 term. He was recognized for his leadership and contributions to the field of biomedical engineering.

Professor Kenneth Heller (physics and astronomy) has been awarded an IEEE Distinguished Professorship.

Associate professor Marc Hillmyer (chemical engineering) has been awarded a George W. Taylor Award for excellence in teaching. Hillmyer was recognized for his outstanding teaching and mentorship of students.

Professor Saikat Mitra (computer science and engineering) has been elected as a Fellow of the Institute for Infrastructure and Information Assurance.
Professor Allen Goldman, head of the School of Physics and Astronomy, has been elected to the National Academy of Sciences. Goldman was selected for his research contributions to superconductivity, a state in which electrons move freely and interact with very low resistance. His work, which built on studies in fluid mechanics, was among the first to explore superthin, two-dimensional metal films. His research helped construct metal films as thin as a few single atoms. Goldman has published more than 250 research publications and is frequently invited to lecture around the world.

Institut of Technology Dean Steven Crouch recently announced several appointments of faculty to leadership positions.

Professor Roberto Ballarini (civil engineering) has been appointed as head of the Department of Civil Engineering.

Professor Art Erdman (mechanical engineering) has been appointed to a part-time position as director of the new Medical Devices Center.

Professor Wayne Gladfelter (chemistry) has been appointed to a half-time position as interim associate dean for academic affairs through June 30, 2008.

Professor Fadil Santosa (mathematics) has been appointed the next director of the Institute for Mathematics and its Applications (IMA), effective July 1, 2008.

In memoriam

L. E. “Skip” Scriven

PROFESSOR L. E. “SKIP” SCRIVEN, a renowned professor in the Department of Chemical Engineering and Materials Science and University of Minnesota Regents Professor, passed away August 3, 2007, of complications from pancreatic cancer. He was 75.

During his illustrious career, Scriven authored more than 400 publications and advised more than 100 Ph.D. students in the department. His research program was internationally renowned, focusing on coating and coating processes. During his career, Scriven also made significant contributions to the fields of capillary hydrodynamics, enhanced oil recovery, colloid science, and the theory of interfacial phenomena.

In addition to his research program, Scriven was very involved in undergraduate instruction in the department. He was the champion for the Unit Operations Lab, the most important chemical engineering lab taken by undergraduates. Scriven also was an advocate for a team teaching program in the department. His graduate course in fluid mechanics was one of a kind. He spent years polishing and perfecting the course.

Marian Stankovich

PROFESSOR MARIAN STANKOVICH, a long-time professor of chemistry at the University of Minnesota, died suddenly on June 19, 2007. She was 59.

Stankovich was an expert in bioanalytical chemistry studying the function of enzymes. She primarily used electrochemical methods to study enzymes in electron transfer reaction. Her research serves as a building block to understanding diseases in the human body including Sudden Infant Death Syndrome.

“She was often the go-to person on using electrochemical methods to study enzymes and collaborated with other researchers here at the University and around the world,” said fellow University of Minnesota chemistry professor Peter Carr.

Stankovich joined the University of Minnesota faculty in 1981. She received her bachelor’s degree from the University of St. Thomas—Houston, Texas, in 1970 and her Ph.D. from the University of Texas—Austin in analytical chemistry in 1975.

She is survived by her brother, Joseph Stankovich; sister-in-law, Patrizia Stankovich; and niece, Emily Stankovich, all living in Houston; and by many colleagues, friends, and neighbors at the University of Minnesota and in the cities of Minneapolis and Houston.
Matthew Ogle, an IT alumnus and founder of Lumen Biomedical, demonstrates the FiberNet embolic protection system on a glass model of the human arterial system. Ogle has more than 75 publications and patents filed for medical applications such as calcification, restenosis, and antimicrobial resistance in the areas of embolic protection, drug delivery, medical adhesives, and coatings.
Innovative IT alumni bolster Minnesota’s role as medical device mecca

WRITTEN BY KERMIT PATTISON
PHOTOS BY JONATHAN CHAPMAN

ENTREPRENEUR MATTHEW OGLE stands in his R&D lab threading a thin wire into a glass model of the human arterial system. The object in his hand is the result of a five-year, $14 million quest—a filter system that catches the debris dislodged when physicians unblock clogged arteries.

He glances up at the framed artwork on a nearby wall—the famous 1932 photo of construction workers sitting on a beam high above New York City. “That’s the startup philosophy,” he said, “you’re sitting out there on the ledge.”

Such risk taking has made Minnesota a hotbed of medical innovation and one of the top medical device centers in the world. Ogle is one of many Institute of Technology alumni who are building on the foundation laid by pioneers like Earl Bakken, the University graduate who founded Medtronic, now the largest medical technology company in the world.

The University of Minnesota has spawned a long list of medical innovations: the oxygenator blood pump (1955) which made open heart surgery a common procedure; the battery-powered pacemaker (1957); and the bi-leaflet mechanical heart valve (1977) that revolutionized cardiac treatment. Hundreds of companies have gotten their start or expanded their business in Minnesota, including St. Jude Medical, Boston Scientific, Mentor, Transoma Medical and countless small startups. Minnesota has more than 580 FDA-registered medical device companies, which employ about 50,000 people. The largest 25 companies alone generate $25 billion in revenue, according to the trade organization LifeScience Alley.

Between 2000 and 2006, medical device jobs in the state rose by almost 24 percent—in contrast to a 13 percent decline in overall manufacturing jobs, according to the Minnesota Department of Employment and Economic Development.

The University of Minnesota has also stepped up its role. A new Medical Devices Center aims to strengthen interdisciplinary research, forge ties with industry and government agencies, and educate the next generation of innovators. The center is part of the new Institute for Engineering in Medicine, a joint initiative of the University’s Institute of Technology and the Medical School to foster collaboration between the biosciences, engineering and physical sciences.

“What we’re trying to do is sustain the state as the leading medical device area in the country, if not the world,” said Art Erdman, professor of mechanical engineering and director of the new Medical Devices Center. “If we don’t continue the seed funding, then we’re going to fall behind. There will be new products on the market and improved health care—that’s the bottom line. It’s going to be very exciting to see the advancements.”

The following stories of three IT alumni represent different segments of the industry. Gerald Timm has pioneered urological devices as both a professor and entrepreneur for four decades. Elaine Duncan uses her expertise to help companies develop new products. Matthew Ogle leads a small company that is launching a new system to more safely repair blocked arteries.

PRIVATE PARTS

Gerald Timm (EE ’63, M.S. ’65, Ph.D. ’67) has spent his career developing devices like penile prostheses and artificial sphincters. Thus it’s a bit of a delicate matter when somebody at a cocktail party asks, “So what do you do?”

“I’ll start with I’m in medical devices,” Timm said. If questioning persists, he gets more specific: urological devices.

“Some people are uncomfortable and once you get to urology that’s it,” said Timm. “Others want to know more—who uses those things? Why would they do that? Quite frankly, anytime people can talk about sex in a clinical setting that’s the way the conversation usually goes. People are curious.”

Timm is curious too—and his drive to discover has established him as one of the founding fathers of the urological device industry in the Twin Cities. He holds 21 U.S. patents and hundreds of international patents.
He has founded or co-founded five companies and developed devices that have found their way into the most intimate parts of our lives. Fifteen of his products have reached the marketplace and Timm estimates the combined sales at about $200 million per year.

Timm’s career developed in tandem with the local medical device industry. He grew up on a dairy farm outside Alexandria, Minn., and spent his youth getting up at 5 a.m. to milk cows. He came to the University to study engineering and planned to work in the burgeoning aerospace or defense industries.

After earning his Ph.D. in electrical engineering, he was recruited to join the faculty of the medical school. A neurologist recruited him to join a project team that used electrical stimulation technology from cardiac pacemakers to help people with bladder control.

At the time, the medical device industry was in its infancy and Medtronic was practically the only major player in the Twin Cities. In 1969, Timm was one of the founders of Mentor Corp, which was developing the bladder control technology, and three years later, he helped found American Medical Systems (AMS), which developed artificial urinary sphincters and penile prostheses.

For Timm, the University has always been an incubator for innovation. He could literally walk across the street and consult with colleagues in other departments. “The University has given me the freedom to think and interact with people from all different disciplines,” he said.

“When you get into a small company you’re so busy fighting off the wolves and dealing with production demands that you don’t have time to sit down and think.”

—GERRY TIMM

Gerry Timm has founded or co-founded five companies including GT Urological. Fifteen of his products have reached the marketplace and Timm estimates the combined sales at about $200 million per year.
Professor Dave Kittelson began working on renewable energy in the mid-1970s. That early experience put Kittelson in a good position for the research he’s pursuing today. “For example, on the artificial sphincter, when I first started putting fluid in these cuffs, I’d leave them on my desk and the next morning they’d be half full of air. I said, ‘gosh, does this thing have a leak in it?’ So I went over to chemical engineering, and they said, ‘Have you ever heard about osmosis?’”

Eventually, commercial demands pulled Timm away from the University. In 1976, he left the faculty to work full time for AMS. Later he started three more urological device companies: Dacomed, Timm Medical Technologies and GT Urological, his current venture which is developing products to treat urinary incontinence.

In 2003, Timm returned to the University as a professor in the Department of Urologic Surgery. “I’m interested in getting the next generation of researchers going in this area,” he said. “And I’m open to learning a little bit myself.”

The part-time appointment gives him the same thing it did three decades ago: an environment to discover. “When you get into a small company, you’re so busy fighting off the wolves and dealing with production demands that you don’t have time to sit down and think,” he said. “This is part of what brings me back—this is the only place I can really do that. I can sit down, talk to students and have an hour when nobody interrupts me.”

HAVE EXPERTISE, WILL TRAVEL

Elaine Duncan (M.S. ME ’81) loved the medical device industry, but she didn’t love the upheaval of small startups. So she designed the perfect niche for herself—as a consultant to medical device companies.

Duncan heads Paladin Medical, Inc., a consulting firm that specializes in regulatory and clinical strategies for the development of new medical technology. Over the last two decades, Paladin has served more than 200 client companies that have developed devices such as portable defibrillators and artificial knee ligaments.

Elaine Duncan’s company name, Paladin, was inspired by the lead character of the same name in the 1950s TV show “Have Gun—Will Travel” who tried to solve problems with his intellect before pulling his six shooter. Duncan studied engineering at the University of Kentucky. “Like almost everybody else, I wanted to be in the space program,” she said. “I actually thought I would design the interiors of spacecraft.”

As it turned out, her career led her north. She was recruited by 3M to its surgical medical division. She worked as senior research engineer on projects such as silicone hydrocephalic shunts, intraocular lenses, and dental prosthetics. She passed up an opportunity to work in Cape Canaveral, in part because 3M and the University of Minnesota offered a unique partnership that allowed her to work full time while attending graduate school at the Institute of Technology. She earned a master’s degree in mechanical engineering with a biomedical minor. Duncan designed her own curriculum and enriched her engineering education with classes in the history of medicine and history of technology.

“‘They didn’t spoon feed the information to you—you worked,’” she recalls. “‘The U of M gave me an independent and free-spirited place to learn.’”

Elaine Duncan
In 1983, she returned to Minnesota and spent four years working as vice president of new ventures for Possis Medical, Inc., in Minneapolis.

In 1987, Duncan founded her own company. “It allowed me to work on medical device development without the feast or famine,” she said. Over the last two decades, Paladin has served more than 200 client companies that have developed devices such as portable defibrillators, disc replacements, and artificial knee ligaments.

Paladin’s offices are in Duncan’s home near the St. Croix River. The house is another testimony to her education at the Institute of Technology. She designed a solar house for a heat transfer class—and later decided to build the house. The house is bermed into a hillside with large windows facing south for passive solar heat. It also has solar water heat, and Duncan plans to add photovoltaic panels to generate electricity. It’s a house designed to take full advantage of its environment.

Similarly, Duncan has taken advantage of the business environment. Minnesota is one of the top medical device centers in the U.S., along with Boston, the Bay Area, and Southern California. She said the University plays a central role in that success.

“It’s been a reservoir of talent and indirect support to the industry,” Duncan said. “If you want to test your products, you can get world-class clinical support without leaving town. This synergy of engineering, clinical, and medical device companies exists in four or five places in the U.S. It’s not only enriched my career, but also enriched the medical device industry here in the Twin Cities.”

HIGH TECH FIBER

Matthew Ogle’s (M.S. MatSci ’99) innovation was born from a casual conversation. In 2002, Ogle, then a rising star at St. Jude Medical, attended a medical conference in Verona, Italy, and chatted with an Italian physician who mentioned a recurring problem: after heart surgery 10 to 20 percent of patients suffered neurological problems. Debris dislodged by the repair of these diseased vessels was causing memory loss, strokes or subtle impairments that left patients unable to complete crossword puzzles they once handled with ease.

“That was the seed,” Ogle said. “I thought, ‘Hey, I can work on this.’”

Sitting in his office five years later, Ogle displays his solution. He is co-founder, president and CEO of
Matthew Ogle's company, Lumen Biomedical, has 23 employees, about half of whom have some connection to the University of Minnesota.
### Institute of Technology by the numbers—Fall 2007

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4,481</strong></td>
<td>Number of undergraduate students in the Institute of Technology</td>
</tr>
<tr>
<td><strong>2,540</strong></td>
<td>Number of IT graduate students</td>
</tr>
<tr>
<td><strong>801</strong></td>
<td>Number of incoming freshmen</td>
</tr>
<tr>
<td><strong>22</strong></td>
<td>Percent of women freshmen, an 11.9 percent increase from last year</td>
</tr>
<tr>
<td><strong>28.7</strong></td>
<td>Average ACT score of incoming freshmen, the highest of any college at the University</td>
</tr>
<tr>
<td><strong>96.6</strong></td>
<td>Percent of incoming first-year students who graduated in the top 25 percent of their high school class</td>
</tr>
<tr>
<td><strong>41</strong></td>
<td>Number of National Merit Scholars in the freshman class, the most of any college at the University</td>
</tr>
<tr>
<td><strong>1330</strong></td>
<td>Average SAT score of incoming freshmen, the highest of any college at the University</td>
</tr>
<tr>
<td><strong>1,000</strong></td>
<td>Percent of increase of IT students participating in international experiences in the last decade</td>
</tr>
<tr>
<td><strong>$20,254</strong></td>
<td>Estimated yearly costs for an undergraduate student taking 13 credits and living on campus</td>
</tr>
<tr>
<td><strong>$24,995</strong></td>
<td>Average loan debt for a U of M graduate in 2006</td>
</tr>
<tr>
<td><strong>30</strong></td>
<td>Percent of undergraduate students receiving University scholarships</td>
</tr>
<tr>
<td><strong>$15 million</strong></td>
<td>Amount of money raised in FY07 for IT student scholarships and fellowships</td>
</tr>
<tr>
<td><strong>$4,161</strong></td>
<td>Average size of a U of M scholarship for students in 2006</td>
</tr>
<tr>
<td><strong>$27 million</strong></td>
<td>Overall amount of money raised by IT in FY07 from private donations for collegewide initiatives</td>
</tr>
<tr>
<td><strong>5,800</strong></td>
<td>Number of Institute of Technology alumni, friends, corporate, and foundation donors in FY07</td>
</tr>
<tr>
<td><strong>990</strong></td>
<td>Number of IT undergraduate degrees granted in 2006–2007</td>
</tr>
<tr>
<td><strong>68</strong></td>
<td>Percent of 2006–07 bachelor’s degree graduates who secured jobs in Minnesota</td>
</tr>
<tr>
<td><strong>664</strong></td>
<td>Number of IT master's and doctoral degrees granted in 2006–2007</td>
</tr>
<tr>
<td><strong>About 400</strong></td>
<td>Number of IT tenured and tenure-track faculty</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Number of current IT faculty who are members of the National Academy of Engineering or the National Academy of Sciences</td>
</tr>
<tr>
<td><strong>324</strong></td>
<td>Number of intellectual property disclosures generated by Institute of Technology faculty in the last five years</td>
</tr>
<tr>
<td><strong>More than 56,000</strong></td>
<td>Number of living Institute of Technology alumni</td>
</tr>
<tr>
<td><strong>2,600</strong></td>
<td>Number of active Minnesota companies founded by IT alumni</td>
</tr>
<tr>
<td><strong>$46 billion</strong></td>
<td>Annual revenue generated by Minnesota companies founded by IT alumni</td>
</tr>
<tr>
<td><strong>4,150</strong></td>
<td>Number of active companies founded by IT alumni worldwide</td>
</tr>
<tr>
<td><strong>551,000</strong></td>
<td>Number of employees working in companies worldwide founded by IT alumni</td>
</tr>
<tr>
<td><strong>$90 billion</strong></td>
<td>Annual revenue generated by companies founded by IT alumni worldwide</td>
</tr>
</tbody>
</table>

Sources: University of Minnesota, University of Minnesota Foundation
Winds of Change

Institute of Technology students, high schoolers, and local companies work together on building a wind turbine to help a village in Nicaragua.
THE VILLAGE OF LA HERMITA is the kind of out-of-the-way place not uncommon in Nicaragua, one of the poorest countries in the Western Hemisphere. Located on a small elevated clearing a half-hour ride up a dirt road from the city of Jinotega, in the rugged northwestern part of the country, the village is home to roughly 25 families—a total of 120 residents, all of them related to one another, who cultivate crops identical to those grown in pre-Columbian times including corn, beans, and squash.

About a half-mile away, there is a freshwater spring, but no means of pumping the water upslope to La Hermita, which is off the country’s electrical grid. Each day, villagers must make the exhausting trek down to the spring to fill up water cans only to haul them back up the hill. This particular daily task, however, is about to change, thanks to the University of Minnesota’s chapter of the National Society of Black Engineers (NSBE).

Bridging the cultural divide
Working in collaboration with students at North High School in Minneapolis, M. A. Mortenson Company, and Cummins Power Generation, University of Minnesota Institute of Technology students in the NSBE group, created the B.R.I.D.G.E. (Building Resources and Innovative Designs for Global Energy) Project. Last year, they designed and built a prototype wind turbine constructed from the kind of scrap materials found almost anywhere in the world, including La Hermita. The turbine is capable of generating 750 to 800 watts—more than enough to power a small pump that could pump the water from the spring uphill to the village.

Last summer, a delegation from the project visited La Hermita to meet the local people and scout out the location’s suitability for power generation from wind energy. This March, another delegation plans to return to Nicaragua to help villagers construct an on-site wind turbine.

“ THE turbine we designed can be made out of scrap parts from old motors, pipes, and sheet metal that can be cut and shaped into aerodynamic propellers,” said Christian Haddad, a senior majoring in electrical engineering and current president of the NSBE chapter. “Our objective for the wind turbine was to ensure that it could be built and operated at low cost by local people almost anywhere in the world.”

“The villagers were very appreciative and very welcoming. I can’t tell you how much they fed us!” recalls Lorna Grauvilardell, a sophomore majoring in chemical engineering. A native of Argentina, Grauvilardell served as interpreter for last summer’s delegation. “They were also very interested and curious about us as people and also in the project.”

In addition to constructing the wind turbine, the villagers will operate it and keep records of wind speed and power output—tasks Grauvilardell says they are eager to take on. Once it is up and running, the turbine will not only pump water to a cistern in the village but also will power a battery-charging station. Many residents of La Hermita have 12-volt deep-cycle batteries that will provide DC lighting.

Electrical engineering senior Tomi Jolaade-Adewale is one of several students from the U of M’s student chapter of the National Society of Black Engineers who regularly visits Minneapolis North High School to teach high school students basic engineering concepts. The University students are also working with the high schoolers on building a wind turbine prototype that will be reconstructed in Nicaragua to help pump water.
Outreach extends near and far

The B.R.I.D.G.E. Project grew out of a summer program in 2006 for female and minority students entering the Institute of Technology. Professor Paul Imbertson, an electrical and computer engineering professor, worked with students in the program and serves as the faculty advisor for the student chapter of NSBE, which has about three dozen members.

“I gave my students the task of designing a wind turbine from scrap,” he explains. When some of his NSBE students became involved in assisting with the summer program, they decided to take the idea back to the chapter as the basis for a renewable energy project. After several brainstorming sessions, the group fleshed out the details of what eventually turned into the B.R.I.D.G.E. Project. “It boils down to three components,” Imbertson explained. “Outreach to high school students here in Minnesota, implementation of the project design in a developing country, and the creation of a bridge from that developing country back here.”

The NSBE students approached North High because one of the students in IT’s summer program had graduated from the school. One of the goals of NSBE is to encourage diverse students, particularly those of African-American heritage, to consider academic and professional careers in engineering. Despite this previous connection, the ambitious undertaking was greeted by the high school with a certain degree of skepticism.

“I didn’t want any broken promises,” said Angela Osuji, a North High chemistry teacher who coordinates the school’s small learning community for students interested in science, math, or technology-related careers. “I wanted a real commitment,” she said. “And that’s what I got. We’ve all really appreciated the level of dedication on the part of the NSBE students and professor Imbertson.”

Building a better future

“Dr. Osuji explained to us that many of her students don’t believe in themselves,” recalls Haddad. “They don’t think they’re smart enough because they’re black. Those of us involved in NSBE at the University of Minnesota thought, well, we’re not psychologists but we can show them that being smart can be cool.”

Twice a week, NSBE students and other Institute of Technology students visit North High. One of the weekly sessions is devoted to discussions of basic engineering concepts, while the other session is spent constructing prototype turbines.

At one of the first sessions, when Haddad asked how many of the North High students wanted to attend the University of Minnesota, a few raised their hands. When he asked how many wanted to go into science or engineering, no hands went up. “Later in the year, we asked that question again,” Haddad said. “Half of them raised their hands!”

Throughout the last year, NSBE solicited and received funding, as well as technical support, from local firms Mortenson and Cummins. Volunteers from both companies work side by side with the students from NSBE and North High School. Volunteer Hassan Idowu (CivE ’04), a field engineer with Mortenson, commutes one day a week to North High from a job site in southwest Minnesota where he is helping to build a wind farm with 137 GE turbines.

“From the company’s standpoint, Mortenson is dedicated to helping the community and introducing high school kids to science and technology by showing them that they are exciting fields that are open to everyone,” Idowu said. “From a personal standpoint, I was really excited about the project because I was a member of NSBE when I was an engineering student at the U of M and wanted a chance to mentor high school kids.”

The start of something more

NSBE’s return to Nicaragua this March will not be the end of the B.R.I.D.G.E Project. Even more ambitious goals are already in the works.

“Once we’ve finished in Nicaragua, we plan to do the same in an African country,” said Abdi Hashi, a senior majoring in electrical engineering and last year’s NSBE chapter president. “We’re already researching a list of countries. Even though we will complete our work in La Hermita, we will continue to offer the villagers assistance as needed.”

“The ultimate goal of this project is to build bridges with communities,” Imbertson said. “If we form a bridge with a community somewhere, we can’t just walk away from it. It’s a commitment we have to keep.”

For more information on the B.R.I.D.G.E. Project or to find out how you can help, visit www.umnbridge.org or contact Paul Imbertson at imbertson@umn.edu or 612-625-6529.

Munira Masoud, an electrical engineering senior, points with excitement at the small motor built by a North High student.
Inventing tomorrow
fall/ winter 2007-08

Mechanical engineering professor Will Durfee (left) oversees a team of graduate students, including electrical engineering Ph.D. student Kin-Joe Sham (right), who are part of the University's New Product Design and Business Development Program. The students are working with startup company Nesos Health to develop a functional prototype and determine the economic viability of a new product to alleviate knee pain.

Our business is
THE PHONE RINGS QUITE A BIT these days at the University of Minnesota’s Academic and Corporate Relations Center (ACRC). From a business executive looking for a strategic way to spend the company’s year-end money to a client seeking venture capitalists for a startup company, the center gets up to 20 requests a day from businesses.

“When the calls come in, it’s pretty much soup to nuts,” said Dick Sommerstad, ACRC director. “We help businesses any way we can because we know it will almost always pay off for the University in some way. It’s a lot of matchmaking. If we can’t connect them here at the U, we’ll tell them where they can find what they need, and we’ll do it in 48 hours.”

As the front door to the University, the center assisted hundreds of businesses last year with relationship managers acting as their corporate concierge, and provided free services valued at more than $3.5 million for businesses, which included sponsoring workshops, seminars, and conferences.

For the University, the ACRC also generates new revenue. In its first year of operation, the ACRC generated about $2.1 million in fees-for-services revenue from hundreds of businesses. Any time a new sponsored research agreement is reached, a faculty member is hired as a consultant, or a collaborative agreement is signed, it’s incremental revenue the University would not have had. For the State of Minnesota, it means new businesses and more jobs.

According to Sommerstad, the expertise of Institute of Technology faculty and students play a key role in the University’s mission to strengthen its ties with the business community.

“The Institute of Technology is one of the units within the University that is in high demand because of its engineering and technology programs,” Sommerstad said. “Engineering, science, and technology grads are highly valued in the workplace. In addition, the Institute of Technology has gems like the Characterization Facility. We’ve had business executives tell us they’ve looked all over Asia to find the equipment that the Characterization Facility has all in one location here at the University.”

A closer look at three recent success stories illustrates how the ACRC and the Institute of Technology are working hand in hand with business to improve the economic vitality of the state and the nation.

Knee-deep in pain relief
Nesos Health, LLC

Jagi Gill, founder of Nesos Health, literally had ideas scribbled on a napkin when he contacted the ACRC for help in bringing his external device for arthritic knees to the marketplace. He asked how he could use the services of University students to help him make a prototype that would eventually be submitted for patent.

Evaluating Gill’s request, the ACRC brought the idea to the attention of mechanical engineering professor Will Durfee, who coordinates the University’s New Product Design and Business Development Program.

Students in the New Product Design and Business Development Program learned from their research that there is a $1 billion market for osteoarthritis products and market potential for Nesos Health’s noninvasive device that delivers electromagnetic therapy to the knee to help alleviate pain for those who suffer from arthritis.
The program provides opportunities for six-person teams of graduate students in engineering and business to develop business plans and create working product prototypes for participating local companies.

“The students in the program work to answer three important questions—Does anyone want the product? Can we build it? Is anyone going to make money with it?” explained Durfee. “For a relatively small investment, anyone with a product idea can test the waters with us to see if they should bring the product to market.”

From their research and based on the $1 billion market for osteoarthritis products, the student team learned that market potential exists for Nesos Health’s noninvasive device that delivers electromagnetic therapy to the knee to help alleviate pain for those who suffer from arthritis.

“The students really helped me give definition to the gizmo, which consists of a disposable, quarter-sized component that provides the electromagnetic therapy, and a cloth-based knee wrap to hold the component in place,” Gill said.

One of those team members is Kin-Joe Sham, a Ph.D. student in electrical engineering and now an employee of Nesos Health. Although Sham’s expertise lies on the technical side, he and his team members spent most of the first semester determining the device’s market feasibility.

“The great thing about the University’s New Product Design and Business Development Program is that you get to see the full operational picture of how to start up a company,” Sham said. “There was no separation of jobs, and all the students became very cross-functional. We learned from each other.”

It’s been nearly two years since Gill approached the ACRC. Today, Nesos is housed in the St. Paul-based University Enterprise Laboratories, Inc. (UEL), a collaborative research center where bioscience startups have access to office infrastructure and laboratory space. The firm has completed the fundraising necessary to apply for approval from the Food and Drug Administration (FDA), and is poised to begin clinical trials in 2008. This year’s student team is currently working on a functional product prototype, which it hopes to complete by the end of this year. The company continues to seek ways to manufacture the product cost-effectively, and find venture capitalists willing to invest in the company.

Through it all, the University has made the difference. “There is an empirical, if not exponential, difference between an idea on the back of a napkin and rendering that idea into a provisional patent,” Gill said. “I could not have done this on my own without the help of the University.”

**Taking Flight**

**Victory Systems, LLC**

Duane Cox, Victory Systems chairman and CEO, was attending a meeting of the Defense Alliance of Minnesota when he met the University’s ACRC director, Dick Sommerstad, in September 2006. His company, which is based in Woodbridge, Va., specializes in cutting-edge robotics—specifically, unmanned vehicles for defense and commercial use.

Cox explained to Sommerstad that he had just received a large contract with the U.S. Army for his company’s new high-performance drone helicopter. Before production could start, he needed to find a wind-tunnel facility that was capable of testing the one-seventh-scale model of the helicopter, which incorporates artificial intelligence in the control systems. He had looked at several facilities nationwide, but felt they didn’t meet all of his needs.

Upon gathering Cox’s requirements, Sommerstad and Ron Antos, a relationship manager at the ACRC, put him in touch with Gary Balas, professor and head of the Institute of Technology’s Depart-
After evaluating the department’s facilities, services and expertise, Victory Systems decided it fit the bill for the testing required for their contract with the Army. A service agreement with the University was drawn up to use the department’s wind-tunnel facilities as well as the services of Greg Nelson, a University aerospace engineering and mechanics staff scientist, who has been on the project since February.

For Victory’s purposes, the Army is interested in characterizing the helicopter and determining if it has the performance level necessary for military use. “The company is looking to optimize the fuselage design by minimizing drag,” explained Balas. “You obviously want the wind resistance to be as low as possible. The less wind resistance you have, the higher the helicopter’s performance and speed.”

The department’s two wind tunnels, located on campus in Akerman Hall, are used for student instruction, research and outside contracting. One is a large closed return (re-circulating) tunnel, the other a smaller open (blow down) tunnel.

“Our wind tunnels are instrumented to collect a variety of information concerning both wind tunnel and test subject performance. Tunnel air temperature, barometric pressure, differential pressure, and balance force and moment values can be configured, and data collected digitally in real time,” Balas said. “The closed tunnel is capable of airspeeds of about 90 mph; the open tunnel maximum is about 85.”

As Victory’s helicopter testing proceeds and its design takes flight, the company is building facilities in Burnsville, Minn., and moving most of its operations from Michigan to Minnesota. The company expects to employ about 1,000 people—many
Inventing tomorrow  fall/winter 2007-08  

additional scientists and engineers will be needed. “Many of those positions may be filled by our IT graduates,” Sommerstad said. “Businesses come to the ACRC looking for solutions, expertise, equipment, and resources. Yet, the number one thing they look to the University of Minnesota for is employees—our students.”

“We wanted to make sure Coloplast in the United States was positioned and positioned in a location and geography that allows us to tap into the best...talents in the U.S.”
—STEVE AUGUSTINE

As Coloplast adjusts to Minnesota, Jim Woodman, ACRC business relationship manager, is helping the company connect with several University research resources, including the Institute of Technology’s Characterization Facility, located in the basements of Shepherd Labs and Nils Hasselmo Hall on the University’s East Bank campus.

The facility is filled with state-of-the-art equipment that can engage in an impressive variety of research, utilizing surface and thin-film analysis, electron microscopy, X-ray diffraction, or other tools.

“We get calls from industry-based scientists who need to run specific tests but don’t have access to the right equipment. Their company either can’t afford to hire analytical research staff or buy its own equipment, or the usage rate wouldn’t justify the expense,” said Greg Haugstad, director of the Characterization Facility. “We work with about 60 industrial companies in a typical year, ranging from small startups to multinational corporations. These interactions include analytical service, training for independent use, and research collaboration.”

Coloplast has made several other connections at the University. The company has signed on as a premier sponsor of the Design of Medical Devices Conference, which will be held in April 2008, and has joined IPRIME, the Industrial Partnership for Research in Interfacial and Materials Engineering, an organization that focuses on creating opportunities for professionals in industry to collaborate with students and researchers at the University. Additionally, many of the company’s employees—from senior executives to team leaders—have been introduced to numerous continuing education opportunities at the University.

The SenSura Click is one of Coloplast’s products developed for ostomy care. The University was a draw for the Denmark-based medical device company’s recent decision to consolidate its U.S. headquarters in Minneapolis.

NEW KID IN TOWN COLOPLAST

Denmark-based Coloplast first connected with the ACRC following the company’s announcement in May 2006 to acquire the urology division of Mentor Corporation, located in northeast Minneapolis. Coloplast, a 50-year-old company that specializes in manufacturing and marketing medical devices and services, chose to consolidate its U.S. operations in Minneapolis primarily because of the University’s reputation in medical technology research and the medical device industry expertise in the region.

“We wanted to make sure Coloplast in the United States was poised and positioned in a location and geography that allows us to tap into the best...talents in the U.S.,” said Steve Augustine, Coloplast vice president for human resources. “Absolutely, the University was a draw.”

Upon hearing of Coloplast’s acquisition, the ACRC met with the company’s local leadership in June 2006 to help fill 130 positions throughout the company. In September, the company consolidated its facilities from Santa Barbara, Calif., and Atlanta, Ga., to Minneapolis, and began plans for a new corporate campus on West River Road in Minneapolis that will house office, research and development and production activities. During the first year, of them engineers—within the first three years of operation.

That’s good news for the state’s economy. “Minnesota would spend thousands to attract a company with 1,000 employees,” Sommerstad said. “Once they are up and running, they will need accountants, human resources people, and all the support staff that make up an organization. The bottom line is that Victory is a high-tech company that is here in Minnesota because of the University’s Institute of Technology.”

“The bottom line is that Victory is a high-tech company that is here in Minnesota because of the University’s Institute of Technology.”
—DICK SOMMERSTAD
“Joining IPRIME is one of the best ways for industry professionals to access the talent and resources available at the University,” Woodman said. “Not only can members identify potential future employees through early contact with students, they have the opportunity to collaborate with faculty on research.”

Coloplast is well-known and well-respected in the European market. With plans to focus on the U.S. market, Coloplast intends to strengthen its ties in the Twin Cities as they expand its new U.S. headquarters.

“The people in Denmark have made it a priority to build lots of relationships with the University of Minnesota,” Sommerstad said.

THE BOTTOM LINE

According to ACRC staff, business and industry look to large research universities, like the University of Minnesota, to be a fountain of resources. Businesses expect ready-for-hire graduates, continuing education opportunities for employees, consulting services from University faculty, access to state-of-the-art research facilities, and more.

Many universities have programs in place to strengthen ties with the private sector. However, Sommerstad believes none are as comprehensive as what the University of Minnesota offers.

“With more than 22,000 organizations in our database alone, we can get to just about anyone in the world,” Sommerstad said.

“We focus primarily on Minnesota companies, but we are expanding our reach far beyond our state’s borders. It’s all about connecting people from the U of M to companies throughout the nation and the world,” he said. “When that works, lots of good things happen—students get hired, the University gets additional resources, the state gets more jobs and companies get the help they need to succeed.”

FOR MORE INFORMATION visit www.business.umn.edu
AMY DANIELSDN contributed to this story.

greg haugstad, director of the institute of technology’s characterization facility, is working to build new connections with coloplast and other medical device companies to use the facility’s state-of-the-art equipment and services on a fee-for-services basis.

“We focus primarily on Minnesota companies, but we are expanding our reach far beyond our state’s borders. It’s all about connecting people from the U of M to companies throughout the nation and the world. When that works, lots of good things happen.”

—dick sommerstad
Connections can make a difference

SEVERAL YEARS AGO, one of the students I mentored was having a crisis about whether she should continue pursuing her goal of becoming an engineer. Scientifically gifted with an outgoing personality, she was worried a career in engineering meant living in a world of isolation.

We can all picture the stereotypical engineer with an impressive understanding of complex machines and programs, but who can’t carry a conversation. Her perception of engineers was stereotypical, and I assured her that it was not generally the case. I suggested she “shadow” me for a day to learn about my job as an engineering consultant. When she saw through her own eyes that I did not sit in a cubicle all day long, but had a great deal of interaction with clients and co-workers, she exclaimed, “This is wonderful, I can be an engineer!”

Even after all these years, I still remember how her face lit up when she finally realized all engineers are not introverts, and she could have the career she dreamed of.

From that mentoring experience, I discovered alumni can participate in the University community in more ways than financial. Even with very little investment of themselves, they can have great impact.

The Institute of Technology’s Mentor Program, which began in 1991, is one of the best ways students can learn about an industry or career path—directly from those who have been there and done that. For alumni, there is no better way to become involved in the life of the University than to become involved in the life of a student. In the process, connections are made to build a strong community that extends beyond the campus.

Being a mentor is not always about resumes and career paths. Guidance can be broad in scope encompassing everything from tips on finding an apartment to advice on transitioning to life after college.

I was a student at the U but I found an excellent one at my first job. My own relationship with that mentor lasted almost 30 years. I not only learned engineering technique from him, but how to manage client relationships, how to run a business, and ethics. These things can be learned at the University, but a mentor can tie them together and give them life in ways that the academic approach can’t.

Many alumni may think they have nothing of value to offer. But whether you’re a recent graduate who is just starting out or you’re a seasoned expert with 50 years of experience, you have more to offer than you may think. Sometimes listening to and understanding a student’s concerns is all it takes.

Your relationship with the University and its students should not end when you graduate. Instead, you can become part of the greater University community—past, present, and future.

I’m inviting you to make a connection to your University by participating in the Mentor Program. Give a few hours of your time. It can be as simple as a telephone conversation or an e-mail, reviewing a resume, providing a network opportunity, or extending an invitation to tour your organization. You can also volunteer for more involved activities such as presenting information for a special class or seminar. The opportunities are endless.

Just get involved. There are lots of ways to inspire young minds. Whether your mentoring activity is a quick phone call or a life-long friendship, you will make a difference when you least expect it.

FOR MORE INFORMATION visit www.it.umn.edu/mentor
Fueling the future of discovery

Chemical engineering and materials science Ph.D. graduate student David Rennard amazes a group of middle school students as he ignites methane bubbles during an interactive workshop on fuels and alternative energy. The session was part of a daylong event this fall sponsored by the Institute of Technology Alumni Society (ITAS). About 150 Minnesota students in grades 4–8 visited the University to learn about energy as they prepare for the LEGO League competition. This year’s competition, sponsored by the local nonprofit group Innovations in Science and Technology Education (INSciTE), will challenge students to build small robots using LEGO technology to demonstrate energy management and conservation.

IT hosts homecoming event

Dennis Cronin (Aero ‘88, M.O.T. ’06) and his wife Beth were two of about 200 alumni and friends who attended a special Institute of Technology Homecoming event that featured games, prizes, and a performance by the Physics Force. To see more photos, visit www.it.umn.edu/homecoming.
THANKS TO THE GENEROSITY of our alumni, friends, and corporate and foundation donors, our college received record level philanthropic support in fiscal year 2006–07. The Institute of Technology received more than $27 million in support for undergraduate scholarships, graduate student fellowships, academic program enhancements, research, and faculty professorships and chairs. On behalf of our students, faculty, and those worldwide who benefit from the college’s innovations, I want to express our sincere gratitude.

Private philanthropy will remain a vital and essential resource to maintain our position as a premier educator and to solve our world’s challenges in energy, the environment, and health care. To achieve these goals, IT Dean Steven Crouch has identified three top fundraising priorities.

Recruiting and Retaining World-Class Faculty

The single greatest key to the quality of the college and its programs is the quality of its faculty. We must improve our ability to compete with other well-known research institutions to attract and retain the best faculty and to provide conditions in which they can develop to their full potential. Endowments are an important way to help and may be established at various levels ranging from $500,000 to $5 million.

Attracting and Supporting Exceptional Students

**Undergraduate scholarships** are essential to ensure our programs are more accessible to high-ability students with financial need from diverse populations. To meet this need, the college has set a goal to secure an additional $10 million in endowed scholarships.

**Endowed graduate student fellowships** enable us to recruit highly qualified students from around the world, and develop those students into the nation’s most sought after doctoral graduates. To improve recruitment and enhance the experience of incoming students, the college seeks to provide a first-year fellowship to every incoming doctoral student, requiring an additional $10 million in annual support.

**Qualifying endowed scholarships and fellowships** receive a one-to-one match from the University, thereby doubling the impact of your gift. Named endowed student funds may be established for a minimum gift of $25,000. Endowments at larger amounts can make an even greater lasting impact. For example, a $250,000 endowed graduate fellowship provides one-fourth of a graduate student’s tuition and an endowed scholarship fund of $100,000 provides one-half of an undergraduate student’s tuition.

Creating State-of-the-Art Facilities

A **new Physics and Nanotechnology building** is needed for our University to compete with other top universities. Keeping classrooms and labs up to date is a constant and expensive priority. Physics—fundamental to technological study—occupies a historic, lovely building, which is entirely out of date. A new building with an attached nanotechnology center is part of the U of M’s six-year capital plan. The Physics building will require significant private support.

A **welcoming student center** is a priority for the Dean to enhance the undergraduate experience. We are in the process of raising nearly $7 million in private support to renovate Lind Hall to create an undergraduate student center that provides a welcoming space for a variety of services including advising.

You will hear more about Dean Crouch’s exciting and relevant vision in the coming months. Your support will help to make that vision a reality. Thank you for investing in the Institute of Technology and for helping us invent tomorrow—today.
IT celebrates record year of giving

THIS PAST FISCAL YEAR, more than 5,800 alumni, friends, corporate, and foundation donors gave a record amount in gifts and pledges to the Institute of Technology. The total raised was just over $27 million, which was an increase of nearly 250 percent in private support compared with the previous year.

Of the total received, a $4 million gift was secured for the new Gemini Chair in Management of Technology, a $10 million gift will support graduate fellowships, and eight new endowed undergraduate scholarships and 10 new graduate student fellowships will be established. Additionally, Campaign FIRST, the fundraising campaign for fellowships in the Department of Chemical Engineering and Materials Science (CEMS) reached $13 million toward its goal of $20 million.

Overall, giving and pledges to the U were up in fiscal year 2007. The total was $251 million, a 39 percent increase from a total of $181 million in fiscal year 2006. “We are very pleased with the support our donors have shown,” said Steven Crouch, dean of the Institute of Technology. “These gifts are crucial to maintaining the excellence of our programs, attracting top faculty, recruiting the best and brightest students, and supporting research that will improve our everyday lives.”

An artist’s rendering of the proposed renovation plans for the north end of the first floor of Lind Hall showcases a Student Welcome Center, which will meld the historic feel of the building with modern amenities.

IT launches campaign to raise funds for Lind Hall renovation

The Institute of Technology has launched a fundraising campaign this fall to fund a renovation of the first floor of Lind Hall to become the academic home for the college’s undergraduate students.

Known for many years as the Main Engineering Building, Lind Hall was built in 1912. A visit to today’s Lind Hall clearly shows that the building does not meet the technology-driven demands of Millennial Generation students. The facilities are in disrepair and offices are configured in isolation from one another preventing seamless services for students.

“Our goal is to enhance the educational experience and opportunities for undergraduate students in the Institute of Technology by improving facilities for academic advising, tutoring, study-abroad planning, diversity and outreach programming, and career services,” said Paul Strykowski, IT associate dean for undergraduate programs.

Renovation plans would enable staff with similar job functions to be grouped together creating an environment where they can share best practices and meet the increasing needs of future students.

In addition, the newly renovated Lind Hall will serve as a welcome center for alumni and prospective students visiting campus and a central gathering location for alumni, faculty, and students at campus events.

It will also create one convenient location on campus where industry partners can interact with Institute of Technology administrative leaders and with students to talk about jobs, internships, and other partnership opportunities.

Total projected renovation costs are expected to be about $7 million. The estimate includes important infrastructure improvements such as upgrading the building to meet fire codes, accessibility requirements, asbestos abatement and historical preservation.

The funds needed for the renovation will come entirely from private donations as there is no state money for this project.

Renovation is expected to begin in fall 2008 and be completed by fall 2009.

Office of Development
Institute of Technology
105 Walter Library
117 Pleasant Street SE
Minneapolis, MN 55455
itdevelopment@umn.edu
www.it.umn.edu/giving
612-624-5537
800-587-3884

TO MAKE A GIFT
To support a project you’ve read about in Inventing Tomorrow or to designate a gift for any purpose, you may contact a development officer directly or call 800-587-3884 for more information.

DEVELOPMENT TEAM
The Institute of Technology’s experienced development team can help you determine your best options for supporting the college. They can give you information about college programs with funding needs that match your interests and that best fit your financial situation.

Kim Dockter
External Relations Director
612-626-9385
dockter@umn.edu

Jennifer Clarke
Senior Development Officer
612-626-9354
jclarke@umn.edu

Anastacia Quinn Davis
Development Officer
612-625-4509
aqdavis@umn.edu

Sally Euson
Development Officer
612-625-6035
euson@umn.edu

Jennifer Pogatchnik
Senior Development Officer
612-626-9501
pogat005@umn.edu

Cheryl Pruden
External Relations Associate
612-624-5537
pruden@umn.edu

Annalisa Strohschein
External Relations Assistant
612-626-7637
annalisa@umn.edu
Computing success for a new generation

The inception of the Department of Computer Science and Engineering can be traced back decades to the early years of computing. From punch cards to multicore processors, computer science and engineering at the University of Minnesota has come a long way. In fact, the inception of the Department of Computer Science and Engineering (CSE) can be traced back decades to the early days of computing, in which many Minnesotans played a pivotal role.

In the 1940s, University computing courses started to emerge in the form of numerical analysis and control devices classes. Soon after, there was a growing interest in computing and its applications to mathematics, physics, chemistry, and economics. Several University departments, along with local companies like Honeywell Aeronautics, were making use of the University’s Reeves Electronic Analog Computer (REAC), which was state-of-the-art in 1949.

Still, not everyone could see the potential and promise of computing. “People didn’t think that working on machines to solve problems was a good idea,” said CSE founder Marvin Stein with a coy grin.

At that time there were only six computers in the country and there were few classes on the subject. Thanks to Stein and others at the University, that was about to change.

In 1955, the University was granted 400 hours on an ERA 1103 computer and the University’s School of Mathematics created a class for high-speed computation. In the class, taught by Stein, students learned about computing machines, called “electronic brains” by some at that time. Stein lobbied for the University to acquire more time on computing equipment and eventually to purchase its own computers, which it did later in 1958.

Throughout the early 1960s, an interest in computing continued to flourish at the University. Stein and a group of faculty members began to notice the need for new areas of computational research not covered in mathematics.

“[Students] wanted to be computer scientists, not mathematicians,” he said. In 1967, the University of Minnesota established a graduate program for Computer and Information Sciences and by the spring of 1970, the University formally established the Department of Computer Science, later renamed Computer Science and Engineering.

During the past four decades, the department has become a dynamic part of the Institute of Technology and is often a hub for interdisciplinary collaboration. The University has awarded more than 4,000 bachelor’s, 1,400 master’s, and 399 doctoral degrees in the areas of computer science and engineering. The department has grown to almost 40 faculty members and the annual research expenditure has steadily grown to around $8 million. In addition, faculty and graduates have formed more than 180 companies in Minnesota and beyond.

Current CSE faculty are leading experts in many computer science specialties and the curriculum is constantly upgraded to reflect the latest scientific and technological advances. The areas of study include: computer architecture and compilers, bioin-
formatics, data mining, graphics and visualization, high performance computing, human computer interaction, networks, security, robotics, artificial intelligence, software engineering, and theoretical foundations.

Researchers in these fields regularly participate in interdisciplinary projects impacting areas of health care, homeland security, computer security, and space exploration. For example, CSE Professor Nikolaos Papanikolopoulos and his students developed the Scout robot and refined it for military use in search and rescue, and reconnaissance operations. It is now being used in Iraq, where robots, not soldiers, are used in dangerous missions. CSE Professor Joseph Konstan is also developing ways to prevent HIV using online learning tools. These projects are saving lives and making an impact on society.

This excellence has not gone unnoticed. In 2007, CSE was ranked third in the Faculty Scholarly Productivity Index in a study reported in the Chronicle of Higher Education and ranked ninth for Citation Impact of Published Research Papers by Science Watch. CSE is also one of only five computer science departments in the nation with multiple recipients of the Presidential Early Career Award for Scientists and Engineers (PECASE). CSE faculty also received 16 National Science Foundation Faculty Early Career Development (CAREER) Awards, since the inception of the program in 1995. This number of awards is among the highest for Computer Science departments nationwide.

The department has become one of the most vibrant and dynamic departments in the college, University, and the computer science field. Vipin Kumar, CSE Department Head and William Norris Professor, said that the department’s present and future success is due to a strong connection to the past.

“The CSE department builds upon the glorious history of computing in Minnesota, which includes the first general purpose computer, Atlas, developed by Engineering Research Associates (ERA), a number of computing giants, including Unisys, Control Data, and Cray Research, as well as a thriving software industry,” he said. “The CSE department is truly poised for a bright future.”

BY ROBYN WHITE

FOR MORE INFORMATION see www.cse.umn.edu

THEN
(Left) Institute of Technology interim dean Frank Verbrugge (standing) looks on as Professor Marvin Stein demonstrates the Control Data 6600, one of the U’s early computers used in the late 1960s. (Right) Verbrugge and Stein inspect magnetic tape.

NOW
(Below) Professors Victoria Interrante and Gary Meyer are two of the U’s current computer science and engineering faculty. Interrante’s research focuses on virtual reality technology, while Meyer’s specialty is in color reproduction.