INVENTING TOMORROW

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Researchers map both ends of the globe

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PHOTO BY CLAIRE PORTER
A QUICK SCAN THROUGH THE ARTICLES in this issue of Inventing Tomorrow shows that the impact of the College of Science and Engineering is felt near and far. Our alumni, students, faculty, and staff are involved in business, research, education, and outreach projects that extend around the globe.

In the cover story, our researchers show how they are literally going “to the ends of the Earth.” For the last five years, earth scientists in the University of Minnesota’s Polar Geospatial Center (formerly called the Antarctic Geospatial Information Center) have engaged in the groundbreaking work of taking hundreds of thousands of two-dimensional aerial and satellite images of the Antarctic and turning them into high-resolution and 3D maps. Now they are expanding their work to the Arctic. These images are used to plan logistics, such as where to land a plane or locate field camps, but are also used to drive science in important ways. Recently, scientists have been using the images to get a first-ever, accurate count of Emperor penguins. The research also gives our undergraduate and graduate students unique educational experiences.

Our students show their international awareness in the article “Winds of Change.” Members of the new student group, called Innovative Engineers, are using their passion, ingenuity, and engineering savvy to build a wind turbine community in Nicaragua. This turbine will bring reliable electricity to remote communities for the very first time. The students are working to build a sustainable partnership that will make a difference in the lives of many people.

In the story “Inventing the Future Together,” we show that our alumni are the backbone of many global science and technology companies. Our alumni are inventing life-saving medical devices, developing cereals you eat every morning, working to fuel the future, and taking on our society’s greatest challenges. We continue successful partnerships and connections with many corporations to maintain our educational excellence and provide the next generation of business leaders.

In our Retrospect story, we show how our college’s UNITE program offers freedom and flexibility in education using new technologies. Today’s Internet-based technology allows students to participate in College of Science and Engineering courses from almost any location around the world.

Innovation and global awareness have long been a hallmark of our college. New developments will ensure this continues. Construction started this fall on a new state-of-the-art building that will make a significant impact in advancing research and educating the next generation of high-tech workers. The facility will also spur new faculty and industry collaborations that will keep us at the leading-edge of research throughout the 21st Century.

This is truly what our college is all about as we are Inventing Tomorrow—Today.
To see these videos and more featuring College of Science and Engineering faculty, students, and alumni, visit our page on YouTube at www.youtube.com/umncse.

**Giant space blob glows from within**
Claudia Scarlata, University physics and astronomy professor, is part of an international collaboration that has shed light on the power source of a rare vast cloud of glowing gas in the early Universe.

**Little rolling robot transforms into helicopter**
Researchers from the University’s Center for Distributed Robotics have created a robot that can wheel over various terrain, then become airborne when rolling no longer works.

**Robotic system for monitoring carp in lakes**
Computer scientists in the College of Science and Engineering and biologists are developing robotic boats to locate and follow radio-tagged carp as part of a new approach to control populations of the nonnative fish.

**CSE winter light show—Aurora Digitalis**
College of Science and Engineering students created a dazzling winter light show to showcase their electrical engineering and computer programming skills.

**Gender imbalance on Wikipedia**
University computer science researchers are leading a team that has confirmed a substantial gender gap among editors of Wikipedia and a corresponding gender-oriented disparity in the content.

**Wind turbine construction time lapse video**
Watch a time-lapse video of the recent construction of a wind turbine at the University of Minnesota’s Eolos Wind Energy Research Station at UMore Park in Rosemount, Minn.

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More than 1,800 alumni and friends have joined us on the College of Science and Engineering Facebook page at facebook.com/umn.cse. Also follow us on Twitter @umncse for the latest news about the college.
Wind energy research begins at UMore Park in Rosemount

A 2.5 MEGAWATT WIND TURBINE now is generating energy at the University’s new Wind Energy Research Station at UMore Park in Rosemount, Minn.

For at least the next 15 years, UMore Park will be the host site for one of the most unique wind research stations in the country. The research station is comprised of a 420-foot wind turbine and a 426-foot meteorological research tower.

The University of Minnesota was one of three university consortia to be awarded a U.S. Department of Energy (DOE) wind energy research grant in 2009. The $7.9 million award to the University’s St. Anthony Falls Laboratory in the College of Science and Engineering, funded through the American Recovery and Reinvestment Act (ARRA), supports an academic-industry consortium focused on wind energy research and education activities. It also includes construction of the U.S.-made 2.5 megawatt Clipper Liberty wind turbine. The Wind Energy Research Station will host not only active consortium research, but also education and training of next generation wind industry workers.

The research group, called EOLDS, will focus on capturing more energy from the wind, improving wind farm design, minimizing the turbine’s impact on radar, reducing noise, preventing ice build-up on the blades, monitoring turbine performance, and improving turbine blade structure.

“This new Wind Energy Research Station is about promoting research collaborations between academia and industry to improve wind energy efficiency and reliability,” said Fotis Sotiropoulos, director of the St. Anthony Falls Lab and consortium leader. “This is about helping the nation reach the goal of producing 20 percent electricity from wind by 2030 through cutting-edge research and work force training.”

For more information about the Wind Energy Research Consortium, visit eolos.umn.edu.

U.S. Department of Energy officials, industry partners, political leaders, and University administration recently “switched on” a new 426-foot-tall wind turbine at the University of Minnesota’s Wind Research Field Station at UMore Park in Rosemount, Minn. The research field station is dedicated to research and education and will help the United States move toward the goal of 20 percent wind energy by 2030.
THE COLLEGE OF SCIENCE AND ENGINEERING’S fall 2011 freshman class is the most academically prepared and the largest with 917 students. The average ACT composite score increased from 30.1 last year to 30.4 this year, the highest of any college at the University and the highest ever for the college. This is nearly three points higher than the 27.5 average ACT score just 10 years ago.

The College of Science and Engineering has about half of the University’s National Merit Finalists while the college’s freshmen only make up about 17 percent of the incoming class on the Twin Cities campus. In addition, 98.4 percent of this year’s incoming first-year students graduated in the top 25 percent of their high school class.

The number of first-year female students in the college remains at an all-time high with 232 or 25.3 percent of the total incoming class. Just 10 years ago the college had 151 women first-year students (17.9 percent). The overall number of applications for admission has skyrocketed in recent years from about 2,500 applications in 2000 to more than 9,000 for this year.

“We are very pleased that we continue to attract top-notch students into our science, mathematics, and engineering programs,” said Paul Strykowski, associate dean for undergraduate programs. “We think prospective students see that we value both classroom instruction and research to create a quality educational experience for undergraduate students.”

THE $6.6 MILLION RENOVATION of Lind Hall, which began early last summer, continues to progress, transforming its first-floor into an up-to-date student hub for College of Science and Engineering undergraduates.

When completed later this year, the remodeled area will provide a one-stop-shop space where students can access a multitude of services including new student orientation, academic advising, tutoring, study abroad programs, career planning, and diversity programs.

According to Paul Strykowski, associate dean for undergraduate programs for the College of Science and Engineering, the reconfigured space also will be more inviting to potential students and will better serve undergraduates. A welcome area will make it easy for prospective students and their families to explore careers and tour campus. “We want to help them easily understand how to make their college experience richer and more rewarding,” he said.

Electronic signage, including plasma screens, and other technology donated by 3M, will provide information to students about upcoming deadlines, meetings, and more. There will be space for student organizations, including shared conference rooms that facilitate collaboration. A coffee shop located on the first floor will provide another place to connect with fellow students.

Built in 1912, Lind Hall is nearing its 100th year. Even though the building’s first-floor layout will be completely reworked and updated with new technology, the historic integrity of the building is being maintained.

The college’s Student Services, Career Center, and Academic Advising departments have been housed in Shepherd Labs next to Akerman Hall during construction. When completed, all those departments will be joined into one central location in the heart of campus.
U researcher among team that finds evidence of climate change warning deep under the Dead Sea

AN INTERNATIONAL TEAM of scientists, including University earth sciences professor Emi Ito, has found evidence that the Dead Sea nearly disappeared about 120,000 years ago. The results were presented at a meeting of the American Geophysical Union last fall and raises questions about how the warming climate will affect the endangered sea.

Conducted over a 10-year period, the research was done to study the climate and earthquake history in the region and to understand the history of the Dead Sea, which has been drying up at dramatic rates in recent decades.

As a result of both evaporation and intensive human demands for water from inflowing rivers, the surface of the lake has been going down by 3 to 5 feet each year, and the lake’s rate of shrinking seems to be accelerating. From 2000 to 2008, levels dropped 26 feet, with another 5 feet lost in 2010.

The research team penetrated some 750 feet of muddy sediment near the sea’s center, under 900 feet of water, then hit a layer of nearly pure pebbles, underlain by some 120 feet of salt. The salt suggests to them that the lake dried quickly, precipitating out solids. The pebble layer represents an ancient beach that filled the lowest level of the basin as the lake was drying up completely or nearly so, the researchers propose.

Experiments in the past using water from the Dead Sea had suggested that the lake could not disappear totally because the loss of water would concentrate salt within the lake, inhibiting further evaporation. But the new findings call that assumption into question. Climate forecasts suggest that the region will grow warmer and drier in the future, said Ito.

“The Dead Sea level is currently decreasing very quickly because humans are using all of the fresh water sources,” said Steven L. Goldstein, a geochemist at Columbia University’s Lamont-Doherty Earth Observatory and one of the project leaders. “The evidence it has dried down in the past without any human intervention, means that the water that is currently flowing and completely used actually stopped running. If forecasts of increasing aridity turn out to be correct, such conditions could return soon.”

“The Dead Sea has witnessed so much of human history from the migration of early humans out of Africa, habitation by early Stone Age people all the way to the Near East politics of today,” Ito said. “To think that we, the humans, are helping it perhaps dry up, is very sobering.”
Giant space blob glows from within

ACCORDING TO RESEARCH by an international team of scientists, including University physics and astronomy professor Claudia Scarlata, a rare vast cloud of glowing hydrogen gas called a Lyman-alpha blob is powered by galaxies embedded within it. It’s the first time anyone has demonstrated that the source of light in the blob emanates from brilliant galaxies hidden within it rather than from the gas throughout the cloud.

“This discovery is significant because it tells us something about how galaxies are able to acquire fresh gas, in other words, the fuel needed to form new stars and grow bigger,” said Scarlata.

Lyman-alpha blobs are some of the biggest objects in the universe. They can reach diameters of a few hundred thousand light-years and are as powerful as the brightest galaxies. They are typically found at large distances—the light from the blob under scrutiny in this study has taken about 11.5 billion years to reach Earth.

U research team discovers new source to generate “green” electricity

A UNIVERSITY RESEARCH TEAM, led by aerospace engineering and mechanics professor Richard James, has recently discovered a new alloy material that converts heat directly into electricity. This revolutionary energy conversion method is in the early stages of development, but it could have wide-sweeping impact on creating environmentally friendly electricity from waste heat sources.

According to the researchers, the material could potentially be used to capture waste heat from a car’s exhaust that would heat the material and produce electricity for charging the battery in a hybrid car. Other possible future uses include capturing rejected heat from industrial and power plants or temperature differences in the ocean to create electricity. The research team is looking into possible commercialization of the technology.

To create the material, the research team combined elements at the atomic level to create a new multiferroic alloy, Ni45Co5Mn40Sn10. Multiferroic materials combine unusual elastic, magnetic, and electric properties. The alloy Ni45Co5Mn40Sn10 achieves multiferroism by undergoing a highly reversible phase transformation where one solid turns into another solid. During this phase transformation the alloy undergoes changes in its magnetic properties that are exploited in the energy conversion device.

“This research is very promising because it presents an entirely new method for energy conversion that’s never been done before,” James said. “It’s also the ultimate ‘green’ way to create electricity because it uses waste heat to create electricity with no carbon dioxide.”

The team’s research was recently published in the first issue of the new scientific journal Advanced Energy Materials.
Winds of Change

College of science and engineering students use their technical education to power developing communities with wind energy.

Members of Innovative Engineers, a College of Science and Engineering student group, hoist the tower for their 1-kilowatt wind turbine in La Hermita, Nicaragua. Alejandro De la Mora, a 2010 civil engineering graduate (squatting) was one of four students who founded the group that designs and implements renewable energy technologies in the developing world.
It may be difficult to imagine, but it’s a fact of daily—and especially nightly—life that nearly a quarter of the world’s population has no electricity in their homes. It’s also a global problem that Innovative Engineers, one of the University of Minnesota’s newest student groups, is eager to help solve with renewable energy technologies.

In just its third year, more than 150 students from all engineering disciplines in the University’s College of Science and Engineering expressed an interest in joining Innovative Engineers this fall. This growing interest clearly demonstrates how enthusiastic the college’s students are to use their technical skills to impact the world.

“It may sound cliché, but our group is truly passionate about developing imaginative and creative ways to design and implement renewable energy technologies in the developing world,” said David Giacomin, Innovative Engineers president and civil engineering student. “We have close to 90 solid members now. It’s really exciting.”

The inspiration for Innovative Engineers started in May 2009 when Alejandro De la Mora, a 2010 civil engineering graduate, traveled to Scandinavia with other University of Minnesota engineering students to participate in a College of Science and Engineering Global Seminar.

The three-week seminar, which was led by Paul Imbertson who teaches in the Department of Electrical and Computer Engineering, focused on renewable energy production methods and included visits to wind farms, power plants, hydro facilities, and solar component manufacturers.

During the seminar, De la Mora became intrigued by wind power and its ability to shape the future. He spoke to Imbertson about his desire to build a wind turbine. With Imbertson’s help, it wasn’t long before De la Mora and four fellow engineering students began designing and constructing the wind turbine in Imbertson’s basement. That following semester, Innovative Engineers was officially founded, and Imbertson became advisor of the group.

“It says a lot about our faculty to give us use of their [Imbertson’s] basement. It certainly isn’t in his job description,” said Scott Morton, former president of Innovative Engineers and mechanical engineering student.

Imbertson’s leadership style is very hands-off. He tells us what he thinks and asks probing questions, yet in the end, he lets us blaze our own trail and learn from our mistakes. He helps us to develop skills that will make us better engineers,” Morton added.

The answer is blowing in the wind

Located a half-hour ride up a dirt road from the city of Jinotega, in the northwestern part of Nicaragua, one of the poorest countries in the Western Hemisphere, is the village of La Hermita. With a population of about 120—or 25 families—it’s a close-knit community where residents cultivate crops like corn, beans, and squash and where meager electrical devices are powered by old car batteries.

In 2006, the University’s chapter of the National Society of Black Engineers (NSBE), which Imbertson also advises, built a wind turbine for the village of La Hermita to power a community water pump. Similarly, Innovative Engineers saw a need they could fulfill for the village with their own wind turbine project.

Before the wind turbine was built, village residents traveled regularly to the nearest town by horseback to have their batteries recharged. The process could take up an entire day.

“They just wanted to be able to turn on a light bulb and listen to the radio so they could get their news and know what’s going on in the country.”

—Scott Morton

After several trips to La Hermita, this past summer Innovative Engineers completed the wind turbine, which now sits on top of a beautiful mountain. It generates one kilowatt of electricity—enough to recharge batteries so they will last about three weeks.

“A lot of teamwork and relationship building with local Nicaraguan students and businesses, as well
as with the La Hermita villagers, went into getting the wind turbine up and running,” said Alejandro Ojeda, Innovative Engineers Global Coordinator and biomedical engineering student. “The experience was a real hands-on education. I just went to build something, but came back learning so much more—marketing, public speaking, leading and managing a group, and gaining a much broader perspective of the world.”

Although wind power generates electricity and convenience for La Hermita, the group cautions that they are not out to change the cultural way of life for its residents.

“We don’t want to be seen as ‘rescuers,’” Morton points out. “We want to help them understand how they can progress with this renewable technology as a community through education and by expanding our relationship.”

“To put it another way, it does no good to give someone a clock if that person doesn’t know how to tell time,” said Giacomin. “We’re here to educate the community and empower them with knowledge in the process.”

Changing the world, one turbine at a time

Now that one turbine is up and running, the group has even greater plans for this small Nicaraguan community.

Innovative Engineers’ newest project, coined “5-5-1”, consists of designing and developing five wind turbines in five nearby villages to create one renewable energy community. All aspects of 5-5-1 are shaped around one central idea—to understand how the knowledge behind a simple low-cost wind turbine design can be successfully transferred across cultural, economic, and language boundaries. It’s an ambitious project that requires cash, connections, and brainpower. Costs are estimated to be about $17,000, which includes wind turbine materials, support tower fabrication, tower components, and half of the travel and lodging expenses for several students.

The group plans to teach the Nicaraguan village communities how the turbines work and how to repair them. Once the village communities understand how the turbines function, the group hopes the residents will be able to alter and modify the designs so they can construct new wind turbines and replacement parts independently, ultimately discovering new designs and solutions for their own success.

“So far, we have a passionate group, a lab in Keller Hall, and help from the Department of Mechanical Engineering’s machine shop. We also have our first successfully completed wind turbine that will serve as a template for future models made of low-cost, recycled materials,” Giacomin said. “Now we just need the financial support.”

Even though Innovative Engineers receives some money from the University for being an organized student group, the group is responsible for raising their own funds and finding resources necessary for projects.

“That’s where we have an opportunity to develop our marketing skills,” Ojeda said. “We plan to work on more fundraising this year by promoting ourselves to various organizations. Some of our college’s departments and centers already have helped. In addition, several corporations have provided discounted and in-kind materials.”

Considering their shoestring budget, the students pay at least half of the costs to travel to Nicaragua, typically lodging at low-cost youth hostels and camping out in the rural areas.
“One night we were camped in an area where animals wandered freely, including a horse that nearly scared me to death,” Morton said.

The students also have saved money on shipping materials to Nicaragua through their creative ways. “We took apart the generators and carried the pieces in our baggage,” Giacomin said. “I stuffed an oscilloscope—an instrument that measures wave action—in my luggage on one trip.”

**Becoming better engineers**

While Innovative Engineers continues to refine its goals and objectives, the group has plans to move forward in other areas of renewable energy. Projects are currently under way to develop hydropower in Nicaragua, harness untapped energy in oceanic waves, create a more aerodynamically efficient blade for wind turbines, and produce a very inexpensive, mobile, functional wind speed meter.

A large part of the group’s philosophy is also to make a positive impact through education and outreach. They actively promote science, technology, engineering, and mathematics (STEM) subjects in the developing world as well as locally in Minnesota to middle schools and high schools.

“We believe that a smart world is built with smart people, and passion is the ultimate driving force. We want to share that passion with young students by inspiring them about science and technology and what we’re doing,” said Ojeda.

Although most CSE students who participate in Innovative Engineers are pursuing rigorous engineering programs that require a great deal of studying outside of class, they are up to the challenge as evidenced by their growing numbers.

“Time management is key to being in this student group. The last time I went to the movies was more than a year ago,” said Ojeda, who would like to work for a medical device company after he graduates. “I’m interested in health care and medical innovation. I want to see science and technology serve a useful purpose to improve the standard of living for all people, and I believe health care provides a great starting point for that.”

For Giacomin, whose career interests lie in finding ways to use the world’s resources more efficiently, there’s no downtime. “This group is my fun, and it doubles as my social life,” he said. “It gives me the chance to work with my hands, and it makes you feel that there’s a lot in this world you can change.”

“This group attracts students who want to experience and strive for their own creativity,” Giacomin added. “It teaches us how to become better professionals. We learn from each other, we work hard, and we’re not afraid to get our hands dirty.”

![Finished wind turbine](image-url)
Without question, Antarctica is one of the harshest, most inhospitable places on Earth.

During the polar winter, temperatures can plummet to 100 degrees below zero over a near-empty landscape made up of broad icy plateaus and jagged ranges of bare rock. So alien is the continent that regions of Antarctica are studied as analogues for the terrain on Mars.

“It was just totally foreign to my sensibility,” recalls research fellow Claire Porter of her first visit to Antarctica two years ago. “There was no green anywhere. In Minnesota, even in the dead of winter, there are pine trees. It was very stark.”
Maps of the “poles” created by College of Science and Engineering researchers are driving science

“...There are 1,200 people at McMurdo whose only reason for being there is to do science. It’s a bad place for free time—but a wonderful place to concentrate and work.”

—PAUL MORIN

It’s also deceptive. In the crystal clear air—there is virtually no humidity in Antarctica—and with little to provide a sense of scale, rock outcroppings or mountains glimpsed in the distance look much closer than they really are. “We’d look across the valley and see a rock and guess it would take a half hour for us to reach it,” Porter said. “Two hours later, the rock I initially thought was waist high would turn out to be several times my height and much farther away than we first imagined it to be.”

Porter is a remote sensing scientist with the Polar Geospatial Center (PGC) in the University’s College of Science and Engineering. In 2009 she joined the center as a graduate student and was hired as a full-time staff member after completing her degree.

The Polar Geospatial Center began life in 2007 as the Antarctic Geospatial Information Center (AGIC) with a $400,000 per year award from the National Science Foundation. At the time, its founder and director, Paul Morin led a team of four that engaged in the groundbreaking work of taking hundreds of thousands of two-dimensional individual aerial and satellite images of Antarctica and turning them into high-resolution and 3D maps of the largely unmapped continent. In the spring of 2011, the organization received a five-year, $4 million grant from the NSF to expand its work to cover the Arctic as well as Antarctica, transforming the AGIC into the PGC.

Each Austral summer—roughly December through February—Morin, Porter, and other PGC members make the long trek to Antarctica to continue their work. Despite—or because of—the remote location and extremes of climate and topography, the continent is a hub of scientific research, drawing scientists and logistical support personnel to the United States’ McMurdo Station. As Morin describes it, “There are 1,200 people at McMurdo whose only reason for being there is to do science. It’s a bad place for free time—but a wonderful place to concentrate and work.”

For as much as 20 hours a day, researchers at the station, he said, “do science and talk science and it’s incredibly fertile.” It’s also, as he puts it, “very multidisciplinary—everyone has read everyone else’s papers.”

McMurdo’s hothouse environment makes it an ample place of opportunity for undergraduate and graduate students working with PGC. Following his first trip to Antarctica two years ago, Spencer Niebuhr, who began working with the center as an undergraduate student, completed three internships in New Zealand and Australia with Antarctic researchers. He is one of less than a dozen undergraduate students at the station. “You can’t buy this experience,” Niebuhr said.
Each year the PGC sends staff to the Antarctic from October to January, where the center conducts its own on-site cartography. Among the fruits of this work are the PGC’s 3D models of all three of Antarctica’s permanent stations and new, much more detailed mapping of frozen lakes located in the McMurdo Dry Valley region.

In addition to supporting researchers’ scientific needs, the PGC supplies invaluable logistical support and locating safe places to land aircraft. Now a research assistant with the PGC, Niebuhr plans to seek a master’s degree in remote sensing. “That’s not what I thought I was going to pursue,” he said. “But I just find it fascinating that we can do so much with satellite imagery.”

As of today, the PGC possesses what Morin calls “seamless coverage” of 90 percent of the Arctic region and 85 percent of the 14.5 million square miles in Antarctica. It provides an array of geospatial services and applications through the United States Antarctic Program (USAP) and now to researchers in the Arctic as well.

The center produces on-demand maps, GIS analysis (a geographic information system, or GIS, integrates hardware, software and data) including spatial, spectral and 3D analysis, and develops new software. It also serves as a repository of earlier maps of both the Arctic and Antarctica—a storehouse that now contains several hundred thousand images—directing researchers to the data they need and then accessing that material for them.
craft on frozen terrain often obscured from view by weather conditions. They also create detailed maps of supply routes for overland traverses, find good sites for establishing field camps, and analyze the landing sites of instrument-bearing balloons as they circumnavigate the polar regions, among other things.

The services provided by PGC have not only made it easier for researchers working at the poles to do their work, it has also advanced that work’s scope and accuracy. “What researchers want is not to do [mapping] themselves,” said Michelle LaRue, a PGC biologist. “They want someone to work with them. They want collaborators.”

LaRue, whose graduate degree is in zoology, cites a recent example of this collaborative approach. Researchers have been using PGC imagery to conduct a census of emperor penguins circling Antarctica. “After working on the data I saw that the same approach could be applied to seals,” she explains.

She followed up by contacting University of Minnesota wildlife ecologist, Robert Garrett, who is studying Weddell seals. “I asked if they were interested in working together,” she recalls. “They said, ‘Absolutely.’”

This spirit of enterprise, observes David Marchant, a professor of earth sciences at Boston University who works with the PGC in his search for clues to prehistoric climate change in the ice of Antarctica’s glaciers, places the center in a category of its own.

“It used to be that science drove imagery,” he says. “Paul Morin and the Polar Geospatial Center have turned that around. Now they are creating imagery that’s driving science.”

Although the Polar Geospatial Center is only five years old, its origins go back much further.

More than 20 years ago Morin, then a University undergraduate and self-described “computer nerd,” was hired by University of Minnesota earth sciences faculty member David Yuen to do programming.

“Paul Morin and the Polar Geospatial Center have turned that around. Now they are creating imagery that’s driving science.”

—DAVID MARCHANT
Polar launch

Shaul Hanany, University professor of physics and astronomy, wants to make one thing clear: research conducted by faculty in the College of Science and Engineering may take them to the poles, but it certainly doesn’t stop there. In fact, it takes them to even more remote places—to the very origins of the Universe.

Like his fellow faculty member, associate professor of physics and astronomy Clem Pryke, Hanany is a cosmologist—someone who studies the origins of the Universe. Toward that end, he and Pryke work with separate research groups that study the cosmic microwave background radiation (CMB), the faint electromagnetic remnant of the energy released during the Universe’s explosive birth some 14 billion years ago. As the Big Bang’s “signature,” the CMB has already revealed important information about the nature, causes and composition not just of the Big Bang itself but of what is known as the inflationary period that took place immediately after when, in less than a trillionth of a trillionth of a second, the Universe expanded by trillions of light years.

Both Pryke and Hanany study the polarization of the CMB’s wavelengths; indeed, Pryke was part of a research team that discovered the polarization in 1999. Triggered by the release of gravity waves during the inflationary period, polarization is expected to yield even more clues about the Big Bang. But the phenomenon is exceedingly difficult to detect and measure, as Pryke explains. “The patterns we are looking for are very small and easily masked,” he says. “It requires equipment with a high sensitivity to study them.”

Hanany and Pryke also need a place where their sensitive equipment can operate optimally, which is why both faculty members have turned to Antarctica as home for their respective research. Pryke’s work is ground-based, employing a large, fixed instrument located directly at the South Pole, a 10,000-ft. high ice-covered plateau that is ideal for his work for its lack of humidity and clear skies. Hanany’s research is air-borne, his data collected by instruments carried aloft by high-altitude balloons. His team chose Antarctica because balloons launched there will circumnavigate the continent in 10 to 12 days without passing over oceans or other landmasses, making them easier to track and recover.

Fourteen billion years after the fact, the CMB is still giving up critical information about the Big Bang. Polarization of the CMB, Hanany said, “is a feature of [the CMB] that has not been probed with sufficient sensitivity.” “We are trying to change that,” he said. “In doing so, we aim to get more information about the birth of the Universe.”
work was 60 percent logistics, 40 percent science,” said LaRue. “In the Arctic, that ratio is flipped: 40 percent logistics, 60 percent science.”

Translation: one of the biggest differences between the Arctic and Antarctica is that the remote sensing the PGC will be doing for researchers at the Arctic will be less about finding out things like whether a particular spot is safe for landing a plane or helping a team of researchers find their way to the precise location where they were working the year before. Instead it will be more about precise measurements of a site using satellite and aerial maps with a resolution of a half meter or less.

But in the loose, ready-for-anything tradition of the unit, the staff at the PGC is looking forward to the new challenges. “I think our experience will serve us well,” said Brad Herried, the PGC’s cartographer and web designer. He points out that while the North and South Pole are on opposite ends of the earth—literally—they resemble each other in many ways, from climate to the kinds of research being conducted, to, in certain areas, terrain.

At the same time, the PGC doesn’t underplay the challenges that lie ahead. In Antarctica it has been able to work within a centralized structure of research and logistical support; in contrast, work in the Arctic is decentralized rather than concentrated in one or two bases, like McMurdo. In Antarctica, the PGC staffers can also meet virtually every researcher working the continent in a single Austral summer—not so in the Arctic. The fact that there is a multitude of research bases in the Arctic spread out all over the polar region will present some new issues in terms of outreach. But that’s not all.

“There are some different applications in the Arctic than in the Antarctic,” Herried points out. “There’s more biology, for one thing in the Arctic and there’s less ice, making the natural landscape more dynamic.”

“It will definitely increase our workload, but we know what we are getting into,” he said. “As an organization, it will lead to some challenges that we will need to solve, but we’re up to it.”

“You can’t buy this experience.”

—SPENCER NIEBUHR

Michelle LaRue and Claire Porter, research fellows in the Department of Earth Sciences, take a break from field work. Seen behind them are thousands of Adelie penguins, the smallest species in Antarctica. The birds build their nests on the rocky beaches of Antarctica.
Three decades ago, Jeff Gorski was a young geoengineering student who was introduced to an oil field services company called Schlumberger at an informational meeting at the University of Minnesota.

The career pitch obviously made an impression. Now as vice president of global accounts, Gorski has spent the last 28 years with the company in a career that has taken him all over the world. Minnesota doesn’t offer much in terms of oil, but Gorski and his employer keep coming back in search of another resource—human talent.

Like many alumni, Gorski maintains close ties with the University’s College of Science and Engineering (CSE) on behalf of his company. He assists with recruiting, speaks to students about technical fields, and serves on the CSE Dean’s Advisory Board. These pursuits keep the pipeline of talent and technology flowing.

It is one example of the symbiotic ties CSE has with global corporations including General Mills,
work for the heart valve was performed at the U.

“Like the pacemaker, there aren’t many novel devices that have stood the test of time like the mechanical heart valve, and have saved literally hundreds of thousands, if not millions, of lives,” said Philip Ebeling, a 1995 chemical engineering graduate and senior vice president of cardiovascular research and development at St. Jude Medical. “The U, based on the preclinical work we’ve done over the years, has been at the center of that.”

Ebeling should know. His team (which is responsible for developing devices in vascular, and structural heart therapies) frequently collaborates with colleagues in the Department of Mechanical Engineering, the Medical Devices Center, Department of Biomedical Engineering, and Experimental Surgical Services.

“It’s hard for me to imagine we would be as successful without support from the University,” Ebeling said. “I’d like to think that’s true on the other side.”

Intellectual property is only part of the relationship; an additionally important element is human talent. The 140-person St. Jude Medical Research and Development team hires five to 10 CSE graduates every year. At any given time, it also hosts 10 or 15 undergraduate or graduate students in internship or co-op programs.

Katherine Ahmann, who earned her Ph.D. in biomedical engineering in 2010, illustrates the talent pipeline at work. As Ahmann neared the end of her doctoral program, her advisor, Robert Tranquillo, a professor in biomedical engineering, called Ebeling with an inside tip: he had a dynamite candidate who would be a great fit for St. Jude Medical.

After a few interviews, the company agreed. Ahmann now works on developing a transcatheter heart valve.

“It’s a great example of how the industry relationship with the U works well,” Ebeling said. “Katie has proven to be as advertised—one of the top 1 percent.”
All told, about 300 University of Minnesota grads work in the General Mills division that covers research, development, quality, and regulatory operations. The Trix mascot may be a rabbit, but the workforce behind it is filled with Gophers.

“We feel a particular affinity and kinship with the College of Science and Engineering,” explained Mendesh, “partly because it’s in our backyard, but mostly driven by a long history of getting good people out of there.”

To that end, the company has made a concerted effort to brand itself to University students. The art of recruiting has changed greatly in the three decades since Mendesh came on board (he cut his teeth at the company developing Cinnamon Toast Crunch in the 1980s). Now the company engages at many touchpoints well before the formal hiring process begins. These efforts include teaching appointments, presentations to student groups, financial support for the solar vehicle project team, and much more.

“It’s as competitive as ever to find really good talent,” says Mendesh. “It requires that we really ratchet up our game in pursuit of that.”

This broadening of the university-corporation relationship is common at many companies. Corporations may send employees to speak to university students about technical careers or job search skills or serve as mentors. Employers can use these appearances to brand themselves to students and earn a reputation as a desirable place to work—all of which ultimately helps recruiting.

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At some companies, the relationship with CSE is so strong that it may hire several dozen graduates in any given year. In recent years, these relationships have extended well beyond recruiting as both sides take a more comprehensive approach that includes philanthropy, research collaboration, and other interactions.

“They don’t just want to show up once or twice for an interview,” Sorenson-Wagner said. “They want to have a relationship with the campus.”
appealed to her interest in geology, physics, and chemistry. She also liked the opportunity to work outdoors and face new challenges every day. “They said you'll never be bored,” Ebert said. “That has pretty much rung true for the 10 years I’ve been working for them.”

The career has taken Ebert to a variety of roles in field engineering, communications, and sales. She also spent three years as a recruiter and hired 191 people—including dozens from her alma mater. “I hired more people than anyone else in Schlumberger history—a lot of those people came from the College of Science and Engineering,” she said. “It was one of my best schools, especially for diversity.”

Schlumberger has deemed Minnesota one of a small number of “focus universities.” Ebert said the company recruits heavily from CSE because its graduates have signature traits: solid foundation in the technical subjects like geology and engineering plus a certain self-reliance and adaptability.

“The college pushes you to be persistent, not give up and develop independently because it’s a large university and you don’t have somebody looking over your shoulder all the time, which is exactly how it is when you start a job,” says Ebert. “The number one thing CSE taught me was taking initiative.”

Schlumberger: Fueling the Future

Jeff Gorski and his employer, Schlumberger, agree. About five years ago, the company tapped Gorski to be a “focus sponsor” to the College of Science and Engineering. The company commonly assigns employees to act as liaisons with their alma maters in order to bolster the relationship outside normal recruiting.

Gorski says his company has established a close relationship with CSE because it has proved to be a reliable source of good employees. CSE grads tend to have solid technical skills, a strong work ethic, and come from diverse backgrounds (a plus for a global company that employs 140 nationalities and has offices worldwide).

“As soon as they finish their engineering training, many of these individuals are dealing with multi-million dollar projects,” Gorski said. “They’re managing projects within a year after college that a lot of people don’t see until later in life.”

Marissa Ebert, a 2001 geoengineering graduate, is living proof.

In her sophomore year, she stopped by the Schlumberger table at a career fair and the company

Many College of Science and Engineering graduates have been responsible for the technical activities behind well-known General Mills’ name brands such as Cheerios, Trix, and Fiber One.

COURTESY OF GENERAL MILLS

We feel a particular affinity and kinship with the College of Science and Engineering... mostly driven by a long history of getting good people out of there.”

—JOHN MENDESH

Marissa Ebert (GeoE ’01), who spent three years as a recruiter for Schlumberger, says the company recruits CSE graduates because of their signature traits that include having a solid foundation in technical subjects.
“We hire from a lot of places. But we look at the College of Science and Engineering as one of our premium recruiting schools.”

—RICH KRUGER
initiatives and had his supervisors talk him into staying another year.

Pucel never went back to school but has kept giving back. He now sits on the CSE Dean's Advisory Board. Members of his team also are represented on numerous other University advisory boards in the Department of Biomedical Engineering, Medical Devices Center, Institute for Engineering in Medicine, and Carlson School of Management Medical Industry Leadership Institute.

This underscores the vital role that business leaders play in advising the University. The CSE Dean's Advisory Board includes about 30 members from companies such as 3M, ExxonMobil, Schlumberger, General Mills, Honeywell, and Boston Scientific. These industry leaders help the college plan for the technical skills and transferrable skills students will need in tomorrow's workforce. Corporate representatives also serve similar roles on collegewide and departmental boards.

"The advice they provide the dean and the leadership really helps us know what industry is looking for in terms of how we educate our students," said Kim Dockter, CSE director of external relations. "That advice and feedback from industry is really beneficial, not only to the dean but also to department heads."

Boston Scientific maintains close relationships with a handful of top research universities such as Stanford, MIT, and the University of Missouri, but these tend to focus on narrow specialties. The relationship with Minnesota is both broad and deep, with multiple collaborations involving research, technology, biomedical engineering, medical devices, the veterinary school, hospitals and the Carlson School of Management.

"It's win-win," Pucel said. "In the future, universities and corporations that have collaborations can exponentially expand their capabilities...In a world that's connected in real time by a web of information, if you're not having these types of relationships, you're not going to be as competitive as those who can."

Even as Pucel leads his company to new frontiers, he is treading on familiar ground. His father was a professor of vocational education and his uncle is dean of the College of Veterinary Medicine. "It was almost predetermined that I would go to the University," he said.

Pucel graduated with a degree in mechanical engineering with a biomedical focus and got a job with a company that was later acquired by Boston Scientific. He planned to go to medical school or graduate school but repeatedly got caught up in new business

Ken Pucel (ME '89), executive vice president of Global Operations and Technology for Boston Scientific, said their relationship with the University of Minnesota is broad and deep, with multiple disciplinary collaborations involving research and technology.

"It’s almost a brand.

When I buy Apple, I’m buying a good brand.

When I buy the College of Science and Engineering, I’m buying a good brand."

—KEN PUCEL
The year, 2012, is going to be a year of looking forward for the College of Science and Engineering. As co-chairs of the college’s new alumni relations task force, we will be spending this year taking a close look at the transformational role alumni leadership can play. How do we help to craft the CSE students of today into the successful alumni of tomorrow? How can we help to build strong, life-long connections between our alumni, the college, and each other? How can we, as a community, use our time, talents, and resources to advance the best future for CSE?

Our alumni are more than living, breathing representatives of our college out in the world. Alumni leaders are our allies, our advisors, and our advocates. One critical way our alumni show their support is through annual gifts to the college and its programs. Some give because they are proud of CSE. Some give because they want CSE to remain one of the greatest colleges of science and engineering in the nation. Others give because they want to voice their support for CSE’s efforts to provide financial aid to current students and many other strategic areas. And some give because they recognize their educational experiences at CSE were supported by the philanthropy of others, and they feel a desire and responsibility to support the students of today and tomorrow.

But all know that any gift, regardless of size, is important to CSE’s success, and, when combined with other gifts, have great impacts on the college and its future successes.

So far, our gifts have provided scholarships, fellowships, and academic program support for our exceptional undergraduate and graduate students, have advanced our outstanding faculty and their pioneering research in human health, energy, and the environment, and have helped build the infrastructure we’ll need for tomorrow, including a renovation of Lind Hall to create a new student center.

We are inspired by our students, faculty, and fellow alumni. We are proud to do all that we can to work toward the brightest future for our alma mater. We hope you join us in supporting the college in ways that are thoughtful and make sense to you.

Haxby and Schiestl receive UMAA Alumni Services award

Two College of Science and Engineering alumni, Roger Haxby (ME ’58) and Randy Schiestl (ME ’77, MBA ’84), have been awarded the University of Minnesota Alumni Services Award, which is given by the Board of Regents to University of Minnesota alumni in recognition of service to the University or its schools, colleges, or departments; or service to the University of Minnesota Alumni Association.

Haxby has been a key supporter of the College of Science and Engineering for many years. As a member of the CSE Dean’s Advisory Board, he has provided important leadership for the college. He also serves on the external relations committee of the board and has played a key role in the college’s fundraising activities, including the successful help raise funds to renovate Lind Hall. Haxby serves as a strong ambassador for the College of Science and Engineering by regularly meeting with principals, superintendents, and students in the St. Cloud, Minn. area in an effort to recruit top students to the college.

As a lifelong Alumni Association member, Haxby stands out among volunteers with his enthusiasm and commitment.

Schiestl has been a true ambassador for the College of Science and Engineering through his enthusiastic support of students and faculty. Drawing on his own experience as vice president of the Engineering Services Group at Boston Scientific, he has served in leadership roles on advisory boards for the Department of Biomedical Engineering, the Institute for Engineering and Medicine, and the Medical Devices Center. His commitment to educating the next generation of scientists and engineers has enabled student design teams to gain experiential learning opportunities with Boston Scientific engineers.

Schiestl’s successful ability to influence others has played an integral part in securing financial support for fellowships in biomedical engineering, the Medical Devices Center Innovation Fellows program, renovation of Lind Hall, and Boston Scientific’s Heart of a Champion partnership with Gopher athletics.
Celebrate the Class of 1962 50-year reunion scheduled for May 3-4, 2012

RECONNECT WITH YOUR fellow classmates on May 3-4, 2012 when the Institute of Technology (now the College of Science and Engineering) Class of 1962 celebrates its 50-year reunion. A reception on Thursday evening, May 3, will feature your induction into the College of Science and Engineering Golden Medallion Society.

The Golden Medallion Society honors those alumni who have reached the 50th anniversary of their graduation. Those who were previously inducted into the Golden Medallion Society, which includes the Class of 1962 and earlier classes, are invited to attend the reunion on Friday, May 4.

Events currently being planned include department tours, panel discussions, lectures, and more. You’ll also have free time to explore campus on your own. Those members of the Class of 1962 will be invited to join the academic procession during the 2012 College of Science and Engineering commencement ceremony on May 4.

Printed invitations with all the details, which will include the agenda, hotel and parking information, and how to register will be sent soon. Watch your mailbox. Information will also be posted on our website at cse.umn.edu/50reunion.

Leadership event celebrates CSE alumni and student leaders

More than 275 alumni, faculty, and students attended a recent College of Science and Engineering leadership event held at the Minneapolis Hilton. (Far left) Robert Hartman (EE ’65) receives an Outstanding Alumni Achievement award. (Lower left) University of Minnesota President Eric Kaler (ChemE Ph.D. ’82) presents the keynote speech. (Above right) Jane Davidson, mechanical engineering professor, and alumni Gordon Lewis (ME ’51) and Lu Vorphal (CivE ’35) compare slide rules. As part of the evening’s activities, those who attended were challenged to solve a problem using a slide rule.
IT IS AN EXCITING time to be at the College of Science and Engineering! We have the most talented students in the history of our college, with average ACT scores of 30.4 and 98.4 percent having graduated in the top 25 percent of their high school class. We have an incredibly brilliant faculty who teach these gifted students and conduct cutting-edge research. We have remarkable alumni who are helping us to educate students through their gifts of time, talent, and treasure.

Even while they are still in college, our students are working to improve our quality of life, both inside and outside the classroom. Our Innovative Engineers student group is building wind turbines in Nicaragua to provide electricity to rural villages. Our Solar Vehicle Project team members are designing and constructing vehicles using the sun as the car’s sole source of power. Our students in Professor Bin He’s biomedical engineering lab are actively involved with finding new solutions to deal with paralysis and epilepsy through their work with Dr. He’s “Thinking Cap.”

We are educating students who will become the next leaders in technology and in business. Undergraduate and graduate students, along with faculty, are conducting research that solves many pressing problems, from paralysis to climate change. These students will follow in the proud footsteps of those who came before them. They will create companies and jobs, fuel our economy, save our planet, and enhance our quality of life. They are our future!

Our alumni and friends are volunteering as advisory board members, mentors, and career advisors in record numbers and have given record amounts to support our students and faculty. Take for example, Randy Scheistl and Roger Haxby, recipients of the 2011 University of Minnesota Alumni Association’s Outstanding Service Award. Randy has been a long-time volunteer and advocate for the college, serving on the advisory boards of the Medical Devices Center, the Department of Biomedical Engineering, and the Institute for Engineering in Medicine. Roger serves on Dean Crouch’s advisory board and served on Dean Davis’ as well. Roger and his wife, Mary, have given generous scholarship support that has helped us to educate many students from the St. Cloud area.

I am pleased to report that last year, alumni and friends gave a record $19.2 million to support scholarships, fellowships, faculty chairs, research, and the renovation of Lind Hall. This support is essential to the college. To quote President Eric Kaler, who received his Ph.D. in Chemical Engineering at the University of Minnesota, “... philanthropy plays a pivotal role in building on the foundation of public investment. Philanthropy is what will transform us from very good to truly excellent.”

Please join us in transforming the College of Science and Engineering from good to great by making a gift today.
**Contributions lead to record year of giving**

MORE THAN 4,500 College of Science and Engineering alumni, friends, corporate, and foundation donors gave gifts and pledges to the college this past fiscal year, totaling more than $19 million, which nearly doubled the total over the previous fiscal year and made for a record year of giving.

Of the total received, donors gave $7.14 million for scholarships, fellowships, and student support; $5.9 million for faculty support; $4 million for academic program support and made significant gifts for capital improvements and research and outreach.

Support for students and faculty was led by Robert F. Hartmann, [EE '65], who made a $4 million gift to endow a 21st Century Matched Scholarship and a $4 million pledge to endow a chair in the Electrical and Computer Engineering Department.

“We are pleased with our donors who have shown commitment to our college and its programs,” said Steven Crouch, dean of the College of Science and Engineering. “These gifts will support top faculty who conduct groundbreaking research, state-of-the-art facilities, and students trained for high-impact jobs in emerging industries.”

**Physics/Nanotechnology Building construction begins**

CONSTRUCTION OFFICIALLY BEGAN in November on a new $83 million Physics and Nanotechnology Building located on the corner of Beacon and Union streets. A ceremonial groundbreaking was held Oct. 12 for University of Minnesota administrators, faculty, and state officials.

Steven Crouch, dean of the College of Science and Engineering, is thrilled to see the project finally begin, after years of pushing for its construction. “This building will raise our profile among our peers and help to make us a national leader in nanotechnology,” Crouch said.

More than 400 businesses and organizations currently use the University’s nanotechnology facilities. Stephen Campbell, director of the Nanotechnology Center, expects usage of the facility will grow, not only among University scientists, but also among researchers from the private sector and other academic institutions.

Gov. Mark Dayton and the State Legislature approved $51.3 million for the building in July 2011 as part of the state’s capital investment plan during the 2011 Special Session. In addition to the $51.3 million, the University received $4 million in planning money for the project during the 2010 Legislative Session. Through philanthropy, an additional $10 million will go toward equipping and enhancing the state-of-the-art facility.

Construction began in November on the University of Minnesota’s new $83 million Physics and Nanotechnology Building. The building will feature a combination of about 40 physics and nanotechnology research laboratories, including a 5,000-square-foot clean room.

**BEHIND EVERY DISCOVERY IS YOU**

The essential ingredients in every success story at the College of Science and Engineering is talent, passion, determination, and you. Your support has helped College of Science and Engineering students, faculty, and researchers address some of the most challenging problems of our time. From solving problems in energy and health care to issues of the environment and infrastructure, behind every discovery we make are generous donors.

Please consider an additional gift to one of these critical areas:

- **Students:** Scholarships and fellowships help prepare students for leadership positions tomorrow.
- **Research:** Private support fuels innovation that results in life-changing discoveries.
- **Faculty:** The generosity of donors helps to attract and retain top-tier faculty.

Visit our website at [cse.umn.edu/giving](http://cse.umn.edu/giving) to learn more about the ways to give to the College of Science and Engineering.
UNITE changes with new technologies

When UNITE (University-Industry Television for Education) transmitted its first black and white television broadcasts to employees at six Twin Cities-based companies in 1971, no one ever envisioned it would be possible to complete an advanced degree without stepping foot inside a lecture hall.

Since then, UNITE Distributed Learning, which is housed in the College of Science and Engineering, has granted 1,204 degrees and presented 3,852 courses to more than 28,000 students.

Demand for distance learning

In the beginning, television broadcasting for educational purposes grew slowly. By the early 1950s, a few universities nationwide were televising college courses for credit.

At the University of Minnesota, interest in distance learning began to develop around the late 1960s. IBM in Rochester, Minn., was the first corporation to partner with what was then the Institute of Technology to transmit courses to their employees via telephone line. Soon other Twin Cities-based corporations, such as Honeywell, Sperry-Univac, and 3M, began to ask for TV broadcasts of graduate-level classes, citing a need for convenient, continuing education for their employees.

UNITE’s first directors, Morris Nicholson, a professor of chemical engineering and materials science, and Arnold Cohen, a recognized pioneer in the computer industry and later associate dean for the college, looked to Stanford University’s distance learning program. Stanford had been televising engineering courses since 1969, and that became the model for the UNITE network.

With a plan proposal and some financial backing from the University and the Dean’s office, Nicholson and Cohen targeted several Twin-Cities based organizations—particularly those with employee training and education departments—to sell the new program.

“By fall 1971, six companies had signed up, and we began broadcasting seven courses on two channels in black and white from two classrooms on campus,” said Douglas Ernie, associate professor of electrical and computer engineering, and current director of UNITE.

Beaming classes into the workplace

Throughout the 1970s, UNITE beamed its broadcasts from a master control center located in the old Mechanical Engineering Building on campus.

“The signal was sent to a transmitter dish on top of the building where it was beamed to the main transmitter on the Foshay Tower in downtown Minneapolis,” Ernie said. “We had a relay tower in Hader, Minn., where it was picked up and sent to the Rochester area. Back then, you needed a direct line of sight to the signal and Rochester was too far away.”

To receive the signal, companies needed a special antenna and dedicated conference rooms where students ventured to watch their classes live as a group over a television set. Participants interacted with the instructor through a microphone located in the room.
During the late 1980s, the transmitter was moved from the Foshay tower to the IDS Center—Minneapolis’ tallest building—and an additional classroom was added. Courses were also being broadcast in color. By fall 1996, the number of participating companies had grown to 33, and 48 courses were being offered.

**The changing face of technology**

A transition started to occur in the late 1990s, as the economy forced organizations to downsize and outsource their training and educational needs. “We no longer had that connection with industry staff, and we started to build relationships directly with students,” Ernie said. “Now our students pay upfront and receive tuition reimbursement from their individual companies.”

UNiTE also began to change the way its courses were delivered. During a three- to four-year period, courses were available both through live broadcast and the Internet, until the television broadcast system was finally shut down in 2006.

This past fall semester, 60 courses were offered and nearly 275 students were enrolled, primarily from Minnesota, Wisconsin, and South Dakota. Courses may be viewed live, on-demand or downloaded to a laptop or portable device.

**Let your fingers do the walking**

From live regional broadcasts to being able to access courses 24/7, UNiTE’s mission throughout the years has been to provide a convenient and cost-effective way for engineering and science professionals to gain knowledge and grow in their careers. Many have taken advantage of completing an advanced degree, yet simultaneously balancing their work and family commitments, all at their fingertips.

Additionally, more undergraduate students today enroll in UNiTE classes because of work or class scheduling conflicts.

“Undergrads may enroll in one UNiTE course per semester with permission from the instructor. For the College of Science and Engineering, having courses online can help to increase four-year graduation rates,” Ernie explained. “Our greatest strength is making courses available to individuals who either find it difficult or impossible to take on campus.”

Fran Schirmers, UNiTE administrator, adds, “Our faculty is fantastic. They are willing to add sometimes 15 to 20 extra students when they have a full class on campus. We couldn’t do this without them. And our students are great to work with. They are the reason we are all in this enterprise in the first place.”

**NOW**

Today’s Internet-based technology allows students to participate in UNiTE courses from almost any location. Scott Becker was able to continue working toward his master’s degree in electrical engineering despite a nine-month deployment to Fort Eustis, a U.S. Army installation located in Newport News, Va.

**FOR MORE INFORMATION, visit unite.umn.edu**
Will I get water today? Waiting in line for hours to get clean water is a daily chore for many slum-dwelling residents in southwest Delhi, India. Often water supplies run dry before containers are filled, forcing residents to walk to distant locations where water may or may not be available.

College of Science and Engineering students Adam Witt, Jessica Barros, and Craig Hill discovered a solution. These civil engineering students are members of the team TextRA, winners of the 2011 Acura Challenge. Despite India’s poverty, 80 percent of its residents have inexpensive, prepaid cellphones, and text messages are free to receive. TextRA uses a network of runners who check on water supplies and report to a central location. Text messages are sent via cellphone to residents indicating water availability—a refreshing new way to provide water access.

Discover more at cse.umn.edu.