University of Minnesota

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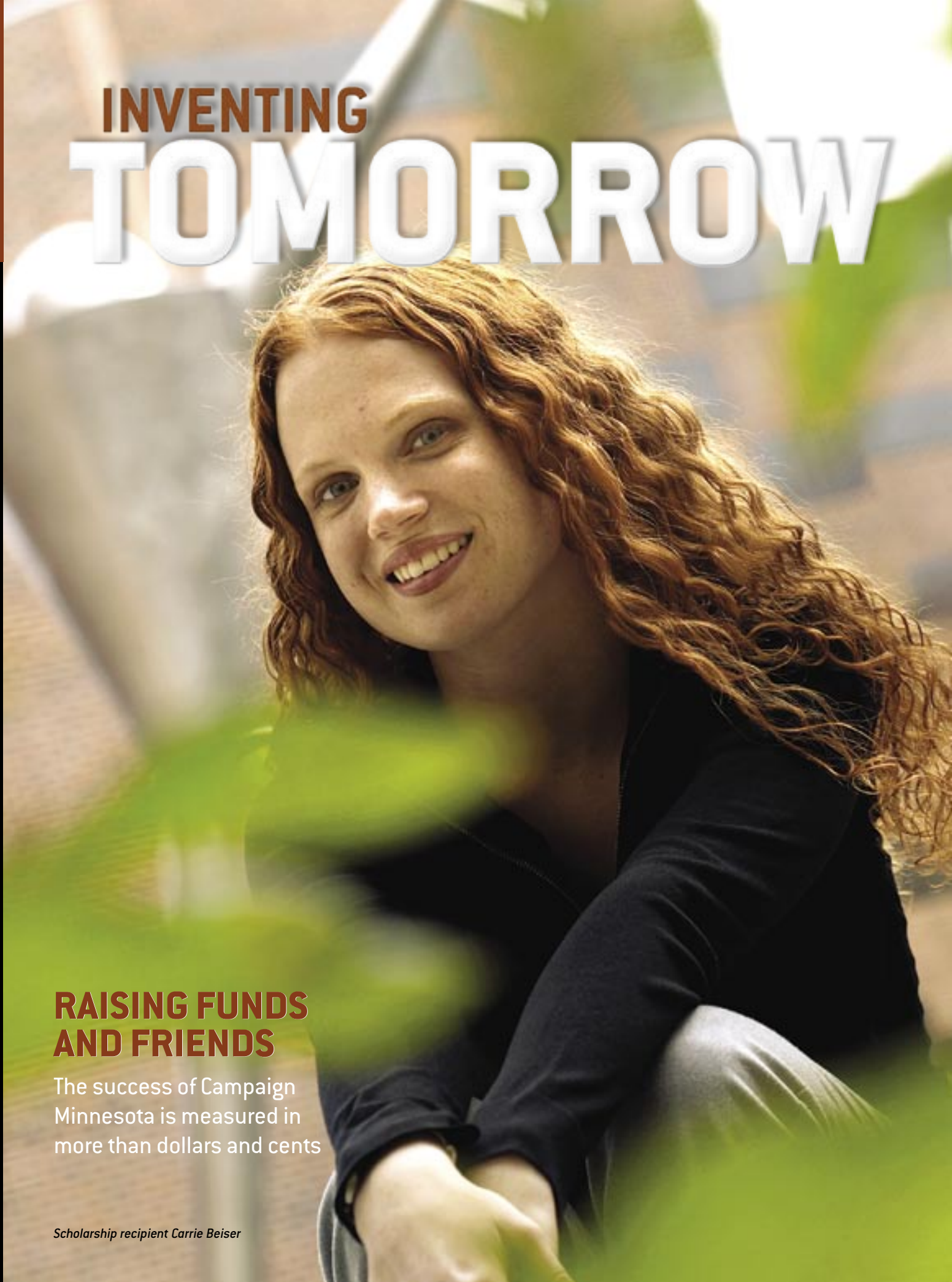
INVENTING TOMORROW



RAISING FUNDS AND FRIENDS

The success of Campaign Minnesota is measured in more than dollars and cents

Scholarship recipient Carrie Beiser

INVENTING
TOMORROW
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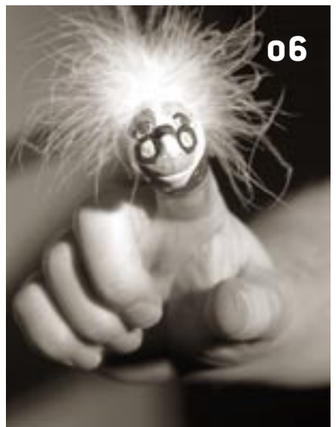
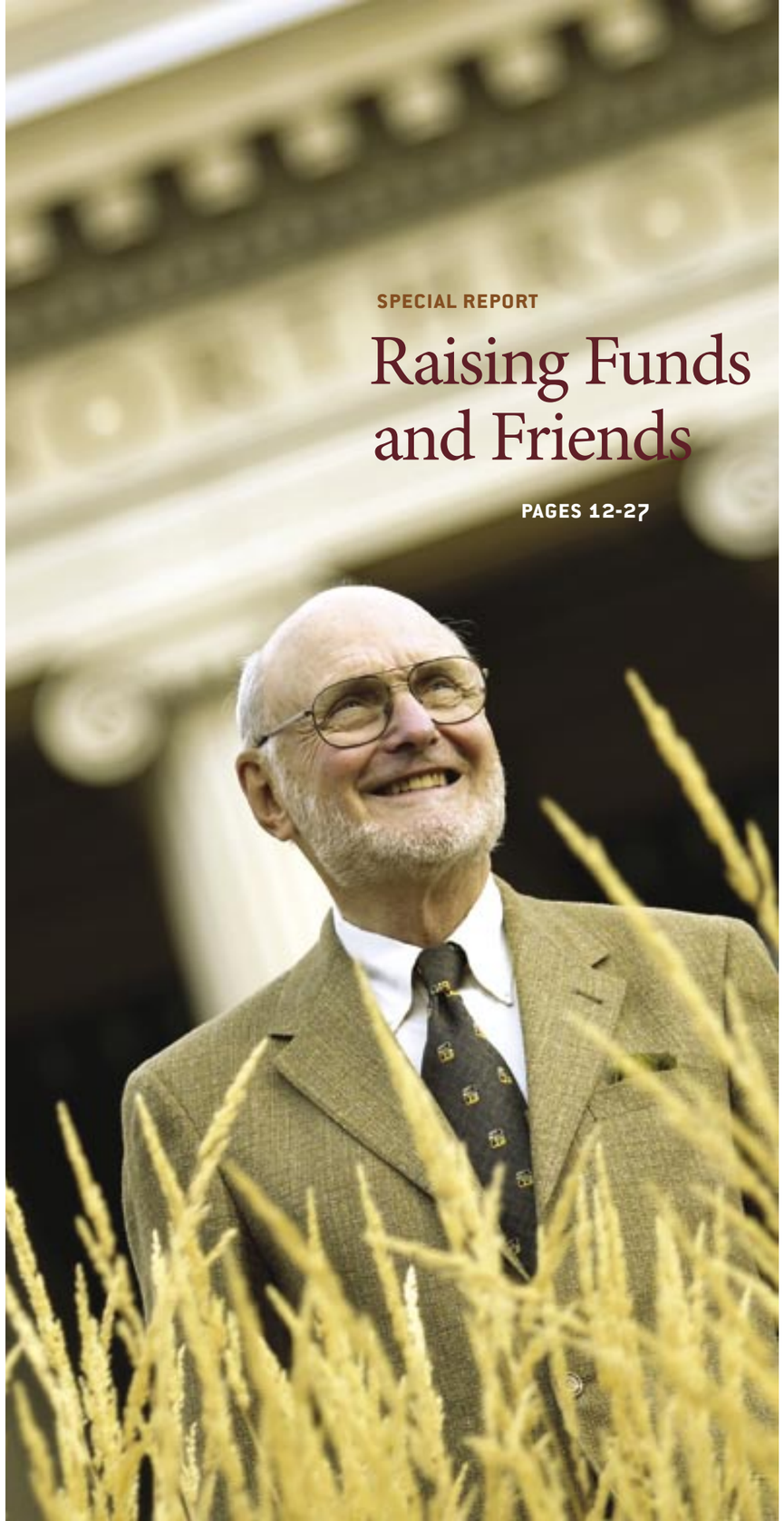




ON THE COVER: *The Bobbie Huston Cronquist Scholarship—established as part of Campaign Minnesota—helps chemical engineering senior Carrie Beiser make the most of her undergraduate years.*
PHOTO BY JONATHAN CHAPMAN

New synergy for renewable energy

THE NATION'S VORACIOUS appetite for energy continues to grow, but last August's massive power blackout—the largest ever in North America—reminded us dramatically that we can't take our energy system for granted. While an estimated 50 million people in the U.S. and Canada coped with the blackout's immediate consequences, the rest of us monitored their struggles, knowing that only pure luck had kept us untouched this time.

The blackout wasn't the only energy-related issue in the news recently. High-profile leaders and average citizens alike express growing concern over our national energy security, the health of global ecosystems, and our economy's dependence on nonrenewable foreign sources of energy.

As its core mission, this initiative will build bridges within the University and between it and the larger community

Amid the clamor and with modest fanfare, the University launched its Initiative for Renewable Energy and the Environment (IREE) with the goal of becoming a leader in the field of renewable energy. Since then, representatives from IT and other colleges have been assembling an organizational structure to support the initiative's goals and coordinate its efforts.

IREE will link faculty across the University whose research supports or complements its goals. To date we've organized four integrated research clusters focused on six critical areas: hydrogen generation, storage, and transport; bio-based materials and energy; ecosystems; conservation and efficient consumption of energy resources; economic analysis of alternative energy; and public policy related to alternative energy.

IT faculty who are cluster co-leaders include mechanical engineering professors Jane Davidson (hydrogen) and David Kittelson (bioenergy and bioproducts); electrical and computer engineering professor Ned Mohan (conservation and efficient energy systems); and chemical engineering and materials science professors Lanny Schmidt (hydrogen), William Smyrl (hydrogen), and Ken Keller (policy, economics, and ecosystems), who also serves as director of the Humphrey Institute's Center for Science, Technology, and Public Policy.

IREE will emphasize Minnesota's economic development, especially in rural areas, by capitalizing on the state's natural and bio-based resources, such as wind, biomass, and solar energy. We'll also work with the private, public, and nonprofit sectors to advance research, technology transfer, and market development of new renewable energy sources and products. Our integrated, "big-picture" approach also includes science-based public policy research and commentary on energy issues.

The 2003 state legislature gave the IREE $10 million in one-time funding from the Renewable Development Fund (fees paid by Xcel Energy for storing spent nuclear fuel) plus five years of funding from Xcel's Conservation Improvement Program. That amount is estimated to be about $1.7–$2 million annually. IREE will actively seek other funding sources as well.

Currently IREE is offering cluster support grants to jumpstart scholarly activities within and across clusters, seed grants to support new collaborative research projects, and special opportunity grants that are ideally suited to external partnerships.

As its core mission, the IREE will build bridges within the University and from the University to the larger community. We all have a stake in what IREE is trying to accomplish, and your ideas and participation are welcome.

H. Ted Davis

REGENTS PROFESSOR H. TED DAVIS is dean of the Institute of Technology. You can reach him at 612-624-2006 or by email at info@it.umn.edu.

SOUND BYTE: ***"Minnesota cannot afford to squander its future by starving higher education."***

—President Robert Bruininks, responding to the governor's 2004 budget

TECH DIGEST

Davis to step down as IT dean

After leading the college for nine years, H. Ted Davis will return to teaching and research this fall, leaving a legacy of distinguished accomplishments

H. TED DAVIS will step down as IT dean and return to a faculty position fall semester 2004. Davis, 66, was appointed dean in November 1995 and is the third-longest-serving dean in IT's history and also the third-longest-serving among current deans on the Twin Cities campus.

"I've had an incredible experience, but after nine years as dean and 24 in administration, it's time to pass the torch," says Davis. "I am deeply grateful for the hard work and dedication of our department heads and many others throughout the institute who have helped us achieve success."

Davis's accomplishments as dean of the University's second-largest undergraduate college include raising $158 million for Campaign Minnesota; developing the Digital Technology Center; securing funds for the renovation of Walter Library, the new mechanical engineering facilities, and the addition to Amundson Hall; increasing diversity among faculty and students; and establishing the Department of Biomedical Engineering and programs for working adults.

"Dean Davis leaves very large shoes to fill," says Christine Maziar, executive vice president and provost. "Under Ted's leadership, the Institute of Technology has had many departments consistently ranked among the very best nationally."

Maziar says that a national search for a replacement will begin immediately and that she hopes to have a successor named by the beginning of the 2004-05 academic year.

Davis, author or coauthor of 500 papers and three textbooks, holds the University's highest academic title, Regents Professor, and is a member of the National Academy of Engineering.

Davis's research and scholarship focus on several areas related to the flow of fluids, including investigations of the molecular mechanisms by which fluid flows, with applications in industrial coating processes, the flow of pollutants through groundwater, and oil recovery; and nanotechnology. He came to the University in 1963 as an associate professor of chemical engineering and materials science.

HIGHLIGHTS OF A NOTABLE CAREER

- **More than 40 years on the U faculty, during which Davis authored or coauthored more than 500 papers and three textbooks**
- **Nine years as IT dean (1995-2004) and 15 years as head of the U's top-ranked Department of Chemical Engineering and Materials Science (1980-1995)**
- **Honors include Regents Professorship, election to the National Academy of Engineering , and the AIChE William H. Walker Award**

JONATHAN CHAPMAN (DAVIS); GETTY IMAGES (ILLUSTRATION)
PATRICK O'LEARY (DAVIS); DIGITAL TECHNOLOGY CENTER (CHEN)

A NEW WAY TO WALK NORTHROP MALL

"VIRTUAL CAMPUS" has a new meaning, thanks to a new project led by McKnight Land-Grant Professor Baoquan Chen. With the aid of a boom truck from the University's grounds crew, Chen and his research group used a state-of-the-art 3-D laser scanner to digitize Northrop Mall.

The project's goal is to scan real-world environments and then develop new graphics algorithms and software to provide an interactive virtual navigation of them. This software, when used in conjunction with virtual-reality tools being developed by the University's Digital Design Consortium, will allow users to walk and conduct architectural design in a digitized site, such as the virtual Northrop Mall.

The equipment used is capable of scanning large environments (up to 650 feet), offers high accuracy (half-inch precision within a range of 650 feet), large field of view (90° x 360°), and high speed (18,000 points/second). Chen's group has been applying this technique to other applications, such as archaeological, historic, and strategic site digitization. The group has scanned Mount Rushmore, South Dakota, and the Mill Ruins Park area of Minneapolis.

A new view

A NEW WINDOW to the universe opened in December when NASA released the first pictures from its Spitzer Space Telescope.

"The images are stunning," says astronomy professor Robert Gehrz, a key member of the team that designed the observatory. "This telescope is a thousand times more sensitive than infrared telescopes on the ground. Consequently, it reveals extremely distant objects that represent the earliest stages in the evolution of the universe."

Because it operates at infrared wavelengths, the Spitzer telescope can peer through clouds of interstellar dust to reveal objects never seen before. It will allow scientists to study some of the coolest and most distant objects in the universe. The telescope is expected to produce images of the universe at earlier ages than was previously possible and to help scientists understand galactic evolution, massive black holes, life cycles of stars, planet formation, and the center of the Milky Way galaxy.

The Spitzer telescope is the fourth of NASA's orbiting Great Observatories (the others are the Hubble Space Telescope, the Chandra X-Ray Observatory and the Compton Gamma Ray Observatory, which ended its mission in June 2000).

University astrophysicists are guaranteed 100 hours of observing time during the Spitzer telescope's first two and a half years of operation.

"We hope to see objects from the beginning of the universe—objects too distant to be detected by telescopes operating on visible light," says Gehrz. "It should help us understand the way all kinds of celestial objects form and evolve."

Launched in August 2003 as the Space Infrared Telescope Facility (SIRTF), Spitzer was renamed in honor of Lyman Spitzer, Jr., who first proposed placing telescopes in space.

Top: The magnificent spiral arms of the nearby galaxy Messier 81, located in the northern constellation Ursa Major, are highlighted in an image from the Spitzer telescope. Above: A dark cloud dissolves into a silky translucent veil, revealing the molecular outflow from an otherwise hidden newborn star.

NASA (SPITZER), TOM FOLEY (KOLTHOFF)

U requests state funding for Kolthoff code upgrades

FOR YEARS, "TEMPORARY" BIOLOGY LABS have occupied much of Kolthoff Hall, one of two chemistry buildings that line the west side of Northrop Mall. As those labs relocate to new biosciences facilities elsewhere on campus, IT is poised to reclaim that space to meet the need for additional chemistry research and teaching labs.

Unfortunately, Kolthoff's infrastructure is showing its age. Although the structure itself is sound, the building systems need renewal in order to extend the facility's useful life.

To meet new code requirements and provide a healthy environment for faculty, staff, and students, the building needs a new ventilation system and other safety upgrades.

The $24 million project—which will help IT attract and retain the nation's best and brightest scholars—is part of the University's $155.5 million 2004 capital budget request.

Governor Tim Pawlenty's $76.6 million capital budget proposal would fund less than half of the state bonding the University is seeking.

Of the six major building projects proposed by the University, only three are included in the governor's budget, including $16.8 million for the proposed Kolthoff Hall renovation.

Calling the governor's recommendations "deeply disappointing," University president Robert Bruininks pledged to take the University's case directly to the state legislature.

Toward that end, the University Legislative Network, a collaborative of alumni, students, faculty, staff, and community members, is working to educate elected officials and the community about the University's importance to the state.

"You don't have to be a political wizard to get involved," adds IT dean H. Ted Davis. "The Legislative Network will give you the tools and resources you need to become an engaged citizen."

To find out more, including how you can help support the University's capital request, see www.umn.edu/groots.

CHEMISTRY IS CRITICAL

Over the last several years, enrollment in chemistry courses has climbed steadily. (In 2002-03 a total of 11,156 students—mostly freshmen and sophomores—were enrolled in chemistry classes.) The increase is attributed to larger overall enrollments at the University and to rapidly growing enrollment in degree programs that require chemistry as a foundation, such as the biological and health sciences. At least one chemistry course is required by 43 different undergraduate degree programs at the University—roughly one-third of all undergraduate degrees offered here.

Honoring the memory of four luminous lives

William Shepherd, noted professor of electrical engineering and former University administrator, died September 5 in Minneapolis at age 92. Before joining the University faculty in 1947, Shepherd worked at Bell Telephone Laboratories, where he and his colleague John Pierce developed the Pierce-Shepherd tube—a tunable device that improved radar capabilities of the U.S. and its allies during World War II.

Shepherd

At the University, Shepherd served as IT associate dean (1954-56), electrical engineering department head (1956-63), University vice president for academic administration (1963-73), and director of the Space Science Center (1973-79). In 1980—a year after he retired—the Space Science Center facility was renamed Shepherd Laboratories in his honor.

His many honors include membership in the National Academy of Engineering and the University's highest alumni honor, the Outstanding Achievement Award.

Karlis Kaufmanis, retired University astronomy professor and lecturer, died June 21 in Florida at age 93.

A gifted orator, Kaufmanis was famed for his "Star of Bethlehem" lecture, in which he hypothesized that the biblical "star in the east" was actually a set of three close pairings of Saturn and Jupiter that occurred in 7 B.C. Thousands of organizations invited him to speak, including the Science Museum of Minnesota, Voice of America, and ABC's "Good Morning America." He taught an introductory astronomy course to more than 26,000 students during his years at the University. After Kaufmanis retired in 1978, the astronomy department honored him by establishing the Kaufmanis Public Lecture Series, which brings distinguished scientists to the University campus.

Kaufmanis

Morton Hamermesh, former head of the School of Physics and Astronomy (SPA), theoretical nuclear physicist, Russian translator, and accomplished chess player, died November 14 in Minneapolis. He was 87.

Under Hamermesh's leadership (1965-1975), SPA branched out into the areas of experimental particle physics and condensed matter physics. His work in theoretical nuclear physics aided the understanding of certain techniques used to study the atomic structure of materials. He also contributed to the design of accelerators, machines that produce particles at high energy.

Tibor Zoltai, a Hungarian native who overcame enormous odds to become a geologist, author, and head of the University's geology and geophysics department (1963-71), died July 13 at age 77.

Zoltai was interned in a labor camp during World War II, lived in a refugee camp in Austria following the war, and later immigrated to Canada, where he hoed sugar beets as a contract laborer. A crystallography specialist, he made extensive early use of computer analyses in his work. After retiring, he and his wife, Olga, established the Zoltai International Scholarship.

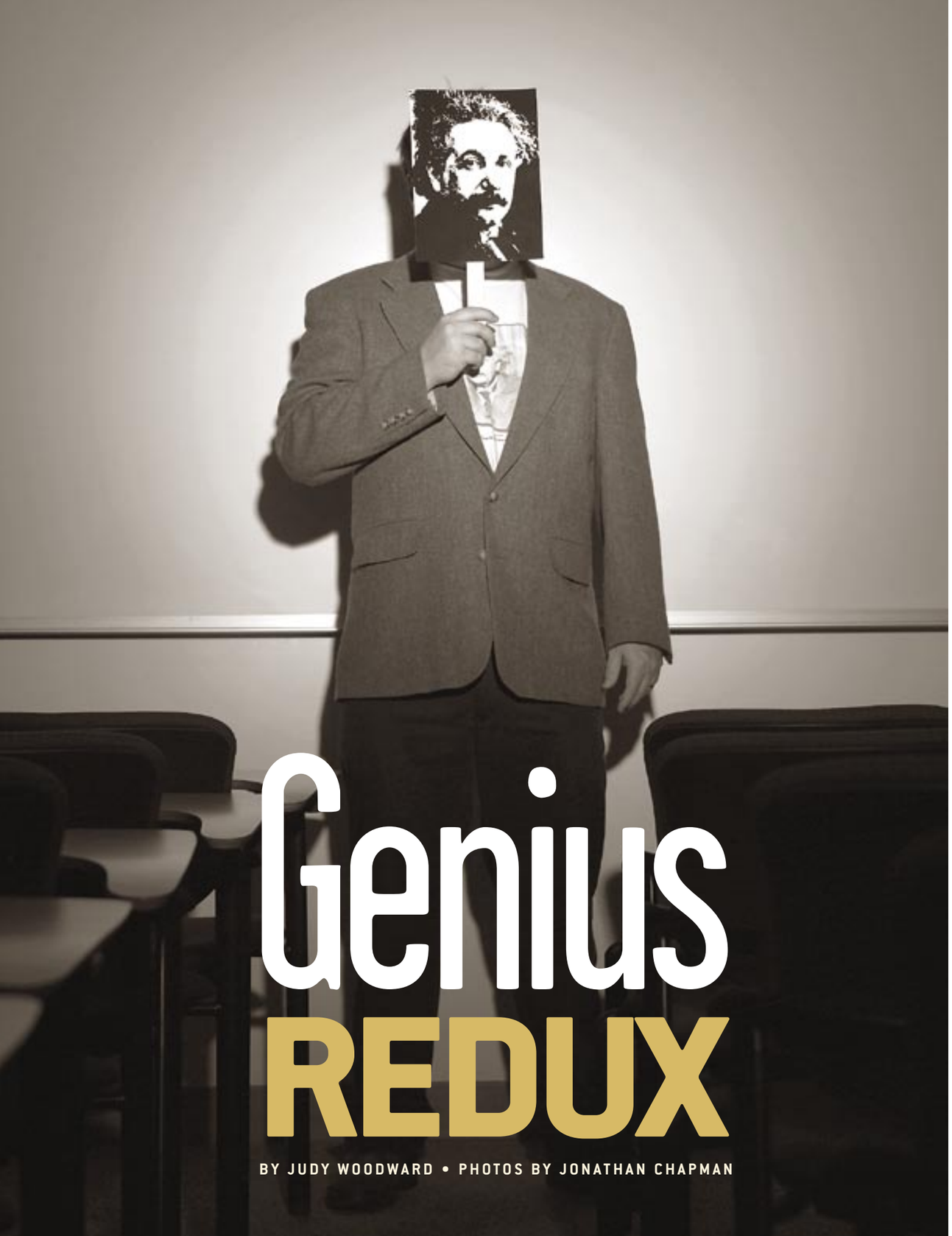
BOREALIS SHINES

THE UNIVERSITY'S SOLAR CAR, Borealis II, placed second in the American Solar Challenge, a grueling 10-day cross-country race along U.S. Route 66 from Chicago to Claremont, California. The University of Missouri-Rolla's entry crossed the finish line about five hours ahead of Borealis II.

U.S. DEPARTMENT OF ENERGY (BOREALIS); UNIVERSITY ARCHIVES (SHEPHERD AND KAUFMANIS)

Four IT faculty among new McKnight Professors

The Graduate School has honored four IT faculty with the 2004-06 McKnight Land-Grant Professorship. Assistant professors Baoquan Chen (computer science and engineering), Heiko Jacobs (electrical and computer engineering), Kristopher McNeill (chemistry), and Joachim Mueller (physics) are among nine University faculty selected for the two-year appointment. The McKnight Land-Grant Professorship is designed to advance the careers of the University's most promising junior faculty at a critical point in their professional lives.



Genius REDUX

BY JUDY WOODWARD • PHOTOS BY JONATHAN CHAPMAN

Michel Janssen's freshman seminar examines Einstein's scientific theories and takes an unflinching look at his human foibles

ASSISTANT PROFESSOR MICHEL JANSSEN WATCHES as one of his students adds a new colored line to a roughly drawn Minkowski diagram, a geometric representation used to demonstrate space-time paradoxes of the special theory of relativity.

The student's grip on his marker wavers a bit, and a classmate asks why his space and time axes aren't drawn from the same point.

"Because I'm a sloppy drawer," is the response.

"That's OK," quips another student. "Like everything else in this class, it's all relative."

It's a predictable line that's heard frequently in Einstein for Everyone, the freshman seminar taught by Janssen, a faculty member in the Program in the History of Science and Technology.

Today the seminar's 13 first-semester students are getting a taste of the heady possibilities of relativistic space-time. They're learning about the Twin Paradox (a mind-blowing proposition based on what Einstein termed the "dilation of time") that identical twins will age at different rates if one twin hitches a round-trip ride on a spaceship.

To illustrate the theory's implications, Janssen describes what he calls a "disgusting male chauvinist pig fantasy," in which a man married to an enticing young woman induces her identical twin to blast off in a spaceship traveling "at 99 percent of the speed of light." By the time the spaceship returns, the husband and wife are approaching age 50, but her twin remains almost as young as her sister was on her wedding day. Says Janssen with a straight face, "So I find myself a divorce lawyer and marry the twin. This scenario is perfectly allowed in special relativity."

"That's awesome, dude," exclaims one young man in the second row.

Other students are equally enthusiastic about Janssen's unorthodox approach to teaching the foundations of modern physics. "This is the most amazing class," says future accounting major Katie Simpson. "You come here and you can feel your brain clicking. It's a great experience to know you're learning. This is what college is all about."

Freshman Kristine Meyer adds, "I'm really enjoying this class. It's the only class I smile in."

Their classmate, Isaac Beaver, a mechanical engineering student, confesses that studying Einstein was not his original plan. "My first choice was Psychopaths and Serial Killers," he says, but that seminar filled before Beaver could register. Nevertheless, he's pleased with his runner-up selection, the Einstein class.

"I always thought the theory of special relativity was interesting when we studied it in high school [physics], but [the teacher's attitude] was 'just accept it,'" says Beaver. "We never learned to do the Minkowski diagrams in high school. In college, [relativity] just got a lot weirder."

Freshman seminars are as unique as the minds that shape them. Faculty from a wide range of academic departments design and teach the seminars to showcase the University's broad intellectual horizons. IT's offerings have focused on disparate topics ranging from astronomy's Extraterrestrial Life to a chemistry department offering entitled Water, Water Everywhere, nor Any Drop to Drink.

The content of Janssen's class includes an unflinching look at Einstein the man as well as an introduction to his scientific theories. During the seminar's first meetings, discussion centers on the work that made Einstein the foremost scientist of the 20th century, but subsequent sessions examine the eventful personal and political life of the thinker who commanded the attention of presidents and the hatred of Nazis. Einstein played an important role in such historical movements as Zionism and pacifism while he also managed a surprisingly complicated private life that included two wives, several mistresses, and at least one child whose existence was kept under wraps.

Anyone who enrolls in the seminar expecting only an overview of Einstein's scientific theories is in for a shock. Required reading includes the book *Einstein in Love*, and students will end the semester by performing selected scenes from a screenplay about Einstein's life that Janssen cowrote. Any illusions of Einstein as an ascetic intellectual are dispelled when the class reads aloud such

GENIUS REDUX CONTINUED ON PAGE 30 ▶

Michel Janssen (above and left) unmasks Einstein in his new seminar.

JONATHAN CHAPMAN

Going for the GOO

Professor Ed Cussler and a team of intrepid swimmers take the plunge for science in an unorthodox experiment

BY JUDY WOODWARD

THE LEAN-MUSCLED SWIMMER stands poised at the side of the pool, glances a bit apprehensively into its depths, and then dives quickly into the greenish, slimy liquid. A few gelatinous globules bob gently to the surface.

What has happened to the normally azure, chlorine-scented waters of the University Aquatic Center?

Much as the scene resembles the anxiety-fueled dream of an athlete the night before a big swim meet, the swimmer and pool actually were part of a real-world—though admittedly unconventional—foray into experimental fluid mechanics.

For a few hours last summer, a University pool was transformed into a body of water that looked more like a fully functioning swamp than a swimmer's arena. Members of the University swim team became field researchers in an effort to settle one of the questions that has intrigued scientists—and swimmers—for centuries:

What effect does the viscosity of a fluid medium have on the speed of a body traveling through it?

Imagine the sensation of swimming through maple syrup. Would you move faster or more slowly than you would in ordinary water? Most people assume intuitively that the sticky stuff would slow you down. But what about the possibility that higher viscosity might actually give you a forward boost in the same way a stiff rope ladder allows a climber to ascend faster than a limp one?

For some people, the thought of diving into anything but unadulterated water is the stuff of nightmares, but aquatic center director Duane Proell says that every dedicated swimmer has wondered about the answers to these questions.

Nobody had ever investigated the matter scientifically, though, until chemical engineering professor Ed Cussler and senior Brian Gettelfinger took the plunge.

Last summer, Cussler, Proell, and representatives of groups ranging from the NCAA to campus facilities management—not to mention a band of intrepid swimmers—cooperated to find the answer to a truly sticky problem.

Cussler first speculated about the influence of drag forces on a swimming body more than 30 years ago when he was teaching at Carnegie Mellon University in Pittsburgh. "A rather tubby Uruguayan grad student…challenged me to a swimming race," he explains. To Cussler's sur-

Professor Ed Cussler (below) and his team transformed a teaching pool in Cooke Hall into the virtual equivalent of a giant bowl of maple syrup.

prise, she beat him.

The unexpected defeat sparked his interest in the physics of swimming. Then he read an intriguing book by the late Jim Counsilman, a legendary Olympics coach who built the University of Indiana into a swimming powerhouse.

"In *The New Science of Swimming* Counsilman [talks about] the 'theoretical square law,' which states that 'resistance [to a swimmer's motion] varies with the square of his velocity,'" explains Cussler. "In other words, to go twice as fast [a swimmer] has to pull four times as hard.

That just jumped out at me when I read his book."

First proposed by Dutch scientist Christiaan Huygens in the 17th century, the idea that resistance is dependent on the square of the velocity of a moving body has an important secondary implication. It suggests that when it comes to determining the rate of speed, the viscosity (or thickness) of a medium is less important than other factors, like the shape of the body moving through it.

In other words, it matters not how thick the goo, the swimmer's force will pull him through—unless, of course, the goo actually provides an unexpected boost.

Cussler had been thinking about these questions for many years, although he's quick to acknowledge there's no commercial application for his experiment. He points out that he was careful to fund the test out of consulting monies that were not assigned to other research goals.

In the end, it was scientific curiosity, pure and simple, that inspired him to propose an experiment involving an otherwise underused swimming pool in late August.

Gettelfinger was an eager collaborator. In addition to his studies in chemical engineering, he's also a varsity swimmer.

"Anyone who's swum extensively has been curious about what it would be like to swim in something other than water," he says. "[The question] crossed my mind a couple of times, but I thought a test couldn't be done."

Gettelfinger was able to persuade several of his fellow swimmers to donate a summer's day to the pursuit of scientific research. "The other swimmers are mostly English majors," he reports. "They just [thought] it [was] funny."

Before they could dive into their work, so to speak, several layers of University administration had to approve the project. "Everything we've done has required the cooperation of a lot of people," says Cussler. "The aquatic center authorities, the people from hazardous materials, facilities management—all had to agree to it." Even the NCAA got involved because the swim team needed a waiver for the highly irregular session.

Proell admits he was slightly taken aback when he first heard Cussler's proposal to dump 700 pounds of guar gum, a thickening agent, into one of the University's pools. Fortunately, though, he recognized the proposal's educational merits.

"Cussler is persuasive, but we didn't need much persuading," he says. "We all agreed that we had an opportunity here to be part of the University's educational mission. [The experiment] involved movement through water. [I]n aquatics, that's our business. It intrigued us."

After securing the necessary permissions, the researchers grappled with the problem of transforming a swimming pool into the working equivalent of a giant bowl of maple syrup. Normally found in products like ice cream and shampoo, guar gum in its natural state is a gritty off-white powder; however, when added to liquid, it tends to clump into telltale globs unless blended vigorously.

According to chemical engineering junior Jonathan DeRocher, the researchers discarded their initial plan for mixing the guar with water. "We were standing around when we saw a garbage can. Our first idea was to mix it in batches and dump them over the side into the swimming pool. Then [chemical engineering adjunct professor] Jeff Schott said we could do it continuously with a pump mechanism."

The team devised a Rube Goldberg-like contraption using a large green plastic garbage can, a drill with a mixing head, and a length of PVC piping. The device permitted them to pump the guar gum solution directly into the pool, an operation that took about four hours on a Saturday afternoon.

JONATHAN CHAPMAN (3)

On the following Monday the swimmers assembled at the pool, which had been closed to outsiders for the experiment. Only one preliminary step remained: Someone had to test the waters.

In the best tradition of a commanding officer who doesn't expect troops to follow where he will not lead, Cussler made the first leap into the guar-laced pool. Although the greenish cast of its waters suggested a rich profusion of pond scum, Cussler emerged showing no ill effects. The experiment was ready to begin.

During its first stage, swim team members and other volunteers swam timed laps in the guar pool. They used a variety of strokes and also tested swim fins and drag suits. After showering and resting, they repeated the process in a nearby "control" pool filled with ordinary chlorinated water.

Volunteer Eric Nuxoll, a postdoctoral associate in chemical engineering, equated the sensation to "swimming through Tang" and estimated the guar pool to be about two-and-a-half times as thick as normal water. Cussler's calculations later put the ratio at about twice the viscosity of water.

"This was the most oddball experiment I've ever done," says DeRocher. "I've learned that Professor Cussler has very original ideas. Some work, some don't."

The findings of this unorthodox investigation?

Swimming in "syrup" doesn't really make that much difference one way or another, according to Cussler. "Swimming in guar does not change swimming speed," he says. "The standard deviation between lengths for competitive swimmers is 2.4 percent, the same as that recorded by their coaches in normal workouts."

Not that the experiment didn't come up with other interesting findings. Cussler also had been interested in the relationship between fluid mechanics and the swimmer's physique.

"The best swimmers should have the body of a snake and the arms of a gorilla," he concludes. "The fact that elite swimmers are not all shaped like this is a wonderful reminder that fluid mechanics is not the only factor in swimming fast." ■

Gettelfinger and the goo.

Scholarship recipient Carrie Beiser

CAMPAIGN MINNESOTA

Underachievers they're not.

Past students and faculty of IT have invented the black box flight recorder, retractable seat belts, the supercomputer, and the cardiac pacemaker. Collectively they're as diverse, creative, and dynamic as Minnesota itself. But recently, IT alumni, faculty, and friends pulled off a feat that rivals all others: In just seven years, they contributed the stunning sum of $158 million to Campaign Minnesota.

Administrators at a public university seldom drop phrases like "exceeding expectations" when talking about finances, but IT dean H. Ted Davis is delighted to make an exception.

"We're very pleased," he says. "At first I thought our goals were overly optimistic, but we made them. We did better than I expected." University-wide, the campaign generated more than $1.65 billion.

Davis attributes much of the campaign's overwhelming success to alumni. "A lot of it was the generosity of our graduates," he says. "Many of them have done very well and have generously given back."

The fundraising effort already has produced tangible results. New mechanical engineering facilities, dedicated in April 2001, are a gleaming example of the progress that $158 million can spur.

"We're seeing evidence of the effort everywhere," says Davis. "We've got new buildings, scholarships, chairs, and professorships." He points out that fellowships and chairs have been crucial in the effort to retain students and professors as tuition rises and government spending on education dips. "This money really makes a difference."

Phil Oswald, the college's director of development, says it's impossible to overemphasize the magnitude of IT's achievement. "There were 12,800 donors who came together to make this happen," he says. "This isn't just about big contributions. We're talking about a range of one dollar to $30 million."

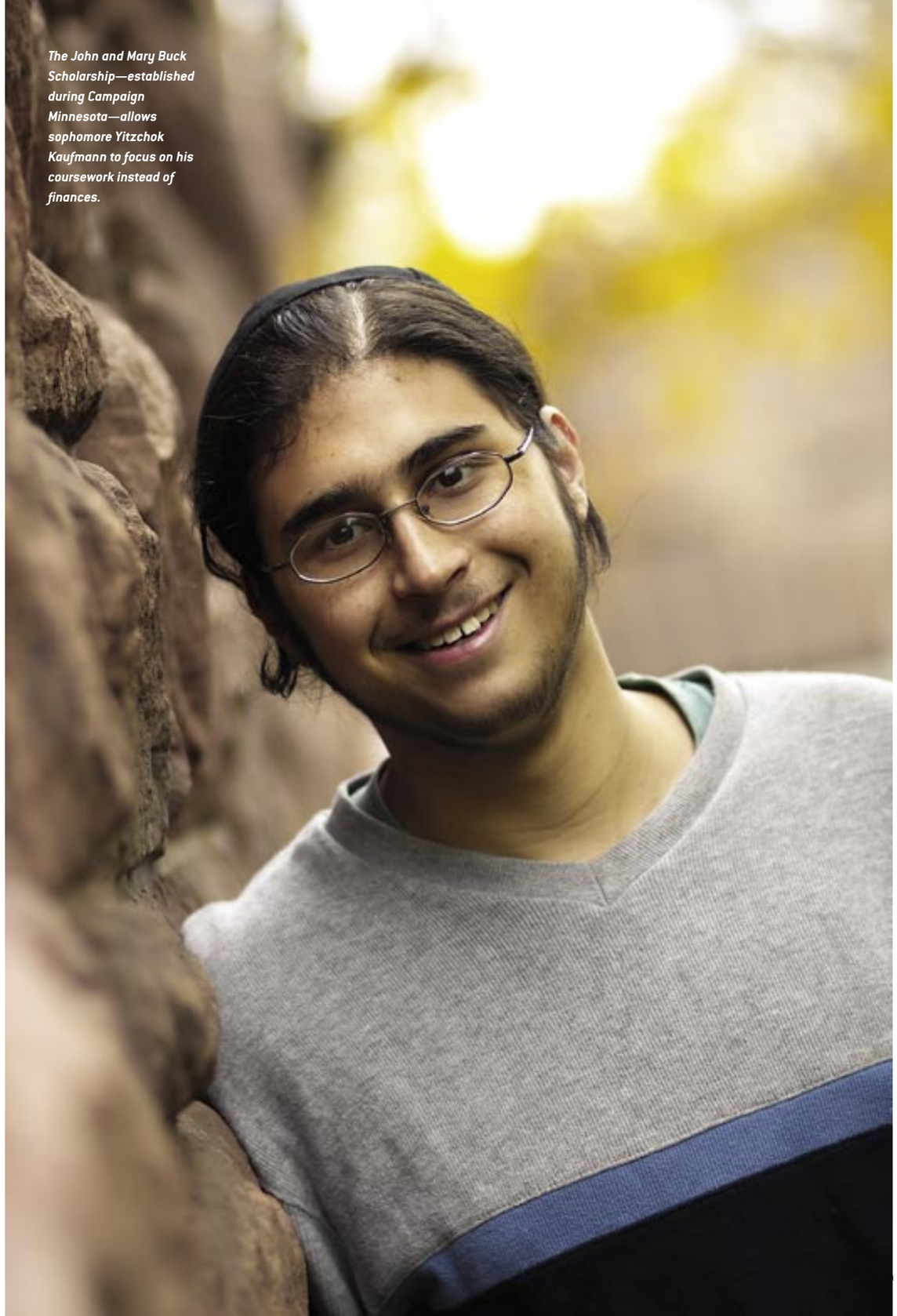
Alumni represented 73 percent of the donors—by far the leading group—but faculty and staff represented four percent of the donors and contributed seven percent of total money raised. Oswald says their generosity is a sure sign that IT staff members want to invest in their workplace and believe in the college's mission.

Although the campaign's primary goal was to raise funds, Oswald stresses that the college has benefited in other ways. "There is a new enthusiasm from our alumni," he says. "We've boosted our efforts to connect with former students and help them reconnect with the University community. We've 'raised friends,' too."

As dean of IT, Davis recognizes—probably better than anyone else—just how much the campaign will brighten the University's future and help the college carry out its mission.

"We're just exceedingly grateful," he says. ■

BY NICHOL NELSON • PHOTOGRAPHS BY JONATHAN CHAPMAN



The John and Mary Buck Scholarship—established during Campaign Minnesota—allows sophomore Yitzchok Kaufmann to focus on his coursework instead of finances.

Smart investments

CAMPAIGN MINNESOTA'S IMPRESSIVE bottom-line statistics tell only part of the story behind this hugely successful fundraising effort. Knowing that the campaign raised $25 million for scholarships—a sum that could defray the annual cost of running a small town—doesn't tell you anything about the hopes and dreams of IT students like Luke Brady, Carrie Beiser, and Kenneth Tritch.

Scholarships are helping them pay for their education and take the first steps toward careers in engineering.

Although their backgrounds, personal situations, and career goals may differ, Beiser, Brady, and Tritch value their education and express sincere appreciation for their scholarships. As many IT alumni will testify—some of whom are profiled in this magazine—the passage of time will only deepen their gratitude for the life-changing education they're receiving and the scholarships that help make it possible.

Brady, a freshman who graduated from Crosby-Ironton High School in Crosby, Minnesota, considered several schools when he was applying to college but says he chose the University's Twin Cities campus because IT was the best place to study engineering.

"It had better programs, newer equipment, and a lot of engineering choices," says Brady. "My parents were glad I went somewhere close, and I was happy to stay in Minnesota."

Brady's high school academic record made him a merit scholarship contender. His grades were excellent—he was co-valedictorian of his class—and he'd taken most of the science courses offered at Crosby-Ironton. He received the Robert K. Anderson Scholarship, an award designated for residents of Crow Wing County.

He says he feels fortunate to have the scholarship because it allows him to concentrate on academics during the critical freshman year. "Some of my friends have to work long hours—it takes a lot of their time," he says. "This way I can take a full class load. I've got 16 credits right now."

He's planning to major in biomedical engineering because he says the field offers him many career options.

Beiser decided on a career field while she was still a student at Blaine High School in Blaine, Minnesota.

"Engineering kind of runs in my family, so it's not that surprising that I decided to get into chemical engineering when I was in 11th grade," she says. "My mom, stepdad, and grandpa are electrical engineers, and my brother is in mechanical engineering."

Scholarships attract talented students to IT and give them more time to focus on academics

Beiser, a senior who will graduate in spring 2004, is contemplating a career in pharmaceuticals but says she's keeping her options open.

Her decision to enter the University came easily. Besides having a highly ranked chemical engineering program, the University offered her a great all-around education at an affordable cost.

Beiser has made the most of her undergraduate years. Besides maintaining good grades, she's been involved in extracurricular activities. She's president of the campus chapter of the American Institute of Chemical Engineers and also completed a summer internship with pharmaceutical giant Pfizer.

"It takes a lot of commitment, but it's really fun," she says of her busy schedule.

Beiser received an award from the Bobbie Huston Cronquist Scholarship Fund that offsets the cost of her textbooks. Cronquist (ChemE '47), who was one of the first women to graduate from the University with that major, established the eponymous scholarship to encourage young women to enter the field.

Beiser is looking ahead to the time when she can return the favor. "Someday I'd like to do something like this for another student, definitely," she says. "It's great to encourage more girls to get into science."

Tritch says that as a youngster his unceasing quest to understand the "why,

INVESTMENTS CONTINUED ON PAGE 27 ▶

A gift for ingenuity

Endowed chairs and professorships promote innovation and honor outstanding scholars

WHEN THE CLASS OF FOURTH graders has finally quieted down, Professor James Leger delivers on his promise. Standing at the front of the room, he holds aloft a thick green dill pickle and dramatically inserts a long steel nail in each end. The children listen expectantly, their eyes fixed on the impaled vegetable, as Leger explains the properties of electrical currents while he attaches a lamp cord to both nails and plugs the cord into a wall outlet.

For 30 excruciating seconds, the pickle remains lifeless, and the experiment appears doomed. And then suddenly the magic happens: The pickle begins to glow with a brilliant yellow light. The children squeal in delight, and Leger grins, knowing he's stirred the curiosity of another group of potential scientists—with a little help from an edible sodium vapor lamp.

Volunteering at local schools is just a hobby for Leger, a way to share his love of electrical engineering with kids. Leger's work at the University is a bit more complicated. He's one of the leading U.S.-based laser researchers, and his work has had a tremendous impact in both academic and professional circles. In 1997 California-based Cymer, Inc., a leading producer of short-wavelength lasers, awarded the electrical and computer engineering department a $500,000 endowment to create the Cymer Professorship in Advanced Optical Systems, Metrology, and Lasers. The company specifically designated that its gift be used to fund Leger's research.

A San Diego native, Leger came to the University circuitously. Interested in science and engineering largely because of the burgeoning space program, he enrolled in California Institute of Technology as an applied physics major.

"When I was in high school, we were landing on the moon," he says. "Science and engineering were the coolest things you could do. That sort of motivation is better than the reason many people give today for an engineering career—money." He had applied at Cal Tech and the University of California at Berkeley but says he would have considered the Peace Corps if he hadn't been accepted at either school. "It was the 60s, remember," he says, laughing.

By the time he entered his senior year, he was intrigued by lasers and holograms. "Holography was an emerging field, and I was fascinated with being able to explain something that for all the world looked like magic," Leger says. "It connected two of my loves, physics and signal processing."

Although his interest in holography waned during his graduate school years at the University of California at San Diego ("Holograms were one of those things that people thought were going to save the world, but now you see them mostly at the Mall of America"), he continued to work with three-dimensional light sources. He dabbled in robotic vision, applying holography to help machines recognize objects.

"We made robots that were able to distinguish between birds and fish, for example," he says.

Leger's research led him to the private sector after he graduated in 1980. His work in optics made him a perfect candidate to lead projects in automatic inspection at 3M.

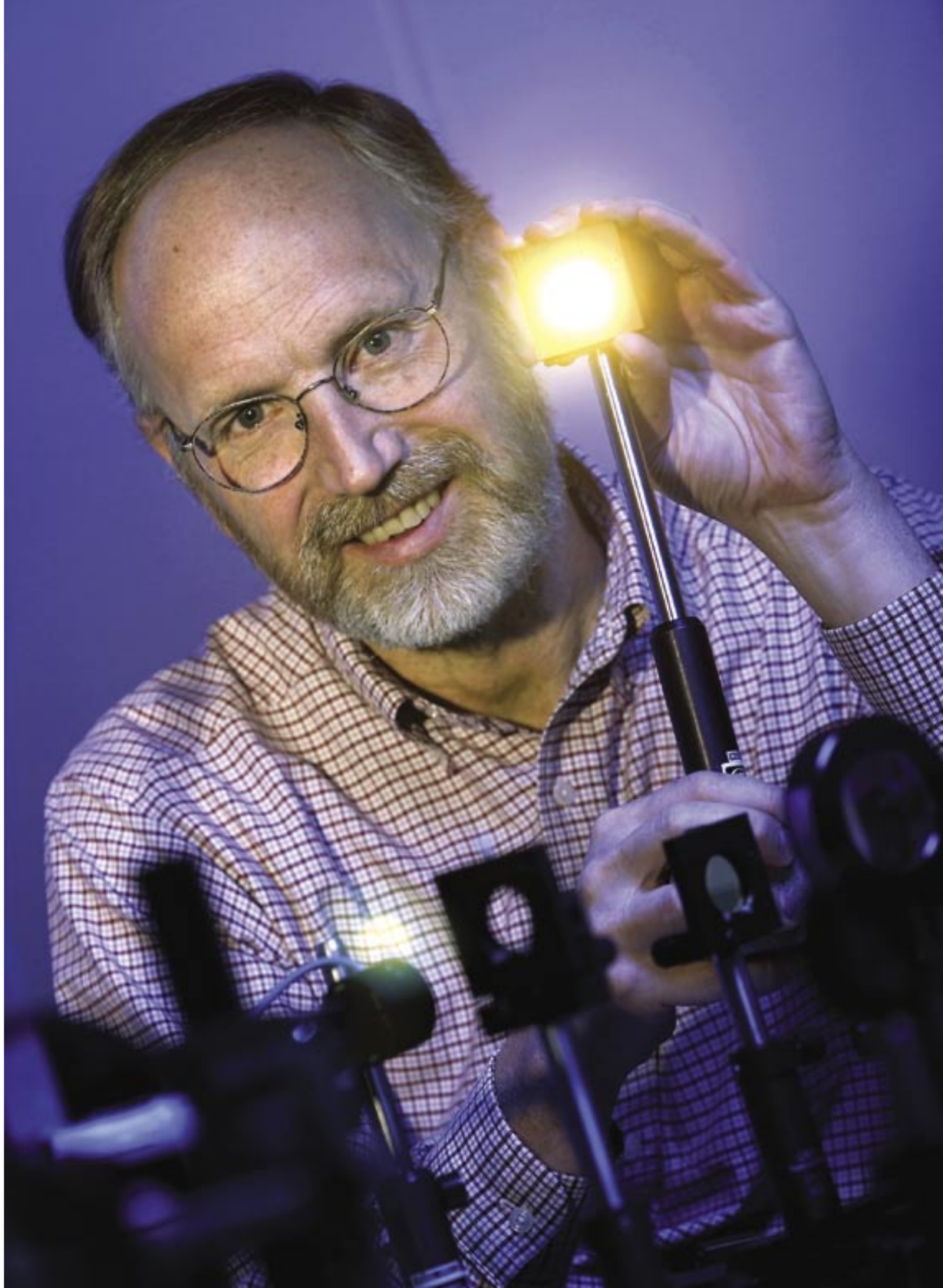
"3M makes products like Scotch tape in huge automated batches, so plant operators need to make certain the manufacturing process is going smoothly," Leger says. "I helped design the optical inspection stations to ensure the tape goo went onto the plastic backing correctly," he says.

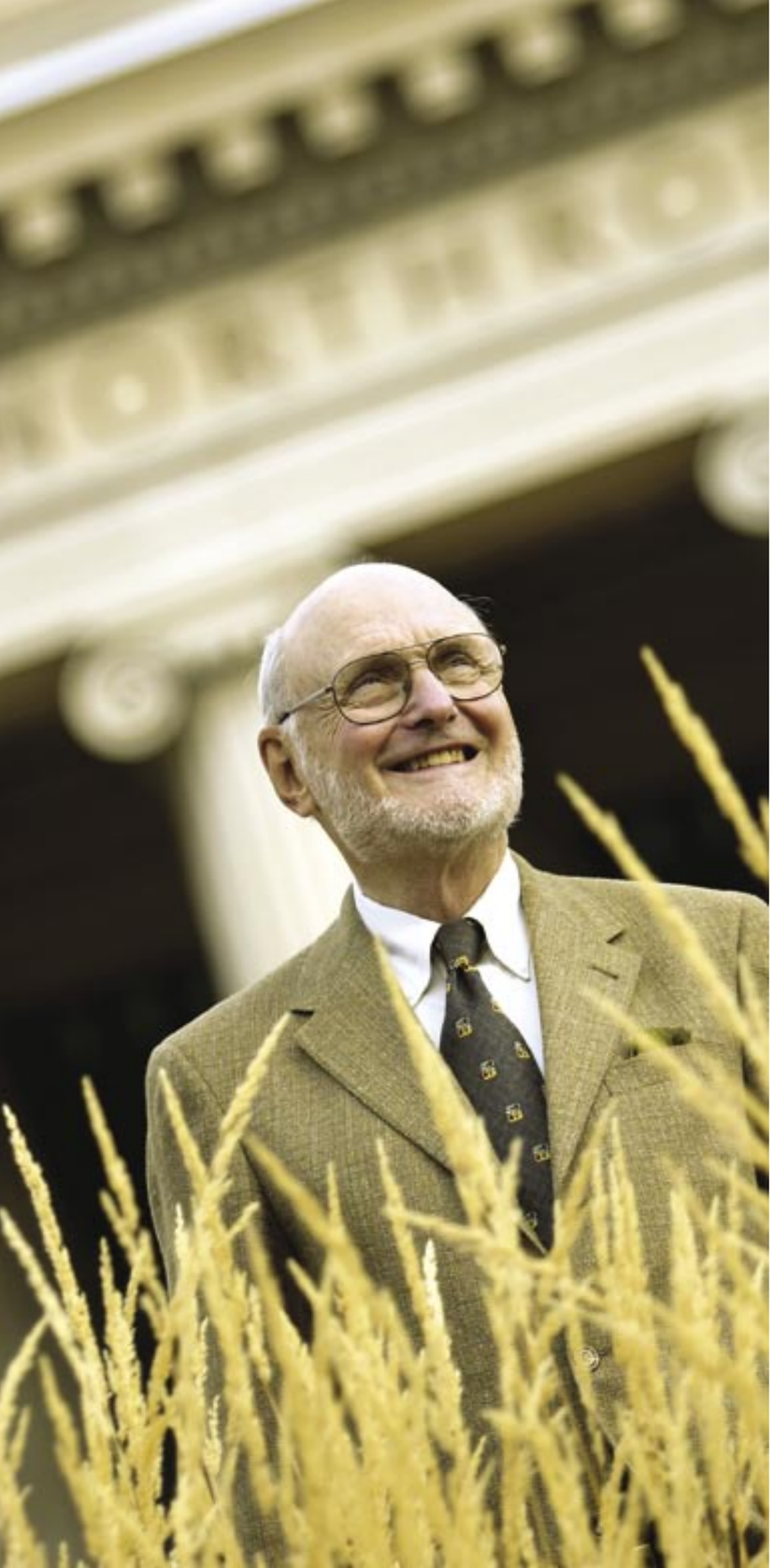
After just three years, Leger was ready for a new challenge, and he accepted an offer to join Massachusetts Institute of Technology's Lincoln Laboratory. A new research group there was pioneering the use of micro-optics and wanted Leger's talents. He loved the work and stayed for more than seven years.

"It was like being a perpetual grad student," he says. "They just told us to go with what we thought was right and provided full funding. It was a very rare opportunity."

A prior connection turned out to be his ticket back into academia. While Leger was employed at 3M, he met Professor Mostafa Kaveh, then a relatively new member of the University's electrical and computer engineering faculty. In 1991

INGENUITY CONTINUED ON PAGE 23 ▶





Engineering success

Alumnus Dick Clarke's passion for education makes him one of the U's most effective advocates

FIFTY YEARS HAVE PASSED since Dick Clarke (ME '53) was a student at the University, but it's possible he spends more time on campus these days than some commuters do. An active member of the Minnesota High Tech Association, the IT Alumni Society, and the Mechanical Engineering Advisory Council, Clarke is a standout among University alumni.

When asked about the demands of all this involvement, Clarke replies matter-of-factly, "My big thing is education, especially education in Minnesota. It's what's important to me."

Clarke isn't the type to pull punches. He's quick to say what he thinks and to act on his beliefs. He's donated his time and financial support to Campaign Minnesota and to the effort to build the new mechanical engineering facilities. He says it's been well worth it.

Clarke calls himself a local boy. He grew up in St. Paul and attended the city's Central High School. Unable to provide financial assistance for his college education, his parents encouraged him to find a means to get his degree.

"That was just the way it was," he says. He entered the University, lived at home, and financed classes with a Naval ROTC scholarship. "On the Holloway Plan, they helped with tuition and books, and we got a stipend of $50 per month," he recalls. "It was a wonderful plan for a lot of us."

When Clarke started at the University in 1948, prospects for engineering jobs were not good. The country was in a postwar recession, and large numbers of World War II veterans were flooding the job market.

"Regardless of the circumstances, I decided that I wanted to be an engineer," he says. "I was always science-minded; it's just the way my brain works."

When he graduated with honors in 1953, Clarke had an obligation to serve three years in the navy. He was assigned to a destroyer as the engineering officer and completed three tours of duty in the western Pacific. "It was tough," he says. "You learn a lot about yourself. It builds a lot of confidence that you can get into a tough situation and work your way through it."

Returning in 1956, Clarke found the job market for engineers much improved. "At that time, all you had to do was apply for a job, and you got an offer," he says. "The choice for me came down to building computers for Univac or building atomic weapons at Los Alamos. I have always been thankful that I chose computers."

His desire to remain in Minnesota strongly influenced his decision. "I just really am a born and bred Minnesotan," he says. "I love the summers, how green it is, and the winters. I really like four seasons."

Clarke became part of the burgeoning computer field, creating the technology that started a revolution. "In 1956 no one realized what the computer industry would become," he says. "That was when computers filled whole rooms," he laughs. "We're talking about vacuum tubes!"

During his three years with Univac, Clarke filed a number of patents for cutting-edge technology and established a strong reputation in the field. One afternoon he received a call from Bill Norris, founder of Control Data Corporation, who offered him a job. "I just about spilled my coffee," Clarke says. "He was sort of a deity in our profession at the time."

When Clarke joined Control Data, its revenues were less than $1 million, and the company made strong annual growth its primary objective. During the computer industry's early days, Control Data achieved spectacular success, but growth also brought other changes.

"Every year when we doubled in size, it became about half as much fun," says Clarke, who eventually quit after 10 years.

After a brief attempt at his own start-up company, he took a job as a vice president with MTS Systems, where he built testing systems for automobiles and airplanes. Although he took his responsibilities very seriously, he wasn't above engaging in banter with his peers.

"We had a little saying: If the wings come off, it can muck up a pilot's day," he jokes. Clarke retired after 22 years with MTS and then turned his attention to the University.

The mechanical engineering building in use at the time had been built in 1950. Clarke believed that updated technology and facilities would allow students and faculty to perform at peak potential and also attract top faculty.

"I thought it was extraordinarily important for the department and for the state," he says. "Being a mechanical engineer is radically different today than it was 50 years ago, and we need the tools and equipment to do the new kinds of work that reflect the needs of industry in Minnesota."

As a member of the Mechanical Engineering Advisory Council, Clarke met with the department head to discuss the possibility of a new building. At the meeting he promised, "We are going to do this for you. I don't know how, but if we don't try, we won't succeed."

With that rallying cry, Clarke revved up the plan. He and a dozen dedicated alumni obtained a funding commitment from the state and then took on the next challenge—raising an additional $10 million, the University's share of the project's cost.

The group raised the funds within four years, and today the gleaming new facilities are proof that the volunteers made good on their promise. "The dean doesn't owe a nickel on it," Clarke adds proudly.

IT dean H. Ted Davis is indeed a happy man. "There was a lot of development work that went into this effort," he says. "The team came together and mapped out strategies for how to approach companies, talk to government, and query donors. They rose to the occasion and made it happen."

ENGINEERING CONTINUED ON PAGE 27 ▶

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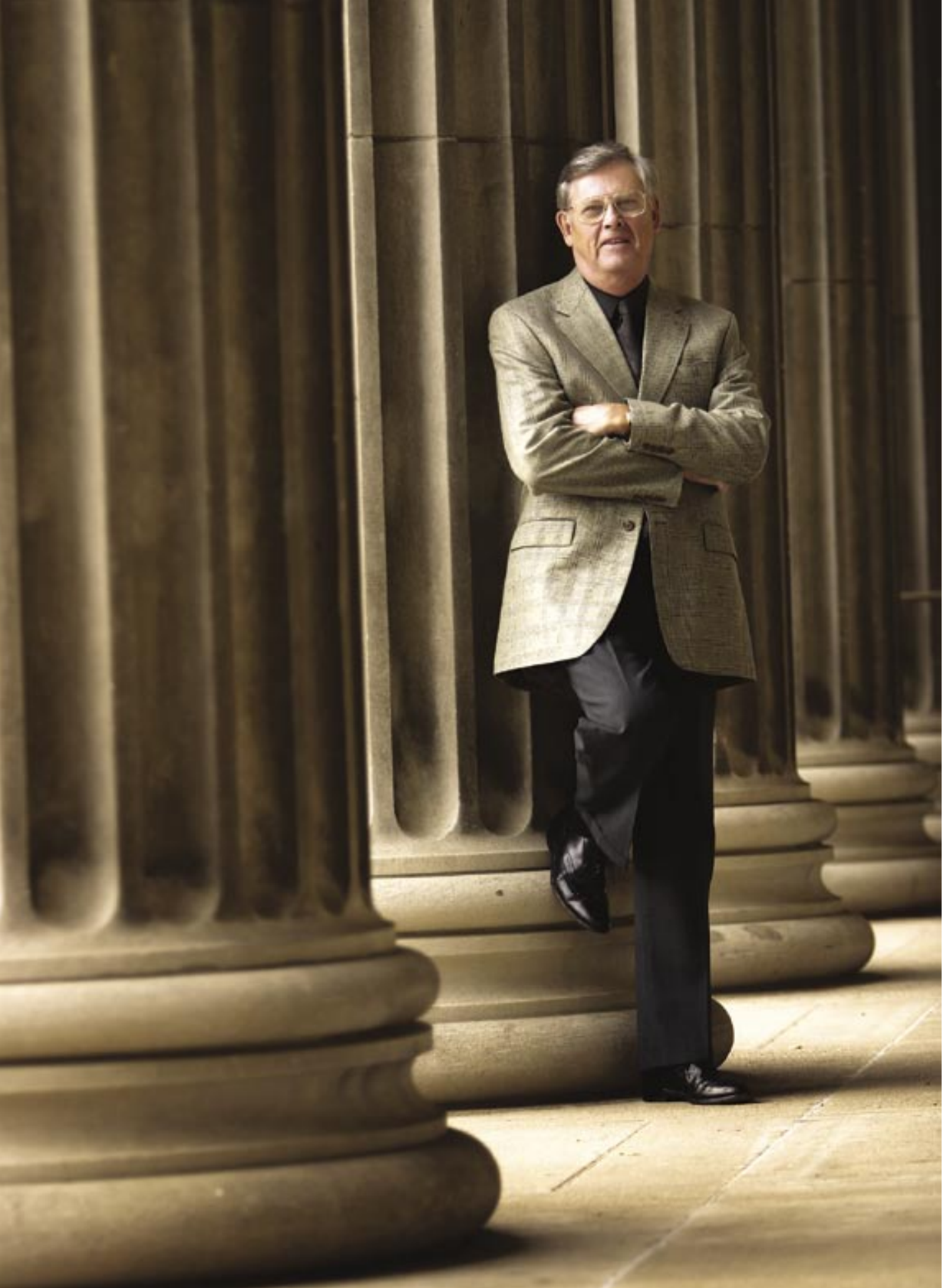

Tireless Texan

In retirement Russ McNaughton devotes his time and talents to serving his alma mater

ATHLETES AND CELEBRITIES WHO don't view themselves as role models would be wise to consider the case of Russ McNaughton (EE '57). When his cousin returned from military service and entered the University to study electrical engineering, the young McNaughton was paying close attention. He admired his cousin's interest in science and engineering and vowed that he would follow the same path.

"In high school I took all the math and science courses that were available," he says. When the time came to select a college, he knew the University was for him. Behold, the power of a role model.

McNaughton lived at home while he attended the University. "It was an advantage from a cost standpoint," he says. "I kept track of every cent, and I still remember it averaged about $240 a year." He met his future wife, Carol, who was also a University student, on a blind date.

In fall 1957, McNaughton entered the army and was stationed first in New Jersey, then at White Sands Missile Range in New Mexico. The couple's first child, a daughter, was born in El Paso, Texas. After he finished his military service, the family returned to the Twin Cities.

"I grew up here, so the area was home," he says. He took a job with 3M, where he worked in various capacities until his retirement in 1993 as vice president of the company's Electro Products Group.

"I was involved in a large variety of technical projects," he says. Initially he dealt mostly with instrumentation but then moved up the ranks, eventually landing the position of division vice president. He was still looking for new challenges, however, and moved to Paris to manage 3M's business in France, where the McNaughtons spent several years with their youngest daughter (who graduated from the American School in Paris). The family returned to the U.S. when McNaughton accepted a position at 3M's newly opened facility in Austin, Texas.

McNaughton's busy career left him little time for maintaining his ties to the University. He'd always wanted to reconnect with his alma mater, however, and after his retirement he began looking for ways to become involved. Luckily, one of McNaughton's high school friends, Lee Johnson, was serving as chair of the fundraising campaign to build a new mechanical engineering facility, and he invited McNaughton to join the effort.

"I was eager to help," says McNaughton. "I had contacts at 3M, both active and retired employees, who were willing to support the effort."

McNaughton joined the campaign committee, flying from Texas to Minnesota for every meeting. He was the committee's sole electrical engineer in a sea of mechanical engineers, but he was no less dedicated. "I really wanted to become involved in a significant way," he says. "The ME building effort was something I felt really strongly about."

To jumpstart the campaign, McNaughton organized a kickoff luncheon for University alumni living in Austin who were current or retired 3M employees. Guests at the event included Mark Yudof, who spoke about his new connection to the University as its president-elect.

"Then the real work began," says McNaughton. In the following months, committee members were swept up in a blizzard of planning meetings, phone calls, and donor receptions.

Their work paid off, and contributions began pouring in. After it became clear that the campaign would succeed, McNaughton began searching for other ways to help the University. He received and accepted an invitation to serve on IT's steering committee for Campaign Minnesota. A huge success, that fundraising drive officially ended this past summer, but McNaughton is showing no signs of slowing down.

"You have to keep setting new goals," he says. "I was just asked to serve on the IT dean's advisory committee, and hopefully that will lead to other things."

His generosity to the University extends beyond volunteerism. Three years ago the McNaughtons formed a charitable remainder trust as a way to support the campus.

"Carol and I really want to help the University and its students, now and in the future," McNaughton says. "We owe so much of our lifelong activities to what we did at the University." ■

The sky's the limit

The University gave wings to Dick DeLeo's childhood ambition, and now he's helping students launch their dreams

THANKS TO THE WRIGHT BROTHERS' historic achievement a century ago, toy airplanes—fueled by a soaring imagination—have been a childhood staple for generations. During the years immediately following World War I, however, when airplanes were still a relatively new technology, children were especially passionate about the flying machines.

Before television dulled the youthful imagination, youngsters like Dick DeLeo (Aeronautical '46, M.S. '48) could fantasize about the gleaming gray birds carrying heroes across the globe to fight for their country. Always passionate about airplanes, DeLeo grew up flying his imaginary fleet around the backyard.

"I knew early on that I wanted to go into aeronautical engineering," DeLeo says. "I loved planes when I was a kid and wanted to work with aircraft."

After graduating from Central High School in St. Paul, he enrolled at the University to fulfill his dream. "My sister had gone there, and it was a well-known and established school," he says.

Like many college students at that time, he lived at home with his family while attending classes. The world's political climate was changing rapidly, however, and in 1943 DeLeo left school to serve in the army. His 33-month tour of duty took him to Louisiana, Texas, and Germany—an intense three years for the Minnesota boy.

DeLeo returned in 1946 to finish his education. After receiving a bachelor's degree in aeronautical engineering, he immediately began working for the University as a researcher while completing a master's degree. He spent nearly a decade at the University and then took a job with Rosemount Engineering Company, working with wind tunnels and on intricate research projects involving flight equipment. The company, founded by three University alumni, was DeLeo's employer until he retired in 1988. Now owned by Goodrich, Rosemount's aerospace division has a tradition of hiring IT graduates.

"We made a point of hiring a lot of students from the University," says DeLeo. "They're always educated and work out well."

In the 1980s, DeLeo served on an aerospace engineering and mechanics advisory board at the University, where he became familiar with the department's financial needs. He began contributing financially in the early 1990s, and in 1996 he established an endowment to provide undergraduate scholarships. The endowment fund's flexibility allows the department to use its proceeds in various ways.

"It's great to see the results of the scholarships," he says.

Among the most exciting opportunities his scholarships give students is the chance to participate in the Reduced Gravity Student Flight Opportunities Program, a nationwide competition sponsored by NASA's Johnson Space Center.

Students submit a research proposal to be conducted onboard a NASA KC-135A, the aircraft used to train astronauts. If their proposal is approved, the students spend nine days at Johnson Space Center learning about NASA, undergoing preflight health and safety training, and finally conducting their experiment during a "roller-coaster" flight. For students who are considering a career as a NASA astronaut or engineer, the trips also are a chance to glimpse the realities of the profession. (The summer 2001 and summer 2002 issues of *Inventing Tomorrow* include stories about University students who have participated in the program.)

The KC-135A performs maneuvers that produce microgravity, an environment that can be physically demanding and even downright unpleasant (nausea is common). DeLeo admits that he finds the students' enthusiasm for these strenuous experiments a bit puzzling, but he understands their passion for the research and calls the aspiration to be an astronaut "courageous."

DeLeo says he's happy to help students get an education and to assist the ongoing effort to make the University a better place.

"I feel a loyalty to the department because it helped make my life what it is," he says. "I know I'm making a difference." ■

A GIFT FOR INGENUITY

CONTINUED FROM PAGE 16

Kaveh, now department head, contacted Leger at Lincoln Laboratory to invite him to make a presentation—and then asked casually if he'd also be interested in a faculty position. Leger joined the department later that year.

Twelve years later, Kaveh is still ecstatic about Leger's defection. "I view Jim as a complete package," he says. "He's a superb researcher, highly known in the industry and academic community, but he's also a great teacher. There is a misconception with the general public that if you are a high-flying researcher at a university, you tend not to pay as much attention to students. In the case of Jim, it's just diametrically opposite. He's a wonderful teacher and mentor."

Leger teaches optics and signal processing classes to undergraduate and graduate students. He also directs the college's lower division programs.

Leger's research has made him a standout in the research community and a valuable commodity to the laser industry. His work in applications of physical optics and micro-optics to laser systems is extremely useful to a company like Cymer, the dominant supplier of excimer light sources for the semiconductor industry.

Excimer ("excited dimer") lasers are used as very pure light sources with a very short ultraviolet wavelength. This short wavelength enables computer chip manufacturers to push microelectronics to ever-increasing speeds and chip densities.

"Computer chips are made by a process akin to photography," Leger explains. "In order to make a very small image of something, you need short wavelength light. You can make smaller and faster integrated circuits with these excimer lasers."

According to Kaveh, the Cymer endowment is a win-win situation for all the parties involved: It honors Leger for his contributions, helps the department attract new faculty and students, and promotes the innovative research that industry needs.

Bob Akins, Cymer's chairman and chief executive officer, views the endowment as an investment in human ingenuity. "We hope the research generated by our endowment yields overall advances in this field of study, some of which will find commercial application in the semiconductor and other microelectronic industries," he says.

Leger considers the gift to be both pragmatic and philanthropic on Cymer's part. "They know they'll be able to hire my students someday, but I think this gift is also an example of pure unabashed corporate generosity, a way to reinvest in the community."

Endowed chairs and professorships "offer academic freedom in the true sense of the word—the freedom to pursue what you think is important," says Leger. Such gifts are "an example of pure unabashed corporate generosity, a way to reinvest in the community," he adds.

The endowment provides Leger with about $25,000 annually in research funds. He says the endowment has changed his work dramatically by giving him a means to break "the researcher's catch-22": To obtain funding, a researcher has an advantage if the project has shown some results, but without funding, it's impossible to start many projects.

"The Cymer endowment allows me to fund a student for speculative research," he says. "It really does offer academic freedom in the true sense of the word—the freedom to pursue what you think is important."

Clearly, the pleasure of learning for its own sake is a driving force behind everything that Leger does, whether it's researching lasers, teaching University students, or dazzling a group of fourth graders with a pickle lamp. ■

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SMART INVESTMENTS

CONTINUED FROM PAGE 15

what, and how" of a gadget or process often got him into trouble at school and at home.

"Early in middle school I had already come to the conclusion that I needed to find something that would allow me to exercise my skills and passion for math and science," he says. Fortunately an insightful middle-school advisor suggested that a career in engineering might suit his talents, and the energetic young student quickly decided to become a chemical engineer.

However, financing a college education presented a daunting challenge. Because his father, a single parent, could not help him pay for school, Tritch worked at various part-time jobs, saving a large percentage of his income for college, and also enrolled in advanced placement and postsecondary courses while in high school. By the time he entered the University, he'd completed a semester of organic chemistry and found employment as an undergraduate research assistant to chemistry professor Wayland Noland, a post he still holds year-round.

Tritch, who will graduate in spring 2004, wants to work for a smaller company that will offer him creative freedom and the chance to help the organization in other areas besides engineering, which is why his degree program includes an emphasis in business and marketing. After spending several years in the workforce, he plans to return to school for a graduate degree in chemical engineering.

Although he has relied on relatively high-paying summer jobs to help pay the bills, during the academic year Tritch finds it difficult to find enough time to work and meet the demands of the upper-division chemical engineering curriculum. That's why he was very grateful to receive the Wendell and Dottie Manske Scholarship this year.

"Senior year is a critical 'keystone' year in the education of a chemical engineer, and the scholarship makes it possible for me to spend a couple of hours each day studying that I would otherwise have spent working," he says. ■

ENGINEERING SUCCESS

CONTINUED FROM PAGE 19

Clarke received the University of Minnesota Outstanding Achievement Award in 1997 and was a candidate for the University's board of regents in 1998.

Clarke's family shares his passion for the University. All of Clarke's children (Marc, Jennifer, and Wade) are alumni. He and his wife, Jean (Home Economics Education '48), have set up an estate trust to benefit the University for years to come.

Despite his munificence, however, Clarke dismisses the label "philanthropist."

"Let's just call it a debt of gratitude," he says. ■

WEIGHING IN

Alumnus Carol Hockert brings a passion for accuracy to her job as director of the state's Division of Weights and Measures

BY NICHOL NELSON

ON A RECENT FRIDAY NIGHT, Carol Hockert's phone rang. Her brother Jack was on the line, and he wanted to see a football game.

"Let's get the family together and road-trip to Green Bay tomorrow," he suggested. For a fleeting moment, Hockert considered the hurdles: a six-hour drive, a scarcity of tickets for the inaugural game in renovated Lambeau Field, and no accommodations.

"I'm in," she declared, and 24 hours later Hockert was speeding across the Mississippi River with six members of her family. "We scalped three tickets, we tailgated, then we painted our faces and stormed Lambeau Field," she says jubilantly. "It was great."

For someone whose personal life seems decidedly uncalculated, Hockert brings a passion for accuracy to her job. As director of the state commerce department's Division of Weights and Measures, she is responsible for creating and upholding the standards of measurement for any commodity or service sold by weight, volume, or length in Minnesota. It's a job that requires concentration, mathematical skills, and the ability to be flexible when problems arise.

She developed her relaxed style as the seventh of 10 children; in such a big clan, there wasn't room for a prima donna. "There's a six-year gap between me and my older brother, which meant the kids were sort of broken into two groups—the 'old' ones and the 'young' ones," she says.

Despite their age differences, the siblings were very close. Her father, Fred Lanners (ChemE '48), made a point of taking the family on a vacation every summer. The Lanners would pack up and head to Brainerd, Minnesota, where they spent two weeks in lakeshore cabins.

Her father, who worked for Ecolab, definitely influenced her decision to attend the University. When it was time for Hockert to consider colleges, he wasn't reticent about voicing his recommendation.

"My dad really loved the U and rallied for me to go there," she says. "He put it really plainly: 'Why go somewhere else when there's a great university right here?'"

Hockert certainly had the academic credentials to choose from a wide range of schools. She attended high school at an all-girls school and attributes some of her laudable academic record to the dearth of boys in her classes.

"I had a 3.9 average in high school, and I'm sure it was due somewhat to the fact there weren't guys there," she says. "It was nice not to have to worry about how you looked. I used to crack up when I saw my daughters curling their hair for school. I automatically thought, 'Why bother?'"

Hockert began her undergraduate studies at the University in fall 1977, but she wasn't a typical student. She married during her freshman year and in 1978 gave birth to a son, Mark. Undaunted by her new responsibilities, she continued to attend classes.

"It was definitely a challenge to go to school with a new baby and a husband," she says. "But it was never a question of whether or not I would get my degree, just about how long it might take." Three years later, she had a daughter, Laura.

Hockert admits that she probably would have achieved a higher GPA if she hadn't had family responsibilities, but she also gravitated toward subjects that made other students cringe. "One of my favorites was thermodynamics—my sister thought I was insane," she says.

Although she lived off campus, Hockert made friends in her laboratory sections. "We often went out afterwards, studied together, and had a lot of fun in all the labs that I can think of," she says. "I usually ate lunch over at Coffman Union and learned what few tunnels existed to get around during the winter."

When she graduated with a chemical engineering degree in 1983, Hockert wasn't sure what she wanted to do with it.

"The economy was in the pits," she remembers. "Interest rates were high, and jobs weren't really plentiful." She interviewed for jobs all over Minnesota and in Chicago but didn't find anything promising. While she was job hunting, Hockert became pregnant with her third child and realized it was time to make a choice.

Hockert is responsible for creating and upholding the standards of measurement for any commodity or service sold by weight, volume, or length in Minnesota.

"When I found out Erin was on the way, I decided this 'mom thing' was maybe the thing to do for a while," she says. She spent the next few years channeling her energy into raising a family and being "a professional volunteer" while her children were young.

Hockert joined the PTA, read at schools, coached soccer, managed political campaigns, sang in a choir, and became president of the local Welcome Wagon. Recalling her busy schedule, she says, "And people would say, 'Call Carol if you need something—she doesn't work.' Hah."

In 1991 Hockert and her husband divorced, and she returned to the workforce. After a brief stint as a temporary clerk for the state, she was offered a job as a metrologist in the Division of Weights and Measures.

"To be honest, I didn't even know metrology existed, yet it's so important to science, industry, and commerce," she says.

The principles of metrology—the science of measurement—are grounded in

physics, statistics, and math. Hockert says metrology gave her what she was looking for in a job: a variety of tasks (some of which occasionally required hands-on physical labor), the use of precision instruments, and highly technical analysis.

Although it may lack the glamour of the governor's mansion or legislative affairs, the Division of Weights and Measures affects the daily lives of most Minnesotans. The division conducts more than 70,000 inspections of commercial weighing and measuring equipment each year, including gas pumps, grocery store scales, and truck scales. The state's metrology lab calibrates and tests devices throughout the country.

Hockert's division conducts more than 70,000 inspections annually. "The jobs can be really enormous," she says. "Out in the field we test railroad scales with a capacity of 300,000 pounds to make sure they're weighing the cargo correctly. But at the other end of the spectrum, we also calibrate jeweler's scales."

"The jobs can be really enormous," Hockert says. "Out in the field we test railroad scales with a capacity of 300,000 pounds to make sure they're weighing the cargo correctly. But at the other end of the spectrum, we also calibrate jeweler's scales."

In 2000 Hockert was promoted to director of the division. Mike Blacik, assistant commissioner for the Minnesota Department of Commerce, hired Hockert and says the move was the next logical step in her career.

"I've worked with Carol since she started, and she has a strong sense of what needs to be done," he says. "She can look at both the big picture and the finer details at the same time. It's remarkable."

Blacik says Hockert has an impressive range of abilities. "She's got three totally different operations to run—enforcement operations, patrolling quality operations, and the metrology lab itself," he says. "They all involve measurement in some way or another, but you need different skills for every one of them."

Hockert is quick to deflect the praise, citing the skills of her staff. "Our division is full of specialists," she says. "There are people who work with scales, and others who do petroleum meters. I specialize in metrology. If someone calls me from somewhere else in the world, that's what I'm good at."

She can't hide her passion for her work and her conviction that accurate measurement literally can save lives. She calls the 1986 accident involving the space shuttle Challenger "basically a product of bad measurement."

She adds, "It's a reminder that measurements are a big deal—but in a quiet way. One small error can cause major problems."

Part of the responsibility of her division is to find errors that affect consumers. Her staff annually inspects approximately 30,000 samples of packaged foods and agricultural commodities to assure packaging accuracy. Unintentional errors are much more common than outright efforts to defraud consumers, according to Hockert.

Sometimes the agency's findings benefit businesses rather than consumers. "We've saved grocery stores tens of thousands of dollars," she says, explaining that retailers sometimes undercharge their customers by deducting the wrong amount of packaging weight from a product's gross weight.

"It may only be a nickel a package, but it adds up when you're selling thousands of steaks," she says. "It's amazing how frequently there are mistakes."

Now remarried, Hockert and her husband, Eric, live in Maplewood, and she continues to take life as it comes. "I'm really happy with what I'm doing now," she says, "but there are interesting positions in the private sector, too."

Whatever direction she decides to take, Hockert credits the University with giving her the tools she'll need. "It's funny," she says. "I didn't know what metrology was when I was in school, but it's definitely the education that prepares you." ■


Michel Janssen

GENIUS REDUX

CONTINUED FROM PAGE 7

scenes as the middle-aged Einstein's declaration of love to the 21-year-old daughter of his longtime lover on the eve of his divorce from his first wife.

Although Janssen uses a noncomputational approach to teaching the seminar, he says that students readily grasp the basic theoretical concepts of Einstein's work. In fact, students sometimes have more difficulty accepting Einstein's human foibles than understanding his theories. Not everyone takes easily to the notion that the preeminent scientific genius of the last century was also a bit of a rake. For that reason, Janssen presents theoretical content first, allowing revelations about Einstein's peccadilloes to serve as an adjunct, not a preamble, to substantive discussions about his achievements.

Born in The Netherlands, Janssen has spent most of his adult life studying Einstein's life and thought. His academic advisors at the University of Amsterdam and the University of Pittsburgh (where he received his doctorate in 1995) were advisors to the Einstein Papers Project. Begun in 1970 by Princeton University Press and Hebrew University of Jerusalem, the project has the goal of publishing "every scrap of Einstein material in their archives." When completed, *The Collected Papers of Albert Einstein* will contain over 14,000 documents and will fill 25 volumes.

After a manuscript by Einstein relating to an early version of the general theory of relativity surfaced during Janssen's second year of graduate school, the young scholar was invited to prepare the manuscript for publication and annotate it. After receiving his doctorate, Janssen joined the Einstein Papers Project staff as an editor and coedited its eighth volume, *The Berlin Years: Correspondence, 1914-1918*. Einstein was working at the height of his creative powers during this period.

After a stint teaching at Boston University, Janssen joined the University faculty in 2000. As a historian of science, he constantly mediates between history and science, but his training in the philosophy of science adds another perspective that complicates the process even more.

To illustrate the differences between the scientific and philosophic approaches to intellectual questions, Janssen cites a debatable premise—"There are no rivers of Coca-Cola"—that he says can evoke a 20-minute discussion among "philosophic whiz kids."

"Is it a contingent sentence?" he asks rhetorically. "Is it a nomological necessity? Philosophers worry about questions like this. Physicists just shrug their shoulders."

Coming from a background that fostered such debates, Janssen admits he suffered "severe culture shock" when he arrived at the University. "People in the humanities look on science as one more human activity [imbedded in the context of the times in which it was developed]," he says. "I want to understand what sets science apart."

Examining the history of 20th-century scientific thought is not the career Janssen dreamed of when he was a schoolboy in Amsterdam. "In high school, I thought physics was the most boring thing in the world," he says. "I wanted to be a writer."

What changed his mind was reading Thomas Kuhn's groundbreaking work *The Structure of Scientific Revolutions*, which introduced the idea of "paradigm shift" in its analysis of how new ideas are accepted by the scientific community.

"I realized that some stories of the history of science were more interesting than anything I could dream up," says Janssen.

He initially trained as a physics teacher but then left The Netherlands for graduate school at the University of Pittsburgh. According to Janssen, his teaching style is better suited to the American classroom than the educational system in his homeland.

"I get manic about things," he says. "I've been advised not to drink coffee before lectures. The Dutch verdict on me is, 'He's enthusiastic.' In The Netherlands that's not a positive thing."

The high-energy Janssen thrives on finding ways to make the more puzzling implications of Einstein's thought accessible to freshmen, including the proposition that if light-speed remains constant, velocity and time will display a disquieting mutability.

Students sometimes have more difficulty accepting Einstein's human foibles than understanding his theories, says Janssen. Not everyone takes easily to the notion that the preeminent scientific genius of the last century was also a bit of a rake.

"It takes discipline not to be thrown if consequences become counterintuitive," he says. "I tell [students] that at this point you're not supposed to have a concrete image [of the consequences of special relativity]. That comes next week."

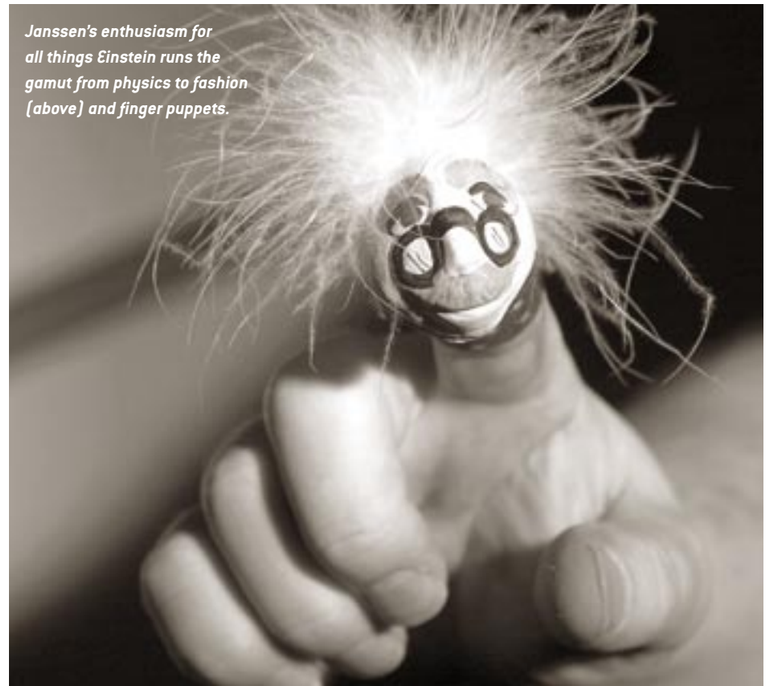
Sometimes he succeeds so well in persuading his students to think in new ways that he must caution them not to abandon all preconceptions about space and time constraints. "For freshmen, the hard thing is not to throw everything out," he says. "They need to learn to trust their intuition in some things."

For Janssen, part of the satisfaction of teaching goes back to his earliest ambitions. "In teaching, I enjoy having a good story to tell," he says. "I hope to share some of the exciting ideas of modern physics without demanding technical knowledge [of the field]."

His infectious enthusiasm makes him a natural in the classroom, but there's another reason why he feels at home in Minnesota. Although he's spent the majority of his working life studying the writings of Einstein, Janssen considers Bob Dylan to be the 20th century's greatest genius. "I'm a Bob Dylan fanatic," he says emphatically. "I'm proud to teach at the school Bob Dylan flunked out of."

The teenage Janssen learned English by listening to Dylan recordings, and he's convinced there's a Dylanesque twang imbedded in his Dutch-accented English.

"Someone once said of me, 'That guy has a thick European accent, but somewhere buried in there is Minnesotan,'" he says. ■


Janssen's enthusiasm for all things Einstein runs the gamut from physics to fashion (above) and finger puppets.

Supporting the common good

I SUSPECT THAT THE PEOPLE who crafted IT's motto—which doubles as the title of this magazine—devoted considerable time and energy to the process. "Inventing tomorrow" neatly summarizes the college's creative mission just as it characterizes the work of our faculty, students, and alumni. The future is what we're about, now and always.

Besides the pursuit of new technology and scientific knowledge, however, there's another engine that drives what we do. Like the University's other colleges and campuses, IT is "devoted to the education of youth and welfare of the state," as the inscription on the façade of Northrop Auditorium declares.

Campaign Minnesota statistics tell an inspiring story of exceptional generosity

More than anything else, the University's dedication to our common welfare is responsible for the huge success of Campaign Minnesota, which began seven years ago with a goal of raising $1.3 billion and ended June 30 with a total of over $1.6 billion.

Over 220,000 donors made gifts to Campaign Minnesota—a truly remarkable outpouring of support for the University and a ringing endorsement of its ongoing service to the community. I sincerely hope our legislative leaders interpret the campaign's results correctly: not as an excuse to cut state support but rather as a signal that people support this University so much they will give of their own assets to ensure its bright future.

IT created a remarkable record during Campaign Minnesota. Donors gave $158 million to IT during the past seven years, a level of support that very few people would have believed possible when we started the campaign in July 1996. However, campaign statistics tell a story of exceptional generosity.

Of the nearly 13,000 donors to IT, over 9,000 were college alumni. Faculty and staff accounted for four percent of the total donors and seven percent of the amount raised. IT received 36 gifts of $1 million or more, new bequest expectations of over $60 million, and $108 million for various endowed funds.

What I find especially noteworthy are the numbers relating to our campaign priorities: $25.7 million for scholarships, $12.9 million for fellowships, $21.5 million for new endowed professorships and chairs, and almost $20 million for new facilities and infrastructure.

At a gala event in mid-September, we paused to savor the campaign's overwhelming success and to thank our donors and everyone involved in the campaign. The event also presented an opportunity to renew our commitment to IT and the University, which face ongoing challenges: competition for the best faculty and students, double-digit tuition increases, and the struggle to maintain financial resources in a tough economy. These issues are nothing new, but they are compounded by what appears to be a diminished perception of public universities and colleges as a "public good" worthy of state support.

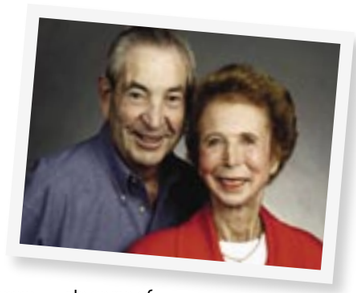
The dean's advisory board certainly will be involved in finding ways to meet these challenges. IT will continue to move forward by building on our strengths in biological, energy, and environmental research components.

Now more than ever, support from alumni and friends is critical to our efforts. Campaign Minnesota was a resounding success because you, too, believe in the motto that guides everything we do here.

Thank you for investing in tomorrow.

PHIL OSWALD is director of development for the Institute of Technology. You can reach him at 612-626-9385 or by email at poswald@it.umn.edu

Alumni make largest-ever scholarship gift to U



THE UNIVERSITY has received a gift of $10 million from alumni Nancy and Larry Bentson for undergraduate scholarships, the largest gift ever received by the University designated solely for scholarships.

"Our interest in helping students dates back generations in our family," says Larry Bentson. "Also, our many successes, personally and professionally, are rooted in our University of Minnesota education. From this background and our desire to have others sample some of these same life experiences, we have established the Bentson Family Scholarships."

The scholarships will provide students with at least $5,000 a year for four years and will eventually support about 100 students annually. The scholarships will be awarded to promising students who also have financial need, with a preference given to those of the Jewish faith.

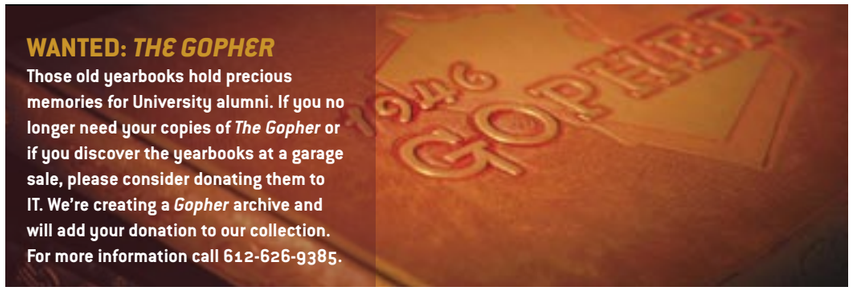
Nancy and Larry Bentson both graduated from the University, Nancy in 1945 from the medical technology program and Larry in 1943 with a degree in mineralogy and petrology.

The Bentsons began giving to the University in 1977 and have supported many different programs, including the Department of Pediatrics and the KDWB University Pediatrics Family Center. They have also volunteered their time in support of many fundraising activities at the University.

"We recognize that we have been fortunate throughout our lifetimes," says Larry Bentson. "Out of genuine gratitude and a sincere desire to share our blessings, philanthropy has been a core value for us throughout our lives."

Chair honors semiconductor pioneer

A RECENT GIFT from David and Joan Henle has established the Robert and Marjorie Henle Chair in Electrical Engineering, which honors David's parents. Considered a pioneer in semiconductor technology, Robert Henle (EE '49, M.S. '51) spent 35 years at IBM, where he served as director of the Advanced Silicon Technology Laboratory. He was an IBM fellow, an Institute of Electrical and Electronics Engineers (IEEE) fellow, a member of the National Academy of Engineering, and a recipient of the IEEE Edison Medal and the University of Minnesota Outstanding Achievement Award. He died in 1989. The gift was announced at a ceremony this fall at which University Foundation vice president Judy Kirk and University president Robert Bruininks presented David Henle with a commemorative chair bearing his parents' names.



WANTED: *THE GOPHER*

Those old yearbooks hold precious memories for University alumni. If you no longer need your copies of *The Gopher* or if you discover the yearbooks at a garage sale, please consider donating them to IT. We're creating a *Gopher* archive and will add your donation to our collection. For more information call 612-626-9385.

DEVELOPMENT OFFICE

Development Team

IT's experienced professional development officers can help you determine your best options for supporting the college. They can give you information about IT programs with funding needs that match your interests as well as information about ways of giving that best fit your financial situation.

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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 1-800-587-3884 for more information.

Extending the connection

LOOKING BACK ON MY CAREER and personal life, I can pinpoint critical junctures that shaped my future. One of the most consequential occurred 44 years ago, when I entered the Institute of Technology (IT) as a freshman. IT became the bridge that connected my youthful aspirations with a highly satisfying professional career. Today my enduring connection to IT is a major focus of an active retirement.

I was born and raised in Owatonna, Minnesota. In middle school I developed an interest in aviation, model airplanes, and model rockets. After graduating from Owatonna High School in 1959, I chose to attend the University, where I could study aeronautical engineering. In 1963 I received a bachelor's degree in aerospace engineering and mechanics, followed by a master's degree in 1965.

IT became the bridge that connected my youthful aspirations with a highly satisfying professional life

Although I had prepared to enter the aerospace industry after graduation, IBM at Rochester, Minnesota, needed engineers with the skills to conduct mechanical and vibration analysis of its electromechanical products. After working there as an engineer and team leader, I joined the company's management team and enjoyed a rewarding 32-year career in systems development, manufacturing, and site services.

During that time I stayed connected to IT by serving for 12 years as IBM's representative to the Mechanical Engineering Advisory Council, including a term as vice chair. I served two years on the Institute of Technology Alumni Society (ITAS) board as vice president of corporate relations and led the team that planned the Science & Technology Banquet, which raised nearly $20,000 each year for IT student scholarships.

Since retiring in 1997, I spend over 30 hours per week as a volunteer serving on higher education boards and committees. Much of that time is devoted to my priorities: IT, the University of Minnesota Rochester, and quality public higher education in southeastern Minnesota.

As ITAS president, I am focusing on two initiatives designed to extend the connections among the ITAS board, IT alumni and friends, and the college. The first initiative is intended to broaden relationships between the ITAS board and the IT dean's office. We've received great support from Kris Kosek, director of alumni relations, and we'll search for more ways to support the dean and strengthen relationships with other members of his staff and IT faculty. We envision a partnership that will yield synergistic results for meeting current and future challenges facing both organizations.

The second initiative is a pilot program entitled "Friends of the Board," which encourages volunteers to participate in board activities. ITAS vice presidents have already added several representatives to our standing committees. This program will help identify future board members and will provide additional support for the board's work.

You can actively support the college and our great University through a wide range of volunteer opportunities that suit your schedule, talents, and interests. Serve on an ITAS board or committee, donate a gift or get involved in fundraising initiatives; support ITAS and UMAA activities like the mentor program; join an academic advisory council; or serve as a legislative advocate for IT. Together we can extend our shared connection to IT.

JIM CLAUSEN (AEM '63, M.S. '65) is president of the IT Alumni Society. You can reach him at 612-626-8282 or by email at itas@it.umn.edu.

Homeland security official to headline 2004 S&T Banquet

CHARLES MCQUEARY, undersecretary for science and technology in the U.S. Department of Homeland Security, will be the featured speaker at IT's 2004 Science & Technology Banquet on April 14.

McQueary leads the department's research and development arm, developing tools to help federal, state, and local officials protect the nation. Prior to joining the department, he was president of General Dynamics Advanced Technology Systems. Earlier in his career, he served as president and vice president of business units for AT&T and Lucent Technologies and as a director for AT&T Bell Laboratories.

McQueary

IT's premier annual event, the banquet benefits the ITAS Scholarship Fund. Last year more than 550 alumni and friends attended the gala, which featured Richard Gross of Dow Chemical and raised nearly $20,000 for the scholarship fund.

To purchase tickets or find out more, visit the IT web site at www.it.umn.edu/banquet.

Spanhake joins board

DAWN SPANHAKE (Civil '92) is the newest member of the ITAS board of directors. Spanhake is the manager of research development and contract coordination for the University's Center for Transportation Studies. She sits on the ITAS K-12 outreach committee and has a special interest in encouraging young girls to pursue science and engineering education.

Spanhake

IT alum wins U international award

Anandakrishnan

MUNIRATHNA ANANDAKRISHNAN (Civil M.S. '57, Ph.D. '60) is among the first nine recipients of the Distinguished Leadership Award for Internationals, a new University-wide award for alumni, former students, and friends of the University who have distinguished themselves in their post-University work as leaders in their professional careers.

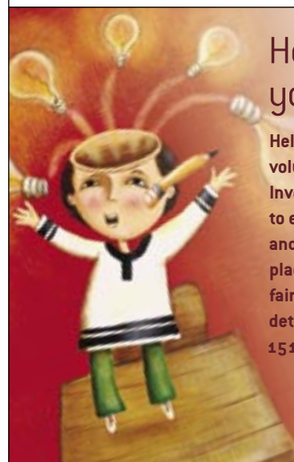
Anandakrishnan is vice chairman of the Tamil Nadu State Council for Higher Education Academy and chairman of the All-India Board of Undergraduate Studies in New Delhi, India. He also serves as advisor to the chief minister of Tamil Nadu on information technology and e-governance and is the chairman-designate of the Madras Institute of Development Studies.

Anandakrishnan was recognized for his lifelong commitment to improving the quality of technical education in India and other developing countries. He has been successful in implementing major structural changes in the curricula of technical universities and colleges in India and in taking the lead in advocating the use of information technology for academic governance and research.

UMAA honors ITAS volunteers

IT ALUMNI SOCIETY members are among the University's most dedicated volunteers. The University of Minnesota Alumni Association recognized two particularly active ITAS members at its annual awards ceremony last fall. ITAS president Jim Clausen (pictured with UMAA executive director Margaret Carlson) earned the 2003 Volunteer of the Year Award. He was honored for his outstanding support of ITAS and the Rochester Area Alumni and Friends of the University of Minnesota. Grant Erickson (EE '96, M.S. '98) received the UMAA Rising Star Award for his enthusiastic leadership of the UMAA's Bay Area chapter.

Erickson



Help support young inventors

Help encourage young inventors by volunteering to support the Young Inventors Fair. We need volunteers to evaluate kids' original inventions and help at the fair. Judging will take place on February 19 and 20; the fair will be held on April 3. For more details or to volunteer call 612-638-1516 or email cmac@ecsu.k12.mn.us.

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Minnesota enters the space race

When it opened in 1969, the Space Science Center became the state's only academic research facility devoted to space and science technology

MOST PEOPLE don't associate Minnesota with the race for space, but during the golden era of lunar landings and planetary exploration a modest building on the Minneapolis campus was the site of important space science research.

When it was built in 1969, the Space Science Center was the state's only academic research facility devoted principally to space and science technology. In 1980 the building was renamed Shepherd Laboratories in honor of electrical engineering professor William Shepherd, who directed the center from 1973-79.

Forty years ago, space science ranked high on the nation's agenda. The U.S. was engaged in a race to put the first person on the moon, and federal spending on space science research reflected that priority.

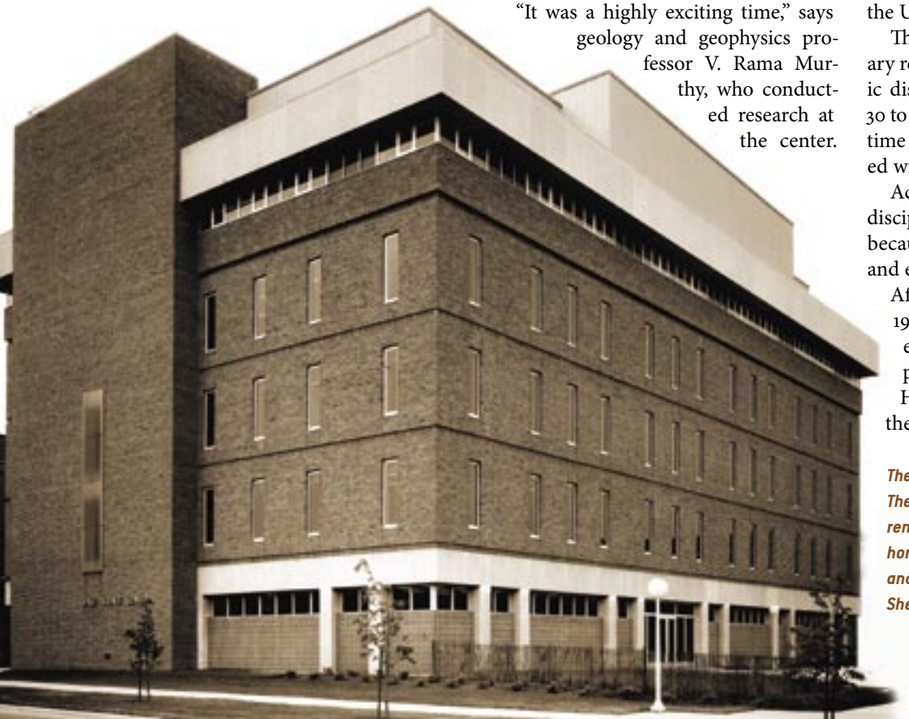
A $2.5 million grant to fund construction of the Space Science Center was announced in June 1965, but the facility wasn't completed until four years later. The funds were included in $4 million given to the University by NASA and the National Science Foundation for the research and development of space science.

"It was a highly exciting time," says geology and geophysics professor V. Rama Murthy, who conducted research at the center. "Without [the building], a large part of the research could not have been done at the University at that time."

The center was a hub of interdisciplinary research, housing 10 different academic disciplines, 50 graduate students, and 30 to 40 undergraduate students. Fifty full-time research professionals were associated with various projects at the center.

According to Murthy, mixing different disciplines in one building worked well because they often shared equipment, and everyone knew each other.

After the Apollo 11 moon landing in 1969, Murthy was one of the first scientists to have access to lunar samples brought back by the astronauts. He studied the samples to determine the relationship between their age and



The Space Science Center opened in 1969. The facility that housed the center was renamed Shepherd Laboratories in 1980 in honor of electrical engineering professor and former University vice president William Shepherd, the center's director from 1973-79.

UNIVERSITY ARCHIVES (2)

NASA's Apollo missions (like Apollo 11, left) spurred a flood of research activity across America in the 1960s and 1970s. In 1972, U.S. Senator Hubert Humphrey presented a gold medal to Space Science Center director Laurence Cahill in recognition of the University's contributions to the space program. Pictured below at the ceremony are University president Malcolm Moos, Cahill, Humphrey, and Prygve Holl.

APOLLO IMAGE COURTESY NASA

lava flow on the moon. The center was equipped with special safes for storing the precious samples, and researchers had to account for the moon rocks to the nearest milligram.

Food science and nutrition professor Irving Pflug researched methods of maintaining sterile conditions in food, drugs, and space vehicles. One such study, commissioned by NASA for the 1975 Viking Lander mission to Mars, resulted in the development of a dry-heat treatment that kept the probe sterile.

Beginning in the late 1960s, the Space Science Center also housed a powerful Scanning Electron Microscope (SEM), one of the few of its kind in the Twin Cities, which was used by researchers in a wide range of scientific fields. Insurance companies even used the microscope to investigate auto accident claims because it could detect stress on metal much better than the naked eye could.

Over the years, the original SEM was replaced by newer models with higher resolution and brightness. The IT Characterization Facility, which manages the equipment in the lab, currently owns five SEMs and four TEMs—transmission electron microscopes.

Laurence Cahill, center director from 1969 to 1973, noted that people often don't realize that everyday technologies like thermostats and air conditioning are derived from a broad research base.

"Much of our research at the center doesn't end up only out in space," Cahill said in 1969. "We have people working on problems ranging from molecular biology to solving urban problems such as transportation and traffic control."

Murthy says the former Space Science Center played a crucial role in University research and continues to house important research today. "I would be hard pressed to imagine the history of IT without it," he adds. ■

—Emily Ayshford

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