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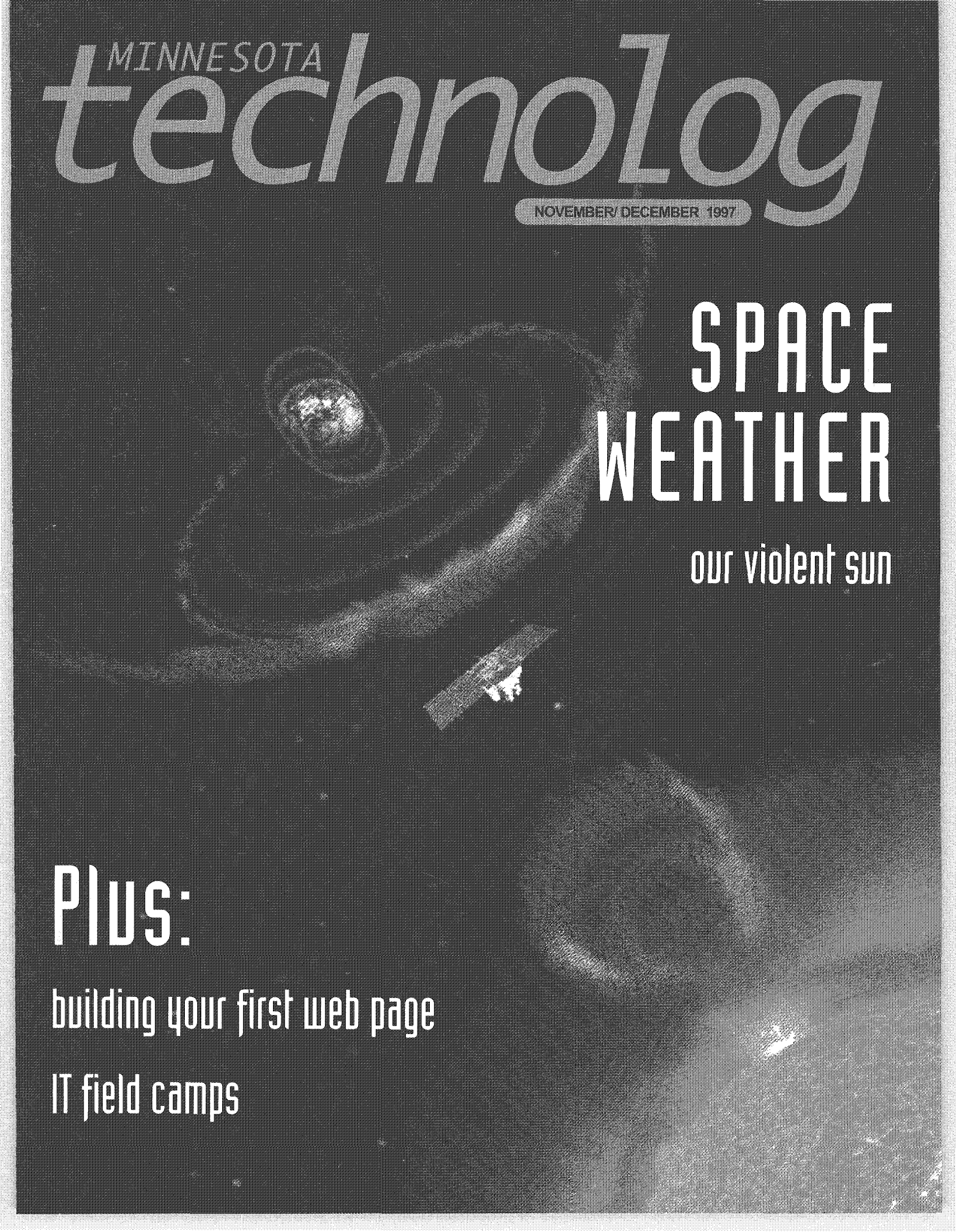

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our violent sun

Plus:

building your first web page

IT field camps

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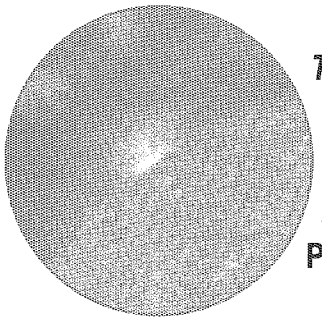
Features



The Winds of Heaven
by Kris Sigsbee
Space weather's effects span the realm from the ordinary to the extraordinary.
Page 6

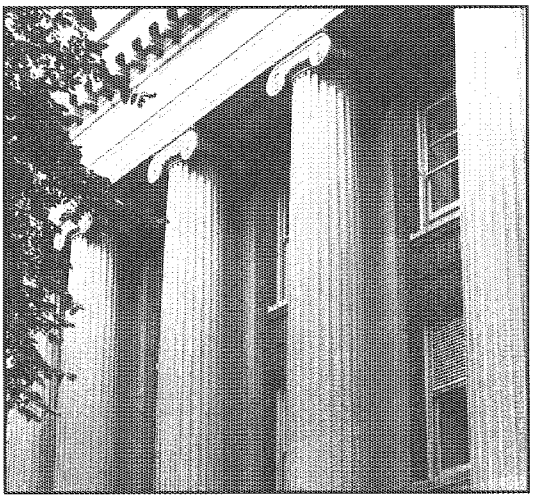
Summer Field Camps: Past and Present
by Erin Davidson and Jackie Couillard
Real life experience for credit in IT really does happen.
Page 12.

How to Build Your Own Web Page
by Steve Gigl
Sources, samples and contacts. This article offers it all.
Page 16.

The state of change at the University

Change is a way of life at the University, but rarely has it been more so than this season. Things have been happening that affect us.

One example of change on campus is our new University President and his Beautiful U campaign. This long-overdue idea finally addressed the discontinuity between decrepit kiosks, peeling paint on the Washington Avenue Bridge and seemingly intangible concepts behind the University, such as a sense of pride in what we do here despite our different disciplines.



Minnesota Technolog stock photo

Another example of change is a plan included in the University budget for a digital technology center in Walter Library, helping carry IT into the 21st century in the growing computer industry along with a planned computer engineering program. Also in the capital budget are monies for a molecular materials lab in Amundson Hall and for improved air quality in Smith Hall. This reflects an overall change at the University from spending more on new buildings than the old to trying to preserve existing buildings before constructing new ones.

The caveat to all this popular change is that an equal or greater undercurrent of potentially unpopular change is sweeping the University, affecting students.

In a telling example of this second sort of change, a committee in the Minnesota legislature has been considering proposals that advocate elimination of the student seat on the Board of Regents as well as all other constituency-based seating. If one of these proposals were to become law, it could mean that students would still be allowed to address the regents, but would no longer have a voting voice. This voting voice is important because, as current student regent, Jessica Phillips, views her job, the student regent brings a recent perspective into the board that might otherwise be lacking. Her maturity and track record on the Board of Regents shows that students can be effective members of policy-forming groups at the University.

Thankfully, it seems unlikely that enough support exists in either the Minnesota legislature or the University for the student seat on the Board of Regents to be eliminated, said both Jigar Madia, president of the Minnesota Student Association, and Darrin Rosha, Phillips' predecessor as student Regent who testified before the Minnesota legislature on November 12.

But Rosha brought up a key point to the notion of an undercurrent of change when he noted that the Minnesota Alumni Association and the Faculty Consultative Committee both support elimination of all constituency-based seating.

Even Victor Bloomfield, chair of the FCC, agreed that such elimination would make it unlikely that a student would ever serve on the Board again. He feels it would be a conflict of interest for students or faculty to serve, anyway. But then one could argue that most federal legislators have a conflict of interest and shouldn't vote. The logic doesn't hold.

And the timing is off. The FCC and the UMAA saw the Presidential change coming. In this change-filled transition after the Board has just selected a new University President who seems to be well-liked, it seems strange that members of the University community would start a power struggle over who should serve on one of the main sources of constancy and continuation of vision at the University, the Board of Regents.

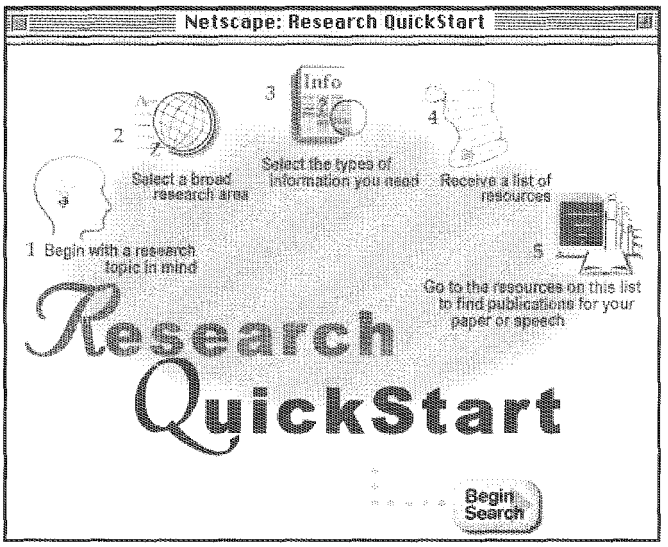
There's going to be change. It's a part of life. We, like Phillips, must find our voices and use our minds to offer suggestions that might not occur to those not in our situation.

Amid all this change, the *Minnesota Technolog* is a staying force. We aim to continue our 78-year, award winning style of bringing you information you need to get through the University and to find your way back to what brought you into IT in the first place.

Jacqueline Couillard

U unveils web-based help resource for researchers

Research papers can be a headache. But a new interactive web page, called Research QuickStart, with roots in three areas of the University could be a cure.



courtesy of John Butler, University Libraries

The Research QuickStart web page, above, debuted this fall.

QuickStart was designed to help undergraduates find information for papers and speeches. It allows students to choose their field of research from a list of academic disciplines and requires that students specify the type of information they seek, such as biographical, encyclopedic or academic information.

QuickStart uses these choices to generate a list of potential resources. This list of resources allows students to skip the time-consuming process of figuring out where to look.

When students use QuickStart over the web, they also have the option to use Research QuickStudy, a research tutorial. This tutorial walks students through the research process by having them answer a series of seven questions, ranging from the basic, "How do I choose a research topic?" to the advanced, "How do I evaluate my information sources."

"What we're trying to do here," said John Butler, a Research QuickStart project team member, "is to provide self-service in areas where students would previously have to consult a reference librarian."

Butler expects that QuickStart will also help faculty with course creation. The page will be part of the forthcoming Online Course Website Builder, which will allow faculty to customize QuickStart for their individual courses.

In the mean time, faculty are receiving QuickStart positively. "One of the testers ... said that he wanted the URL right away so he could use it immediately in his course, " Butler said.

Butler added that, "... one of [the tester's] comments was that it was as if he had designed the tool himself."

QuickStart is the result of collaboration among the Digital Media Center, University Libraries and the Java and Web Services group.

Research QuickStart and its companion, Research QuickStudy, can be accessed at:

http://research.lib.umn.edu

as well as from the University Libraries home page:

http://www.lib.umn.edu.

-- Frederick Beecher

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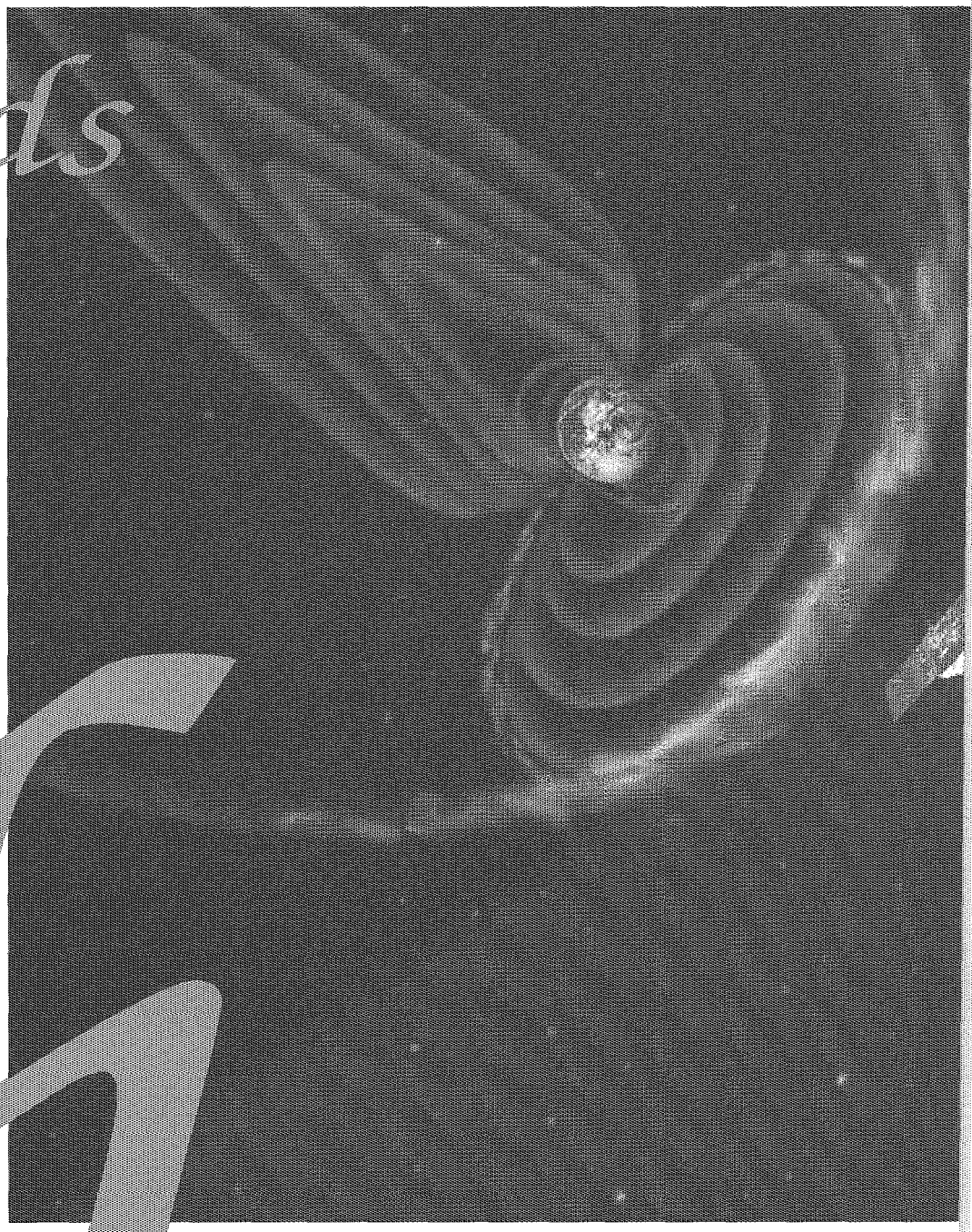
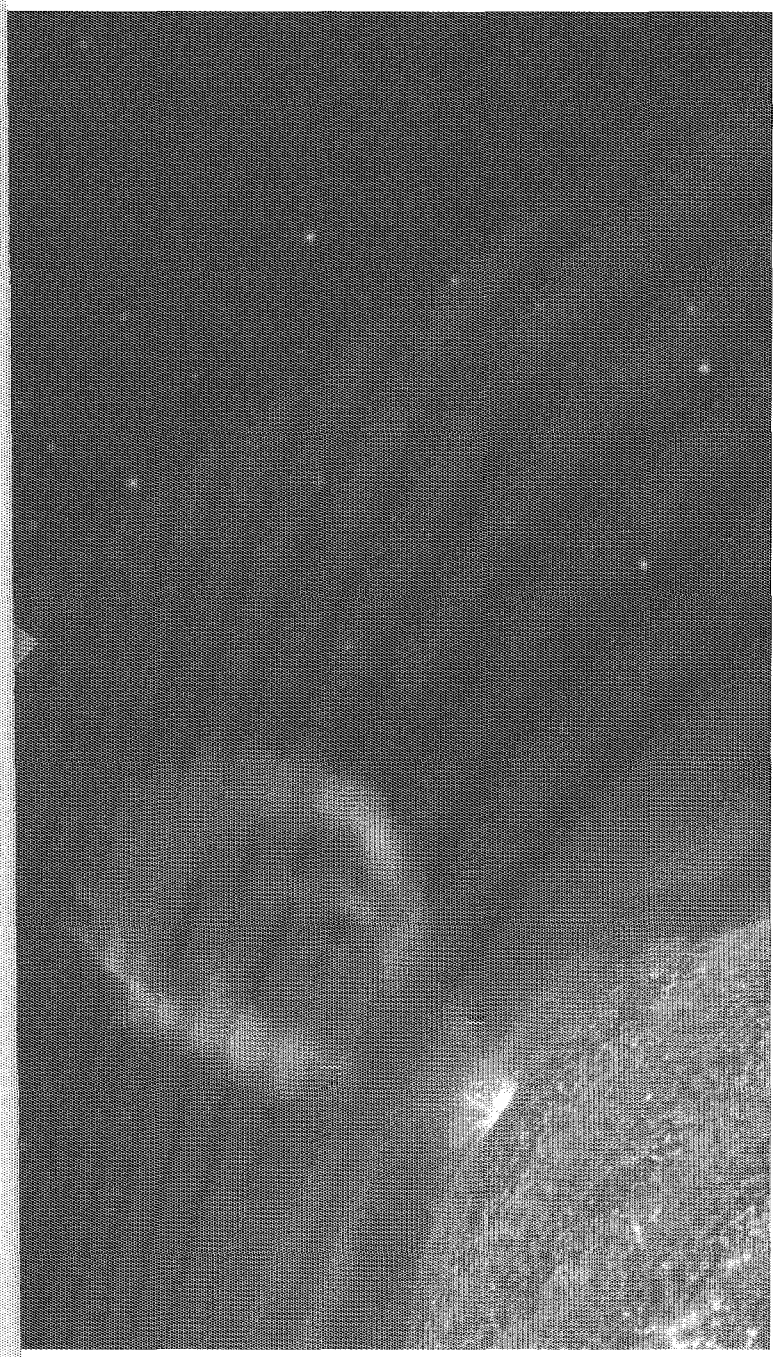
The Winds of Heaven



by
Kris
Sigsbee

The operator on duty at the Lulea, Sweden telephone office probably never expected the shock she got at work on September 25, 1909. When the operator picked up a microphone, she received a sudden electrical shock that partially paralyzed her hand. "Both the instrument and the hand were surrounded by an intense, diffuse light, casting out sparks and causing blisters," wrote David Stenquist, an early 20th century scholar at the University of Stockholm, in his 1914 Inaugural Dissertation called "The Magnetic Storm of September 25, 1909." Stenquist reported that "a strong, crackling, thunder-like sound" was heard on the telephone lines to Lulea, Sweden that made communications impossible at times.

Observers in both the northern and southern hemispheres saw incredibly spectacular aurora on September 25, 1909.



courtesy of Steele Hill NASA/GSFC

A coronal mass ejection in this computer-generated image is shown heading toward Earth's magnetosphere and the SOHO satellite.

Stenquist believed the cause of the strange events of the strange events of that day was "the sun and the dust it sends out." He was not too far from the truth. The magnetic storm that disrupted communications throughout Scandinavia in 1909 was most likely the result of a disturbance that began on the sun and traveled through interplanetary space toward Earth.

Magnetic plasma storms in outer space probably sound like something you saw on Star Trek last night, but they aren't science fiction. Magnetic storms occur in the space environment near Earth and still cause problems with communications and other terrestrial systems in spite of the advances in technology since 1909.

The 1909 magnetic storm was an early example of space weather -- events in space that interfere with communications, power systems on Earth, and satellites. Space physicists and engineers at the University of Minnesota and around the world are trying to understand why geomagnetic storms occur and how space weather affects life on Earth.

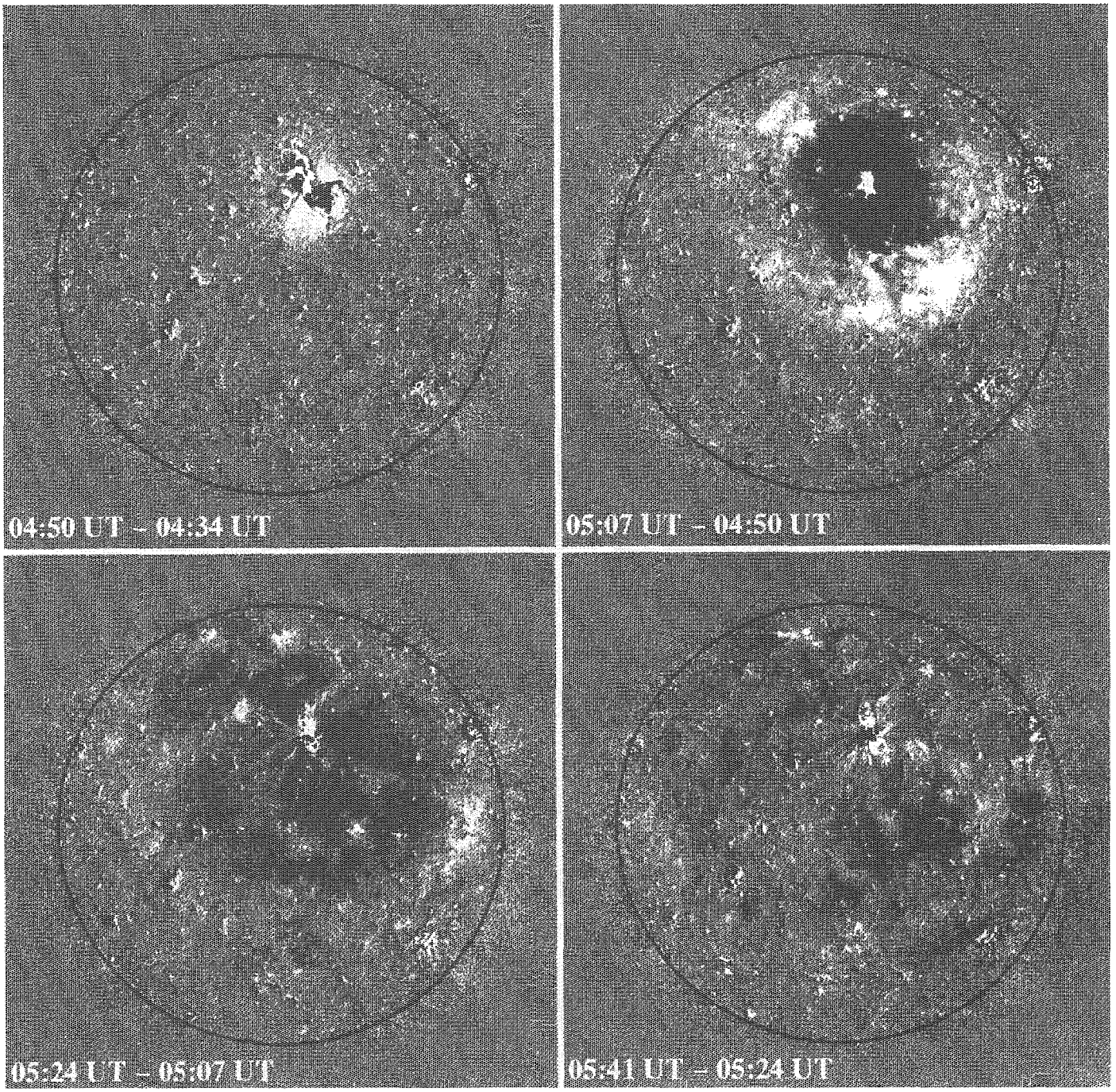
Geomagnetic storms are related to particles from the sun, just as Stenquist believed. The uppermost layer of the sun's atmosphere, called the corona, constantly emits streams of plasma, known as the solar wind, into space. Dr. Barbara Thompson is a 1996 University of Minnesota graduate who now studies the structure of the solar corona using data from the Extreme Ultraviolet Imaging Telescope on board the SOHO (Solar and Heliospheric Observatory) spacecraft, a joint mission of NASA and the European Space Agency. She explained the solar wind by comparing the atmospheres of Earth and the sun. "Imagine if the Earth's atmosphere was really hot - you would expect that a lot of the gas could reach escape velocity."

When a particle in Earth's atmosphere or the sun's corona reaches escape velocity, it is moving fast enough to escape from the gravitational field pulling it down towards Earth or the sun. Solar wind electrons and ions escaping from the sun's corona travel to the most distant regions of our solar system.

The solar wind plasma also carries the sun's magnetic field far away into space, creating an interplanetary magnetic field throughout the solar system. On an average day, the solar wind blows at a blustery 400 km/sec (894,816 miles/hour). The solar wind was predicted by astronomers who observed that long cometary tails were always directed radially away from the sun. Its existence was verified by instruments on board the Soviet Lunik 1 and Lunik 2 spacecraft in 1960.

Although the solar wind blows continuously, the level of activity on the sun varies with a period of about 22 years. During solar maximum, the peak in the cycle of solar activity, the number of sunspots increases. Solar wind velocities and temperatures are higher than usual and the solar wind is accompanied by large fluctuations of the interplanetary magnetic field. Violent activity such as solar flares and coronal mass ejections is more common. "A coronal mass ejection is a sudden eruption of millions of tons of solar material, and a large portion of the sun can participate in the eruption," explained Thompson.

Fortunately for life on Earth, when the high speed solar wind plasma encounters a magnetized planet, such as Earth, the interaction between the solar wind and the planetary



courtesy of Barbara Thompson at NASA

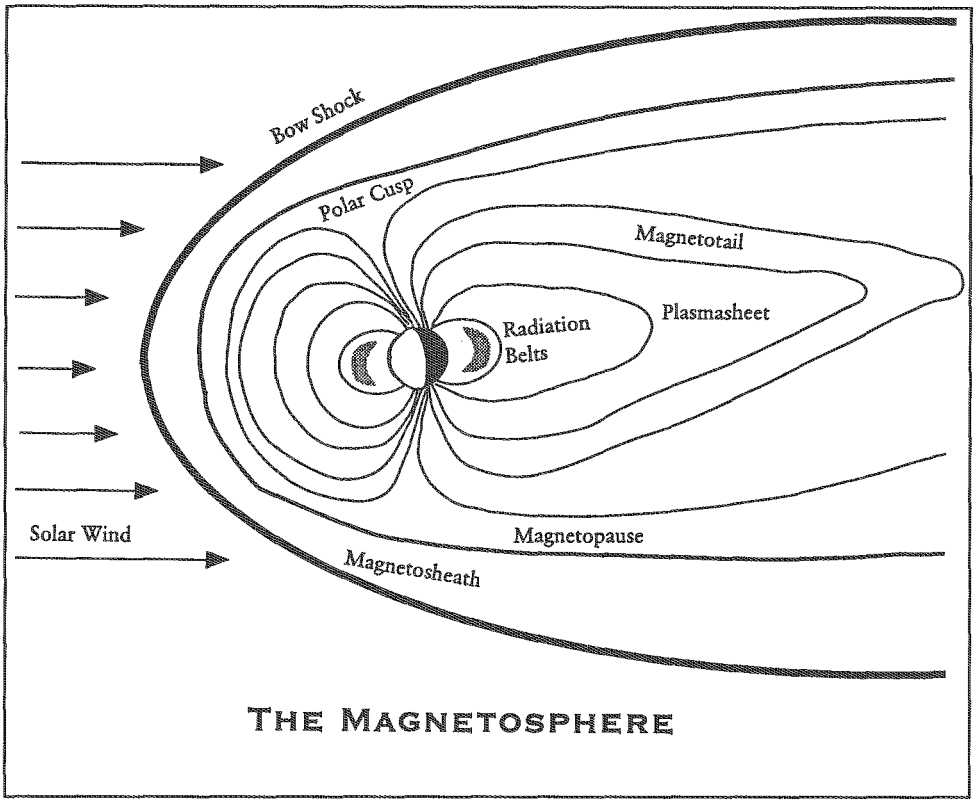
Above is a coronal mass ejection as recorded by the SOHO/EIT telescope. Each image shows the difference from the previous images. By looking at the these "difference images," it is possible to see the eruption spreading across the sun.

magnetic field forms a protective magnetic cocoon called a magnetosphere. The outer boundary of Earth's magnetosphere, the magnetopause, separates the planetary magnetic field from the solar wind. The magnetopause is located where the dynamic pressure of the streaming solar wind particles balances the magnetic pressure of Earth's magnetic field.

Magnetospheres are extremely large and asymmetric. The sunward location of Earth's magnetopause is about 10 times the radius of Earth (39,630 miles) away. However, increases in the solar wind speed can compress the day-side location of the magnetopause to within the distance of 6 times the radius of Earth (23,778 miles), close to the orbits of communications satellites in geosynchronous orbit.

On the night side of Earth, the interac-

tion between the solar wind and Earth's magnetic field drags the magnetic field lines backwards, creating a long magnetic tail, or magnetotail, extending beyond 200 times the radius of Earth (792,600 miles). Professor John Wygant, a space physicist studying Earth's magnetosphere at the University of Minnesota, describes the magnetotail as a sort of magnetic "wind sock" blowing in the solar wind.



by Kris Sigsbee

Above is an informative diagram showing the magnetic field lines in earth's magnetosphere.

The interplanetary magnetic field embedded in the solar wind has a strong effect on the configuration of the magnetosphere. When the solar wind magnetic field points northward (same direction as Earth's magnetic field) the solar wind is deflected harmlessly around the magnetosphere since like magnets repel each other. If the solar wind magnetic field turns southward (opposite Earth's magnetic field), magnetic field lines on the day-side magnetopause can merge with the solar wind magnetic field in a process called magnetic reconnection.

Magnetic reconnection opens up the magnetosphere and allows solar wind particles to enter. Newly reconnected field lines convect over Earth's poles and eventually pile up in the magnetotail. Vast amounts of energy can be stored in the magnetotail by this process.

During a geomagnetic storm, the energy stored in the magnetotail is explosively released towards Earth. The Earth's magnetic field pulsates and huge electrical current systems reach down into Earth's ionosphere producing brilliant displays of aurora.

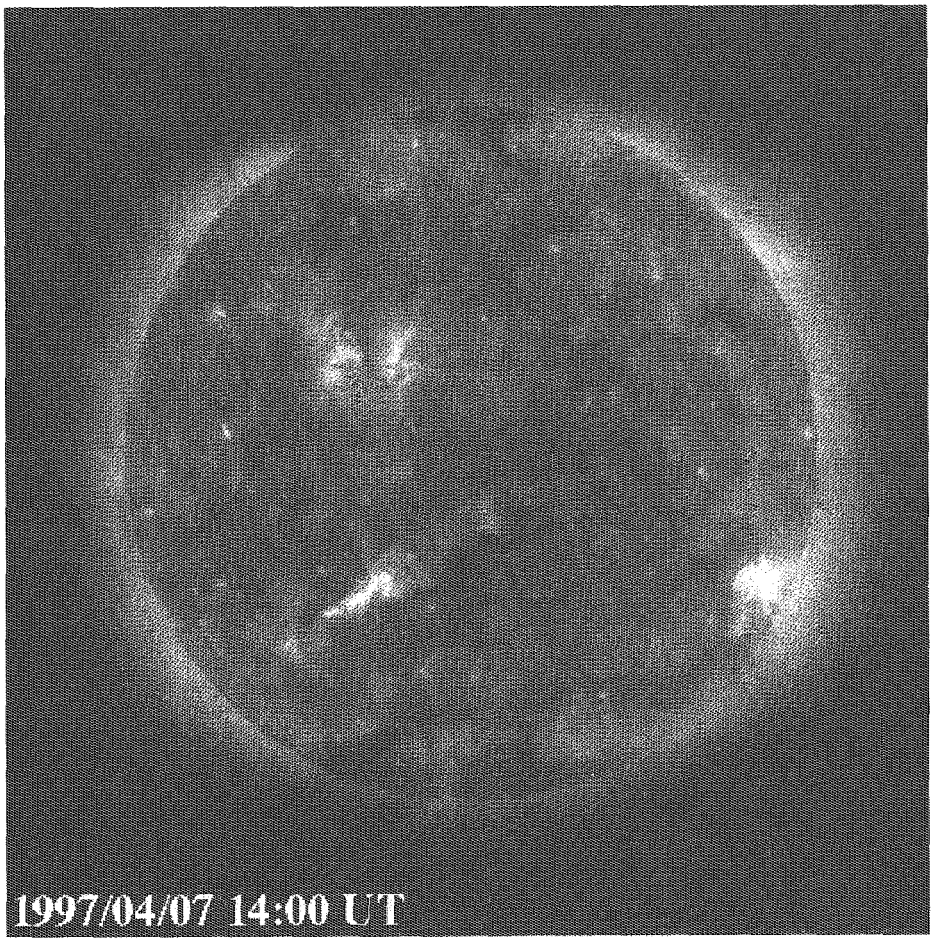
The auroral light is produced when energetic particles traveling along Earth's magnetic field hit the ionosphere, exciting atoms of oxygen and nitrogen at altitudes of around 100 km (60 miles). Aurora occur in a ring around Earth's north and south poles called the auroral oval. To an observer on Earth, the aurora can appear as undulating green and red ribbons of light, or as a diffuse glowing cloud in the northern sky. In North America, the aurora borealis or northern lights are normally only visible at high latitudes in Alaska and Canada. However, during periods of high geomagnetic activity the auroral oval expands southward, making the northern lights visible at lower latitudes. Sometimes the northern lights can actually be seen in Minnesota.

Because the solar wind magnetic field undergoes daily and sometimes hourly variations, small magnetic storms occur often even during solar minimum. The most severe geomagnetic storms are related to solar events such as coronal mass ejections and occur more frequently near solar maximum.

The physical processes involved in geomagnetic storms and how they affect the magnetosphere are not well understood. According to Wygant, the outstanding problems of space physics research today are the creation of the aurora, the processes that cause the release of stored energy in the magnetotail and initiate major geomagnetic storms, how particles in the magnetosphere are accelerated, and how the radiation belts are produced.

"The United States, Europe, Russia and Japan have put up a fleet of spacecraft that are monitoring electric fields and particles in different regions of space," said Wygant. He has assisted with the design, construction, and testing of electric field instruments on the CRRES (Chemical Release and Radiation Effects Satellite), Polar, and Cluster spacecraft.

In space, electric fields are measured by long pairs of wire booms held out by centripetal force on board a spinning satellite. Spherical probes at the ends of the booms contain electronics and sensors. The voltage difference measured between the spherical probes tells scientists the value of the local electric field.



courtesy of Barbara Thompson at NASA

This solar image is from the SOHO project, a joint mission of NASA and the ESA.

Designing this type of instrument has many unique problems. On the Polar spacecraft, which spins at a rate of 6 revolutions/second and has 100 meter booms, the spheres at the ends of the wire booms rotate at a speed of 150 miles/hour. The signals space physicists want to measure are small and typically have values of only 0.1 to 1 volt. "The spacecraft body itself can charge up to 1000 volts," explained Wygant. This makes it difficult to distinguish the signal from the background. In spite of these problems, Wygant believes building electric field instruments for spacecraft is worth the effort.

Studying electric fields in Earth's magnetosphere helps space physicists understand how particles are accelerated in auroral processes. When a charged particle, such as an electron or proton, encounters an electric field it feels a force that changes its speed and direction. Similar processes may accelerate particles in other astrophysical environments light years away.

"There aren't many situations where we can study the acceleration of particles in space directly," said Wygant. Understanding the acceleration of charged particles in the magnetosphere may give scientists valuable insight into the production of cosmic rays, extremely high energy charged particles traveling through the universe at close to the speed of light. Some cosmic rays may have been accelerated by solar flares, while others come from pulsars and supernova explosions in distant regions of the galaxy where it is impossible to send a spacecraft.

"The purpose of flying these spacecraft is largely scientific in nature," said Wygant, but space physics research has important applications. The same phenomena that produce beautiful displays of aurora have the potential to severely disrupt communications and damage satellites in low-Earth orbit. During geomagnetic storms, ions and electrons striking a spacecraft can cause different portions of the satellite to become electrically charged. If enough charge builds up, an electrical discharge will arc across the spacecraft, damaging electronic components. Other kinds of malfunctions, such as single particle upsets can also damage satellites. A single particle upset occurs when an individual particle penetrating the spacecraft creates enough free electrons, negatively-charged particles that are not permanently attached to a specific atom or molecule, to produce a logic state change in a microelectronic device.

Logic circuits generally operate between two discrete voltages, a high voltage that represents a 1 and a low voltage that represents a 0 in a binary system. This kind of circuit stores information, performs arithmetic, and carries out instructions in a computer. When errors occur in circuits critical to spacecraft operation, control systems can latch-up and switch into undesirable modes, causing burnout of electrical systems.

Potentially worse effects could occur if systems controlling propulsion or the orientation of the spacecraft, also known as the spacecraft attitude, are involved. Safeguards against malfunctions can be built into spacecraft, but accidents still happen. The great geomagnetic storm of March 13, 1989, caused one such accident. The Navy had to take four navigational satellites out of service for up to a week.

In addition to causing problems with electronics on satellites, solar and geomagnetic activity can actually influence satellite orbits. The level of short wavelength solar radiation and geomagnetic

activity changes the scale height of Earth's upper atmosphere, which affects the drag on satellites in low-Earth orbit. Understanding the changes that will occur during the next solar cycle will help scientists and engineers plan how to boost the orbit of the Hubble Space Telescope and the assembly of the International Space Station.

Here on Earth, geomagnetic storms can wreak havoc with electrical power systems. Electrical and computer engineering Professor Emeritus Vernon Albertson first became interested in the effects of geomagnetic storms on power grids while working for Otter Tail Power Company in Fergus Falls, Minnesota, in 1958. On a clear, winter night a transformer station "tripped out" and the aurora borealis was suspected to be the cause. When Albertson came to the University of Minnesota in 1963, he began doing his own research on how geomagnetic storms affect power systems.

During geomagnetic storms, the auroral current systems produce fluctuating magnetic fields. "The Earth is a conducting sphere that finds itself in a changing magnetic field," said Albertson. Magnetic fields that change with time produce electric fields that can drive currents in an electrical conductor. Because of this physical principle, "you are going to induce currents in the conducting sphere," said Albertson.

Geomagnetically induced currents flowing through the Earth cause problems in power systems because transformers have grounded neutral points connected to the Earth. When geomagnetically induced electrical currents flowing through Earth come near a transformer, they always follow the path of least resistance.

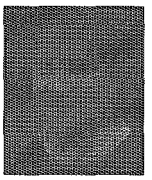
"Zip. Up goes the current through the transformer and into the transmission line," said Albertson. The presence of geomagnetically induced currents in a transformer causes the magnetic flux, or number of magnetic field lines crossing a unit area, inside the transformer to go to abnormally high levels during half-cycle saturation. This can cause heating and generate oscillations at multiples of the frequency of the alternating voltage, called harmonics, elsewhere on the power system. During the great geomagnetic storm of March 13, 1989, the entire Hydro Quebec system and its more than 6 million customers plunged into a blackout for 9 hours because of this kind of malfunction. A large transformer at a nuclear power plant in New Jersey overheated and failed as a result of the same storm.

Currently, the sun is in a period of relatively low activity, and the risk of major geomagnetic disturbances is small. However, the level of solar activity is increasing and the number and severity of violent solar disturbances, such as coronal mass ejections, is growing.

"For a while there was only one [mass ejection] per month which had a strong impact on Earth, but as we head toward solar maximum we could be dealing with almost daily events," said Thompson.

The next solar cycle is predicted to near its peak in late 1999 or early 2000. Severe geomagnetic storms are likely to occur during the period from 1999 to 2005.

The threat posed by geomagnetic storms during the next solar cycle has sparked a renewed interest in space physics and has spawned the field of space weather forecasting. In the not so distant future, space weather forecasters will be able to predict geomagnetic storms by carefully monitoring activity on the sun, in much the same way meteorologists predict weather here on Earth. Satellites such as SOHO and Wind, which carries an instrument built by University of Minnesota scientists, are already providing enormous amounts of data about the sun and the solar wind. Missions such as ACE (Advanced Composition Explorer), launched in late summer 1997, will send valuable new information to scientists and space weather forecasters on Earth. During the next millennium, space physics research and space weather forecasts will be crucial to the protection of spacecraft and electrical power networks against costly malfunctions and damage.



Kris Sigsbee is a graduate student in physics. She first encountered the topic of the solar wind through her own research in space physics.

SPACE PHYSICS ON THE NET

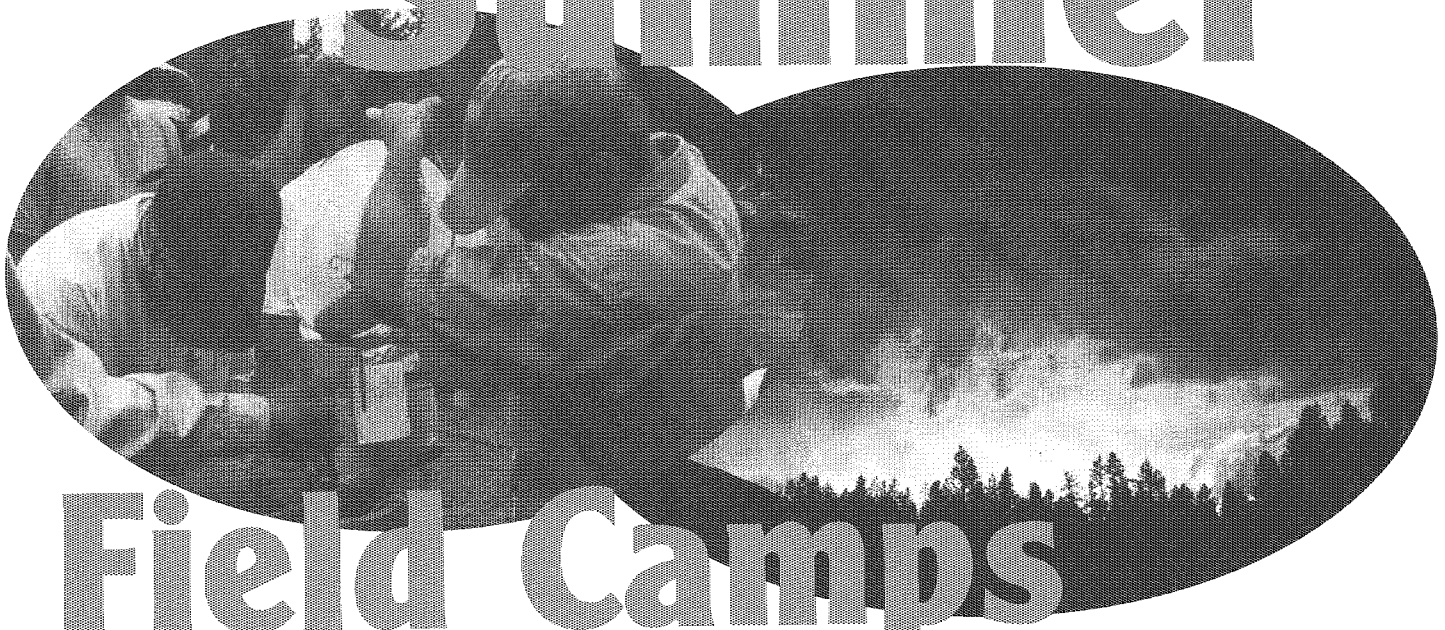
http://ham.space.umn.edu/spacephys/
Satellites, auroral images, seminars and classes.

http://www.mpelectric.com/storms/index.htm
Effects of Geomagnetic Storms on Power Systems.

http://sohowww.nascom.nasa.gov/
Solar images, movies, and more!

http://www.sel.noaa.gov/index.html
Today's space weather forecast and general space weather information.

Summer Field Camps *past and present*



STORY BY ERIN DAVIDSON AND JACKIE COUILLARD

Whether they were listening to loons while writing up labs or looking out on miles of striped hills and inferring a geologic history from the color patterns while eating lunch on the highest peak to be found, the more than 50 geoscience students who attended University field camps during summer 1997 immersed themselves in understanding their natural surroundings on some of the most exotic "field trips" ever required for graduation.

Depending on the camp they attended, 1997 field camp participants watched as a well was constructed and tested near Itasca, Minn., collected seismic data along roads in the University's Rosemount Research Area, or mapped Frying Pan Gulch in Montana.

A field camp is primarily an outdoor summer-session class aimed at giving students in geology and geo-engineering a hands-on learning experience. At these camps, students are graded on a series of projects, assignments, and, often, reports.

The department of Geology and Geophysics requires geology and geophysics students to take two field camps to graduate while geo-engineers take at least one. The field camp options for summer sessions in 1997 included introductory field camp, hydrogeology field camp, and a newly created geophysics field camp.

IT has a long history of field courses. As far back as 1920, civil engineering students took surveying and mapping as a summer field camp through the University.

Professor Emeritus Miles Kersten helped teach the surveying camp from the '50s through the early '60s, when it was cut from the program. Kersten had attended surveying camp at Cass Lake, Minn., as an undergraduate at

ABOVE LEFT: Scott Alexander, a University staff member, poured fluorescent dye down a monitoring well at the hydrogeology field camp during an aquifer tracer test lab. Students look on. Courtesy of Associate Professor Mark Person.
ABOVE RIGHT: The sun sets over the introductory geology field camp in Montana with spectacular beauty. Courtesy of Gunther Kleieschka

the University.

"In those days, practically all civil engineering schools had summer surveying camps," said Kersten. But times changed, he pointed out, and the surveying camp was a casualty of an overall movement in the '60s to compress the civil engineering undergraduate program from five years and more than 200 credits to four years and 180 credits.

Still, Kersten reminisces about the class. "You went out in the field and you did stream gauging, lake sounding, surveying work, railroad work, mapping work, highway location and star shots at night and sun shots during the day," he said. And he said he thinks the civil engineering field camp provided students with camaraderie and the chance to see large, hands-on projects to completion that students today might not get in their other classes. He believes that the projects and camaraderie at the civil engineering camps was a memorable part of college for those who experienced it.

"The students remembered the summer camps probably as well as anything at the University, " Kersten said.

Jason Erickson, a senior in geology and geoengineering at the University, echoed Kersten from a current student's perspective. "The [introductory] Montana field camp was probably the best class I've ever taken at the University," he said.

Like Erickson, Sarah Smith also went on the introductory geology field camp during 1997 in Montana. "It was nice to get the field experience because now I sit in the classroom and they talk about something, and I have a mental picture of what I saw in the field," she said.

Gunther Kletetschka, a teaching assistant for the field camp, held near Dillon, Mont., said that part of the value of the field camps is that students learn to deduce the geologic history of a region when they see rocks in their natural environment. Students identify the rocks they see and have to find out why those rocks are found in certain places in structures. And, all the while, students at the camp eat, sleep and study in the breathtaking Montana wilderness.

They rise at about 7:00 a.m. for breakfast and start their field work at about 8:00 a.m. Then they hike to the outcrops of rock they wish to inspect for their assignments and stop amid the rocks for lunch. Often, they will also climb to the highest point they can find to get a better understanding of the spatial arrangement of the rock formations around them. Breakfast and dinner are prepared in the woods by a hired cook. Camp participants use chemical bathrooms or pit toilets and shower two to four times a week in town. And, though the field work each day is officially done at about 5 p.m., students have the option to use a study tent with a lamp powered by a generator when they wish to begin work on their maps and cross-sections or just play a game of cards. Field camps are structured in the same manner as classes.

Instructors take the students on "tours" of good outcrops of various rock formations in the region so that students can learn to recognize the formations when they see them in a less ideal setting. The students take notes in field books so they can refer to this knowledge later because it is another building block toward the later projects in the class.

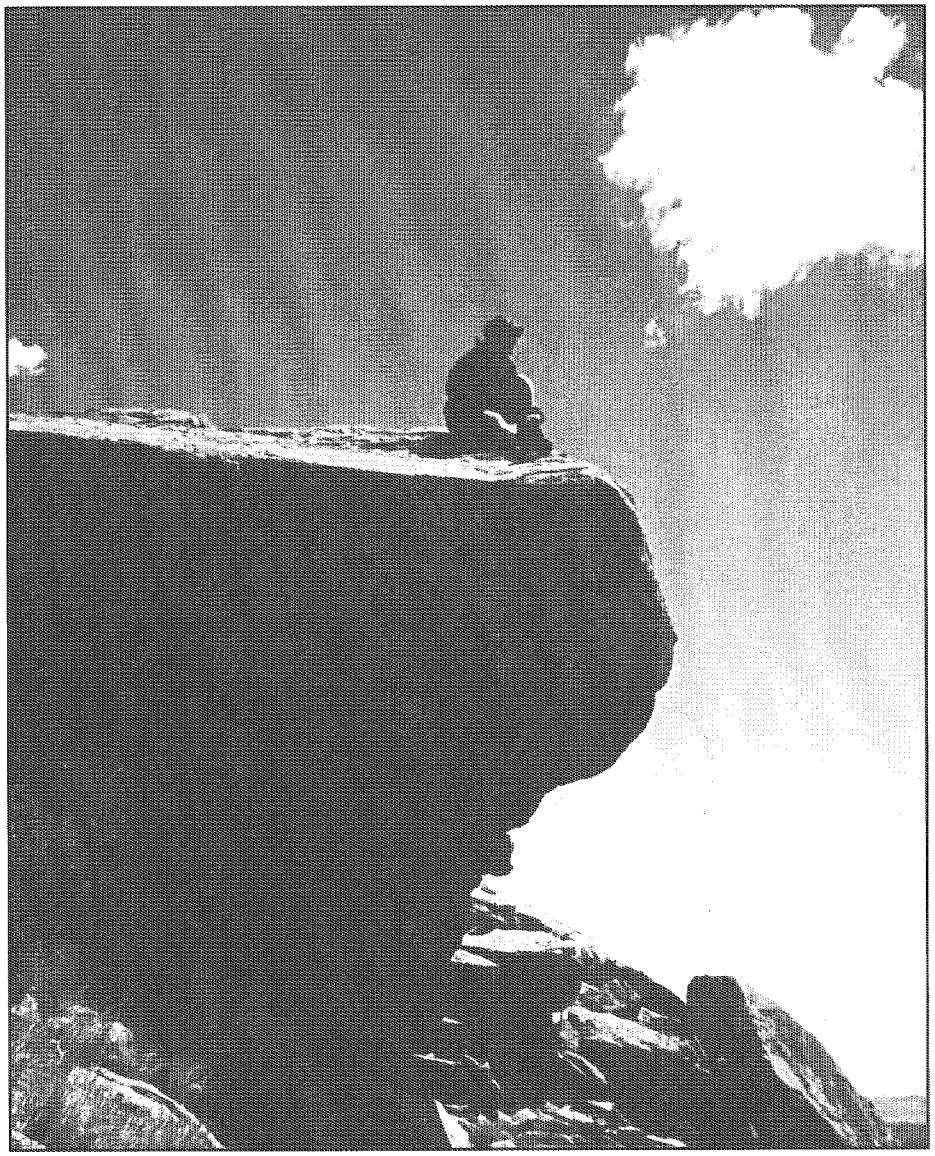
The first mapping assignment students receive lasts only a few days in

courtesy of Gin Kletetschka

Introductory field camp participants listen to Professor Chris Paola discuss this site.

a simple sedimentary rock environment. Students work in groups to map the area and turn in a geological map and cross-section of the area individually. The map and cross-section can be thought of as diagrams of the different materials and formations on and under the surface, respectively. During the mapping assignment, students have to figure out why certain layers of rocks are in different positions. Students have to measure the three-dimensional orientation of sedimentary layers. This enables them to recover an end-product of enormous deformation that took place during geologic history. "It's like solving a mystery," said Kletetschka.

As students progress, the professor and teaching assistants add complications to the assignments. For the first complication they chose areas with igneous rocks and metamorphic rocks. The second complication is to assign a more deformed area. The last complication is to assign an area with vegetation coverage. These complications challenge students and make them aware that not every are has simple or well-exposed geology.



courtesy of Jen Anderson

"A good place to stop for lunch is always the Colorado Formation," said Chris Streifel, pictured above atop the rock formation he mentioned. Streifel is a senior in Geology and attended the introductory field camp over the summer.

Erickson said of the last project, "I think I got an appreciation of the difficulty and complexity of interpreting the geology of the site." Smith elaborated on the Block Mountain area, the last site, by saying that it included folds, faults, anticlines, synclines, and "a mishmash of stuff."

Val Chandler, of the Minnesota Geological Survey assisted with the geophysics and hydrogeology camps this past summer. For the first two days of the hydrogeology camp, students were housed at the University. After that, they moved to the University's Biological and Forestry Field Station in Itasca Park, Minn. Their field work took place 30 miles away on the Interdisclipinary Research Initiative Site. This site has over 100 observation wells, climatological stations, and stream and lake gauge stations over an eight-lake watershed. Students were exposed to hydrogeologic field techniques including well-drilling, aquifer pumping test analysis and GPS surveying. This was the third time the class was offered.

The camp was designed to teach students how to solve hydrogeological problems by collection and analysis of hydrogeologic and chemical field data. Students also learned exploration geology, which is the use of physics and physical phenomena to study or make guesses about geology at depth. Students used seismic refraction to estimate the depth of the water table. They also used resistivity, an electrical method that can be used to identify layers of rock, soil or sediment based on how well earth materials conduct electricity. For example, one can determine whether the material is clay or sand.

This past summer was the first year for the geophysics camp. It was held primarily in Rosemount, Minn., for three weeks. Camp participants conducted their field research at Rosemount Research Facility, an old army ordinance area from World War II. Their assignments ranged from taking gravity

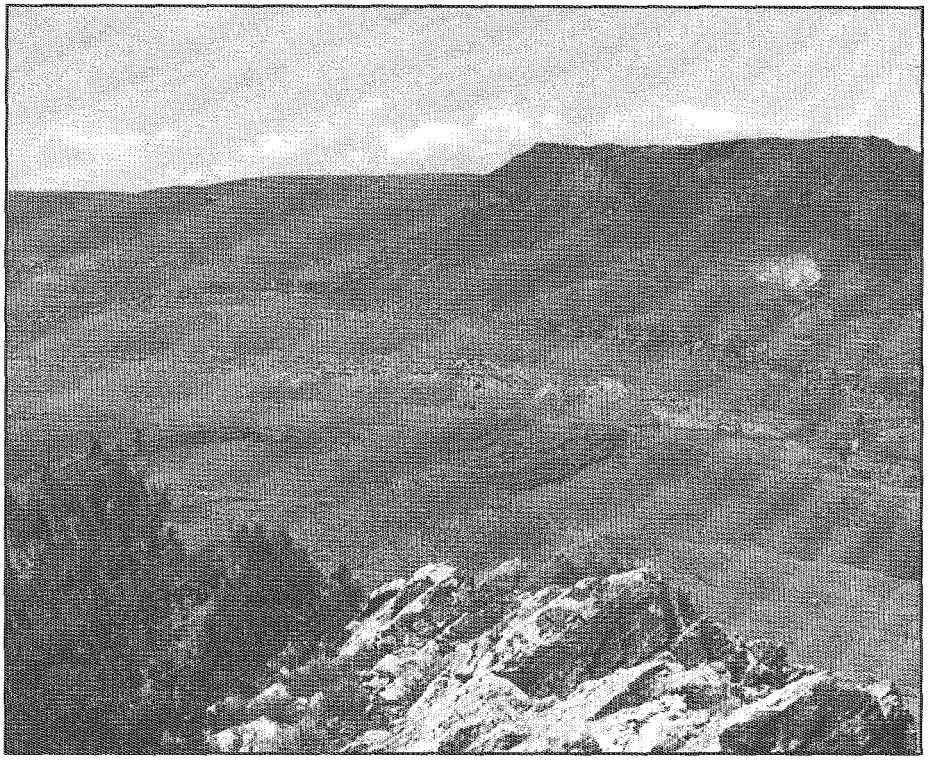
measurements along a roadside in St. Paul in an effort to find a buried tunnel to looking for buried construction materials in an airfield at Rosemount research facility with a two-person electromagnetic setup, where one person got to wear what resembles a futuristic hoop skirt.

Students used seismic methods, refraction and reflection, electrical resistivity, magnetics and gravity methods to gain data for their reports in the geophysics field camp. They examined depth to bedrock with resistivity and looked for a change in velocity on seismograms to indicate a new layer of a different sort of rock in the subsurface. They used all the methods to locate possible faults in the bedrock. "This is a great exercise for students to learn to locate hidden structures," said Chandler of the geophysics field camp.

Kletetschka said field camps are good for students with different learning styles, pointing out that not all students learn best through textbooks. He says that some students are better at hands-on learning, and field camps allow those students a chance to excel. Kletetschka, now a graduate student in geophysics, was a student more than once at a field camp. He enjoyed the introductory geology camp immensely and wanted to attend another camp.

"It's a blast," said Kletetschka. Attending field camps was his motivation in becoming a teaching assistant at the Geology camp this past summer, he said.

Chandler and Kletetschka both see field camp as beneficial to geoscience students. "For natural sciences, it is crucial to see this first hand," explained Chandler. But field camps might not be necessary for all disciplines at the University, he said. In geology, he explained, one can read about faults, but when one actually sees a fault, it is a different world. "You can tell someone about something, but it's more effective to take them out and show them how it's used," Chandler said.



courtesy of Gin Kletetschka

Folded rock formations stretch into the distance. In the far upper right corner of the photo, Block Mountain squarely looms over the Montana landscape.

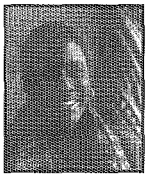
While civil engineers can survey an area on campus, there are too few clear-cut, instructive sites to run geology field camps on campus, and, with three or more instructors per course, it might be prohibitively difficult to try and coordinate everyone's schedule during the school year, even if there were suitable sites around the Twin Cities. Clearly, experiences like digging a well in the hydrogeology field camp would be frowned upon on campus.

"We couldn't just dig wells here. ... No one would appreciate that," said Erickson, who also attended the hydrogeology field camp.

So University students in the geosciences forego or cut back on the time they spend at summer jobs for educational benefit.

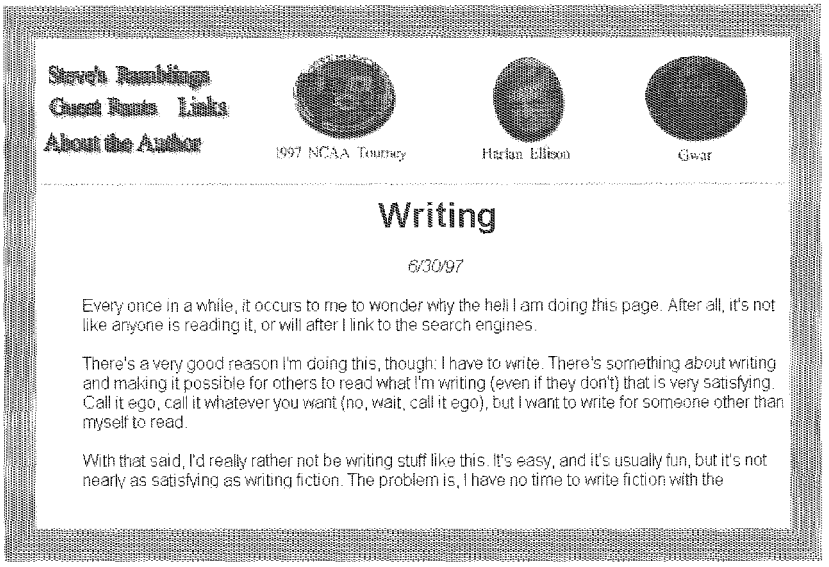
Chandler said that money was a factor considered for the location of the geophysics camp. Because it was held in the metro area, it was more affordable for students. "This decision was made to help students who work in the summer," said Chandler. He said that students could commute to camp and work in the evenings at their jobs and still be able to earn summer money. The department of geology and geophysics also offered scholarships to help defray the cost.

Field camps have become an important part of some IT students' academic careers. The camps tax a student's ability to earn money over the summer, but both students and faculty seem to agree that the educational benefits are worth it. It appears that field camps offered through the Department of Geology and Geophysics are here to stay and benefit students in all the ways that civil engineering field camps once did.



Erin Davidson is a senior in the School of Journalism and Mass Communications. She enjoys talking to fun-loving IT people.

HOW TO build YOUR OWN web page



by Steve Gigl @ http://www.tc.umn.edu/nlhome/m414/gigl0002

So you want to make your own web page. Why? Have commercials or peer pressure led you to think that everyone needs a web site? Do you want to use it as a way to promote yourself or distribute your resume? Are there things that you want to say? Or, are you just curious about the possibilities that having a web site presents? All of these, with the possible exception of the first, are good reasons to start learning the art of web design.

There are, however, more important and noble-sounding reasons. The Internet is the largest and most unique library in the world, simply because of its accessibility and lack of discrimination. Everyone with access is allowed to contribute, and while that includes a lot of hacks, even very poor sites can be worth a visit if you find an interesting link there. By pointing visitors to pages you find interesting, you can become part of the most amazing index this planet has ever witnessed, a constantly changing set of cross-references that allows access to everything from good recipes for gumbo to the most recent pictures from Mars. A web page is also a place you can practice writing for an audience, as well as provide entertainment for your visitors (or at least attempt to do so).

How to Get a Web Page from the U of M

Until a few years ago, the only way students could read their e-mail was through a terminal emulation program called Telnet, which allowed them to log into the UNIX environment in either maroon or gold and read e-mail with a Unix-based program called Pine. Unfortunately, this type of account results in heavy use of the server's resources, and slows down access for everyone involved. For this reason, the U now starts new students with a client/server account, which only allows students to use programs like PopMail and Netscape Mail which log on, download e-mail to the computers they are working on, then log off in a matter of seconds.

If you only have client/server privileges, then you will have to pay $10 every three months for the "interactive" e-mail option before you can create a web page. To check or change your e-mail account type, go to http://www.umn.edu/validate and click on the "Directory Update Form" link and look at the section titled "Account Options."

Once you have an interactive account, you will be able to access via Telnet or FTP (File Transfer Protocol) the directory called "web-docs," which was set up when your account was changed to an interactive one. For information and links relating to getting your web site ready for development, go to the Academic and Distributed Computer Services (ADCS) homepage at http://www.umn.edu/adcs/ and click on the "create web pages" link under the

"e-mail/Internet accounts" heading. That link should be able to answer almost any question you might have.

Learning HTML

Once you have a place to put your page, you need to find a way to create it. HTML (HyperText Markup Language) is the programming language that programs such as Netscape Navigator and MS Internet Explorer use to combine text, image files, and Java programming into web pages. It is a very simple language based on the idea of "tags," which are simply text markers. Tags are similar to the opening and closing quotation marks that indicate that someone is speaking in a story. For instance, if I wanted to put the phrase "These are the smiling liars" in italics, I would type the following lines in a simple text writing program (in a file with the extension *.html or *.htm):

```
<html>
   <body>
   <i>These are the smiling
     liars</i>
   </body>
</html>
```

The <html> tags (Each tag has an opening tag and a closing tag, which has the slash in it.) tell the web browser that the file is a HTML file. The <body> tags tell the browser where the normal content -- text and images, as opposed to page titles and background colors -- begins and ends, and the <i> tags indicate that the text between the tags is to be displayed in italics.

Because of the number of tags that have to be learned to create pages that are more than simply text with a background, few people still hand-program their HTML files. Besides the program that comes with any recent version of Netscape, there are hundreds of other software titles that allow you to simply create a word-processing-style document with images and convert those files to HTML files without ever learning a line of HTML. In fact, most recently-released word processing programs, such as MS Word and Corel WordPerfect, have the ability to convert documents to HTML files.

By pointing visitors to pages you find interesting, you can become part of the most amazing index this planet has ever witnessed.

However, I would recommend that you consider buying or finding as freeware a program that allows you to see what you are doing as pictures and text and allows you to see the raw HTML code. Besides allowing you to see exactly how your pages work, a WYSIWYG ("What You See Is What You Get") editor that also lets you use raw code allows you to add newly developed tags that your HTML editor may not recognize. The program I use has a set of menus on the right that allow you to click on, for example, the <img> tag, which adds images to the page. The program then places the tag on the page and, if I double-click on the tag, displays a window that asks me for all the information about the image and lets me choose the options I want for it. When I click "OK," it puts all that information into the correct spot within the tags, and by clicking on another button I can preview how the page will look to a program like Netscape. However you want to create your pages, it is important that you consider your options and avoid spending money on software you will hate after a month.

Designing a Page

The best way to begin designing a web page is simply to put your ideas on paper. Brainstorm for a while, writing down ideas that fit within the theme of your page. If your page has no theme, this is easy, but that may bother some readers. Once you have enough good content to fill the space you want to use, start making a flow chart of the way you want the individual pages to be linked. There are two opposite methods that beginners like to use when they create pages: putting everything on one page and putting every bit of information onto its own page. Both have their good points: if everything is on one page, you don't have to worry about links between pages, and the reader doesn't have to click so often; but if each little bit gets its own page, the reader isn't likely to get confused. Unfortunately, putting everything on one page tends to make the reader lose interest or get lost within the page, and splitting everything up tends to get the reader lost in a maze of pages that are so small they are hardly worth looking at. In general, it's best to limit each individual page to the size of a normal page of text, possibly up to two pages if you have graphics and enough well-placed white space to keep the reader from getting bogged down.

An example of a standard layout would be the one I used for my web page. The first page is an index with links to the rest of the pages, plus a small rant on a particular subject I wanted to write

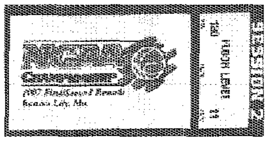
The web page

Use this tag (or h2 through h6) for different sized headlines

The "p" tag denotes the beginning and ending of paragraphs. The "body" tag allows you to set certain variables for your whole page. Above I have set the background color ("bgcolor=") to white. I use the "Arial" font on my pages because it is very clean and readable.

This is a link to my homepage, and this is the text that a reader will click on to activate the link.

This text will be in italics. **This text will be bold.** This text will be underlined.



Above is the tag that lets you place an image onto your page. It also allows you to set the height, width, and placement of the image. Below is another use of the "a href" tag web authors use to let their readers contact them.

Email me!

The HTML

```
<html>

<head><title>
This is the title that will appear on the
program window
</title></head>

<body bgcolor="#FFFFFF">

<font face="Arial">

<h1>Use this tag (or h2 through h6)
for different sized headlines</h1>

<p>The "p" tag denotes the beginning
and ending of paragraphs. The "body"
tag allows you to set certain
variables for your whole page. Above
I have set the background color
("bgcolor=") to white. I use the
"Arial" font on my pages because it
is very clean and readable.</p>

<p>This is a link to my homepage, <a
href="http://www.tc.umn.edu/nlhome/m4
14/gigl0002"> and this is the text
that a reader will click on to
activate the link</a>.

<i>This text will be in italics.</i>
<b>This text will be bold.</b>
<u>This text will be underlined.</u>
</p>

<p><img src="pics/ticket1.gif"
width="250" height="228">
Above is the tag that lets you place
an image onto your page. It also
allows you to set the height, width,
and placement of the image. Below
is another use of the "a href" tag
web authors use to let their readers
contact them.
</p>

<p>
<a
HREF="mailto:gigl0002@maroon.tc.umn.
edu">Email me!
</a>

</font>
</body
</html>
```

about (I made a web page mainly to keep my writing chops alive). It's a basic magazine style that a large number of pages use: a cover page with table of contents, connected to the "feature articles." Of course, a lot of those pages, including mine, also use frames, an advanced HTML feature, to keep the site menu with the reader at all times.

Text

Text is the backbone of almost every site on the web. The main consideration when using text on a web page is readability, because all the images and sounds in the world won't help if you can't read the text that explains them. To that end, it is important to use a font that can be read clearly with almost any background. Most people find reading black text on a white background easy, so that is the combination most pages use. Black backgrounds with colored text is also popular, but the designer then needs to be very careful to make sure the text can be seen clearly. Fancy fonts and text art are also popular and can be visually appealing, but their use should generally be limited to headlines and other words to which you want to draw special attention. A whole page written in a visually impressive but hard-to-read font might cause a reader to just give up, rub his eyes, and move on.

Besides using readable fonts and colors, there is the issue of editing. Typos are a fact of life, and it is always a good policy to give a piece of writing a read-through to look for spelling and grammatical errors. Remember, you are making this page to be read by others, and it can be hard to communicate when the language you write with isn't quite the English people are used to reading. Using "netspeak" to shorten words and phrases is OK once in a while, but putting all the abbreviations (such as IMHO for "in my humble opinion") through a translation can get tiresome if a page is covered with them.

As a final note on text, due to the nature of some of the HTML tags, it is not always easy to integrate text and pictures on a web page exactly as you wish. One way to avoid these problems is to use HTML tables to arrange paragraphs of text and placement

of pictures (one picture or paragraph per cell). Tables can be generated without borders so that the reader does not know they are being used, and allow the author to determine exactly the layout of the page. You may want to check out a book on web design to learn more about tables.

Graphics

Another important tool for the web designer is an image editing program. These programs are generally used to crop, format, or alter photographs, and can be purchased for less than $50. More complete (and expensive) programs like Adobe Photoshop can be used to create very intricate and appealing graphics, from 3D fonts to background textures. Unfortunately, these programs tend to be stunningly expensive (Photoshop retails to students for roughly $270 at Williamson Bookstore.), and have many features that most people just won't use.

Scanners and digital cameras are also useful tools to help get images, but are very costly. Often it is easier to have photos digitized and put on CD by a photo developer or to use a public scanner at one of the computer labs or at Kinko's. Once you have some images to use, the first thing on your list of considerations will be the background of your page. You can choose to use a background image, which will be "tiled" to cover the entire area of the page, or to make the background a certain color. If you are going to use an image, try to make sure that it does not make reading the text on your page completely impossible to read. In my case, since I wanted to concentrate on writing, I used a basic white background and put images where they were needed, keeping with the magazine style theme I mentioned earlier.

A quick warning about background images: besides tiling up and down, browsers like Netscape Navigator tile them left and right. A pattern or band of color down one side of the page is a very popular way to add color without obscuring the text, but it is important that the image used to create the effect (usually a wide, thin bar that is tiled downward by the browser) is wide enough that the bar of color does not repeat itself on ANY monitor, even the monster 21" ones. This means that background images that you don't want repeated right and left should be at least 1300 pixels wide. 1600 pixels is even better.

Next on the list is images. This is a very vague term that refers to pictures or text art, generally saved in one of two file formats: Compuserve GIFs (*.GIF), and JPEGs, (*.JPG). There are quite a few other image types including BMP, TIF, PCX, and PPM, but JPEGs and GIFs are used more often in web editing because the image files in those formats are more compressed so that more picture can be fit into a smaller file. Images can also be used as links to other pages, or as imagemaps. An imagemap is a picture that has certain areas defined as links to other pages, and can be created from any picture using most commercial web page design programs. Another frequently used (and often overused) type of image is an animated GIF, which is basically a collection of related pictures that browsers display in reasonably rapid succession, like frames in a movie. They can be nice to look at, but tend to take a long time to download; plus, a whole bunch of these on one page can be annoying.

A word of warning about image files: they're big. A little thumbnail picture of decent quality can be 10 kB, and a

standard-sized graphic will be about 25-40 kB. Those are fairly decent sizes to use, because even older modems will download them fairly quickly. Unfortunately, some people don't realize how long it takes to download images. I've visited pages with 150 kB images on slow servers that take forever to download with a 14.4 modem. If you feel the need to have a large image (anything over 50 kB), try to provide a warning about the size and content of the picture, so those with slower connections can decide whether it's worth waiting for.

Design Warnings

Frames, which allow a browser to load more than one page into a browser window, are a popular way to provide a table of contents for the reader during his travels through a site. My page currently features such a table of contents, so that the reader doesn't have to keep returning to the front page to visit other portions of the site. Unfortunately, frames can be a nuisance if misused. Packing the window with five or six frames is unnecessary (especially if they are just displaying graphics) and can confuse the reader.

There are ways, by using Javascript or a background sound, to have a sound effect or MIDI song play automatically when a page is loaded. My advice? DON'T DO IT. Rarely have I encountered a feature of a web site that annoyed me more than MIDI music blasting through my speakers without giving me a way to stop it, short of turning down my speakers. If you want to provide a sound effect, add a link to that sound so the reader can make the choice.

As I said before, linking other sites to your own is standard procedure for web page designers. Unfortunately, checking up on those links does not seem to be as standard. The "Not Found" message is getting to be far too common, and would almost be eliminated if people visited their own pages once in a while to check the links.

Lastly, a legal note: images and sounds ARE protected by copyright laws. So, do not steal graphics and sounds from other sites. Ask permission and credit the originator. And make sure that you put a copyright at the bottom of each of your pages.

Putting Your Site on a Server

Before other people can visit your site, you have to place your pages on the server of your Internet service provider and make the files accessible. Some web design programs will do this for you automatically, but you should get instructions for this procedure from your ISP before you try it. Remember, you have to put every file -- source pages, images, backgrounds, and sounds -- in the location you indicated when you referred to the file in your HTML file. The easiest way to be certain of this is to create a set of directories (one for graphics, one for HTML files, one for sounds, etc.) on both your home computer and the ISP directory that houses your web page. That way, you always know where to put the files and the locations listed in your HTML code should still be accurate. It's always good to check, though.

Connecting to Search Engines

Once your page is ready for public consumption, you have to find a way to lead the public to your page. The best way to do this is to link to the various search engines people use to look for interesting pages, including Yahoo, Lycos, Alta Vista, WebCrawler, InfoSeek, Excite and others. Each search engine has a different method to link your site, so you have to spend a little time registering your site with each one. With the thousands of new sites per day being registered, it takes a long time for the search engines to link your site. Plan ahead and register a little early.

After your site is up and running smoothly, visit a few times yourself to determine what tweaks or changes you'd like to make for the next incarnation. Your site generally will not need to change on a daily basis. But rarely updated sites are rarely visited, so it's in your best interest to continually update and improve your site. After all, you wouldn't want the internet to become stagnant and boring, would you?

Now a senior in electrical engineering, Steve Gigl holds the record for the the *Technolog* out of all our staff. He's been writing for the *Technolog* since his freshman year at the University.

HTML Resources

"Web Pages that Suck": www.webpagesthatsuck.com : Shows you how NOT to design your web page and also gives examples of good technique.

"Using Your Web Space": www.umn.edu/accs/help/webhelp.html: Tells U of M students how to maintain their web space and provides links to U of M web policies and a useful list of web and HTML resources.

"Colorcenter": www.htmlhelp.com/color-center/intro.html : A site you can use to test colors and backgrounds with text so that you are sure your page will be readable.

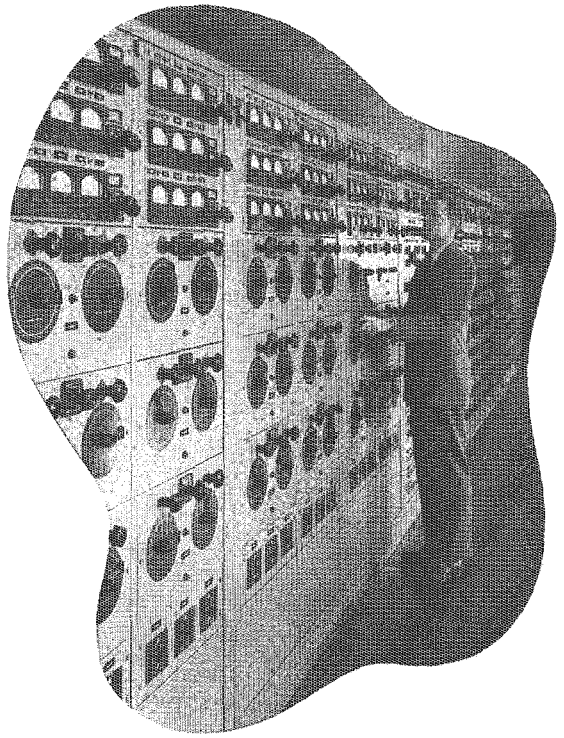
archives

The Old Tech Issue

November/December 1989

You enjoy registering for class. In fact, you enjoy it so much that you interrupt the movie showing on your three-dimensional holographic television set to select some winter quarter classes. Sliding your student ID into the convenient slot on the side of your personal supercomputer, you are instantly interfaced with the University of Minnesota Computer Network. Your faculty adviser appears on your computer screen and asks what classes you'd like to take. "Ah, something easy," you reply as you download your one-year plan from IT's computer. With your advisor's approval, registration is a snap. An artificial intelligence construct makes sure all your classes fit. The push of a button switches you over to the bookstore's computers where you select your textbooks from the computer shopping program. You complete your winter quarter plans by paying for your tuition and books with the simple phrase, "Put it on my card."

Even though it may not look like it, the new student identification cards are a step towards this future. With these new cards, the University hopes to combine the many current student files into a single database that can be used campus-wide.



Getting the right answers—*fast!*

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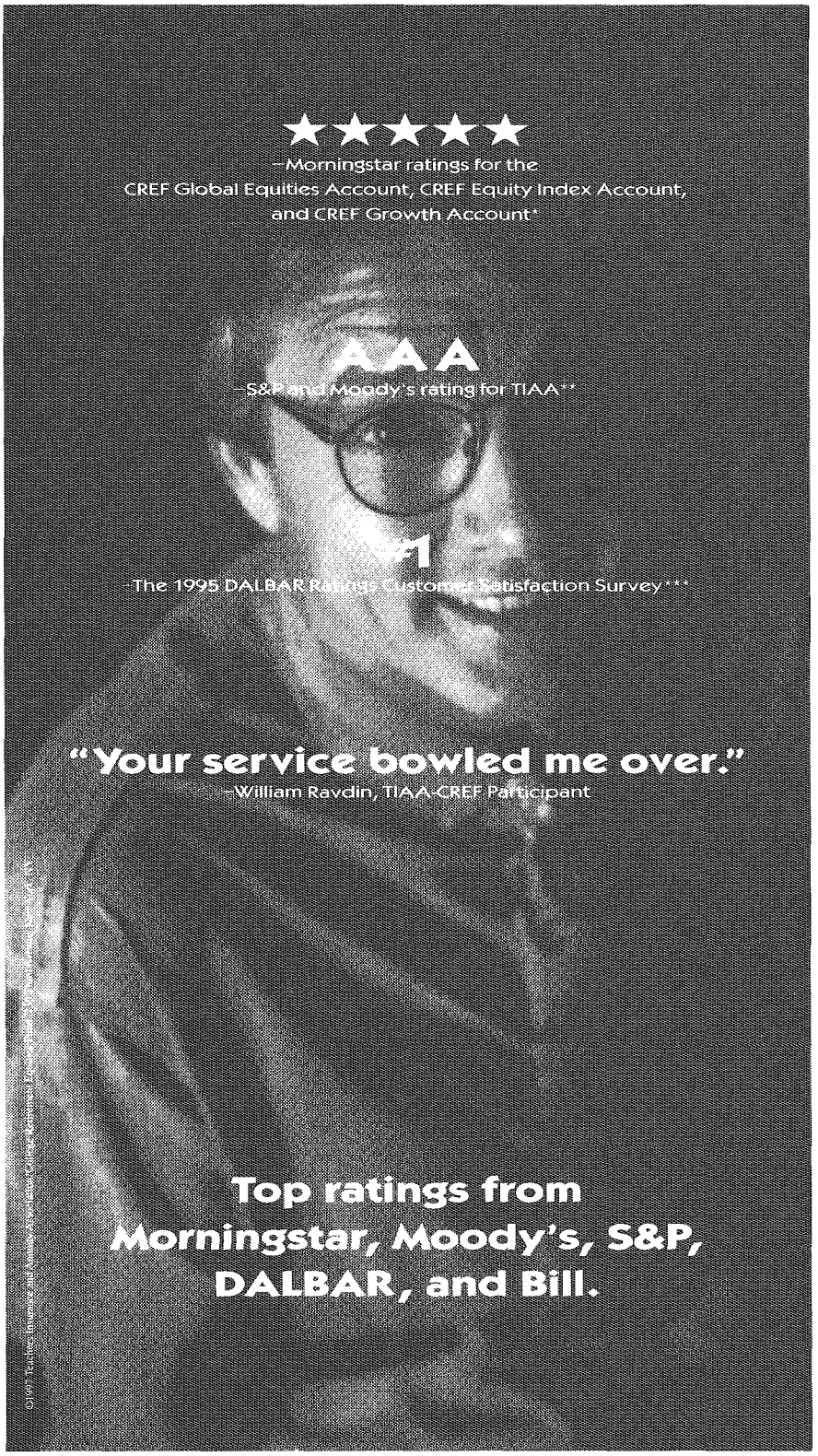

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3-Year	4/1,423	4/566	4/1,423	5/274	5/1,423	5/1,423
5-Year	4/924	4/364	4/924	5/158	N/A	N/A
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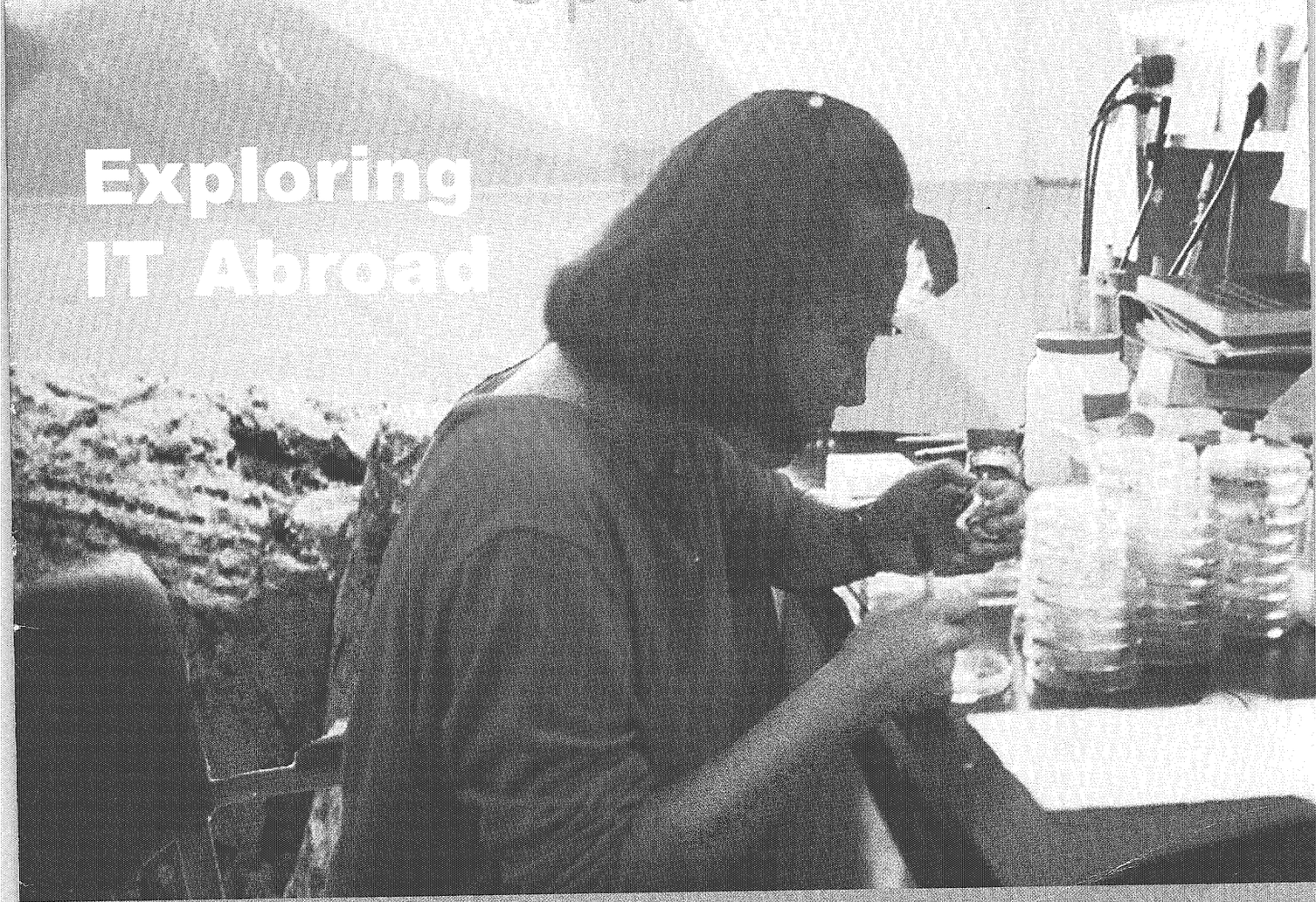
MINNESOTA
Analog
MARCH / APRIL 1998

4th Place Sci-fi Special Feature

Exploring IT Abroad



Deep Blue Chess Champion . Classes Via Internet

make

new friends

build

an impressive resume

conquer

the universe

The *Minnesota Technolog* is currently recruiting creative, power-hungry individuals for its 1998-1999 invasion force. Writers, artists, graphic designers, and soldiers of fortune are encouraged to apply. If you are a creative person interested in technology and handy with a blaster, the *Technolog* is the place for you. Contact our Earth-based HQ for a briefing:

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March / April 1998

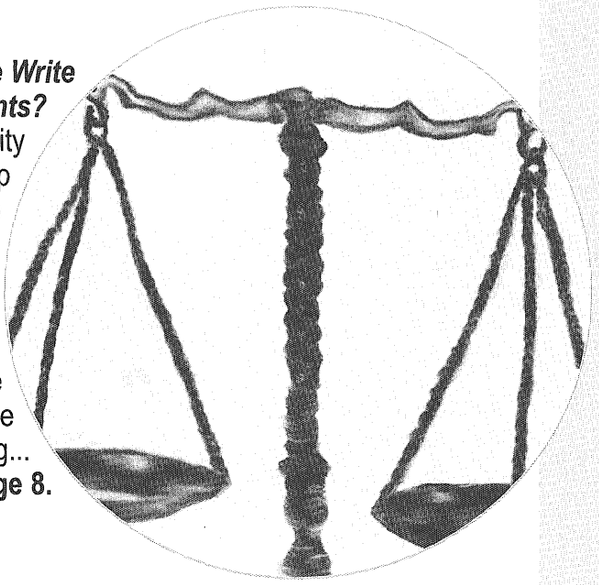
University of Minnesota
Vol. 78, No. 2

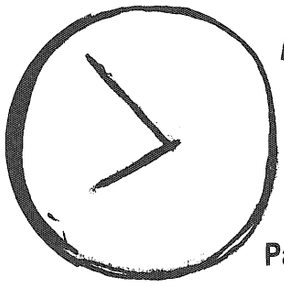
MINNESOTA technolog

Features

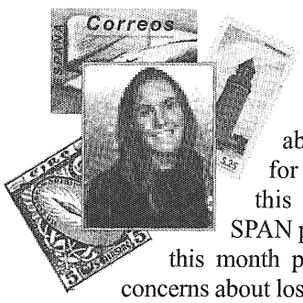
Exploring IT Abroad
by T.A Bennett
Study abroad isn't just for the liberal arts any more. Read about IT students' adventures abroad and the possibilities for the future.
Page 10.

The Write Requirements?
by Michelle Moriarity
Will senior comp ever really help you get a job? Communication through the eyes of students, professors, and the people doing the hiring...
Page 8.





Experiencing a Nexus
by Jason Wetter
This story of a boy's fate and a grim future took fourth place in our annual sci-fi contest. Future issues will count down to our grand prize winner's story.
Page 17



Window to a World of Knowledge

The University has finally woken up to look out the world's windows. Studying abroad is and has been a viable option for U students at least since the middle of this century with the inception of the SPAN program. However, as our feature story this month points out, IT students have long had concerns about losing time they could have spent on their major requirements when going abroad. Programs encompassing IT options abroad were past due.

Perhaps one of the reasons I chose to discuss this in this month's editorial is that I believe strongly that a research institution the size of the University has no excuse not to have programs designed to offer international experiences in any major. As students, we pay for tuition and services, and I would hope, and am pleased to see happening, that one of the services a large research institution can provide would be to organize programs abroad from as many different fields of study as possible.

My experience abroad is limited to the summer I spent attending a German *Gymnasium* (the equivalent of a college-prep high school), and living with a host family. If I could go back to being a freshman, I would probably jump at the chance to study abroad in my major. Next year will be a test run of programs for just that. Staff members at the Global Campus expect to have a full line-up of study abroad options for all IT majors within a year, and the IT administration is helping fund the effort.

Nearly all the students profiled in this issue's "Exploring IT Abroad" story went abroad despite the possibility that it might delay their graduation or leave them with more liberal arts credits than they need for graduation. A lesson that University administrators could take from this situation is to be proactive in designing programs and policies to meet student needs. Like the study abroad programs for IT, many policies, procedures, and programs have been overdue at the University. Unfortunately, many still are. It is a bureaucratic nightmare to get both an IT major and CLA major to appear simultaneously on a transcript. Many advisers at the University don't even know that it is possible to work toward two degrees in two different colleges at the University simultaneously.

That may seem to be an esoteric example. So here are a few others. If you have an ongoing scholarship that requires you to send in a transcript quarterly, you already know that the Office of the Registrar does not store the recipient's address on the same computers that they use to call up your transcript. You have to bring the address every time.

Or let's say that you are a part of a campus life organization, either a sports club, a residence hall, or an IT student group. The University will have changed your group's financial system to CUFS, and now you can no longer simply write checks or get reimbursed without advance paperwork for the little expenses in life like stamps, parking for guest speakers, or highway tolls when travelling with the group.

All this may sound menial, but the point is that the University is large enough to employ people to work out these problems before they arise, to think ahead. And we, as students, should not expect the administrators to be the only proactive arm of the University.

In this issue's story about IT students and communication skills, students had some firm opinions on the senior writing requirement, yet the same students are sitting by and letting others draft a better set of requirements without offering input. I am one of those students. We all are, sometimes. But imagine what this place would be like if we all were to wake up from our apathy and take charge of what matters to us.

Jacqueline Couillard

Reinventing the classroom: U offers classes on the Net

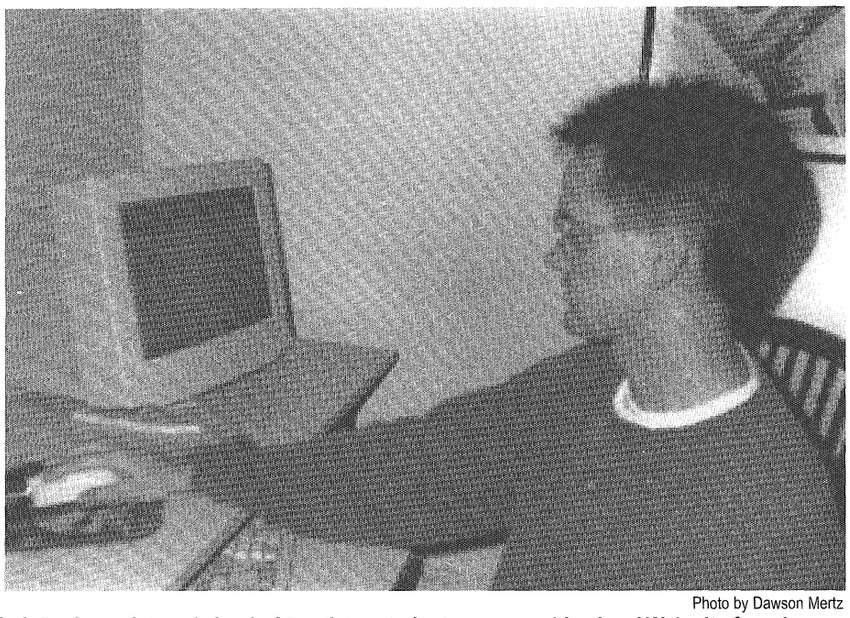


Photo by Dawson Mertz

Mark Davies, a future School of Dentistry student, accesses his class' Web site from home.

For hundreds of students, the Internet now serves as a surrogate teacher. These students participate in classes almost exclusively by peering into monitors. Throughout the quarter, Internet students attend class only a couple of times. They read texts, take tests, and communicate with each other over the Internet from their homes throughout the Midwest.

Internet classes have unique advantages over traditional classes. Most Internet students feel the biggest advantage to learning online is that it allows them to learn independently. But besides this obvious benefit, there are many more not-so-obvious benefits.

Some students in one of the University's Internet classes, Inquiry in Practice, live in St. Cloud, Minn. while others live in Wisconsin. They all log on in their homes to attend the Minneapolis-based class.

Lee Fertig, a T.A. for Inquiry in Practice, said, "The Internet enables us to serve students who are away from the school and potentially makes thousands of resources available throughout the duration of the class."

But not everyone in a Net class is participating because they live too far away. Students in the Twin Cities and even some who live on campus attend classes on the Web. Mark Davies, a graduated biology major going on to the School of Dentistry, lives only a block from the St. Paul campus, yet he chose to join a physiology class that uses the Internet. He said he is happy with the class but feels that the price should be less than that of a normal class because of the infrequency of the professor lecture hours. In the end, though, he had more positive than negative things to say about the class. "The professors are really responsive to your e-mail, and the class is accessible 24 hours a day," he said.

continued on p. 6

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continued from p. 5

Like Davies, most Internet students seemed to agree that the convenience of the independent learning is the best advantage to taking Internet classes.

Amy Gregoret, a teaching assistant for the geology course Earth Systems Science, a class that uses the Internet in conjunction with traditional class time, pointed out some other advantages. "One of the biggest advantages [of Internet classes], for IT students especially, are the databases that can be accessed from a class Web site," Gregoret said. She added that the Internet allows collaboration. "U of M students can work on projects with knowledgeable students of faculty at universities all over the world."

With IT participating in the national Internet2 initiative to develop a faster Web connection for universities, many administrators hope collaboration will only get easier.

In 1994, a University class about Internet skills was introduced. Over the past three years, the number of Internet-based classes has steadily increased. Eight classes are now available online, covering a broad scope of subjects from statistics to microbe engineering, and more classes are planned.

Web classes consist of a Web site with many pages of text, some activities and tests, e-mail and discussion forums, some general information pages, and traditional print resources. Students find a guide to their Web course on their class home page. They work at their own pace and rely on the instructor for answers to their questions.

Throughout the quarter, the instructor's job is to mediate discussion groups, answer e-mail, and act as a resource, should the students run into problems. The instructor also takes charge at the rare or nonexistent face-to-face meetings. These meetings usually involve an introduction to the course or an exam that can't be taken over the Net.

Students could, theoretically, travel the world all quarter and still earn University credit as long as they attend infrequent class meetings. Unlike a traditional class, which can clutter students' schedules, an Internet class allows completely self-paced learning.

For students who don't want to be taught strictly over the Web, professors are offering the chance to learn online at many different levels. Web sites devoted to University classes have existed for years, and according to Linda Jorn, acting director of the Digital Media Center, there are currently more than 150 such sites. They range from simple sites listing general class information to sites with a labyrinth of text, pictures, and even video. For example, one site for a Russian class includes streamed video of instructors pronouncing difficult words. The site also includes streamed video that demonstrates how to write in Cyrillic. Some art history web sites have huge stocks of pictures, and the geology course called Earth Systems Science has an interactive time line on its site.

Although Web classes can be visually stimulating, they must also focus on content. "For a Web site [to be] really helpful to the students, there has to be more than just pretty pictures [on the site]," said Gregoret, the T.A. for Earth Systems Science.

Fertig warned of the ease of providing Net classes. He said, "[We] need to pay attention to the quality of online courses. We cannot simply think that it is easy to post an online course and leave it alone. We must ensure that there is a good rationale for offering the course online and also that it is delivered in a thoughtful manner." Students who attend Internet classes do it completely by their own will, and all the students interviewed had a positive view of the program.

Stephen Regenold is a newcomer to our staff. Please write in and tell us what you think of his writing. His pay depends on it.

Chess champion's creator to speak at U

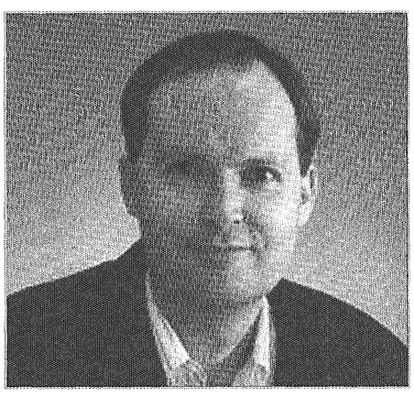


Photo courtesy of the Center for the Development of Technological Leadership

Murray Campbell will speak about the Deep Blue, the chess-champion computer at a 7 p.m. lecture on May 7 in EE/CSCI 3-210.

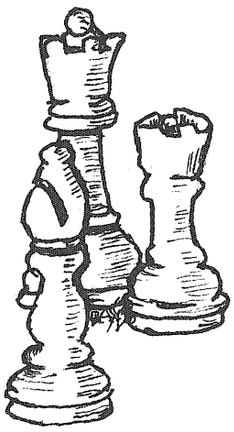
After watching a computer playing chess at the University of Alberta, Murray Campbell decided to combine a passion for chess with his newfound interest in computing.

In an unusual twist of fate, those interests took Campbell to the top of the chess world. A research scientist at the IBM T.J. Watson Research Center in New York, Campbell participated in the development of Deep Blue, the first computer to defeat a world chess champion. In 1997, Deep Blue beat Garry Kasparov, avenging an earlier loss to Kasparov.

The 1997 chess match fulfilled a long-standing challenge in computer science -- and heightened the debate over the role of artificial intelligence.

Campbell will talk about the development of Deep Blue and the implications of the computer's victory at the 1998 Honeywell-Sweatt Lecture: "Did Deep Blue's Win Over Chessmaster Kasparov Signal a Deep-Sixing of Humankind as Well?" The lecture begins at 7 p.m., May 7, followed by a reception at 8 p.m., in Room 3-210 of the Electrical Engineering and Computer Science Building at the University of Minnesota.

While Deep Blue enjoys status as a champion, the computer also raises questions about artificial intelligence. If intelligent computers such as Deep Blue can beat the best that humans have to offer, what does that mean for society? Are machines already smarter than humans? Campbell will explore those issues in his lecture.



Many factors contributed to Deep Blue's success, including a single-chip chess accelerator, a large-scale parallel system, selective search algorithms, and a complex evaluation function, says Campbell. As an expert chess player and former chess champion of Alberta, Canada, Campbell made good use of his chess expertise and focused much of his work on developing the computer's evaluation function.

"That's important," says Campbell, "because even if you can search many moves into position, search forward all the possible moves, you still have to evaluate those positions at the end of the sequence of moves that you've looked at. If you evaluate them incorrectly, you're going to play poor chess." Campbell worked to help Deep Blue evaluate positions continuously.

While completing his Ph.D. in computer science at Carnegie Mellon University, Campbell met doctoral student Fenghsiung Hsu, who had developed a single-chip move generator. The two collaborated in 1986 to construct a chess-playing computer, Chiptest, and both joined IBM in 1989.

Now Campbell's new computer, Deep Blue, has become the first computer to defeat a grandmaster in tournament play.

What's the next step for the battle between Kasparov and the computer? Can Kasparov rebound and beat new and improved versions of chess-playing computers?

He sure will try. He will come back well prepared and armed with new ideas for playing against the computer, predicts Campbell. But, with nearly 50 years of computer chess research contributing to its win, Deep Blue is no flash-in-the-pan success story. Indeed, the chess computer's time to compete at the highest level has come. "I did think that some day it would happen, that we'd be competing with a world champion, and I, in fact, thought it would be about now."

❖❖

EDITOR'S NOTE: This article was reprinted with the permission of Darlene Gorrill, the author of this piece and the producer of the newsletter from which this story came. Thanks also to the Center for the Development of Technological Leadership for helping us find her.

CELEBRATE!

I.T. WEEK 1998

Schedule of Events:

May 4 --Opening Ceremonies

May 5 -- Quake2 game tournament
Climbing Wall
Barbeque
Bat Race
Moonwalk

May 6 -- Tech Fair
Banquet
Moonwalk

May 7 -- Tech Fair

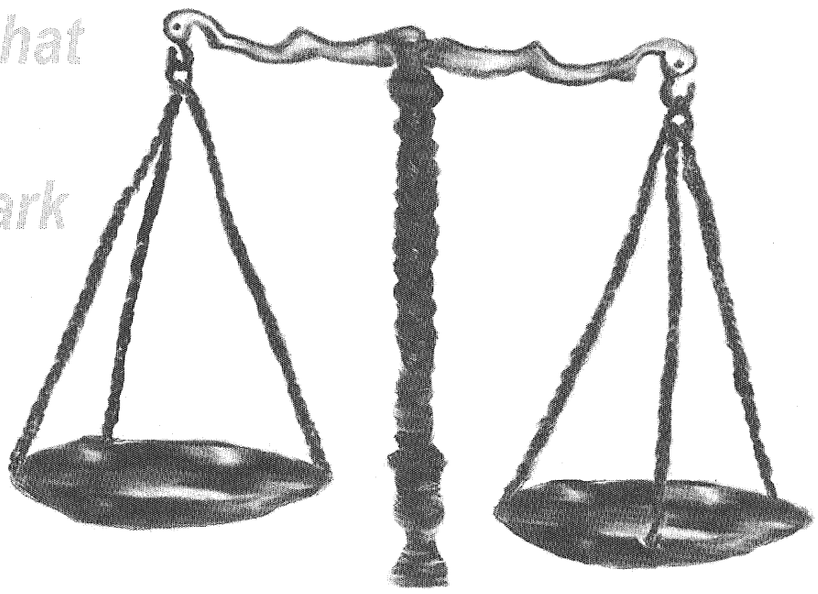
May 8 -- I.T. Olympics
(Hay Bale Toss
Calculator Toss
Volleyball
Pi Mile Run)

To find the event sponsors or the place and time for any event call Plumb Bob at 626-1552. More coming!

GET I.T.!

The Write Requirements?

Sources agree that communication skills are the mark of a marketable grad. But how well do we communicate?



by: Michelle Moriarity

College students measure success in two principal ways: their performance in college and their performance in the potential workplace. In college, students and faculty measure success by performance in their most challenging courses. In the professional world, success is measured by technical competence and communication skills.

John Broadhurst, a professor in the physics department, says that despite evidence of excellent oral communication in class presentations, he finds his students lacking skills necessary to research and write a scientific paper -- completeness, accuracy in presenting technical information, and readability. Classes such as his would probably be considered some of the most challenging in IT, and he emphasizes communication skills as well as the physics students expect to learn from his class. "On coming into the course, the students are deficient in writing compactly," Broadhurst says. But by the end of one of his courses, he says, most students improve their writing skills and meet his expectations.

Exams and grades are abandoned in favor of promotions and raises when it comes to judging a person's competence in industry. And workplace performance is judged not only on technical abilities, but also on an ability to communicate knowledge to colleagues and to clients, the general public.

Jennifer Ohm, staffing manager for Honeywell's corporate offices, says that interpersonal communication skills are crucial to an ideal technical candidate. She says, "[We have trouble] finding people that have both the technology background and the interpersonal skills. It's not an impossible task, but that's really where the challenges are."

Students with good communication and interpersonal skills that pursue technical careers are a rarity, say personnel directors. It seems that prepared students have a bright professional future ahead of them. That is, at least, what one University student, Bill Dupre, is hoping.

When Dupre began working at Northwest Airlines in 1989 as an aircraft mechanic, he had little idea that workplace challenges would land him at the University within five years. After a few years of deciphering aircraft maintenance manuals, Dupre enrolled as a student at the University to gain the qualifications to return to Northwest and write better manuals.

"A problem at Northwest is that engineers know engineering," Dupre says. "They're not very good at communicating. I saw continuous problems. ... The maintenance procedures were poorly written, hard to follow, [and] not complete enough for someone to really understand how to do it without having someone there who's been in that exact position for years to kind of walk you through it."

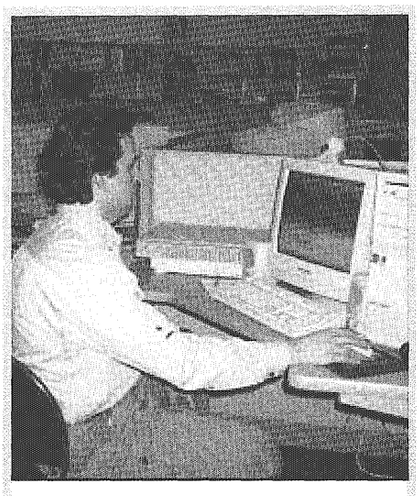
Now Dupre is working toward a degree in scientific and technical communication. Part of his program plan includes Technical Writing for Engineers, a course that he shares with many IT seniors.

Dupre's major concern about the technical writing he encountered in the workplace was that "The technical writers were former mechanics that had little, if any, formal education. [The company] tried to hire people from the outside who were English majors or journalism majors, but they don't know anything about aviation," he says. "They had no other option but to hire aircraft mechanics ... and hope like hell they could write fairly well and communicate with engineers [about] the procedures."

Career magazines and corporate recruiters alike parrot Dupre's message -- in order to succeed in the business world, scientists and engineers must possess not only the technical skills their duties require, but also the ability to communicate on many levels. Electronic Engineering Times called communication skills such as understandable oral, written, and visual communication, soft skills.

After paging through some of the free magazines available in the IT Career Services office, you would start to notice a pattern. "Employers look for job candidates who have good communication and interpersonal skills," asserts one publication. Another echoes it with, "Employers seek ... excellent communication skills to augment a candidate's technological experience."

Promotion in technical industries depends on an individual's ability to communicate with others, with an emphasis in expression of technical ideas in simple, everyday terms. "[Technical workers] need to be able to relate to their customer," Ohm says. "Strong interpersonal skills [are necessary] because they're translating customer needs into hardware and software solutions."



"A problem ... is that engineers know engineering. They're not very good at communicating"

Bill Dupre

"[We have the] expectation that people are fundamentally sound in their writing, that they can articulate their words on paper clearly, succinctly," Ohm says. However, she says, it's difficult to evaluate these skills through the interview process.

Tony Hoffman, technical staffing manager at 3M, agrees with Ohm. When candidates come from an accredited institution such as the University, corporate recruiters expect competence in basic skills in their field. "[We] assume that it has prepared the candidates properly for entering the work force," Hoffman says. "We feel that, by progressing through a fairly rigorous curriculum, that is evidence in and of itself that they're able to master those principles and [that] they would be reasonable candidates for us." But judging candidates' writing through their resumes has become more of a challenge, Hoffman says, because word processing technology like spellcheck and grammar programs coupled with the availability of resume critique services help polish and conceal writing insufficiencies.

"Communication is an integral part of any job," Hoffman says. He says that the ability to describe thoughts and ideas and sell them to colleagues is "probably more [important] as a new hire because you're not going to have the years of experience and credibility. You need to be able to think clearly and be able to process the data you're dealing with and put it into an organized format."

Though IT students receive rigorous technical training, they must meet only basic demands in terms of communication. The University requires all students to complete introductory composition and an upper-division composition class pertinent to their majors. For most IT students, "Your Portal to College" -- as the English composition 1101 Web page cheerily announces -- gives way to composition 3031: Technical Writing for Engineers.

Attitudes toward this requirement vary. Dupre, who is currently enrolled in 3031, says that, in terms of learning communication skills, "[Taking courses] is the best way to get prepared."

Steven Rouse, a senior in statistics who

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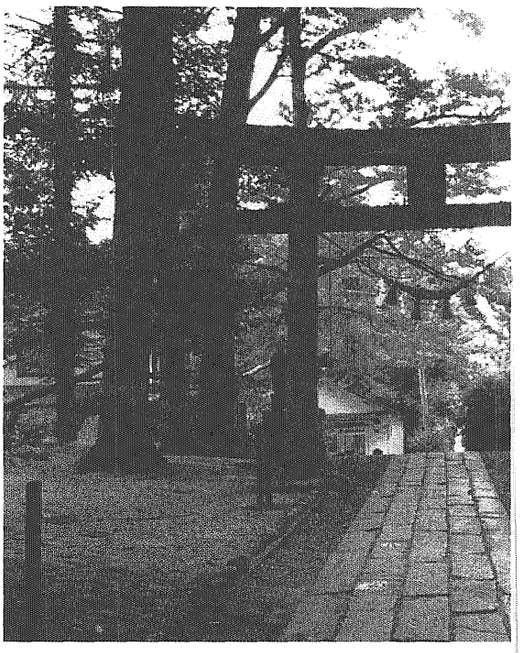
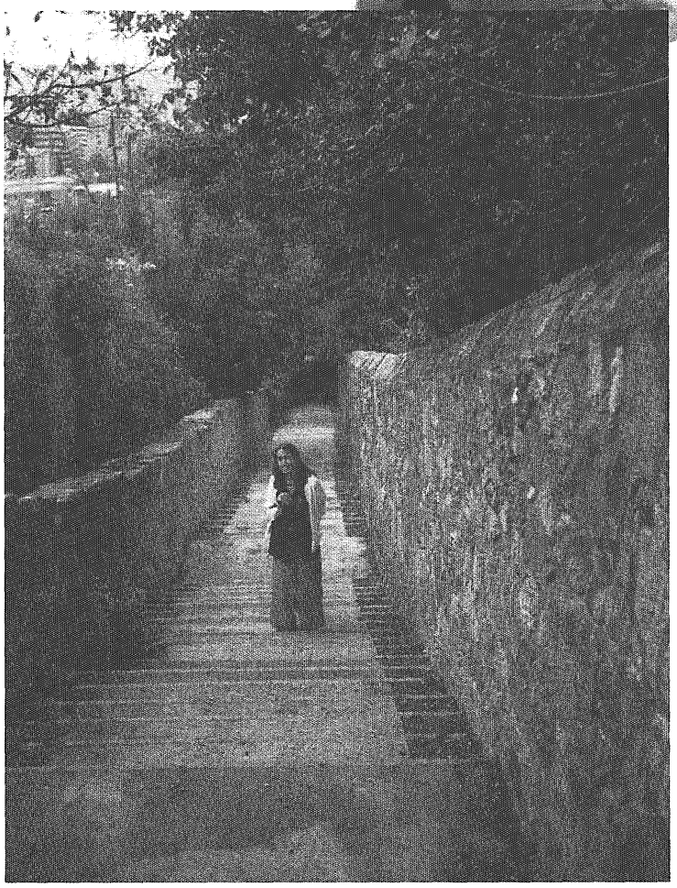
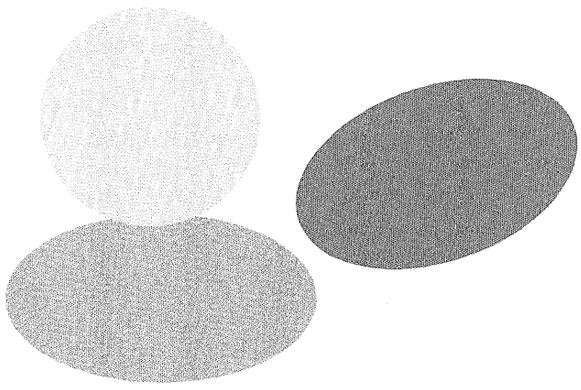






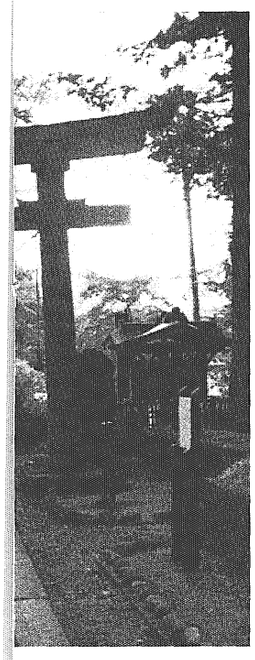
COUNTERCLOCKWISE FROM TOP:

Top right: Greg Shipp studied in Italy last year.
Photo courtesy of Greg Shipp

Top middle: A scene from Japan
Photo courtesy of A-Yia Thoj

Top left: Shipp and his girlfriend visited the leaning tower of Pisa while in Italy.
Photo courtesy of Greg Shipp

Bottom left: Michelle Ehrenberg went to Spain.
Photo courtesy of Michelle Ehrenberg



Exploring IT Abroad

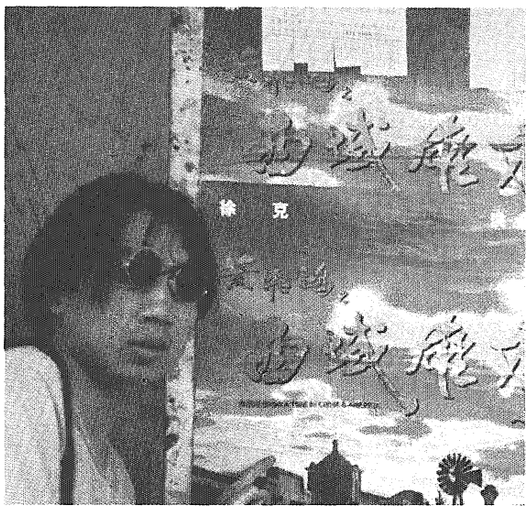
story by T. A. Bennett

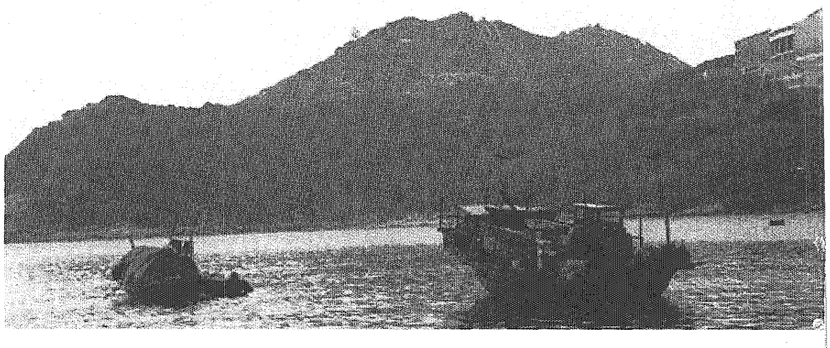
The world just got wider. IT students who travelled abroad lent the Technolog their memories. And a new partnership between IT and the Global Campus hopes to lend you some dreams.

IT students are redefining the stereotype of students abroad with international experiences that are adding value to their education and adding marketability to their post-graduation job search.

The technical quality of an IT education gives students a competitive edge in employment, but in the work world, students will face a new challenge: internationalization. The high number of foreign students in IT is a reflection of the larger employment population its students will find after graduation. Many IT graduates will be working with people who learned English as a second language. Travel and postings overseas will also challenge IT graduates. IT Dean Peter Hudleston says, "In the global marketplace, where people get moved from country to country, there's a good chance of technical employees being moved around."

International employment trends are prompting IT students to include overseas experiences as part of their curriculum. Ge Thao, a sophomore majoring in mechanical engineering, spent two quarters studying at Minnesota State University-Akita in Japan with fellow IT student A-Yia Thoj, a junior in mechanical engineering. Thao's interest in the Japanese language expanded to a cultural interest with a professional twist. "I wanted to go abroad and experience how the Japanese environment is more technologically based. I had heard and read this, and I wanted to see if it was true," he says. The Akita program allowed him to enroll in Japanese language classes, experience the culture, and complete some of the liberal education requirements needed for his ME degree in Minnesota. "It's probably the best way to solve this liberal education requirement -- like killing two birds with one stone. Once there, you have a different way of doing things," says Thao. "Instead of reading textbooks, you do



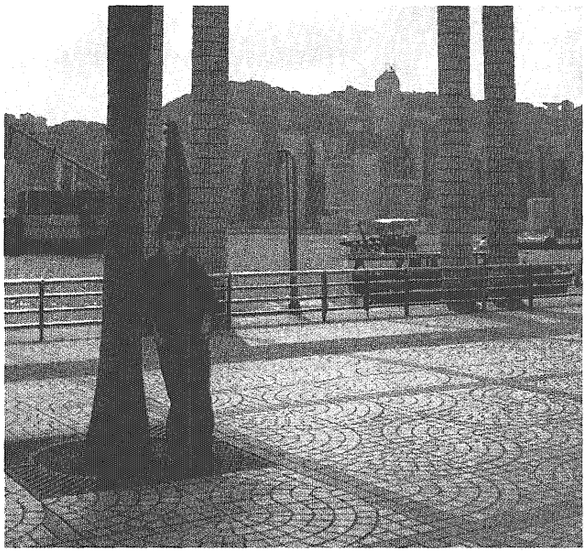


Photos on both pages are courtesy of Ge Thao from his time in Ja

that internationalization and the other benefits of studying abroa

fact that the University had not yet established a program where

complete IT coursework abroad.

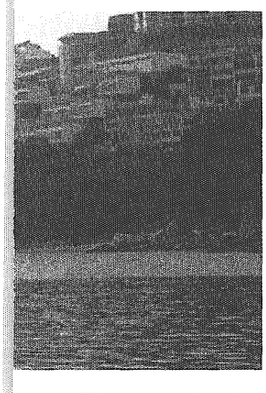


different things that help you learn. I could watch a Japanese television show for my language class."

Thao had no Japanese language skills when he arrived in Japan, but because classes were held in English and his fellow Japanese students had studied English all through their schooling, language did not present a problem. "If I had a question on my homework I asked my Japanese roommate and he could help me out. In their society, they study English really well, and their grammar is good. It's the part about speaking and listening that gets to them. They see it as a fast pace," Thao says.

Living in a dormitory with Japanese suitemates gave Thao a relatively easy entry into Japanese culture and a set of ready-made friends. "I was thrown into the Japanese society quickly," he says. "It also exposed me to the Japanese way of thinking, and even though I'm not an expert on Japanese culture or society, it helped me out in how to interact with them. And in that way, with the world being internationalized and everything, it helps a lot for in the future when everyone is going to work together."

A-Yia Thoj, Thao's friend form the University who also participated in the Akita program, was attracted to the program by a strong cultural interest. "I went because I wanted to meet people from another culture, to share my culture, and to learn theirs," Thoj says. In addition, Thoj also saw the internationalization factor. "I wanted to make international ties and in a sense make the world a smaller place for me."



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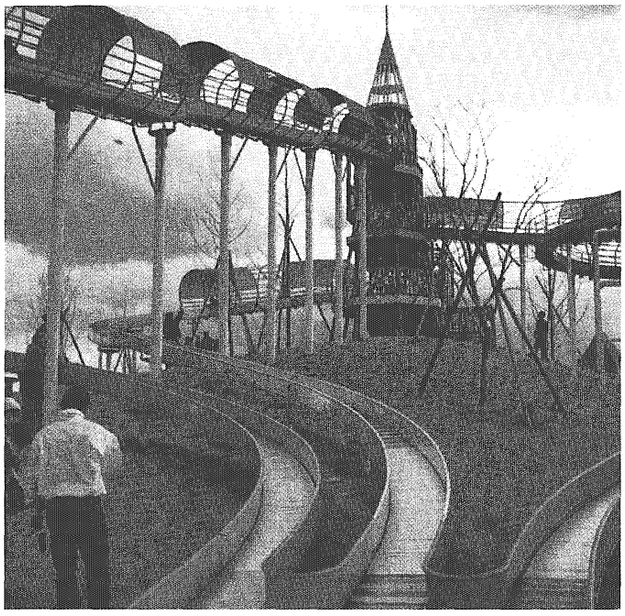
d outweighed the
IT majors could

Although he believes internationalization will play a key role in the work environment, Thoj stresses the philosophical aspects of study abroad. "I believe cross-cultural exchanges allow a person to grow both emotionally and mentally. A lot of times, we, as students, get too caught up in our studies, and we forget about things like other cultures and foreign lands," he says. "It opened my eyes to the fact that everything I knew is not necessarily valid just because it works here. It doesn't always work in Japan." Thoj says this experience has helped him see other viewpoints. "I realize that we, as people, tend to interpret things in our own ways, especially when communicating. But we don't usually pay attention to what it's saying to our listeners."



Both Thao and Thoj enthusiastically advocate study and travel abroad but acknowledged many students' concerns about cost. Thoj says he thinks students might be more willing to go abroad if they didn't have to pay the entire cost themselves. "I think it's especially true for U of M students. I mean, I came here because I didn't have the money to go to Carleton College. I believe that a lot of the students here are in pretty much the same situation as I am. Money counts," he says.

But cost often turns out to be less of a problem than students might think. In order to use financial aid, the University requires only that students register abroad for the same number

A Summer Researching Abroad

Left: Sandy Choi, spent summer 1997 in Korea doing research. Her experience abroad was unique because it was individually arranged.

Photo courtesy of Sandy Choi.

As the wheels of the 747 hit the pavement of Kimpo International Airport, a life-changing summer began for me. During the summer of 1997, I seized an opportunity to do research at the Korea Advanced Institute of Science and Technology (KAIST) in Taejon, South Korea. At KAIST, I worked in Professor Ho Nam Chang's biochemical engineering laboratory.

Professor Chang's laboratory worked on a variety of projects from waste management to fermentation. My main project was to optimize conditions for electro-transformation of an Escherichia coli-Rhodococcus shuttle vector in Rhodococcus. Rhodococcus is an important genus with many metabolic activities such as production of acrylic acid and acrylamide, conversion of steroid compounds, and bioremediation of chlorinated hydrocarbons and phenolics. An efficient transformation method was determined to be necessary to better understand its genetics and to develop strains with enhanced activities. Before I left KAIST, I gave a seminar on my research project.

During weekends, I traveled. Korea was a beautiful country with green mountains and endless oceans surrounding it on three sides. The cities were full of action while the countryside, just a few hours away, was serene. I went hiking on several of the mountains during my stay. The scenery from the top of the mountains was spectacular. I also visited a few islands and coastal cities, which were beautiful. Overall, the country was amazing and the people were friendly and helpful. Throughout the summer I made many new friends. They helped me get acquainted with the town, culture, history, and traditions. As the summer progressed I grew very fond of one of their favorite pastimes, karaoke. After mastering several songs soaring the Korean charts, I came to the conclusion that karaoke is one of the best ways to practice a foreign language.

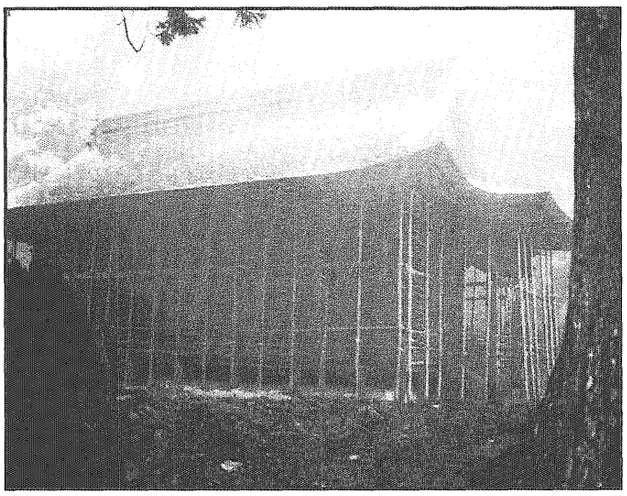
My summer at KAIST was one of the most incredible experiences I have ever had. Although when I first arrived there I thought I would never adjust, I felt very comfortable there in the end. I am glad I chose to go to South Korea and would highly recommend others to consider similar foreign experiences. Lastly, I would like to thank Dr. Chang for sponsoring me and Dr. Wei-Shou Hu, my advisor in the Department of Chemical Engineering and Material Science, who arranged this foreign experience for me.

GET IT CREDITS ABROAD

Starting this year, it just got easier to get IT credits abroad! Following are two examples of programs through the Global Campus, 102 Nicholson Hall, arranged specially for IT students. Check it out!

CHEMISTRY: Programs are available in Australia, Canada, Denmark, the Netherlands, and the Phillipines. You can study everything from organic, inorganic, and physical chemistry to specialties such as catalysis and spectroscopy.

GEOLOGY AND GEOLOGICAL ENGINEERING: Programs covering everything from water resources to structural geology are available in a variety of different nations including Denmark, England, Scotland, and Australia.



of credits that they would be taking if they were here on campus. In fact, financial awards may even be increased to support study abroad programs. Thao found that studying in Akita was only slightly more expensive for him than attending the University during the same period would have been.

Gregory Van Heel, a geological engineering major, spent fall 1996 with eight other University students in the Denmark International Studies program (DIS) in Copenhagen. "During my exchange, the civil engineering department paid for half of my costs, and a matching scholarship was offered by the Danish school. Essentially, all of my incurred costs -- including airfare -- came out to approximately what I would have paid for tuition here at the U of M," Van Heel says.

IT Dean Peter Hudleston says that IT would like to see more of its students take advantage of study abroad programs. "It's important for people to be aware of the differences between cultures," Hudleston says. To achieve this, IT is partially funding the work of Global Campus employee Michelle Cumming and others involved in the project this year. The IT Study Abroad Project is an effort to identify, package, and promote study abroad opportunities best suited to IT students. "We're working with each of the undergraduate studies advisers to determine which universities overseas will work best for their students," Cumming says. Advising materials are already available for civil and geological engineering, chemistry, and geology. Cumming expects the list to be comprehensive for all IT majors by the end of the quarter.

"It's important for people to be aware of the differences between cultures."

IT Dean Peter Hudleston

Above: April Heine, at left, studied in Venezuela.
Photo courtesy of April Heine
Left photo courtesy of A-Yia Thoj

"What we're thinking is that IT students don't think of study abroad as an important part of the undergraduate experience the way that a CLA student might," Cumming says.

Statistics support Cumming assertions. Twelve IT students participated in study abroad programs last year. Only three of those took coursework relating to their major. The IT Project aims to increase these numbers by adding what Cumming sees as an IT student's main concern: finishing a degree in a timely manner. The key to accomplishing this is to find programs and coursework overseas that will fulfill the same requirements as University coursework. This way, students will not lose time by going abroad.

"It's kind of a relationship thing, too," Cumming says, "The professors in IT here need to be able to trust that, if they send one of their students over there in their junior year, they'll come back as a senior as ready to take their classes as a junior who stayed on campus. There's going to be a lot of back and forth and some test students."

The desire to pursue technical coursework as part of an overseas experience is echoed by Michelle Ehrenberg, an electrical engineering major who participated in the International Program in Toledo, Spain. "I think IT students would be more apt to study abroad if they could take their technical classes over there. I think that most IT students are too worried about getting their technical classes in to broaden their ideas," Ehrenberg says. "I went to Spain over the summer so as not to screw up any of my sequences. In doing so, I probably missed out on some valuable work experience, but I would never trade the experience I had in Spain," she says.

Few students would. Most participants of study abroad say it was one of the best experiences of their life. Now the IT Project through the Global Campus is geared toward making it easier for IT students to have those experiences.

T.A Bennett (a pseudonym) is an English major hoping to do some traveling of her own in the future.

STUDY ABROAD ON THE NET

Global Campus
http://www.umabroad.umn.edu/
Discover some of the 170 study abroad programs offered at the University of Minnesota.

The Online Study Abroad Directory
http://www.istc.umn.edu/osad
Search through study abroad programs, scholarships, and the Rock Bottom Study Abroad section which highlights lower cost study abroad options.

StudyAbroad.com
http://www.studyabroad.com
StudyAbroad.com offers an online guide to travelling abroad, and chat and discussion boards that let you hear firsthand from people who have already done what you are thinking of doing.

continued from p. 9

is also taking the course, disagrees. "Technical writing [the course] could be important. We're working on resumes right now," Rouse says, "[But] It is taken pretty lightly. We're usually pretty bored in class."

The senior design project, a requirement in many engineering majors, is one of few existing opportunities for IT students to write in a cross-curricular setting by combining practical technical skills with intensive writing in a hands-on environment.

Plans on the horizon call for a revision in writing requirements.

"[There have] been a lot of communication components to the chemical engineering classes I've taken, particularly Chemical Engineering Laboratory," says Chris Damsgard, a senior in chemical engineering. Students must prepare an oral report every week and a final report every two weeks, and all assignments must be professionally written, he says, "They get really picky about our writing skills."

IT Director of Admissions Ben Sharpe says, "We've never had the faculty to teach intensive writing courses within the major." But plans on the horizon call for a revision in writing requirements. This change, Sharpe says, will dispose of the upper division composition requirement in exchange for several courses created within each major that would include tailored intensive writing components. Sharpe says that existing technical writing courses have done a fine job, but future courses would narrow the scope of writing.

David Weinlick, a composition instructor who has taught Technical Writing for Engineers and Writing in the Sciences, supports the proposed change in writing requirements. "It sounds like a good idea," he says, "If it's implemented properly, it could be a success."

Weinlick's main complaint is that the University lacks enough courses for developing writing skills. Despite students' grasp of the English language. "They seem unsure of their writing," he says. "Very few students leave their last composition course truly prepared to write for a greater audience," Weinlick says, because they only have one course in which to polish their skills. Another obstacle he encounters as an instructor of scientific and technical writing courses is that students of all skill levels participate in composition courses.

"This is a difficult issue to come to grips with," Sharpe says. Many students enrolled in IT take all of their general requirements on a pass/fail basis. Under these circumstances, any English communication deficiency remains unaddressed or unidentified, he says. An option, he says, is comprehensive English testing for all University students, but costs prevent this from becoming a reality.

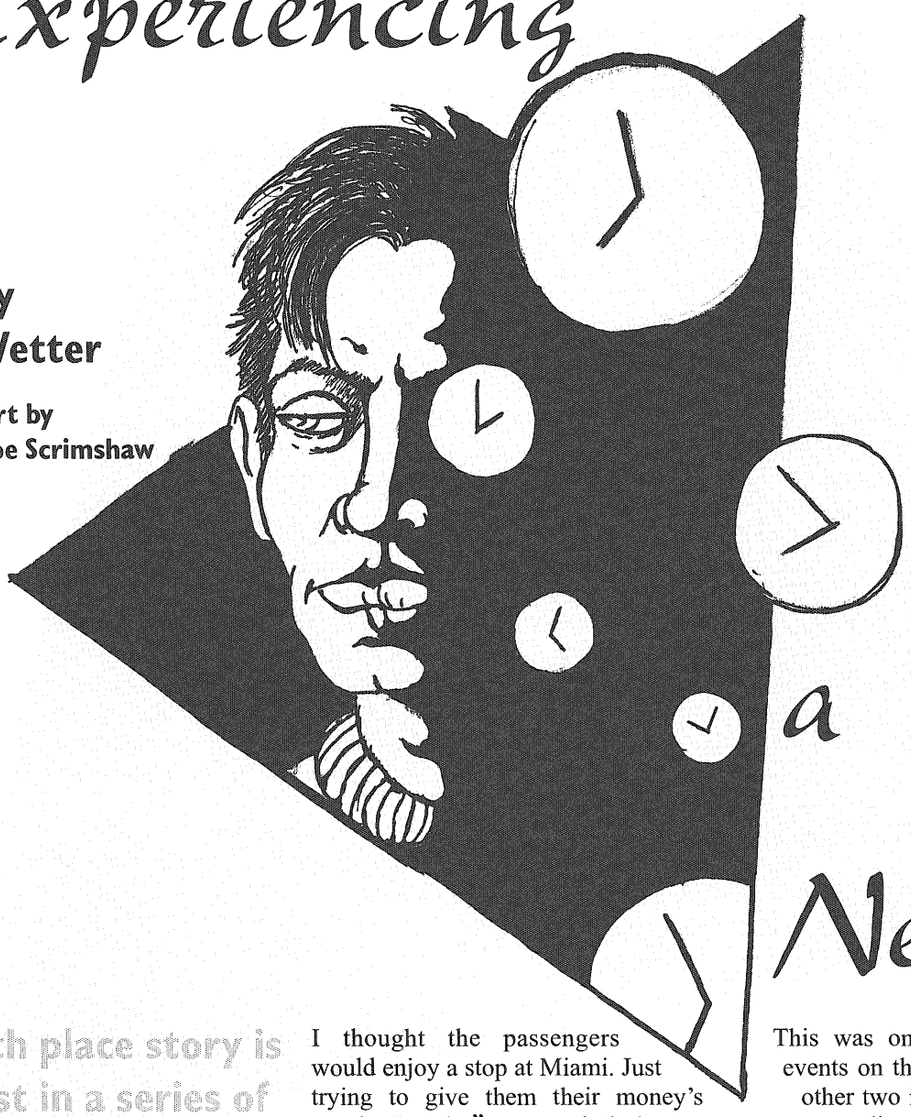
While administrators and instructors build the University's future writing requirements, Bill Dupre delights in digging through the current gold mine of courses at the University dealing with technical communications. Dupre's intention is to develop a specific set of skills to bring back to Northwest. He says, however, that "through taking courses in this degree, I've found out that there are endless opportunities for someone with good communication skills."

Michelle Moriarity isn't in IT, but we like her anyway. Maybe if she took up engineering, she could be a wealthy manual writer...

Experiencing a Nexus

story by
Jason Wetter

art by
Joe Scrimshaw



This 4th place story is the first in a series of sci-fi special features counting down to the 1st place winner in our sci-fi contest.

The captain was pissed off. "Simley, you know I hate traversing the Bermuda Triangle." The young and arrogant first mate Simley did not care about the likes and dislikes of his captain.

I thought the passengers would enjoy a stop at Miami. Just trying to give them their money's worth, Captain," answered Simley.

The captain was well aware that this was a privately chartered pleasure cruise, but he still did not tolerate insubordination from his crew. "Simley, turn this yacht around immediately and follow steadfastly my original course to New Orleans. Oh, and by the way, you have now volunteered your services to the passengers on this three-week cruise."

"Aye, aye, Sir," and now the first mate was pissed off.

This was one of three significant events on this pleasure cruise. The other two included childbirth and a mass discrepancy. Two affluent passengers were married and prominent scientists. Samuel Thomas held a doctorate in astrophysics; and his wife, Veronica Thomas, was a master in genetics. When first mate Simley steered the ship into and backtracked it out of the Bermuda Triangle, Veronica gave birth to her only child, Seth Thomas, two months premature. The yacht raced to the nearest port close to a hospital. Because of the hectic environment brought upon the yacht due to Seth's premature birth, the crew and passengers did not notice the date right away. When Samuel filled out several hospital record forms, however,

the discrepancy came into full view. The hospital officials told Samuel he had the date wrong. Samuel was one day into the future relative to the rest of the world. After some resistance, Samuel conformed to the date given by the officials. He was mentally fatigued from the stress of his son's precarious birth. He also remembered that no watches, clocks, calendars, radios (with the exception of an emergency one), or televisions had been allowed on the yacht. The policy was supposed to reduce stress for all passengers. So he could be mistaken, although he was positive he was correct. Besides, the whole of civilization was against him.

The rest of the passengers came to realize individually that they did not agree with what day it was. Some conformed because they were not as sure of themselves as Samuel. Others let themselves be persuaded. The main reason, however, that they all gave little resistance was that they had all become aware of their discrepancy on their own instead of collectively. During the race to save Seth's life, the yacht's engines became damaged from rough use. So the cruise ended at the port close to the hospital, and the passengers dispersed. The crew of five (captain, first mate, chef, and two waiters) stayed together for a short period longer. Most of the crew during that time, under the guidance of the captain, came to blame the whole date issue on the Bermuda Triangle and Simley.

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Seth was now 12 years old.

"Aww, come on, Seth. You never want to play," whined Jimmy.

"Naww. You guys go ahead. I got some other stuff to do," answered Seth. Jimmy was right. He never did want to play with other kids his age. "It's probably my unique education that alienates me from others," thought Seth as he walked away.

"Fine, Seth. Have it your way. I'm tired of being a one-way friend to you. We're finished, Seth. I won't bother you any more."

Seth didn't even hesitate or respond to Jimmy. It wasn't that Seth was mean or haughty. He just didn't hear Jimmy. He had fallen into deep thought, as he often did. Self-reflection was as common to Seth as dirt was to most boys his age. Seth often wondered why his parents took such an interest in furthering his education at home. In his few conversations with peers, he had found that they learned only in a formal manner during school. Seth attended public school, but he also received lessons from his parents as well as intense physical training. Seth could run five kilometers in 15 minutes and seven seconds as well as lift 170% of his 92-pound body weight. His father had told him that, even when he was in his mother's womb, they would take turns reading and solving mathematical equations to him. Education was important to Seth, but he felt cheated out of a childhood he saw all his counterparts enjoying.

"Seth, what have you been doing?" asked his mother.

"Not much. Just went for a walk," Seth replied. He hadn't even realized he had walked into his own home, so he was startled. It amazed him how he *didn't* run into things and was able to navigate despite being in a daze. He continued up the stairs to the refuge of his room. Once there, Seth stretched out on his bed. "Why am I so tired? I did not overexert myself mentally or physically today ... Ahh, I remember now, I am experiencing depression."

"Son, your mother just told me you entered the house in a stupor again. Tell me what is bothering you."

"Why is he so annoyed with me? He should have knocked before coming in ... Or did I leave the door open?" thought Seth. "Father, I am trying to find the reason why you and Mom decided to educate me so intensely from the moment of my conception. I question your mutual decision, for I have not seen this behavior exhibited by any other parent I know."

"You don't seem pleased by our decision. We only wanted you to have the opportunities that your mother and I didn't have--mainly a comprehensive education at a time in our lives that our brains would have been most receptive to knowledge. This optimal time is childhood, Seth. If you were taught all the things you now know in high school and college for the first time, it would have taken more effort on your part. This was the disadvantage that your mom and I had to overcome. We did not want you to have this handicap."

"But Father, the advantage you have given me has cost me my childhood. I consider myself an outcast among my peers. It is difficult for me to get interested in their irrational or superficial conversations. They seem offended at the larger vocabulary I use in my speech. They are threatened by my perfect grades and by the fact that I do not have to work hard for my equally excellent performance in school sports. I do not like to be around people who are uncomfortable being near me. I am depressed because my only social outlet is my immediate family. I have no friends."

"Mom and I always encouraged you to be social and play with children your age."

"And didn't I try. At first, it was easy to get along with my classmates. They enjoyed listening to what I knew. They were curious like me. Something happened, however, in the

third grade. They began to form social groups. Kids that shared certain characteristics started grouping together. Well no one was like me. So no one liked me. The kids that did give me attention did it out of selfishness; they either wanted access to my brain or use my fit and talented body for sports. You can't have it both ways Father; either you can be social and be near the average level of development at a given age, or you are cut loose from society for deviating too much from the 'norm.' My fate is the latter."

"It doesn't have to be that. . . ." Samuel Thomas stopped talking because he saw a single tear leave the left eye of his only son. He had not seen Seth cry since they boy was two. He felt sick. He slowly walked over to the door, opened it, exited, and softly closed the door behind him.

Seth had never seen his father react this way and was deeply disturbed by his father's actions. He began to cry with full force. Emotions struck him with an intensity he had never known before. Even as he started to lose control of his mind, he realized what was happening to him: all of his repressed feelings were rushing into his consciousness. The second last thing Seth felt before losing consciousness was fear. He soaked his pillow with tears and he screamed so loudly in his own head that his vision became patchy. Then he felt a pop in his head. Bodily convulsions followed. . . .

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Seth awoke lying in a fetal position, cold from excessive sweating. He was clear across his room from his bed. He had several lacerations on his shins, bruises on his arms, and a bump on his forehead. All around his room he saw disarray and disorder. From the look of the mess he made while obviously having gone through convulsions, he was surprised he hadn't suffered more serious injuries. Seth picked himself up from the carpet. Something else was bothering him. The devastation of his room must have made a lot of noise, so why hadn't his parents come to his aid? He made his way downstairs and into the living room. He was distraught. His parents appeared grotesque. Quickly he realized, however, that this was because their faces were frozen in intense anguish, and the rest of their bodies were immobile as well. Seth had also never seen his father's head in his mother's lap with his mother comforting his father; both had always been very strong. For some reason they were frozen.

"Seth touched them. They felt cold. He found that his parents' bodies were not rigid, but very pliable. The whole situation made him very uncomfortable."

Seth touched them. They felt cold. He found that his parents' bodies were not rigid, but very pliable. The whole situation made him very uncomfortable and sent his mind spinning trying to find answers. He left his house.

Immediately after leaving he noticed his neighbor's house smoldering through the night's darkness. A burning pick-up truck sticking out the side of the house must have started the fire. Five other auto wrecks were within view of his porch. Seth saw no emergency vehicles or evidence that any had come. Seth moved back into his house and turned on the TV. He looked at a clock for an entire minute. Then he flipped to a network that he knew should be broadcasting a live show. Static. Seth now made a conclusion, a truly horrifying conclusion. All of humanity, except for himself, was frozen by some unknown force. This meant that any people who were operating machines and/or vehicles at the time of becoming frozen were in serious danger or already dead. Thousands of airplane crashes and hundreds of thousands of car accidents came into focus. Construction site accidents and factory mishaps came to mind. People who were walking up or down stairs, crossing streets, biking, skating, downhill skiing, skydiving, etc. passed with horrifying clarity through Seth's thoughts. The destruction and vast human loss this paralysis had caused and was still causing overwhelmed Seth and brought him to the brink of a paralysis like that of the people around him.

Seth came out of his trance near midnight. "Why am I not affected? What makes me different?" questioned Seth. Seth recalled the convulsions he endured. Then he remembered the pop he had felt in his head. Did he somehow cause this condition of mankind? The story of his birth floated to the forefront of his consciousness. His parents swear to be exactly one day into the future relative to the rest of the world. How did all these facts explain the current conditions?

His parents had taught him about Einstein's theories, especially those concerning the relationship between time and space. He now called upon that knowledge to help him answer his questions. Somehow, while in the Bermuda Triangle, his parents and everyone else on board that pleasure cruise had been pushed or displaced exactly one day into the future. "And I was born being one day into the future relative to the rest of humanity," thought Seth, "This must carry a special significance. It is the only factor

that I can pick out that distinguishes me form the rest of those affected."

Seth knew time itself had not stopped. Photons were still bombarding his eyes, allowing him to see. It was humanity's experience of the flow of time that had been stopped; the flow of time continued. Seth had concluded from having examined his parents that every human being's internal universe (metabolism, consciousness, and any other internal human processes had also halted. As for the mechanism that was responsible for this big step, he had no idea. He only knew that he was the epicenter of the whole event since its inception because it did not influence him. He was pretty sure that it was his sudden release of libido (Seth had studied Freud, too) after his conversation with his father that triggered this unknown human paralyzing mechanism. Somehow, this paralysis of humanity was tied to the energy of his ego or consciousness. It was the only reason he could rind that explained why this effect happened now. It was 12:30 a.m. according to his living room clock. He estimated that he had felt the "pop" in his head around 5:30 p.m. the previous day. "So seven hours have already passed," Seth thought, "If my understanding of this whole situation is correct, humanity shall begin to experience the flow of time once again around 5:30 this evening. Then after the passage of 24 hours, all of humanity will (including those who had been on the yacht when he was born) experience time relative to everyone else. Everyone's present would be the same."

"Now what genius?" Seth said out loud. He understood the phenomenon. But this understanding could do little to remedy the situation. He knew he was humanity's only hope for any kind of salvation. He was the only one not paralyzed. Yet, he was impotent. Most of the world's destruction had already taken place. Seth's frustration was mounting. Soon he could no longer sit around.

Seth knew how to drive his father's sports car and he had a valid pilot's license. His parents had urged him to learn how to drive and fly early on. Seth felt intensely guilty for having yelled at his father for cheating him out of a childhood. He was angry with himself for focusing on what he didn't have. He never fully appreciated what his parents had done for him. Seth suddenly became aware that he had parked in front of the nearest airport. He was prone to losing track of where he was going when walking, but had never before absent-mindedly operated a vehicle. . . .

Seth ignored the dozens of mauled people, some lying in cars and others crushed beneath cars around him. Seth walked around and over the frozen people who were in the terminal. Seth walked out onto the airfield. The carnage was too much. He shut the dozens of charred fuselages and bodies from his perception. His only goal was to find a small, fast, long-range jet. In the third hangar from the terminal, he reached his goal. The jet had a single seat, a single engine, a top speed of 2.3 mach, and a range of 2,000 miles. And it was fully fueled. Without hesitation, Seth jumped in , sealed the cockpit, engaged the engines, entered a flight plan into its onboard avionics, and taxied it onto the runway. Then he took off.

Seth climbed to an altitude of 50,000 feet so that he could not see the death and destruction on the surface. His destination was the capitol since it was wired in to the rest of the world. An hour after takeoff, Seth saw a huge crater where the heart of D.C. should have been. "Nuclear bomb," Seth whispered while ascending.

Seth tried Atlanta next. "Buildings. A good sign," he said cynically upon seeing the city's skyline. He landed on an empty stretch of expressway. Most cars were in the ditches. Their immobilized drivers couldn't have kept them on the road. He jumped out of the plane, and his watch showed it to be 5:30 a.m. Seth walked toward downtown Atlanta to keep moving. "Only 12 hours left. What to do? What to do?" thought Seth. A realization struck him with almost physical force. If he had been born one day into the future, and human experience was now in the process of equalizing itself, why was he still awake? By being awake, he was not being put back into the present. His parents (and the others on the pleasure cruise) had been, like him, one day into the future, but now they were being brought back to humanity's present. But Seth was still experiencing. He was not being brought back to the present. In fact, he had never been part of humanity's present. Seth did not count the seven months of his gestation before the cruise because he reasoned that this time had no relevance. During that time, he had been part of his mother and was, therefore, unable to have an individual experience of the flow of time.

"I am going to cease to exist in a little over ten hours," Seth said aloud. Seth sat down, legs crossed, right where he was, in the lobby of a fancy hotel. For three hours he just sat there unmoving but with racing thoughts. Seth contemplated finding an attractive female and having his way with her, as other self-pleasures crossed his mind, too. He had nothing to lose. But his intelligence dissuaded him because he understood the worthlessness of these activities. He knew he was only thinking these thoughts because of the tremendous frustration that he was feeling. He had witnessed the devastation of civilized humanity, and he could do nothing to alleviate it. He knew his own death was near, and he could do nothing to prevent it.

Seth stood up and looked at his watch. One thing he could do for his species was to write down all he knew about

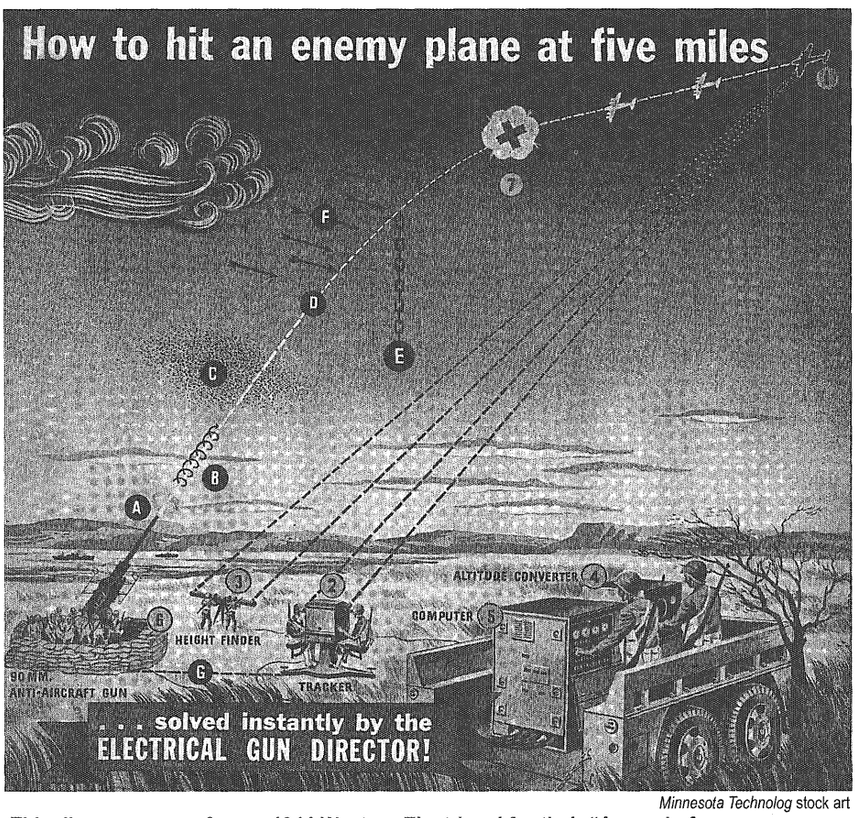
the workings of how humanity had become frozen. Then the rest of humanity would know the truth when they would begin to experience time again. This might prevent the remainder of humanity from placing blame on each other for the sudden mass global destruction and from seeking revenge on one another because of it. He found some stationery on the reception desk, and put it into the printer on the desk. The words flew through his fingers at 90 words per minute as he typed for an hour on the hotel's PC behind the reception counter. Then he printed out his explanation and made ten photocopies. He placed one copy in the hands of the frozen hotel manager in the room behind the reception desk. He left the hotel and walked down the corpse-laden avenues until he found Atlanta's city hall. The door was unlocked, so he walked in and placed the remaining copies in the hands of the frozen officials

There was nothing more for him to do. He was happy that his parents were still intact and hoped they would stay that way until 5:30 p.m. so that they could wake up. Seth considered what his end would entail. "Will I die a normal physical death?" thought Seth, "Or will I just disappear?" Whatever the outcome would be, Seth did not want to be awake for it. To rest was Seth's final objective. Therefore, Seth strolled back to the hotel. Once there, he found an empty suite. He peered outside and saw burned out buildings, crushed cars, and mangled bodies. He lay down on a bed. Just before falling asleep, he wondered if he would wake up. He decided that he wouldn't and that he was lucky. ■

October 1940

Don't draft the young engineer! Local boards and national officials should hearken to that cry. . . .

Our defense should not only be a temporary measure, but a long time program with its greatest strength in the future. Technical students, even recent graduates, are not immediately vital to industry, but these same men are the ones that compose the potential intelligent guiding power of our industrial system. Cut down their number by draft lottery and one of the most important defense pillars of our country will be chipped at the base. To say that an aeronautical engineer, or a chemical, or a civil, will be of more value to his country as a soldier of one year's training that as a specialized engineer with four years' tested schooling behind him is preposterous.



Minnesota Technolog stock art

This diagram comes from a 1944 Western Electric ad for their "Arsenal of Communications Equipment."

April 1961

Space exploration, by chance, has been greatly accelerated due to the military's desire to have a stockpile of long range ballistic missiles. This fact is a result of varied uses of the boosters required for such missiles.

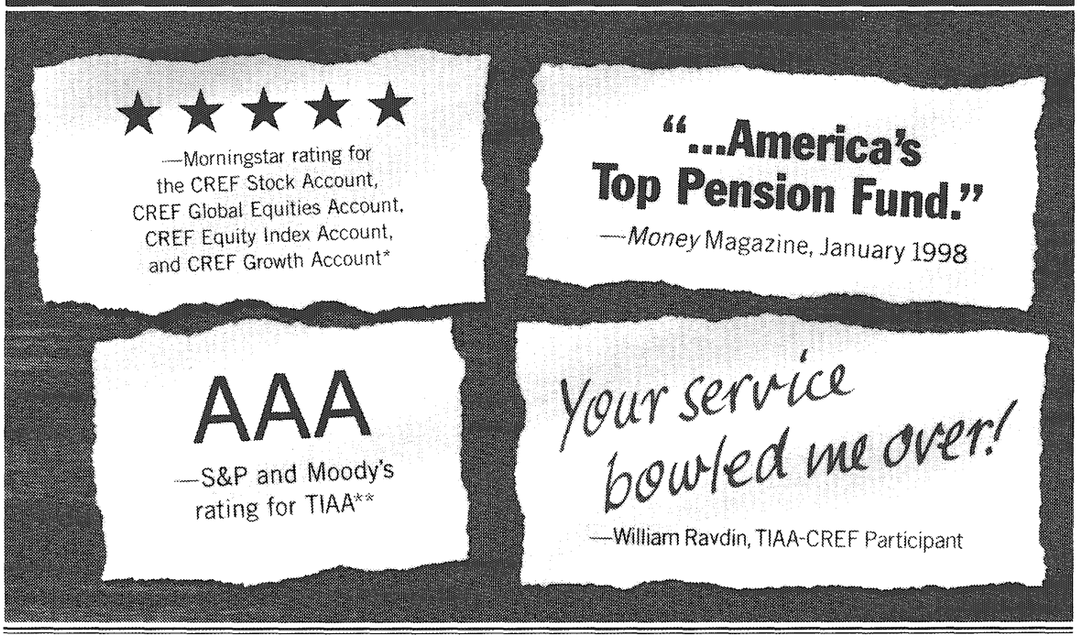
The only change necessary to transform war vehicles to space probes is the replacement of the warhead by an assortment of scientific instruments of about the same weight, and to shoot the rocket straight up instead of sending it along a slanting trajectory towards an enemy target. In 1958 and 1959, the U.S. was forced to perform such modifications in various ballistic missiles. However, the outlook for the future is in sharp contrast to this.

At present, there are at least three boosters in either the initial or advanced development stage and each will be versatile enough to accomplish many goals. The three boosters are Centaur, Saturn and Nova. But, in all honesty, one can say the ballistic missile was the spark that promises to vault the human race to the threshold of space and true three-D existence.

October 1945

Industry is snapping up quantities of Army tools of war and putting them to peacetime application. It might be wise for educational institutions to recognize this obvious Eldorado in classroom applications of weapons of war. It is evident that the obsolete spit-ball will soon be replaced by the more efficient 30 caliber machine gun. In this case, the merits are twofold. Primarily, through combat experience, the veteran will have an edge on the instructor and the nonveterans as far as survival is concerned. Secondly, this natural selection of the fittest will help keep the enrollment of large schools under control.

FOR *the* EDUCATION *and* RESEARCH COMMUNITY



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* Source: Morningstar, Inc., January 31, 1998. Morningstar is an independent service that rates mutual funds and variable annuities. The top 10% of funds in an investment category receive five stars and the next 22.5% receive four stars. Morningstar proprietary ratings reflect historical risk-adjusted performance and are subject to change every month. They are calculated from the account's three-, five-, and ten-year average annual returns in excess of 90-day Treasury bill returns with appropriate fee adjustments, and a risk factor that reflects performance below 90-day T-bill returns. The overall star ratings referred to above are Morningstar's published ratings, which are weighted averages of its three-, five-, and ten-year ratings for periods ending January 31, 1998. The separate (unpublished) ratings for each of the periods are:

Period	CREF Stock Account Star Rating/ Number of Domestic Equity Accounts Rated	CREF Global Equities Account Star Rating/ Number of International Equity Accounts Rated	CREF Equity Index Account Star Rating/ Number of Domestic Equity Accounts Rated	CREF Growth Account Star Rating/ Number of Domestic Equity Accounts Rated	CREF Bond Market Account Star Rating/ Number of Fixed Income Accounts Rated	CREF Social Choice Account Star Rating/ Number of Domestic Equity Accounts Rated
3-Year	4/1,856	4/391	5/1,856	5/1,856	4/675	4/1,856
5-Year	4/1,218	5/207	N/A	N/A	4/443	4/1,218
10-Year	5/612	N/A	N/A	N/A	N/A	N/A

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