Summer-Fall 1985

ITEMS

From the Institute of Technology, University of Minnesota

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Neal Amundson

Gutsy administrator, academic innovator, consummate professional—personal qualities that translate into professional success for the "Chief." Builder of IT's top-rated chemical engineering and materials science department, Amundson returned to the University for yet another honor.

By Bob Geiger

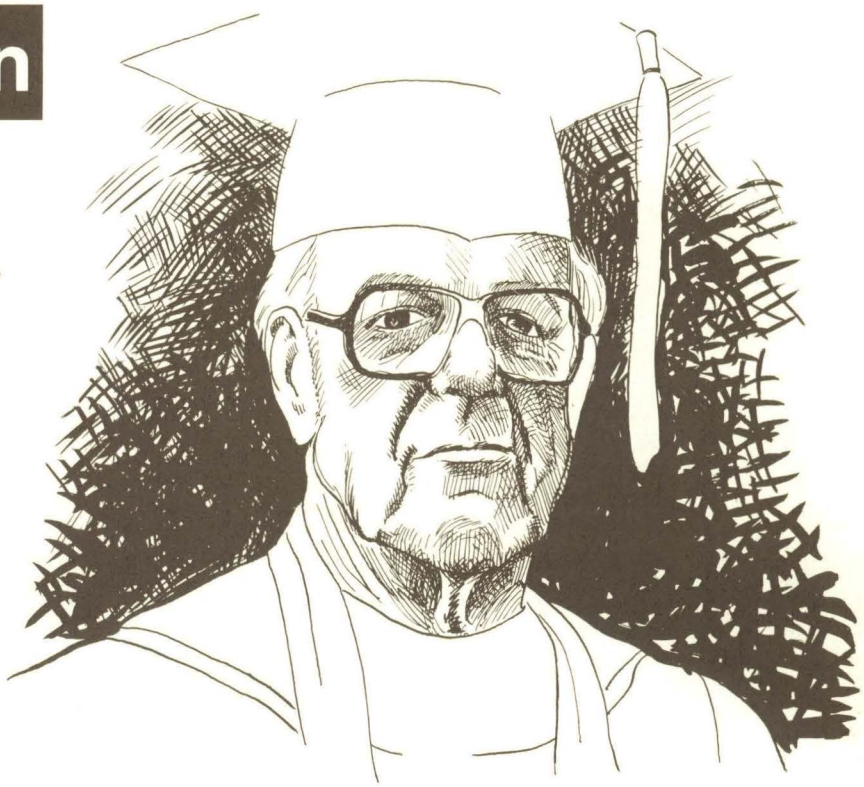

Illustration by Matt Fuller

Any history of IT's chemical engineering and materials science department must include a chapter on the 25-year leadership of Neal Amundson.

Just as he created revolutionary mathematical models to map chemical reactions, Amundson charted a dramatic new direction for the department, guiding it to the top-rated national position that it retains to this day.

In recognition of Amundson's contributions, the University presented him with an honorary doctor of science degree at the May 31 Institute of Technology commencement exercises.

Amundson is known simply as the "Chief," a moniker for chemical engineering heads when the department was a division of chemistry. During the Chief's reign from 1949 to 1974, the division was transformed into the chemical engineering and materials science department. Because of Amundson's strong leadership, though, his nickname lingered.

Eleven years after leaving the University, the no-nonsense Chief now enjoys a new renaissance of academic independence at the University of Houston.

"I have the best professorship in the world," he said. "They pay me a lot, and I do what I want to do." Amundson, 69, comes to the Twin Cities only as a visitor now, but his influence remains etched as an important part of University history.

Amundson's nickname fits well with his seemingly contradictory blend of gentleness and firm leadership. A quick decision maker, allergic to paperwork, impatient for results, he truly values his independence.

The University has named the chemical engineering and materials science building after him. Amundson, chosen as a Regents' Professor of Chemical Engineering nine years before he left the University, was department head when many of the department's current faculty were hired.

When Neal R. Amundson left the University, the era of one-man departmental control had ended.

Frustration with University bureaucracy played a role in Amundson's decision to leave the University in 1976. Amundson's opinion about the best way to run a department is simple: "You must have one person running a department," he candidly said during a recent trip to Minneapolis.

Dressed casually in corduroy slacks and a sweater, Amundson relaxed in a desk chair, using his folded hands as a headrest, and stressed the benefits of strong leadership. The Chief rarely minces words when he talks about time-consuming efforts at "quasi-pseudo-democracies" in University of Minnesota departments.

"If you look at democracy," he said, "it doesn't work in small groups. It works in large groups."

But Amundson's criticism of University red tape does not mean that he overlooks the good. He speaks fondly of colleagues and is reluctant to take all the credit for bolstering the department. Instead, he defers honors for his nationwide reputation as an academic innovator to former IT Dean Athelstan Spilhaus.

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From the Dean

Legislative funding allows the institute to make significant improvements

As a result of alumni, corporate, and legislative support, the Institute of Technology can start making important changes that will help spur high-technology development in Minnesota. The Legislature approved funding for many IT projects, allowing us to proceed with our long-range plan. I know that your support, telephone calls, and letters had a great deal to do with those positive decisions, and I appreciate your effort.

Although the legislative appropriations fell short of the funds requested, they support Minnesota's tradition of high-quality postsecondary education.

For the Institute of Technology, these decisions mean significant improvements: we will gain the new and renovated space that we need so badly. We can begin to remedy our critical shortage of support staff and equipment. We can continue our research centers and help to start a new supercomputer center. And we can better support efforts to attract and retain top-quality faculty and graduate students.

Relocation and Library Consolidation

IT's extreme space constraints and outdated facilities pose a major barrier to our continued excellence. Legislative funding for the new Electrical Engineering and Computer Science Building—the lynchpin of IT's long-range plan—will help ease space problems (see story on page 7). Other legislative appropriations will initiate much-needed renovations in Amundson Hall, scheduled for completion in the 1987-88 biennium.

But during the construction and renovation, IT has had to sacrifice quite a bit of existing space, and since inadequate space is already our primary problem, we face a very difficult period. The old Experimental Engineering Building and two temporary buildings must be razed to make room for the new Electrical Engineering and Computer Science Building, dislocating many people and activities. For more than two years, some IT programs will participate in moves that bear an uncomfortably close resemblance to a game of musical chairs.

Concurrent with these moves, the physics and astronomy, chemistry, engineering, and geology and geophysics libraries have been relocated and consolidated in Walter Library, which has been renovated

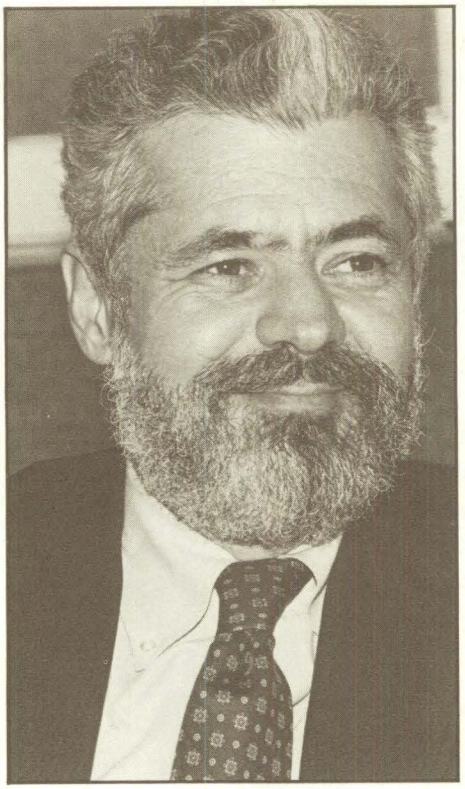

Photo by Kevin Gutknecht

Ettore Infante

to accommodate the addition. The architecture and mathematics collections, which are used almost exclusively by their students and faculties, will remain with those departments. All other materials have been combined into a central science and technology collection that will offer significantly improved facilities and services for students, faculty, and the state's scientific and technological community. I feel that this step will prove to be a most significant improvement over our current inadequate library facilties.

The dean's office also will be relocated to Walter Library, as will the offices of the development officer and the editor. This move will free needed space in Lind Hall, as Walter becomes the new center of IT activities.

Support Staff

The long-range plan also delineates a critical shortage of support staff and equipment in several IT departments, particularly in electrical engineering and computer science. The Legislature has allotted discretionary funds to help keep the University on a par with its peer institutions in these and other important areas. These limited funds permit the University and the institute to take its first important step to correct these shortages.

Research Centers

The Legislature granted continued funding for several of our important research centers, including the Center for Microelectronics and Information Sciences, the Minnesota Geological Survey, the Mineral Resources Research Center, and the Productivity Center. Although less than originally requested and low in relation to the investments made by other states for similar activities, the funds permit us to solidify our activities in these areas and prepare for future expansion.

The Supercomputer Institute

The University of Minnesota soon will be the only American university that has access to three supercomputers: the Cray 1, the Cray 2, and the Cyber 205. Recognizing the significance of this opportunity, last year's Legislature approved an appropriation for construction of a Supercomputer Institute. Financed jointly by the state, the University, and the city of Minneapolis, the institute has already begun to attract researchers in computer-related fields from all over the world. This year's Legislature has provided funds for the operation of the Supercomputer Institute that complement those provided by the National Science Foundation and the private sector, most notably Cray Research, Control Data Corporation, and ETA Systems.

I am pleased to report that Peter Patton, a pioneer in supercomputing activities at the University and former director of the University Computer Center, has left his position as vice president of the Microelectronics and Computer Technology Corporation in Austin, Texas, to return as director of the Supercomputer Institute. In August, the Supercomputer

DEAN to page 28

Postwar correspondence

Library consolidation sparked debate

By Nancy Lewis
News analysis

Just mention library consolidation, and the response of most departmental faculties will be a declaration of war.

After all, no one who needs to consult a periodical or review a text feels that it's reasonable to prepare for a foray across the often snowy wastes of Northrop mall when a quick dash downstairs has always done the job.

Moving the chemistry, engineering, geology, and physics libraries from their respective departments into Walter Library has been a controversial idea ever since it was proposed by Dean Ettore Infante.

The now-final decision sparked controversy between faculty, students, and alumni concerned about convenience and service on one side, and administrators concerned about increasing shelf and study space on the other.

Administrators did not undertake the change lightly, said Cynthia Steinke, director of the new science and technology library. Steinke describes IT's combined science and technology collection as one of the most important information resources of its kind—not only in the Twin Cities, but in the state—and redistributing it required serious consideration. In fact, the library move, which the Board of Regents approved in March, was again discussed at the July board meeting in light of faculty, student, and alumni protests.

Many IT alumni can remember studying in dark, overcrowded departmental libraries. Projections used to formulate IT's long-range plan showed that the IT libraries could accommodate only about 10 percent of their students at a time.

Worse yet, inadequate shelf space limited access to collections. Shortages ranged from 39 percent in the chemistry library to 80 percent in the engineering library. The long-range plan revealed that, without intervention, students and faculty would lose even more books to storage, and study space would continue to dwindle during the next decade.

Both faculty and administrators agreed that the ideal solution would have been a new library building connected via skyways and tunnels to several departments. But with funding for the badly needed Electrical Engineering and Computer Science Building barely approved, most acknowledged that a new library wasn't a possibility now.

Many faculty opposed the consolidation of their departmental libraries. For example, earth sciences head Peter Hudleston argued that, although the geology library was too small (with 62 percent of its collection in storage), it was a pleasant place in which to work and provided excellent service. Hudleston described the ideal library as one that "best satisfies the users." If the goal of consolidation is service, he said, the greatest service to geology would be to leave the library within the department. To gain support for keeping the geology library in the department, earth sciences students mobilized alumni to write protests and organized a hearing to oppose consolidation before the regents in July.

Arguments against consolidation were persuasive. Most faculty members did not want to spend their valuable time on a trip to the library. A departmental library, faculty also argued, provides a natural forum for interaction among students and between students and faculty that decreases students' sense of isolation and enhances the educational experience. Many believed, too, that library service would decrease in quality—that nothing could replace the responsible librarian who has intimate knowledge of departmental materials.

For all these reasons, the IT Library Committee recommended last year that the departments retain their individual libraries.

Supporters of library consolidation pointed out the benefits that would result from the move. By consolidating the collection in Walter, they said, everything could be moved from storage to open-access shelves. Good access to library holdings is vital to IT's nearly 8,000 students and faculty members and to local and state scientific and technological communities, Steinke said.

Centralization would enhance interdisciplinary study necessary for certain scientific fields in which boundaries have begun to blur. In addition, Steinke noted, library users would have a much broader, interdepartmental forum for interaction that would help decrease the feelings of isolation so often expressed by University students. And space for study, peer tutoring, and discussion would become available in the vacated libraries.

Steinke stated that the quality of service would improve. Individual libraries, she pointed out, are generally open from 8 a.m. to 5 p.m.; only faculty and graduate students with keys have access at other times. Currently, Walter Library is open from 7 a.m. to 1 a.m. on weekdays and from 9 a.m. to 1 a.m. on weekends. According to future library plans, Walter may stay open 24 hours a day.

The benefits of shared skills, services, information, and collections should compensate faculty and students for inconvenience caused by the move, Steinke said. With the advent of more efficient computerized library service, newer forms of electronic information-sharing with industry will be possible, including, for example, telefacsimile systems that swiftly beam information back and forth, she said. The upgraded facility at Walter would allow for proper care and preservation of the crucial collections that are the underpinnings of technical and scientific study in Minnesota, Steinke also noted.

By now, most of the collections have been moved to Walter, and it appears that the worst of the conflict is over. Although the decision to consolidate was not the most favored solution, all agreed that something had to be done. As Hudleston states, one must not look at consolidation as a question of service to selected departments, but of service to IT as a whole. The institute's future rests on today's compromises, however difficult they may be to achieve.

Neal and Shirley Amundson with University President Kenneth Keller. Amundson hired Keller as an assistant professor of chemical engineering in 1964.

Photo by Tim Rummelhoff

AMUNDSON from page 1

"Athelstan Spilhaus was responsible for changing the whole operation from one that was so-so to one that could stand on its own two feet," Amundson said. "It was very easy at that time to be a department head because you could do a lot without taking a lot of hell from someone in authority."

Early in his life, though, Amundson obeyed a wise dictate from his father. In the depths of the Great Depression, Oscar Amundson insisted that his son Neal attend the University of Minnesota. This, the elder Amundson was convinced, would mean that Neal wouldn't have to work as hard as he did to make a living.

The Chief's interest in chemistry started early—in Mr. Bush's chemistry classroom at St. Paul Central High School. There, Amundson was fascinated with mixing chemicals that produced a "heady" bright orange solution called lead dichromate, a crystalline substance sometimes used in paint.

Amundson began attending the University of Minnesota in 1933, working part-time as a janitor during his freshman and sophomore years to earn spending money.

He received his bachelor's degree in chemical engineering in 1937, followed by a master's degree in the same field in 1941. Later that year, he began his teaching career at the University of Minnesota as a mathematics instructor.

He had wanted to become a chemist. But the thought of a career spent standing in a laboratory didn't appeal to him. Instead Amundson branched out into mathematics and received his doctorate in applied mathematics from the University in 1944.

Amundson was named acting department head when he was a "scrappy," 33-year-old associate professor. Peers credit Amundson for having the ability to hire well. He successfully tapped private industry in the mid-1950s and early 1960s, bringing to the University highly talented scientists.

Those faculty remember the Chief as a gutsy administrator, an academic innovator, and a consummate professional who demanded excellence from his teaching staff and students. He boldly infused physical chemistry with mathematics—making complicated chemical reaction systems understandable in rough mathematical models.

He was one of the few administrators who foresaw dramatic changes in chemical engineering and recognized the importance of uniting engineering and science. "He had a vision of the way the profession was going, an eye for the next important program," said Rutherford Aris, a Regents' Professor of Chemical Engineering.

Chemical engineering professor L.E. Scriven described the changes Amundson

made in the University's chemical engineering program as a combination of foresight, dreaming, and "fabulous good fortune."

"His style was simply a belief that quality was everything," said H. Ted Davis, current department head.

Recite these accolades to Amundson, though, and they sink in as deeply as rain onto duck feathers.

"It's kind of an accident of nature," Amundson said. "One of the reasons I enjoyed this success was that I was in the right place at the right time."

Cambridge University in England was one of the right places, according to his faculty, and there the Chief studied as a Fulbright Scholar and a Guggenheim Fellow from 1954 to 1955.

When Amundson returned from his sabbatical, he began hiring new faculty, some from industry and some from disciplines other than chemical engineering.

"That was not happening in the rest of the United States, so we made a hell of an impact," Amundson noted. He hired "by the seat of his pants" without the input of large faculty search committees, he said.

There were search committees, but the way Amundson operated vastly simplified the process. Early in Amundson's term as department head, search committees consisted of one person, and the search process took one day. After 1959, the whole faculty functioned as a search committee.

Amundson's speed, combined with his ability to keep in touch with his faculty for advice and consent, enabled fast changes in the chemical engineering department when the field was in a state of flux.

Chemical engineering professor William Ranz is living proof of the lightning-quickness of an Amundson hiring decision. The Chief heard Ranz speak while Ranz was a graduate student at the University of Wisconsin-Madison and approached him with an open-ended job offer after his speech. Before that night, the two had never met. Eight years later, with no further communication, the job offer was repeated, and Ranz accepted.

To broaden chemical engineering's horizons into biomedical fields, Amundson led his faculty in hiring now-University President Kenneth Keller in 1964.

In addition to initiating many professional and academic changes during his tenure as department head, Amundson also is remembered as a dominant but non-threatening Chief who communicated closely with his faculty and made few enemies in the department.

"He's very much of a father figure in the best sense of the word," Aris said. "His leadership is not the possessive type, but rather he has the ability to bring the best out of people."

He's very much of a father figure in the best sense of the word. His leadership is not the possessive type, but rather he has the ability to bring the best out of people.

And he communicates clearly, Aris said: "He doesn't beat around the bush. If he doesn't like your work, he comes right out and says so."

Aris said that one of Amundson's most important achievements during his University years was strengthening team teaching—breaking 60-student classes into four recitation sections taught by different faculty members.

Amundson, who commonly attended lectures, said that this technique bolsters teaching quality because, "you don't give a bad lecture in front of your peers."

The program also gave younger professors a chance to rise through the ranks quickly—re-enforcing Amundson's reputation as a department head you worked with, not for.

Amundson differed from today's administrators because he worked more for the overall quality of the department and wasn't interested in taking the credit himself, said Ranz. Today's administrators more typify the "me generation" than the hard-working attitude of togetherness that followed World War II, he said.

In 1971, Scriven said, Amundson told all his colleagues that "styles were changing." He resigned as department head in 1974 but continued to teach in the department until 1976, when he accepted the University of Houston position.

In his new position at Houston, though, the Chief still faces college bureaucracy. Amundson now belongs to advisory committees mapping the future of the University of Houston's chemical engineering and mathematics departments.

But he does have a large degree of freedom at Houston to do and teach what he wants—as was his administrative style during the 1950s and 1960s. With a joint appointment in the University of Houston's chemical engineering and mathematics departments, Amundson teaches a graduate-level course in advanced mathematics for chemical engineers on Mondays and Wednesdays.

That leaves him plenty of time to work with Houston faculty and to tend to personal pursuits. Amundson and his wife, Shirley, raise orchids in two greenhouses next to their home in south Houston. Amundson started raising orchids after taking a horticulture class on the St. Paul campus. To preserve his rare orchids, Amundson took some 1,300 with him to Texas and now has some 3,000 plants.

Although he misses the more intellectual Minneapolis-St. Paul area, Amundson enjoys living in Houston because he can help shape the future for a university.

He is also comforted by the growing number of University of Minnesota chemical engineering and materials science alumni on the rolls of prominent national chemical engineering faculty.

"If you scratch out all the names of the graduates of the University of Minnesota," he said, "you wouldn't have many people left."

ITEMS

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The 1985 Legislature

Some very important IT projects received funding, while other improvements may have to wait.

By Bob Geiger

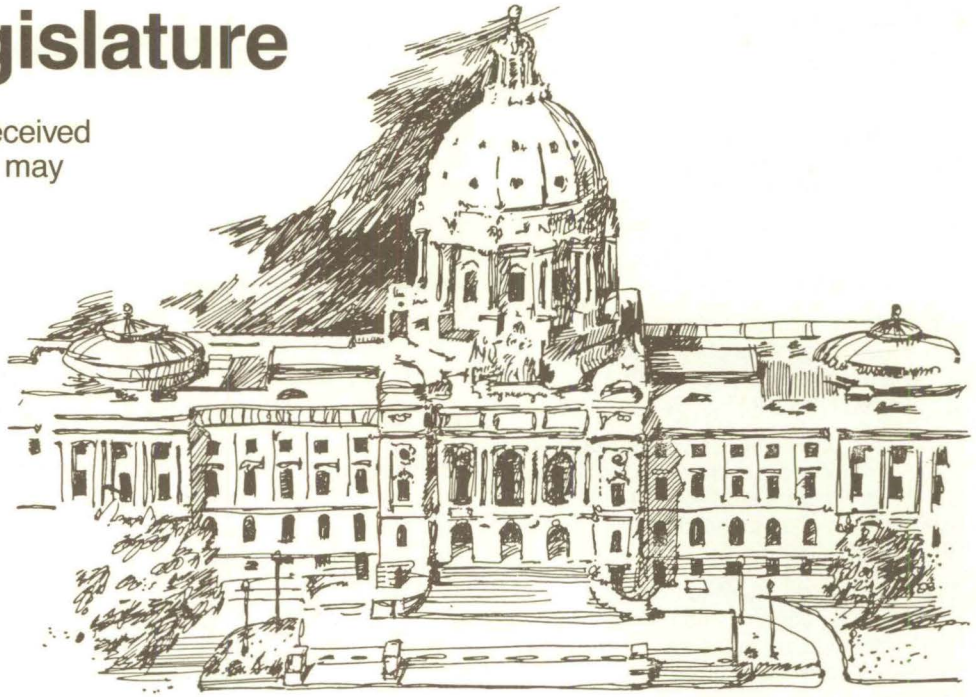

Illustration by Mike Patrick

Thanks to the 1985 Legislature, IT can move ahead with improvement and building plans, including the construction of a new Electrical Engineering and Computer Science Building.

But while IT's share of the pie will boost some programs, the institute needs more state funding to remain competitive, said IT Dean Ettore Infante.

Completed in June, this year's legislative session produced both triumphs and disappointments for IT.

"It's a first step," Infante said about the 1985 Legislature and the benefits to IT. "It's a modest level of funding that will enable us to do it right."

However, doing it right applies to fewer projects than Infante would have liked to see the Legislature approve.

The most notable IT victories in the 1985-87 state budget were $42.8 million to build a new Electrical Engineering and Computer Science Building and $6.8 million to help establish the University's Supercomputer Institute (see related stories).

When contrasted with other states' efforts for their universities, though, some of the victory glimmer fades.

"I don't think this is anything to boast about if you look at our competition," Infante said, citing inadequate per-student expenditures, a need for more equipment, more building funds, and better faculty pay.

The University's per-student expenditures vary widely from one college to another, and IT receives less funding per student than other University colleges.

Over the long run, Infante said he would like to see that per-student inequity worked out so IT can pour more money into classroom equipment.

The University did get a fair shake from the 1985 Legislature, receiving $704.8 million in direct state appropriations, and the spirit of giving should continue, he said.

The following lists major projects and cash infusions to IT during the next two years:

- $42.8 million for construction of an Electrical Engineering and Computer Science Building before 1988
- $6.8 million to help defray costs for a University Supercomputer Institute by fall 1986
- $3 million for the second phase of remodeling Amundson Hall and the Civil and Mineral Engineering Building
- $400,000 for the Minnesota Geological Survey
- $450,000 for the Mineral Resources Research Center

It's a first step. It's a modest level of funding that will enable us to do it right.

IT also benefited from project funding OK'd by the Legislative Commission on Minnesota Resources. That group approved a total of $1.9 million for the following projects:

St. Anthony Falls Hydraulic Laboratory

- $190,000 for lake water quality studies

Minnesota Geological Survey

- $225,000 for study of groundwater pollution in Lanesboro Watershed, southeast Minnesota
- $100,000 for a study to determine age of groundwater from various wells
- $800,000 for aero-magnetic mapping of Minnesota to further reveal geological formations under the glacial drift

Department of Civil and Mineral Engineering

- $200,000 for computer modeling of groundwater floor levels

Mineral Resources Research Center

- $390,000 for purchase of equipment to test for iron ore in Minnesota's Arrowhead region

The institute also received more funding for faculty research, for department and faculty incentives to apply for grants, and for pay boosts.

Funding approved for new 160,000-square-foot building

By Bob Geiger

Some 30 years after the invention of the transistor, the Institute of Technology's electrical engineering and computer science students finally will be able to study in a building worthy of the invention's significance.

In June, the 1985 Legislature allocated $42.8 million to build and equip a 160,000-square-foot Electrical Engineering and Computer Science Building—as University lobbyists and administrators heaved a sigh of relief.

"I kept on holding my breath," said IT Dean Ettore Infante, "but everyone was satisfied that this had to be done."

Indeed. Some students in the Department of Electrical Engineering, currently scattered between six University buildings, study in hallways. Ditto for those students in the Department of Computer Science, which is based in Lind Hall, but calls five different structures home.

Even with all those buildings, the two departments claim a total floor space of only 78,732 square feet—just 44 percent of the new building's expanse.

Groundbreaking for the new, six-floor building was Oct. 1, with a scheduled completion date of March 1988. The U-shaped IT flagship will provide more space for classrooms, offices, research, and studying.

Located behind Lind Hall, the building will be 40 percent underground, with daylight beamed to subterranean levels through skylights.

The construction mandates razing of the Experimental Engineering Building and the seemingly permanent wooden barracks known as Temporary North Court Engineering and Temporary South Court Engineering.

Built after World War II, the creaky pair of temporary buildings most recently housed student offices. The brick Experimental Engineering Building was constructed in 1911.

The University has actively sought a new Electrical Engineering and Computer Science Building since 1981, the start of a period of economic ups and downs for the state.

Gov. Rudy Perpich has supported engineering programs at Minnesota universities, saying that they create new jobs in the state and contribute to economic recovery.

Perhaps in response to the governor's support and an improving state economy, legislators appropriated $2.6 million in 1984 for planning the Electrical Engineering and Computer Science Building—seemingly clinching a vote for building funds during the 1985 session.

But optimism dimmed when some lawmakers didn't want to consider a bonding bill this year—which might have signaled an end to building plans.

"My feeling was that if we didn't get it this time, that it would never happen," Infante said.

Needs for the new building parallel the needs cited when the current Electrical Engineering Building was built. The woes with cramped facilities were cited in the April 17, 1924, issue of *Minnesota Alumni Weekly.*

"The completion of the new electrical building will relieve a dangerous congestion in laboratories, which are now crowded to several times their expected

BUILDING to page 8

Supercomputer Institute receives legislative backing

By Bob Geiger

Despite some legislative concern about the ambitious nature of the project, the University took a $6.8 million "byte" out of Minnesota's 1985-87 budget to help establish a Supercomputer Institute.

Results of funding aid OK'd by the 1985 Legislature will be impressive: a $12 million, 129,000-square-foot Supercomputer Institute stocked with four supercomputers—including the world's most powerful and fastest computer, the Cray II. The institute will be located at the junction of Interstate 35W and Washington Avenue near the University's West Bank.

The institute plans to purchase two new Cray IIs for the new building, scheduled to open in September 1986. The Cray II computers dwarf the memory and power of the University's two existing supercomputers.

The Cray II, the world's largest supercomputer with a 256 million-word memory, and a model with a smaller 16 million-word memory will arrive this fall at a cost of $18 million. They'll join the University's Cyber 205 and Cray I supercomputers, which have 8 million and 1 million-word memories, respectively.

"It's not supercomputing for the sake of supercomputing—it's a whole new area of computational research," said John Sell, development officer for the University Computer Center.

The University also hopes to attract Fortune 500 companies, which could use Supercomputer Institute computers for modeling, simulation, and other corporate projects. The price for supercomputer time? About $8,000 per hour.

Virtually all of the 300 people housed in the three-story building will be faculty and researchers, who will use supercomputers to conduct research.

The building will feature a crystalline atrium near the entrance to accentuate the high-tech nature of its use, Sell said. Roughly the size of a card table, each computer will sit in the middle of the institute's computer room. The public can view the four supercomputers from a second floor balcony during planned tours.

Computer watching may not yet be a hot pastime, but the machinery required to prevent the computers from overheating is by itself a high-tech tourist attraction.

To keep their cool, the machines are protected by a sleeve of water. Every minute, a pump pushes 170 gallons of 50-degree water around the computers to maintain a proper operating temperature.

The additional $6.8 million from the Legislature will help the Supercomputer

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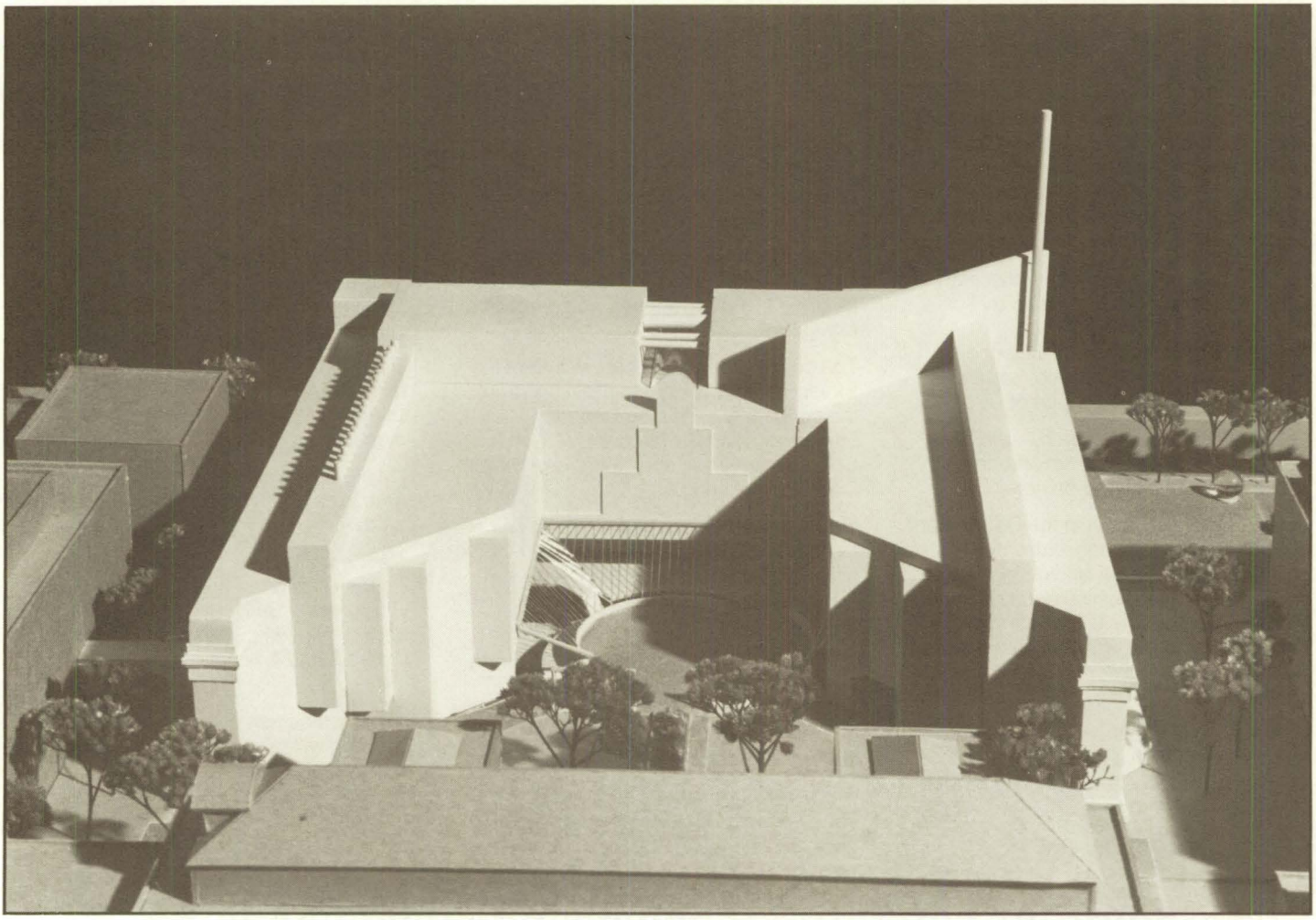

A closer look at the $42.8 million, 160,000-square-foot Electrical Engineering and Computer Science Building, scheduled for completion in 1988.

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capacity," wrote George Shepardson, electrical engineering professor.

Technological advances consistently have outpaced the University's ability to provide enough space for classrooms, faculty offices, and research. Consider that all buildings used by the electrical engineering and computer science departments are more than 60 years old. That's 50 years before integrated circuits, 40 years before the laser, 20 years before the first computer, and at least 45 years before the University's Department of Computer Science even existed.

Finding space for electrical engineering wasn't a problem 99 years ago, when the first course in electrical engineering was taught at the University.

At that time, the electrical engineering and physics departments filled five rooms on the first floor of the new Mechanical Arts Building, which cost $30,000. Of course, that was BC (before computers) and BI (before inflation).

The Experimental Engineering Building in 1926 following completion of the south addition.

COMPUTER from page 7

Institute attract more customers for computer time. Time is important because the institute needs $15 million a year just to meet operating expenses.

Enter Research Equipment Inc. (REI). A University-owned commercial entity, REI leases the supercomputers from ETA Systems, a Control Data Corporation spinoff, to the University and markets the computer time to the University and private businesses.

To fulfill its part of the $15 million in yearly operating costs, REI must sell $5 million of computer time. The state and federal governments will pay the remaining $10 million. Minnesota provides direct funding, while the feds infuse cash through National Science Foundation grants and computer-time buying.

Building the Supercomputer Institute is a team effort involving the state, University, and city of Minneapolis. Legislators in 1984 set aside $5 million for the structure; Minneapolis pledged $4.5 million; and the University will assume the remaining cost with proceeds from the sale of its Computer Center in Lauderdale.

For participating in the project, Minneapolis will use 25,000 square feet of space in the institute.

Sell, who is also an REI vice president, is understandably optimistic about REI's chances of commercial success since the University isn't playing catch-up in the supercomputer race. The University bought the nation's first supercomputer in 1981; since then, several other colleges and universities have purchased similar machines.

Considering the quickly changing world of computers, Sell said he expected some opposition from legislators. That sentiment was outweighed by supercomputer proponents.

"It's surprising that there's been as much support for (the Supercomputer Institute) as there is, when you think for a minute that a supercomputer is not exactly a household item," Sell said.

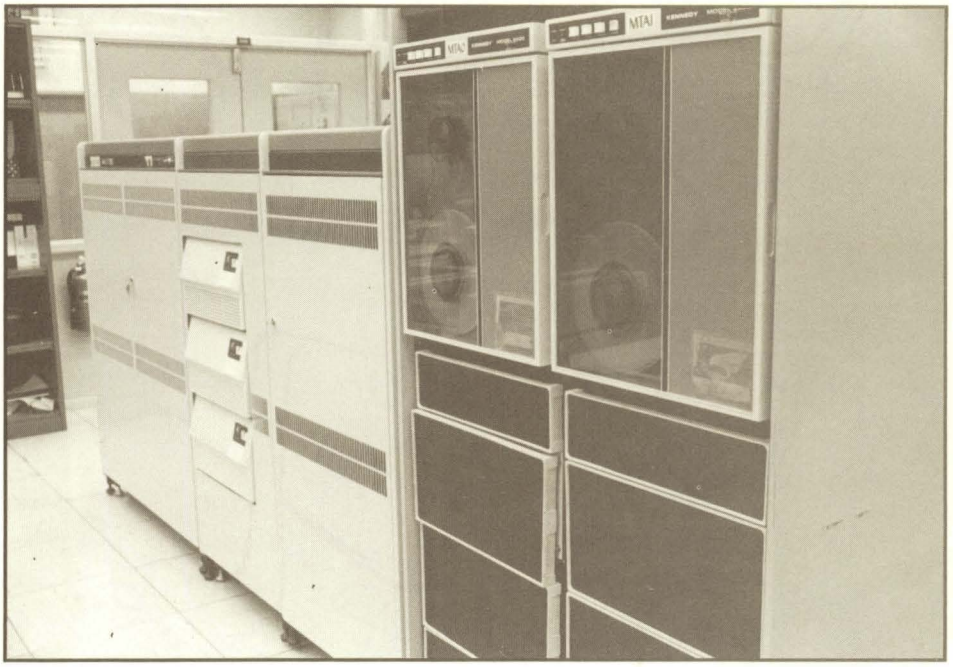

Photo by Tom Foley

When the University acquired its Cray I supercomputer (pictured here), it jumped ahead of the pack. With the addition of two new Cray II supercomputers and a Supercomputer Institute, the University will remain a supercomputer leader.

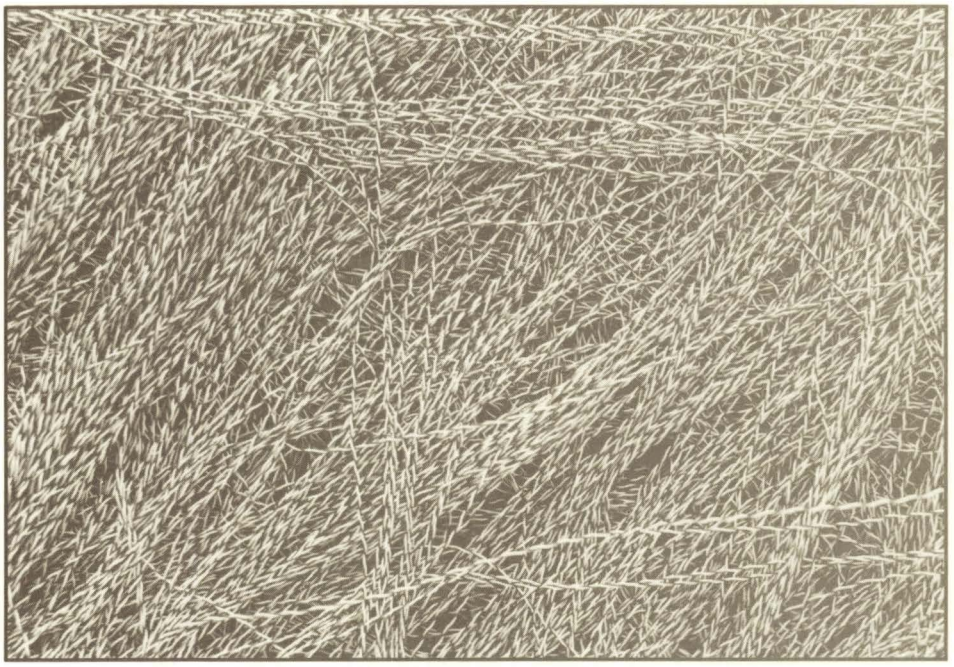

Photo by Tom Foley

Open up a supercomputer, and you find a tangled maze of wires that allow computations of incredible speed.

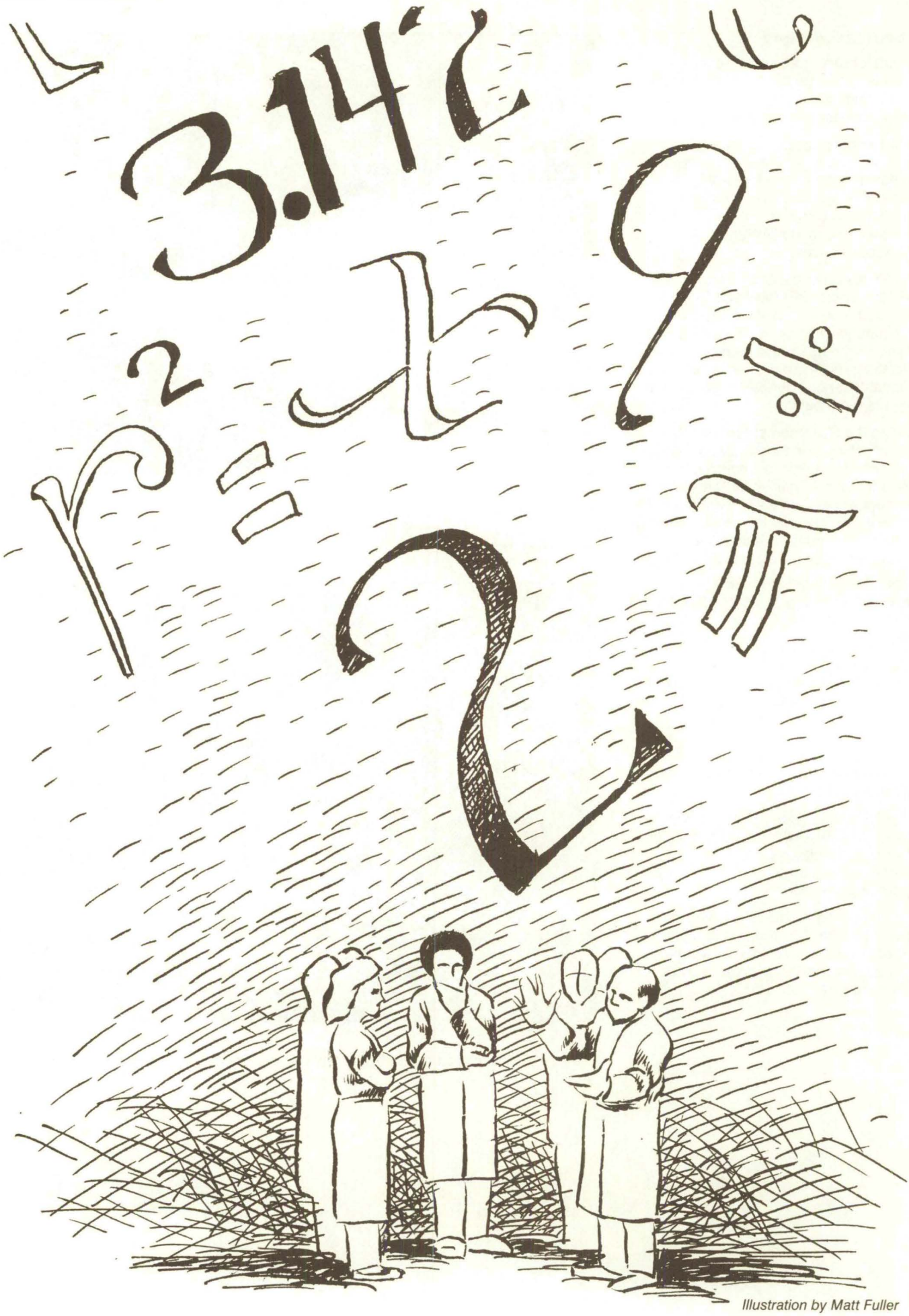

Illustration by Matt Fuller

The Institute for Mathematics and its Applications

A place where tradition leaves and innovation enters, a place where applied and pure mathematicians meet, talk, and break new ground—sometimes before breakfast.

By Nancy Lewis

What is invisible yet can be seen, intangible yet can be used to create physical reality, and uniform yet can be varied? No, the answer is not an esoteric MIT undergraduate code or the law of gravity. The solution to the riddle can be found in one powerful word: mathematics, the fundamental language of science and engineering.

The people at the National Science Foundation (NSF) know the important role mathematics plays in powering vital science and engineering advances. In 1981, alarmed about a declining emphasis on math studies, the NSF decided to fund a five-year pilot program.

One of the few in the nation to blend pure and applied mathematical approaches, that pilot program—now known as the Institute for Mathematics and its Applications (IMA)—represents an important and prestigious addition to the Institute of Technology at the University of Minnesota.

George Sell, the institute's associate director, remembers wryly that the NSF committee was "confused" by the unexpected excellence of Minnesota's proposal for the institute. But when the committee arrived for an on-site inspection, IT's strong industry connections and effective advisory council made such a positive impression that Minnesota won the institute.

In November, NSF will decide whether to renew institute funding through 1992. NSF representatives visited IT in April to examine how well the institute has succeeded in its unprecedented mission: to build bridges between pure and applied mathematicians, between mathematicians and other scientists and engineers from both academia and from industry, and between experienced senior researchers and promising graduate and postdoctoral "beginners."

Most mathematicians see themselves as either pure or applied mathematicians, and the two groups don't easily communicate. Pure mathematicians tend to ignore the interrelationship between mathematics and its applications. Without encouragement, many forget to remind their funding sources of the important applicability of their work—a vital necessity to maintaining funding.

IMA wants to interest both kinds of mathematical wizards in the very complex, multifaceted mathematical problems researchers encounter and to improve communication between the two groups.

Who are these mathematical wizards? The program's roster reads like a small United Nations and also includes representatives of most major American universities and technological institutes. Last year's program drew visitors from such countries as England, France, Germany, Spain, and Japan, among others. Carnegie Mellon, Stanford, Brown, Cornell, Texas, MIT, Rensselaer, Princeton, and Maryland sent representatives, along with other major Midwestern universities. Industry and government personnel also attended IMA sessions.

If success can be measured by the distinction of the program's participants and the length of their involvement, IMA is off to a good start. Each year a group of distinguished scientists spends three to ten months in residence at the program. During the first year, IMA hosted a total of 139 visitors, of whom 16 stayed for 20 weeks or longer. Of this year's 238 participants, 16 stayed for up to 19 weeks, and 28 stayed longer. This year's program features an exciting addition: K. Ito, a most distinguished scholar and senior researcher in the field, will be in residence for the entire year.

IMA's programs also are designed to enhance the contributions of younger researchers. Promising postdoctoral researchers who received their Ph.D.s within the last six years are valued for their fresh point of view. The older researchers are urged to spend time talking and working with these young people. Beginning this year, IMA is encouraging graduate students to attend the program and provided a "pre-workshop" session that explained and introduced the program's principal topics.

Like a sociological experiment in motivation and information sharing, the institute's non-traditional structure enhances communication among participants. IMA staff describe the institute as "flexible." Programs encourage digression from the topic and foster interaction between researchers in different fields and with different levels of experience. IMA workshops serve as catalysts—to engender spontaneous discussions between participants. IMA staff would rather see people talking to each other than people listening to lectures; as a result, they organize no more than three lectures per day.

One can immediately sense an air of positive energy on the fifth floor of Vincent Hall, where the institute overlooks the mall. People are either deep in discussion or deep in thought. Well-used "conversational" blackboards in the offices and lounge help participants illustrate what they are thinking.

On a typical morning, participants begin to trickle into IMA's quarters remarkably early, considering many talked late into the previous night. As they resume yesterday's discussions, offices start to overflow with people who eventually migrate down the hall to the more spacious lounge. Designed to be a popular discussion center, the lounge offers perpetual coffee and tea pots and groups of couches and chairs. Frequently, the staff provides treats like sweet rolls or croissants to encourage participants to gather and talk.

What do they talk about? Thoughts, problems, ideas, anything inspired by the program's stimulating topics. Each year, the institute conducts a year-long study program centering on a carefully chosen topic that either has applications in a number of mathematical fields or applies to a broad area of mathematics with applications in many scientific fields. IMA program topics have included statistical and continuum approaches to phase transition, mathematical models for the

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Clumsy robots can help us learn much about human coordination

By Deane Morrison

Getting out of bed in the morning can be tough, but for a robot it's impossible. To researchers like Max Donath, the gulf between humans and machines only shows how much scientists still have to learn about human mobility.

Donath, an associate professor of mechanical engineering, studies human walking and hand movements, breaking these complicated tasks down into basic elements of movement and coordination. He uses a variety of computer-controlled robots to test his ideas on how we manage these feats, which are, indeed, devilishly difficult to "teach" a robot.

Donath wants to discover the ways in which people relate to their environment.

"We use our hands, ears, eyes, and tactile sense and coordinate all these to perform useful functions," he said. "We study these things as a means to improve the way we rehabilitate individuals and to develop better ways of diagnosing and treating walking disorders."

The complexity of human locomotion relates to the amazing versatility our species enjoys. Cars may be faster on land and boats on sea, but only humans can swim a mile, run a mile, and climb a tree all in one day. Yet our wonderfully agile joints must rely on such relatively crude mechanical devices as knee braces, hip replacements, and artificial legs when the body fails. Ideal replacements will not be designed until more is known about how joints work, including which features are dispensable.

In the walking laboratory of the mechanical engineering basement, Donath and his computer watch a parade of normally mobile volunteers. The volunteers stroll back and forth along a walkway with all sorts of wires and sensors attached to their knees, thighs, calves, and feet. A computer monitors changes in the sensors' positions during walking and then prints out a diagram showing the circular motions of knees, the bending of legs, and other patterns of movement.

A square section of the floor in the walkway's middle is sensitive to forces acting on it. Changes in vertical pressure or in the shear forces that might result from scuffing the feet can be tracked as a person walks across the square. For example, these measurements tell the amount of weight bearing down at any time during a stride. In addition, Donath puts sensors on the soles of the volunteers' feet to see what part of the foot is making contact at each moment.

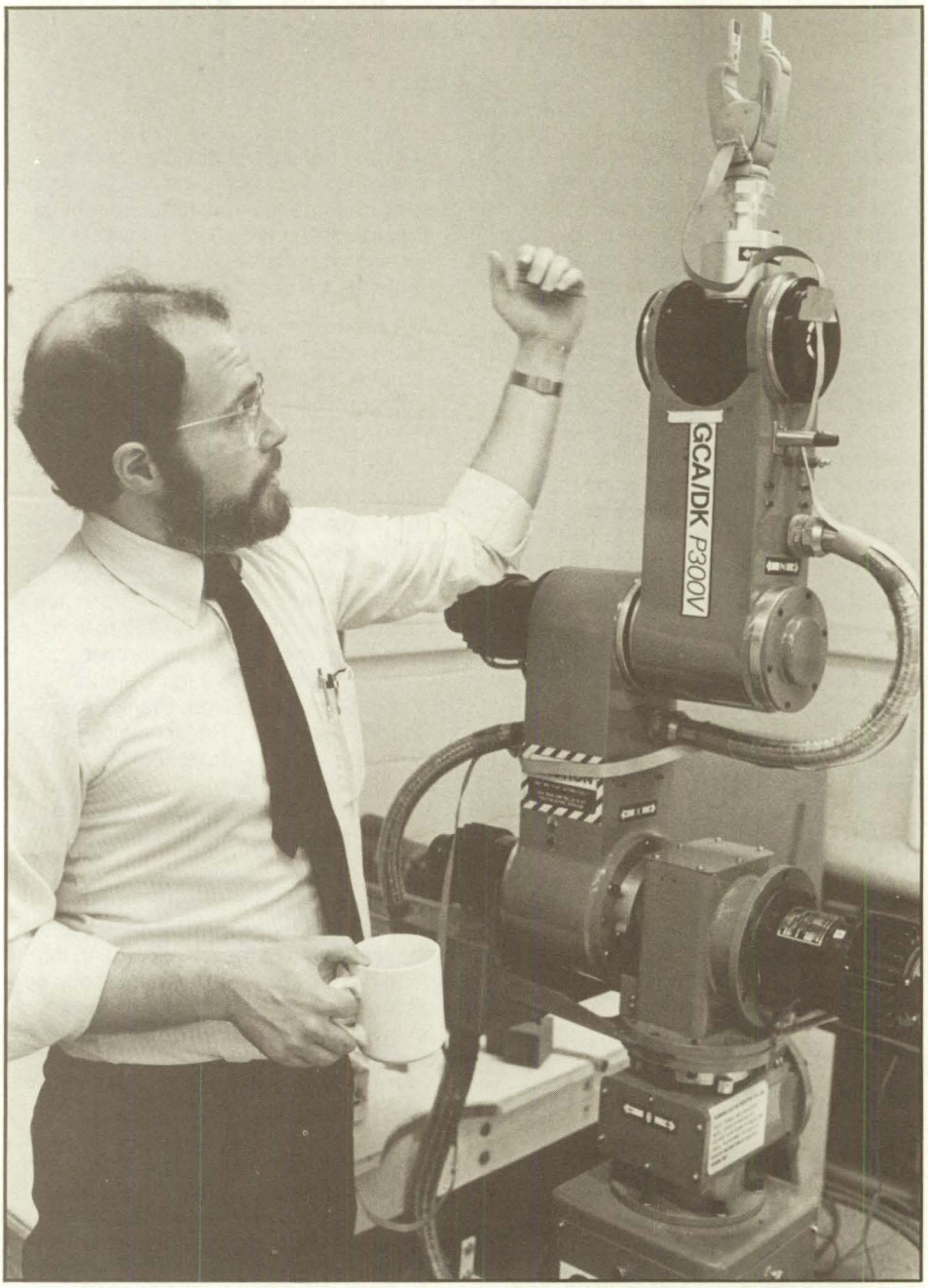

Photo by Tom Foley

Poor robot. Its fingers can't move as well as those of Max Donath, assistant professor of mechanical engineering. Studying the way machines move may help researchers like Donath understand more about human motion.

Pulling the data together in a meaningful way is a real challenge. Our legs move with many degrees of freedom, the result of individual joints and segments that each perform several motions. Mathematical models of all these separate and combined motions get so complex, Donath said, that it is easy to lose the physical sense of movement. He wants to find out if some of the math is unnecessary for a good description of walking.

"We're working on building machines to study walking, trying to incorporate enough degrees of freedom to study the concepts of control and stability," Donath

said. "An orthopedic surgeon was in here the other day and said the latest theory (of walking) had about 80 equations.

"But perhaps we can start off with simpler models in trying to duplicate two hips, a pelvis, and legs. Can we walk, say, on two stilts with six degrees of freedom? How many degrees of freedom do we really need to walk normally? We have to study that and try to give the model some of the human's ability to compensate for changing conditions like those we experience inside a moving vehicle."

Donath works closely with University physicians from physical medicine and rehabilitation, orthopedic surgery, and rheumatology, who also are trying to help people with walking disabilities. The scientists want to pinpoint specific walking patterns in people with different problems, such as those who suffer difficulties with joint implants. Supported by the National Institute of Handicapped Research, this work may allow researchers to compare joint implants and determine the best implant. But the best one may not necessarily be the one that allows a person to walk most normally. Some people with certain disabilities may tire rapidly if forced to adopt a normal gait, Donath said.

"The knee brace may have been designed by orthopedic surgeons using trial and error," Donath said. "There is no understanding of what muscle or bone the brace presses against. Our research is to identify specifically what is going on quantitatively. The questions we ask are these: Can we make measurements of human performance? Can we understand them? And can we do something with this knowledge?"

In the future, machines may do some of our walking for us, but they will need good sensors in order to avoid obstacles in their path. Sensors must put the environment in context, that is, pick out the important cues and ignore the irrelevant in the same way humans do. For instance, our ability to interpret lines and shapes allows us to distinguish a tree from a stretch of road. But a robot would need much collision insurance because to robots, both trees and roads appear as straight lines with solid color in between. Robot vision is a developing field, but machines still are unable to classify what they "see," Donath said.

"We must write a program to measure each object," he explained. "It's tricky because so far robot vision can tell where edges are, but it often gets the number wrong because it perceives edges where we see none." Thus a log cabin may be interpreted by a robot as a stack of plates. Then there is the very important cue of scale, which is necessary for even humans to make correct judgments.

"I teach a course on vision," Donath said. "I show slides of microscopic pollen fibers to the students, and they see strawberries, cantaloupes, and the like. When you see something for the first time, you interpret it in terms of what you know. Context is important, and robots don't have contexts as yet. But the algorithms are getting better and so are our sensors."

It would be helpful if robots could measure and interpret not only stationary objects, but moving ones, as might be seen from the driver's seat of a car. A robot-guided navigational system could help the hapless motorist who, lacking strong perceptual abilities, couldn't read a map or even tell north from south. But as things stand now, robots are a long way from such feats.

Robots also will have a hard time matching the mechanical efficiency of muscles. "The classical industrial robots are arms that move objects around," Donath said. "Massive robot arms may weigh 150 pounds and move only five. But our arms weigh much less, and some people can lift hundreds of pounds. Or figure out the power in one knee squat. If we built a motor to do the same thing it would be very big. We haven't been able to come close to duplicating the power-to-volume ratio of the human muscle."

Donath has constructed a two-fingered robot that resides in the basement of the mechanical engineering building. It weighs 150-200 pounds and boasts such moving parts as a "shoulder," "elbow," and "wrist," yet it can lift only about 10 pounds. A human arm that big could heft a horse.

Currently in the building stage, a three-fingered robot hand will allow Donath to study how humans grasp and manipulate objects. The three robot fingers will each have three degrees of freedom. The fingers come with 27 sensors to keep track of their positions relative to one another and to other objects. A good working version of this hand might free industrial robots for more sophisticated jobs.

"Robots in industry today do extremely trivial tasks—boring tasks," Donath said. "That's one reason we have robots. It's not because they're cheaper, but because they can maintain these routines better than a person." It remains to be seen just what more advanced tasks robots might be able to handle above and beyond moving objects from point A to point B. Whatever those tasks are, though, they are likely to be confined to the industrial arena, Donath said.

"We'll do some interesting things over the next couple of years, but nothing of much use to the average person," Donath said. "Personal robots can't do much useful and are very expensive." That means that it will be a long time before robots learn to serve breakfast in bed or clean a house.

Photo by Tom Foley

These feet were made for walking. Volunteers with wires attached to their knees, thighs, calves, and feet stroll on a pressure-sensitive walkway. Researchers record their motions to discover more about human locomotion.

Hot time in Montana

Digging for dinosaurs

By Darlene Gorrill

Accompanying geology professor Robert Sloan to Montana can be a real travel nightmare—no Howard Johnson's or hot tubs here. The nearest gas station is 70 miles away. During the day, even brief exposure to the sun means a burn of uncomfortable proportions; at night, the cold comes, bringing with it 50- to 70-mile-per-hour winds.

Sloan, of course, really isn't on a vacation, even though he's visited the same place almost every summer since 1959. He and his ever-changing caravan of anxious explorers, mostly graduate students, have a scientific purpose—to search out and find dinosaurs, or, more accurately, the remains of dinosaurs.

The missions have been successful—the remains are almost as common as the dinosaurs themselves once were. Using this wealth of fossils, Sloan pursued a new research approach; he examined all environmental and ecological factors that might have contributed to the dinosaurs' demise.

Those who cling to theories about dinosaurs as romantically obsessed, suicidal creatures may be disappointed in Sloan's conclusions. Virtually everyone has pet theories about dinosaur deaths ranging from disease to racial old age, poison gases, comets and meteorites, climate changes, cosmic radiation, floods, shifts in the earth's poles, continental drift, sunspots, and a mass of other unconventional theories, labeled "paleoweltschmerz."

Sloan's searches for dinosaur, plant, and early mammal remains in Montana and more recently in China have resulted in a more down-to-earth extinction explanation.

"Dinosaurs dropped off one by one," Sloan said. Dinosaur extinction was hardly dramatic—they left with a whimper, not a bang. Basically the prehistoric creatures were the victims of an incredible streak of bad luck, an example of Murphy's law gone wild.

But if fate had been on their side, dinosaurs might very well have been our ancestors instead of mammals, Sloan said. In their prime, dinosaurs stalked the forest with awesome force. Despite its size, tyrannosaurus rex could run 50 miles per hour. Dinosaurs had large brains, and some came equipped with a thumb and fingers.

For about 10 million years, dinosaurs didn't have many worries. They lived a relatively easy-going life in the then-tropical rain forest zone of North America. But changes gradually began to disrupt their comfortable routines.

First, a significant shift in the weather occurred. The temperature became cooler and more variable (dropping from 86 degrees Fahrenheit to 41 degrees Fahrenheit within 20 million years). The warm rain forest was transformed into our familiar coniferous forest. This climatic switch meant a decrease in the dinosaurs' food supply.

And, as if that wasn't enough adversity, the precipitous arrival of a large asteroid further contributed to the decrease in available food sources. Although now fewer and fewer in numbers, dinosaurs still managed to survive.

But man's early relatives supplied the final shove into oblivion for dinosaurs. Many varieties of small mammals were becoming common in North America. Because of their size, they adjusted much better to the changing environment. "They took, quite literally, a bite out of the dinosaur's food supply," Sloan said.

By the end of the Cretaceous period, some 64 million years ago, few dinosaurs roamed North America. But even these persistent survivors ultimately lost out to what would be the fastest evolution on fossil record. Mammals kept multiplying and were changing form all the time. This was no slow process; the mammals evolved before the dinosaurs really had a chance to figure out what was happening.

"The change was too fast," Sloan said. "The rug was pulled out from underneath them. It's never really a question of animal adaptation. It's a question of how rapidly selection can operate."

"Extinction is the rule rather than the exception," Sloan wrote in 1966, "and we can, if we choose, calculate a sort of half-life of a species. A long, continued survival of a group of animals is a rare event. Only some .003 percent of the species of vertebrates that lived at the end of the Paleozoic era, some 230 million years ago, have any living descendants at all."

For Sloan, dinosaur hunting always has been a fascinating pursuit.

"When I was 3, my father took me to the World's Fair. I remember him carrying me on his shoulders, and I looked up and there was a life-size model of a brontosaurus." Inside the exhibit, there

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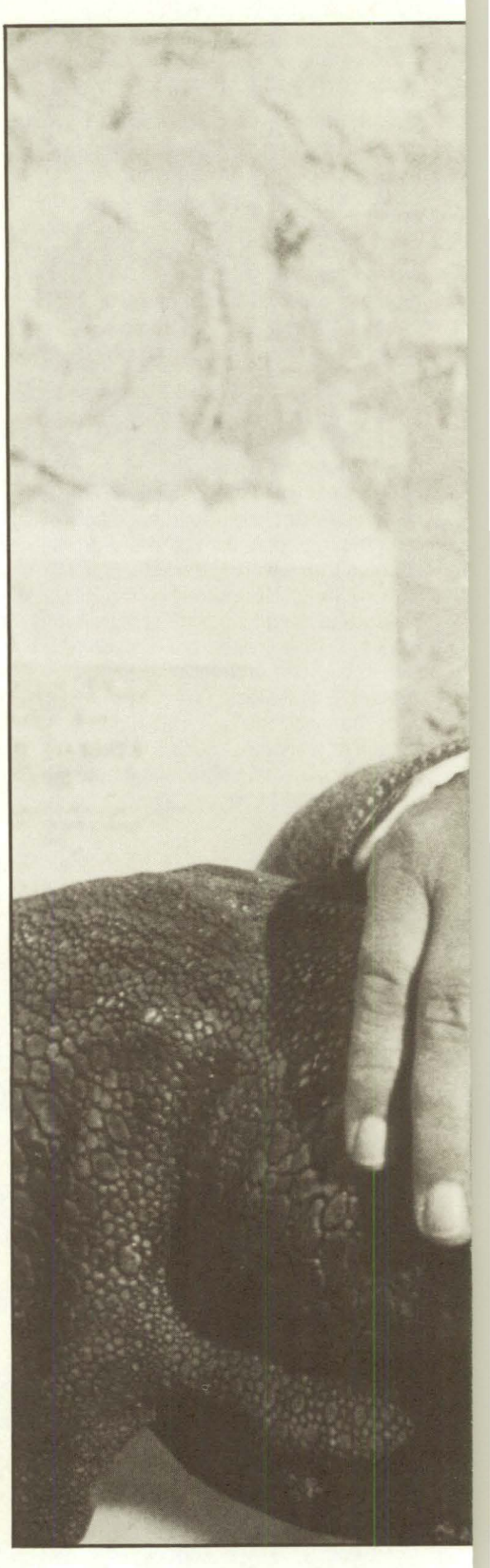

Geology professor Robert Sloan

Photo by Charles Bjorgen, courtesy of the Minneapolis Star and Tribune

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was even more to ignite the young boy's interest: a whole exhibit on paleontology.

After that introduction, Sloan spent most of his spare weekend time roaming around Chicago's Field Museum of Natural History. He received his Ph.D. in geology from the University of Chicago in 1953.

Later that year, he began his career as an instructor at the University of Minnesota. He then decided to begin a systematic investigation of dinosaurs.

Getting started wasn't easy. Because of the proliferation of wild theories, few organizations were willing to fund research on dinosaurs. But the money finally became available, and a group set out to find a dinosaur for the Science Museum in St. Paul.

That was actually simpler than it sounds. Group members discovered the first dinosaur, now on exhibit in the Science Museum, only a few hours after landing in Montana. "They're extremely common out there," Sloan said.

But fossil digging—finding traces of smaller plants and animals—requires patience and the right tools. Sloan says his wide-brimmed white hat, which makes him easy to spot on campus, is also perfect for dinosaur hunting. He pulls the wide flaps down to cut the Montana sun's fierce glare.

To carefully chip away at the mountains, researchers turn to the reliable penknife. Diggers use shovels sparingly, because they have the potential to destroy delicate fossils. Once soil is collected, researchers fill a screen box with the debris. Water is run through the box to wash away the soil, and bone and tooth remnants are left behind. Researchers have learned to identify fossils from each of the 93 different kinds of vertebrate as quickly as coin collectors can spot priceless money.

This knowledge, work, and care has resulted in some important scientific findings. "It was a great day when we found the oldest primate in the world," Sloan said. And one that he won't easily forget. The team climbed a steep Montana hill, 120 feet high with a 50 degree slope, and quarried 10 tons of sand from the top down to the bottom of the hill, and then sifted through the sand. For this effort, they decided to name the first primate Purgatorius after the steep slope, which they had come to call Purgatory Hill.

While the riddle of the dinosaurs may be solved, Sloan wants to continue studying the second half of the puzzle—the development of the first mammals. He recently traveled to China to study mammals that developed at the same time as those in North America. He'll go back to China in January, after returning from another summer in Montana, digging in the hot sun.

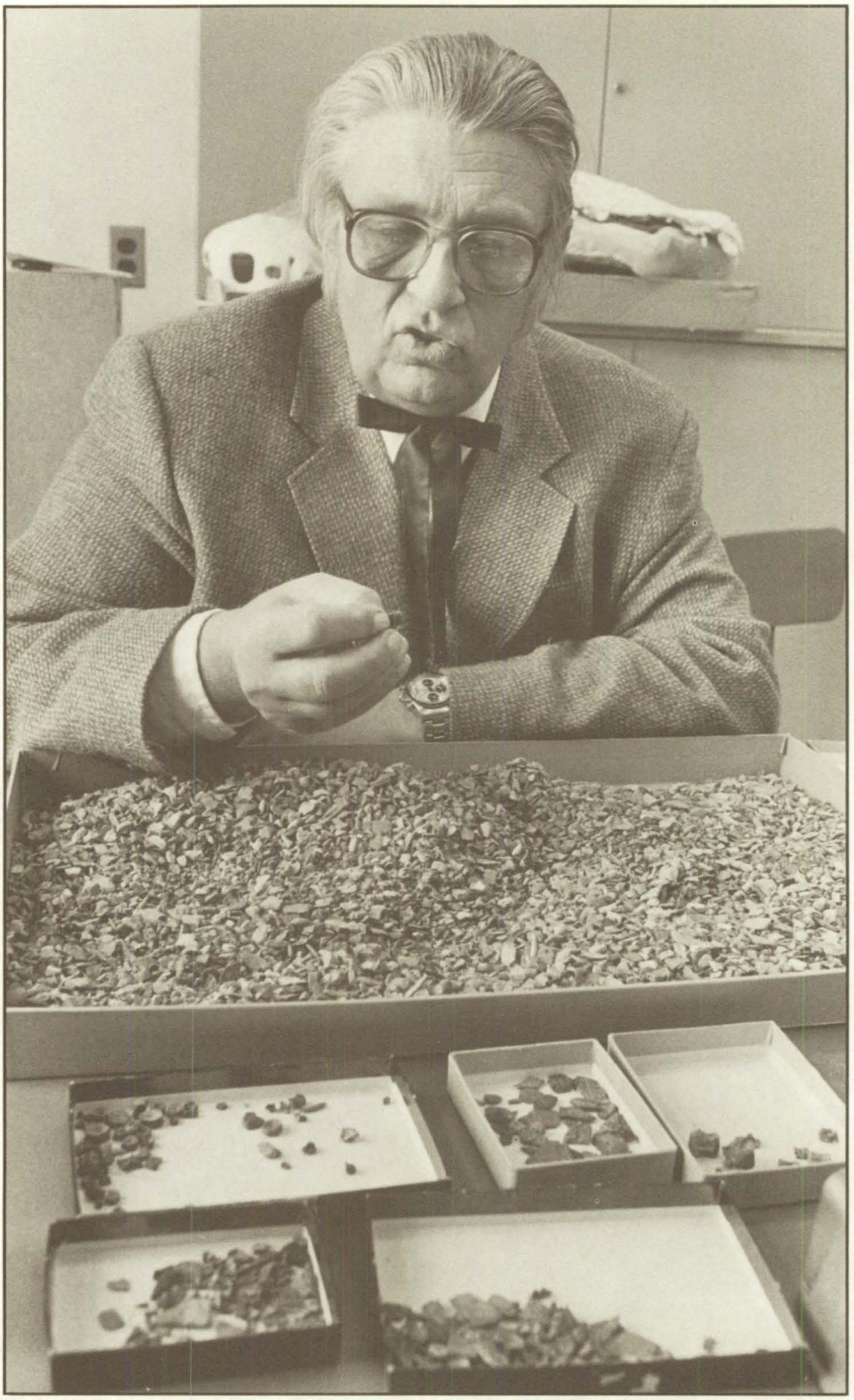

Photo by Mike Zerby, courtesy of the Minneapolis Star and Tribune

Sloan sifts through a box of bone scraps. Sloan and his dinosaur-hunting crew can identify fossils from each of the 93 different kinds of vertebrate as quickly as coin collectors can spot priceless money.

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economics of decentralized resource allocation, and continuum physics and partial differential equations.

IMA divides the year-long program into several two- to four-month periods of concentration on particular aspects of the program, determined by areas of application or by techniques. Each change of concentration addresses a different set of problems. For example, in this year's program, stochastic differential equations and stochastic analysis, application areas discussed will include infinite particle systems, statistical mechanics, quantum theory, control theory, electrical/computer engineering, and operations research.

Planning and coordination of a year's program begin long before the event and generally take up to three years of work and thought. A board of governors recommends topics and key participants for IMA's yearly programs and annually chooses the members of a nationally staffed organizing committee responsible for determining the program's scope, topics, and senior participants. The board of governors is composed of distinguished mathematics researchers from the Universities of Illinois, Michigan, Washington, and Chicago; New York, Harvard, Stanford, and Princeton Universities; MIT, and IBM Corporation.

Acting on the decisions of the organizing committee, local coordinators from IT's math school arrange the programs. They must be experts in the field to plan these very sophisticated science programs and must possess great vitality to survive the experience. This year, Jerry Ericksen, joint professor of aerospace engineering and mathematics, and David Kinderlehrer, mathematics professor, handled a large part of the program's details.

An Industrial Advisory Panel composed of senior-level researchers from major local corporations also assists IMA. Representatives from IBM, 3M, Honeywell, Cray Research, Control Data, CPT, Sperry, EPT, and National City Bank currently serve on the interactive panel, advising IMA of industry needs that could be addressed in institute programs.

The institute is central to a regional consortium of 13 Midwestern universities, each contributing $10,000 per year to the institute. In return, the universities participate in institute programs and invite institute visitors to speak at their campuses. Member universities also submit proposals for an annual IMA-sponsored external workshop and vote to select the topic.

The institute's total staff numbers only eight full-time people. Hans Weinberger and George Sell direct the institute; and Marian Boykan Pour-el works on IMA's public relations. Each year, this small staff must meet the needs of a new and larger group of program visitors, many of whom are unfamiliar with American customs and language, and most of whom need housing for up to a year.

About 75 percent of the institute's yearly support, nearly $1 million annually, comes from the National Science Foundation. The initial five-year grant period ends in 1987.

In spite of the suspense of waiting for NSF's November funding decision, the staff feels confident that the institute has proved its value, and plans for programs through 1992 continue. For 1986-87, a program on scientific computations is being organized. In August 1987, a new type of "mini-program"—a one-month workshop on robotics—will be undertaken. And in 1987-88, the program will focus on applied combinatorics—scientific coding problems.

As the Institute of Mathematics and its Applications is still in its infancy, objective measures of its success are difficult to define. IMA encourages feedback through evaluation forms and asks participants to explain how institute programs have affected their work. Many corporations have found the institute worthwhile and have made financial contributions: grants from Honeywell, IBM, Cray Research, Magnetic Controls, and 3M total between $27,000 and $35,000 each year, and CPT Corporation has donated equipment worth about $15,000.

But the best measure of IMA's value may be its success in a personal way: seeing participants' rapt faces, hearing their excited voices, and feeling the electricity in the air as they share insights and tackle challenging new problems.

Summer math institute held for Twin Cities teachers

Mathematics teaching in the Twin Cities got a boost this summer when 19 secondary math teachers gathered for the Summer Mathematics Institute. From June 10-28, the teachers attended an intensive course in mathematical problem solving and learned how to develop model lessons based on these problems for use in their classrooms. The teachers also got a taste of the use of hi-tech math when the staff of Honeywell's Systems and Research Center presented a series of lecture/demonstrations.

The Twin Cities Mathematics Collaborative, a group headed by mathematics professor Harvey Keynes, sponsored the institute. One of five urban mathematics collaboratives established around the country with funds from the Ford Foundation and local sources, it unites the resources of universities, museums, and businesses with teachers to improve their professional status and opportunities, Keynes said. Project coordinator Christopher Ennis orchestrated the institute, which got rave reviews from the teachers.

"It's given me new ideas to bring into my classroom for the next year, such as hands-on activities using problem solving," said Eileen Wells, a teacher at Folwell Junior High School in Minneapolis. "It's nice to see something nice done for teachers. It's not done often."

Rich Dehlinger from South High School in Minneapolis looked forward to encouraging other teachers to attend the institute next summer and to using what he learned to motivate students. "We're going after the middle students—the ones who will do well if we make an effort to motivate them," he said. "We'll have a measurable impact."

The teachers received a $600 stipend and four graduate mathematics credits for their work.

A council consisting of five teachers recently was established to advise the collaborative. The teachers who have agreed to serve on the council are: Dehlinger, Naomi Baer (Johnson High School, St. Paul), Sue Grue (North High School, Minneapolis), Marly Henke (Central High School, St. Paul), and John Maus (Roosevelt High School, Minneapolis).

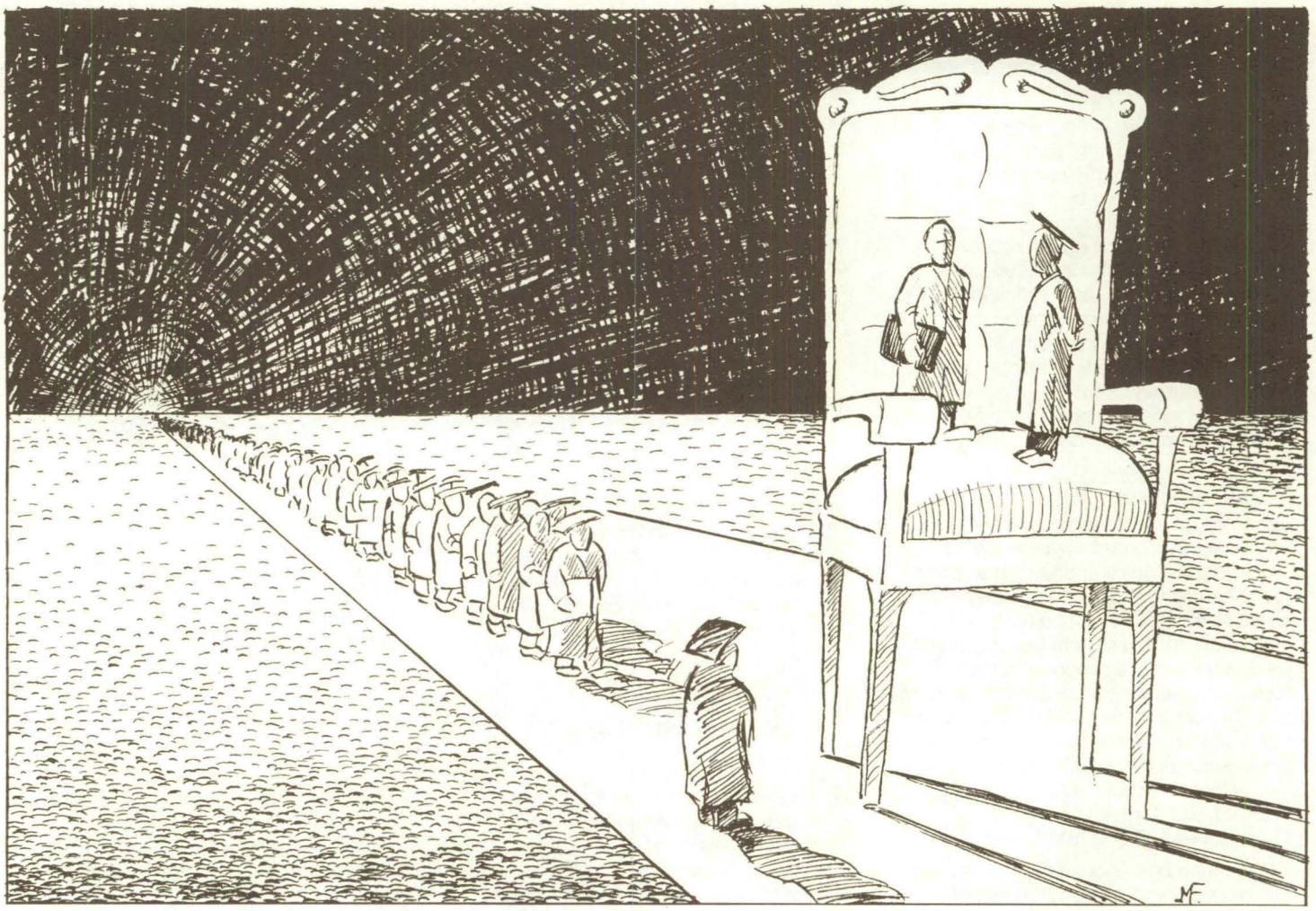


Illustration by Matt Fuller

Star search

IT explores new ways to bring more faculty luminaries to campus

By Leslie Fox

During the Middle Ages, commoners sat on stools, wooden benches, or storage chests. The gentry sat on cushions. The most valuable piece of furniture—a chair—was reserved for teachers who had achieved the high status of professor. The concept of a chair to honor professors has evolved from its literal meaning to a symbol that represents outstanding quality in education, great prestige to the select few who hold the title, and continued resources upon which a university can build to meet future demands. In a cosmic sense, the gravitational force that pulls matter together in the universe to form stars resembles the force of endowed faculty positions in attracting luminaries to a university.

At the University of Minnesota, we now have an unusual opportunity to increase the number of our faculty luminaries. The 1985 Legislature recently released proceeds from the $65 million Permanent University Fund (PUF) that can be matched by private sector donations for endowed chairs. Our goal: to establish 120 endowed positions and move into one of the top five positions among public universities.

The PUF consists of income received from the original land granted to the University by the federal government in 1862, including proceeds from the sale of lumber and timber, mineral permits, royalties on iron ore, occupational taxes, and profits on sales of bonds. The interest income from this permanently invested fund was used in recent years to offset a portion of the University's state appropriation. Recognizing, however, that public support alone can no longer meet University needs, the Legislature accepted the University's proposal to release these public funds for purposes of "match-making" with donations from the private sector.

To build stronger educational programs, we must enhance the University's most important component—its people. In this respect, the importance of attracting top-quality faculty members cannot be overstated. The presence of distinguished faculty members at a university has a magnetic effect: they attract other talented

faculty, outstanding students, and research grants. Many benefits result: by their contributions, these professors stregthen the departments and programs in which they work and improve education to all students. This, in turn, enhances the prestige of the university and confers greater distinction upon the degrees it grants.

The intense search for top-quality faculty among universities is much the same as the competition for talented executives in the corporate world. Consequently, universities must scramble as corporations do to retain their best people and to attract leaders from other institutions. Private endowments serve as an important tool to accomplish this; public support alone cannot provide the funds necessary to attract faculty stars.

The University of Texas provides a good example of ways endowments attract outstanding faculty. In a campaign similar to our own, Texas used the interest from its permanent endowment—a fund consisting of income from oil-rich, university-owned land and investments. In the past year alone, Texas established 32 newly endowed chairs, now occupied by some of the best minds in the nation.

Increasing endowments is clearly the soundest strategy for building long-term excellence into any institution. Although it is difficult—even in this day and age—to imagine being able to provide the $1 million required to establish a faculty endowed chair, this is one chair well worth the investment. The interest income from the permanently invested $1 million endowment ensures the initiation or continuation of important educational programs. These programs become self-sufficient and are no longer vulnerable to the fluctuations of outside financial support. The professor's salary, staff assistance, and research costs are guaranteed, allowing the chair's occupant to pursue pathbreaking research without delay or obstruction.

Under our new campaign, three types of faculty positions will be endowed: a $1 million private gift will establish a faculty chair, a gift of $500,000 will establish a land grant chair, and a $250,000 gift will endow a professorship.

Obviously not everyone who would like to make a donation of this size has the resources to do so. Therefore, under this program, donors can support an area of their own choice either individually or collectively. In some cases, many individuals working together or a corporation can establish chairs, perhaps spurred on by an alumni drive to memoralize a particular person or to encourage education in an area of special interest they share. For example, veterinary medicine's Benjamin S. Pomeroy Chair in Avian Health will be funded by many donors, including colleagues and corporate sponsors. In the Institute of Technology, Control Data Corporation has established a computer science chair. In addition, pledges can be made individually or collectively over a three-, four-, or five-year period.

University President Kenneth Keller recently pointed out that the University must now choose between simply maintaining itself or continuing to grow—not in size, but in stature and reputation. Currently, the University has 27 endowed chairs, six of which are in the Institute of Technology. Although already considered leaders in international research, both the University and IT fall far short in numbers of endowed chairs compared to similar quality institutions. In addition, a recent study found that we are still well below other Big Ten schools in funding levels for the instruction of our students. It is obvious that these problems cannot be corrected without drawing upon both the public and private sectors for financial support.

For this reason, we hope to inspire some highly creative chair drives to honor distinguished faculty members, to integrate special studies in one or more disciplines, or to reflect the specific interest of one or more friends of IT.

To meet the challenges of the 21st century and to protect the future health of the state—both economically and culturally—public and private support must go hand in hand. By using the Permanent University Fund in this way, the University has further focused its commitment to achieve excellence as an educational institution. But to succeed, this commitment needs to be met by your support, not only through your contributions, but also in terms of your creativity and personal assistance in helping us organize this fund-raising campaign.

Data General gives superminicomputer to IT

By Deane Morrison

Data General Corporation has donated an ECLIPSE MV/10000, one of the computer industry's most powerful superminicomputers, to the computer science department.

The system is valued at $514,000. The new computer, which has been installed in Lind Hall, will be used for classroom teaching and for research on database systems. More than 300 students are expected to work with the computer each quarter.

Among the software used with the MV/10000 is Data General's Ada Development Environment (ADE) software, which allows programs to be written in the Ada programming language. Ada is mandated by the U.S. Defense Department as the standard computer language for use by all branches of the military.

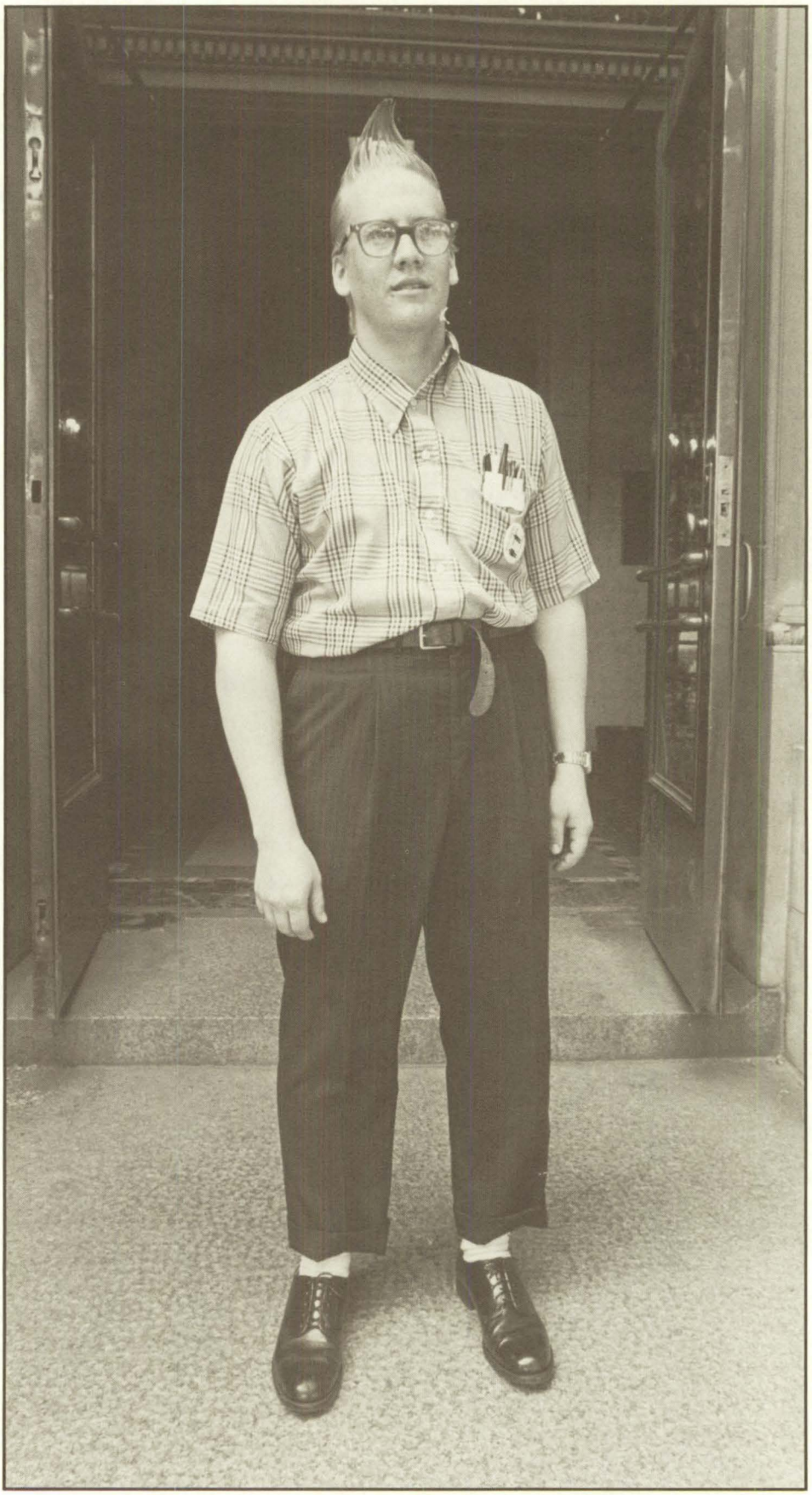
In addition to University students, engineers from such companies as Honeywell, Sperry, Control Data, IBM, and 3M will use the computer through the UNITE program, a continuing education program for professional computer scientists and engineers. Computer terminals at IBM have been connected by telephone to the MV/10000, allowing company engineers to use the computer from their workplaces. Terminals at the other companies were connected this summer.

The ECLIPSE MV/10000 is the second superminicomputer donated to the University by Data General. The company donated an ECLIPSE MV/8000 to the computer science department in 1983. That system is now used by the University Department of Surgery's Coordinating Center for the Program on the Surgical Control of Hyperlipidemia, a heart disease research project.

"Data General's donation program benefits both educational institutions and industry," said Philip C. Thomas, director of the company's Federal System Division. Data General, based in Westboro, Mass., has donated about $10 million worth of computer hardware and software to U.S. universities and colleges during the past several months.

A Nerd Beauty Contest?

Every spring, IT students go a little crazy. They did it again this year at annual IT Week celebrations in May.



Stranger in a strange land. Steve Palm commited all the fashion felonies and topped off with a punk flourish to finish first in the IT Nerd Beauty Contest. Note the winner's subtle styling details: misbuttoned shirt, dab of TP staunching a shaving wound, glossy shine on the steel-toed shoes. The only thing missing seems to be a calculator holster. Maybe that's what the dreamy-eyed Palm is remembering right now.

You think this is easy? Just try running fast with a group of people tied together.

Ready, set, hit those keys. A calculator race kept students' fingers and brains moving at high speeds. In addition to the traditional "fun activities," IT Week also featured serious speeches and discussions on international technology. The Plumb Bob Honorary Leadership Fraternity coordinates IT Week activities. Plumb Bob members, all IT students, promote school spirit and foster public awareness of technological developments through IT Week.

Part of IT Week, the Technology Fair brings major corporations to campus. Students visited the fair's Northrop mall tent and talked to company representatives.

We Hear From You

Education plays a vital role in the development of high technology

Guest columnist John Malinka is president of the Minnesota High Technology Council (MHTC). His remarks are from a speech given at an MHTC meeting.

Can the United States truly call itself one of the world's most developed countries?

Maybe not.

Statistics recently collected by the Minnesota High Technology Council seem to support a grimmer view of U.S. fortunes. Optimistically, though, our decisions as shapers of a new technology age can reverse the current course. We all must recognize one important solution: a stronger commitment to knowledge. But what does that commitment include?

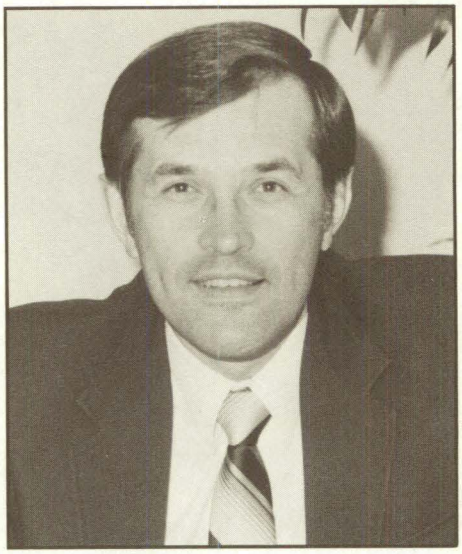
To answer that question, we must first look at the scope of the problem. The facts are not comforting.

In 1950 we contributed 40 percent of the world's gross national product, but today we provide only 24 percent. In 1950 we made 52 cars out of every 100 to Japan's one; today we make 19, and Japan makes 23 out of every 100.

We have all felt the impact of this change. A member of one suburban development group told me these facts made him change his view. "I realize that we are no longer competing against Eagan and Edina, but against the world," he said. State governments, too, must recognize that we're not just competing with other states, but with other nations, some of which we hardly know anything about.

The economic impact of high technology on our state cannot be underestimated. In a recent report, state economists Wilbur Maki and Hosein Akhavipour estimated that technology-intensive industry in Minnesota, both directly and indirectly, provides 25 percent of the state's jobs and 35 percent of the state's economic output and total revenues. Based only upon our top industries, these figures become even more significant when considering the full scope of technology's role in all Minnesota companies.

The most important criteria for attracting and locating high-tech industries in Minnesota all relate to education. For years the Minnesota High Technology



John Malinka

Council has worked to inform legislators and the public of this fact. Several hundred private and governmental studies examining successful siting of high-tech companies and similar conclusions from foreign representatives who recommend site locations in the U.S. reinforce this point. They all agree that the single most important criterion is proximity to outstanding universities.

Other priorities relate to the first. Proximity to high-technology businesses ranked second, followed by quality of local schools, educational level and quality of the available labor force, and concentration of scientists and engineers.

So consideration of technology-intensive industry leads us right back to consideration of our entire education system, particularly the quality of higher education and the role of elementary and secondary schools in preparing lifelong learners.

From one perspective, Minnesota certainly seems to be doing something right. Over the four-year period 1980-83, *Forbes Magazine*'s annual survey of 300 up-and-comers, as summarized by Regents' Professor of Geography John Borchert, identified the Twin Cities as the fourth largest contributor to that category. Three years ago, a federal report ranked Minnesota ninth in the number of technology-intensive industry jobs provided; a more recent report ranked the Twin Cities sixth in terms of our business mass, and the Department of Commerce reports that our state is third in national and worldwide shipments of electronics and computer equipment.

We want to keep doing things right, so it's important to look at the equivalent educational statistics. A recent report by the American Society of Engineering Education compared the number of engineering degrees granted per population in 48 states. Twenty-sixth in population, Minnesota granted 906 bachelor degrees in engineering; that made us number 42 out of the 48 states studied.

We all should be concerned about both secondary and postsecondary education. We should not only care about the quality that comes out of our Minnesota engineering "pipeline," but we should also look closely at the preparation of the student that goes into the pipeline.

Eighty-four percent of high school graduates nationwide haven't taken any physics. Sixty-five percent haven't taken any chemistry, and 48 percent no geometry. In Japan, every high school graduate has had at least one year of calculus.

But even if we made desirable changes, we would have problems. Since 1972, education colleges nationwide have turned out fewer and fewer science and math teachers. In 1972, Minnesota graduated 344 math teachers; in 1980, of 80 qualified graduates, only 35 actually went into teaching. In 1972, 201 qualified life science teachers graduated, compared to 21 in 1983—of whom, I am informed, only one is teaching. And unless something is done for the future, we will have a shortfall, especially of math and science teachers.

In May 1985 the National Research Council (NRC) published a study outlining current problems in secondary and postsecondary education. For higher education, the report cited as concerns increasing undergraduate enrollments, faculty shortages, diminishing numbers of doctoral students, and rising faculty retirement over the next few years.

To correct these problems, the NRC study recommended some commonsense solutions for Minnesota: making faculty salaries competitive with Ph.D. industry engineer salaries; improving facilities to

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Milestones

P.R. Sethna, aerospace engineering and mechanics professor and department head, has been appointed to the editorial board of the *International Journal of Dynamics and Stability of Systems.* □

W.L. Garrard, aerospace engineering and mechanics professor and associate department head, conducted a short course this summer on parachute technology in conjunction with Sandia National Laboratories, Albuquerque, N.M. ■

John L. Nieber joined the agricultural engineering department faculty as an associate professor in June. His research interests include hydrologic modeling, flow through porous media (saturated and unsaturated), spatial variations of properties of soils, and solute transport in porous soil. ■

George Barany, assistant professor of chemistry, conducted a seminar on commercialization of new peptide synthesis methodology at Biosearch, San Rafael, Calif. □

Chemistry professor **Robert Brasted** conducted a seminar at Gustavus Adolphus College in April concerning the Republic of South Africa—its industrial complex, political environment, and new parliamentary system—from a visiting professor's point of view. Brasted also participated in the American Chemical Society's May meeting at Miami Beach, Fla. He was elected to serve as vice chair of the society's Council Policy Committee. □

Margaret Etter, assistant professor of chemistry, presented papers during May seminars at Augsburg College's chemistry department and at Kodak. In June, Etter attended the American Chemical Society Great Lakes regional meeting at Purdue University. □

John Evans, associate professor of chemistry, conducted seminars in March at the University of Utah and Brigham Young University in March and presented an invited paper at the regional May meeting of the American Vacuum Society in Oconomowoc, Wis. □

Chemistry professor **Paul G. Gassman** will chair the American Chemical Society's Committee on Science and will serve on the editorial advisory board of the *Journal of the American Chemical Society*. During January and February, Gassman lectured at universities and industrial companies in Delhi, Calcutta, Hyderabad, Madras, Bangalore, and Pune, India. In April, he delivered the W.J. Probst Memorial Lecture at Southern Illinois University, and in May he lectured at the Massachusetts Institute of Technology. In June, Gassman spoke at the Barberton Laboratories of PPG Industries Inc. and the American Chemical Society regional meeting in Akron, Ohio. Gassman was also an invited lecturer at Sterling Winthrop Pharmaceutical Corp. in Rensellaer, N.Y. □

Chemistry professor **W. Ronald Gentry** lectured at the American Physical Society's April meeting in Washington, D.C., and at the Tenth International Symposium on Molecular Beams in Cannes, France, during June. □

Wayne Gladfelter, associate professor of chemistry, conducted seminars in March at the State University of New York at Buffalo, the University of Rochester, and Amoco Research in Naperville, Ill. □

Essie Kariv-Miller, associate professor of chemistry, lectured at Luther College, Grinnell College, and Drake University in Iowa during April. She also spoke at an organometallic electrochemistry symposium during the Electrochemical Society's June meeting in Toronto. □

Chemistry professor **Maurice Kreevoy** lectured in March at the U.S. National Bureau of Standards in Boulder, Colo., and at the University of Indiana in Bloomington. □

Chemistry professor emeritus **I.M. Kolthoff** was invited to participate in the 30th International Union of Pure and Applied Chemistry Congress in Manchester, England, during September. □

Chemistry professor **Edward Leete** lectured in April at Rice University and at the International Symposium of Natural Products Chemistry in Monterrey, Mexico. □

Chemistry professor **Sanford Lipsky** lectured at the June Symposium on Vacuum UV Photochemistry in Kingston, Ontario. □

Thomas Livinghouse, assistant professor of chemistry, **Kent Mann,** associate professor of chemistry, **Larry Miller,** chemistry professor and department head, **Lou Pignolet,** chemistry professor, and **Lawrence Que,** associate professor of chemistry, lectured and presented papers at the American Chemical Society national meeting in Miami Beach, Fla. □

Timothy Lodge, assistant professor of chemistry, chaired a session and presented a paper at the Society of Rheology's national meeting in Blacksburg, Va. In March, he presented this paper at the American Physical Society's national meeting in Washington, D.C. □

Chemistry professor and department head **Larry Miller** conducted seminars at Dow Chemical in Michigan and American Cyanamid and Uniroyal companies in Connecticut earlier this year. □

Chemistry professor **Albert Moscowitz** presented a paper in May at the Midwestern Theoretical Chemistry Association's conference in Milwaukee, Wis. □

Chemistry professor **Wayland E. Noland** has been appointed to the development council of the Center for Limnology at the University of Wisconsin. He also attended the American Chemical Society meeting in April. □

Lawrence Que, associate professor of chemistry, lectured at the University of British Columbia and Washington State University in March and at the International Bioinorganic Conference in Albufeira, Portugal, in April. □

Marion Stankovich, assistant professor of chemistry, presented a paper at the Electrochemical Society's June meeting in Toronto. □

Chemistry professor **Donald Truhlar** conducted a seminar at Johns Hopkins and Harvard Universities in April and spoke at a Massachusetts Institute of Technology colloquium in May. □

Chemistry professor **Archie Wilson** presented a paper at the annual meeting of the Minnesota Academy of Sciences in April at the College of St. Catherine, St. Paul, Minn. ■

John Gulliver, associate professor of civil and mineral engineering, presented a paper at the August Congress of the International Association for Hydraulic Research in Melbourne, Australia. ■

Steven K. Case, associate professor of electrical engineering, was elected a fellow of the Optical Society of America, a distinction reserved for only five percent of the society's membership. □

Mostafa Kaveh, associate professor of electrical engineering, has been appointed publications board chairman for *IEEE Acoustics,* the journal of the Speech and Signal Processing Society. □

Electrical engineering professor **Robert F. Lambert** has been appointed associate editor of the *Journal of the Acoustical Society of America.* ■

MILESTONES to page 24

MILESTONES from page 23

Geology and geophysics professor **Subir K. Bannerjee** delivered the Snider Lecture on the origins of the magnetic compass at the University of Toronto in May. Oxford University Press will publish his monograph on the history of the magnetic compass and discovery of magnetic declination. ■

Jack Conn, associate professor of mathematics, has received an A.P. Sloan Fellowship in recognition of his significant contributions to mathematical research. □

Mathematics professors **Warren S. Loud** and **Yasutaka Sibuya** were invited speakers at the International Conference on the Theory and Applications of Differential Equations in May at Pan American University, Edinburg, Texas. ■

Acting as a consultant for the United Nations Industrial Development Organization, **Martha Russell,** associate director of the Microelectronic and Information Sciences Center, in June worked with the Economic Council of Latin American Countries in Caracas, Venezuela, to establish a regional Latin American microelectronics network. ■

Mechanical engineering professor **Edward A. Fletcher** and **Donald R. Riley,** associate professor of mechanical engineering, lectured at the Faculte des Science et Technique, Universite de Monastir in Tunisia and consulted with faculty members on solar energy research and computer-aided design. Fletcher later discussed solar energy at the Weizmann Institute, Rehovot, Israel, on a trip sponsored by the Academy for Educational Development. □

Mechanical engineering professor **Ephraim Sparrow** presented the George Hawkins Memorial Lecture in Heat Transfer at Purdue University in April and in June delivered the keynote address at the Canadian Congress on Applied Mechanics in Ontario. ■

I. Iwasaki, professor at the Mineral Resources Research Center, presented two papers at the June meeting of the International Mineral Processing Congress in Cannes, France. □

John J. Moore, associate director of the Mineral Resources Research Center, conducted a presentation in May on deoxidation of heavy steel castings at the Steel Founders Society of America Workshop on Cast Quality Improvements in Chicago. ■

A paper written by physics professor **George W. Greenlees** and **Frederick D. Becchetti,** formerly Greenlees' student who is currently a faculty member at the University of Michigan, has been designated as a Citation Classic by the publication *Current Contents.* The paper has been cited in more than 1,200 publications since 1969. □

Physics professor **Howard Hanson** retired this spring after 38 years of teaching in IT. ■

Ray Sterling, director of the Underground Space Center, will serve on the international committee for the International Symposium on Earth Architecture, scheduled for November in Beijing, China. He also will present a state-of-the-art review paper at the meeting. ■

IT Dean **Ettore Infante** will serve as chairman of the National Research Council's Committee on Applications of Mathematics through June 30, 1988. Infante also has been elected a trustee of the Society for Industrial and Applied Mathematics. ■

Awards

The National Endowment for the Arts awarded former IT architecture school head **Ralph Rapson** a $20,000 distinguished designer sabbatical fellowship grant. Rapson will visit national and international architecture schools to observe recent changes in architectural education and problems faced by urban architects and planners. After he returns he plans to use his observations as a basis for lectures, classes, and seminars and to publish his findings. ■

Neal R. Amundson, Regents' Professor of Chemical Engineering, received an honorary doctor of science degree during IT's May 31 commencement ceremonies (see story on page 1). ■

Chemistry alumni **Johannes Coetzee** and **George Parshall** each received University of Minnesota Outstanding Achievement Awards for 1985. Coetzee's award will be presented during Science and Technology Day weekend, Oct. 25. Parshall received his award during his visit to campus as Kolthoff lecturer in early October. □

Chemistry professor **Robert Brasted** received the University's Gordon L. Starr Award for "service to the Minnesota student" in May. ■

Civil engineering junior **David Potyondy** received the top award—a $5,000 scholarship—in the American Consulting Engineers Council's 1985 national scholarship competition. ■

Director of the Center for Electric Energy and electrical engineering professor **Vernon D. Albertson** received the Edison Electric Institute's 1985 Power Engineering Educator Award, commemorating his accomplishments as an outstanding American educator. ■

John Clausen, mechanical engineering professor and director of IT's lower division programs, received the Eminent Engineer Award in May from the Minnesota chapter of Tau Beta Pi National Honorary Society. The award recognized Clausen's contributions to engineering education. □

Donald R. Riley, associate professor of mechanical engineering, received the 1985 AT&T Foundation Award from the North Midwest Section of the American Society of Engineering Education. □

Mechanical engineering professor **Ephraim Sparrow** received the 1985 George Taylor/IT Alumni Society Teaching Award in May. ■

Astronomy and physics professor **Roberta M. Humphreys** received the George Taylor/IT Alumni Society Research Award in May. ■

IT's student publication, *Minnesota Technolog*, won 10 out of 13 awards at the April Engineering College Magazine Associated Convention. *Technolog* editors involved in the award-winning issues are last year's editor **Alan Hauser** and current editor **David Herridge. John Clausen,** director of IT lower division programs, is *Technolog* adviser. ■

Events & Visits

Representatives from IT's **astronomy** department and from seven colleges interested in forming a telescope consortium met in June at Charlottesville, Va., to discuss plans for construction of one or more world-class telescopes. Institutions attending included the Universities of New Mexico, Virginia, and Wisconsin; Indiana, Michigan State, and Boston Universities; and the New Mexico Institute of Technology. ■

In June, the University of Minnesota hosted the first combined meeting of the **American Society of Limnology and Oceanography (ASLO)** and the **Ecological Society of America.** More than 2,000 scientists attended. Civil and mineral engineering professor Patrick Bresonik served as local arranger and

ASLO program chairman. A local committee with representatives from IT and the Colleges of Biological Sciences and Forestry also assisted. □

IEEE/ASSP Frontiers in Education Conference, coordinated by Karl Smith, assistant professor at the Mineral Resources Research Center, was held in Golden, Colo., Oct. 20-22. The conference focused on the link between research and education. IT associate dean Russell Hobbie chaired a session on undergraduate research, and civil and mineral engineering professor Anthony Starfield chaired a session on the application of artificial intelligence concepts to engineering education. ■

The **Center for Microelectronic and Information Sciences** held a Gallium Arsenide Workshop in July and hosted the Sixth Annual Molecular Beam Epitaxy Workshop, sponsored by the American Vacuum Society, in August. The workshop's proceedings will be published in the *Journal of Vacuum Science and Technology.* ■

The **St. Anthony Falls Hydraulic Laboratory** held a June dedication ceremony for a new turbine test stand, which will be used for testing model hydroturbine units and for other basic research. The only independent unit of its kind available for sponsored studies in the U.S., the stand can test model turbines or pumps of up to 100 horsepower. IT Dean Ettore Infante, state Rep. Doug Carlson, and Minnesota Department of Energy representative Paul Helgeson spoke at the dedication. ■

Correction

The spring issue of *Items* erroneously described a new Ford Foundation sponsored math collaborative program as statewide and incorrectly named its director. Mathematics professor Harvey B. Keynes directs the Urban Mathematics Collaborative. Designed for Twin Cities teachers, the collaborative strengthens mathematics teaching in inner city schools by fostering collegial relations and interaction among teachers and the wider mathematics community. For more information, see story on page 17.

News Shorts

...S & T Day Weekend offers alumni many options

S&T Weekend, Oct. 25-26, will offer innumerable pleasures for all who attend, including the traditional banquet, the opportunity to attend seminars and classes in your department, the homecoming parade and game, departmental breakfasts and reunion lunches, the dean's reception, dancing, and more. For information, call 612/376-2448.

...Geology publishes biannual newsletter

The geology/geophysics department has published the second issue of its new biannual newsletter (fall/spring). Alumni who didn't receive a copy should write to the Minnesota Geological Survey, University of Minnesota, 2642 University Ave., St. Paul, MN 55114, or call 373-3372.

...MEIS publishes new directory

The Center for Microelectronic and Information Sciences (MEIS) has produced a new publication called *Interest Profiles, 1985.* This informational directory lists and highlights the research background and interests of IT's microelectronic and information sciences researchers, including MEIS faculty, fellows, and graduate students. For a copy, please call the MEIS office 612/376-9122.

...Professors study secrets of Lake Superior

Civil and mineral engineering professor Steven Eisenreich and Christopher Paola, assistant professor of geology and geophysics, studied the secrets of Lake Superior this summer from within a 22-foot submersible.

The two studied the lake's lower currents and the furrows currents create on the floor of the lake. Eisenreich looked at the movement and deposition of contaminants and collected samples of suspended solids from the lake bottom for later analysis. Paola examined the ways furrows affect movement of suspended materials through the lake to determine how furrows could function as natural measures of bottom current strength.

The same type used in ocean-floor exploration, the submersible operates from a parent ship. Equipment on board the submersible includes high-resolution television cameras, a seven-function manipulator arm, and a "critter getter" for capturing biological specimens. Michigan State University organized the expedition, and IT received funding from the National Oceanic and Atmospheric Administration and the Minnesota Sea Grant.

...Space Science Center receives equipment

The Space Science Center has received a state-of-the-art isotope-ratio mass spectrometer. Purchased with grants to Emi Ito, assistant professor of geology and geophysics, the triple-collector gas-source spectrometer will be used to measure the isotope ratios of carbon and oxygen and can be upgraded to measure the isotope ratios of hydrogen, nitrogen, and sulfur.

...Fund-raising drive supports engineering education & research

The American Electronics Association (AEA) Minnesota Council collected $764,000 in its fund-raising drive (described in the winter issue of *Items*) to support engineering education and research at IT.

Zycad Corp. donated $491,000 worth of equipment, including a logic evaluator, Zylos software, and a maintenance package. Used in the design of advanced semiconductors and electronic systems, the logic evaluator allows the user to rapidly test any design for flaws before entering production.

Other contributions came from ADC Telecommunications, Cray Research, Data Card, Dicomed, Honeywell, and Network Systems. Each company has agreed to sponsor a four-year, $52,000 fellowship/loan. Half of the $52,000 constitutes a loan, which will be waived after the recipient has taught at a university for three years. The Center for Microelectronic and Information Sciences will administer the fellowships.

The AEA also has sponsored faculty development grants to aid in recruiting and maintaining excellent faculty.

Grad Notes

'33 Harley R. Schneider (MINES), "semi-retired" in New Ulm, Minn., acts as a part-time consultant in engineering and land surveying for the firm of Bolton and Menk. Historian for the Minnesota Land Surveyors Society, Schneider became Brown County surveyor in June 1984. He received the Minnesota Land Surveyors Association's first annual E.A. "Bud" Rathbun Award of Merit, recognizing his contributions to historical research of state public land surveys. Schneider discovered the original plats of the Minnesota-Iowa border in an Iowa Capitol vault; these records have now been archived by the Minnesota Historical Society for use by Minnesota surveyors and researchers. Schneider's work also has led to microfilming of the original public land survey system notes and plats, which predate Minnesota's territorial status. He writes that he hopes his efforts "spark an interest" in others who might do similar research.

'34 William R. Sears (AEM), who established the aerospace engineering department at Cornell University in 1946, will be honored through an annual lectureship at Cornell. Currently a University of Arizona faculty member, Sears is an honorary fellow of the American Institute of Aeronautics and Astronautics, a fellow of the American Academy of Arts and Sciences, a recipient of the Bendix Medal of the American Society of Engineering Education, and a member of the National Academy of Sciences and the National Academy of Engineers.

'45 Lynn Hokinson (ME), an industrial commercial/business realtor in Dayton, Ohio, lives in Springfield, Ohio, and is president of the Minnesota Alumni Association branch in that area.

'49 Chell Eric Bosson (ME) retired from his position as senior engineering specialist with Rockwell International; he will remain president of Chell of California.

'63 Virgil W. Ostrander (ARCH) is assistant commissioner for contracts at the U.S. General Services Administration in Washington, D.C.

'65 Paul A. Chapla (CE) is commanding officer at the Navy Public Works Center in Subic Bay, Republic of the Phillipines. He directs all maintenance, engineering, transportation, utilities, and other public works services for the base. Chapla has served in Great Lakes, Ill., Guam, Port Hueneme, Calif., Gulfport, Miss., Vietnam, and Treasure Island. He received the Bronze Star Medal, the Meritorious Service Medal (twice), the Navy Achievement Medal (twice), and other awards and decorations. He married Sarah Craig Bollock-Webster of Bristol, England; they have a 14-year-old son, Geoffrey. Chapla writes that **Paul Yeutter ('59)** is also stationed at Subic Bay's ship repair facility.

'70 Roland Weber (EE), former IT professor and member of the IT Alumni Society Board of Directors, was appointed chairman of the board and chief executive officer of Numed Corporation in Minnetonka, Minn. Formerly vice president and general manager of Perkin-Elmer Corporation's physical electronics division, Weber is also a director of Pandex Laboratories Inc., Mundelein, Ill.

'70 V. William Zmistowski, Jr., (ARCH) is head of William Zmistowski Associates, Architects, which received an American Institute of Architects Western Mountain Region Award, honoring the firm's design of the Desert Highlands Golf Club's clubhouse in Scottsdale, Ariz.

'71 Frederick T. Strobl (EE) is chairman and cofounder of CNS Inc., a computerized medical electronics manufacturer in Eden Prairie, Minn. CNS recently received clearance from the Federal Drug Administration to market its CNS-16 Cerebral Tracer—a computerized analysis machine that prevents brain damage during surgery. Strobl graduated from medical school in 1975 and completed residency and fellowship training in neurology and electroencephalography at the University of Minnesota and the Mayo Clinic in 1979.

'71 Jay Kiedrowski (ME) was appointed Minnesota Commissioner of Finance by Governor Rudy Perpich.

'72 Lance D. Drager (MATH) is an assistant professor in the mathematics department at Texas Tech University.

'74 James M. Ronning (CE) is a projects engineer for Johnson Bros. Corporation in Duluth, Minn.

'75 Michele A. Brekke (AEM; MS '77) works for NASA as a payloads officer in mission control during space shuttle flights. In May, *Good Housekeeping* selected Brekke as one of America's 100 most promising women. Michele and her husband, Bob (listed below), live with their two sons in Friendswood, Texas.

'76 Bob Brekke (EE) works for Ford Aerospace as an expert in the field of artificial intelligence.

'76 Atul K. Bhatt (EE; Ph.D. '79) is a professional consultant in system design at Sperry Corporation. This spring, he developed and taught a graduate-level IT course in fault tolerant computing with L. L. Kinney, associate professor of electrical engineering.

'78 David Lawrence Graham (ARCH) received a master's degree in architecture from Harvard University's Graduate School of Design in March. Graham is a project management/design associate with BRW Architects.

'78 David Rehbein (MS PHYSICS), a West Point physics instructor, received the Defense Meritorious Service Medal for his contributions to the SDI program. Rehbein served as course director for West Point studies in fusion energy and in physics of modern weapons. He participated last summer in an SDI program at Los Alamos, N.M.

'80 David G. Wick (EE) was promoted to system applications engineering manager at Honeywell's Digital Product Center in Colorado Springs, Colo. He is responsible for product planning and definition of new VLSI integrated circuits.

'81 Thomas E. Nelson (CHEM E) was recently elected to Alpha Omega Alpha, a national honor medical society at the University of Minnesota.

'82 S. Bruzzone (EE; Ph.D. '82) received a 1984 IEEE/ASSP Society best paper award for "Information Tradeoffs in Using the Sample Function in ARMA Parameter Estimation," co-authored with Mostafa Kaveh, associate professor of electrical engineering. Bruzzone works for Argo Systems in Sunnyvale, Calif.

'82 Robert W. Goetz (ARCH) received a master's degree in landscape architecture from Harvard University's Graduate School of Design in June.

'82 Brian D. Hamerski (EE) received his master's in electrical engineering from the University of Southern California in 1984. Recently promoted to group head at Hughes Aircraft Space and Communications in California, he supervises the integration and testing of satellite payloads.

'83 Victor M. Chen (C SCI) is a programmer for IBM Corporation in Raleigh, N.C.

'83 Brenda M. Lund (EE) is an electrical engineer with the 485th Engineering Installation Group at Griffiss Air Force Base in New York.

'84 Randal A. Rethorford (AE) works as an engineer at Douglas Aircraft in Long Beach, Calif.

'84 Colleen M. Guest (ME), who lives in Plymouth, Minn., is an associate quality engineer for Honeywell's residential division.

'84 Steve Woletz (AEM), who lives in Madison, Ala., is a space station structural dynamics and loads engineer for Boeing.

'84 Timothy Virant works as a gas engineer for Pacific Gas and Electric Co. in California. He writes that the job is very good and that California is great.

'85 Martin D. Chorzempa (ME) is an industrial engineer in IBM's financial services products division at Charlotte, N.C. Chorzempa is married to Jean Page, R.N., formerly of North Dakota.

'85 Steven B. Prater (ARCH) is an intern with Thos. Hodine Architects in Minneapolis.

Letters

I was glad to see the use of metric units in the article, "U Searches for Telescope That Will Give IT Astronomers a Little Piece of Heaven," in the winter 1985 issue of *Items.* In particular, the article states that the diameter of the desired telescope mirror has a range of 2.5 to 4 meters. (Unfortunately, I cannot praise the preceding article, "Alumni Help Make Powerful Space Telescope That Will See New Horizons," as those measurements were converted to the U.S. system.)

It is now common practice to give telescope mirror diameters in metric units. The United States is reluctant to convert the metric system for everyday measurements, mainly due to a misunderstanding of the simplicity of the metric system and out of fear of change. Articles that convert scientific measurements to the inch/pound system for the sake of the reader only serve to create a misunderstanding about the role of metrics in science. Newsletters, like *Items,* can serve to break this ignorance by not converting metric measurements for the sake of its readers.

The metric system is the world system, adopted by virtually all countries except the United States. It is no longer a matter of *if* we convert to metric, but *when.* Are we doing any good by postponing the inevitable?

Don Hillger
Ft. Collins, Colo.

ITAS considers speakers forum

The Institute of Technology Alumni Society (ITAS) may begin a new periodic technical speakers forum for alumni members. This forum would replace the annual S&T Day afternoon symposium, which has now been discontinued.

Before establishing this forum, we need to know if enough alumni are interested in attending. One forum would be held on the University's Minneapolis campus each winter and spring quarter beginning at 7:30 p.m. The meeting would include a 90-minute formal presentation followed by an opportunity to socialize with fellow alumni. Topics would be broad in scope, encompassing all aspects of technological issues.

Please let us know what you think by completing and returning the following form to: IT Alumni Society, c/o Minnesota Alumni Association, 100 Morrill Hall, 100 Church St. SE, Minneapolis, MN 55455.

I would attend an ITAS-sponsored speakers forum: yes no

I would prefer to meet at 7:30 p.m. on (circle two): M T W Th F

Topics of interest to me are:

_____

_____

_____

Suggested speakers:

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Your name and address (optional):

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WHAT'S NEW WITH YOU?

Let us know. Just clip this form and send it to *Items,* 103 Experimental Engineering, University of Minnesota, 208 Union St. SE, Minneapolis, MN 55455.

Name_____

Street Address_____

City, State_____

Grad. Year/Dept._____

Job_____

Other News_____

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Institute held a four-week program for 25 graduate and postdoctoral students from all over the nation. The National Science Foundation provided a $241,000 grant for this program, the only university-related project of its kind in existence. We are most optimistic that under Patton's expert guidance, this will be but the first step toward many exciting activities in supercomputing education and research.

Graduate Fellowships

Top-quality graduate students tend to attract other fine students and talented faculty. Consequently, the long-range plan places great emphasis on developing resources that allow us to competitively recruit first-class students. Aware of the need for graduate student support, the Legislature set aside $2.5 million for University graduate fellowships. These fellowships will be distributed through the Graduate School, and IT will receive its share of the funding.

New Faculty

The searches for director of the Center for Microelectronics and Information Sciences and for computer science and electrical engineering department heads are now completed. I am delighted to welcome Wallace W. Lindemann, new director of the Center for Microelectronics and Information Sciences (MEIS); David W. Fox, new head of the computer science department; and our colleague Robert J. Collins in his new position as head of the electrical engineering department.

Lindemann, an alumnus of IT's electrical engineering department, and one of MEIS' early supporters, comes to us from Control Data Corporation, where he was vice president in charge of CDC's microcircuits division.

Fox, formerly director of Mathematical and Information Sciences in the Air Force Office of Scientific Research (AFOSR), received degrees at the Universities of Michigan and Maryland and was for many years associated with Johns Hopkins University.

Collins, chairman of electrical engineering from 1963 to 1969, has long been an esteemed member of IT's faculty, whose pioneering research has made invaluable contributions to laser technology worldwide.

Permanent University Fund Endowments

This issue contains an article on endowments (see page 18). This article details the history and purpose of the Permanent University Fund, which will now be used to create more endowed chairs. This fund permits the University to compete for the very best faculty and the fine graduate students who come to work with them.

IT is proceeding with the first steps in its long-range plan. By using our funding wisely, we will show that IT is a desirable investment, meriting continued and expanded support.

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enable top-level research; reducing teaching loads; increasing doctoral fellowships, including stipends equal to at least half the industrial starting salary of a new engineering graduate; encouraging engineering students to take more non-technical courses (such as economics, humanities, communications skills) earlier in their training and to specialize later; expanding work-study programs; and providing better precollege preparation in math and science.

The NRC study also suggested these changes for secondary education: increased student requirements; a reform of teachers' preservice education; more and richer inservice education; improved access to appropriate curriculum materials, facilities, and equipment; and better awareness of the need for science and math in the curriculum.

These goals parallel those of MHTC: we have and will continue to work to see that these goals are achieved in Minnesota. Our future depends on it.

ITEMS

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