



From the Institute of Technology, University of Minnesota

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Photo by Kevin Gutknecht

They're Back!

When the leaves change, so does the University of Minnesota. The return of students is evident—at campus restaurants, on Northrop Mall, and, most importantly, in the classroom. This issue of *Items* features photos showing some of the signs that mark the beginning of a new academic year. Above students receive help while registering for classes, which started Sept. 20. More photos on page 10.

Science and Technology Day:

Minnesota's technology needs examined

By David Siegel

Most government, business, and education representatives agree they must cooperate to meet Minnesota's future technological needs. This year's Science and Technology Day, set for Friday, Nov. 9, will focus on current and future cooperative efforts.

Sponsored by the Institute of Technology Alumni Society, the annual event features speakers from public and private groups, including Lt. Gov. Marlene Johnson and Erich Bloch, director of the National Science Foundation.

Alumni and spouses are encouraged to bring friends and attend the evening banquet, said Tom Rusch, publicity chairman for S and T Day and senior project scientist in the physical electronics division for Perkin-Elmer.

The evening banquet is the annual meeting of the Institute of Technology Alumni Society; this year ITAS is trying to generate strong interest among alumni, Rusch said. "Gather some friends and come along. View it as an alumni reunion," he said.

The theme follows a tradition of blending technological and social issues that have attracted public interest—"how the public and private can work together," said Kris Black, quality assurance supervisor at Sperry Corporation in Eagan and another S and T Day planner.

"We feel that development of our high technology industry isn't just the province of the companies here (in Minnesota). They need the educational resources to support the growth of technology companies," said Rusch.

Alumni this year have been invited to the noon luncheon at the Campus Club in Coffman Memorial Union. The cost is \$10. The afternoon seminar featuring five speakers follows and continues through 4 p.m.

At 1:15 p.m. in the Theatre Lecture Hall at Coffman Union, Rex Krueger from Control Data will talk about the case for balanced growth in technology-based development. Richard Caldecott, Consultant to the President on Technology Transfer and former dean of the College of Biological Sciences, will discuss the role of the University in technology transfer. Caldecott will examine issues surrounding patentable research that is jointly sponsored by public and private agencies.

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From the Dean

With help from many groups, IT begins formulating long-range plans

It is a distinct pleasure to communicate, for the first time through this column, with the alumni and friends of the Institute of Technology. I intend to use this space periodically to describe the institute—its activities, needs, and opportunities. I hope that through this forum, readers of *Items* will learn about the questions we confront and will take part in formulating thoughtful and imaginative approaches to our tasks and goals. All of us within the institute, and I in particular, sincerely welcome comments, suggestions, and recommendations to improve our educational, research, and service activities.

Since my arrival at the institute, my impressions about it—developed over 20 years of a distant acquaintance with its activities—have been confirmed. The physical sciences, mathematics, engineering, and architecture at the University of Minnesota have a well-deserved national reputation for teaching and research; in some cases—for example, chemical engineering—our programs are regarded as outstanding. The institute, encompassing all of these disciplines, is a solid institution with unusually strong traditions of excellence. It has served the University, the state, and the nation extremely well through its research and education of a large number of distinguished scientists, engineers, and architects. No doubt all of us—alumni, faculty, and students—are determined to strengthen the institute's research and scholarly programs, which ensure that our students will be extremely well prepared for their future professional and personal endeavors and that we will continue as the focus of scientific and technological activities in Minnesota.

These goals are clear; reaching them implies great benefits to Minnesota, both to its economy and its quality of life. Yet goals require planning; at this time we in the institute are devoting considerable energy to fashioning strategies and priorities for the use of human and financial resources. We believe that our plans will be stronger and better balanced if alumni and friends of the institute contribute to their formulation.

Planning is, of course, a continuing endeavor in any organization. There are times, however, when changes in circumstances, in perceptions, or in opportunities prompt a deeper, more introspective, and longer-range planning activity. This, I believe, describes the current emphasis at the Institute of Technology. Financial circumstances, both at the state and federal levels,



Ettore Infante

suggest optimism; people have renewed a commitment, both in Minnesota and throughout the country, to the idea that increased investments in science, engineering, and especially in young people are proper and desirable; scientific and technological opportunities abound across the broad spectrum of disciplines in the Institute of Technology. The Minnesota Legislature, during its last session, requested that IT develop a long-range facilities plan. It seemed appropriate to us at the University and the institute to develop a coherent plan for all of the institute's activities—a broad, long-range plan that would be based fundamentally on our educational, research, intellectual, and service missions within the state and the nation.

So far, the plan has outlined a number of thoughtful choices. While retaining and strengthening research and educational programs that are highly developed now (chemical engineering and mathematics, for example), we want to increase our activities in fields such as electrical engineering, computer science, and the material sciences—areas in which a combination of scientific opportunities, need for sophisticated personnel, and our location amid high technology industries require significant further emphasis. Unusual opportunities must be considered. The Twin Cities

area is the supercomputer capital of the world, and the University has the opportunity to become a national focal point for science and technology, for the basic research underpinning their use, and for appropriate university-industry applied research that leads to new developments. The institute rightly looks with considerable pride on the contributions made by its alumni in science, mathematics, engineering, and architecture. Education of the next generation of scientists, engineers, and architects is one of our essential missions. To do this properly we must carefully consider needs such as faculty, laboratories, library holdings, and general instructional facilities; in particular, we must ensure that appropriate study and lounge space is available to our undergraduates, most of whom commute to the University. Students learn not only in class and in the laboratory but also from each other; hence it is essential that space for communication among students be available.

Other questions being explored are the proper balance between undergraduate, graduate, and postbaccalaureate education, and ways to foster mutually beneficial relationships between IT and other state and private institutions that provide instruction in science, especially in engineering.

These are some of the questions we are considering. A careful and thoughtful analysis of these questions, and of the resources that we can bring to bear to address them, will lead to a long-range development plan.

Several committees from the IT faculty are contributing to this planning process. So are department heads. The Minnesota High Technology Council continues to be of great help, as does the IT Alumni Society Board of Directors. The planning process is proceeding within the entire institute, and in the near future tentative drafts of policies will become available to serve as a framework for further discussions by faculty, students, alumni, the University administration, and our industrial colleagues. We will then settle on a plan, ambitious but realistic, that provides a guide for our activities and a basis by which to judge progress toward our goals.

OAA-winner Lester Krogh demonstrates innovation and leadership skills at 3M

By David Siegel

Lester Krogh knows that sometimes it takes tenacity to make ideas work.

In the early stages of his career at 3M, Krogh invented a process that could adhere items to polyester film. He filed for a patent in 1955 and continued to perfect the process, using the technique to put material onto the film and color it. By coating the film and putting pressure sensitive tape on the back, it became an instant blackboard.

3M attempted to sell the invention to the United States government as a map paper, replacing materials that became soggy and wet in the field. But because Krogh's board made noise when used, the government decided not to buy the product.

That wasn't a setback for Krogh, though. The process is now used for making abrasive polishing agents for plastic lenses in glasses, for finishing the surface of diskettes, and for many other electronic, optical, and fine-finishing purposes. In fact, the adhesion technique was one of the keys to making the first successful videotape, Krogh said.

Krogh's accomplishments during his lifetime career at 3M have attracted attention. He will soon be honored with the University of Minnesota Outstanding Achievement Award, granted by the University Board of Regents.

"He's a good farm boy," said Larry Miller, chemistry professor and chairman of IT's chemistry department. Miller nominated Krogh for the award.

Krogh was born and raised in Ruskin, Neb. He attended the University of Nebraska and obtained degrees in chemical engineering and organic chemistry. After serving in the U.S. Navy, he earned a Ph.D. in organic chemistry from the University of Minnesota in 1952.

He spent two summers working for 3M and was offered a job as a senior chemist with central research laboratories when he graduated. Krogh progressed through company ranks, serving as manager for research and development in the abrasives laboratory, as director of the chemical research laboratory in central research laboratories, as general manager of new business ventures division, and as division vice president of commercial chemicals division. In 1982, he was appointed vice president for research



Lester Krogh

and development. At that time, he became a member of the 3M management committee.

Krogh oversees 3M's complicated research and development network. He is responsible for 6,000 research and development employees, 4,500 in the United States and 1,500 around the world. There are 48 divisional labs,

four sector labs, and one central research laboratory, where most long-range research occurs. It is the central research laboratory that works most closely with universities. 3M has arrangements with about 20 universities in the United States and Canada that allow students to publish research findings but still protect 3M's interest, Krogh said. The company also has established a program that gives grant money to nontenured professors across the country.

3M and the University of Minnesota work together, Krogh said. Last fall, Krogh helped organize a 3M/University-sponsored conference on electro-optic materials. Krogh's selection as an OAA recipient highlights that cooperation between industry and education, said Miller.

The University uses an extensive review process before OAA winners are chosen. Miller's recommendation was approved by the Institute of Technology Honors Committee, which gave Krogh's name to the University Honors Commit-

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IT starts microcontamination research center

Semiconductor and computer industries will be aided by a new Center for Microcontamination Research at the Institute of Technology.

According to center director Benjamin Y.H. Liu, the center's major research goals will be "to significantly reduce the particulate contaminant levels in clean rooms and to achieve zero-contaminant levels in gases used in semiconductor and integrated circuit manufacturing."

Significantly reducing contaminant levels in the clean manufacturing environment of the electronic industry is vital to improving the yield and performance of large-scale integrated circuits, particularly those with very large-scale integration and those of next generation electronic devices with submicron structures, Liu said.

The center, part of IT's mechanical engineering department, started with a three-year \$610,000 grant from four companies: Texas Instruments of Dallas, Texas, a major electronic company; Millipore Corporation of Bedford, Mass., a leading manufacturer of equipment for gas and liquid purification; Liquid Air Corporation of San Francisco, Calif., a leading supplier of

gases used in integrated circuit manufacturing; and TSI Inc. of St. Paul, Minn., a leading manufacturer of particle generating and measuring instruments. More corporate sponsors are expected.

The center is an outgrowth of the Particle Technology Laboratory, which has gained national and international recognition for its basic and applied research on airborne particles.

"The microcontamination research center will bring the expertise and resources of the (existing) laboratory to bear on a problem of major importance in integrated circuit and computer manufacturing," according to Liu, who is also laboratory head.

As home to several national electronic and computer firms, the Twin Cities is already a major electronic manufacturing center. Plans for a supercomputer institute at the University, the University's current Microelectronic and Information Sciences Center, and the new center will further enhance the state's position as a focal point of activities in the electronic and computer area, Liu said. Further information about the center can be obtained by contacting Liu at 612/373-3043.

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tee. That committee recommended him to the Board of Regents, explained William Pohl, mathematics professor and chairman of the IT Honors Committee.

"A primary factor was his success at 3M," said Miller. "In addition, he has a record of being a civic leader and being interested in the scientific community. He's an all-around nice guy." He has served on PTA curriculum committees and as Chairman of the Board of Centennial United Methodist Church and the National Home Fashions League Educational Foundation. He has been a director of the Minnesota Academy of Science and the Eastern Heights State Bank. He is a former member of the American Industrial Health Council's Board of Directors and a current member of the American Industrial Hygiene Foundation.

"I have always enjoyed talking to younger people who were doing research at the bench. I want to make them feel that's what happened to me could happen to them."

With a department as large as his, Krogh admitted it's difficult to keep in touch with all of the laboratory workers. He initiated an annual state of the department address at 3M to give employees the opportunity to ask questions with no recriminations. "Whatever you're managing, you've got to be seen." He also has top-notch people to brief him, and he reads countless reports.

In addition to communicating with staff, Krogh keeps a close watch on the international research picture. Representatives of 3M are constantly traveling to other countries to gather information. "What we try to do is be sure we're staying abreast of research in the United States and around the world," Krogh said. "We don't want to get left sleeping at the switch."

Despite its size, Krogh believes 3M has managed to encourage the entrepreneurial spirit. "3M will continue to be an innovative, entrepreneurial type of company with a more diverse set of technologies from which to draw," he said.

Krogh said 3M researchers will continue to work toward filling unusual market niches. The company's commitment to research will continue to grow, and a greater portion of research and development money will be spent in the area of basic research, following an industry-wide trend, he said.

That has led to exciting projects. When the next space shuttle goes up, it will contain 3M experiments, the first organic experiments run in space, Krogh said. The objective is to use organic solvents to make large, defect-free crystals, he explained. The company has plans for thin film experiments on later shuttles.

Krogh spends about 60 hours a week at the office, and he travels and lectures as well. He has between 30 and 40 speaking engagements scheduled this year.

Sometime in fifth or sixth grade Krogh became interested in chemistry. "I was an avid reader. I found a chemistry text." Naturally he read that for fun. After that, "I knew I was going to be a chemist," he said.

His mixed background of chemistry and engineering has "stood me in good

stead. The engineering has been extremely valuable." For Krogh, the toughest thing has been deciding what position at 3M he has enjoyed the most.

"I left abrasives and I didn't believe I'd been there 10 years. And it's been that way in just about every job," he said.

In his speeches, Krogh often talks about making research pay for itself. At 3M, it benefits both the stockholders and employees, as well as creating new jobs. A good research and development company must continue to grow. The company already has 85 different technologies and Krogh expects that number to increase. Understanding all of them "is the challenge of 3M," he said.

Krogh enjoys photography, golf, and handball. He decorates his office on the 14th floor of the 3M tower with rotating sets of photographs he has taken. He said he has more than 20 sets.

The challenge of 3M's array of technologies and products and the thrill of working with young researchers are among the highlights of Krogh's career.

"I have always enjoyed talking to the younger people who were doing research at the bench," said the 59-year-old Krogh. "I want to make them feel that's what happened to me could happen to them."

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Michael C. O'Donnell, a member of Gov. Rudy Perpich's staff who heads the Office of Biomedical Health Systems and is chairman of the Medical Tech Task Force, will explore ways Minnesota can maintain medical technology leadership.

Public and private partnerships will be the focus of the next two speakers involved with Minnesota Project Innovation, which helps entrepreneurs obtain federal and state grants for research and development. Kathleen McLaughlin, director of Minnesota Project Innovation, will speak first, focusing on the importance of innovation and entrepreneurship. Timothy Flynn of Peat, Marwick, Mitchell and Co., will then explain more about Minnesota Project Innovation and ways the public-private partnership works.

The banquet is at 6 p.m. at the Radisson South Hotel in Bloomington, Minn. The cost is \$19.50. Tables will be arranged by departments to give alumni an opportunity to meet new colleagues, Black said. Lt. Gov. Marlene Johnson will speak, and IT Dean Ettore Infante will introduce Erich Bloch, new director of the National Science Foundation and former IBM vice president.

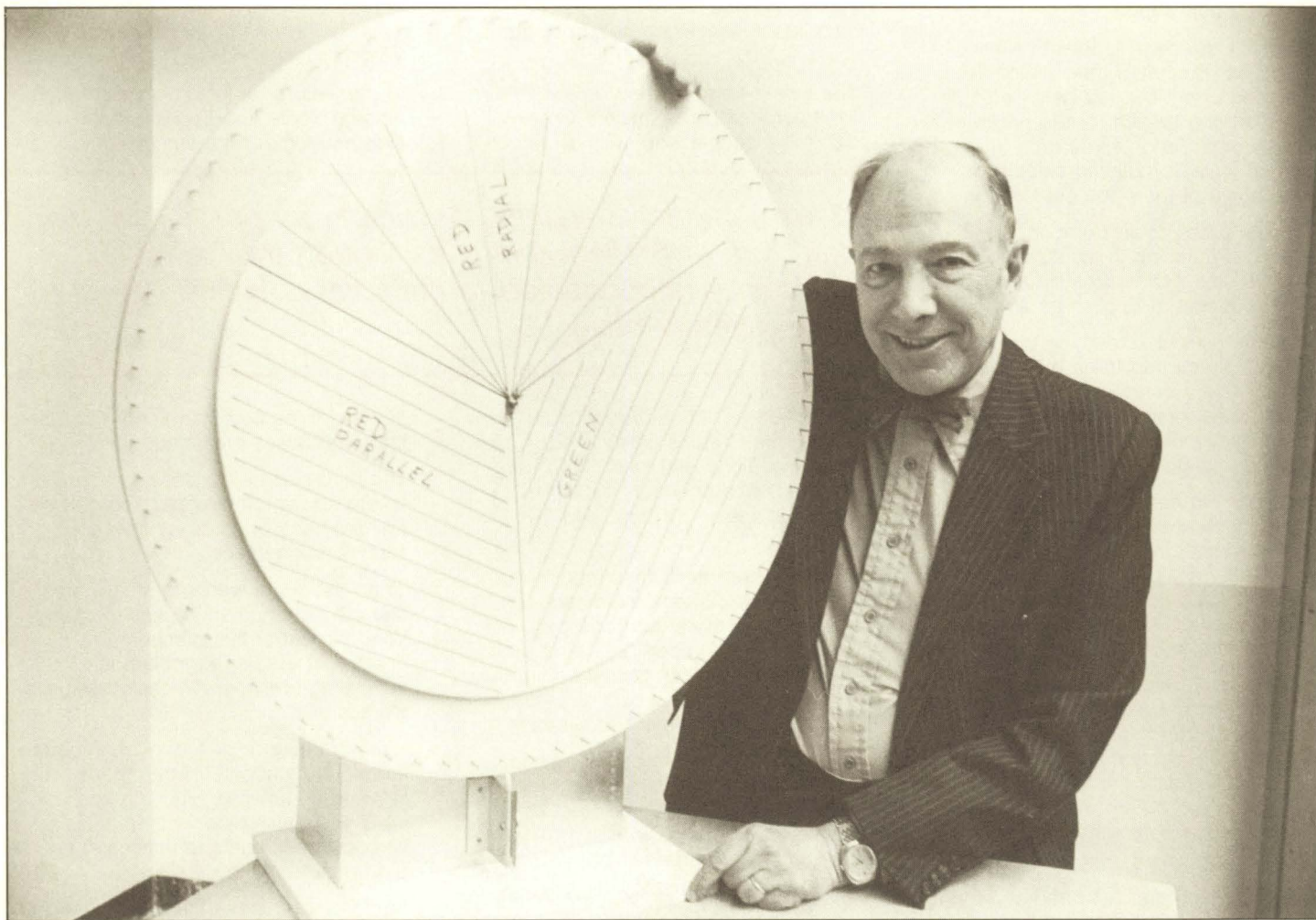
The banquet is the major fund-raising activity of the IT Alumni Society, whose members organize virtually every detail of the event. Companies traditionally purchase tables as sponsors. Proceeds support IT student scholarships, the George Taylor teaching award, and student activities such as IT Week, Technology Fair, and *Connections*, a student publication. Part of *Items* and ITAS's operations also are supported by these funds.

This year's George Taylor Institute of Technology Distinguished Teaching Award will be presented at the noon luncheon to physics professor Walter Johnson. Lester Krogh, vice president for research and development at 3M, will receive the University's Outstanding Achievement Award at the banquet.

Black said the planning committee expects between 150 and 200 people for the afternoon seminar, and 900 for the banquet. Legislators will be invited to the evening banquet, she said.

The overall chairman for the event was Don Sudor from IBM Rochester. Curtis Green and John Kugler handled solicitation from companies. Pat Dwyer arranged the banquet. Jack Braun of Braun Engineering Testing Inc. is ITAS president.

"There's been quite a few people involved, and each in their own way has done a super job," said Sudor.



Regents' Professor Lawrence Markus uses a homemade roulette wheel to demonstrate the laws of probability.

Photo by Tom Foley

Regents' Professor Lawrence Markus keeps honors students interested in math

By Maureen Smith

One way to keep students interested is to dazzle them: perform experiments that look like magic and show them how mysterious and complicated everything is.

Regents' Professor of Mathematics Lawrence Markus, who taught a freshman-sophomore honors course this spring on fundamental mathematical ideas, does it another way. He shows students the deep-down simplicity of things.

"I like to keep everything as simple as possible," he said. "I don't like to present things as though they're magic and totally unconnected to the level of knowledge students already have."

Three topics were covered in the class: probability laws of large numbers, Boolean algebra (or mathematical logic), and geometry of five dimensions.

"Logic and probability are both subjects that go very deeply into mathematics, yet they are both easy for beginning students to appreciate," Markus said.

Markus uses a homemade roulette wheel to illustrate the laws of probability and simple mechanical devices to demonstrate mathematical logic. He could put together fancy machines with flashing lights and whistles, but he prefers to keep the devices simple—"the simpler the better to see the inner core of the idea."

Take the device Markus used as he began his discussion of logic. "To be," he said, flipping a switch to set off a bell inside a small box. "Or not to be," flipping the switch in reverse and setting off the bell again. The device, which Markus calls Hamlet, illustrates the principle that "either a statement is true or it is not, at least in mathematical logic."

"To be or not to be—of course when Hamlet said that, he was not making a statement about symbolic logic. He was musing in a dramatic way about whether or not he should kill himself because of his concern about family problems."

In another demonstration, Markus dropped metal balls down a transparent tube. The tube had two stoppers, which Markus called the red gate and the green gate. The simple reasoning device could test the truth or falsity of the statement: "The red gate is open *and* the green gate is open."

A ball fell through the tube and clanked at the bottom. "True," Markus said. "It did its thing." The point was obvious—everybody knew the ball was going to drop—but Markus was building to something larger.

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A similar device, a tube with two branches, illustrated the mathematical meaning of *or*. The red gate could be open on one branch, or the green gate on the other, and "if you drop in enough balls, simulating electric current, some of them will get through."

Or both gates could be open. "*Or* has a special meaning in symbolic logic," Markus said. "*Or* means what's ordinarily counted in English as *and/or*."

Now the leap to something larger: "Suppose you had three million gates. You'd have a computer. Symbolic logic is the basis for all the multi-million-dollar or multi-million-pound or multi-million-yen computers in the world."

And, *or*, and *not* are the only logical components that are used, or could ever be used, in a computer, he said. A powerful computer is "merely a large collection of these three types of elementary logical circuits connected to one another in intricate patterns."

In presenting each topic, Markus shows connections between the mathematical ideas and other things students know about. In the section on probability, besides playing with the roulette wheel and doing some card tricks, he talked about statistical sampling and political polling.

How can a pollster tell if more voters in a state favor Mondale or Hart? "We don't talk just about the mathematical side but the political side—not whom you should vote for, but how do you select a random collection of voters. That is not a mathematical question. Everything is not contained in the math," Markus said.

"The math can be added up right, but it just means you added up your grocery bill right. Maybe you had the wrong bill."

Some things that are true by the laws of probability are not what would be intuitively perceived. For example: what are the odds that two people in a group of 25 will have the same birthday? Intuitively, most people think the likelihood of a match would be small. In fact, it's better than 50-50.

But Markus doesn't expect students to take his word for it. He helps them to think it through. "The hint is that 365 is too big a number to think about," he said. "Let's think about four people at a bridge table and whether any two will have the same birth month." Once that problem has been solved, the same process can be used with the bigger numbers.

"That's enough hard stuff. Let me now talk about funny stuff," Markus said near the end of a lecture on logic. You

can go only so far in logic before running into a perplexing puzzle or paradox.

The oldest paradox may be the Cretan liar's paradox. "The ancient Greeks didn't like people who lived on the is-

"I like to keep everything as simple as possible. I don't like to present things as though they're magic and totally unconnected to the level of knowledge students already have."

land of Crete," Markus recounted. "They said Cretans always lied. A Cretan came along and said, 'I am lying.' This sentence is queer. If it's true it's false, if it's false it's true. You give up."

A more recent mind teaser is known as Richard's paradox. Numbers can be expressed in more than one way. For example, the number 729 could be expressed as 36. Now consider this: the smallest number that cannot be described with less than 100 symbols.

Count the characters or symbols in that statement—60 letters plus a period. The smallest number that cannot be described with less than 100 symbols has just been described in 61.

Richard's paradox is "so bewildering that nobody knows what to do with it," Markus said.

Markus likes to give students some mathematics history and talk about some of the personalities behind it. "A lot of people don't recognize that mathematics has historical development.

They think if it's mathematics it's true," he said. "We know things people 300 years ago didn't know."

In the lecture on logic he talked about George Boole, the English mathematician and logician for whom Boolean al-

gebra was named, and Leonhard Euler, the great Swiss mathematician.

The third part of the class, on the geometry of five dimensions, focused on the geometry of orbits, or how you steer through space.

"If an astronaut wants to steer from one orbit to another, he has to change from one set of five numbers to another. It's really a problem in navigating in higher-dimensional space," Markus said.

"I'm not going to give enough information so the student will quit the University and go down to Houston and ask for a high-paying job," he said. He is introducing students to concepts, not giving them all the details.

Students who leave the class may not be ready for careers as astronauts, but they won't be coming away with nothing. When you've learned some fundamental ideas from a Regents' Professor, and you've had fun in the process, you're probably going to remember it.

Physics lab construction begins at Soudan Park

Construction for the new underground physics laboratory in northeastern Minnesota's Tower-Soudan State Park has started.

This facility will house a 1,000-ton proton decay detector, which will be used to help scientists understand nature's fundamental interactions by searching for the spontaneous decay of matter.

This experiment represents a collaboration among physicists at the University of Minnesota (Professors Hans Courant, Kenneth Heller, Marvin Marshak, Earl Peterson, Keith Ruddick, and Michael Shupe) and physicists at the Argonne National Laboratory, Oxford University, the Rutherford Appleton Laboratory of the United Kingdom Science and Engineering Research Council, and Tufts University. Financial support for this \$10 million project has

been received from the U.S. Department of Energy, the government of the United Kingdom, the state of Minnesota, and the University of Minnesota.

The new laboratory, which will be 235 feet in length, 45 feet wide, 38 feet high, and located 2,400 feet underground, is scheduled for completion by late spring. Then the installation of the proton decay detector will begin. Half of the detector modules will be assembled in Chicago at the Argonne Laboratory, while the other half will be shipped across the Atlantic from England.

The engineer for the \$1.5 million civil construction phase of the project is Charles Nelson and Associates, Minneapolis. The general contractor is Glenn Rehbein Excavating, Lino Lakes.

Chemistry prof travels around the world

By David Siegel

Chemistry professor Robert C. Brasted figures he can get a free cup of coffee almost anywhere in the world.

That could mean Singapore, South Africa, Hong Kong, Delhi, or the far reaches of the Soviet Union. He has been to all of those places and more during his 37-year career at the University.

Brasted has traveled around the world nine times and logged more than 1 million miles, 70,000 in India alone where he has been nine times. Memorabilia from his trips crowd his office. On his desk sits a metal nameplate written in English and Hindi. Stuck to his walls are maps of India and even a Russian notice—"disinfection done"—taken from a rather decrepit bathroom in Siberia. Pictures and an airline travel record hang above a collection of some 15 medals and awards.

Brasted is concerned about the quality of education on an international scale, as well as at the University. Often he addresses departments, societies, and academies around the world on the subject of education and on his research.

And he learns from his travels. After returning in 1982 from South Africa, Brasted gave a 20-hour honors colloquium on the political and economic situation there. He once used a chemical phenomenon he saw in Yugoslavia for an article relating real-life situations to chemical theory. The natural water in a sequence of Yugoslavian lakes has a high concentration of calcium hydrogencarbonate. Sticks and other objects that fall in the lakes become like "instant" stalactites covered with a white, coral-like substance—as a result of the chemical makeup of the lakes, he said.

In all his travels, Brasted has found no place (other than home) he likes better than New Zealand. "The mountains are elegant. The people are friendly."

Now after two Fulbright Fellowships in Germany, guest professorships in India, Costa Rica, Taiwan, Tokyo, South Africa, Colorado, and California, and four distinguished teaching awards, including one from the University of Minnesota, Brasted may be honored once more.

He is one of two final nominees for the 1986 presidency of the American Chemical Society, which has about 130,000 members and is one of the largest professional societies in the world. Balloting will be completed in early November.



Photo by Kevin Gutknecht

When not traveling around the world, chemistry professor Robert Brasted is "at home" in his University office.

The presidency is a three-year responsibility and would occupy much of the 69-year-old Brasted's time. That should present few problems, though, as Brasted is contemplating retirement within two years.

He plans to travel abroad interviewing international students who wish to come to the United States, testing their professional competency and communication in English. Then he could make a determination about their qualifications as teaching assistants. The timing of this project, as well as a Foreign Scholar Award to Japan, is dependent upon the election.

He keeps in touch with many former students. About half are involved in academics; others are with private industry. He stopped counting students at about 40,000. "I'm not egotistical enough to say I taught them all," he said. "I've stood in front of them and tried, however."

But if awards, certificates, and honors are any indication, he has done more than teach his students; he's taken an active interest in their lives.

Brasted knows the University can intimidate students because of its size. The general chemistry program has between 5,000 and 6,000 students each year. He works hard "to make them feel that they're not just a number. That door's never closed," he said, gesturing toward his office door on the second floor of Smith Hall.

All four of Brasted's children have attended the University, although one re-

ceived his bachelor's degree at St. Olaf College. "I don't believe that the one who went to the smaller school has any larger circle of friends. You must reach out when you come here, as well as any other school. You can't expect people necessarily to come up and say, 'I want to be your friend.'"

Brasted's book shelves are stacked with such publications as *Inorganic Chemistry*, the *Journal of Chemical Education*, and other professional publications to which he has contributed. The bottom drawer of one of his many file cabinets remains open, jammed with files of student projects and records. Copies of 14 books he has authored or coauthored are scattered among other chemistry texts.

Staying informed about changes in the field can be difficult. Computers provide almost unlimited resources in research and teaching, he said. Some research cannot be done without them. Students still need to have the basics: "I want them to be able to do some things in chemistry the 'hard' way," he said.

To help students, Brasted has recorded a series of 31 instructional tapes that are available at University Learning Resource Centers. He also has acted in a Hollywood film; in 1962 Brasted spent a week at Wexler Studios, Hollywood, preparing an elementary chemistry film financed by the National Science Foundation. He was the sole actor in the 20-minute film, translated into many languages.



Photo by Teresa Fett

Thanks

From left to right: Russell Hobbie, IT associate dean; John K. Munson, vice president, marketing liaison, Calma Company; Gordon Beavers, IT associate dean; Robert Buck, professional recruiting and university relations, General Electric; Lewis Edelheit, general manager, GE Medical Systems' CT Programs Department; IT Dean Ettore Infante.

Productivity Center receives General Electric donation

General Electric Company has donated to the University advanced automation and design systems with a value of more than \$300,000. The company's donation of an MC 2000 controller and

a P-50 robot to the Department of Mechanical Engineering's Productivity Center will permit the Institute of Technology to "significantly advance" its development of an integrated, automated flexible machining cell, according to Kim A. Stelson, assistant professor of mechanical engineering.

GE's Calma subsidiary also donated a Calma System II with DDM system software to the mechanical engineering department for computer and engineering graphics and robotics studies.

"The new Apollo-configured Calma system will provide students in our senior and graduate programs with experience on modern computer-aided design equipment," said Max Donath, associate professor of mechanical engineering. "The Calma system will also be used by students taking a graduate level seminar in robotics and artificial intelligence," Donath added.

The 1984 GE and Calma grants to the University of Minnesota, in addition to equipment donated earlier this year, are part of a \$3.6 million General Electric Engineering College Equipment Assistance Program for several key engineering schools in the United States. The grants to the University of Minnesota were arranged through L.S. Edelheit, General Manager of GE Medical Systems' CT Programs Department in Milwaukee, Wis.

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Brasted is looking forward to the \$16 million remodeling of Smith Hall over the next four years. The remodeling is much needed to keep the department and its teaching facilities current, he said.

Much research in the chemical field is now focusing on catalysts that help break down basic compounds, such as water, to bring out pure fuel resources, such as hydrogen. Brasted also said work in one of his research areas of sulfur and nitrogen ring systems continues to be popular. This research has some potential in T.B. chemotherapy and possibly even anti-radiation drugs.

Throughout his career Brasted has worked closely with industry, which he would like to continue to do as a consultant.

Over the years, his experiences with students has involved about everything from chemistry to divorce to suicide. "Ninety percent of the chemistry will not stay very long with a student; I'm sure they hope it will linger long enough to pass the next exam," he joked.

He hopes that students remember him as "somebody that's human. I'm interested in the student. I'm especially interested in what they're going to make of themselves."

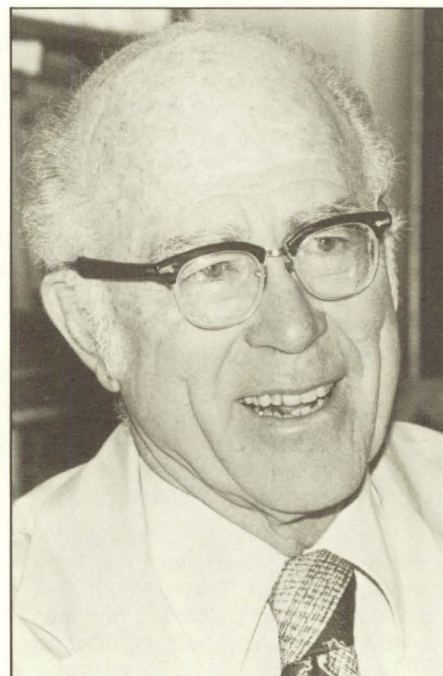


Photo by Kevin Gutknecht

Robert Brasted



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The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, handicap, age, or veteran status.

EE prof heads team that develops device

IT researchers are developing a device that "listens" to joints and could be used to diagnose and monitor joint problems.

"It's so simple that it's surprising that nobody ever thought of it before," said James Holte, electrical engineering professor and head of the invention team, which also includes researchers in radiology, orthopedics, dentistry, and veterinary medicine.

A small buzzer on the device beeps sound waves into the skin over a bone, while a microphone held elsewhere over the skin retrieves the sound as it comes out.

The biotechnology device has listened to human jaws to diagnose clicking and locking problems. Jaws and hips of four dogs and 21 human jaws have been tested. The tests so far show that troubled joints emit a pattern different from normal.

The device might be able to precisely diagnose hip problems in the elderly—including monitoring the fit of artificial hip joints, a very common operation—and diagnose arthritic deposits in any joint from the hand to the knee to the spine. A whole-body joint survey and basic research on how joints manage the loads they must endure in ordinary functioning are possible, Holte said.

"There are no dangers that I can imagine," Holte said. People who wear

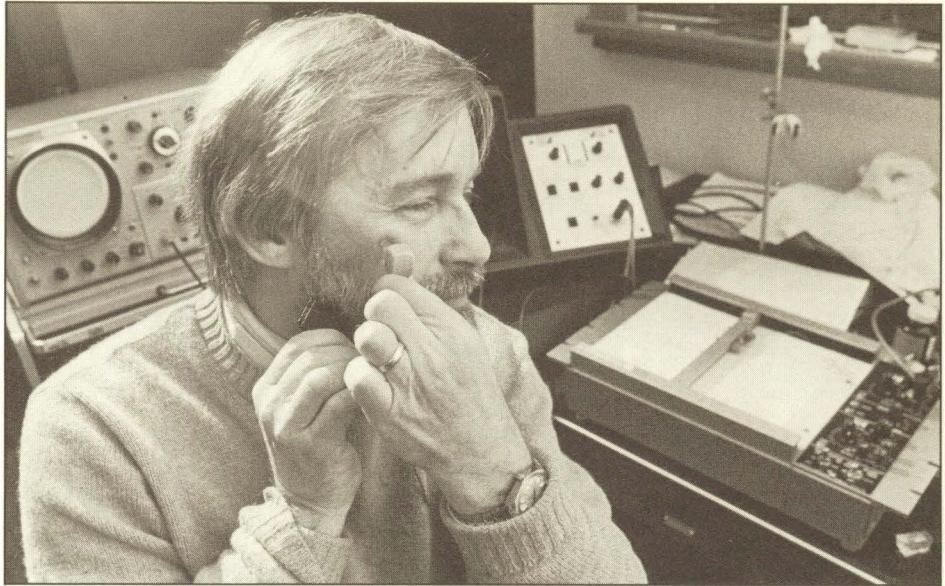


Photo by Charles Bjorgen, courtesy of the Minneapolis Star and Tribune

James Holte, associate professor of electrical engineering, tests the device that diagnoses joint disorders.

an earphone radio or attend a symphony or rock concert expose their bones to more sound than this device produces, he said. The device should sell for about \$3,000, inexpensive compared to other medical equipment.

Starkey Laboratories, the Minneapolis company that custom designed the prototype for the researchers, plans to apply for a patent for the device and

to involve the researchers in the effort, according to David Preves, Starkey's vice president for engineering.

Researchers are still experimenting with other locations on the face, including the chin and teeth, to place the sound emitter and the microphone. They also want to learn more about the way audible-frequency sound waves move through bones and tissues.

Patent office reorganization to benefit faculty and industry

By Deane Morrison

A reorganization of the University's offices of research administration and patent administration should speed up the patenting of inventions by University faculty and help industries seeking information on faculty consultants or on the use of University facilities.

The two offices have been combined under the leadership of Anton Potami, former acting director of the patent office, who is now assistant vice president for research administration and technology transfer. John Thuente, a patent attorney, has been director of technology transfer and licensing since February.

"Our objective is to improve the performance of the patent office," Potami said. "We want to encourage faculty to tell us about as many inventions as possible, and we'll get them evaluated."

Thuente has hired two licensing assistants to help evaluate faculty inven-

tions, a process that should take a couple of weeks after the patent office is informed of the plans. The University would like to see marketable inventions licensed to companies, but Potami said that both faculty and companies seem to have misconceptions about the patenting process and University policy.

"Some companies and faculty think the patent office won't give an exclusive license to a company sponsoring research at the University or outside the state. That's a fallacy," he explained. "We can, and prefer to, give licenses to these companies, but we must have safeguards that the company will use the license well or else the company will forfeit it."

The Office of Research Administration and Technology Transfer and a University faculty committee are working on guidelines to govern the University's dealings with industry on matters such as patents, conflicts of interest, and the role of graduate students in joint endeavors.

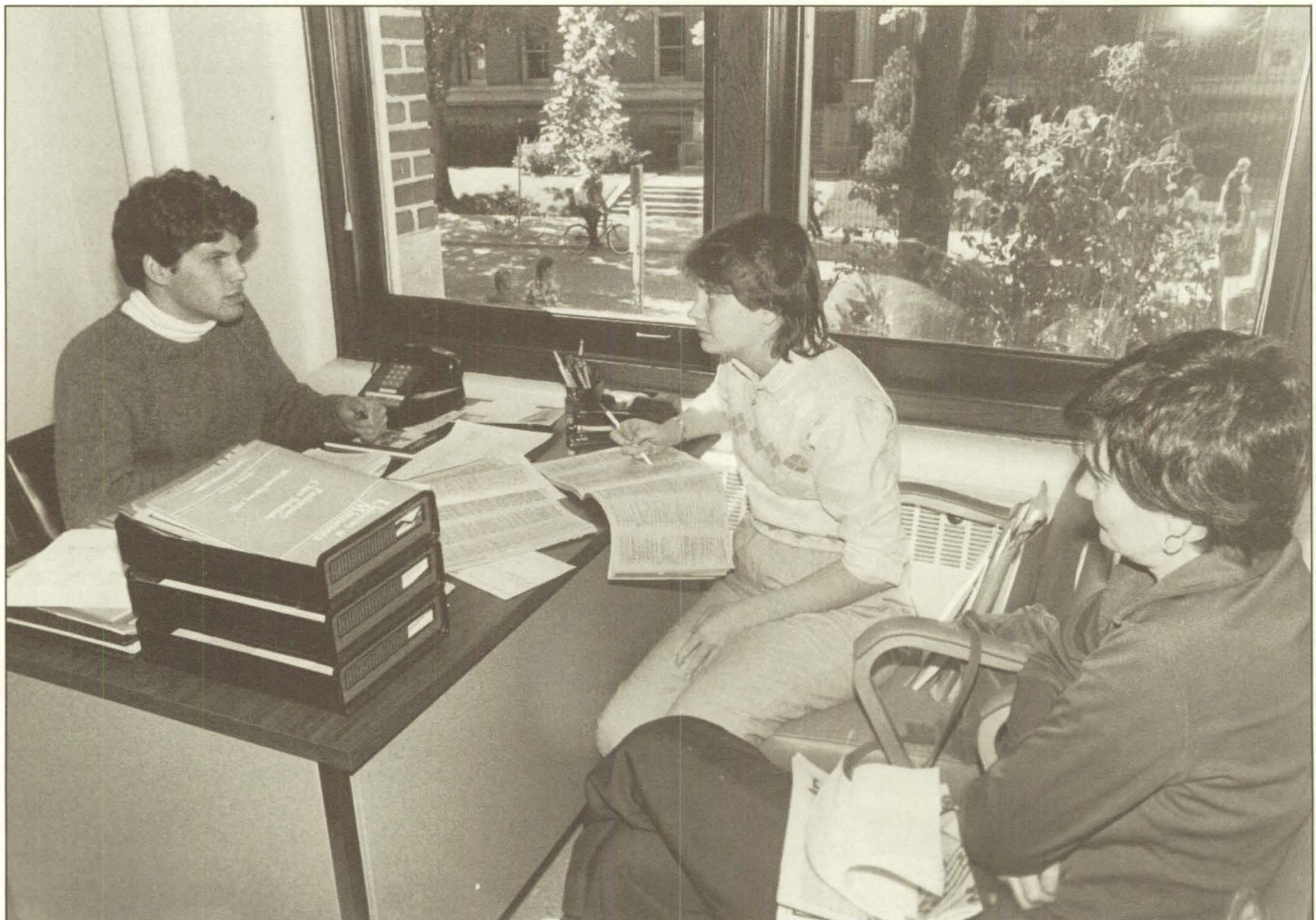
The University's patent policy calls for a patent committee composed of faculty members. The patent office recently received permission from the Board of Regents to expand the committee from eight to 12 members. Potami hopes the committee will establish a network through the various colleges and departments to identify faculty members who may have patentable inventions. He would like the committee to determine if the patent policy gives incentives for patenting, provides adequate safeguards for inventors and the University, and enables the licensing of technology. He also wants to know if the policy restricts interactions with industry.

"There have been problems in the past due to insufficient staff and not putting emphasis on the functioning of the patent office," Potami said. "Now we see the importance to the faculty, the University, and the economy. We want to be a focal point for industries with questions on faculty consultants or University facilities."

Fall spells school's traditional season opener



Students find two popular forms of transportation—bikes and buses—to take them back to school. Both the bike rack near the Civil and Mineral Engineering Building and the bus stop outside Amundson Hall provide spots for IT students to load and unload.



As part of IT's peer advising program, new IT electrical engineering freshman Lorrie Visco from Somerville, N.J., and her mom Theresa received information about IT and some friendly words from advisor and aerospace engineering junior Tom Wittrock.

Photos by Kevin Gutknecht

Math project challenges top students

By Deane Morrison

Most high school students are happy if they can handle the amount of mathematics homework they get on a regular night, but not Laurie Christianson. The 14-year-old high school freshman drives 65 miles every Thursday in search of challenging mathematical courses.

She is one of 433 Minnesota students attending the University of Minnesota's Talented Youth Mathematics Project, which gives gifted youngsters a crack at advanced math courses that are not taught early enough—or not at all—in their own schools.

"I don't really mind commuting," Laurie said. "Here we have a chance to work faster than in regular math classes, so we don't have to keep going back over stuff we've already learned. There are two others from Owatonna here; our parents take turns driving."

UMTYMP offers students like Laurie, who otherwise would face the frustration of sitting through classes well below their mathematical ability level, accelerated courses in high school and college math. The students can master algebra 1 and 2 in their first year at UMTYMP, then complete geometry, trigonometry, and other precalculus subjects in their second year, and spend the next three years chalking up as many as 30 college honors calculus credits. The courses offer bright students a specially developed curriculum tailored to their high abilities and taught at a rapid pace they can handle in a positive, supportive, and encouraging atmosphere.

A better idea of the pace comes from project director and mathematics professor Harvey B. Keynes. The UMTYMP is a highly valued service of the School of Mathematics to the local school districts, he said. "Regular Minnesota high school algebra courses, both beginning and advanced, average 180 contact hours per year per course, or 360 total hours for both courses. The UMTYMP covers two years of high school mathematics in just 60 hours, or in one sixth the usual time period."

The project is a continuation of the Minnesota Talented Youth Mathematics Project, which began in 1976 in the Twin Cities and Duluth with funding from the federal Department of Education and help from an advisory board set up by the Minnesota Department of Education. The initial Twin Cities program, housed at St. Paul's Hamline University, comprised just two courses in algebra: one for ninth graders and another for seventh and eighth graders.

From 1977-78, MTYMP offered one algebra and one geometry/trigonometry class. This was the pattern until June 1980, when the federal grant expired and the University of Minnesota took over the project. The UMTYMP got a vital boost from two private contributors, Mrs. George W. Taylor of Rockford, Ill., and James M. Vaughn of Houston. Their support and a grant from the University helped the program expand to include calculus classes.

This year the UMTYMP offers 12 classes on the University's Minneapolis campus: students may enroll in algebra, geometry/trigonometry, and precalculus, or first-, second-, or third-year calculus. New this year are outreach programs in Rochester, Owatonna, St. Cloud, and Fargo-Moorhead, each of which offers an algebra class. Instructors are chosen from outstanding local high school and college teachers. Enrollment this year for the four outreach classes is 110 students, and the total UMTYMP enrollment reached a record 433 students.

Some of the participants have managed feats that would be remarkable for students several years older. Last year, for example, a 12-year-old seventh grader in the first-year calculus class scored a perfect 800 on the national Scholastic Aptitude Test in math. Three other students, ages 12 to 14, scored at or above 760, which represents the 99th percentile of all college-bound high school seniors who took the SAT in math. This year, UMTYMP students posted five of the top 11 scores and seven of the top 21 in a field of 12,352 students who took the Minnesota section of the American High School Mathematics Examination.

For all their mathematical prowess, UMTYMP students are far from the image of the bespectacled young geniuses who can talk only in equations. "These young people are extremely talented in other areas," Keynes said. "Many have won prizes and honors in music competitions, debating and oratory activities, and various athletic competitions. These students generally dispose of the myth that mathematically talented students are only interested in mathematics." Still, many plan careers in math, science, or engineering; a sampling of UMTYMP 1983-84 calculus graduates turned up such career fields as astrophysics, robotics/artificial intelligence, biochemistry, mathematics/music, and ownership of a small genetics/artificial intelligence firm.

A vexing problem for the program has been retaining female students who have successfully completed their first

year with UMTYMP. The most common reasons for not returning were the availability of geometry in local schools and a desire to take classes with friends at home. But Keynes thinks things are improving.

"We've seen a big increase in the numbers of new and returning female students this year," he said. "The algebra class in Rochester, in fact, is more than 40 percent female. One third of the 155 new algebra students in the Twin Cities are female, the highest percentage and number in the nine-year history. I think it's becoming more socially acceptable for women to do this sort of thing. Also, half of the teaching staff are women, and that probably helps."

Keynes said that a fair number of UMTYMP students choose to attend the University, but there is room for improvement. "Financial aid packages are not quite as good as at many private schools," he said. "Also, these students are looking for strong peer relationships, which you get in honors programs and small classes with students of similar ability. We have to offer more aid based on merit. And the Institute of Technology needs a stronger honors program and more small classes." He added that IT gave merit scholarships to two UMTYMP graduates this year and that Dean Ettore Infante is committed to doing more to attract high-ability students.

The state of Minnesota now provides the bulk of support for the project. The Legislature approved \$90,000 for the 1983-85 biennium and an additional \$75,000 for expansion and the outreach program. But, said Keynes, more support from both state and private sources is necessary as the project inevitably grows. For example, students enrolled in algebra at the outreach sites this year will need courses in geometry and precalculus next year. He feels that the fees and tuition should be contained in order to maintain a wide appeal, and that state support cannot increase indefinitely. Thus, Keynes hopes that corporations and foundations will assume a greater share of the costs.

"Without such a program, gifted students just suffered along with classes that went too slowly," Keynes said. "The UMTYMP focuses attention on the needs of gifted and talented students in Minnesota. The parents and home schools have been tremendously supportive of the UMTYMP. We have been very pleased by its enthusiastic acceptance and excellent success."

New School of Architecture head named

By David Siegel

Harrison Fraker believes a building should convey a message.

"In designing a work of architecture you have both the opportunity and the responsibility to say something of value. If you don't realize that fact you probably won't set out to communicate useful ideas," said Fraker.

Fraker will be setting forth his beliefs about architecture, and helping to chart a long-range course for architecture education as the new head of the University of Minnesota School of Architecture and Landscape Architecture. He assumed his position as the fourth head of the school in October.

The former Princeton University professor replaces Ralph Rapson, who directed the school for the past 30 years and established its reputation as a leader in architectural design and architectural education.

At Princeton, where he received his B.A. in 1964, Fraker's early emphasis was on architectural history and theory. He particularly enjoyed studying the Renaissance and did thesis work exploring the place of windows and doors in architecture.

Fraker spent the first year of his graduate studies at the Cambridge University School of Architecture. Architectural theory was a focus, but Fraker was determined to test theory through practical application in buildings.

After obtaining a Master in Fine Arts from Princeton's School of Architecture and Urban Planning in 1966, Fraker began working for Geddes, Brecher, Qualls, and Cunningham.

He contributed to the design of the Southern Illinois University Humanities and Social Science Building, which won an Honor Award from the American Institute of Architects. He also worked on the Rutgers Humanities and Social Science Center at the Newark, N.J., campus and on the Institute for Advanced Studies at Princeton.

While teaching at Princeton he became interested in energy and its applications to architecture. His work with energy concerns led to the formation of the Princeton Energy Group, a research and consulting firm that has received more than \$2 million in grants for energy research.

Fraker is particularly proud of the Princeton Professional Park, a suburban office complex designed by Harrison Fraker, Architects. Three buildings use central atriums to collect

heat and to distribute daylight. Designing the buildings required a combination of technical research, architectural design, and architectural scholarship—"a major experience in comprehensive thinking," as Fraker describes it.

The firm also designed six branch libraries for a New Jersey county library system. Each facility uses solar energy and all were created to complement surrounding buildings.

Fraker's corporate experience with management, research, and design have been blended with university ties to give him a strong understanding of the role of a school of architecture. He looks for an effective mix of history, technology, and theory to reinforce design. He also wants to provide opportunities for faculty development by helping faculty obtain funding for research.

His interest in architecture began early. As a child in Princeton, N.J., Fraker built American Flyer train sets with his father, a publisher. Before entering college, he designed a prize-winning yacht. He struggled between a strong

interest in English and architecture. "I guess I liked exercising both sides of the brain. I just found the architecture much more compelling."

But Fraker has continued to write, and his research is widely published. He has received many honors and awards, including those from the New Jersey Society of Architects, *Progressive Architecture*, and the Fifth National Passive Solar Conference.

"It's an exciting age for architecture. There is substantial public interest in the field, and the profession is in a period of great fervor. There's also a renewed and healthy interest in architectural history. Architecture schools must encourage intelligent and literate solutions to problems. Architecture is more than the building of buildings."

Fraker said he hasn't had time to fully absorb the potentials of his new position. "But there's no question about it. I'm excited," he said. "One of my major goals is to enhance the theoretical background of graduates so that the kinds of buildings they design contribute to architectural ideas as a whole."

Alliance for Science public hearings held

Minnesota Alliance for Science representatives shared plans to improve math and science education with teachers, parents, business people, and government representatives at 10 statewide public conferences in October.

The alliance, a public-private partnership sponsored by IT and the College of Education and funded by the Bush Foundation in St. Paul, was formed to find methods for improving the science and math skills of secondary and elementary students.

Discussed at the conferences were strategies for sharpening students' math and science skills. The approaches include: increasing awareness that knowledge of science is necessary to function in society; linking math and science teachers in secondary and elementary schools with people who use the sciences in the private sector; improving science and math curricula; enhancing teacher training; proposing relevant public policy; and building local alliances for science.

Conference sites were Rochester, Mankato, St. Paul, St. Cloud, Thief River Falls, Fergus Falls, Brainerd, Virginia, Willmar, and Marshall.

The series was sponsored by Cray Research, First Bank System Foundation, and regional educational cooperative

service units. For more information, contact Deborah Claesgens at 612/376-2582.

Alumni contribute to Kolthoff Fund

Alumni and friends of chemistry professor emeritus I.M. Kolthoff have honored him through their contributions to the Kolthoff Fund. The fund, established in 1976, has been used to support a lecture series in chemistry. With the additional contributions, the Department of Chemistry also will be able to award a Kolthoff Fellowship to an outstanding graduate student.

There has been an enthusiastic response from alumni, said Larry Miller, chemistry department chairman. Substantial contributions also have been received from Dow Chemical Company and publishers John Wiley and Sons. Kolthoff has had long-term associations with both firms. In total, the Kolthoff Fund has been increased this year by more than \$60,000.

Kolthoff, who turns 91 on Feb. 11, continues to be active in research. He has published more than 1,000 papers in analytical and physical chemistry and has received more than a dozen national or international awards for research and teaching.

Milestones

Aerospace engineering professor **P. R. Sethna** received a \$71,703 renewal grant from the National Science Foundation to study nonlinear dynamical systems. ■

Philip R. Goodrich, associate professor of agricultural engineering, presented a paper in June on biogas research at the BioEnergy '84 World Conference in Gothenburg, Sweden. □

Agricultural engineering professors **Robert J. Gustafson** and **Harold A. Cloud** presented four papers at the National Stray Voltage Symposium in Syracuse, N.Y. Held in October, the symposium focused on research at Cornell, Michigan State, and the University of Minnesota that addresses electrical problems in livestock facilities. ■

Harrison Fraker, former architecture professor at Princeton University, is the new head of the University's School of Architecture and Landscape Architecture. See story on page 12. ■

Astronomy professor **Kris Davidson** was invited in October to address a NASA workshop on "The Crab Nebula and Related Supernova Remnants." Davidson's review was entitled "Chemical Abundances in the Crab Nebula." □

Robert C. Kennicutt, Jr., assistant professor of astronomy, was invited in September to the European Southern Observation in Munich where he addressed a workshop on "The Virgo Cluster of Galaxies." Kennicutt's review was entitled "Optical Comparison of Virgo Cluster and Field Galaxies." ■

Assistant professor of chemical engineering **A. Franciosi** in August organized and chaired the MEIS workshop "New Frontiers in Semiconductor Materials," sponsored by the Graduate School and the Microelectronic and Information Sciences Center. In September Franciosi went to Europe to perform experiments at the Italian Synchrotron Radiation Facility PULS; he also was invited to speak at the University of Milan and at the International Center for Theoretical Physics, sponsored by UNESCO, in Trieste. □

Chemical engineering professor **John Weaver** received an Army Research Office grant to study metal-silicon, silicon-metal, and silicide-based interfaces. In March, Weaver organized and chaired a "Workshop on New Directions in Photoabsorption" in Asilomar, Calif., and in September he addressed the AIME/ASM DEPTH Committee in Detroit on the use of synchrotron radiation for materials science research. Weaver also will chair a session of the American Vacuum Society in Reno in December. ■

Geology professor **Subir K. Banerjee** has been appointed to the American Geophysical Union's mineral physics committee, which coordinates national priorities in mineral physics research. In October, the NASA Lunar and Planetary Institute invited Banerjee to address a conference on the moon's origin in Kona, Hawaii. □

Joseph Shapiro, director of the Limnological Research Center, received a \$200,000 National Science Foundation grant to study the phosphorous excretions of migrating zooplankton—and whether there is a net benefit or loss for phytoplankton. Shapiro also received a grant from the Legislative Committee on Minnesota Resources to study biological methods for lake restoration. And in March 1984, Shapiro was made a fellow of the American Association for the Advancement of Science. ■

Charles Conley, formerly a mathematics professor at the University of Wisconsin, joined the faculty of the School of Mathematics this fall as a professor of mathematics. Conley is a researcher in functional analysis and differential equations. ■

Mechanical engineering professor **E. Pfender** lectured in August on the "Overview of the Scientific Base in Thermal Plasmas" at the Gordon Research Conference on Plasma Chemistry in Tilton, N.H. ■

Martha Russell, associate director of the MEIS Center, gave a talk in October on "Robots and Thinking Machines" for Science and Technology Day at the Duluth campus. In August Russell presented a paper, "Science and Engineering: An Interdisciplinary Reciprocity," at the Knowledge Engineering Conference at the University of Manchester, U.K. That month she also presented a paper on the "Development of Interorganizational Collaboration at the DARPA Conference on Formation of Technology Consortia in Seattle, Wash." ■

Physics professor **Woods Halley** in September addressed a workshop on "Mathematical Modeling and Biology" at the German Cancer Research Center in Heidelberg. Halley also was invited to lecture on double layer theory at the Fritz Haber Institute in Berlin. □

Physics professor **Konrad Mauersberger** presented in September a paper entitled "Precise Ozone Measurements Using a Mass Spectrometer Beam System" at the Quadrennial Ozone Symposium near Thessaloniki, Greece. □

Physics professor **Y.C. Tang** presented a paper entitled "Multi-Configuration Resonating Group Theory" in August at the Fourth Workshop on Few Body Physics and Many Particle Scattering Theory. In July Tang addressed the fourth International Conference on Clustering Aspects of Nuclear Structure and Nuclear Reactions in Chester, England. His paper was entitled "Clustering Aspects in Astrophysics and Relativistic Heavy Ion Reactions." ■

Roger E.A. Arndt, director of the St. Anthony Falls Hydraulic Laboratory, lectured in August at the fifth American Society of Civil Engineers-EMD Specialty Conference in Laramie, Wyo. His address was entitled "Cavitation Research and Its Relevance in the Practice of Hydraulic Engineering." Arndt also traveled under the sponsorship of the National Science Foundation to Bucharest, Rumania, in July to participate in the planning of the U.S.-Rumanian workshop on water resources engineering. □

John Gulliver, assistant professor in the St. Anthony Falls Hydraulic Laboratory, presented in November a paper on the use of microcomputers in hydropower at a symposium entitled "Uses of Microcomputers in Agriculture, Health, and Energy" in Sri Lanka. □

Peter Kitanidis this fall has joined the faculty of the St. Anthony Falls Hydraulic Laboratory. Kitanidis, formerly from the University of Iowa and affiliated with the Iowa Institute of Hydraulic Research, is an associate professor of civil engineering; his special area of interest is hydrology. ■

Awards

Klavs F. Jensen, associate professor of chemical engineering, and graduate student **David B. Graves** jointly received the Young Authors' Award in Solid State Science and Technology from the Electronical Society for the paper "Modeling and Analysis of Low-Pressure CVD Reactors." ■

Paul D. Gassman, chemistry professor and head of the organic chemistry area, received the James Flack Norris Award in Physical Organical Chemistry sponsored by the northeast section of the American Chemical Society. □

Hung-wen (Ben) Liu, assistant professor of chemistry, received the 1984 Camille and Henry Dreyfus Grant for Newly Appointed Faculty in Chemistry. The \$25,000 award is to be used over five years for new ideas and concepts. ■

Regents' Professor Emeritus **Alfred O.C. Nier** of the School of Physics and Astronomy received the Geochemical Society's V.M. Goldschmidt Medal for major achievements in geochemistry and cosmochemistry. ■

Heinz G. Stefan, associate director of the St. Anthony Falls Hydraulic Laboratory, has become chairman of the Hydraulics Division of the American Society of Civil Engineering. The division has 12,000 members and 42 committees working on water resources engineering subjects. ■

Events & Visits

Professor Donald Carlson from the University of Illinois-Urbana will be a joint visiting professor in the Department of **Aerospace Engineering & Mechanics** and the **Institute for Mathematics and its Applications** during the 1984-85 academic year. Carlson, whose specialty is continuum mechanics, will teach winter and spring quarters. □

Wolfgang Burger from the University of Karlsruhe, West Germany, was a visiting professor of aerospace engineering and mechanics during the summer. Burger, one of the world's leading experts on the mechanics and mathematical modeling of toys, gave lectures and demonstrations in the math institute. He has appeared in a science series presented by West German television. ■

Mathematics professor Bjorn Dahlberg from the University of Goteborg, Sweden, has been appointed as Samuel Ordway Visiting Professor of Mathematics for one quarter of each academic year 1984-89. Dahlberg is a winner of the Salem prize in harmonic analysis. □

With the support of the Samuel Ordway Endowment, the following mathematicians are visiting the School of Mathematics and the Institute for Mathematics and its Applications during fall quarter 1984: David Edmunds, University of Sussex; Harry Furstenberg, Hebrew University; Jean Marc Fontaine, University of Grenoble; Constantine Dafermos, Brown University; J.L. Lions, College de France. □

The Institute for Mathematics and its Applications in October sponsored a workshop on "Homogenization and Effective Moduli of Materials and Media." The workshop focused on recent advances in the theory of homogenization of differential equations and in the determination of effective moduli of materials and media. The workshop was organized by Jerry Ericksen and David Kinderlehrer of the School of Mathematics, J.L. Lions of the College de France, and Robert Kohn of the Courant Institute. □

Mathematics professor Naresh Jain gave one of four invited talks at the regional meeting of the American Mathematical Society on Nov. 2 and 3. The society meeting, held on the Minneapolis campus, organized special sessions on nonlinear problems in mechanics, variational methods in partial differential equations and applications, mathematical logic, applications to analysis, physical theory, and computer science, algebraic geometry, and enumerative combinatorics. ■

Pierre Aigrain, who was secretary of state for research during the administration of French President Valery Giscard d'Estaing, led an Oct. 15 **MEIS** seminar entitled "France Facing the High-Tech Challenge." Aigrain, who currently is scientific and technical director of Thomson CSF and Thomson BRANDT companies in France, is a recipient of the Prix Robin from the Societe Francaise de Physique. ■

Susan J. Seestrom-Morris, a University **physics** research associate, gave a talk in October on elementary nuclear excitations with pi-mesons at the fall

meeting of the American Physical Society. Seestrom-Morris works with a University users' group at the Los Alamos Meson Physics Facility in Los Alamos, N.M. ■

About 60 theoretical physicists from universities, government laboratories, and industry throughout the Midwest attended the 12th Midwest Solid State Theory Symposium, held in September in St. Paul. IT physics professor Woods Halley chaired the organizing committee of the symposium and will edit the symposium's proceedings. Sixteen invited talks focused on the physics of disordered systems and interfaces. About 30 people also presented shorter papers. Lockwood Carlson, a staff scientist and theoretical physicist at 3M, discussed the role of theoretical physics in industry. The symposium was sponsored by the University Graduate School, the School of Physics and Astronomy, the Argonne Universities Association, and the Argonne National Laboratory. ■

Gary Parker from the University of Canterbury, Christchurch, New Zealand, was visiting Erskine Professor in the University's Department of Civil and Mineral Engineering and at the **St. Anthony Falls Hydraulic Laboratory** from July through September. ■

Technology colloquium planned for Feb. 21-22

IT Dean Ettore Infante will introduce a College of Liberal Arts Humanities and Arts Colloquium entitled "Technology in a Human(e) Society." The colloquium is scheduled for Feb. 21-22 in Coffman Memorial Union. Its agenda has been prepared by authors Pierre-Philippe Druet, Peter Kemp, and George Thill, who wrote the 1980 *Quelle Technologie? Quelle Societe?* Topics will cover a broad range of technology's effects, from the role of intellectuals in high-tech society to technology's impact on democratic forms of government. Organizers set a Nov. 8 deadline in their call for papers from faculty and students on subjects appropriate to the colloquium's theme. For more information contact Nancy Cobrin at the Center for Humanistic Studies, 612/376-8322.

IT grad uses skills to help others

By David Siegel

"Thank you so much for your help and support. God bless you."

That short note, in sprawling, far-from-perfect letters, was the first thing Mary had written since being almost completely paralyzed in an automobile accident eight months before.

She was able to write the note with the assistance of a machine invented by IT alumnus Albert Baak, Lake San Marcos, Calif. Baak graduated from the University of Minnesota in 1932 with a degree in aeronautical engineering.

Baak calls his invention the mobile. A disabled patient places his or her arm in a cloth sling. A series of pulleys and adjustable weights allow the forearm to rotate, requiring little muscle strength or coordination. With the mobile, Mary can paint, type hunt-and-peck style, and feed herself.

Baak, a retired Honeywell inventor and former president and chief executive of Cam-Sat Inc., Los Angeles, has always tinkered around the house. He patented a type of golf cart he built for fellow retirees in the neighborhood, but he said he never expected to use his creative genius designing devices for disabled people.

Baak became involved with his first project when his neighbor, Tom Batey, had a stroke. At the North County Health Center of San Diego, a branch of Children's Hospital and Health Center of San Diego, Batey used a number of muscle-strengthening devices. He asked Baak to visit the center to see if Baak could build a simple finger-exercise device based on models at the center. Baak's first trip to the center was an eye-opener; immediately he saw the need for many devices.

"None of us knows what's going on" in the area of the disabled, Baak said. "You sort of assume they're all being helped."

Baak made a finger-exercise device for Batey using rubber bands. He then copied a number of other devices at the center. "That got me started in this new endeavor."

He began tinkering in his garage with his bandsaw, lathe, and drill press. Each day Baak writes himself a check for motivation, as though he is getting paid. He sometimes spends long hours at the workbench. "My wife sometimes wonders if I'm coming in," he joked.

He is most excited about his latest project—the mobile. Baak designed a



Baak's device allows Lillian Ellner to regain mobility in her arm and shoulder after suffering a stroke.

large one for the center. The device would have cost between \$5,000 and \$10,000 to build commercially, he said. By doing most of the work himself and talking local scrap metal dealers into donating some materials, Baak was able to build the device for much less. He has few written plans, drawing mostly from an idea in his head. "I sort of invent as I go along," he said.

Baak also has built a smaller table-top mobile for Mary, the 23-year-old accident victim. He recently completed the mobile and gave it to Mary. Despite near-complete paralysis, "she's got a

fantastic outlook and a great sense of humor," said Baak. Working with Mary and others in need has been a rewarding experience, Baak said. "They've got more courage than you can imagine."

Mary brushed her own teeth for the first time in eight months with the mobile. "These are the things that touch you the most," he said.

Baak would like to see more engineers and engineering students using their skills this way. Colleges and even high

Photo by Dan Rios, courtesy of the Escondido Times-Advocate

Grad Notes

'39 **Charles G. Schmitz** of Towson, Md., has retired after 37 years as technical coordinator of the asphalt division of Chevron USA Inc.

'57 **Wilson B. Wardwell, Jr.**, of Plantation, Fla., has been made a fellow in the Florida Engineering Society. Wardwell, who works as a supervising engineer in the Fort Lauderdale office of Consulting Engineers Inc., won his fellow designation as a result of 10 years' participation in the Minnesota Society of Professional Engineers and 11 years' participation in the FES.

'71 **Frederick T. Strobl** ('75 M.D.) of Minneapolis is chairman of the board and cofounder of CNS Inc., a computerized medical electronics company based in Eden Prairie, Minn. Company products perform functions that include automated, real-time EEG analysis and evoked-potential analysis. Strobl, also a neurologist with the Minneapolis Clinic of Psychiatry and Neurology, was awarded the Upjohn Award in 1975, given to a senior medical student most likely to make a contribution to medicine. In 1978, he was given the Schapiro Award for excellence in neurology.

'72 **R. Roger Johnson** ('76 M.S.) of Golden, Colo., is president and founder of the Solutech Corporation, a company that will develop and market software for those working in the field of environmental protection. The information database programs will, among other things, allow environmentalists to track and monitor pollutants and legal compliance with federal and local regulatory agencies.

'74 **James E. Leslie** of Minneapolis has cofounded Deltec Systems Inc. in St. Paul, where he is director of engineering. Formerly he was a senior development engineer at Cardiac Pacer-makers Inc., St. Paul.

'75 **Greg Carlson** of St. Paul has co-authored a recently published tour guide of the Twin Cities entitled *Twin Cities—The Tour*. It draws on his knowledge of art and landscape architecture.

'77 **James S. Henderson** ('82 M.C.E.) of Minneapolis has accepted a position as project engineer with the engineering consulting firm of Howard, Needles, Tammen, & Bergendoff in their Minneapolis office. He specializes in transportation projects and airport engineering.

'79 **Michael J. Sivertsen** of Rocky Hill, Conn., has been promoted to associate scientist at Northeast Utilities in Connecticut. Sivertsen, who joined the

company in 1981 as an assistant scientist in the radiological assessment branch of the nuclear engineering department, is also a member of the Health Physics Society.

'83 **Robert A. Eades** of Lisle, Ill., has received a postdoctoral appointment with the Theoretical Chemistry Group at Argonne National Laboratory in Illinois.

David L. Holmstrom of Fridley, Minn., has accepted a position with Control Data as a systems programmer and analyst in advanced systems development.

Deaths

Bruce G. Eaton, senior scientist in the School of Physics and Astronomy, died Aug. 3, 1984. He taught at the University for 15 years and was recognized last summer with the Award for Distinguished Service from the American Association of Physics Teachers, of which he was a member. Eaton coauthored a book on laboratory equipment and was well known in the physics community as the editor, beginning in 1972, of the apparatus notes section of the *American Journal of Physics*.

Chemical Engineering & Materials Science:

Student computation center planned

IT's Amundson Hall will have a new Student Computation and Design Center thanks in part to donations from chemical engineering and materials science alumni.

More than 300 alumni have donated roughly \$38,500 for the facility, and more donations are still coming, said H. Ted Davis, head of the chemical engineering and materials science department. The alumni contributions will be added to University funds to finance the \$60,000 center.

Construction of the facility will begin in late November and should be completed by December, said Davis. An open house for alumni is expected to be held after the facility is completed.

The center, in the building's old library space, will provide a quiet area for study, a place to house student organizations, an area for computers, and a design-calculation and problem-solving center. "It will give our students in chemical engineering and materials science a place to work and a departmental identity," said Davis.

The department has planned winter quarter courses to make use of the new facility. Its use will "grow in coordination with changes in courses to increase computer use," Davis said.

The fund-raising drive began about a

year ago. It hasn't met all its goals, but Davis said he was nonetheless pleased with the results. The drive gave alumni a chance to communicate with the department and without their contributions the center could not have been built, he said.

Traditionally, the University of Minnesota Foundation invites alumni to contribute via a letter from the dean of the Institute of Technology and via the department newsletter, along with a general phone call informing alumni of the fund-raising drive.

But in this case "class agent" alumni contacted alumni. Class agents chosen from certain geographic locations organized teams that called more than 3,000 department alumni.

Alumni of public universities are realizing that private funds are needed to preserve and upgrade the quality of education, Davis said; something private-school alumni have known for years.

Davis was encouraged by the response to the drive. "Alumni will continue to support us at the present level and continue to grow. Our history of alumni support is one of steady increases," Davis said. As more funds are donated, the department will continue to become more effective in undergraduate and graduate education, he added.

Former IT student's jazz collection saved

By Deane Morrison

Patricia Bratnobar tried for eight years to find a good home for her late husband's collection of nearly two hundred 78 rpm jazz records. She asked her four grown children, several record stores and jazz magazines, and she placed an ad in the newsletter of the Twin Cities Jazz Society, but found no takers. Finally, faced with moving to quarters too small to accommodate the collection, she left it for the garbage collectors.

The next day she got a call from University jazz studies professor Reginald Buckner. Buckner had just heard about the collection and wanted it for the University's music library. "I told him I was terribly sorry, but he was a day too late," said Bratnobar. "However, unbeknownst to me, my friends Bob Anderson and Randall Egan had spotted the records sitting in my alley and retrieved them. When I found out, I called Dr. Buckner back."

Buckner picked up the collection, which turned out to be a gold mine of original recordings. A list of the artists represented in the collection reads like a who's who of jazz greats from the 1930s through the early 1950s—Harry James, Benny Goodman, Duke Ellington, Lena Horne, Meade Lux Lewis, Fats Waller, Count Basie, and the big bands of Artie Shaw and Glenn Miller. Many of the records feature the piano, which isn't surprising since Bratnobar's late husband Harry was an accomplished amateur jazz pianist. Harry was a mechanical engineering student at the University in the 1940s.

Although others have contributed jazz records to the library before, Buckner hopes the Bratnobar collection will form the nucleus of an extensive jazz collection by encouraging more people to donate large numbers of records.

Harry Bratnobar's connection with the University began in 1941, when he and his friends Ken Green, Bob Baker, and Leigh Kamman organized the Boogie-Woogie Club. Their first concert drew an audience of 3,000 to the newly built Coffman Union. In attendance was Dmitri Mitropoulos, conductor of the Minneapolis Symphony Orchestra—now the Minnesota Orchestra—who said he was deeply touched by Green's rendition of his composition, "Beat Me, Dmitri."

The club held a reunion in February 1978, after it had been learned that Harry had cancer. But, said Patricia, they didn't treat it as a memorial to Harry—they just insisted that he play



Reginald Buckner and Patricia Bratnobar with some of the jazz records from her late husband Harry's collection that she donated to the University.

for them and had a good time listening.

Harry's passion for jazz was one of his numerous interests. He taught French in several area colleges and found that his technical skill came in handy about 25 years ago, when language labs equipped with tape recorders were first being introduced as aids in foreign language instruction. He smoothed the way by conducting summer seminars for teachers who were bewildered by this complicated new technology.

"Harry made friends from all age

groups and all walks of life," said Patricia. "He was the kind of person who kept other people's babies from crying on airplanes."

His broad interests are mirrored in his jazz collection. Most major styles from the heyday of jazz—big band, boogie-woogie, stride piano, and progressive jazz—are represented. Included with household names like Goodman and Basie are influential artists who never achieved much fame outside of jazz circles. Two such giants are Art Tatum,

Photo by Tom Foley

We Hear From You

Universities and industry need to better understand each other's role

William G. Shepherd was director of the University's Space Science Center from 1973-1979. He also was vice president for academic affairs from 1963-1973 and headed IT's electrical engineering department from 1956-1963. Shepherd is a professor emeritus of electrical engineering.

There has been much recent discussion about the relationship between universities and industry, some appearing in *Items*. Part of this dialogue suggests to me that the nature of universities is not always understood and that, as a result, unrealistic expectations may arise. Reflecting on the obstacles, the ways universities and industry cooperate, and the benefits and limitations of that relationship should help both groups understand each other better and benefit society.

First, I would like to touch on some factors that affect the university's ability to respond to overtures for cooperation with industry.

An immediate problem for universities is the decline in federal support for educational equipment and research, on which universities traditionally have been heavily dependent. Inevitably, if the quality and future relevance of education and research programs decline, universities will be able to train fewer graduate students to supply the needs of industry and university faculties.

And although universities have been encouraged to seek industry support to replace federal funds, even generous support from the private sector is far from sufficient and frequently is not available in critical areas.

Another factor influencing university contributions to industry is the real concern that the United States is losing its technological lead to other countries, especially Japan. Because universities have provided a basis for American technology, one reaction is institutions of higher learning have become inefficient in transferring technology from university research to industry. The other is that the mission of university education and research must reflect industry's current economic needs.

Industry-university interactions at Minnesota are not new and have taken many forms. These have involved situations benefiting employees and students alike. Consulting activities by faculty have served effectively to foster technology transfer of university research and have enriched classroom instruction through faculty awareness of the "real-life" applications of the sub-



William G. Shepherd

jects they teach. Conversely, the appointment of lecturers from industry as adjunct faculty brings their special expertise into the classroom. This has been particularly useful in design courses. Design problems can be posed in which constraints of manufacture, economy, and durability are presented by someone who has dealt with them in practice. University research programs also have spawned a number of new Minnesota companies in which graduates have translated their University research experience into new products and services. Less obvious but larger in scale is the technology transfer resulting from the employment of University of Minnesota undergraduate and graduate students by established state industries.

Further examples of useful educational interactions are the formal regular courses made available through IT's Unite program, and presentations on special topics in which faculty members from this and other universities, as well as industrial participants, join in the instruction and discussion.

Finally there are IT departmental colloquia involving presentations of current research results by speakers who may be graduate students or faculty from this or other institutions. These are generally open to the public and publicized widely. Many of them are broadcast over Unite.

With all these opportunities for interaction, one might wonder why university-industry relations are currently the subject of so much discussion in Minnesota. The discussion itself is not new—it has been ongoing as long as I can remember. It stems in large part from the formidable challenge foreign

competition poses to our technological lead. It is also stimulated by the changing nature of our economy; high technology industries are seen as the key to future growth as the "smoke-stack" industries decline. Clearly universities are viewed as an important source of the science and technology that will move our economy forward. This is a well-founded expectation, since a substantial part of our technology has its roots in university research. It is ironic that these expectations have arisen when the support for university research has declined.

Given this situation, it is appropriate to examine what is realistic to expect. Understanding the limitations can improve the effectiveness of the relationships. The first fact of life is the limitation of resources, both human and physical. The admirable service of the agricultural schools in supporting the production of food and fiber is frequently cited as a model for other university-industry relationships.

But there are three important differences between agriculture and industry in general. One is that few, if any, farmers are in a position to support the research that makes production effective. Thus the land-grant universities have been given a mandate to carry on research that serves the farmers collectively. The second is that farmers do not perceive themselves in competition with each other as industries do, and, therefore, do not regard the research results as proprietary knowledge. The third is that the Agricultural Extension Service is organized and staffed to disseminate the findings. Both the research and dissemination receive ongoing funding from federal, state, and local governments.

There is no counterpart for this in the physical sciences and technology. The Institute of Technology is staffed to carry on instruction at the undergraduate and graduate levels. Most graduate research is funded predominantly by grants from federal agencies or foundations. Such grants are made in response to individual faculty proposals, judged on individual merit. Faculty with established reputations resulting from publication of their research results clearly have an advantage. Frequently they assist new faculty by involving them as coinvestigators until the latter have established their own credentials. The importance of faculty publication in refereed journals as a means to merit support of graduate education is apparent.

From the Alumni

Alumni can help recruit high-ability students

Institute of Technology Alumni Society president J.S. "Jack" Braun ('56 B.C.E., '57 M.S.C.E.) is president of Braun Engineering Testing Inc., geotechnical materials and environmental consultants with offices in Minnesota, North Dakota, and Montana.

Hospitals advertising for patients?
Lawyers discounting fees and running legal clinics?
Salaried dentists practicing in shopping malls?
Engineers and architects sharing equity positions in projects?

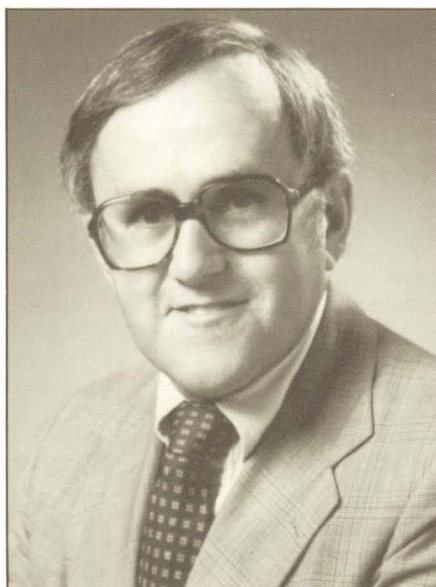
Universities recruiting outstanding students?

In 1984 the answer to all these questions is yes. It may seem to many Minnesota Alumni Association members that very little on campus is the same. But with declining enrollment and increased competition among colleges for high-ability students, the University's drive to attract the brightest students is an important initiative. Let's look specifically at IT's efforts to recruit top high school students.

In the same way Lou Holtz needs to attract outstanding high school talent as he rebuilds the University's football team, IT head "Coach" Ettore "Jim" Infante and his specialty coaches in various IT departments need the best high school students. With those students, departments can continue building programs that reach the national prominence currently enjoyed by departments at schools like MIT and Cal Tech.

Support is crucial to any drive. Lou has the dome and a new indoor practice facility; Jim has the new Civil and Mineral Engineering Building and support for a new electrical engineering and computer science building. Lou has many new coaches; Jim continues to attract outstanding engineers and scientists for the department. Both need help to recruit outstanding prospects, including private financial assistance, of course. You've probably heard a lot about the Williams Fund, and I have talked about IT's need for financial support in earlier *Items* issues. But there are other ways to help.

What is ITAS doing, and what can you do to assist student recruitment efforts? A significant number of the large group of IT alumni who volunteered as part of a membership survey two years ago have been calling high-ability high



J.S. "Jack" Braun

school students on lists furnished by the ITAS office. Responses to those calls are encouraging. To help make this year's honors freshmen feel welcome, ITAS has scheduled a pizza party. We hope these top students will tell future freshmen that the University is not a cold, impersonal campus.

Beyond these organized efforts, each IT alumnus can help in day-to-day conversations and contacts. Speak with pride and enthusiasm about your college. IT gave each grad a good foundation and springboard for entering the job market. Many renowned educators and scientists currently are doing some very exciting work on campus (see stories on pages 5, 7, 9, and 12). Let's stop apologizing for our size. It's not a problem. It can't be explained away; so let's sell the University's size as the asset it is, emphasizing the diversity and program strength that accompany it.

Project with justifiable pride the strong advantages and benefits available to outstanding students at our outstanding Institute of Technology. You'll feel good about it; you'll help your University and region; and at the same time, you will be doing a favor to the engineers and scientists of the future.

BAAK from page 15

school physics classes might require students to work on a project that helps a disabled person, he said. (Mechanical engineering seniors at the University can participate in a program that allows them to design devices for disabled Twin Cities students. For more information, see the spring issue of *Items*.) Some retired people might become involved as well. After the local newspaper published an article on Baak, he said a number of retired neighbors offered to lend a hand if he ever needed it. "There are lots of people who are ingenious," he said.

"It almost seems as if I've discovered this," said Baak; he explained that's only because of his enthusiasm. "There are others out there doing it." But there is still a need to do more, he said.

Next he plans to build a machine for a 13-year-old cerebral palsy victim. "She needs something to feed herself," he said. The girl can only push in spastic movements. Baak's device will have a lever that she pushes three or four times to wind a spring. To add some fun, when the spring is wound something—like a jack-in-the-box—will pop up or bells will ring, Baak said. Another lever would release the spring, dropping a spoon to a plate. The spoon would scoop up food and return to mouth level. It's not life-sustaining, Baak said, but it will give the girl a true sense of independence. This one, like most of his devices, will require little maintenance.

His greatest reward is their looks of appreciation. "You can't buy that for money," he said. "No way."

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 _____

City, State _____

Grad. Year/Dept _____

Job _____

Other News _____

Calendar

Through Nov. 20: Seminars in **chemical engineering and materials science** continue on Tuesdays at 1:15 in 240 Amundson Hall. On Tuesday, Nov. 13, Professor William R. Schowalter will speak on "Cavitation in Non-Newtonian Liquids: Dynamics of Nonspherical Bubbles." Schowalter teaches in the Department of Chemical Engineering at Princeton University. On Nov. 20, Harold Sowman of the 3M Company will speak on "Sols and Solutions in Chemical Ceramics."

GUEST from page 18

Openness of research is important for this reason alone, but it is not the most fundamental reason. Open discussion of research with competent peers provides not only a stimulus to further progress but also quality control and a means of certifying the competence of the investigators. Openness is especially important for the graduate student who can test, defend, and modify her or his thinking in discussion with fellow students. It is for these reasons that classified or secret research is discouraged or flatly banned in universities as incompatible with their dual missions of creating and disseminating knowledge.

This starkly brings out the problem of carrying on industrially sponsored university research if the sponsor insists upon protecting a proprietary position. It is a problem that requires sympathetic understanding of the constraints designed to protect the integrity of the university mission. Universities, however, have generally established policies to protect patentable rights, which may arise from research and sponsors' entitlements to them.

Universities sometimes come under criticism for placing emphasis on the importance of research, implying that classroom teaching suffers. This over-

looks the fact that universities have the responsibility to create as well as disseminate knowledge. Moreover, university research is a learning experience for both faculty and graduate students—the most demanding teaching of all. Professor Henry Hartig had a motto in his office: "a student who learns from one who has finished learning drinks from a stagnant pool; while a student who learns from one who is still learning drinks from a running brook." One teaches past practice—the other prepares for the future.

Lastly I should like to comment on the expectation that educational and research activities at the University should reflect current societal needs. The key word here is current. University faculty certainly should be aware of the current needs of society and be able to comment upon them and consider their implications. But the foremost mission they have in both teaching and research is to address future problems. If they concentrate on current problems, their students will be prepared for the past by the time they are productive members of society. A university's teaching mission is to convey current knowledge and develop analytical and critical skills that prepare graduates to address future problems. Correspondingly, university research will best serve society if it is directed to develop knowledge that will provide a broader base for solutions of future problems. If a university fails on either or both counts, it will have failed its mission.

Universities and industry can and should work together for the benefit of society, which ultimately is the purpose of both. It is important that each understand its mission, respect those missions, and seek arrangements that ensure both are faithful to their commitments. If they can be mutually supportive, society will be the beneficiary.

JAZZ from page 17

whose virtuosic playing has been a model for jazz pianists for the last 50 years, and pianist Mary Lou Williams, who was one of the first to produce written arrangements of jazz pieces.

Buckner knows quite a bit about the history of jazz too, having taught the subject through the University's Afro-American and African studies department. He said that jazz crossed the color barrier in the 1930s, when it rode the airwaves into homes across the continent. Many people who didn't go to nightclubs to see the jazz greats became radio fans. "I often heard of kids being punished by being stuck in their rooms. They discovered jazz on the radio," he said.

Although jazz has widened its appeal, there are many "closet" fans who are reluctant to admit their fascination with jazz. They need to "come out" and support American music, Buckner said.

Jazz is probably the fastest-evolving type of music. In the short 80 years it has progressed from simplistic melody, rhythm, and harmony to some of the most complicated of all musical creations. Because jazz is so young, many of its pioneers are still alive. Thus jazz musicians have an opportunity to exchange ideas with the immortals of their art—an opportunity long lost to classical musicians. This chance should not be wasted, Buckner said.

"We need to provide all of our students with the creative experience in music as well as in the language arts. Jazz should not dominate the musical curriculum, but it and other indigenous American forms of music—Indian and country-western, for example—should have a place. For American music to be a mystery to its own people is ridiculous," he said.



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