WINTER 1985

ITEMS

From the Institute of Technology, University of Minnesota

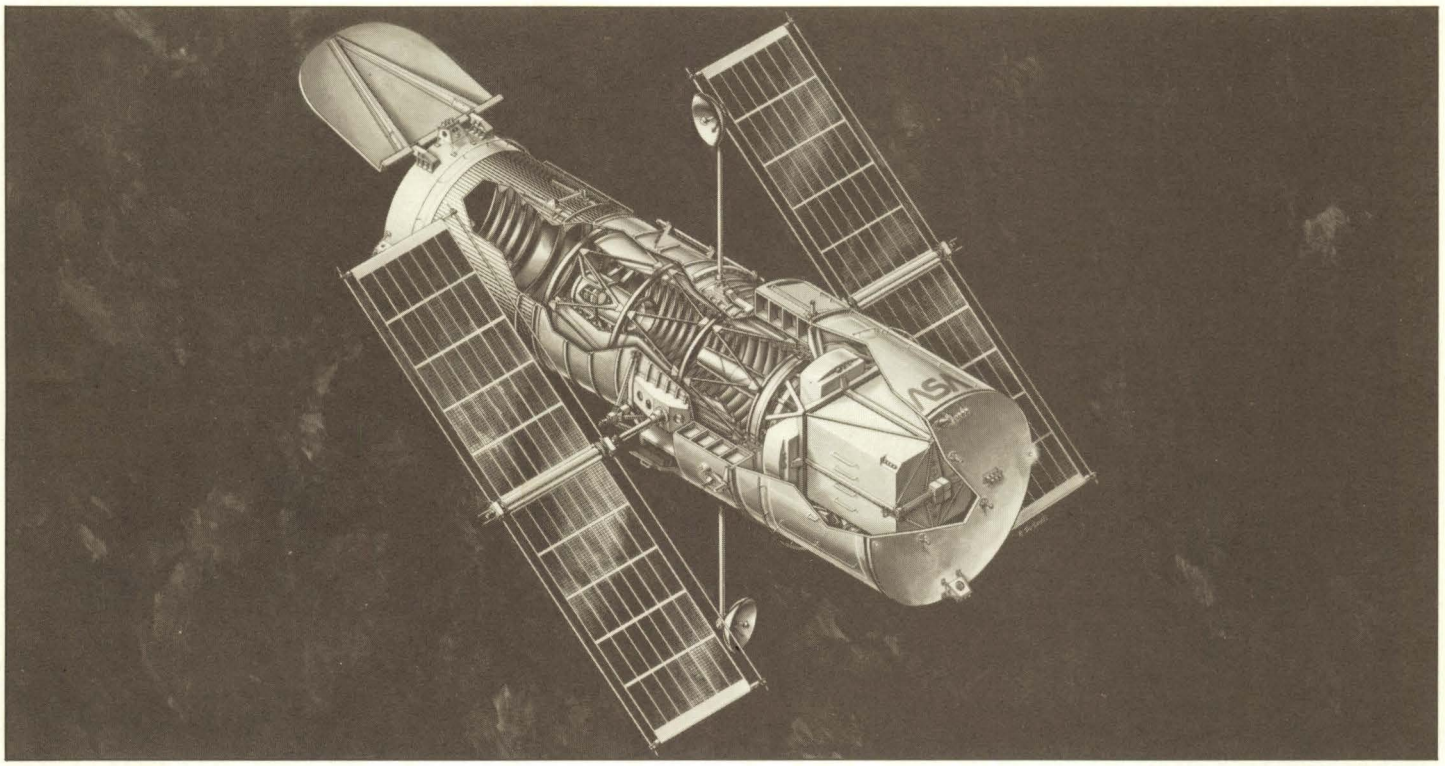

Photo courtesy of Perkin-Elmer

Space Odyssey

Work by IT alumni will help make the Hubble Space Telescope an astronomical first—the telescope will be the largest scientific instrument ever placed into space. The above drawing shows a cutaway of the Optical Telescope Assembly, the spacecraft's centerpiece. For more details, see page 8. Stargazing closer to home, the University forms a consortium to build a telescope of its own (page 10) and a Nobel Prize winner visits campus to talk about the formation of stars (page 11).

From the atomic bomb to Mars...

"One should try to do interesting things"

By David Siegel

Alfred Otto Carl Nier would make a good neighbor to anyone. A short, sturdy man with trifocals and a ready smile, he is thoughtful and chooses his words carefully, listening well and easily sharing stories. He prefers an open-collar shirt and vest to a suit and tie. The colors he wears are pleasingly mild, much like Nier himself.

This unassuming presence contrasts sharply with the awe his name carries in the scientific world. A University of Minnesota Regents' Professor Emeritus of Physics, Nier is often regarded as Minnesota's most prestigious physicist.

At 74, his love for the challenge of scientific scholarship is still apparent. Many important adventures have resulted from this devotion—a quest to determine Earth's age, a space mission to find life on Mars, and the search to perfect a now commonly used scientific instrument, the mass spectrometer.

But perhaps Nier's most significant work is his role in the development of the atomic bomb, dropped 40 years ago on Hiroshima.

It was 1939 and German physical chemist Otto Hahn discovered nuclear fission. "The word spread like wildfire," Nier said. Scientists believed uranium 235 was the key to the process, but they questioned how the element could be isolated.

In April 1939 at a meeting of the American Physical Society in Washington, D.C., Nier met Italian-born American atomic and nuclear physicist Enrico Fermi, considered one of the fathers of nuclear physics. Fermi was impressed by Nier's work on the mass spectrometer, an instrument that measures the mass, or weight, of molecules.

"Fermi urged me to try to separate a little bit of uranium to see which isotope was really responsible," Nier said. "I realized some improvements I had made on the apparatus [the mass spectrometer] would make it possible to study the isotopic composition of the elements and do a better job than anyone had ever done before.

NIER to page 4

From the Dean

The institute develops a long-range plan for programs and facilities

In the fall 1984 issue of *Items*, I explained institute efforts to develop long-range plans for IT's programs and facilities.

We completed the first step of this process in early January and submitted a three-volume report, *Institute of Technology Master Facilities Plan, 1984-1994*, to the University Board of Regents. Prepared in response to a 1984 Minnesota State Legislature request for information about IT's future building needs, this report presents the results of a comprehensive evaluation of IT's program and facility requirements over the next decade. After consideration and perhaps modification, the regents plan to submit the report to the Legislature as IT's official long-range plan.

The Legislature originally requested a 10-year plan outlining building needs. But physical facilities alone do not determine either the prominence or the quality of an academic institution; it is the academic programs, the personnel, and the equipment within those programs that form the foundations upon which academic excellence in both instruction and research is built. But high-quality academic programs, personnel, and equipment need high-quality modern facilities. Therefore, in this report, planning for physical facilities is built on an analysis of institute goals and of the current status of IT's diverse components.

The broad educational and research goals of the Institute of Technology remain unchanged. Among these, the institute must underscore its mission to provide well-educated scientists, engineers, and architects at all academic levels; it must sustain and expand the research role that underpins the education of today's and tomorrow's students and that advances knowledge in science and technology; and it must be a focus of activities and a resource to the industrial and academic community of the state and the region.

Given these goals, an analysis of current activities indicates that this is a critical period for IT. Over the past 15 years, disproportionate changes in undergraduate and graduate enrollment have occurred within the institute; in fact, undergraduate enrollments in engineering and computer science have more than doubled despite the imposition of stringent entrance requirements. From 1968 to 1983, the ratio of undergraduate to graduate students in IT has increased from 2.5-to-3.9. This reflects a change of emphasis necessitated during that period: a weakening of the research and graduate mission in response to educational demands posed by the ever-increasing undergraduate component. This imbalance has had a serious, deleterious effect on the quality of both research and education.

Photo by Kevin Gutknecht

Ettore Infante

While student enrollments have grown rapidly during the past 10 years, the resources (faculty, support staff, equipment, facilities, and funds) have remained essentially constant until one or two years ago. There is a need to significantly increase all these resources and to appropriately balance these and the teaching and research demands to which IT can properly respond. Currently, the single most crucial problem facing the institute is the shortage of adequate facilities to meet its educational and research goals.

Constructed during the "smoke-stack" era of American technology, many of IT's buildings are inappropriate for "high-tech" education and research. These facilities were designed for a much smaller number of students and faculty; in particular there is a severe shortage of library space and student lounges, essential facilities given the very high proportion of commuting students.

Our report outlines a 10-year programmatic and facilities plan designed to correct IT's most severe problems and to keep the institute at the forefront of teaching and research in science and technology. The report describes programmatic plans and options that would strengthen IT's undergraduate educational component and rebalance its graduate and research component. A building and refurbishing plan essential to the programmatic plan also is presented.

In the next issue of *Items*, we will present an outline of this long-range plan, which by then probably will have been approved by the regents. I sincerely believe that it is a realistic and comprehensive plan, one upon which to base the further development and evolution of IT, and one that merits the careful attention of the IT community.

Correction

The fall 1984 issue of *Items* incorrectly reported information about a visit made by Gary Parker, an associate professor in the civil and mineral engineering department. Parker visited the University of Canterbury, Christchurch, New Zealand, as a visiting Erskine Professor from July through September 1984.

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Computer science and electrical engineering

Shortages spur current fund-raising drive

By David Siegel

The United States needs 1,000 new engineering faculty each year, but produces only 450 faculty. And equally distressing to industry, fewer students are obtaining doctorate degrees in electrical engineering and computer science.

The shortage of electrical engineering and computer science professors and industry personnel poses a serious danger to high-technology advancement in the nation, according to the American Electronics Association (AEA).

To deal with the problem, the AEA has begun a $750,000 fund-raising drive. The funds would establish 15 graduate fellowships for University of Minnesota students who plan to become teachers in electrical engineering and computer science.

Companies are asked to contribute up to 2 percent of their research and development budgets to pay for the four-year, $52,000 fellowships, said Frank Simon, development officer of the AEA's Electronics Education Foundation.

The drive began in early January and will continue through April. The AEA hopes that by providing more qualified faculty, the University can enroll more students to meet the shortage of electrical engineers and computer scientists that industry faces, Simon said.

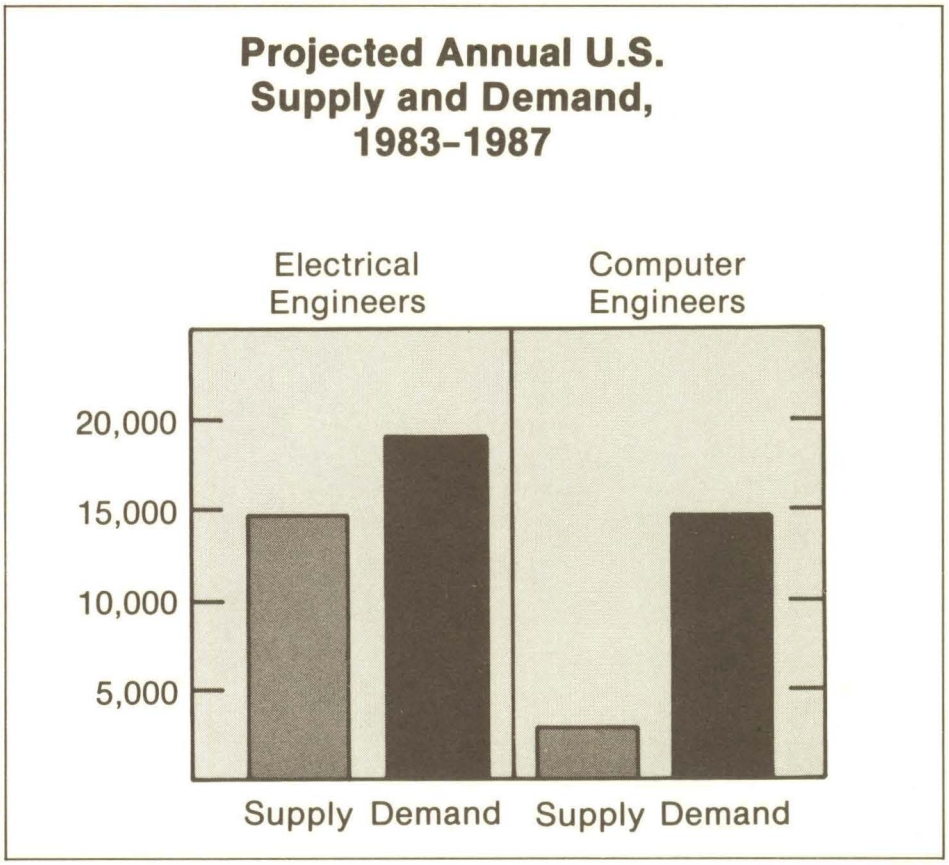
"We don't lack for students, but we do lack for professors, and that is a problem to companies because they want to draw their engineers, their technicians, their future employees from the University of Minnesota Institute of Technology," said Vi Traynor, Midwest region manager for the AEA.

The high cost of education and better corporate salaries deter students from entering teaching, according to the AEA.

The fellowships will enable students who promise that they will teach upon graduation to obtain computer science and electrical engineering degrees. Having top-notch students in the Ph.D. program also will enhance the prestige of the University, Simon said.

The program began nationally in 1981, Simon said. Committees have been formed across the United States in areas with concentrations of high-technology industries. These committees consist of concerned corporate executives who call on their peers in industry, Simon explained.

John Rollwagen, chairman of the board, Cray Research Inc., is heading Minnesota's committee. Also involved in Minnesota's regional committee are: Gerald Dineen, vice president of science and technology, Honeywell Inc.; Charles Denny, president of Magnetic Controls Co.; Gary Holland, president of Data Card Corp.; Wayne Huelskoetter, president of Dicomed Corp.; John Walker, president and chief executive officer of Braemer Computer Corp.; and Herbert Johnson, chairman of DataMyte Corp. and of the Minnesota High Technology Council.



Graph courtesy of the AEA

Three companies with executives on the Minnesota regional committee recently made firm commitments. Cray Research will give one fellowship of $52,000 and support one more fellowship if 10 fellowships are met. Dicomed and Magnetic Controls will each give $52,000, Rollwagen said.

The funding is "desperately needed," Simon said.

For every million people, Japan graduates 163 electrical engineers, the Soviet Union produces 260, and the United States graduates 67.

In 1983, 23 percent fewer electrical engineering Ph.D.s were awarded than in 1973. And 40 percent fewer computer science Ph.D.s were awarded in 1983 than in 1981, according to AEA figures.

Industry and the University also can benefit in other ways from this fund-raising activity.

"The benefit of what we're doing here is getting people closer together [and letting them realize] they can help each other," Simon said.

"What we're doing is raising the awareness to the problems of the University to our member companies. And we're asking for their united effort so that they participate in solving these problems as best they can, which is good for them, and also gives us a base upon which to represent the interest of high technology in Washington, D.C., or in state capitals like St. Paul."

Some states have contributed money in conjunction with the AEA fund-raising drive for specific purposes. New Jersey and Oregon have such programs, Simon said.

Frank Simon can be contacted through the office of Vi Traynor, American Electronics Association, Southdale Office Center #123, 6750 France Ave. S., Edina, MN 55435, 612/927-4112.

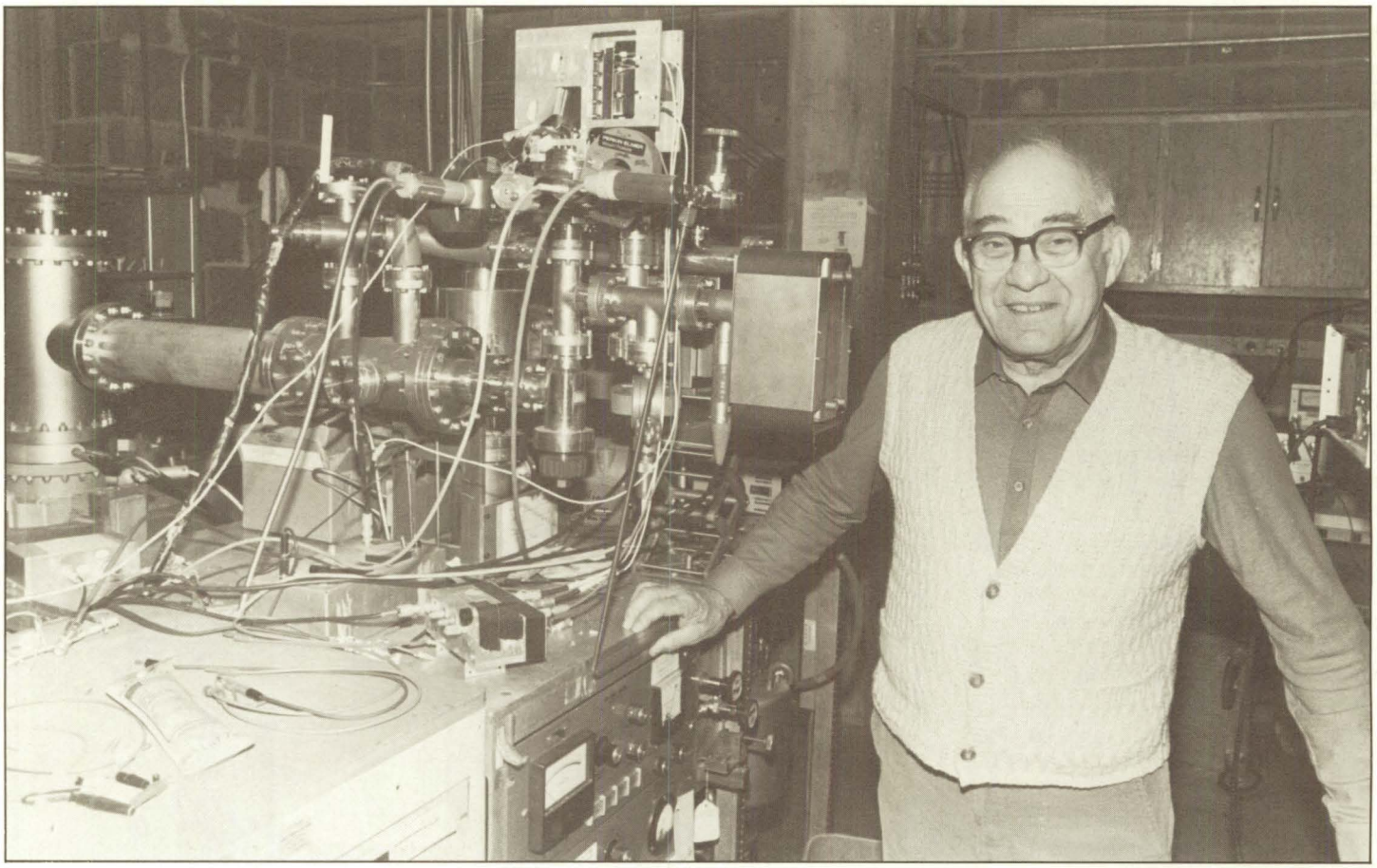


Photo by Kevin Gutknecht

Armed with his mass spectrometer, physicist Nier (modestly) finds answers

NIER from page 1

"I thought about it. I thought it was going to be too difficult so I put this off," Nier said.

In October 1939, Nier received a letter from Fermi, who wrote that isolating uranium 235 "is of considerable theoretical and possible practical interest." Nier still laughs at the irony of the phrase "possible practical interest."

The discovery

The letter convinced Nier to refocus his efforts. On Feb. 29, 1940, in a small basement laboratory at the University's physics building, he separated the first amounts of uranium 235 and uranium 238. He taped them to the margin of a long-hand letter and drove to the Minneapolis post office.

"These were little tiny strips of metal [platinum about 1/16 of an inch wide and 1/2 an inch long]. The amount of uranium on them was so small you couldn't see it. It was maybe a little smudge." He sent them air mail special delivery to friends at Columbia University. They were received Saturday afternoon and analyzed throughout the night.

"It is true, as the popular accounts say, I was awakened Sunday morning by a long-distance telephone call," said Nier. He had indeed isolated uranium 235.

Nier published details of the discovery two months later and described uranium 235 as potentially 30 million times as powerful as TNT.

Almost immediately "that kind of work went underground" because the war in Europe had begun, Nier said. The University of Minnesota became the center for analyzing nationwide efforts to separate larger quantities of uranium 235, he said.

In 1943, Nier left the University to work for Kellex Corp., which built a plant in Oak Ridge, Tenn., for scientists to separate larger quantities of uranium 235. Nier lived in New York and commuted frequently by train to Oak Ridge until the end of the war.

No regrets

Today Nier has no regrets about his work on the first atomic bomb. "I don't think the people in charge here in this country, and by that I mean people very high in the government, President Truman for instance, really had much choice in the matter."

In a war environment, threatening to use the bomb, even demonstrating its power, was not a realistic alternative to actually using it, Nier said.

"There were GIs dying in the Pacific every day. They [U.S. officials] were talking about invading Japan. There would have been tens of thousands of American boys killed, maybe hundreds of thousands and millions of Japanese. It's wonderful to philosophize over these things. But I don't think that if there was a war and people

were dying that you wouldn't use the most effective weapon you had.

"What's happened since, this escalation into this horrible situation we have now, that's something else again. But I don't think with the extent of what we knew at that time you could hold back on this. I don't think once these things were known that you could ever stop that."

And dropping the bomb showed the world the effects of a nuclear explosion, he said. "I don't think that people would ever believe you about the horror of a nuclear war unless you actually had some casualties."

Nier remains convinced nuclear power can be safely used for peaceful purposes. "It's most unfortunate that you have this confusion between the peaceful uses of nuclear energy and the military uses because nuclear power plants are very safe, they're very effective, and they ought to be used more.

"It's just irresponsible to say that we shouldn't use nuclear power. That doesn't mean there aren't problems. But I think you have to put the problems into perspective. I think the biggest problem is the political hassle over the disposal of nuclear waste. The means are at hand for safely disposing of it."

The start of something big

Finding ways to solve problems has always been a Nier hallmark.

Nier's father was a mechanic who let his son tinker with projects in his basement. Each Christmas the young Nier received additional gears, pulleys, and other accessories for his Meccano building set.

Nier visited the library regularly to read *Popular Mechanics* and *The Boy Mechanic*. He and his friends talked endlessly about radio circuitry, discussions that fostered Nier's interest in electricity.

At the age of 16, Nier entered the University of Minnesota to obtain an undergraduate degree in electrical engineering. He stayed to pursue a master's degree, also in electrical engineering. It was the beginning of a long association.

By age 25, Nier received his Ph.D. in physics from the University. He then received a National Research Council Fellowship at Harvard. There he used his mass spectrometer to measure geological age.

"At that time the Earth was believed to be 2 billion years old. And I had samples that gave ages older than 2 billion. From the variations that I had found in samples, I could have predicted that the earth had to be much older than 2 billion years, [the current estimated age is 4 billion years] but I never followed through on this.

"Other people later on, using my data as a matter of fact, showed that the Earth was much older than that," Nier said, still chuckling about his near-scientific hit.

After two years of fellowship study, Harvard offered Nier a faculty position, considered a plum in the eyes of many. But Nier had developed a strong loyalty to the University and the public schools he attended. "My experience here was a happy one," he said. "I was treated well by the institution." Family considerations, a chance to work again with the renowned physicist John T. Tate and other physics faculty, and an attractive offer brought Nier back to the University of Minnesota.

Nier called the period after the war the golden era. Graduate students and faculty returned to campuses around the country. The University of Minnesota had an energetic young faculty who was anxious to apply its efforts to peacetime scientific inquiry, Nier said. "This place really boomed."

Life on Mars

Nier himself began to explore another horizon—space. When the National Aeronautics and Space Administration announced plans to send into space a satellite that would study the Martian atmosphere, Nier was ready. He reduced the size of his mass spectrometer to fit in a rocket. By then a Regents' Professor, Nier was given leadership of the five-person Entry Science Team of the Viking flight to Mars.

Nier was stationed in Pasadena, Calif., for the project during July 1976. Because the Entry Science Team had difficulty finding computer time, Nier suggested sending the data back to the University of Minnesota. The team rented a Datafax machine and sent the data from the Viking Mars Lander over the telephone line from Pasadena to Minneapolis. Every six minutes a new piece of paper was inserted in the machine. A few undergraduate students plucked them out and plugged the

NIER to page 6

Columbia University
in the City of New York

DEPARTMENT OF PHYSICS

October 28, 1939

Dr. Alfred O. Nier
Department of Physics
University of Minnesota
Minneapolis, Minnesota

Dear Nier:

Since our discussion last spring in Washington on the possibilities of using a mass spectograph separation of the uranium isotopes for deciding whether the slow neutron fission is or is not due to 235 isotope, I have convinced myself that this is actually the best way to decide the question, which is of a considerable theoretical and possibly practical interest.

I understand that you have lately undertaken such a separation, and I should very much like to know whether and how this work is progressing.

Please give my best regards to Professor Tate.

Yours sincerely,

E. Fermi

The letter that motivated Nier to concentrate his efforts on uranium 235

NIER from page 5

data into a computer.

"I like to tell about this, especially [at] places where they have big powerful computers, because the analysis of the Martian atmosphere was done by a couple of undergraduates who were paid by the hour and used a Hewlett-Packard desk computer," Nier said.

The scientists didn't discover life on Mars, and that disappointed Nier.

"Going to Mars was an opportunity to really learn something about another planet. Mars was the only place in our solar system where it seemed likely that you could find life." Despite the failure to find life, scientists learned a great deal, Nier said.

An individualist

Although Nier enjoyed working on that team project, he has preferred to work alone during his scientific career. "Most of the great discoveries have been made by individuals," he said. Today, science requires tremendous group efforts, and, as a result, Nier probably wouldn't want to be a current graduate student in physics, he said.

"Everything has become so big. It was quite different when I was a student. Now it's pretty hard to survive as an individual. Entrepeneurship plays a much more important role. In industry this has always been the case, and that's all right. But I kind of prefer to do my own thing."

Evidence of his independence is apparent in his hobbies. Until this year, Nier was an avid downhill skier, skiing the Swiss Alps and Colorado mountains annually. However, his doctor has advised he drop skiing due to a back problem. Nier is still considering the advice.

Nier and his wife, Ardis, who worked in the physics department 20 years before marrying him, spend time during the summers at a cabin they own on Cass Lake. Although he likes to read, he finds he has barely enough time to keep up with scientific publications.

Nier also has been involved in many campus committees and received a raft of professional honors. He has been elected to the National Academy of Sciences, is a member of the American Academy of Arts and Sciences, and has written or co-written more than 175 publications. He is a foreign scientific member of the Max-Planck Institute in Germany and was recently appointed a foreign member of the Royal Swedish Academy of Sciences.

He supposedly retired in 1980, but still reports to his office in the physics building almost every day. Shelves filled with technical journals and research findings line one office wall from top to bottom. A sign reading "Old teachers never die, they just lose their class," hangs on the opposite wall.

Nier meets former students everywhere. He offers only this little bit of advice: "One should try to do things that are interesting. I think one of the very satisfying things in my life is that the things I've done have been fun. If work can be fun, then you can put up with an awful lot of problems.

"I think that's one of the great joys of being involved in a major university such as this. One of the fun things to me always was teaching undergraduate classes, because it's interesting to see the young people and fun working with them. I think it helps keep you young."

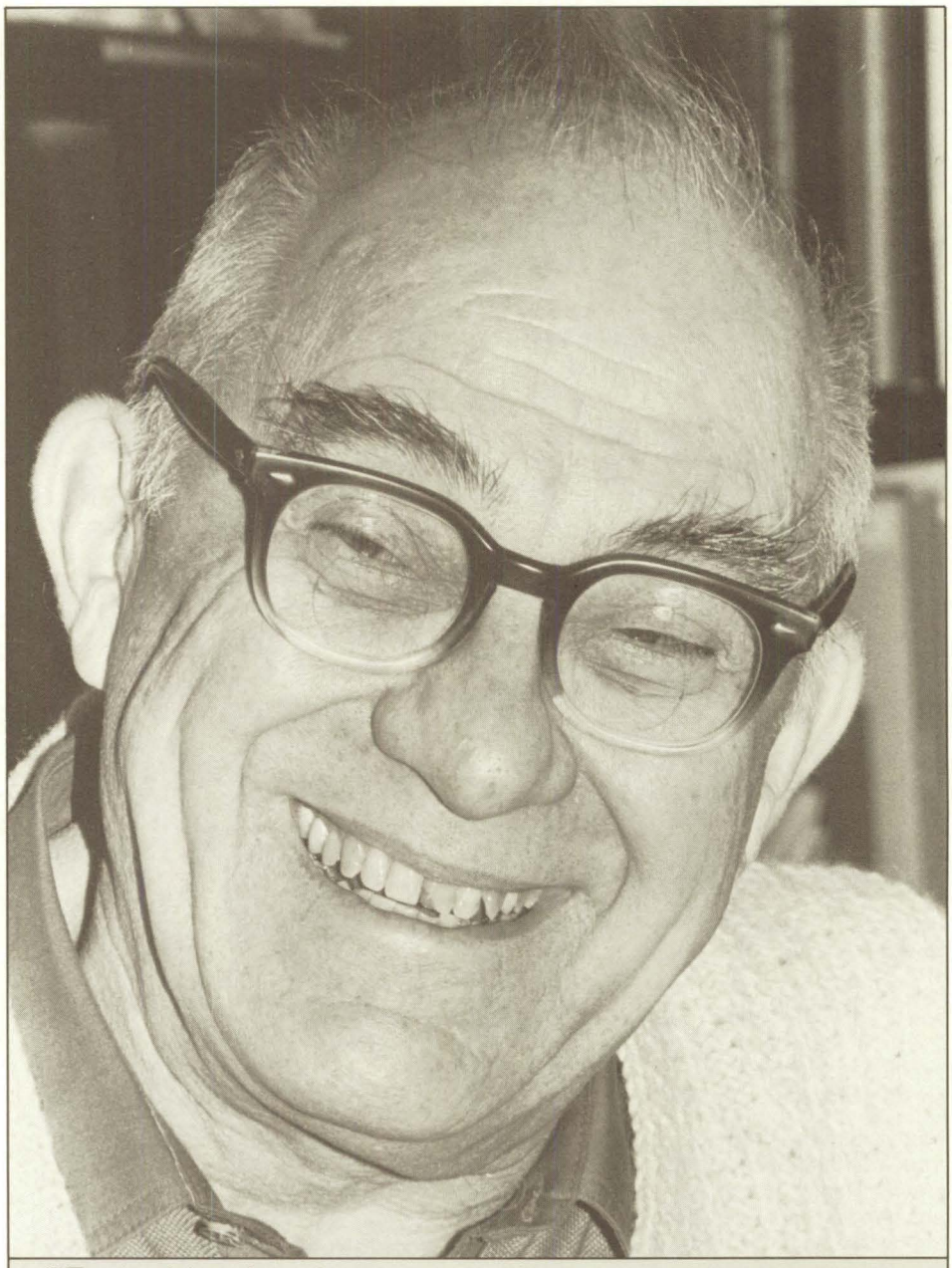


Photo by Kevin Gutknecht

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. . . Alfred Nier

1984 S & T Day emphasized cooperation

With the theme "Minnesota & Technology: An Outlook for the Future," Science and Technology Day 1984 focused on current and future cooperative efforts between public and private sectors. Afternoon speakers were Rex Krueger, general manager, higher education marketing, Control Data Corp., Richard Caldecott, consultant to the University president on technology transfer and former dean of the College of Biological Sciences, Michael C. O'Donnell, a member of Gov. Rudy Perpich's staff who heads the Office of Biomedical Health Systems, Kathleen McLaughlin, director of Minnesota Project Innovation, and Timothy Flynn of Peat Marwick Mitchell & Co.

Physics professor Walter Johnson received the George Taylor/Alumni Institute of Technology Distinguished Teaching Award at the luncheon.

Erich Bloch, director of the National Science Foundation, addressed the evening banquet. He emphasized the need for government, industry, and universities to form a partnership if the United States wants to stay technologically strong. Lt. Gov. Marlene Johnson also spoke. Lester Krogh, vice president for research and development at 3M Co., received the University's Outstanding Achievement Award.

S and T Day is the main fund-raising event for the Institute of Technology Alumni Society (ITAS), whose members organize the activities. It also serves as the organization's annual meeting. Overall chairman was Don Sudor from IBM Rochester. Proceeds support IT student scholarships, the Taylor teaching award, and student activities such as IT Week, Technology Fair, and *Connections*, a student publication. These funds also support part of *Items* and ITAS's operations.

The following companies sponsored tables at the Science and Technology Day banquet Nov. 9, 1984:

ADC Magnetic Controls
Allen Arthur Inc.
American Hoist & Derrick Co.
American Society for Quality Control: Minnesota section
Barr Engineering
BMC Industries Inc.
Bonestroo, Rosene, & Anderlik
Braun Engineering Testing Inc.
Centraire Inc.
Consulting Engineers Council of Minnesota
Control Data Corp.
Conwed Corp.
Coopers & Lybrand
CPT Corp.
Cray Research Inc.
Delton Industries
Donaldson Company Inc.
Economics Laboratory
Engineers Club of Minneapolis
Faegre & Benson
Fenner Co.
FluiDyne Engineering Corp.
FMC Corp.
H.B. Fuller Co.
General Mills Inc.
Graco
Hammel Green & Abrahamson Inc.
Henkel Corp.
Honeywell Inc.: Avionics Division
Honeywell Inc.: Corporate Human Resources
Honeywell Inc.: Corporate Tech Center
Honeywell Inc.: Defense Systems Division
Honeywell Inc.: Residential Division
Honeywell Inc.: SSED
Honeywell Inc.: Systems & Research Center
IBM Corp.
IBM Marketing
Lee Data Corp.
Medtronic Inc.
Meyer, Borgman & Johnson Inc.
Midtown Manufacturing
Minco Products Inc.
Minnesota High Technology Council
Minnesota Power and Light
MTS Systems
Northern States Power Co.
Northern Telecom
Northwestern Bell Telephone Co.
O'Connor and Hannon Law Office
Okabena Co.
Onan Corp.
Opus Corp.
Peat Marwick Mitchell & Co.
Perkin-Elmer Corp.
Pillsbury Co.
Remmele Engineering
Research Inc.
Rosemount Inc.
Setter, Leach & Lindstrom Inc.
Specrotech
Sperry Corp.
Tennant Co.
3M Co.
3M Co.: Divisional Engineering
3M Co.: E & IT Sector Administration
3M Co.: Environmental Engineering
3M Co.: Office of Patent Counsel
Tunks Inc.
Twin Cities Testing & Engineering Laboratory Inc.

Photo by Tom Foley

A New President

Gregg Vandesteeg ('76, Ph.D. in chemistry) assumed the presidency of the Institute of Technology Alumni Society from J.S. "Jack" Braun ('56 B.C.E., '57 M.S. in civil engineering) at the 1984 Science and Technology Day Banquet, held Nov. 9, 1984. Braun is president of Braun Engineering Testing Inc., geotechnical materials and environmental consultants with offices in Minnesota, North Dakota, and Montana. Vandesteeg is manager of product development, Dental Products Laboratory, 3M Co.

Alumni help make powerful space telescope that will see new horizons

By David Siegel

Imagine a telescope so powerful that from Washington, D.C., it can spot the flicker of a firefly 10,000 miles away in Sidney, Australia.

Consider the scientific significance of a telescope that can look out 14 billion light years to the edge of the universe and view celestial objects 50 times fainter than is now possible—a telescope that can enlarge the observable volume of the universe by 350 times. You can understand why IT alumnus William Chorske ('59 B.E.E., '61 M.S. in electrical engineering) is excited.

Chorske, senior vice president of Perkin-Elmer Corp., and head of the Danbury, Conn., company's optical group, has been overseeing construction of the instrument's main part, the Optical Telescope Assembly, which includes the telescope's mirror.

Developing the optical centerpiece "is the most difficult thing we've ever attempted," said Chorske.

Perkin-Elmer received a contract from the National Aeronautics and Space Administration (NASA) to build the telescope's core. As big as a boxcar, the 43-foot long, 25,500-pound telescope is expected to be launched into Earth's orbit by Space Shuttle Atlantis during summer 1986.

Named the Hubble Space Telescope after Edwin Hubble, who discovered the expanding universe, the telescope will be the largest and most complicated scientific cargo ever placed into Earth's orbit.

The $1.2 billion telescope, which some scientists have termed the greatest advance in astronomy since Galileo invented a simple telescope nearly four centuries ago, will circle 310 miles above the Earth every 93 minutes.

In space, unhindered by atmospheric haze, the telescope will look seven times further than Earth-based telescopes. It may answer questions not even asked yet, Chorske said.

Because light from distant planets or galaxies takes so long to reach the Earth, looking out into space is like looking back in time. Scientists may observe the possible birth of galaxies and quasars actually formed billions of years ago.

"We think the universe is about 14 billion years old so you'll be looking at events that occurred when the universe was created," Chorske said. "We've never been able to do that. Astronomers will tell you they have no idea what we will see."

Perkin-Elmer received the contract for the Optical Telescope Assembly in mid-1977 and has devoted more than 4 million human hours to the project, Chorske said.

The 94-inch mirror, the telescope's "crown jewel," is the most perfect of its size ever constructed, Chorske said. The company also developed guidance sensors enabling the telescope to lock onto extremely faint objects for 24 hours. From the top of the World Trade Center in New York City, the telescope could see a dime on the steps of the U. S. Capitol in Washington, D.C., 200 miles away.

"A lot of dedicated people worked seven days a week, 24 hours a day to get this thing out. This is really where engineering comes to its best moment. Most of the disciplines are represented here."

Perkin-Elmer shipped the Optical Telescope Assembly, which contained five science instruments, to Lockheed Missiles and Space Co., Sunnyvale, Calif., in November 1984. Lockheed will assemble the telescope, which will undergo a year of tests before its launch.

The telescope's life is 15 years, "but they expect to extend it by either refurbishing it in orbit, or taking it back down," Chorske said.

Instruments on board will take the light and convert it to electrical signals. Those will be beamed back to a ground station in the United States and will be relayed to a new Space Telescope Institute at John Hopkins University, Baltimore, Md., Chorske said.

NASA and the Space Science Institute will allocate viewing time on the telescope, which will be used by scientists from all over the world. It should help them understand the age and size of the universe, the origin and evolution of galaxies, the formation of stars, and the workings of the solar system, quasars, pulsars, novae, and supernovae.

One interesting note "is simply the difficulty and engineering challenge involved with this telescope," Chorske said. "Those difficulties were overcome by some super engineering. A lot of dedicated people worked seven days a week, 24 hours a day to get this thing out. This is really where engineering comes to its best moment. Most of the disciplines are represented here.

"I'm just delighted to have been involved and to have been here when the thing was really completed," Chorske said. "There was a lot of jumping up and down when it left."

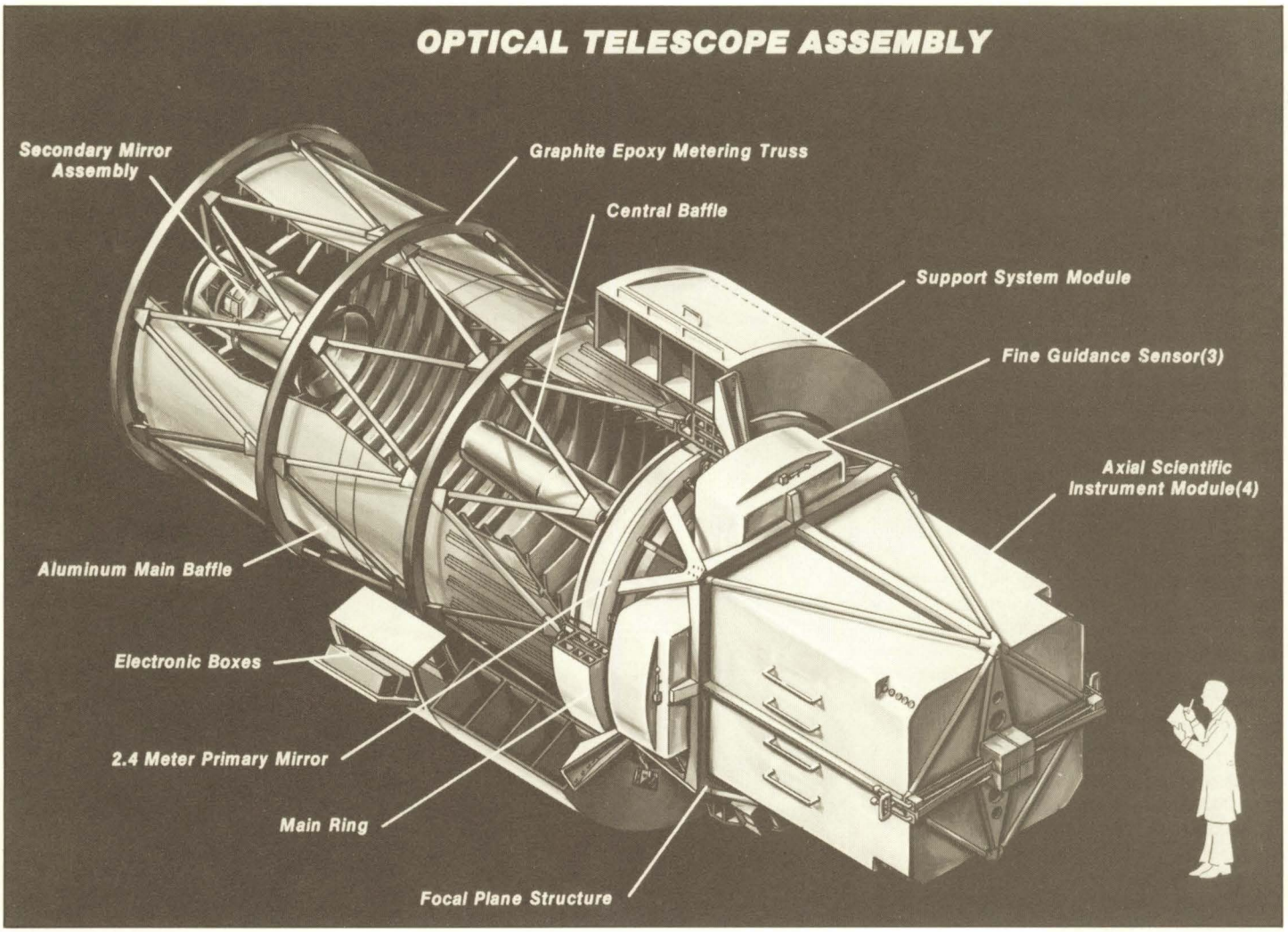
Professional Instruments Co., Minneapolis, contributed to the construction of the Hubble Space Telescope. Minnesotans and alumni involved in Professional's work included Eugene Dahl, ('70 aeronautical engineering); Timothy Sheridan, ('80 mechanical engineering); Daniel Oss, ('81 mechanical engineering); and Norman Silver, ('42 metallurgical engineering). Silver is past president of the Institute of Technology Alumni Society.

Perkin-Elmer scientist David Dean ('66 M.S., '71 Ph.D., in electrical engineering), also has been heavily involved in the project, Chorske said.

Chorske reflected for a moment on his days at the University. "I went through IT on a football scholarship. Myself and the captain of the team that year were the only double Es [electrical engineering majors] I think for a long time to go through the football program."

Chorske played halfback under Coach Murray Warmath . Even then, he thrived on challenges. He carried that determination through to the Hubble Space Telescope project.

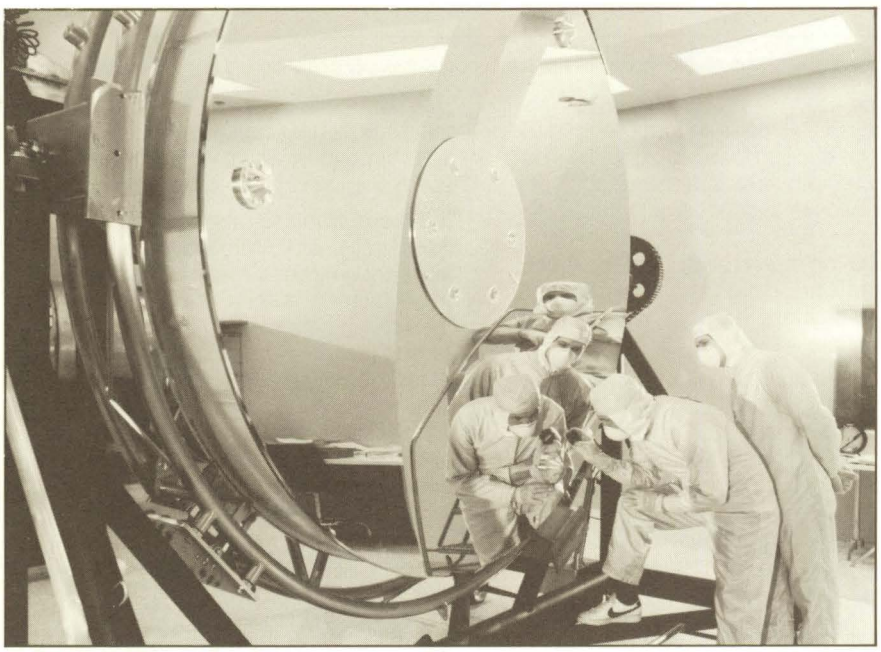
"There were really respected people who said that this just couldn't be done," he said. "Our guys are pleased that in fact they were able to build it and prove that it could be made."



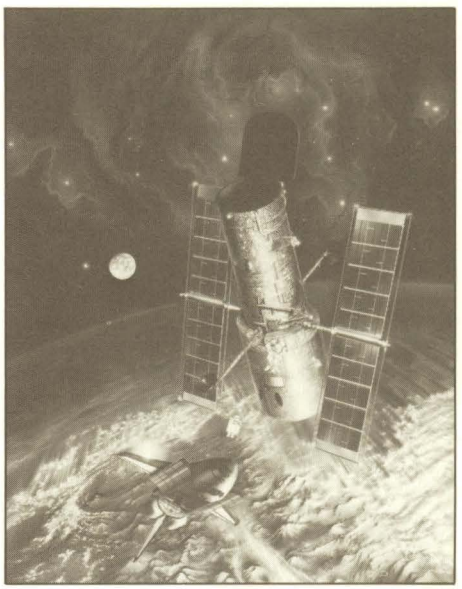
Photos courtesy of Perkin-Elmer

To Build a Telescope

An inside look at the Optical Telescope Assembly, the instrument's centerpiece. Light enters the telescope's open end, is projected by the primary mirror onto the smaller secondary mirror, and is directed to the science instruments in the Axial Scientific Instrument Modules for analysis.



The 94-inch primary mirror is coated with a reflective layer of pure aluminum 2-millionth of an inch thick protected by a layer of magnesium fluoride 1-millionth of an inch thick.



Scheduled for launch during 1986, the 25,500-pound, 43-foot long space telescope will make observations across a wide range of the electromagnetic spectrum—from the far ultraviolet to the far infrared.

U searches for telescope that will give IT astronomers a little piece of heaven

By Deane Morrison

The astronomy department is one of the best in the nation, yet its members have no guaranteed access to the very powerful telescopes needed to see the faintest objects in the sky. University astronomers must rely on the 4-meter national telescopes at Kitt Peak, Ariz., and Cerro Tololo, Chili. But these telescopes are already oversubscribed by a 4-to-1 ratio, said Roberta Humphreys, astronomy professor.

Humphreys recently organized a group of astronomers from 12 institutions to seek funding for a new telescope, which would guarantee them access to the kind of instrument many of them need. In December 1984, the group met at the University to discuss formation of a consortium that would finance a telescope in the 2.5- to 4-meter range. Telescope designer Frank Melsheimer of Boulder, Colo., described available models to the group, which decided to commission a feasibility study.

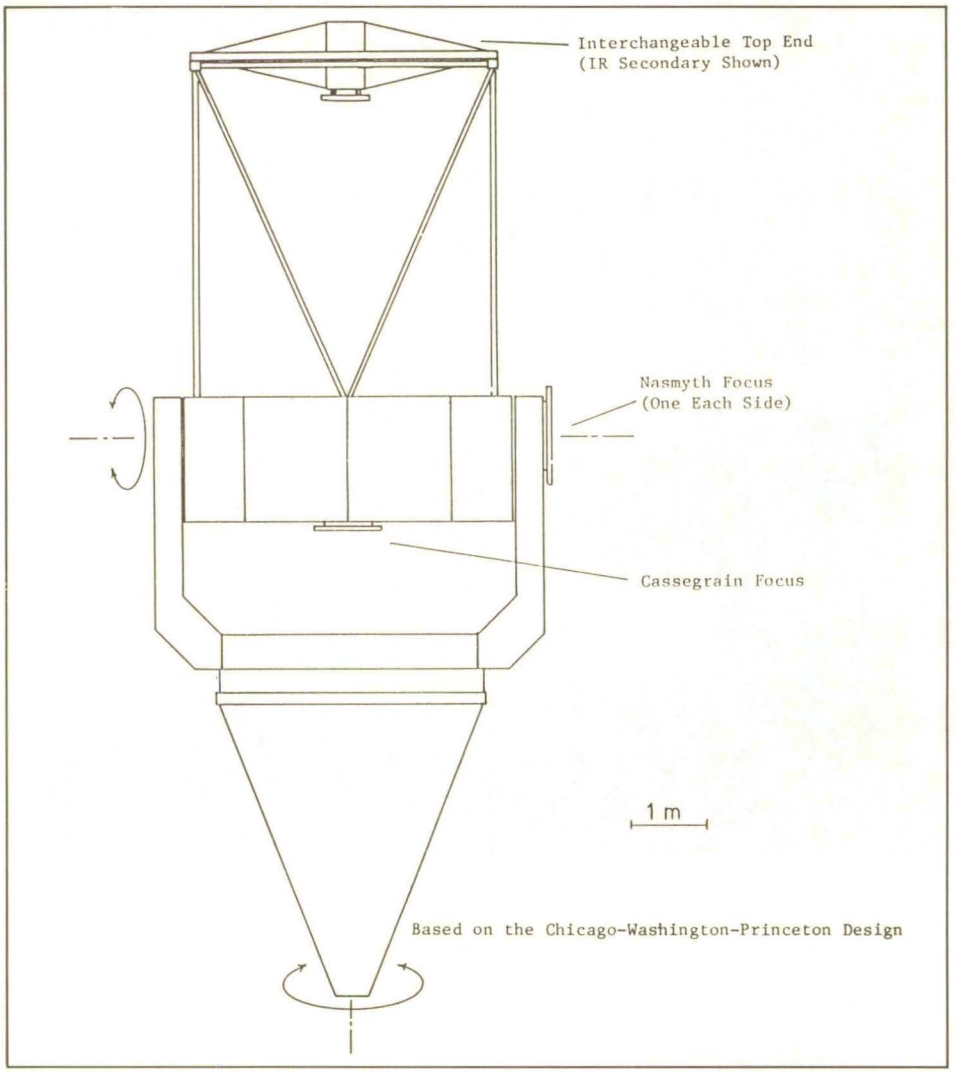
The astronomers favored a Sacramento Peak, N.M., site, where high elevation and dry weather would mean nearly ideal viewing conditions. Other University astronomers at the meeting were Thomas Jones, Terry Jones, Kris Davidson, and Wayne Stein. In addition to Minnesota, representatives from the Universities of Massachusetts, Missouri, Wisconsin, Illinois, Colorado, Virginia, and Michigan State, Indiana, Ohio State, Yale, and Iowa State Universities attended.

Most universities owning large telescopes are on the East Coast and in California, Humphreys said. Without their own telescope, many Midwestern universities cannot continue to compete and attract top students. The national observatories cannot give any astronomer more than a few nights a year, which is hard on those whose projects require years of observation. Humphreys has one of those projects.

"I've been interested in studying the brightest stars in other galaxies such as Andromeda," she said. "Those stars are very faint here, so I needed a large telescope to study their spectra. It took me four years to survey those stars because I only got about four nights out of each six-month allocation period at the national observatories."

Competition is not the only limitation on viewing time. Viewing is only possible on clear nights in the dark of the moon when the observatory computer is "up." Even the top facilities can only meet all those conditions less than one third of the time.

University astronomers share a 1.5-meter telescope at Mt. Lemmon, Ariz., with the University of California at San Diego, but it is not large enough to be competitive in infrared astronomy and spectroscopy. Nor will the space telescope, due to be launched in 1986 or 1987 (see story on page 8), bring much relief. Demand for its services will be so high that no astronomer can count on more than two hours of observation time.



A sketch showing one possible model for the telescope University astronomers hope to use in their research

Having agreed on the need for their own telescope, the universities must soon decide on a design and start raising money. IT Dean Ettore Infante allocated $5,000 for the feasibility study, with Wisconsin and Illinois contributing $1,000 and $2,000 respectively. The group must choose a design by next fall, Humphreys said.

If enough money is raised, one option involves building two telescopes of comparable size. Or, since consortiums of other universities also want to build telescopes on Sacramento Peak, the group could link its telescope to others nearby with fiber optics, which would create, in effect, a single even larger instrument.

The group wants to raise $10 million, Humphreys said. "With that amount we could not only build a telescope but set up an endowment of, say, $1 million to equip, operate, and maintain it," she said. Even pooling their resources, it would be tough for the 12 universities to build the telescope. The group must, therefore, find outside resources, and plans to seek major funding from private donors. The price is actually low for a world-class telescope; prices have declined recently with the advent of lightweight mirrors and the corresponding lightweight fast telescope design.

A target date for completing the telescope won't be set until funding is secured. "The sooner the money is raised, the sooner it will be built," Humphreys said.

Nobel winner looks to the stars

By Darlene Gorrill

Physicist William A. Fowler treated more than 500 faculty members, students, and corporate visitors to an explanation of his Nobel Prize-winning work, as well as to some humorous, non-scientific digressions, when he delivered the Institute of Technology's Second John & Abigail Van Vleck Lecture Nov. 7, 1984.

Fowler, who has spent his entire professional life at the California Institute of Technology, received the 1983 Nobel Prize in physics. He has been a Fulbright lecturer at Cambridge University and a Guggenheim Fellow. His research examines the nuclear processes that generate energy in the sun and other stars and that produce the various chemical elements.

The Van Vleck Lecture Series, established by University graduate Abigail Van Vleck in memory of her husband, brings outstanding scientists to the University. John Hasbrouck Van Vleck, universally recognized as the father of modern magnetic theory, taught at the University from 1923 until 1928 and shared the 1977 Nobel Prize in physics. Van Vleck died in 1980.

People frequently ask Fowler why he hasn't pursued administrative work, he said. His decision not to apply for more deanly appointments happened one day when he spotted a sign over a hot-air hand dryer in a college restroom. The sign said: "If you want to hear a two-minute speech by the dean, press button." Continuing in a lighthearted vein, Fowler also showed pictures of his grandson and of the Nobel Prize ceremony.

Fowler received the prize for his work in nuclear astrophysics, which is the application of nuclear physics to astronomy. He has investigated the structure of light nuclei, thermonuclear sources of stellar energy and element synthesis in stars and supernovae, supernova models, and general relativistic effects in quasar and pulsar models.

Most scientists believe that the sun's lighter elements of hydrogen and helium were created in the "Big Bang." But they now recognize that not all of the sun's elements were present during the "Big Bang." Fowler and others search for an explanation of how the sun's heavier elements, such as carbon, oxygen, and nitrogen, were synthesized.

Fowler's work focuses on the nuclear processes inside a star that, through a series of complicated steps, combine light nuclei to make heavier ones. Some of the elements produced as by-products result from explosions caused by the pressures of extremely hot temperatures in burning stars. Stars that explode scatter those elements throughout the galaxy. Fowler has worked out the steps of these processes, providing a foundation for future study of astrophysics and the energy-making processes of stars.

Photo by Teresa Fett

William Fowler, winner of the 1983 Nobel Prize in physics

While outlining the development of elements such as carbon and nitrogen, which are created in stars and serve as foundations for matter on Earth, Fowler also related a more poetic thought about the whole process.

"It is possible to say you, your neighbor, and I—each of us—are truly and literally a little bit of stardust."

Agreement to improve blood pump approved

The University of Minnesota and Bio-Medicus, a Minneapolis manufacturer of blood-pump systems for advanced surgical procedures, have signed an agreement to license and develop a device that protects bearings on blood pumps during open-heart bypass surgery or after implantation in patients.

Perry L. Blackshear, Jr., mechanical engineering professor and director of graduate studies in biomedical engineering, will direct the project. The University and Bio-Medicus will share funding for the venture.

The program seeks to improve both long-term protection for the bearing seals of Bio-Medicus's new line of centrifugal blood pumps and the design of advanced systems for future models of blood pumps. These improvements will be incorporated in the Bio-Medicus product line under a royalty arrangement with the University.

"We are very pleased to enter into a close working relationship with the University, which will benefit not only the parties but the medical community," said James F. Lyons, president and chief executive officer of Bio-Medicus. "We are particularly pleased that the skills and experience of Dr. Blackshear, who has an impressive background of achievements in the field of biomedical engineering, will be devoted to this program."

The agreement represents an increasing connection between industry and the University, said A.R. Potami, assistant vice president for research and technology transfer administration. "We are pleased to have concluded this arrangement as part of our increased efforts to transfer faculty discoveries into commercially viable products and services," he said.

Chemistry professor's garlic research could help medicine

By Jeanne Hanson

"Eat no onions nor garlic, for we are to utter sweet breath"—Shakespeare

While some people may think garlic is good only for keeping away vampires, assistant professor of chemistry George Barany believes the substance has much more potential.

Barany and researcher Andrew Mott have developed an easier way to discover garlic's potential. They synthesize garlic's active ingredient, creating a method that also can be applied to make peptides—chains of the amino acids that compose all living things—in less chemically destructive ways.

Grinding up garlic bulbs to isolate the active ingredients can take months, and, even then, results in very little material with considerable impurity. The new way of synthesizing garlic's active ingredient, allyl methyl trisulfide, provides absolutely pure material "in a couple of afternoons," Barany said. The natural and the synthetic molecules—complete with their pungent odor—are identical.

This pure, concentrated garlic could be useful in medical studies, Barany said. Researchers have found that allyl methyl trisulfide can inhibit blood clotting. Scientists are investigating the ingredient's use as a means to aid serum cholesterol levels, as an agent to fight some bacteria and fungi, and as an insecticide.

Allyl methyl trisulfide is an asymmetrical molecule built from a string of three sulfur atoms with different, small clumps of carbon and hydrogen atoms on both ends. Barany and Mott, who specialize in work with this kind of tricky molecule, realized

that they could not forge its molecular bonds with typical chemical methods using strong chemical acids and bases.

They needed to devise a milder method and took their clue from the way the body makes and breaks sulfide bonds internally. For example, within the liver, the molecule glutathione breaks down toxic chemicals quite undestructively and safely.

Building the garlic molecule required the engineering of two chemical reactions involving methoxycarbonyldisulfanyl chloride, two thiol molecules, and a mild catalyst in the solvent chloroform. Since researchers can easily remove the only two by-products, a sulfide gas and methanol, the key garlic ingredient is produced in a very respectable yield of 60 percent.

The laboratory process does provide a bouquet of odors, including a scent resembling gas used for gas stoves and wood alcohol and, of course, garlic odor. The resulting garlic substance—even when diluted 3,000 times—still smells just like garlic.

That means any medicine made with the garlic substance probably would make one's breath or body smell of garlic, Barany said. But a chemist might modify the molecule to reduce the odor while maintaining the medicinal value, he added.

Barany's and Mott's work was presented in April 1984 at the annual national meeting of the American Chemical Society and has been published in the August 1984 issue of *Synthesis*.

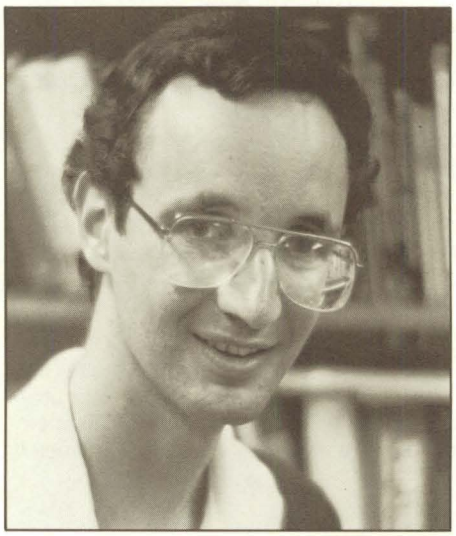
George Barany named one of *Science Digest's* top young scientists

George Barany, assistant professor of chemistry, has been named one of the United State's top 100 scientists under 40 by *Science Digest*. The scientists, named in the magazine's December 1984 issue, were chosen on the basis of recommendations by leading senior scientists. Barany, 29, was the only Minnesota scientist on the list.

Barany was born in Budapest, Hungary, and raised in New York City. The son of two research scientists, he went directly from high school to a graduate program at the Rockefeller University, where his research adviser was Bruce Merrifield. Merrifield, who is still at Rockefeller, won the Nobel Prize in chemistry in 1984 for inventing a new way to link together amino acids—the building blocks of protein—in chains known as peptides.

After completing his Ph.D. degree in 1977, Barany remained at Rockefeller as a postdoctoral fellow until becoming an assistant professor at the University of Minnesota in 1980. *Science Digest* noted that Barany has improved methods for the chemical synthesis of oxytocin, a peptide hormone that induces uterine contractions, and methionine enkephalin, a natural painkiller made by the brain. One example of Barany's research is profiled in the accompanying story.

"My work is to come up with mild methods for peptide synthesis that will result in higher yields and greater product purity," Barany said. "I was very surprised to have been selected for this honor and am in very distinguished company."



George Barany *Photo by Tom Foley*

Alliance develops plan to improve math and science education in state

By Darlene Gorrill

WANTED: *Educated employees who can recognize trouble faster than a speeding electron and solve complex problems quicker than a splitting atom.*

Constantly in demand, such employees can be more powerful than a Cray computer to a company. Yet many corporate leaders say they're hard to find, especially those who are well prepared in science and math. Why can't the educational system produce more outstanding workers?

One key to answering that question concerns how education works—what students learn and how well that prepares them for the world of work. In the Institute of Technology, the public-private partnership of the Minnesota Alliance for Science has learned much about the appropriateness, quality, and quantity of science and math education.

Begun in 1982 with funding from a Bush Foundation grant and co-hosted by IT and the College of Education, the alliance has involved more than 100 representatives from government, education, and business in planning.

Their conclusions and practical strategies may surprise some.

"Students do in fact acquire the basic skills," said Von Valletta, the alliance's executive director. "What's missing is taking the facts and formulas and principles and concepts that have been committed to memory and using those skills to solve complex problems."

Science and mathematics teaching must go beyond the basics and produce students who can solve problems, she said. The alliance plans to improve that learning in a unique way, by paying careful attention to the face-to-face moment when the student and teacher interact, Valletta said.

The alliance has completed a six-year plan with strategies to identify what students should learn and how that learning can be improved. Those strategies fall into the following six areas:

Creating awareness

"We have to increase awareness of learners and parents that this world requires intelligent problem-solving behavior," said Valletta, who served as deputy commissioner of education in Minnesota before heading the alliance.

Toward this end, alliance representatives held a series of 10 regional conferences across the state in October 1984 to explain alliance goals and strategies. The alliance also intends to send a letter to parents of eighth-grade students, explaining the importance of concentrating on English, math, and science classes and of developing good study habits. A brochure, advertising, and alliance participation in conventions also are planned.

Photo by Tom Foley

Von Valletta, executive director of the Minnesota Alliance for Science

Linking teachers to resources

"I have taught science for 20 years, yet I have never practiced science. It would be helpful if a practicing scientist could come into my classroom and share that experience with my students and me."
—teacher

"The corporate sector in Minnesota has indicated a commitment to improved learning in mathematics and science, yet companies ask how they might efficiently share resources and still get their primary work done."
—corporate representatives

Corporate participation is crucial to alliance goals. Companies such as First Bank System, Control Data, IBM, 3M, General Mills, Medtronic, Cray Research, MTS Systems, Honeywell, and Sperry have contributed time and resources to the effort, Valletta said.

That cooperation has resulted in tangible benefits for students. For example, professional groups such as the Association for Women in Computing and the science honorary society Sigma Xi have volunteered their services to school districts.

Companies have many resources to share and are looking for ways to do that without overtaxing employees, the alliance report said. The alliance can serve as an information broker—for example, matching companies that may routinely throw away test tubes to schools that don't have enough. Under alliance plans, pilot programs would be established for developing an "exchange network" with information about teacher needs and resources.

Establishing appropriate curriculum

The alliance proposes to collect, review, and make available materials that explain content and techniques for teaching math

ALLIANCE to page 14

ALLIANCE from page 13

and science, and, if necessary, develop curriculum to fill identified gaps.

Professional organizations such as the National Science Teachers Association, the National Council of Teachers of Mathematics, and the National Science Board of the National Science Foundation have published criteria for math and science curricula that outline what students should know and describe teaching methods.

Studies suggest, for example, that math teaching should develop skills in estimation and approximation; in understanding of basic data analysis, statistics, and probability; and in selective use of calculators to help develop concepts. Science teaching strategies might include developing a logical sequence of activities and using concrete, hands-on examples and community resources, such as field trips.

Curriculum ideas and materials such as these can be refined and distributed through the alliance.

Renewing elementary teachers

Curriculum development and teacher renewal set the groundwork for the alliance's most costly strategy—ensuring that teachers can and do use the materials and teaching practices.

Many elementary teachers feel unprepared to teach math and science, according to an alliance survey. Sustained efforts to communicate research findings to teachers who can use them in classrooms have not been made, the report said.

This part of the plan calls for updating 1,800 elementary teachers (grades four-six) in math and science subjects and teaching methods. By the end of the proposed six-year training period, the alliance estimates that some 300,000 students would be reached. School districts would pay teachers' tuition and supplement their salaries for time spent in training.

Faculty from 27 post-secondary institutions will form mathematician/scientist teams throughout the state to collaborate with teachers in curriculum changes and teaching techniques.

Renewing secondary teachers

The alliance found that secondary teachers generally feel better prepared than elementary teachers, but secondary teachers have a hard time finding appropriate materials.

This strategy involves establishing summer institutes and other seminars in which updated learning materials and techniques can be shared.

Preparing for teacher shortages

A shortage of math and science teachers will accelerate from 1988 to 1998, a period during which many current teachers will retire, Valletta said. To cope with the shortage, the alliance proposes compiling a list of qualified candidates, to assist local school districts searching for math and science teachers.

All of these strategies require a financial as well as human investment. The total proposed cost is $13.6 million. Roughly $2.5 million is expected to be raised from the private sector, with a $10 million public investment. The largest single expense is the renewal of elementary teachers—a $960,000 private investment and an almost $9 million public investment.

"I would like to point out that this [$13.6 million] is approximately the cost of providing one day of instruction in the state," Valletta said. "We think this makes much more sense than considering adding another day to the school year."

The alliance also intends to participate in public policy making. For example, the alliance plans to ask the Legislature in 1985 to provide some funds for teacher training.

"There is a common perception that educators are very resistant to change. Our view is that it's not true. They don't have the adequate resources to do both [teach and develop]," Valletta said.

The alliance recently received an additional $400,000 three-year grant from the Bush Foundation to continue operations. Currently, the alliance is working with school districts, communities, and the private sector to build support for the plan.

"We will pay a handsome price if we don't make an appropriate investment now," Valletta said. "People will not be adequately prepared to work in a highly interdependent and very complex world."

Those interested in the alliance's six-year plan for action can receive a copy by writing: Minnesota Alliance for Science, 313 Walter Library, 117 Pleasant St. SE, University of Minnesota, Minneapolis, MN 55455

Chemistry professor investigates ways to block undesirable alkaloids

By Deane Morrison

The plant Senecio riddellii can be a real killer. When the weather gets dry, the plant's drought resistance makes it a target for hungry livestock unable to find enough of their normal food. But the plant is loaded with carcinogens, and people who eat meat from these animals run the risk of exposure.

There isn't much chance of teaching cattle, sheep, and goats to avoid Senecio, but it may be possible to control the amounts of toxic substances produced in such plants. That is one reason chemistry professor Edward Leete devotes his efforts to unravelling the processes by which plants produce alkaloids, a class of compounds that includes cocaine, nicotine, mescaline, and the substances in Senecio that cause liver cancer. Leete finds ways to block or redirect key steps in the chain of events leading to the synthesis of undesirable alkaloids.

Leete's research is helping the U.S. Department of Agriculture take the first step toward controlling the Senecio problem.

At the University, Leete feeds Senecio plants with radioactive forms of chemicals known to be building blocks of the poisonous alkaloid riddelliine. The plants will then produce radioactive riddelliine, which Leete will extract and send to the USDA in Fargo, N.D. USDA scientists will feed the "hot" riddelliine to experimental animals and, using the radioactivity as a signal, trace the fate of the chemical in the animals' livers. Their findings should help determine how riddelliine and related alkaloids cause cancer.

Unfortunately, the opportunities for human exposure to the chemicals don't end with eating meat.

"There has been some work showing that goats ate Senecio and the alkaloids got into the milk, causing ill effects in children who drank the goats' milk," Leete said. "These plants are used for folklore medicine in teas, and the comfrey plant, which has the same alkaloids, is used in Britain to treat aches and pains. People rub it on their skin."

Leete also is engrossed in the mysteries of how—and why—a more familiar alkaloid is made. The roots of tobacco plants make nicotine through a series of about 10 steps. Each step is the enzyme-catalyzed conversion of one molecule to the next in the series, with the appearance of nicotine the last step.

Blocking any step would prevent the syn-

LEETE to page 20

Partners Program links people & resources

By Sharon Grimes

When H.B. Fuller Co. decided to reorganize, it had to pinpoint key employees for additional training and find out what kind of training was available.

BMC Industries Inc. had a productivity problem in their manufacturing process and was also looking for students to fill internship positions.

As members of the University's Business and Technology Partners Program, they contacted the liaisons at the Institute of Technology or the School of Management. These contacts help businesses find and use University resources such as seminars, courses, research results, library materials, faculty experts, and job recruiting offices. Company representatives can identify employees who are interested in continuing education and particular areas of research.

H.B. Fuller received information about University courses and advice on the feasibility of hiring faculty members to teach courses at its plant.

BMC representatives toured the University Productivity Center and talked to a faculty member who was doing fiber optics research. In addition, the company worked with placement officers to find students for internships and to recruit students for jobs. The company also established a consulting contact for a research project with a faculty member.

To join the Business and Technology Partners Program, a company is asked to make an initial two-year commitment and support the program through membership grants, which are based on the company's annual earnings. Companies with earnings under $50 million give yearly grants of $5,000; those with earnings of $50-$200 million give grants of $10,000; and those with more than $200 million in earnings provide $20,000 grants.

Companies that cannot afford full membership grants, but still want to support the program and have access to the benefits, can belong as affiliates. Currently, there are 38 member and affiliate companies. In the next several months, 10 new companies will be contacted about joining the program.

"You can walk the halls of industry to find out what some of the needs are in education," according to Leslie Fox, IT's assistant director of development and one of the contacts for the Business and Technology Partners Program. The University of Minnesota must keep abreast of corporate needs because companies are the future employers of University graduates, she said.

The Partners Program also provides the two colleges with needed unrestricted funds. Money raised through regular development efforts is generally restricted, that is, designated for specific uses. Partners money can be used by the deans for projects that are important but lack funding. The program has thus far raised $2 million, she said.

Money has been used to fund publications such as *Items*, graduate assistantships and fellowships, undergraduate scholarships, course and curriculum development, placement activities, equipment, recruitment of new faculty, and administrative costs of development and public relations activities.

The deans of IT and the School of Management hope to collaborate even more on future Partners Programs. Joint continuing education courses will provide management skills for technical people and technical training for managers. Eventually, a joint degree program may be developed to meet industry's need for management skills in the high-tech area.

Member companies include American Hoist & Derrick Co.; BMC Industries Inc.; CPT Corp.; Carlson Co. Inc.; Conwed Corp.; Donaldson Co. Inc.; Economics Laboratory Inc.; FMC Corp.; Gelco Corp.; Honeywell Inc.; Magnetic Controls Co.; Medtronic Inc.; National Computer Systems Inc.; Northern States Power Co.; Northwestern National Life Insurance Co.; Peat Marwick Mitchell & Co.; Rosemount Inc.; Sheldahl Inc.; Super Valu Stores Inc.; 3M Co.; Toro Co.; and Valspar Corp.

Affiliates include American Hardware Mutual Insurance Co.; Burlington Northern Inc.; Champion International Corp.; Deluxe Check Printers Inc.; Farmers Union Grain Terminal Foundation; H.B. Fuller Co.; Graco Inc.; Geo. A. Hormel & Co.; Internorth Foundation; Inter-Regional Financial Group Foundation; Kroy Inc.; Northwestern Bell Telephone Co.; Owatonna Tool Co.; Piper Jaffray & Hopwood Inc.; Sperry Corp.; and Tennant Co.

For further information about the program, contact one of the liaisons:

Leslie Fox, Assistant Director of Development
Institute of Technology
103 Experimental Engineering
208 Union St. SE
University of Minnesota
Minneapolis, MN 55455
612/376-2448

Kay Hubbard, Director of Corporate/Community Relations
School of Management
150 Management and Economics
271-19th Ave. S.
University of Minnesota
Minneapolis, MN 55455
612/376-9246

3M Co. contributes $400,000 to MEIS

The 3M Co. has contributed $400,000 to the University's Microelectronic and Information Sciences Center (MEIS). The gift, which was announced in December 1984, will help sustain research, education, and technology transfer programs at MEIS. It is the first gift to the center beyond the seed grants given by Control Data Corp., Honeywell Inc., Sperry Corp., and 3M Co. that helped establish the center in 1981.

"Now that the MEIS programs are in full swing and halfway through their first program cycle, we are seeking continuing contributions to further develop these programs," said Martha Russell, the center's associate director. A major object of such support is team research projects in intelligent systems, III-V compounds and high-speed devices, high-performance integrated circuits, and artificially structured materials for microelectronics. These projects are joint endeavors involving scientists and engineers from participating companies and University faculty and graduate students. MEIS has presented project reviews of research results obtained in the first three projects; the artificially structured materials team will hold its first review April 8.

In addition to the four companies that provided seed grants, the center receives support from the state of Minnesota, federal sources, and other companies, including Cray Research Inc.

The purpose of MEIS is threefold: to sponsor and conduct research at the frontiers of microelectronic and information sciences; to strengthen the educational offerings of the University in these sciences; and to provide exchanges between those involved in research and those applying research findings.

One example of exchange is the MEIS Doctoral Fellows Program, through which first-year graduate students obtain a summer of work experience at participating companies. About 200 people—faculty, graduate students, and industrial scientists and engineers—currently participate in MEIS-sponsored activities.

"I believe strongly that technology transfer is a two-way process," Russell said. "The University and industry both excel at different tasks, so collaboration helps the process tremendously."

Milestones

Philip Goodrich, associate professor of agricultural engineering, helped plan and presented a paper at an international conference on biogas technology in Cairo, Egypt, in November 1984. He also participated in the 20th anniversary celebration of the environmental engineering laboratory at the University of Tokyo.

Agricultural engineering professor **Harold Cloud** helped develop studies on alternative storage facilities and management of dry edible beans and sorghum on a trip to Kigali, Rwanda, Africa, in November and December 1984.

Julia Robinson, assistant professor of architecture, has received a National Endowment for the Arts research grant for a project titled "Housing Form: Empirical Description."

Paul Barbara, assistant professor of chemistry, gave an invited seminar, "Ultrafast Isomerization Reactions in Solution," during a workshop at the Argonne National Laboratory in October 1984. In November 1984, Barbara also presented seminars at Purdue University and at a workshop in West Lafayette, Ind.

Chemistry professor **Robert Brasted** discussed teacher behavior and classroom dynamics at the 1984 Edwin O. Siggelkow Student Leadership Retreat. Brasted also presented a seminar, "The Educational Wheel of the '80s: Rotating, Spinning, or Reinventing," at Virginia Commonwealth University and at William and Mary University in October 1984.

Chemistry professor **Peter Carr** presented two seminars, "What is Analytical Chemistry" and "High Performance Liquid Chromatography of Proteins," at St. John's University in Collegeville, Minn., in October 1984. In November 1984, Carr presented the seminars, "High Performance Liquid Affinity Chromatography" and "Linear Solvation Energy Relationships and Chromatography," at the University of Florida, Gainesville.

Chemistry professor **John Ellis** presented a seminar, "Recent Results in Metal Carbonyl Anion Research," at Texas A & M University and at the University of Houston in October 1984.

John Evans, associate professor of chemistry, presented a paper, "Analytical Applications of Plasma Etching of Polymers," in October 1984 at the Midwest University Analytical Chemistry Conference in Madison, Wis.

Jed Fisher, assistant professor of chemistry, chaired a lecture session at the Fourth Annual Midwestern Enzymes Meeting hosted by the University of Illinois, Chicago, in October 1984.

Chemistry professor **Paul Gassman** chaired a post-meeting forum of chemistry department heads at the September 1984 annual meeting of the Council for Chemical Research in Berkeley, Calif. Gassman also presented a lecture, "The Use of ESCA in the Characterization of Stable and Transient Transition Metal Complexes," at John Carroll University in Cleveland, in October 1984 and at Occidental Chemicals and Union Carbide Corp. in South Charleston, W.V., in November 1984. Also in November, he presented a lecture, "Electron Transfer From Highly Strained Carbon-Carbon Sigma Bonds," at Canisius College in Buffalo, N.Y.

Wayne Gladfelter, associate professor of chemistry, presented a seminar, "N-H Bond Formation on Metal Carbonyl Clusters," at North Dakota State University and the University of North Dakota in November 1984.

Thomas Hoye, associate professor of chemistry, presented a seminar, "Dilactones, Triepoxides, Tetrahydrofurans, and Related Observations," to the chemistry departments at the University of California at Davis and Berkeley and the University of Nevada at Reno in October and November 1984.

Chemistry professor **Maurice Kreevoy** travelled to Ottawa in October 1984 to present a paper, "Application of Marcus Theory to Hydride Transfer Between NAD+ Analogues."

Chemistry professor **Edward Leete** presented a seminar, "Biosynthesis of Cocaine and Related Tropane Alkaloids," at Cornell University, Ithaca, N.Y., in October 1984.

Tom Livinghouse, assistant professor of chemistry, attended the IUPAC Conference on Organic Synthesis in Freiburg, West Germany, in August 1984.

Timothy Lodge, assistant professor of chemistry, presented a paper, "Diffusion of Branched Polymers in Concentrated Solutions," in Madison, Wis., in October 1984. He also presented a seminar, "Measurement of Diffusion in Concentrated Polymer Solutions and Polymer Films," in Duluth, Minn., in November 1984.

Essie Kariv-Miller, associate professor of chemistry, was an invited visiting professor at the University of Rome and consulted at Tel-Aviv University in September and November 1984.

Chemistry professor **Donald Truhlar** gave a lecture, "Large-Scale Quantum Mechanical Scattering Calculations on Vector Computers," at the Workshop on Future Directions for Supercomputer Use in Chemistry at Evanston, Ill., in October 1984 and at the Supercomputer Applications Symposium at Purdue University, West Lafayette, Ind., in October and November 1984.

Anand R. Tripathi joined the computer science department as an assistant professor in December 1984.

V. Rama Murthy, former acting dean of the Institute of Technology, was named associate vice president for academic affairs in September 1984. Murthy, a professor of geology and geophysics, also is a consultant for a Public Broadcasting Service production, "Earth: The Rediscovery." The series, scheduled to air in October 1985, ties together the scientific disciplines involved in the study of the planet.

John Splettstoesser, senior scientist for the Minnesota Geological Survey, was a guest lecturer in geology on two cruises to Antarctica and the Falkland Islands on the *Lindblad Explorer,* a commercial tourist ship operated by Society Expeditions of Seattle. The ship left Nov. 22, 1984, and returned Dec. 17, 1984.

Mathematics professor **Carlos Kenig** participated in a symposium on analysis at Beijing University in China during summer 1984. Kenig was one of seven Americans invited to the symposium.

Max Donath has been promoted to associate professor of mechanical engineering and **Virgil A. Marple** has been promoted to full professor.

Mechanical engineering professor **Arthur G. Erdman** has been elected a fellow in the American Society of Mechanical Engineers.

R.J. Goldstein, mechanical engineering professor and department head, has been elected to the executive committee of the International Center for Heat and Mass Transfer.

Mechanical engineering students **Donald Johnson, Myron Koehn,** and **Bennet Louwagie** received second prize for an electrically operated casement window in the American Society of Mechanical Engineers Mechanisms Model Competition. Mechanical engineering professor **Arthur G. Erdman** is the students' advisor.

Mechanical engineering professor **Thomas E. Murphy** has been elected to the Society of Automotive Engineers Board of Directors for a three-year term beginning in 1985.

Terrence W. Simon, assistant professor of mechanical engineering, received an Amoco Foundation engineering faculty grant to support his research and educational activities over the next three years. The program, sponsored by the Amoco Foundation of Chicago, is directed at attracting and retaining outstanding engineering faculty members at highly recognized engineering schools throughout the country. Simon also received a re-

search grant from the NASA-Lewis Research Center to investigate the effects of flow ascillation on heat transfer.

J.J. Moore, associate director of the Mineral Resources Research Center, organized, chaired, and lectured at a short course, "The Segregation and Application of Electromagnetic Stirring of Continuously Cast Steel," in November 1984 for members of the steel industry from North America, Europe, and Japan.

K.J. Reid, director of the Mineral Resources Research Center, served as program director for the First National Mineral Institute Workshop held in January 1985 in Washington, D.C. Reid is chairman of the National Association of Mineral Institute Directors.

Karl Smith, assistant professor at the Mineral Resources Research Center, and **David Johnson,** professor of educational psychology, conducted an October 1984 workshop on the instructional use of controversy at an IEEE/ASEE conference in Philadelphia.

Physics professor **John H. Broadhurst** participated in a workshop on "Transients in Electrostatic Accelerators and in the Vivitron" at the *Centre de Recherches Nucleaires de Strasbourg*, France, during January 1985.

Physics professor **Allen M. Goldman** has been elected a fellow of the American Physical Society.

Alan Shapiro, professor of history of science and technology in the School of Physics and Astronomy, has been elected to the International Academy of the History of Science.

Cesar Farell, associate professor at the St. Anthony Falls Hydraulic Laboratory, served as a United Nations development program expert advising on the development and design of wind tunnels, water cavitation tunnels, and circuits for valve testing and flow meter calibration at the *Laboratorio de Hidraulica Aplicade* in Buenos Aires, Argentina, during August and September 1984.

Raymond Sterling, associate professor and director of the Underground Space Center, will lead a Science Museum of Minnesota study tour to visit the sites of underground settlements in the Mediterranean region in August and September. Stops include Cappadocia, Turkey; Matmata and Bulla Regia, Tunisia; Granada, Spain; and the Loire valley in France. For information, contact Sterling or the Science Museum.

Awards

Robert J. Gustafson, professor and director of graduate studies in agricultural engineering, received the A.W. Farrall Young Educator Award for teaching, particularly for his skills in teaching finite element analysis and in developing appropriate learner-level computer programs. The award was made during a December 1984 American Society of Agricultural Engineers meeting in New Orleans.

Architecture students **Martha Abbott** and **Timothy Stefan** have received Thomas Ellerbe Foundation Awards. Each was awarded a $2,000 fellowship.

Stephen Weeks, assistant professor of architecture, received one of only six citations given for research in *Progressive Architecture*'s Design Awards Program. Weeks evaluated nearly 650 households in the Minneapolis/St. Paul Family Housing Program to discover people's dwelling preferences. The work was published in the January 1985 issue.

R.A. Oriani, professor and director of the Corrosion Research Center, received the Alexander von Humboldt Award from the Federal Republic of Germany in recognition of research accomplishments.

Herbert E. Wright, Jr., Regents' Professor of Geology and Geophysics, received the Pomerance Award for Scientific Contributions to Archeology in December 1984.

Alfred O.C. Nier, Regents' Professor Emeritus of Physics, received the Frank H. Field and Joe L. Franklin Award from the Alpha Chi Sigma Fraternity for outstanding achievements in mass spectrometry. (See story on page 1.)

Events & Visits

Professor Yookun Cho from Seoul National University in Korea is a visiting professor in the **computer science** department.

Professor Erwin Engeler of the mathematics department at the *Eidgenossische Technische Hochschule* of Zurich will visit the **computer science** department and **mathematics** school. Engeler was a member of the School of Mathematics faculty from 1958 to 1962 and from 1964 to 1972.

Paul E. Queneau from Dartmouth College presented the Henry Krumb Lecture to the Twin Cities subsection of the **Society of Mining Engineers** Oct. 22, 1984. Sponsored in cooperation with the University's continuing education program, the lecture series allows local groups to hear prominent engineers.

The following professionals will be lecturing at the **School of Architecture and Landscape Architecture** winter and spring quarters: Barbara Solomon, San Francisco landscape architect; Colin Rowe, Cornell University urban design professor; Frank Gehry, Los Angeles architect and professor; William Porter, MIT architecture professor; and Kevin Harrington, IIT professor of architectural history.

Organizers of a conference on Advancements in Aerodynamics, Fluid Mechanics, and Hydraulics at the University of Minnesota are asking for paper proposals. The conference, scheduled for June 3-6, 1986, in Minneapolis, will summarize advancements in aerodynamics, fluid mechanics, and hydraulics relating to **civil engineering.** Those interested should submit abstracts, which will be used to determine final paper selection for the conference, by April 1, 1985, to H.G. Stefan, St. Anthony Falls Hydraulic Laboratory, 2-3rd Ave. SE, University of Minnesota, Minneapolis, MN 55414. Those who wish information about the conference should contact John Vollum, Department of Conferences, 222 Nolte Center, 315 Pillsbury Drive SE, University of Minnesota, Minneapolis, MN 55455.

First-phase renovation of Amundson complete

First-phase construction for the renovation of biochemical engineering facilities in Amundson Hall is near completion. Chemical engineering professor Arnold G. Fredrickson and Wei-Shou Hu, assistant professor of chemical engineering, recently moved their laboratories into the renovated room.

The laboratory is equipped with a state-of-the-art New Brunswick fermentor, which was purchased with funds donated by General Mills Inc., Pillsbury Co., the University's Graduate School, and the Department of Chemical Engineering and Materials Science. Equipment donations from Bristol-Myers Inc. of Syracuse, N.Y., also add to the laboratory's capabilities.

More space in Amundson Hall will be renovated for biochemical engineering research and instruction. The work is scheduled for completion in summer. The department plans to offer a new biochemical engineering laboratory course and a biochemical separations course in spring quarter 1985.

Earl Bakken:

Pacemaker engineer leads industry giant

By Pamela LaVigne

Medtronic's corporate headquarters stands tall in its surroundings, but could hardly be said to dominate the landscape. Its address is far from flashy: Old Highway Eight. Inside there's a clean, well-scrubbed air about the place. Hallways are wide, offices spacious, lots of nice contemporary art hangs on the walls.

Modest, pleasant, private—like Medtronic's building, IT graduate Earl Bakken creates a similar first impression. He's disarmingly unpretentious. Although Bakken founded and still leads this company, he clips on a photo ID card like any other employee. On this cold day there's an added measure of simplicity: peeking out from the edge of Bakken's grey silk suit are several inches of navy warm-up pants.

His calendar records commitments for two years to come. At each of those meetings with employees, physicians, industry leaders, and others, he'll wear two pins on his lapel: the square 35-year service pin and the round Bakken Society pin, forms of recognition only within Medtronic. He enhances the prestige of these symbols by wearing them himself. But more than that, they telegraph to all who see and ask about them Bakken's total belief in this company.

Bakken designed the world's first wearable, battery-operated heart pacemaker. At 61, he chairs the board of directors of Medtronic, the world's leader in the manufacture of pacing systems, which also produces bioengineered products for dispensing drugs, providing pain relief, and monitoring body chemicals.

The change from designing the products the company makes to leading the company itself seems enormous for this soft-spoken engineer, yet there are still signs of Bakken's early interests and ideals.

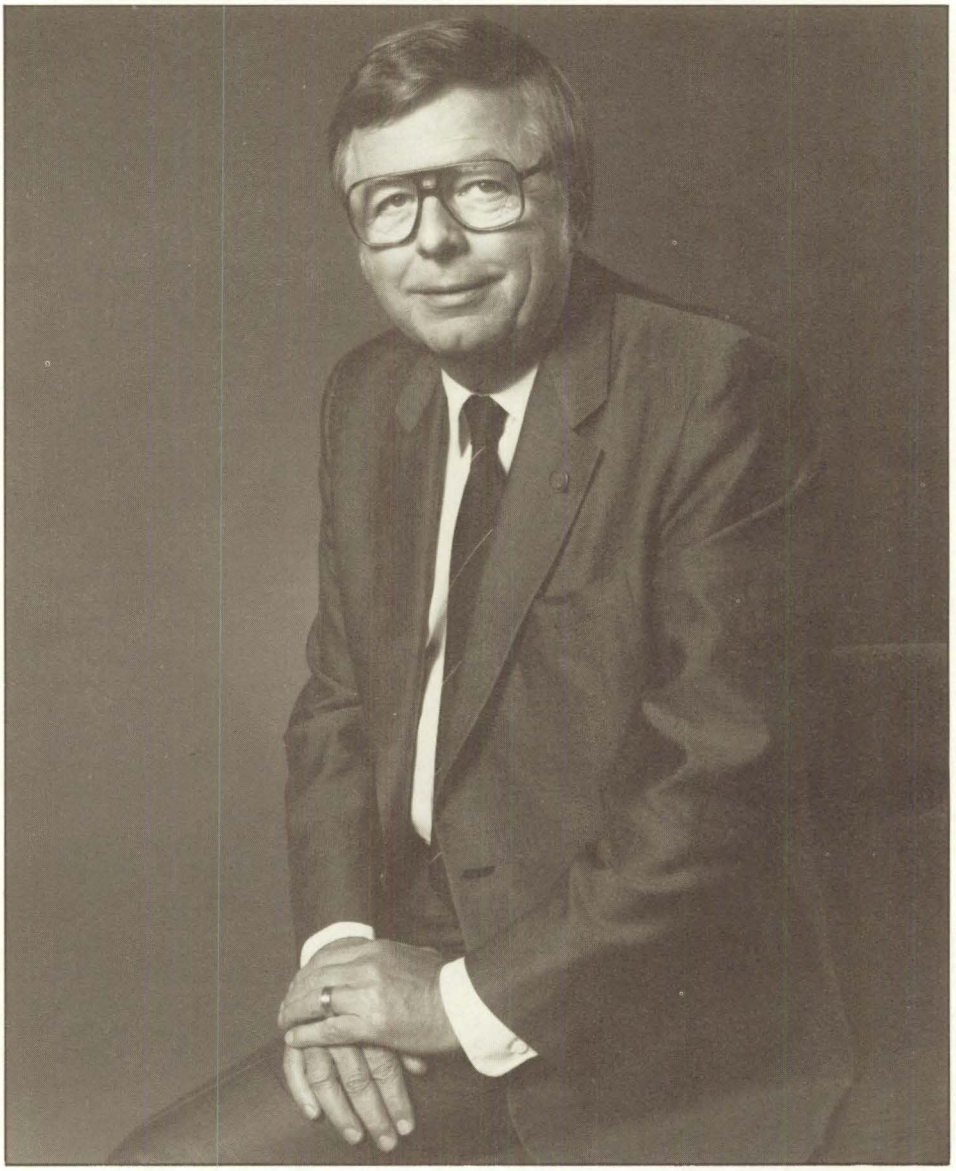


Photo courtesy of Medtronic

Earl Bakken

The young inventor

He was born and raised in "Nordeast," a section of Minneapolis known for the industriousness of its citizens, many of whom are descendents of European immigrants. His heritage is Norwegian, and his grandfather was a mathematician and inventor, creating variations on two-wheeled vehicles.

An only child until 18, Bakken spent much time by himself, cooking up experiments using electricity. As a grade schooler, he had a workshop in the family's basement, where he fashioned countless radios, a private telephone hookup to a friend's house, and a 5-foot tall robot made of Erector Set parts and plywood. Its eyes blinked, its head moved, and, thanks to hot-water bottle lungs and a small electric motor anchored mid-"belly," the thing was a chain smoker.

After graduating from high school, Bakken enlisted in the Army Signal Corps. His proficiency at radio licensing tests qualified him to teach radar maintenance, and he eventually transferred to the Air Force. He served three and a half years during World War II.

Back in Minneapolis after the war, he entered the University under the GI Bill and started work toward a degree in electrical engineering. There wasn't time for many student activities, Bakken remembered—he received his degree in three years, attending classes through the summers.

"So many of the students were former GIs, and they had matured greatly in that three, three and a half years that had intervened between high school and college, so they were at a much more serious, determined level.

"I think it was a period that instructors probably enjoyed because the students were so eager and demanding. But it was really cutthroat—they were really competing against each other."

Bakken earned his degree in 1948, married soon after, and started graduate school—a familiar story. But it soon changed.

Development of a company

Bakken often passed the time by repairing medical equipment, calibrating this thing, tinking with that. At one family birthday party, Bakken and his brother-in-law Palmer Hermundslie talked about forming a company to handle such repairs. Talk quickly became reality.

Hermundslie was the fund raiser and business manager; Bakken was the technical expert. A 600-foot garage Hermundslie owned became headquarters for the new firm, which the two named Medtronic—a contraction of medical and electronics. The two worked at homemade desks; lumber from old refrigerated box cars was the paneling. It was April 1949.

Total billings for the first month in business came to $8—for repair of a centrifuge. After a lean first year, the two added sales duties to their fledgling service business, becoming representatives of three medical products firms.

But Bakken continued to make specials, as he called them—adaptations enabling his physician customers to use the medical products Bakken sold.

During this time Bakken renewed his ties to the University, working with noted heart surgeon C. Walton Lillehei. "Blue babies" were Lillehei's concern in those days—infants born with a congenital heart defect who appear blue because their blood lacks sufficient oxygen. The stitches used in surgery could interfere with their heart's normal beating, and large, external pacemakers were needed. This cumbersome equipment produced potentially harmful electrical shocks and was vulnerable to power outages.

At first Bakken considered using a car battery—running it through a converter and diminishing the power considerably. That idea was rejected as wasteful. Poring over back issues of *Popular Electronics*, Bakken hit on a solution: a circuit design for a metronome. With modifications, it did the trick. About the size of three cigarette packs inside a canvas covering, the world's first battery-operated wearable pacemaker had been made.

Immediately Medtronic tried to improve its new product.

But in New York, surgeon William Chardack and engineer Wilson Greatbatch already had used Medtronic leads to develop an implantable pacemaker. Hermundslie flew his own plane to New York to meet with them and signed a 10-year contract for the exclusive manufacture of their pacemaker.

Too much success

From servicing to manufacturing, the homegrown operation was suddenly very big time. Staff mushroomed, and the firm rapidly expanded its product line as well. Although the company seemed to be in a stage of phenomenal growth, it was essentially bankrupt—too much growth, too quickly. In addition, Hermundslie, a diabetic, was becoming seriously ill. Ten years old, Medtronic was about to collapse under the weight of its own sudden success.

"In 1960 I made the recognition that if the company was going to survive, I was going to have to manage it and not spend my time engineering," Bakken said. Medtronic became a corporation, and Bakken became its first president.

"That was a crucial turning point for me," he said. "My pleasure had always been in making devices—building them, delivering them, seeing them work.

"In my youth, I never planned to become head of a major manufacturing company. My goal was to be just a research engineer, doing my thing in some corner of some company like Honeywell. I'd always been extremely introverted....I had no other plans but to hide someplace."

It was a hard decision to make and execute, he said. Staff was cut from 54 to 27; some "fantastic instruments" the company had been producing were dropped; all efforts were concentrated on the implantable pacemaker.

By 1963 the company was showing a profit, as it has every year since. Medtronic currently has revenues of $423 million and profits of $60 million, and employs 5,200 workers. Its products are sold in 75 countries.

Personal changes

Medtronic's deep and steady changes have paralled Bakken's own personal changes. The man who used to be afraid to fly and who had little experience with public speaking now spends most of his time flying around the world and speaking before groups.

His days of tinkering in the basement and the garage are long gone, though he does still own and operate a group of shortwave radios. He says the last thing he designed was that first pacemaker.

But it would not be fair to say that Earl Bakken has given up engineering entirely. It's only the materials that have changed. Since 1960 when he became Medtronic's president, Bakken has been engineering an organization, crafting a distinctive corporate culture.

The tone is set in the corporate objectives, which include contributing to human welfare, developing biomedical engineering products, recognizing the personal worth of employees, and being a good corporate citizen. Making a profit is fourth on the list. Before it comes a pledge "to strive without reserve for the greatest possible reliability and quality" in the firm's products.

The importance of education

Education is a cornerstone to achieving company goals. "When we were small, 10-15 people, we each took turns learning something, like a journal article, then we would teach the rest in the evening."

Since then, Medtronic has invested heavily in staff training, offering an impressive array of engineering, product, and language courses for its diverse and far-flung staff.

Bakken's interest in education extends beyond Medtronic to the University. He would like to see a bioengineering/biomedical engineering school developed at the University. "They do have all the elements to put it together. It's just a matter of someone taking the lead....We'd like to see a chair in bioengineering if we could get somebody, a dynamic mover to make it happen."

The Bakken Museum of Electricity in Life is another example of Bakken's belief in the value of education. Bakken wanted more information about the development of pacing, which wasn't easily available.

To his surprise, Medtronic's librarian found that work on cardiac stimulation dated back to the 1700s. "The main use of electricity up until about 1900 was for treating disease," Bakken said. "They didn't have anything else to use it for. So all of the early electrical devices grew up around the reaction of the body to electricity."

Like Medtronic, the collection started slowly—a book, a pamphlet, a machine, then two. It outgrew a display case, then a room, then a floor.

Finally a foundation was established. The museum was named and installed in West Winds, a Tudor-style mansion on Lake Calhoun in Minneapolis. The collection now contains 1,000 early electrical devices and some 12,000 rare books, manuscripts, and journals.

"We want to encourage its use—that it's not just an archive for people to come and say, 'Isn't that neat.' We want it to be used as a study and philosophical center."

During summer 1984 the museum cosponsored with the University's Graduate School a workshop for high school physics

BAKKEN to page 24

Bakken donates award

In December 1984, Earl Bakken donated $10,000 to IT for a biomedical engineering scholarship. Bakken himself received the money when he was named winner of the 1984 Med-Tech Outstanding Achievement Award, presented annually by Med-Tech Services of Whale Securities Corp., New York.

Bakken was recognized by his peers for three decades of extraordinary achievement and dedication toward improving the quality of health care throughout the world.

In 1981, Bakken received the University's Outstanding Achievement Award, the highest honor the University bestows on alumni.

Bakken's continuing contributions to the biomedical engineering industry and to the biomedical engineering program at the University have increased student interest and opportunities in this field, said Perry L. Blackshear, Jr., mechanical engineering professor who accepted Bakken's gift. Blackshear also cited Bakken's readiness to meet with student groups.

LEETE from page 14

thesis of nicotine. For example, giving the plant an "analog" chemical that resembles one of the normal intermediate molecules can "trick" enzymes into interacting with them instead of the normal target molecule, thus shutting the enzymes off.

Even though the tobacco plant can survive without nicotine, scientists have discovered the plant will go out of its way to make nicotine. When Leete fed tobacco plants an analog of ornithine, a raw material for nicotine synthesis, nicotine was still made.

Researchers Richard Larson and Karen Marley at the University of Illinois have suggested that some alkaloids, including nicotine, strychnine, atropine, and reserpine, destroy a dangerous form of oxygen that can wreak havoc on plant and animal tissues. Small quantities of this material, which consists of charged oxygen atoms, can be formed from normal oxygen by sunlight. Larson and Marley point out that alkaloids tend to be produced in greater quantities in sun-drenched tropical plant species than in temperate ones.

Alkaloids also may serve to make plants toxic to insects, Leete said. "Nicotine makes a good insecticide, and some insects avoid tobacco presumably because of it," he said. "Also, the bitter taste of pepper is due to alkaloids, which seem to keep birds from eating the plants."

Another possible role for alkaloids stems from the limited ability of most plants to excrete wastes. Sometimes plants release wastes through their roots, but by and large they are stuck with what they absorb from the soil. Plants may simply make alkaloids as a way to store excess nutrients, such as amino acids, which contribute to the makeup of most alkaloids.

Leete cautioned against clinging to any single theory of alkaloid function. "Alkaloids can't have the same biological role in all plants because they're so diverse," he said.

Leete's work with Senecio and tobacco is part of his extensive research. An authority on the synthesis of cocaine and a long list of other alkaloids, he also discovered that higher plants make cholesterol by the same mechanism as animals. Because plants quickly convert cholesterol to other compounds, even fatty plant foods like peanut butter are cholesterol-free. That discovery came while Leete was studying how the purple foxglove makes cardiac glycosides, a class of molecules that includes the heart drug digitalis.

Leete has a rooftop greenhouse where he raises Senecio, tobacco, and some rather exotic plants for his experiments. But perhaps the most remarkable thing about this 35-year veteran of research is his unwillingness to let others have all the fun of discovery.

"Beautiful crystals of a new compound still give me pleasure," he said. "I'm amazed when I see scientists still in their 30s who have stopped working in the lab and are content simply to direct the work of others. I find that by doing things myself, I have a much better feel for whether a particular procedure will work or not. I don't understand why some scientists want to miss out on the thrill of discovery, which is what science is all about."

Alumni gathered in New York to meet dean

On Sept. 19, 1984, a prominent group of Institute of Technology alumni gathered for a reunion at the University Club in Midtown Manhatten, N.Y., to meet IT's new dean, Ettore Infante.

George Piercy ('38, B.Ch.E.) hosted the luncheon. A retired senior vice president of Exxon Corp., he now is chairman of the board of the University of Minnesota Foundation.

"The University of Minnesota and its foundation are extremely fortunate to have graduates like George Piercy who continue to take a very strong interest in the academic programs that prepared him for a successful business career," said Stephen Roszell, the foundation's executive director and associate vice president for alumni relations and development.

Members of the President's Club, who are major donors to IT, were invited to the reunion. The list included: Maurice King, a 1932 chemical engineering graduate with King Research Inc.; John Scott, a 1934 chemical engineering graduate and retired executive of Atlantic Richfield Co.; Robert Batey, a 1947 chemical engineering graduate with Continental Bank; Leslie Lasker, a 1971 physics graduate; and Michael Geyer, a 1973 graduate of the School of Architecture and Landscape Architecture with Geyer, Blinder and Bell.

Infante shared his observations about IT and some of his long-range goals and plans with the graduates, said Elaine Battles, IT development officer, who also attended the luncheon.

Donor's contributions help programs

By David Siegel

Mrs. George W. (Edna May) Taylor, a long-time friend of the University, visited the campus in October 1984.

Most Institute of Technology students don't know her. But when they have difficulty with math, physics, chemistry, or a related subject, and receive help from tutors at the University or at six metropolitan high schools, they can thank Mrs. Taylor.

Mrs. Taylor provided much needed funding to expand the tutorial program in 1980, explained John Clausen, director of IT lower division programs and mechanical engineering professor.

The program has improved students' attitudes and increased the number of students who stay in IT, Clausen said.

"There's less frustration and a much better attitude about IT."

John Ryan, planned giving director for the University Foundation, described Mrs. Taylor as a petite and vivacious woman. She once wrote for the society pages for newspapers in California, and has retained her wide interest in people, Ryan said. "She's a no nonsense person and has a great sense of humor."

Mrs. Taylor usually visits the University once a year. She lives in Rockford, Ill. Her late husband George Taylor was a successful executive with the Woodward Governor Co. A 1934 mechanical engineering graduate, George Taylor "left here with fond memories," said Clausen.

"He was appreciative of the education he had received and started giving to help reward good teachers.

"Mrs. Taylor is thrilled by the developments she sees when she visits. She just loves seeing firsthand how her funds are being used."

She particularly enjoys talking with students who have been involved in programs she has assisted. Her gifts established the University's Talented Youth Mathematics Project in which junior high and high school students receive advanced math training. Many of those students choose to attend the University upon graduation from high school.

Clausen added: "The students who have met her just love her. They just think she's a neat lady."

Grad Notes

'23 Fred D. DeVaney of Duluth, Minn., is editor for sections of the *AIME Minerals Processing Handbook,* scheduled for completion in 1985. Now retired, he worked in the development of the taconite process. He has received many professional awards and in 1960 received the University of Minnesota Outstanding Achievement Award.

'46 Kurt E. Landberg of St. Louis, Mo., has won two interior architecture awards from the American Institute of Architects, St. Louis chapter.

'47 Wallace A. Kirkpatrick of Minneapolis, retired as superintendent of the operations control laboratory at Northern States Power Co., Minneapolis, after 35 years with the company.

'49 Robert D. Gunn of Wichita Falls, Texas, chairs the Texas prison system's board of corrections. He is an exploration geologist and chair of Gunn Oil in Wichita Falls.

'50 Milton P. Gordon of Seattle has been appointed acting chair of the biochemistry department at the University of Washington in Seattle.

Fred Krysel of Hopkins, Minn., has been named chief engineer of Polar-American's tank trailer plant in Opole, Minn. He had been employed for 30 years by Butler and Penske Tank, Minneapolis.

John O. Punderson of Marietta, Ohio, has retired after 32 years in DuPont polymer research. He is now president of Punderson Consulting Inc., advising on fire safety and smoke toxicity of plastics.

'53 Frank S. Settimi of Hoyt Lakes, Minn., has been promoted to plant superintendent at Erie Mining in Erie, Minn.

'56 Byron W. Engen of Toledo, Ohio, has received a Distinguished Service Award from the American Society of Heating, Refrigerating and Air Conditioning Engineers. He is an engineering manager at Owens-Corning Fiberglass Corp., Toledo.

Rodney M. Larson of Anoka, Minn., won the 1983 Honeywell H.W. Sweatt Award for inventing computer hardware algorithms. He is an engineer and scientist at the company's systems and research center in Minneapolis.

'58 James R. Tacheny of St. Louis Park, Minn., has been promoted to vice president of system production, operation, and maintenance for Northern States Power Co., Minneapolis. He has been with the firm since 1958.

'59 Larry C. Oyen of Naperville, Ill., has been named head of the Radwaste division of Sargent and Lundy, a Chicago-based engineering firm.

Philip E. Yeutter is a captain in the U.S. Navy stationed at the Naval Ship Repair Facility in San Francisco. He joined the Navy after graduation and has had 13 different postings, including chief engineer of a cruiser.

'64 T. Richard Andresen of Minneapolis has been named program superintendent of the Life Extension Action Program for Northern States Power Co., Minneapolis.

'67 John E. Mikkonen of Shakopee, Minn., manages the component standards division of Control Data Corp., Minneapolis. He has been with the firm for 17 years.

'68 G. Ross Alexander of Villa Park, Ill., received a master's degree in accounting and international business from De Paul University in Chicago and is a certified public accountant in Illinois. He supervises the financial services department of Rockwell International in Chicago.

James Haugen of Aurora, Colo., is project manager for Merrick and Co.

Russell C. Heinselman of Salt Lake City, Utah, is manager of performance evaluation and analysis for Sperry Network Systems, Sperry Corp., Salt Lake City.

'69 Marshall C. Hudson of Northboro, Mass., has joined Raycom Systems Inc., as vice president of technology. The Boulder, Colo., firm specializes in fiber optic communications equipment.

David W. Krantz of La Crosse, Wis., is senior principal engineer in the brazed aluminum and industrial heat transfer engineering department of Trane Co., La Crosse.

Thomas A. Rasmusson of Rexford, N.Y., is manager of power system sales for General Electric's industrial power systems engineering operation, Schenectady, N.Y.

'70 Robert J. Morast of Minneapolis is now transportation division chief for Orr-Schelen-Mayeron & Associates Inc. He was with the Minnesota Department of Transportation.

'72 Timothy K. Sehnert of Minneapolis was one of five Twin Cities business people to participate in a four-week educational exchange program with Japan, sponsored by Rotary International Foundation. He is quality assurance engineering manager for Tennant Co., Golden Valley, Minn.

'74 James McLinn of Minneapolis has been elected chairman of the Minnesota section of the American Society for Quality Control. He is a component engineer at Litton Microwave Co.

'75 Michael J. McCarthy of St. Paul, a civil engineer for Twin City Testing and Engineering Laboratory, St. Paul, has been registered as a professional engineer in Minnesota.

'76 Gerald J. Brinda of Minneapolis has received a Distinguished Technical Achievement Award from NCR Comten, a St. Paul-based computer systems firm.

Stephen P. Patrick of St. Paul was one of the winners in a housing design competition funded by the National Endowment for the Arts. He is employed by BWBR Architects, a St. Paul firm.

'77 John R. Kingery of St. Paul is program manager for standard products for the component handling division of Micro Component Technology Inc., St. Paul.

'78 Elizabeth S. Berman of Asheville, N.C., recently received a Ph.D. degree in polymer science from Pennsylvania State University and is now a senior research chemist at American Enka Co., Enka, N.C.

'79 Dean J. Dovolis of Edina, Minn., graduated summa cum laude from Harvard University in June 1984 with a master's degree in architecture and urban design.

Gary S. Flom of Rochester, Minn., has completed graduate training in general surgery at the Mayo Graduate School of Medicine in Rochester and will practice medicine in St. Louis, Mo.

'81 James J. Kobe of Maplewood, Minn., has been promoted to advanced product development engineer in the industrial specialties division laboratory of 3M Co. in St. Paul. He has been with the firm since 1981.

'82 James R. Chick of Minneapolis was one of the winners in a housing design competition funded by the National Endowment for the Arts. He is employed by BWBR Architects, a St. Paul firm.

'83 Peter D. Cavaluzzi of Minneapolis was one of the winners in a housing design competition funded by the National Endowment for the Arts. He works for BWBR Architects, a St. Paul firm.

Warren B. Jokinen of St. Louis, Mo., is a software engineer, real-time applications for an F-15 advanced design program at McDonnell Aircraft Co.

David Packard of Omaha, Neb., is an architect at Savage/Findley.

Photo by Teresa Fett

Learning

Continuing education students concentrate intently on their work at the new computer lab in the Earle Brown Center for Continuing Education. With 22 computers, the lab assists students in IT's continuing education programs.

Deaths

Robert George Cerny, founder of the University's achitecture department, died Jan. 31, 1985. Cerny, 76, designed the Metropolitan Stadium and the Minneapolis-St. Paul International Airport passenger terminal. He taught at the University for 42 years before his retirement in 1976.

Charles C. Conley, mathematics professor, died Nov. 20, 1984. Conley, 51, was a member of the University faculty for less than three months. He was a member of the University of Wisconsin's mathematics department from 1963 to 1984. Conley received B.S. and M.A. degrees from Wayne State University and his Ph.D. degree from the Massachusetts Institute of Technology. His specialty was differential equations and dynamical systems, and he contributed to research in celestial mechanics, mathematical biology, and nonlinear wave propagation.

John Overend, chemistry professor, died November 26, 1984. Overend, 56, received his B.A. and Ph.D. degrees in chemistry from St. John's College, Oxford. From 1955 to 1958, he was a postdoctoral fellow at the University of Minnesota. After spending two years at Dow Chemical Co., he returned to the University. His speciality was vibrational spectroscopy and molecular dynamics. He received the Coblentz Memorial Prize in 1964 and a Guggenheim Fellowship in 1967.

Lyle Pederson, president of the Minnesota Federation of Engineering Societies, died recently. Pederson, 55, was past president of the Minnesota section of the American Society of Professional Engineers and a former faculty member.

Frank Verbrugge, physics professor emeritus and former director of computer services at the University, died Jan. 15, 1985. Verbrugge, 71, served as professor and associate dean of IT from 1959 to 1967, twice assuming the duties of acting dean. In 1968, he became the first director of the office of computer services, a position he held until his retirement in December 1983. While in that post he established a statewide computer time-sharing system for schools, colleges, and universities and played an active role in the University's 1981 acquisition of a Cray supercomputer. He received a B.A. degree from Calvin College, Grand Rapids, Mich., and an M.A. degree and a Ph.D. degree from the University of Missouri at Columbia.

From the Alumni

IT Alumni Society's new president encourages alumni involvement

Institute of Technology Alumni Society (ITAS) president Gregg Vandesteeg ('76 Ph.D. in chemistry) is manager of product development, Dental Products Laboratory, 3M Co.

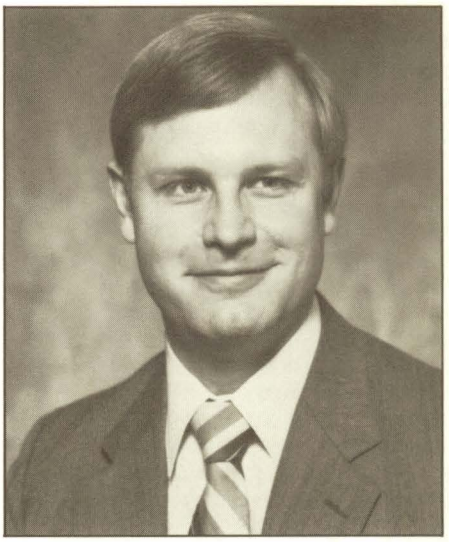
At the end of the Institute of Technology Alumni Society's Science and Technology Day Nov. 9, 1984, I had the distinct pleasure of becoming president of ITAS for 1985. I look forward to serving as your president, and hope all members and fellow alumni will support ITAS as a primary resource to IT and its alumni.

1985 promises to be an active year; we will continue to support a number of student initiatives and strengthen alumni involvement with IT. New activities for ITAS, now in the discussion stage, include a quarterly dinner speakers' series and box lunch programs with IT students. As always, we will continue to help fund the student newsletter (*Connections),* student scholarships, IT Week, and the Paul Cartwright Student Leadership Award. Support of *Items* and the George Taylor teaching award also will continue.

The second edition of the ITAS membership directory soon will be available to all members. The membership directory will provide a valuable resource for personal and professional contacts.

Plans already are under way for the 1985 Science and Technology Day, scheduled this year for Oct. 25. We will return to the Radisson South for the evening banquet. I encourage you to mark your calendars now. Science and Technology Day also serves as the annual meeting of ITAS.

Please help us make this year a successful one for ITAS. Should you wish more information about ITAS, its activities, or membership procedures, please write: IT Alumni Society, % Minnesota Alumni Association, 100 Morrill Hall, 100 Church St. SE, Minneapolis, MN 55455



Gregg Vandesteeg

Letters

Dear Editor:

Some readers may recall my pleading in the last issue for them to contact their legislator(s) and tell them of the needs of our Institute of Technology. I worked moderately hard on that piece. Let me tell you of my success. Zero. That's right. Not one reader was moved to send me a copy of his or her letter to the legislator(s).

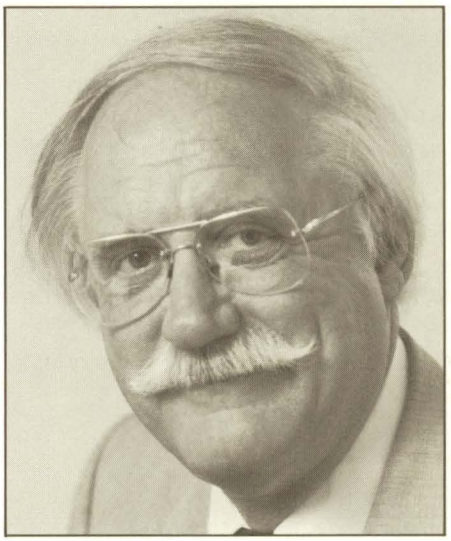
I failed. I don't like to fail—particularly after trying for success. So, I'm trying again. Perhaps in my previous article, I didn't emphasize strongly enough that this was serious business. Post election, I can tell you that it is, indeed, serious business. Already I'm hearing that our new government is determined to save every dollar it can. That has some serious implications for a University that is one of the more poorly funded of the majors and with an Institute of Technology that is the poorest funded of any in the Big Ten.

So, now is the time before positions become hardened into rigid stands—spend that 60 cents and send a letter to your House and Senate members with a copy to me. Tell them you want our University to be funded at least up to parity with other Big Ten schools. Tell them it doesn't make sense that IT should be at the bottom. Tell them we need more space in IT.

I would argue that we're really talking about the economic future of our state. We just can't afford to lose on these issues. Please do it.

Sincerely,

Herbert Johnson
Chairman of DataMyte Corp.
and of the Minnesota High Technology Council



Herbert Johnson

WHAT'S NEW WITH YOU?

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

Name_____

Street Address_____

City, State_____

Grad. Year/Dept._____

Job_____

_____

Other News_____

Calendar

MARCH

30: University of Minnesota **Outstanding Achievement Award** presentation to geology and geophysics alumnus Samuel Goldich. For information, contact geology professor Tibor Zoltai, 612/373-4025.

APRIL

13-14: **Pedestrian Systems: A Conference on Skyways, Streets, and Tunnels** at the Walker Art Center in Minneapolis and at the University's School of Architecture and Landscape Architecture. Co-sponsored by the Walker, the University's architecture school, the Hubert H. Humphrey Institute of Public Affairs, and the Center for Urban and Regional Affairs, the conference will examine architectural, social, economic, and public policy aspects of pedestrian systems in the United States and Canada. For information call 612/375-7622.

18-20: **Sixth Workshop on Grand Unification,** held at the University of Minnesota and sponsored by Argonne Universities Trust Fund, the U.S. Department of Energy, and the University of Minnesota. Astronomy professor Thomas F. Walsh and Serge Rudaz, assistant professor of astronomy, are co-chairmen.

BAKKEN from page 19

teachers, in which they replicated classic experiments in their field. It was well received, and there are plans to repeat the workshop or a similar one every summer.

Just as Bakken took pleasure in turning out a "special" for a customer, he still views his work in terms of service to individuals.

At the company's Christmas program last year, four people spoke to employees about Medtronic products they use—a heart valve, an implanted drug pump to relieve a spastic condition, a pain relief device, and a pacemaker. "To have these patients tell us what their devices mean in their lives, that is tremendous feedback and satisfaction—to know our work is helping people, never hurting anybody.

"I don't know what more satisfaction one could have."

News Shorts

. . . You may receive a phone call from an IT student

Institute of Technology alumni soon will hear from their alma mater.

In March, University students will contact alumni asking for support. The telephone campaign allows the University to learn more about its alumni and gives alumni the chance to learn more about the University. Alumni may earmark donations for a specific purpose or permit the institute to use the gift where it is needed most. All contributions help ensure the quality of education in IT.

. . . Billboards featured math program for youth

The Minneapolis school district recently featured the University of Minnesota Talented Youth Mathematics Project on billboards located in the following spots: Broadway St. east of Central Ave.; Lowry Ave. and California St. NE; 310 E. Hennepin; 50th St. and Penn Ave. S.; 4315 Upton Ave. S.; 3469 Minnehaha Ave.; 31st Ave. S. south of 26th St.; east 38th St. and 28th Ave. S.; 141 E. Lake St.; and 3900 Nicollet Ave.

. . . Science and Technology Day set for Oct. 25, 1985

The Institute of Technology's annual Science and Technology Day is scheduled for Oct. 25, 1985. This date coincides with homecoming weekend and with the annual IT reunion.

Please mark your calendar now. Additional information will appear in the spring 1985 issue of *Items.*

. . . Teaching award nominations sought

The Institute of Technology is asking for faculty nominations for the AT&T Foundation Award, which provides a cash award of $1,500 and recognizes outstanding teachers of engineering students. For information concerning qualifications, call John Clausen at 373-7531 or Raymond Sterling at 376-1200.

ITEMS

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