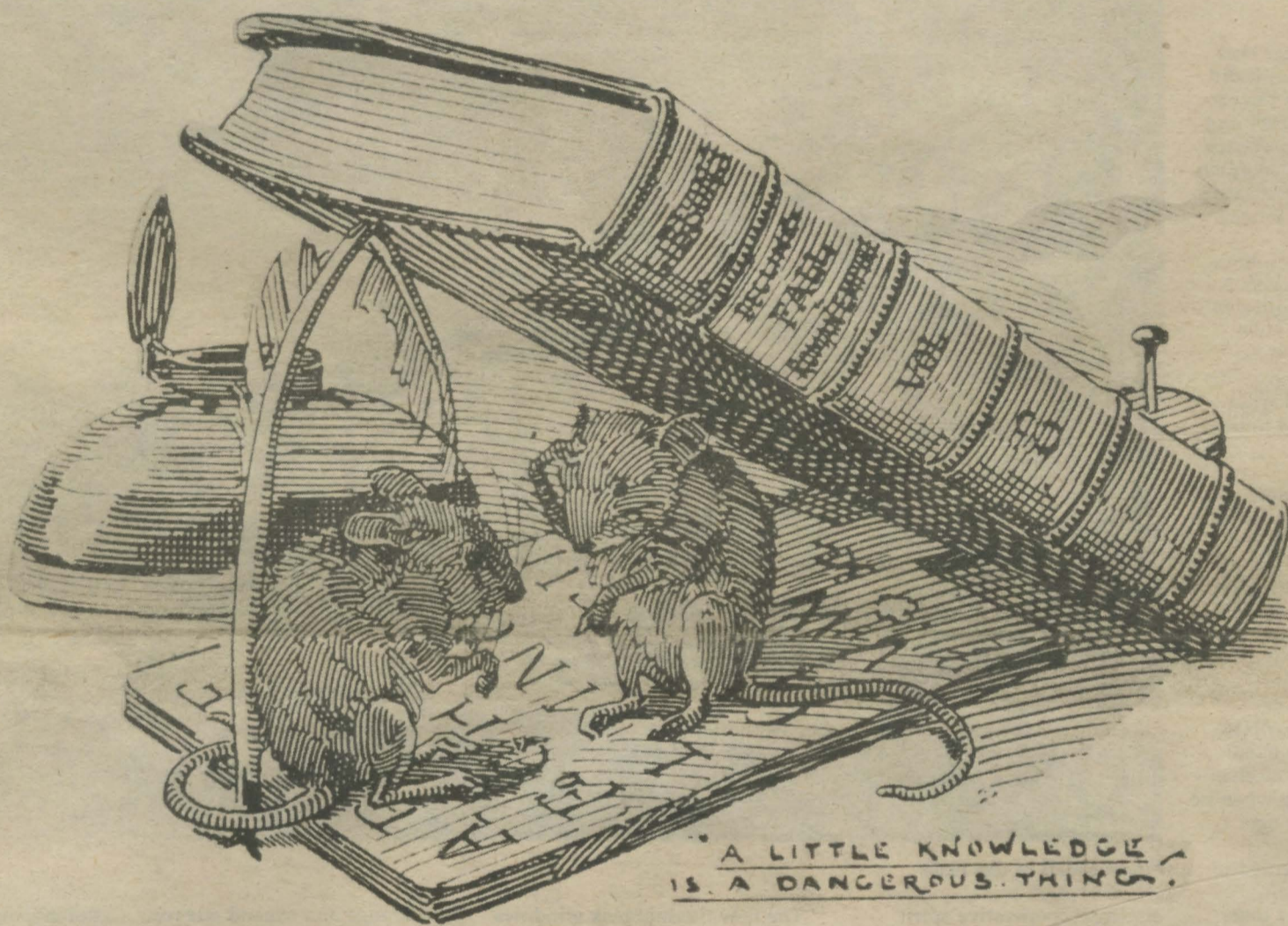


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UPDATE

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A late 19th-century drawing by Linley Sambourne, an illustrator for *Punch*. Two mice on a hornbook ponder the alphabet beneath a volume of Gibbon's *Decline and Fall of the Roman Empire*. Story page 7.

Meet Monsieur Cholesterol.

A Contemporary Look at Children's Art.

A Historical Look at Education Through the Eyes of Artists.

Pioneer Gets Over-Hailed.

Some Dos and Don'ts of Pills and Victuals.

Why Some Cans Should Be Banned.

New Ideas on Care for the Dying.

All Inside.

by William Hoffman

Pioneer Hall has changed some in the nearly half a century since it was built.

No longer is it exclusively a residence hall for men, nor is it still accessible by streetcar. Visiting hours are virtually unlimited, and students dine in denim these days.

But until recently Pioneer Hall looked much the same as it did in the early 1930s when the cornerstones of both the north and south courts were laid and each of the 16 houses of the Georgian colonial building was dedicated to a famous Minnesota pioneer.

In fact, it still looks much the same, despite a two-year \$3.3 million renovation designed to conserve energy, to improve plumbing, electrical, and fire-safety systems, and to allow for more economical use of space. The renovation was due to be completed in January.

"In spite of the renovation, we were able to maintain much of the original character of the building, both outside and inside," said Peter Hackett, director of the Minneapolis dormitory. "Our objective was to preserve its architectural charm whenever possible."

Hackett said that Pioneer Hall had never undergone a major renovation and that its mechanical systems were failing when he arrived there five years ago.

The Housing Office decided in 1975 to renovate the dorm, Hackett said, and rather than putting it completely out of service for a year it resolved to devote the summer months of 1977 and 1978 to the project, with the contractor providing concentrated work crews during these months. But a strike by construction workers delayed completion, which had been scheduled for the beginning of the current school year.

"The only thing that went wrong was the strike," said David Anderson, director of the Housing Office. "It occurred in the middle of last summer and lasted six weeks."

C. Luverne Carlson, assistant vice president for support services and operations, added that the strike "had a staggering impact and affected other trades involved in the renovation."

"The students deserve the thanks," Anderson said. "We had to displace 110 residents to Frontier Hall and triple them up in double rooms with residents there." Hackett also cited the

An Old Favorite Enters the Future



Pioneer Hall in the 1930s

students' cooperative spirit. "Our own residents and students in the other halls have been very understanding. I can't say enough about them," he said.

"Excellent" cooperation helped reach the goal of "preserving and extending the life of the hall," Carlson said. "We look at this as a successful transition from one era to another."

Funds for the renovation were provided by raising dormitory fees \$5 per quarter for the next three years.

Pioneer Hall has been one of the two most popular dormitories over the years, according to Anderson. Hackett said that the building, with its dignified architecture and interior decor, its many original fixtures and furnishings, and its comfortable three-room suites, "is what students expect a residence hall to look like when they go off to college."

But some alterations of the original were necessary in order to meet electrical and fire codes and in the interests of convenience and conservation.

"The new thermobreak windows are far more efficient," Anderson said. "Also in the interests of saving energy we have added insulation to the attic and the dormers and changed the heating system from steam to hot water." The heating system will be monitored from the University power plant.

Hackett said that the building is 38 percent more energy-efficient than before the renovation. Each room has a heat control on the register, and bathrooms have been remodeled and equipped with new water-saving fixtures.

"About a quarter of the expenditure was for life-safety features. We now have smoke detectors every 35 to 40 feet, and all of the 16 stair towers have fire doors and sprinklers. We now have a sophisticated fire-alarm system, and we have connected all the houses so that there is more than one way out in case of a fire," Hackett said.

The long, narrow corridors of Pioneer are broken now, but the renovation cost the building only two suites and in fact added about 30 single rooms, increasing the dorm's capacity from 551 to 568 residents.

"By excavating the 'crawl spaces' in the basement we were able to provide room for a new televi-

sion lounge and expand our recreation room. We have a new woodworking shop, a sauna, a sewing room, a pool room, two music practice rooms, and an updated handball court," Hackett said.

Dormitory residents affected by the renovation had mixed feelings about it. Scott Shuppert, a junior who has lived in Pioneer Hall for three years, is "all for it. It hasn't been an inconvenience for me at all."

As a clerk at the main desk, Shuppert said he has heard some gripes and complaints, but only a few. "I'm one of the lucky ones because I just moved into a large single room on the fourth floor of house 13, one that was just finished," he said.

Construction noise was not a problem for Shuppert, but it was at least a small problem for freshman Julee Richards. She said that she likes to sleep late sometimes and that the noise of the heavy equipment disturbed her.

Some students were upset that facilities offered at the time they signed up to live in Pioneer have not been available. Evelyn Katzke, a sophomore, noted the absence of study rooms, game rooms, and a television lounge. Art Griffith was one of a few

students displaced to Territorial Hall. "The renovation was an inconvenience to me in that there wasn't enough space for studying in my room and the study lounge was always full. I think my studies suffered some," he said.

Protests from residents in early January called attention to areas of unfinished remodeling in several of the houses, and some residents have asked the Housing Office for rebates, citing safety hazards and inconvenience.

"There have been no problems around the construction site this year," said Gene Callahan, general mechanic for the dorm. "Last year there was some damage to the equipment, probably because they started work before spring quarter was finished and some of the students were angry because of the noise. Besides, the noise carried more last year when they started working in the south court, right beneath the residents' windows."

"But this year there were no problems in the north court," he said. "Except that some students might have picked up a few bricks here and there for bookcases."



Tom Foley



Tom Foley



Tom Foley

James Doss
of the same

The main lobby in the 1930s and the main lobby today (above left). New light fixtures, emergency exit signs, and a new drinking fountain have been added. Additional wainscoting has been matched to the original.

The north cafeteria in the 1930s — family style dining in proper dress — and the north cafeteria today — cafe style dining in denim (left). Semicircular grillwork directs traffic to the lunchroom and the basement. Light fixtures, windows, and woodwork are the same. The room was remodeled in the late 1950s.

The north lounge in the 1930s and the north lounge today (above). Pioneer Hall director Peter Hackett brought the original furniture out of storage two years ago. New light fixtures have been added "in keeping with the Georgian-colonial architecture." Two new doorways open from the south side of the lounge onto an enclosed landscaped courtyard where the north and south courts are linked.

by William Hoffman

Who would claim that the human stomach can't take a punch? Figuratively speaking, it may take several a day — depending on what and how much you eat — and still hang in there. But an adverse food and drug combination can knock it for a loop.

Food and drugs don't always mix well in the digestive system. Usually the consequences of an unfavorable mixture are not serious — perhaps only mild discomfort or poor absorption of the food or drug. But a few drug-diet interactions can be fatal, and the increasing use of drug therapy makes it more likely that dangerous interactions will occur.

Joseph Cornell, temporary head of the drug information center at University Hospitals, said the study of drug-diet interactions is now at the stage that the study of drug-drug interactions was at 10 years ago. He thinks the subject isn't receiving enough attention from researchers and that better understanding of it is needed by physicians, pharmacists, and dietitians.

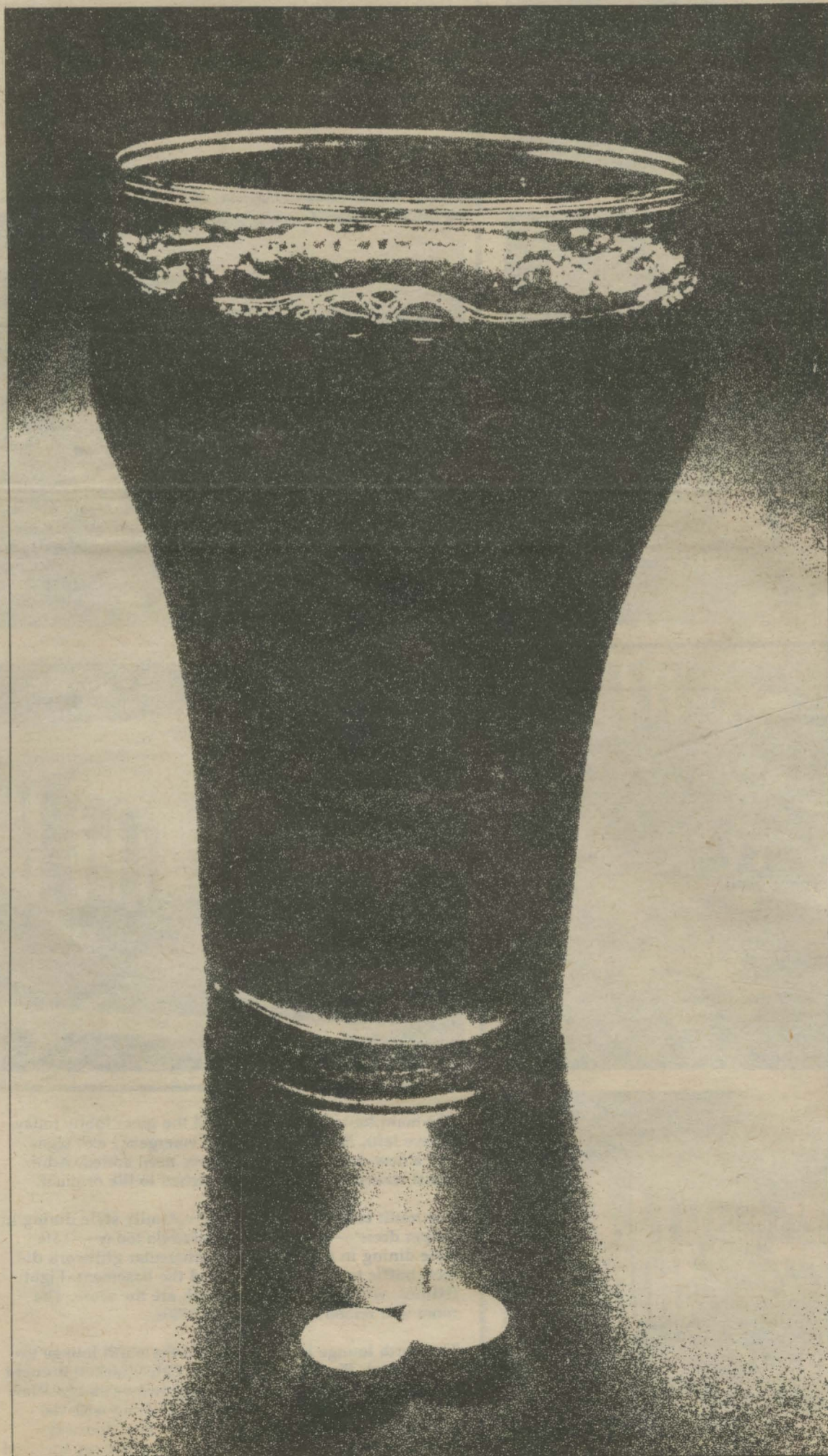
"We wish we knew more about the interactions between drugs and food," he said. "We don't fully understand what the reactions are, and neither the pharmacist nor the physician usually knows the dietary habits of the patient."

Dietitians are responsible for getting information on patients' eating habits in order to adapt their diets to the nature of the drugs they will be taking. But that poses problems of its own. According to Susan Marx, principal dietitian at University Hospitals, dietitians must rely on a patient's being candid and cooperative.

"When a doctor puts a patient on drug therapy, we are charged with the mundane task of finding out what the patient's diet is, whether he or she eats at home or someplace like a fast-food restaurant, and if the patient likes such things as candy and cookies," Marx said. "We have to rely on patients' telling us what they eat."

Cornell said that food sometimes interferes with the absorption or elimination of a drug, or vice versa. Pharmacological agents in foods, whether natural substances, food additives, or con-

Some Dos and Don'ts of Pills and Victuals



taminants, may interfere with drug therapy. And drugs may inhibit appetite.

As a general rule, drugs are absorbed more slowly when taken with food, and many drugs lose their effectiveness when they must compete in the stomach with large amounts of food. Aspirin, for example, is poorly absorbed with food, and penicillin can be destroyed when the stomach's gastric juices are activated at mealtime, Cornell said. That kind of conflict can be prevented by careful timing of meals and medication.

The rate of absorption is more important for some drugs than for others. Some drugs will work even if they are absorbed slowly. But others, such as antibiotics, need clear sailing in order to reach effective concentrations in the blood. For them, food is an obstacle.

Certain foods may affect the total amount of a drug absorbed as well as the rate of absorption. In the case of the antibiotic tetracycline, this is important. Interaction with the calcium in dairy products can reduce the concentration of tetracycline in the blood almost to zero, Cornell said.

Some foods alter the effects of drugs by changing the body's acid-base balance. According to Cornell, many juices and other beverages contain citric acid, which changes the gastrointestinal pH balance. This may slow down the rate at which such drugs as aspirin are absorbed.

Some drugs are more or less effective depending on the nature of the patient's diet. Griseofulvin, an antifungal drug, develops a much higher concentration in the blood plasma when taken with a high-fat meal or on an empty stomach.

Warfarin, an anticoagulant, is reported to be less effective if the patient eats leafy green vegetables that contain vitamin K, a physiological antagonist of warfarin. But Cornell called this interaction "not significant" because dietary sources of vitamin K are negligible compared with the amount produced naturally within the human body. Reports like this "merely contribute to the confusion surrounding the topic of drug-food interaction."

Any drug may cause discom-

fort — dyspepsia, for example — but some drugs inhibit the function of the gastrointestinal tract and block the absorption of vitamins and nutrients, he said. Neomycin, an antimicrobial drug, damages the intestinal membrane and inhibits enzyme action on food. Cathartic drugs speed up the passage of food through the patient's system, reducing its nutritional value.

Birth control pills and Dilantin, an anticonvulsive drug, tend to deplete the levels of several important vitamins in the body. For example, they inhibit the normal production of folic acid, and people taking these pills may need to supplement their diets with folic acid tablets in order to prevent anemia, Cornell said.

Some diuretics tend to flush potassium from the system. Consumption of potassium-rich foods like bananas, grapefruit, oranges, dates, figs, raisins, and dried apricots can compensate for the action of the diuretic, but because of the high calorie content of these foods, patients may choose a potassium supplement instead.

Monosodium glutamate, a meat tenderizer commonly used in Chinese food, acts like a diuretic in that it tends to speed up the body's excretion of sodium. People with a low threshold for it may suffer "Chinese restaurant syndrome" — headaches and chest pain. Some pharmacists advise patients on diuretics against eating food with excessive amounts of monosodium glutamate, but Cornell believes the danger is exaggerated.

Licorice is a food to beware of, but only licorice that contains the natural extract and only if it is consumed in large amounts. It can cause hypokalemia, an abnormally low level of potassium in the blood, or salt and water retention, which may in turn result in high blood pressure. This can be particularly dangerous for patients who are taking digoxin for congestive heart failure. However, most American licorice is synthetic and poses no hazard, Cornell said.

Perhaps the most dangerous drug-diet interaction is the one that occurs between tyramine-containing foods and drugs known as MAO inhibitors. Monoamine oxidase, or MAO, is an enzyme present in the liver and gastrointestinal tract that neutralizes tyramine and other toxic agents in food. The MAO inhibitors — often used to fight depression — can prevent it from doing its job.

Combining a MAO-inhibiting drug with cheese, chicken liver, pickled herring, beer, or Chianti wine — all high in tyramine — can be lethal: the interaction can

bring on a stroke.

"We dispense just a few MAO inhibitors," Cornell said. "Last year we filled such prescriptions for only 80 patients." All patients who receive MAO inhibitors are given instructions on how to use them and a specific list of foods to avoid, he said.

It is a good rule of thumb not to mix drugs and alcohol. This is especially important for people taking tranquilizers, sleeping pills, and antidiabetic drugs, for their interaction with alcohol can be fatal. Use of alcohol with certain nonprescription drugs, particularly with cold and sinus medicines, can increase the sedation that is a normal side effect of these drugs.

"Some patients don't realize how important it is not to drink when they're taking certain drugs," Marx said. "Perhaps we should stress it more."

Cornell applauds the current effort of the Food and Drug Administration to require drug manufacturers to spell out possible adverse drug-drug and drug-food interactions on package inserts for prescription drugs.

Once a year Cornell lectures nu-



Joseph Cornell

trition students on the interactions of food and drugs. Busy medical students don't have an opportunity to spend much time on the subject, either.

Despite the lack of information and research on the subject of drug-diet interactions, Cornell believes that pharmacists and dietitians are equipped to handle problems that arise. Marx agrees.

"More and more, pharmacists and nutritionists are working with physicians to prevent adverse drug reactions," she said.

"We have a good situation at University Hospitals. New methods of treating patients are challenged here." But the public needs more information about drugs and their side effects, she said.

Prof Pans Some Canned Foods, Notes Dangers of Tin in Diet

by Mark E. Canney

Certain soft drinks and canned foods may be dangerous because of the presence of tin in them, according to research by a Twin Cities campus scientist.

John Wood, director of the Gray Freshwater Biological Institute and a major contributor to recent research on mercury poisoning, has found that tin in the human diet may pose the same threat as mercury.

In 1968, Wood headed a team that discovered the process through which nontoxic mercury is transformed into the highly toxic methyl mercury in rivers and lakes.

According to an article by Wood in the July 1977 issue of *Science* magazine, tin goes through a similar methylation process within the human body. Bacteria in the gastrointestinal tract initiate the process, in which a carbon and hydrogen compound is attached to the metal. When this happens, the metal becomes toxic.

The stannous, or tin, chloride present in some soft drinks is one source of tin in the human diet, Wood said. Stannous chloride is used in carbonated lemon-lime diet soft drinks to maintain their transparency. Sugar preserves lack of color in nondiet drinks.

The stannous fluoride in some toothpastes is not a problem since it doesn't normally reach the gastrointestinal tract, Wood said.

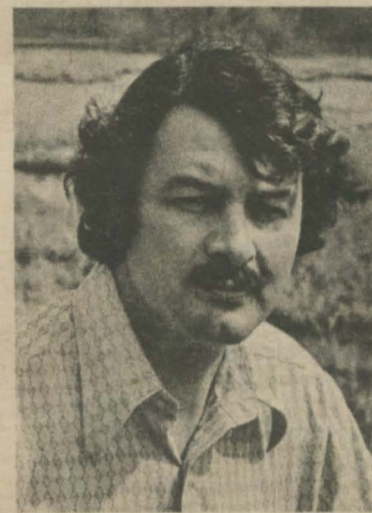
Humans ingest tin when they eat acidic fruits or vegetables that have been canned, Wood said. The acid in foods such as tomato products and citrus fruits can leach tin from the inside of the can.

"The longer the acidic food remains in a can, the more tin is in the food," Wood said.

Methylated tin and methylated mercury are neurotoxins — toxins that attack the central nervous system. Symptoms of neurotoxic poisoning are numbness of the fingers and lips followed by a loss of speech and hearing. Eventually, the afflicted person becomes spastic, and it is at this point, Wood said, that

the damage is irreversible. The end result is coma and eventually death.

"The danger of methylated metal poisoning is acute in the human fetus," Wood said. Both the placenta and the brain are constructed for the quick passage of



John Wood

oxygen across cell membranes, and as a result they absorb methylated metals quickly. This tissue does not have the filtering capabilities of other body tissues, so the metals accumulate.

Pregnant women who have consumed methylated mercury may not suffer the effects themselves; instead, the fetuses are affected. Offspring of mothers who have taken in large amounts of methylated mercury showed the effects of poisoning at birth, Wood said.

Wood reported these findings at a recent meeting sponsored by the Canadian Center for Inland Waterways. He has since been contacted by representatives of the Seven-Up Company in Canada and a can manufacturer in the United States.

There are some solutions to the tin intake problem. "It's a question of economics," Wood said. "Stannous chloride is the cheapest additive of its type available at this time."

Ascorbic acid, also known as vitamin C, works just as well as the tin compound in keeping diet drinks transparent, Wood said, but it's more expensive. And it may be possible to coat the inside of tin cans used in packaging acidic fruits and vegetables.

Not much is known about the amount of tin currently in the human diet, Wood said, although scientists have measured methylated tin in human urine and blood.

"The use of tin in advanced industrial societies has increased 14-fold over the last 10 years," Wood said. This increase, along with the widespread use of other potentially dangerous metals such as lead, arsenic, and mercury, could pose a serious metal poisoning hazard for humans.

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Hospice: A Concept of Care

by Paul Schurke

A middle-aged man lies dying in a hospital, his body ravaged by cancer. For months he has received chemicals to halt the spread of the disease. But now, emaciated and wracked with pain, his body can no longer tolerate the powerful drugs. Everyone knows the chemotherapy is not working. The cancer has spread. The treatment is to be stopped and a place found for him to die.

Until recently, there have been few options for persons needing a warm and understanding atmosphere in which to spend the dying phases of an incurable disease.

To make way for the curable, hospitals have generally discharged them. And friends and family are reluctant to assume the responsibility of caring for them, the once-strong tradition of dying at home existing mostly as a memory. Mainly it has been nursing homes — often costly and unpleasant — that have been ready to shoulder this inevitable human burden.

But that is changing, and a new concept in caring for the terminally ill has captured the attention of a great many persons. "Hospice" advocates maintain that the greatest needs of the dying are relief from pain and closer contact with loved ones; they want to get the dying back into their homes, or, if that is not possible, into homelike settings.

Medieval hospices were way stations where pilgrims found rest. In the late 19th century, the term was first applied to places where Roman Catholic nuns cared for the dying.

Interest in the hospice concept is gaining momentum, and a good share of it is coming from the Twin Cities. "I wouldn't say we are on the front line, but we are definitely on the second line," said Howard Bell, a Lutheran minister who is director of the Coalition for Terminal Care. The coalition, an adjunct of the University YMCA, concentrates on the care and services available to the terminally ill and serves as the nerve center for hospice-organizing activities in Minnesota. At last count, there were 15 hospice-forming groups in the state, Bell said.

Bethesda Lutheran Hospital in St. Paul already has an inpatient hospice unit, and others are about to open at St. Mary's in Minneapolis and St. Joseph's in St. Paul. Many hospitals are integrating hospice concepts into their home care programs.

Transplanted from England, the hospice movement was launched in the 1940s by Cicely Saunders, medical director of St. Christopher's Hospice in London.

In this country, the movement has a thriving national lobby and the approval of the American Medical Association and of Joseph Califano, secretary of health, education, and welfare.

"The present popularity of the hospice idea is due in part to the growing interest in death and dying issues inspired by Elisabeth Kübler-Ross," Bell said. Her book, *On Death and Dying*, has moved the subject of death out of the shadows of cultural taboo and onto the agendas of educators, medical professionals, and policymakers.

"Questions are being raised about the advances in medical technology that enable life to be maintained by machine and about the quality of that life," Bell said.

Hospice advocates are concerned about the "cure at any cost" syndrome that they say pervades established medicine. They hold that valiant lifesaving efforts make sense for heart attack and accident victims, but not for persons with advanced cancer.



Ida Martinson

In hospice care, back rubs and baths are common; X-rays and transfusions are not.

Although hospice is primarily a concept — humanizing care of terminally ill patients — many specific methods are associated with it, Bell said.

Most importantly, the goal of hospice care is to be available 24 hours a day and to meet the physical, social, and spiritual needs of both patients and their families. To this end, an interdisciplinary team of physicians, nurses, therapists, nutritionists, psychologists, and clergymen are involved, he said.

Follow-up concern for bereaved families and a strong support program for staff members involved in this emotionally draining work also are important elements in the concept.

Another is the highly sophisticated control of chronic pain with analgesics and anxiety-relieving drugs like morphine and methadone.

This kind of care can be provided in a hospital, "but the real crux of hospice is the integration of home care with the necessary professional services," Bell said.

Whatever the setting, hospice care primarily involves cancer patients, for whom chronic pain and fear are particularly severe.

Minnesota's largest cancer center is the University's Masonic Memorial Hospital. Each year nearly 2,000 cancer patients visit its clinics or are treated there. Staff members there are taking a hard look at what hospice offers.

Some changes already have been made. "They seem like little things" — like putting clocks and calendars in the rooms and making dining and visiting hours more flexible — "but they are really big accomplishments," said nurse Sue Edstrom.

But the nature of the University's center, which is a high-technology research institution, poses special challenges for the implementation of hospice care.

One is the definition of a hospice patient. At a research institution, where experimental therapies abound, it is difficult to determine when the possibilities for cure-oriented care have been exhausted.

"As chemotherapy improves, there is always one more possibility and one more decision to be made," said social worker Edith Johnson, who heads a University subcommittee that is exploring the hospice concept. "The basic thing is a commitment to the patient all the way through not only the physical needs but also the psychological ones. I think we've had that all along."

The hospital has a cancer information and support group coordi-

nated by Johnson and her colleague Doretta Stark. Three times a week, cancer patients, members of their families, and staff members meet to discuss the nature of the disease and various ways of coping with it.

Masonic does not have a separate hospice unit for the terminally ill, Johnson said, and she is not certain that it *should* have one. Most of its patients are referred from community hospitals from a wide geographic area for short-term specialized care.

A hospice-related area in which the University is emerging as a leader is home care for dying children. Nursing researcher Ida Martinson recently reported on the first large-scale study of the



Edith Johnson

feasibility of caring for dying children at home. With support from home care nurses, terminally ill children in 46 of 58 participating families were able to die at home. University records show that only five young patients died at home before the study.

"Families treasure that final moment," Martinson said. And parents and siblings who are involved in home care seem to adjust more easily to the death.

Martinson contends that there is no reason home care for the dying can't be more widely implemented. "We have the mechanism for it in public health nursing. Good public nursing care is what hospice is all about," she said. "The nurses are willing to do it, but they need financial support from county commissioners."

Commissioners tend to cut nursing budgets, she said, not realizing that ultimately they are raising overall medical costs, since hospital care costs much more than home care.

Martinson has reason for optimism, though. "While we are

studying how well home care works," she said, "Katie Humphrey is making it work now."

Humphrey is coordinator of the University's Home Health Services Department. With the help of public health nurses throughout the state, she keeps track of about five children with cancer each month.

Like Martinson, she believes that the idea of home care for the dying has great potential. "Eventually, I don't think there will be any medical services that can't be performed at home," she said.

Humphrey recently received a thank-you note from a woman whose son had recently died, at home, of cancer. "Having him home gave me a chance to be 'mom' until his death," she wrote.

The University also offers home care services for adult cancer patients. About eight terminally ill patients are involved in the program at any given time, and some staff members say this is an area that could be expanded.

In addition to its other advantages, hospice care costs less. Daily inpatient hospice care costs are about two-thirds, and home care costs about an eighth, of acute hospital care costs. Ironically, however, finances may be the biggest obstacle to the survival of hospice care, Bell said.

Insurance companies have been reluctant to pay for medical services that are comfort- rather than cure-oriented. Coverage by insurance companies may depend on recognition of hospice care by state legislatures, he said.

Several Minnesota legislators are exploring the potential role of state government in the development of hospice care. Only Connecticut, New York, and California now have legislation supporting hospice care.

Insurance companies are not the only pockets of resistance the hospice movement faces: some doctors also have strong reservations about it. They contend that death is so unpredictable that the most humane approach is aggressive medical treatment until the end.

But those attitudes may be changing. Surgical oncologist Theodor Grage says doctors are increasingly sensitive to death and dying issues and to the needs of the terminally ill. Medical students make rounds with

Hospice, p. 16

Education Through the Ages: A View From Artists

by William Hoffman

Nobody knows exactly what education is. Each age defines it anew according to its needs and wishes.

In our age, we tend to think of education as the mundane act of going to school and taking or teaching a class, depending on what one has in mind.

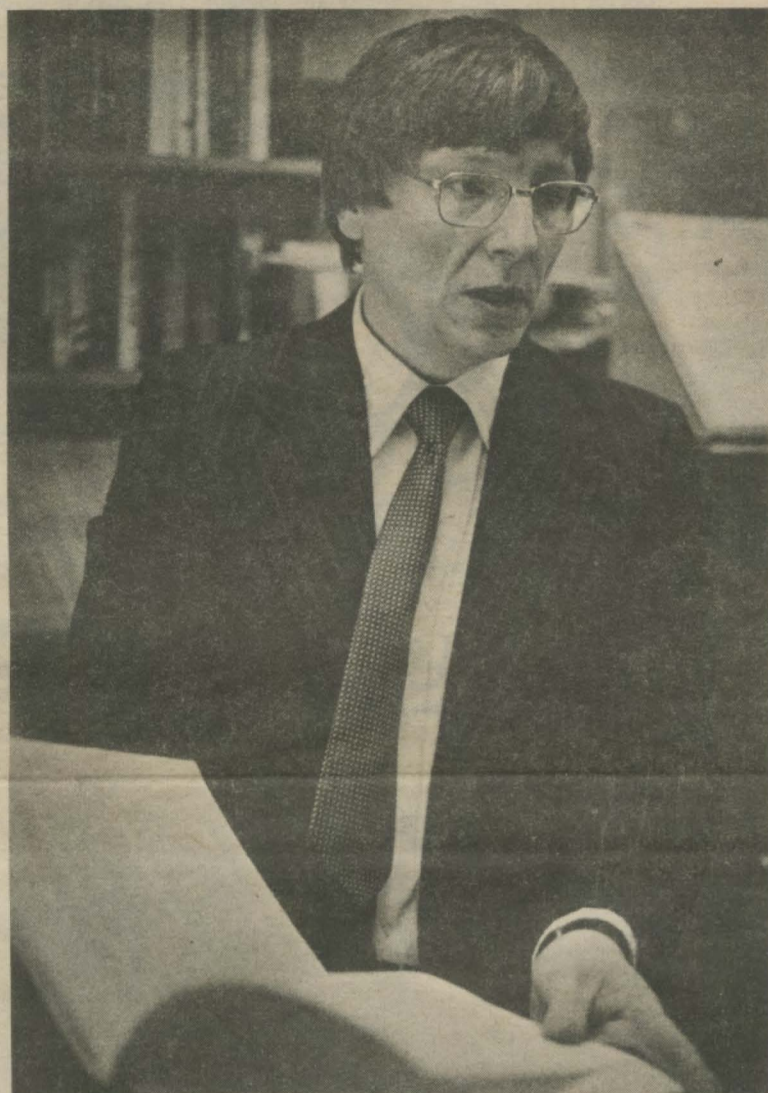
"Education is a term we've come to take for granted in our time," said Ayers Bagley, a professor in the College of Education on the Twin Cities campus. "For us there is actually one interpretation, and no one in modern society would fail to understand it."

"But historically education has had many different meanings and a wide variety of images associated with it," he said.

Three years ago, Bagley got an idea to assemble a collection of these images so that students and faculty members interested in the history of Western education could see how education themes have been represented in the figurative arts.

With the support of three other faculty members — Melvin Waldfogel and Carl Sheppard, Jr., of art history and Gerald Erickson of classics — Bagley submitted his proposal to the Center for Educational Development.

The center provided the initial funds for the Education Iconography Project, a preliminary gathering of imagery representing "important figures, motifs, and themes central to the history of Western education."



Ayers Bagley

Bagley and his research team collected images on education themes from art books. Bagley supplied some of his own photographs, of art objects he had seen in his travels abroad.

The collection now consists of color slides of paintings, drawings, woodcuts, engravings, illuminated manuscripts, sculpture, vases, and other objects. Each slide is identified in one of three catalogs: one on examples from ancient Greece, one on the Middle Ages, and one on modern examples.

"The next step is a fully illus-

trated catalog with annotated text and image definitions," Bagley said. "But we need more funding to continue the project."

Education imagery in the art of the West is a subject that has not been researched very well, according to Bagley. "It is as though we have been largely blind to the visual expressions of education," he wrote in a report on the project.

"The project is a cross-disciplinary study that includes education, art history, literature, and psychology," he said. "You have to know how education themes were classified. For example, in the 17th century John Locke saw learning as only part of education. For him it also included wisdom, civility, and breeding. To find and interpret these images you have to know something about the literature and history of the period.

"Also, you have to know something about this type of art, but not so much that you begin to speculate. You have to know what to avoid, such as stylistics and aesthetics, which only art historians can talk about with authority."

Bagley found that most education iconography either expresses myth, metaphor, or symbolism revealed in the artistic imagination of the time, or merely illustrates an aspect of everyday life. But the artistic

Tom Foley



The Education of Achilles. From an engraving taken from a painting by Jean-Baptiste Regnault, an 18th-century French artist. Chiron the centaur became the mythological pattern of the ideal teacher responsible for the whole development — moral, physical, and intellectual — of his pupil. Actually more a tutor than a teacher, he covered every branch of knowledge, including medicine, hunting, music, and the science of warfare, in his instruction. Homer mentions that Achilles was handed over to Chiron for him "to rear." Xenophon notes that Chiron's pupils learned how to become virtuous through hard work.

image was also used extensively for instruction. He cited a remark made by Pope Gregory the Great in the sixth century: "What those who can read learn by means of writing, that do the uneducated learn by looking at a picture."

Currently there are no other collections of education images in art in this country, Bagley said. "The *Index of Christian Art* at Princeton University probably comes the closest, but that collection ends around 1400 A.D. Rutgers University has a collection of iconography from Greek and Roman mythology that is part of an international undertaking based in Basel, Switzerland. For the post-Renaissance period the Frick Art Reference Library in New York is helpful, but not especially so in iconography.

"Compared with other subjects, the history of education is studied very little," Bagley said. "There's lots of literature on the subject, but not much attention is paid to it in university curricula. I think it's time to accept it as part of the teaching of Western civilization, and as an aspect of literature, history, and the humanities.

"Ideally, we would like to establish a center for education iconography at the University. It could be useful to many departments, including American studies, religious studies, women's studies, classics, history, and the cultural aspects of a number of foreign languages. It could be located in either the Art Library or the Education Library and be used in conjunction with the Learning Resources Center.

"But I don't foresee the establishment of such a center in the near future. This is a period of austerity and retrenchment, and new programs will not get funded. I doubt we'll even engage in serious discussion about it," Bagley said.

"Still this project can enrich existing curriculum courses. I hope that in the spring we will have a course on the subject of education iconography. I've proposed to the curriculum committee that one be established," he said.

The Medieval Tower of Learning. Taken from a 16th-century German woodcut, the tower symbolizes the fusion of classical and Christian learning in the Middle Ages. A woman, possibly representing the spirit of learning, unlocks the door and holds out a hornbook to a child. Donatus and Priscian, who wrote early grammar textbooks, occupy the first two levels of the tower. At the apex is Peter Lombard, a church doctor representing theology and metaphysics, two important subjects in the medieval curriculum.



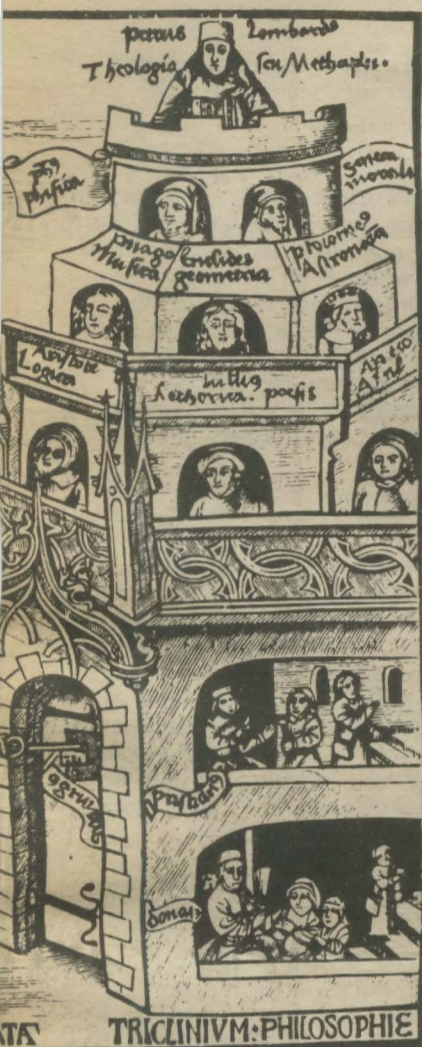
The Ass at School. A travesty of 16th-century village schooling and a commentary on human folly, by Peter Brueghel the Elder, a Flemish painter. This engraving has a Latin caption that translates: "You may send a stupid ass to Paris: if he is an ass here, he won't be a horse there." A proverbial equivalent: "Once an ass, always an ass." Despite the advantages of candlelight, eyeglasses, and written music, the donkey is likely to bray the same old way. In the foreground, two young monks dispute a point of doctrine. To the right, a budding naturalist examines a beehive up close; to the left, a student studies in a basket.



The Dame School. A late 18th-century watercolor by English artist Isaac Cruikshank. Dame schools originated in England and were transplanted to America during the colonial period. Often little more than nurseries, they were conducted in the homes of elderly women who usually divided their time between their pupils and their domestic duties. The dames instructed the children mainly in religious and moral matters, and their favorite method of discipline was a rap on the noggin with a thimble.



The Music Lesson. A recurrent theme in art, the music lesson is rendered here in Steen, a 17th-century Dutch painter. It shows the music master preoccupied with the woman rather than her progress at the keyboard. In the art of the following century he gradually moves closer to her, and by the early 19th century he is pictured kissing her.



The Education of a Boy. An 18th-century canvas by Pietro Longhi, a Venetian painter. Time is collapsed in that the past, present, and future education of the patrician child all are represented. The scene includes his domestic nurse, his dancing master, his priest, his music teacher, and a gentleman who will provide instruction in law and statesmanship. Notably absent are the boy's parents: aristocrats customarily turned over the education of their children to others.

Ancel Keys Is Alive and Well and Living in Italy

by William Hoffman

"There's a little hotel in Brussels that my wife and I stop at now and then, and every time I go in there the maitre d', a lady in her sixties, says, 'Ah, Monsieur Cholesterol!'"

Ancel Keys no longer totes his statistics tables to prove a point, or at least he doesn't need to anymore. His theory on the connection of diet, blood cholesterol levels, and heart disease is widely recognized now.

But if the great cholesterol controversy of the 1950s and '60s has waned, Keys plainly has not. His retirement home on the Mediterranean south of Naples is perhaps more a way station than a seaside retreat.

"I was invited to give two lectures at the International Congress on Nutrition in Rio de Janeiro. So we left the Twin Cities for New York last summer — we like to spend July and August in Minnesota — and flew to Rio. Then we flew to Lisbon, Zurich, Milan, Naples, and home for a rest. Then we went to Athens, Bangkok, Singapore, where I lecture, Hong Kong, Japan, where I gave the inaugural lecture for the Noboru Kimura Foundation for Medical Research, back to Italy, and then back to the Twin Cities. That's about 40,000 miles by air."

Professor emeritus in the School of Public Health and former director of the University's Laboratory of Physiological Hygiene, Keys has spent a fair portion of his life between stops. His first experience of traveling, when he was only two years old, was as a refugee from the devastation following the San Francisco earthquake of 1906. Some 20 years later he traveled to China aboard ship, and roughly 10 years after that trip he scaled a peak in the Chilean Andes in midwinter. Since then he has traveled the world over — a number of times — as a leading authority on diet and cardiovascular disease.

Still spry and voluble at 75, Keys has had a number of diverse occupations. As a boy he worked in a lumber camp for a while, then shoveled bat guano in an Arizona cave. He served as a powder monkey in a Colorado gold mine and later as a clerk in a Woolworth store. Many years later, as a physiologist and nutritionist, he developed K rations (K for Keys) for army combat troops, and then

instigated and directed the first scientific study of human starvation.

He is a former chairman of the International Society of Cardiology and has been a consultant to the World Health Organization and the Food and Agriculture Organization for almost 30 years. He is a member of countless medical and science organizations and has written hundreds of articles. And he is a friend of many peoples.

"I'm fully in favor of Minnesota except for the winters," said Keys, who lived in St. Paul for 35 years. "But I wouldn't want to live in a tropical area either, though Singapore is lovely. In Italy we have snow in the mountains. Winters are mild. I noticed the temperature in Rome this morning was 59 degrees and a couple of days ago it was 61. We're a little warmer than that near Naples, but it gets down into the 40s at night."

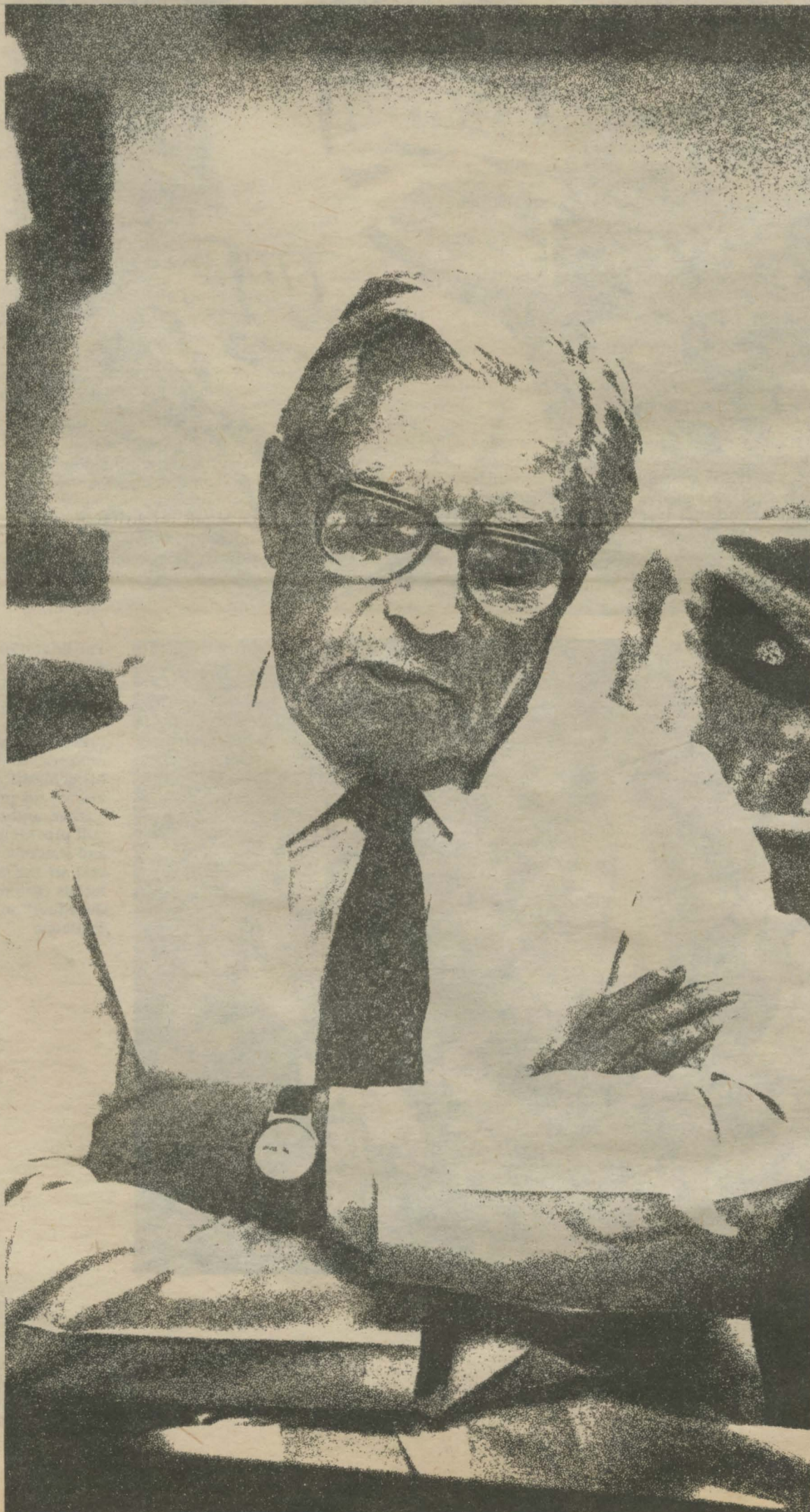
Keys revealed his characteristic blunt manner of speaking while sitting in his office at Health Sciences Unit A, a new building on the Twin Cities campus. "This building is antiseptic. No charm or character at all. But I suppose it works after a fashion. Still it's too cold in the summer, too hot in the winter."

"The old lab was below the football stadium, you know. It was strictly a temporary proposition back in the early '40s, then it was extended. We borrowed and stole and cheated to fix it up a bit, but at least it had some character. The facilities here are very good indeed, as far as I can make out. But the building itself is sterile."

Keys retired in 1972 after 36 years at the University, 26 of them as director of the Laboratory of Physiological Hygiene, where most of his pioneering research on cholesterol and heart disease was conducted, along with other research designed to "find out before people get sick why they get sick."

Shopping around

An only child, Keys was born in Colorado Springs, Colorado, in 1904. His family moved to San Francisco and, after the earthquake, to Los Angeles and finally settled in Berkeley, where Keys attended school. After his experiences in the lumber camp, cave, and mine, he entered the



Ancel Keys in his office in Health Sciences Unit A

Tom Foley

University of California at Berkeley in 1922.

"I started out in chemistry. The department of chemistry at Berkeley at that time was perhaps the leading one in the country, with many students. I did about two-thirds of the chemical stuff, but I wanted to get out of school in a hurry so I checked into the idea of switching majors. Another reason was that at the end of my freshman year they offered a scholarship, and I was only runner-up for it. So I was a little disillusioned."

Keys switched to economics and political science, then left school temporarily to sign on as an oiler aboard the S.S. *President Wilson*, bound for China. "The diet was mainly alcohol," the nutritionist told *Time* magazine in 1961. "I don't remember eating anything." Upon his return he went back to the University of California, where he received a bachelor's degree in 1925.

"I didn't know what I wanted to do, so I went back to the university and talked to the one professor in political science and economics who had impressed me. His name was Paul Cadman, and he was quite a character in practical economics, you might say. He was an adviser to several banks in San Francisco, that sort of thing.

"He had impressed me a good deal with his course, which reminds me very much of John Kenneth Galbraith's book *The Age of Uncertainty*. The course was on the history of economics and political thought. Anyway, Cadman listened to me for a while and then he said, 'Look, I think you ought to see my friend Professor Kofoid.' I'd never heard of Kofoid, but it turned out he was head of zoology."

Although he had not taken a biology course since high school, Keys finished his master's degree in zoology in six months by "sort of tripling up on course work," and in 1928 was on his way to the Scripps Institute of Oceanography in La Jolla. "They got me a fellowship down there. I had been hard up for some years, so this was great. Big money. A hundred dollars a month and I lived in a nice little redwood bungalow on the cliff." He was granted a Ph.D. in oceanography and biology two years later.

A National Research Council fellowship for two years of study in Europe took him to Copenhagen to work under Professor August Krogh, a Nobel laureate in physiology. Next he went to the University of Cambridge, where he did research, lectured, and earned a Ph.D. in 1936.

"It was fairly common in those days to move around a lot. Not

so much nowadays, perhaps, but it used to be — shopping around from one school to the other as a postdoctoral fellow. If you had the wherewithal to hold body and soul together, that's what you did. I was just about to accept a permanent job at Cambridge, however, when I got a cable from Harvard. So I said to myself, 'Okay, go to Harvard and see what's happening in the States.' I taught biochemistry at Harvard and stayed for three years.

"Before this, I had been thinking about questions of high altitude adaptation, things like that. So I very quickly planned an expedition and spent six months in the Andes. Coming back and writing it up accounted for half my time at Harvard."

Keys's boss at Cambridge, John Barcroft, had climbed to the top of Tenerife, the largest of the Canary Islands, "about 12,000 feet, not all that high actually." Barcroft's book on his high-altitude study inspired Keys and a friend to conduct a major high-altitude study in the Andes. He thought findings of the expedition would have practical import for the Chilean copper miners living and working at great heights. And at Harvard money was available for such research.

"I took a small group down there to make preparations. We stayed at about 9,500 feet for two months and made a base. The actual work at higher altitudes took about five weeks — at successive altitudes from about 15,000 up to 20,000 feet or a little over. Sir Brian Matthews and I did the highest work because we stood the altitude better. We were up over 20,000 feet for about 10 days.

"It was awfully damned cold constantly, because it was midwinter. We had expected to go to the Himalayan region in Asia at a latitude of 25 or 30 degrees north. Instead we ended up being 22 degrees south in July, which is the middle of winter. In the cold, you easily lose your breath, but you just pace yourself. We got along.

"We had a little snow shelter — put up a few poles and blankets over them — and crawled in there to get out of the wind and cold. At night the temperature dropped to 50 below. We didn't do much cooking, of course. Through it all I lost a little weight but wasn't sick in any important sense, though of four others who came up from time to time two were very sick. One of them was John Talbott, who later was editor of the *Journal of the American Medical Association* for many years. We had an awful time getting him down. He was not blue but black — gas pain, retching. We

thought he was going to die. You see, Brian and I had the advantage of having lived at 10,000 feet for a couple of months beforehand."

K rations and starvation

Several months later Keys accepted a job offer from the University of Minnesota's Mayo Foundation in Rochester. "They offered me twice my miserable salary at Harvard and an opportunity to set up a new division of biochemical research on human beings, human physiology and biochemistry. But after I'd been there a year I found it a little confining. With my background, it just seemed to me awfully provincial, if you don't mind my saying so. All the docs talked nothing but doc business and the evenings were devoted to bridge."

After a year in Rochester, Keys was invited by Lotus D. Coffman, then president of the University, to come to Minneapolis to organize what was to become the Laboratory of Physiological Hygiene. Among Keys's early research projects were subsistence tests for the defense department. A study of the physical differences between athletes and nonathletes caused a writer for *Life* to call him "the only U.S. scientist whose work is supported on the budget of a University athletic association." In that study, Keys concluded that athletes' hearts are no larger than those of nonathletes, but they beat more slowly.

In 1941, serving as a special as-

sistant to the secretary of war, Keys started working with the army to develop rations for troops in combat. The first K rations resembled a typical bag lunch and were tested by soldiers at Fort Snelling. "We bought the stuff down at Witt's, the best market in the Twin Cities in those days.

"Six months later, I went down to Fort Benning, Georgia, to run more elaborate trials. Then General McNair, the chief of infantry at the time, said that *this* was going to be the combat ration because it was easy to hand out. The logistics were simple, that's all. But I was surprised when I saw the packages start to roll in with 'K' on them. Then I got a letter from Colonel Logan of the Quartermaster Corps in Washington saying he hoped I wouldn't mind. Of course, it's all different now — roast turkey and ice cream and who knows what else."

Toward the end of the war Keys began to realize that starvation "was going to be a huge problem" in war-torn countries. He consulted military and civilian authorities in Washington and then launched the "Minnesota starvation experiment" involving a first-rate research team and 36 conscientious objectors who volunteered for the experiment as a form of alternative service.

"They were a remarkable group of youngsters. One or two of them defected, so to speak, but in general they were really remarkable. Of course, we did a lot of screening because we found all the kooks in the world in that conscientious objector

pot. But the Church of the Brethren and the Quakers made sure we had good, decent, honest youngsters who were not simply trying to stay out of the war but wanted to do some service.

"As for the rights of human research subjects, well, the Helsinki Declaration hadn't been signed at that time. But the volunteers were informed about what they were up against, and they were very carefully monitored."

For five months the volunteers received half the normal number of calories for adult males. Each man was required to keep a diary and to exercise regularly on the treadmill. The diet was designed to duplicate that of the occupied countries of Europe, so that "each volunteer would become the nutritional equivalent of a Pole or a Greek." After a while, the men became irritable and were obsessed with thoughts of food. Simple strength declined only about 10 percent, but endurance on short, heavy tasks dropped by half. Keys noted that men who were initially most fit showed the greatest deterioration. The average weight loss was 25 percent per man.

Three months after the experiment, none of the men had regained his former weight or physical capacity. Keys learned that effective rehabilitation for an adult male requires that the daily calorie level be above normal for several months, that the proportion of protein in the diet be increased, and that he take



Army paratroopers feasting on K rations, named after Keys. Each ration contained 3,000 calories — a day's food requirement — and came in a gasproof brown-paper package. The main course was a small tin of meat or meat and eggs. Small envelopes of powdered coffee, bouillon, and lemonade

also were provided, and for the soldier's desert the army furnished its own "nonmelting" chocolate bar. Other contents: graham-like crackers, cigarettes, chewing gum, and toilet paper (colored brown to reduce visibility from the air).

vitamin supplements. This information was sent to various national and international relief agencies at work in Europe. "Starved people cannot be taught democracy. To talk about the will of the people when you aren't feeding them is perfect hogwash."

Keys reported the results of the experiment in his two-volume *Biology of Human Starvation*, published by the University of Minnesota Press in 1950. He maintains that it is still the definitive work on the subject. "In Rio a couple of months ago the president of the nutrition foundation asked if I would consider doing a review of work along this line. He said we would bill the Minnesota experiment as one to which nothing else compares. I doubt another of its kind will ever be done."

Monsieur Cholesterol

Statistics from northern Europe showing that as food supplies became short the death rate from coronary heart disease dropped markedly led Keys to launch a long-range study to discover the factors involved in degeneration of the heart. For this task he recruited 286 Minneapolis and St. Paul businessmen, including such University notables as Owen Wangensteen and Bernie Bierman. At about the same time, he organized a metabolic research unit at the state hospital in Hastings.

Keys's earliest suspicion that fat produces high blood cholesterol was aroused when he examined a Wisconsin dairy farmer referred to him by the University of Wisconsin medical school. "He had big knobs on his knees and elbows and over his eyes, and when you opened them, it was just pure cholesterol inside. They had tried various things at Madison, including giving him thyroid extract to a point where he was shaking all the time.

"We checked this fellow's serum cholesterol level, and the first reading was 1,000. His brother, who came with him, had a reading of 600. The average level in the United States is about 220 or 230, so of course this was sky high. So we put them over in the laboratory, fed them there for a week, and bang! Their cholesterol levels dropped down to 500 and 300. Essentially we put them on a fat-free diet. Wasn't very tasty.

"Then we got thinking about the possibility of giving them some fat. We gave them some vegetable margarine and their cholesterol levels shot back up again. That led us to think it was just the fat. We didn't realize that

the vegetable margarine in those days was made of saturated fat. The saturated story didn't come up till some years after that. Anyway, that got me thinking furiously, and it was the testing of these ideas about the diet and fat that led us to Hastings."

Cholesterol, named from Greek words meaning *solid bile*, is a yellowish waxy substance. Synthesized primarily by the liver, it is an important element in brain cells and nerve tissue, and it carries fatty acids in the bloodstream. But when it builds up in the arteries over a period of time, "it looks as if someone dumped Cream of Wheat in them. A heart attack occurs

"Starved people cannot be taught democracy. To talk about the will of the people when you aren't feeding them is perfect hogwash."

when the blood clots or when a blockage forms in the congested arteries."

But Keys discovered that the amount of fat in food, not the amount of cholesterol, has the greatest effect on the serum cholesterol level in the blood. Later he traced cholesterol buildup to saturated fats — fat molecules with a full load of hydrogen atoms — found mainly in meat and dairy products.

From this point on, Keys concentrated on dietary factors and lipid metabolism with the idea of preventing cardiovascular disease rather than curing it. Time and again he was criticized by various commercial interests for his findings, particularly by the meat and dairy industries. "There'll always be commercial interests involved in matters like this, but most of their arguments have gone by the wayside. The important thing is to make people aware of the dangers.

"People nowadays are wondering if, at the advanced stage of heart disease, dieting is helpful. I say it is helpful, in the psychological sense if nothing else. If you tell someone there's nothing to be done, it's hopeless. But if you say, 'Well, here's a diet. You can eat this and that and the other thing,' that helps them a lot emotionally. We can bring serum cholesterol down that way. Not as much as we'd like, because people don't like to give up their habits."

In 1950 Keys went to Rome as

chairman of the World Health Organization's first joint commission on food and agriculture, and the following year he took a sabbatical to Oxford as a senior Fulbright fellow. His interest in epidemiology was stimulated by exploratory surveys done in Italy, Spain, and England.

"I went down to Naples, and a friend of mine arranged for one of the young doctors to assist me. He got some volunteers from the fire department — it was just across the street from the medical school — and we took their blood pressure, blood samples, height and weight, and we asked them a few questions about their diet.

"Later that year I was invited to lecture in Madrid, and I arranged to make a similar study of people in the poor quarter there. Then I asked my sponsor, who was number one in medicine in Spain at the time, about patients with coronary heart disease, and he said he saw a lot of them in his practice. These were all rich people, of course." Keys's conclusion was that the difference in diet between poor people and rich people accounted for the greater incidence of heart disease among the wealthy.

The Naples firemen and the Madrid poor had significantly lower blood cholesterol levels than

"People nowadays are wondering if, at the advanced stage of heart disease, dieting is helpful. I say it is helpful, in the psychological sense if nothing else."

Americans, and fat represented a smaller percentage of their daily diets. But 50 professional men in Madrid, all of whom had diets comparable to diets in the United States, had cholesterol levels comparable to those of their American counterparts. High-fat diets in England and New Zealand also were reflected in a correspondingly high rate of heart disease.

It was in 1954 that Keys "really began more serious study of car-

diovascular epidemiology" with help from President Eisenhower's heart specialist, Paul Dudley White.

"Paul at that time was president of the International Congress on Cardiology, and he asked me to organize a symposium on epidemiology for a meeting in Washington. It produced the biggest overflow crowd of the session. We had the biggest room, 800 capacity, and there were more than 1,200 people jammed in there. That was the beginning of cardiovascular epidemiology."

In 1955 Keys and his wife, Margaret, a biochemist, went to South Africa to begin systematic work on the Bantus, Cape Coloreds, and Europeans. "She did all the fieldwork," Keys said. The highly publicized findings showed that the calorie intake of fat varied widely in the diets of the three groups, and blood cholesterol counts and the incidence of heart disease correlated with diet — lowest for Bantus and highest for Europeans. The following year Keys studied Japanese men living in Japan, Hawaii, and Los Angeles. Again, cholesterol levels and incidence of heart disease were closely tied to fat consumption: all were lowest in Japan and highest in the United States.

Through the late 1950s and early '60s, the Keyeses were constantly on the go. "There were some big contrasts along the way. We went to Japan in the spring of 1956, and this was a fascinating experience. But to go three months later to Finland, the absolute opposite, was really something." In Finland, Keys noticed that the farmers and woodcutters, many of whom were lean and muscular yet suffered from heart disease, buttered their cheese. He launched

a long-range research program to study the effects of dietary fat consumption on the incidence of heart disease, and followed with similar programs in Italy, the Netherlands, Greece, and Yugoslavia.

Keys accompanied White on a goodwill tour to the Soviet Union in 1956, and after an interview with Stalin's doctor reported that the former premier apparently died of natural causes, rumors to the contrary notwithstanding. At that time, Keys noted "the friendliness — the freedom with which everybody talked to us" and predicted a break in the cold war, at least on the scientific front.

Meanwhile, the American press and broadcast media were paying more notice to the Minnesota physiologist. Newspapers and wire services often carried stories about him and his ideas. In a 1956 Associated Press story, Keys remarked that, generally speaking, the higher your income, the more fat you eat. "But after you're earning \$200 a week, you probably can't do any more harm. You probably can't eat any more fat."

"Americans have Sunday dinner every day," Keys told *Time* magazine in 1959. At another time he was quoted as attributing heart disease to "the North American habit of making the stomach the garbage disposal unit for a long list of harmful foods." He once charged that television was "doing a disservice to the nation and the individual" because viewers tend to eat a lot and remain inactive. "If we could find some way to make people do push-ups during commercials, then we'd all be strong as lions — the commercials are so long."

In his many talks, public and private, he announced "new remedies" for heart disease, namely proper diet, exercise, emotional stability, and no smoking. And he argued that obesity, in and of itself, is not necessarily a major heart risk unless it is extreme.

While in Yugoslavia in 1958, Keys and his wife corrected

proofs of their book *Eat Well and Stay Well*, which became a best-seller. Readers were advised to "eat less fat meat, fewer eggs and dairy products. Spend more time on fish, chicken, calves' liver, Canadian bacon, Italian food, Chinese food, supplemented by fresh fruits, vegetables, and casseroles." Margaret Keys supplied 200 low-fat recipes.

For the next few years, Chinese restaurants nationwide exhibited "window streamers and counter cards plugging Dr. Ancel Keys's book." Eventually it was translated into Finnish, Spanish, Italian, German, Japanese, and Portuguese. Minneapolis *Tribune* columnist Will Jones lamented the loss of the "mad, carefree past — the world as we knew it before Ancel Keys came along." Keys admitted that "nobody wants to live on mush. But reasonably low-fat diets can provide infinite variety and aesthetic satisfaction for the most fastidious — if not the most gluttonous — among us."

Staying on top

Keys's continuing interest in high-altitude experiments took him to White Mountain, California, in 1962. He and five other scientists from the Andes expedition — now ranging in age from 58 to 72 — tested the ability of older men to function at an altitude of 14,850 feet.

Keys has always believed in the benefits of regular exercise — he walks and swims a lot in Italy — but he has no intention of joining up with the joggers. The director of the Florida Heart Association, who was 48, recently dropped dead while jogging. "I've seen just too many cases like that.

"To take up a fairly vigorous thing like jogging at older ages when you've never done anything like it at earlier ages is just asking for trouble. A friend of mine at a Los Angeles university

who is a big mover in this business told me last year that he personally had been in on the obits of four people in one month who had dropped dead while jogging. And one of our ambassadors in Europe just dropped dead while jogging. I try to persuade people to have some pleasurable, safe exercise, preferably useful, when they are older."

And dieting can be dangerous, too. "Diet fads are for the birds, if you don't like birds. My friend Ed Rynearson — he was

"Americans have Sunday dinner every day."

in charge of the division of metabolism at the Mayo Clinic — pointed out that we're overridden with diet fads. His particular peeve was Adele Davis. She's dead now, and I shouldn't speak ill of the dead. But her books are just full of hogwash. She has a variety of diets, but no great sense to them at all — lots of natural things, which I suppose is all right. The health food stores have stacks of her books. She made a pot of money, I'm sure.

"Most diet fads don't do a great deal of harm — lamb chop and pineapple, that sort of thing. But such things as the Zen macrobiotic diet definitely are harmful. And about that liquid protein diet, I was asked to be a witness at the hearings and legal proceedings in Los Angeles a year ago. People from the Food and Drug Administration were in on that, but they couldn't make their case stick and so it's still on the market. I sent material, but I didn't testify."

The problem of rising medical costs in the United States is one that Keys concedes is out of hand, though "it's hard to put the blame on anyone for it." Socialized medicine is not necessarily the answer. "In Italy, everyone is covered by a type of social security, and there are various ways of paying into it. Everybody gets taken care of, but there are an incredible number of bureaucratic hurdles.

"I also know something about the situation in Sweden because my daughter lived there for five years, and one of her children was born there. She had wonderful prenatal care and she re-

ceived a check for \$300 from the government to buy a layette for the baby. Really socialized. But if you're just plain sick, unless it's obvious that you're at death's door, you may have to wait months and months to see a physician. The quality of medical care is at least as good as it is here, I think probably better.

"I can't say the same for Italy. Some of it is very good, some very poor. Italy has three times as many doctors per capita as the United States, and many of them can't make a living. But a

few of them make pots of money. A friend of mine in Rome won't see anybody for less

says that they are changing all over the world. Some of the changes he believes are detrimental, such as the lowering of language requirements for medical students at the University of Minnesota. "Now we're getting the backlash in that medical graduates don't know how to read and write, let alone how to do arithmetic."

Keys thinks Minnesota "has turned out to be a cross between a trade school and a university — a place for kids to hang around while they decide what they'd like to do. I guess that's true of many places. In the Scandinavian countries that's not true. Students really work and have some real objectives — some profession — in mind."

In time, he expects less emphasis to be placed on "just going

this last trip we had to get a young fellow to drive us to Rome because the railroad was on strike. The trip is about 180 miles on a very beautiful toll road. When we got to the end of it, even the toll collectors were on strike."

But life in Italy away from the cities is another matter. The Keys home is outside a fishing village. The townsfolk are friendly, and life is lived at a patient pace. "Just a few days before we left I went down with a big stack of mail and discovered I'd forgotten my wallet. The postmaster said, 'Forget it, pay me some other time.' We know everybody in town, though I'm sure I couldn't tell you the names of 90 percent of the people, or maybe just their first names or nicknames. And people bring us things — a fish, a rabbit, a loaf of home-baked bread. They're not rich.

"We come back to Minnesota for July and August, primarily because our little village swells from 500 people to 4,500 during the tourist season. Two-thirds of the tourists are Italian and the rest are German, Austrian, Swiss, and French. Not so long ago, when we bought our house, the roads were poor and there were no hotels in the whole south of Italy. Now, of course, they're having all sorts of problems — water shortage, an overloaded power system, and so on."

These days, besides traveling and lecturing, Keys is writing up the results of long-range studies on cardiovascular epidemiology, including a 10-year study of 12,600 men in several European countries. "That's the biggest single study I've conducted. The manuscript will be published by Harvard University Press this year." Studies he initiated in Finland, the Netherlands, and Yugoslavia now are into their 20th year.

And he finds time for safe, useful exercise. "Margaret and I get lots of pleasure from working in our yard. We just started the olive harvest. We have 80 olive trees and 75 citrus trees. We have oranges, tangerines, apricots, pears — lots of pears —



Keys was the subject of a Time magazine cover story in 1961.

than 100,000 lire. That's \$110 just to walk in the door. On the other hand, the son of our village mayor, after long labors, got through medical school and specialization in orthopedics. He's 38 and well established but earns considerably less than a good tile setter."

Having spent half a century at educational institutions, Keys

to college" and more on attending an institution of higher education for a particular purpose.

"Diet fads are for the birds, if you don't like birds."

"In Italy, if I had a private fortune, I'd like to put it to use in vocational training. We need plumbers and electricians. We don't need all these eggheads."

Keys is concerned about the unstable political conditions in Italy and particularly about the strikes. "When we started off on

plums, and four apple trees that produced only one apple so far.

"Also we have kumquats and chinotto. You probably don't know about chinotto. It's a citrus fruit, redder than most tangerines, and it grows on a beautiful tree. Produces lots of wonderful fruit for marmalade."

by Maureen Smith

If you are like most adults, you draw the way you did when you were 10 years old. Your verbal and mathematical skills have advanced, but you never went beyond the childhood level in art.

Michael Day, head of the art education program on the Twin Cities campus, thinks it's "a tragedy of sorts." Without adequate instruction in art, he said, most children give up when they reach an age of critical awareness and are not satisfied with their drawings. A rich opportunity for expression is then cut off.

All over the world, almost all young children draw. They start by scribbling, and "they actually learn quite a bit from their scribbles," Day said. They learn that they can make something happen, that they can literally "make a mark on the world."

As children scribble they begin to "develop a repertoire or vocabulary of marks," Day said. Between the ages of two and four they typically start to make little shapes. The next step is to invent symbols by attaching meaning to shapes, calling a shape "mommy" or "me." Day said this primitive but significant symbol is "usually a circular shape that emerges from pages of scribbles and marks."

Day drew an analogy with the development of speech. "Scribbles are similar to the babbling sounds," he said. "Naming a scribble is similar to learning a word."

At this early stage, he said, "most adults view children's figure representations as heads with arms and legs protruding where the ears and neck ought to be." Such seemingly incorrect depictions of the human figure are puzzling to adults who know that the child is aware of the major body parts and their relationships.

"The puzzle is solved," Day said, "when one realizes that the circular shape that appears to be the head is really the child's primitive symbol for 'person.' The symbol is developed through additional marks that result in 'person with eyes and a mouth,' 'person with hair,' and

School Art Projects Cramp Kids' Style



Michael Day

'person with arms and legs.'"

From scribbling marks and primitive symbols children move to schematic drawing systems, Day said. Usually between the ages of six and eight they develop certain ways of drawing. "Little girls often draw little girls. They'll do it the same way over and over again, using pretty much the same basic symbol," with perhaps some variation in the clothing or the hair.

Each of these developmental steps — from scribbles to symbols to schemata — is "a spontaneous occurrence common to children from all parts of the world," Day said.

Another developmental progression is in the shapes children are able to draw. Shapes approximating circles seem to be the easiest for children. It might take a couple of years more before they can manage horizontal and vertical lines and draw anything resembling a square. Diagonal lines come later still. "Of the basic shapes, the last thing they can do is the diamond," Day said.

Children also develop in their depiction of spatial relationships. Three- and four-year-olds "think the world revolves around them," and in their drawings the "me" symbol is typically in the center with other persons and objects orbiting around it.

A child who has become aware that people and objects do not float in space is likely to draw figures with their feet planted on the bottom of the page. More sophisticated older children (eight or nine years old) will depict figures on a base line.

Children draw pictures about the things that are interesting in their own lives, Day said, and their drawings offer "insight into what they are thinking and feeling." Drawings give children a chance to "work out relationships in the real world in a form they can control. Things can turn out just the way they want them to."

Another advantage of drawing is that children are free to develop

their own symbol systems, he said. In school they have to learn the conventional verbal and mathematical symbol systems, but when they draw they can express themselves in their own way.

"Because of the spontaneity of fundamental drawing behavior," Day said, "no instruction is required at early ages." But appropriate instruction could enhance the process, and children need to develop technical competence if they are to continue drawing as they enter adolescence.

"Children's verbal language development is one of the primary concerns of parents and educators and occupies a large proportion of time spent in the education of children," Day said. By contrast, he said, children's "drawing development is virtually unattended to in the schools and in many homes as well."

Children with natural artistic talent often go unrecognized in school, he said. "Some kids pick up math easily, other kids are very verbal, some are very visual. Those who are artistically

oriented don't have the opportunity to excel."

Day recently talked with a young woman in one of his classes who showed a natural but undeveloped talent for drawing. She always liked to draw, she told him, but nobody encouraged her and she felt inferior to her academically gifted sister. "She never had the opportunity to develop in the area where she probably would have excelled," Day said. "She never received recognition. I just think that's too bad."

Whether or not they excel in verbal and mathematical skills, Day said, children are cheated when the opportunity for artistic expression is blocked.

Art projects in the schools often stifle creativity, he said. "There are a lot of stereotyped projects." He pulled out what he called a typical example. The children had traced around a shape of a tree — "a pretty dumb tree, to tell you the truth" — and had wadded up little pieces of paper and attached them to the tree to represent flowers or fruit.

"You would walk in the room and see 30 of these hanging up on the wall," Day said. "The kids sort of follow directions and that's about all. There isn't any expression or learning." In other typical projects, the children had been told to recreate someone else's version of a leprechaun or an Easter bunny.

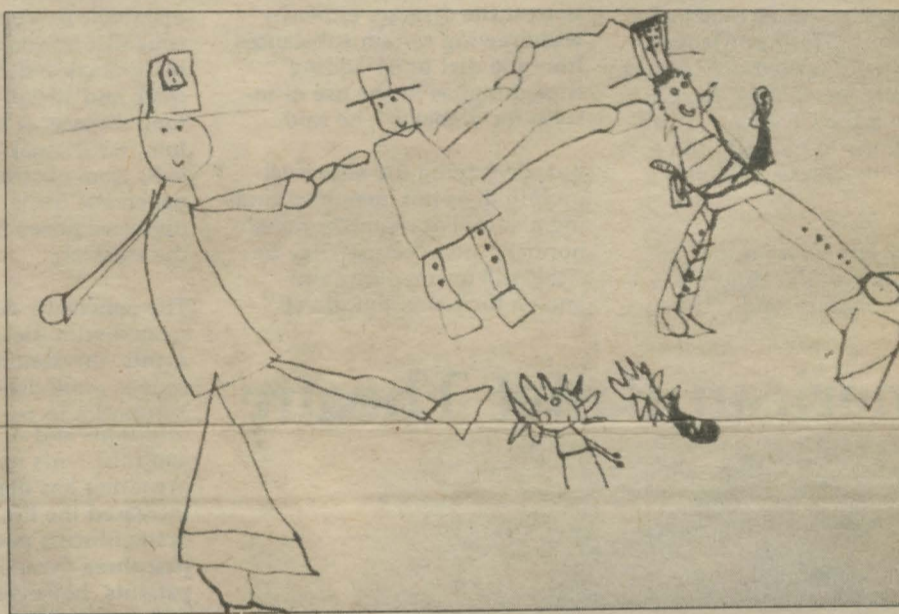
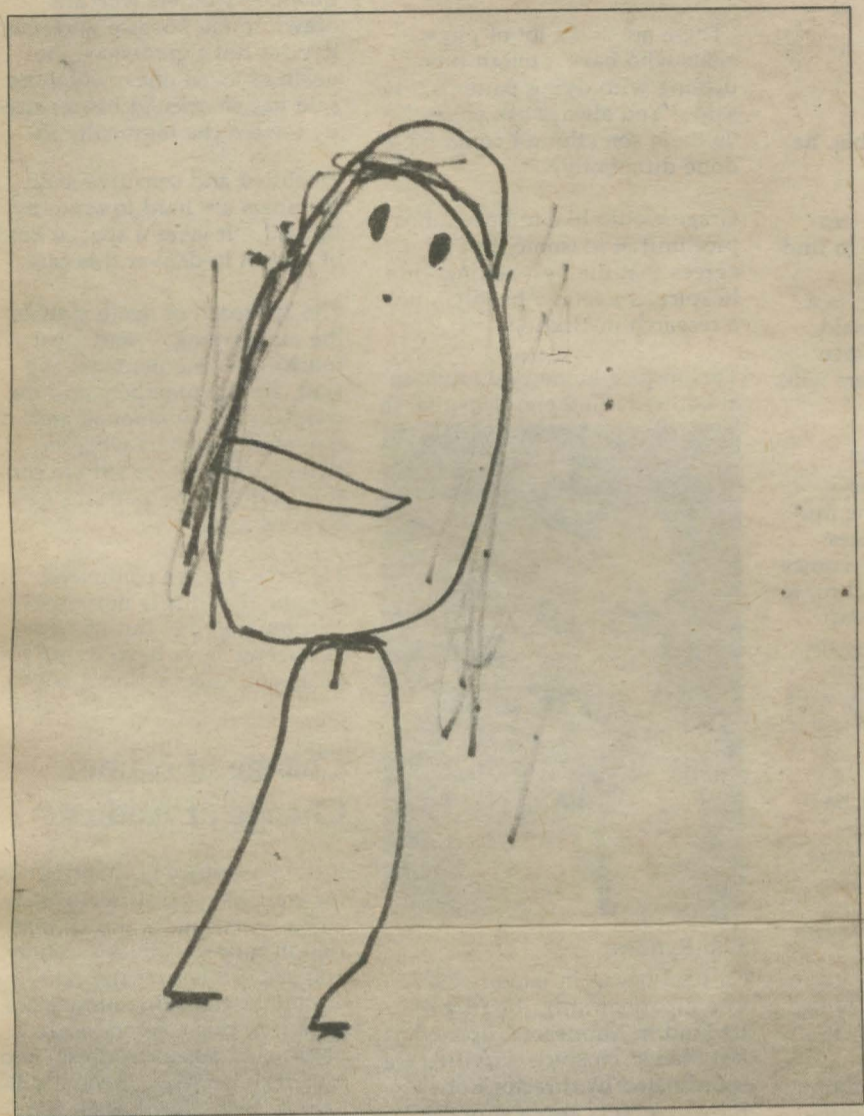
"These are cute little projects that the teachers plan, and some of the parents really like to see that kind of thing, but they are of questionable value. The message the teacher is communicating is, 'You're not able to draw a leprechaun, so I'll give you one.'"

For similar reasons, Day doesn't like coloring books. Besides, he said, "so many coloring books are such poor art. The drawings are really stereotypes in themselves. If I wanted my kids to copy somebody else's drawing, I would expose them to the best instead of the poorest.

"Coloring books tend to be baby-sitters. I suppose that's all right once in a while, but children will stay engrossed longer in their own work. Coloring in a coloring book is a pretty mundane activity."

It isn't necessary to turn to coloring books, Day suggested, when the tools for original drawing are so readily at hand. "You just have to have a pencil or some crayons and a piece of paper. I don't think there's any other way a kid can be creative so easily."

Tom Foley



To adult eyes, this drawing (above left) by a three-year-old suggests a strange understanding of human anatomy.

A four-year-old boy's drawing of a Thanksgiving scene (above)

An eight-year-old girl has developed her own way of drawing little girls (left), all following the same pattern but each one a little different.

Researchers Closer To Finding Cause of Cystic Fibrosis

by Paul Schurke

A major discovery by Twin Cities campus geneticist Burton Shapiro has brought researchers closer to exposing the genetic culprit in cystic fibrosis (CF), the most common fatal heritable disease.

Shapiro's research, scheduled to appear in an upcoming edition of *Science* magazine, indicates that the genetic abnormality in cystic fibrosis causes cells to age prematurely. This knowledge, together with related discoveries concerning metabolism in cells expressing the CF gene, will advance efforts to pinpoint the cause of the disease, Shapiro said.

"Nobody knows what the protein product of the abnormal gene is," Shapiro said. "Ulti-

mately, most questions about cystic fibrosis will be answered by finding that protein."

Through chemical analysis, researchers are searching among the 50,000 to 100,000 cellular proteins for those associated with the disease. Shapiro's evidence greatly narrows the field of candidates.

"When we find that protein, theoretically we should be able to treat the disease, either by withdrawing certain substances from the diet or by adding something, as in the use of insulin for diabetes," he said.

But identifying the abnormal protein does not guarantee finding a cure. For example, the abnormal protein responsible for sickle cell anemia has been known for years, but direct

treatment is not yet feasible, he said.

However, identifying the protein will make it possible to find the one person in 20 who, though otherwise healthy, is a carrier of the disease, he said. There is a one-in-four chance that children of two carriers will have cystic fibrosis.

Between 25,000 and 50,000 Americans suffer from this metabolic dysfunction. The mucus that normally lubricates body ducts and airways becomes thick and sticky, causing chronic lung disease. A second symptom, nutritional deficiency, results from obstruction of the pancreatic ducts, which prevents digestive juices from reaching the stomach.

The pancreatic defects can be treated with dietary supplements; the abnormal lung mucus is more deadly. Use of antibiotics to prevent lung infections and of chest massages and mist tents to improve breathing has dramatically increased the life expectancy for cystic fibrosis patients over the past three decades. Most patients, however, still cannot expect to live much beyond the age of 20.

Cystic fibrosis research is aimed at normalizing the lung mucus as it is formed or modifying the cells of the mucous glands.

Shapiro's discovery of premature cell aging was spurred by a discrepancy in the literature on studies of cystic fibrosis. Investigation of conflicting research reports on the life span of CF cells led to the discovery that whereas normal cells produce about 27 generations, CF cells produce only about 18 generations.

Additional studies amplified Shapiro's findings. Two aging-related factors, increased oxygen consumption and calcium concentration, were found in CF cells by graduate students Bob Feigal and Louis Lam.

"We have preliminary evidence that the calcium abnormality is caused by the abnormal CF protein. That's what we are hunting for now," Shapiro said.

It might be years before the protein is identified, but, Shapiro said, "the fact that the calcium findings can be detected in carriers means we are not far away."

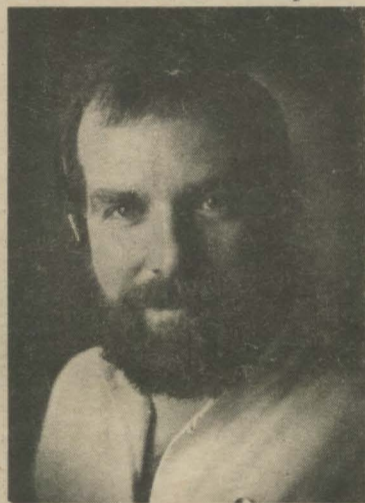
Hospice . . .

Grage, among whose patients are many persons terminally ill with cancer.

"There are still a lot of physicians who have a tough time dealing with dying patients," he said. "You always ask yourself, 'Is there something I could have done differently?'"

Grage would like to have a hospice unit at Masonic, but he agrees that the best setting for a hospice is a family hospital, not a research institution.

The hospice home care program at Bethesda Lutheran Hospital in



Tom Foley

Bob Ryndes

St. Paul began in January 1977. The inpatient unit, the first of its kind in Minnesota, opened last March. Hospice activities are coordinated by director Robert Brown, who is also a surgical oncologist at the University, and nurses Carmian Seifert and Bob Ryndes.

In the hospice unit there isn't much fancy medical equipment — intravenous tubes and such. But there are a lot of nurses. Each hospice nurse handles two or three patients, about half the case load of nurses in other units.

The atmosphere is relaxed and quiet and patients are encouraged to bring their own wall hangings, stereos, and even furniture.

"We try to establish the rituals of community," said Ryndes, a soft-spoken young man who weighs each statement carefully before speaking. "We begin each morning by singing to the patients."

Tranquility pervades the halls and rooms, but a faint sense of desperation registers on the faces of some patients who, gaunt and emaciated, choke

back tears as they read their last Christmas mail.

Like many others who are drawn to the hospice movement, Ryndes has experienced the death of loved ones, which he said has sharpened his sensitivity toward the terminally ill.

Qualified and sensitive staff members are hard to come by, he said. "It takes a special kind of person to deliver this care."

The approach of death signals the most trying — and most touching — moments for the staff. Family members and the chaplain are summoned and, often, staff members whisper hymns, prayers, or simple comfort in the dying person's ear, Ryndes said.

He paused, then continued, "It may be that this is not important for anybody but us. After all, people have been dying for years and years without advice."

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American Ballet Theatre



The American Ballet Theatre's Martine Van Hamel performing in *La Bayadère*. The ABT will present seven programs at Northrop Auditorium on the Twin Cities campus between February 27 and March 4. The festival, billed as the year's biggest dance event in the Upper Midwest, will include three 19th-century romantic classics — *Giselle*, *Swan Lake*, and *La Sylphide* — along with a repertoire of newer works by choreographers George Balanchine, Glen Tetley, and Antony Tudor. Tickets are available at the Northrop ticket office and at Dayton's and Donaldson's.

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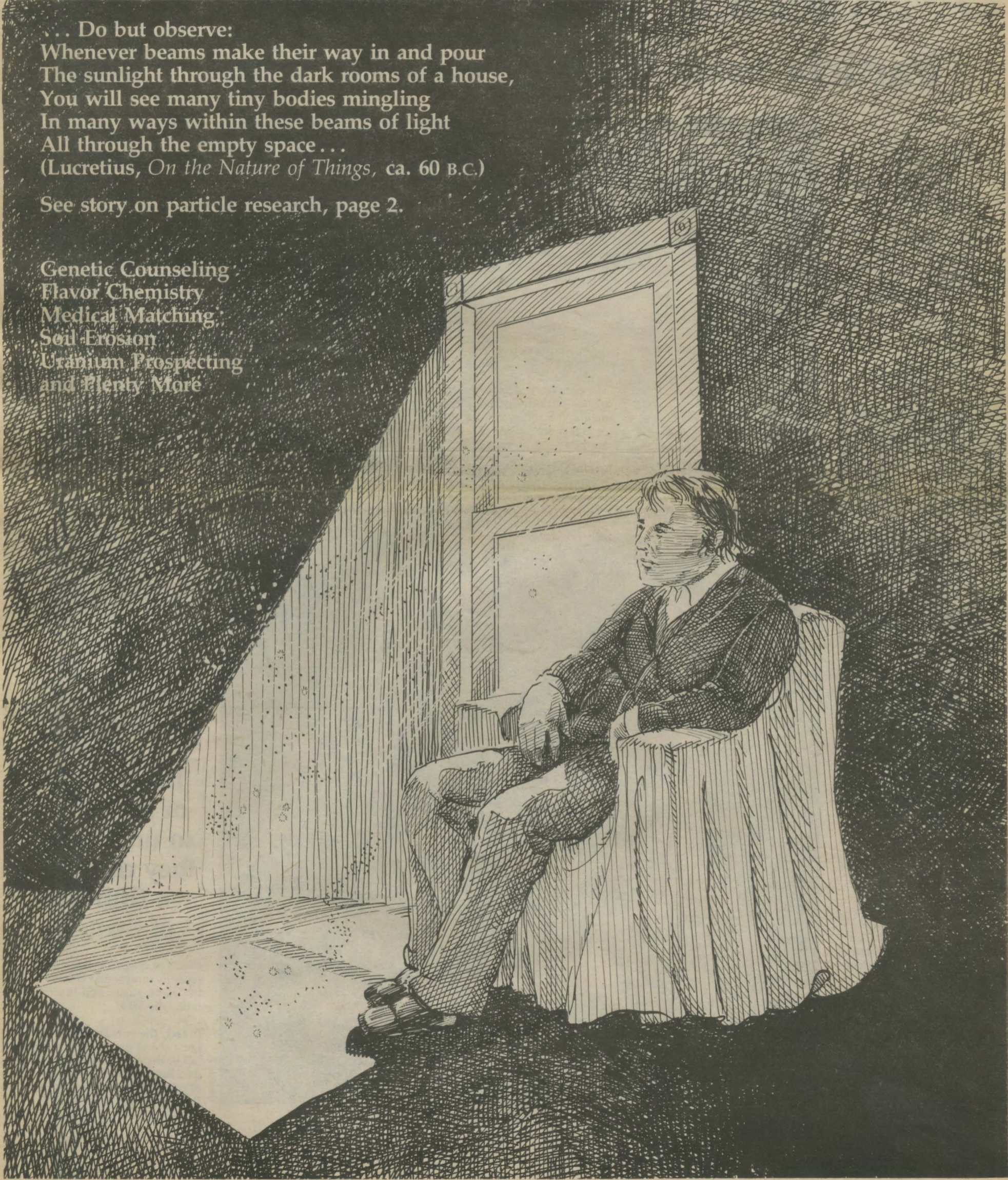
Spring 1979
Volume 6
Number 3

A Publication for
Friends of the
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... Do but observe:
Whenever beams make their way in and pour
The sunlight through the dark rooms of a house,
You will see many tiny bodies mingling
In many ways within these beams of light
All through the empty space...
(Lucretius, *On the Nature of Things*, ca. 60 B.C.)

See story on particle research, page 2.

Genetic Counseling
Flavor Chemistry
Medical Matching
Soil Erosion
Uranium Prospecting
and Plenty More



Charles T. Smith

'U' Science Team Battles Bad Air

Particle Posse Sets Sights on Clear Vistas

by William Hoffman

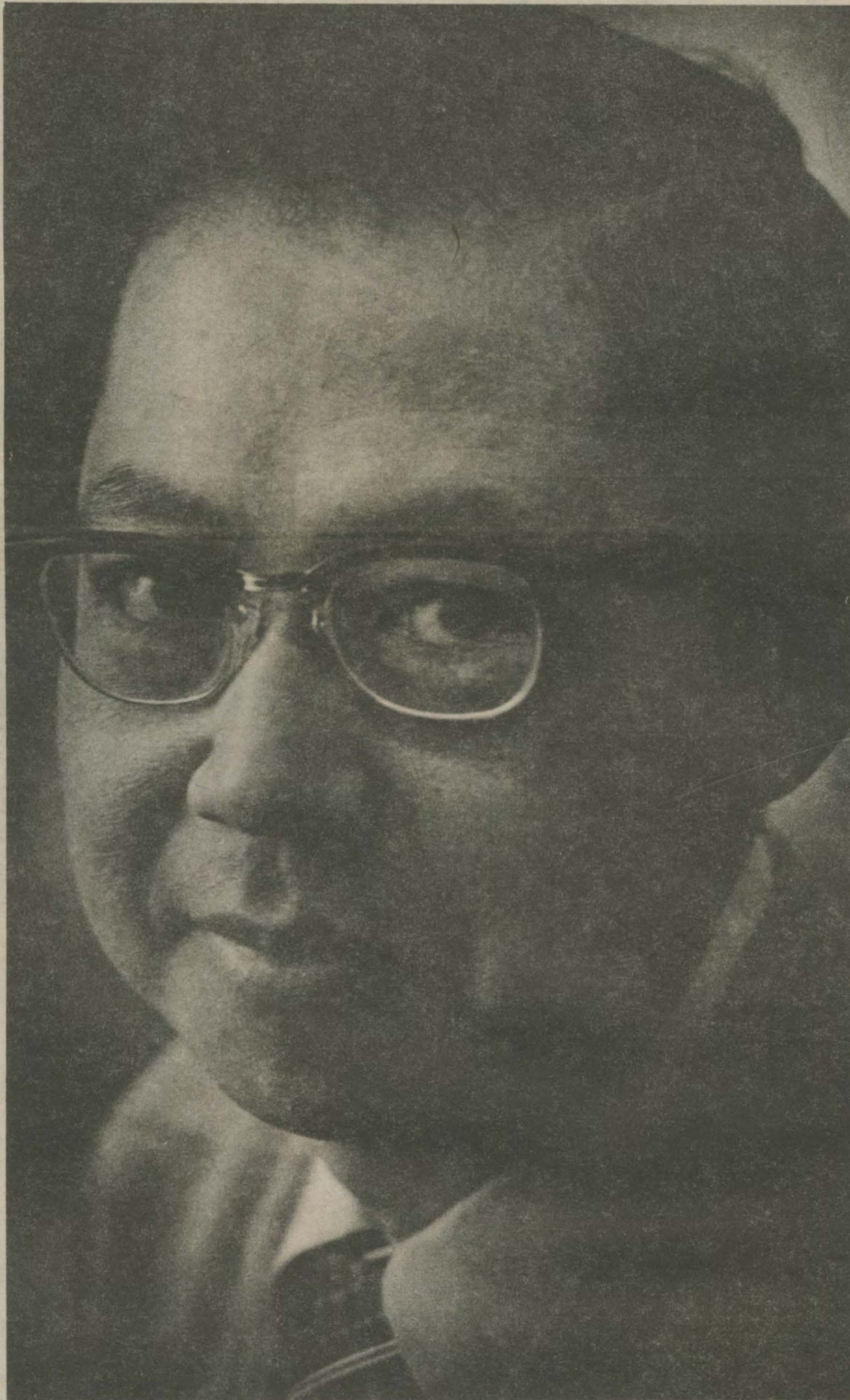
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In many ways within these
beams of light
All through the empty space,
and as it were
In never-ending conflict waging
war,
Combating and contending
troop with troop
Without pause, kept in motion
by perpetual
Meetings and separations...
(Lucretius, *On the Nature of
Things*, ca. 60 B.C.)



So the ancient poet speculated on the nature of matter. To him, the universe was made up of motes tossing about in a great void. He was trying to illustrate the behavior of atoms, but his verse tells more about the behavior of airborne particles.

The air we breathe is laden with powders and dusts, fibers and filaments and droplets, both natural and manmade. Such particles are present in the air of Antarctica as well as in that of Los Angeles. Smog and hay fever would not exist without them, but then, neither would clouds and rainbows.

These particles in the air are called aerosols. An aerosol is a colloidal system, a suspension of finely divided particles in a continuous medium. Specifically, aerosols are fine particles of solid or liquid matter suspended in gas, sometimes producing a mist or a haze. An aerosol may reside in the atmosphere for days or for minutes depending on its chemistry, its concentration, the weather, and agitation on the earth's surface.



Benjamin Liu

Their behavior is so unique that aerosols constitute "a fifth state of matter," according to Benjamin Liu, professor of mechanical engineering and director of the Particle Technology Laboratory on the Twin Cities campus.

Besides the familiar states of matter as solid, liquid, and gas, scientists recognize a fourth state—plasma or ionized gas. But aerosols have properties different from any of these.

In the Particle Technology Laboratory, one of the best in the world, five University scientists are endeavoring to learn more about the properties of aerosols, the way aerosols form and spread and interact, so that their effects on visibility, climate, and human health can be better understood.

Sizing up particles

The universe is made up of particles that range in size from stars to subatomic particles, Liu said. "Here at the particle laboratory we work with particles between the size of molecules and rain drops, or between .002 micron and 100 microns in diameter."

Liu, who has directed the lab since 1973, is himself designing particle control devices. He is quick to point out, however, that not all fine particles are nuisances or hazards. "Particles are

The behavior of aerosols is so unique that they constitute "a fifth state of matter."

found in magnetic tapes and film, in sprays, and in foodstuffs like flour, sugar, and instant milk," he said.

In fact, the particle laboratory grew out of an old flour milling lab in the early 1950s. Its founder, Kenneth Whitby, professor of mechanical engineering, was its sole faculty member until

Tom Foley

1962, when Liu joined the laboratory.

As a graduate student, Whitby designed the first of many instruments developed through the laboratory over the years and marketed commercially, a form of technology transfer to private industry.

One such instrument, an electrical aerosol analyzer developed by Whitby and Liu, measures aerosols smaller than 1 micron and is the only instrument of its kind in the world.

In all, the lab has developed 13 instruments, "the largest number of aerosol instruments developed anywhere," said Liu, who himself has seven patents. "We are at the forefront of fine-particle research."

The lineup of funding sources bears this out: the Environmental Protection Agency (EPA), the U.S. Department of Energy, the Bureau of Mines, the National Science Foundation, the National Bureau of Standards, General Motors, the Electrical Power Research Institute, the Coordinate Research Council (an auto industry-oil industry organization), the state of Minnesota, and the University's Graduate School.

Whitby said that the laboratory uses a novel approach to obtain funds for research projects. Instead of competing with other research laboratories for funded projects, researchers here generate ideas of their own, examine them, and then search for a sponsor to support them.

"We are under no obligation to produce something, so we can try new things," he said. "We need freedom and flexibility for this type of research. So far, our success rate is high."

Today the laboratory has five faculty members, seven full-time research associates and civil service personnel, and about 20 part-time graduate and undergraduate students. Its annual budget of \$700,000 supports research ranging from the theoretical to the highly practical.

Ambient air

With current interest in clean air, it is hardly surprising that half the laboratory's budget goes to atmospheric research. This includes Whitby's work in the EPA-funded study of ambient air quality, specifically in areas affected by power plant emissions.

Actually, Whitby has been studying air pollutants since 1955. Before that, he developed filter systems with funds from a heating and air conditioning or-

ganization. But with passage of the Clean Air Act of 1955, he applied for and received a grant from the National Institutes of Health to work on air filters. "We've received continuous grant support from them ever since," he said.

He was part of a research team that studied smog in the Los Angeles area in 1968, and he noted that the study is "a classic and a model for similar studies of smog." It was the first well-managed collaborative study involving a physicist, a chemist,

bama, and Cumberland, Tennessee. Whitby expects to release the results soon.

"One of our main goals is to determine the amount of four types of components found outside the stack," he said. The four kinds of particles are aerosols such as fly ash that are formed by combustion, scrubber carry-over such as spray droplets and residues, aerosols formed in the plant itself, and aerosols formed in the plume. He noted that their size and chemistry determine how far particles travel.

pendent in the atmosphere and travel for miles.

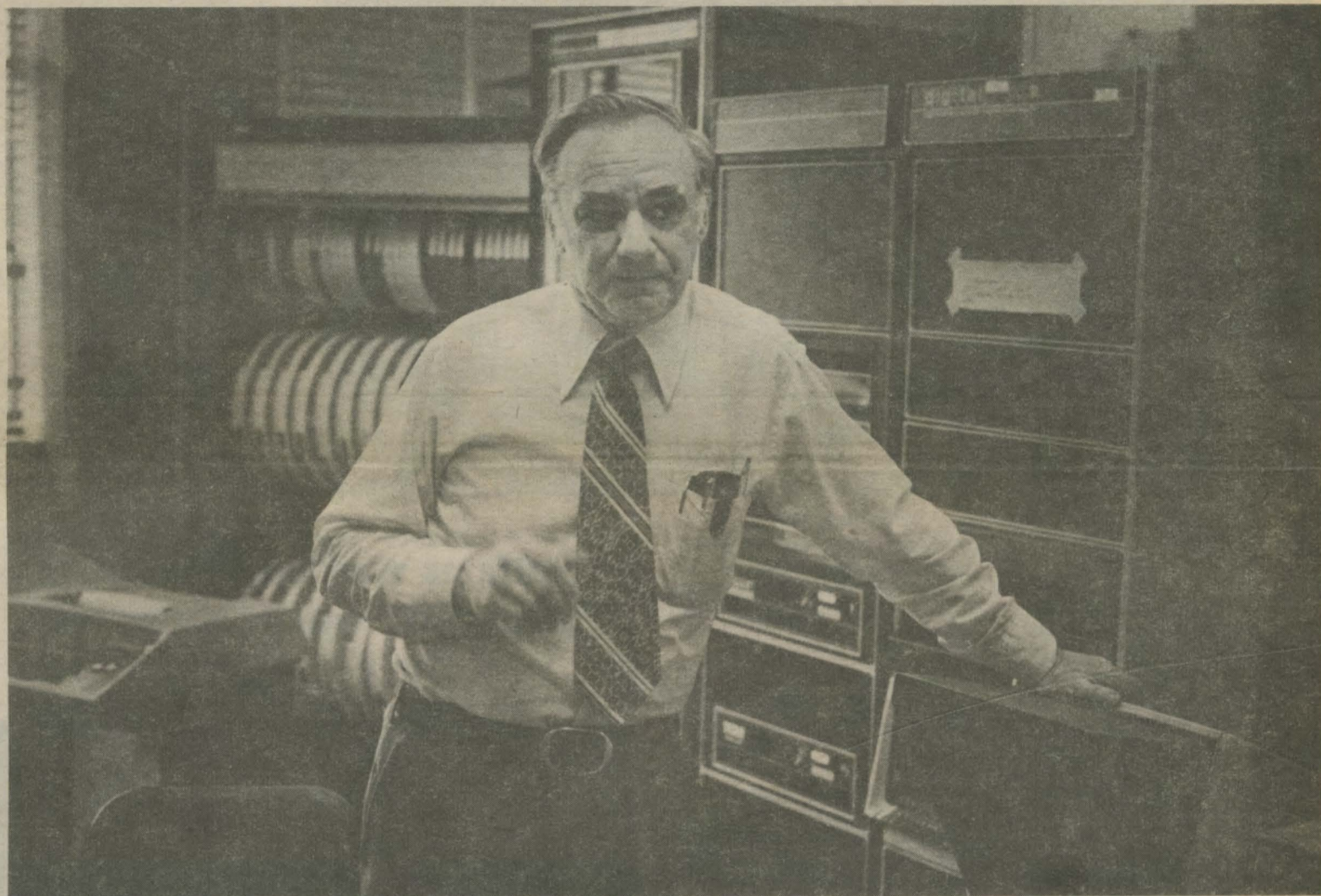
Quantitative data is needed to know "what is emitted and what is safe to breathe. We know that breathing sulfate haze is not good for you, but just because it's hazy out doesn't mean that there are sulfates in the air."

According to Whitby, power plant scrubbers designed to curtail sulfur dioxide emissions "are not a good solution" to offset the effects of burning high-sulfur coal because they are so

and could issue an alert for that area. During an alert, plants in certain zones would be advised to switch to low-sulfur coal.

That way, Whitby said, the nation could burn its vast reserves of high-sulfur coal without exceeding the environment's capacity to flush the sulfate away.

"Atmospheric research is a critical field," Whitby said. "The EPA is breathing down our necks to get this data out. But we need facts, not speculation. Our work combines high science



Kenneth Whitby

and a meteorologist, he said.

Since then, Whitby and others have participated in several major studies of air quality, including one conducted in the St. Louis area between 1973 and 1975. Among other things, researchers traced the plume arising from power plants and oil refineries in the urban area as it drifted westward.

Last summer Whitby took to the air to monitor the plume from Northern States Power's Sherco plant in Becker, Minnesota. In a specially outfitted airplane, scientists traced the plume for 30 miles to determine how effective the plant's stack scrubber is in trapping harmful emissions and what happens to those that fly free.

The Sherco plant was one of three plants studied. The others were Tennessee Valley Authority plants at Widow's Creek, Ala-

Whitby conceded that the problem of controlling power plant emissions "is more and more pressing," but at the same time "this is a many-faceted thing. You can follow the plume in one day, but this data accounts for

expensive to install. Moreover, they create a new problem by generating sludge that is difficult to dispose of.

One possible solution is a strategy in which the nation is di-

"We know that breathing sulfate haze is not good for you, but just because it's hazy out doesn't mean that there are sulfates in the air."

only a small part of the final readings."

The problem is to find the link between a source of emissions and the level of air pollution in a given area, he said. But particulate emissions may stay sus-

vided into zones that share similar pollution problems. By studying meteorological formations, scientists could predict conditions in which sulfate fumes might endanger an area

with mechanical engineering. But this is a multidimensional problem involving many disciplines, and it requires careful handling of data.

"My work is not in instrument development anymore, but in management, in developing procedures for extracting meaningful numbers from data. This is much more complicated than most people realize. Lots of judgment goes into data analysis."

Free at the wheel

The University five have yet to attack the air pollution problem by sea. But with Whitby's plume

flights, they now have attacked by air and by land—by land in the mobile air pollution research laboratory, a roving probe.

In the early 1970s, the state of California commissioned the particle laboratory to build a mobile unit. "So we built one for them, another for EPA, and

check haze levels and the effect of widespread continental hazes."

The effect of hazes spread over thousands of square miles is alarming some scientists and environmentalists. Sulfate emissions sometimes remain in the atmosphere and travel for miles before they dissipate or are

nearby power plants to see if particle emissions are invading the park," Whitby said.

The diesel picture

The power plant is not the only focus of debate on the energy versus clean air dilemma. The

automobile also is at center stage in the controversy, and the relative advantages and drawbacks of the diesel engine point up the problem.

The government has openly encouraged diesel-powered automobiles because of their fuel economy. But the EPA has clamped down on auto emissions, and the diesel engine emits far more particles than the gasoline engine. Stringent restrictions on particle emissions will be imposed in 1981, and even lower levels will be required by 1983. This prospect bodes ill for proponents of the diesel engine.

According to Liu, a diesel automobile emitting 1 gram of particulate matter per mile if driven 100,000 miles emits the equivalent of 220 pounds of matter into the air. Some diesel particles are known to be mutagenic—that is, they have the ability to alter an organism's genes or chromosomes—and some are suspected of being carcinogenic, he said.

The Particle Technology Laboratory is one of a few labs in the country working on the diesel engine. David Kittelson, associate professor of mechanical engineering, directs the three-year-old program, which combines particle technology and

power propulsion engineering.

Studies of the diesel engine are taking two main directions. "First, we are trying to characterize the nature of the particles emitted," Kittelson said. "We are examining their chemical and physical properties and conducting biological analyses to determine the mutagenic compounds."

Rex Lovrien, professor of biochemistry, currently is testing particles emitted by diesel engines and expects to complete one phase of his work this summer. Most scientists would agree that some of these particles are mutagenic, Lovrien said, but whether they are carcinogenic is still in doubt.

"We are interested in learning more about how far these particles penetrate into the lung once they are inhaled," Kittelson said. "We are interested in knowing how they are dispersed over the roadway, what their optical properties are, and what their effect is on microclimates. Do they increase heat absorption in a given area, or is this only speculative?"

Like Whitby and McMurry, Kittelson recognizes the difficulty in simulating atmospheric conditions in the laboratory. "A very important aspect of our research is that we are taking measurements not only in simulated laboratory conditions but also outside on the open road."

Last summer Kittelson mounted an air sampling instrument on a flatbed trailer and pulled it around the racetrack at the state fairgrounds with the lab's own diesel-powered Volkswagen Rabbit. He conducted a similar test in Columbus, Indiana.

The research conducted by General Motors and the EPA is all indoors, he said. "Changes in particulate matter occur in the dilution process, which must be simulated as closely as possible. By conducting these studies out in the open air, we know exactly what the source is."

The second area of Kittelson's research is learning how particles are formed in the diesel engine. "First we measured the emissions, and using those measurements we successfully modeled the physical process—the particle size and distribution in diesel exhaust."

Then he conducted a number of experiments "to determine what's in the cylinder at a given time during expansion. As a particle is formed in the cylinder, it is burned. But more burning takes place at the top of the piston stroke than at the



Peter McMurry

then two for ourselves," Whitby said.

"We were getting bad simulation of air pollution in the lab, so we decided to take the cutting edge of science out to the junk," he said. "It's been a very successful program so far."

The mobile lab program is under the direction of Peter McMurry, assistant professor of mechanical engineering. The labs are housed in Chevrolet Step-vans and are equipped with power generators, air inlet systems, and sampling hardware, and each has a minicomputer.

McMurry echoed Whitby's comments about atmosphere simulation. "It's difficult if not impossible to simulate atmospheric conditions in a lab. Furthermore, the process of aerosol growth is not understood. It requires relatively well-controlled experiments to discover anything about aerosol formation. You need to know a lot about organic chemistry."

One of the mobile units was used in the study of emissions from the Minnesota, Alabama, and Tennessee power plants. McMurry noted that, in the southeastern United States, "there is fairly good evidence that haze is increasing with power plant production. In two summers we'll go back there to

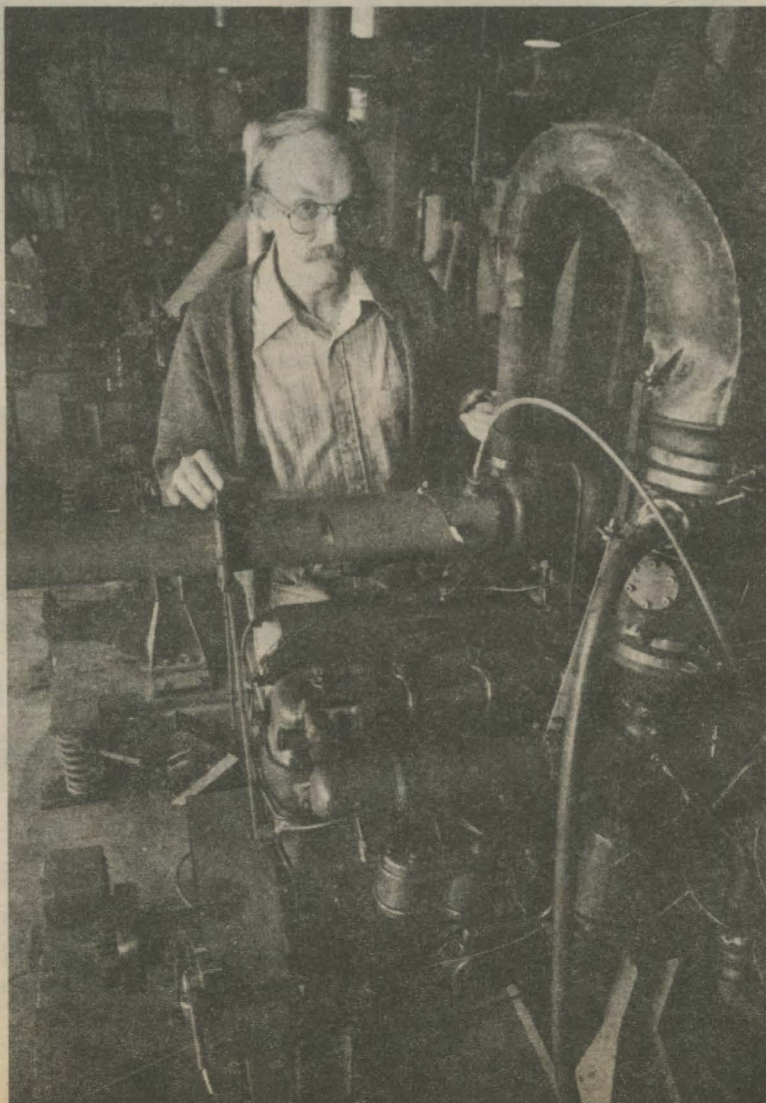
washed to earth. Those washed to earth produce a phenomenon called "acid rain," which wreaks havoc with the ecosystem where it occurs.

McMurry said that meteorological science "can give you a good idea of air flow patterns from a pollution source," and studies conducted by air "can characterize the spatial distribution of haze." With these tools, and with help from the mobile lab, "maybe we can learn something about the horribly complicated chemical changes in aerosols and learn where they go.

"This requires a team effort, and we have one of the most experienced teams of aerosol researchers anywhere. Yet there is the danger that if we get loaded down with routine work we lose the scientific aspect of it, the basic research of it. I like to divide my time evenly among lab work, fieldwork, and theoretical work. I think this is the best way to go," McMurry said.

The way he is going this summer is westward—to the Grand Canyon to take part in a federal project there. The 1977 Clean Air Act was a mandate for clean air in all national parks. "We have to determine the physical and chemical characteristics of the air and follow the plumes from

Sulfates washed to earth as "acid rain" wreak havoc with the ecosystem.



David Kittelson

bottom. We'd like to increase this burning if possible.

"By inserting probes in the cylinder, we may be able to learn something about particle formation, size, and temperature, so that eventually we can control this process." Kittelson plans to try a new method for capturing the particles—blowing the cylinder seals with blasting caps and emptying the contents into a heavy duty bag.

The diesel engine's fuel efficiency is 20 to 30 percent better than that of the gasoline engine, but "it is not true that better fuel ef-

ciency means less pollution. That is influenced by peripheral factors," Kittelson said.



Virgil Marple

He noted that diesel emission levels of carbon monoxide and hydrocarbons are lower than those of gasoline engines and that the emission of oxides of nitrogen are "about the same but not as easily controlled." Catalytic converters, used to remove these emissions, are

"It is not true that better fuel efficiency means less pollution."

"clumsy and less efficient for diesels." The emission of parti-

cles is "from 10 to 100 times worse in the diesel." Among the devices for reducing particle emissions in diesels, Kittelson listed high-pressure fuel injection and turbochargers. Both would increase particle burning in the cylinder, he said.

Kittelson believes the smaller diesel cars will meet the 1983 emission standards. The VW Rabbit is close already and the Mercedes is within range, he said, but the larger models have a way to go. General Motors is asking for more time on the 1981 limit for its line of diesels.

tional Academy of Science committee that is studying the measurement and control of dust at work sites. "There is a general feeling that we need to know more about this whole area," he said.

In his work for BOM, Marple is developing instruments to measure the size distribution of coal dust. And he is developing calibration instruments to keep those measuring instruments accurate and honest. A high concentration of coal dust is known to cause black lung disease, a respiratory ailment common among miners. Marple analyzes

ments such as dust monitors. "There's lots of research going into just how to calibrate instruments. For example, calibration of an optical counter for silica, for potash, or for rock dust is a little different in each case."

very broad in the industry."

Liu and Marple have proposed an international conference on industrial dust for 1980, to be sponsored by the department and held in the Twin Cities.

Black lung disease is caused by a high concentration of coal dust, brown lung by cotton dust.

Marple has calibrated instruments for cotton plants to gauge cotton dust levels. Cotton dust can cause "brown lung," another respiratory sickness. And he has calibrated power plant stack impactors, the instruments with which EPA measures particle emissions.

Like his colleagues concerned with atmospheric aerosols, Marple wishes to simulate the conditions he is studying in the laboratory. "We're building a chamber here to simulate a mining environment. We'll generate a dust cloud around the measuring instruments and then take readings."

This summer, Marple will accompany McMurry in the mobile lab. On the return trip from the Grand Canyon they will stop at an open pit coal mine in northern Colorado, where Marple will examine the effect of dust from mining operations on neighboring communities.

Whitby attributes the success of the laboratory to a first-rate staff. "Ours is a spartan outfit, really. We need to expand the faculty, and we need more professional people to run the computer center. Students are here only three to five years, and that's not long enough. But the thing that really counts in quantitative research is quality people. We have them."

Human activity the past few hundred years has increased the atmospheric dust load—to dangerous levels in some places. Only in the past decade have we started to fight back. The University's particle posse can be expected to stay at the forefront of the fray.

UPDATE

Spring 1979

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Tom Foley, art director

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

Is the diesel the wave of the future? Kittelson thinks it is one of the waves. "I expect to see a multiplicity of engines in the future. After all, it is only recently that the monolithic gasoline engine has been challenged. The way I see it, there are a number of paths to the solution. Perhaps the smaller cars will retain gasoline engines, but the higher energy efficiency in the diesel cannot be ignored."

Dust in the mine

While Whitby has been flying in plumes and McMurry driving in hazes and Kittelson trailing diesels, Virgil Marple has been sampling aerosols underground for the Bureau of Mines (BOM).

An associate professor of mechanical engineering, Marple is primarily interested in industrial aerosols, particularly those affecting occupational health—the particles people inhale in mines and factories.

Marple is a member of a Na-

these concentrations with a computer.

According to Marple, the Federal Coal Mine Health and Safety Act, passed by Congress in 1969, requires that coal dust concentration not exceed 2 milligrams per cubic meter of coal mined. One instrument used in the mines to measure coal dust aerosol is the optical particle counter, which Marple modified from a commercial machine. This instrument measures the size distribution of particles by means of an electrical pulse.

Currently he is developing a smaller optical counter with a laser diode light source. This is a low-power instrument so there is less concern about a methane gas explosion from a spark. All other units have incandescent lights and are potentially dangerous, he said.

Parallel to his work in instrument development, Marple evaluates the range, accuracy, and parameters of commercial instru-

The visible future

Particle technology gets around, from the earth's interior, across its surface, and now into space. Spacelab, scheduled to be launched next year, will carry three instruments developed by the particle laboratory that will aid in analyzing cloud droplets and cloud formation at zero gravity.

Meanwhile, on the educational front, the particle laboratory is gaining national and, indeed, international recognition. "We think we've done basic education very well," Liu said. "We've trained a lot of people here, many of whom have gone on to establish themselves in the field. At the many aerosol conferences we attend, the Minnesota alumni group is the largest contingent. Our influence is

by Elizabeth Petrangelo

Describe the taste of coffee. It's not that easy.

Perhaps *robust* captures it best. Or *hearty*. Maybe it just tastes brown. Basically, the best way to describe the way coffee tastes is to say it tastes like coffee.

Gary Reineccius, on the other hand, can tell you exactly what coffee tastes like. To Reineccius and the other flavor chemists of the world, coffee tastes like a careful blend of about 700 flavor components that combine to produce the flavor we recognize as coffee.

Reineccius, an associate professor of food science and nutrition on the Twin Cities campus, spends his time identifying the flavor components found in nature and looking for ways to isolate flavors from foods so they can be studied.

"Flavor is the most important attribute of food," Reineccius said. "Food has to look good first so that you want to try it, but once it passes the look test, flavor is the most important quality."

Along with other academic flavor chemists, Reineccius studies what makes some foods taste good and others taste terrible—and why some foods that start out tasting good end up tasting disgusting.

It is the academic flavor chemist who has discovered the 700 chemicals that contribute to the taste of coffee, the 700 to 800 flavor components in meat, and the 250 components that make a strawberry taste like a strawberry.

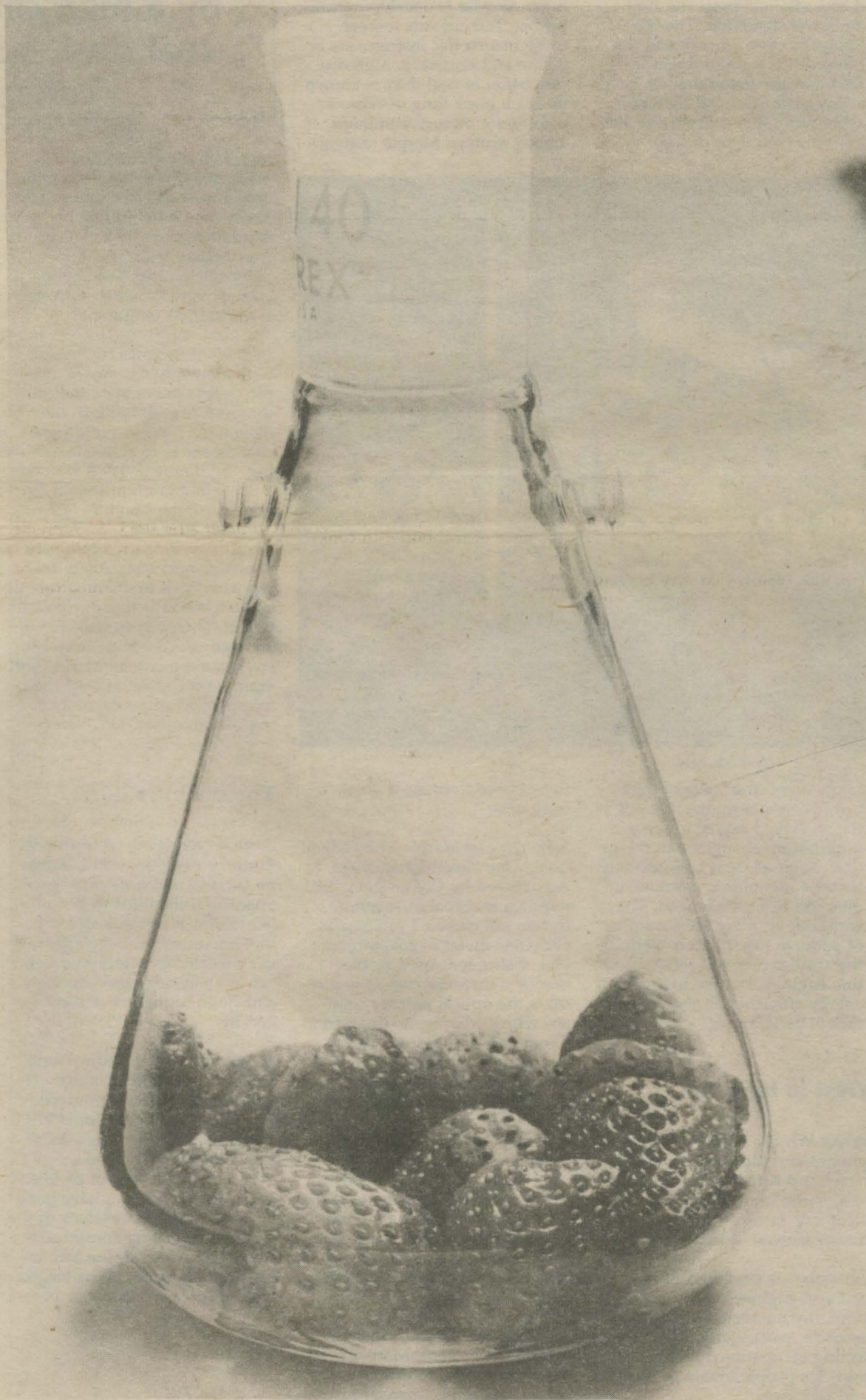
The academic flavor chemist also studies "off" flavors—flavors that are unpleasant—and what makes good flavors go bad. What makes beer develop a skunky flavor after it's been left in the sun, and why does milk develop a rancid taste?

In the flavor chemistry course he teaches, Reineccius covers several aspects of flavor. "Where do flavors come from, for instance? How does a plant make flavors? For some reason, nature has put them there, but they serve no purpose to the plant," he said. "We don't know what flavor's function is, and perhaps it doesn't have any."

His students study the external conditions affecting flavor. "Flavor depends on where things are grown," he said. "There really are 'robust' Colombian coffees, for instance. If you take that same tree and transplant it to Mexico, the coffee it produces will be totally different in taste."

The effects processing has on food flavor are also studied. "We

Flavor Chemist Shows Good Taste



go into why canned peaches, or all canned fruits for that matter, have very little similarity to their fresh counterparts. But they are accepted by the public. Why?"

The flavors of some foods change drastically once they are removed from their natural state, but some are easier to study. Bananas, for instance, ripen off the vine and their flavor can then be studied. The onion has no flavor at all until its cells have been crushed. Then it develops all of its flavor in about two seconds.

"If an onion smells, it's because of cell damage," he said. "If you put an onion in the refrigerator and then cut it, it won't make you cry because the chemical reaction that causes you to cry is slowed down due to the cold. You can cut and chop and dice and squeeze and laugh your head off."

The task of the academic flavor chemist is quite different from that of the trade flavor chemist. Trade chemists create flavors from scratch. "Pillsbury might go to a trade flavor chemist and say, 'Give me a sour cream chocolate frosting,'" Reineccius said. "Then they would say whether they wanted an artificially or naturally flavored product. If it's artificial, the chemist would start pulling chemicals off the shelf—maybe 20 or so that remind him of chocolate, and another 10 that remind him of sour cream."

Using this group of chemicals, the trade chemist mixes and mixes and, primarily by smell, comes up with something close to sour cream and chocolate. He adds this concoction to an unflavored base and then tastes. Eventually, after tasting some mediocre combinations, some a little better, and some downright nasty, he will come up with a good frosting flavor.

Academic flavor chemists, on the other hand, don't create flavors or teach students to create flavors. "I think it's too bad that we don't teach people how to do it," Reineccius said. "Industrial flavor chemistry is a lucrative field with a strong demand. But no schools are training people because there are no textbooks. It's a trade based entirely on secrets. Flavor chemists have about 3,000 flavors to work with, and they have to know from experience what each tastes like."

Isolating a flavor for study is a difficult task, since flavor components are present only in minute amounts. "Flavors are present in such small amounts, and they're buried in so much garbage," he said. "If you took one drop of the flavor component in green bell peppers and put it into 6 million gallons [of an unflavored base], one taste would tell you 'green pepper.'"

Tom Foley

or, Nothin' Says Good Food Like Somethin' From the Test Tube

A big part of Reineccius's course

deals with artificial flavoring. Artificial flavors are big business, and many packaged foods contain them. Why would Pillsbury want its flavor chemist to concoct an artificially flavored chocolate sour cream frosting at all if natural flavors are available—particularly in the face of what seems like heightened concern on the consumer's part?



"That's just it. It is almost impossible to get pure oils anymore," he said. "Three times as much supposedly pure vanilla is sold in the world than there are vanilla beans grown to make it. It's extended and added to and passed off as pure.

"Virtually all essential oils on the market are not pure. If manufacturers can add cheaper elements, they can double their profits. Unethical people are involved," Reineccius said. It is now impossible to buy pure oil of cinnamon or clove, and a rare oil like oil of rose sells for \$6,000 a pound. "What an incentive to add some phenylethyl alcohol," he said.

"You can still get pure oils of some of the less expensive things like oil of almond or vanilla, but only if you're willing to pay the higher price," he said. "If you buy at the lower price, you get doctored vanilla."

Reineccius feels that consumer demands for natural products will die soon because of the realities of supply. "The argument between natural and artificial flavors can't last long. Economics will force the move to artificials," he said. "There aren't enough strawberries in this world to support the demand for strawberry flavor."

Reineccius isn't concerned about artificial flavoring from a safety standpoint. To him, holding up a natural flavor as the healthiest choice is irrational. "I can pick

out 300 components in a cup of coffee that would never be allowed in an artificial product because of safety. But people will be concerned about a coffee substitute that has 30 such components and choose the real coffee with the 300 problem components," he said.

Some artificial flavors have a better character than their natural counterparts, Reineccius said.

"Sometimes they taste better, although I know that may be hard to swallow. I can't conceive why someone would buy bottled apple juice after tasting it. If that taste reminds you of the taste of real apples, I wish you'd let me know." A good artificial apple flavor can taste more like the real thing, he said.

Reineccius spent the past year in New York City working on flavors for the dried beverage industry, which he feels is the fastest growing segment of the food industry. "We'll be seeing



Gary Reineccius

more and more dried products. They don't spoil on the shelves, at least not because of bacteria," he said. "They are easier to ship and store. Who wants to ship water?"

What rankles Reineccius is that although very good artificial flavors have been developed, some

very poor ones are being sold. "It's disappointing to me that the largest selling dry lemonade is a spoiled product. It's oxidized. There's a bad lemon taste to it," he said. "Because of effective advertising, consumers are buying it. They are told they don't have to worry about it spoiling or the flavor changing. This product will never change because it's spoiled already. Some of the lemonades with the best flavors enjoy poor sales."

A heightened appreciation for flavor has led Reineccius to an avid involvement with gourmet cooking. During his stay in New York City, he took several courses in French cooking, and he spends much of his time at home whipping up gastronomic delights for his largely unappreciative children.

Periodically, he raids his local grocery to test new products, sometimes with disastrous results. "I refuse to eat such things as Hamburger Helper," he said. "It's an atrocious product. The flavor is terrible."

He deplores the increased popularity of margarine over butter and sees it as a poor flavor substitute. "There is nothing like the taste of real butter in cooking," he said. Artificially flavored cheeses leave him cold. "Why in the world would anyone want to eat a wine-flavored smoked cheese food?"

Despite his love for good flavors, Reineccius is firmly against legislation to prohibit adding artificial flavors to foods. "It's not the fault of the food companies if terrible-tasting products are on the shelf," he said. "It's the consumer's fault for buying them. Consumers should have the right to buy any kind of garbage they like. We shouldn't legislate against bad food products any more than we should legislate against what you can read and write."

Occasionally, Reineccius and his colleagues philosophize about the work they are doing. "A friend and I discuss what we would like to do with our lives, and he says he wants to do something significant for mankind. I'm not out to do anything great for humanity. I just want to make better tasting food."

Law School Drops Minority Quota

by William E. Huntzicker

The University of Minnesota Law School has changed its admissions policy as a result of the U.S. Supreme Court decision in the Bakke case, which raised questions about minority admissions programs.

The new policy, recently approved by the law faculty, eliminated a reference to "up to 15" students who could be admitted through a special minority program. The number had been interpreted by some as a quota for minority admissions.

The new policy states, however, that the faculty hopes for at least as many minority students in the future as have attended the Law School in the past. About 45 of 710 current law students are members of minority groups.

The changes in the policy are the result of a review of admissions policies promised by President C. Peter Magrath last summer after the U.S. Supreme Court struck down a minority quota in admitting Allan Bakke, a white male, to the medical school at the University of California, Davis.

At that time, Magrath said the Law School was the only University unit that had a formal admissions policy affected by the Bakke decision.

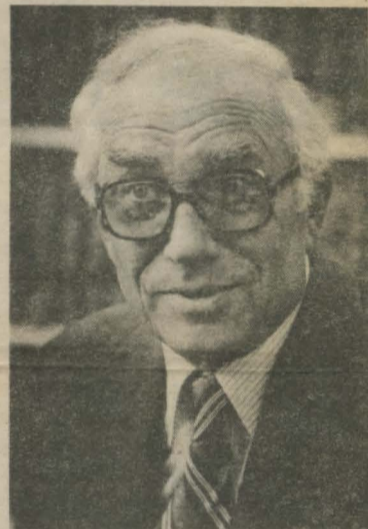
The new policy avoids the mention of any numbers of minority students. "The precise number of minority applicants to be admitted," it states, "will depend upon the comparative credentials of minority and nonminority applicants."

"No racial/ethnic quotas," it also states, "will be fixed that exclude any applicants from consideration for any places in an entering class. It is the sense of the faculty that the desired diversification of the law student body will not be achieved unless minority applicants are admitted in more than token numbers, and it is hoped that the number will be at least as large as those

that have been admitted in the past few years."

The policy continues the faculty's adherence to affirmative action goals to allow the Law School to have a diverse student body, according to associate dean Robert Grabb, chairman of the admissions committee.

Grabb said he feels that the Law School has been successful in attracting a diverse student body while relying primarily upon "traditional predictors of success" such as undergraduate



Robert Grabb

grades and the national Law School Admissions Test.

On the basis of the Supreme Court decision, the law faculty considers a diverse student body one that includes students with various racial and ethnic backgrounds, physical handicaps, and economic disadvantages.

Other factors considered in the definition of diversity include the applicant's career goals, extracurricular activities, ability in languages other than English, leadership positions, community or public service, experience, and achievement.

by Maureen Smith

No area of research arouses more hope and fear and curiosity than human genetics, and it isn't surprising.

Think about tampering with human reproduction—think about wombs for rent and human eggs for sale, or a hundred little Hitlers created by cloning—and genetic research seems to be putting the most deeply held human values in peril.

Then think about offering new hope to people who have been unable to have children or who

ty is scattered among several units. The Dight Institute and the Department of Genetics and Cell Biology are in the College of Biological Sciences. Human and Oral Genetics is in the School of Dentistry, an accident of history that resulted from the wide-ranging research interests of Regents' Professor Robert Gorlin. Specific genetic disorders such as hemophilia and cystic fibrosis are studied in individual clinics within University Hospitals.

Jaroslav Cervenka is a professor of human and oral genetics whose primary research interest is chromosome disorders. Like

perhaps order chromosomal and biochemical tests.

But a decision cannot be based on facts alone, and the counselor will always explore the couple's own feelings about the problem. "Sometimes feelings of guilt are expressed that are not appropriate," Anderson said. "Sometimes the husband and wife have different views that they may not even have expressed to each other."

Sometimes the woman comes for counseling alone, Cervenka said. "Then you suspect something could be wrong, because they

Genetic Counselors Face Moral Dilemmas

hesitate to have children for fear they will be afflicted with genetic disorders, and genetic research seems to be one of the most worthy and compassionate of endeavors.

V. Elving Anderson, professor of genetics and cell biology and acting director of the Dight Institute for Human Genetics on the Twin Cities campus, understands the hopes and fears that are aroused by genetic research, but he thinks people may look to the research with greater expectations and greater alarm than is justified.

"I think there has been an undue emphasis on the future possibilities," Anderson said. "We need some kind of perspective."

Some people take the view that "nothing should be done for the first time" because it may lead to something harmful, Anderson said. This attitude has been characterized as the "slippery slope" view of science. "I think the problem is that one step could lead to another step, but it does not inevitably do so," he said. "We are always in the difficult position of having to evaluate each step as it comes."

Research at the Dight Institute has focused on the genetic factors in such problems as mental retardation, psychotic disorders, and epilepsy. "We deal with relatively common conditions and look for genetic factors. Any time we deal with something that's common, we know that it will be a mixed bag and there will be many causes," Anderson said.

Genetic research at the Universi-

Anderson, Cervenka is interested both in seeking new knowledge and in making what is already known available to those who need it. Both men offer genetic counseling in addition to their teaching and research.

Most people would applaud the availability of genetic counseling, but ethical questions arise, especially in the case of disorders that can be detected through prenatal diagnosis. "Prenatal diagnosis is inherently tied to abortion, and that poses a lot of questions," Cervenka said. "Then you are into the ethics of the interruption of life."

No prescriptions

Genetic counseling in essence is "providing information to individuals and families so that they can make their own reproductive plans," Anderson said. "It's not prescriptive—it's counseling in the sense of helping people make their own choices."

Usually people who come for genetic counseling have a genetic disorder themselves, or they have a child with a problem and want to know how high the risk is that another child would have the same problem. Counseling is also being sought increasingly by women over 35 who want to have a baby but are concerned about the risks of chromosome disorders.

Several pieces of information go into the estimate of risk. The counselor will take a family history, review the latest information on the disorder, and

both should come." It is preferable for both parents to be present at each stage of the counseling, he said.

In the case of some conditions—notably Tay-Sachs disease and sickle cell anemia—it is now possible to test for carrier status and to state the risks for couples before they have any children at all.

Genetic conditions that are chromosomal and biochemical can be diagnosed in the womb with almost total accuracy. If prenatal diagnosis reveals a serious disorder, the couple can prepare themselves psychologically for the care of the child or decide on an abortion. The most common technique for prenatal diagnosis is amniocentesis, in which a small amount of amniotic fluid is withdrawn from the uterus and analyzed.

It is especially when abortion is an option that a counselor's own values might be reflected. "It is possible to describe amniocentesis in such a way as to say, 'You wouldn't want to do that, would you?'" Anderson said. "In the way you present information you may knowingly or unknowingly reflect your own value choices."

Both Anderson and Cervenka said it is important that counselors not impose their views—for or against abortion, or for or against pregnancy in a high-risk situation—on their clients. "It's a matter of principle that you do not tell the parents what they should do," Cervenka said.

Anderson said he believes most counselors respect the values and religious beliefs of their clients. "I do not introduce religious considerations, but per-



sonally, as a Christian, I would be sensitive to a couple's religious concerns. I don't mean to say that I'm unique. I think that counselors are generally very thoughtful."

Burdens and risks

In deciding whether to have a child, a couple will want to weigh both the burden and the risk of having a child with a genetic defect. The burden will be determined by the seriousness of the disorder and the emotional and financial resources of the family.

If one parent has a condition that is transmitted as a dominant trait, the risk to each child is 50 percent. Huntington's chorea, for example, is a progressive disease that typically strikes at around age 35 and is characterized by mental deterioration terminating in dementia. Often people don't even know they have the disease until after they have had children. If they do know, they know that they are facing a high-risk, high-burden situation.

In the case of a sex-linked recessive trait such as hemophilia, the risk is 50 percent for each boy (or 25 percent overall). Another example is Duchenne's muscular dystrophy, which is "a terrible disorder," Cervenka said. "All of the affected will die. They will be born beautiful kids, and most of them will die before they are 10." Again, the risk is high and the burden enormous.

Disorders that are polygenic, or multifactorial, in origin have lower risks. "When we say multifactorial, it means that we're in doubt," Cervenka said. "We don't know what the cause is, so we say there are many factors."

If healthy parents have a child with a cleft lip or cleft palate (a polygenic disorder), the risk is between 2 and 4 percent that their second child will be similarly afflicted. If two children are affected, the risk for the next child is between 5 and 9 percent. "That means there is a 95 percent chance that the child will be healthy," Cervenka said. Risk figures for polygenic disorders are arrived at empirically, "calculated from hundreds of pedigrees," he said.

The sex of a fetus can be determined by prenatal diagnosis, and such a determination "might be useful if we're dealing with a sex-linked trait like hemophilia," Anderson said. The parents might choose an abortion if the child is to be a boy.

"Short of that, most genetic

counselors that I know would not even carry out the study if there was any indication that the reason was to terminate the pregnancy if the fetus was the 'wrong' sex," Anderson said. "This contradicts what I said before about always giving the family the information and letting them decide. It is judged that this reason does not justify the test."

Cervenka agreed. "We would not do the amniocentesis for that reason, because we are medical people and amniocentesis is used to detect medical problems."

Pro-life decision

Chromosome disorders are among the most severe genetic anomalies. It is known that a woman's risk of having a malformed child increases "perhaps beginning at about age 35 and more markedly so after 40," Anderson said. "There is some recent evidence that the age of the father has an effect as well.

"When we're dealing with

requested. We're talking about a lower risk here—probably not above 5 percent even at a fairly advanced age—but one that is of some consequence."

The risk of chromosome damage is about 15 percent when the woman is 45 or over, Cervenka said, and Down's syndrome is the least severe of the chromosome disorders. "With the most severe anomalies, 90 percent of the children die within six months," he said.

Even people who usually oppose abortion might find it justified in such a case, Cervenka suggested. "It's not pro-life if the children die 100 percent of the time after exhausting the families emotionally and financially."

For some people, Anderson said, the choice is between prenatal diagnosis with the possibility of abortion and giving up on having more children or any children at all. A family with two afflicted children may not be willing to risk having a third. An older couple who are worried about chromosome disorders may not want to take a 5

For them it is a pro-life decision, if you will."

Who deserves life?

In an article on "Biological Engineering and the Future of Man," Anderson expressed concern about "the more general implications of prenatal diagnosis. It is one thing to request amniocentesis for any one of a series of relatively rare conditions. It is quite different to assume that families have a natural 'right' to expect that every child should be healthy. There is no medical way to provide such an assurance. A fetus that has no obvious chromosomal anomaly still runs the risk of other disorders for which no test has been made."

And what if most potential victims of Down's syndrome or hemophilia or muscular dystrophy were aborted? What would be the message to those who survived? Would they be seen as second-rate human beings who would have been better unborn?

Anderson wouldn't go that far. "Our views of health do enter in," he said. "A humane approach is to reduce the level of the problems but also to deal in a concerned way with the people who do have problems.

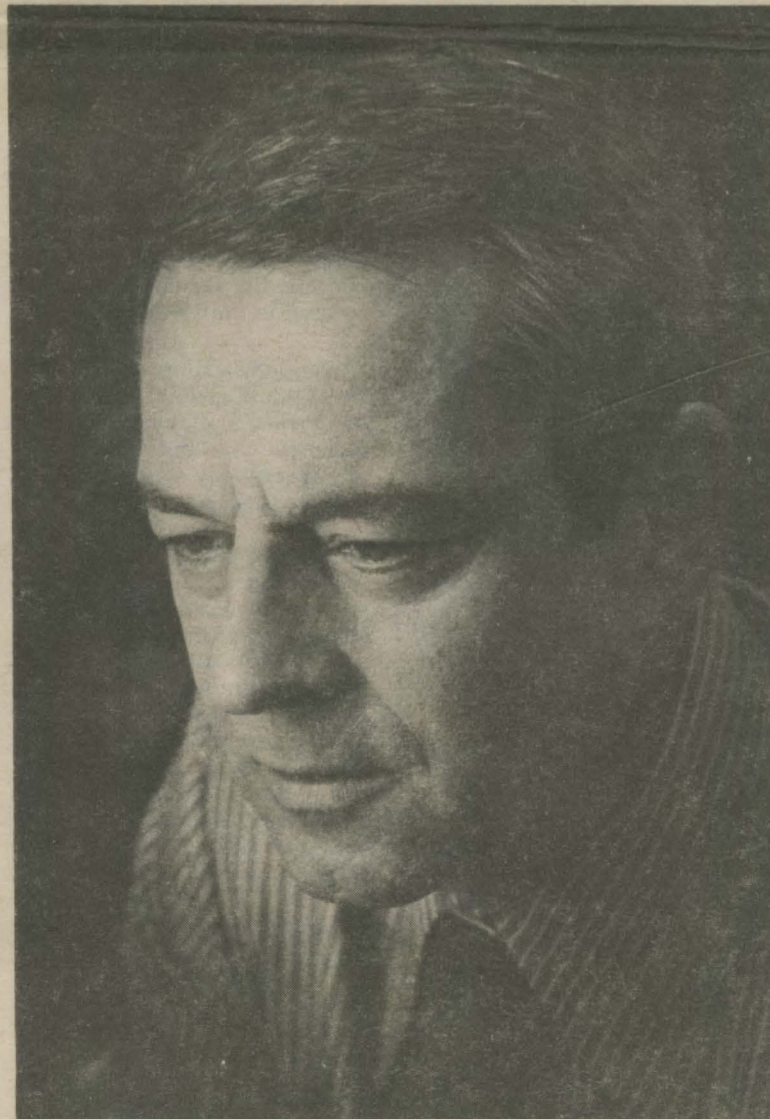
"Many families are aware of their risks because they have a child with a problem. It's entirely possible for them to love and respect that child and still not wish to have another child with the same problem."

Different kinds of people are valuable in different societies, Cervenka said. Among a group of Eskimos with whom he lived for a time, it was clear that the people who were needed were fertile women and men who were good hunters.

"What's needed now and here? I have no idea. There was a man in *Time* magazine who was studying black holes. His brain is fantastic, he is loved by everybody, and physically he is nothing. He can't move, write, or function.

"We don't only need fast, strong, beautiful people. Many of them are sitting in the prisons. There are people who are congenitally disabled who are extremely valuable.

"In Czechoslovakia I saw many patients with abnormalities who were extremely useful people. There was a virtuoso violinist I remember, there were doctors, craftsmen, good parents, lovely people. There were some failures, too. You can be disabled and be 10 times more useful



Jaroslav Cervenka

Down's syndrome, where there is a specific chromosome change, it is possible to detect that in the fetus. This information should be known to families so that amniocentesis can be

percent risk even though they dearly want a child.

"It is quite clear that some people, if this option were not possible, would simply choose not to have any more pregnancies.

than your neighbor whose physical condition is perfect," Cervenka said.

Still, Anderson said, "the decision of whether to be born or not cannot be made by the child. It's obvious that that kind of decision, for better or worse, must be made by the parents. I would far rather have the decision made at that level" than prescribed by law or determined by a panel of experts.

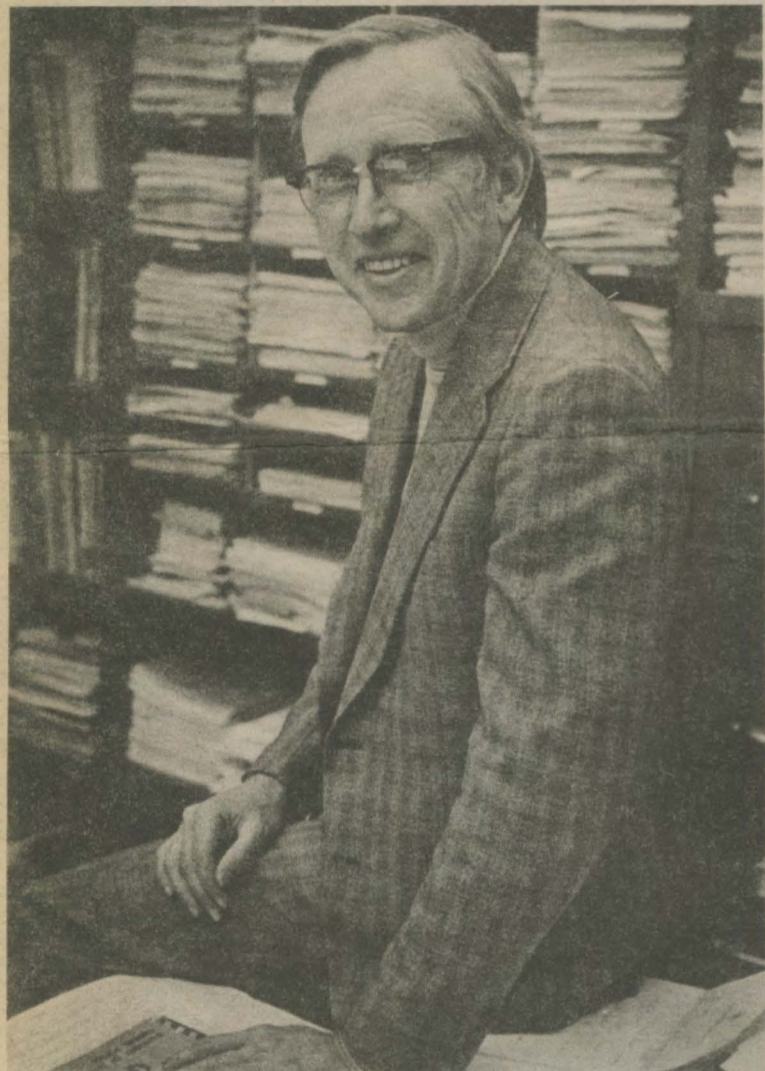
Armies of clones

Cervenka is unhappy about the sensationalism with which news

"There will be no cloning of armies, no cloning of geniuses on a massive scale," Cervenka said. "I would not be worried a bit. Besides, cloning of humans is not yet possible and will not be possible for a long time.

"Regular and pleasurable procreation by sexual intercourse will continue as long as the human race continues. If some few will be born by these expensive and complex methods, it will be an insignificant number," Cervenka said.

"It's hard to imagine a use for cloning," Anderson said. "There is no particular problem that cloning would treat. There is lit-



V. Elving Anderson

of genetic developments is treated in the press. Louise Brown, who was born last summer in England, for example, was "not a test tube baby," he said. (The process was not even a genetic process, but genetic research and fertility research are often linked in people's minds.)

"The egg is taken out of the mother, fertilized out of her body by the father's sperm, and reimplanted in her uterus. It's done to bypass the diseased tubes. It's a medical procedure for sterile women, it's beautiful, and it's an ethically uninteresting procedure," Cervenka said, although he added that "it's a little more complex than that."

"My 14-year-old heard at school about cloning armies," Cervenka said. Cloning is a form of asexual reproduction in which the offspring is an identical twin or copy of the donor.

tle that cloning could do that couldn't be done better some other way.

"Cloning would restrict the human variability that we know to be desirable. It imposes a deliberate choice on the genetic constitution of the next generation, and we don't know enough to positively select that way. I don't take it seriously and I don't think it's likely to be used."

Most people tend to have an exaggerated view both of the promises and the dangers of science, Anderson said. "We should be open to developments but not count on them to resolve all our problems, and we should be aware of the possible harm that might arise and examine the possibilities with caution. My own view is a modest expectation of science and a modest worry about the dangers."

Can Intolerance Be Tolerated?

by Jeanne Hanson

Look in the mirror. Do you see an intolerant person? You'll probably say no.

But research conducted at the University of Minnesota and reported in *Psychology Today* indicates that intolerance in U.S. society has not diminished since the McCarthy era of the 1950s. Although the targets of intolerance have changed, the potential for repression of unpopular groups remains, according to researchers John L. Sullivan, James Piereson, and George Marcus.

Studies done in the 1950s on political intolerance concluded that as the level of education increased, the level of intolerance would decrease. "We're challenging that doctrine of progress here," said Piereson, a visiting professor of political science on leave from the University of Pennsylvania.

Although people today are more tolerant of such left-wing groups as the communists and socialists than they were during the 1950s, they are now less tolerant of right-wing groups such as the John Birch Society and the Ku Klux Klan, he said.

The researchers found that about two thirds of those surveyed would like to see some group of people outlawed. The proportion is nearly the same as that discovered in the 1950s studies.

"Everybody's supposed to be tolerant and mellow now," Piereson said. "It may be liberal chic to believe that, but it isn't accurate. Everybody seems to hate somebody sometimes."

To measure intolerance, the researchers drew up a list of groups—including communists, socialists, fascists, atheists, pro-abortionists, anti-abortionists, and the John Birch Society, Black Panthers, Ku Klux Klan, and Symbionese Liberation Army (SLA)—with an option to name any group not on the list. They gave the list to a national sample of people and to a sample of Twin Cities area people.

Those surveyed were to choose the group they liked the least and answer the following questions about it: Should the group be outlawed? Should members of the group be banned from being president of the United States? Should they be allowed to teach in the public schools? Should they be allowed to make public speeches? Should their phones be tapped by the gov-

ernment? Should they be allowed to hold public rallies in the city?

Although 70 percent of the people in the national sample would allow a member of their least liked group to make a speech, about 66 percent felt the group should be outlawed outright. Some 59 percent would not want the government to tap a group

Hell's Angels, and "gang bangers," Sullivan said.

People's personalities influence their level of intolerance, Sullivan said. The most intolerant people are those who are the least secure about themselves and those who perceive some threat, realistic or unrealistic, from the group involved. In contrast, studies have tied self-



John L. Sullivan

member's phone, and 50 percent would allow the group to hold public rallies. Less than a fourth of the people surveyed would be willing to see a member of the group they dislike become president or teach in a public school.

Twin Cities area residents were only slightly more tolerant than those in the national sample, said Sullivan, an associate professor of political science.

Today's top objects of prejudice, chosen by a total of 30 percent of the people surveyed, are groups on the radical right—the Klan, fascists, and the John Birch Society. Communists came in next, followed by the Black Panthers and the SLA, together chosen by 14 percent. Atheists, pro-abortionists, anti-abortionists, and socialists were chosen as most hated by fewer people, Sullivan said.

About 3 percent of the people named as their most disliked group one that they added to the list themselves. These ran the gamut from the "Moonies" to homosexuals to "holy roller Baptists," "poor white trash and blacks," environmentalists,

esteem, self-actualization, faith in people, and diminished fear of a group to tolerance.

No difference in tolerance between men and women or between younger and older people was evident. Once they're allowed to choose their own objects of prejudice, people are equally intolerant, Sullivan said.

The diversity of the groups disliked and our fragmented political atmosphere in general are signs of hope, according to Piereson. "Probably no one group will be selected for repression, not even one of the groups that are themselves intolerant," he said.

According to Piereson, that is the challenge and the paradox: "Can a tolerant society tolerate intolerance?"

'U' Ranks Fifth in Federal Funds

by William E. Huntzicker

The University of Minnesota ranked fifth among American universities in the amount of federal money received during fiscal year 1977, President C. Peter Magrath said recently.

Magrath told the Minnesota Senate education subcommittee that the University received \$92.7



Tom Foley

C. Peter Magrath

million in federal funds, an increase of \$5.7 million over the previous year.

Universities receiving more federal income than Minnesota were Howard, \$115.9 million; the Massachusetts Institute of Technology, \$109.4 million; the University of Washington, \$96.9 million; and the University of California, Los Angeles, \$96.4 million.

Universities ranking behind Minnesota included Stanford, Harvard, the University of California, San Diego, the University of Michigan, and Columbia.

The University's increase in federal funding over the previous year was the largest among the top 12. Only Minnesota, UCLA, and MIT received increases in federal funds.

Magrath said that Minnesota ranked seventh in 1976 with \$86.9 million in federal income, putting it behind Howard, MIT, Washington, the University of Wisconsin, Madison, UCLA, and Stanford in that year.

Magrath said that the figures include the \$8.3 million federal share of the pharmacy-nursing building that is under construction as part of the health sci-

ences complex on the Twin Cities campus.

The list was compiled by George Robb, assistant vice president for institutional relations, from figures provided by the National Science Foundation.

Most of the income from the federal government was for agriculture, the health sciences, and the Institute of Technology, Magrath said. He released the figures during a presentation on the University's request for increases for health sciences and agriculture.

Lyle French, vice president for health sciences, asked for state money to offset some of the decreases anticipated in federal appropriations to the schools of



Tom Foley

George Robb

medicine, dentistry, and public health.

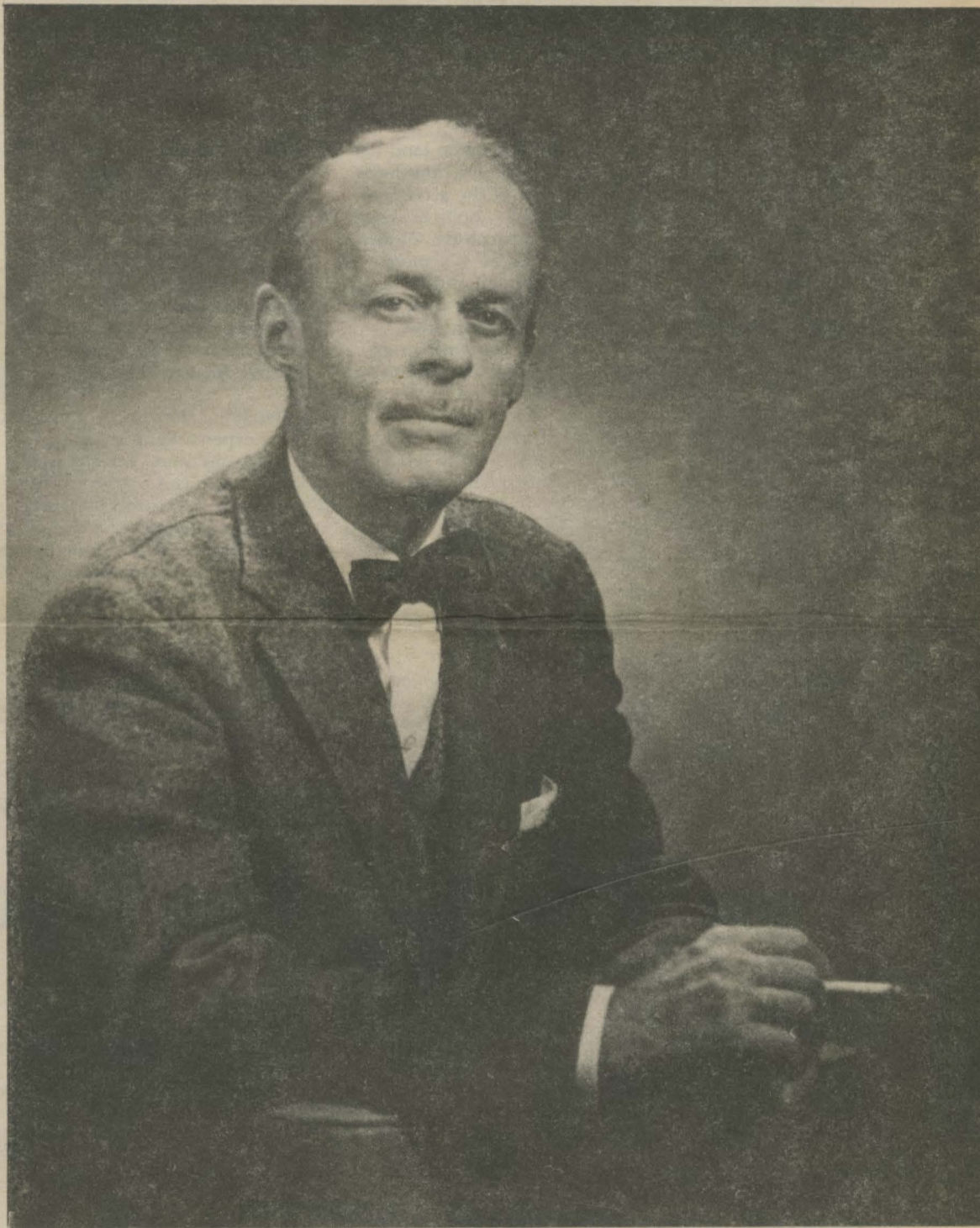
William Hueg, Jr., deputy vice president and dean of the Institute of Agriculture, Forestry, and Home Economics, asked for increases in funding for agricultural research, which, he said, pays off in returns to Minnesota farmers and agribusiness.

Among other details on the rankings compiled by Robb for members of the subcommittee was that the University of Minnesota ranked second in federal funding in 1971, when the first building of the health sciences complex was funded. The amount of federal money coming to the University in that year was \$72.5 million.

Robb said that the University of Wisconsin, Madison, ranked ahead of Minnesota in 1976 when it received funding for a health sciences building.

Minnesota also ranked fifth during 1975 with \$73.6 million and in 1972 with \$64.2 million, Robb said. The institution's lowest ranking in the past 10 years was 11th, in 1970. It was ranked 16th in 1966, the earliest year for which figures were provided.

In Memoriam



University photo lab

Allen Tate, 1899-1979. Poet, critic, University regents' professor emeritus of English.

Landowners Urged To Be on Guard...

Americans must be guardians—not just owners—of land.

That is the conviction of Charles Biggar, assistant professor of soils at the University of Minnesota, Waseca. But it is a message that people have a hard time hearing.

"The idea of acting as a steward or guardian of land is something the American public has not accepted yet," Biggar said. "The ownership concept is still so powerful in our minds that we think we can do with the land whatever we choose. We could allow the construction of a road or expansion of a housing complex, or allow the soil to erode from a hillside, and say it is all right—because we own the land."

The old attitudes of ownership would be appropriate if the amount of land were unlimited, Biggar said. "But it is not. That is why a guardianship is necessary and why farmers must become stewards of the soil."

Land use is an issue of major concern in rural communities today, but it isn't just farmers who need to be stewards of land. "Either directly or indirectly, all citizens affect land use," Biggar said. The same land might be used for agricultural production,

waste disposal, home construction, industrial expansion, or roadway construction.

Land used for one purpose is sometimes so altered that it could never be used for anything else. "With this in mind, it becomes imperative that we make the wisest choices on use of land," Biggar said.

Several federal bills on land use have been introduced but have failed because of the actions of lobbying groups, none of whom represented agriculture, Biggar said. A few states—Vermont, Hawaii, Michigan, and Iowa—have adopted their own legislation that seeks to control erosion, water contamination, and housing construction on agricultural land.

Minnesota has more than 20 laws that are indirectly related to land use, Biggar said, and they are effective in regulating some forms of water pollution but inadequate "when it comes to controlling confiscation of good agricultural land for housing or soil degradation through erosion."

Land use and zoning policies are being developed to curb urban sprawl in rural areas like Waseca, Biggar said. His biggest concern now is the loss of productive land through erosion and the pollution that results

from soil erosion.

"The amount of erosion that takes place nationwide is a much greater problem than even insecticides and fertilizers that reach the various waters. The soil lying in streams and lake bottoms is easily agriculture's biggest contribution to pollution," Biggar said.

Some erosion is natural, he said, and there are deposits of soil and silt lying in the bottom of streams and lakes that date back to the glacial period. But human beings are responsible for much of the current problem. "Any time you put in a road and its ditches or expose the soil to the elements by tilling, you alter the natural amount of soil loss."

Remediating the effects of erosion is an expensive undertaking, Biggar said, and "the situation is not improved by the tax cuts at various governmental levels that have been experienced of late." Minnesota has done better than most states in appropriating the money that is needed, he said.

Changes in land use are evident, Biggar said. He sees the land "becoming more and more of a recycling ground for wastes" and being used in cleaning the environment. "Land is one of the best systems we have for taking care of some of the pollu-

tion we cause, especially water pollution," he said.

Land will continue to be used for more housing development, Biggar said. Because of local pressures and political bargaining, he said, "I don't think we will ever see zoning that's really going to control the number of houses in a given area. Tax legislation that gives a break to those using land for crop production near cities will help."

Production of food and fiber will continue to increase as technological knowledge and good crop and soil management practices are applied, Biggar said. If ways are found to suck irrigation waters efficiently from the Missouri and Mississippi Rivers, he said, the potential is so vast that it can hardly be imagined.

On the other hand, he said, there are places in Texas and Kansas where water sources have already dried up. "I know of places where in 10 years there will be no water or the quality will be so degraded that it will be sufficient only for the growth of very salt-tolerant plants, not corn and soybeans."

Conservation measures in Minnesota to date have been primarily voluntary, Biggar said. "Soil conservation is such a localized problem that no strict set of guidelines or policies can be

developed to accommodate the myriad conditions. Each farm may have a unique conservation problem. I fear the time when a law may be written to cover all conditions. It could actually break some of the farmers. It would take a very talented person to write the law that could serve all farmers, and it would take an even more talented person or agency to administer the law. County government would have to play a big role.

"I hope we can stay with the voluntary program. I'd like to think the stewards or owners of land think enough of the future to do this, but I'm not sure there is hope for that. I've been told by conservationists that erosion control practices have slipped backwards in the last 15 years. The fault is not just with the farmer—it's with all people. It's difficult because times have changed and the problems of conservation have changed. It takes a long time to get measures into practice and a very short time to plow them up again."

...But Soil Program Losing Ground

by William Hoffman

Minnesota farmers soon will have more to worry about than heavy weather, if Clifton Halsey's guess is right. He sees compulsory soil conservation looming on the horizon.

Wind and water continue to eat away the state's most precious resource, despite more than 40 years of federal aid for soil conservation. Soil erosion reduces crop yields and eroded sediment damages the quality of water in lakes and streams.

"Excessive erosion is still occurring on about half the land, and it is increasing," Halsey said. "The present voluntary system isn't working." He perceives a nationwide drive toward mandatory controls.

An associate professor of soil

science on the Twin Cities campus, Halsey has a professional interest in land—its chemistry, behavior, and migrating patterns. As a conservationist with the Agricultural Extension Service, he understands both the desire of farmers to maintain high production and the public concern for clean water.

Halsey concedes that mandatory conservation "is a very touchy subject," but unless farmers respond to financially supported voluntary programs, "efforts to limit erosion by regulation can be expected to continue and intensify."

Several developments in the last decade have caused attention to be focused on the problem of soil erosion.

Chief among these developments is the impact of the environmental movement. Federal

legislation requires that state and local agencies regulate "nonpoint" sources of water pollution as well as specific points of waste and sewage discharge. Agricultural runoff is the main nonpoint source of pollution, carrying pesticides and fertilizers from fields and depositing them in rivers, lakes, and streams.

Such runoff pollutes drinking water supplies and causes toxic reactions in fish and wildlife. It may lead to the "biological death" of some water bodies by fostering excessive growth of plant life.

The problem with nonpoint sources of pollution, Halsey said, is that it is so difficult to trace them and to determine who is responsible for them. And as for the nutrients in fertilizers promoting plant growth in water, naturally occurring nu-

trients present in the soil may do the same thing, he said.

"Farmers are like other people," Halsey said. "They are concerned about the environment, but they also are concerned about feeding their families and paying their debts and having a little money for recreation."

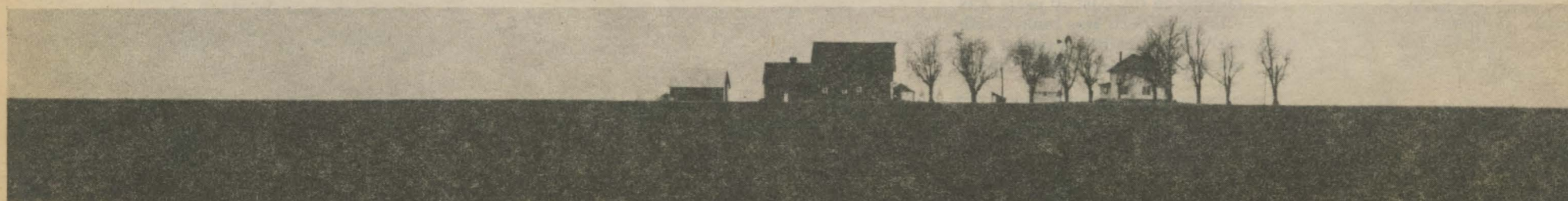
More and more marginal land is going under the plow as farmers aim at high production of such cash crops as corn and soybeans. Not only are pastures, groves, and grasslands lost as buffers to erosion, but the subsequent planting of these lands with row crops compounds the problem. Topsoil washes down from hilly slopes and "ends up in a ditch or a flood plain or a trout stream or a reservoir."

"Farmers won't be able to afford high loss of topsoil and still maintain high productivity,"

Halsey said. He noted that from three to five tons of topsoil per acre is a "tolerable loss" each year, for about that much soil is generated annually through natural processes. But in some areas of Minnesota more than twice that much is lost each year.

"For more than 40 years we've had a soil conservation plan," Halsey said. "The government has offered technical assistance and cost-sharing programs in an effort to encourage voluntary conservation. Both the Environmental Protection Agency and the Soil Conservation Service want the voluntary system, but I'm afraid they've got a tiger by the tail. It could happen that the government will ram a mandatory program down our throats."

Fear of just that event has prompted state representative Elton Redalen of Fountain to of-



fer erosion control legislation in the current legislative session.

Redalen's bill is based on an Iowa soil conservation law passed in 1971. That law established a state committee of farmer representatives that handles complaints against landowners, defines tolerable soil loss and adequate sediment control, disburses cost-sharing funds for erosion control practices such as terracing and contouring, and takes legal action against landowners as a last resort.

Redalen, a dairy farmer, is uncertain how the proposed law will be received. But if it provokes discussion, he said, then it's worth the effort.

"If we farmers don't take the initiative in this matter, then someone else will," he said.

Benton County, in western Minnesota, has a wind erosion control ordinance that makes it illegal to remove or destroy a field windbreak without a permit. Elsewhere, two local ordinances address the topic of soil erosion, but specifically exempt agricultural practices. Redalen's bill is the first to deal with soil erosion statewide since 1973, when a proposed bill failed in the legislature.

Part of the reason for the poor record of the voluntary system is that "in many cases not enough money is provided for specific conservation practices. In the short run, farmers don't have enough incentive to employ such practices," Halsey said. "We've been looking for a state with a successful voluntary conservation program, but we haven't found one."

If indeed the problem is money—subsidy—then the complaints of some farmers during the Washington tractorcade seem to have merit. As one farmer put it, "How does the nation combat enormous erosion of prime crop land when the administration continues to reduce federal funds to the Soil Conservation Service?"

Then, of course, there is the bureaucratic tangle. "I see a whole continuum of bureaucracies addressing the problem. And there are great rivalries for federal monies and leadership positions in all this," Halsey said. "It's a problem in itself to find out what's going on."

He admonished the Agricultural Extension Service for not being as active as it might be in soil conservation by focusing too narrowly on what farmers think is most important.

"But overall the extension service must be pretty good. It has been copied in one form or another throughout the world," he said.

Uranium Sparks Mining Interest

by Paul Schurke

It may seem to be one of the best kept secrets in the state, but it's true: the Minnesota uranium rush is on. More than 100,000 acres in three east central counties have been leased for uranium prospecting, primarily by three Colorado mining firms.

They say the odds are against them, but Rocky Mountain Energy, Energy Resources, and Martin-Trost Associates are betting that substantial pockets of the ore—used to produce fuel for nuclear power plants—lie deep under the glacial drift of Carlton, Pine, and Aitkin Counties.

Their keen interest stems from a federally commissioned survey prepared in 1976 by University of Minnesota, Duluth (UMD), geologist Richard Ojakangas. The survey indicates that the area is geologically similar to two of the world's richest uranium fields, in Australia and Saskatchewan.

"It's impossible to say for sure if there are large deposits of uranium in Minnesota," said Ojakangas, who heads the geology department at UMD. "But all the information I have collected so far points in that direction."

Uranium pockets usually occur in areas where solid bedrock containing dispersed particles of uranium is overlain with a soft permeable rock like sandstone. Over thousands of years, the particles may be leached out of the bedrock by groundwater in the sandstone and deposited in a central area.

Ojakangas said that areas of east central Minnesota have all the geological components necessary for the formation of ore pockets, including a thick layer of sandstone overlying the Canadian Shield, a huge bedrock formation that stretches down from Canada.

The prospecting activity is not unique to Minnesota. Skyrocketing ore prices resulting from the Arab oil embargo have made the uranium industry a booming business. Uranium is being mined in six Rocky Mountain states, and mining companies are looking for new pockets of ore in eight other states, including the Dakotas, Michigan, and Wisconsin.

The most intense exploration in Minnesota is along a broad belt

Prospectors Say Ore Pockets Tucked Under Minnesota Bedrock

about 20 miles wide from Duluth to Denham, in northwestern Pine County. But counties in southwestern, northwestern, and central areas of the state are also being eyed by such energy giants as Exxon and Kerr-McGee Corporations.

The Colorado firms began three years ago to survey the east cen-

trality. Landowners generally get \$2 to \$5 an acre for the first year of exploration and a smaller amount each year after that. If a strike is made, landowners will receive about 5 percent of the value of the mined ore.

Much confusion among landowners has resulted from the differences in lease arrangements. Staff members at the U.S.

talk of the "mother lode" rippled through the West a century ago.

Company representatives say that although no strikes have been made, there have been enough encouraging signs to keep them looking. But because the firms are in competition with one another, they aren't disclosing their findings.

This secrecy worries area environmental groups like Clear Air-Clear Water, the Minnesota Public Interest Research Group, the Sierra Club, and the Northern Sun Alliance. They contend that the state is being caught off guard, that prospecting activities are progressing too rapidly for state agencies to follow.

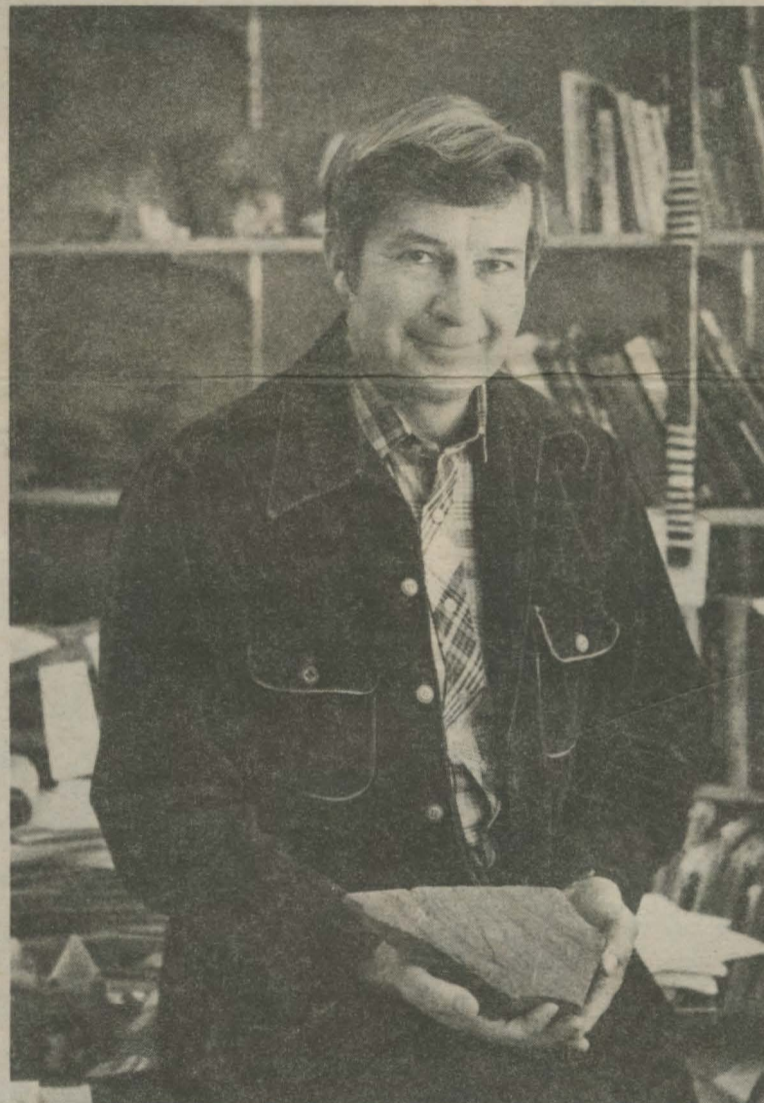
Officials at the Minnesota Pollution Control Agency (PCA) and the Department of Natural Resources (DNR) agree. Dale McMichael, director of the PCA's environmental analysis office, wants to make sure that test holes are adequately plugged to guard against possible contamination of water tables by uranium ore.

Elwood Rafn, chief of the DNR mineral division, is concerned that the state is "regulatorily unprepared" to handle uranium mining. "State laws governing this activity are obsolete and inadequate," he said.

Recommendations regarding guidelines for uranium prospecting and mining are being prepared by DNR and PCA staff people for consideration by the legislature, which has been asked to appropriate \$25,000 for a one-year study of the impact of mining activities. Meanwhile, the mining companies are pressuring the DNR to lease state land for prospecting.

Rafn said state officials are concerned that exploration and any future mining activities be properly regulated and monitored to prevent radioactive contamination of air and water. In the past, emissions from the tailings of uranium mines, which include radioactive radon gas and gamma rays, have been associated with increased incidence of lung cancer.

"There is a sense of urgency about this," McMichael said. "We don't have a good understanding of the ramifications of these activities. But we are trying to move ahead as quickly as possible."



Richard Ojakangas

tral counties by air and on foot with scintillometers, technological descendants of the Geiger counter. They have recently begun drilling test holes, 500 to 600 feet deep, in spots found worthy of closer examination.

Recorded leases for uranium prospecting in Carlton County now include about 70,000 acres. The total acreage leased in Pine and Aitkin Counties is estimated at about half that amount.

The lease agreements vary, depending on the property and the

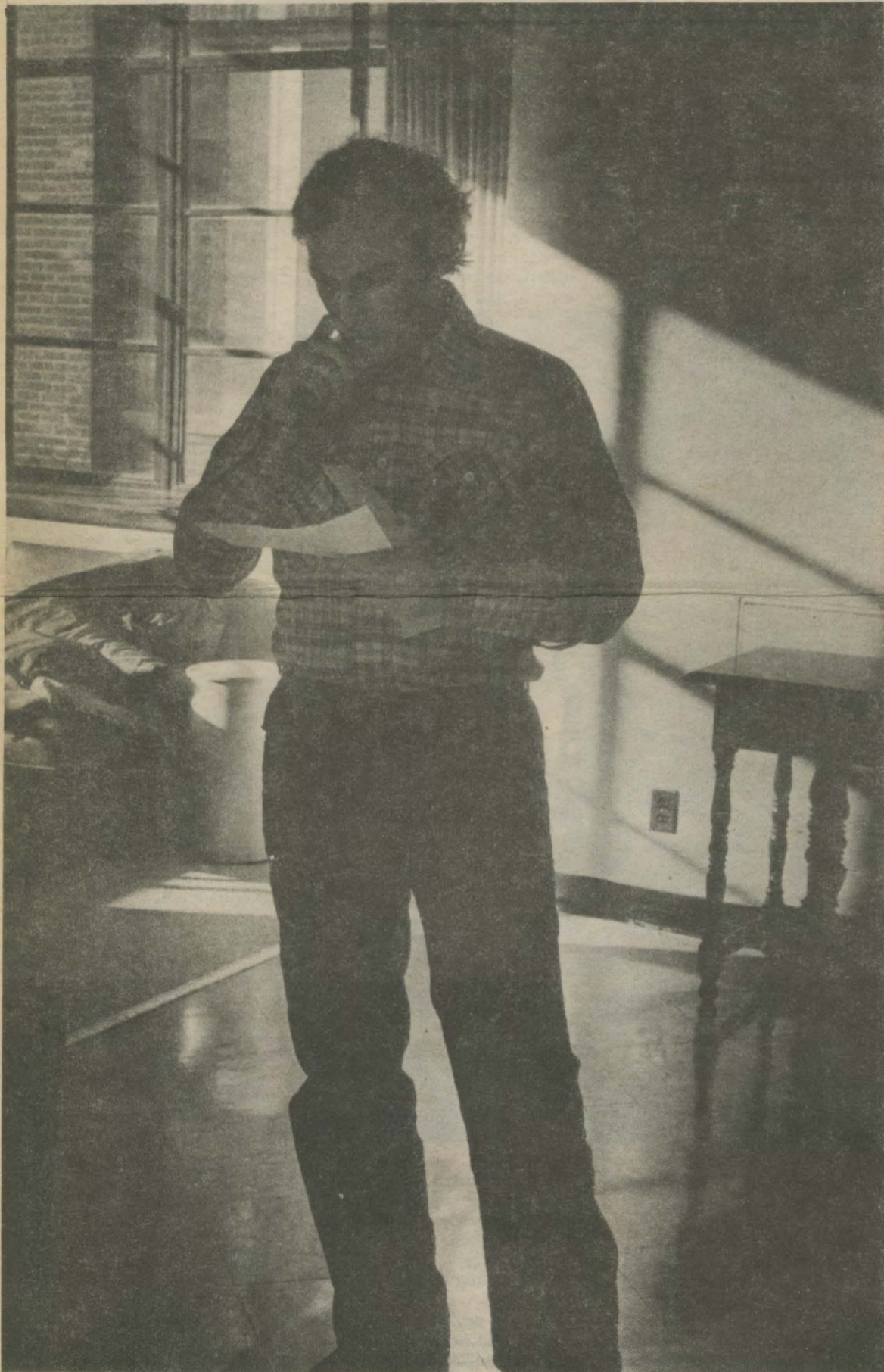
Bureau of Mines office in St. Paul who are handling calls from confused landowners are encouraging them to consult with lawyers or geological engineers before signing leases.

At current prices, a small body of ore could net landowners up to several million dollars. Area farmers could become instant millionaires, and an economically stagnant area of the state could boom. But company officials say that even if uranium is found, it would take many years to develop the mines.

The prospecting has spawned a great deal of excitement among area residents. Speculation on the likelihood of a strike ripples through local towns like Moose Lake, Barnum, and Denham as

Ken Moran

Medical Students Meet Their Match



by Maureen Smith

At 3:55 p.m. on March 14, medical student Lily Burke didn't know where she would be spending the next few years of her life. She would soon receive an envelope telling her whether she would be doing her residency at a hospital in Cleveland or New York City or Alabama or Vermont.

John Billings, waiting for his envelope with his wife and two children, thought he had a good chance of going to the Mayo Graduate School of Medicine in Rochester, his first choice. Still, he was a bit nervous. "There's always a little doubt," he said. "Anything that's important to you, you worry about."

Medical students were milling around in the foyer of Mayo auditorium in Minneapolis, calling out to each other, laughing uneasily, waiting to hear what hospitals they had been matched with. "People are a little hyper," Burke observed.

One day in mid-March is always a day of high drama in medical schools across the country. On "Match Day," the schools release the results of a national computer-matching program for senior medical students who are seeking residencies and hospitals who are looking for residents.

"You start worrying about it as soon as you get into medical school," Burke said. Competition to get into medical school is intense, and "our year and the year before us were the most competitive. To a certain extent it's a matter of luck when you get in, because there are so many qualified applicants. Then you start to worry about whether you'll get a residency. Actually it's not as bad, because hospitals need people to take care of their patients."

The senior medical students and the hospitals have a chance to look each other over in the fall, when the students are given two weeks off from medical school for interviewing.

"Some of them have decided that they absolutely don't want to leave the Twin Cities, and they will only look at Twin Cities hospitals," said W. Albert Sullivan, associate dean of the Medical School. Others will fly from one part of the country to another, often taking advantage of special rates for unlimited air travel in a given period of time, and interview at a number of hospitals.

Billings never left Minnesota. Burke squeezed in 16 interviews all across the country. "I interviewed every day and traveled every night," she said. "If it was

Wednesday, I knew it must be Atlanta."

The match game

After forming their impressions of each other and considering all the information that is available to them, the students and the hospitals rank their preferences. Students are allowed to rank as many hospitals as they wish. Burke listed ten, Billings just two.

Once the rankings have been submitted, the computer goes to work. The first time the match was conducted, in 1950, the design was a "student first choice" program, which, as it turned out, put a great premium on the adroitness with which students made their choices of hospitals. Students successfully urged adoption of the "hospital choice algorithm."

On the face of it, the present model might seem to favor the hospitals—their rankings are given priority over the students' preferences—but what it means in practice is that students are free to rank prestigious hospitals without jeopardizing their chances to be matched with hospitals that are more realistic choices. "Many students put down the most prestigious hospital and don't really expect to get it," Sullivan said. "Sometimes one of them will get that spot."

Burke ranked Case Western Reserve University in Cleveland as her first choice, but she didn't think she was likely to get it. "The fact that I put Case Western first doesn't hurt me" in getting a place at a hospital for which there was less competi-



W. Albert Sullivan

tion, she said.

Students and hospitals are pledged not to make any deals or give any assurances before Match Day. "It is absolutely forbidden for a hospital to offer a spot or a student to ask for a spot," Sullivan said. "The hospital can say, 'We like you and we hope you will rank us.' The student can say, 'I really liked being out here,' but that student may have liked Seattle and San

Tom Foley

Tom Foley

Francisco and Salt Lake City also."

Although the Mayo Graduate School had not offered a spot to Billings or made him any promises, he had reason to be optimistic. "They indicated as best they could that they were really

given to the medical schools, who then notify any students who were not matched. At a designated time on Match Day—11 a.m. Eastern time, 10 a.m. Central time—efforts to place unmatched students or fill empty positions can begin. With the help of their counselors and

matched," she said a few minutes before she received her envelope.

Staying in the state

Burke was unusual in that none of her 10 choices was in Minnesota. A majority of her classmates—52 percent, Sullivan later announced—would be staying in the state.

"Except for California, Minnesota has a higher percentage of medical students who stay in their own state than any state in the country," Sullivan said in an interview a few days before Match Day. "We also have one of the largest graduating classes, with almost 300 a year." The number of students who stay in the state for their residencies is significant, he said, because doctors tend to go into practice in the states where they do their residencies.

What accounts for Minnesota's good record of retaining its

choice of Minnesota medical students, but its popularity has been fading. "At one time as many as 20 or 25 percent of our students went to California," Sullivan said. "Last year it was only 7 percent." As a result of the 1979 match, 16 Minnesota students—less than 6 percent of the class—were headed for California hospitals. Eighteen students were matched with hospitals in Wisconsin.

The envelopes, please

At 4 p.m. on Match Day, the medical students and their families and friends went into the auditorium to hear a short talk by Sullivan, who shared some of the statistics with them. He told them that 80 percent of them had been matched with hospitals that were their first, second, or third choices. "I think most of you are going to be happy," he said.

He told them that 83 percent of them were going into one of the primary care areas—family

Burke's name was the last to be called.

How did she feel as everyone's name was being called but her own? "How do you think I felt? I was sure they had forgotten to send mine out."

With her unopened envelope in her hand, Burke saw a friend and asked him where he was going. "Milwaukee," he said, and she hugged him. It was clearly a match he was happy with.

Then it was her turn. "Oh, all right!" she said as she saw her match. "It's Alabama."

"Where it will be warm," a friend said. "I had dreams that I was going there," Burke said.

Alabama had been her fourth choice but her "first realistic choice," she said. "It's a real good program. I'm really happy about it."

Billings, as expected, was matched with the Mayo Gradu-



Lily Burke

pleased with what they saw in me and that they'd like me to come there," he said.

The pattern of matches in his field of anesthesiology may have been another reason for Billings's optimism. In 1978, 79 percent of all students in anesthesiology in the country were matched with their first-choice hospitals and 10 percent with their second choice. By contrast, students in Burke's specialty of internal medicine were least likely to be matched with their first-choice hospital. Only 42 percent of the internal medicine students in 1978 received their first choice.

"I applied all over the country, and every place I listed is a place I like," Burke said. "I'll be happy anywhere."

Missing a match

For one reason or another, some students are not matched in the computer process. The hospitals they rank are matched with students who are ranked higher by the hospitals.

Two days or so before Match Day, results of the match are

deans, students look at the available positions and start making phone calls.

A student in family practice, who had wanted to go to Seattle, learned on the Monday before Match Day that he hadn't matched. He found a position at a hospital in Akron, Ohio.

"That happened to be the first one I called, and they were interested," he said. "Some of the physicians on the staff here knew about the program, and they were very positive about it. I'm very satisfied. I feel pretty good."

The goal is to have all unmatched students placed before 4 p.m. so that they can receive envelopes along with everyone else. Unless the students volunteer the information, their fellow students don't know who matched and who did not.

Burke, who had ranked 10 hospitals but knew she "wasn't a sure thing to get into any of them," was relieved when she didn't hear that she hadn't matched. But just to be sure, she made a point of being seen in the vicinity of the deans' offices. When nobody said, "We've been trying to reach you," she felt more secure. "I'm happy I



John Billings and his daughter Erin

medical students? "Minnesota's a good place, and the grade of medicine that's practiced here is probably the best in the country," Sullivan said. "I can say that without chauvinism because I'm not a native."

"We have good doctors, and we have good patients. Doctors in other parts of the country accuse us of lying when we say our patients will return after 25 years for a follow-up. Their patients won't even return to have stitches taken out."

"Look at our health statistics. People live longer here. We have a lower maternal mortality rate than any other state. Doctors like to do good medicine, and it's particularly nice if you have good, intelligent, well-informed patients."

California used to be a popular

practice, internal medicine, pediatrics, or obstetrics and gynecology. He told them that 71 of them would be "staying right here" at University Hospitals or a hospital affiliated with the University, and he told those who were leaving to spread the word about what a good place the University is. He joked with them and was greeted with laughter and groans.

"I know the brilliance of my speech is such that you'd like to stay here all afternoon," he said, but he kept his talk to five minutes. Then it was time for the envelopes to be distributed.

Billings and Burke both went to the corner of the auditorium where the envelopes were being given to students whose names started with a letter from A to D. Within that alphabetical grouping, the envelopes seemed to be handed out at random, and

ate School of Medicine. "You got it," his wife Paulette said when he opened his envelope.

Paulette Billings later said she was "kind of excited" about the move to Rochester but "kind of sad to leave our neighborhood and kind of scared about all the time I'll be spending alone. I worked as a nurse, and I saw what the residents had to go through."

"We're just really happy," Billings said about his residency, which will begin in early July. "But then it rapidly comes crunching down on you that you'll have all that responsibility."

Correspondence



Charter Resident

Of the several excellent pieces in the current issue of **Update**, the article and photos on Pioneer Hall had especial appeal for me. As a country-boy freshman in the fall of 1931, I was one of the charter residents of that then sparkingly new dormitory. It was a most memorable experience for me, my freshman year at Pioneer Hall. Several of the many friendships formed there have lasted to this day, and the memories of the others are still fresh.

In all probability I am among the diners about to be served their evening meal by the white-coated waiters in that one photograph. What decorum we observed then, without being conscious of it. Everyone wore shirt and tie, and probably a three-piece suit, for dinner. And that was in the midst of the Depression! Nobody had any money but we seemed to dress pretty well. Certainly we ate well. Only three or four of the Pioneer Hall men had cars that year—beat-up Model T Fords—but the streetcars ran every few minutes on Washington Avenue and they would get you anywhere in town for a nickel or so, day or night.

You are putting out an excellent publication. Congratulations and best wishes.

Charles T. Duncan, A.B. '36,
M.A. '46
Professor of Journalism
University of Oregon
Eugene

Tasteless Erratum

Your article "Some Dos and Don'ts of Pills and Victuals" in the winter issue of **Update** was a good brief overview of interactions of foods and drugs or food ingredients and effects on physiology. By now, however, you must have been told by the food scientists at the University of Minnesota that monosodium glu-

tamate is certainly not a meat tenderizer, but a flavor enhancer. There would be no reason to use a meat tenderizer in Chinese food. Also, as you probably know, MSG and its re-



Tom Foley

lation to soy sauce makes a close connection to Oriental foods.

All in all, your interview with Joseph Cornell was presented in a clear and informative manner and you are to be commended for the article.

Allen A. Kraft
Professor
Food Research Laboratory
Iowa State University
Ames

Editor: *Mea culpa on the MSG.*

A Superior Idea

We would like to tell you how much we enjoy **Update**. The variety of the articles, the investigative nature of some of them, as well as the up-to-date topics, make this newspaper a pleasure to read.

We share it with other University of Minnesota graduates in our community. They appreciate keeping up with University developments.

Thank you for great reading.

Doug and Brenda Berglund
Superior, Montana

Editor: *We'll gladly send copies of Update to any University of Minnesota graduate. If the other alumni in your community would like copies of their own, have them write to us.*

Spreading the Word

I found your winter issue very informative and interesting reading, and I intend to show it to and leave it with the editor of the Clearwater *Sun* for using some of the articles in the paper.

H. G. Christenson, '25
Clearwater, Florida

Cheers!

We were very pleased to read your last issue and enjoyed the articles on Ancel Keys and Michael Day.

We are sending a small check to cover a few of your expenses. Probably just enough for one round of beer at Manning's on Como.

Mr. and Mrs. E. R. Gross
Juneau, Alaska

Editor: *We like Manning's, but we reluctantly had to return the check. If after reading Update you want to give money to the University, by all means do so. Checks should be made out to the University of Minnesota Foundation. You can send them to us, and we'll pass them on.*

Change of Name, Change of Address

If the post office is charging you for your issues of **Update** lately, chances are you've gotten married or moved. Check carefully and see if this isn't the case. Then take the old mailing label, stick it to this coupon, write in your new name or address, and mail it to **Update**, University Relations, S-68 Morrill Hall, 100 Church St. S.E., University of Minnesota, Minneapolis, MN 55455.

Correct Name & Address:

Bismarck and Bernhardt to Unite



University Summer Session is pleased to announce the forthcoming engagement of Prince Otto Eduard Leopold von Bismarck, Berlin, Germany, and Ms. Sarah Bernhardt, Paris, France, as part of "Interplay '79: A Search for Understanding." Interplay '79 is an experimental course that will explore interrelationships among the arts, humanities, social sciences, and physical sciences in the latter half of the 19th century. Fifteen departments from the College of Liberal Arts, the University Gallery, and

six professional arts organizations—including the Guthrie Theater, the Minnesota Orchestra, and the Minneapolis Institute of Arts—will join in the program. Among the subjects to be studied are political unification and realpolitik, Prince Bismarck's areas of expertise, and the classical and romantic theater, Bernhardt's chief interest. For information, contact University Summer Session on the Twin Cities campus.

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A Publication for
Friends of the
University of Minnesota



Tom Foley

Williamson Hall, the University's subterranean bookstore and admissions and records center.
See story on underground buildings inside.

**Furthermore: Nurses Are in Short Supply; State Has Cattails To Burn;
Sunflower Stalks Vegetable Oil Market; Elderly Folks Vacation in School;
Birds Banded at the Bottom of World; Russian Women Bear Double Burden;
And so forth.**

Going Under To Stay on Top

Underground Housing Gets Lift from 'U' Space Center

by Paul Schurke

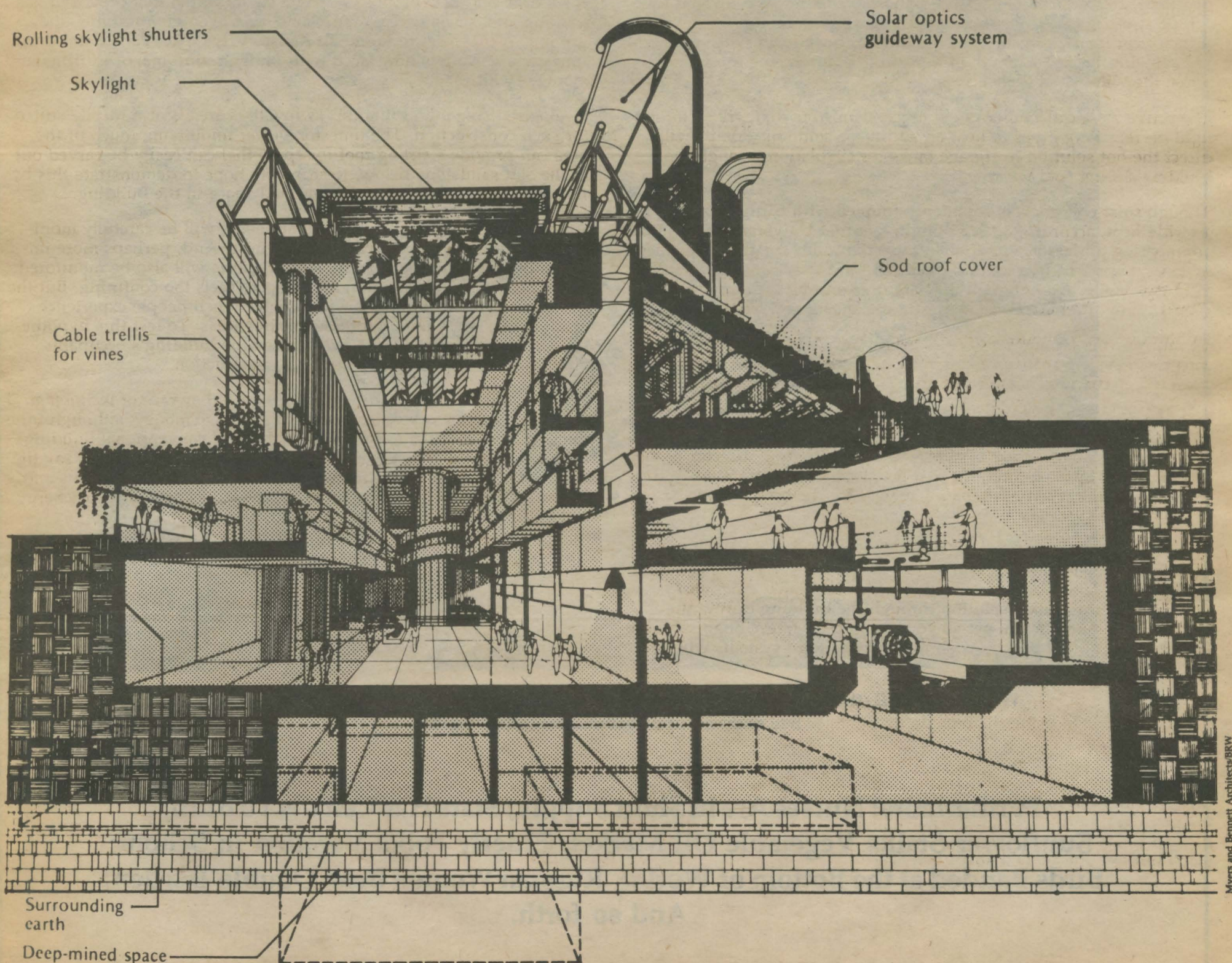
Ask engineering faculty at the University what's up these days, and they'll correct you—it's what's down that matters, they say. And nowadays, as efforts to reconcile competing demands for energy and for environmental protection increase, that includes increasing numbers of earth-sheltered homes and buildings.

Faculty and students of the Department of Civil and Mineral Engineering on the Twin Cities campus are on the cutting edge of a nationwide move to plug more new structures into the earth's protective crust. They have established the Underground Space Center, a national focal point for underground research and information exchange. They are monitoring seven earth-sheltered homes in the first large-scale test of such housing. And, with the mechanical engineering de-

partment, they are monitoring Williamson Hall, the University's award-winning underground building, which in its first year has shown energy savings of up to 65 percent over conventional buildings.

The department's members are enthusiastic about these developments, but they are most excited about the design proposals for their own new home. Backed by a \$15.8 million appropriation from an enthusiastic legislature, construction is soon to begin on a 150,000 square foot underground instruction-administration facility. A national demonstration project, the building is to tap the sun for heat and light and store winter's frigid cold for summer cooling.

The primary objective is to replace the department's 1912-vintage facilities (deemed a "disaster" by a national accrediting body) with ade-



A schematic drawing of the civil and mineral engineering building. More than 95 percent of the building will be underground.

quate research and teaching facilities. But with the unique structure, designed by Myers and Bennett Associates and described in the department's current newsletter, they also hope to demonstrate that an earth-sheltered building can achieve maximum energy conservation and still be functional and attractive.

Unlike Williamson Hall, which was plugged into the ground primarily to preserve the view and open mall space, the civil and mineral engineering building seeks foremost the temperature-moderating qualities of the earth, said department head Charles Fairhurst. At moderate depths—say 40 feet—the temperature is constant the year around, requiring only a small amount of energy to maintain comfort levels.

The building is to be 95 percent underground, but the completed site won't be a grassy mall interrupted only by occasional vent pipes. On the west end an atrium will protrude with skylights and the solar heat and light collection systems. A descending courtyard on the east end will lead to the entrance.

"We try to avoid a vertical approach," architect David Bennett said. "If you enter through a sunken courtyard or a gently sloping ramp, the feeling of going underground is eliminated."

Solar heat will be gathered both passively, through design features, and actively, through mechanical systems. Design features include double-paned, southern exposure windows that may be covered by rolling shutters to reduce heat loss at night. In addition, vines will be grown over the windows, reducing interior heat during the summer yet allowing the full strength of the sun to enter during the winter when the vines shed their leaves.

The active solar collection system involves mirrors that will focus sunlight on receiving pipes to heat an antifreeze solution. Pumps will direct the hot solution to storage tanks for circulation through the building during cold weather.

Though solar collection is commonly coupled with earth sheltering to provide heat, according to Tom Bligh, a former University mechanical engineering professor, "solar collectors are usually the most expensive energy component in a building like this, and they generally aren't used efficiently. Even though they are used during the summer for air conditioning, they aren't used during the spring and fall."

To improve the economics of solar collection, Bligh has designed an integrated system that combines solar heat collection with a steam-powered electrical generator and an ice air conditioning system.

Solar-heated water will power the generator, which, though expensive, can greatly increase the energy output from the collectors. "Another advantage of the system," said Ray Sterling, director of the Underground Space Center, "is that it will be generating most of the electrical energy when electricity demands are the highest—in the middle of the summer."

The ice air conditioner borrows from the design of the icebox. Copper coils on the solar collectors will gather the winter's frigid cold to form a huge block of ice in an insulated underground tank. Another system will circulate the chilled solution through the building during the summer. "Essentially you get all your cooling for free," Bligh said. He added, though, that backup cooling—and heating—systems will be provided.

To ensure that working areas feel comfortable and unconfined, efforts are being made to bring the outside in. Sunlight will directly penetrate about half of the rooms on the building's four floors from banks of windows along the courtyards. Other rooms will open into the center atrium. And sunlight may be piped into some of the remote interior areas through an experimental optics system of mirrors and prisms. On cloudy days and at night, photoelectric sensors would activate a single powerful backup source of light that would be channeled through the same distribution system.

"The amount of natural light is important for creating a livable space," Bennett said. "The Williamson Hall bookstore is washed with sunlight, and this seems to be the key to its being perceived as a pleasant environment."

In a smaller scale experiment, a view of the outdoors may also be piped in. Using remote view optics—a new twist on the design of the periscope—an image from the outside can be transmitted to interior areas. If this sounds a bit much, rest assured that the designers also have reservations about it. "We don't know if it will work—if it will establish a sense of connection to the outdoors or if it will be perceived as just a trick of technology," Bennett said.

Some facilities that don't need direct contact with the outdoors—those for storage, movies, and lectures—may be tunneled into the sandstone bedrock 90 feet down in an extension of an earlier departmental research project.

A 50-by-100-foot underground test room gouged out of the sandstone by department researchers in 1974 has shown that the area's subterranean depths offer an economical alternative for urban space. What's to be gained? A sound- and vibration-proof environment of constant and moderate temperature and humidity, and an option to avoid urban sprawl by building down rather than out.

It's a tried and true proposal. Long a leader in the field, Sweden has parking lots, sewage treatment plants, and even gymnasiums underground. A bit closer to home, in Kansas City, space carved out during limestone mining is now laced with underground manufacturing and storage facilities.

Geologists have found that the Twin Cities area is also ideally suited for such construction. The limestone layer underlying much of the area can provide a strong roof for space that can easily be carved out of the soft sandstone below. Researchers hope to demonstrate this by incorporating two floors of deep-mined space in the building.

All of the building's innovative components will be carefully monitored for their utility and cost effectiveness. And, perhaps more importantly, the building's psychological effects will also be monitored. Some people find that underground space feels too confining. But the designers believe objections will dissolve when people experience carefully designed underground working areas. To test this hypothesis, University psychologists will survey the building's occupants about their attitudes before and after construction.

All this adds up to a building that will be a showcase of technological alternatives in energy conservation. It will save money: although initial costs are expected to be par with those of conventional buildings, operating costs will be greatly slashed. But more importantly, say the designers, it will make a dramatic statement to today's students and tomorrow's decision makers about imaginative approaches to energy and environmental problems.

Russian Women Bear Double Burden

by Maureen Smith

An old Russian proverb reveals a view of women that lasted for centuries: "A chicken is not a bird, a woman is not a human being."

Russian women have come a long way. And in a new course on the Twin Cities campus this spring, their story was told.

"Russian women are a remarkable group of people, and they have been throughout history," said Irina Corten, assistant professor of Slavic and East European languages, who developed and is teaching the course. "They have overcome tremendous obstacles."

The course is half historical, half contemporary. Corten has drawn on her academic background in Russian literature and culture and on her own experiences. The daughter of an American father and a Russian mother, she spent the first 12 years of her life in Moscow.

Her father, Henry Shapiro, was Moscow correspondent and bureau chief for the United Press International, and his United States citizenship made her an American by birth. But because her mother was then a Soviet citizen, she and her mother were not permitted to leave the Soviet Union until after Stalin's death in 1953.

Corten said her mother, now an American citizen and a journalist and translator, was her partner in developing the course. "My mother and I worked as a team. She has given a lot of public lectures, and she started putting together a collection of slides. It kind of dawned on us that this could be a course. I talked to my colleagues and students, and they thought it was a good idea." With help from the Small Grants Program of the all-University Council on Liberal Education, Corten expanded the slide collection for the course.

No damsels in distress

Women in Russia were suppressed for about 700 years, Corten said, but before the arrival of Christianity Russia was a matriarchy. Russian folklore is dominated by images of strong women.

Three female types recur in the folklore: the warrior woman who



A Soviet cartoon depicts the double burden of Russian women.

leads armies of women and men, the wise woman who outwits men and knows how to heal, and the woman of great moral courage whose integrity is tested.

"There is no such thing as a damsel in distress in Russian folklore," Corten said. A man is abducted, through his own foolishness or someone else's vil-

lainy, and his fiancée goes out in search of him. Tales of strong women survived through the centuries, Corten said, and persisted alongside the proverbs about the inferiority of women.

Mother Earth was the main goddess in pagan Russia, Corten said, and some of the earthiness was carried over into Russian Christianity. "The cult of Mary was very strong, but she was

quite different from the Catholic Mary. Her virginity was never emphasized, but her motherhood. She was usually portrayed as a middle-aged woman, and in countless legends she was either a hard-working peasant woman or a miracle worker."

Such images of Mary continue among Russian peasants today, Corten said. And when Mary intercedes, it is "usually kind of an argument with God." She

tells God what will happen "if you don't do this for my people."

Naked shoulders

Before the time of Peter the Great, Corten said, upper class women were locked away in a section of the house called the *terem* and hidden from public view. (The *terem* was similar to the harem in Muslim households, but without the element of polygamy.)

"The women were left completely uneducated, they rarely went outside, they were literally fattened up like geese because corpulence was considered desirable," Corten said. "They ate, drank, slept, gossiped, reproduced—that was their life. There were some exceptional women who broke through.

"Peter the Great did away with the *terem* very abruptly. He told the nobles that the women had to come out into the open." Peter instituted European-style balls and "the women were literally dragged to them. They were forced into European dress, with naked shoulders and arms. They were terribly embarrassed, the men were furious, it was considered an outrage. But after a few years the women got used to it."

The 18th century was a time of woman rulers, and by the time Catherine the Great sat on the throne, attitudes had changed. "Women were beginning to be treated as human beings."

Real emancipation for women began in the 19th century, and many women played a part in the revolutionary movement. With the Bolshevik revolution in 1917 came a dramatic change in the status of women, Corten said.

"Lenin was probably one of the leading feminists. He made a very significant statement, that no country can be free if half of its population is enslaved, and he was referring to women."

In a series of decrees, women were granted equality. "It's always easy to do in a dictatorial state," Corten said. But it took a decade or more for women to be aware of the freedom they had gained. Most women in 1917 were illiterate, and "they had the mentality of slaves."

Immense effort

"By the 1930s the women awakened and entered the country's

labor force," Corten said. Then came World War II, and "their contribution to the war effort was just immense."

Few women were in combat, but Soviet party leader Leonid Brezhnev has said that the war efforts of men and women could be placed on a scale and "the scale wouldn't tip in either direction."

Almost every able-bodied man was at war. "The women fed the country, they fed the army, they kept the country going," Corten said. "Agriculture was in their hands, most of industry was in their hands."

With 20 million men lost in the war, the women led the postwar reconstruction. "It's been a remarkable contribution," Corten said. "American and European women have a lot to learn from Russian women—their endurance, their spiritual strength, their independence."

Female students find the example of Russian women inspiring, she said. "They find a kind of support in knowing it's possible for women to achieve things of such magnitude."

Women at work

Russian women today have achieved near equality in the work force and the professions, Corten said, but some fields seem to be closed to them—notably politics and diplomacy at the high levels—and they typically "don't rise to the very top."

Three out of four doctors, about half the surgeons, a third of the engineers, and 40 to 45 percent of the lawyers and judges in the Soviet Union are women.

Corten said she has talked with Russian men about their woman doctors, and it would never occur to them to prefer men. "They say that of course women make better doctors, because medicine is a caring field. These are cliches, but it's interesting that they feel medicine is just made for women."

But medicine in the Soviet Union is not a lucrative profession and never has been. A beginning general practitioner makes less than a factory worker, Corten said.

(Surgeons make more money by accepting bribes, she said. "It's bribery within the Soviet system. From our point of view it would be private practice. If you need complicated surgery and you don't want to go to your local clinic—you want the best

surgeon—you give a substantial amount of money. It's a semi-legal thing. The government knows perfectly well that this kind of thing goes on.")

Most Russian women would never consider not working, Corten said. "A Soviet woman assumes that work is her life." And women with children don't have the option of part-time work. "There is no such thing as a part-time job in the Soviet Union." On the other hand, it is not illegal for women not to work, as it is for men. "An able-



Irina Corten

bodied man can be prosecuted for parasitism."

Women receive equal pay for equal work, Corten said, and they are given generous benefits—four months of maternity leave with pay and another year without pay when jobs and seniority are protected, two half-hour periods a day for breast feeding, child care facilities at a nominal fee.

Still, there is the absence of women at the top. At a major metropolitan hospital, most of the staff will be women but the head surgeon will be a man. More women than men have college degrees, but the high-ranking academic positions are dominated by men. Women are scientists, but those named to the prestigious Academy of Sciences "could literally be counted

on the fingers of one hand."

Beast of double burden

Why don't women get to the top? "There are all kinds of theories, but I think it is mainly because the Soviet woman is a beast of double burden," Corten said. "She has a full-time job outside the home and practically a full-time job in the house.

"The women do the lion's share of the work in the home, and

tended families and child care was provided by grandmothers. As more housing has become available, "people are beginning to spread out a bit, and grandma is moving out. There is a kind of grandma liberation movement.

"A lot of my friends in Moscow complain, 'My mother just won't do it any more.' " Younger grandmothers are still working, and those who are retired want to take it easy at last. "Now probably a majority of working women rely on day care," Corten said.

The government is aware of the heavy burden on women and is waging a public campaign to encourage husbands to help with the housework. "Almost every day, there will be something on the radio or in the paper telling men there is nothing shameful in washing a teacup," she said. But change is slow, and Corten predicts that it will take a generation or two before men assume any major share of the responsibilities in the home.

Part of the problem stems from the war, she said. "With 20 million dead, a living man was worth his weight in gold." Those women lucky enough to find husbands were willing to pamper them.

"For five or ten years after the war, the government encouraged women to have children without getting married, and many women did." The government was concerned about population decline but also about the loneliness of the women, Corten said.

Men are no longer in short supply in the Soviet Union, she said, but "the attitude lingers on. That was the generation of our mothers, and young and not-so-young women were raised in that atmosphere."

But Corten thinks "there is hope for Russian men." The more educated men are becoming "more cooperative and flexible," she said. "You can go out on a Sunday and look at the young men who are pushing baby carriages. A peasant wouldn't do it, but the young sophisticated urbanites think nothing of it. They're even beginning to do some shopping, which is no mean task."

For now, Russian women are carrying the double burden. "As my mother puts it, women are equal professionally and more than equal at home," Corten said. "That means they get all the opportunities to do the housework."

Urban families in the Soviet Union tend to be small. A couple will typically have just one child. "If you have two children, that is considered a big family," Corten said.

Until half a generation ago, she said, most Russians lived in ex-

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Sunflowers Aren't Just for Gardens Anymore

by William Hoffman

"Sunflower, a native American crop, has a foot in the door of Minnesota agriculture. Can it get in?"

The sunflower has got in, here and around the country, to the marching music of drums and bugles. And it's likely to stay.

Leading the way for sunflowers is R. G. Robinson, professor of agronomy and plant genetics on the Twin Cities campus. He posed the question above 25 years ago while testing sunflower varieties at agricultural experiment stations around the state.

Robinson is responsible for developing some improved sunflower varieties that have allowed for greater crop yields and resistance to disease. More and more growers across the country are benefiting from the research of Robinson and his colleagues on *Helianthus*.

State farmers sowed more than a million acres with sunflowers this spring, mostly in the northwest and west central regions where agricultural economist Fred Benson says sunflowers are more profitable to grow than wheat. That's part of more than 5 million acres nationally.

Most sunflowers are grown for their oil. The seeds of some varieties are more than 40 percent oil. Sunflowers produce more oil per acre than soybeans, currently the top oil-seed crop, Robinson said.

World demand for sunflower oil is growing. Most of the domestic oil seed crop is shipped overseas, chiefly to Europe where fastidious chefs and restaurateurs insist on sunflower oil and buyers pay a premium for its quality.

But once American consumers get wise to the practical and nutritional advantages of sunflower oil over its competitors, the market may shift. "It's the best vegetable oil for many uses," Robinson said. Minnesota sunflower oil has the highest content of linoleic acid, an essential fatty acid in the human diet, and is high in polyunsaturates, he said.

Russia is by far the world leader in the production of sunflower oil with about half the total. It got the seed from the Netherlands during Peter the Great's reign, when peasants cultivated the plant in their gardens for its nutlike seed, tasty when roasted whole. The seed had been brought from the New World by Spaniards who grew the sunflower as an ornamental garden plant.

Before that, American Indians made meal from the seeds of the wild sunflower. Then it was reintroduced into this country—as a garden crop, probably by the Mennonites who brought seeds from Russia.

Early in this century, sunflowers were grown largely for silage, with little interest in crushing the seed for its oil. At mid-century, however, high demand for edible oil gave agronomists reason to take a closer look at the sunflower, but soon prices dropped, and the advent of improved soybean varieties left it in the wake. The 300 acres of state sunflowers in 1953 were for bird feed.

Then, in the early 1960s, the St. Paul Agricultural Experiment Station released the Mingren variety, developed by Robinson, and soon Minnesota sunflowers supplanted California's crop in the whole-seed and salted nut trade.

The biggest break occurred in 1961, when data from the University's Rosemount Agricultural Experiment Station showed that some Russian oil varieties, obtained from France, would produce more than 40 percent oil. Commercial interest in the crop followed in 1967, spurred by changing eating habits and popular preference for salad and cooking oils low in saturated fat.

In the mid-1970s sunflower farmers began planting new hybrids. Today nearly all domestically raised sunflowers are self-compatible hybrids, lessening the risk of disease and poor plant pollination from overworked bees. "There aren't enough bees around to pollinate all the sunflower acreage in the United States," Robinson said, noting that such hybrids take care of fertilization without bees.

Besides bees, birds are also part of the sunflower scene, but a part that farmers would gladly do without. Birds can be devastating to sunflowers, causing "more direct loss than any pest to date," Robinson said. "We just have to accept the loss." Scaring devices and repellents are only partially effective. One approach is to avoid planting sunflowers near roosting areas.

Some hybrids have built-in resistance to downy mildew disease, which often ravages the open-pollinated varieties. The same holds true for plant rust. On the whole, although crop pests "are more hazardous for sunflowers than for other crops," plant breeding shows great promise for reducing loss due to disease and insects, Robinson said.

Finally there is the problem of weeds, which used to affect crop yields. Nowadays herbicides can keep weeds at bay. Robinson noted that Minnesota was the first state to gain government approval for sunflower herbicide, and that the use of herbicides ranks with the use of hybrids in making sunflowers a more practical cash crop.

Despite these advances, "the sunflower is still a risky crop," he said. Costs are lower and yields higher than other oil crops, but the hazards of disease and insects may grow as more land is put into sunflower production.

Volunteer plants hamper operations by spreading disease, with crop rotation, specifically of corn and small grains, one remedy.

And sunflowers cannot tolerate drought very well. A long stretch of dry weather can be damaging.

Yet a crop with the highest yield of the highest quality vegetable oil per acre has a future, perhaps even without federal price support protection, which sunflowers have never had.

The sunflower might be looked at as an efficient biological factory run by energy from the sun. It manufactures a valuable product with a variety of uses. It's likely that more sunflowers will adorn the Minnesota countryside in the years to come.



Will Cattails Ease the Energy Squeeze?

by William Hoffman

All green plants capture energy from light, but few do it better than the cattail. Think of its long, narrow leaves as solar collectors operating from early spring to late fall. On some bright tomorrow, Minnesotans may grow and harvest cattails to help fill the state's energy needs.

Cattails as an energy crop? University scientists have been studying just that possibility for nearly six years, and the prospects are brighter every year.

Not only do cattails have a high yield per acre of plant matter that could be converted to usable energy, but their roots and underground stems are rich in starch and sugar and so have considerable food value. Going further, the versatile plant can be processed into paper and also can be used to clean up polluted wetlands.

It is the possible use of cattails as a renewable energy crop, however, that has the eyes and ears of state legislators and energy agency officials. The idea has prompted inquiries from energy and natural resources experts across the country.

The cattail is an aquatic plant that grows thickly in marshes, swamps, bogs, and shallow lakes—land that is too wet for conventional agriculture. Minnesota has about 7 million acres of peat bogs and another 2 to 3 million acres of wetlands, according to estimates by Douglas Pratt, head of the botany department on the Twin Cities campus.

"Minnesota has about 10 million acres of land suitable for growing cattails," said Pratt, who is directing research on the plant. Nearly half of the total is flat, open peat land in the northern part of the state, land that is wet and rich in nutrients but that also plays a part in regional water drainage and serves as a wildlife habitat.

A state energy agency study has indicated that cattails yield up to 30 tons of dry organic matter per acre per year (compared to 13 tons for corn). It indicates further that 5 million acres of cattails, at 30 tons per acre, represent as much in stored energy as the state burns each year.

That's in theory. In fact, if cattails become an energy crop at all, it will be on a much smaller scale, probably for use only in rural areas. Questions arise of how to adapt the plant to mech-

anized agriculture and how to convert cattails to energy at an acceptable cost. There are environmental considerations, too.

Pratt and his colleagues are searching for answers both in the field and in the laboratory. They are seeking funds from government and private sources and are enlisting the aid of chemists, biologists, engineers, economists, and industrialists. And they are making headway.

At a game refuge near the Twin Cities, Pratt is directing experiments on every stage of the cattail growth cycle—on planting and seeding and harvesting, on fertilizer treatment, and on plant regeneration.

Much depends on how the cattail would be harvested. If only the above-ground part of the plant (about half the plant) were harvested, then the roots and rhizomes (the underground stems) would regenerate the plant the following year. This would require less-complicated harvesting machinery and allow for the production of paper as an option.

The visible part of the plant produces good paper, and commercial machines could be modified to harvest it, Pratt said. "But most of the energy potential is below ground, particularly at harvest time when the plant begins to store nutrients for the next year."

The cattail rhizome is a storehouse of starch and sugar that could be processed into flour or animal feed, Pratt said. Robert Glass, professor of biochemistry, is testing its nutritional value.

The 70 percent of their dry weight that is edible carbohydrate could make cattail rhizomes more valuable as food than as an energy source. "It all comes down to a question of economics," Pratt said, adding that rhizomes are also "an ideal feedstock for making ethyl alcohol."

Pratt believes both the above- and below-ground portions of the cattail plant could be harvested annually "if cattail stands were harvested in strips, leaving undisturbed rows to populate cleared ones." Rhizomes can spread several feet during the course of a season, filling in harvested rows.

"We've learned a lot about seeding and fertility, about planting

rates, to maximize growth," he said. "But we need to know more about the difference between growing cattails on peat and on agricultural soil. And we need to grow them on a larger scale. Right now we are working with very small plots."

Conversion of cattails to energy might take one of several forms, according to Pratt. Burning dried cattails is one option, but not a satisfactory one in most instances because they burn so fast. Processing them into pellets or briquets is an alternative.

Extracting alcohol or methane "would probably yield less total energy, but the energy product would be a more convenient liquid or gas," Pratt said.

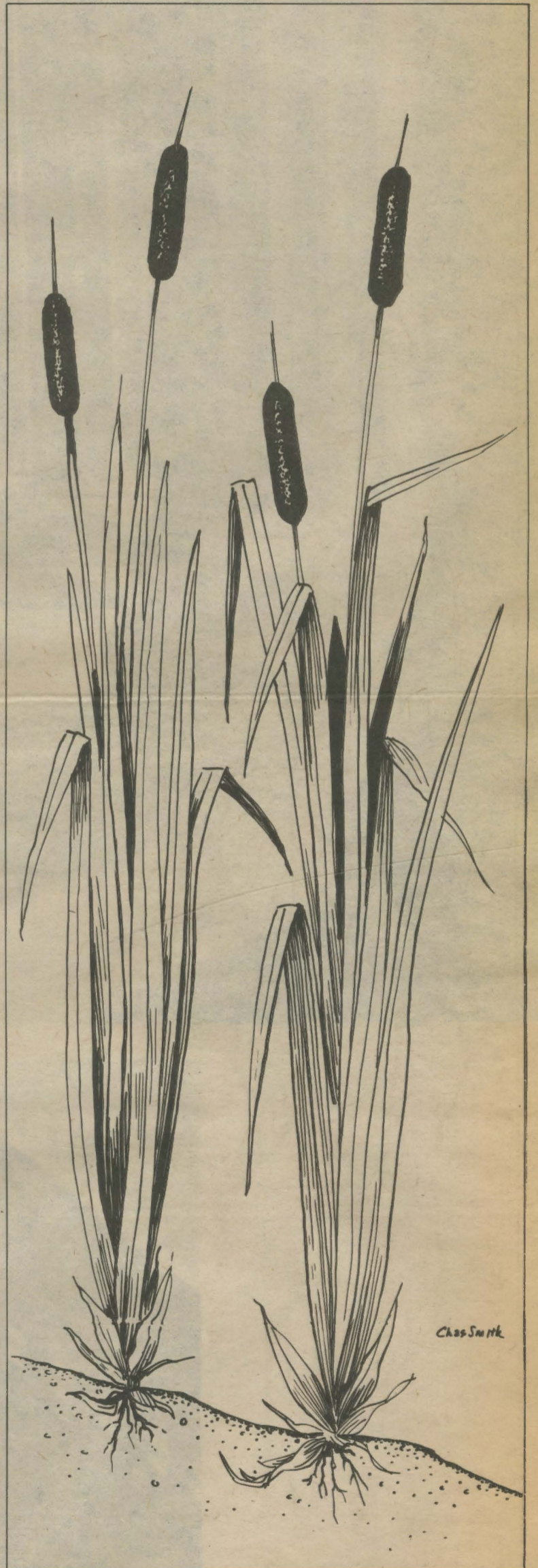
Small-scale development of cattails as alternative fuel could be done without serious environmental hazards if they were harvested late in the fall or early in the winter, according to the state energy report. The agency figures that cattails could provide 7 percent of the state's energy demand by the end of the century, Pratt said.

Unlike peat, another subject of University research on alternative fuels, cattails are a renewable resource, he said. He suggested that strip-farming cattails would improve waterfowl habitats by opening thick stands, allowing greater mobility. And he noted that burning cattail-based fuel would not release large amounts of carbon dioxide into the atmosphere.

Accumulation of carbon dioxide from burning fossil fuels has some scientists worried. It tends to increase the temperature of the earth, they say, creating a "greenhouse effect" and melting the polar ice caps. Cattails would recycle carbon dioxide rather than produce it, Pratt said.

Because cattails prefer soils rich in nitrates, Pratt thinks some cattail plantations could be located near sewage treatment plants and feedlots "as an advanced treatment process for removing nutrients." The potential of the cattail as a biological filter should not be ignored, he said.

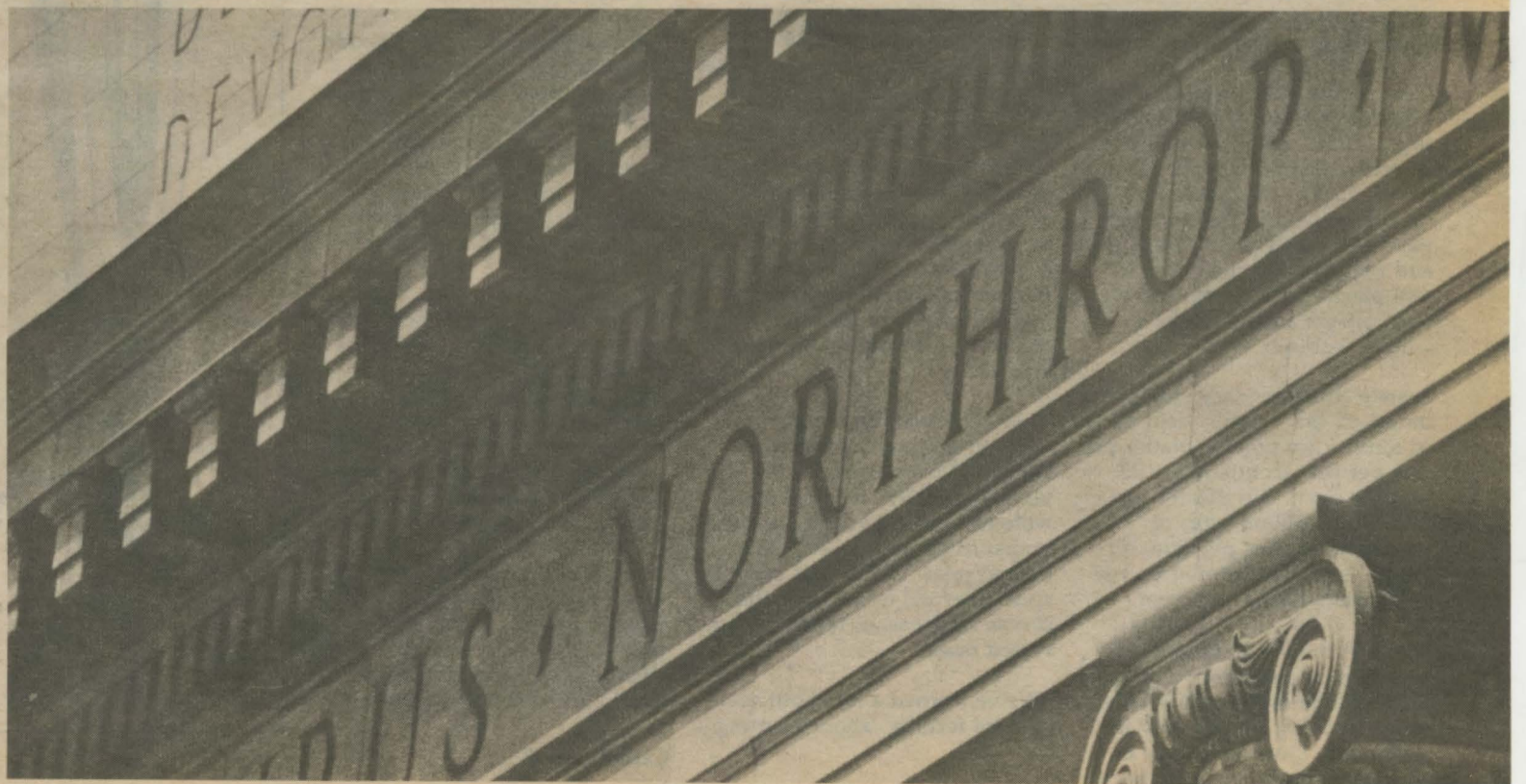
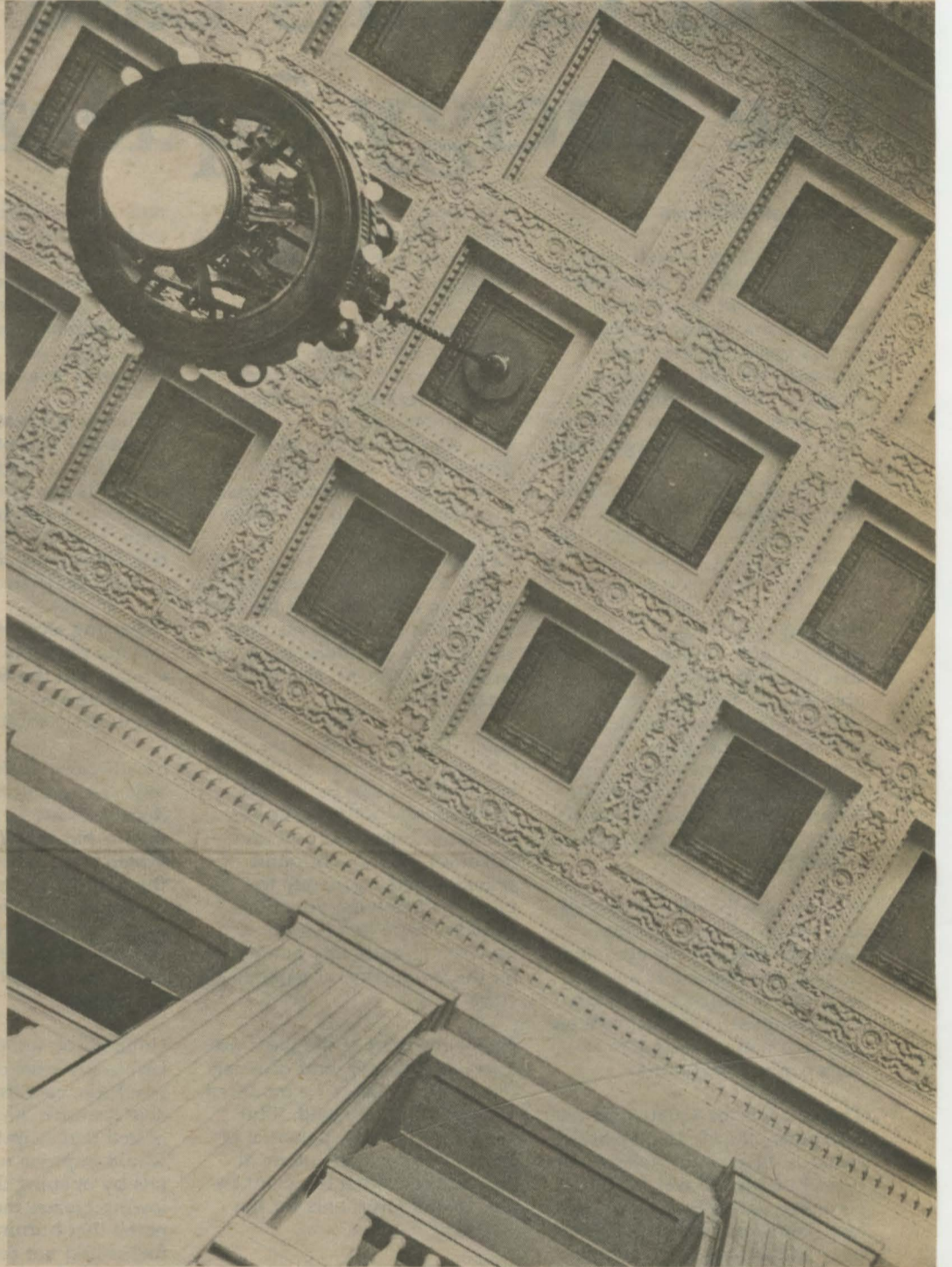
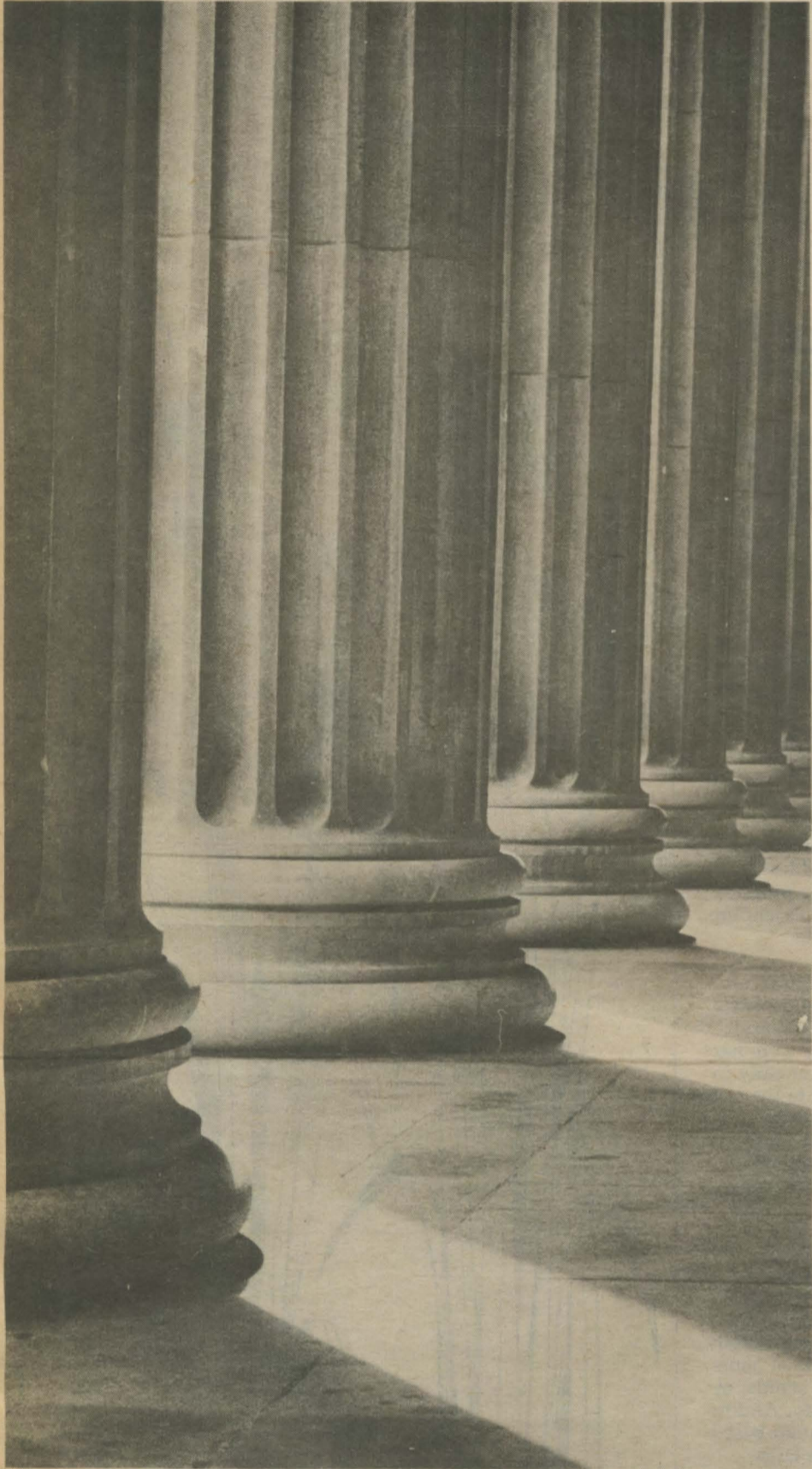
Pratt is trying to generate interest among scientists, industrialists, and public officials in plants as an energy source. "There is safety in diversity," he said. "It frightens me that the

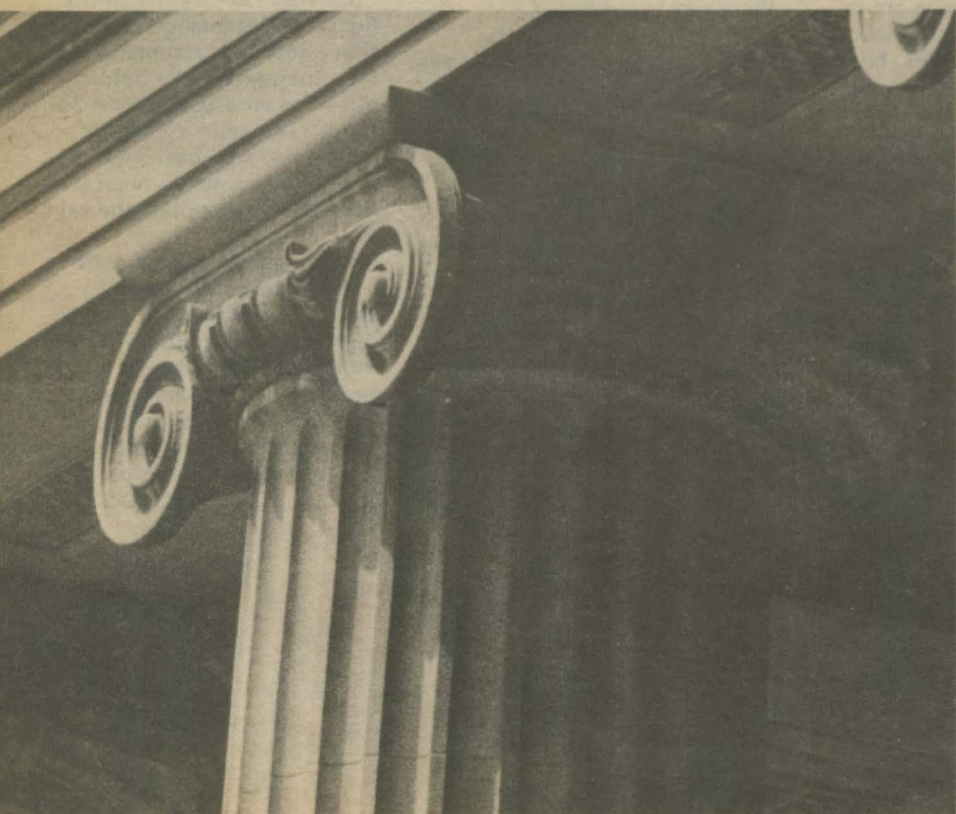
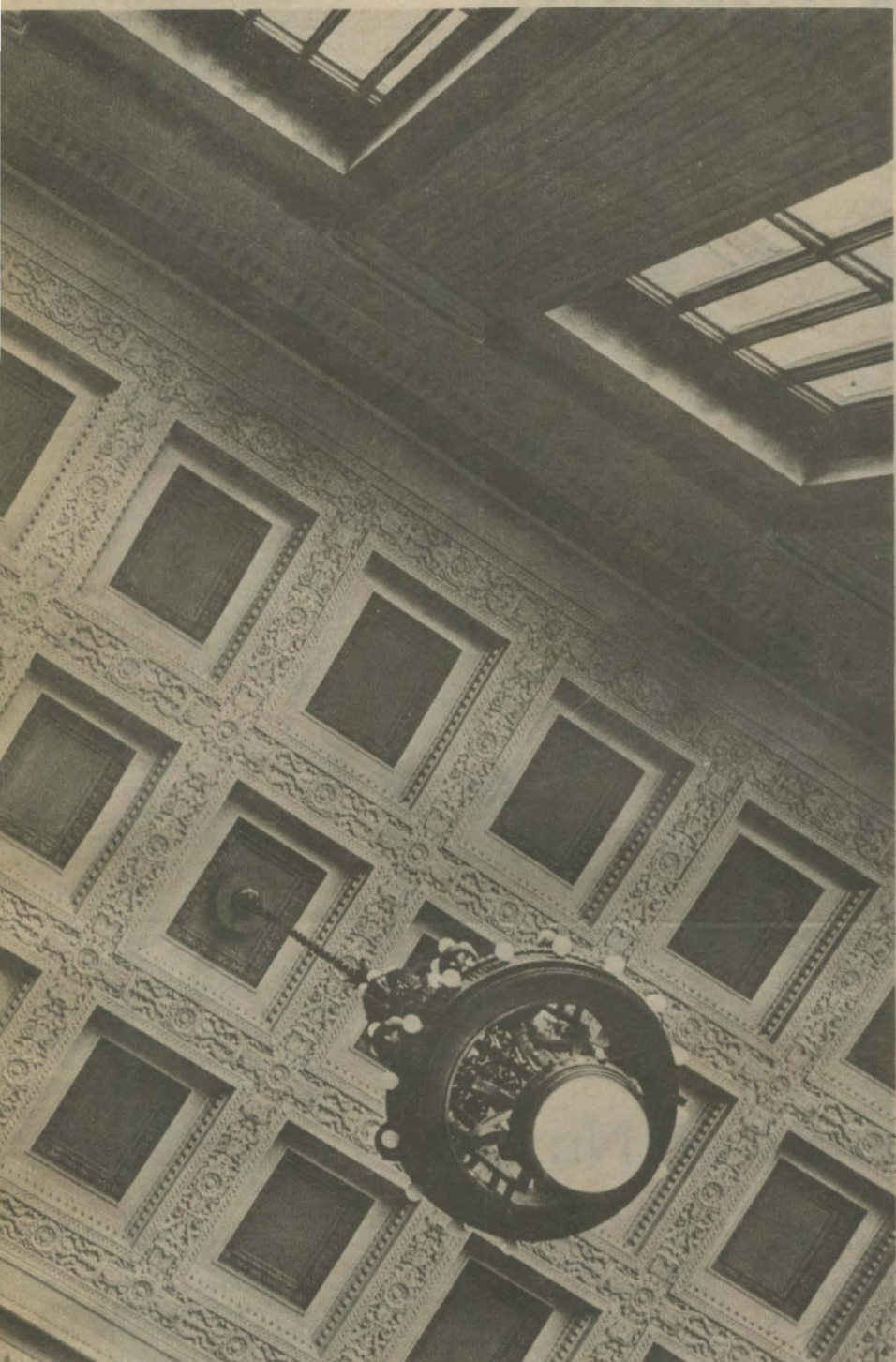


Cattails, p. 13

photos by Tom Foley

NORTHROP





by Paul Schurke

Editor's note: Irene Ramey, dean of the School of Nursing since 1975, died of cancer June 28.

The statewide job market for professional nurses these days is great and promises to become even better. That's good news for registered nurses. But it is an ominous sign for health care consumers, say nursing educators on the University's Twin Cities campus.

Hospitals and county health services throughout Minnesota are reporting seasonally high numbers of vacancies. The shortages have not yet seriously crippled health care delivery, but they are posing growing challenges for recruitment officers.

"This is the first year we've had to advertise heavily in the newspapers," said Barbara Tebbitt, nursing services director for University Hospitals, where there are about 90 part- and full-time nursing vacancies.

Due to high employee turnover rates during the spring months, some hospitals regularly have many vacancies at that time of year. They are usually filled later by June graduates. But, Tebbitt said, vacancies this year occurred earlier and in greater numbers than usual.

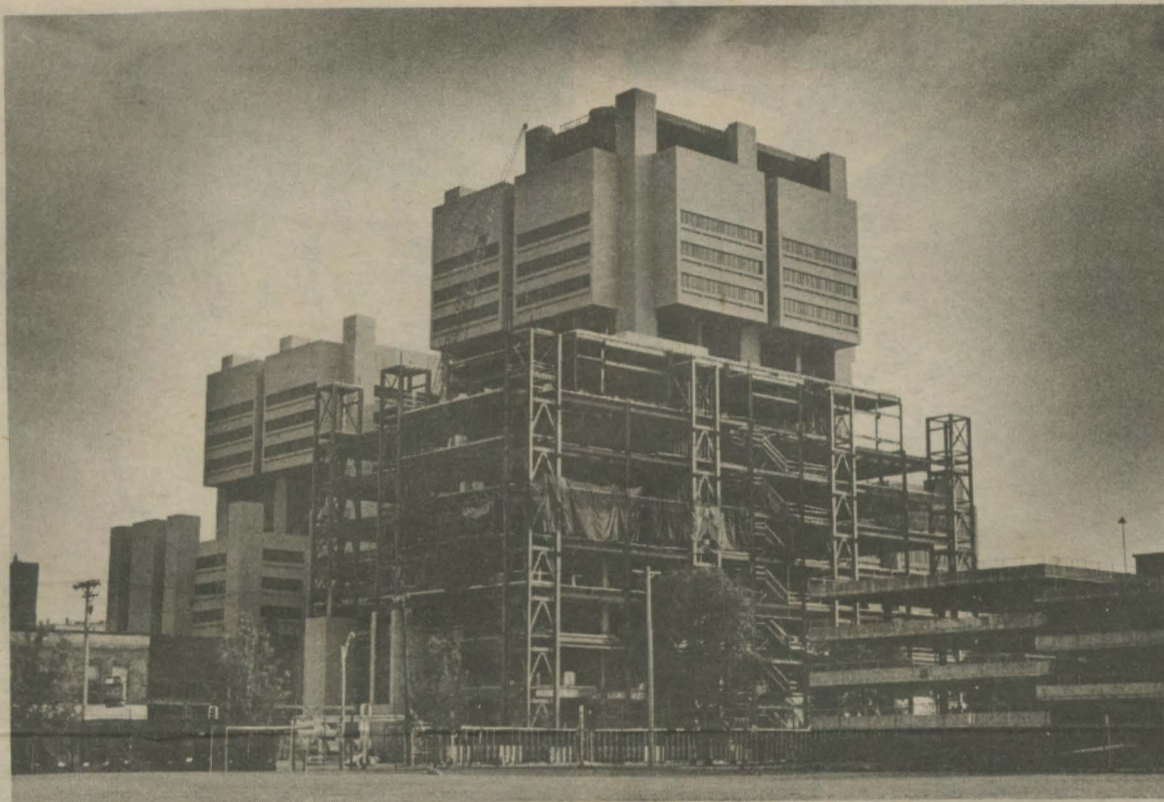
Spot checks with other metropolitan area hospitals confirmed her observation. For most, including University Hospitals, it has meant intensified recruitment efforts. At St. Mary's Hospital in Rochester, shortages have resulted in the temporary closing of 130 beds.

"They've put a bounty on nurses," quipped Mitzi Duxbury, assistant dean of graduate studies in nursing at the University. St. Mary's employees who refer a nurse to the hospital get a \$100 bonus.

The situation in Minnesota is not unique. In fact, administrators say the state is on the tail end of a nursing crunch that is sweeping the nation. Although all areas have been affected, the hardest hit are states in the east and south, where nursing shortages have caused numerous bed closings.

Shortages here are particularly

Nursing Shortage Sweeps State, Nation



Health Sciences Unit F under construction. The building, which will house the schools of nursing and pharmacy, is expected to be completed in late 1980.

or, "They've Put a Bounty on Nurses"

critical because Minnesota, with its numerous nursing schools, has traditionally been considered a supplier state, Duxbury said.

As in other states, shortages here have resulted from both decreases in supply and increases in demand for nurses. Supplies are down, nursing educators say, because many nurses—faced with uncompetitive salaries and expanding career options—are no longer practicing.

This worries administrators, but it is the increasing demand—coupled with cutbacks in nursing education—that is of greater concern. The need stems from the rise of health care practices that require many nurses. Examples are health maintenance organizations, home-based care, and the medical services being developed for an increasingly older population.

"The health care system has changed a lot, and health care professionals need to look at the changes," said Ruth Lunde, director of the Minnesota Nursing Association. "We need more nurses for new types of care."

Employment conditions are favorable for lower level practical nurses and nurses' aides, but the real need is for registered nurses (RNs).

As a cost-saving measure, some hospitals are switching to all-RN staffing, said Irene Ramey, dean of the School of Nursing. "It is cheaper to hire nurses who are better prepared than practical nurses and aides because they don't need on-the-job training and they don't need as much supervision," she said.

Better preparation often includes four years of college training. In fact, Lunde said, "the future of the professional is at the baccalaureate level."

A recent federal study that charts future nursing needs in Minnesota supports her contention. In four years, at projected graduation rates, the supply of nurses with bachelor's degrees will fall about 4,000 short of the state's minimal needs (12,000), the study indicates.

An increasing number of nurses are responding to this growing need by seeking extended college training. But they are finding that nursing schools—beset with budget and faculty cutbacks—are not always able to accommodate them, Ramey said.

Faced with an enrollment squeeze, nursing faculty are incensed with President Carter's pocket veto last fall of an extension for the 1975 Nurse Training Act. Carter's action on the act, which contains crucial faculty development monies for many nursing schools, is being challenged by Congress.

If the veto holds, Ramey fears it

will jeopardize the recent expansion of the University's master's degree program in nursing. Last fall, the nursing school nearly doubled its graduate school enrollment to 210 students. Without the expanded program, Ramey believes there will be a very critical shortage of nurses with master's degrees for administrative, supervisory, and faculty positions.

"Nursing schools around the state have been on my back since I came here. They are saying we have got to have more nurses with master's degrees," Ramey said. "We haven't been graduating enough to even begin to fill the need."

Ramey cited needs projections for nurses with master's degrees in the federal study. The study, which charts needs for 1982, indicates that projected graduations will continue to be well below half of the state's minimal needs.

But one doesn't have to look to 1982 for the impact. Thirty unfilled faculty positions currently exist in the state's six southeastern nursing schools alone.

"One nursing school in Minnesota has already lost its accreditation because of faculty shortages, and two others are in jeopardy," Duxbury said. Furthermore, she said, more than half of the state's nursing faculty are not adequately prepared. "Ideally, we would like our faculty to have doctorates, as they do in other departments. But the employment situation does not allow this."

Nursing administrators believe the solution is to secure more funding through aggressive lobbying. Ramey said that nurses throughout the state are sensing this need. She pointed to the barrage of phone calls from nurses that accompanied the Board of Regents' consideration—and later acceptance—of the nursing school's bold request for an \$800,000 increase in funds. The state legislature, which also was besieged with phone calls, passed major portions of the proposal, she said.

Lunde, who heads the state nursing association's lobby, agreed that activity is increasing. "I do think nurses are becoming more politically astute and active. There has been a significant increase in their involvement at the legislature and it is making a difference."

Tom Foley

Experiment Station Built on Rail Baron's Gift

by William Hoffman

Among James J. Hill's many philanthropic contributions to Minnesota agriculture, perhaps few have done more for the public good than his donation of 452 acres of land north of Crookston "to discover how to farm the prairie."

The Northwest Experiment Station, built on the railroad baron's gift, was one of the state's first branch experiment stations. Its establishment was funded by the legislature in 1895, largely through the lobbying efforts of Willet M. Hays, University agricultural scientist and later U.S. assistant secretary of agriculture.

The story goes that the University administration was cool to Hays's ideas, but he persevered in his belief that branch stations were necessary to manage field operations for crop and soil experiments in different regions of the state.

Before the Board of Regents had formally considered the project, Hill offered the land, telling Hays, "Young man, you go ahead."

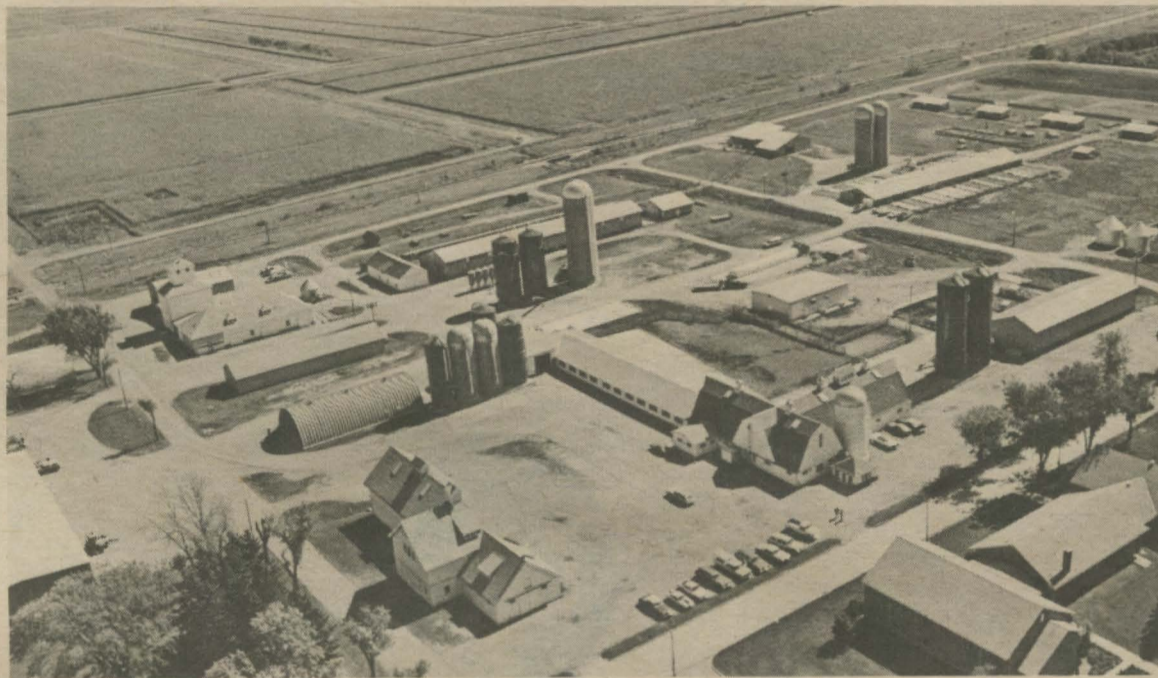
"Our forefathers were pretty sharp and perceptive in realizing what was necessary to insure an adequate supply of food and fiber for a growing nation," said B. E. Youngquist, current superintendent of the Northwest Station. "They built agricultural experimentation into the state land-grant college system."

The Morrill Act passed by Congress in 1862 required that part of the federal endowment to colleges be used to purchase lands for experimental farms. But not until the Hatch Act of 1887 were agricultural experiment stations actually established.

Shortly afterward, thanks to Hays's vision, branch stations began to appear in Minnesota "in order to fit the technology of agriculture to each part of the state," Youngquist said.

Besides the Northwest Station at Crookston, the University operates branch stations at Grand Rapids, Waseca, Lamberton, Morris, and Rosemount. Together they constitute a system that's "the best in the west," according to Youngquist.

Personnel at branch stations "must have a broad base of scientific training since we must work closely with the industry of agriculture and study the whole scheme of production agriculture in our region," he said. "Crossing crop varieties in a



The Northwest Experiment Station at Crookston

greenhouse is the work of more specialized researchers at St. Paul. The branch station scientist must put the new varieties on trial in the field—in our case the raw, hard, cold Red River basin."

The Northwest Station serves the open prairie country of the Red River basin as well as the transition land between the prairie and the heavily forested land to the east. The station has tripled its original size and now extends nearly 1,500 acres into the surrounding countryside. And the University's technical college is right next door.

The station has a hand in all the crop, soil, water, and livestock practices used in the valley. It has been involved in the development of new wheat, barley, and sunflower varieties, in potato and sugarbeet research, in the production of livestock forage, and in testing fertilizers, herbicides, and pest control practices.

It is conducting several studies on livestock management that include such factors as animal breeding, nutrition, and environment. It has one of the top dairy herd management experts in the country in George D. Marx.

One of the success stories of the station's work, Youngquist said, is the sunflower, now in high demand worldwide for its oil and nutmeats. "We fathered the

sunflower industry," he said. Thanks to the early plant selection studies of R. G. Robinson, University agronomist working in St. Paul, and to the work of plant breeders since, new varieties ideal for growing conditions in the valley were produced.

But the gigantic increase in land devoted to the crop—from 3,000 acres 20 years ago to several million in Minnesota and North Dakota today—worries Youngquist and others. They foresee problems of plant disease and insect control and in "transport-



James J. Hill

ing that enormous volume of crop to market." The Duluth port may not be able to handle the load, he said. New crushing plants are expected to help solve the transportation problem within two years by reducing the load to oil, eliminating the bulky hulls.

In the livestock department, animal scientist Harvey Windels is studying sheep management systems with a view to stimulating interest among young farmers in raising sheep as a profitable enterprise. By crossing standard breeds with Finn sheep, known for multiple births and early maturing, he is able to produce more lambs more often.

Besides helping sheep flock owners to produce more lambs for market, Windels is looking at ways to cut costs of feeding and housing sheep. He acknowledges that predators may be a problem for anyone going into the sheep business, but the greatest problem is farther west where wildlife ordinances protect the coyote. In the Red River valley, sheep raisers are permitted to protect their flocks with guns if necessary, he said.

Speaking of reducing the cost of raising livestock, E. C. Miller, associate professor of agricultural engineering, has demonstrated that agriculture is attuned to the energy crunch. He has outfitted a livestock building with a solar collector.

Tests show that the collector helps to heat the building and aids ventilation. Good ventilation in livestock buildings is crucial because damp air fosters the growth and spread of harmful bacteria. The collector helps to reduce average humidity by 40 percent.

"Agricultural research costs, but it pays many times over, and there's plenty of evidence to prove it," Youngquist said. "The return on the public dollar is between 20 and 40 percent."

Youngquist sees food producers and the public as "more sophisticated nowadays. People want the answers to higher yields and disease control and a clean environment right now.

"But one thing should be kept in mind. The biological world moves at its own pace. You can't really do much to rush it."

by William Hoffman

Some birds fly north for the winter. This is not a freak of nature, but a perfectly natural phenomenon, and David Parmelee knows a great deal about it.

Parmelee is an ornithologist, but not of the ordinary sort. Two months of the year he studies and sketches birds from his base at Palmer Station on Anvers Island, just off the Antarctic Peninsula.

University professor and chairman of the Field Biology Program, Parmelee is also principal investigator for one of the University's two antarctic research teams, which are part of the United States Antarctic Research Project (USARP) run by the National Science Foundation.

One team is conducting research on seals under the direction of Donald Siniff, professor of ecology and behavioral biology. The team headed by Parmelee is mainly interested in the ecology, behavior, and migration of *Aves antarcticus*—the antarctic tern, the petrel, the gull, the sheath-bill, the shag, the South Polar skua, and, of course, the inevitable penguin.

The team of one postdoctoral researcher and four graduate students, all from the department of ecology and behavioral biology, knows that the penguin is not the only remarkable bird residing at the bottom of the world.

Several antarctic birds are known to sit on their frozen nests in the dead of winter. One species, the giant petrel, annually circumnavigates the ocean surrounding Antarctica. The arctic tern, a visitor from the north, spends part of each year on the antarctic pack ice. Due to its bipolar flight, it "probably sees more daylight than any other vertebrate," Parmelee said.

Early in 1976, David Neilson, one of Parmelee's students, outfitted a flock of skua fledglings with identification bands. South Polar skuas leave the Palmer Station area in April for the antarctic winter and return in October, but until recently no one knew where they went.

Then one of Neilson's banded skuas was recovered in arctic Greenland after it was shot by an Eskimo. Danish authorities contacted the bird banding headquarters of the U.S. Fish and Wildlife Service in Maryland.

Getting from Antarctica to Greenland by wing is no small feat. It's about 9,000 miles as the crow flies and probably more than that as a skua flies. Neilson's banded skuas also have

Banded Birds of Passage Tracked by Antarctic Team



South Georgia pintail. Parmelee's illustrations of antarctic birds will appear in his book *Bird Island*, to be published by the University of Minnesota Press.

been found in the Baja peninsula of Mexico and on the coast of Brazil.

But the annual migration of the South Polar skua to Greenland is perhaps less of a surprise to Parmelee than to other ornithologists. Years ago he recognized the species in a Copenhagen

museum, misidentified as an arctic skua. "This is no fluke," he said. "These birds are awfully strong fliers."

The winter vacation of the skua helps to explain the bipolar distribution of a species of lichen, according to Parmelee. A University of Wisconsin algologist believes the skua is responsible

for having transported the lichen between the only two places it grows—certain rocky areas of Greenland and Antarctica. Another example of the interdependence of nature.

Parmelee and the Minnesota team have an idea for harnessing radio transmitters to baby

skuas to monitor their migration via satellite.

"We'd like to track their longitudinal migration over long distances," Parmelee said. "It's hard to know exactly where these birds go. By monitoring them from satellite we could find out and at the same time open a new horizon for migratory research."

Electrical engineers in the Field Biology Program pioneered in radio telemetry and are now working on a technique that will involve satellite tracking, Parmelee said.

The Palmer Station area is one of a few places on the antarctic coast where the sea stays open year around, he said. "There's great opportunity to observe nonmigrating birds during the winter. The open water provides a rich feeding ground for resident gulls and shags." At least one team member stays on through the antarctic winter.

Besides being the scene of scientific observation and inquiry, Antarctica is also experiencing the consequences of economic competition and tourism. "The southern ocean is one of the greatest untapped sources of food in the world," Parmelee said. "And krill is one of its key foods."

The krill, a tiny shrimplike crustacean, is protein-rich and abundant in antarctic waters. Microscopic plants and animals flourish because of the higher oxygen content in cold water and because "ocean upwellings in that part of the world bring nutrients to the surface from the ocean floor, producing an extraordinarily rich food chain," Parmelee said.

"Fisheries people from Germany, Poland, Japan, and Russia are developing special techniques to harvest krill," he said, adding that cooperation among these and other signatories of a 1961 treaty, including the United States, "has been very good overall. There is some exploitation of whales still going on, but the seals are making a strong comeback."

Uncontrolled tourism is posing a hazard to the delicate balance of nature. Parmelee said that wealthy individuals in tourist ships like to stop off at seal colonies and penguin rookeries. "Uncontrolled tourism can be devastating to wildlife."

More enterprise can be expected soon, however, because of the growing tourist business. As better communication and transportation continue to make the world smaller, Antarctica is likely to loom larger in the minds of vacationers and entrepreneurs as well as scientists and military strategists.

Meanwhile, scientists from many countries continue to co-

operate through international scientific organizations. The Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) is an endeavor by several nations interested in the region to study all of the biological aspects of the southern ocean.

Another organization, the Scientific Committee on Antarctic Research (SCAR), is engaged in similar work, but includes geological and atmospheric research.

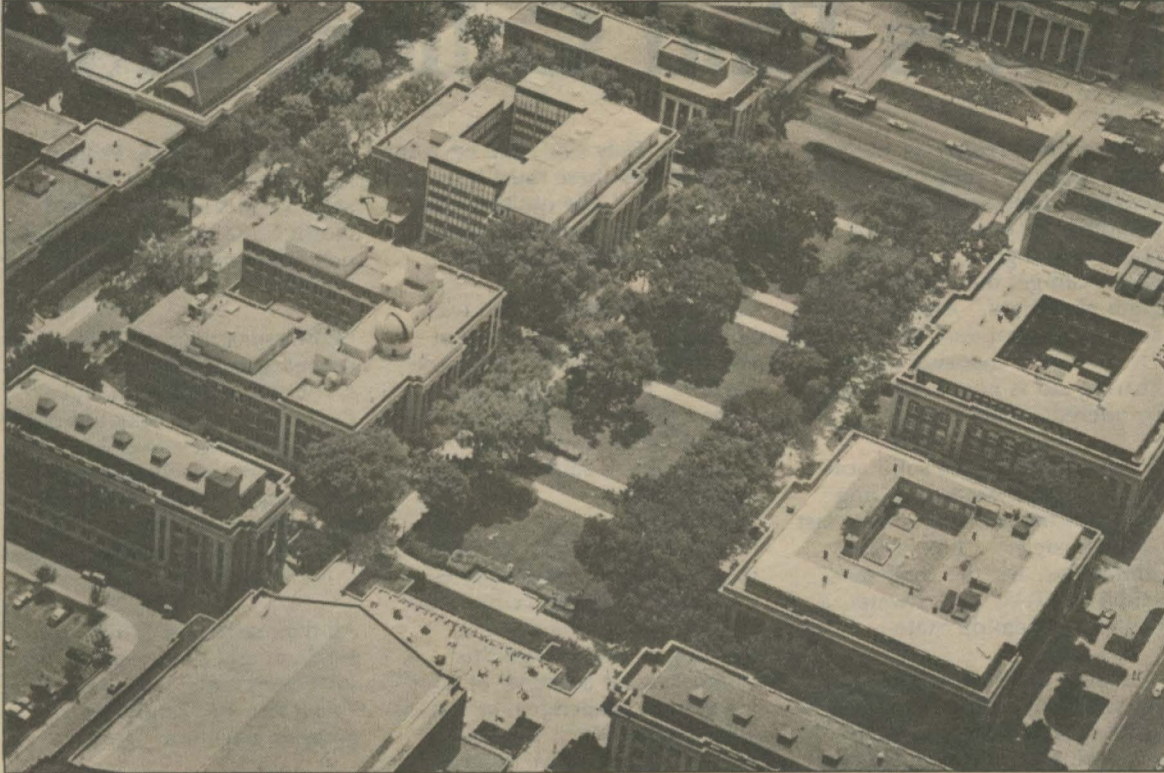
"I'm the U.S. representative of SCAR's biological subdivision on birds," Parmelee said. "We meet each year in one of the countries involved in the program. Last year we met in France, and in August we'll meet in South Africa." Other representatives to SCAR are from Great Britain, Germany, Poland, Chile, Argentina, Norway, Australia, and New Zealand.

Parmelee's annual migration south is more than a professional task. "It's my true love, you might say. Before I came to Minnesota I had made 10 expeditions to the Canadian Arctic. When I took the job as director of the Itasca station for the summer months I had to drop 15 to 20 years of arctic research. But I had the opportunity to switch polar regions and summer seasons."

Parmelee noted that women are gradually working into the antarctic program. "I think it's a healthier and more natural situation," he said. "At Itasca we have nearly as many female as male students." He hopes to see the same in Antarctica.

When he is not studying and drawing birds ashore, Parmelee might be found doing the same aboard the *Hero*, a National Science Foundation research vessel. And as the *Hero* passes by the Antarctic Peninsula, he might look up and observe Parmelee Massif and Neilson's Peak—recently christened by the government's geographic names division.

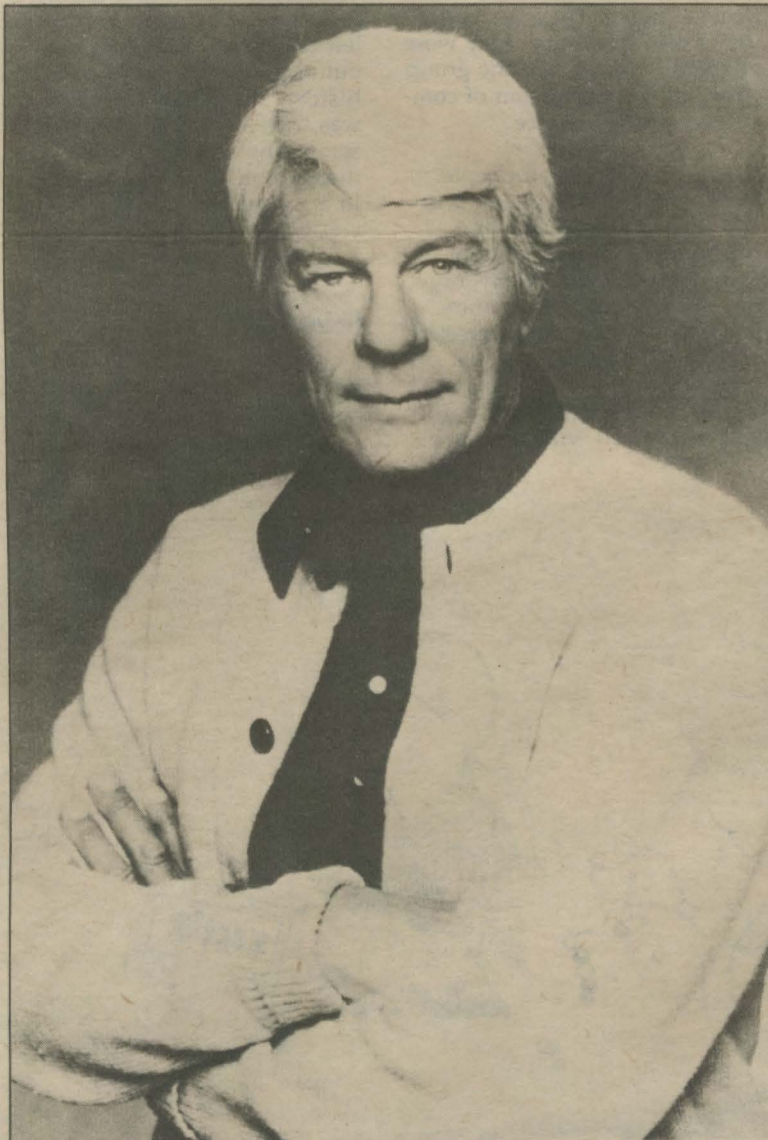
Such are the benefits of braving the antarctic cold.



Big is Beautiful

The mall on the Minneapolis campus, looking south toward Coffman Union. The Twin Cities campus remains the largest in the nation both in total enrollment and in the number of undergraduate students, according to recent figures released by the National Association of State Universities and Land-Grant Colleges. The Twin Cities campus has a total enrollment of 63,223, a figure that includes both day and evening students. The total University system is the seventh largest in the nation, with 75,711 students.

Tom Foley



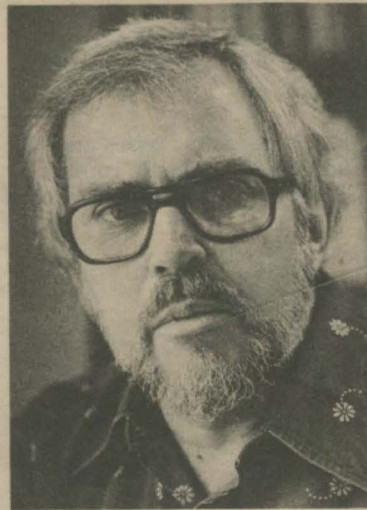
Graves to Head Minnesota Fund

Movie and television star Peter Graves, a University of Minnesota alumnus, has accepted the position of national chairman for a new fund raising campaign to benefit the University. The Minnesota Fund is an effort to solicit financial support from alumni for University programs. Contributions will be used for, among other things, scholarships, student assistance, library acquisitions, and programs within specific colleges and departments.

Cattails . . .

government is not looking into alternative fuels more actively."

He hopes to form a biomass research center at the University. "We need a systems approach, and we need to rethink the en-



Douglas Pratt

ergy problem in terms of economy of scale."

For instance, cattails, although not a practical fuel for a large city, could provide all the energy needs of small communities located near cattail plantations. Regions of northern Minnesota might be economically revived by biomass development, he said.

Instead of such communities suffering fuel shortages at the end of the pipeline or fostering the growth of mammoth power plants many miles away, more would be accountable to themselves. More would be inclined to conserve energy and keep their backyards clean.

Tom Foley

Elderhostelers Find College Best Vacation

by Maureen Smith

When Sally Hillengass of Cloquet was on the Twin Cities campus last summer as an Elderhostel student, she started the mornings with a spring in her step.

"You go to your classes and you get the feeling that you still have much of life ahead of you," she said. "You can absorb college-level classes. It boosts your ego. When I left there I felt 20 years younger."

Inspired by the youth hostels and folk schools of Europe, Elderhostel offers one-week experiences of campus life and learning for people over 60. The program, which began on the East Coast, is in its fifth year nationally and its second year in Minnesota. More than 15,000 hostelers are expected at campuses across the country in 1979.

Hostelers live in dormitories and eat in college dining halls with other summer students. To keep costs down for people on fixed incomes, the colleges offer the program at no profit, and grants have been received from private, state, and federal sources. Hostelers in Minnesota in 1979 will pay just \$94 for a week.

Four University of Minnesota campuses—Twin Cities, Duluth, Morris, and Crookston—are among 19 participating colleges in the state. Carol Daly learned about Elderhostel from her parents, who came to the Twin Cities as hostelers last summer, and she now coordinates the state-wide program from her office on the Twin Cities campus.

Daly's parents were enthusiastic about their Elderhostel experience: "It was the best week's vacation they had ever had, and it was also the best visit we ever had," she said. "This year they're coming for two weeks."

Something brainy

At the heart of Elderhostel are serious academic courses. "I liked the fact that the courses offered were all solid and had some 'meat' in them," said Marvin Holian of Northfield, a hosteler in 1978. "Anyone can take 'Advanced Sandbox' anywhere."

Gladys McDonald of Rockville, Nebraska, said she was pleased "to hear college professors lecture to us, not as senior citizens, but as people capable of absorbing all they had to offer."

"One of the precepts of the program is to offer only liberal arts courses," Daly said. "We are avoiding the crafts—not that crafts are no good, but older adults can get that kind of program elsewhere." Also avoided are courses that deal with aging. "A course on choosing a proper hearing aid is not ever going to be offered," Daly said.

Appreciation for the solid academic classes was a recurring theme in the comments from last year's hostelers. "I liked the stimulation and the challenge," said Theo Telke of Stillwater, a hosteler at Bemidji State.

"I'm sure there are a lot of people who like ceramics and knitting, but I'd rather have something kind of brainy," said Edelweiss Huntley of Cyrus, who is 81 and planned to return to the Morris campus this summer for her second year as a hosteler. "It looks to me as if our Minnesota-Morris has the most interesting curriculum of all."

"I'm not into rosemary or making puppets," said Mayme Glavan of Bloomington, a hosteler on the Twin Cities campus last year. "A rest home won't be good for me."

Only three crafts classes are included in the 60 or 70 courses offered by Minnesota Elderhostel

this year, Daly said, and even in these classes there must be some "head stuff." The quilting class at Crookston, for example, includes a history of quilting.

The quilting class, which was offered last year too, was just what some hostelers were looking for. "I was determined to come here and take quilting," Harriet Gelula of West Des Moines, Iowa, said last summer in Crookston.

Professor Norman Moen, who taught a Minnesota history class for hostelers on the Twin Cities campus last summer and is teaching a similar class this summer, is an advocate of offering serious academic material to older adults. Moen was impressed with his Elderhostel students: "They were alert, articulate, lively. They laughed, they asked questions, they were attentive." Moen said the group gave him an impression of competence and assurance.

"They were informed people. Many of them read a good bit, and their interests were not solely retrospective. I taught a history class and I like history, but these were contemporary people who were not interested only in the past."

The Elderhostelers were similarly impressed with their pro-

fessors. "I nominate Professor Moen ambassador of Minnesota," said Viola Babcock of North Carolina. "What a treat to listen to him impart his love for his state."

"Professor Liberman was an excellent, inspiring teacher, a scholar of real breadth and depth. We were lucky to have him," Betty Nelson of Mankato said about Anatoly Liberman, who taught a class on Scandinavian folklore last summer and is teaching a German folklore class this summer.

All the teachers at Morris were excellent and philosophy professor Peter French was "remarkable," Huntley said. "We're going to have him again."

For many of the hostelers, the learning didn't end when they left campus. "I took some books out of the library on Minnesota history, that's how interested I was," Hillengass said. "There's something you can follow through on. They give you a lot in a week and leave you feeling you want more."

Friends for life

Elderhostel is more than classroom learning. Each campus plans social and cultural events

and tours for the hostelers, and dormitory living offers opportunities for making friends.

"A lot of the hostelers are frightened when they come, but a real sense of camaraderie develops," Daly said. "The dormitory experience is good although it doesn't have all the comforts. That doesn't seem to matter."

"You meet the nicest people," Hillengass said. "I've made friends I'm sure will last a lifetime. After concerts, we'd have gab fests in somebody's room. It was just like being in college again."

Hostelers on the Twin Cities campus stayed in Centennial Hall last year, and Gerald Griffin of Park Rapids enjoyed checking out the remodeling of nearby Pioneer Hall, where he had lived when he was a Gopher quarterback under Bernie Bierman in the early 1930s. "It was nice to see the campus again," he said.

Many of last year's hostelers were from other states and other parts of the country. "There was a good deal of sectional banter, a lot of fun," Moen observed.

Talking with younger students and international students is another plus for the hostelers. "There were summer students that we saw and talked to. We



ate in the same hall," Glavan said. "There were people from Nigeria. We took a Japanese girl when we went to a Dixieland concert." Hillengass was happy for "a chance to visit with some of the young people and some students from Morocco."

Telke and Frances Johnson of Eagan met at Elderhostel at Bemidji last summer, formed a friendship that has continued, and volunteered together to help spread the word about Elderhostel—writing news releases, placing public service announcements on television stations, addressing envelopes. "The program is so good, it's just a matter of getting the news around," Telke said.

Elderhostel gypsies

Planners were surprised last year by the number of hostellers who came from other states. "We had expected that people would be mostly from Minnesota, and they weren't," Moen said. "And yet they were very interested in the Minnesota history course."

"Some people go from one Elderhostel to another all summer long. A couple in the class I taught were going the next week to Montana. They were Elderhostel gypsies."

Frederick Rathjen of Sun City, Arizona, was at Crookston last year at his eighth Elderhostel of the summer. "You get a much better idea of a place through Elderhostel than you would on a vacation," he said. "The price is right. There is no other place you can go on vacation for \$100."

Whether they attended several

Elderhostels or just one, other hostellers agreed. "Travel is nothing compared with Elderhostel," Hillengass said. "It's so much better than going on an ordinary vacation. You get everything in one package—you see points of interest, there are cultural activities—and all at a price that's remarkable."

"It's the best vacation in the world, the best activity. It's learning and having fun."

Coming back for more

Daly said she was surprised when applications for this year's Elderhostels started coming in and she saw how many of last year's hostellers would be returning. One registered for Elderhostels on five campuses in Minnesota and another for six Minnesota Elderhostels.

"I called the first one because I couldn't believe it—I thought she had made a mistake and was giving her first through fifth choices, but she wanted all five."

"One of the delights of the program for me has been what it has done to my stereotypic image of aging," Daly said. "It really is wonderful to be around so many bright, alert, strong people, older adults who have deteriorated not at all. Aging isn't nearly as scary to me now."

Older people themselves have been fed the same discouraging image of aging, Daly said. "They have to say to themselves, 'It must be everyone else—it's not me,' when in fact the image really is mythical."

"Elderhostel says to older adults that we believe they want to continue learning and they are capable of dealing with any material anyone else can deal with," Daly said. "We know they want to be stimulated and challenged. They've proven to us that they do."

Older people "don't need basket weaving every day," said Trish Blomquist, coordinator of Elderhostel on the Twin Cities campus. "Their minds haven't stopped functioning."

"A person my age really needs an ego boost," Hillengass said. "I have to go to Elderhostel again to have my battery charged again."

Sixteen 'U' Alumni One Big Happy Family

by Ronaele Sayre

Eighty-four-year-old Lucy Gibbs Hamel of Minneapolis graduated from the University of Minnesota in 1918 and last year attended the 60th reunion of her graduating class.

But Lucy Hamel's connections with the University of Minnesota go far beyond class reunions. Six of her 10 children attended the University and nine of her 50 grandchildren have attended or are attending the University.

With its 16 University alumni, the Hamel family qualified easily for top honors in a recent search by the Minnesota Alumni Association for the family with the largest number of lineal, living alumni.

The Hamels were honored at the Alumni Association's 75th anniversary celebration in June.

Lucy Gibbs graduated with a degree in English and French, was active in many campus organizations, and earned a letter with the women's swimming team. She was elected to Mortar Board, an academic honor society.

About a year after graduation, she went to an alumni gathering and met Arnold Hamel, a 1915 graduate of the University's Medical School and a general practitioner in Minneapolis. The couple married and raised ten children, five boys and five girls.

At the time of Dr. Hamel's death in 1946, seven of the children were in college, six of them at the University of Minnesota. Hamel children who attended the University are Robert, Arnold Hamel, Jr., Mary Hamel Ryan, Anne Hamel Hickey, Virginia Hamel O'Connor, and Lucy Hamel Wilhoit.

Two Hamel sons and a grandson have continued the family involvement with the University's Medical School. Arnold Hamel, Jr., received his master's degree from the University and is an associate clinical professor in orthopedics, Joseph Hamel is an associate clinical professor in obstetrics and gynecology, and Hamel grandson Ed Ryan is a third-year medical student. Virginia Hamel O'Connor worked as an assistant head nurse in pediatrics at University Hospitals from 1955 to 1960.

The Hamel family members do not have to wait for class reunions to trade stories about life at the University. Seven of the Hamel children live in south Minneapolis, close to their mother, who lives with son Jim at 5640 Pleasant Avenue. In addition, the entire family spends varying lengths of time at the family retreat at Big Whitefish Lake, 30 miles north of Brainerd.

"Until my daughter Mary and her family moved to Fargo, North Dakota, my whole family lived near me," Hamel said. Her daughters come twice a day or make sure someone else comes to help her with the traction required for a degenerative condition of the spine.

"I enjoy my children very much. Both my husband and I wrote poetry, and I plan to write about my children and call it 'Love Story: The Blessings of Children,'" Hamel said.

Some Hamel alumni have spouses who also attended or graduated from the University. Anne Hickey's husband, William, is on the board of directors of the Minnesota Alumni Association.



Lucy Gibbs Hamel and family alumni

Tom Foley

by Mark E. Canney

Scientists at the University of Minnesota have enlisted one of nature's more efficient cleaning agents to rid coal of inorganic sulfur.

Since supplies of oil are uncertain, coal is being touted as a major source of energy for the future. Theoretically, there is enough coal in the United States to satisfy the country's energy needs for the next 400 years.

The use of coal, however, does have serious environmental consequences. Inorganic and organic sulfur contained in coal produce airborne pollution when the coal is burned. This pollution can irritate the eyes, throat, and lungs and has been implicated in bronchitis, emphysema, and asthma.

Inorganic sulfur is found at high levels in coal from the eastern United States, and organic sulfur is predominant in coal from the western states.

When sulfur-containing coal is burned, sulfur dioxide is released and transformed in the atmosphere into ammonium sulfate and sulfuric acid. Ammonium sulfate causes lung damage in humans, and airborne sulfuric acid may fall to earth as acid rain, which has already caused extensive damage to lakes and waterways.

Michael R. Hoffmann, assistant professor of civil and mineral engineering, and microbiologist Henry M. Tsuchiya have been experimenting with bacteria that "eat" inorganic sulfur.

Bacteria have been accused of causing major disease epidemics. But bacteria also are known for their ability to break down various substances to fulfill their own nutritional requirements.

Bacteria Enlisted To Clean Coal



The bacteria Hoffmann and Tsuchiya have been studying are not disease-causing, and they may prove to be an efficient tool for cleaning coal.

The bacteria under study are found in acidic streams flowing through abandoned coal mines in the eastern United States. Inorganic sulfur, in the form of iron pyrite, is part of their diet.

A process currently in use in the coal industry removes some of

the inorganic sulfur from coal. In this process, called the slurry method, sulfur is separated from coal by adding water to pulverized coal. Sulfur, which is denser, sinks, while the less dense coal floats. The coal can be removed from the solution, leaving the sulfur behind.

Tsuchiya and Hoffmann's bacteria method begins with the same mixture of crushed coal and water but goes a step further. Bacteria are introduced into the

mixture to break down the sulfur and eventually ingest it. The tiny organisms send out an extracellular enzyme that acts as a catalyst in oxidation of the sulfur.

After they ingest the sulfur, the bacteria can either be removed from the cleansed coal or left to feed on additional nutrients supplied them until the next batch of dirty coal is introduced. Left without nutrients, the microorganisms eventually become

cannibalistic and kill each other off, Hoffmann said.

"The slurry method removes approximately 60 percent of the sulfur. The bacteria are capable of removing up to 98 percent," Hoffmann said.

The slurry method is not as thorough in its cleaning abilities as the bacteria method, but is the faster method, Hoffmann said. The slurry method takes only a few hours, whereas the bacteria can take several days to remove the sulfur.

According to Hoffmann, "culture shock" is the prime reason for the sluggishness of the bacteria. When they are introduced into the water and coal solution, the bacteria go into a slump. They won't eat, and they seem to enter a period of dormancy. The researchers are now looking for a way to help the bacteria overcome the shock of being put into a new environment.

"Young persons are supposed to be better able to adjust to new environments. We're looking for the bacterial age that is analogous to that resilient age in young people," Hoffmann said.

Once the bacteria best able to adjust to the change are found—and Hoffmann is confident that they will be—he and Tsuchiya are certain that the bacteria method will prove to be much more effective than the slurry method.

Hoffmann and Tsuchiya's research has so far dealt primarily with inorganic sulfur, but they are beginning to study similar methods for removing organic sulfur.

Correspondence

A Vital Link

Our daughter was graduated [in June] in ceremonies at Northrop (B.S., biology and physical education, with distinction), and during the two-plus years she was on campus, we have received—and enjoyed—*Update*.

In my opinion, it is an exceptional editorial effort and, really, the *only* communication we have ever received from the University of Minnesota. It has been our only link with the University. The photography and editorial development [are] truly outstanding.

Please keep us on the mailing list. We look forward to your upcoming issues.

Ray L. Clark
Kenilworth, Illinois

Uranium Dangers

Your article "Uranium Sparks Min-

ing Interest" [spring 1979] was very interesting to me. The article, however, did not note a couple of matters which I point out below.

A moratorium on uranium prospecting should be imposed, at least, until safeguards for waste disposal have been found. Tailings can remain active for 80,000 years. If no adequate waste disposal system is found, radioactive wastes will pose a potential danger to future generations.

There is still no true guarantee that ground water will not be contaminated. Until proof is found that such waters can not be contaminated, all exploration should stop. Health problems could result from low-level radiation.

Our state must enact a policy before uranium is discovered and mining begins. The legislature did not act this year. Next year, however, action may very well be taken.

This is a potentially dangerous activity, uranium mining. Notice that I

have not even mentioned the danger there is in what this mined uranium will be used for. Remember Three Mile Island.

R. J. F. Kramer, President
International Ecology Society
St. Paul

A Matter of Taste

I was intrigued by your "Flavor Chemist Shows Good Taste" article [spring 1979]. What I mostly appreciated about the article was that unlike a lot of academic readings, this one was intellectual, informative, interesting, and positively oriented. It had life to it. Elizabeth Petrangelo is an excellent writer.

Thomas Bonhiver
Minneapolis

Editor: We think she is, too.

In a Nutshell

May I compliment you and your staff on the scope and quality of informative material in *Update*—it is

sparkingly intellectual. My wife, an alumna, receives your quarterly, and we have found that it updates our knowledge in areas that include many not usually covered in general news publications.

Scanning the last five years of *Update*, it occurred to me that a cumulative index, perhaps once a year, would be very useful, if it gave subject, and cross-indexed title and persons interviewed. We file all the issues for future reference.

Vernon Holgate Hayes
Del Rio, Texas

Editor: We are considering your suggestion.

A Village Voice

Your *Update* publication has done a superb job of describing and promoting the University. I enjoy each issue. Although the Pioneer Hall article and photos [winter 1979] were particularly interesting to me (I lived at Pioneer immediately after World War II), I confess that *all* the write-ups have been good reading. The

format, photography, and artwork add to the *Update* attractiveness. Best regards.

Robert B. Morris, B.S. '42,
M.A. '48
Village Manager
Glencoe, Illinois

Perennial Doubt

Just a word of appreciation for the present edition of *Update*. I have always found your publication interesting, but the current number [spring 1979] is outstanding. It reminds me that Lord Balfour's *Defence of Philosophic Doubt*, though published in 1879, should be of current interest to scientists and theologians as well as to professional students of philosophy. The problems of the latter discipline are indeed perennial.

A. C. M. Ahlen
Minneapolis

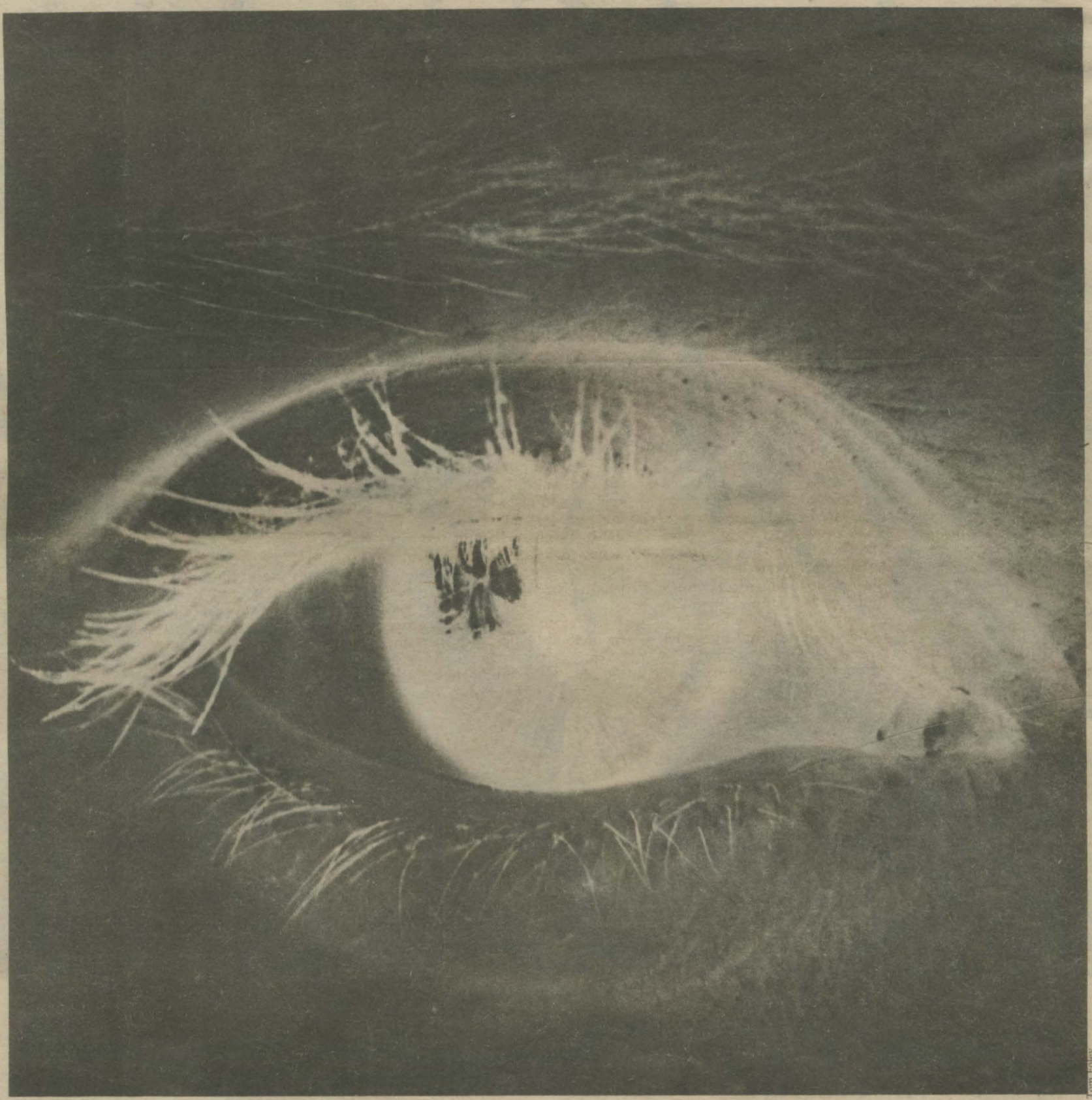
Editor: Indeed.

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UPDATE

Fall 1979
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Number 1

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Friends of the
University of Minnesota

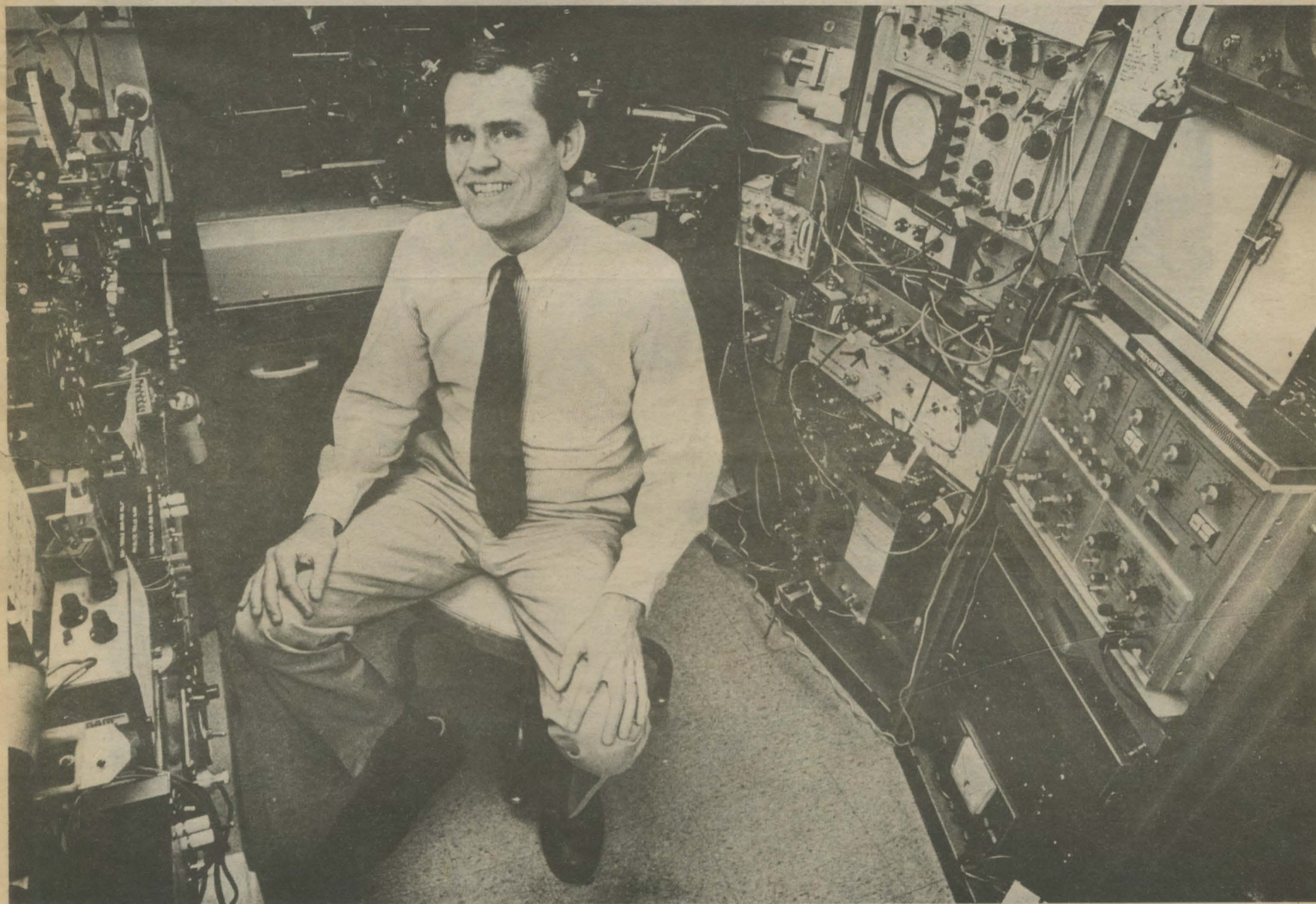


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How does the eye see color? For the answer look inside.

**Also: Field Biology Blooms at Itasca • Historian Travels a Two-Way Street
Remembering a University President • 'U' Signs Exchange Pact With China
A Visual Visit to Freshman Camp • A Timely Treatment for Cancer Victims**

Scientist Sheds Light on Secrets of Color Vision



Dwight Burkhardt

by Elizabeth Petrangelo

Flashing fires, bottomless pools, glittering lamps, wells of truth, windows of the soul—for centuries, poets and songwriters have used countless figures of speech to describe the human eye as an object of mystery.

Although still mysterious to wordsmiths, the eye is rapidly yielding its secrets to scientists, who have taken the theories Isaac Newton devised in the 17th century and added to them layer upon layer of research.

But the eye still keeps a few secrets to itself, and Dwight

Burkhardt, professor of psychology on the Twin Cities campus, is working to understand one of them—how the eye sees color. Using a sophisticated battery of equipment and an unlikely research subject, Burkhardt has added new information to our knowledge of the way the eye sends its electrical messages to the brain to produce a perception of color.

Scientists know that vision begins in the retina, which lies along the inner wall of the eye. "The retina has been called the 'little brain inside the eye'

because of the similarities between the retina and the brain," Burkhardt said. "The retina develops from brain tissue. To some extent, what we learn about the retina has implications for our understanding of the brain."

"The retina is a complex network of interconnected nerve cells," he said. "Trying to understand it is roughly the same as being handed a computer and told what it does and then being asked to find out how it does what it does. We're trying to untangle the network."

The retina is made up of five basic types of nerve cells, or neurons. The receptor cells lie at the back of the retina. Then follow, in order from back to front, the horizontal cells, the bipolar cells, the amacrine cells, and the ganglion cells, which channel into the optic nerve and into the brain.

There are two classes of receptor cells, the rods and the cones. The rods are responsible for night vision and the cones for daylight vision. Without cones,

the eye would see only shades from white to gray to black.

Although they are the last cells to be struck by light, the receptor cells actually begin the process that ends in perception. Light first passes through the pupil, the iris, the cornea, and the lens, then through each succeeding set of retinal nerve cells, before striking the receptor cells.

When a bit of light strikes the eye and travels to the retina and the receptor cells, a complicated electrical chain is set in motion. Each set of cells communicates

to the next an electrical message that is modified as it is transmitted, determining the code that will be sent to the brain. The brain receives the coded

to work. Using extremely sensitive equipment and a box shielded from external light and electrical interference, Burkhardt inserts a fine glass electrode into

nature of the light source from a complex optical system operated by Burkhardt.

With a series of lenses and optical elements, Burkhardt can vary the size, position, intensity, and color of the light. The responses are recorded on magnetic tape and fed into a small computer for analysis.

Dye is then injected through the microprobe into the cell. "We then remove the electrode and can cut the eye tissue into very thin sections, look at it under a microscope, and study the specific cell from which we have recorded," he said.

The procedure is relatively new, and until it was developed, researchers could not be sure they were looking at the same cell from which the electrical responses were coming. "For the first time, we can link the function of a specific nerve cell with the structure of the cell," he said.

According to Burkhardt, the method has been applied so successfully to the retina that all of the major classes of neurons have been identified and classified. The horizontal cells in the eye of the walleye, for instance, are also very large and can be studied in this way. These cells discriminate red from green by giving a negative response to green and a positive response to red.

Burkhardt brings an eclectic academic background to his study of vision. He holds a master's degree in optometry from Indiana University and a doctor of philosophy degree in experimental psychology from



A receptor cell injected with dye

Brown University, and he did two years of postdoctoral work in the ophthalmology department at Johns Hopkins University.

He is no ivory tower researcher. On the faculty for the past 10 years, Burkhardt teaches a large undergraduate course on sensation and perception and graduate courses in sensory neuropsychology and vision and this year will collaborate in the *Color vision*, p.16

Why Newton and Goethe Failed To See Eye to Eye

by Elizabeth Petrangelo

The search for empirical information about the eye and how it sees color is centuries old. Since 1960, the exploration of color vision—and the whole field of vision research, for that matter—has exploded. But modern scientists are expanding on work that was begun hundreds of years ago by some of the

twist, and cripple Nature's heart. Superstitions and confusions are with us since ancient times—leave the specters and delusions in the heads of narrow minds. When you turn your eyes to heaven skyward to the azure flow, when at dusk the Sun is



Isaac Newton

greatest minds of Western civilization.

The physics and the biology of color perception are intimately linked, and to understand how the eye sees color scientists first had to discover the physical properties of light itself. In 1677, Sir Isaac Newton first demonstrated that all the colors of the spectrum are revealed when white light is passed through a prism.

This classic experiment, which is fundamental now to every elementary physics class, was greeted with such skepticism by his contemporaries that Newton said, "I was so persecuted with discussions arising out of my theory of light that I blamed my own imprudence for parting with so substantial a blessing as my quiet to run after a shadow."

Hounded by his critics, Newton put off publishing *Opticks*, his historic work on light, for 32 years, until his fellow physicists were ready to accept it.

But even as late as 1810, the German poet and philosopher Johann Wolfgang von Goethe was still unwilling to accept Newton's work. Ever the poet, Goethe did not approve of the experimental method and felt that the true essence of color was sorely mistreated by scientists fiddling in dark chambers. In *Zahme Xenien* he wrote:

Friends, escape the dark enclosure,
Where they tear the light apart
and in wretched bleak exposure



Johann Wolfgang von Goethe

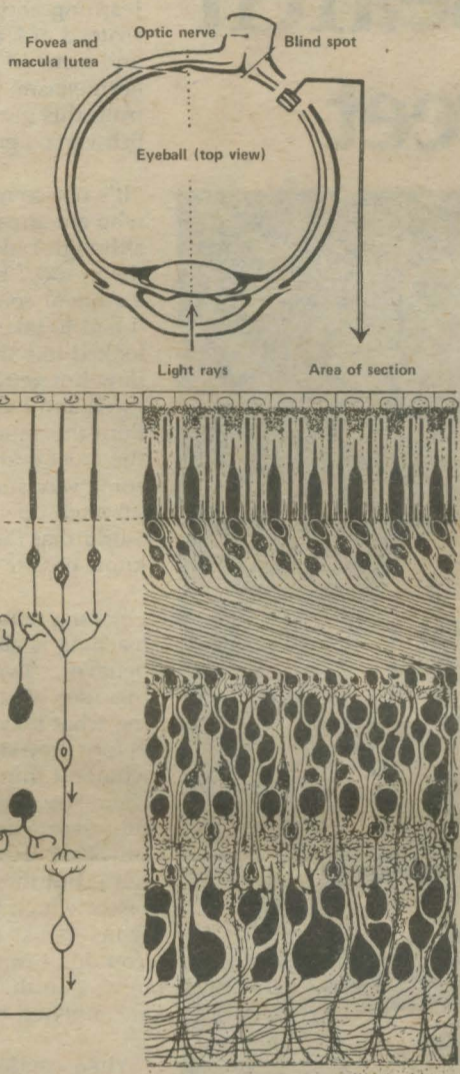
driven down in crimson fireglow
There in Nature's deepest kernel
healthy, glad of heart and sight
you perceive the great eternal essence of chromatic light.

But Goethe's antiexperimental bias did not prevent him from making a contribution to the understanding of color perception. He pointed out certain subjective aspects of color vision ignored by the Newtonians and argued for the study of these aspects by direct observation.

Goethe's idea of observation seems to have influenced Ewald Hering, who based much of his work in the late 19th and early 20th century on common experience. Hering theorized that there must be two basic dimensions to perception—color and brightness. If we see things in these two ways, then we must have two different physical systems in our eyes—one that signals brightness and another that signals color.

Hering also observed that we never see blue and yellow at the same place at the same time, and that if blue and yellow lights are combined we see no color at all, only white. But instead of attributing the effect to some property of the light itself, Hering theorized that the phenomenon of "complementary

Newton and Goethe, p.16



A cross section of the human eyeball (top) and a cross section of the human retina (bottom)

information and analyzes it, and the result is vision.

To understand just how the retinal neurons relay messages, researchers must be able to measure the minute electrical responses and, further, to determine the exact cell from which a response is emanating. To make those measurements, they have turned to animals as subjects of study.

"Fundamentally, the eye is similar from fish to man," Burkhardt said. "The basic plan is the same in all vertebrates."

But human retinal cells are extremely minute, so small that physical manipulation can easily damage them so that their function cannot be studied.

Scientists had already discovered that turtles and certain fish had retinal cells large enough to study. But several years ago, Burkhardt happened across a lucky discovery: an anatomy paper published in 1944 that said the cones of the walleye—the Minnesota state fish—are remarkably large, larger in fact than the cones of any other animal.

After stocking his laboratory with a supply of walleye—no easy task in itself—Burkhardt set

a functioning walleye cone and measures the electrical response to light.

The procedure works like this: The eye is removed from the walleye and kept in an oxygenated chamber, where it will respond normally for up to five hours. It is dissected to expose the retina and positioned on a thumb-size platform that vibrates when activated.

A microelectrode—a hollow tube about 1/100,000 of an inch across at the tip—is placed on the functioning cellular tissue. Then the vibrating platform is activated, and the electrode penetrates the cell.

The microprobes are made individually in the laboratory, using a principle taught in elementary chemistry. The tiny glass tubes are heated, then pulled apart with a snap so that the tips are drawn down to wisps.

After the electrode is in place the "fishing" begins. The probe is manipulated by remote control until an electrical response to light is displayed on an oscilloscope, signaling that the electrode has entered a cone. The nature of the electrical response changes with the

by Maureen Smith

Last spring when a number of University faculty members were receiving prestigious awards, Stuart Schwartz was a double winner, honored for both his teaching and his research.

Schwartz, professor of history on the Twin Cities campus, received a Guggenheim fellowship for research on the sugar economy of Brazil and a Horace T. Morse-Amoco Foundation award for outstanding contributions to undergraduate education.

Is it unusual for the same person to excel in teaching *and* research? Schwartz insists that it is not. One of his strongest convictions is that teaching and scholarship go together.

"If you looked down the list of people who have won teaching awards or who are known by students to be good teachers, you would not find a division between them and those who are known to be excellent scholars," Schwartz said in an interview. "There are exceptions, but often the distinction that is drawn between teaching and scholarship is used as an excuse by people who don't like to do one or the other."

Schwartz likes to do both. He works long days—he says his work begins in earnest once his work day on campus has ended at 4 or 5—but his wife tells him it isn't really work because he enjoys it so much.

His own experience exemplifies the way that teaching and research can nourish each other. "It's not a one-way street," Schwartz said. "It isn't just that I bring in my research to enrich my teaching, but in some ways the teaching has provoked questions that I find useful in research."

One course Schwartz teaches, with his colleague Russell Menard, is a comparative course on slavery in the Americas. "Usually a large number of the students in the class are black graduate students," Schwartz said, "and some of the questions they have raised have helped me to define research questions."

Opening a window

Schwartz came to the University in 1967 as the first full-time Latin Americanist in the history department. "I have always perceived myself as sort of a proselytizer for Latin America

Historian Finds Teaching and Research a Two-Way Street



Stuart Schwartz as Juan Gines de Sepulveda, a Spanish scholar indifferent to the rights of Indians. Schwartz and a colleague annually reenact a 16th-century debate between Sepulveda and Bartolome de las Casas, a defender of the Indians. "We ham it up considerably," Schwartz said.

and things Latin American," he said.

Students often sign up for his classes in order to satisfy a foreign language requirement by learning about another culture instead of learning a language, and some of them enter with no enthusiasm. Winning converts from this group is one of Schwartz's greatest joys.

"It's not so much the students who are already interested, although I like working with them, too," he said. "But when a student comes to me and says, 'I had to take this class and it looked like the biggest bore, but now I'm getting kind of interested and I'm going to Mexico or Peru this summer'—for me that's the most gratifying. I've been in some way successful in opening up a window to a part of the world that the student didn't know or care about before."

Opening windows is what good teaching is all about, Schwartz believes. "I've never understood this idea of students determining what they're going to study before they start. Students wouldn't think of going into a chemistry course and telling the professor what chemical combinations they want to work with, but they will tell a professor which historical events or which books they want to study. You don't run into that so much now as in the sixties, but I have encountered it.

"When you learn some things you didn't know anything about, you broaden your horizons for the rest of your life."

A good show

Every year Schwartz and his colleague Allan Spear dress in academic robes and stage a recreation of a debate that was held in 16th-century Spain.

"The Spanish were very concerned about the justice of their conquest in the New World and whether they had treated the Indians fairly, and rather remarkably the Spanish crown decided to hold a debate," Schwartz said.

In 1550 the two sides were presented on different days, but Schwartz and Spear engage in a face-to-face debate. Spear always takes the role of Bartolome de las Casas, a defender of the Indians, and Schwartz plays Juan Gines de Sepulveda, a scholar who didn't care much about the rights of Indians. "I get the heavy in the debate," Schwartz said.

"We ham it up considerably, but our arguments are based on the

actual presentations of the two men," he said. "We ask the class to serve as the council of the king, and over the years the students have found it to be a very effective teaching tool."

The students enter into the spirit of the debate, addressing questions not to "Professor Schwartz" but to "Dr. Sepulveda."

"We do it in good humor, but the intellectual content is very real," Schwartz said. "The students like it and we like doing it." Some students have told Schwartz that they had read about the debate in a book and it didn't mean much but now they will never forget it.

Schwartz remembers the time that Frank Sorauf, then dean of the College of Liberal Arts, walked by the room when the debate was being staged and did a double take. But Schwartz wasn't worried about what his dean would think.

"I don't think good teaching is showmanship, but there's nothing wrong with using showmanship when it's effective," he said.

Benign slavery?

For his Guggenheim project, Schwartz will be writing a book about the plantation economy and social structure of Brazil in the 17th and 18th centuries, a time when Brazil was under Portuguese rule and slaves were being brought in from Africa to work the sugar plantations.

"They used to say in the 17th century that without Brazil there could be no Portugal, without sugar there could be no Brazil, and without slaves there could be no sugar," Schwartz said.

Slavery in Brazil was similar in some ways to slavery in the American South and very different in other ways, he said. The traditional view among historians has been that slavery in Brazil was more benign, and scholars have looked for explanations in Portuguese culture or in Catholicism.

Instead of looking at the question from a cultural perspective, Schwartz has collected data from wills and testaments, notary records, land transfers, and census material, and he believes that the statistical material sheds quite a different light on the subject.

"The physical condition of slavery in Brazil was probably as brutal as existed anywhere in

the New World, and my study will document that," he said.

The brutality resulted not from Portuguese cruelty so much as from the nature of sugar production, he said. "It simply consumed people."

A major difference between slavery in Brazil and in the American South was that the slave population in Brazil did not reproduce itself, Schwartz said. "There were always more deaths than births." Schwartz has used census material to study the different rates of birth and death in the slave and free populations.

Because the mortality rate among slaves was so high, plantation owners in Brazil kept bringing in more slaves from Africa. It was cheaper to buy a new slave than to invest in the care of a child who might not live and who would not be able to work until about the age of 14 anyway.

By 1860 almost all of the slave population in the United States had been born in the United States, but most of the slaves in Brazil had been born in Africa. As a result, Schwartz said, even today the black culture of Brazil is more overtly African than the black culture in the United States.

Racial discrimination in Brazil has taken a different form than in the United States, he said. Because of intermarriage among people of European, African, and native Indian ancestry, Brazilians are not just black or white but all shades of tan and brown in between, and "it makes a difference what color you are."

Brazilians of all colors have held to a myth that their society embraces racial equality, he said, and as a result black Brazilians have not protested against the discrimination that does exist and have not achieved gains.

It is probably true that in 1900 blacks in Brazil enjoyed better conditions and higher status than blacks in the United States, he said, but the situation is beginning to be reversed and many Brazilian blacks are looking to the experience of American blacks as an example to follow.

Pieces of a puzzle

About four years ago Schwartz conducted a large quantitative

study of the slaves in Brazil who were voluntarily freed through letters of manumission. When he presented the material in the class he teaches with Menard, the students expressed great interest and asked whether a similar study could be done in the United States.

Menard, an American historian, recently went to Maryland and Virginia and found manumission records that were not only similar to the records Schwartz used in Brazil but better, with information included on the ages and weights of the slaves who were being freed.

"Those records exist and nobody has used them," Schwartz said. He and Menard now plan to work together on a comparative study. "To some extent our decision was generated by the interest of the students in the class."

Slave manumissions in Brazil might not seem to be a topic that would attract wide interest, but Schwartz thinks his study is an example of how a research project on "an arcane subject" is part of a larger whole.

After Schwartz had published an article on his manumission study, he heard from a scholar in South Africa who constructed a similar study based on the same questions Schwartz had asked in Brazil. "He sent me his paper and even his computer cards," Schwartz said. "We are sharing the data. I've made my materials available to this fellow in South Africa, and he has made his available to me."

When Senator William Proxmire of Wisconsin gives his Golden Fleece Award to research projects that seem useless to him, Schwartz said, he does not understand that a project that does not seem to make sense in isolation may be an important piece of a puzzle.

Besides, Schwartz said, "If you ask what good could it do to study the concept of love in the Spanish ballad of the 16th century, you are saying that culture isn't important."

Now that Schwartz has collected the data for his present project and is at the writing stage, he is already thinking of other questions he might pursue. Perhaps a study of the ages at which women began childbearing would tell something about why the slave population reproduced in the United States and not in Brazil.

"That's what's neat about research," he said. "It doesn't ever end anywhere."

International scholar

To collect data for his study of the Brazilian sugar economy,

Schwartz made a number of trips to Brazil—to visit the major cities where the archives are located, a number of small towns in the interior, and the ruins of old plantations—and also conducted extensive research in Portugal and elsewhere in Europe.

On the Guggenheim fellowship he will be making a research visit to Rome. The plantation on which he has focused his attention was owned by the Jesuits, and the records are in Rome.

For some parts of his research he has worked in conjunction with Brazilian scholars, and he said that the contact has been helpful.

Publication of research findings is an important part of the process, he said. "As a researcher you have a responsibility to make your work known to a wider audience, in many cases an international audience. That's where it's tested."

Some people say they like to do research but don't like to write. "That's no good," Schwartz said. "Scholarship is in effect another kind of teaching, and a published article is in effect a sort of lecture. You simply are teaching a different audience."

Doing it all

Schwartz just ended a three-year term as chair of the history department, a rotating position now taken over by Stanford Lehmborg. How did he chair a department while doing all his teaching and research? "With great difficulty," he said.

But Schwartz believes that the people who do the most are often the people who do the best work. "In this department we have people like Paul Murphy and Clarke Chambers, who are award-winning teachers, scholars of national reputation, and also leaders in the University community who are always being asked to head one committee or another."

People who say they don't do much scholarship because they are so busy teaching are often using teaching as an excuse to "fill up their time without doing the research," Schwartz said. "Research is what distinguishes us from the community colleges. The University would be a much poorer place if we doubled the amount of time people spent in the classroom.

"Then on the other hand, there are some people who don't like to teach, or can't teach very well, who say that they are research-

ers. The University can't afford to have people who look upon teaching as an interference in their lives. Meeting a class isn't enough. It takes a lot of preparation. The best teachers tend to be the best scholars.

"People should be engaged in research, but not to the exclusion or detriment of teaching. A university without a strong research component is a university without a lifeblood."

UPDATE

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

by Paul Schurke

It's not promising any cures, but the young science of chronobiology—sometimes called medicine's "fourth dimension"—is making impressive inroads into cancer therapy, and University of Minnesota scientists are on the cutting edge.

Animal studies have repeatedly shown that therapies tied to the chronobiologic rhythms of organisms dramatically increase survival and cure rates. At the University, initial efforts at translating these findings to the treatment of human cancer patients are showing promise. And another University study indicates that the monitoring of rhythms may have some utility for the prevention of cancer.

University chronobiologists are eager to share these concepts with others, but they often find they must explain their new science before they can explain its applications.

"Chronobiology is the study of the rhythms exhibited by all biologic systems," chronobiologist William Hrushesky said. Some are short—measured in minutes—and others last hours, days, months, or even years.

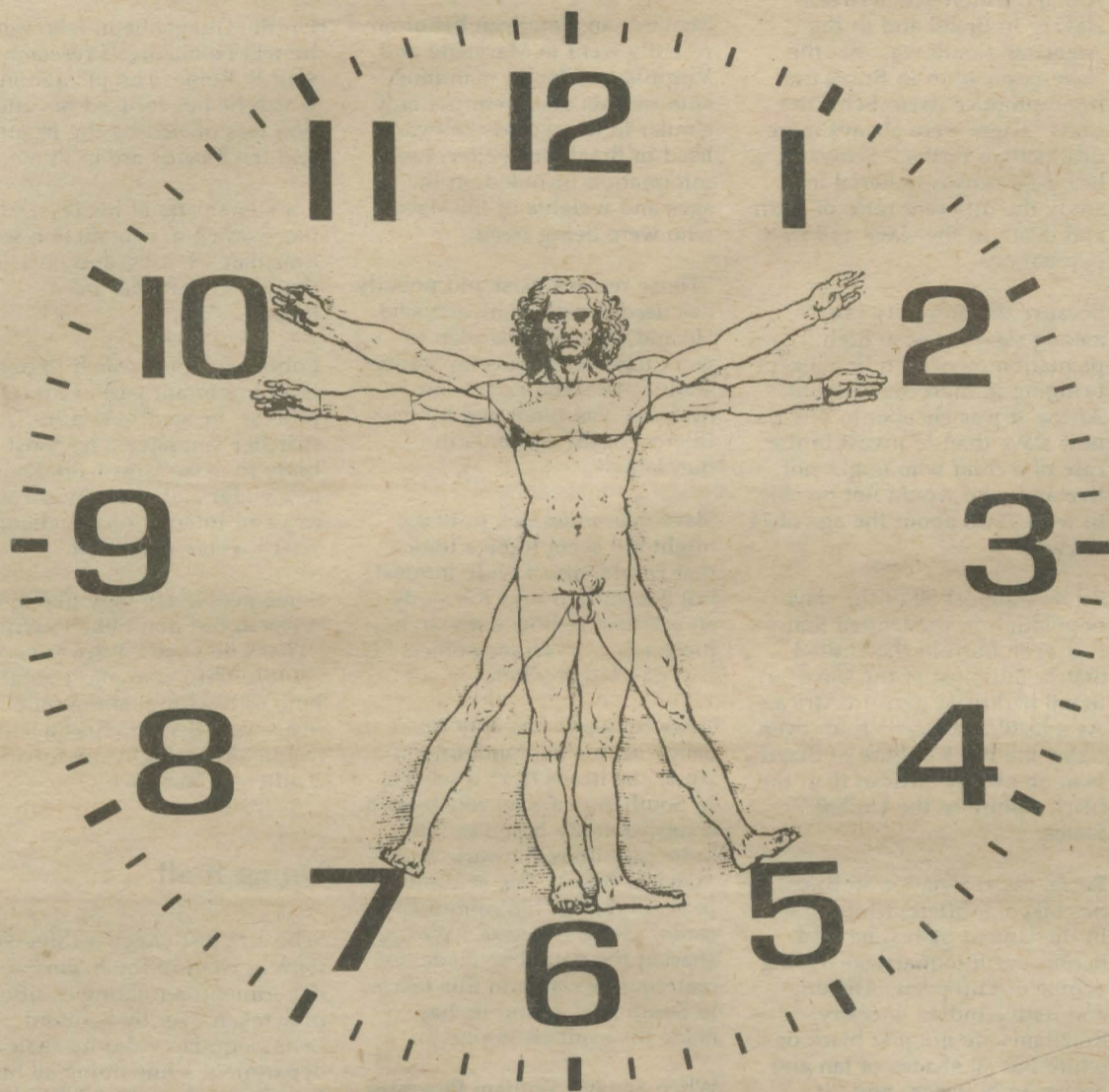
Hrushesky is a medical oncologist. The rhythms found to be most useful and manageable for his field are circadian rhythms. The word *circadian*, meaning "round the clock," was coined by Franz Halberg, director of the University's chronobiology laboratory and generally regarded as the science's founding father, to describe the bodily rhythms that wax and wane every 24 hours or so.

Circadian rhythms may be seen in the daily fluctuations of such physical phenomena as body temperature, blood pressure, hormone secretion, and alertness. People who find themselves to be at their brightest and best at a certain time of each day are experiencing their daily rhythm peaks. Though no central clock has been discovered, chronobiologists believe the rhythms are set from within the body and synchronized by such outside time cues as the sun, moon, and tides.

Chronobiologists found that normal rhythm patterns could be established and graphed for every person they studied. Their first goal has been to define health by these patterns.

This notion presents a challenge to the fixed-time tradition of patient care. Take "odd hour" hypertension as an instance. In this condition, blood pressure may be dangerously high, but only at a certain time of day—in the morning, for example. If a person has checkups only in the

Chronobiology Shows Promise in Treatment of Cancer



afternoon, the condition might go unnoticed and a crippling stroke could result.

Health then comes to mean not only homeostasis, or an overall constancy of body function, but also the synchronization of rhythms. These rhythms are not to be confused with biorhythms, chronobiologists point out. (Biorhythms, the 23- to 33-day cycles said to govern physical, emotional, and intellectual peaks, have been invalidated, chronobiologists contend.)

The importance of synchronized chronobiological rhythms is increasingly being acknowledged. But chronobiologists realize that widespread application of this concept in health assessment is a long way off. In the meantime they are pressing on and exploring the application of circadian rhythms in disease treatment.

That's where the work on cancer, known in this field as chrono-oncology, comes in. "The reason we are so excited about the potential of chronobiology in this area," Hrushesky

said, "is that we have no wonder drug like penicillin for cancer." Unlike penicillin, most cancer-fighting drugs have a low therapeutic index, he said. That is, the range between the dose that harms the cancerous tissue and the dose that harms normal tissue is very small.

Most cancer-fighting drugs work by interfering with the reproduction of fast-growing cells, among them the cancer cells. But some normal cells also grow fast, including those of the body's immune system. Consequently, conventional cancer-fighting drugs eventually break down the immune system, and the patient often dies of pneumonia or another infection.

Chronobiologists believe that attention to circadian rhythms could break this pattern. Their rationale is this: Cells of healthy tissue have a circadian rhythm of mitosis, or cell division. Cancer cells may show a circadian rhythm of mitosis that is either in or out of sync with the host's healthy tissue rhythm, or they may multiply without any evidence of group rhythm. The objective of "chronotherapy" is

to administer chemotherapy when the healthy tissue is most resistant to toxicity and the cancer cells are most susceptible.

Even if it is found that the cancerous tumor has no rhythms (research on this subject is under way), the benefits of timing treatment to coincide with the host's rhythm of resistance would be a considerable improvement over current chemotherapy regimens, Hrushesky said.

Experiments with animals have confirmed this theory. In a hallmark study completed at the University of Arkansas three years ago, the cure rate for mice inoculated with leukemia was four times more successful than the best conventional techniques when drugs were combined, then administered in harmony with body rhythms.

University of Minnesota researchers confirmed this finding and went on to perform numerous other tests of chronotherapy on animals. One, for example, found that leukemic mice treated with the drug ara-C according to the most favorable schedule survived 50 percent longer than

those treated by more conventional methods.

These results are dramatic but, of course, they directly benefit only leukemic mice. Transferring them to clinical practice is difficult. Although people and rodents have some similar rhythms, the relative timing of circadian rhythms in body temperature, blood cell count, certain hormones, and some cell reproduction differ markedly.

At Masonic Memorial Hospital, the initial steps in exploring chronotherapy's applications for human cancer patients have been taken. Researchers are attempting to use this tool to magnify the advances they recently made in chemotherapy for advanced cancer of the bladder, a fatal disease for which there are few therapies. University researchers recently achieved unusually high rates of remission and survival in a small group of patients with this disease with a new combination of the cancer drugs platinum and doxorubicin. Some patients encountered problems caused by the toxicity of these powerful agents, however, suggesting to the researchers that a chronotherapeutic approach should be explored.

In animal models, they tested—and confirmed—the theory that the toxicity of these two drugs is, as they put it, "circadian stage dependent." In fact, the gap between success and failure was extremely wide. A normal dose of one of the drugs given at, say, 9 a.m. might kill every mouse, while the same dose given at 9 p.m. not only doesn't kill the mice, it also succeeds in destroying leukemic cancer cells.

In addition, Hrushesky and his colleagues found some evidence that these cancer tumors are also influenced by rhythms. This led to investigations of the concept of phase shifting, which simply means changing the peak times of rhythms.

Through phase shifting, one of the hottest items in the field of chronobiology, researchers hope to adjust the rhythms of cancer tissue so that its greatest susceptibility to chemotherapy or radiation coincides with the body's time of greatest resistance. To test the concept, Hrushesky shifted the rhythms of mice by manipulating time cues—light/dark, activity/rest, feeding/fasting—and repeated chronotherapy with platinum and doxorubicin. The results underscored the value of phase shifting.

With these encouraging findings, Hrushesky has begun testing chronotherapy with cancer patients. Some 20 persons with advanced bladder cancer and a similarly severe disease, ovarian cancer, have been put

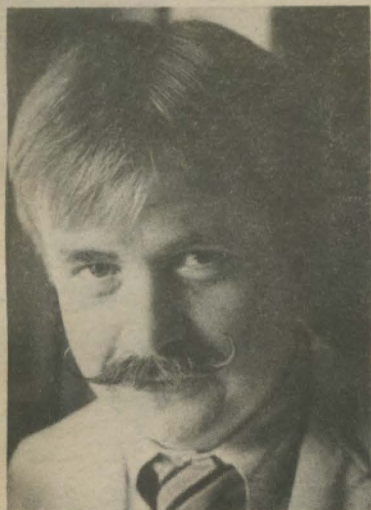
on chronobiotic drug regimens of platinum and doxorubicin. Preliminary results show the drugs are metabolized by the body differently at different times of day. Results indicated that the kidneys (a target organ for the toxicity of platinum) were least susceptible to platinum in the morning.

So far that's all that can be said with certainty. With such a small group of patients, researchers aren't able to translate their findings into optimum treatment schedules—as they could with the mice. But more patients and a multi-institutional study might make it possible in the future, Hrushesky said.

"These general principles may apply to every cancer-fighting drug," Hrushesky said. "They may also apply to other therapies such as immunotherapies and radiation." Efforts to explore chronobiologic applications of these therapies have begun at the University and elsewhere, he said.

While research in chronotherapy continues, chronobiologists—an imaginative if not impatient bunch—are pursuing chronobiology's applications on a new front: chronoprevention of cancer.

"What we are trying to do is get into the disease process as early



William Hrushesky

as possible," Allan Radke said. The presumption is that rhythm alterations may precede the stage at which disease can be diagnosed, he said.

Radke is an epidemiologist who is pursuing graduate research in chronoprevention with the aid of Halberg and Erhard Haus, another prominent chronobiologist. Breast cancer was chosen as the disease model for the first (and so far the only) study in this field, conducted with the cooperation of Japan's Kyushu University. The researchers selected a group of 36 American women and in a rigorous monitoring program charted some of their rhythms during the course of a year. At Kyushu, rhythms from a similar group of Japanese women, selected as a baseline population

since they run one seventh the breast cancer risk of American women, were gathered.

The researchers then compared the rhythms of the two groups, looking for differences that might relate to the increased risk American women face. They found significant correlations between risk and annual rhythm swings of three hormones and that these correlations were dependent on the time of year. Prolactin rhythms measured in the spring, for example, showed a different correlation with risk than those measured in the fall.

"Knowing the significant parameter and the significant times of measurement, we now need to take this experiment to a larger population group," Radke said. If larger studies confirm these findings, researchers could explore clinical applications.

Radke has given a good deal of thought to what form chronoprevention might take. "What we could do is find the persons who are at high risk for breast cancer based on known risk factors such as diet, family history, and geography and monitor their rhythms regularly. If a rhythm change occurs, it might signal the beginning of a disease process, and they would then be followed very closely." And maybe ways to intervene to correct those errant rhythms and avoid disease could be found, he said.

"For example, as research into disease mechanisms and disease factors progresses, we may be able to correct rhythms by changing diet, weight, or health habits before the disease gets a good start.

"Rhythm changes that signal other cancers or chronic diseases such as cardiovascular and cerebrovascular disease might also be found. This could lead to truly cost-effective means of health care. Once your normal rhythm patterns have been established, a doctor could simply look for those out of sync. Knowing what they signal, the doctor could use appropriate means to correct them."

From the timing of a meal to the administration of an anticancer drug, working with the body's rhythms can tip the scale between disease and health, chronobiologists say. At this point, however, chronobiology's role in the future of preventive medicine seems less assured than its role in the future of cancer therapy. But, its advocates maintain, the recent advances suggest that it is only a matter of time before the monitoring of rhythms becomes a tool with widespread health care application.

U of M and China To Exchange Students, Faculty, Technology

by Elizabeth Petrangelo

Four agreements to exchange students, faculty, and scientific information have been signed by the University of Minnesota and colleges and universities in the People's Republic of China.

The agreements were described by Wenda Moore, chairman of the Board of Regents, at a news conference in September.

"Our accomplishments far and away exceeded anything we thought possible for a first trip to China," said Moore, who led a delegation of 12 University faculty members and administrators on a 21-day tour of Chinese educational, medical, and research institutions earlier in the month.

Generally, the signed agreements call for exchange of faculty members, scholars, and graduate students, collaboration in research projects, and exchange of teaching and scientific research material.

The agreements are with Jilin University of Technology in

are a comprehensive university," said LaVern Freeh, assistant dean of the Institute of Agriculture, Forestry, and Home Economics, and a member of the China delegation. "Many of the Chinese universities are not, but are quite specialized. Consequently, we had to make agreements with many institutions."

Freeh said it is likely the Chinese will benefit more from the exchange agreements in technology and agriculture than will the University. "But in terms of art, and Chinese language and history, and archaeology, I think we will gain a lot, so we'll strike a good balance."

Within the next few months, names of University of Minnesota graduate students will be submitted to some of the Chinese institutions for consideration, Moore said. University East Asian languages professor C. J. Liu is already in China and will remain there for two years to smooth the way for those participating in the exchanges, Moore said.

in China is critically short, Freeh said.

The agreement with Jilin University includes provision for a summer institute in English next year in China. "The Chinese people have found that the most productive way to take advantage of the educational opportunities in the United States is to pursue English first, particularly technical and scientific English," Moore said.

Professor Betty Robinett, who has done pioneering research on the teaching of scientific and technical English and is director of the University's English as a Second Language Program, was particularly sought after as a lecturer by the Chinese during the delegation's visit, Moore said.

The University of Minnesota is one of only a handful of American universities that have signed agreements with Chinese institutions, Moore said, and its delegation was only the second educational group to be received by Vice Premier Fang Yi, the



Regent Wenda Moore meeting with Chinese Vice Premier Fang Yi

Changchun, a technical and agricultural engineering school; Nankai University in Tianjin, a liberal arts and technical university; the National Academy of Agricultural Sciences and the National Academy of Agricultural Engineering in Peking; and the Peking Agricultural University.

In addition to the signed agreements, several verbal agreements were made with hospitals and medical schools in Peking, Moore said.

"It is a real advantage that we

There are now 9 Chinese scholars studying at the University, and the number should grow to 16 by the end of the year, Freeh said. "The doors are open, and the numbers [we exchange] will be dependent on the interest," he said.

Most of the Minnesota students who go to China will be graduate students in East Asian studies and in agricultural and technical areas. Undergraduate students are not likely to be included in the exchanges for some time since housing space

third-ranking Chinese government official.

The members of the delegation were uniformly pleased by the reception they received during their stay. On their arrival at Jilin University, for instance, the group was greeted by the faculty and students, who lined the road and clapped, Freeh said.

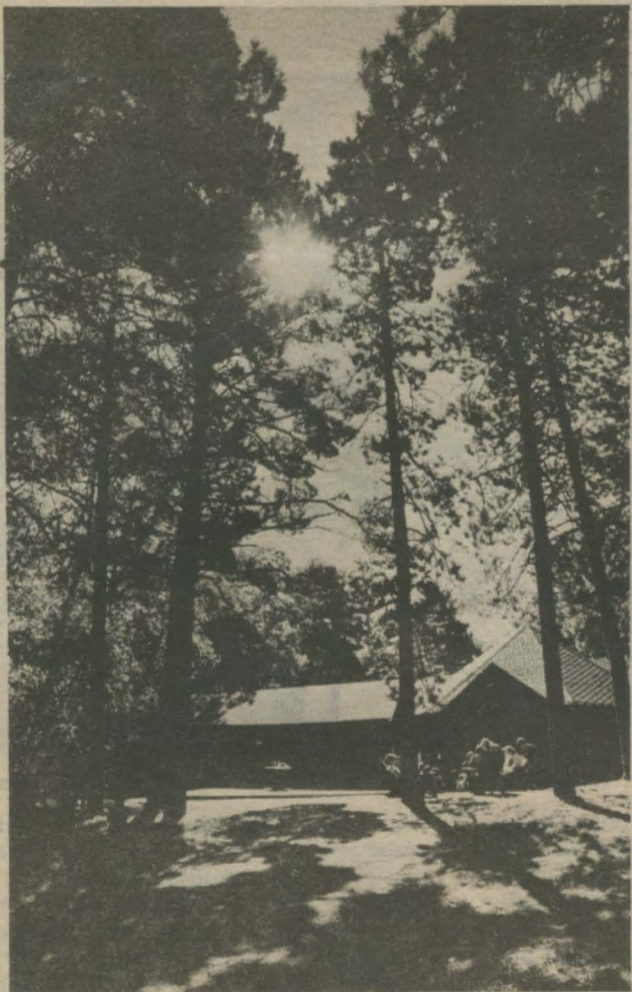
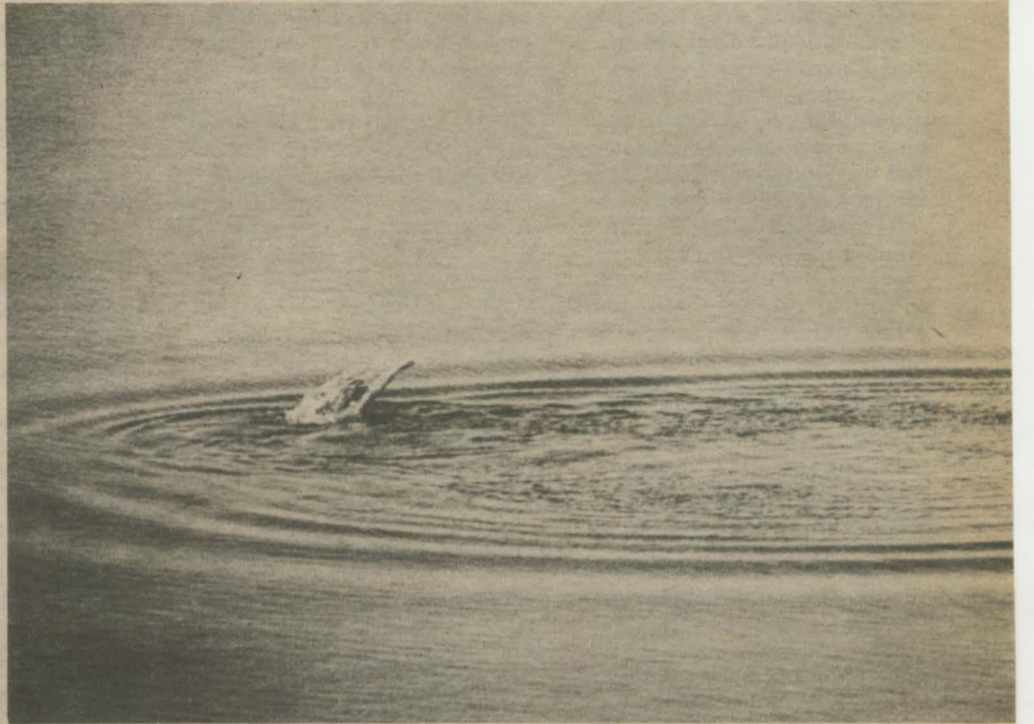
"It wasn't easy. Negotiating is difficult and there was a language problem, but when we sat down later and tried to think of anything we would have changed, we could come up with nothing," Freeh said.

photos by Tom Foley

Freshman Cam



Firing up for the trip north



The bus ri



The dance

For more than 50 years freshman camp has offered new University students an opportunity to get acquainted with University life before classes begin. Participants spend a three-day weekend learning about the University from camp counselors and lecturers, joining in social and sports activities, and generally having fun. This year's camp was at Lake Hubert, north of Brainerd. The theme was "You've Got A Friend."



Backstage at the talent show

Field Biology Blooms at Itasca Summer Session

by William Hoffman

Lake Itasca shimmered like an opal in the fading light of a summer day. The sad call of the loon echoed through the pine forest, signaling the approach of dusk. All else was quiet.

Near the northeastern shore of the lake, in a string of lighted cabins, people were reading books and journals and pondering notes and charts. They were visitors and their stay was short. But before they left they had added measurably to their own and others' understanding of the natural world.

These people were participants in the summer biology session at the University's Lake Itasca Forestry and Biological Station. As a scientific laboratory within a natural preserve—Itasca State Park—the station is a superb facility for biological research and field study.

To go further, it is perhaps the best inland field biology station in the nation and an integral part of a proposed national network of ecological reserves. The summer program draws first-rate students, faculty, and research scientists from across the country, and sometimes from across the sea. During the summer the Itasca station is as much a cooperative community as the communities of plants and animals in the surrounding area.

No longer is the Itasca biology program an experiment as it was deemed by University president L. D. Coffman when it was launched in 1935. Before then Itasca was strictly a forestry station, established in 1909 and devoted mainly to training forestry students. In 1966 the biology program was expanded to two five-week sessions during the time when the natural activity of the park is in full bloom. The summer forestry program follows the second biology session.

The summer biology session is a joint enterprise of the Colleges



A pond located conveniently behind the mycology laboratory

of Biological Sciences, Forestry, and Agriculture. The University of Wisconsin and the University of North Dakota also participate in planning the program.

The session includes courses in botany, ecology and behavioral biology, entomology, fisheries and wildlife management, plant pathology, and soil science. The academic departments provide instructional supplies and equipment—the microscopes and dissection kits and autoclaves.

Veritas caput

Just up the road from the Itasca station a little stream runs out of the north arm of the lake. This little stream has made Lake Itasca famous, for it is the headwaters of the Mississippi River, the source of the "father of waters."

In 1832, while traveling along the south shore of the lake looking for the Mississippi's headwaters, explorer Henry Rowe Schoolcraft turned to an associate and asked for the Latin words for the headwaters of a river. He was told *vernum* (true) and *caput* (head). He substituted the stronger word *veritas* (truth) and then borrowed from each: (ver)itasca(put).

But to biologists the Lake Itasca area is unique for other reasons. According to David Parmelee, chairman of the Field Biology Program and director of the biology session, Itasca is the focal point of three ecosystems: the northern coniferous forest, the eastern deciduous hardwood forest, and the western prairie.

"All this gives rise to diverse habitats and consequently to diverse wildlife," Parmelee said. "This makes it very interesting biologically."

The park, embracing 50 square miles of forest, is dotted with swamps, bogs, and lakes, excellent habitats for all manner of

Tom Foley

flora and fauna. "We have a great mixture of birds, including loons, ospreys, herons, and bald eagles," said Parmelee, an ornithologist. "And we have many species of mammals such as deer, beavers, otters, and raccoons."

Lake Itasca itself is "a biologist's lake, with more than 2,000 species of algae identified already," he said, adding that algae experts from around the world come to the station.

The station's 55 buildings include 11 laboratories, a herbarium, a library, a large dining hall, an office building, and several dozen cabins for students and faculty. Many of the buildings are winterized for year-round use.

The summer biology session is limited to 125 students by agreement with the park, Parmelee said. "This is to protect the environment, but also because classes have to be small to be effective. About 20 is the maximum number for class size. It's compatible with the environment and permits a good rapport between students and instructor."

About half are graduate students and usually nearly half are from out of state. Many come back, and word of mouth is the program's most effective recruiting method, Parmelee said.

Although an increasing number of students are deciding to work rather than go to school in the summer, Parmelee is confident that the reputation of the program—"all these experts on hand"—will continue to attract enough qualified students.

Ferns and fungi

One of the courses offered this year was on the biology of ferns, taught by Warren H. Wagner, Jr., professor and curator of pteridophytes at the University of Michigan and past president of the Botanical Society of America.

Pteridophytes—ferns, club mosses, and horsetails—are homosporous vascular plants, that is, they produce only one kind of spore and are characterized by a system of vessels for the circulation of plant fluid. Pteridophytes are very old plants, dating back millions of years.

"All major families of ferns are represented in Minnesota," Wagner said. "Some are very tricky to identify, however."

Among the pteridophytes best developed in the Itasca area are boreal ferns, rock ferns, swamp

ferns, and jackpine club mosses, Wagner said.

During the ice age, about 14,000 years ago, ice up to 5,000 feet thick covered the region. When

predicting and testing of predictions," Wagner said. Ferns grow in places from the bottoms of lakes to the surfaces of dry rocks, he said. One of the problems in hunting for aquatic

ferns is to find lakes clear enough for researchers to see and study the ferns.

Wagner called the biology session students "the cream of the crop." They work well together and are curious about the special problems in whatever it is they are studying, he said. "They want to learn botany at its roots."

Wagner's wife, a botanist and research scientist, accompanied him to the station. "We work as a team," he said.

Though he has high praise for the Itasca station (this was his fourth year there), Wagner reserves highest honors for his own University of Michigan biological station near the Straits of Mackinac. It is the abundance and variety of ferns that keep bringing him back to Itasca.

Are ferns troublesome to raise domestically? "That's the popular impression, but it's simply not true," he said. "In fact, fern gardens and clubs are becoming more popular all the time."

Itasca is also a mushroom hunter's paradise. Warm summer rains bring out sulfur shelf mushrooms, morels, puffballs, Indian pipes, snakeskin, and many other fungi.

Elwin Stewart, University assistant professor of plant pathology, taught an introductory mycology course that, like most courses at the biology session, involved both fieldwork

and lab work. Stewart also cultivates and manages fungi at the herbarium on the Twin Cities campus.

According to conservative estimates, there are about 100,000 species of fungi, and more are being discovered constantly, Stewart said. "Someday the number may equal the estimated 200,000 species of vascular plants," he said. As an indication of this possibility, he noted that the distribution pattern of fungi species today corresponds roughly to the distribution of mycologists around the world. Fresh discoveries are not uncommon to roaming mycologists.

"I myself have identified four new species and have submitted a manuscript describing a new genus and a new species within that genus," Stewart said. One of the new species discovered and named by Stewart is *anthracina* or "coal black."

Fungi are the principal agents in reducing forest litter to humus, thus enriching the soil and enhancing plant growth. They attack and soften everything from fallen trees to pine needles.

Fungi are either parasitic, saprophytic, or symbiotic. The parasites exist at the expense of other living organisms; the saprophytes live on dead or decaying organic matter; and the symbiotics, called mycorrhizal fungi, form a mutually beneficial association with certain plants through their root systems.

Stewart's work is primarily with mycorrhizal fungi that associate with pine trees. Such an association substantially increases the efficiency of the tree's root system. For its part of the bargain the fungus takes a share of the tree's nutrients, Stewart said.

Mycorrhizae or "fungus roots" are particularly common in conifers and orchids, although many hardwood trees have them, too. They even exist on some agricultural crops.

Some of Stewart's students worked with Wagner in investigating fern mycorrhizae. Others searched familiar fungi habitats—the pine forest, the hardwood stands, the swamps and bogs, even bird feathers. Students first try to identify fungi spotted in the woods and then bring a sample back to the laboratory to be studied and preserved.

Fungi are unusual plants. Some are beneficial to other plants, some are destructive. Some are eminently edible, others are highly toxic. A number of people die every year from eating poisonous mushrooms—about as



Warren Wagner

the ice sheet retreated it left behind lakes and moraines. The forest grew up and the pteridophytes gradually moved back in from the south and the east.

"There are migrants here from more concentrated fern regions in Wisconsin and Michigan," Wagner said. "In all, there are about 70 species and hybrids identified so far. This is an excellent place to study ferns."

Fern hunts can be adventurous affairs involving considerable travel. "We always take a trip," Wagner said. This year the class traveled more than 250 miles to check out an arctic species that grows on the hard rock of the Canadian Shield. The exploration was funded by the U.S. Department of Agriculture and the Canadian government.

Closer to home, just north of Bagley, Wagner and company discovered a new fern population growing in a cedar bog. "Sometimes we stumble onto something new, and sometimes we fail to find what we're looking for. Sometimes students get lost in the process. In fact, I got lost this year at Leech Lake.

"We are trying to interpret the edge of fern ranges, among other things. We do a lot of



Elwin Stewart

many as die from poisonous snake bites, Stewart said.

"Overall, relatively few mushrooms are fit for the table," he said, adding that the Department of Plant Pathology provides public information on the toxicity of mushrooms. Several deadly species grow in Minnesota.

On a field trip this year, Stewart noticed a squirrel digging furiously at the base of a tree. On a hunch, he chased away the squirrel and carefully continued the dig. Soon he unearthed a fungus that would pop the eyes of a Frenchman—honest to goodness truffles! Squirrels like them, too.

Touring the grounds

The Itasca station is never without someone looking after things. As resident manager, Robert Boyle is in charge of buildings and grounds and of generally keeping the station in good working order.

David Bosanko has spent the past five years at the station as its resident biologist. His job is to keep records on wildlife activity, to take care of the animal and plant collections, and to help those who come to the station use its facilities. He works closely with Parmelee.

"I enjoy the job," Bosanko said. "It provides a constant variety of activities. It's never boring. And I get a lot of cooperation from the people who run the park and from the Department of Natural Resources."

Bosanko is busiest from May to October, preparing for the biology session, seeing it through, and then winding down and getting set for the harsh Itasca winter.

During the biology session Bosanko accompanies classes to the



David Bosanko

field. He also helps students with their research projects and keeps track of supplies. When a class wants to investigate a particular plant community, Bosanko often knows where to

find it—maybe at Iron Springs or Squaw Lake or Demming Pond or along the Bohall Trail.

Winter finds Bosanko assisting interim classes from colleges around the state. Ecology courses are held at the station from January through March, and one research group—working on bogs—spends the entire winter there.

"It's much colder at Itasca than in the Twin Cities," Bosanko said. "We've had frost every month I've been here, and it always snows in November."

While Bosanko is lending a hand and keeping a journal, Gary Bennett is cooking up a storm at the station's dining hall, which is located on the lakeshore. Bennett is chef at the Itasca Dining Club, a cooperative formed each year by the students and managed by Bosanko.

Bennett's culinary training started when he was 14, when he worked as a fry cook in sundry part-time jobs in drive-ins and restaurants. When he heard of an opportunity to serve as a chef on an antarctic research mission he applied forthwith.

"They needed a cook right away at the Palmer Station [the National Science Foundation's research station on the Antarctic Peninsula]," he said. "It was the turning point of my life."

Bennett hooked up there with the University's antarctic research team and spent several years cooking on the frozen continent.

"I took a lot of cookbooks with me to Antarctica, such as the textbook of the Culinary Institute of America, which has just an incredible variety of stuff," he said. "The freezers and storerooms throughout Antarctica have been packed with food ever since [British explorer Robert] Scott starved to death. No one is taking any chances.

seriously. I agonized over the menu so that we'd never have anything twice if possible."

So it is at the Itasca Dining Club, Bennett plans the meals himself and sees to it that there are no repeats in the menu for each five-week term. The average meal costs around \$1.65, he



Michael Singer

said. "The cooperative is a nonprofit operation. Everyone takes his or her turn at KP. It works very well."

Bennett would like to go back to Antarctica, but in another capacity—as a researcher. Ultimately he'd like to write, drawing from his antarctic experiences. "I read a lot of books down there," he said. "I'm impressed with the possibilities of fiction."

Just up the trail a piece from the dining hall is the library. The library building is one of the newer facilities at the station, housing books and journals in the upper level and a laboratory and shop in the lower level.

The station's library is "a stepchild of the Biomedical Library," according to librarian Rose Mary Schaefer. It has many of the library materials basic to fieldwork, and what it doesn't have on hand can be requested, she said.

"It's best if students aren't here all the time, even though the door is always open. We like to

see them spend most of their time observing nature," Schaefer said.

"This is an incredible experience," said Robyn Lillehei, an Edina native who is working on her Ph.D. degree in behavioral science at Rockefeller University in New York. "There's a whole

Heinrich from the University of California at Berkeley and Stephen Hubbell from the University of Iowa.

Rather than focusing on plant and animal classification, students are required to propose a hypothesis and then gather data to test it. Invariably, this means tramping through bogs and cordoning off plots and eyeing the activity of aphids and ants and butterflies and recording it in minute detail. It also means charting graphs and peering through microscopes.

"Students in this course are not here to do brilliant, publishable research. They are here to generate ideas and test them and to discuss the practical difficulties they encounter," Singer said. The course is heavily biased toward insects and plants because insects "are more predictably abundant, much more dense" than mammals and other animals.

The course is at the forefront of field biology instruction, according to Parmelee. "This is a new type of approach, based on the OTS model. It is taught by bright young faculty and researchers.

"But traditional courses are still vital, courses that include local flora, plant identification, examination of the entire organism, descriptive and taxonomic courses. This means a lot of laboratory work with expensive equipment. We are past the days of getting by with notebooks, hip boots, and butterfly nets," Parmelee said.

Despite the attraction of summer jobs, Parmelee expects biology students to continue to seek summer field experience, especially in an age of concern for the environment. The greater problem may lie in persuading the government to funnel more dollars into field research and instruction.

"I can remember when ecology was a vague term," Parmelee said. "Now the term is widely used and it has affected student interest in field biology. But it has not affected the dollar flow, which is slow. With a deteriorating environment, however, that is bound to change."

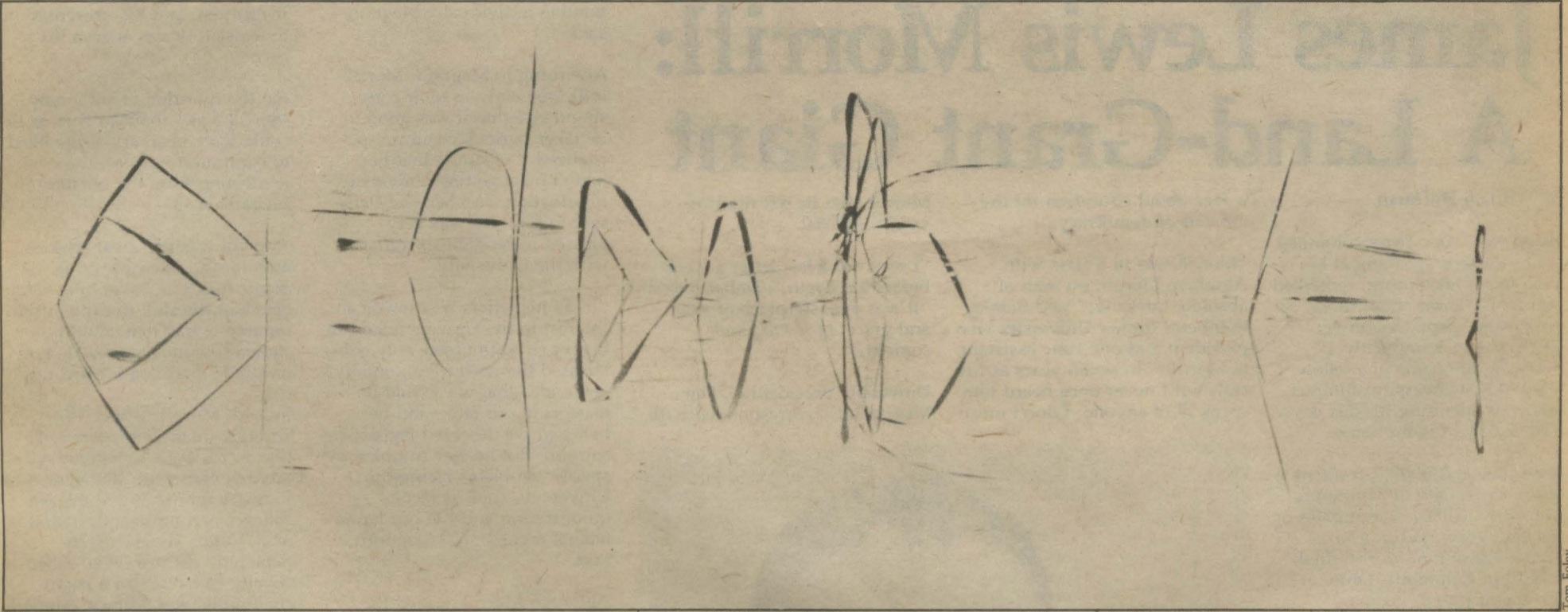
world of biology up here that most programs can't give you."

Michael Kelleher, a University graduate student, also found the biology session valuable. "I've never had field experience before. It's tough to get in. You have to have good grades, letters of recommendation, plus you have to write an essay for the screening committee. You have to be qualified."

Taking the field

Both Lillehei and Kelleher were students in a new course—Advanced Field Ecology—based on a format used by the prestigious Organization for Tropical Studies (OTS) in Costa Rica. It involves the formulation and testing of ecological theory under field conditions.

"It's an unusual field course," said Michael S. Singer, assistant professor of zoology from the University of Texas. The course is open only to top graduate students and is team taught. Singer was assisted by Bernd



Tom Foley

Reeds in the water suggest oriental art work.



Tom Foley

Lake Itasca is a biologist's lake.



Tom Foley

One of Itasca's native inhabitants

James Lewis Morrill: A Land-Grant Giant

by William Hoffman

When *New York Times* columnist James Reston, speaking at his alma mater last spring, remarked that he is "a nut about these great, vast, populous universities," he was implicitly honoring the name of a fellow Ohio State University alumnus who was spending his last days in a nearby nursing home.

James Lewis Morrill, president of the University of Minnesota from 1945 to 1960, was a giant of the land-grant tradition in higher education. Morrill died July 29 in Columbus, Ohio, at the age of 87.

Beginning his career as a journalist, Morrill soon turned to teaching and then to academic administration, devoting the greater part of his life to, in Reston's words, "the great experiment...launched to educate the children of an entire public."

Morrill's book, *The Ongoing State University*, published in 1960, is a testament of his faith in the land-grant idea.

That idea was made law during the presidency of Abraham Lincoln. Named for another Morrill—United States Senator Justin Morrill of Vermont—the Morrill Act or Land-Grant Act of 1862 provided for the donation of public lands "to the several states and territories" for them to establish colleges "in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

James Lewis Morrill, once president of the American Association of Land-Grant Colleges and State Universities, believed that such institutions constitute "the most comprehensive system of scientific, technical, and practical higher education the world has ever known," and that research conducted in them "has been an infinite source for scholarly, scientific, social, and economic advance."

Thanks to the Land-Grant Act, education is no longer "a private affair, purchasable like any other commodity by just those who can afford it," Morrill wrote. He believed low-cost tuition and financial aid programs make higher education available to the many rather than to just the few.

Those who knew him remember Morrill as a genial and dignified man, a strong administrator and

a sage about education for the citizens of democracy.

"Morrill was in a class with Abraham Lincoln—a man of absolute integrity," said Stanley Wenberg, former University vice president and one-time assistant to Morrill. "In seven years as his assistant I never once heard him speak ill of anyone. I don't mean

Morrill after he left the University in 1960.

"I received a last letter a week before his death," Ziebarth said. "It was a masterpiece of style and grace, of format and content."

University president C. Peter Magrath also corresponded with



James Lewis Morrill

to suggest that he wasn't tough—when necessary, he could be very firm. But there was no malice in him and he bore no grudges."

"Morrill represented for his time the best in university administration," according to E. W. Ziebarth, professor of speech-communication and former dean of the College of Liberal Arts who once served as interim president of the University. "He was one of the most distinguished, graceful, and poised persons I have ever known," Ziebarth said.

Ziebarth is one of a group of faculty who kept in contact with

humble individual," Magrath said.

According to Magrath, Morrill indicated early in their correspondence that it was good to be taken seriously and not patronized. "I learned that he hadn't been getting University information, so I had the *Daily* sent to him. He was very pleased to reestablish contact with the University."

"In all his letters he showed an interest in the University and in higher education generally. He stressed the need for autonomy—the idea that we should be masters of our fate—and he believed we deserved legislative support. But he was troubled by specific problems facing the University, such as faculty unionization and the burden of federal regulation," Magrath said.

Although Morrill guided the University through the postwar enrollment boom, the McCarthy era, the establishment of a regular process of consultation with faculty, and the expansion of the University outstate (to Duluth, Rosemount, Waseca, and Morris), "he thought the job of a university president is far more complicated today," Magrath said. "But I suppose this is a relative thing. He is seen as having done a good job in a tough era."

Magrath said he last saw Morrill two years ago in the Columbus nursing home. "His wife had died that spring. I remember that he was dressed in a three-piece suit and looked very dignified. He escorted me from the nursing home, and he saluted me when I left. It was an emotional farewell."

Ziebarth remembers that Morrill was "rigorously honest and very persuasive. He once asked me to take a deanship. When I asked him how much time I had to make a decision, he said, 'You have as much time as it takes to say yes.'"

According to Wenberg, Morrill had "administrative imperturbability, something he once told me that I needed more of. He was a great teacher."

Morrill's imperturbability and persuasive skills came in handy when he dealt with the state legislature. "He regarded good ties as very important," Ziebarth said. "Morrill was highly respected by members of the legislature. He was even held in awe by them, and they were kind to him. Some became his close friends.

"He did about as skillful a job as any University president I've known well, but in a very formal way. He felt the legislature had a special responsibility to the

institution, and his presentation to legislators was always his own."

On the question of autonomy, Morrill was "about as firm as he could have been about the need to continue to protect the institution from the outside," Ziebarth said.

"Morrill was the ideal spokesman for the principle of academic freedom," Wenberg said. "He had the skill to explain the issue in a way that could be commonly understood. He was uniquely qualified for this task."

Indeed, Morrill believed so strongly in academic freedom that in his book he openly criticized government, business, and industry for "trying to tell the colleges and universities what, or what not, to teach." He deplored "the rash of so-called 'loyalty oaths' which a frightened public has seemed minded to impose upon professors as a special class."

At the same time, he believed that "any American institution of higher learning which tolerates on its faculty the presence of a proved or self-confessed Communist betrays the trust and the tradition of intellectual freedom."

Ziebarth said that Morrill would have had trouble being president during the Vietnam war protest years. "I used to meet him in New York back then, and he told me that he just couldn't understand what was happening on college campuses." Neither could he understand the contemporary student press. "A recent issue of the *Daily* hurt him very deeply," Ziebarth said.

But Morrill did not find the college scene wholly bleak in his last years. He told Magrath that he was particularly pleased with international education programs. When he was president, Morrill served as head of an advisory commission formed by President Truman to study the exchange of students with other countries.

When he left Minnesota in 1960, Morrill moved to New York City, where he became educational consultant to the Ford Foundation. He directed a program that provided grants for educational and research institutions in Latin America.

Ziebarth remembers Morrill's interest in international student exchange and international study: "Whenever I got a foreign assignment, Morrill saw to it that I got all the institutional help that could possibly be given. Once, when I was about to go on a special mission to Japan, he talked to me about the trip. I was amazed at his

Students Urged To Take Stock in Liberal Arts

by William E. Huntzicker

Despite the high cost of living, it's still popular.

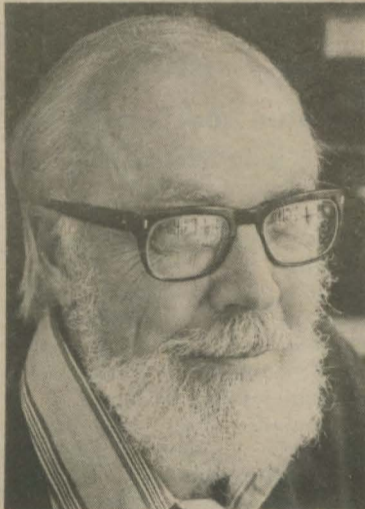
Yet many people believe that the real value of living can be lost when the concern with making a living comes at the expense of other important things in life.

In the academic world, the relationship between a liberal education and vocational training has become a subject of discussion, particularly in liberal arts colleges where enrollments are declining and budget difficulties are projected.

"Nobody denies that a liberal education is important," said University graduate student Carol Boyer. "But some people tend to think about it as a luxury rather than a necessity. The more complicated society gets, the greater the potential impact of a liberal education."

Her view was echoed by history professor Clarke A. Chambers, chairman of a committee that studied bachelor of arts degree requirements at the University to see if they provide a liberal education.

"In the last 20 years, there's been such an acceleration of



Clarke Chambers

history that we just can't deal with it as individuals and as a society without being prepared to move quickly beyond what we know now. That's why the teaching of different modes of inquiry is so important," Chambers said.

Students should be prepared in school to deal with problems they may face in the future, problems they cannot predict while they are students, Chambers said. Solutions to such unforeseen problems will be based

on information not yet available, he said, and a liberal education can teach a student how to make informed decisions.

The Chambers committee report is Minnesota's response to a situation that is being studied at institutions of higher learning throughout the country, including Harvard, Berkeley, Michigan, Indiana, and Carleton College in Minnesota.

"Fiscal retrenchment, inflation, declines in enrollment, a surge of vocationalism among undergraduates, faculties heavily (and increasingly) tenured, retardation of professional mobility—these constitute a source of trouble for liberal arts colleges throughout the nation as well as here in Minnesota," the report states.

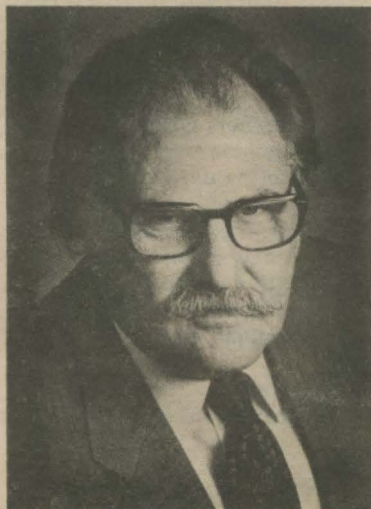
The report, which is being discussed at faculty and student hearings, recommends more emphasis on communication, individualized projects to help students integrate the methods they learn in different courses, and some changes in the course distribution requirements for a bachelor of arts degree.

Fred Lukermann, dean of the College of Liberal Arts (CLA), said the main purpose of the discussion is to create a consciousness among faculty and students about the definition of a liberal education.

"It's not to teach a trade. And it's not to fill up our minds with a bunch of facts. It's basically to be liberally educated, to be able to learn to make use of learning," he said.

Lukermann feels there need be no tension between liberal and vocational education. "There's no segment of this college or this university that shouldn't be teaching what it's teaching in a liberal way," he said.

A liberal education, Lukermann said, involves teaching people how to learn, how to develop an open mind. "It isn't what you learn in a factual sense that



Fred Lukermann

constitutes a liberal education, but the way in which you inquire, the way in which you ask questions, and, then, the way you organize what you've found out so that you can act.

"In other words, you learn by doing. The meaning of anything is in the consequences of acting on it and not from some dictionary definition. Liberal education is a mode of inquiry, a way of doing things as much as learning how to think," he said.

About 16,000 students are enrolled in CLA, making it the largest college in Minnesota.

"The liberal arts teach students to analyze," said Anthony N. Zahareas, director of CLA's office of research development. "To analyze means to observe, to describe, to explain, to interpret, to evaluate, and even to classify."

Zahareas, who is also a professor of Spanish, said that learning a language, for example, can help students acquire discipline for factual learning and at the same time prepare them to look at the world from the perspective of another culture.

While the role of the liberal arts is not to train students for specific jobs, Zahareas said, they do teach students to deal with information and problems they will encounter throughout their professional and personal lives. "There is no more concrete, practical education," he said.

Lukermann said that graduates in a tight job market—Ph.D.'s in English, for example—get jobs on the basis of skills they obtain in acquiring a liberal education.

According to Boyer, a liberal education is successful if a student is intellectually stimulated "so that the person will not want to stop learning, in formal or informal ways."

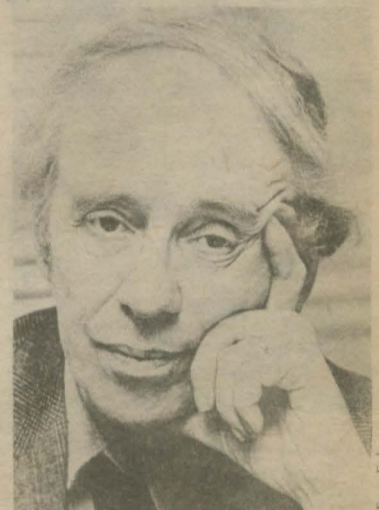
Mulford Q. Sibley, professor of political science and American studies, feels that a liberal education contributes to a person's freedom.

"In principle, there is no need to ration intellectual ideas because they're infinite," he said. "My possession of an idea doesn't prevent you from possessing it. My appreciation of a work of art doesn't inhibit you from appreciating it. In the material realm, however, if I fence off a piece of land then I can prevent you from using it."

No area of study has all the answers, and exposure to a broad range of ideas is impor-

tant to a liberal education, Sibley said. But each area of study provides as many questions as answers.

"As science advances, mystery multiplies. In the higher reaches of almost any area of study—quantum physics, for example—the kinds of propositions that are posed egg you on to more study. Instead of finding answers, we get more questions. New knowledge poses new questions," he said.



Mulford Q. Sibley

Lukermann agreed that science cannot provide all the answers. "The power in learning, I suppose, is in asking the right questions, not in the answers. The answers have always been wrong. We've replaced Aristotle with Ptolemy, Ptolemy with Copernicus, Copernicus with Newton, Newton with Einstein, Einstein with Planck.

"Nobody ever has the right answers," he said. "Conceptually we have to structure the world in order to get out more facts. These facts are not suddenly revealed. If you don't arrange them, if you don't order them, if you don't manipulate your sense experience, then you can't make choices. Then you never discover anything new."

"Einstein isn't wrong in any absolute sense any more than Newton was wrong," Lukermann said. "Each culture, each generation, each era, in a sense, has found the truth in resolving its questions."

"Every system of thought," Sibley said, "has to depend on an act of faith. That includes systems of scientific thought. I don't consider faith irrational; it's something you work with—like logic itself."

The answers of previous generations will not work for the questions of today, Lukermann said. And, Chambers said, today's answers will not work tomorrow.

sophistication about Japanese problems."

Morrill must have been pleased, too, with the development of the University's West Bank. It was during the final years of his presidency that the legislature appropriated money for the purchase of land and the construction of buildings on the west side of the river.

"Morrill felt a deep sense of unity about the institution," Ziebarth said. "For example, he was bitterly opposed to the sharp division of the Minneapolis and St. Paul campuses. But he recognized a need to expand to the west bank, despite the opposition of some of the faculty who thought this move would be harmful to campus unity."

Morrill had learned to deal with faculty opposition early on. Indeed, his selection by the Board of Regents concerned some faculty members because Morrill did not have an advanced academic degree, something Ziebarth believes he was very sensitive about.

But the faculty came to respect Morrill and to admire him. Theodore Blegen, then dean of the Graduate School and favored for the presidency over Morrill by some faculty members, became one of the strongest supporters of the new president, who depended upon him heavily for advice, according to Ziebarth.

"Though he didn't have a Ph.D. degree, from my perspective Morrill was a far more thoughtful man than some reports have made him out to be," Ziebarth said. Morrill had a reflective mind as well as outstanding administrative abilities, he said.

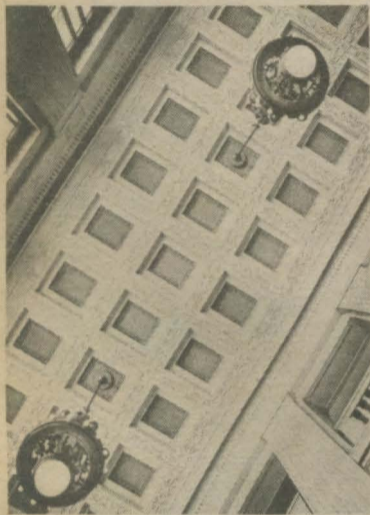
Wenberg agreed. "I think he had a far better mind and ability to express himself than he gave himself credit for. But he didn't fancy himself as an intellectual leader. He saw himself as a spokesman, a spokesman for the land-grant idea."

Perhaps no encomium is more fitting to the memory of Morrill than the words inscribed on the facade of Northrop Auditorium, words Morrill himself was fond of quoting: "Founded in the faith that men are ennobled by understanding; dedicated to the advancement of learning and the search for truth; devoted to the instruction of youth and the welfare of the state."

Correspondence

Hanging Out at Northrop

I quite enjoyed this (summer '79) issue of *Update*. I had just read (in *Our World*, an American Field Service publication) about Russian teachers in the U.S. and Russia, and the *Update* article about Russian women seemed an interesting addition to my reading.



But it's the pictures of Northrop Auditorium that prompt me to write. I spent four, almost five, wonderful years ushering there, in the days when the then Minneapolis Symphony played there, and often used to eat my lunch or study in one of its several quiet corners, or sit on the front steps and enjoy the aura of whatever it is that makes Northrop a nice place to be. I miss it—there's nothing on the University of Washington campus that quite compares. My mother played with the Minneapolis Symphony under Eugene Ormandy, and Northrop was always a part of my life, even before I "hung out" there in the sixties!

Update is always interesting; I look forward to its coming quarterly. Thank you for giving alumni, et al., such a good publication.

Barbara Slife-Beermann, B.A. '65
Seattle, Washington

A Venerable Diploma

I have read with great pleasure your publication, *Update*, which you have sent to my daughter, a recent alumna of the College of Education.

As a matter of possible interest to you, our daughter graduated from the University in 1978, exactly 40 years after my "tour" at the U's Institute of Technology and exactly 80 years after my father graduated on the University's St. Paul campus. My father's diploma was somewhat of an historical item in having the

original signatures of the then president, Cyrus Northrop, of John Sargent Pillsbury, president of the Board of Regents, and of Fred B. Snyder, long-time regent and prominent Minneapolis attorney. This diploma bounced around our home until March 1974. At that time I cleaned out a great deal of memorabilia, and gave this diploma to Frank Kaufert, then dean of the University's forestry school. Returning this certificate to the institution from which it came, I hoped, would insure a greater degree of preservation and a larger exposure to those interested in the University's history and development than I could give.

Franklin J. Ryder
Minneapolis

A Big Stink

The summer edition [was] a lively, attractive, highly readable piece.

I have only one complaint, a minor one at that. It concerns the sunflower article, an informative, but essentially biased, statement.



The significant thing about the sunflower (which you carefully neglected to mention) is that it stinks.

Sidney N. Hurwitz
St. Paul

An Educated Jest

Please find enclosed my documents to change my address on the *Update* mailing label.

I carefully measured the little box and then measured the mailing label. I discovered, in comparing the two items of data, that either the box was too small or the label was too big. In order to get the label to fit the box, it would be necessary to alter the label in such a way that you could not determine my old address!

Consequently, owing I'm sure to the excellent quality of education received at the U of M, I felt the best approach in this instance was to attach one to the other and trust your incisive minds to handle the matter from that point on.

Thank you very much for sending me *Update*. I appreciate the wide-ranging content of the articles. It makes me proud to have graduated from such a fine school.

David L. Sundell
Washington Depot, Connecticut

Color vision . . .

introductory psychology course. He was recently elected a fellow of the Optical Society of America and serves on a National Institutes of Health committee that reviews grant applications for basic research in vision.

As far as he knows, he is the only researcher in the world using this technique on walleye cones. But his work is fraught with frustration. "First of all, it's difficult to get the fish on a regular basis because there are no commercial suppliers," he said.

The walleye is also one of the most difficult fish to keep alive in captivity. "I get all of my fish from the Department of Natural Resources, and their cooperation has been essential to my work. My students and I have driven to Spicer and Waterville in snowstorms just to pick up a few fish."

Another major hurdle is that the procedure is based largely on trial and error. "We're on the borderline of what's possible," he said. "The biggest problem is getting the microprobes inside the cells. We can't see the cells, so it's a random search procedure."

Further, it's a major task to keep the microprobe in the cell long enough to gather significant information. The slightest vibration in the building can be enough to knock the electrode loose. "If somebody slams a door down the hall, it can disrupt the recording or knock out the electrode altogether. Or it may just skip out spontaneously."

When everything works—when Burkhardt finds a cell and inserts the microprobe and it stays in place—measurements can be taken for anywhere from 5 to 25 minutes. "Ideally, I'd like to be able to study a cell for an hour or more," he said.

Throughout his years of research, Burkhardt's primary interest has remained the study of human vision. "I began with an interest in human vision, which led to an interest in the retina," he said. "That led me to the study of animals, and the desire for large cells led me to the walleye."

But researchers will not gain a total understanding of the human retina until they can find a way to study it cell by cell. Although it is probably years away, it may eventually be possible to develop Burkhardt's technique for work on a functioning human eye.

In the meantime, Burkhardt's studies have paid off in two

collaborative studies with researchers at other institutions. In one such effort, Burkhardt collaborated with photochemists from Harvard University and Woods Hole Marine Biological Laboratory who found that there are two types of cones in the walleye retina, one sensitive to green and the other sensitive to red.

"Their measurements coincide almost exactly with measurements we have taken here from electrical responses," Burkhardt said. In other words, the Harvard and Woods Hole scientists proved chemically what Burkhardt had already proven electrically. The electrical responses and the photochemistry are intimately linked: light absorbed by the photopigment causes the electrical response.

"This is basic research," Burkhardt said, "but it may have some eventual practical application. The more we know about how the retina acts normally, the greater the chances we may eventually be able to treat disorders of the eye."

The National Institutes of Health Eye Institute, which has been backing Burkhardt's research for about 10 years, is banking on that possibility. "In the history of vision research, there have been many instances where work on lowly creatures has led to important insights into human vision," he said.

Newton and Goethe . . .

colors" is the result of the physiology of the eye.

In other words, Hering argued, somehow the response of the eye to blue is antagonistic to the response of the eye to yellow. The idea of Hering's opponent color theory is this: When presented alone, blue light might evoke a positive response in the eye. Likewise, if yellow light were presented alone, the result might be a negative response. When blue and yellow are presented together, the positive and the negative responses would cancel each other out. The result: no color at all.

Although the general idea was not new—Leonardo da Vinci and Goethe had both suggested that blue and yellow were somehow opposite—Hering was the first to suggest that the cause was in the physical characteristics of the eye. Hering extended his theory to include a red-green system as well.

But Hering's theory was accepted no more readily than was Newton's since it ran counter to just about everything that was accepted up to that

point about the physiology of nerve cells.

As a result, Hering's theory languished for nearly a hundred years until Leo Hurvich and Dorothea Jameson, two American psychologists working at Eastman Kodak, provided conclusive measurements of the red-green and blue-yellow systems at work.

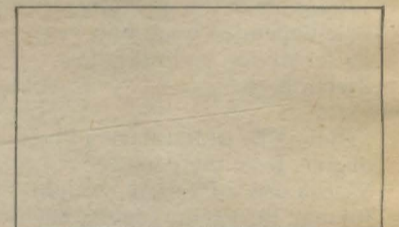
The work on vision in general and color vision in particular continues. Significant contributions have been made by Thomas Young Helmholtz, James Clark Maxwell, and Edwin Land, for instance, who developed the Polaroid process and proposed a theory of color vision.

Scientists are now searching for answers to other basic questions about color vision.

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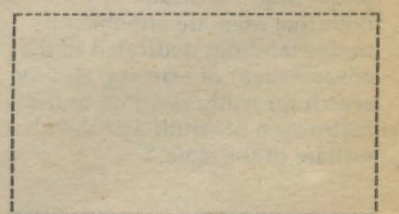
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