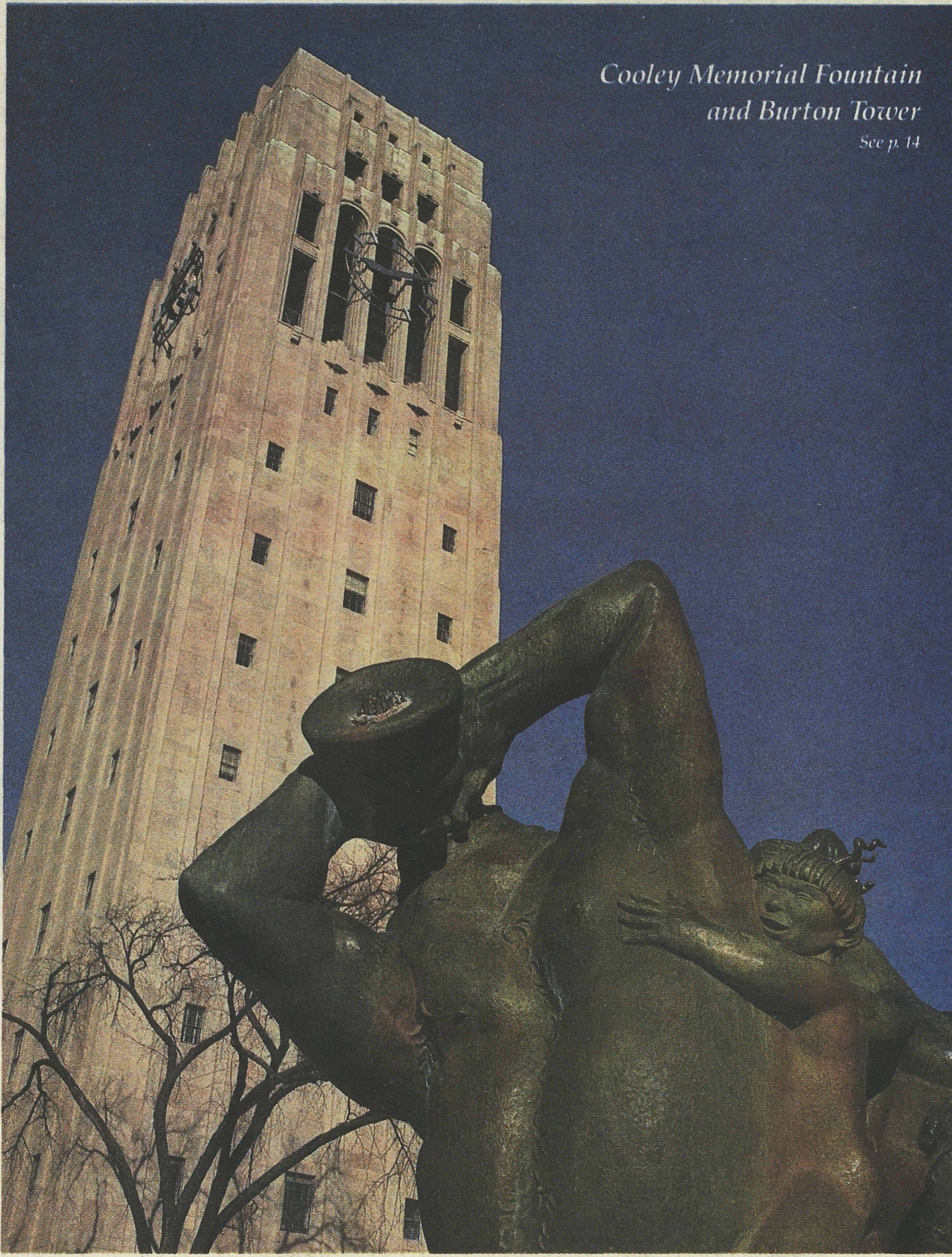


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Michigan Today

The University of Michigan

October 1989 Vol. 21, No. 4



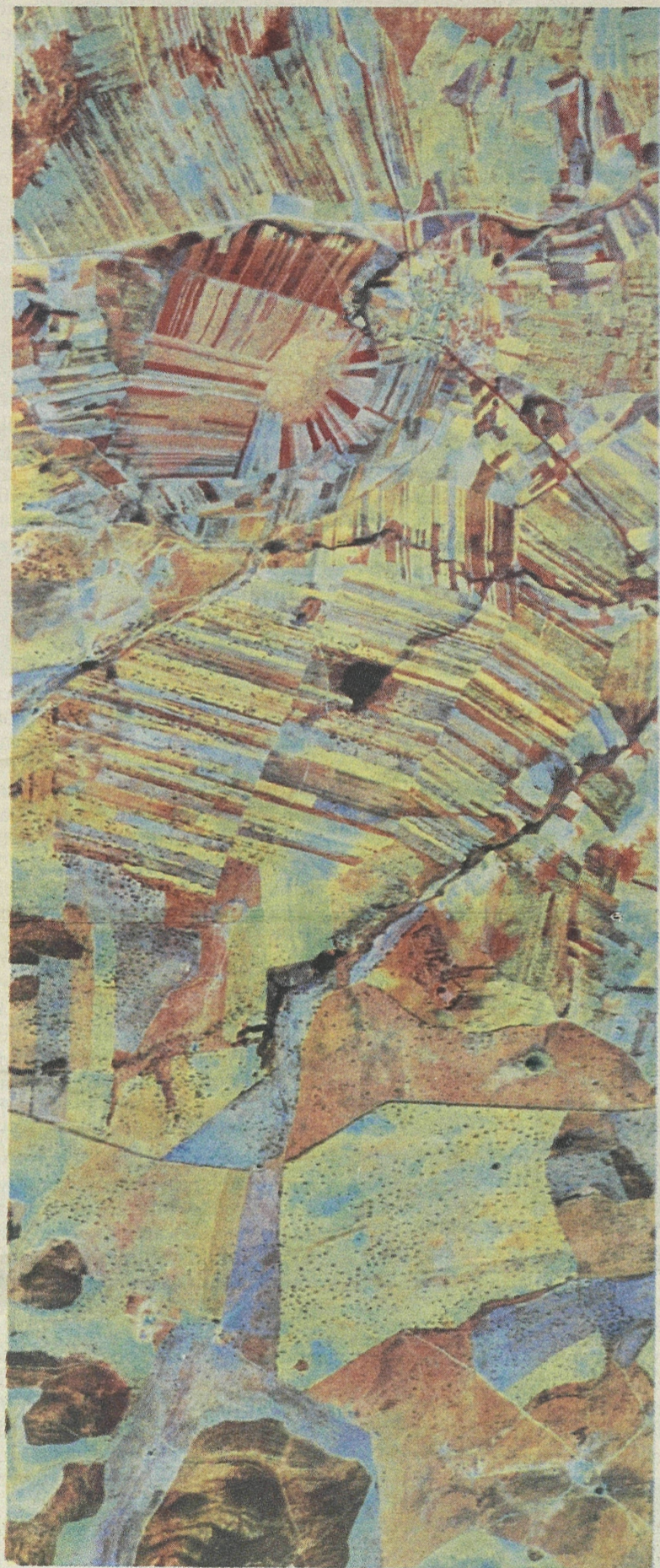
*Cooley Memorial Fountain
and Burton Tower
See p. 14*

Photo by Jeff Mitchell

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REMOTE SENSING

'Man must rise above Earth to the top of the atmosphere and beyond, for only then will he fully understand the world in which he lives.'

Socrates

By Eve Silberman

Twenty-five centuries ago Socrates imagined the benefits of peering at Earth from the heavens, but he could not have predicted the more disturbing ramifications that fulfillment of his vision would bring.

Scientists and engineers have developed ultra-sophisticated technology to scan and measure all features of Earth's environment from as far away as platforms orbiting in space, but the understanding that this has brought is more a source of alarm than joy, because the images collected from these surveys show human-inflicted damage that could prove fatal to our planet.

What Socrates did foretell, nonetheless, was the relatively new science of remote sensing — seeing and studying the world from a distance. Charles E. Olson Jr. — professor of natural resources, director of the University's Remote Sensing Laboratory and one of the pioneers of this new science — likes to give Socrates credit for originating the idea of remote sensing even if the philosopher and other ancients failed to come up with the means of achieving this vision. Nevertheless, it should be noted that the term "remote sensing" was coined in 1960 at one of the early meetings of the Geography Branch of the Office of Naval Research. Olson helped draft the original proposal for that series of meetings in which military and civilian experts planned the transfer of military-reconnaissance technology to civilian-run, environmental-imaging programs. The first symposium on remote sensing was held in Ann Arbor in 1962 (see accompanying story).

Broadly outlined, remote sensing consists of acquiring photographs or images that are obtained by sensor systems placed in aircraft, satellites or on the ground. In its earliest days, remote sensing could be said to include information detectable only with the visual spectrum, such as sightings from balloons or by telescope. But as the field advanced, the various spectra of electromagnetic fields opened up one by one to instruments sensitive to specific ranges of radiant energy.

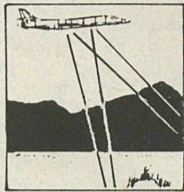
Environmentalists hope that the technology's preservation applications will be more far-reaching than the military sort. One of the most dramatic remote sensing systems today is the Landsat satellite, which has been circling the globe in various metamorphoses since 1972, collecting both visible and infrared images of our planet. Either Landsat 4 or 5, the latest versions, circles the same land masses of Earth every eight days, recording changes in vegetation, coastlines, geological structures and shallow water areas for scientists to study.

From vantages closer to Earth's surface, sensors are now routinely used for everything from surveying the soil to tracking icebergs to drawing up maps. "When we couple the computer with a number of these sensing devices, it makes possible very rapid response to environmental change," Olson says, "whether its an earthquake, flood or oil spill."

At U-M, work in remote sensing ranges widely, from aerial photographs that help ecologists find illegal toxic dumps and monitor the pest damage to Christmas trees, to radar and other out-of-human-sight sensors that let us scan Earth from space, to satellite-carried sensors now on the drawing board. The coming generation of extremely remote, space-based sensors will provide scientists with more information about atmospheric conditions far above Earth, including the ozone layer, radiation belts, the upper atmosphere and outer space. Which is where Socrates advised us we ought to go.

REMOTE SENSING

Continued from page 1



THE BIRDS-EYE VIEW

"The engineers build instruments," says Chuck Olson with a wry smile, "and people like me try to find ways to make them useful."

Olson's office in the School of Natural Resources is a base for graduate students in remote sensing whose research appears to cover most square inches of the planet. For their theses, students have explored everything from undiscovered coal basins in Australia to the Lake Superior ice cycle to penguin rookeries in Antarctica.

Olson is fond of reminding students that the most familiar sensor of all is the human eye and that remote sensing is "a series of techniques to overcome human limitations."

The graduate program — one of a about a dozen nationwide — is so popular that about half the students arrive without guarantee of financial aid. Basic courses include "Map and Image Interpretation," "Imaging Radar as a Remote Sensor," "Optical Instruments and Measurements for Remote Sensing." Several of the dozen students in the recent class were from Third World countries badly in need of a more high-tech orientation to environmental issues.

"I'd love to go back and do research in Mexico," says Lourdes Sanchez-Solis, a recent graduate. Sanchez-Solis has a special interest in the problems of ecology and population. Since suitable farm land is at a premium in Mexico, she points out, remote sensing instruments that can more quickly identify fertile land can play an important role.

"We try to design our international students' projects appropriate to what they can do at home," says Olson. He cites as an example a student from Indonesia, which lacks the computers and aircraft to make use of the most sophisticated sensors. The Indonesian student learned how to use a portable field spectroradiometer, a device that fits



OLSON'S ability to interpret infrared photographs has helped students from developing countries increase crop yields and American environmentalists spot toxic waste dumps.

in a back pack and measures reflected energy to help researchers analyze plant, forestry, soil and rock conditions.

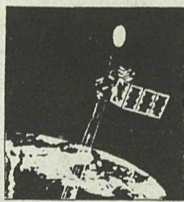
A 1952 U-M forestry grad, Olson spent a couple of years as a Navy instructor in photo interpretation. He's been at U-M since 1963. Although he's watched remote sensing developments soar along with the satellites carrying many of the sensors, he's quick to point out that "a lot can be done with your basic 35-millimeter camera."

For example, a typical project Olson took on was a study for the Michigan Christmas Tree Growers Association of Michigan. His ability to interpret infrared photos taken from a camera mounted on a plane enabled him to help the growers detect early infestations of insects and fungi. (The damage shows up in the infrared spectrum of light before it becomes visible to the human eye.)

With the use of aerial infrared photographs, Olson can "cover an area the size of U-M in less than an hour, versus the minimum of four hours it would take me on the ground."

Learning to interpret a photograph or image is one of the challenges for remote sensing students. An expert in aerial photo interpretations, Olson is often called on when the history or use of a particular piece of land is under question. He tells of how he was called upon in court to testify whether the owner of a gravel pit was at fault for the existence of toxic waste barrels buried on his land. The owner, who was being sued for several million dollars by the Environmental Protection Agency, said the barrels must have been there before he purchased the pit.

By studying tiny blobs visible on an old aerial photograph of the area, Olson used solid geometry to determine where the camera had been when the picture was taken. He then correlated the size of the indistinguishable blobs with the size of the barrels and concluded that the barrels had indeed been in the pit for many years before the defendant purchased it. The judge agreed with him. "If you want to be melodramatic, you can argue that we saved our client eight or so million dollars," Olson says.



MOVING HIGHER UP

For Olson, remote sensing involved a lot of practical, close-to-home applications. But much of the heart of Fawwaz T. Ulaby's research focuses on looking at Earth from space.

The Syrian-born scientist, a professor of electrical engineering and computer science, is concentrating on developing the tools and interpretation techniques for sophisticated radar systems that NASA plans to fly in the 1990s, as well as exploring hitherto untapped bands of the electromagnetic spectrum for missions in the 21st century.

Ulaby, who came to U-M from the University of Kansas in 1984, smiles when he recalls that he started his career as a radio astronomer. "I was looking up at the stars. And now, instead of looking up, I'm looking down and studying the Earth."

Ulaby specializes in radar-based remote sensing. The application of radar as a remote sensor is important for a variety of reasons, he explains. "Radar waves can penetrate clouds, and therefore they're unhampered by weather conditions when you're using them from satellites. They can also operate at night because they have their own transmitter."

A few doors from Ulaby's office in the new Electrical Engineering and Computer Science building on North Campus is a large computer-filled laboratory with an adjoining room that looks to be straight out of a sci-fi movie, its interior lined with hundreds of jutting cones with carbon surfaces. This is an anechoic or radar-absorbent chamber.

One recent morning Ulaby and members of his research team set up a small pine tree on a wooden platform in the middle of the chamber. They bounced radar signals off the tree and took measurements. The measurements help Ulaby build a computer-generated mathematical model of the tree that will improve scientists' ability to obtain and monitor data about whole forests.

Ulaby is involved in what he emphasizes is "very preliminary" research on the ways in which radar can be used to "map tree species and tree distribution and tree density." He hopes his model will be a key diagnostic tool in determining the health of forests through systematizing data about moisture content, the size and health of leaves and other indices of tree growth.

"I observe stages of tree growth, with leaves, with no leaves. So I can learn their dynamics as observed by radar," says Ulaby. "The process is not really that foreign from studying a tree with your eyes, except that instead of observing with optical waves I'm using radar waves."

Ulaby hopes his research will contribute to efforts to save Earth's vanishing rain forests in South America, Africa and Asia.

"The deforestation puts additional pressure on me to work on the problem because the harm it could do over the next 20 years may be irreversible," Ulaby says.

In June 1988, NASA established nine university-based Space Engineering Research Centers, one of which is at the U-M under Ulaby's directorship.

The newly formed centers, which cover a wide range of specialties from robotics and propulsion to solid-state electronics, will conduct research and develop technologies relevant to the establishment of operational bases on the Moon, to manned and unmanned operations on Mars, to space flight missions to other parts of the solar system, and to observations of the Earth's environment from space platforms. The nine Centers were selected from among 115 proposals that were submitted by many U.S. universities in 1987.

The U-M Center, officially known as the NASA/Center for Space Terahertz Technology (NASA/CSTT), will focus on the development of "terahertz" devices, circuits, antenna arrays and sensor systems in support of future remote sensing observations of planetary atmospheres, including the Earth's upper atmosphere. The research involves literally charting new ground in the electromagnetic spectrum.

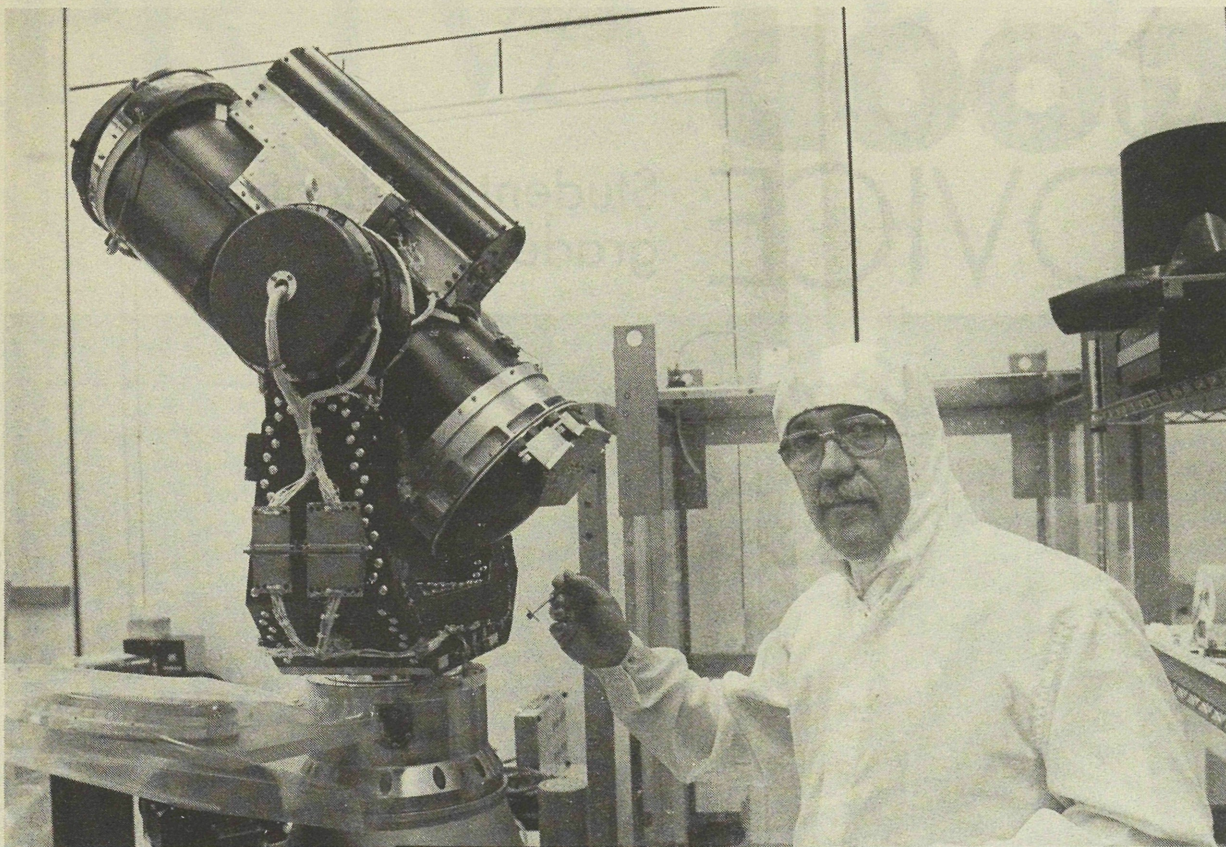
The electromagnetic spectrum comprises a wide range of wavelengths, of which visible light is just a small part. Most of the wavelengths such as gamma rays and x-rays are invisible to the eye. Ulaby and his colleagues are studying a little-known frequency band called the terahertz region, which he thinks has the potential to increase scientists' ability to study some of the molecules and gases in the upper atmospheres of Earth and other planets. Among other things, this might help lead to a better understanding of the ozone layer — the buffer between Earth and harmful ultraviolet rays that has been punctured by hydrocarbons released by the vehicles and devices of human "progress."

Since the research is so new, the U-M research engineers will also be developing the equipment (hardware, semiconductors) that operate at terahertz frequencies.

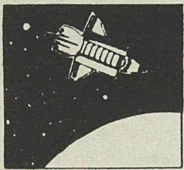
In another recent development, Ulaby and his research team were among a small number selected to take part in a major NASA initiative called EOS (Earth Observing System). It's a giant, study-the-Earth-to-save-it project that Ulaby excitedly describes as "the largest thing that ever happened within the NASA system."

Four giant satellites, (two from the United States, one a joint European-American effort, and one from Japan) will be equipped with the most sophisticated and largest remote sensing system to date. Starting in the mid 1990s, the satellites will compile data on Earth's ecosystem for 15 years.

"NASA says we owe it to ourselves to start developing technology to provide precise data on our environment to help us make better decisions than our predecessors," Ulaby says. "We need to start now so that we can have something in place 20 years from now."



HAYS is preparing his robot-like 'old friend' HRDI, a Doppler-imaging interferometer, for its scheduled 1991 voyage to study winds of the upper atmosphere for the first time.



STUDYING REALLY HIGH WINDS

Paul B. Hays half-jokingly calls the \$23 million instrument he's spent 12 years developing as an old friend. "It's almost human to us!" Hays exclaims, looking at a 300-pound, robot-like apparatus called the High Resolution Doppler Imager, called HRDI ("Hardy") for short. "We've built all the parts, you know, tested each one. And we've slowly added an arm here and a leg there until finally it's almost operable."

Most of the time HRDI resides in a large white box in a sealed-off space-simulation chamber down the hall from Hays's office in the Space Research building at the College of Engineering, where he is professor of aerospace engineering and of atmospheric, oceanic and space sciences. HRDI's secure residence is quite understandable because it is the most expensive single instrument ever built by U-M researchers, and Hays and others hope HRDI's payoff will be as impressive as its price tag.

HRDI will be a passenger in the 1991 space shuttle: its mission, to boldly go to the upper atmosphere and take a close-up look at the winds there. "HRDI will enable man to observe upper atmosphere winds for the first time," Hays emphasizes. "This is very important because we really don't know in detail what the winds in the upper atmosphere are like."

In the past, these winds could generally be studied in only two ways, Hays explains, by data sensed from devices at the highest altitudes reachable by balloon or by "inferring the winds," a technique in which "you measure the temperatures on the Earth's surface and then calculate the winds, which is what the National Weather Service does today."

One application of HRDI is tracking jet streams, which may help pilots tack in the jet stream as sail boats do in the wind, which could improve speed and save fuel. HRDI could also help scientists build a better picture of how hurricanes form and how changes in the sun affect Earth's climate.

But HRDI's most important contribution may be to provide more facts about the eroding ozone layer. "Ozone is mostly created near the equator, where the sun is shining on the atmosphere most directly," Hays notes. "But actually the winds blowing away from the equator carry ozone to the highest latitudes. Knowing more about those winds is very important in studying the chemistry of the atmosphere."

HRDI's basic components consist of a telescope and a sensing device. A very precisely built optical instrument, HRDI scans the sky and measures emissions of atmospheric light

"While the satellite orbits Earth at an altitude of about 365 miles, HRDI will peer down through the atmosphere," Hays explains. "By detecting

the absorption of sunlight in 32 spectral regions simultaneously, it will measure atmospheric motion in two directions — towards and away from the satellites.

"Like a lot of remote sensing instruments, HRDI doesn't take pictures like a camera does. It takes pictures by moving the telescope; it creates an image sequentially."

HRDI is the latest product of U-M's Space Physics Research Lab, which has been involved in "experimental investigation of what's out there since the late Forties," Hays notes. "We've been involved in space research long before there was a NASA."

The birth and growth of HRDI was an extraordinarily complex process. At one point, recalls Hays, the team had to spend time learning all about glues in order to develop a special procedure for gluing mirror mounts together. "It's been like wading through molasses," he sighs. "We've had several major difficulties to make this work."

Their work may have taken them along different avenues — or, more accurately, paths of flight — but Olson, Ulaby and Hays all feel that remote sensing has brought Earth's environmental ailments home to them with the force of a close-up photo. None professes to know either the extent of the damage done by the Earth's most developed nations, or about the policies needed to reverse it. But all emphasize that for all their powers of transcending the limitations of the naked eye, the sensors can only expose the problems; the earthlings must act to solve them.

Hays warns: "There's no question that the climate is slowly being modified by man. It's a kind of experiment in which we may be the ultimate losers."

'...to the top of the atmosphere and beyond'

"Remote sensing means the acquisition of information at a distance. The eye is a remote sensor, as is the camera," says Prof. Fawaz T. Ulaby, an engineer and computer scientist.

But in the past two decades "remote sensing" has come to mean the process by which pictures and images are taken from a dazzling, futuristic assortment of usually airborne instruments. Many sensors are used to recapture the parts of the spectrum nonvisible to the human eye (like infrared and microwave radiation). The energy phenomena that are sensed are usually transformed into visible form via computer printouts, video screens and so forth. For example, a thermal infrared airborne line scanner is used to detect plant and forest disease. HRDI, a doppler imaging interferometer developed by U-M researchers, will be put on a satellite in 1991 to study the winds of the upper atmosphere.

Remote sensing as a discipline is said to have started when aerial photographs were taken from balloons in the 1860s. Aerial photography became widespread during World War I after the development in 1915 of the infrared filter, which allowed a glimpse into the infrared region not visible to the human eye.

The University played a key role in the next advance in the field. The former Willow Run Research Laboratories administered by Michigan was a launching pad for some crucial remote sensing developments during and after World War II, specifically in radar. Synthetic aperture radar was first demonstrated here in 1957. This radar technology was small enough to be carried on an airplane and still produce highly detailed maps in any weather from virtually any altitude. In 1962 the first national symposium on environmental remote sensing was held at U-M.

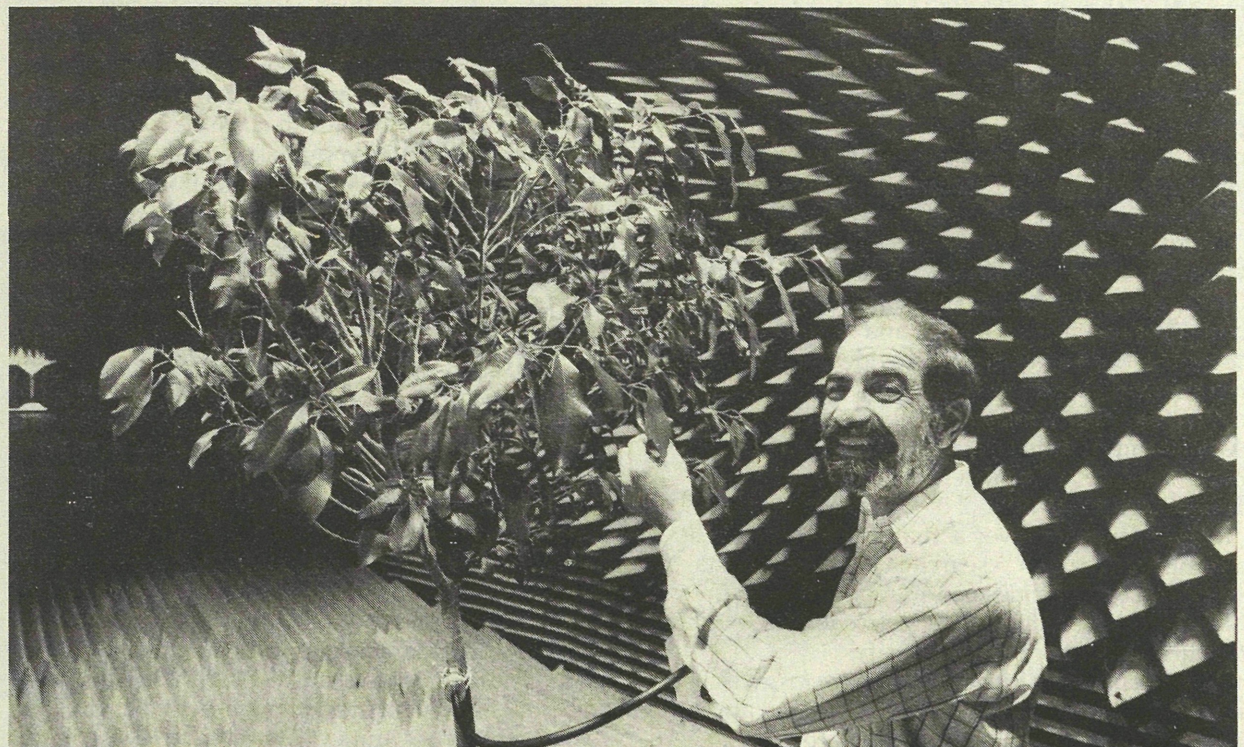
Many Willow Run projects were funded by the Department of Defense, and the military applications became increasingly controversial. After the U-M responded to anti-war activism by limiting military and classified research, Willow Run separated from U-M to become the Environmental Research Institute of Michigan (ERIM).

Today, ERIM has several hundred employees and continues research and development on radar and an assortment of other sensors with military, industrial and environmental applications. ERIM engineers have spun off several other area companies, including Daedalus, which specializes in airborne heat sensing devices, and Geospectra, which specializes in processing and interpreting images taken from satellites.

The legacy of that pioneering remote sensing work remains strong, with some of the most important research in the country continuing to take place at Michigan.

"In Southeast Michigan," stresses U-M natural resources professor Charles E. Olson Jr., director of the Remote Sensing Lab, "you've got as great a consortium of remote sensing expertise as exists anywhere in the world." ■

Eve Silberman is an Ann Arbor free-lancer and a staff writer for the Ann Arbor Observer.



ULABY hopes his experiments in an anechoic (radar-absorbent) chamber will result in a diagnostic tool that can determine the health of forests.

GOOD ADVICE

Student publication grades the faculty

By Michele Thompson

When students are selecting courses and want to know something about a professor's teaching style and effectiveness, personality, or grading practices, they often need some sound advice. At Michigan they can get it from *Advice*.

Advice (Academic Development Via Instructor and Course Evaluation) is a student-run publication funded by the Michigan Student Assembly (MSA). Approximately 9,000 copies are distributed at the beginning of fall and spring terms.

The most recent issue provided 70 pages of evaluations of more than 3,000 classes and their instructors. The end-of-term evaluations are written anonymously by students who have received forms from their teachers. Most questions require numerical ratings but there also is space for written comments. The scores are sent to the Center for Research on Learning and Teaching (CRLT) for processing and then passed along to the academic departments.

The average score for each statement, with which the student either 'Strongly Agrees' or 'Strongly Disagrees' on a five point-scale, is calculated from data obtained on the forms.

ADVICE Fall, 1989			
POLI 496	UG-SEM AMER GOV & POL	Corcoran	
Class size was 15 of whom 73% responded.			
Workload is (Heavy = 1 to Light = 5) 1.29			
Receptive to student questions 4.71			
Exams/papers reflect what's covered 4.58			
Grades fairly determined 4.29			
Recognizes student difficulty 4.71			
Expected grade (Median) 4.58			
Clearly defined course requirements 4.58			
Presents material effectively 4.58			
The course, overall 4.89			
The instructor, overall 4.58			
CIVIL 536	CRITICAL PATH METH	Ponce De Leon	
Class size was 21 of whom 86% responded.			
Deepened interest in subject matter 4.13			
Thorough knowledge of subject 4.90			
Answers to questions 4.68			
Well-prepared for class 4.73			
Part of course 4.27			
Impartially 3.4			
. 4.37			

Jim Kulik of CRLT says the evaluations are used for merit reviews of faculty by department chairs and deans, although no specific weighting is given to the student evaluations. Nevertheless, Kulik says, "more and more concern is being given to student evaluations. Departments are establishing databases to keep information on file that has been collected over the years in order to call up any class or professor at any given time."

The original function of the service was to provide feedback for faculty to use in shaping and conducting their courses. They can even tailor-make their own evaluation questionnaire to fit the features of their classes. Over time, however, most faculty have adapted to the standard form, and few alter it.

The *Advice* staff plugs the CRLT data into a specially designed computer program that produces average scores on each question, the number of students in the class and the percentage of students who responded, along with an overall average for the teacher and course.

Why do students want such a publication when the University produces the *LS&A Course Guide*, a comprehensive manual that describes course requirements, format and subject matter? They like *Advice* because it provides well-informed information about a professor's teaching style, course workload and predictability of grading. Another advantage is that *Advice* has entries for many College of Engineering courses and some School of Art and School of Education courses.

Advice tries to convey actual teaching ability at a campus on which research is strongly emphasized. Also it provides continuous feedback in hopes of promoting more effective teaching at this first-rank research university.

One form of positive feedback *Advice* gives is its "Honors Evaluation List" of professors and instructors with a rating equivalent to an A+, based on a scale of one to five.

Ralph G. Williams, associate professor of



STUDENTS LIKE *Advice* because it provides 'well-informed information about a professor's teaching style, course workload and predictability of grading,' says editor Thompson.

English, has made the A+ list several terms. He says appearing in *Advice* is "like having your grade published in the town newspaper for everyone to see." But he likes the evaluations because they help him "learn what sorts of things students value."

One concern that Williams and other faculty members share is that *Advice* is "the only organized, consistent form of response to teaching that is made available to us." While students' responses are certainly valuable, teachers need more peer review and other types of feedback as well, Williams thinks.

Williams suggests that MSA or some other University body initiate an exit poll of graduating seniors, asking them to write down the five classes from which they gained the most valuable knowledge with a short explanation of the reasons they cited those courses.

The *Advice* staff encounters a variety of problems. It has been difficult to obtain data for several reasons; one is that an instructor's permission is required before the evaluations can be released to *Advice*. Furthermore, student evaluations must be loaded into the *Advice* computer program designed specifically for this project. With a current staff of only three students, the very involved publication process is difficult to complete on time.

Despite these problems, an informal poll of 10 peer institutions indicates that *Advice* is one of the best student evaluation publications in the nation. Only about one-half of peer institutions have similar guides.

At the University of California, Berkeley, for example, an evaluations guide hasn't been produced in about three years, and Duke University's *Teacher Evaluation Book* has succumbed to the same red-tape struggles that *Advice* is encountering.

Students at the University of North Carolina, Princeton University, the University of Illinois and the University of Virginia publish course guides similar to *Advice*.

Many other universities, however, offer only course guides produced by the administration, and these publications do not enjoy the credibility of those produced by the students who are choosing and taking the courses.

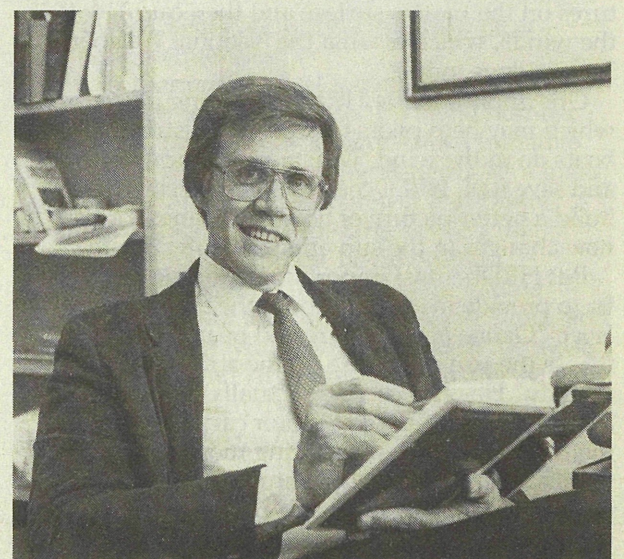
MSA would like to expand *Advice* to cover all undergraduate courses in the 19 U-M Schools and Colleges. Every student is directly paying for *Advice* by way of a tuition allotment to MSA, so every student deserves to benefit from evaluations of even the most obscure classes.

It also would be useful to print some of the comments that students write on the coded evaluation sheets, as does *Q Guide* at Harvard University. With a staff of approximately 20, the students on the *Q Guide* can distribute and collect the evaluations and record the results. The publication enjoys virtually complete independence. Deans and faculty provide all requested information so that the students can be accurately and thoroughly informed.

The virtue of the Harvard model is that if a faculty member receives an extremely high rating, a student considering the course can learn that it was because students found the professor to be interesting and charismatic instead of an easy grader who canceled class a lot. Prospective students also would like to know that a professor received a poor rating because he or she was unapproachable rather than unknowledgeable.

It's sometimes said that "those who can, do; those who can't, teach." The fact that it is an ancient saying does not make it true. To know how to teach is a rare, priceless gift, and *Advice* hopes to encourage professors to keep on giving. **MT**

Michele Thompson '90 of Livonia, Michigan, editor of *Advice*, is majoring in communication.

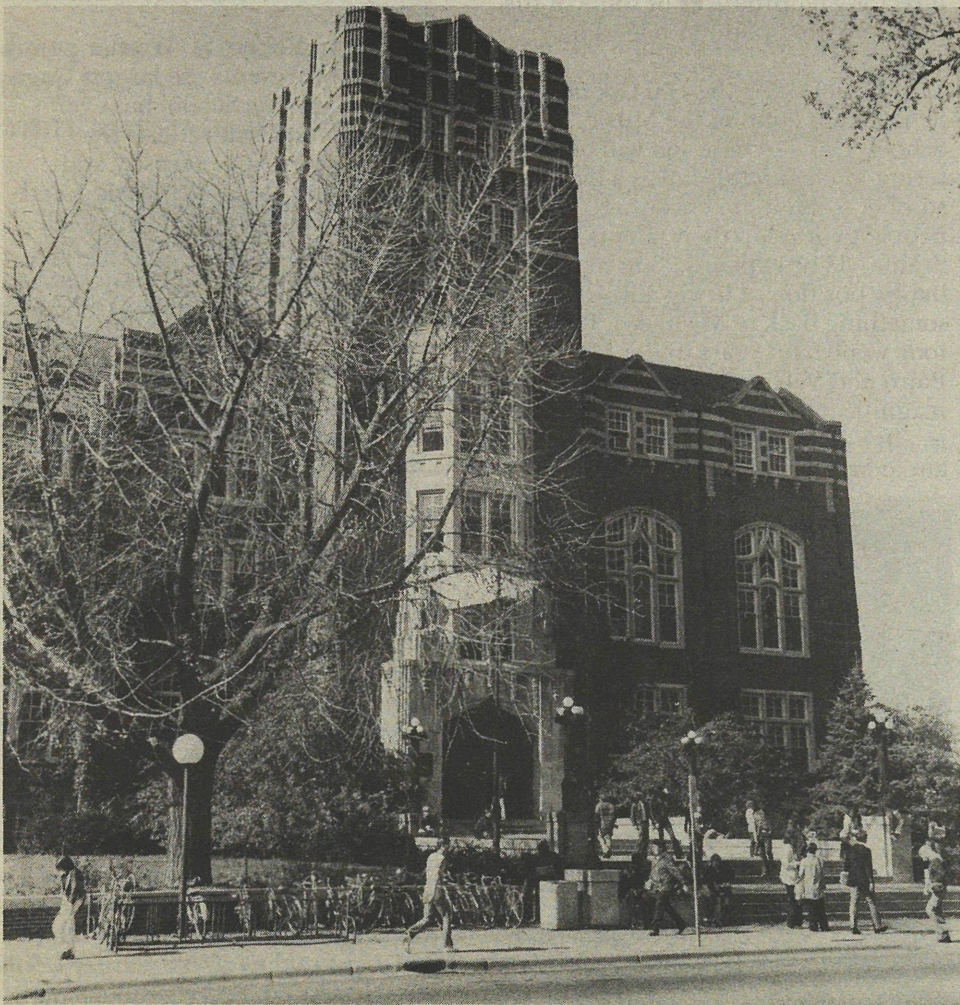


AN A+ is the norm for Ralph G. Williams, associate professor of English, in LS&A student ratings of the faculty. His pedagogical credo: 'Hume once said, "The secret of morals is love." Well, the secret of teaching really is love.'

PRIVATE GIVING

A Report on Private Giving 1988-1989

The University of Michigan



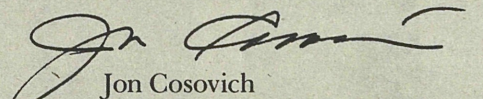
The University of Michigan Student Union

Over the past year, alumni and friends of the University have continued to demonstrate, through their gifts and their volunteer participation in its fundraising efforts, how strongly they are committed to Michigan — to its growth and its continued excellence. In this Report on Private Giving, which we publish annually in *Michigan Today*, we pay tribute to those many friends whose generous support and dedication help make this University what it is. As you read this insert, please recognize that the donors and the volunteers profiled here are among many others whose belief in the University is essential to its continued well-being. As the University prepares its students for the rapidly approaching twenty-first century, that support will become increasingly important.

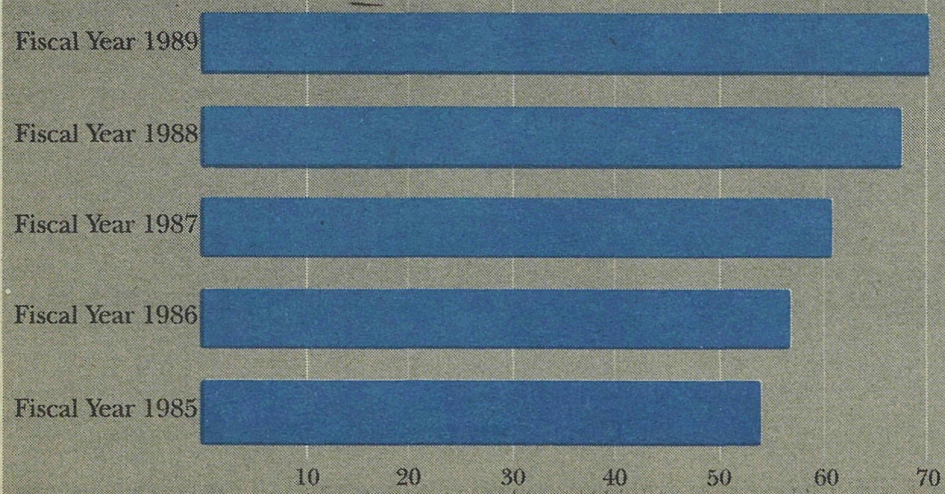
In 1988-89, the University received \$70,711,706 from nearly 96,000 donors. These figures represent an important increase over those of last year; not only do they indicate that Michigan has been the beneficiary of significantly increased private support, but they also show that the number of University donors has increased by more than 20 percent.

Such a dramatic increase in the number of private individuals, corporations, and foundations who have demonstrated their dedication and commitment is an important sign that Michigan is answering the needs of the public it serves. More importantly, however, this level of generosity will allow the University to maintain its leadership role as one of this country's premier educational institutions.

We invite you to read this Report, to meet some of Michigan's donors and volunteers, and to understand how these funds are being used across the University.


Jon Cosovich
Vice President for Development

Growth of Private Giving As of June 1989 Total Dollars in Millions



Gifts at Work

Sometimes it's easy to forget just how remarkably large and multi-faceted Michigan really is, how many disciplines it teaches, how many programs it offers, and how many forms its service takes. The gifts described here are a wonderful reminder of the scope of the University, and the many and varied giving opportunities it offers. At the same time, such diverse gifts should also remind us that Michigan's colleges and schools are interdependent — parts of the whole; and, thus, by supporting any one area of study or research, we automatically strengthen the University as a whole.

A Gift for Educating Educators . . . and Helping the Humanities

Thanks to the somewhat disparate interests of Martin Frank (BA Mathematics, '58) and his wife Linda (BA Education, '59), two units of the University have been the recipients of magnanimous gifts. The Franks — who come from a long line of U-M alums, and whose children both graduated from Michigan — decided to divide their \$50,000 donation between the Institute for the Humanities and the School of Education.

The importance of the Franks' gift to the Institute is summed up by its Director, James A. Winn, who notes that "We rely on private contributions to support the faculty and student Fellows who work at the Institute as well as the many visitors we bring to campus. The Franks' endowment will enable us to expand the Institute's exciting, growing program of fellowships, courses, and public events." The gift will also qualify for a match from the Institute's Mellon Foundation challenge grant.

Linda's ongoing interest in education is reflected in the \$12,500 gift pledged to the School of Education: "I've been an elementary school teacher and found it very rewarding work. A teacher has a terrific impact on the future, and I'm glad to do what I can to encourage students to become excellent teachers."

A Southern Acquisition from a Northern Collector

Irwin Holtzman (BA political science, '49) has always been an avid reader and collector of books, particularly modern Russian and Israeli literature. Recently, he and his wife, Shirley, donated their 40-year collection of Faulkner books, manuscripts, and Faulkneriana — nearly 1,200 items in all — to the University Library. As Holtzman explains, "I've been reading and enjoying Faulkner since my graduate student days. I decided to give my collection to the U-M because I love the University, and I want to strengthen its library holdings. This gift is my way of encouraging people to read and buy books. Also, I know that the collection is in good hands, since Michigan, unlike many libraries, will keep it all together as it should be, rather than separating it by categories, such as books, magazines, and articles."

A New Scholarship: A Favorable Ruling for U-M Law Students

When lawyer Kathryn Dineen Wriston (JD '63), decided to establish the Robert E. and Carolyn B. Dineen Scholarship for Law Students in honor of her parents, she knew they would be delighted. Both Robert and Carolyn Dineen were lawyers and, according to Kathryn, took a great interest in young people and in their educational development.

Robert, who died in April of 1989, was a prominent figure in the insurance industry, credited with bringing about modern insurance regulation. Kathryn's mother, Carolyn, practiced law and later became active in civic and philanthropic affairs.

All three Dineen children pursued legal careers, with Kathryn beginning hers in New York at the firm of Shearman and Sterling. She currently serves on the boards of numerous corporations and institutes, and she has served on the Law School's Committee of Visitors since 1981.

The timing of the endowment was fortuitous, as Kathryn notes: "My father was thrilled with the endowment. I'm grateful that the scholarship was established while he was living, and that he took such pleasure in it."

Promoting New Ideas in Marketing



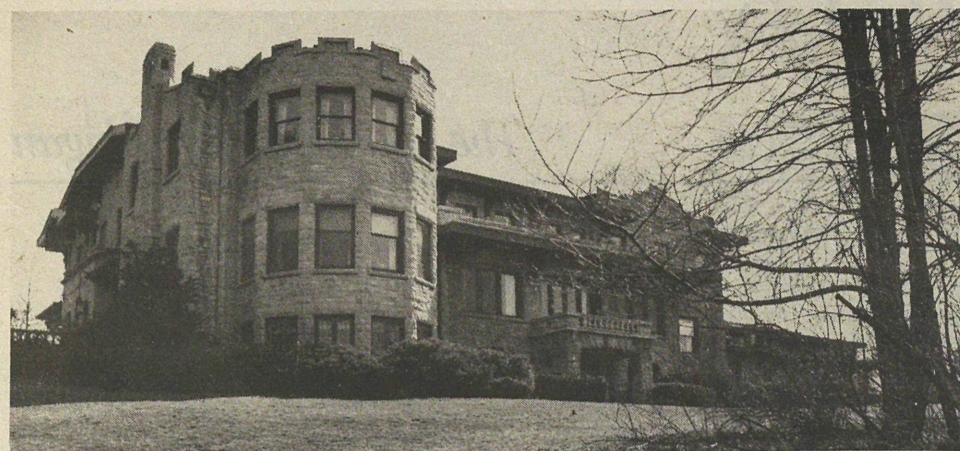
Milton Kendrick (right) and Jose Antonio Rosa

Although Milton Kendrick earned his degree in History (BA '29) and never took a business course, he has always been deeply interested in business and, in fact, worked for many years as the sales manager of Michigan Consolidated Gas. So, when he decided to make a major contribution to Michigan, it seemed only natural to establish a fellowship in marketing. "After all," as he is quick to point out, "marketing was an important part of my career, and I want to do what I can to promote research and new thinking in the field."

The annual award, named in honor of Kendrick and his wife, Josephine, who died earlier this year, is given to second- and third-year Ph.D. students who submit winning papers "written on a substantive marketing topic with a theoretical basis." In 1988, two students received awards. This year's winner is Jose Antonio Rosa, a doctoral student in marketing.

Kendrick, who has been an avid Michigan supporter for many years, is a University Club board member and is recognized at the Tappan Society level.

HIGHLIGHTS OF GIFTS AT WORK



The Henry Ford Estate—Fair Lane on the Dearborn campus

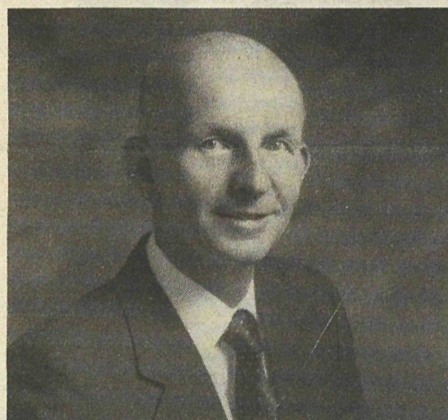
U-M Dearborn's Annual Fund Gets a Boost

Bob Bonczyk's (BBA '63) opinion of the U of M is unequivocal: "Michigan is the finest university in the country, a school whose graduates have contributed a great deal both to the state and the nation." Like many alumni, he believes it's important to return something to the University that has given him so much — in this case, by making a gift to the Annual Fund. Unlike other gifts, contributions to the Fund are unrestricted

and can thus be used as needs dictate: for scholarships, teaching awards, research grants, library acquisitions.

Thanks to Bonczyk and others like him, U-M—Dearborn's Mardigan Library has been able to obtain two CD-ROM workstations. The new CD-ROM system uses compact disks to store vast amounts of data; specifically, indexes on the subjects of education and psychology. This, in turn, makes it possible for students to locate the references they need by scanning a computer screen and pushing a few buttons.

A Happy Note for Revelli Hall



Donald R. Shepherd

Donald Shepherd (BBA '58) is a long-time admirer of the Michigan Marching Band, an institution he firmly believes "prepares students for life outside the University in a way that few other campus organizations do." His generous contribution for the renovation of Revelli Hall, home of the Michigan Marching Band, has brought the organization closer to a new and much-needed building addition which will be named the Donald R. Shepherd Wing.

It's expected that the new wing will allow the Marching Band to address both present and future needs. Renovation plans call for the addition of adequate changing space for women band members (who, until now, have had to use one small rest room) as well as a new audiovisual room to house the electronics equipment that is revolutionizing the Band's preparation for performances.

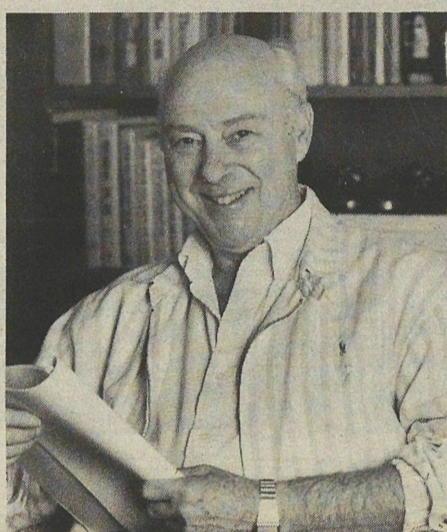
Avid Campers Work for Michigan

Camp Michigan, located on Walloon Lake and operated by the Alumni Association, has been a recreational and educational retreat for U-M alumni and their families for more than 27 years. Each weekly camping session hosts 70 families, offering them the opportunity for tennis, swimming, hiking, and other outdoor activities, as well as enter-

A Dramatic Gesture from a Grateful Alum

Hal Cooper (BA '46) has come a long way since his days as a theater student at the University. Over the past 42 years, he has been a writer, director, and producer of some of the country's most popular television shows.

By establishing the Hal Cooper Scholarship Fund in the Music School, Hal — whose son will be entering Michigan this fall as a biology student — hopes to encourage young people to develop their talents in drama. As he explains, "I'm in the happy position of being able to give something back to Michigan. I had four wonderful years under Claribel Baird and Valentine Windt, both magnificent teachers. And Michigan is, after all, responsible for where I am today."



Hal Cooper

tainment such as evening square dances and lectures by U-M faculty.

For long-time campers and U-M supporters Verne (BA '62, MBA '63) and Judy (BA '62) Istock, the Camp is indeed a special place.

Recently elected president of the Alumni Association, Verne commented at the time of his inauguration about "the many lifelong personal friendships and truly memorable family experiences [that he has enjoyed] for many years at Camp Michigan." And so, when they were asked to take part in the \$2 million campaign to renovate and refurbish Michigan's buildings, the Istocks eagerly agreed — not only making a generous gift but also serving as co-chairs of the Camp's Leadership Gifts Committee. To date, more than \$300,000 in alumni pledges have been received; and it's hoped that by early fall, the campaign will have reached the \$1 million mark.

Cause for Celebration at the School of Information and Library Studies

Virginia Spencer Ehrlicher (ABLS '41, AMLS '61, Ph.D. '74) and her husband, Arthur (BA '18) have been dedicated U-M supporters for many years. Their decision last year to fund a new convocation room for the School of Information and Library Studies reflects their gratitude to their alma mater. In Virginia's words, "Both of us have received large portions of our education at the

University of Michigan and are pleased to make this gift to further the cause of education for future students." The \$185,000 pledge will be used to restore and refurbish a room located over the historic Engineering Arch, which adjoins the School's new quarters in the West Engineering Building.

As Dean Robert M. Warner points out, this represents the largest single personal gift the School has ever received, "one that reflects the Ehrlicher's great generosity and commitment to the University's and School's mission, and one that will enhance our program enormously. We're very grateful for this donation, which will enable the school to plan large functions without depending on the scheduling and availability of spaces in other units of the University."

Fighting Cancer with a New Research Fund

Like many people, the lives of John (BSE '55, MBA '58) and Suzanne Munn have been touched by cancer. Their response has been to form what they call "a lasting, continuing, and long-term relationship as supporters of the U-M Cancer Center." Most recently, that support has taken the form of a \$1 million pledge to endow the John and Suzanne Munn Endowed Cancer Research Fund. As John explains, "Suzanne and I felt that a gift to the Cancer Center would best express our feelings about the University as well as allow us to attack, in some way, this miserable disease. All of our family members — including my son, John, and daughter, Laura, both of whom are Michigan graduates — are very supportive of this gift and the hopes behind it."

"We have met several of the doctors at the Cancer Center," he continued. "You can't help but be caught up with their energy, their enthusiasm, and their new ideas. You can't help but feel that there is hope." According to Cancer Center Director, Dr. Max Wicha, the Munn endowment has created significant new opportunities for the Center by providing seed grants to give new ideas a chance to develop. As Wicha explains, "The successful preliminary work funded

through the Munn endowment will enable our researchers to demonstrate to national agencies and foundations that their work has sufficient probability of success to merit major long-term funding. We have found that this kind of funding can multiply its effects many times over."

Many Units Benefit from Donor's Continuing Generosity



Bruce Zenkel

Bruce Zenkel (BBA '52) has "a very sincere love of the U-M, because of my own experience as a student and also because of the wonderful education my two children received at Michigan."

Supporting the University is nothing new for Bruce and his wife, Lois. Their many generous gifts to Michigan have included minority scholarships in LS&A, the Lois and Bruce Zenkel Fund for Faculty Research and Development in the Business School, contributions to the Business School Growth Fund, and a book fund at the Jean and Samuel Frankel Center for Judaic Studies. Bruce has served as a member of the Business School Development Advisory Board as well as on the Board of Trustees for the Michigan Business School Growth Fund which invests in promising growth companies. In addition, Zenkel has recently made a \$1 million bequest to the University.

Fellowships Established in History Department

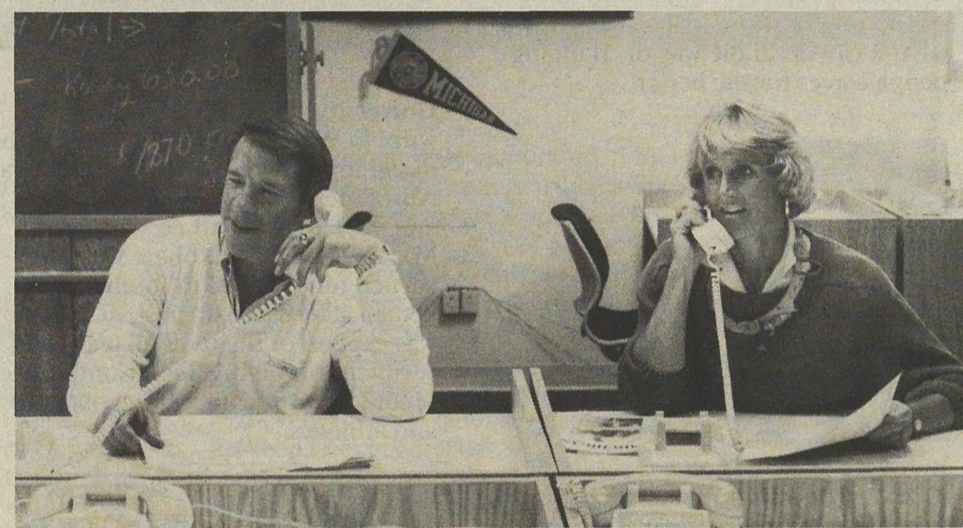
Since earning his degrees in history, Syd Mayer (BA '62, MA '63) has had an illustrious and far-ranging career as a lecturer, writer, and editor of scholarly works, and founder of the Bison Group, a publishing company specializing in illustrated books. Over the years, Mayer has maintained close ties with the University, ties dating from his first encounter as an undergraduate with history professor Preston Slosson.

In tribute to both the Department of History and Professor Slosson, who died in 1984, Mayer has established an endowment that will eventually support six graduate fellowships awarded for up to three years each. The goal, as Mayer expresses it, is to "encourage students to become really

excellent professors, the kind of lecturers who have long-term impact on their students."

He has also initiated the Bockman/Hall Fellowship in East Asian History to help recruit outstanding graduate students. The fellowship is established in honor of Robert Bockman, a lifetime friend who died in 1985, and John Whitney Hall, Emeritus Professor of Japanese History at Yale University.

Mayer speaks of his gifts as paying a debt of gratitude: "If I had not gone to Michigan, I would not have become the person I am. In a very real sense, I owe Michigan everything, and now I am repaying that debt. One of the most satisfying ways of doing that is by establishing living gifts — gifts that will endure as long as there is a University of Michigan."



Robert M. and Susan Brown

Two Alumni Champion the Center of Champions

When Robert M. Brown (BSE '63) became captain of the Michigan football team in 1962, he was following in the footsteps of his father, Robert J. Brown. Robert J. was the Michigan team captain in 1925, the same year he was named All American.

By establishing the Robert J. Brown Fund for the Center of Champions, Susan (BA '63) and Robert are honoring the memory of Bob's father.

The Center of Champions has been described by honorary building fund campaign chairman, former President Gerald R. Ford, as "the

cornerstone to putting our athletic facilities in place for the 21st century." The Brown gift has been earmarked for the new building's Varsity Locker Room.

Both Bob and his wife, Susan, have been enthusiastic and generous supporters of the University for many years. They served as Co-chairs of the Campaign for Michigan Fund and were members of the National Campaign Committee for the Campaign for Michigan. Bob is also a member of the Business School Development Advisory Board and Chairman of the Kalamazoo-Battle Creek Major Gifts Committee.

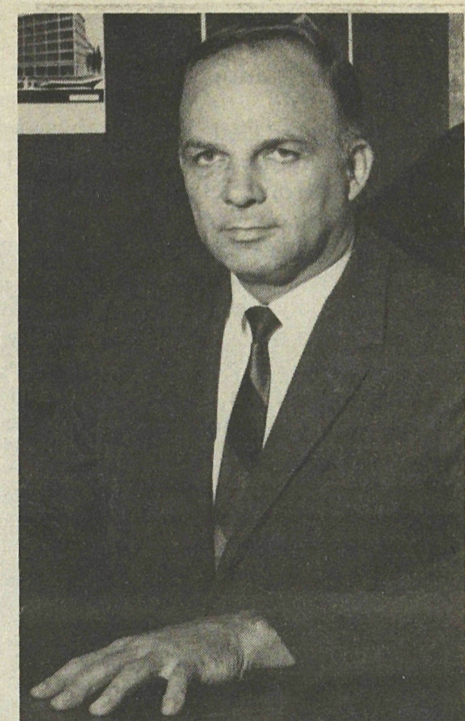
Putting Dollars to Work Against Disease

Richard Garrett (BA '47) and Marilyn Holtom (BA '47) met when they were students at Michigan, with Richard pursuing a degree in civil engineering and Marilyn working on a degree in speech correction and an education certificate. Last year, the Garretts — both of whom come from long lines of U-M graduates — made a pledge of over \$250,000 to establish the Garrett Family Fund in Neurology.

The Garrett family has had a particular and personal interest in neurological research since Marilyn was stricken with multiple sclerosis 23 years ago. However, according to Richard, they were motivated by other reasons as well: "In the first place, my wife's father was a graduate of the Michigan Medical School. . . . In addition, we've had a lot of fun at the University, both as students and as alumni." Those strong, positive feelings about the University are shared by their daughter, Marcia A. Mootz, who graduated from the College of Pharmacy in 1979.

For the Department of Neurology, the Garrett Family Fund serves two important purposes: it helps support the work of gifted faculty researchers, and it represents a significant step toward a long-term goal: the establishment of an endowed professorship in clinical neurology.

A Winning Gift for the Athletic Department

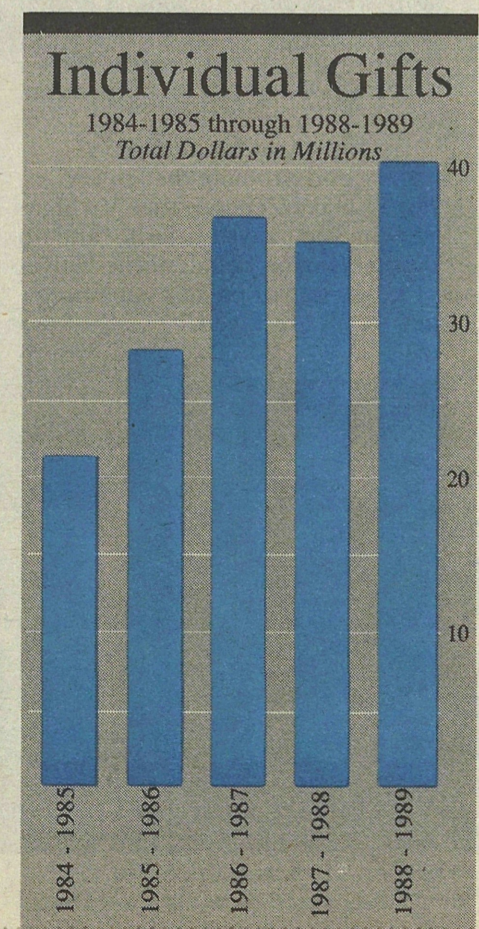
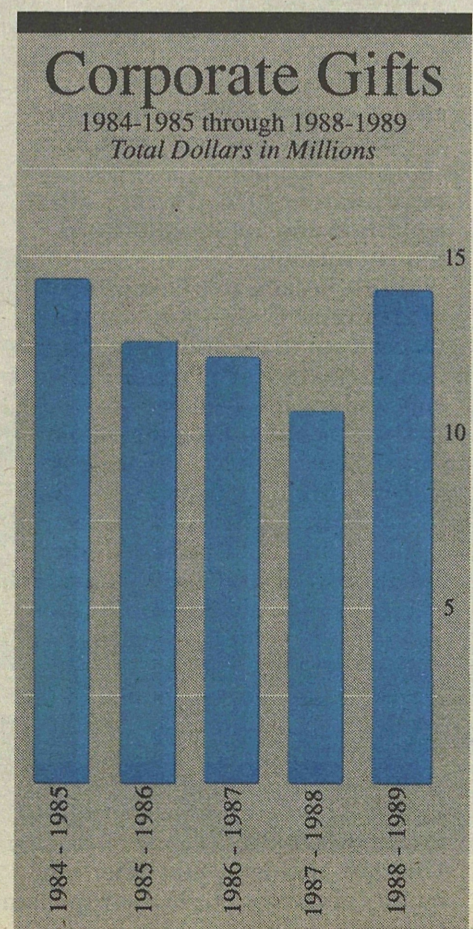
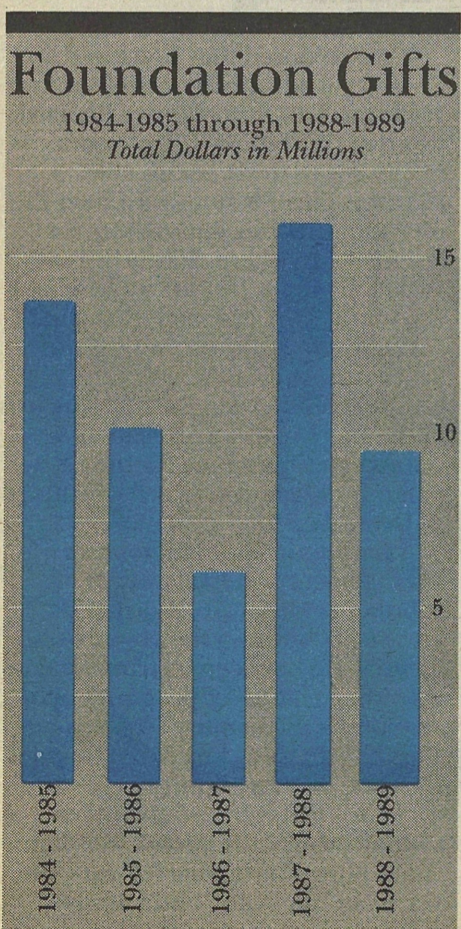
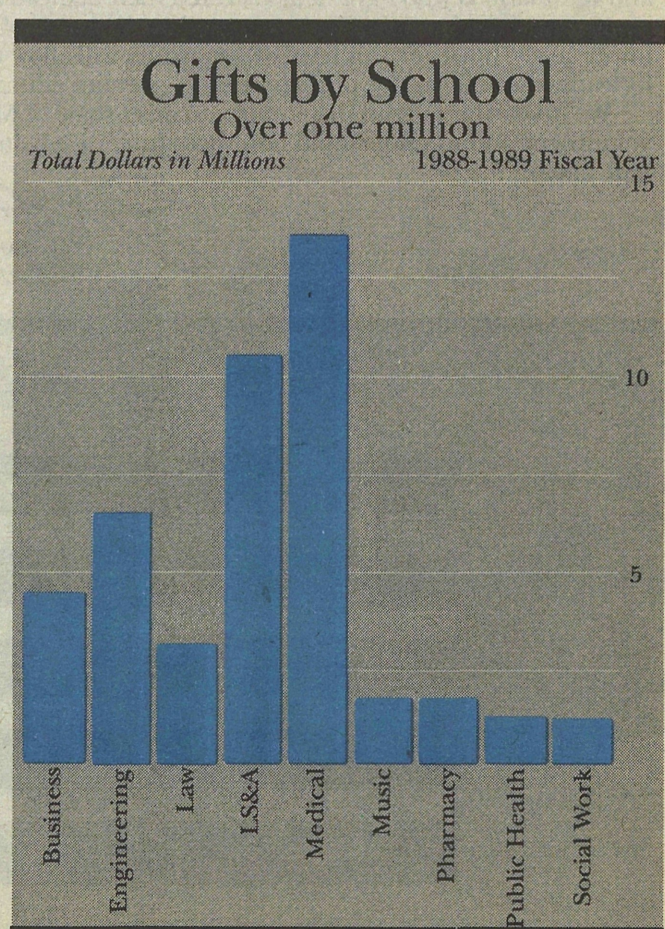
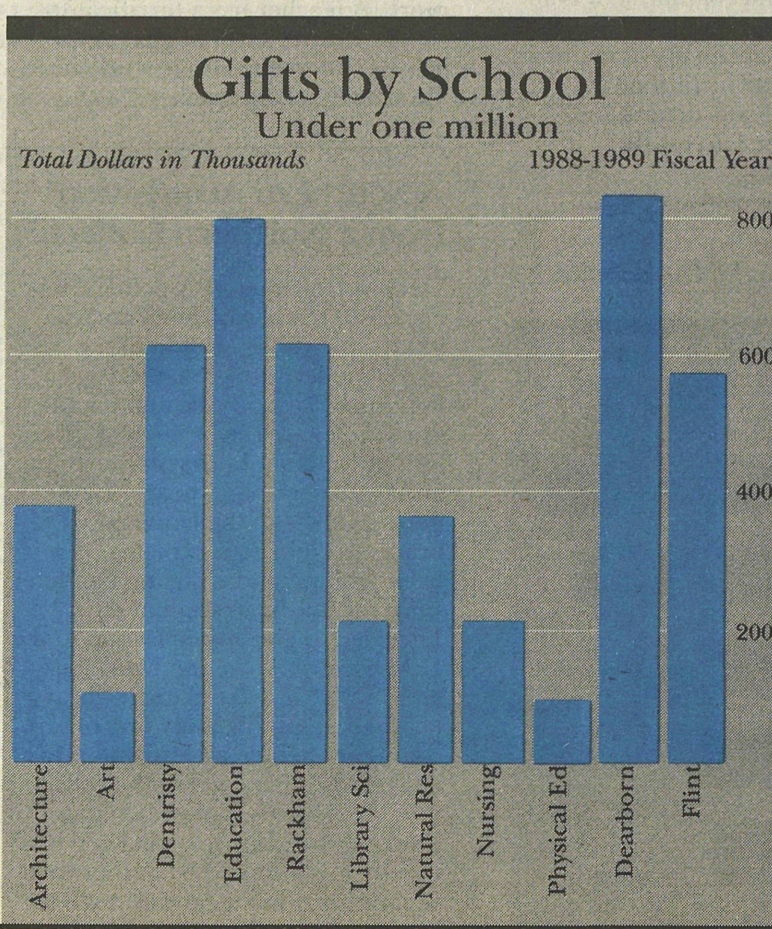


Russell J. Osterman

Although Russell J. Osterman earned his Michigan degree in engineering ('52), athletics in general — and varsity football in particular — were an important part of his U-M experience. This past year, his interest in Michigan athletics took the form of a half-million dollar contribution to the Athletic Department's new Football Building, also known as the Center of Champions.

According to Osterman, "The University has been a great help to me in my engineering career, and naturally I'm grateful. Of course, I have other ties and other reasons to be grateful to Michigan as well, since my daughter, Mary Jo Scamperle (BA '85, Ed. Cert. '85), and her husband, Paul (BA '85, BSE-CHE '85) both graduated from Michigan.

"But I also benefited tremendously from athletics. And so, I've made it my goal to promote Michigan athletics."



VOLUNTEERS

Volunteers: The People Who Move Michigan Forward

These days, it seems that everyone is busy. Schedules are crowded. Time is short. And yet, during the past year, hundreds of alumni — men and women with extremely demanding lives — found the time for volunteer activities in support of Michigan. They organized meetings and seminars, hosted get-togethers, solicited funds, served on committees, chaired fundraising drives. They gave us their time, their talent, and their advice.

What is it that motivates people to become volunteers? We asked a number of them that question, and here's what they told us:



MARLENE BORMAN

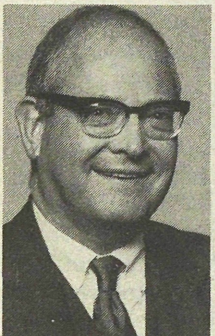
"I love the University of Michigan and I want to do all that I can to help it," says Marlene Borman (BA '55). "My college experience was wonderful: it helped me to form my blueprint for living and it taught me how to think."

A member of the Detroit Major Gifts Committee, the LS&A Visiting Committee, and the Institute for the Humanities Advisory Committee, Mrs. Borman works hard to demonstrate her commitment to the University.

"I was in the College of Literature, Science, and the Arts," she says, "and I still feel strong ties and obligations to it. In fact, our son, Gilbert, also graduated from LS&A."

"I am also happy to be working with the Institute for the Humanities. I am very impressed with the variety of courses it offers from a number of different disciplines. I have attended a number of Institute presentations and found them to be fascinating. The faculty and staff of the Institute are doing really exciting things; they're bringing in first-rate people as lecturers and visiting scholars."

"The great thing about being a volunteer," she summarized, "is that I continue to gain so much from the experience. It has expanded my horizons enormously."



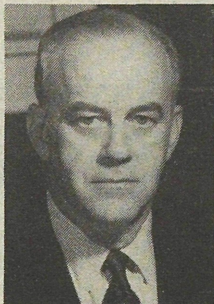
MILLARD H. PRYOR, JR.

An imaginative and dedicated volunteer, Millard H. Pryor, Jr. (AB '55, MBA '57), Chairman of Corcap, Inc., and President of Lydall, Inc. of Hartford, Connecticut, contributes his time and energies to the Institute for the Humanities Development Advisory Committee and the LS&A Visiting Committee. He is an active member of the Hartford U-M club. During the Campaign for Michigan, he served on the National Campaign Committee.

"Serving on the Humanities Institute and LS&A Committees gives me a valuable perspective on both the University and its fundraising efforts. I have found," says Pryor, "that, in the long run, people thank you for asking them to make a gift to Michigan. They recognize that they can help and that their support does, indeed, make a difference."

Millard Pryor acquired his enthusiasm for the University at an early age. His father, Millard Pryor, Sr., earned his BA at Michigan in 1925 and his MBA in 1927; his mother also attended the University. His twin brother, Fred, taught in the Michigan economics department for two years, and daughter, Liz, is enrolled in the School of Art.

"I am a product of the public school system," comments Pryor, "and I believe that the great strength of our public schools and universities lies in their diversity. Michigan is an excellent example. I am proud to support the University because of what it can do in the way of changing people's lives for the better."



ROBERT P. LUCIANO

An active volunteer for the University of Michigan, Robert P. Luciano (JD '58) is a member of the Law School Committee of Visitors, the College of Pharmacy Advancement Program Steering Committee, and the Manhattan Major Gifts Committee. During the Campaign for Michigan, he was a member of the National Campaign Committee and area chairman.

"The University of Michigan was very important to me when I left the Army and was preparing to enter the business world," comments Luciano, now chairman and chief executive officer of Schering-Plough Corporation in New Jersey. "My Law School education opened doors for me and made opportunities available to me that I might not otherwise have had."

"My wife Barbara and I had three happy years in Ann Arbor," Luciano recalls. "We still return to campus once or twice a year to attend meetings and, when possible, to cheer on the football team."

"It's important for alumni to support and promote the level of educational excellence that Michigan has achieved," says Luciano, "and my volunteering on behalf of the University is one way of paying something back for all I received."



TIMOTHY JOHNSON, M.D.

"When I arrived at Michigan as a freshman, I had never seen either Ann Arbor or the University before," remembered Tim Johnson (BA '70, MA '71, Medical trainee '79).

"I discovered that it is a wonderful place; it has so many opportunities to

pursue different areas of interest — in my case, French, Greek, and the Great Books, all of which helped to make me a better doctor. The University also gave me the opportunity to meet people from many different backgrounds."

Co-chair of the drive for the J. Robert Willson Professorship, Dr. Johnson played a major role in the successful completion of this effort. In fact, he has continued his commitment to the Medical Center's Department of Obstetrics and Gynecology by volunteering for additional fundraising activities on its behalf.

A member of the host committee for the Baltimore Medical School Alumni Reception, and member of the Alumni Association, Dr. Johnson is Director of the Division of Maternal-Fetal Medicine at the Department of Gynecology and Obstetrics at Johns Hopkins School of Medicine.

"When I think of all that I've been able to accomplish in my life, I realize just how many thanks I owe this University," he said.

For the Johnsons, support of the University is a family affair. Tim's wife, Jo Wiese Johnson (BS '73), is the daughter of two U-M grads: Barbara Ann Piper Wiese (AB '45, MS '45) and the late Robert Lee Wiese (BSE ME '44, MSE '48). Robert Wiese earned nine letters (in football, basketball, and baseball) and, in 1944, was captain of the football team and recipient of the Big Ten's Conference Medal for proficiency in scholarship and athletics.



BARBARA ("DEDE") FELDMAN

"The University has been in my family's blood for many years," says Barbara (Dede) Feldman (Certificate of Dental Hygiene '51). "My husband, Oscar (BA '43, MBA '47), our son, Richard (BS '77, MD '81), my two brothers, and my father all received degrees from the University of Michigan."

"Perhaps the best description of me would be as 'professional volunteer,'" Dede Feldman commented. "My volunteer work has been much like a series of ongoing postgraduate courses in community and government awareness, fundraising, art education and appreciation, and human relations."

"I first became involved with the University," she said, "when it reached out to me and my husband. Our attendance at a President's Weekend, and my involvement with the Women's Seminar brought me into close contact with the University's leadership and its faculty."

"I was motivated to become actively involved with the University," she continued, "by its determination both to improve the quality of education and to prepare for the challenges of the 21st century."

Dede Feldman is a member of the Major Gifts Committee in Detroit and the Friends of Slusser Gallery at the School of Art. In addition, she is an active volunteer with the Detroit Institute of Arts, the League of Women Voters of Michigan, and other community organizations in metropolitan Detroit.



AMY ROSE

"I'm very proud of Michigan and of my degree," says Amy Rose, an April '89 LS&A graduate. "I felt that it was important to give back some of what it has given to me."

Amy was serious about that commitment. Co-chair of the Senior Pledge Program, she worked to raise seniors' awareness of the need for annual fund support.

"I think that students now on campus have an obligation to help those who follow them," Amy commented. "The University must rely increasingly on private support and the Senior Pledge Program is a way of training on-campus seniors to recognize their obligations as alumni when they graduate."

Her sense of responsibility also extended to her sorority, Delta Phi Epsilon, where she was president and chairwoman of philanthropy, as well as of fundraising.

Now working for Dwelling Managers, Inc., a New York City real estate firm, Amy remembers her years at Michigan with fondness.

"I loved my four years there," she declares emphatically, "and I loved Ann Arbor. The University is a very special place. It's dynamic, it's exciting, and it has variety. It can either be a big school or a little one, depending on your classes and your housing. It has everything that anyone could want."



RICHARD RIORDAN

"I'm convinced that I received the finest legal education possible at the Michigan Law School," says Richard Riordan (JD '56). "My professors taught me to think and to take chances. There is simply no finer faculty and no better atmosphere for learning, anywhere. For those reasons, I'm always pleased to do what I can for the University of Michigan."

Chairman of the recently established Los Angeles Major Gifts Committee, Riordan was also co-chair of the Los Angeles area National Campaign Committee for the Campaign for Michigan, which concluded in December 1987.

A partner in Riordan Venture Management and the law firm of Riordan & McKinzie, Riordan is a strong believer in the power of literacy. He has been instrumental in providing computer programs and systems for elementary school youngsters in the city of Los Angeles and the State of Mississippi.

"I have a number of volunteer commitments," comments Riordan, "but I always have time for the University of Michigan, and I always will."

By Peter Seidman

The world's new political environment — with its falling demand for weapons sales, reductions in military spending and attempted cooling-down of regional conflicts — may decrease world tension, but it is increasing the pressure on top executives of the major arms-manufacturing corporations. One of the most experienced, influential and insightful of those executives is Robert A. Fuhrman '45 B.S.E., vice chairman of the board and chief operating officer of the Lockheed Corporation.

Lockheed's new mission-style office building in Calabasas, California, 20 miles northwest of Los Angeles, seems more appropriate for a book

package procurement contract process" in those days, which sometimes meant the companies had to design and make products based on untried technologies and then to manufacture them in large quantities even before they were fully tested. The system had "a high potential for problems," he says, because "the balance between the requirement and the price was not equal," and companies therefore had to pay unrecoverable costs to make their products perform as desired.

Lockheed ran into big technical difficulties and cost overruns on its "fixed-price total-package" contract for the C-5A Galaxy, a cargo plane that eventually airlifted supplies to Israel during the Yom Kippur War, and with the Army's AH-56 Cheyenne advanced helicopter.

his tasks included helping Rolls Royce back on its feet and bringing home the floundering L-1011 commercial jet program. He was elected to his current post at Lockheed in 1988.

"We had \$2 billion in inventory, no engines and were paying 15 percent interest to our bankers," Fuhrman recalls of the early '70s, "but I could put the tee in the ground on a Saturday afternoon and forget all those problems for four hours. I firmly believe that you have to have ways of getting away.

"We paid off the government loan in a relatively short time, and as a result, we decided never again to bet the corporation on one or two programs. And although the L-1011 was a great technological success, we finally got ourselves out of the commercial airplane business."

PILOTING LOCKHEED

Engineering alumnus Robert A. Fuhrman '45

publisher than a defense contractor. The halcyon view from his third-floor office overlooking the Santa Monica mountains belies the fact that Fuhrman must remain more concerned for the might of the sword than of the pen.

Fuhrman is a large man with bushy white hair; he wears conservative blue or gray suits and speaks in a soft, bass voice. Like his office, his demeanor can make a visitor forget that Fuhrman heads the nation's second-largest NASA and eighth-largest U.S. Department of Defense (DoD) contractor. It is a company with a turbulent past, and a future bristling with the tough engineering and financial problems that CEOs like to call challenges, but others may label as hazards.

The challenges of the early '70s almost proved fatal to Lockheed for a number of reasons. For one thing, Fuhrman says, the government placed military manufacturers within a "fixed-price, total-

Those problems were compounded by others involving the L-1011 commercial jet when Rolls Royce, the engine supplier, declared bankruptcy in Great Britain.

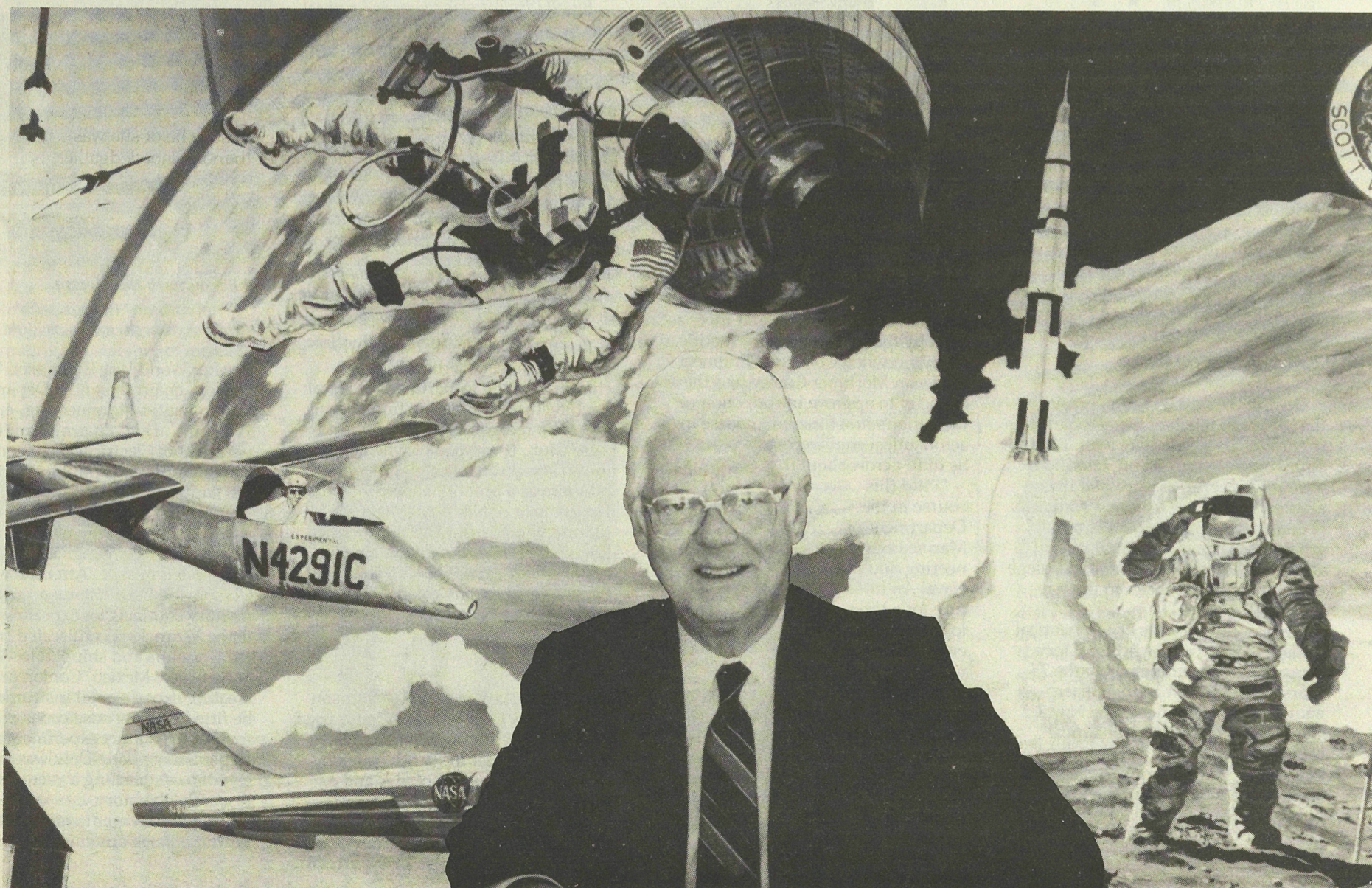
"Any two of these problems would have been critical, but the fact that we had all three gave us severe financial burdens," Fuhrman says matter-of-factly. The U.S. government, concerned about the welfare of a major supplier of programs critical to national defense, guaranteed loans to keep Lockheed afloat.

In 1970 Fuhrman was transferred from his position as general manager of Lockheed's Missile Systems Division to the presidency of the Lockheed-Georgia Company, where he was responsible for completing the troubled C-5 Galaxy, at that time the world's largest plane. He was transferred 20 months later to the Lockheed-California Company as president, where

Today, although he's still in a business field that involves high risks, Fuhrman thinks Lockheed has a better balance of programs. It is much more involved in space and electronics for NASA than it used to be, as well as with research and development for the Strategic Defense Initiative (Star Wars). The DoD, meanwhile, has moved away from using fixed-price contracts in the development of high-risk projects.

Fuhrman is heartened by the Bush administration's announced support of reforms that would include abolishing "concurrency," in which research into new technologies proceeds concurrently with the manufacturing of the product.

Under the reforms, in order to identify technical problems in advance, more prototypes would be built before production began, when it is relatively inexpensive to make fixes. By dropping concurrency, however, the government can cancel



Background: Detail from mural in the Aerospace Engineering Building by Brian R. Myers; dedicated by astronaut Alfred Worden '63 M.S.E. in 1979.

LOCKHEED Continued

military programs even after companies have made considerable investments to develop products — so the new environment brings considerable risks to contractors, like Lockheed, that rely heavily on military programs.

The reforms also advocate broadening the responsibilities of the undersecretary of defense for acquisition to oversee the procurement process and standardize the Navy, Air Force and Army procurement requirements.

"People are beginning to realize that we must have more teamwork," Fuhrman says. "It's in the national interest to have viable, competitive industries, and not to tie the contractor down to situations that practically ensure major losses."

But Lockheed still is confronting big risks, perhaps nowhere as great as in the race to develop the

all-purpose, stealth-like Advanced Tactical Fighter (ATF) to replace the aging F-15. The ATF would be the Air Force's and Navy's top combat planes.

Lockheed, leading a team with Boeing and General Dynamics, is up against Northrop and McDonnell-Douglas in a high-stakes competition for a DoD contract valued at \$45 billion.

"The ATF is requiring both contract teams to invest a considerable amount of money — many millions of dollars — up front," Fuhrman says. "But full-scale development will be done under a cost-reimbursable, incentive-type of contract." Under that contract, the government will pay excess costs, but the winners of the contract will receive their promised fee only if they stay at or below cost and deliver a good product. Fuhrman says this arrangement "helps the customer and the contractor work together to stay on target."

The ATF contestants risk a financial setback of several hundred million dollars if they fail to win the contract because losers in the bidding will not recover research and development investments.

But changes in the balance of economic,

technological and military power are posing challenges to executives like Fuhrman that are even broader in scope and with much longer-term consequences.

"America's technological superiority has diminished. Many countries, including Japan and the Soviet Union, challenge our leadership in technologies essential to defense," Fuhrman has written in a study conducted by the Defense Science Board, "Defense Industrial and Technology Base." The board is an appointed Pentagon advisory group of 32 top defense specialists; Fuhrman heads the management panel of the group.

The study's main charge was to recommend to the government what must be done to ensure that industry is capable of developing the technologies necessary for the United States to meet its national security objectives.

"My argument is that globalization is here," Fuhrman says. "I don't propose to turn the clock back and try to create a 'fortress America.' It's absolutely impossible. We'll always have a certain dependence on foreign sources. Now the ques-

tion is, how can we protect ourselves against that dependence.

"A flat-to-negative defense budget means the same number of contractors will have to compete for a smaller share of the pie," he continues. "So the contractors will become more cost-competitive, and there will be few major new programs. With fewer systems opportunities, there is going to be a need for fewer new product-design teams but much more need for upgrading existing systems."

There is a "high potential" for a winnowing out of defense contractors in the coming years, Fuhrman predicts. Those who survive are likely to have done so by becoming more adept at what he calls "Total Quality Management, such as use of computer-aided manufacturing and engineering."

When Fuhrman was studying aeronautical engineering at Michigan in the '40s, the future belonged to those who could bridge the engineering gap from propellers to jet propulsion. He not only leaped that gap but has remained at the head of

the aerospace field as it moved from jets, to rockets to space stations.

Fuhrman, who was born in Detroit in 1925, went on to the University of Maryland, earning his master's degree in mechanical engineering in the years from 1946-53, when he was a project engineer for the Naval Air Test Center in Patuxent River, Maryland. Then he moved to chief of technical engineering at Ryan Aeronautics Company until 1958, when he joined Lockheed as head of systems engineering on the Polaris Program.

Rising through the ranks at Lockheed, he became familiar with the Byzantine process by which the Pentagon acquires technology from private industry, and he is in a good position to know why that process may be leading manufacturers to refuse defense work, saving their most advanced technology for the safer commercial market.

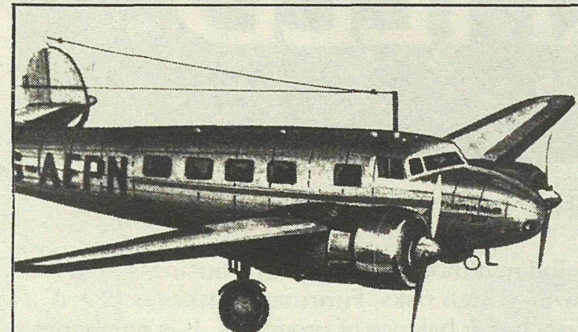
Should the United States take the Japanese approach to R & D, and increase the public-sector support of the private sector?

"I don't see this country getting to the point

of outright subsidies for our or other major industries," Fuhrman replies. He advocates using government incentives to increase efficiency in industry and recommends passage of tax laws that would encourage industry to invest in equipment required for modernization by allowing faster write-offs of capital investments.

"Government should encourage us to become efficient and we should be given support in that area and then go out and compete. Then we will end up with the strongest industry instead of support for the weakest," he maintains.

"We can have what I would call a 'surge capability,' if we needed it in an emergency. But so-called mobilization of our industrial effort, as we considered it in World War II, is not conceivable any more because this country doesn't have the capability to build all the things that we would have to build."



An illustrated history of Aerospace Engineering

The study of flight

Even before 1914, when Michigan's College of Engineering became one of the first in the nation to offer a course in what was then called aeronautical engineering, its students — members of the U-M Aero Club — were defying gravity with primitive balloons, gliders and hydroplanes.

Like a baby learning to walk, they had their share of setbacks. Once aloft, some balloons drifted into snowstorms and crashed into trees; others, worn by age and the sun, tore at the seams. The gliders sometimes nose-dived, in one case taking the life of a passenger.

"What we've tried to do is move toward excellence, to be among the three to four best aerospace engineering departments in the country," says Prof. Thomas C. Adamson Jr., chairman of the Department of Aerospace Engineering, "and that's what we've achieved by attracting faculty and students who are among the best in the United States and the world."

The course was taught by Felix W. Pawlowski, a young Pole who, inspired by the Wright brothers, had applied to 18 American colleges before being hired by Michigan in 1913 as a teaching assistant in mechanical engineering with the promise that he could teach a course in aviation.

Lockheed later hired Johnson and, after many tests, he not only corrected the problem but went on to become one of America's greatest aircraft designers. *Time* magazine called him "perhaps the most successful innovator since Orville and Wilbur Wright."

Johnson designed more than 40 planes, including the P-38 of World War II, the U-2 high altitude plane, the F-104 and the SR-71 Blackbird, which can fly at more than 2,000 mph. He has made it a point to be a passenger on every plane he has designed. In the case of the P-38 one-seater, this required riding on the test pilot's shoulders.

Pawlowski (r) and Orville Wright in 1928, at U-M celebration of the 25th anniversary of the Wright Brothers' flight.



By 1917 Pawlowski's course had evolved into a four-year program leading to the Bachelor of Science degree in aerospace engineering. The identity of the first student to receive the degree is disputed. A 1954 publication, *The University of Michigan: A Century of Engineering Education*, says it was William Frederick Gerhardt in June 1917. But a history of the Department's first 50 years by the late Robert P. Weeks '38, '52 Ph.D., an English professor, says Flavius Earl Loudy, one of seven students who enrolled in Pawlowski's course, "Theory of Aviation," deserves that distinction, although Weeks doesn't say when Loudy graduated.



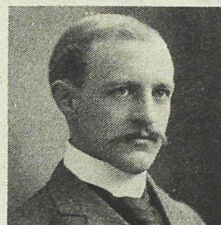
Johnson with the Electra.

In 1911-12 Michigan's other early aviation pioneer, Herbert Sadler, chairman of the Department of Naval Architecture and Marine Engineering (NAME), reorganized the moribund Aero Club. It was Sadler who accepted in 1917 the aeronautical engineering program as a unit of his newly named Department of Naval Architecture, Marine Engineering and Aeronautics. Required courses included "Theory and Design of Balloons and Dirigibles" and "Theory and Design of Kites."

In 1933, Clarence "Kelly" Johnson '32, '33 M.S.E., '64 Ph.D. (Hon.), used Michigan's wind tunnel to test the Lockheed Model 10 Electra, one of the first twin-engine planes and a forerunner of commercial aircraft. Johnson announced to shocked Lockheed officials that there were dangerous instabilities in the aircraft.



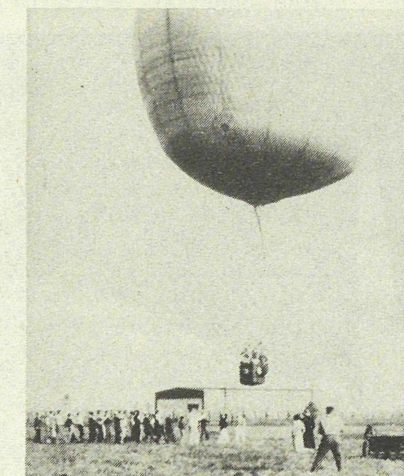
Cooley



Sadler

The Wright brothers' 1903 flight at Kitty Hawk, North Carolina, galvanized interest in aviation. Europeans were quick to see the potential for the practical use of flight, while Americans continued to see the design and lofting of aircraft more as a hobby than a subject for scientific study. So when College of Engineering Dean Mortimer Cooley had the audacity to approve introduction of the nation's first for-credit course in aeronautical engineering 75 years ago, he didn't crow about it.

"I hid this course in the Department of Marine Engineering and Naval Architecture for a time, for aeronautical engineering was not considered important enough to make it conspicuous," Cooley wrote in his autobiography, *Scientific Blacksmith*.



Balloonists in the 1920s.

During the next 75 years, gravity — the source of much of the aeronauts' frustration — yielded not a bit. But the study of aeronautical and, later, aerospace engineering progressed from an eccentric hobby to one of America's primary measures of technological greatness. Throughout, in industry, academia and government, the College of Engineering has been in the forefront of that effort.

Next month, dozens of aeronautical leaders will gather at Michigan for a symposium to commemorate the 75 years since the first course in aeronautics was taught here. The Nov. 1-3 symposium is titled "Aeronautical Design Centennial: The Lessons Learned." (The gathering will also observe the 100th anniversary of the publication in Germany of Otto Lilienthal's *Bird Flight as the Basis of Aviation*.)

took wing 75 years ago

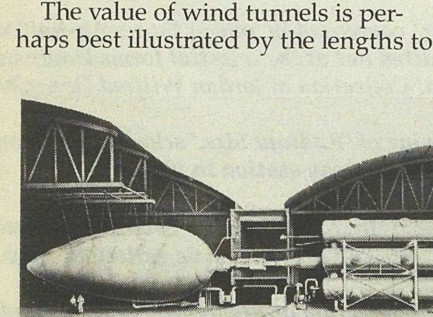
They just wanted to get up in the air and take measurements, and the V-2s were available," says today's chairman, Adamson.

Their efforts led to creation of the High Altitude Engineering Laboratory and the Space Physics Research Laboratory. The SPRL, which evolved into a unit separate from the Department of Aerospace Engineering, launched five V-2s at White Sands, helping to lay the groundwork for the development of intercontinental ballistic missiles and electronic guidance systems.



U-M engineers research V-2 rockets.

The Department's 5' by 7' subsonic tunnel, built in 1956, is used for a wide variety of experiments, from testing aircraft, production automobiles and racing cars to determining the stability of airport signs in high winds.



Drawing of early wind tunnel.

certain engineers have had to conduct certain experiments without them. In the early 1950s, before U-M had an ice wind tunnel, Profs. Harm Buning and the late Richard Morrison had to climb Mount Washington in New Hampshire three times in midwinter to study the rate of ice formation on air-

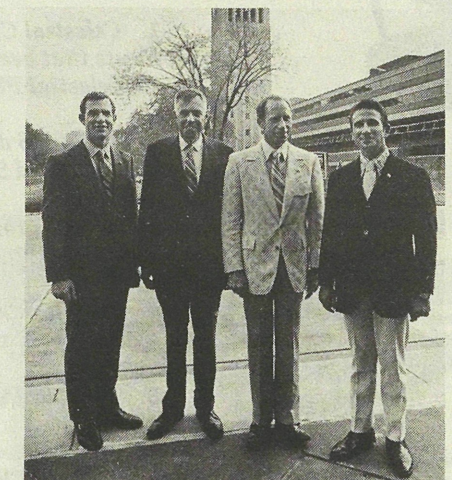
plane wings. The clouds at the summit of Mount Washington often produce icing conditions and the winds always blow fiercely.

"It was sort of an outdoor wind tunnel. But we couldn't get any sharp proof of anything," Buning recalls, "just some approximate verification of some of our theories." Nevertheless, their data contributed to the design of anti-icing devices used on airplanes.

When aeronautics leaped into space in the 1960s, Buning's focus shifted from airplanes to rockets. He traveled frequently to the Johnson Space Center in Texas to teach astrodynamics to U.S. astronauts, including the three Apollo II astronauts, two of whom — Neil Armstrong and Edwin E. (Buzz) Aldrin, Jr. — were the first persons to walk on the moon.

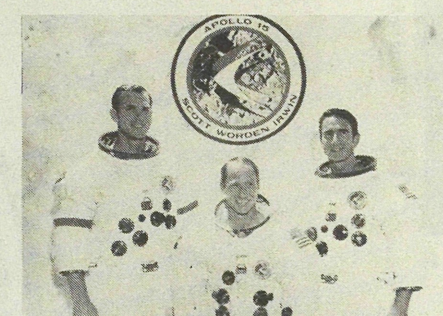
Three astronauts who either orbited the moon or landed on it are U-M alumni. The crew of Apollo 15, launched in 1971, formed an "All-Michigan" team: James Irwin '57 M.S.E., David Scott, who spent his freshman year at Michigan before transferring to the U.S. Air Force Academy, and Worden '63 M.S.E.

While Worden piloted the command module, Irwin and Scott walked on the surface of the moon

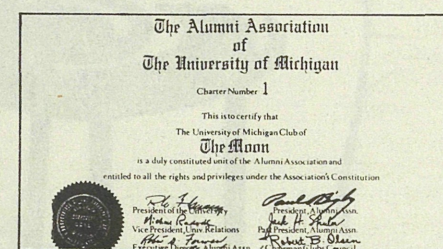


Scott, Buning, Worden and Irwin in 1971, when the astronauts came to campus to receive honorary Doctorate of Aerospace Science degrees from Michigan after their flight in space.

and named a crater "Wolverine." Other U-M astronauts included Jack R. Lousma '59, '73 Sc.D. Hon., who commanded Skylab and piloted the third space shuttle flight; Edward H. White '59 MSE, '65 Sc.D. Hon., who made the first space walk as part of the Gemini program in 1964 and died in the 1967 Apollo launch pad fire; and James A. McDivitt '59 MSE, '65 R. Hon., commander of Apollo 9, which tested the lunar lander.



Does the Moon carry a U-M flag? The rumor that it does is unfortunately just so much green cheese, says Professor Buning, who quizzed Al Worden about the matter. Buning adds, however, that Worden knows several small U-M and Alumni Association flags made the trip and that a charter of the U-M Alumni Club was left on the lunar surface.

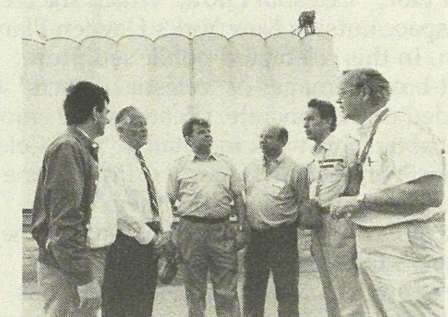


Department graduates are dispersed throughout the aerospace industry. Perhaps nowhere is their presence more strongly felt than at the Lockheed Corporation, the nation's second-largest NASA contractor. U-M alumni there include Robert A. Fuhrman '45 (see accompanying article), vice chairman and chief operating officer; Willis M. Hawkins '37, '64

R. Hon., former vice president-aircraft; Leland M. Nicolai '66, '68 Ph.D., director of advanced design; and Kenneth Canestra '54, president of Lockheed Aeronautical Systems Company.

Other leading Department alumni include George Skurla '44, former president of Grumman Corporation; Jim Knott '38, retired vice president of Allison Engine Division, General Motors Corporation; G.K. Richey '75 Ph.D., technical director of the Wright Research and Development Center in Dayton; and Richard Weiss '57, director of the Astronautics Laboratory at Edwards Air Force Base, California.

This summer 250 aerospace engineers gathered at U-M for the 12th International Colloquium on the Dynamics of Explosions and Reactive Systems. Among them was C. William Kauffman, associate professor of aerospace engineering, who is studying dust and gas explosions — research that is helping to prevent devastating blasts in grain elevators, coal mines, pharmaceutical factories and other industries where fine dust is produced.



Kauffman (r), an expert on explosions, discusses safety methods in grain mills with Jiffy Mix president Howard Holmes Sr. (2d left) of Chelsea, Mich., and engineers from Poland and the Soviet Union.

Other faculty are studying turbulent flows and turbulent combustion, hypersonic flow, composites and other new materials, the dynamics and control of large structures in space, and robotics and other control problems.

Blurring the Line Between Art and Function

By Ann Berman

Artist Michele Oka Doner '66, '68 M.F.A., is well-known for both her site-specific public sculpture and the more intimate, small-scale pieces that have found their way into museum and private collections around the country. The Florida-born Doner, who now lives and works in Manhattan, feels that her years at Michigan were important to her development as an artist, and as a person.

"The University of Michigan was a very fertile place to be educating oneself in the 1960s," Doner explains. "It was a human stew — very vital. It was not unusual to see a student from 'small-

quality of vibration that keeps it from being a flat, solid tone.

"I discarded all thoughts of a complex design," Doner says of the project. "People are already oversaturated visually, and to add complexity would create even more hustle and bustle via overstimulation. By immersing passers-through in this golden, radiant light, I hope to give New Yorkers what they need as they go to and from work — a moment of reflection. I want to replace the sensation associated with the subway system of descending into a dark underground."

Doner brings the same concerns for the viewer and the same artistic philosophy to her other public installations, and also to smaller, more personal pieces that flout the conventions of traditional art and its limitations. As she talks about the work featured in the accompanying photographic spread, Doner points out that "art hanging on the wall is quite recent in terms of all history. Historically, art has been integrated into the daily lives of people. This is a tradition I understand and am comfortable with — I have always enjoyed the beautification of the necessary and of the rituals of life. Like the Japanese, I believe that the spoon, the teapot, the chair should be beautiful."

BRONZE CHAIRS

"When I was done with 'Celestial Plaza,' I had developed over 500 forms based on celestial concepts. I had two 'universes' — a whirlpool galaxy and a spiral galaxy — lying unused in boxes in my workshop. In a moment of lightness one afternoon, I tentatively lifted them up and composed a seat with the whirlpool and a back with the spiral. It was one of those 'Ah-ha!' moments. The visual interest of these spirals in a vertical position was exhilarating! I immediately called my fabricator, and he welded while I held. Together, we made the first chair, 'Celestial Chair.'



Doner

Photo by Richard Hirnstein

town' Michigan walking next to a Sikh with a turban." Doner studied with Prof. John H. Stephenson, who still teaches at the School of Art. She was influenced by his "Zen" approach to teaching and his "respect for clay as a language with which one could speak." She also studied with the art historian Oleg Grabar (now at Harvard University), an Islamic scholar from whom Doner learned "about pattern, composition and repetition."

These concepts are apparent in Doner's masterwork of 1987, "Celestial Plaza," which she created for the space outside New York's Hayden Planetarium. In this celebrated public sculpture, 230 cast-bronze images of "celestial objects" are embedded in the concrete. (Readers will enjoy reading about this work in detail in "The Celestial Objects of Michele Doner" by Prof. Diane Kirkpatrick, chair of the Department of the History of Art, in the Spring 1989 issue of the University's LSA Magazine.)

"The awareness of art in public places has grown tremendously — every city has a committee for it," Doner notes. "People are tired of living in harsh surroundings." Doner will next tackle a particularly harsh section of New York — "the world's busiest subway station," Herald Square at 34th Street and 7th Avenue, traversed by 17 million people a year. As one of two winners of the New York Transit Authority's public art competition, Doner will cover a pedestrian tunnel wall with many thousands of gold, candy-bar-size, maintenance-free tiles made by hand at the Pewabic Pottery in Detroit. Each tile will be finished with the famous Pewabic reflective glaze that Doner describes as having "a depth and a



2

"These chairs are a return to specialness — not just plain old objects. I think my furniture brings back a sense of ritual and dignity to the act of repose. That is what chairs did originally — elevated the elder of a village, for example. The Egyptians, who made beautiful seats, the Africans, who made beautiful seats and stools — all these cultures didn't think 'art or function.' They didn't draw the line. This line is reflective of how far our society has allowed itself to become fragmented. I didn't think 'use' or 'art.' I thought seat. Should it be comfortable? Absolutely. These are more comfortable than they look. The seat is oversize, and when you cast a spiral it becomes like a spring — the bronze moves."

CIRCULAR BENCH

"I hope that my bench, 'Ice Rings,' will be a gathering point — a focus. When I made it, I was thinking about the fact that in old cities like Rome, public seating was built to bring people together. Today's cities are built for cars. I want to bring back an elevated concept of seating to the city. The ring is a very social shape, but my initial inspiration for the form and texture of the bench was the ice rings of Saturn, after pictures from Voyager showed how beautiful and fierce those objects were. Am I concerned that people look at the bench as a 'work of art'? No. But it should convey a sense of permanence, of quality, evocative of a great civilization."

THORN FURNITURE

"I found a branch on a friend's property and thought that the way the thorns were arranged was exquisite. Were they that way to protect some particularly succulent fruit or leaves? I was seduced, and brought the branch back to the studio.

"The thorn furniture is the 'yin' to the 'yang' of the bench. The bench is large and comfortable, while the thorn furniture is unusable — unthinkable, even. It is a fetish object, not made for public use, but to explore my own thought processes. The small ones, for example, are an exercise in transmitting a negative image into something 'sweet.' What does this thorn say? In black it says one thing; in gold that voice is muted.

"There has always been a provocative part of my vocabulary of work. To only focus on what is traditionally considered beautiful is to ignore the necessary 'other' of life. But I didn't think: 'thorns on a chair seat.' This is not a 'dark vision.' I am thinking form and shape. I am blurring the line between art and function. I don't like these lines. Who put them there?"

A retrospective exhibition of Michele Oka Doner's work will open in Rochester, Michigan, at the Meadowbrook Gallery of Oakland University in March 1990.

Ann Berman is a New York-based free-lance writer.



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1. 'Celestial Chair,' composed in 'one of those "Ah-ha!" moments' from elements that been edited out of the celestial forms Doner used in the pavement of 'Celestial Plaza.' Collection of Jordan Wilfred Doner, New York.

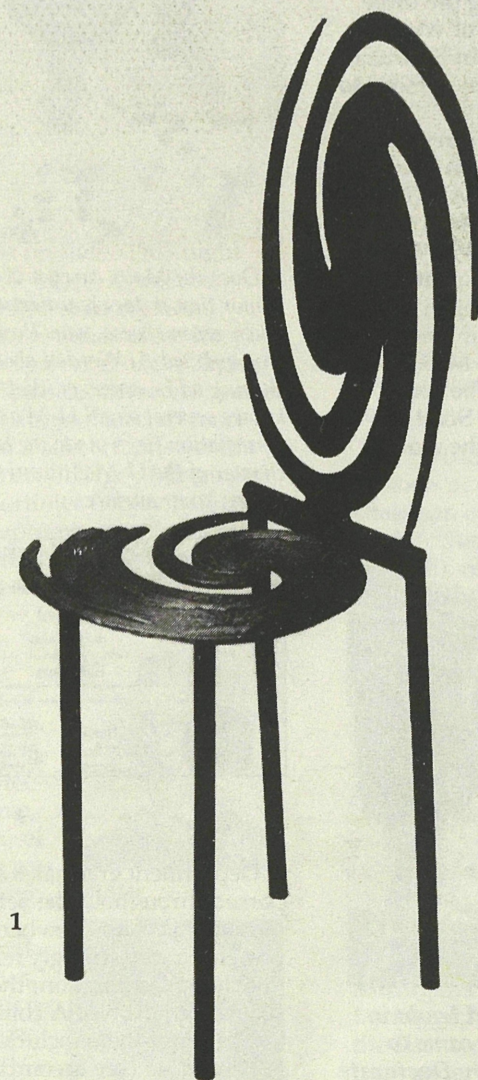
2. ARTIST'S drawing of 'Radiant Site,' scheduled for completion in New York's Herald Square subway station in 1991.

3. The circular bench 'Ice Rings' and the bronze chairs were installed as a solo exhibit last April at Art et Industrie gallery in New York, April 1989.

4. 'Physics Chair' (collection of Rolf Sachs, Munich) and 'Fire and Water' (collection of the artist). 1989.

5. 'Terrible Table', cast bronze, 1988. Collection of the Art Institute of Chicago.

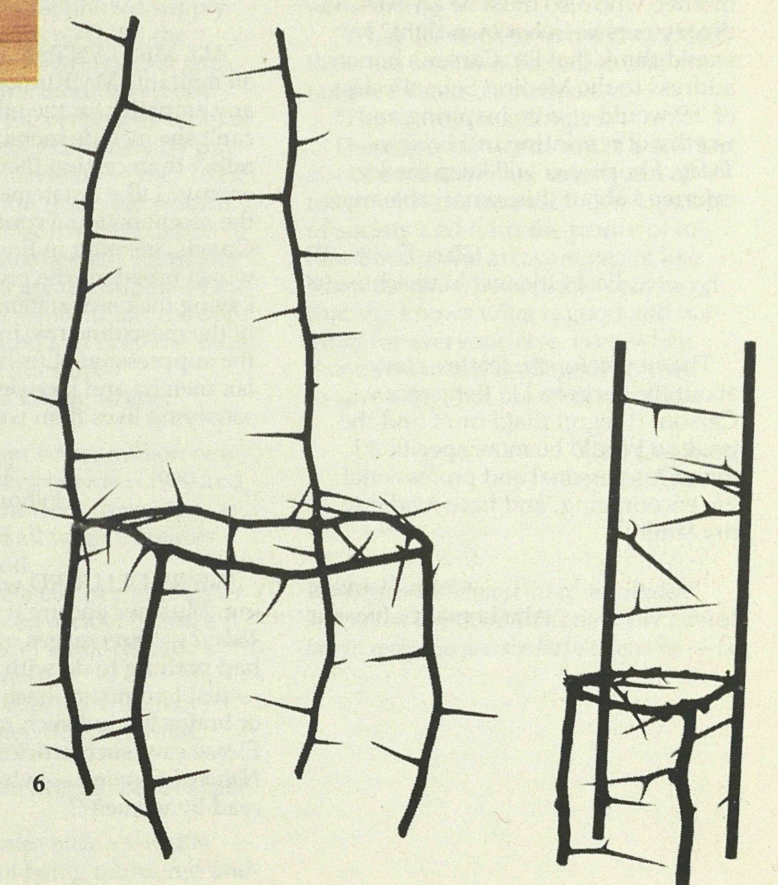
6. 'Terrible Chair I' and 'Terrible Chair II,' cast bronze, 1988. Private collection.



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Photo by Joe Casella Jr. for Art & Industrie

LETTERS

More Michigan Fiction

I HAVE been intrigued by *Michigan in Fiction* in the December 1988 issue and the subsequent letters adding additional works in which Michigan is mentioned. I would like to add a best-seller of the 1970s, *The Vicar of Christ*, by Walter F. Murphy, professor of jurisprudence, Princeton University. This novel traces the remarkable (and unlikely) career of Declan Walsh, law professor at the University of Chicago, Marine Corps colonel in Korea, special representative of President Truman and dean of the U-M Law School. This leads to his appointment as chief justice of the United States. Following his wife's death he resigns from the court to become a Trappist monk and is ultimately elected pope. The interlude at Michigan is brief, but is pivotal to his career.

William A. Groening Jr. '34, '36 J.D.
Midland, Michigan

THE BOOK *Inevitable* by Saul Parker (New York: Vantage Press, 1975) is the story of a Michigan law professor who is elected governor of the state in 1988 and discovers that there is a vast difference between theory and practice in government. I am grateful to D.D. Miller (letters, April issue) for the information on Clarence Cook Little as the model for "Victor Marston" in Jean Hamilton's *Wings of Wax* (1929). As poorly written as Mr. Miller suggests, the book nonetheless gives an interesting picture of campus life in the 1920s from the point of view of the dean of women.

Robert Beasecker '70 A.M.L.S.
Muskegon, Michigan

'An Inspiring Story'

YOUR FEATURE on Dr. Benjamin Carson in the February issue was a warm and inspiring story deserving of the highest commendations. I found myself making many photocopies of the article to share with friends who were equally moved. May I suggest that you consider doing a story on his mother, who also must be an extraordinary person in her own right? I would think that Dr. Carson's honors address to the Medical School's class of '89 would also be inspiring and worthy of reprinting in *Michigan Today*. I hope you will keep readers informed about this remarkable man.

Clare Forbes '52
East Orleans, Massachusetts

Thank you for the feature story about the surgeon Dr. Benjamin Carson. (I regret that I can't find the issue so I could be more specific.) I found his personal and professional life encouraging, and have read it to my family.

John Henkels
Alta Loma, California

On MacKinnon and Pornography

AS ONE who has long felt pornography is demeaning and debasing to men as well as to women and who had also previously noted the coming of Catharine MacKinnon to Michigan, I turned with anticipation to your interview with her. My interest quickly turned to surprise and chagrin. That a leading scholar would have clearly reasoned positions on the major issues of the day is expected. That a leading scholar would absolutely refuse to acknowledge even the possibility of any evidence counter to her own views (such as a possible biological component behind some social relationships) is astounding, particularly in light of the vast amount of attention exactly such possibilities have received in recent years.

To her credit, however, MacKinnon does not conceal her conviction that "evidence" is irrelevant to those who are seeking for themselves the power they believe others hold. For her and those for whom she claims to speak, the key to that power lies in the deliberate manipulation of social institutions and norms, and even biological realities become grist for their ideological mills.

David J. Krause '62, '86 Ph. D.
Livonia, Michigan

IN AN otherwise excellent issue your MacKinnon interview was not only personally distasteful to me, in certain parts, but contained several statements by her that are gross exaggerations or actual untruths. Examples: her final assertion that today's discrimination against women "keeps in place the system that's killing us"; or that women "have no job security"; "women are getting obliterated"; "women are the booty"; "white men are raping Black women at a great rate." Talk about discrimination! She surely must represent an attitudinal discrimination against men at its worst. I'm sure that her future U-M students will quickly recognize this unfortunate, greatly slanted perspective and evaluate her "teaching" accordingly.

Robert W. McIntosh '56 Ph.D.
Onkama, Michigan

ALL MILITANTS scare me, and like all militants MacKinnon fails to show any empathy for the other side. Why can't she include men in her liberation rather than casting them solely as the enemy? I like a statement adopted by the recent national conference of U.S. Greens, meeting in Eugene, Oregon, which broadens the problem in the following inclusive statement: "Because of the masculine role in general and the suppression of feelings in particular, men by and large lead shorter, less satisfying lives than women."

Allyn Weinert '73
Hollywood, California

WE'RE DELUGED with men-bashing. Must we endure it in *Michigan Today*? — three pages of garbage — had nothing to do with pornography — just feminist re-hash — no thought or brains behind such rambling. Please save such articles for the *National Enquirer* — which is mostly read by women??

E. Beabout
Van Alstyne, Texas

WHAT IS left of academic freedom and tolerance when Professor MacKinnon argues that requiring students to read misogynistic literature can be construed as "sexual harassment?" It is indeed ironic that students are to be denied access to (perhaps tasteless) works of literature in order to "liberate" their minds, while those of us who see value in exposing our students to all that the humanities have to offer are denounced as if we were child pornographers. On the same ground perhaps we should prohibit students from reading Lenin's *The State and Revolution* or Hitler's *Mein Kampf* because doing so would constitute class-based or racial "harassment."

Finally, there is a deeper problem involved when one tries to reduce all forms of sexism to the fact that "perfectly good biologically male little boys are [socialized] into rapists." Reducing all of sexism to the equivalent of rape does not make us as horrified at *Penthouse* as we are at gang rape, rather it works the other way. If everything is rape, we lose our ability to distinguish between the misogyny of pornography and the brutality of physical rape. As a consequence we will lose our proper sense of outrage at real rape, as have the social scientists who keep finding excuses for those boys who raped a woman in Central Park.

Steven Horwitz '85
Asst. Prof. of Economics,
George Mason University
Fairfax, Virginia

RADICAL feminists such as MacKinnon use the horror of rape to seize the moral high ground and further their own agenda. By claiming that any cause they advance is really an effort to fight rape, they can claim moral superiority over anyone who disagrees with them, accusing the dissenters of being less concerned about rape. This holier-than-thou exploitation of rape has one serious drawback, however: virtually every credible study on rape offenders, including FBI and Justice Department reports, indicates that Black men commit a disproportionately high number of both interracial and total rapes. Thus, by anointing themselves as the vanguards against rape, the feminists have found themselves exposed to

charges of racism. Any such suspicion, no matter how frivolous, seriously diminishes the feminists' assumed moral position. The feminists can't defend themselves against organizations whose expressed purpose is to fight racism, because those organizations enjoy a greater victim status, which affords them the superior moral authority. The feminist must defer to this authority or suffer a trouncing at their own sinister game. Consequently, the feminists most effective claim to the moral high ground, their opposition to rape, carries with it the greatest risk.

So how do the feminists get around this dilemma? Their solution is simple: they lie their way out of it. They shamelessly state or infer that it's the other way around (sometimes citing contrived "studies" by other feminists). MacKinnon engaged in this shameless deception when she said that "White men were raping black women at a great rate and still are." What does she mean by a "great rate?" "Great" compared to whom? Or to what? MacKinnon has no problem altering the truth to spread what her twisted mind perceives as a greater truth. There's nothing more ridiculous than being preached to by a self-righteous liar who can't handle her own sexual hangups, and who is scared to death of racial issues.

Tom Roelofs '78
Farmington Hills, Michigan

MACKINNON is to law as Lysenko was to genetics. Her universally rejected First Amendment "theory" merits the same place in the legal curriculum as creationism in the biology curriculum and astrology in the astronomy curriculum. Woe to the law student who, upon graduation, relies on her "theory" to answer a question on the bar exam!

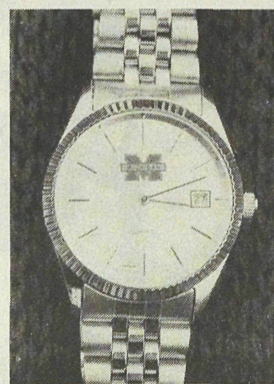
Whenever she's at a loss for an answer — which, for a claptrap peddler like MacKinnon, is often, even when questioned with uncritical servility as your Peter Seidman does — she fobs us off by saying, "Much of what I talk about isn't about experiences men have." But all she talks about is an experience women don't have (according to her, anyway) — pornography.

But anti-porn is a path to career achievement and potentially, through



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alliances with right-wing groups such as MacKinnon forged in Minneapolis and Indianapolis, to political power. This kind of "feminism" offers nothing to ordinary women who have more serious problems to worry about than the abstract indignity of pornography. The Dworkins and MacKinnons are cashing in precisely *because* they misdirect the women's movement and reduce it to the handmaiden of the likes of Edwin Meese and Jerry Falwell.

Robert C. Black '73
Albany, New York

MACKINNON believes biological differences to be entirely irrelevant to how men and women relate to each other in society, instead arguing that gender role differences are artificial — that is, social. But this argument ignores the question of how social norms are formed. Men and women have obvious and profound biological differences. They also have psychological differences, as many studies have documented. The social roles of men and women are based heavily on these *natural* differences between the sexes. This is why, as MacKinnon herself states, gender roles are amazingly similar across almost all cultures, going back to the beginning of history. Surely if gender roles are primarily the result of social pressures, independent of natural differences, we would witness more variety in sex roles across cultures.

Civil society is based on the *social repression* of individuals' appetites for violence and sex. No society that wishes to preserve itself, including our own, encourages rape. In fact, the notion of chivalry, that masculinity is defined (among other things) by *protecting* and *respecting* women is a *natural* instinct that is *overtly* stressed in most Western societies (though less so now that we are more "liberated" from old-fashioned "sexist" social mores.)

MacKinnon is right in believing pornography to have harmful effects on society, and therefore, society has the right to take steps to protect itself from it. But then she makes a huge leap. Hard core pornography, she states, is becoming more violent, which she says, shows that men are aroused by dominating and attacking

women. Furthermore, since men are aroused by dominating women, and "women have been socialized to be a thing to be sexually used" (e.g. motherhood?) the act of sex itself is, almost by definition, part of her male domination conspiracy theory. The fact is, being sexually aroused from dominating someone else is a perversion, and to characterize an entire sex by a perversion demonstrated by a small minority is sheer intellectual dishonesty.

The human relationship between a man and a woman can be one of equality regardless of who performs which functions. Conversely, creating "equality" in functions will not eliminate the natural differences which heavily influence social behavior — the Israeli army, for instance, had to remove women from combat because male soldiers would do foolish things trying to rescue female soldiers under fire. MacKinnon wants to re-engineer society (necessarily through totalitarian means) to eliminate all social manifestations of gender differences. If she were empowered to perform this destructive folly, she would learn that re-engineering society will not produce this goal — she will have to re-engineer the species.

Brandon Crocker '87 M.B.A.
San Diego

HOW DOES one respond to a revolutionary thinker and voice for equality between the sexes? Professor MacKinnon's thesis touches every aspect and dimension of our social intercourse, challenges every assumption and belief used to support our patriarchal society and destroys many a myth upon which the perpetuation of that society depends. One must heed her unsettling message in order to begin to repair the damage done by generations of male-governed society.

For males, the tragedy of institutionalized inequality is that ultimately we victimize ourselves. By locking women out, we lock ourselves into a variety of sex roles — whether it be breadwinner, "stud," disciplinarian of our children or what have you, there is no shortage — which control us even as we assert dominance in playing them out. While this does not fit neatly into MacKinnon's thesis, I believe that the resulting debilitation is

no less profound and disruptive than that experienced by women.

I found it entirely inapt for you to refer to MacKinnon as "The Pornographer's Nemesis." I don't believe that she singles out pornography for disparately harsher scrutiny than any other societal expression of male aggression. It is simply another spoke on the wheel that holds up the system, albeit a rather conspicuous one that makes it a relatively easy target. It seems to me that she is *for* women and equality before she is against anything, including pornography. By casting her as a nemesis you obscure any advocacy element of her positions and reinforce the negative and antagonistic, which is, I suspect, basically what men want to hear.

Scott R. Winkler '80

ONE THING MacKinnon and other feminists dislike is to hear a man explain the female experience, especially in a negative manner. "How dare he! He's not a woman. How can he possibly know why women do what they do?" So true, and MacKinnon should apply that same reasoning to herself before making such absurd statements as, "Masculinity is defined, among other things, in terms of one's ability to rape women." This merely gives men permission to respond in kind: "Femininity is defined, among other things, in terms of one's ability to economically rape men." This statement is as true for men as MacKinnon's is for women, but how do such hyperbolic generalizations improve the male-female dynamic?

There is no power in earning money — only stress, sweat and responsibility. The power of money is in spending it, and the ad people will tell you that most of the advertising is geared toward wives because they usually decide how the family's money is spent. From a non-feminist man's perspective, femininity is also defined as one's ability to spend money earned by a man. Now that's real power.

Women aren't trained to take the risks and initiatives requisite to financial success; men often hunger for success because for males, money and fame bring access to women and help a man escape rejection. As every marketing searcher knows, "Promise him the woman and he'll become successful enough to buy the product."

One of the "products" is the man's magazine with its amalgam of soft- or hard-core pornography and its features on "upscale" bachelor consumerism. Ironically, however, *Playboy*-type centerfolds actually weaken men's power by increasing men's demand on the limited supply of real-life women who fulfill the centerfold image. To bridge that gap, men either become more successful (to attract a real-life centerfold-type) or satisfy their needs vicariously by purchasing more centerfolds — the "fixes" that make rejection from real women bearable. Like most fixes, the centerfold images simultaneously stimulate the demand for a greater supply of the centerfold types, while in fact the supply remains limited and only the value of the centerfold goes up.

"The system is killing women," MacKinnon said.

Fact: Of the over seven million new jobs in this country between 1980 and 1985, 74.8 percent went to women, as did 65 percent of all wage increases during this period.

Fact: Men have a 600 percent higher rate of work-related accidents and a much higher rate of work-related deaths than women.

Fact: Men are afflicted with more of the stress-related diseases than women.

Fact: Women on average outlive men by eight years.

Fact: White males have a 1-in-104 lifetime chance of being murdered and

Black males a 1-in-21 lifetime chance. White women, the group most vocal about the "violence against women," have a 1-in-369 lifetime chance of being murdered.

Fact: Fifty percent of the pornographic videos are rented by women. Is this evidence that porn is a "male thing?"

All this is not to be vindictive against women. Women's behavior is formed largely in reaction to men's behavior, and men's behavior largely in reaction to women's. MacKinnon ought to be telling women that they have as much changing to do as men. She can only discourage women, make them disdain men, and impede equality by telling women they will remain victims until men become "good guys" and cease the oppression.

Jerry A. Boggs
Westland, Michigan

WHAT A lot of feminist magniloquence and bombast! I weary of such discriminatory generalizations about the human male *and* female. Most men are *not* tyrants and rapists. Most women are *not* cowering slaves. I continue to wonder why the media give so much time and space to feminists who seemingly suffer from severe paranoia or sexual frustration or both. "Deliver us also, O Lord, from strident females and their psychological rape of American males."

James B. Way
Hendersonville, North Carolina

I'VE RESPECTED, supported and admired MacKinnon; she is a champion to be cheered at the battlements, engaging where most have failed to hold ground. I lose her, though, somewhat through her recent interview. She makes a harsh twist. Her doctrine takes the cast of the anchorite. What of those that are not the stripe of Irish Catholicism? I'll be content to remain amidst the haltingly human, whose flesh is weaker than she can allow. My conscience shall guide me. I will abide the consequences; indulging as fortune permits, avoiding, I pray, cause for deep atonement.

S. Klipper
Minneapolis

"WHEN WOMEN resist economic subordination, they are punished economically."

"Everything is arranged in an attempt to silence all of us who say what we're saying."

"What is less clear to me is whether there are sexual experiences that are not predicated on inequality."

"The system is killing us."

These are the words not of a scholar but of a madwoman, utterly out of touch with the historical development of society and with the reality of today. Beware the arrogant zealot like MacKinnon, who is firmly convinced that she knows what is good and not good for everyone else, even when those whom she is allegedly trying to save reject her brand of salvation.

Carl Goldberg
Tempe, Arizona

We forwarded almost all of our readers' letters to Professor MacKinnon and invited her to reply. So far, she hasn't done so — Ed.



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Hubbs fellowship continues family tradition of ichthyology

A family tradition of scholarship begun at the Museum of Zoology will be passed on to future generations of students, thanks to the Carl L. and Laura C. Hubbs Fellowship in ichthyology. The Fellowship was recently established by the Hubbses' son Clark, a 1942 U-M graduate, and his wife, Catherine Symons Hubbs.

Curator of fishes at the University from 1920 to 1944, Carl Hubbs not only established the U-M as an international center for the study of fishes, but wrote many papers with his wife, Laura, a statistician who worked alongside him, beginning a family tradition of scholarship in the field.

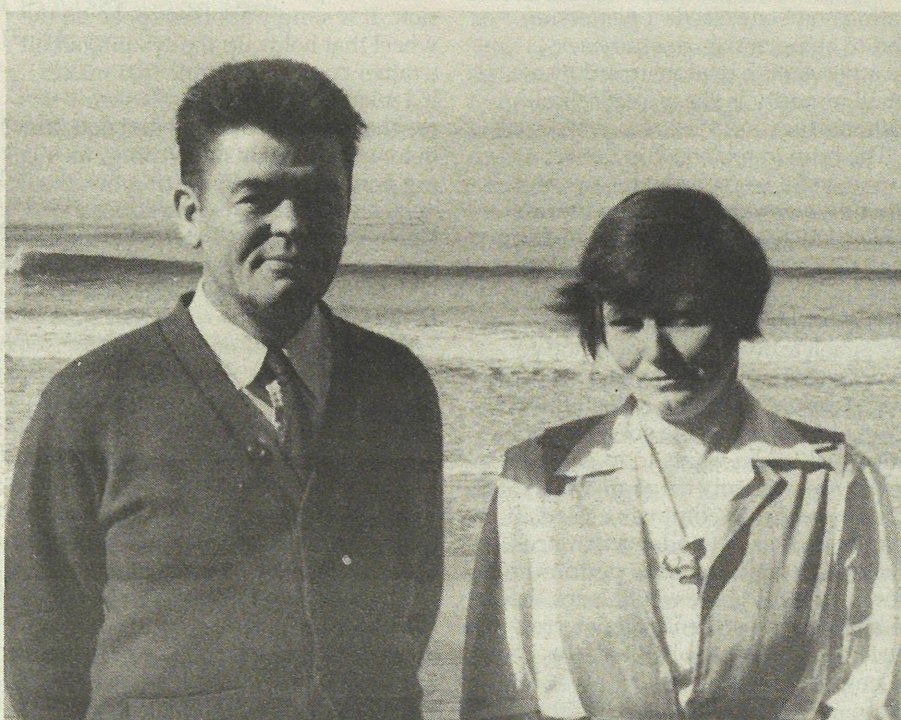
The Hubbs family has had an enormous impact on fish biology. Clark Hubbs is a well-known ichthyologist at the University of Texas at Austin. His sister, the late Frances Hubbs Miller '40, was a well-known collaborator in ichthyology; in 1981, she completed an indexed bibliography of her father's 707 publications. Her husband, Robert Rush Miller '43 M.A., '44 Ph.D., is a U-M professor emeritus of biological sciences and curator emeritus of fishes.

Another son of Carl's and Laura's, Earl, was an innovative teacher of biology in California and served as naturalist for the U.S. Park Service.

The family tradition of scholarship and dedication to Michigan is carried on by grandchildren. Frances Miller Cashner '65 is on the faculty of the biology department of the University of New Orleans, where her husband, Robert Cashner, is an ichthyologist. And Clark's daughter, Laura Ellen Hubbs-Tait '73 teaches psychology at Washburn University in Topeka, Kansas.

This tradition of focused scholarship is an important reason why Clark and Catherine Hubbs decided to give the Fellowship to Michigan.

"My father's career began at Michigan," Clark Hubbs says, "and my wife and I wanted to acknowledge that. He was convinced that an area without ongoing research was a field that soon would die. He believed that it was very important to support graduate study. My wife and I felt that this Fellowship would help address those concerns."



Carl and Laura Hubbs in La Jolla, California, 1944.

It will. The Fellowship will support a candidate for the Ph.D. in ichthyology for the final two or three years required to obtain the degree.

"Before a student becomes a candidate," explains Prof. Gerald Smith, a member of the committee that will administer the Fellowship, "he or she must serve as a teaching assistant in the Department of Biology. In addition, fish students are given the opportunity to work as curatorial assistants in the Museum. Both of these positions allow students to earn a little while they are studying. However, during the final years of their study, when they are under pressure to complete their research, it is often difficult to work as well. Hubbs Fellows will be freed from this worry; they will be able to concentrate all their energies on their research."

However, the impact of the Hubbs Fellowship will reach beyond the individual students that it will help. It will also strengthen Michigan's program in ichthyology as a whole.

"As far as I know," Professor Smith

says, "this Fellowship is the only one at any university that is specific to ichthyology. Some other universities have been able to offer more financial assistance than we. Because of this, we have lost a number of students we would have liked to have. With this Fellowship, however, we will more easily be able to recruit the most promising students to Michigan."

"We have an active, international program, with students from all over the world," Smith adds. "In large part, that program was developed by Carl and Laura Hubbs, so it is very fitting that this Fellowship should honor their memory while it perpetuates their love of the study of fishes."

To expand the Fellowship, the Museum invites Carl Hubbs's former students and colleagues to join his son, Clark, in his wish to strengthen the study of ichthyology at the University. For further information, contact the U-M Division of Fishes, 1031 Alexander G. Ruthven Museums Building, 1109 Geddes Road, Ann Arbor MI 48109.

Gerstacker Foundation aids engineering faculty

The Rollin Gerstacker Foundation has established the Rollin M. Gerstacker Foundation Fund for Faculty Development for The University of Michigan College of Engineering through its gift of \$500,000.

The Fund is designed to enhance the professional growth of faculty in the College of Engineering by providing funding to encourage the development of research areas outside traditional academic boundaries, and to foster innovative approaches to teaching.

"Through a University program with which we were previously involved, we became interested in working with Michigan to develop top-quality faculty," commented E.N. Brandt, vice president and secretary of the Foundation.

"It also is true," he remarked, "that University officers are very persuasive in making their case."

In discussing the gift, Charles M. Vest, provost and vice president for academic affairs and former dean of the College of Engineering, said, "The College of Engineering is fortunate to have recruited a number of extremely talented new faculty members. The generous gift of the Gerstacker Foundation will enable the College to establish a unique program that will enhance this faculty's career development by providing special opportunities to explore new programs in research, scholarship and teaching."

The Rollin M. Gerstacker Foundation was founded in 1957 by Eda U. Gerstacker in memory of her husband. The Foundation annually allocates a substantial portion of its gifts to education, including, since 1983, \$100,000 to the College of Engineering for a fellowship program in chemical engineering.

Carl Gerstacker, Rollin's son, has a long history of supporting Michigan and other institutions of higher education. A member of the Albion College board of trustees, he received the U-M Outstanding Alumni Achievement Award in 1982, and delivered the College of Engineering's commencement address in 1985.

Mike Wallace to chair LS&A Fund:

'One of life's choices is how to give'



Wallace

Mike Wallace '39, well-known to viewers of "60 Minutes" and other CBS televised news programs, is the new national chair of the Enrichment Fund for the College of Literature, Science, and the Arts. Last year the volunteer post was held by Henry W. Bloch '44, who founded, with his brother, the H&R Block Company, which specializes in tax preparation.

Wallace is enthusiastic about working with other University alumni and friends in his new role.

"Those of us who went to Michigan were the beneficiaries of many good things," he commented. "It's time for us to grasp the chance to give back to the school that gave us so much. I've no doubt that our years in Ann Arbor helped launch us. How do you begin to repay that debt? How do you help make that opportunity available to others?"

More than 22,000 alumni and friends of LS&A answered these questions last year with gifts to the College totaling more than \$2 million. The gifts, which were unrestricted, were used for a variety of LS&A needs, in-

cluding funds for faculty research and publication, for computer time for undergraduate students and for library acquisitions.

The flexibility of the unrestricted gifts to the Enrichment Fund allows the College to respond quickly to unanticipated demands — both needs and opportunities — as they arise. For example, equipment was purchased for the new chemical sciences facility with money from the LS&A fund.

An equally important but less direct function of Enrichment Fund monies is the fact that they can augment other LS&A funds that otherwise would not have been sufficient to support a given project.

Wallace's warm feelings about the University stem not only from his experiences on campus but also from those of other members of his family.

"I love Ann Arbor," he said. "It's where I began to grow up — professionally and in other ways. I also have a family feeling about the University. My uncle, Leo Sharfman, was chairman of the Department of Economics for more than a quarter century, and

it was through his suggestion that I came to Michigan."

Michigan was the school of choice for other members of Wallace's family. Several of his cousins — Katherine S. Lester '45, Nelson A. Sharfman '33, '35 L.L.B., Warren L. Sharfman '32, William L. Sharfman '64 and Marcia L. Sharfman Gilmartin '39, '46 — enjoyed a Michigan education.

Today 17,800 undergraduates are enrolled in LS&A, the University's largest College. The College comprises 25 academic departments; eight museums; and specialized centers, institutes and programs.

Wallace points out that it is important for alumni to recognize the quality of the education offered by the College.

"When I return to the University to visit, my time is full of nostalgia," he said, "but we must also remember that Michigan is an excellent academic institution, and we want to support that. Life is a series of choices, and one of them is the choice of how to give. It's important to give where it's most useful."

On Exhibit

By Terry Gallagher

Photography's sesquicentennial is being observed this year at the U-M Museum of Art with several major acquisitions dating from the early history of the art, including rare portraits, architectural studies and scientific illustrations.

In 1839, French painter Louis Jacques Mande Daguerre and English scientist William Henry Fox Talbot, working independently, described processes for using light-sensitive materials to make permanent images — Daguerre's on polished metal plates and Talbot's on paper.

The recent acquisitions include a view of Queen's College, Oxford, taken by Talbot, a photograph that was included in Talbot's *The Pencil of Nature*, the first photographically illustrated book.

"From a teaching point of view, these are very useful tools to study the history of photography," notes U-M art historian Graham Smith, interim director of the Museum. "It means that we have a good representation of images by the inventor of the negative/positive photographic process."

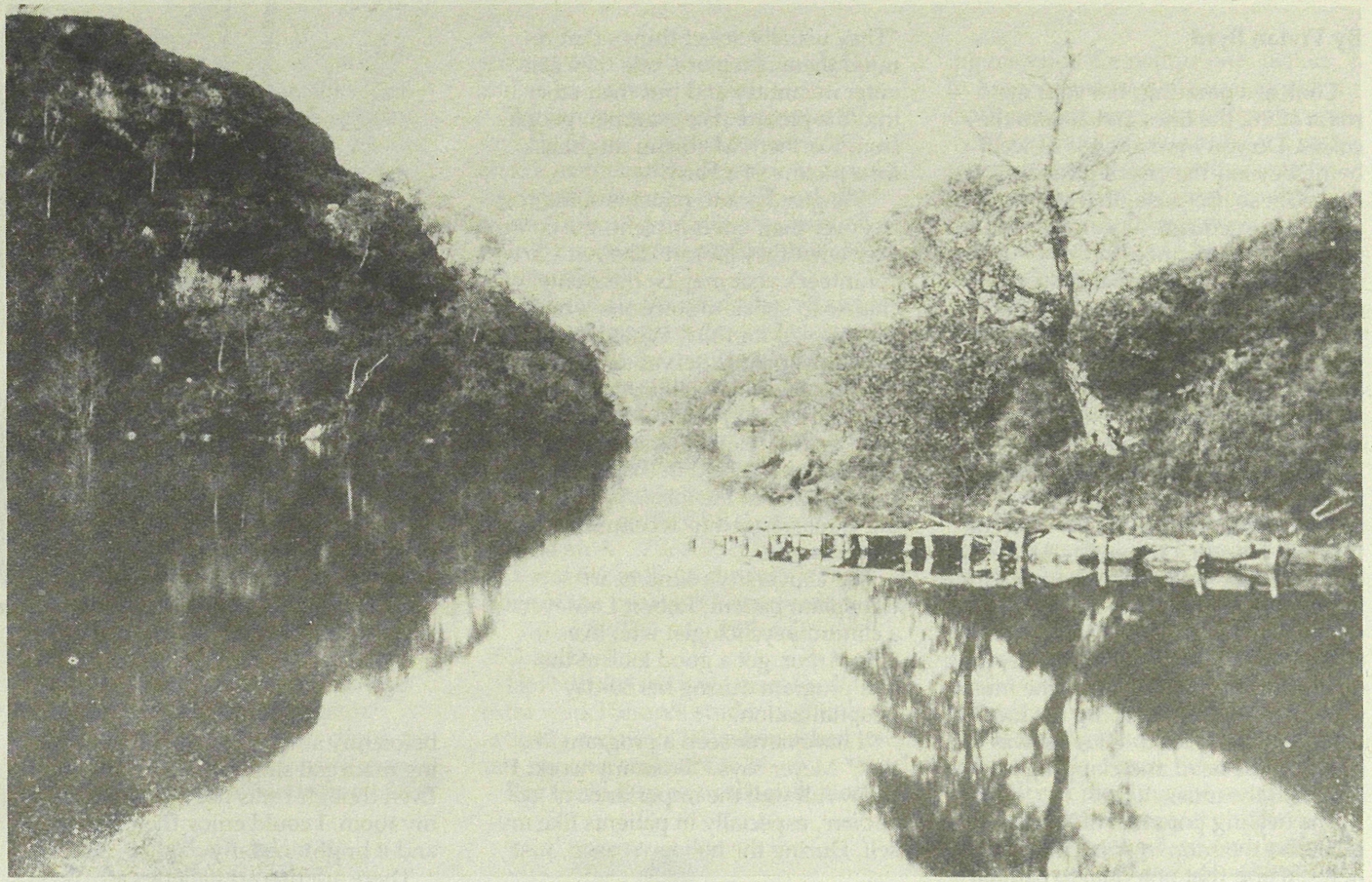
Also acquired recently are an extremely rare negative and a positive print from the same portrait session photographed by Talbot's disciples David Octavius Hill and Robert Adamson, dated to 1843-47. Very few American collections have both a negative and related positive, according to Smith.

Another important acquisition is an early example of the use of photography for scientific illustration, a life-size cyanotype print of the plant *Equisetum sylvaticum* taken by botanist Anna Atkins.

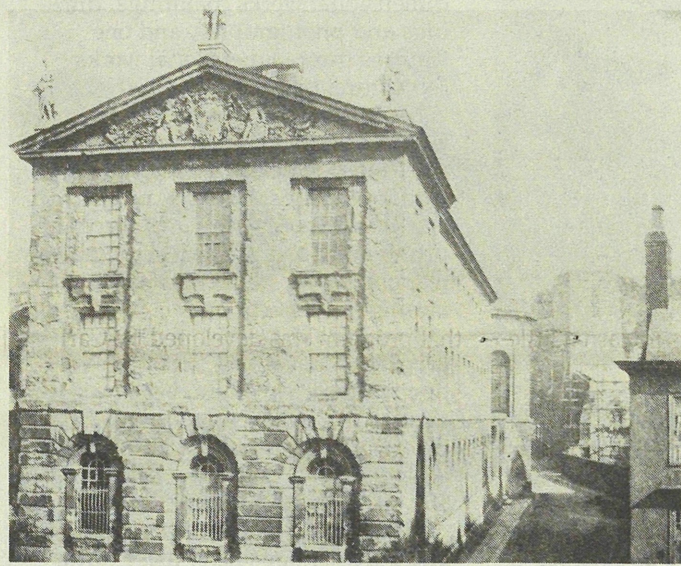
Other recent additions to the U-M collection this year include a view of Michelangelo's Medici Chapel in Florence taken by the Italian photographer Leopoldo Alinari around 1855, and a view of a crusader's castle in Syria taken by French photographic pioneer Louis De Clercq. Harry H. Lunn Jr. '54, a former editor of the *Michigan Daily* and currently one of the premier international dealers in photographs, donated the De Clercq.

Some of the acquisitions were purchased with funds provided by the Friends of the U-M Museum of Art, revenues from sales in the Museum's gift shop and donations, Professor Smith points out.

The Museum is planning two photographic exhibitions this fall. "Sun Pictures in Scotland," focusing on the first years of photography in Scotland, will run through the end of October. "The Reflective Lens: 150 Years of Photography," displaying the range of the Museum's photographic collection, will run until December.



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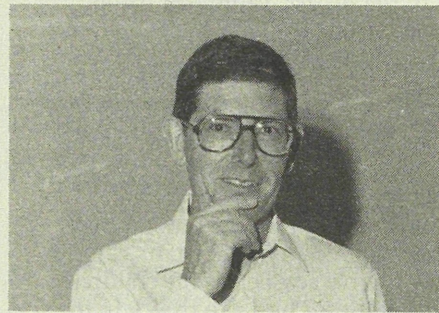
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3

1. An autumn 1844 photograph by W.H.F. Talbot, independent co-inventor of photographic processes with Louis Daguerre, of Loch Katrine in Scotland. The lake became a tourist attraction after it was popularized by Sir Walter Scott in "The Lady of the Lake." The print was a gift of the Friends of the Museum.
2. A view of part of Queen's College, Oxford, by W.H.F. Talbot (1844/45). The Friends of the Museum made a contribution toward the purchase of the photograph this year.
3. Sir David Brewster, a major figure in the popularization of photography in its early days, as photographed by John and Robert Adamson in 1842. This photograph was a gift of the Friends of the Museum.
4. This 1853 cyanotype by Anna Atkins (1799-1871) of varieties of the plant *Equisetum sylvaticum* is one of the earliest applications of photography to scientific illustration.

Graham Smith



A link to the Scottish Enlightenment

As a scholar, Graham Smith is a Renaissance man, having written widely on Italian painting and drawing of that era. But perhaps because he is a native of Scotland, he's also a connoisseur of the most influential form of modern image-making — photography.

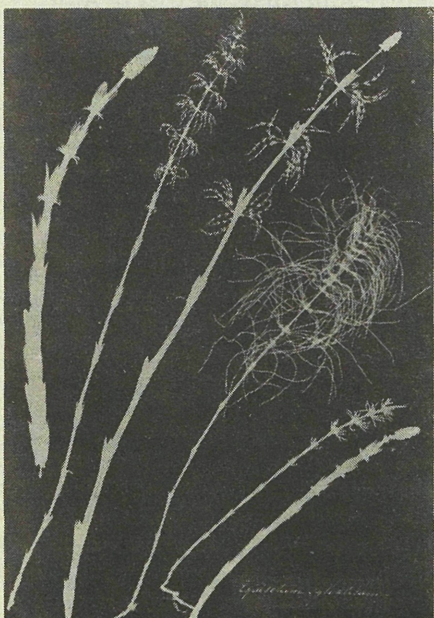
Professor Smith was educated at St. Andrews University and at Edinburgh University before he came to the United States for his doctoral studies at Princeton. "Scotland in general and St. Andrews in particular were centers in the early development of photography," he says. "In the first four years of the medium, it was concentrated at St. Andrews and later at Edinburgh."

Many of the technical developments in the early days of photography were extensions of the Scottish Enlightenment, a period of intense intellectual ferment that generated many advances in philosophy, economics, science and technology in the late 18th and early 19th century. One can

say both literally and figuratively that many of the engines that propelled the Industrial Revolution, and Britain's imperial conquests, were the work of Scottish intellectuals, Smith notes.

During that period, Scottish thinkers defined much of what we know as the modern world. James Watt, whose refinements of steam power made large-scale industrial production possible, coined the term "horsepower." Adam Smith, who held the chair of moral philosophy at Glasgow, provided the systematic formulation of modern capitalism. The skepticism expounded by philosopher and historian David Hume had enormous influence on the political philosophies that swept the Western world in the 18th century.

Among their other advances, Scottish scientists were making great strides in understanding light and optics, two of the foundations of the development of photography.



4

The medicine of art

By Vivian Byrd

Look at a painting. Let your eye roam along the lines and absorb the colors. Do you have a sense of well-being beyond the visual pleasure? Probably so. Because, in a sense, art can be medicine — curative and preventive medicine.

That is the premise behind Gifts of Art, an innovative visual and performing arts program for patients at University Hospitals. Gifts of Art was launched in June 1987 with two years' worth of seed money from the University of Michigan Hospitals.

"What we do enhances the healing process," says Gary G. Smith, director of the arts program. "We see it every time we present a program. At our last concert, there was one guy — a tall, large man with a scowl on his face — who wouldn't come into the area and sit down; he stayed in the back leaning on a column. But as soon as the music started, he started tapping his foot, listening to the band. Later he was bopping his head and clapping his hands to the music."

The healing potential of art and music on the human spirit is not news; using that potential to combat illness is. There are just seven such programs in all of the United States, and only the ones at Duke University and the University of Iowa are as extensive as the one at U-M Hospitals.

In every patient room at University Hospitals, at the foot of every bed, is a piece of poster art. The Art Cart, which Leigh Sweda, the exhibit coordinator, stacks with numerous types of poster art — classics, landscapes, animals and others — circulates once each week to every patient room. The piece in the room can be exchanged for whatever strikes the patient's eye. The most often requested are nature scenes, trees, lakes and rivers. Animals also are popular. There is little call for scenes with people or for abstract art.

"Patients want something that puts them someplace else. They don't want scenes that encumber them with other people's relationships," Sweda says.

"They usually select things that remind them of a place, one they can enter in fantasy and put their story into the picture. For example, people from Northern Michigan might ask for a picture of a barn.

"We give back to patients some control over their environment, the control over what they look at. The Art Cart volunteer's visit may be their only chance to speak to someone who is not pressed for time. What happens is that the picture serves as a kind of 'picket fence' to talk over."

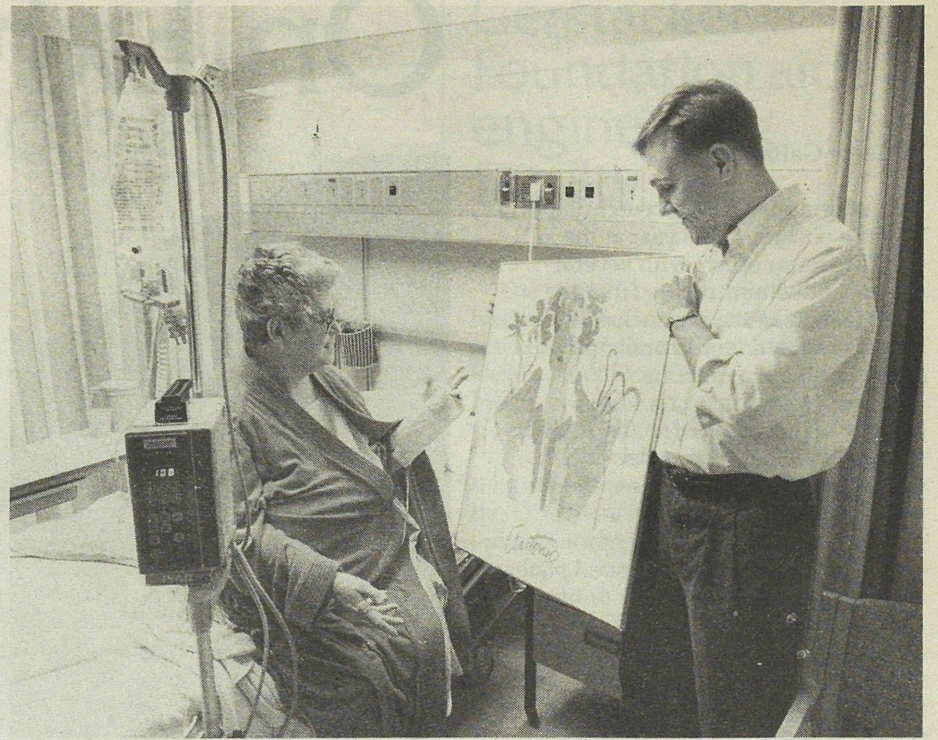
Weekly concerts and other events such as artist demonstrations, theater and dance, are held in the Hospital courtyard or in the lobby, where seating is rearranged to accommodate the performance.

The University's 62nd heart-transplant patient, Robert L. Meyer, a clinical psychologist who lives in Ann Arbor, got a good look at the arts program during his 60-day hospitalization.

"I have never seen a program like this," Meyer says. "From my work, I know full well the importance of *joie de vivre*, especially in patients like myself. During the holiday season, just



ICE SCULPTOR Cynthia Halse was one of four artists who demonstrated their technique in U-M Hospitals' courtyard last February as patients watched. The sculptures were exhibited in the courtyard until they melted.



ART CART volunteer Gregg Billeter brings selections of paintings to patient Nora Schroeder in her room.

before my surgery, I remember hearing madrigal singers in the hallway. Even though I was not allowed to leave my room, I could enjoy their singing and it brightened my day."

There are five art galleries at U-Hospitals; four exhibit two-dimensional works (paintings, drawings and photographs), and one features three-dimensional works (sculpture, pottery and glass).

Michigan has the second-largest collection of artwork of any university in the United States, after Princeton's, including the Hospitals' 500 original art works and more than 3,000 pieces of poster art. The Gifts of Art program is responsible for overseeing and maintaining the collection.

To continue its work, the Gifts of Art program must raise \$75,000 per year operating expenses and become self-supporting. A recent grant of \$250,000 from the Friends of U-M Hospitals will be paid in yearly installments of \$50,000 through June 1993.

"While the grant is very generous and a tremendous help, these funds will cover less than half of the program's budget," Smith says.

"Money is needed for purchasing new art, replacing worn or damaged works and frames, paying performers' fees, supporting program promotional efforts and paying staff salaries. Most of the works exhibited are for sale, and the program realizes a 20 percent commission on its sales. Some funding comes from the Michigan Council for the Arts. However, the bulk of the \$75,000 must be gathered through private donations from individuals and support from foundations."

The program has received a Michigan State Equity Grant to purchase video equipment so that performances can be filmed and broadcast free to patients via the Hospitals' closed-circuit television network. Since some patients can't leave their rooms, television will bring performances as close as the TV remote-control unit in their hands.

No other hospital in the United States has closed-circuit broadcasts to patient beds for the arts.

Ann Arbor free-lancer Vivian Byrd is on the staff of the U-M Institute for Continuing Legal Education.

About our cover

The Triton Story



The news from Triton via Voyager 2 this summer was confusing: the pinkish sphere that is Neptune's biggest moon was brighter, frostier and smaller than scientists had thought. Voyager researchers also reported that Triton is "in the wrong orbit — it's going backwards around Neptune — something truly catastrophic must have happened some time in the past."

That confusion and catastrophe surround the Neptunian moon or anything else associated with Triton surprises no one who has studied the biography of that minor Greek sea god, whose U-M incarnation appears on the cover of this issue.

Confusion? First, there is the name of the fountain where Triton resides in the courtyard between Burton Tower

and the Michigan League. It's called the Thomas M. Cooley Fountain, "Sunday Morning," the Cooley Memorial Fountain and "Triton Blows His Horn." Either of the first two names appears to be preferred.

Confusing, too, was the array of possible representations of the god from which the Swedish sculptor Carl Milles had to choose for his depiction of this son of Poseidon (Neptune to the Romans) and Amphitrite.

The Greeks and Romans almost always showed Triton as a merman, although he was half-animal in the earliest icons. Some accounts have Triton driving a horse-drawn chariot over the waves; in others he is self-propelled. He usually carried a seashell that he could sound to calm or arouse the seas. But he also might wield a trident, a dolphin or a drinking horn. And sometimes he was headless. That's where ancient catastrophe comes in.

In one story, Triton had been raiding the cattle of the Tanagrans in the Greek province of Boeotia and plundering their ships. These attacks continued until the people left a jug of wine on the shore. Triton drank it, fell asleep, and a local chopped off his head with an ax. Hence his headless image.

Another legend reports that Triton, disguised as a crewman of the Argo,

provided Jason and the Argonauts with the Mediterranean sea route that took them safely home with the golden fleece.

On another occasion Triton made some improperly aggressive advances toward the women of Tanagra as they were bathing in preparation for festivities honoring Dionysus, the wine god. Dionysus drove Triton away before he could satisfy his desires.

In the *Aeneid*, Vergil has Triton drown a human who challenged him to a trumpeting contest with a seashell — no doubt the same shell Triton blows in the story of Deucalion in Ovid's *Metamorphosis*. In this tale of the great flood, it is Triton's blasts that send the waves into retreat.

It is in his benevolent mood that Triton appears on Michigan's campus, blowing his seashell as his children scramble over him in a frolic in the waves. Milles, the sculptor, said the work embodied childhood memories of summer mornings swimming at the seashore in Sweden with his father and brothers.

Dedicated on June 20, 1941, the 10-by-25-foot fountain with its 7-foot central figure was Ann Arbor's first public fountain; it was a gift of Charles Baird '95 B.A./L.L.B., '40 Ph.D. (Hon.), the University's first athletic director, in honor of Prof. Thomas McIntyre Cooley. Cooley joined the law faculty

in 1859. As a member of the University's first law faculty, he was instrumental in transforming the program into the nation's first law school. Cooley was dean of the school for 13 years.

Baird also donated funds for Burton Tower's Baird Carillon, which is behind Triton on our cover photo. Thanks to Baird and other donors to the Tower (chiefly the U-Michigan Club of Ann Arbor, the City of Ann Arbor, the Regents of the University and the Alumni Association), we can stand before Cooley Fountain today, listen to the Carillon ring and share Wordsworth's ardent wish, expressed in the "Sonnet" of 1807, to "hear old Triton blow his wreathed horn."

Michigan Today

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Michigan Today is published five times a year by News and Information Services, The University of Michigan, 412 Maynard St., Ann Arbor MI 48109-1399. Circulation: 310,000

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In this problem, the negatives are known

How do we teach mathematics better?

By Michele Thompson

American students spend less time on mathematics than do students from most other industrialized nations, recent studies have shown. Effort and success at math also vary within the United States.

According to *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, American students from public schools in large cities test lower in mathematics than do students from suburban schools.

Students from low-income urban and rural areas who have received high grades in mathematics in secondary school often find themselves underprepared for the depth of math understanding expected in college, says Philip Uri Treisman, director of a pioneering mathematics workshop at the University of California, Berkeley.

But inadequate preparation is only one of the problems Treisman has found in an informal study he began in 1978. Asian-American students spend an average of 15 hours a week on math classes alone, while African-American students reported that they thought seven hours a week was adequate study time.

Not surprisingly, Asian-American students received the highest grades, while African-American students received the lowest grades of all ethnic groups in the study, says Treisman, who has helped many Black and Hispanic students succeed in math and science in his workshop.

Many low-performing students and their parents are shocked when they learn how much a good math student must study, Treisman notes. The solution seems simple and in fact it is: Students need to study longer and more effectively to excel in math.

It also helps to study together. Treisman says the self-reliance that has served Black students well in getting to college can backfire in college calculus classes. Studying in groups, a common practice of Asian-American students, is effective in math learn-

ing, Treisman says, so he devised a program in 1976 that intensifies individual math study while also placing students in study groups. The results: higher grades for workshop students, more students majoring in fields requiring math proficiency and increased retention rates.

The University of Michigan's Comprehensive Studies Program (CSP) has a regimen that is similar to Treisman's in helping students learn to study math and other subjects more intensively and successfully.

CSP offers special sections of entry-level mathematics courses that meet more often than regular sections. Students in the intensive sections take departmental exams and are graded by uniform departmental standards. But instead of meeting Monday through Thursday for one hour, a CSP section meets every day, and in addition students attend one-on-one conferences with their instructor.

Many students in CSP's sections are from disadvantaged minority groups, but the sections are open to any LS&A

student who wants to work harder to realize his or her potential.

The intensive program is necessary, says Pat Shure, joint lecturer in CSP and in mathematics, because early college math courses — usually calculus — presuppose a preparatory level of training and understanding that some students lack.

Shure routinely checks her students' notebooks and gives frequent tests in addition to those regularly scheduled. She also forms study teams by sending a row of students to the board to work a homework problem.

The proof of the CSP math program is in the results. In a recent calculus course, 15% of the CSP students earned an A, 22% a B, 38% a C, 19% a D, and 6% an E. In the regular sections of the course, 8% received an A, 20% a B, 35% a C, 22% a D, and 15% an E.

How do the students react to all the extra work? Shure's students enthusiastically exclaim, "11!" when asked to rate her on a scale of 1 to 10.

But secondary and collegiate teach-

ing methods are not the only factors in American students' unsatisfactory math performance, Shure emphasizes.

"Many students do not have a real mastery at each stage in their mathematics education, beginning with multiplication and long division back in elementary school," Shure says. She attributes this to the practice of most teachers of requiring students to memorize equations rather than teaching them how to visualize a problem and its solution.

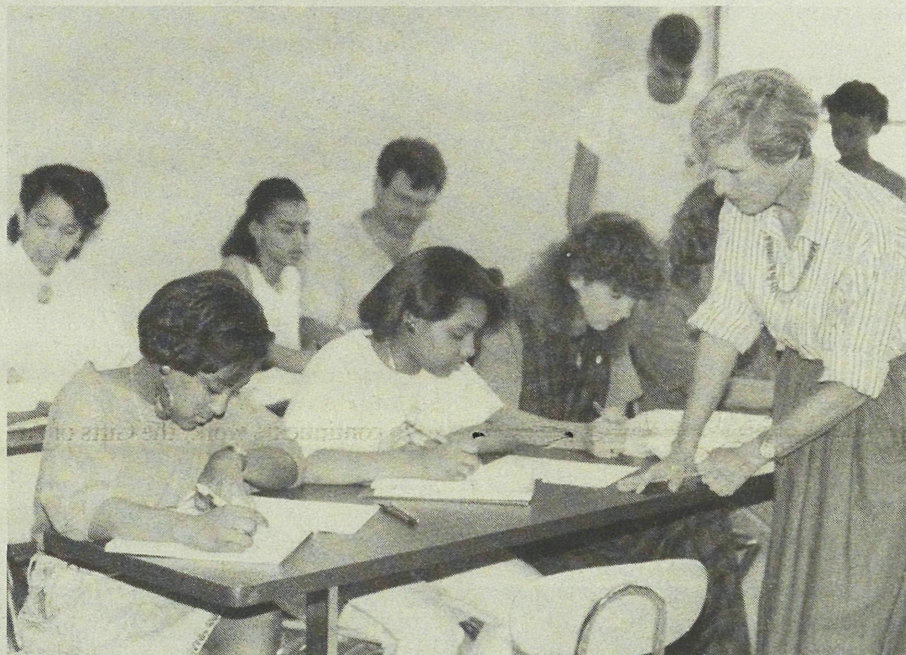
Shure says teaching students mathematical equations is like giving someone directions to her house. "If I give you the directions, I expect you to show up at my door," she says. "Therefore, if a student can learn to say the problem in plain English, there is a better chance of visualizing how to create a solution."

It would seem logical — even ideal — if every math section leader used Shure's active approach. The reason this is not the case at Michigan or other schools, Shure believes, is the difficulty of juggling the many time constraints that most faculty have.

But what can be done on a national level? No one has a ready solution, Shure says, but she does have some suggestions, including the following:

"Society must change its attitude toward teachers. It is unfortunate that so many negatives are attached to the teaching profession in the eyes of society. The lack of appreciation for teaching deprives the profession economically and makes it increasingly difficult to interest outstanding students in teaching. Furthermore, there are not enough women and minority-group role models for students among math and science teachers.

"Unfortunately, the attitude that only basic mathematics is useful in adulthood is passed from generation to generation in the United States. Children need to be shown that math is an essential component in several occupational fields and is becoming more so year by year."



Shure and some of her mathematics students.

Photo by Sree Nallamothu '91

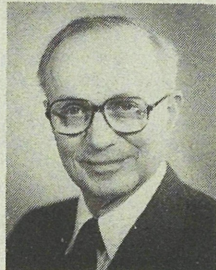
As I See It

More Self-Education! Less Stress!

By Wilfred Kaplan

As one who has taught at the University over most of the last 50 years, I have always felt that the role of the teacher should be one of opening doors, of revealing the many possibilities for developing knowledge and skill, of making it easy to develop strategies for acquiring such knowledge and skill, of encouraging and gently guiding those who are pursuing such strategies.

Thus I have always wanted to emphasize the initiative of the undergraduate student and considered the teacher to be a passive participant in the process, helping to get it started, providing assistance as requested,



Kaplan

continually making the student aware of different directions one can go and of resources to help in achieving success — that is, mastery of the objective the student has set.

Ideally the student could eventually dispense with the teacher and find his or her own way. This occasionally happens even at an early age. After a high school education in a small town, Sri-

nivasa Ramanujan (1887-1920), a great Indian mathematician, taught himself advanced mathematics by filling in the missing proofs in a well-known summary of the subject.

One expects a graduate student to be able to learn new aspects of his or her field of specialization and to make original contributions to the subject. Such independence and drive, however, could and should come at a much earlier stage — for me, the first years of college. (Indeed, there is no lower limit to the age at which initiative of the learner can be encouraged.)

With these ideals in the back of my mind over the years, what has been my real-world experience?

Unfortunately, it has only rarely and on a very modest scale corresponded with the ideals. I should like to suggest some reasons for the failure.

One is the pace of the University program. Course, credit and degree requirements appear to have steadily increased over the years, even though one still allows four years for the normal college degree. The trimester has made matters worse; compared with the semester system, the trimester reduces the number of weeks allotted to study each year by more than 10 percent.

A second reason lies in the pressure on the university from within and without to become a machine for "pro-

ducing graduates." With so massive an enterprise to be coordinated, much standardization is perhaps inevitable, such as in clearly spelled-out courses tied to established textbooks, uniform examinations, much emphasis on course grades and setting of grades by uniform statistical rules. Where in this well-oiled and smoothly functioning apparatus is there a place for individual exploration?

A third reason is a broad cultural endorsement of uniformity and passive reception of ideas, an attribute of our times present for children and adults alike. Undoubtedly, television and other mass media are the principal sources of this aspect of our culture.

There are many exceptions to the negative portrayal I have offered. Some college teachers break out of the standardized formats and encourage their students to freewheeling explorations of their fields. And some students, even when carrying a heavy burden of required learning, find the time and energy for thinking and delving on their own. The "Keller plan," which emphasizes self-pacing and self-instruction, is used successfully in some courses.

I am convinced, however, that much more could be done to benefit all concerned. At Harvard University, where I was a student in the 1930s, many courses had a "reading period" of about two weeks, during which the students were on their own, to comb the school's libraries as they prepared for final exams and finished major research papers.

Our own Undergraduate Library (the UGLI) at Michigan was in fact planned to encourage exploratory reading by placing the books in open shelves, making browsing easy and comfortable. (I was on a University Library Committee many years ago and learned that the UGLI's design resulted from an experiment on how students used library stacks. The experiment had found that when students went to limited-access stacks for assigned required reading, they "studiously" avoided opening nearby books.)

Instituting a reading period and making books temptingly accessible might further enliven the academic atmosphere, but far more can be done. The calendar and workload for students should be freed up, so that there is time throughout the academic year for exploring, contemplating and browsing, and for intense discussions with teachers and friends. The modes of instruction should allow and encourage individual plans and projects.

Above all, faculty and administrators should strive to ensure that college life is not one of great stress but is rather a life of freedom, challenge, excitement and opportunity, a life that empowers students to find their own way in the intellectual realm.

Wilfred Kaplan is U-M professor emeritus of mathematics. "As I See It" is an occasional column for essays by U-M readers. Submissions should be no more than 600 words.

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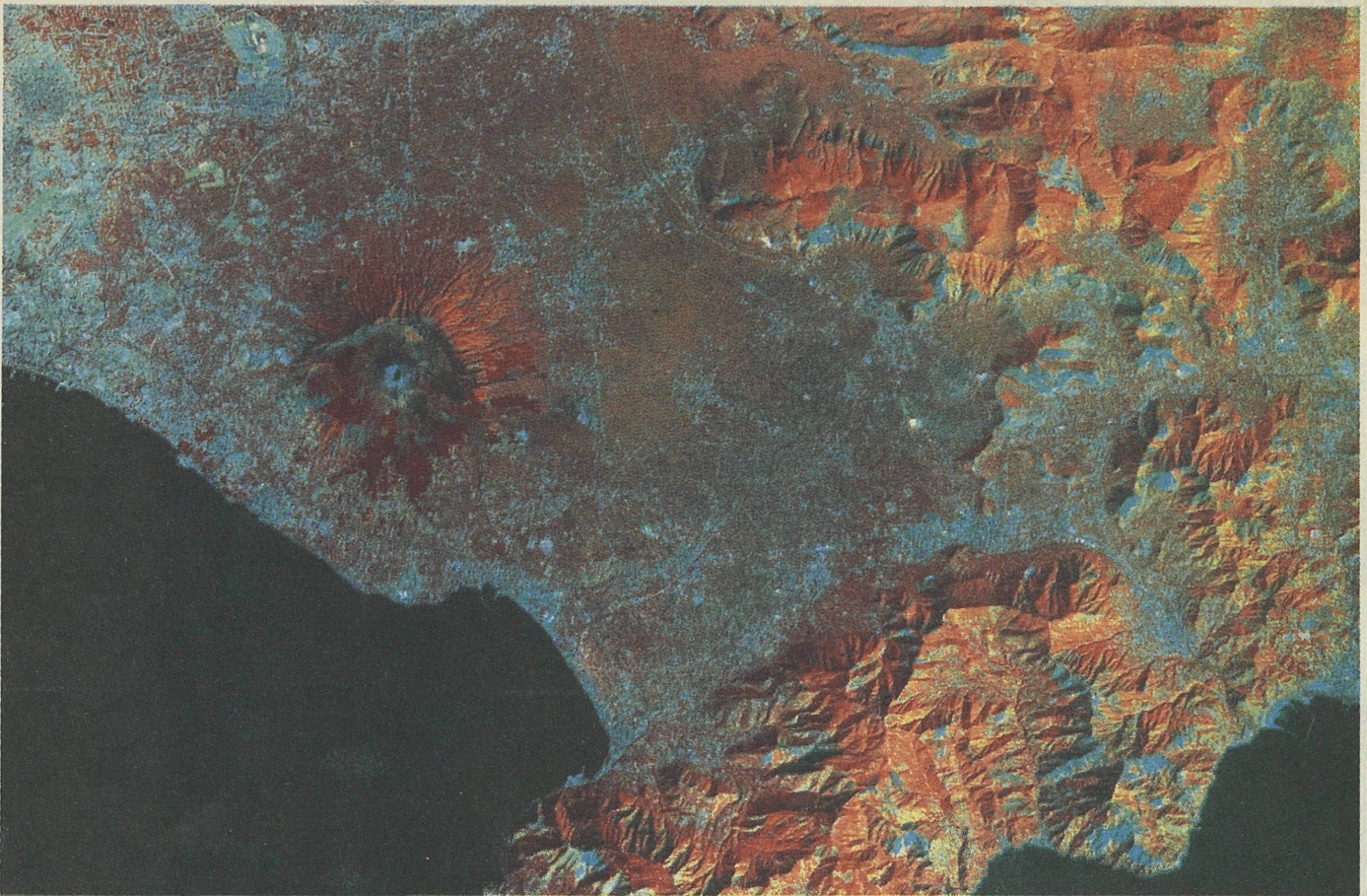


Image Courtesy of Environmental Research Institute of Michigan

MT. VESUVIUS — Italy's famed volcano bulges up on the left side of this false-color composite image produce by Erim, an Ann Arbor-based, remote-sensing, private research institute that originated at U-M's Willow Run Laboratories. Naples is at the far left of the image; Pompeii, buried in 79 A.D., lies at the southeastern foot of the mountain. (October illustration from the Erim 1989 calendar.)

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