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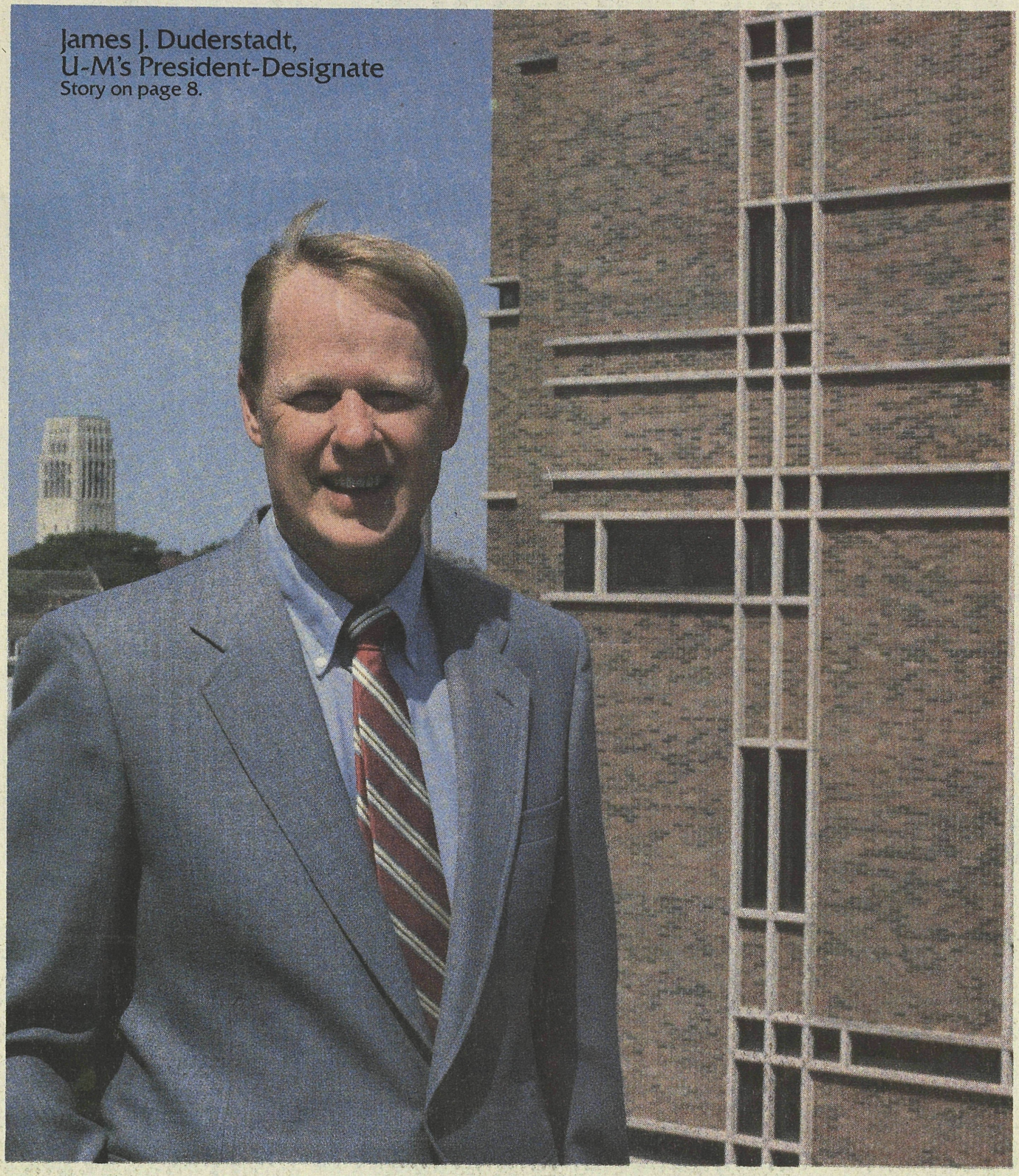

James J. Duderstadt,
U-M's President-Designate
Story on page 8.

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Physicist seeks to illuminate a new world between the micro- and macroscopic.

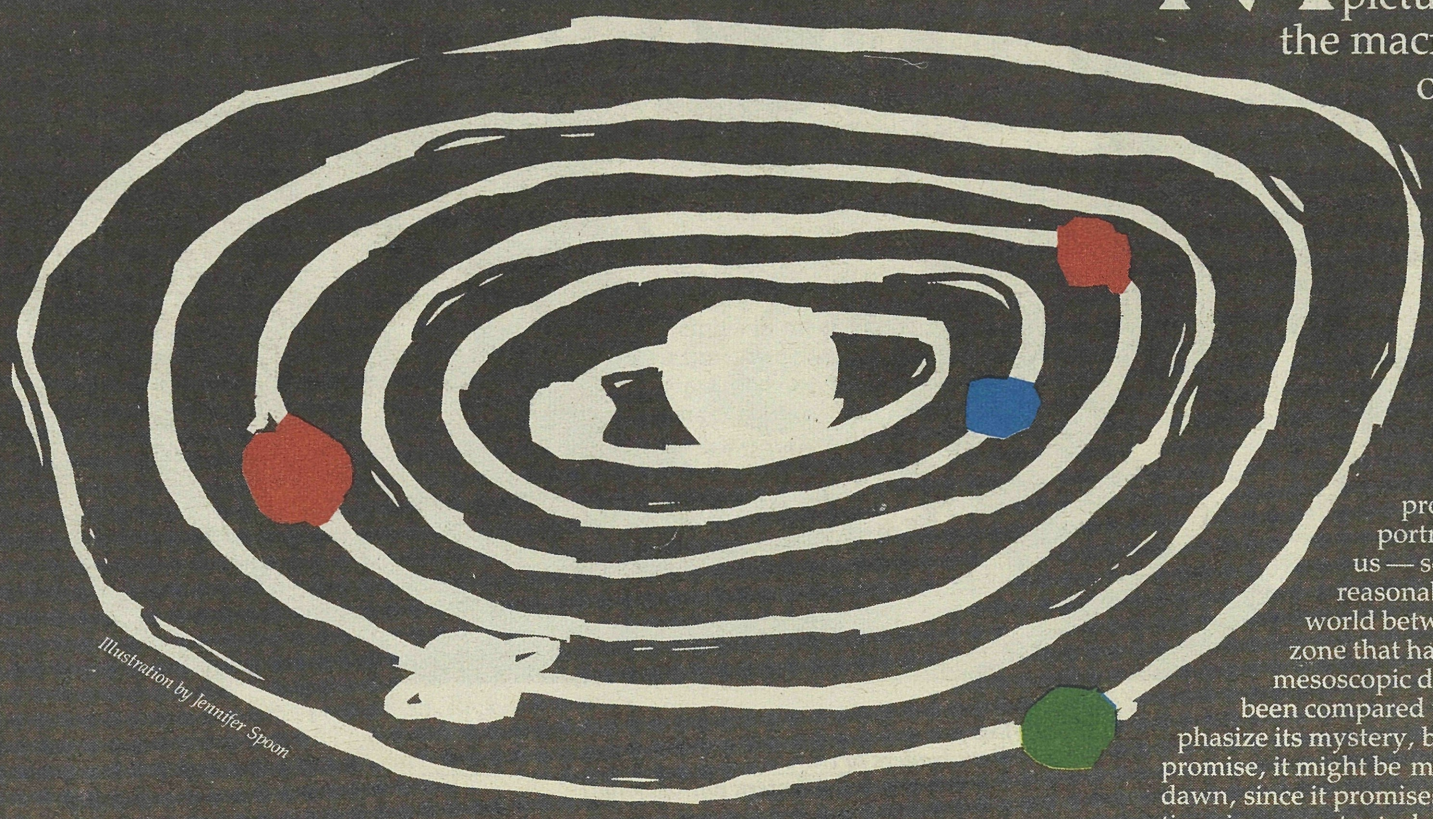
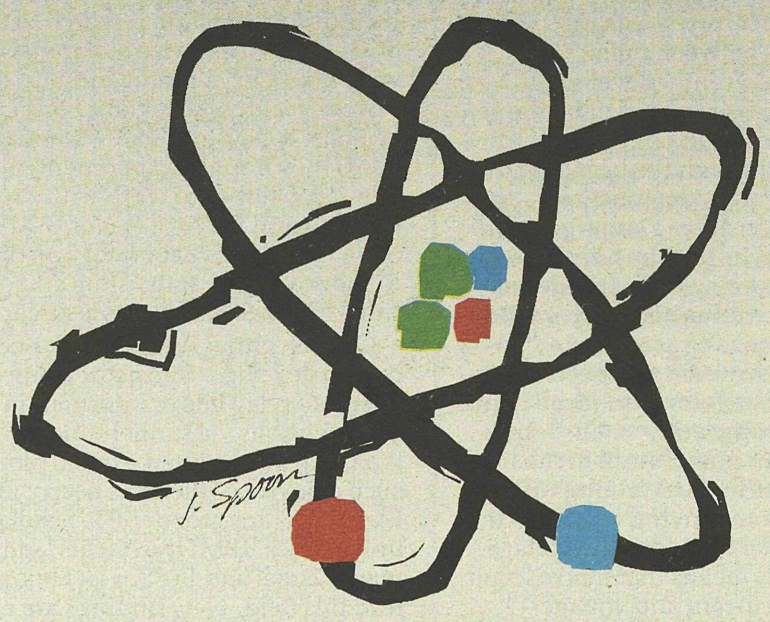


Illustration by Jennifer Spoon

He calls it 'mesoscopia' or:

THE TWILIGHT ZONE

By John Woodford



Modern physics accepts two distinct pictures of reality: the macroscopic world of objects large enough to be described by classical mechanics, and the microscopic world of extremely small objects described only by quantum mechanics. These two descriptions produce radically different portraits of the world around us — so different that it is reasonable to hypothesize a world between these two, a twilight zone that has been dubbed the mesoscopic domain. This region has been compared with the twilight to emphasize its mystery, but to symbolize its promise, it might be more apt to link it with the dawn, since it promises revolutionary applications in computer technology and the fabrication of electronic elements and metals, and possibly in medicine and biotechnology.

Since the theories springing from the "micro" and "macro" portraits of reality are mind-boggling enough, physicists around the world are faced with a new challenge in this hybrid of the two, the mesoscopic domain. Some of the pioneering work in "mesoscopia" has been carried out by Prof. Eshel Ben-Jacob, working with his students in U-M's Department of Physics and with collaborators worldwide.

As Ben-Jacob and his senior graduate student, Kieran Mullen, explained during a series of discussions about mesoscopic theory and research with their group, physicists know what's going on at the atomic and subatomic levels. Many transistors are based upon quantum effects, and nuclear power and weaponry employ the physics of the quantum world. But this world is decoupled from the intermediate region, where objects are of the size of large molecules.

"We don't know how a single macromolecule works," Ben-Jacob points out. "We know how the atom works, and we have a firm basis for biochemistry — but not the region in between. Yet fundamental biological activity occurs at this level."

The two wings of physics that describe the macro- and microscopic worlds produce radically different portraits of our universe. The picture of classical mechanics — macro physics — is one that agrees with our intuition because it reproduces day-to-day experience and conforms with our intuitive assessment of this experience. In the macro-world, objects have definite location or velocities, independent of our observation of them.

In the micro-world described by quantum mechanics, however, not only are quantities like position and velocity to some degree uncertain, it is meaningless to assume that they have a value independent of our act of measuring them.

The differences between these two pictures of reality might be tolerable if there were no overlap between them, but this is not the case. In quantum theory, for example, microscopic entities do not possess objective existence independent of our external observation of them. Yet it is these same microscopic systems that make up macroscopic ones, which do have an objective existence. This point is carried to the extreme in the famous paradox of Schrodinger's Cat (see accompanying story about quantum-mechanical principles).

A second difference between micro and macro

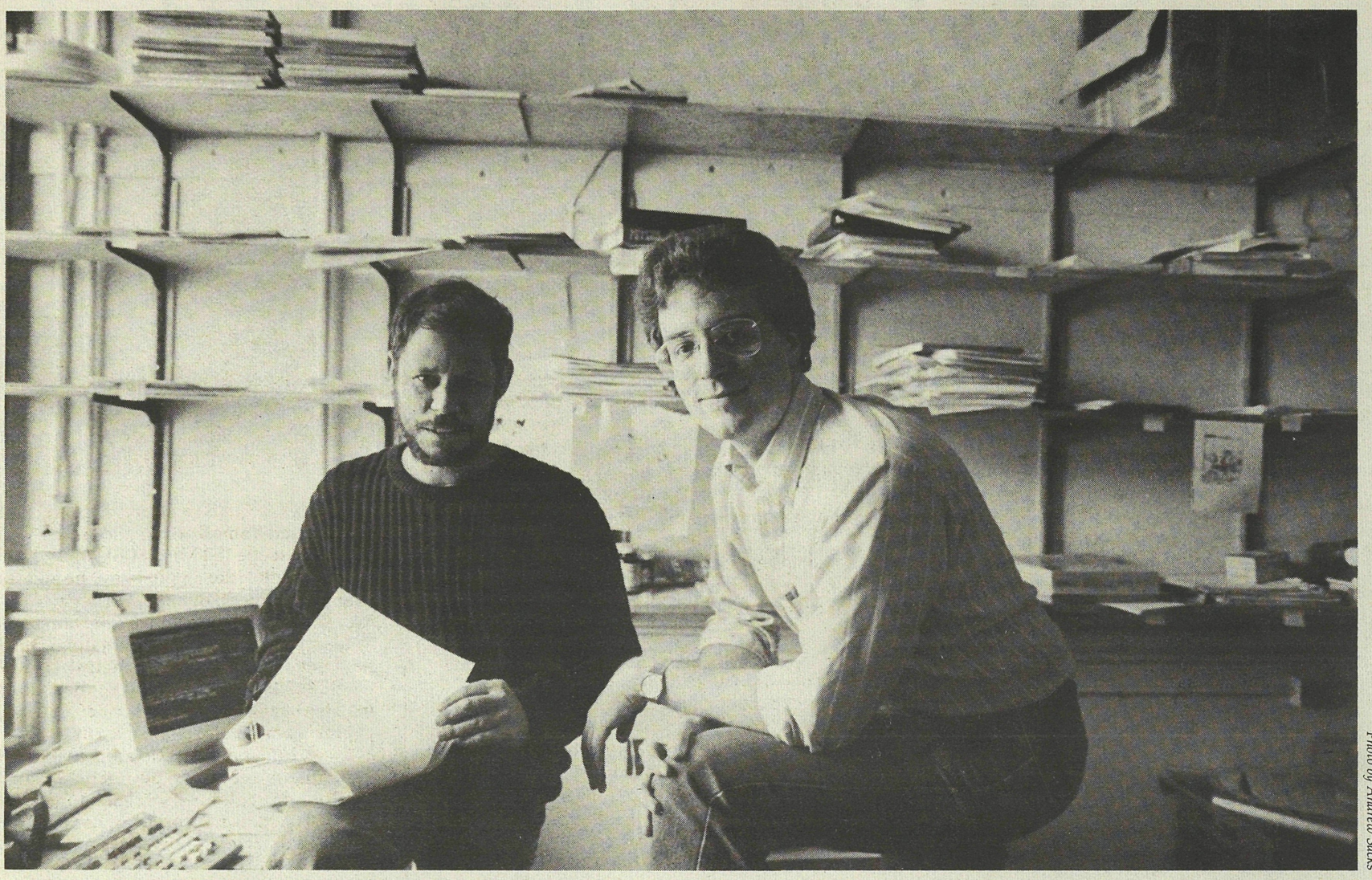


Photo by Andrew Sacks

ESHEL BEN-JACOB (left) and graduate student Kieran Mullen are leaders of the U-M team investigating the mesoscopic realm. 'Western philosophy,' Professor Ben-Jacob says, 'has often been excited by the biggest or smallest phenomena — the farthest from our reach. The mesoscopic zone may seem boring, trivial or messy to high-energy physicists, but we hope to find out how to fit micro and macro systems together — the quantum and classical.'

systems lies in their reversibility. It is still not known, Ben-Jacob and his students maintain, how to proceed from the microscopic region, where all interactions are reversible, to the irreversible macroscopic region of classical thermodynamics — without producing new assumptions, such as the mesoscopic world.

From a theoretical standpoint, the mesoscopic hypothesis embraces these questions: Does nature, in principle, recognize our current distinction between macro and micro systems, or are these distinctions somehow the result of our own limitations? Does the complexity of a macroscopic system bring about new principles not derivable from microscopic ones, or is there ultimately one whole world that is, according to analytical philosophy, merely the sum of its parts?

If the macro world is more than the sum of its parts — that is, if we accept the micro-macro division — then the next question is: Is there a smooth transition between the two worlds with no surprises along the way, or is there a special intermediate realm between the two? And finally, should we treat this speculation about one, two or three worlds of physics as a Pandora's box of philosophical speculation best left closed because it has no practical importance, or can these questions have impact on current research and technology?

Ben-Jacob and Mullen contend that applied physics and engineering are the vehicles that have already carried theoretical physics into the mesoscopic domain, that "a complete picture of the physical world requires a concept of mesoscopia."

Advances in the fabrication techniques of transistors and other small electronic devices have made it possible to create devices in which mesoscopic issues become questions of fact, not speculation. Electronics manufacturers are already making and monitoring electronic elements no bigger than large proteins — the building blocks of life. These objects are approximately one-thousandth the size of the diameter of a human hair and bring us to the hypothetical threshold of the mesoscopic domain.

Studying these electronic devices has already showed that there *are* surprises along the way between micro and macro physics. In 1984, Ben-Jacob and Yuval Gefen of Israel's Weizmann Institute predicted that extremely small electronic devices called "tunnel junctions" should show novel dynamics due to their sensitivity to the passage of single electrons.

Tunnel junctions are based upon the quantum-mechanical idea of tunneling, one of the effects that led Werner Heisenberg to state the Uncertainty Principle in 1927. Tunneling is a random process responsible for the radioactive decay of heavy elements as well as the properties of various electronic devices.

As Mullen explains it, to understand tunneling imagine a ball placed inside a box, with a barrier dividing the bottom of the box into two wells. The ball will always remain in the half in which it was initially placed. It is impossible for it to reach the other side because it does not have enough energy to go up over the barrier.

If we switch the system from macro- to microscopic, however, and replace the ball with an electron, then, according to quantum mechanics, the momentum of the electron — and therefore its energy — is to some extent uncertain. The electron's momentum will fluctuate about some average value, and after a period of time this fluctuation, coupled with the electron's subatomic size, will be sufficient to carry it into the other well.

Another example of tunneling: If two aluminum wires are placed together, theoretically, under classical physics, the oxide barrier on their surfaces should prevent any charge from passing between them. But in fact, physicists discovered that a current does pass between them.

A tunnel junction is a recently developed minuscule device that passes a current by the tunneling process described in our example of the electron tunneling through the barrier in the box. (In much the same way, the junction — the electron's pathway — can enter a superposition of states in which an electron is considered to have a certain chance of being on both sides of the junction at once, as well as being on one side or the other.)

Tunnel junctions present rich prospects for research and development efforts, Ben-Jacob points out: "If the junction is sufficiently small — and this is a condition we can now control in the research laboratory thanks to the scanning tunneling microscope [see accompanying article] — the location of a *single electron* can affect the voltage across the junction. This means that macroscopic observables — such as current and voltage — depend upon the microscopic state, which obeys quantum mechanics. Physicists are now trying to determine to what extent such a device displays quantum-mechanical or classical principles, and to what extent they are based upon principles still undiscovered. These are open questions of intense theoretical and experimental interest."

Why the interest? Because if the current passes in a way describable only by quantum mechanics, it not only confirms the theoretical quantum-mechanical view of small systems, but also points toward the applicability of quantum physics to larger systems, and that application may well require mesoscopic physics.

Once developed, such a physics could lead to obvious benefits to human society: computers, communications systems, engine controls and other devices that use semiconductors could be reduced to a tenth, hundredth or thousandth of their current size and power consumption.

Mullen and Ben-Jacob, along with Robert C. Jaklevic of Ford Motor Company's Scientific Research Laboratory in Dearborn and Zeev Schuss of Tel Aviv University in Israel, demonstrated that coupling two tunnel junctions would, in certain cases, simplify the observation of single-electron effects and produce a device with useful electronic properties. Concurrent experimental work by researchers at the University of Notre Dame and subsequent experiments in the Netherlands verified these predictions.

This year, Mark Amman, a graduate student in the new Applied Physics Program headed by Prof. Roy Clarke, joined the mesoscopic team. Amman, Mullen and Ben-Jacob have extended their tunnel-junction research to the possibility of using such a device as a transistor. Working with Brad Orr, a recent addition to the Applied Physics faculty; Jaklevic of Ford Labs; and Rick Wilkins, a U-M graduate student also working at Ford, they hope to experiment on such systems. Ben-Jacob hopes to work with Profs. George Haddad and Pat McCleer of U-M's new Solid State Electronics Laboratory on North Campus to fabricate such transistors and other electronic devices based on mesoscopic principles.

Only recently, AT&T announced its intention to develop a transistor using single-electron effects to relay bits of information and perform computations via tunnel-junction circuitry. There is a tremendous international race to develop such a device, which has been called a Single Electron Transistor or SET. Scholars from other universities, IBM, the Netherlands, West Germany, Israel and the Soviet Union are striving to lead this field. New findings are emerging all the time, and some of them, according to the U-M

Super tool for super research:

Scanning Tunneling Microscope

Theoretical physicists need to test their hypotheses in the laboratory. But that means the proper tools must not only have been invented — something that is not always the case — but available. Five years ago, the U-M's Eshel Ben-Jacob would have been out of luck on both counts.

Fortunately for the U-M group, the scanning tunneling microscope [STM], which began to be developed in the late '70s, was finally in working operation four years ago, and one of the few STMs laboratories in this country was nearby, at Ford Motor Company's Scientific Research Laboratory in Dearborn.

The STM, whose Swiss inventors G. Binnig and H. Rohrer won the 1985 Nobel Prize, uses the phenomenon of electron tunneling, which is described in the main story, to study the surfaces of solids atom by atom. Ford and other industries are using the STM to study the surfaces of microchips, metals and many other objects; the U-M group uses it to explore study the physics of tunnel junctions (described in main story).

"We're quite fortunate that Ford is letting us use its STM laboratory," Ben-Jacob says. "The lab is headed by one of the research pioneers in tunneling phenomena, Dr. Robert Jaklevic. He's supervising one of our graduate students, Rick Wilkins, who is continuing to lead the experimental part of our mesoscopia project. Rick took the great risk of setting up the experiment with a theoretician like me at a time when no other experimentalist wanted to work on such a speculative project."

The STM can be used as part of a tunnel junction that is sensitive to the passage of a single electron. Researchers around the world are seeking to understand this phenomenon as a way to produce prototype transistors a fiftieth of their present size. A single-electron transistor would operate with virtually no resistance in the circuitry, greatly reducing the heat build up in current computer, power-generating and communications systems.

The U-M physicists are subjecting this microscopic phenomenon that operates by quantum principles to macroscopic physical laws by forcing a time direction on it through voltage. In studying the energy of such a system — its oscillations of voltage and other variables — Ben-Jacob is exploring the physics of what he calls the mesoscopic domain.

Arguments that there is such a domain must be backed up by such experiments and the mathematico-physical reasoning and equations resulting from it. Already, the U-M team has produced what physicist call an "effective equation" that has given them confidence that they are on the right track.

group, especially by a Dutch team, verify meso theories.

Even more promising is the vista this new physical realm may offer to medicine. In all branches of medical research today, great attention is being placed on interactions between cells, especially on the interchanges of electrical charge and energy at cellular surfaces and through membranes. This is now recognized as the twilight zone of biophysics and molecular biology.

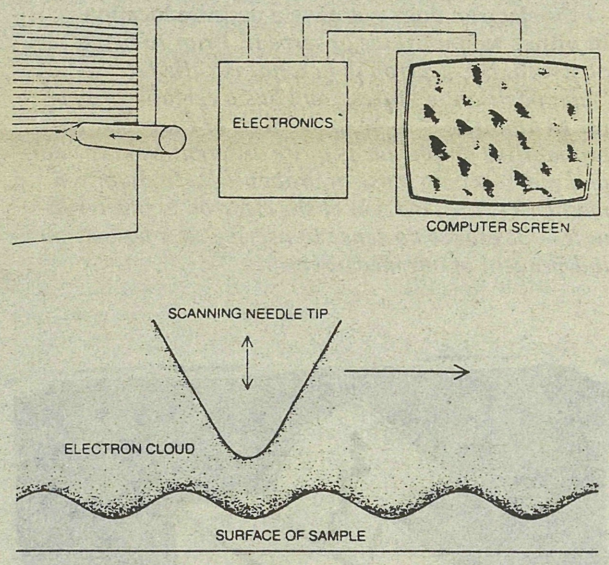
"It may not be a mere accident of evolution that much of the dynamics of charge and energy transfer happen on the mesoscopic scale," Ben-Jacob observes. "The cell-membrane system is, after all, between microscopic and macroscopic realms and might therefore employ or display at different times the different properties of classical and quantum systems. Sometimes such systems may even act in reverse, performing energy transitions that would not be possible in a purely classical system."

Greater understanding and control of such biological systems would bolster medical science, which is now focused on the complex biochemical-electrical activity that occurs at the surface of cells and through cell receptors, such as the cells in the immune system and the molecular gates that were recently identified as playing a key role in the functioning of the brain's memory circuits.

Other biological processes that have been identified but whose physics remains unknown include protein synthesis, active transport across cell membranes, cell differentiation and the conductance of the action potential along nerves.

Mullen is also interested in the philosophical ramifications of mesoscopia: "Let us say we experimentally confirm the applicability of micro physics to larger systems. This would heighten the Schrodinger's Cat Paradox and undercut what we can say with certitude even about macroscopic reality. One might say that to the extent that quantum-mechanical physics described observable reality, our knowledge of the world would challenge our intuition to develop a Schrodinger's-Paradox grasp of reality."

As a theoretician, Ben-Jacob is drawn to mesoscopia not so much for the practical applications it promises in computer science, microbiology and medicine, as for obtaining a more complete picture of the physical world. "Even though the most fundamental features of mesoscopia are still to be discovered, we still have far to go to understand nature's hidden phenomena," Ben-Jacob says, "but at least we've taken our first steps toward mapping this twilight zone."



THE SCANNING tunneling microscope is based on the phenomena of electron tunneling and the piezoelectric effect. First, the scanning needle tip must be brought so close to the substrate that the space in between is small enough to put an electron cloud somewhere between the boundaries — that is a distance of one angstrom, which is to one yard as the height of a man is to the distance from Earth to the Sun.

Controlling such infinitesimal distances depends upon the piezoelectric (piezo from the Greek 'pressure') effect, a property certain crystals have of changing their length when they are subjected to changes in an electrical field applied to them. The piezoelectric material controls the movement of the tip.

The electron cloud between the needle and substrate is not a mass of electrons but one electron which, because of its indeterminate location and 'smeared out' wavelike property, has the probability of lying beyond the surface of the needle tip. A voltage is applied to the system, forcing electrons to tunnel from the tip through the cloud and to the substrate. The current varies with the distance of the tip to the substrate, so experimenters change the current and/or distance to change the current in the direction they wish.

A feedback mechanism senses the tunneling current and feeds data into sensitive electronics, keeping the tunneling current at a specified value.

Many aspects of the group's experiments have relevance to superconductivity, and in fact Ben-Jacob is the project director of a recently formed U-M team studying this phenomenon.

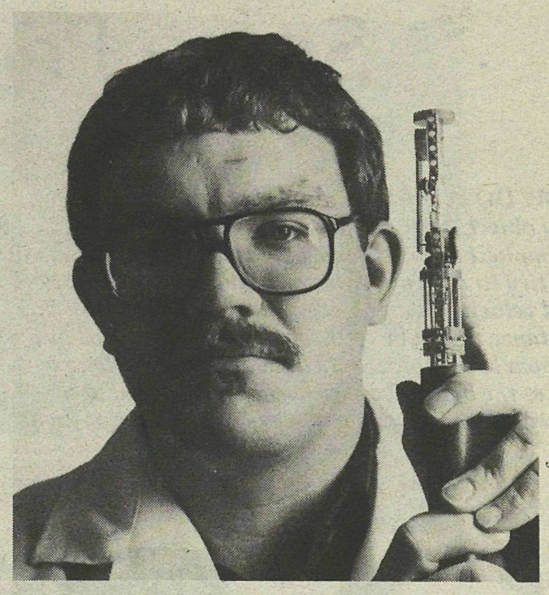


Photo by Andrew Sacks

RICK WILKINS of Derry, Pennsylvania, has devised a small, sturdy scanning tunneling microscope (STM) that fits on the end of what looks like a pool cue. The size and shape are important because they permit him to slip the STM into a liquid helium container to obtain the extremely cold temperatures necessary to control the tunneling current of a single electron — the object of the theoretical inquiry headed by Professor Ben-Jacob.

Most commercial STMs cost at least $75,000, but as a theoretician, Ben-Jacob had very little money for experimental research, let alone enough for an STM. 'Our STM has cost $20 or so — not counting Rick's salary and the laboratory support we get from Ford,' Ben-Jacob says. 'Rick used gears from slot car kits and some silica-based epoxy plastics and other stuff that he bought at the University student supply shop.'

Only the active support of Jaklevic and Ford Labs allowed the experiment to proceed. Until they received a Kellogg Presidential Initiative Grant this spring, the 'twilight zone' researchers had a very limited amount of money for experimentation, and had paid for it pretty much out of pocket.

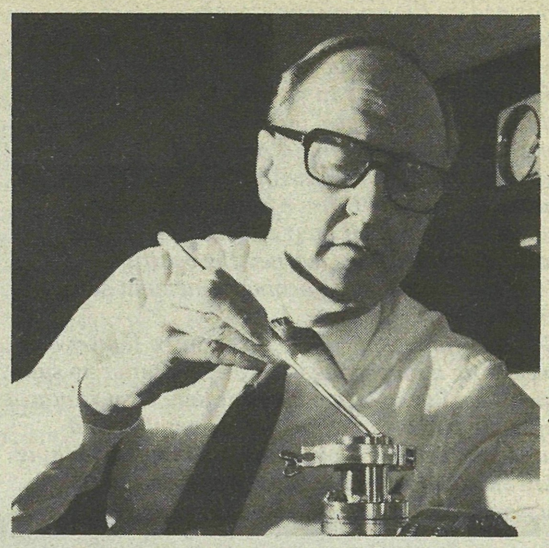


Photo by Andrew Sacks

'UNIVERSITIES and corporations are realizing that this partnership in research, like our lab's and Eshel's, is the way to go,' says Robert Jaklevic, as he leans on a new vacuum chamber in which he'll perform scanning tunneling microscopy experiments. Jaklevic, one of the earliest investigators in his field and head of a Ford Motor Company research lab in Dearborn, says, 'Both of us gain from collaboration. We have the money and facilities, but not enough of the kind of people we'd like to have. IBM and Bell Labs are increasingly doing this, too. We'd like to provide more support for student salaries, and may do so in the future.'

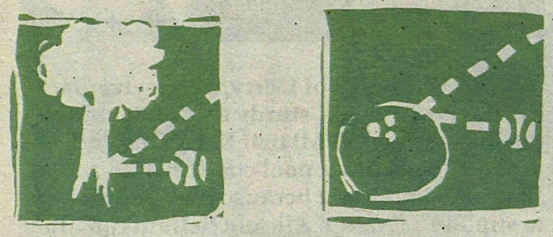
The STM applications that especially interest Ford can be generally described as answering the question, 'What are atoms doing on surfaces?' These include such phenomena as the catalysis of automotive exhaust systems, semiconductor surfaces ('Impurities on silicon are one of the biggest bugaboos in the quality of computers,' Jaklevic explains), the superconductive properties of various materials, the surfaces of alloys and plastics (for example the granular structure of plastic car bumpers).

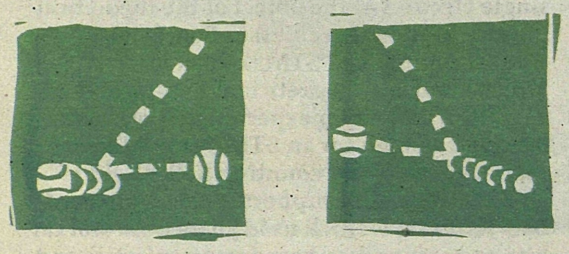
Jaklevic concludes, 'Ford is very happy to be associated with Eshel; he's one of the world's foremost theoreticians in small-particle physics, and this brand new device has brought us together.'

Some Principles Of Quantum Physics

HOW DO WE determine the location of an object, any object, such as a tree?

Implicit in the scheme of classical mechanics is the ability to determine precisely the starting location and velocity of an object. One way to measure this distance would be to throw a rubber baseball at a known speed toward the tree and see how long it takes the ball to bounce back; since we know the speed of the ball and can measure the time of flight





Illustrations by Jennifer Spoon

quite accurately, it is simple to determine the distance to the tree (making allowances, of course, for the compression time of the ball and some reduced speed on rebound due to energy loss).

This method may seem peculiar, but it certainly is feasible under classical physics and, as we will see, has a direct bearing on how measurements are performed on the microscopic scale.

Now replace the tree with a smaller object, say a bowling ball. The above method still works — although our aim has to be a bit better. But if we replace the bowling ball by something smaller, like another baseball, we run into difficulties: The ball at rest will move when the thrown ball hits it. The time of flight of the thrown ball no longer tells us where the second ball is, *it tells us where it* was *before we hit it. We have learned the position of the ball at the expense of knocking it away at some unknown velocity.*

The solution is, of course, to throw a lighter ball. If we throw a ping-pong ball, we encounter no such difficulties. But what do we do if the target is now a ping-pong ball? As the target gets smaller and smaller, we become hard-pressed to find something small enough to throw at it and not disturb its location.

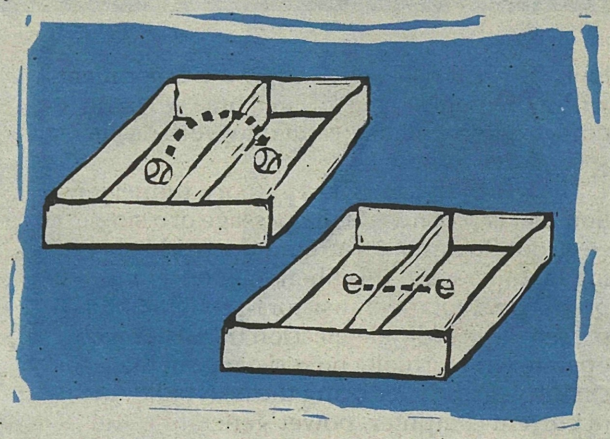
THE UNCERTAINTY PRINCIPLE

On the microscopic scale we always do something similar to learn the position of an object. We try to scatter something else — like light or electrons — from it. But any attempt to measure the position of a particle such as an electron can tell you only where it was before you measured it, because in measuring its position you have suddenly changed its velocity. In a similar fashion it can be shown that any attempt to precisely measure the velocity of an object leaves its position uncertain.

This Uncertainty Principle, first stated by Werner Heisenberg, leads to many important effects that are seen in experiments but cannot be explained by classical mechanics.

For example, consider a ball placed into a box with a barrier down the center so that the bottom of the box is divided into two wells. The ball will always remain in the half in which it was initially placed. It is impossible for it to reach the other side because it does not have enough energy to go up over the barrier.

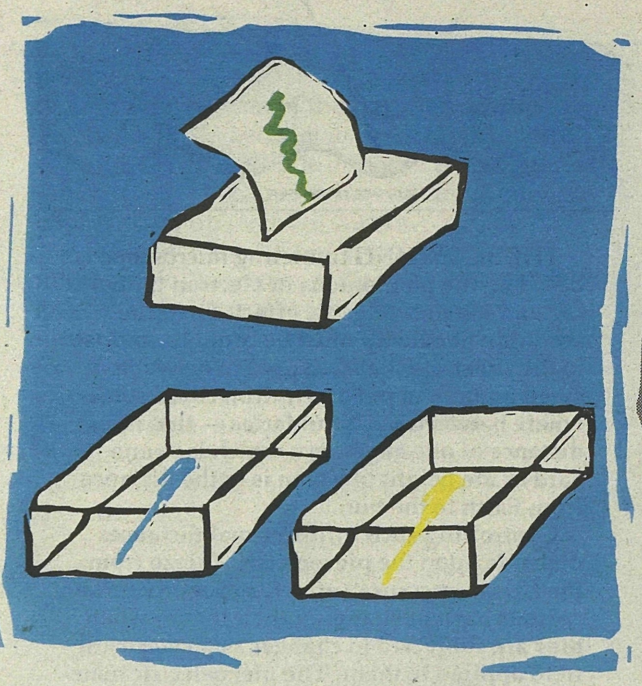
But if we switch the system from macro- to microscopic, replacing the ball with an electron, then quantum mechanically the momentum of the electron (and therefore its energy) is to some extent uncertain. The electron's momentum will fluctuate about some average value, and after a period of



time this fluctuation will be sufficient to carry it into the other well. This process, known as 'tunneling,' is responsible for the radioactive decay of heavy elements as well as the properties of various electronic devices.

INDETERMINACY AND THE SUPERPOSITION OF STATES

THE FACT that the electron can tunnel through the barrier does not imply simply that sometime it will be on the left and sometime on the right. According to the Copenhagen Interpretation — an approach to quantum mechanics suggested in 1926 by Neils Bohr — the electron does not have a definite location in either well *until we observe it. Prior to being observed, the electron is in what is called a 'superposition of states,' and has a certain 'probability amplitude' to be in one well or the other. This probability amplitude is quite different from the normal macroscopic sense of probability. In quantum mechanics, the position of the electron is indeterminate — it makes no sense to ascribe to it a position independent of our measurements.*



In one sense 'uncertainty' is not limited to quantum mechanics. Suppose you are given two closed boxes, one containing a blue pen and the other a yellow pen. You then know that there is a 50 percent chance of their being a blue pen in a given box. With quantum-mechanical 'pens' (with electrons of different spins, for example) you would get the same result: Whenever you performed an experiment to 'look at what is in the box' (measure the spin), you would obtain a 50-50 split.

What is surprising is that certain experiments show that, in the microscopic realm, so long as you don't open the box, both color pens are present in a given box at the same time. *It is as if after being told that a blue pen was in one box and a yellow in the other, you could draw a piece of paper through one of the boxes and find not a yellow or a blue line, but a green one showing the effect of both pens at once. In quantum mechanics, before you look, the pen is in a superposition of the state blue-and-yellow.*

SCHRODINGER'S CAT

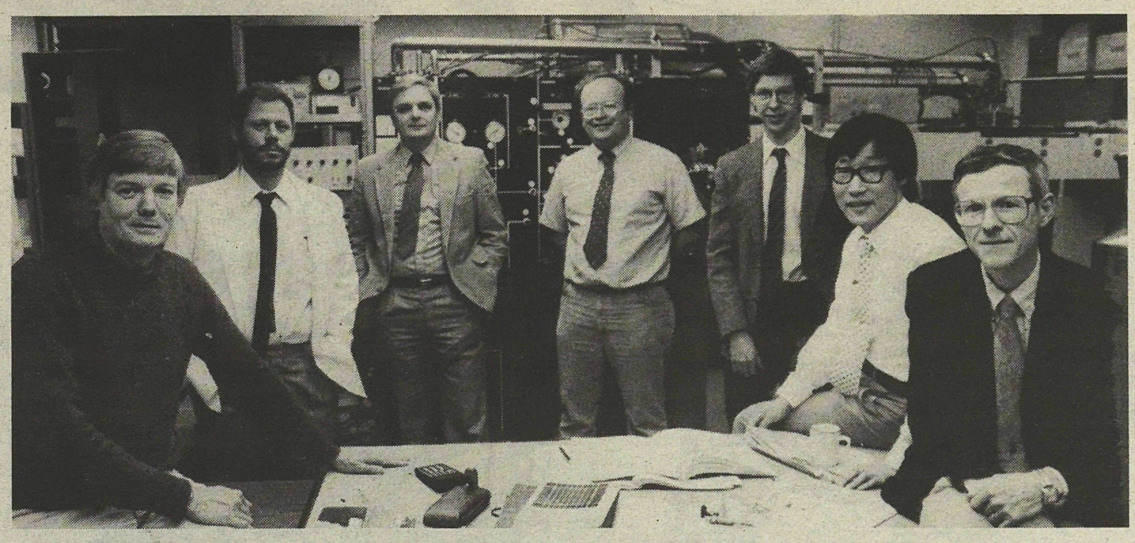
IN AN ATTEMPT to demonstrate how quantum mechanics violates our sensibilities, the German physicist Erwin Schrodinger proposed his now-famous Schrodinger's Cat paradox. In this paradox, we assume that we place the electron in one well of our divided box, but then we add to the experiment a measuring device consisting of a cat, a vial of poison and some sort of detector.

If the electron is detected to be on one side of the box (say the left), a signal is sent that releases the poison, which kills the cat.

Let us suppose that the box sits for some time without being opened. When we spoke of the electron in the box, we noted that if the system was not observed, we could not talk about the electron's being in one well or the other; it is in the superposition of states described above.

But what of the cat? Is it in a superposition of states, somehow both alive and dead at the same time? Can we say that the life of the cat has no objective existence until we actually check to see if the cat is alive?

When quantum effects are extrapolated, as in this paradox, to macroscopic systems, we obtain results that offend our intuition. But this is the precise point: Microscopic systems obey a law that violates our intuition because our intuition is based on our experience of the macroscopic world. At some point we must cross over from one picture to the other. But how do we do it? When do we have to do it? How do we know when? This paradox of the micro-world has not been resolved.



Clarke (left), Ben-Jacob, Uher, McCleer, Orr, Chen and Allen

Team of Scholars on Track In Superconductivity Race

A program for research and teaching in high-temperature superconductivity was one of five winning proposals to receive support from the U-M Presidential Initiatives Fund.

The project director is Eshel Ben-Jacob, assistant professor of physics (see related story on page one). Other investigators are James W. Allen, professor of physics; I-Wei Chen, associate professor of materials science and engineering; Roy Clarke, professor of physics and director, Applied Physics Program; Patrick J. McCleer, associate research scientist, electrical engineering; Bradford G. Orr, assistant professor of physics; and Ctirad Uher, associate professor of physics.

The January 1986 discovery of superconductivity above the boiling temperature of liquid nitrogen — a rare scientific breakthrough — is expected to produce a technological revolution comparable to those brought about by the laser and the transistor.

Superconductivity is a phenomenon in which electrical currents pass through materials with no loss of energy.

In 1911, the Dutch physicist Heike Kamerlingh Onnes discovered superconductivity by showing that mercury loses its resistance to electrical current at the astoundingly low temperature of -269 C (-452 F) — that is, just 4.2 degrees above absolute zero, now known as 0 kelvin. Subsequent metal-cooling experiments by Onnes, who received the Nobel Prize in 1913, showed that the critical temperature for superconductivity T_c varies from substance to substance.

Subsequently, Onnes showed that currents were able to pass through wires made of various metallic conductors when they were in the new superconducting state with no voltage drop and no loss of energy as long as they were less than some "critical current." A magnetic field did not destroy superconductivity as long as it did not exceed some "critical field."

But try as they might, Onnes and generations of physicists after him could not achieve superconductivity above a temperature of 23 K or -250C (-418 F) still far too cold for the phenomenon to be useful because such temperatures can be achieved only by using extremely expensive liquid helium.

In 1985, however, IBM researchers Karl Alex Muller and Johannes Georg Bednorz of Switzerland and West Germany, respectively, showed that an oxide of barium, lanthanum and copper became superconducting at about 30 K (-243 C or -405 F). This work, which earned Muller and Bednorz the 1987 Nobel Prize, stunned the scientific community for two reasons: It brought the critical temperature to a range where cooling was technologically easy to produce; and the conducting compound was a ceramic, a class of materials that usually make poor conductors.

The following year, using the same materials, superconductive properties were demonstrated at about 100 K or -173 C (-279 F). In this temperature range, cooling can be achieved with liquid nitrogen, which costs, in comparison with liquid helium, as milk does to cognac.

These recent superconductivity breakthroughs have been followed by a lively, some say hysterical, international competition to understand how these materials superconduct and to learn how to control the materials, which are still too unstable at relatively high T_cs for reliable use in experiments or applications.

While the field is highly competitive, the expertise to support a first-class program in high T_c research already exists on campus. The designers of this project intend to position the U-M as a "center of excellence" in the field and to participate in competitive national initiatives now under development in Congress.

The group will address four key aspects of high-temperature superconductivity, ranging from fundamentals to sophisticated applications in the area of electronic circuits and sensors. In addition, the project will support and coordinate the development of courses and lab projects on various aspects of high-temperature superconductivity.

The new superconductors can be operated in higher magnetic fields and still retain their superconducting properties, and already are used in nuclear magnetic resonance imaging, a technique that gives physicians a three-dimensional picture of internal organs. These magnets also can be components of small, powerful and efficient electric motors, and some scientists envisage using them to float high-speed, friction-free "Maglev" trains several inches off their tracks.

Finally, high T_c superconductors can be used to store and transmit electricity, saving as much as 10 percent of the electricity generated in the United States and possibly expanding the use of underground power lines.

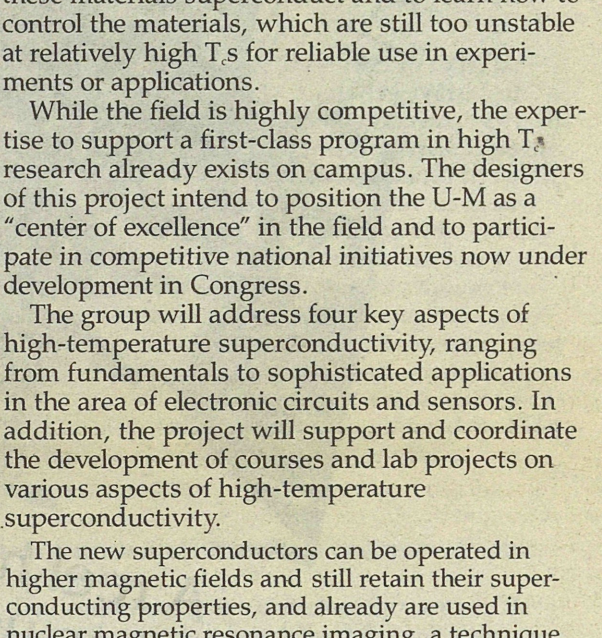


Photo by Andrew Sacks

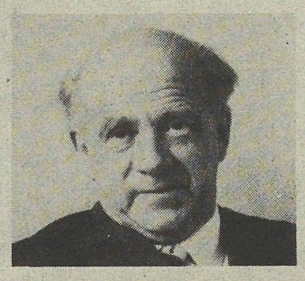
***THE FLOATING MAGNET** grad student Rick Wilkins has suspended over a superconductive current cooled by liquid nitrogen demonstrates a phenomenon of superconductivity called the Meissner Effect: Below a critical temperature the ceramic superconductor forces magnetic fields out of its interior — that is, a magnetic field cannot go into a superconductor. There is speculation that such fields could suspend no-friction, no-rust railways powered by low-cost electricity via a cable linked to solar-electric systems in faraway deserts.*

REVERSIBILITY

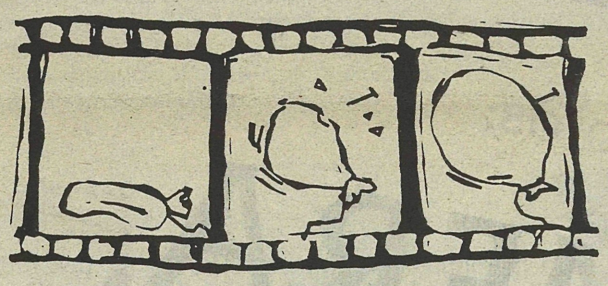
***IN ADDITION** to uncertainty and indeterminacy, a third difference between the microscopic world and the macroscopic world lies in the question of reversibility versus irreversibility. Some processes happen only in a given order: A drop of ink falls into a glass of water* **and then** *it diffuses; someone bumps the glass, and then it hits the ground and shatters; a balloon is pricked with a pin, then it explodes with a bang.*

Bohr

Schrodinger

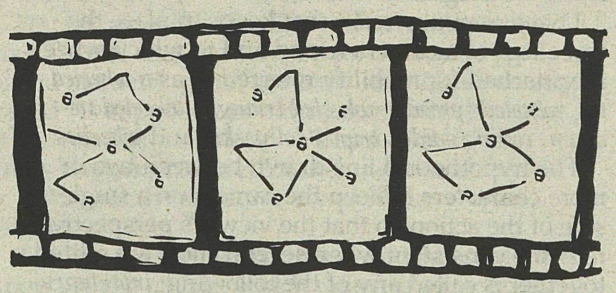


Heisenberg



If we were to film a picture of such everyday events, it would be a simple matter to tell if the film were being projected in reverse since all sorts of absurd things would happen: a glass of inky water would separate into a glass of pure water and a drop of ink; a broken glass would reconsolidate; air might whoosh together, filling a balloon that then sealed itself with a pin.

On the macroscopic level there is a direction to the arrow of time because we know when it has been reversed in the film. Events that cannot go backwards, such as the popping of a balloon, are called irreversible. Irreversibility is described by the laws of thermodynamics, more specifically by the principle of maximum entropy.



IRREVERSIBILITY

Now assume that we film the same events with a camera that has a special lens that magnifies the image thousands and thousands of times, so that we can observe things on the atomic scale. At this level all we can see are particles flying through space, bouncing off one another. And if we play the picture backward, it will look much the same as it did running forward; we still see only particles bouncing off one another. It becomes impossible to tell the direction of time.

Our thanks to Kieran Mullen, graduate student in physics from Detroit, for his assistance in preparing this article.

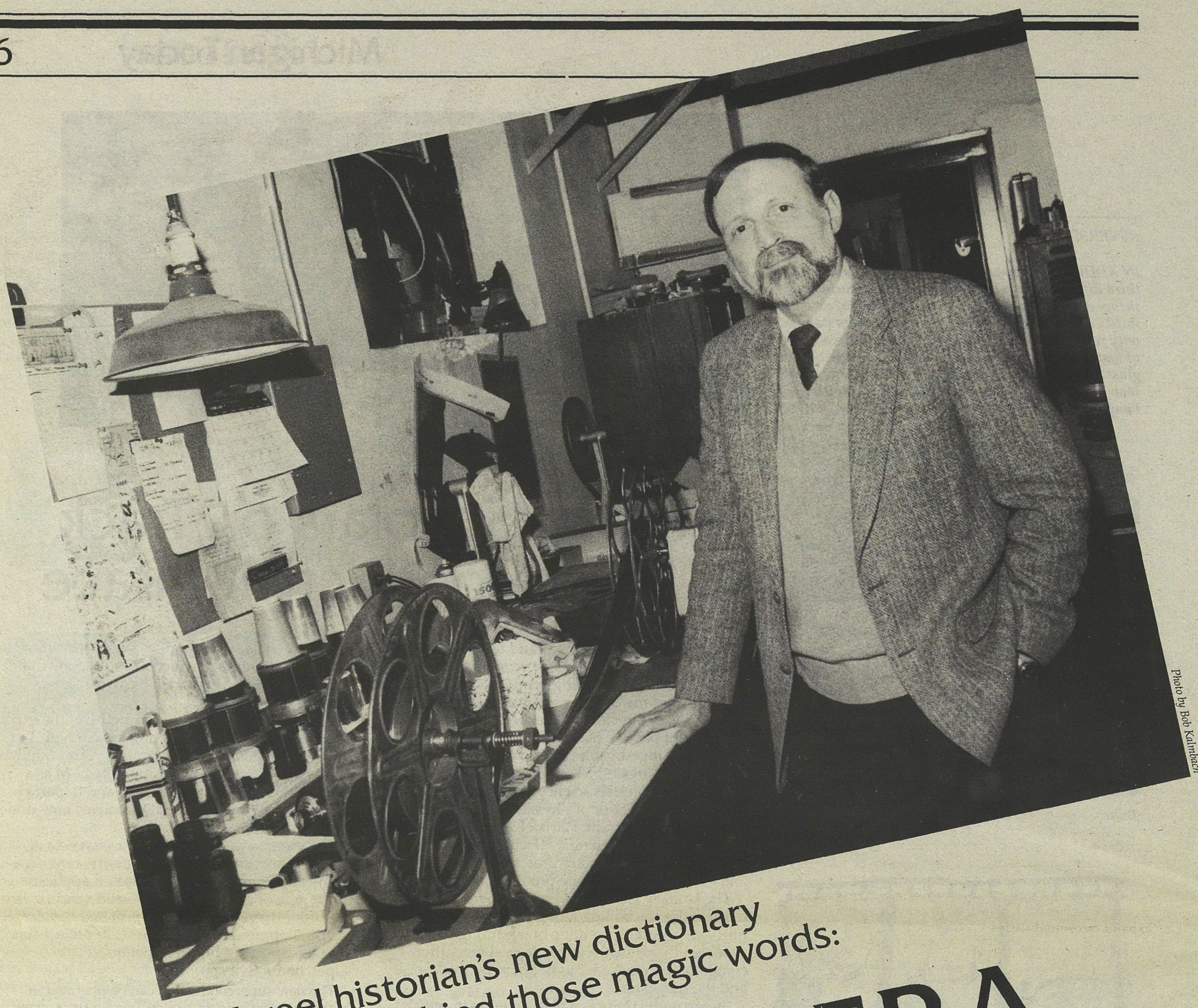


Photo by Bob Kalmbach

A reel historian's new dictionary takes us behind those magic words:

LIGHTS, CAMERA, ACTION!

By Ira Konigsberg

I innocently remarked one day to an editor from a New York publishing firm that students of my film course were quite knowledgeable about motion pictures but seemed to have no language with which to express their ideas or reactions.

One month later I was signing a contract to complete a concise film glossary. Well, it began as a "concise glossary," but early on, I discovered that the most popular art form of the 20th century had no definitive dictionary to define and correct its language. As long as I had gotten this involved . . . .

Two years later, I had completed the agreed-upon number of pages, but was immersed somewhere in the middle of 'f'. The publisher and I had a parting of the way.

Finding a publisher willing to put the entire enterprise into print did not turn out to be a problem, but completing the work became a labor and an obsession. I found myself working in five very specific areas of film: history, economics, technology, technique, and criticism and theory.

There were all kinds of problems in trying to establish a precise language in a field as extensive and complex as motion pictures. Usages varied between the West Coast and East Coast, between the United States and England. For example, the person now called the *second assistant cameraman* is still sometimes referred to by the British title, *clapper boy or clapper loader,* a term derived from the fact that this individual marks the slate and claps the sticks on the clapboard before each shot, and loads the magazine with film.

I have seen a *spreader* that keeps in place the three legs of a camera tripod and to which wheels are attached for mobility referred to as a *wheeled tee, wheeled spreader, wheeled triangle, wheeled tie-down, rolling spider, tripod dolly, skid* and *wheelies.*

The hypothetical line drawn between two or more characters to keep the camera on a single side of the action so that the viewer's perspective remains consistent when several shots are edited together is called any of the following: *imaginary line, line of interest, action axis, center line, screen direction, stage line* or *director's line.*

Some distinctions in nomenclature may at first seem insignificant, but they become very important when you are lighting a set — or filling a sales order: A small incandescent lamp, between 100 and 250 watts, which is frequently used to light a limited area, may be referred to as a *inky dink, dinky ink, inky* or *dinky.* But one will also find technicians using the term inky dink specifically for an open incandescent lamp with a 200-watt bulb or for a closed lamp of this type with a 100-watt bulb; and the term dinky for a closed incandescent luminaire with a 100-watt bulb and inky for either an open-faced lamp of this type with a 100-watt bulb or for a mini or midget lamp with a 200-watt bulb.

Clapboard, clapper board, clapstick board, number board, slate board, production board, take board — you name it. The hinged boards on top, called clapsticks, are banged together to allow the film editor later to synchronize picture and sound. After the clapping is filmed, the editor coordinates the frame in which the clapsticks come together with the first noise on the sound track — a process now also done electronically.

IRA KONIGSBERG in the projection room of the Michigan Theater — 'a vintage movie palace, a honey of a theater and Ann Arbor's chief landmark.' The Michigan's '60s-era projection technology predates the heavily automated 'platter system,' and thus requires projectionists to make two or three reel changeovers per film. The platter system enables one person in one booth to project six movies at a time, thus spawning the multimovie film halls that Konigsberg somewhat scornfully refers to as 'pillbox theaters.'

Computer graphics: animation created through a computer, *aka* digital scene simulation (DSS), a process which is in turn *aka* digitizing. Used here in *Tron* (1982) with Jeff Bridges at the controls, and even more effectively in *The Last Starfighter* (1984) and *Young Sherlock Holmes* (1985). Though perhaps the 'newest and most revolutionary technical advancement in film,' Konigsberg says, the question is 'whether this technology will continue the dehumanization of motion pictures or, instead, expand our sensibilities.'

Test Your Cinema Savvy

By Christine Blouch

I. Can you define these terms? If you can't, perhaps your film trivia needs buffing. (Answers on p. 15 or in *The Complete Film Dictionary*.)

1. *megger*
2. *MOS*
3. *gaffer*
4. *best boy*
5. *insert car*
6. *walla*

II. Match the terms with the definitions:

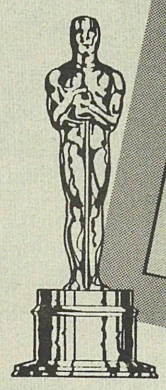
A. *Pixilation*
B. *Mickey mousing*
C. *Overcranking*
D. *Aleatory technique*

1. Shooting and recording without plan, relying upon chance or luck, a technique often employed in documentary filmmaking to achieve unstaged and realistic behavior and actions, as in the films of Joseph Weisman.
2. To coordinate sound, especially music, so closely to the image that it seems to describe exactly what is taking place on the screen.
3. A type of animation, generally with people as subjects, that achieves rapid, jerky movements for a cartoon effect.
4. Another term for slow motion.

III. Match the technique or film school with the directors:

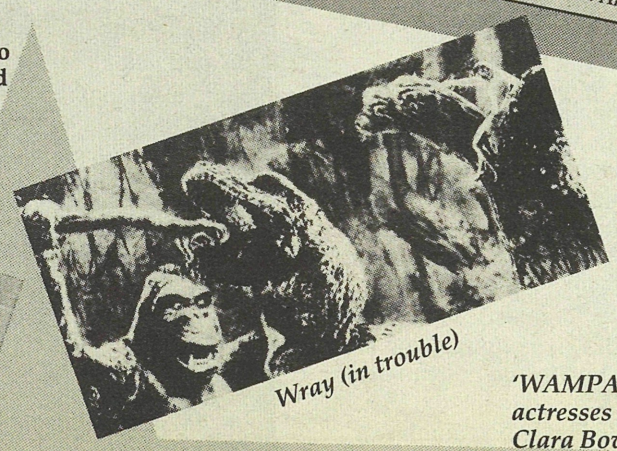
1. *Dynamation*
2. *Rembrandt lighting*
3. *psychodrama*
4. *deep focus*
5. *Smell-O-Vision*
6. *cross cutting*
7. *naturalism*
8. *New Wave*

A. *Michael Todd Jr.*
B. *Erich Von Stroheim, Luis Bunuel, Fritz Lang, Samuel Fuller*
C. *Cecil B. de Mille*
D. *Ray Harryhausen*
E. *Claude Chabrol, Francois Truffaut, Jean-Luc Godard*
F. *Edwin S. Porter, D.W. Griffith*
G. *Orson Welles, Robert Wise*
H. *Maya Deren, Kenneth Anger*



Oscar (b. 1931) supposedly got his name from Margaret Herrick, a film librarian who said that the statuette looked like her Uncle Oscar.

Blondell

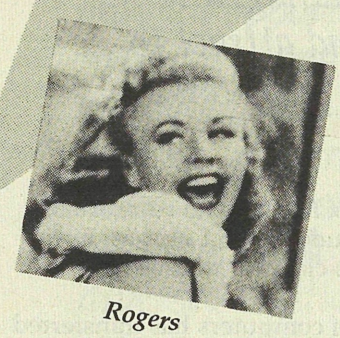


Wray (in trouble)

FROM 1922 to 1934, the Western Association of Motion Picture Advertisers (WAMPAS) cited 13 young starlets each year as having promising careers as actresses. The public eagerly awaited the new bevy of 'WAMPAS baby stars.' Among the actresses who were recognized were Clara Bow in 1924; Mary Astor, Joan Crawford, Janet Gaynor and Fay Wray in 1926; Jean Arthur and Loretta Young in 1929; Joan Blondell in 1931; and Ginger Rogers in 1932.

Crawford

Arthur



Rogers

Bow

But with all my effort to make the technology of film clear and well-defined, it is still the nuts-and-bolts language of cinema, the frequently seen but marginally understood or amusing words, that will have the greatest interest for the non-technical reader of the book.

Two words I'm often asked about, generally because they appear in the closing credits of a film, are *gaffer* and *best boy.* (Those of you who don't know what these terms refer to can find out in the accompanying quiz.) And there are, of course, words with interesting origins. In silent-film days the term *bicycling* was used to describe the process of carrying the same print to more than one theater by means of a bicycle. Today the term is used for an actor or director who shuttles between two productions being filmed simultaneously, by any means of transportation, or who gets involved in a film immediately after another is completed.

You can out-trivialize Trivial Pursuit by telling your friends that the term *Oscar,* the famed gold-plated statuette given annually as a film industry award , is supposed to have come from a librarian at the Academy of Motion Picture Arts and Sciences named Margaret Herrick, who said, back in 1931, that the statuette "looks like my Uncle Oscar."

Two similar terms that film enthusiasts might know are the *weenie,* which refers to some object that motivates the action of a plot, such as a stolen map or idol in a film serial; and the *Macguffin,* a term coined by Alfred Hitchcock for some plot device that gets the action moving in a film and about which some characters may care a great deal, but about which the audience may care very little, for example Marion Crane's (the character played by Janet Leigh) theft of money in *Psycho.*

There are some humorous refinements in the trade for distinguishing various types of modern horror films. For example, the term *splatter film* refers to a motion picture that features a good deal of violence and a large amount of blood, while *stalk-and-slash* is a more specific categorization of a splatter film — one that features a knife-wielding maniac tracking and dispatching a series of victims. A *slice-and-dice* film is similar to a stalk-and-slash, only with less stalking and more graphic surgery.

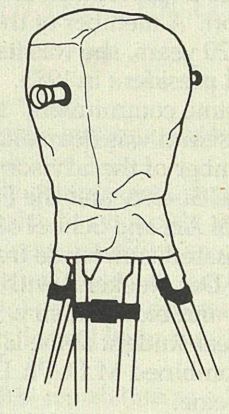
Did you know that a documentary called *The Great Wall of China* was released in 1959 with a revolutionary process called AromaRama (the name undoubtedly suggested by the wide-screen three-dimensional process Cinerama)? AromaRama brought smells that corresponded with the film's action directly to the audience through the theater's air-conditioning ducts. Did you also know that Michael Todd Jr. sponsored a 1960 film called *Scent of Mystery* with a "revolutionary process" called Smell-O-Vision? This process released the appropriate odors through tubing that ran to each seat in the movie house.

Both of these odorific techniques were part of Hollywood's attempt to lure people back to the movie houses and away from television, but neither survived its initial presentation. But they did earn distinction as a particular film genre: Cynical film people dubbed them *smellies.*

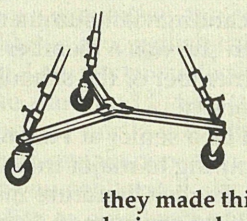
My own favorite term in the entire dictionary is *WAMPAS baby stars,* a term both amusing and yet resonant with the culture and fantasies of an earlier time. The first word is derived from the initials of the Western Association of Motion Picture Advertisers, and the second two words refer to the starlets who were cited by this organization for 13 straight years, from 1922 to 1934, as the most promising young film actresses.

There was much excitement about the selections each year and the public paid serious attention to the careers of the winners. Among the actresses who were recognized were Clara Bow in 1924; Mary Astor, Joan Crawford, Janet Gaynor and Fay Wray in the vintage year of 1926; Jean Arthur and Loretta Young in 1929; Joan Blondell in 1931; and Ginger Rogers in 1932.

There is magic in words. A term such as WAMPAS baby stars can conjure up a whole era of movie history the likes of which we will never see again.



Barney: A flexible, waterproof covering used to cover a camera when a blimp (you'll have to look that up for yourself) is too restrictive or not available. The term comes from the comic strip 'Barney Google,' which had a racehorse named Sparkplug who always wore a tattered blanket.



Wheeled tee, wheelies, wheeled spreader, wheeled triangle, wheeled tie-down, rolling spider, tripod dolly, skid: Seems they made this whatchamecallit a lexicographer's nightmare. By any name, it moves the camera, but is rarely suitable for moving shots.

Ira Konigsberg, professor of English, teaches courses on the art of the cinema. His recently published 420-page work, The Complete Film Dictionary *(New American Library, $24.95) has been called "comprehensive, long overdue and enormously useful" by the director Lawrence Kasdan ('70, '72 M.A.).*

DUDERSTADT TO LEAD U-M

Provost and Former Dean Of College of Engineering To Take Office Sept. 1

Self-described as having "inherited the values of small-town Midwest America," James J. Duderstadt, the University's chief academic officer, will become its 11th president Sept. 1.

Duderstadt, a professor of engineering and former dean of the College of Engineering, is currently provost and vice president for academic affairs. He was elected president by the Regents at a special public meeting June 10.

One-fourth of a family that he says all "tend to be over-achievers, teetering on the brink of burnout most of the time," James Johnson Duderstadt was born Dec. 5, 1942, in Fort Madison, Iowa. He was raised in the small predominantly German-American farming community of Carrollton, Missouri.

"I've been told on more than one occasion that you can take the boy out of the country, but you can't take the country out of the boy," Duderstadt says. "Even today, the country still stays in this boy."

An all-A student and the first in his high school to take the Scholastic Aptitude Test, he also played varsity football, basketball, and baseball and was a member of the track team.

A member of the Yale University football team in his freshman and sophomore years (recruited to play football, he jokes that Yale may have confused his team with one in Carrollton, Texas, that won the championship in that state), Duderstadt graduated summa cum laude in electrical engineering in 1964 and went on to get his master's in engineering science and Ph.D. in engineering science and physics from the California Institute of Technology in three years.

A true son of the "middle border," Duderstadt happily accepted the opportunity to leave the West Coast and return to the Midwest as a U-M assistant professor of nuclear engineering in 1969. Seven years later he was a full professor, and five years after that he was named dean of the College of Engineering.

"I don't have much interest in being part of an institution that doesn't strive to be the best. If you're not playing to win, you shouldn't be in the ball game."

Duderstadt, who is the author of eight textbooks and more than 60 technical articles in scholarly publications, says he "tends to write as therapy," but adds that where he "used to write books, now I write speeches and memoranda."

He also directly supervised 22 Ph.D. dissertations and served on committees for more than 100 others.

Duderstadt's teaching and research interests focus on topics in applied theoretical physics and mathematics, including nuclear reactor theory and design for both nuclear fission and fusion systems, radiation transport theory, kinetic theory and statistical mechanics, laser physics and computer simulation.

During his five-year stint as engineering dean, the University saw an investment of roughly $70 million in new construction for engineering facilities, allowing the College to consolidate on North Campus. The unit's base budget grew from $11 million annually to $34 million, and federal- and industrial-sponsored research also increased, from $16 million a year to $36 million. He was named provost and vice president for academic affairs in 1986.

Yale roommate Terry Holcombe recalled in an October 1986 *Ann Arbor Observer* article that on one occasion in their college days Duderstadt and several classmates were discussing what they would be doing in 25 years: "Jim said he wanted to be a major academic administrator at a large research university," Holcombe said. "He was the only one of us who stayed right on course."

Tall (6 feet 4 inches) and solidly built, the strawberry-blond 11th president of the U-M keeps fit by jogging 25 to 30 miles a week and by playing tennis and basketball.

Obviously proud of his family, Duderstadt lists their accomplishments along with his on his curriculum vita. He married his high school sweetheart, Anne Marie Lock, in 1964; she was a cheerleader and Carrollton's homecoming queen. She holds a bachelor's in home economics from the University of Missouri and a master's in clothing, textiles and related arts from Eastern Michigan University. For the last 10 years, however, during which she has been auditing LSA classes, her interests have shifted to classical studies and literature.

'I don't measure progress in terms of quantitative achievement or particular accomplishments, but in the quality of the people that I've managed to identify and attract to important positions.'

Duderstadt's love of computers has transferred to his wife, who has "automated" the Faculty Women's Club and continues to provide most of the group's computer support. A member of the organization for almost 20 years, she was its Newcomers chair in 1971 and president in 1985.

Having given a "full-time commitment" to the University while her husband was dean and provost, Anne also is a member of the advisory board of the University Musical Society and the Friends groups of the Museum of Art and School of Art.

Daughter Susan graduated cum laude from Yale University on Memorial Day weekend with a B.A. in molecular biophysics and biochemistry. She will be a first-year medical student at the U-M this fall and may pursue a combined M.D./Ph.D. program in molecular medicine.

At Yale she was director of the Yale Chamber Singers, managed a Scandinavian summer tour of the Glee Club (of which she was a member for four years) and was a member of the school's Gilbert and Sullivan Society.

Daughter Kathy will be a senior at Harvard in the fall. Originally planning to major in astrophysics, she is now an English literature major. She spent last fall in a U-M program in Florence, Italy.

Kathy won varsity track letters in her freshman and junior years for the heptathalon and high jump. She was a member of the women's heavyweight crew in her sophomore year.

Upon accepting his nomination to the University presidency, Duderstadt told a crowd of students, faculty, staff and administrators in the Regents Room of the Fleming Building that he was "deeply honored to have been selected by the Regents as the next president of The University of Michigan." He continued:

"My wife, Anne, and I have been privileged to be part of this University for the past 20 years, and we are deeply committed to it. We look forward with great pleasure to serving the students, faculty, staff and alumni of the University and the people of the state of Michigan in the years ahead.

"I am grateful to the Board of Regents for their perceptive understanding of the University and the challenges before us; to Interim President Robben W. Fleming and his wife, Sally, for their very special contributions to the University these past months; and to former President Harold T. Shapiro and Provost Billy E. Frye; and to my colleagues and the Executive Officers, deans and faculty for the leadership they have provided the University."

THE UNIVERSITY OF MICHIGAN

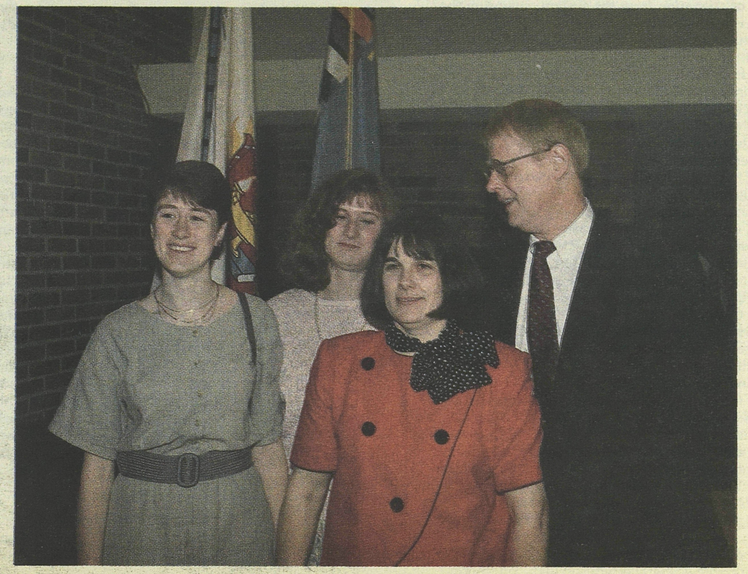
President Duderstadt will preside over a University that enrolled 49,244 students on the Ann Arbor, Dearborn and Flint campuses in the 1987 fall term and has a total operating budget of $1,336,587,502 for the current fiscal year. In addition to the 17 schools and colleges at the Ann Arbor campus, there are five at the U-M-Dearborn and three at the U-M-Flint.

The University also operates 39 centers, 18 institutes, 2 bureaus and 9 hospital units in the U-M Medical Center which, with 32 buildings on 82 acres, is one of the largest concentrations of health care facilities in the world.

The U-M had a volume of research in 1986-87 of $213 million. Its alumni body of 316,546 living degree holders is one of the largest in the nation and world.

Interview

Appearing here are edited excerpts from the 105-minute public interview the Presidential Selection Committee and chairs of its advisory committees conducted June 10 with President-designate James J. Duderstadt. Regents present at the interview were Paul W. Brown, Thomas A. Roach, Neal D. Nielsen, Philip H. Power, Veronica Latta Smith and Nellie M. Varner. Advisory committee chairs were Judge Geraldine Bledsoe Ford (alumni), Prof. Thomas E. Kauper (faculty) and David Newblatt (student).



THE DUDERSTADTS at the June 10 press conference following his election as U-M's 11th president. From left to right are Susan, a Yale graduate who is to enroll in U-M Medical School this fall; Kathy, a senior English major at Harvard; Anne, past president, Faculty Women's Club; and Jim.

On challenges facing higher education, particularly the role of the U-M:

When I became provost, I realized the years ahead would be a time of extraordinary opportunity due to a change in the fabric of this nation — a shift from a resource-intensive society to a society increasingly dependent on knowledge, on intellectual capital, dependent on educated people and upon ideas. That kind of future will become increasingly dependent on research universities such as the U-M because we are the source of that knowledge.

The future is characterized by a number of major challenges — the greatest will be due to the increasing pluralism and diversity of American society, leading to a multicultural society. Society also is becoming increasingly internationalized as every aspect of our nation becomes deeply involved in the global community.

This also is a time of unusual intellectual ferment in higher education and a time in which the central role which a liberal education has played in higher education is being questioned in a world of increasing professionalism, a time in which the balance between disciplinary and interdisciplinary activities is being explored, a time in which many institutions recognize that the renewal of intellectual mission is one of the most important goals of all.

All of these factors suggest that it is not a time when the U-M can approach its future in a passive way. Rather it is a time in which we must seize control of its destiny and chart a course for the 21st century.

On the University's programs to balance its goals of racial and cultural diversity with its aspirations to maintain its excellence:

There's no doubt that the America of the 21st century will be multicultural, a society in which we set aside the concept of the mixing pot, and, indeed, have learned to accept, tolerate and respect people from different races, cultures, nationalities and ethnic backgrounds. The first development of these models will occur on university campuses because universities embrace diversity — that's one of our most critical elements.

At the U-M, we have learned that our traditional approach toward the objective of excellence — primarily based on affirmative action and access — is incomplete, that simply providing and achieving representation from underrepresented minorities is not sufficient. We must move beyond that to understand diversity in all aspects as a critical component of achieving quality in teaching, research and service.

We realized we would have to build on our campus a model in which people from vastly different backgrounds are respected both for their differences and indeed are pulled together by some common ideals. We must build an environment that cherishes diversity, which attempts to not simply tolerate, but to respect and value the differences among people and to pull them together.

'The University has not only an opportunity, but indeed a responsibility, an obligation, to be the leading university in the nation in developing the model of what the diverse, multicultural research university will be in the 21st century.'

Many components already are in place. The University has not only an opportunity, but indeed a responsibility, an obligation to really be the leading university in the nation in developing the model of what the diverse, multicultural research university will be in the 21st century.

On his reputation as a "pusher" in terms of management style:

I have a reputation as a steamroller. While it is true I like to accomplish things and move fairly rapidly, I always precede those actions with an effort to learn and listen, to get out and find out what people think, what they're concerned about, to build a certain consensus, because without consensus you can't move ahead.

The key to excellence and achievement rests with people, not process or organization. I don't measure progress in terms of quantitative achievement or particular accomplishments, but in the quality of the people that I've managed to identify and attract to important positions. I'm a very people-focused person.

On the University's responsibility, as a public institution, to the state and its people, and how best to respond to their needs:

As a public institution, as an institution supported by the people of Michigan, we have certain important responsibilities to respond to the need for a quality education for the sons and daughters of our citizens, for providing educated leaders and professional people, for providing public service.

That bond has evolved over 150 years and is very, very strong. There has been an ever-increasing intensity of the commitment of this University to serve the state, but the way in which we serve the state is evolving.

The University can provide seeds for the prosperity and well-being of the citizens of Michigan. The involvement of this University in the knowledge-intensive future is a very critical role that we will play, and it will intensify in the future. It's not the only role we will play.

. . . We must be sensitive to the needs of the state, from the critical needs of the urban environment of Detroit to the needs of the Upper Peninsula, to deploy our resources to reach out, to find out the needs of those citizens and how best to respond to them. This is an important characteristic of a public university. The public supports this University. It has the right to ask what it should expect from us, and we have an obligation to respond.

On making the case for strong state support of the U-M:

The state needs to increase its investment in higher education. Michigan faces many critical needs. Those needs must be responded to and balanced against investments that really will have the most dramatic impact in the long-term future.

I believe that the most valuable resources in Michigan are its human resources, its people. Higher education, K-12 education, the private sector, business, labor, management, the public

DUDERSTADT
Continued

sector, state government all must form a new coalition that supports education, the development of human resources, stressing an investment in the future of our people as the most critical investment we can make.

On what can be done to change students' feeling of alienation from the system, changing the "us vs. them" attitude:

Students are the vital component of the institution. The way we approach and interact with students must not be confined to the classroom, laboratory and library. Much of the educational process extends beyond the formal curriculum.

The confrontational attitude of the 1960s and 1970s has led to a division, a gap between student government and the "administration." The irony is that the goals of the student community and the goals of the University, by and large, are the same. So again, it's a process of listening, learning, enfranchising to some degree, of making an effort to involve students in a broader array of University activities, in taking very seriously student views and weaving these into the mission of the University.

On the perception of some that an emphasis on research has caused a drop in the quality of teaching; on the University's role in reshaping, defining a liberal education:

It is imperative that the University begin to address in a leadership role what an education in the context of a research university means, how we can draw on its extraordinary resources. Teaching is a critical component, a paramount focus of this institution, but it must be teaching that really pulls in our research, our scholarly activities, that provides an excitement to the students.

In a world dominated by professionalism, a liberal education has become more and more important. A liberal education is the pursuit of knowledge. We too often look at education as training or preparation for a career, as access to knowledge. The only thing that can prepare graduates for a lifetime in which they may make make as many as five career changes is a truly liberal education through which you develop the capacity to seek wisdom, to reflect, to use disciplined inquiry, to question. It is not a future you can be prepared for by narrow training and professionalism.

It is important for this University to reconsider the central role played by a liberal education and liberal learning in our literary college and professional schools, and provide the links between that education and the professional education most of our students pursue.

On the appropriate relationship between the University and its alumni:

Our alumni are a marvelous human resource. One of every thousand Americans is a U-M alumnus. It's an extraordinary network. They are people deeply committed to this institution. The University is dependent on its alumni for many things, not the least of which is its distinction. The University's distinction is determined by its people — that extends beyond the faculty, staff and students on campus to the alumni, friends and people who identify with and depend on this institution.

Alumni play a very key role in this institution, through their financial support and also through their involvement. They provide to students a sense of the importance of a Michigan education. The achievements of our alumni are truly extraordinary, and by their involvement they demonstrate their achievements to our students — the impact of that education. They furthermore demonstrate by that involvement the importance of what our faculty and staff are about, of our teaching and research activities.

Our alumni "pass the torch" — the torch of excellence, the tradition of this institution from one generation to another. They sustain that long line of maize and blue that has made the U-M what it is, and will sustain the U-M far into the future. Alumni are part of the extended University community, and I believe they must be woven into our activities at every stage.

The strength of the University will be dependent as much as any other factor on the degree to which we involve our alumni and the degree to which they involve themselves.

On the high cost of tuition and making a U-M education affordable for state of Michigan students:

We have a major responsibility to do everything possible to constrain increases and to provide quality education in an efficient and cost-effective manner. The philosophy that we've taken is that we'll meet full, demonstrated financial need of any Michigan resident admitted to the institution. We've invested more than $120 million in student financial aid in the last year.

Nonetheless, we are not adequately responding to all components of the people of Michigan. We are responding adequately to the most impoverished of our state. The financial aid we provide to students of middle-income parents, particularly those with large families, is not adequate and we are now making a commitment and generating resources to broaden that financial aid program.

While we will do everything we can to constrain costs, those actions must be taken in conjunction with the commitment to sustain the quality of our programs, because in the end it is the quality of the programs that best serves our students and the people of the state of Michigan.

On resolving the U-M's problems with racism:

Our view has focused on access, characterizing American society as a melting pot in which all people would eventually become the same. The future America will not be a melting pot but will be multicultural, where people from vastly different backgrounds will come together. We want to protect those cultural roots yet come together with a shared sense of value for tolerance, respect and an appreciation for differences as well as similarities.

To achieve a major culture change within the institution we must first create an awareness of the challenge, of the differences that separate people and the need to pull people together and to get them committed to action, committed to change. We have made great gains, but it will require persistence and vision, a long-term commitment. We must propel the University into a position of leadership in this area. Diversity and excellence are intimately linked in our future. Our capacity to achieve quality in teaching, research and service will be determined by our diversity. Those are not conflicting views; they are linked.

On your view of a student "code" of conduct:

Until the turn of the century, the primary focus of education was not the development of the mind but the development of character. We separated the development of moral character from the discipline of the mind, particularly in the 1950s and 1960s.

There is an increasing sense that abdication of that responsibility for moral development among institutions of higher education is not appropriate. Education occurs outside the classroom as well as within. To be a scholarly community requires a commitment to certain fundamental values that extend beyond intellectual values and include character and social values. Whatever standards are developed, they must be developed and accepted by all components of the institution.

I do support President Fleming's actions on standards of behavior for racial and sexual harassment for students. We are in the process of putting in place similar standards for faculty and staff.

An honor code can't be achieved in an institution this large, but in working with students, in particular student government — MSA, we can move to some common sense of fundamental rules that protect values such as truth, honesty, tolerance and respect, which must govern a scholarly community such as the U-M.

On what you perceive to be your personal weaknesses and how you propose to put together a management team:

My principal weakness is impatience. I like to see things happen, and I like to see them happen very quickly. I don't move off in a certain direction until I've had extensive consultations and interaction. I rarely have original ideas, but think I'm quite good at pulling together creative ideas from other people and focusing them. President Fleming has done an extraordinary job in teaching me that you must first build consensus and prepare the way.

The real key is identifying outstanding people, persuading and encouraging them to move into key positions, giving them what they need to get the job done and letting them do it. That's the way I'd build a management structure as president. It's an intensely people-dependent activity.

One final question: Should the Board vote to extend to you an offer of the presidency, would you accept?

My wife and I have committed our entire careers to this institution for almost two decades. The commitment to the institution, the students, the faculty, the staff and beyond that to the people of Michigan is very deep. We would be honored and privileged to accept such an offer.

Deans Praise Choice

Several deans of U-M Schools and Colleges attended the public interview of President Duderstadt by the University Regents. The deans responded to that interview; some of their comments are excerpted here:

"MY congratulations to Jim and good luck to Anne. I am am very fond of both of them, and as colleagues I congratulate them both. This is a wonderful accomplishment for Jim. His rise from 'farm boy' to nuclear engineer to president is a testament to what higher education in America is all about — access, support and nurturing — and he's a wonderful example of this. He has personally experienced the transformation that education makes possible."

Marjorie Levy
Dean, School of Art

"THOSE WHO see him as a narrowly focused, parochial technocrat who has no knowledge of and respect for the liberal arts and their role in society are dead wrong. Behind that big, boyish and brash exterior lies a very intelligent, sensitive and understanding person."

Ara G. Paul,
Dean, College of Pharmacy

"I'M VERY pleased with the appointment, and I'm pleased with the long interregnum. I've known Jim Duderstadt both during his term as dean and during his term as provost, and I have the highest regard for his intelligence, his energy and his dedication to keeping The University of Michigan one of the world's great universities."

Peter O. Steiner,
Dean, College of Literature, Science, and the Arts

"I HAVE been particularly impressed with the initiatives he has begun so rapidly in the area of improving the diversity of both our faculty and student body. In the long run, this may prove to be one of his strongest accomplishments as provost."

Charles M. Vest,
Dean, College of Engineering

"JIM IS one of the most approachable high-ranking administrative officials I've ever encountered. I think he'll bring great commitment and energy to this position. He also is a person you really can't stereotype. When I was discussing the possibility of being an interim director, I thought he would be talking about technology and technological values. Instead, he talked about human values and the importance of communications at the University. None of us can foretell history. There is one thing of which I am absolutely certain: This is going to be an interesting, exciting administration to be around. No one is going to be bored."

Robert M. Warner,
Dean, School of Information and Library Studies and
Interim Director, University Library

LAW MAN

After a half century of courtroom duels, Oscar Baker Jr. ('35L) is enjoying probate, where the principals tell no tales and all raconteuring is left to him.

By Marianne Danks Rudnicki

"Law," says Oscar Baker, "is a profession of controversy. Instead of a gun like in the Wild West, you take the law into a courtroom and shoot it out."

After 53 years at the bar, the 77-year-old Baker ('33, '35L) now leaves the major shootouts to his younger colleagues at the Baker and Selby law firm in downtown Bay City. Baker prefers the less demanding probate cases because "dead people can't induce that much stress."

It is easy to picture Baker making his points in court. His voice still rises and falls in an expressive cadence that can become booming when he feels passionately about the subject, as though his listener were an undecided juror.

Today conversation with Baker, an inveterate tale-spinner, takes a thoughtful turn, centering on stories about the people who helped, supported and inspired him along his career. Prime among them are members of his own family, most especially his father, Oscar Baker Sr., with whom Baker shared his practice until the senior Baker's death in 1952.

From his tone of voice during one story, it is difficult to guess that Baker is talking about a day 65 years ago, a day still deeply etched in his memory.

Baker and his young playmates were outside the Baker home in Bay City when a strange, scruffy-looking fellow wandered on to their street. He was different — weird, the boys thought — and they began to taunt him and call him names.

From inside the house Oscar Baker Sr. recognized the voice of his son, which even back then could boom above the others. Suddenly, in a voice that he knew meant trouble, Baker heard his father call out, "'Bud,' (that was what he called me) 'come in the house.'"

"I went in," Baker continues, "and my father turned my little brown butt cherry red. Then my father said to me, 'Now do you understand that you must have respect for everybody?' When I thought about what I'd done, I was ashamed."

But to a Black child who had never experienced prejudice, and Baker says that as a child he had not, the concept of discrimination was a moot point, even though it had not been moot to his father or his grandfather.

James Baker was the first of the Baker family to settle in the "Thumb" area of Michigan shortly after the Civil War; he had served in the 101st Michigan Infantry. He appears to have been a jack-of-all-trades, briefly running a restaurant in Saginaw and working at various times as a handyman, barber and constable. In 1898 he ran for state land commissioner on the People's Party, the first Black to run for that office. He lost, but today James Baker's picture on a campaign flyer holds a place of honor in his grandson's law office.

Misfortune struck the Baker family when James' son, 7-year-old Oscar, lost a leg in a train accident. The elder Baker hired a lawyer and sued the railroad for running a speeding train — it had been traveling at 15 miles an hour — through town. The court awarded $5,000 in damages, a tremendous sum at the time. That money got Oscar Baker Sr. to the University of Michigan Law School where in 1902 he became one of the first Black students in Michigan's history to receive a law degree. By the time he died in 1952, Oscar Baker Sr. had become one of Michigan's best known attorneys.

When it came time for Oscar Jr. to decide on a career, he chose law and the University of Michigan Law School as well.

College life for a Black student in the early '30s brought with it subtle and not-so-subtle forms of discrimination. For one thing, says Baker, Blacks were discouraged from living in the dorms, though never overtly. "No matter who may deny this," Baker says emphatically, "I can substantiate it if anyone asks."

One particular incident, Baker recalls, moved him to take action that presaged the lunch-counter sit-ins that Black students conducted 25 years later. There was a small store near his house that sold sit-down and take-out meals. Blacks could buy take-out but they were refused sit-down service.

First Baker approached the owner and pointed out that he was violating state civil rights law. When this produced only an angry response, Baker asked his father to send him a brief on the law. With brief in hand, the young student visited the prosecuting attorney's office. The matter was investigated and the owner was forced to comply with the law.

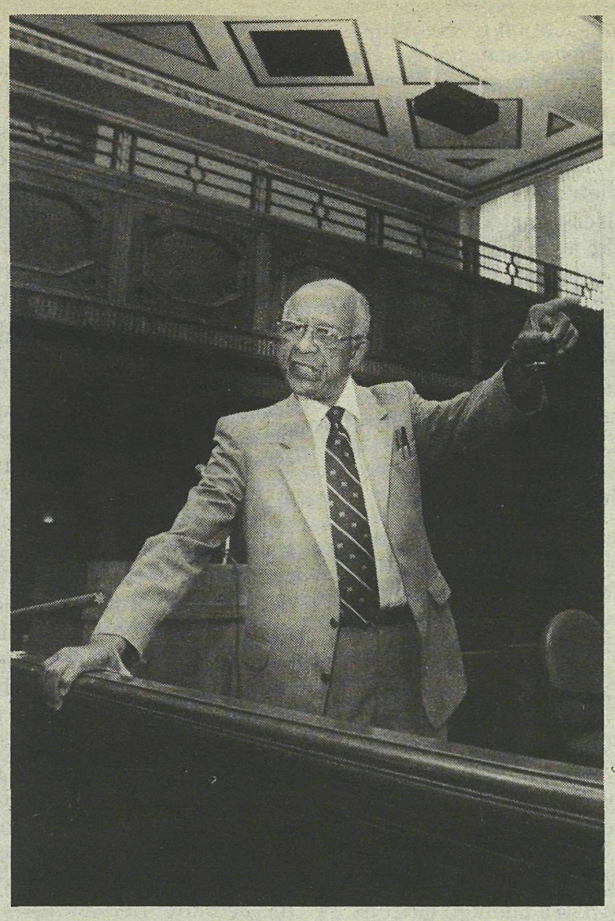


Photo by Suzanne Weaver

BAKER TRIED the first of his many cases in this Bay City courtroom. Now he's glad to have stopped trial work, which he compares to Western shootouts, to concentrate on probate cases because 'dead people can't induce that much stress.'

Baker still remembers the prosecutor for doing his job — upholding the law he had sworn to protect regardless of his opinions on the matter. "It helped me respect my duty when I became a lawyer," he says. "It is important to the American future that all people be treated equally. Who will listen to us if we can't live in peace and understanding with ourselves?"

Degree in hand, Baker returned to Bay City in 1935, and he and his father opened their own firm. Baker remembers those early days in practice as "working at anything I could get."

His first case was a divorce motion in which the wife had disappeared. Even though he faced no opposition attorney, Baker recalls vividly his fright at first standing alone in a courtroom. But soon he "came to be known as 'Oscar Baker's son,'" he says. "People thought, 'If the old man is such a tiger, the kid must have some of it too.'"

In the early '50s, Baker's brother James ('49, '51L) joined the firm headed by their father. (A third brother, Robert, is a U-M grad but a non-lawyer, having received his B.A. and M.A. in 1939 and '40. Another brother, Albert, and a sister, Dorothy Baker Lewis, attended Michigan. Oscar Jr. and his wife, the former Robbie Brooks of Detroit, have three daughters. Gail, a 1965 U-M grad, recently completed 15 years as an administrator of the Afro-American Institute in New York. Cheryl is an attorney in Detroit, and Christine a probation counselor in Cleveland.)

The majority of Baker's clients have always been white and his general practice has largely consisted of personal injury, bankruptcy and probate law. But Baker has always been concerned for the rights of the oppressed and disenfranchised. He has at times felt the brunt of racial prejudice himself from witnesses as well as from other members of the legal profession. Some opposing attorneys had clearly assumed that a Black lawyer wouldn't be as well-prepared as they were. "Then," he says with a grin, "I'd whip their tail off."

"Some whites," Baker continues, warming to his topic, "forget their own roots. Their ancestors came to this country to escape oppression — not to organize or invest in corporations. They were slaves in the country from which they came — social and economic slaves. Beginning with the Pilgrims, they represented the bottom class."

Baker advises young Black attorneys not to let themselves get upset when they encounter bad racial attitudes in whites. "There's weakness in that approach," he says. "You've got to learn how to be objective and four-square youself."

Being four-square for Baker has meant becoming involved. He was a member of the Michigan Civil Liberties Committee from 1952 until 1964, the Citizens League for Low-Rent Housing and the Governor's Commission on Migratory Labor. It also has meant leaving his home and family at a time when it would have been much easier, and safer, to stay.

"I knew I just couldn't sit comfortably. I knew I had to go Mississippi," says Baker of his participation in the violence-scarred drives to register Black voters in the face of segregationists' opposition in 1963 and 1964.

"As I thought about it, I decided my approach would be to expect respect — and I didn't get anything else but. I didn't have any more trouble in Mississippi than here. Nobody ever threatened me. There was no time that I was afraid I wasn't going to make it back. I've never known, though, if I was just one of the lucky ones or if it was my attitude to act as if I were white that made the difference."

He adds, however, that some civil rights workers he knew, Black and white, were not so fortunate. "I met a man in Hattiesburg," he says. "I don't recall his name but I can still see him — he had an unusual combination of brown skin and bright blue eyes. I learned later that his home had been firebombed, and that he had managed to save his family but not himself. It was a reminder of how near to danger and death you could be down there."

If the law sometimes appears to be a shootout, life, Baker believes, is a game of give and take. "I do what I can do for those who come along," he explains. "I feel I owe a debt. I owe a debt to whites and Blacks who helped me along the way. All middle-class Blacks damn well shouldn't forget where they came from or the debt they owe to Blacks and whites in society for making it out."

Baker leans slightly forward, his eyes aglow, to emphasize a point that is already apparent: "I feel this to the tip of my toes."

LETTERS

Rackham's Golden Year

YOUR APRIL issue was splendid, particularly the article "Rackham's Golden Years." Of special interest to me was the continuing golden years experienced by Rackham. The quality of its leadership has continued undiminished and may it continue to be thus.

Your reference to University fellowship stipends takes me back to 1949 when I was a recipient in history. At that time the sum was $875.00 per annum ($87.50 per month for 10 months. Believe me, that was a golden sum in those days — a complete dinner at the Old German Restaurant was 90¢.) I am still appreciative of that honor.

Only one minor part of the article raised my critical spirit. Horace Rackham invested $5,000 in the Ford Motor Company in 1903. When his stock was repurchased by Henry Ford in 1919, he received $12,500,000 (a handsome capital gain). His accumulated dividends, 1903-1919, were $4,935,750. His total return for a $5,000 investment was $17,435,750. Horace Rackham received back his original investment 3,487.15 fold.

A.K. Steigerwalt
AM '50, PhD '52
Ann Arbor

FOR THREE reasons I was very interested in the article on "Rackham's Golden Year." First, because I was attending U-M in those years when the Rackham Building was new, and although just an undergraduate, I spent much time there; prestigious speakers then included Monsignor Fulton Sheen and Bertrand Russell.

Second, because I worked for Ford Motor Company for nearly 40 years and heard often the story of Horace Rackham's reluctantly agreeing to take stock in lieu of money for his legal services, and thereby becoming a millionaire.

Third, because of a rather pathetic story told to me by a distant relative of the Rackhams: Mary Rackham had a ne'er-do-well brother who confidently expected that his older sister's death would enrich him. Instead he was left a very modest trust fund, and what might have been his millions went, of course, to the U-M's "largest endowment and . . . magnificent building."

C.W. Smith, '40
West Columbia, S.C.

Victorious Birthday

ON SATURDAY, June 6, 1987, I had counted on being in Ann Arbor and becoming an Emeritus. Instead, we were on the Argonaut cruising the Bay of Biscay from La Corona, Spain, to Bordeaux, France. A compensation though, the lecturer was Marilyn Stokstad, (Ph.D., History, '57) and her sister Karen Stokstad Leider (MLS, '56). They spent the afternoon teaching the Scottish pianist and accordionist how to play "The Victors" at dinner. The orchestra played several "Happy Birthdays," and then to my surprise the accordionist serenaded me with "The Victors" while I disclaimed it as my birthday 'til I suddenly recognized the tune! Add that to the long list of places where "The Victors" has been played.

Gerald McCarthy, BS '37E, MS '38E
Mt. Hood, Oregon

Horace Rackham

Mary Rackham

'Hysterical Diatribes'

IN RESPONSE to the hysterical diatribes against Prof. Tanter (*See "Who Is at the Helm," December '87 issue*) and U.S. policy towards Nicaragua printed in the Feb. '88 "Letters" section: Daniel Ortega and his pack of thugs have pirated the revolution of the Nicaraguan people to their own Marxist ends, and in the process have become the Soviet's boys in Central America.

The blood of the freedom fighters will be on the hands of the Congress who abandoned them, and organizations such as Quest for Peace who actively assist the enemies of our nation. The tragedy lies in the truth of the sentiment that to be an enemy of the United States is sometimes risky, but to be an ally is often fatal.

As to the attacks upon Dean Steiner, my copy of *Michigan Today* states, "It is the policy of The University of Michigan that no person, on the basis of race, sex, color, religion, national origin or ancestry, age, marital status, handicap, or Vietnam era veteran status, shall be discriminated against." This sounds like a square deal to me. None of Dean Steiner's comments contradict the letter or the spirit of this policy. I, for one, agree that The University of Michigan should not try to emulate Wayne State or Howard, but rather make our unique institution available to all qualified applicants. To put it bluntly, Wayne State and Howard couldn't carry Michigan's jockstrap!

William J. Pfund, '83
Richmond, Virginia

Dorothy Donnelly

THANKS SO much for your excellent interview with poet Dorothy Donnelly in the February issue. Your interviewers seemed to touch upon the pulse and vitality of Donnelly's art while bringing to our attention yet another of Ann Arbor's talented citizens. Along with Donnelly, many Hopwood winners have gone on to distinguish themselves in arts and letters, and perhaps this could be the starting point of an occasional feature in *Michigan Today*. It is people like Dorothy Donnelly who enrich our lives in Ann Arbor, so that our little city seems to be one of Donnelly's "miniature isles . . . where a heron may wade" or writers flourish.

Eric LeDell Smith, '80 MLS
Ann Arbor

Diversity and Representation

PERHAPS the percentage of Asian (or Black or . . .) high school students qualified to attend college and willing to attend a diverse university, or the percentage of Asian (or Black or . . .) people qualified to join the faculty and willing to serve at a diverse university, may be different from the percentage of Asians (or Blacks, etc.) in the general population. Thus, by setting goals of "representation proportionate to their numbers in the population," without any appa.ent consideration of what "the population" means, U-M may have set itself up for a long period of frustration and unwarranted criticism.

The chart, "Black Ph.D.s Awarded in 1985" in the 20 April '87 issue of the *University Record* is an indicator that such differences may exist; i.e., Blacks are about 11-12 percent of the general population but received anywhere from 0.5 to 16.3 percent (depending on subject area) of the Ph.D.s awarded in 1985. Further, some of these Ph.D.s may wish to enter industry or politics, or to serve at a Black-only university, or whatever. From this example, I assert that saying U-M's student body and faculty should be X% Asian and Y% Black, etc. on the ground that the general population is so distributed, is terribly simplistic.

Roger C. Krueger
MSE, Rackham, '62
Slidell, Louisiana

I WAS shocked beyond measure by the remarks of Dean Peter Steiner on minority admissions, not so much for their silliness (I deal with deans all the time) or their pretentiousness (Ann Arbor, the Harvard of the West — are you still pushing that line?) as for their crudity. Surely a prominent university like Michigan can find someone with more sophistication and finesse to deliver its pronouncements.

The letters in the April *Michigan Today* were largely predictable, particularly those that claimed to see expanded minority enrollment as somehow a threat to academic standards, as Steiner also claims. This is a fraudulent argument. It is fraudulent partly in that the University has for decades compromised academic standards whenever it thought there was something to gain — for semi-literate football stars; for underachieving offspring of moneyed alums from Bad Axe, Saginaw and points west; for a host of privileged groups. But the academic standards defense is fraudulent in and of itself. There is no conflict between racial decency and high academic standards, as anyone who has actually tried it knows. What is required, of course, is a commitment to decency sufficiently strong to move the institution to an appropriate allocation of resources. The University of Michigan, now as in the past, seems unwilling to make that commitment.

The shameful ditherings of Dean Steiner and some of the letters in your last issue make it clear that racism is alive and well around Ann Arbor. How glad I am that I left to become an effete snob on the East Coast! There's a real Harvard out here, and it doesn't have to exclude Blacks to please a sad-sack constituency.

Thomas H. Jackson, '57 MA
Bryn Mawr, Pennsylvania

Tisch's Tenure 'Too Short'

I HAVE just received the April 1988, which includes an article on Preston Robert Tisch. It is not my purpose to denigrate Mr. Tisch's outstanding record as a successful businessman. His accomplishments in the business world speak for themselves. It is his 20-month stint as the postmaster general that requires an objective evaluation.

The United States Postal Service is one of the mammoth enterprises of our country, with over 800,000 employees and some 39,000 facilities. For 1987 the Postal Service's total operating expenses amounted to $32.5 billion. Mr. Tisch's tenure was much too short to accomplish anything other than superficial changes. The allegation that he had brought increased efficiency and respectability to the Postal Service is not evident in the postal operating records nor in the minds of the mailing public, especially among the large-volume mailers. His short service was an unmitigated disaster. Although Mr. Tisch frequently reported that service performance, during his tenure, was at the highest level since the Postal Service was organized, the fact is that the Postal Inspection Service in 1987 twice reported that these data were falsified. As far as harmony with the postal labor unions is concerned, Mr. Tisch did improve labor relations, but this was accomplished by giving the postal employees all they had requested and more in the 1987 labor negotiations, with the result that the Postal Service will have increased its salaries and benefits, over the life of the current contract, by over $1 billion more than the Postal Service had originally planned.

As noted, Mr. Tisch's tenure was far too short to be really effective. He spent most of his 20 months with the Postal Service visiting postal facilities, dedicating new stamp issues, and making speeches at new postal facilities. My only purpose is to set the record straight.

Elmer Cerin, '40 Law
Washington, D.C.

Martha Cook Alumnae

DURING the weekend of Oct. 26-28, 1990, the Martha Cook Building will celebrate the 75th anniversary of its founding. The Martha Cook Alumnae Association is requesting that alumnae who have not previously notified the Association of their mailing list forward that information to: Martha Cook Alumnae Census, 19230 Canterbury Rd., Detroit MI 48221.

Shirley A. Vaughn
Detroit

More on Shirley Smith

THE LETTER in the April issue by Marjory K. Bentley concerning U-M Vice President Shirley Smith reminded me of an often-recurring fantasy. How wonderful it would be to make available a bequest to the University to be called the Shirley Smith Student Loan Fund in memory of the dour, kindly man who, in charge of student loans, helped so many of us over difficult moments with small loans in a time when all funds were precariously low.

Stanley Marcus, PhD, G'42
Salt Lake City, Utah

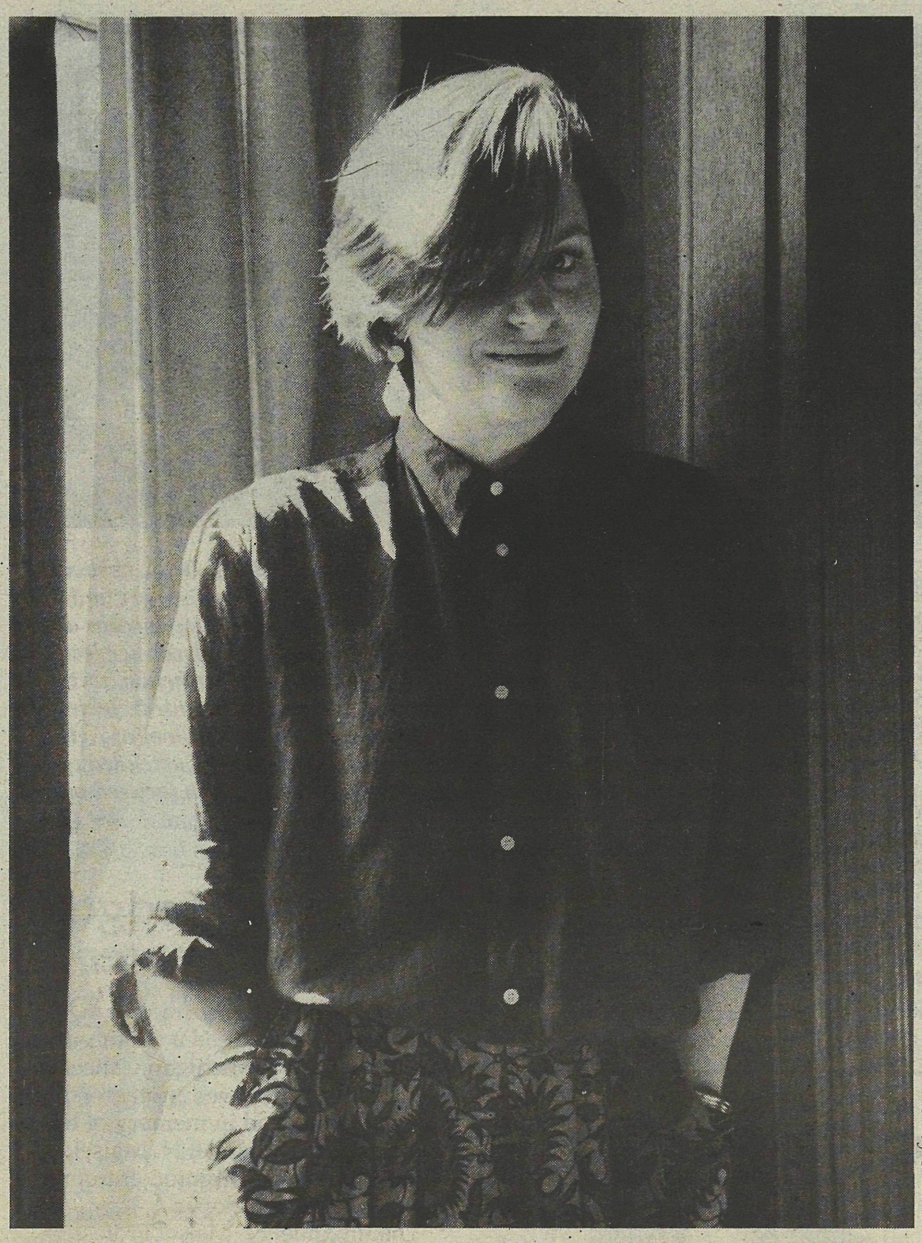


Photo by Grace Lee

RIGID ACADEMIC specialization, as in most universities of her native England, is helpful when a student is sure of her career, says Laura Bear, but the 1987-88 Power Scholar said she benefited from the freedom to cross the 'division between science and art' at Michigan.

Archaeology 'Madness' Overtook Power Scholar

By Grace Lee

Laura Bear seemed older than her 21 years as she sipped her soft drink and talked about the topics that have dominated her thoughts and feelings during her studies in America.

"I was born in London in 1965, and lived there most of my life," Bear said. "It was a big event when I decided to become an archaeologist when I was about six, which was slightly extraordinary. I went to school in London, then to Cambridge, and went through all the procedure of selection to come to the U of M."

Bear is a Power Scholar, studying at Michigan on an international student exchange scholarship sponsored by Eugene B. Power, a former U-M professor and University Regent.

Both of Bear's parents are involved in the arts. "My father is a television designer. My mother is an art administrator. Neither has a thing to do with archaeology. It was just that this madness overtook me."

In her first year at Cambridge an anthropology course strongly influenced Bear. "Anthropology is this thing which makes you see that the British way of life, or the Western way of living, is not the only way of life," she said. "There are all kinds of ways of organizing society. The Western civilization is not necessarily the pinnacle way of life, which I think is very important to realize. And that was a very exciting realization."

This conclusion no doubt helped her when she arrived in Ann Arbor last year, even though she confessed to having imagined that Ann Arbor would be "quite urbanized," a misapprehension she attributes to the "wild city life" she saw portrayed on American television programs broadcast in England.

She was surprised to find Ann Arbor was not a city of high rises but of "very interesting architecture, with buildings that wear details from different periods of history, such as references to Egyptian and classical art. I really liked the human scale and knew I'd enjoy living here."

England's educational system is much stricter than the United States', according to Bear. Young people are not given much liberty to choose their course work, she said, nor do a great percentage of young men and women have the opportunity to enroll in college.

Intense competition for relatively few spaces places great stress on British students, who start preparing for university qualifying examinations at 15.

Another difference is that at Cambridge, "you are a specialist once you are an undergrad; if you are an archaeologist you are an archaeologist, and you only take classes in that." Bear thinks specialization is good when a person knows exactly what career he or she wants to pursue, but deprives the unsure student of an opportunity to explore other fields.

"Now that I'm out of that specialized system," Bear said, "I can take linguistics, psychology or art in my graduate program, and that's an incredible feast for me. I don't like a rigid division between science and art, and that's what happened in Britain. Here, I actually find science in art, which is very interesting. And that's why I really enjoy archaeology, because you can use all these different kinds of elements and thinking.

"There are many famous archaeologists teaching here at Michigan, though most students have probably never heard of them," she continued. "But I didn't come here so much because the program is excellent as because the theoretical approach to archaeology here is very different from that at Cambridge. I wouldn't say one is better than the other. They're both very good. But I didn't want to be the product of one school of thought. If I had gone on to the Ph.D. program in Cambridge, I would know only the Cambridge way and nothing else."

And what aspects of her homeland has she missed most? "A feeling you get of England's decaying grandeur," she responds. "The architecture is old, but you get this sense of beauty and dignity. America is a very new country. There's a different kind of feeling, a feeling of optimism."

HEMALATA Dandekar (left) and Marilyn Mason are two of 20 U-M faculty members who are teaching 27 courses through Sept. 1 in the Alumni Association's new Alumni University. Dandekar, an urban planner, will discuss Third World development on June 29. Mason, University organist, will lecture on J. S. Bach on July 12. For a schedule of all other courses (enrollment for most is $10 per two hours), contact Joel S. Berger, Alumni Center, 200 Fletcher St., Ann Arbor, MI 48109.

President's Weekend

A Chance to Meet, Mingle and Muse

The University of Michigan twice yearly invites members of the Presidential Societies to a President's Weekend, a special on-campus program hosted by the University president.

The experience is highly prized: participants socialize with each other and converse with deans, faculty and other University officials.

Each President's Weekend centers on a particular theme; the one scheduled for September 23-24 will focus on the undergraduate experience.

The September weekend will highlight the challenge and new opportunities for undergraduate education, especially the impact of the rapid development of high technology. Speakers will discuss such diverse topics as the processes of scientific investigation; how values and ethics affect the design of new products; whether libraries are obsolete; and good communication skills, like creative thinking and clear writing.

In addition, as part of President's Weekend's planned entertainment, guests will be treated to a celebration and performance by members of the School of Music faculty on Friday night in honor of former president Harlan Hatcher's 90th birthday.

On Saturday afternoon, guests will enjoy a tailgate picnic before attending the football game between Michigan and Wake Forest.

The Presidential Societies are designed to recognize donors to the University at five significant levels. They combine existing and recently created recognition groups, with each component named for an outstanding president of the University. The oldest of these recognition levels is the Presidents Club, which honors donors who have achieved a cumulative record of gifts totaling at least $15,000.

Besides the Presidents Club, four Presidential Societies recognize donors at successive levels. The Henry P. Tappan Society, named after the University's first president, honors donors of $50,000 or more. The Harry B. Hutchins Society, named after the University's fifth president, was recently established to honor donors of gifts of $100,000 or more. Alexander G. Ruthven was one of the University's ablest administrators, and the Society bearing his name honors donors of $500,000 or more. The James B. Angell Society, the most prestigious of the Presidential Societies, honors donors of $1,000,000 or more.

The May 20 President's Spring Weekend was devoted to "The Humanities at Michigan." Participants heard lectures on such topics as "Humanistic Perspectives on the Scientific Enterprise" and "Architecture: A Reflection of Cultural Values" and also attended a live music-video performance.

Photo by Paul Jaronski

MARGARET C. Root (left), associate professor of Near Eastern art and archaeology and associate curator of the Kelsey Museum, discusses her lecture on 'Persia and the Parthenon' with members of the Presidential Societies at a reception in the School of Art. More than 260 persons attended the Spring Weekend, which focused on the 'Humanities at Michigan.'

Wallenberg Endowment Fund Approaches $145,000 Mark

Spurred on by a grass-roots effort involving community members at every level, nearly $145,000 has been raised toward a goal of $250,000 for the Raoul Wallenberg Medal and Lecture Fund.

The Wallenberg endowment honors the Swedish humanitarian and 1935 U-M graduate who almost singlehandedly rescued tens of thousands of Hungarian Jews from Nazi extermination. The fund will allow a University committee to select a contemporary humanitarian of international stature to receive this prestigious award. Each medalist will receive an honorarium and a citation, and will deliver a public lecture that will be published.

"This award will annually give us the opportunity to tell Raoul Wallenberg's story," said Irene H. Butter, co-organizer of the Wallenberg Fund Committee and professor of public health policy and administration in the School of Public Health. "Wallenberg's courage and idealism should be communicated to successive generations so that his values can be passed on."

A graduate of the College of Architecture, from which he emerged with the American Institute of Architects' silver medal, Wallenberg was appointed Sweden's attache to Hungary in 1945. He saved thousands of Jews in Budapest by placing them in "safe houses," which were protected by the Swedish flag and by manufactured Swedish documents. He was arrested and imprisoned by the Soviets in 1945, and in the intervening years efforts to secure his release or even to verify his survival have proved fruitless.

Earlier this year, Per Anger, a Swedish diplomat who served in Budapest with Wallenberg, lectured on the U-M campus on the topic "Raoul Wallenberg: Honorary Citizen of the United States."

"Wallenberg's legacy to us is his work," Anger said, "and it is our responsibility to remember and honor his sacrifice."

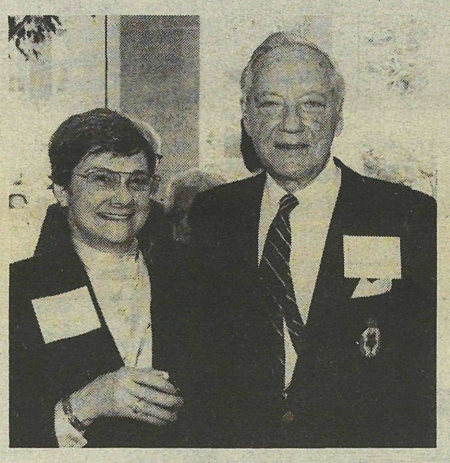
Preceding his address, Anger met with a group of interested donors to the Fund, which is continuing to seek support.

College of Engineering Prof. Andrew F. Nagy, associate vice president for research, spent the last six months of the war in Budapest in a "safe house" protected by Wallenberg. Today he is a joint organizer of the Wallenberg Endowment Committee.

"We want this lectureship to spread the word about Wallenberg," Nagy said. "We want people to hear about what he did and to understand that one person can make a difference."

Only the income from the principal of the $250,000 endowment will be used to support the program's annual expenses. The principal will be retained in perpetuity to ensure the permanence of the Wallenberg awards and lectures.

The person selected to receive this honor, the committee announced, will be internationally recognized as someone whose life's work has been devoted to the defense of liberty and human rights, resistance to oppression, and support for hungry, powerless or persecuted peoples. Contributions may be sent to the Wallenberg Lecture and Medal Fund, c/o Prof. Irene H. Butter, School of Public Health II, Ann Arbor, MI 48109-2029.



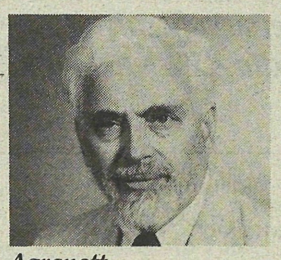
SWEDISH DIPLOMAT Per Anger (right) chatted with Shirley Yolles ('47) and other members of the Wallenberg Endowment Committee after lecturing in the Rackham Building on 'Raoul Wallenberg: Honorary Citizen of the United States.'

Markey Charitable Trust Awards U-M $8.25 million

The Lucille P. Markey Charitable Trust has awarded a grant of $8.25 million to The University of Michigan Medical Center. The gift will support five years of research into the complex way in which nerve cells exchange messages in the brain.

The focus of the research will be on neurotransmitter receptors — proteins that act as gateways between nerve cells. It will be led by co-principal investigators Prof. Bernard W. Agranoff, professor of biochemistry in psychiatry and director of the U-M Mental Health Research Institute, and Sid Gilman, professor of neurology and chairman of the Department of Neurology.

"This is one of the largest research grants ever received by the University. We are very pleased to be the recipients of this exceptionally generous award by the Markey Trust directors," said Interim President Robben W. Fleming.



Agranoff

Scientists have become familiar with a number of neurotransmitters, such as dopamine, implicated in Parkinson's disease; acetylcholine, implicated in Alzheimer's disease; and glutamate, associated with learning, memory and epileptic seizures. But very little is known about neurotransmitter receptors.

"We have had little information on their physical properties or the exact manner in which they perform their function," Gilman said. "We are thus poised to begin a new era — one in which we can study brain receptors with molecular tools.

"Our project is devoted to understanding how neurotransmitters are regulated, what determines the number of receptors that occur at a particular time, what is responsible for their maintenance, and what causes their increase and decrease," Gilman said.

One aim of the project is to decipher the genetic code used by the nerve cell to produce the proteins that act as neurotransmitter receptors. Knowledge of the code would enable scientists, using genetic engineering techniques, to cause a nerve cell to produce more or less of a receptor protein.

Major Gift Pledged To Cancer Center

Geneva Maisel of Birmingham, Michigan, has pledged a major gift to the University of Michigan Cancer Center for an endowed professorship and research fund in memory of her late husband, Emanuel N. Maisel, a highly successful inventor, entrepreneur and land developer.

The Emanuel N. Maisel Professorship of Oncology will enable the two-year-old Center to attract an internationally recognized scholar and scientist devoted to exploring promising new directions in cancer research. The accompanying research fund will provide support for projects undertaken by the Maisel professor.

"Together, the Maisel professorship and oncology research endowment will offer a level of prestige and an environment for scientific innovation that are available at few institutions in the world," said George D. Zuidema, vice provost for medical affairs.

Establishing the distinguished professorship in Maisel's name "clearly demonstrates the impact that private support can have on our efforts to overcome cancer," Zuidema said. "Mrs. Maisel's leadership will draw attention to the need for cancer research and the work being undertaken at the U-M Cancer Center. For this we are deeply grateful."

The Center's director, Max Wicha, noted that "the research component of the Maisel professorship offers an unusual degree of freedom for scientific creativity. By helping provide support for innovative research projects, the fund has the potential to help the Maisel professor pursue exciting new directions in cancer research."

Women Discuss Future at U-M

By Mary Jo Frank
U-M News and Information Services

Optimists like Rhetaugh G. Dumas and Marjorie Levy view the future for women at the U-M as full of promise.

Some of their women colleagues — women with disabilities, women of color, mothers of young children, female tenure-track scholars striving to combine an academic career and family, older women — are not so sure.

Nearly all of the 28 female faculty and staff members, students and community residents who shared their concerns and perspectives at the University's first public forum sponsored by the Affirmative Action Office on "The Future for Women at the U-M" in April agreed that more needs to be done to achieve equality.

Dumas, dean of the School of Nursing and professor of nursing, said women's rights movements throughout history have followed civil rights movements and she believes that "we are embarking on a revival of such movements. I think the revival of the women's movement is at hand as we reach the close of the 20th century."

Trends indicate that women are gaining some ground, albeit too slowly, Dumas said. The number of women at the senior faculty level has increased since 1977, noted the dean, who said at one time she was the only woman at meetings of deans and directors. Women still constitute a disproportionate number in lower-level staff positions, she added.

Dumas, who came to the U-M seven years ago, noted that there is now one female vice president, two female assistant vice presidents, three female deans, 21 female assistant associate deans, 14 female directors and four department chairwomen. Acknowledging that there are still not enough women in administrative positions, Dumas said she is encouraged because "I've seen most of these people come since I've been here."

Another speaker, Dar Vander Beek, director of Disabled Student Services, told the audience that she is not optimistic about the future for disabled women at the University because "there is no future, there is no present" for those women.

"We are still waiting for our opportunity," Vander Beek said. "We are still waiting for the bus, for the entrance, for the toilets, for the water fountains, for my office of Disabled Student Services to be accessible to students, faculty, staff and workers with disabilities."

"There are bright spots. Things are happening," Levy, dean of the School of Art and professor of art, told the audience. She cited her unit, where three out of the four top administrators and 38 percent of the full-time faculty are women. Among the faculty there is a broad spectrum of people reflecting a variety of lifestyles, making it a wonderful environment in which to be a faculty member, administrator or student, Levy said.

TRENDS INDICATE that women are gaining some ground at Michigan, albeit too slowly, says Rhetaugh G. Dumas, dean of the School of Nursing. The number of women at the senior faculty level has increased since 1977, she noted at a forum on women's future at U-M, but women still constitute a disproportionate number in lower-level staff positions, she added.

Big Wheels Keep On Turning

By Mary Jo Frank

The University's record of providing uninterrupted bus service since 1945 is a source of pride for transportation employees and Patrick J. Cunningham, manager of Transportation Services.

"We just added two new charter buses to the fleet this month," Cunningham says. Until now, regular buses have been used for charters. The new air-conditioned buses are equipped with high-back seats and luggage compartments.

Cunningham envisions the buses traveling anywhere within the continental United States, carrying athletic teams, alumni, student organizations and other University groups.

The U-M campus bus fleet includes 36 buses that carry 350,000 passengers a year, most of them students, faculty and staff who need to be shuttled across campus seven days a week, except for holidays. Although there is no fare, drivers count passengers at each stop. Buses run on schedule 95 percent of the time, Cunningham says.

Each bus seats 53 and has a 95-gallon fuel tank. Because the buses are diesel powered, they are kept in a heated garage in the winter. The six new buses that recently joined the University's fleet replaced buses that had seen as much as 22 years of service.The most-traveled retirees had racked up 450,000 miles while operating up to 17 hours a day, day in and day out, through July scorchers and through blizzards that shut down Ann Arbor schools and offices.

Seventeen full-time drivers and 20 to 35 students who work part time drive University buses. Most full-time drivers have at least five years of experience as a bus or truck driver before joining Transportation Services, Cunningham says.

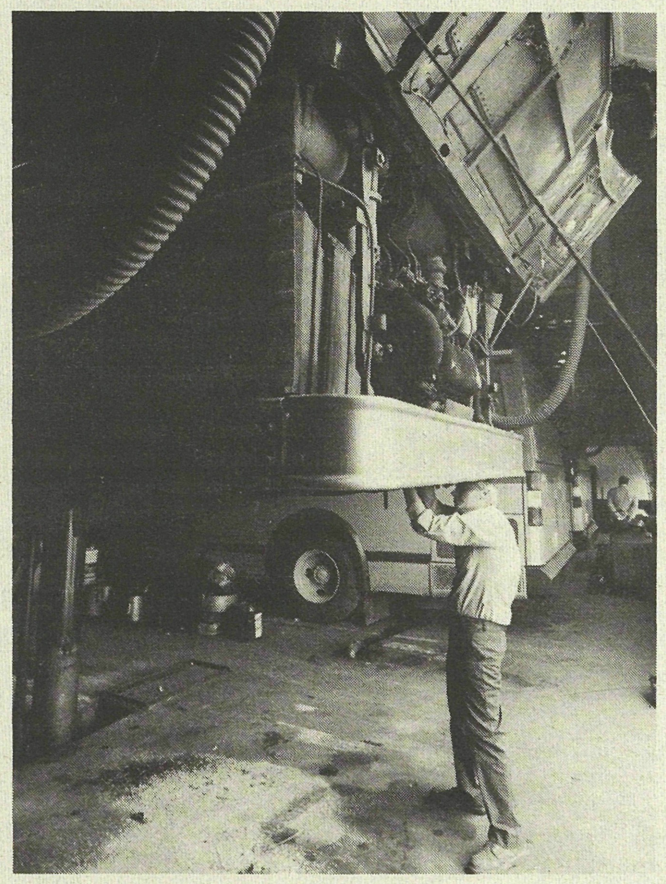
Although the U-M's commuter route, North Campus route and Nite Owl Bus Service are the most obvious aspects of Transportation Services, the department offers a variety of services to University units, ranging from operating a charter bus service to leasing trucks and automobiles and maintaining all University-owned automobiles, trucks and a vast array of mechanical equipment. The equipment includes tractors, mowers, forklifts, trash compactors, rubbish trucks, stand-by generators and snow-removal equipment.

Through its leasing program, the U-M operates and maintains a fleet of more than 265 automobiles and 315 trucks — all American-made products purchased through the competitive bidding process. Automobiles may be rented for University business for a day or two or leased by the month or year. A tow truck and free loaner vehicles are available in the event of a breakdown with a leased vehicle.

Three specially trained mechanics work on buses. Leo J. Kennedy, service foreman for the day shift, says one reason the University's buses are on the road for up to 22 years is because of preventive maintenance. "If you stay ahead of it, you don't have any problems," Kennedy says. Buses are a big investment. The six new Flxible (that's right, no 'e') buses cost more than $145,000 each.

To keep all the trucks and buses clean, Transportation Services has a semi-automatic wash. There also are hand washing facilities for automobiles.

All totaled, Transportation Services' annual budget is $4 million.



PREVENTIVE maintenance is the key to the 22-year careers of some U-M buses, says Leo J. Kennedy, service foreman for the day shift. 'If you stay ahead of it, you don't have any problems," he says. U-M's six new Flxible (that's right, no 'e') buses cost more than $145,000 each.

ANSWERS TO FILM QUIZ ON P. 6

I.
1. A term sometimes used for the director and derived from the megaphone that early film directors used; also, the person who held the megaphone through which silent-film directors barked their orders.
2. Initials printed on a clapboard and indicating the scene was shot without sound. In the early days of sound films, technical personnel were often foreign-born, and the initials stand for "mit out sound," as they might have been spoken by a German-born director or crew member.
3. The head electrician for a production. "Gaffer" is originally a British term for a foreman or boss of a gang of laborers.
4. The assistant to the gaffer — and not always a male.
5. A vehicle equipped to carry cameras, lighting and generator as well as to tow a vehicle that is the subject of the shooting.
6. A sound effect for the murmur of a crowd in the background in which no distinct voices are heard.

II.
1-D; 2-B; 3-A; 4-C.

III.
1-D First used in *The Seventh Voyage of Sinbad* (1958) and last used in *Clash of the Titans* (1981), this technique combined live action with stop-motion animation.
2-C Dramatic lighting that emphasizes shadows and highlights — the term was facetiously coined by deMille for his *The Warrens of Virginia* (1915).
3-H Dreamlike, improvisational films that feature the filmmaker and his or her psychological conflicts within the work, as in Deren's *Ritual in Transfigured Time* (1946) and Anger's *Fireworks* (1947).
4-G Great depth of field, bringing all planes of the image — foreground, middle ground and background — into sharp focus, as in Welles's *Citizen Kane* (1941, photographer Gregg Toland) and Wise's *The Haunting* (1963, photographer David Boulton).
5-A If you read the article, this one was easy.
6-F Cutting between two or more related actions occurring simultaneously at different locations, or occurring at different times. Early examples appear in Porter's *The Life of an American Fireman* and *The Great Train Robbery* (both 1903) and Griffith's *The Lonely Villa* (1909) and *Intolerance* (1916).
7-B As in *Greed* (1923), *Los Olvidados* (1950), *The Big Heat* (1953) and *Pickup on South Street* (1953), respectively.
8-E Chabrol's *Le Beau Serge* (*Bitter Reunion*, 1958), is considered the first of these films, but Truffaut's *The 400 Blows* (1959) and Godard's *A bout de souffle* (*Breathless*, 1959), are better-known examples.

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SYMBOLISM AND NOMENCLATURE can be confusing when you're somewhere in Asia, speculating on the mass-production of collegiate clothing for a faraway university with a strange mascot like the wolverine. But perhaps in the world of anti-matter, there is *a Michigan University, one with the gumption — or misfortune — to identify itself with Mickey Mouse. (Photo by Peter Yates)*

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