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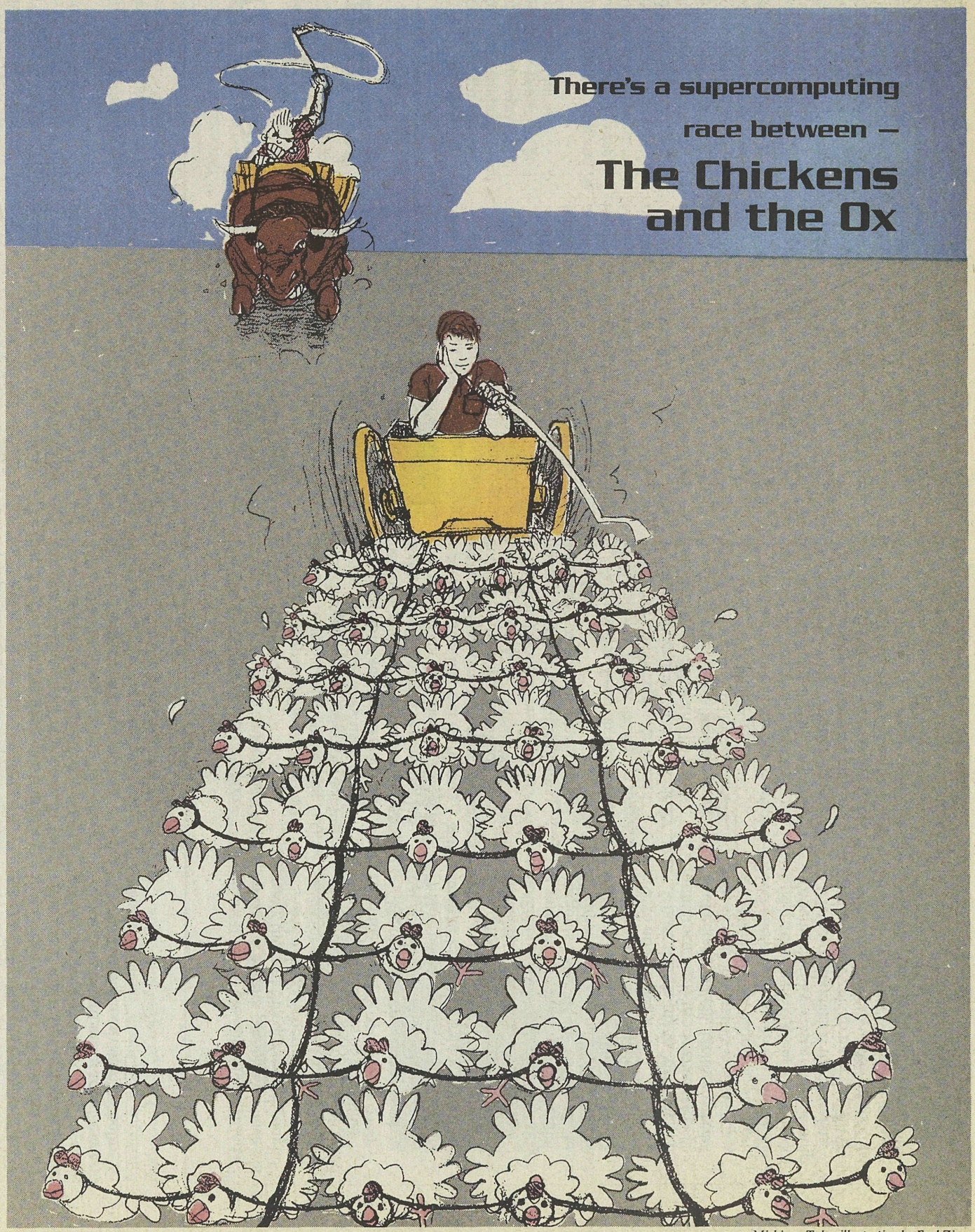

Michigan Today illustration by Fred Zinn

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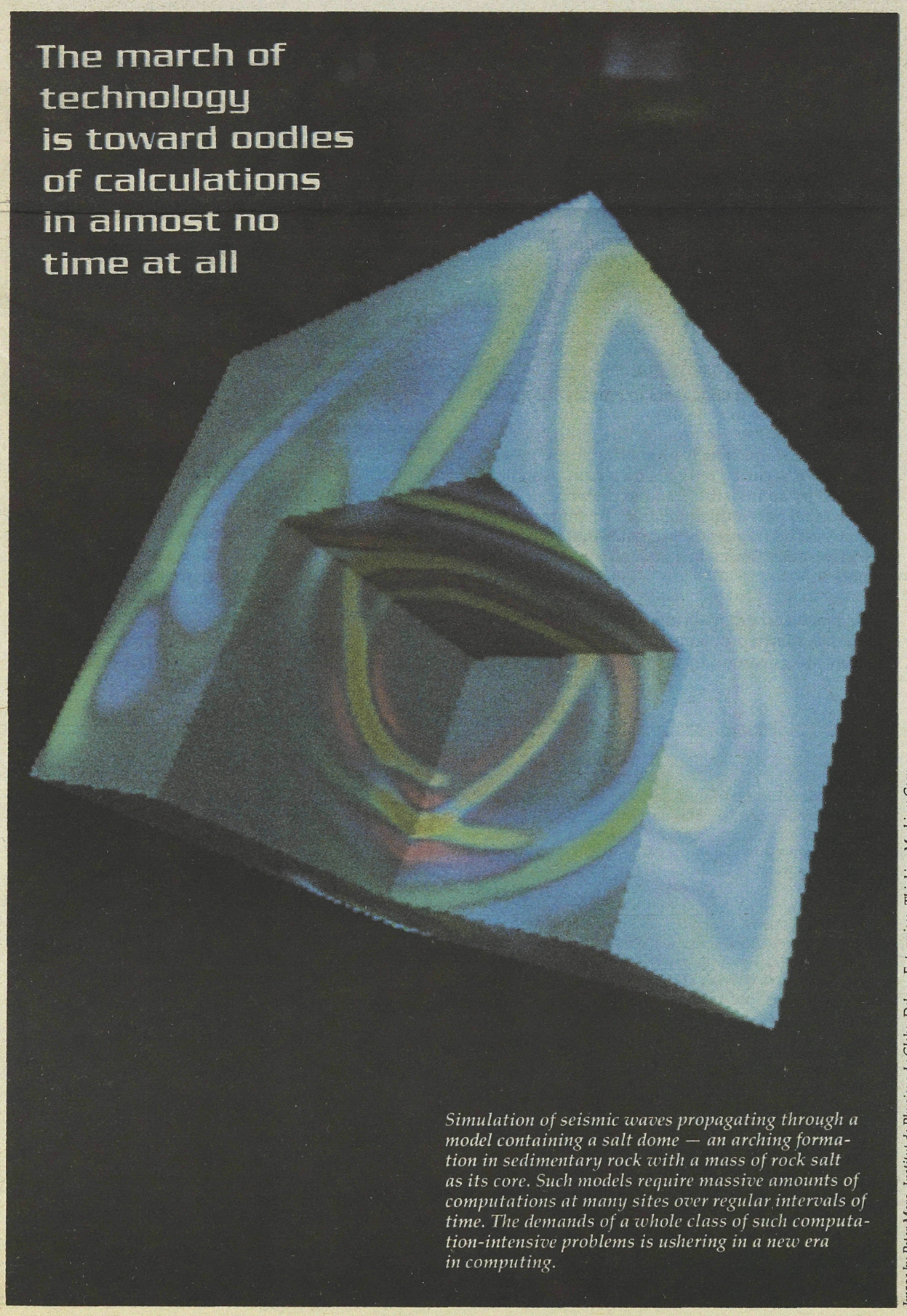
The Ways of Counting



Simulation of seismic waves propagating through a model containing a salt dome — an arching formation in sedimentary rock with a mass of rock salt as its core. Such models require massive amounts of computations at many sites over regular intervals of time. The demands of a whole class of such computation-intensive problems is ushering in a new era in computing.

Image by Peter Mora, Institut de Physique du Globe, Delany Enterprises, Thinking Machines Corp.

By Philip Emeagwali

HUMAN COMPUTING

"Can you do addition?" the White Queen asked. "What's one and one and one and one and one and one and one and one and one and one?" — Lewis Carroll, *Alice Through the Looking-Glass.*

The word "computer" is often thought to have been coined with the advent of the first electronic computer in 1946. Actually, according to Webster's dictionary, the earliest recorded use of "computer" came exactly 300 years earlier, in 1646.

From the 17th century until the turn of the 20th century, the term was used to describe people whose jobs involved calculating. In his 1834 book *Memoirs of John Napier of Merchiston,* Mark Napier wrote: "Many a man passes for a great mathematician because he is a huge computer. Hutton and Maseres were great calculators rather than great mathematicians. When their pages were full of figures and symbols, they were happy. [John] Napier alone, of all philosophers in all ages, made it the grand object of his life to obtain the power of calculation without its prolixity."

Human computers have both strengths and weaknesses. We humans have great powers of reasoning. Most of the things we do come from knowledge that we have developed culturally or that we have learned as so-called common sense rules. We also have great tolerance for ambiguity. Confronted with a sentence that has several possible interpretations, humans can choose the correct interpretation for the given context. Humans also have the capacity of categorization, such as identifying and classifying birds, understanding regional variations in accented speech and so on.

At the same time, we are unable to perform more than one calculation at a time (sequential computing). We compute at a very slow rate, and with a very small memory. Even worse, our limited memory sometimes causes us to forget intermediate results and thus to fail to reach solutions. We need to write down many intermediate results and can use only simple procedures to solve mathematical problems.

Since the human computer preceded the electronic computer, and since humans developed the electronic computer, we created it in our own image. This means early electronic computers reflect our limitations. Just as the human computer has only one brain, so the early electronic computers had only one processor. Since our brain can perform only one calculation at a time, most computers were built to perform only one calculation at a time.

The world's first large-scale general-purpose electronic computer, the ENIAC (Electronic Numerical Integrator And Computer), was designed with only one processor. (Michigan's Arthur W. Burks, professor emeritus of electrical and computer science, helped design and build ENIAC. A model of ENIAC, which was operated from 1946 to 1955, stands on display in the Electrical Engineering and Computer Science Building on North Campus.)

One of the primary problems that motivated the design of ENIAC was to calculate the trajectory of ballistic missiles at the U. S. Army's Ballistic Research Laboratory in Aberdeen, Maryland. Before the invention of ENIAC, Army engineers used 176 human computers to perform the calculations needed to produce firing and bombing tables for gunnery officers. Such calculations must be sequential, and therefore they mapped well onto the early electronic computers with their sequential processing.

Another example of a technology matched to the human image is robotics. Early robots tended to have arms and/or legs and one centralized brain. This design has shifted recently to one in which robots now have a network of small, simple brains (or processors), each devoted to a single job such as lifting an arm.

As mathematical reasoning progressed, however, it became apparent that sophisticated mathematical techniques suited for electronic computing diverged from those suited for the human brain. For example, the 10-based decimal system has proven to be the best for human computers, while the binary system based on the number 2, although too awkward for humans, is a natural match for electronic computers, where strings of bits with values of either 0 or 1 are used to store data.

COMPUTATION-INTENSIVE PROBLEMS

"'Firstly, I would like to move this pile from here to there,' he explained, pointing to an enormous mound of fine sand, 'but I'm afraid that all I have is this tiny tweezers.' And he gave them to Milo, who immediately began transporting one grain at a time." Norton Juster, *The Phantom Tollbooth.*

As mathematics progressed, the tasks undertaken by human computers grew increasingly complex. By the late 19th century, certain calculations were recognized as outstripping the calculating capacity of hundreds of human clerks.

The 1880 United States census posed one of the biggest computational challenges of that time. To analyze the 1880 census results, the U.S. government employed an army of clerks (called "computers") for seven years. The population changed significantly during those seven years, however, rendering the results out of date before they were published. More timely results could have been obtained by employing even more clerks, but that would have been too costly.

WORKING IN PARALLEL

The human computers worked independently and simultaneously on the 1880 census data to produce numerous and voluminous sets of tables. In the field of computation their method is termed "working in parallel." It was the best technique known at that time, but since the results were still unacceptably slow in coming, the Census Bureau held a competition to find a more effective way to count the population. This competition led to the invention of Hollerith's Tabulating Machine, which was subsequently used to compute the U.S. population more accurately in 1890.

A DRAG STRIP FOR COMPUTERS

The century-old idea of holding a competition to solve computation-intensive problems was revived in 1986 by the Institute of Electrical and Electronics Engineers Computer Society with its annual Gordon Bell Prize Competition. As in 1890, competition has spurred advances in computing.

The solution of important computation-intensive problems, like those required in weather-prediction, demand the calculation of trillions, quadrillions and even more calculations, whether by human or mechanical or electronic devices. Solving these problems one at a time or in a step-by-step fashion is analogous to moving a pile of sand one grain at a time. It takes forever.

Fortunately, many computation-intensive problems do not have to be performed one step at a time. In fact, performing thousands and even millions of calculations at the *same* time is the only way to solve many computation-intensive problems quickly enough for the results to do some good. The latter approach is called massively parallel computing — but with machines instead of the human computers that used this system in the 1880s.

NATURAL PARALLELISM

Researchers are now learning that many problems in nature, human society, science and engineering are naturally parallel, that is, they can be effectively solved by using mathematical methods that work in parallel. These problems share the common thread of having a large number of similar "elements" such as animals, people and molecules. The interactions between the elements are guided by simple rules but their overall behavior is complex.

An individual ant is weak and slow, but ants have developed a method of foraging for food together with other ants. Their massively parallel approach is well described by the scientist and writer Lewis Thomas in *Lives of a Cell:*

"A solitary ant, afield, cannot be considered to have much of anything on his mind; indeed, with only a few neurons strung together by fibers, he can't be imagined to have a mind at all, much less a thought. He is more like a ganglion on legs. Four ants together, or 10, encircling a dead moth on a path, begin to look more like an idea. They fumble and shove, gradually moving the food toward the Hill, but as though by blind chance. It is only when you watch the dense mass of thousands of ants, crowded together around the Hill, blackening the ground, that you begin to see the whole beast, and now you observe it thinking, planning, calculating. It is an intelligence, a kind of live computer, with crawling bits for its wits."

Massive parallelism can also be found in human society. We see it in wars, elections, economics and other endeavors characterized by the simple, independent and simultaneous actions of millions of individuals. This parallelism is so natural that people aren't even aware of it. Adam Smith described it in *The Wealth of Nations:*

"Every individual endeavors to employ his capital so that its produce may be of greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is in this led by an invisible hand to promote an end which was no part of his intention. By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it."

In science and engineering the common thread that makes many problems naturally parallel is that they are governed by a small core of physical laws that are *local* and *uniform*. Local means that to know the temperature in say, Detroit, in the next few minutes, we only have to know what is happening right now in the nearby suburbs of Detroit. Uniform means that the laws governing weather formation in Detroit are the same as in Timbuktu, Vladivostok or anywhere else.

In weather forecasting five uniform and local laws are used: conservation of mass; conservation of momentum; the conservation equation for moisture; the first law of thermodynamics; and the equation of state.

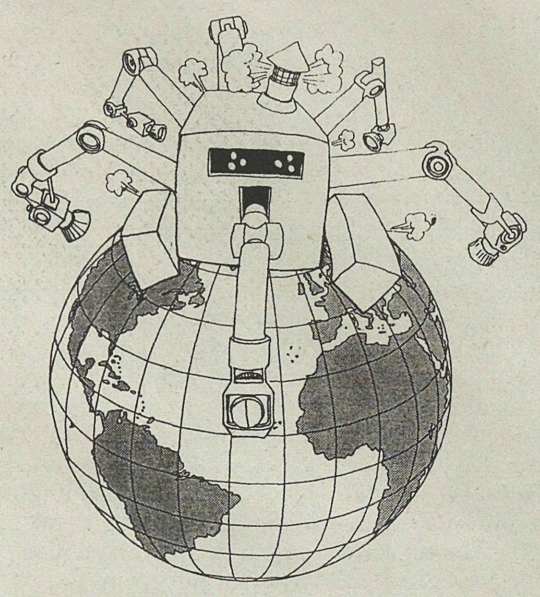
CHALLENGES IN COMPUTING

Constructing and running a computer model with the level of spatial resolution required for accurate computer-based weather forecasting takes quadrillions of arithmetical operations. Yet even this spatial resolution is too coarse to image tornadoes and other damaging local weather phenomena.

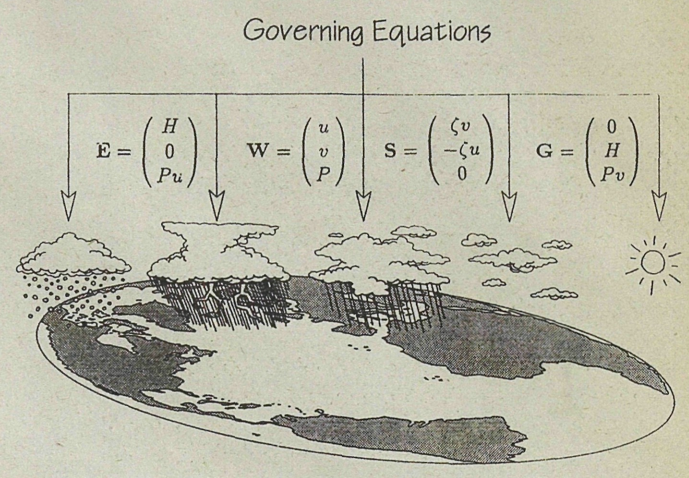
To improve the spatial resolution so that it images local weather increases the amount of calculation required by 10s of times, and consequently makes the original problem computationally intractable even for a modern supercomputer.

The U.S. government has identified weather forecasting as one of 20 computation-intensive

Why the chicken is



Quadrillions of calculations are needed to model Earth's climate. A conventional supercomputer (diagram #1) tries to use one processor to perform the quadrillions of calculations. It's very powerful, but not powerful or fast enough to complete the calculations in time to yield a useful forecast of approaching weather.



The natural laws governing Earth's weather — and the mathematical equations derived from those laws — operate at all locations in our atmosphere, and in the same way (diagram #2). Therefore, the quadrillions of calculations required to solve weather equations are distributed evenly throughout the globe, whether the climatic conditon is a blizzard in Boise, a thunderstorm in Oslo, torrential rains in Bangladesh or bright sun over Harare. When a natural law applies to all locations in the same way, the problem is inherently massively parallel.

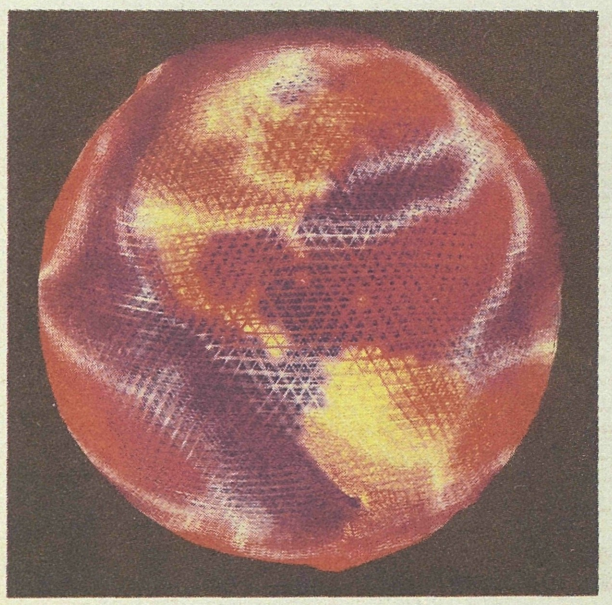


Image courtesy of Harold Trease, Los Alamos National Labs; Delany Enterprises, and Thinking Machines Corp.

Climate Modeling: Using a Connection Machine supercomputer, scientists at Los Alamos National Labs are modeling Earth's climate. They stretch a mesh of 500,000 tetrahedrons over a model of the globe, then compute changes to the weather in each cell. Every tetrahedron spans an area of about 20 miles.

To gain accuracy, the mesh actually stretches out over areas of calm weather, but twists and bunches up around local disturbances like hurricanes. Red areas indicate high kinetic activity; land-masses are yellow; low and lowest areas of activity are whitish and purple, respectively. The technique was first developed to model explosions.

The advantage of a massively parallel computer like the Connection Machine is that after one processor is programmed to calculate such weather variables as pressure, temperature, humidity and wind-speed for its tetrahedron, the computer does the rest, directing the other processors to calculate the variables at the remaining half-million locations at discrete intervals.

In *The Mathematics of Chaos*, Ian Stewart compares numerical weather prediction to a three-dimensional chess game. The tetrahedral grids form the board, the numerical values assigned to weather variables are the pieces, and tomorrow's weather corresponds to a position of the game. The governing rules are the equations of motion of the atmosphere.

And the outlook for tomorrow is . . .

Computing the Weather

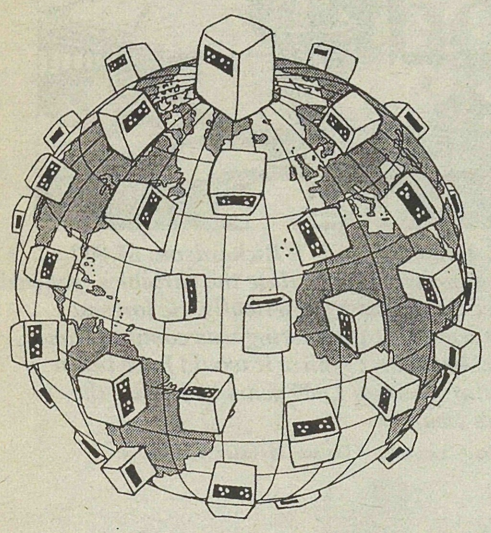
'The answer, my friend, is blowin' in the wind'

Perhaps Bob Dylan is right when he sings, "You don't need a weatherman to tell which way the wind blows." But you certainly need considerable expertise to know which way it will be blowin' tomorrow or a few days hence, how strong its blast will be, where it is likely to turn and what damage it is capable of doing.

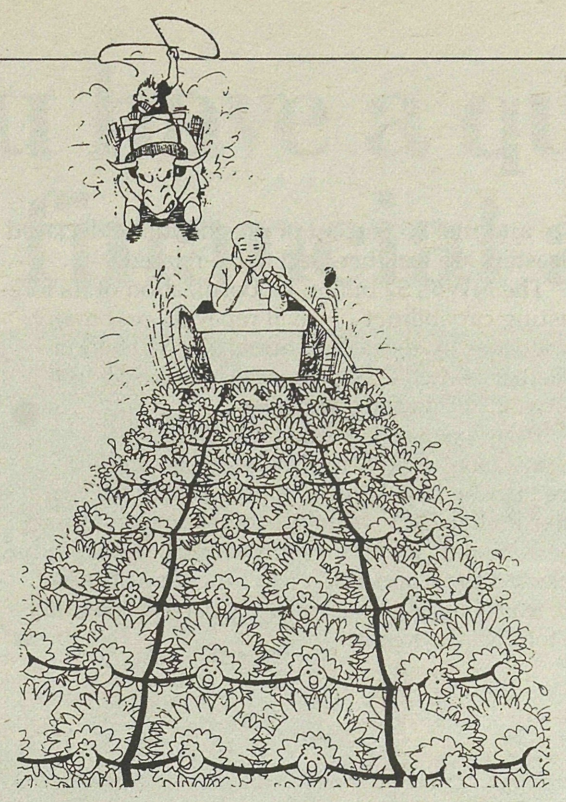
Throughout history, people have attempted to predict the weather — usually with little success. In the Middle Ages it was believed that the weather could be forecast by studying the motions of the stars, the behavior of wildlife or the condition of certain plants. Today, some people still rely on the *Farmer's Almanac,* which uses a 200-year-old "secret formula" and "calculations based on solar activity."

English meteorologist Lewis Frye Richardson,

avored over the ox



The architecture of a massively parallel computer is designed to match the computer with the problem. To perform calculations in weather prediction, a massively parallel computer assigns different locations around the globe to different processors inside the computer (diagram #3). Today, the most powerful massively parallel computer has 64,000 processors. A massively parallel computer with a million processors is under construction.



The cart pulled by the ox (diagram #4) represents a conventional supercomputer. Intuition might lead one to think that the bull can outperform the cart pulled by a multitude of well-trained, harnessed chickens. But the coordination of many smaller units results in better performance. Similarly, a massively parallel computer is faster and more powerful than a conventional supercomputer.

"grand challenges." Others include improving extraction of oil deposits, modeling the ocean, increasing computers' skill at understanding human speech and written language, mapping the human genome, and developing nuclear fusion. Many other problems in mathematics would take trillions of years to solve with the faster computers currently available.

EXPLOITING PARALLELISM: A PARADIGM SHIFT

Seminal ideas in science usually occur in a process that has been described as a series of paradigm shifts, that is, a shift in the dominant patterns or examples which humans use in thinking or portraying "how things are." A well-known example of paradigm shift is the transition from the belief that the Earth is flat to the belief that it is round. With this paradigm shift, Magellan became aware that he could travel around the globe.

If only one human computer had been used to analyze the 1880 census, the work would have taken forever to complete. Similarly, if only one computer were used to solve a computation-intensive problem of today, it would take forever to complete it. This paradigm of using one computer to solve a problem is called *sequential computing*.

We are now living through a great paradigm shift in the field of computing, a shift from computing in the image of the human brain (sequential computing) to massively parallel computing, which employs thousands or more computers to solve one computation-intensive problem. Just as a paradigm shift in the belief about the shape of the Earth led to routine circumnavigations on the high seas, we will soon routinely solve important societal problems that are so computation-intensive that we had previously only dreamed of attempting them.

Examining the roots of this paradigm shift will show why continuing efforts to solve computation-intensive problems with sequential computers will succeed only as well as the early aircraft did by attempting to fly by flapping bird-like wings.

Since many computation-intensive problems are inherently parallel, it only makes sense to build and use a computer that exploits their inherent parallelism. Such a computer will give the best performance when it "looks" like the inherently parallel problems that it is trying to solve. The problems — such as modeling atmospheric conditions, as discussed earlier — arise from myriad simple interactions between thousands or millions of elements. As a result, the total calculations required carry us into the realm of "teraflops" computing.

TERAFLOPS — HARDLY A DINOSAUR

"Teraflops" may sound like the name of a dinosaur, but it does not describe extinct creatures, rather a level of computing yet to be achieved — computing on the *trillionfold* level. The Holy Grail of large-scale computation is to attain a sustained teraflops rate in important problems.

As Elizabeth Corcoran put it in January's *Scientific American*, "From the perspective of supercomputer designers, their decathlon is best described by three Ts — a trillion operations a second, a trillion bytes of memory and a data communications rate of a trillion bytes per second."

The effort to increase computing speed is an old one. It is the primary motivation that led to the invention of the abacus, logarithmic table, slide rule and electronic computer. However, these devices share one fundamental limitation: they are based on sequential computing, and thus are subject to the speed limits imposed by computing singly. As a result, some investigators now believe that massive parallelism is the only feasible approach that can be used to attain a teraflops rate of computation. Only massive parallelism allows us to perform millions of calculations at once.

The most massively parallel computer built so far, known as the Connection Machine, uses 64,000 processors to perform 64,000 calculations at once. This approach makes it 64,000 times faster than using one processor.

The Connection Machine has attained computational speeds in the range of five to 10 billion calculations per second. The next generation of the Connection Machine is expected to use one million processors to perform one million calculations at once. That could make it one million times faster than using a single processor. The target computational speed for this machine is one trillion calculations per second.

Massively parallel computers also have properties that make them far less costly than conventional computers. When the number of processors are doubled, the performance doubles, but the cost increases only by a few percentage points, since many components are shared by all the processors.

A massively parallel computer also runs cooler than a conventional supercomputer. You can rest your hand on it while it runs; it doesn't require the $10,000-a-month energy bills needed to keep a mainframe supercomputer from overheating.

We have come a long way from the individual with an abacus to today's massively parallel computers. The motivation along the path from then to now has been the existence of computation-intensive problems requiring computing resources of larger magnitude than those available.

Despite humanity's great progress in computing, the national grand challenges compiled by the U.S. government identify computation-intensive problems that will inspire us to find even more new ways of computing. In five years, we should be computing at the teraflops level. It will be fascinating to see what achievements and new challenges will come after that. MT

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a pioneer in mathematical weather prediction, was the first investigator to understand the computation-intensiveness of weather forecasting.

The following passage from Richardson's *Weather Prediction by Numerical Process*, published in 1922, illustrates his farsightedness. It is a description of a huge amphitheater filled with "64,000 computers to race the weather of the whole globe." (In Richardson's day, "computer" still referred not to a machine but to an individual using an abacus, logarithmic table or slide rule. Here is Richardson's vision of the assemblage of computers needed to predict the weather mathematically:

"Imagine a large hall like a theater, except that the circles and galleries go right round through the space usually occupied by the stage. The walls of this chamber are painted to form a map of the globe.

"Myriad computers are at work upon the weather of the part of the map where each sits, but each computer attends only to one equation or part of an equation. The work of each region is coordinated by an official of higher rank. Numerous little 'night signs' display the instantaneous values so that neighboring computers can read them. Each number is thus displayed in three adjacent zones so as to maintain communication to North and South on the map.

"From the floor of the pit a tall pillar rises to half the height of the wall. It carries a large pulpit on its top. In this sits the man in charge of the whole theater; he is surrounded by several assistants and messengers. One of his duties is to maintain a uniform speed of progress in all parts of the globe. In this respect he is like the conductor of an orchestra in which the instruments are slide rules and calculating machines."

Several features of Richardson's giant computer with human components correspond to the fastest and most powerful supercomputer known today, the Connection Machine, designed by Danny Hillis of Thinking Machines Corporation of Cambridge, Massachusetts. The similarities include the following:

- The 64,000 human computers of Richardson's vision are analogous to the 64,000 processors of the Connection Machine.
- The slide rules and calculating machines that increased computational speed in Richardson's era are analogous to the "floating-point accelerators" of modern computers.
- The "myriad computers at work upon the weather of the part of the map where each sits," can be described as *mapping* and *load distribution* in the Connection Machine.
- Richardson's concept that "each computer attends only to one equation or part of an equation" is known today as *local computation*.

Richardson's vision was bold and wonderful because he understood that weather forecasting is computation-intensive and envisioned massive parallelism as a useful tool in solving weather equations.

What Richardson did not foresee, however, is that accurate weather forecasts would require about a quadrillion (1,000,000,000,000,000) calculations. In fact, it would have taken his 64,000 human computers more than 1,000 years just to forecast the next day's weather!

Each processor in the Connection Machine has far greater computing power than one human computer. Collectively, the 64,000 processors of the Connection Machine can solve the equations that govern weather forecasting at a rate surpassing six billion calculations per second, or two days.

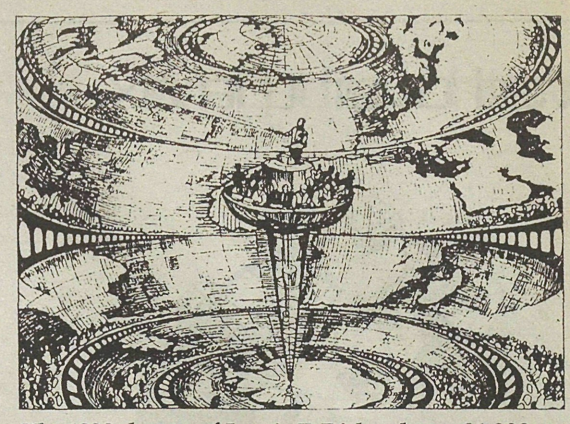
Weather Continued

The analogy between Richardson's vision and the contemporary use of computers for weather forecasting is of more than historical interest. Huge social and economic benefits could be achieved if massively parallel computing leads to more accurate weather forecasts. Accordingly, the President's Office of Science and Technology Policy included weather forecasting as one of 20 national computational Grand Challenges in science and engineering.

Citing the benefits to be gained from more accurate weather forecasting, Elbert W. Friday, director of the U.S National Weather Service noted in an address to the 18th annual Computer Science Conference that the United States has more violent weather than any country of comparable size and that 85 percent of presidentially declared disasters are weather- and flood-related.

"The NWS's $2 billion modernization of its forecasting capabilities . . . will repay its cost many times over by reducing annual $30-$40 billion weather-related U.S. economic losses by 5 to 10 percent," Friday added.

Friday's remarks would have delighted Richardson, who was dismissed as an idle dreamer by his contemporaries. Today, 70 years after Richardson wrote his mathematical fantasy, the National Center for Atmospheric Research has selected the Connection Machine for a study of the feasibility of using massively parallel computers to forecast the weather. MT



The 1922 dream of Lewis F. Richardson: 64,000 human computers to calculate the variables required to predict the weather numerically. He foresaw that mathematical forecasting was computation-intensive, but didn't realize it would have taken his calculating army 1,000 years to predict the next day's weather.

Illustration by A. Lannerback, **Dagens Nyheter,** *Stockholm.*

Grad student Philip Emeagwali —

One of the world's fastest humans

By John Woodford

Faster supercomputers are needed to solve important scientific and engineering problems. Computing twice as fast would be impressive; ten times faster would be even more impressive.

Philip Emeagwali, a doctoral candidate in scientific computing in the College of Engineering and the 1989 recipient of the Gordon Bell Prize for his supercomputing research, has increased the speed of a massively parallel supercomputer to as much as 1,000 times faster than a mainframe computer and 1,000,000 times faster than a personal computer.

Almost as impressive as its speed of operation is the massively parallel computer's thrift. It costs only about one-fiftieth of the money to perform computations on a massively parallel computer as on a conventional supercomputer.

"The supercomputer industry and much of the academic establishment have claimed that massively parallel computers were suited only for certain types of problems," Emeagwali says. "But in the past few months, reports at scientific gatherings and in the news media have indicated that some investigators using the Connection Machine — the largest massively parallel supercomputer now available — have proved the establishment wrong."

Emeagwali had already been looking at computation-intensive problems from a theoretical standpoint. When he learned of a $1,000 prize offered by the Institute of Electrical and Electronics Engineers Computer Society for the fastest computation in a scientific and engineering problem requiring trillions of calculations, he decided to compete.

Emeagwali studied the U.S. government's list of the 20 most computationally difficult problems. The one that interested him most involved calculating oil flow. Even before the onset of war in the Persian Gulf, American experts recognized the importance of improving the efficiency of oil extraction.

"The oil industry purchases 10 percent of all supercomputers and is keenly aware of the difficulty of computing oil-field flow," Emeagwali says.

Oil has properties that make calculating its flow patterns within an oil field more difficult than modeling the flow of groundwater. To model oil-field flow in a computer requires simulation of the distribution of the oil at tens of thousands of locations throughout the far-flung field. At each location, the computer must be programmed to make hundreds of simultaneous calculations at regular intervals of time to determine such variables as temperature, direction of oil flow, viscosity, pressure and several geological properties of the basin holding the oil.

"Even a supercomputer working at the rate of millions of calculations a second is far too slow to reach a result that can be acted on in a timely fashion," Emeagwali explains. "The oil companies need the results quickly enough to decide how to recover the maximum amount of oil."

Since an average of only about 30 percent of oil is recovered in an oil field, Emeagwali notes, "It's easy to understand why the industry is keenly interested in more accurate simulations of oil flow. An improvement to even a 31 percent recovery rate — just one percentage point — translates into billions of dollars of savings."

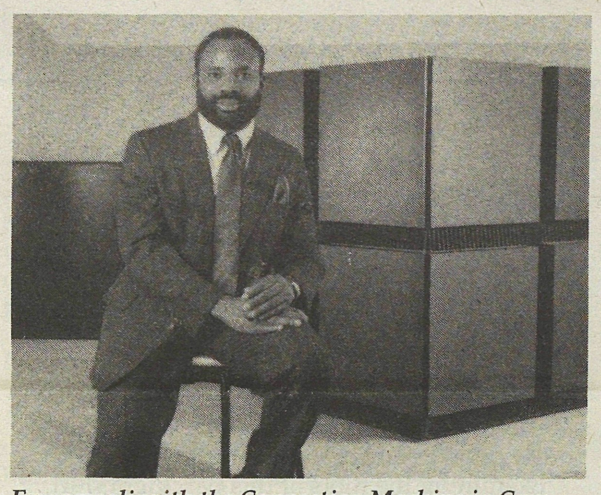


Photo by Jon Chomitz for Thinking Machine Corp.

Emeagwali with the Connection Machine in Cambridge, Massachusetts. Massively parallel computers are a young technology. Only a few universities have acquired their own models. The U-M is now considering venturing into this field, Emeagwali says.

Emeagwali attracted the attention of many industries and investigators when he won the Gordon Bell Prize by showing how he used a $6 million massively parallel computer to perform the trillions of oil field-modeling computations at three times the speed of the mightiest $30 million supercomputer. He hit a computational speed of 3.1 billion calculations per second.

How did he do it? It took some creative mathematical thinking for Emeagwali, who was renowned for mathematical prowess even as a child in Nigeria, to hit upon a "new" technique that resurrected some equations that had grown dusty in the computing field for 50 years.

Rather than use the equations that have been used throughout the century to calculate oil-field flow and similar phenomena, Emeagwali asked himself, "When did we start using these equations, and why did we start using them?"

He researched those questions and learned that in the late 19th century "a type of partial differential equation similar to the classical 'heat equation' was derived to perform the kinds of calculations required to describe oil-field flow."

There are three families of partial differential equations — elliptical, parabolic and hyperbolic. The equations usually used to simulate an oil reservoir fall into the parabolic category. Oil reservoir equations take into account three of the four major forces affecting flow: pressure, gravitation and viscosity (or drag). They ignore the fourth force — inertia (or acceleration).

In 1938 a Soviet mathematician, B.K. Risenkampf, derived a set of partial differential equations that included the fourth force. The Risenkampf equations belong to the hyperbolic category.

Until the invention of the massively parallel computer, it made no sense to try to apply Risenkampf's equations to problems like oil-field flow; it would have taken too many computations for existing computing technology — from calculating machines to supercomputers.

"The fourth, or inertial, force affecting the slow flow of oil in the ground is about 10,000 times smaller than the three other forces," Emeagwali explains, "so neglecting inertia didn't result in much error even though the solutions still resembled those of the parabolic equations.

"If I put 10,000 dollar bills on the table in ones and you take a dollar, I'm not likely to detect and report the crime. In the same way, it was reasonable to ignore the inertial force back then."

Emeagwali had become interested in the Risenkampf equations while working at the National Weather Service, and decided to take a "top-down approach" by seeing if the hyperbolic equations would result in a better model of oil-field flow.

"I knew that hyperbolic equations result in solutions that more accurately reflect the real world," Emeagwali says, and so he expected them to yield a better representation of the real properties of oil-field flow.

Even though they are more complex, Emeagwali theorized, hyperbolic equations would open "a shorter and quicker path" to the solution of modeling flow. And in terms of his academic goals, using hyperbolic equations on a massively parallel computer would show that "calculations that could take months, even years, to perform on a personal computer could be done in seconds or minutes.

"If we had massively parallel computers a hundred years ago," Emeagwali continues, "we would have used hyperbolic equations instead of parabolic. The serial computer hardware we have today reflects the absence of a need to go the hyperbolic route. But once you have a certain kind of hardware, it reinforces the methods you've used. It's not that anyone is to blame for it, but in a sense computers have developed down a blind alley."

In the future, Emeagwali says — and the very near future at that — the architecture of massively parallel computers like the Connection Machine will trickle down to the personal computer level. They will increase realism in what computer buffs call artificial reality (AR).

More important for civilization will be the impact of massive parallelism at the supercomputer level. Emeagwali expects to see quite soon "automakers using these computers to fully simulate car crashes on the computer rather than crashing expensive rigged-out models at up to $750,000 a test."

In medicine, "Investigators will find that using computers based on the technology of massive parallelism will permit them to study human diseases by studying humans without compromising human health, instead of using mice, chimpanzees and the like."

"Any way you look at it," Emeagwali concludes, "the computer industry will have no choice. They will have to switch to massive parallelism."

Emeagwali hopes to give the industry a big nudge in early 1991 if his latest submission for the international computing contest is as convincing as last year's.

"I'm trying to prove that we now know how to reach the Holy Grail of computing — computing at the teraflops level by performing trillions of calculations in a second" [see main article].

Emeagwali says massively parallel supercomputers are approximately five times faster than conventional machines now, but he forecasts that the advantage will approach 100-to-1 in 10 years. If he's right, you can expect radical changes in the computer industry very soon. MT

Do you have a question about financial aid?

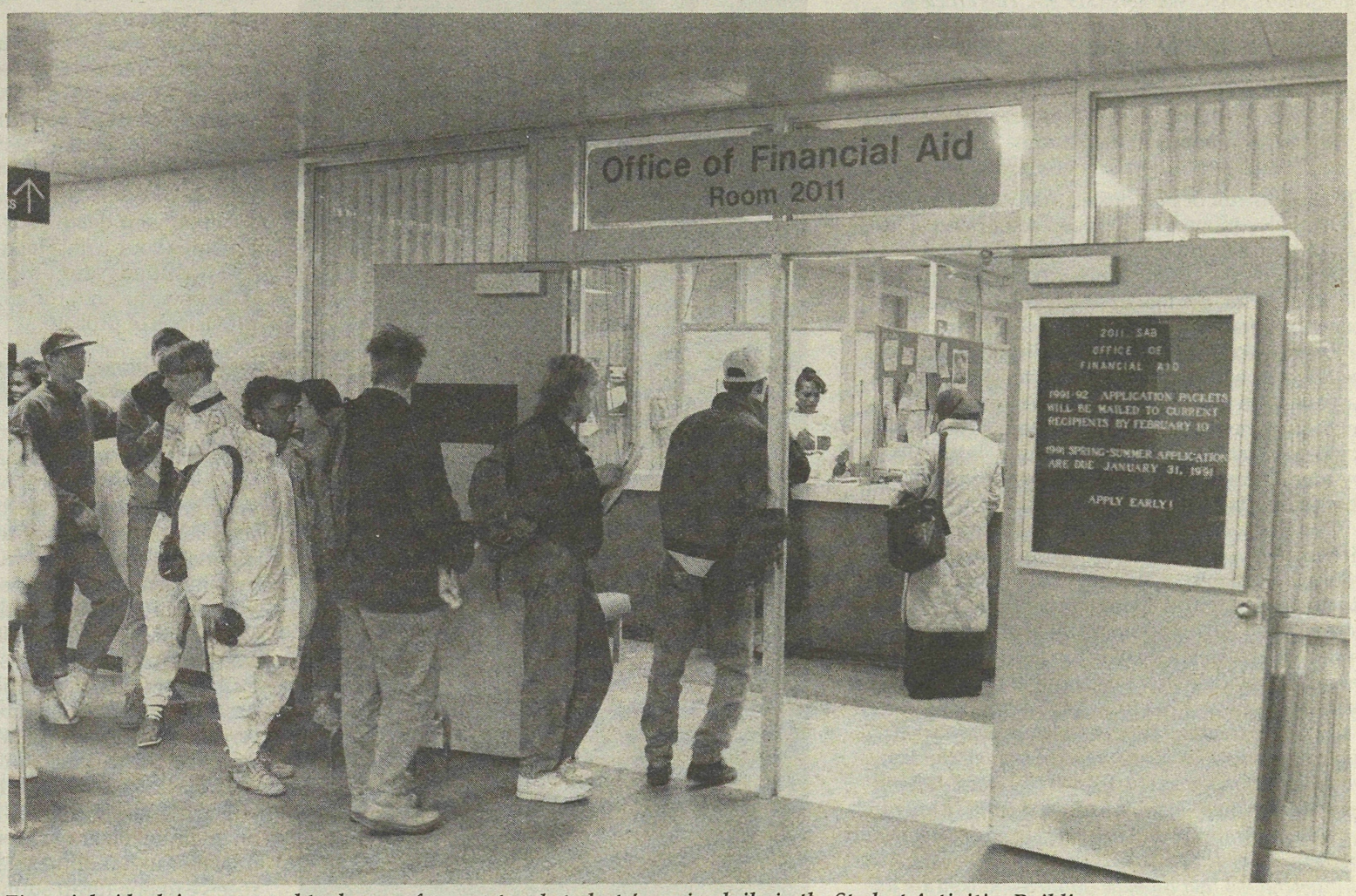


Photo by Bob Kalmbach

Financial aid advisers respond to dozens of parents' and students' queries daily in the Student Activities Building.

By Vivian A. Byrd
Office of Financial Aid

Parents address thousands of queries to the Office of Financial Aid each year. The most frequently asked questions, and brief answers to them, include the following:

What is financial aid?

Financial Aid is the total of resources available to assist students and their families in meeting educational costs. There are two kinds of financial aid — gift aid (grants and scholarships) and self-help aid (loans and Work-Study employment).

How is financial need determined?

Need for aid equals the total cost of education for an academic year minus the amount that a family is deemed able to contribute.

The family contribution has two parts: the parental contribution and the student contribution. The parental contribution is an estimate of how much parents can afford to pay toward costs for the year. It is based primarily on parents' income and assets. The student contribution is based on student income, savings and checking accounts. The amounts of both the student and the family contributions are derived from a uniformly applied formula prescribed by the U.S. Department of Education (DOE).

If your family contribution for a given academic year is less than the cost of attending, you have shown "demonstrated financial need" and may be eligible to receive financial aid. Cost includes tuition, fees, books and all living expenses.

Part of our family's savings are separated for retirement. Why should we have to use those assets to send our children to school?

In assessing financial need, the financial strength of the family is considered. Thus, current income as well as assets are used in the analysis. Allowances, based on the age of the parents, are made for retirement needs. The amount of assets "protected" for retirement increases as the parent approaches retirement age.

I have divorced and remarried, and have custody of our college student. Do I have to include my new husband's income along with my own on the Financial Aid Form?

The income and assets of all family members must be reported to be considered for financial aid. The family would include the custodial parent and his or her spouse. The income and assets of the non-custodial parent are not included in the analysis.

I'm not going to claim my child this year as a dependent. Will you treat her as independent?

The criteria for independent status are complex. A decision not to claim a child is insufficient in itself to give a student independent status.

There are, however, some straightforward circumstances under which the student is considered independent, such as being 24 years old or a graduate student. For younger undergraduate students, the criteria for independent status include assessment of the students' available resources during specified periods of time and whether parents claimed them as dependents. Since this is a complex issue, discussion with a financial aid officer is advised.

Next year I will have two children at U-M. Will I have to pay double the parental contribution?

No, the parental contribution derived from the DOE formula is based on annual income and assets, and is the amount the family should be able to afford for educational expenses. If a family has two children in school, the amount would be divided by two, one-half available for each of the two children. If there are more than two children in school at one time, the amount would be divided by the number of dependent children in college.

When do I have to pay the parental contribution to the University and where do I pay it?

The parental contribution is not a fee to be paid to the University. It represents assistance from the family to the student during the year and can be applied toward tuition, room and board costs, or to other expenses.

Does my child have to accept the Work-Study part of the financial aid award? I really don't want him/her to work while at school.

Some parents worry that work will interfere with academic performance. Studies have demonstrated that the opposite is true. Many students begin building a professional resume through Work-Study jobs, most of which are funded for eight to 16 hours a week with flexible hours to accommodate the student's class schedule.

Some jobs currently available are laboratory assistant in the Department of Chemistry, assistant teacher for Community Day Care, and clerk for the University's News and Information Services. Often a job during the semester adds structure to a student's schedule, making it easier to budget time. Since the alternative to working is often borrowing, it is wise to explore Work-Study.

How can I get in-state residency for my child?

Residency status is determined at the point of admission. Any appeals to the status must be submitted to the Residence Status and Residence Audit Section of the U-M Registrar's Office.

Although the difference between resident and non-resident expenses is substantial, we consider this cost difference in determining financial need.

What if there's a death, a divorce or a job layoff in our family during our child's matriculation?

We encourage the student or the family to contact us as soon as possible any time there is a significant change in family circumstances. Aid awards may be revised when warranted, and the Office of Financial Aid maintains some resources for responding to emergency situations.

Financial Aid Facts

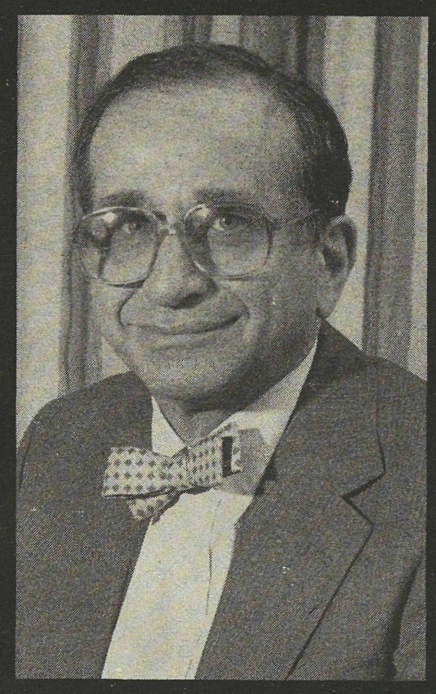
The University currently estimates that the total annual budget for first-year and sophomore in-state students students is $9,700 for tuition, housing, meals, books, fees, travel and leisure, and $10,000 for juniors and seniors.

Any in-state student could qualify for aid up to the amount by which the annual budget exceeds the family contribution. If, for example, an incoming in-state student's family can contribute $3,000, the student would qualify for a combination of grants, loans, Work-Study and scholarships totaling $6,700.

President James J. Duderstadt has emphasized that no in-state student who meets U-M qualifications needs to worry about meeting school costs.

In-state tuition for 1990/91 is $3,366 for first- and second-year students and $3,738 for juniors and seniors. About $4,000 more is figured for room and board; so the difference up to $9,700 is spending money and miscellaneous expenses that vary from student to student.

Leaving Money Wisely



Author, attorney, alumnus David Belin guides families in estate planning

This article is excerpted from several chapters of David W. Belin's Leaving Money Wisely, *published in January by Scribner's Sons, New York ($19.95). This article is copyrighted by the publisher and the author; no portion of it may be reprinted without their permission.*

By David W. Belin

Life is full of paradoxes, many of which involve money. I have been astounded at how many women and men spend lifetimes accumulating money, yet spend so little time in deciding what the fate of their property will be once they are gone.

One does not have to be a multimillionaire to be affected by the federal estate tax laws. Today, anyone with more than $600,000 in assets — including the value of a home, life insurance policy proceeds and retirement plans — is affected by these laws, and millions of Americans fall into this category.

One thing I can guarantee: Whether you are rich or poor, old or young, married or unmarried, you will probably be making a big mistake if you do not have a will or living trust. If that is the course you chose, the state will write your will for you. In some states, here is the kind of a will the law will provide if you have no will or living trust of your own:

If I am married and have children, I leave my surviving spouse one-third of my property and my children two-thirds of my property. If I don't have a surviving spouse or children, I will leave my property to my parents, and if neither parent is living, I will leave it to my brothers and sisters.

I understand that if I have children and they are under 21, guardians will have to be appointed who will manage the property for my children through a guardianship court proceeding until a child reaches age 21, when he or she will get all of his share of the property outright.

If you want your spouse to get more or less than one third of your property, if you want your children to have property held in a way to avoid cumbersome and expensive guardianship or conservatorship proceedings, if you don't want children to get a big lump sum of cash when they reach the age of 21 because you are concerned about whether they can handle it properly, then you better prepare a will promptly. If not, and you die without a will, the laws of the state in which you live will determine where your property goes.

What is a Living Trust?

If you want to leave money wisely, I urge that you consider adopting a living trust. It avoids publicity. It avoids tying up property in probate courts. It avoids executor fees. It substantially reduces legal fees. Perhaps most important of all, a living trust in essence is a posthumous gift to your family, for it can save them a lot of time and effort and avoid the frustration that often comes when one has to deal with the complexity of probate courts.

I have planned my estate in a way to minimize costs, just as I recommend to clients. I have executed a living trust and have transferred all of my assets to that living trust.

My house and my car are not registered in my name. Rather, legal ownership is in the name of the David W. Belin Living Trust.

My checking account is not in my own name. When I sign checks, I merely sign my name, but below the signature line is the word "Trustee," and the actual bank account is in the name of the David W. Belin Living Trust.

Everything I own is in the name of the David W. Belin Living Trust — stocks, bonds, real estate and even household furniture and furnishings.

When I die, since all of my property has been transferred to my living trust, there will be no estate to probate and no need to have ancillary probate proceedings in any state outside of Iowa where I might have a real estate investment. As a result, there will be no executor's fees to pay, and although there will be legal fees to take care of such matters as filing any estate and inheritance tax returns, these fees will be minimized.

My family privacy will also be protected, because no inventory of property will be filed in a probate court, which would let the whole world know the amount of property I own. No one, other than the beneficiaries of my living trust, will know how much money I left to individuals, how much money I left to charities and how I disposed of the remaining part of my estate. There will be no probate of my estate, except for what is called a *pour-over will*, which will cover the contingency that all of my assets may not have been transferred to my living trust.

Since at the time of my death all of my assets, hopefully, will already have been transferred to a living trust, these assets can be sold, new assets can be bought, distributions can be made to my heirs without any delays, and all of the red tape of probate will have been avoided.

The living trust has one other basic advantage. In the event of your temporary or permanent incapacity — through physical or mental illness — the trust instrument continues to own your property, and the other named trustee can manage your affairs without going into court and undertaking any formal legal proceedings in the form of a conservatorship or guardianship.

What does a living trust not do? It does not save federal estate or state inheritance taxes; tax returns still must be filed. It does not save income taxes. It does not avoid valuation problems and tax problems that arise upon one's death and the professional fees necessary to deal with these problems. And, if you're not thorough in transferring all of your property to the trust and leave part of your property outside of the trust, which may necessitate extensive probate proceedings, there may be no material savings of lawyers' fee and other probate costs.

The key provisions to understand are that you can be one of the trustees, you can have all of the income and all of the right to principal during your lifetime, and you can have the right to amend or revoke the trust at any time you desire.

Every single provision that you might want to include in a will can be included in a living trust, for upon your death your living trust in essence becomes your will. The major difference is that it will distribute your property automatically, without going through the cumbersome and expensive provisions of probate.

Psychological Factors

Money holds the promise of providing opportunities to beneficiaries, enhancing their security, imparting responsibility to them and encouraging positive feelings toward you, toward themselves and toward the entire family. But leaving money also carries with it the possibilities of overburdening your beneficiaries, creating an environment in which relatives maneuver or fight with one another, potentially inhibiting motivation and fostering laziness, and even creating or exacerbating feelings of anger, guilt, envy and regret among family members. A litany of books written by unhappy children of wealthy and powerful individuals can testify to the latter.

There is the potential risk associated with a child receiving her or his inheritance outright on attaining legal age. Young people often make mistakes in handling large sums of money they receive in one lump sum, mistakes they would not make if they were older and had more experience. Despite my overall disposition that free choice is a desirable state of affairs, I have seen lots of situations that suggest that young people who receive large amounts of money in one lump sum may dissipate all or a major portion in a relatively short time. Restraints on access to inherited wealth make sense in many instances.

Some Scenarios

Often when clients turn to me for advice as they struggle to resolve these problems, I refer to what I call "Belin Basic Rules One and Two."

Belin Rule Number One: There is more than one right way.

Belin Rule Number Two: When trying to choose among two or more alternatives, consider what you would advise your best friend to do if he or she came to you for advice under similar facts and circumstances.

In a first marriage, the typical will for a married couple with no estate tax problems is usually very simple. Each person leaves all of her or his property outright to the surviving partner. If the spouse does not survive, then the property will go outright to the children or, if none, to brothers and sisters or nieces or nephews. Although this is a very natural and understandable approach, it can result in major problems.

For instance, if a wife and husband (or single parent) are killed in a car accident, and there are children under legal age who survive and there is no trust, the property will generally be managed under the jurisdiction of a court. This is often a cumbersome and relatively expensive proceeding, with the added disadvantage of limited investment flexibility.

Problems can also arise when a couple has no children. If an experienced businessman or businesswoman leaves everything to a spouse, and the spouse is not experienced in handling assets, the property could be mismanaged and conceivably be entirely dissipated. The event of remarriage poses another potential problem: property owned by an inexperienced widow or widower may become subject to the control of the second spouse, which can lead to many negative ramifications.

Related to these scenarios is the question of what happens to property owned by a couple without children when one partner leaves everything to the other. If the husband dies first and the wife receives all the property, on her death the property might very well go to members of

her family — brothers and sisters, nieces and nephews — with none to the family of the husband. Sometimes couples avoid this eventuality by having wills that state that the person who is the second to die will leave the property, half to the husband's side and half to the wife's side.

Here is my overall recommendation, should you have no strong preferences of your own: *Leave your property in a trust*. A well-prepared trust instrument with capable trustees offers protection and flexibility for many possible problems that can arise. Consider making your surviving spouse a co-trustee. Give your spouse all of the income and give the independent trustee the additional power to use whatever principal is needed to provide for the proper care, maintenance and support of your spouse.

Leaving Money Outright To Children Is Not Always Best

In the typical will for a person with children, if there is no surviving spouse because of death or divorce, the property generally is distributed outright to the children.

In many instances this may be fine, but there are situations where this can result in difficulties. We have already discussed problems that can arise when property is left outright to children who are not of legal age. Even when the size of the estate is not large, the astute person with young children will consider putting the property in trust instead of leaving it outright to children. The trust terms can provide that the income can be used for their proper care, support, maintenance and education, and the trustee can be given discretionary power to invade the principal, if necessary. Then, when the children reach an age when the parent thinks they can handle large sums of money, the property can be distributed outright.

Many individuals are naturally concerned about whether trustees would be sufficiently generous in the event that a particular family need arose. My experience is that trustees generally respond liberally in times of need, but I suggest that, if there were any doubt, the trust terms could give the child a right each year to take out 5 percent of the principal.

Another advantage of using a trust arises if a child is divorced. Property owned outright by a child generally becomes part of the property to be divided by the court. On the other hand, if property remains in trust, it is at least partially shielded from claims of the child's spouse.

There is yet another advantage to a trust: It can act as a shield from the psychological pressures exerted by a spouse or other members of a family.

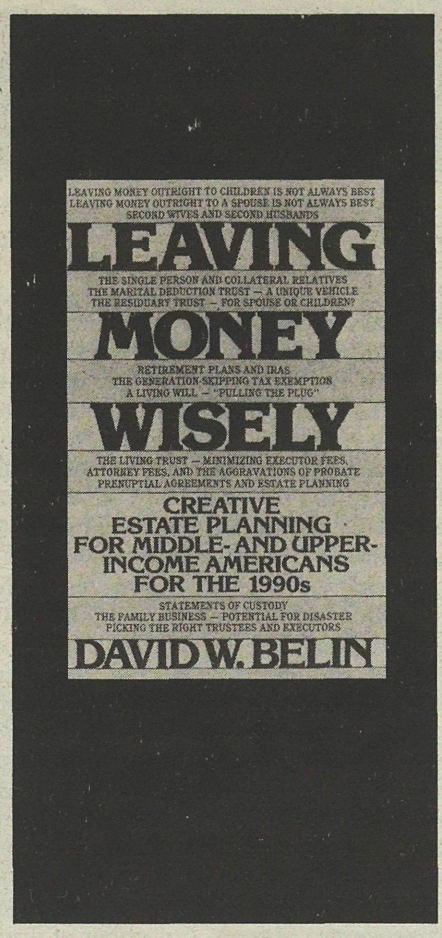
When Should Property Be Distributed Outright to Children?

My own preference is to give a child two or three opportunities to handle a large sum. For example, if a trust were to have $75,000 of principal, instead of having a child get the entire $75,000 in one lump sum at age 21, I might suggest distributing half at 25 and half at 30, or one third at 25, one third at 30, and one third at 35. The undistributed balance can continue to be held in trust, with the income distributed each year to the child. There can also be flexible provision to invade the principal if there are specific needs, such as medical bills, college or post-graduate education costs, a down payment for a house, the purchase of an automobile or household furniture, etc.

All Children Are Not Equal

What do you do when you have three children — a schoolteacher earning $30,000 a year, an ophthalmologist earning $300,000 a year and a graduate student heading toward a business career? Do you divide your property equally among all three?

When this problem was presented to me several years ago, I developed a proposal that I called the "extra common share" approach, and my clients liked the concept. I suggested that my clients, instead of dividing their estates into equal parts for each of their three children, divide their estates into four parts. The fourth part would be a common share. The income from that share would be distributed to those children who were earning less than $75,000 a year annually, with that figure to be adjusted by inflation. If all of their children



were earning above the $75,000 floor, then the income would be divided equally among all three, but if only two were earning above $75,000, then the third child would get all of the income from the fourth share.

There is more than one right way to divide property among your children. In making decisions about which path to take, one cardinal rule to remember is that all children are not equal, and there is no absolute requirement that all children must be treated equally under a will or living trust.

Leaving Money to Grandchildren

If there are four grandchildren, three by one child and one by another, there are two ways to leave them money: *per stirpes* distribution: one grandchild ends up with half of the total estate of the grandparents and the other grandchildren each end up with one sixth (or collectively three sixths) of the estate.

The alternative approach is what is known as a *per capita* distribution, where each grandchild would get one fourth of her or his grandparents' property.

In looking at the conundrum of grandchildren equality, there is one other consideration which, of course, is similar to questions that arise when one considers how to leave property to children. What will the grandchildren think? If one grandchild receives three times as much as his cousins because he or she happened to have no siblings, will this lead the cousins to feel that they were unfarily treated by their grandparents? Should this be of concern to the grandparents in their deliberations about how to leave the property?

Some people have come to me and raised the possibility of discussing the per capita-per stirpes dilemma with their children and grandchildren and telling everyone how and why they reached their decision. However, my experience has been that in many families premature discussions about these decisions often create unpleasant situations for all concerned. If you are in doubt, I would recommend not discussing this emotionally charged issue with your family unless you think there is a compromise that would satisfy everybody.

Blended Families and Adopted Children

If a person dies without a will, the law in most states will generally treat natural-born and adopted children equally. However, differences arise in blended-family situations where there is no formal adoption.

Where there is a blended family, it is even more important to consider the possibility of a trust. Take Walter, who is divorced and has custody of his two young sons. Walter marries Betty, a young widow with one child. If Walter were to die before Betty and leave property outright to Betty, rather than in trust, there is every likelihood that Betty could in turn leave the property to her child and exclude Walter's two children from his prior marriage. The same situation could happen in reverse if Betty predeceased Walter and Walter had not adopted Gloria.

In general, the best way to deal with the increasingly common circumstances of the blended family is to use the flexibility of a trust. Thus, instead of Walter leaving property outright to Betty, he could leave the property in trust for her benefit. The trust would provide that, during the remainder of Betty's life, she would get all of the income. The principal could also be used for her benefit and, if Walter so provided, for the benefit of all three blended-family children, if needed. On the death of Betty it would go in equal shares to Walter's two children and Betty's child, Gloria.

Second Wives and Second Husbands

In today's society, increasing numbers of first marriages unfortunately often end in divorce. On the other hand, many people find great happiness in their second marriages, including those whose first marriages ended because of the death of a spouse. However, complications can arise when estate-planning issues are discussed.

There might be three sets of children — the wife's children from the first marriage, the husband's children from the first marriage, and the children of the two together. Each partner wants to treat all of her or his children equally. But one child (assuming one child from the second marriage) will in a sense be ultimately receiving property from both parents in the second marriage. The children from the first marriage could inherit from additional sources, too — from the other natural parent or from grandparents. When children from neither marriage have a potential large inheritance from a source other than yourself, it is easier to determine a measure of equality between them. But when there are potential large inheritances that apply to only one set of children, it is more difficult to determine what is fair.

I believe that, if one is to err, it is better to err on the side of generosity because it has one major fringe benefit: It helps make the second marriage work. One of the best ways to reach the heart of a partner is to reach out to the hearts of your partner's children.

A Final Plea

You have within yourself the ability to make the kinds of personal decisions that will be best for you and your loved ones. The worst thing you can do is to do nothing. If you care about all of the sweat and toil that have gone into accumulating whatever estate you have, if you care about your loved ones and want to make it a little bit easier for them in the sorrow of your death, if you want to take advantage of the tax-saving features that the laws allow, then undertake the effort to plan how you want to leave your property. MT

David W. Belin worked his way through the University of Michigan in six years, earning in that time three degrees — all with high distinction — a B.A. in 1951, an M.B.A. in '53 and J.D in '54. The National Law Journal *has included Belin in its list of the 100 "most powerful and influential lawyers in the United States."*

Belin is also the author of Final Disclosure, *an account of his service as chief counsel for the Warren Commission that investigated the assassination of President John F. Kennedy.*

Belin finds it regrettable that "most Americans believe erroneously that there was a conspiracy involved in the assassination of President Kennedy." He blames the news media for this collective gullibility, not the "conspiracy-theory profiteers."

"This is a bad chapter in the history of the U.S. news media," he says. "The underlying philosophy of a free press is that it will help the public reach conclusions about issues and events. But when news media play up groundless charges of assassination conspiracies and then give little or no coverage to rebuttals, they are not carrying out the principles for which our country has established and maintained a free press.

"The most disheartening thing is that in colleges and universities it's being seen as liberal to believe in a conspiracy behind the Kennedy assassination. Mark Lane, a profiteer and a liar, has been invited to speak on the U-M campus about the assassination, while I, an alumnus who was counsel for the Warren Commission, have never been invited to speak on that subject."

Belin adds, however, that he sees the most important lesson of the assassination controversy as the fact that "we live in a country where a David Belin can investigate all of the facts about the Warren Commission and write and publish a book about it."

So much more to it than meets the eye

THE ALPHABET OF COLOR

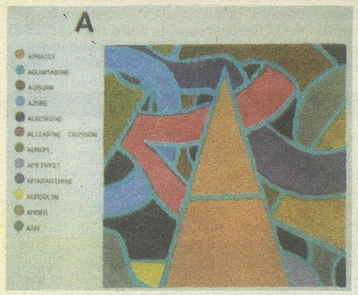
By Margaret Parker

Several years ago, rummaging through an old art supply store, I came across tubes of paint whose names I didn't know. With a luxurious thrill I picked up "Sap Green" and "Madder Lake."

As a painter I'm used to handling "pure" color, the pigment itself. Mixed from treasured formulas of earths, oils and poisons, it snakes out of a tube with a life of its own. Each pigment has its own texture, its own mixability with other colors, its own flow or grab when applied to paper or canvas. As a child, I secretly ate my crayons and licked paints to taste color. Delicious knowledge.

Sap Green had a slight stink when it gobbed out of the tube, slipping under the brush in a transparent acid yellow-green that was lost immediately when mixed with other colors. *The Artist's Handbook of Materials and Techniques* listed it as a dye pigment "made from unripe buckthorn berries. Fades rapidly." No wonder Sap Green, despite its urges toward spring, has been dropped from the lexicon of modern paints. That started me wondering what other colors might have been lost. I began collecting colors by name and grouping the names alphabetically. Then, for the fun of it, I began painting an alphabet with these colors.

Apricot, azure, alizarine crimson and aquamarine made up my letter "A." Each color was identified by name and hue. The shape of the letter built a framework that freed the colors from association with objects, allowing the colors to stand on their own. I loved the way grouping the colors alphabetically set the rules of color on their ear.



At first I saw this idea as a possible book for children, to be called The Alphabet of Color. Most introductory color books deal with only about 10 colors. They identify colors through objects, "bluebirds, blueberries and bluebells," and use only the brightest colors. Toys, too, are colored in the same harsh and limited palette. The theory at work here is that children see and respond first to bright primary reds, blues and yellows, and learn best in simple steps from a small set of choices. The result is that in our earnestness to educate we reduce the vast to the mundane. Why not spread a full palette before our children and let them play and learn however they like?

Victorian toys allowed children to see forest green and china pink as well as flaming crimson and velvet black. These fascinating colors gave toys a mystery and illusion that continues to make them prized possessions. Another Victorian plaything, the Mother Goose rhymes, make and break the rules of language with equal abandon, using a ridiculous vocabulary, higgledy-piggledy, that will never be used again. The rhymes are still among the greatest teachers of the English language. I had in mind a Mother Goose of color.

But what about the rules of the spectrum that I'd been taught in school, the color charts and wheels that demonstrate so precisely how every color relates to every other? Why confuse the visual with the verbal? What do names have to do with actual color? Does color have meaning like the verbal meaning of words? My playful alphabet contradicted everything I thought I knew about color and forced me to re-examine its source. As my search widened, like the botanical explorers who sailed the world, I dug up and collected lost and exotic colors and beautiful color concepts to include in my alphabet.

What is color? In the everyday jumble of life, color is inseparable from the surrounding world of objects. It is one of our fundamental means of separating one shape from another, defining volume, recording the passage of light and time. Light strikes objects and refracts into our eyes in a kaleidoscope of color.

Consider the number of ways that blue may be produced. The blue of the sky is caused by the scattering of sunlight through the atmosphere (more red in London or yellow in Los Angeles due to pollutants). The blueness of water reflects the light of the sky on a smooth surface; a cloudy, rough day makes the water gray. The blue portion of the rainbow is due to light dispersion through water droplets. The iridescent blue of a beetle's shell depends on the angle of view across fine, evenly spaced ridges on the shell that intensify and distort light waves. The wing of a housefly has many transparent layers whose interference with light waves causes iridescent colors similar to those produced by oil films.

Most coloration in animals, like blue eyes, is a result of the scattering of light. The blues of sapphire and lapis lazuli result from charge transfers in a crystal field. The star Sirius glows blue from the temperature of its atoms and ions. The blue from a color TV owes its light emission to bombardment by a stream of electrons. Vapor lamps, lightning, auroras and some lasers are created by gas excitations. A blue gas flame is a condition of the vibration and rotation of light. Blue dyes from organic compounds form transitions between molecular orbitals. The milk-and-fire blue of an opal is caused by light diffraction. With C. L. Hardin's compelling list of blues from *Color for Philosophers: Unweaving the Rainbow*, I knew I had discovered my letter "B."

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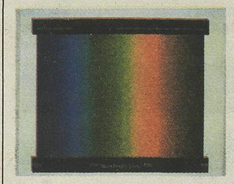
Fascination with the color of objects is what first attracted me to painting. Trying to paint the roundness of a cup, the variations of the red of an apple, daylight on a checkered tablecloth, the importance of a shadow, I learned immediately that every color is relative to and altered by its circumstance. Change one dab of gray and the lip of the cup bends in instead of out, shadow becomes more interesting than the cup, green foliage goes muddy, a porcelain cup turns to clay. Painting asks how the human eye receives, stores and recreates color. Painting honors the fact that an object can not only create color in several ways, but also affect the color of nearby objects. There may be a transmission color, a reflection color, an interference color — each of which can be further altered by the angle at which a viewer sees them and by the character of surrounding light.

Philosophers pose the question of whether color even exists as "color" before it is perceived by the human eye and brain. My search for the origins of color turned from the outer world to the inner eye. As the full range of light and dark strikes the inner eye, only a narrow band of energy is capable of creating the rainbow of color called the spectrum. This is a sliding scale of undiscriminated hue.



Spectrum graph paper, Technical and Education Center of the Graphic Arts, Rochester Institute of Technology.

Color is perceived anatomically, not bit by bit but along an overlapping and intermixing continuum. Receptor cells of the retina at the back of the inner eye take in the spectral information and then, unlike a passive camera, continually rework and reorganize the captured image. Seeing is an act of interpretation from the first glimmer. When you look at this page, your eye tells you not only all the colors of this spectrum but also that it's printed on paper, not reflected through a glass prism or a rainy sky. Eminently adaptable, sensitive to the slightest contrast, the optical network of color vision is an instrument set to detect and interpret as much as possible from one point of view. I captured and pinned down the spectrum for my letter "S."

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There appear to be three irreducible primary colors — red, blue and yellow — from which all other colors can be produced. That is the first "rule" about color that everyone is taught. As with everything else about color, however, this first rule is not hard and fast, but relative. The exact color of those primaries fluctuates; they are different in light, paint or printing; they are not so much a rule as a function of three mutually exclusive hues within a given system. Each color is perceived in three dimensions: the brightness of the color from light to dark; the hue of the color named "red," "blue," "purple" and so on; and the saturation of a given color from its "pure" hue to gray.

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The challenge of demonstrating how colors relate has led to some marvelous charts. The "color wheel" is the most basic. It shows the primary colors as red, blue and yellow, in wedges of a circle with their secondary mixtures — purple, green and orange — between.

To demonstrate the three dimensions of light/dark, hue and intensity simultaneously, a sphere is often proposed with pure hues circling the perimeter, becoming darker toward the bottom to black, lighter toward the top to pure white, and cutting through the center from top to bottom to a core of gray. Mesmerized by these charts, I wanted to include that systematic approach in my alphabet. The letter "W" shows my version of the color wheel.

The need for all these charts points to a central enigma of visual perception. Unlike the auditory recall of pure pitch, color memory for a single precise shade is poor. When tested, as Rudolf Arnheim reports in *Art and Visual Perception*, observers "cannot agree on where the principal colors appear at their purest. This is true even for the fundamental primaries, especially for pure red." Furthermore, words fail to pin color down. Verbal description falls short of any dependable color accuracy. So even if we can perceive all these dazzling variations on the charts, we can't communicate those perceptions without actually reproducing the color itself. Consider these lines from Amy Lowell's poem, "The Customer."

. . . She minced up to the counter, said:
'I want three years of ribbon - red.'
Sat down upon a stool and waited.
The tranquil atmosphere vibrated.

I bowed and brought a brilliant red,
Flaming and smooth as though each thread
Were new-run blood or molten glass
She gave one look and let it pass.

I brought her scarlet, a poppy shade
Hot as a subaltern's cockade.
It darted out between my hands
Like a spurted flame of many strands.
She shook her head and murmured, 'Crude.' . . .

I urged a cardinal crimson — she pouted.
Magenta, vermilion — both were flouted.
Carbuncle, ruby, cinnabar,
The counter looked like a mad bazaar.

I brought down carmine doubled with gold.
I found pale buffs under which rolled
A faint suggestion of watchet or blue.
Nothing I showed her seemed to do . . .

These undefinable shades of difference between outer perceived color and inner imagined color have caused some philosophers to show the white flag and designate color the prime example of pure, unanalyzable quality. This is when my alphabet of color comes in handy. Letter "R" revels in the many reds of red.

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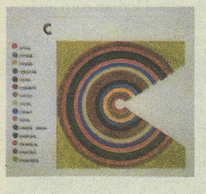
Every culture has names for colors. Beginning with the distinction between light and dark, then a word for red, societies add color names to their languages in a pattern. In my growing collection, names are as evocative as the colors themselves. They bring to mind sources of pigments, like cobalt and cochineal. Coral, canary and chestnut vividly recall colors in nature, while cream, cocoa and charcoal evoke tastes, smells and textures. My search came to a turning point when I discovered the National Bureau of Standards' *Universal Color Language and Color Names Dictionary*. Here I found 7,500 colors listed alphabetically by name and charted by number through seven ascending levels of accuracy. The color dictionary may not satisfy philosophers, but it does set industrial standards of textile design, chemistry, graphic arts, printing, tanning, horticulture and optics for color codification. (*See accompanying article*). I was both overjoyed and overwhelmed, but I also learned what my alphabet was not.



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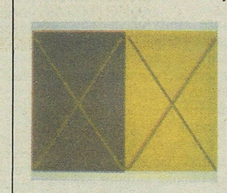
Now that the search for color names had become a matter of choice, I began looking back to the colors themselves. Contemporary American artists who have explored pure abstraction have considered color as a subject all its own. Throwing paint, spraying it, soaking, stripping, chunking, even massing it into whole walls, artists let paint refer to nothing but surface and let color play as freely as music to reach the emotions of each viewer in a totally uninterrupted interchange.

Two seemingly contradictory approaches to color have been used — a step-by-step experimental method that mirrors the scientific discoveries of the century, and a method that is an inner search of emotion and imagination, a meditation like that practiced in certain Eastern and Native American religions.

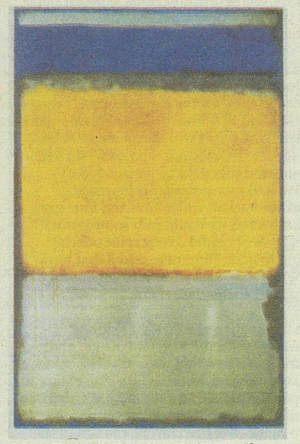
Josef Albers' method in *The Interaction of Color* was the classic example of the first approach. He demonstrated the various effects of color contrast in a series of eloquently simple visual experiments. He chose colors not because they harmonized but because they demonstrated his points about color contrast. His format of visual proof is the format I use in my alphabet, although my objective is more open-ended. I chose color arbitrarily (alphabetically) and a known series of shapes (the letters of the alphabet) to observe color unrestricted.



The second contribution of American artists to the understanding of pure color has been to set it apart, to frame it as worthy of our concentration, to use it as a mode of contemplation.

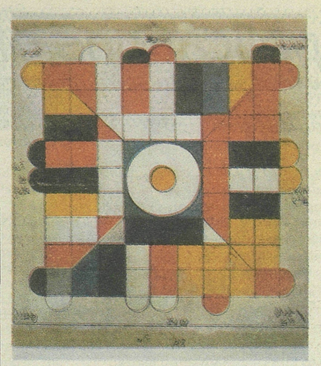
When allowed our deepest uninterrupted attention, color can open up what Mark Rothko called "states of soul." Rothko looked for a way to reveal the source of light that our seeing implies. His approach was similar to the ancient use of color as a point of meditation. Or as he put it: "A painting is not about experience, it is an experience."

As an internal contemplation, the discipline of yoga associates color with bodily organs and with the seven points of the spine through which the yogi experiences the rise of the inner spirit through the physical body to the infinite. Color is also used as an external meditation. The mandala is one form, a circle within a square where color enacts the cyclical flow of self to cosmos.



Mark Rothko's 'Number 10' (1950, oil on canvas, MOMA)

Color stimulates not only the eye but the whole body. Rudolf Arnheim reported in *Art and Visual Perception* that strong, bright colors in the red-orange range produce excitement. Muscular power and blood circulation are increased by colored lights shown in sequence, beginning with blue, the least effective, through green, yellow, orange and red. Patients with a cerebellar disease have been found to be so sensitized to color that one, a woman wearing a red dress, became dizzy, lost her sense of balance and was in danger of falling, symptoms that disappeared when she changed to a green dress. Our whole organism has been found to have an expansive response to the range of yellow to red colors, and to constrict or withdraw towards the center of the organism in response to the blue to purple range of color.



18th-century Indian diagram used in computing astronomical periods and in meditation. From **Tantra,** *by Philip Rawson, Thames & Hudson, N.Y. (1973).*

These physical reactions give color immediate command over our faculties. They strike at the instinctual, intuitive, emotional level of being. Looking at a color for a long time is the best way to learn one's own physical and emotional reactions to it. I hope my alphabet of color stimulates those reactions and reflections.

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Color is as much about social history as it is about the spectrum. Color reaches us subliminally, as in the red dress Bette Davis wears in the film *Jezebel*, which is seen as a shade of gray in the black-and-white film. Yet, the red has seared through layers of celluloid and time into our social memory.

Color can define experience, as we in America have demonstrated, in the cruelest to the most subtle forms. The distinguishing color of skin pigmentation has been misused by every race as a rationale for the harshest domination. Where color for one group is a means of control, color for another group is a matter of life. Color systematized into human stereotypes is never more dangerous, more enmeshing. In the great lyric tradition of the blues, "blues" names emotion, situation, a history of great endurance, the musical beat that both remembers and releases the pain.

Color absorbs and records our memories of pleasure and pain. When leftover scraps of materials are stitched into quilts, colors patched from old patterns into new become dense with memories. My letter "Q" takes a piece from every other letter to make a quilt.

The narrative of color is carried still further with a single evocative word. Though we can't compare it with a visible spectrum, we can't forget how Melville expanded the meaning of the color "white" in *Moby Dick*. The African writer Amos Tutuola records the terror of color magic in *The Palm Wine Drinkard*. We travel with a man and his wife looking for the "Deads Town" and pass through zones of color where anything can happen. Here they are entering a "Red-Bush," a bush that "was in deep red together with all the trees, ground and all the living creatures therein. Immediately we entered this 'Red-Bush' my wife and myself turned deep-red." Tutuola vividly induces the fear of color's mastery over our inner and outer landscape. We have only the wife's words as protection: "This is only fear for the heart but not dangerous to the heart."

There seems to be a great need to control color, a fear of its mutability. Color changes with every personal interpretation and has many more meanings than letters of the alphabet. My alphabet is just one interpretation, and also an homage to color in its multitudinous garbs, and for its power to engage our energies, emotions and memories. MT

Photo by Suzannah Hall

Margaret Parker '69 of Castine, Maine, majored in painting at the School of Art. Her 14 terra cotta reliefs representing lives of the homeless as images of the Stations of the Cross were published together with meditations by Father Daniel Berrigan (Stations, the Way of the Cross, *Harper & Row, 1989).*

Applications of color

(Or why it's hard to sell a green car)

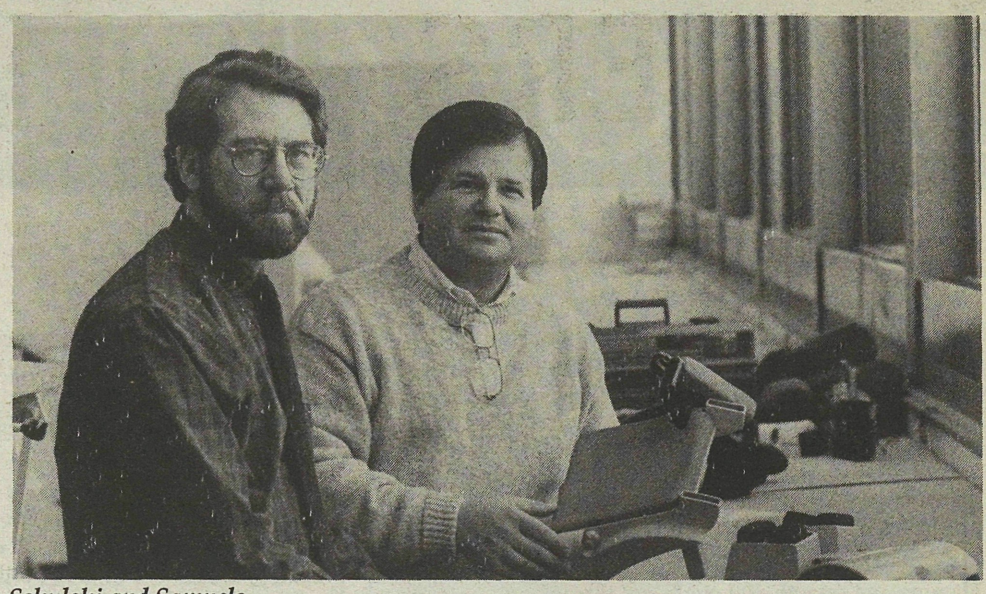


Photo by Bob Kalmbach

Sekulski and Samuels

By Linda Walker

Why, instead of a vivid, glowing rainbow of colors in our daily life, do we usually face relatively few choices in everything we buy, from car shift knobs to carpets and drapes, kitchen cabinets, sweaters and stationery? This is because a color committee of people from these industries gets together to decide what is best for them and us. There is no color clash, or much choice, in American consumer products — by design.

Every six months about 500 industrial decision-makers meet to decide what the colors will be in three years' time for everything from cars and bricks to fabrics and greeting cards.

These colorists, as they are called, are members of the Color Marketing Group (CMG), explains Charles McGrew of Indiana, a former automotive designer for Navistar International.

"Here's how it works," McGrew says. "At one of the two annual meetings there are workshops of about 20 members each, organized around an industry. There might be five transportation workshops and all the members will be decision-makers — the people who are designing cars, commercial vehicles or boats as well as people who work in fabrics, leathers and paints.

"Every member brings forecast guesses, samples of color — actual bits of fabric — and by consensus each workshop presents the five colors they predict. Then the captains and co-captains get together," McGrew continues, "and narrow down the 25 choices from the workshops to five, which in turn go to a steering committee that includes the captains from fashion, home furnishings and other workshops. All the colors are homogenized down to 15 or 20 colors best representing all industries."

Robert S. Daily, color marketing manager for Du Pont's Automotive Products Finishes Division in Troy, Michigan, is charged with putting together a palette of exterior colors for auto manufacturers to choose from. Like McGrew, he attends CMG meetings and looks for trends in color everywhere.

"We take note of the fall fashion showings in Paris, Milan and New York," Daily says, "and there's a trickle-down effect to cars. But fashion can turn around in a year. Cars take a longer lead time because we have to coordinate vinyl, plastics, fabric, leather and paints."

"The whole point is to keep a manufacturer from choosing the wrong color and losing money," McGrew explains. "Carpets and wallpapers have to agree and 85 different disciplines from silk flowers, packaging, greeting cards and cosmetics all tie in."

Color is as much a matter of function as aesthetics for two University of Michigan industrial designers whose work includes dishware, furniture, office partitions, locomotives and industrial machines.

Allen J. Samuels, professor in the School of Art, was aware of the CMG when he worked for Corning in the 1960s. "Trends were important," he says, "and our designs had to fit in with the avocado, harvest gold and burnt orange kitchens of that era.

"Color is a function of ergonomics," he continues. "When I design surgical instruments I take into account the operating room — the low light, the fact that it's a room full of people in a condition of stress. I have to take into account what they can see and feel. Colors are a function of those things; for example, there are no red instruments. There must be a contrast, and white is the best color to contrast with blood.

But white and beige are the worst colors for the sides of bathtubs, Samuels notes, "because age flattens the lens of the eye. Elderly people often can't perceive depth when it is white on white, so they often fall when getting into a bathtub. A glass of milk on a white tablecloth presents the same problem. The elderly have trouble distinguishing it, and can knock it over."

Ronald Sekulski, assistant professor at the School of Art, has designed furniture and office systems for Herman Miller and Steelcase and chairs for Harter Contract. Like Samuels, he has a private design practice.

Sekulski says he uses the same criteria whether he's designing a machine for making pistons for the Ann Arbor Machine Company or designing chairs. Both tasks require "unity of aesthetics and function, color, shape and safety."

To design the piston-making machine, Sekulski had to understand the product environment, "how people interface with the equipment, what environmental contaminants there are that might affect the paint, what kind of light there is — full-spectrum, fluorescent or halogen — and whether workers have to wear tinted glasses."

Even when the choice of color is more a matter of taste than function, compared with the infinite variety of color, choices available to consumers seem quite narrow.

"The staples for cars are black and white, the bread and butter; then the reds that shift," says the CMG's McGrew, "and peach is a new basic color for fashion and the home."

When it comes to cars, green is tricky. "No one wants to do it; it's controversial," Daily says. Although the color enjoyed salad days in the 1950s and '60s, Daily says people get tired of green and don't wear it much because it's not complimentary to the skin. What to do with it? "Probably the most salable way is a deep jewel color like hunter, which exudes elegance and richness. Jaguar has used it."

Colorists agree that brighter colors are on the horizon in the auto industry, and that they will appear first in less expensive models and sports cars.

Other color specialists emphasize that despite fads, the pendulum of color taste does not swing far from the norm. The Pantone Cororation, maker of ink and fabric samples used throughout the print and textile industries, tracked 900 printing colors over 25 years and found that 90 percent of those used fell in less than 10 percent of the color range. MT

There's still a maize in world of crayons

"As of this time, Dixon Ticonderoga, the maker of Prang's Color Art crayons, has no plans to discontinue maize."

With those words, Michael Gordon, the Maitland, Florida, crayon manufacturer's senior vice president for marketing and sales, brought hope to a U-M community shaken last Aug. 7, when the number-one crayon maker, Binney and Smith, dropped maize from its line of 64 Crayola crayons.

Crayola also eliminated lemon yellow, orange yellow, blue gray, violet blue, green blue, orange red and raw umber. Of the eight dropped, three were yellows and three were blues. Was it a plot?

Lina Striglia, Crayola's spokesperson, insists not. "We talk to the children who come through on our tours and they told us we needed to change. We had many similar color pairings — maize and goldenrod, cadet blue and blue gray — and we discovered we could pull some out without its being detrimental to our color offering. We're going to offer eight new colors that have higher energy. The ones we're retiring are muted and boring and so are their names."

Boring?!

Striglia is sensitive to offended feelings. "There's lots of passion for certain colors, and some distress, not just that we're retiring colors, but that we're retiring favorites. We don't want to be disrespectful to them, so we are putting them in our Hall of Fame — they will never be forgotten. We've made oversize crayons of each of the eight retired colors and they will be on permanent display."

Crayola introduced maize in 1949. Are 41 years enough? Striglia says yes, because today's children want "lighter, brighter colors."

Amaizin' Facts

How did the "muted and boring" color maize come to be adopted as half of the U-M's official colors?

• Maize and azure blue became the first official colors of the University in 1867 after a three-member committee of the class of 1867 adopted them. But a lot of different blues started to show up in subsequent decades on athletic uniforms, commencement ribbons, banners and dance programs. The hues ranged from baby to midnight blues. Seeking to end the riot of blues, in 1912 a faculty committee replaced the lighter hue with the darker one used today.

• Did the class of 1867 want the color yellow but not the word's associations of cowardice? Is that why they called it maize as some schools call it gold?

• If yellow is shunned, why do we of Michigan sing, "The Yellow and the Blue"? Perhaps because the school's hymn and the 1867 colors predated the craven connotations of the word "yellow." According to the U-M's sesquicentennial songbook, Charles M. Gayley wrote the words for Michigan's hymn in 1878; yellow did not mean cowardly until around 1910, in reference to the yellow press of the day.

• The word maize entered the language in 1555 from the Spanish for the grain we know as corn, which early on was also called Indian corn and Guinea, Turkish or Indian wheat.

• Yellow, denoting our brightest color, can be traced back to Old English *geolu* and made its first written appearance in Beowulf about the year 700. ("Yolk", spelled "yelk" until the 19th century and still pronounced that way in some regions, shares the same root.)

• Is there a platonic ideal of maize? The nearest we can come to an official shade is something called "light yellow 86." Many professions have codified colors to standardize descriptions of stones, birds, flowers and even symptoms of disease. The U.S. Department of Commerce's Bureau of Standards combined many of these earlier codifications in their book, *Color — Universal Language and Dictionary of Names*, and included seven hues of maize. The Commerce department bases its categories in the *Color Names Dictionary*, published by the Inter-Society Color Council and the National Bureau of Standards, which catalogued colors according to hue, value and chroma into 267 color-name blocks.

• The seven maizes listed in the department's book are made up of such color-name blocks as medium orange yellow 71, brilliant yellow 83 and vivid yellow 82. Of the seven maizes listed, three were derived solely, and one partially, from the color-name block light yellow 86. — *L.W.*

Linda Walker '66 M.S.W. is an Ann Arbor free-lance writer.

LETTERS

Oosterbaan

NOWHERE in all the words written about the great Bennie Oosterbaan did I see a word about his only son, Bennie Jr. Those of us who were student nurses at the U-M in the postwar years stood by helplessly as Bennie and his wife, Del, watched young Bennie (about 8 years old, not sure) slowly die of an incurable brain disease. What a caring, kind couple they were! We never heard a word of reproach to the hospital staff. Indeed, we grew to love them as we watched their silent suffering. I can still see the haunting sadness in their eyes as they stood by Bennie's bed. In spite of this burden, which seemed interminable, Bennie still managed to perform his jobs as Michigan's assistant football coach and head coach in admirable fashion, even though his heart was breaking. Those of us who knew him during this trying time in his life will never forget what a tender, loving man he was.

Elizabeth Lee Gannon '47N
Farmington, Michigan

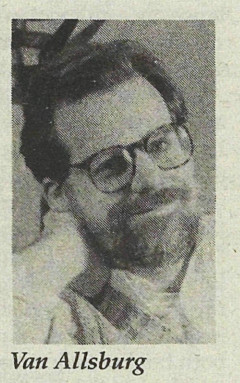
P.S. Love my little clock as a reward for becoming a life member in the Alumni Association.

Hindsight

IT HAS been said that to settle for a tie in a sports event is like kissing your sister. When Michigan elected to go for two points to win its game with Michigan State in the closing moments, the consensus undoubtedly was that even though unsuccessful it was the smart thing to do. But subsequent events proved how wrong was the decision not to kick the tying point.

Michigan ended its season in a four-way tie at 6-2 with Michigan State, Illinois and Iowa. If Michigan had tied the game with Michigan State, as it could easily have done, its season would have ended 6-1-1, making it the Big Ten winner. It would have been in the more lucrative and prestigious Rose Bowl instead of the Gator Bowl, and if it had won the Rose Bowl by a big score, it could have wound up chosen as number one again in the final national poll. So much for hindsight!

George F. Wilcox '24 Eng.
Longwood, Florida



Wahl *Van Allsburg*

CORRECTION: *The photographs of authors Chris Van Allsburg '72 and Jan Wahl '58 were reversed in our December issue. Here are the correct identifications.*

Maddy, not 'McNetty'

I WOULD think that anyone connected with the University would know that Joe Maddy ran the National Music Camp at Interlochen! *[Thank you. A transcription error caused the misspelling — Ed.]*

Jane Lombard '37, '51 MA
Dearborn, Michigan

Books for the young

FOR PERHAPS 12 years, I read to my children each evening before bedtime. Our favorite book was Jan Wahl's *Pleasant Fieldmouse* ("Once Upon a Time Is Now," December 1990). We actually wore that book out. Not only were the stories fun to read but every one had a message for adults and the children.

Terrence E. O'Loughlin '55 MBA
Columbus, Ohio

I VERY much enjoyed Cathleen Collins Lee's interviews with U-M children's book writers and would like to add Joan Blos, whose *Gathering Days* won the 1979 Newbery Award; Gloria Whelan, whose *The Secret Keeper,* published this year by Scribner's, is her seventh book for young people and, like the others, distinguished for its lyrical beauty and moral and psychological insights; and X. J. Kennedy, whose volumes of clever, amusing, literate verses for children are unsurpassed (see "The Owlstone Crown," "The Phantom Ice Cream Man" and at least half a dozen others).

Martha Bennett Stiles
Paris, Kentucky

ENCLOSED IS information about children's books and short stories by Martha (Wells) Bennett Stiles '54, a Phi Beta Kappa graduate in chemisty and winner of two Hopwood Awards. I missed mention of her work in the article on children's publications.

Sister Hilda Bonham, IHM
Coordinator of the Hopwood Program, 1979-81
Adrian, Michigan

(Thanks for pointing out this oversight. Stiles is a journalist, novelist, fiction writer and poet. The latest of her nine novels, Kate of Still Waters *(Macmillan, 1990) is set in rural Kentucky, and was singled out by the Kirkus book review as a work "of unusually high quality" — Ed.)*

AFTER READING about writers of children's books, I thought you might be interested in my wife, Kay Cooper Watt, who graduated in 1963 with a degree in journalism. *(Kay Cooper recently published her 12th work for young readers,* Where in the World Are You? *(Walker and Co.), an introduction to geography — Ed.)*

John Watt '63 Pharm
Springfield, Illinois

On social progress

IT LEAVES this old grad breathless to observe the social progress being achieved by our alma mater. For example, the new rule that invites a student to report anyone who derogates his or her heritage and genetic or gender-related attributes. I wish such recourse had been available to me when — as a white male underclassman aspiring to be a varsity basketball player — I was subjected to hurtful comments directed at me by the coaches and lettermen who made clear in all sorts of invidious and occasionally physical ways that my personal attributes would prevent me from making the team. A clear case of institutional bias against people who couldn't run, jump or shoot.

Now the LS&A faculty has taken another giant step with the establishment of mandatory courses in race and ethnicity. Conservatives will be quick to complain that the content of such courses has been left almost totally undefined, but never mind: The important thing is "that faculty members from all departments are urged to think creatively about how their fields might contribute to the requirement." The syntax appears to have come directly from the College of Engineering, but the concept is noble: Surely, the times demand that teachers cast off obsolete notions of scholarship and rigorous proof and start to think creatively. Besides, who wants to take one of those old-fashioned, noncreative courses where the structure is logical and factual?

In view of these enlightened initiatives, I am puzzled that the University has failed to address an even more obvious relic of past discrimination. I refer, of course, to the blatantly sexist and oppressive treatment of female members of the varsity cheerleading teams. I ask you: Why is it that only the women wear those short little pleated skirts? Don't the authorities know how cold it is out there? And why does our school continue to allow the women to be tossed up in the air and twirled around by the men? If women are to be regarded as more than "objects," shouldn't they have equal opportunity to be the tosser and twirler, instead of merely tossee and twirlee?

I urge the LS&A curriculum committee, with its customary scholarly precision, to issue a formal apology to the affected students, pay such reparations as may be appropriate and resolve to prevent any future occurrence.

Marshall C. Lewis '49
New Canaan, Connecticut

Not so gruff

FROM EARLY early 1924 through 1926, I was on the staff of the *Michigan Daily,* during which time I had the medical beat. When I first contacted Aldred Scott Warthin *[a professor whose attitude toward women was debated in June and October Letters columns — Ed.]* in attempting to gather information, his gruffness almost caused me to resign. However, after the initial encounter, he was always most pleasant and helpful. He introduced me to his assistant, Dr. Simpson, who for almost three years kept me abreast of much of the medical news. I also remember that Dr. Cabot, who I believe was dean of the Medical School, was an excellent source of news.

Simon Rosenbaum '27
Grand Rapids, Michigan

Women's songs

OVER THE YEARS, I have been impressed by your coverage of feminist issues and alums who have published books. Thus, I'd like to call to your attention the work of Hilda Wenner '57. (formerly Hilda Engel). Her book *Here's to the Women* is an anthology of traditional and contemporary songs, the first major collection to tie women's songs to their culture and their story. It contains 100 songs with words and music plus commentaries that place the songs in historical context and provide information about the songwriters.

Originally published by Syracuse University Press in 1987, it is about to be reprinted by the Feminist Press (City University of New York) — the first in a series titled "Women in Music." Hilda is producing a teaching tape of 25 of the songs.

Ann R. Haendel '57
St. Petersburg Beach, Florida

COULD YOU please include U-M's calendar in your publication? As a parent, I would appreciate knowing the vacation dates, semester lengths, etc. Perhaps U-M has a calendar it could send me? *[Academic year calendars are available from the U-M Office of the Administration Registrar, 1510 LS&A 1382, Ann Arbor, MI 48109.]*

Norma P. Thomas
Mankato, Minnesota

More about Eve

I STRUGGLED through Suzanne Fleming's article in the December issue, "All About Eve." The story tells of the controversy between molecular biologists and "human fossil" anthropologists on the origin of *Homo sapiens.* Why, oh, why this controversy?

Are these learned men, these scientists, not aware that the origin of man is very simply, clearly and succinctly recorded in the *Book of Genesis?* If so, shouldn't they rather be interested in really important things, like did the Creator give Adam and Eve navels, or decorate Adam's chest with nipples?

The molecular school uses a clock in its calculations. Of course there was a clock! The first 24 hours, Sunday, the first day, saw the creation of light and its separation from darkness. Monday saw the creation of the firmament — division of the waters which were under the firmament from the waters above the firmament. The third day, Tuesday, was very busy. It saw the separation of land from the waters and the beginning of vegetation, grass, herbs, fruit trees. Very early in the morning of the fourth day, Wednesday, a very bad storm seems to have caused an outage, forcing the Creator to create the sun, the moon and the stars. Thursday witnessed the creation of whales and birds. Friday saw the creation of land animals — beasts and cattle and creeping things, and the Creator created man in his own image, and he also created some females. On the seventh day, Saturday, the Creator was so tired from creating all these creations that he took the day off and rested.

Now, the author of *Genesis* isn't clear as to when the Creator created Adam: on Friday or the second Sunday? All the creations of that first week are recorded in Chapter 1. Adam and Eve are not introduced until Chapter 2, which leaves the reader in doubt as to whether Adam was created on Friday or the following Sunday.

After He created Adam, the Creator decided that Adam should have a helpmeet. For some reason the author doesn't explain, the Creator decided not to let Adam choose among the females who had been created on Friday. He performed surgery on Adam, took one of his ribs and created Eve. Aside from the cooking, housecleaning and other domestic duties, Eve became the first librarian in charge of the library then known as the "Tree of Knowledge." Like any good librarian worth her salt, she decided to read one of the books. The one she chose seems to have had a picture of a snake on its cover. She found it so exciting that she gave it to Adam to read. Unfortunately, she had chosen the wrong book to read, and she and Adam were driven out of the garden.

Yes, yes, I know. The author of *Genesis* speaks of apples on the Tree of Knowledge rather than books in a library, but like so many stories in the Good Book, they have to be considered allegorical to be believed.

Richard D. Rowley
Bellaire, Michigan

I WAS pleasantly surprised to see the story about one of my professors from the just-finished term, Milford Wolpoff. The class I had was a Collegiate Seminar on the exact topic the article was about, divergence in the theory of evolution. The problem I had with the article was that it was written very subjectively. Professor Wolpoff tried to keep our class as objective as possible on such a debatable topic, but your article pointed to his theories and only glossed over in-depth studies done by geneticists.

Geneticists now offer more evidence toward the theory of a single African ancestor. Mitochondrial DNA studies done by Linda Vigilant at University of California, Berkeley, using new polymerase chain restriction, point to a single origin for humans in Africa. New techniques in nuclear DNA testing will offer even more insight.

Paleoanthropologist Chris B. Stringer of the British Museum of Natural History offers a different perspective on

fossil finds. According to his studies, fossils don't show a gradual evolution across regions of Europe and Asia. Also Africa contains very good examples of Neanderthal and *Homo sapiens* fossils found right next to each other. This suggests replacement of species instead of gradual evolution.

The violent "holocaust" that Professor Wolpoff describes is a hypothesis that only discredits the opposing theory. It also sensationalizes the debate instead of offering new insight. It is possible that the mother of us all had an advantage that the Neanderthals of Europe and archaics across Asia did not have. Allan Wilson of Berkeley suggests speech ability.

Many linguists have traced languages back to 100,000 years ago. There is a very good probability that what "Eve" possessed was a higher mental ability achieved as a result of evolution in Africa over 100,000 years, perhaps by gene mutation or by the triggering of the actual ability to communicate by some sort of social event or by a new need to communicate, such as the changing weather of the Ice Age. Fossil finds offer proof that our oldest ancestors had the same physiology as we do. The mental ability is still at question.

These areas of studies and points of views were left out of the article, thus leading to a one-sided argument. I understand that space in the journal is an issue, so maybe a second part to this article might be appropriate. Please try to present a more well-rounded view in the future. Isn't that what we students are all in college for?

Alex Sirota '93
Ann Arbor

I'VE BEEN fascinated with the "Eve theory" ever since it was first reported. I tried to follow Milford Wolpoff's refutations, which I realize are based on many years of scientific research. However, I failed to grasp one glaring flaw in his theory of multiregional evolution, which states that *Homo sapiens* evolved slowly from *Homo erectus* in areas all over the world.

I thought the whole controversy is about whether Eve was the first woman, the one mother of all humankind, not about how humankind spread all over the world. Does Wolpoff posit that *erectus* was the first human being instead of Eve? All of his arguments seem to deal with when and how humanity spread, rather than with its origin.

His statement that people have always intermingled certainly misses the point about the origins of humanity, as does the statement he is trying to refute, that a small band of Africans swept around the world and replaced all other people. After the original male and female (call it the "Garden of Eden theory"), there had to be some kind of proliferation before there could be people to intermingle. I'd like to hear Professor Wolpoff's answers about the flaws in logic I have discussed.

Jean Tenofsky May '41
Pittsburgh

Students and the police

STUDENT skepticism with President Duderstadt's professed concern for campus safety is fully justified. Very few staff live on campus as Duderstadt does, but many students do. If they felt that an armed police force commanded by Duderstadt would make the campus a safer place, they would be demonstrating in favor of such a force, not against it.

All serious students of police activity agree that police patrol has little effect on crime rates. The new police cannot possibly deter the typical serious campus crimes, like date rape, that take place behind closed doors. If campus crime is suddenly condemned as alarmingly high, that is an argument against police, not an argument for them.

Since police are not the answer, students reasonably infer there must be another question they *are* the answer to. What else can it be but political repression?

Is Duderstadt, though obviously mistaken, at least sincere in saying he needs police for protection, not for politics? There's an easy way to find out. Place the police force under the control of a democratically selected board — of *students*. Who better to place in charge than those whom the police, according to Duderstadt, are there to serve? If the Administration does not take this proposal seriously, its sexist and paternalist yammer about campus crime should not be taken seriously either, and Duderstadt's political police should be run off campus as soon as possible.

Robert C. Black '73
Albany, New York

60 Minutes 'despicable'

HOW CAN you tell if it's going to be a bad day at the office? When you find Mike Wallace and the "60 Minutes" camera crew waiting for you in the reception!

Granted that Mike Wallace (see "Big Ticker," December '90 issue) has achieved an unparalleled top Nielsen rating for longer than just about any ongoing network program, there is some question about his methods in achieving it. He has mastered the art of deception in his interviewing and subsequent cutting and pasting. Responses that were spoken in all candor have been taken out of context and rejuggled in such a way that the respondent is made to appear to be contradicting him/herself.

Example: In his great expose of abuses in Credit Bureau reporting, he blindsided John Spafford who, as president of the Associated Credit Bureaus' trade association, was made to say that there was no way that a nonmember could get his/her hands on an individual's credit history and use it to that person's disadvantage.

This was accomplished in a typical "60 Minutes" ploy. After a lengthy interview, Wallace said, "John, we've only got 15 seconds left on the video tape. Yes or no, is there any way that a nonmember could get hold of a credit report and misuse it?"

"No way!" John replied.

This flat-out assertion was used as the opening statement of that "60 Minutes" segment. Unbeknownst to Spafford or anyone but the "60 Minutes" conspirators, the Wallace crew had set up a dummy corporation with a valid New York City address, complete with stationery and a firm name on the door. Using this blind, the crew then set out to obtain credit reports from a number of Credit Bureaus, using the plea of urgency to save a sale as the excuse for bypassing the formality of membership. Most respondents declined. A few fell for the plea and sent a copy of the file information, compromising their privileged status by divulging confidential information to a non-member. Despicable! But typical of "60 Minutes'" techniques.

Norman Williamson '36
Claremont, California

Mystery date solved?

YOU HAVE marvelously alert readers! I rightly was taken to task by Elizabeth Turner Harmon '38 and "several other readers" in the December issue for erroneously having written that in 1932, the late, then Georgina (Gig) Karlson, thrilled an entire Mosher-Jordan corridor with the stunning news that Tom Harmon had just telephoned to ask her for a date.

However, almost immediately following publication of my letter, a charming personal response from Elizabeth Shaw Weesner '41, Karlson's sister-in-law, informed me of my mistake. A vain attempt to correct my error has involved several telephone calls. Those involved have included, among others, Joel S. Berger, director of membership services of the Alumni Association; publicist Dawn Yoakum, who checked the Sports Information Department's Vertical File, and Karen L. Jania, reference assistant of the Bentley Historical Library, who checked *The Michiganensian*.

Their kind, combined aid produced a list of our football squads for the years of 1932-4. From those lists, may I say with complete lack of assurance, that Karlson's football-hero date, which I inadvertently seem to have made historic or at least a *cause celebre*, was with either Chris Everhardus '34 (listed as Chris on one line-up sheet; Herm, on another) or with Fred Petoskey '34. The latter's name tinkles a bell a trifle less faint. At least I am sure the call did not come from amother football stalwart of those days — Gerald Ford.

Because the information I needed took time to acquire, the kettle of fish I stirred up obviously has dramatically increased. As a result, I could not immediately eat crow. But during this three-month time lapse, as a culinarian, I have been puzzling over which particular herbs and spices will at least enhance the bird.

Meanwhile, may I add that along with another of your readers, I too, cheer Lawrence Kasdan's quite wonderful address to the 1990 graduating class. And in the interest of ongoing information — the University is mentioned both in John D. MacDonald's *Darker Than Amber* and Elmore Leonard's *Freaky Deaky*. Because my major was English literature, I must justify this choice of reading matter — both books made a recent virulent virus attack almost bearable.

Concerning my professional name — Helen Worth — my husband, Arthur M. Gladstone, author of some 40 pseudonymous novels sees very much eye-to-eye with Nancy Willard '58 (Dec. '90). In an engaging feature, Cathleen Collins Lee, quotes Willard as saying she "wants to discover the story" of her books as she "goes along." Gladstone says that during writing his, he can't wait to find out how they will end!

Helen Worth '35
Charlottesville (Ivy), Virginia

Making a lasting gift through a bequest

The impact that bequests have had on the University can be seen from one end of Central Campus to the other. The rewards for Michigan have been substantial. Building projects have been funded, scholarships and fellowships established and research opportunities opened.

From early in the University's history, alumni and friends have left a variety of gifts, some small, some large, but all of great value to the academic mission of the University of Michigan.

In recognition of the benefits that bequests offer the U-M, the John Monteith Society has been created to recognize those donors who make a bequest to the University (see accompanying article).

For Buildings

On the south side of campus, the Law Quadrangle was built through a generous gift from the estate of William W. Cook, who received his baccalaureate in 1880 and his law degree in 1882. On the campus's north side, Hill Auditorium was made possible by a bequest from Regent Arthur Hill of the class of 1865.

Looking at its Tudor Gothic style, it is hard to imagine that the Law Quad dates only from 1933. After funding and furnishing the Martha Cook dormitory for women,(named after his mother), William Cook, a New York attorney, was asked to fund another residence hall. When that plan fell through, he was approached about a new facility for the Law School.

Cook responded with unprecedented generosity, making provision in his will for the four magnificent buildings that make up the Law Quad and for a substantial endowment in support of legal research.

The final dollar value of the Law Quad buildings, including equipment and books, was $8,643,370; but the benefits brought to the University and the Law School by Cook's gift are incalculable.

Hill Auditorium, so central to the intellectual and cultural life of the University, almost wasn't built. Although the University's need for an auditorium was long recognized, and plans were drawn up for a suitable building in 1894, years of fund raising proved fruitless.

Then Arthur Hill, who became a regent in 1901, took matters into his own hands. Telling no one of his intention, he made a provision in his will for a $200,000 bequest in support of the auditorium project. The University received this gift in 1910, and Hill Auditorium was dedicated in 1913.

Arthur Hill recognized a need of the University and met it. His generosity continues to enrich thousands of lives through the concerts, convocations, plays and performances presented in the building that is his lasting legacy.

For a Personal Interest

Buildings are not the only enduring legacies created by bequests. Michigan's first endowment for an active professorship was created in 1898 by a bequest from Elizabeth Bates, a physician from Port Chester, New York. Although not an alumna, Bates left the University the bulk of her estate to endow the Bates Professor of the Diseases of Women and Children.

As President James B. Angell said at the time, "She was moved to remember us in this generous manner by the fact that this University was one of the first to offer medical education to women. She wished to testify her appreciation of the service thus rendered her sex and to enlarge our facilities for medical education."

The Bates Professorship is an example of how a bequest for an endowment can perpetuate a person's concern about a particular issue or area of study.

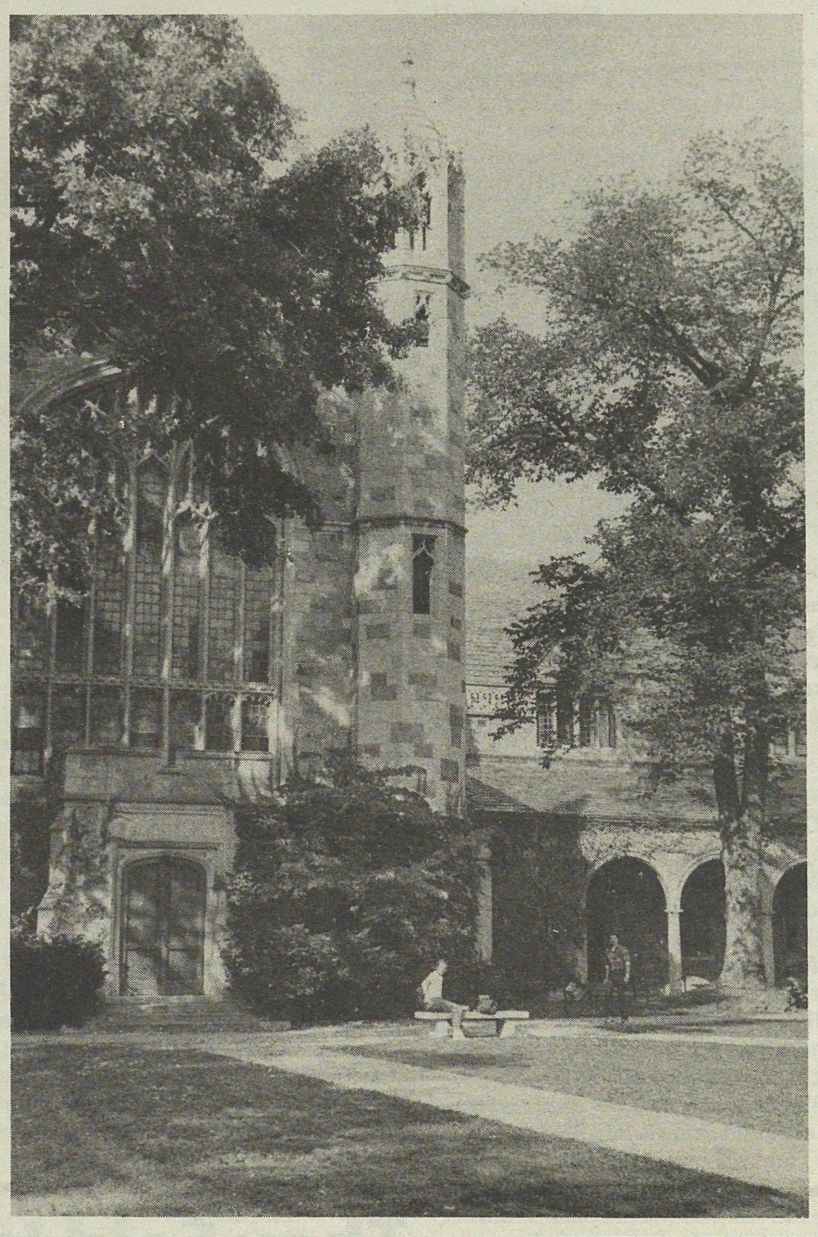
Many others have followed Elizabeth Bates's example. William Bandemer '22 B.S.E., a prominent business executive and civic leader in Ann Arbor, used his will to further his interests. His bequest funded a substantial scholarship program for engineering students and established an endowment for research in plastic and reconstructive surgery.

Recently, Willard J. Banyon '34, '38 L.L.B., an attorney, businessman and newspaper publisher in the Benton Harbor and St. Joseph twin cities, addressed his dual interests in the College of Engineering and Michigan athletics by leaving $250,000 to the dean of engineering's discretionary fund and $50,000 to the Glenn E. (Bo) Schembechler Hall.

Another bequest to the University resulted from a donor's life long love of art. The U-M's Museum of Art has been greatly aided by a bequest from W. Hawkins Ferry of over $1 million to strengthen the Museum's collection.

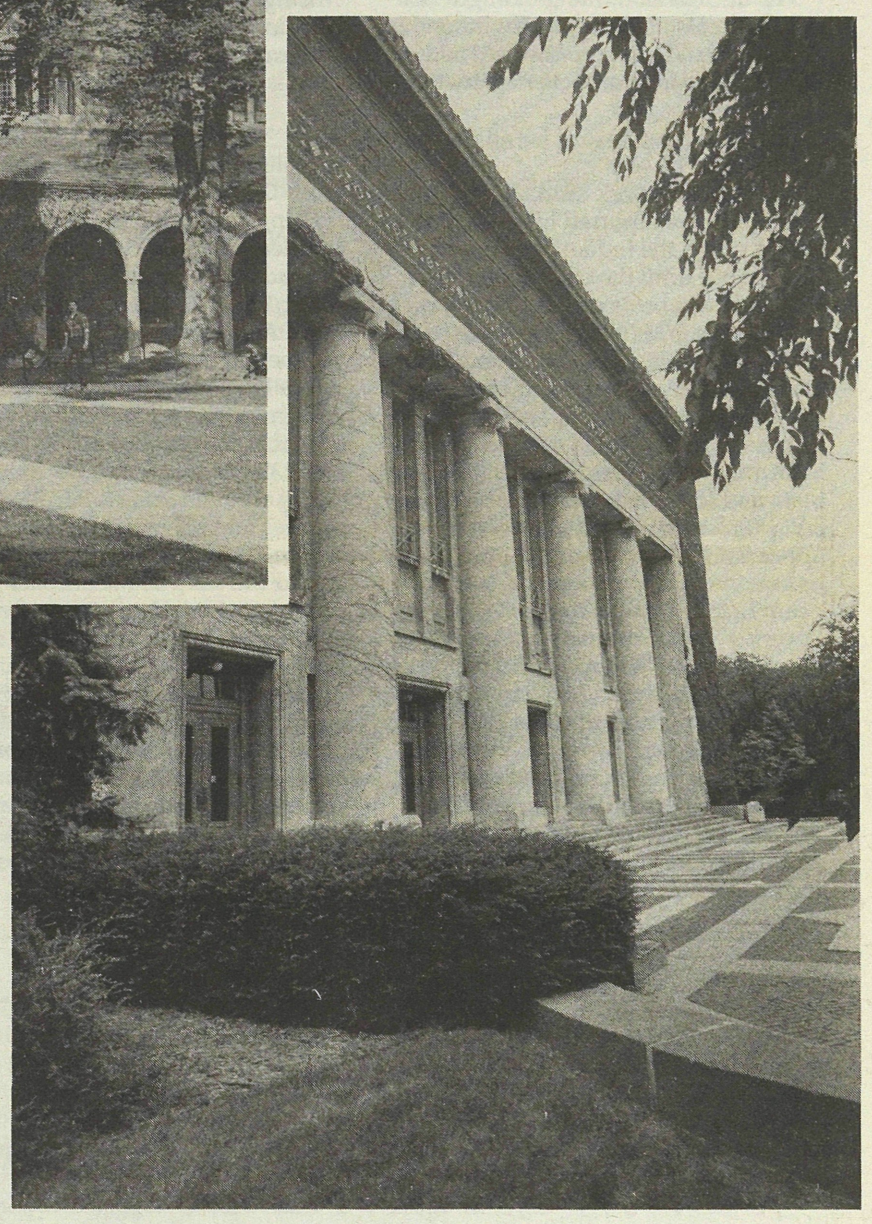
Ferry, a noted architectural historian and renowned collector of modern art, has carried on his father's tradition of generous support to the arts in Detroit. During his lifetime he made gifts to support the arts at U-M as well.

The direct financial benefits that these and other bequests bring to the University are readily apparent. But these gifts bring an additional benefit. They serve as a lasting testament to a generosity of spirit that has characterized so many of Michigan's alumni and friends through the years. This generosity strengthens and sustains the University, and it has inspired succeeding generations to emulate it.



William W. Cook initially wished to endow a professorship in the Law School, but later expanded his vision to include the magnificent Law Quadrangle.

Regent Arthur Hill told no one that he had made a provision in his will to fund Hill Auditorium.



The John Monteith Society

In the summer of 1817, when Michigan was still part of the Northwest Territory and Detroit was a small village of French and Indian fur traders, three prominent men came together to develop a strategic plan for a government-supported University.

Father Gabriel Richard, a French Sulpician missionary, Augustus A. B. Woodward, the newly appointed chief justice of the Territory, and the Reverend John Monteith, a recently ordained Presbyterian clergyman, formed the Catholepistemiad of Michigania, now known as the University of Michigan. John Monteith was elected president of the newly formed university because of his reputation as a courageous individualist and classical scholar.

In honor of those who share John Monteith's vision of the need for a great public university, the U-M Presidential Societies Executive Committee unanimously approved a new donor recognition program at its spring 1990 meeting.

Named the John Monteith Society, the program recognizes people who demonstrate his foresight by making a bequest to the University. Members will be asked to provide the University with a copy of the portion of the estate plan pertaining to their gift and to sign a John Monteith Society Statement of Intent.

The University will invite members to special donor recognition programs, including President's Weekends. In addition, Monteith Society members may be eligible for recognition at one of the Presidential Societies levels.

The Office of Trusts and Bequests at the University can provide additional information. The office may be reached at 301 E. Liberty, Ann Arbor, MI 48104-2260; (313) 998-6085.

Victory crowns a tough career

By Lisa Failer

The 1991 35-3 Gator Bowl victory — perhaps the high moment of Michigan's mercurial football season this year — was team co-captain John Milligan's goodbye to a way of life.

"I'm done with football," says Milligan, a fifth-year graduating senior. "I don't see any future in it for me. But that doesn't bother me. I don't need football."

Milligan suffered a series of almost insurmountable injuries. In September 1987, his first year on the team, he tore ligaments in his left knee during practice and underwent reconstructive surgery (*Michigan Today*, "Cutting on His Own Knee," October '87). That entailed a month-long hospital stay because of a serious staphylococcus infection, followed by six months on crutches.

His doctors said Milligan might not be able to play football again, but a year later he came onto the field as a starting inside linebacker against Notre Dame.

"It was a great reward for all the hard work," he says.

But the hard work didn't let up. As a junior, Milligan injured his ankle halfway through the Indiana game, not finding out until the clock ran out that the ankle was broken.

This season, Milligan broke his foot early in the second quarter of the UCLA game, again not realizing it until the game was over. The injury grounded him for the next five games, including the defeats by Michigan State and Iowa that cost the Wolverines a Big Ten crown and Rose Bowl appearance.

In retrospect, the physical setbacks seem to fade against the hard-won recoveries, which were an inspiration to the team. "That's maybe why the team elected me captain," Milligan reflects, "because I was able to come back from all that adversity."

Lloyd Carr, assistant head coach and defensive coordinator, who recruited Milligan from Trenton, Michigan, calls him a "mentally tough individual." After injuries like Milligan's, "you lose something in terms of ability, but he was able to play over that," Carr adds.

Being co-captains when Gary Moeller replaced Bo Schembechler as head coach sharply tested the leadership of Milligan and Jarrod Bunch '90 of Ashtabula, Ohio.

"There was a lot of pressure on us to do well this year, to make Moeller look good and to carry on with the tradition of Michigan football," says the 6'3", 233-pound Milligan.

The adjustment was hard for coaches and players at first. But as the season progressed, Moeller began to regard the team as his to coach, Milligan says. "He became more and more like himself. It was a real hard situation for him to come into."

Still, the losses to Michigan State and Iowa on home turf were devastating — and it was the responsibility of Milligan and fullback Bunch to keep spirits up. "Coach Moeller always said that to be a good captain is to lead by example," Milligan says. "You can't have a down day as a captain."

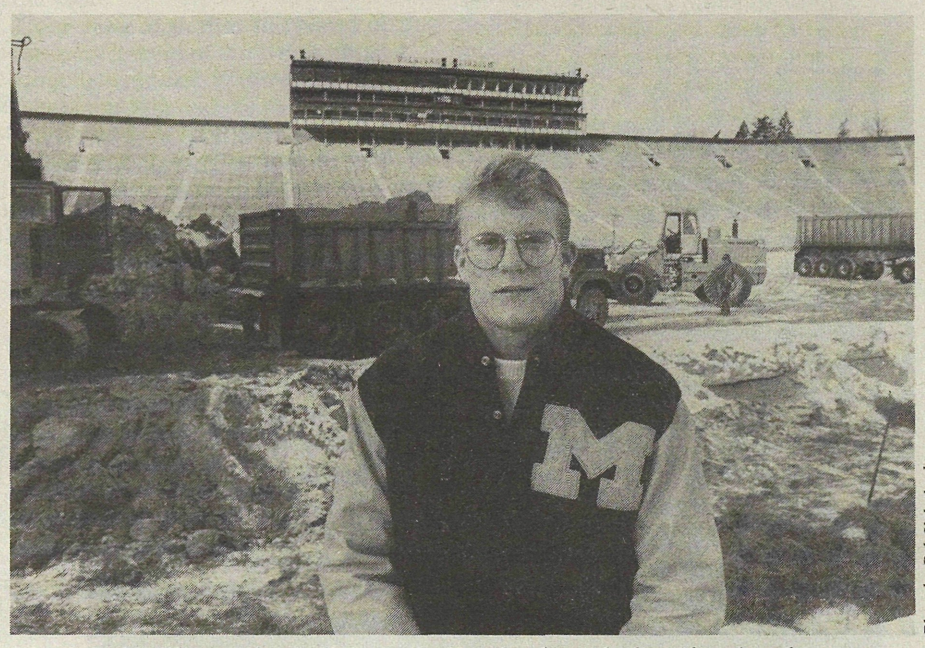


Photo by Bob Kalmbach

The end of Milligan's football days also marks the end of artificial turf at Michigan Stadium. The 'rug' — prime suspect in the injuries of many players at Michigan and elsewhere — is being torn up, to be replaced by earth and natural grass.

Carr says Milligan's attitude helped even the coaches remain optimistic about turning the season around. "Losing games at home back to back affects you as a coach every bit as much as it does a player. Following those losses, every day was like a month. John never lost his positive outlook. That had a tremendously positive impact on coaches and players alike."

The Ohio State game and the Gator Bowl trouncing of the University of Mississippi were among Milligan's best performances, Carr says. But they were also his last.

To inside linebacker coach Jim Herrmann, the fact that Milligan's football career is over is beside the point. "Less than 1 percent of college players go on to the pros," he says. "For Milligan not to go, that's not a big deal. But here at Michigan, he achieved everything he wanted to. He was able to leave that last game, the Gator Bowl, saying that he gave everything and did everything possible to be the best player he could be."

These days Milligan, who carried a heavy academic load as a psychology major, spends more time studying, and he's also applying for jobs in human resources and social services in Colorado and California.

"Football was my whole life here; it was my identity; it was what I did," he says. "When it's over, you lose what you're focused on. Everything was regimented. Now, your schedule is left up to you.

"It probably will be a lot harder for me when next fall rolls around. But it's all part of life. You have to move on. I can't see that I hit the peak of my life at 23 years old."

Lisa Failer '88 M.F.A. is an Ann Arbor freelancer.

They Said It

"Everything's happening all at once. Basically, I'm thrilled to have made it this far. I don't really know what to say" — senior **Mike Barrowman,** after making the list of 10 nominees for the Sullivan Award, which goes annually to the nation's top amateur athlete. Only days before, the English major and Big Ten All-Academic team member had lowered for the fourth time his world record in the 200-meter breaststroke at the World Swimming Championships in Perth, Australia.

★ ★ ★ ★ ★

"Basically, I'm doing this for personal and economic reasons. I think I can go pretty high — in the first three rounds of the draft" — junior **Jon Vaughn,** announcing he hoped to leave college early to play professional football. Vaughn topped the Wolverines with 1,236 yards rushing and added 128 more in the 35-3 Gator Bowl thrashing of Ole Miss. He had two more years of athletic eligibility.

★ ★ ★ ★ ★

"The U.S. locks up Black males at a rate four times greater than South Africa. Given that fact, and the alphabet soup list of other problems Blacks face here — drugs, teenage pregnancy and absent fathers, homicide as the number-one cause of death among Black males, Bush's veto of the 1990 Civil Rights Act — well, I think our troubles are here, not in the Middle East" — **Bunyan I. Bryant,** co-chair of the U-M's 1991 Martin Luther King Jr. Symposium Planning Committee and associate professor of natural resources.

★ ★ ★ ★ ★

"We believe the University community to be fully united in our compassion and concern for all those who will suffer through this war, although we may be divided by widely differing views about the conflict itself. Let us not add to the tragedy of war by abandoning our fundamental values of free speech and respect for the rights and privileges of all members of our community. We hope that dissent will be expressed freely but in the light of reason and mutual respect" — Michigan President **James J. Duderstadt** in response to concerns expressed by students as the Gulf war began.

★ ★ ★ ★ ★

As the coalition of armed forces attacked Iraq, the Michigan Daily *published these reactions from the U-M community:*

"It really hurts to see countries clash like this. My heart goes out to all those soldiers fighting on our behalf in the Gulf" — **Amrikh Singh '93**

"By not listening or adhering to diplomacy and reason, Saddam Hussein has left the United States and the allies in a situation that can only be resolved with force" — **Jeffrey Gerson '92.**

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Immigrant author sees 'a dark side to multiculturalism'

By John Woodford

"Our American intellectuals need to become aware of the dark side of multiculturalism. Emphasizing of differences can marginalize the non-white immigrant or citizen. We see danger in times like these when someone is identified as an Arab-American or Iraqi-American, instead of just an American."

The author Bharati Mukherjee told *Michigan Today* that she arrived at this conclusion after living in Canada in 1966-80. There, she said, as a result of Canadian immigration policies deigned to bring about "a salad-bowl rather than melting-pot nation," she and other Asian immigrants were cursed, spat upon, abused and discriminated against.

"There was no constitution, no civil rights laws," continued Mukherjee, who was on campus in January to read from her latest novel, *Jasmine*, at the 1991 Hopwood Underclassmen Awards ceremony and to serve as a visiting fellow of the Institute for the Humanities.

"What I say is that we immigrant writers — as distinguished from expatriates — are remaking American culture, braiding it, combining it till the broth is new. In the old days, they sold a white block of margarine with a orange pellet to mix in, and in the end both colors mingled till a third and new product was created.

"It's not a matter of newcomers mimicking the Anglo models that they found, as they did in the 19th century fashion, but of rerooting themselves and transforming the people and places they find themselves among. This new process is frightening to many whites. But when you hyphenate Americans, this sets up a vertical structure in which there is a group that is the prototype, that does not need to hyphenate, which is 'the' Americans."

Far healthier than the hyphenation trend, Mukherjee said, is America's older "national mythology of being a nation of immigrant peoples who make themselves over as Americans." The most influential cultural expression of the melting-pot myth, she added, was created by Jewish immigrants via Hollywood movies.

Her Canadian experiences have led Mukherjee to celebrate the openness of American society in her fiction while in no way compromising her perceptions of her new homeland's peculiar or unpleasant features.

Jasmine (Grove Weidenfeld, 1989) is the tale of a young Indian woman's harrowing but oddly comical journey through several incarnations, from a rundown farm in a village in the Punjab to early widowhood, from illegal immigration to the United States to emergence as a footloose, worldly wise American.

Many readers assume from the graphic force of Jasmine's adventures that Jasmine is Mukherjee. But the author's background resembles her heroine's in a literary, not a literal, sense. Mukherjee's father owned a pharmaceutical company in Calcutta, had three daughters and sent them all to study abroad.

"No events in *Jasmine* are true," said Mukherjee, who holds a Distinguished Professorship at the University of California, Berkeley, "but they all reflect the intensity of my appetites and the shape of my life and desires. I write with what I call my iceberg method — only the tip of the story shows, and it floats right if the part on the page suggests the large submerged text."

The author and her favorite characters thrive on "odysseys of dislocation" and celebrate "the fact that in America nothing lasts. To me that means America is not stuck with the detritus of history."

The "cancellation of history" her characters enjoy, Mukherjee said, means "getting rid of the barriers that fate has cast about you. But in making your fate, you don't know the meaning of your actions, so the thing is to make every moment and action special. That is a true Hindu view."

Sometimes the "true Hindu view" negates Hindu customs. After sending her to study writing at the University of Iowa in the early '60s, Mukherjee's parents wrote her that they had picked out her Bengali bridegroom.

"But I had already had a whirlwind courtship with a Canadian writer, Clark Blaise," Mukherjee said, "so I told my father by letter that by the time he received it, it would already be too late for the Bengali."

She and Blaise, who heads the international writing program at the University of Iowa, enjoy a "biracial, bicultural and now bicoastal marriage," Mukherjee said. They have two grown sons, a film cameraman in New York City and a Reed College student who maintains, to his mother's amusement, "that nothing worth reading has been written after the 14th century."

Mukherjee, who read from her novel* Jasmine *at the 1991 Hopwood Underclassmen Awards ceremony, is the only naturalized U.S. citizen to win the National Book Critics Circle Award in fiction.

U-M policy on students who withdraw to enter U.S. military service

U-M students in military service receive fee refunds, academic credit and readmission priority.

The Regental action governing the policy, passed in April 1968, says that after the first two weeks of withdrawal from school to enter U.S. military service, a student is entitled to "a refund of the semester fee equal to the fraction of the semester not completed at the time of withdrawal. Any such student returning to the University after the close of the registration period of a semester shall, with the approval of the appropriate faculty, be required to pay only that part of the semester fee which is proportional to the fraction of the semester remaining."

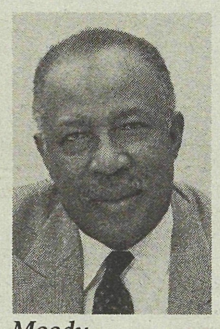
The U-M also holds it as a "general principal" that a student who has withdrawn to serve in the U.S. military should "be granted prorated or equitable credit for work completed after such examinations as may be determined upon by the faculty of the school or college in which the students is enrolled, due regard being taken for special circumstances in each case."

The students also "should receive priority consideration for readmission upon termination of his [sic] service, subject to adequate notice of intention to return and limitations of space for particular programs."

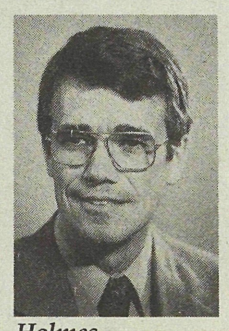
In early February, seven U-M students had left the University to serve in the Persian Gulf; meanwhile, LSA announced that it was reviewing its policy on course credits.

Faculty and staff are granted leaves of absence for the duration of their active duty.

U reaffirms minority commitment



Moody



Holmes

"The University reaffirms its commitment to both currently enrolled and prospective minority students with respect to scholarships and fellowships," said Gilbert R. Whitaker Jr., provost and vice president for academic affairs.

"We are committed to attracting and maintaining a multiculturally diverse student body," Whitaker continued. "Minority students' awards will be fully honored under the original conditions of the offer."

Whitaker made his statement in response to a December ruling by Michael Williams, head of the Department of Education (DOE) Office for Civil Rights, that called into question the legality of race-based financial aid. Williams's decision was in reaction to an announcement that Fiesta Bowl officials in Arizona would offer scholarships to Black students of universities that agreed to play in the game despite Arizona voters' rejection of a proposed state holiday honoring Martin Luther King Jr.

Williams said that "race-specific" scholarships violated civil rights law and that schools receiving federal money risked losing the funds if they continued to award scholarships on the basis of race.

Charles D. Moody, vice-provost for minority affairs and professor of education, said the University "will continue to create an institutional climate conducive to the growth and development of students of color. We want them to transfer these achievements to additional education and to jobs."

Moody said Williams's ruling was "an effort to jump to a color-blind society without paying attention to the fact that the country didn't get this way by being color-blind. Thirty years of affirmative action don't make the playing field level after 400 years of not having a level field. Financial aid programs have not been in place long enough to level the playing field."

Moody compared the issue of race-based affirmative action measures with changes in the design of running tracks: "In the past they used to run races without a staggered start. But then they realized that the competitors in the outside lanes were running farther. Nowadays the lanes are staggered to make things fair, but it still may seem to casual or uninformed observers that the runners in the outside lanes have an advantage."

Stephen J. Tonsor, professor of history, said he thought Williams had raised important constitutional questions.

"I am not very keen on race-based scholarships," Tonsor said in an interview with the *Michigan Review*, a student publication. "It is possible for a student to be Black and be a millionaire, well able to afford a college education, and simply by accident of race receive a scholarship.

"Whether or not a race-based scholarship is constitutional, whether or not it is even in the American tradition of equal opportunity, is an important question. I believe you can make a case for scholarship assistance on the basis of being disadvantaged. It is much more difficult to make that case on the basis of race. Where do you end? Whom do you include? Because you are white does not necessarily mean that you are not equally disadvantaged. I think perhaps we have not really thought this question through."

According to Robert B. Holmes, assistant vice president for academic affairs, the University has not received any new regulations or guidelines from the DOE.

"We're conducting business as usual," Holmes said, adding that "many people question the Department of Education's stance on the issue, and are concerned about how it may affect the recruiting of minority students.

"Schools are worried that this sends a very chilling message to potential students." He said the University has a "substantial" amount of financial aid targeted for minority students since their financial need is often high relative to other students.

Under the Michigan Mandate announced by President James J. Duderstadt in 1988, Holmes noted, one of the University's goals is "to commit to the recruitment, support and success of members of historically under-represented groups among our students, faculty, staff and leadership."

He pointed out that the Mandate pledges the U-M "to meet the full financial needs of all under-represented minority students who are Michigan residents and to expand significantly the financial aid resources available to non-resident under-represented minority students."

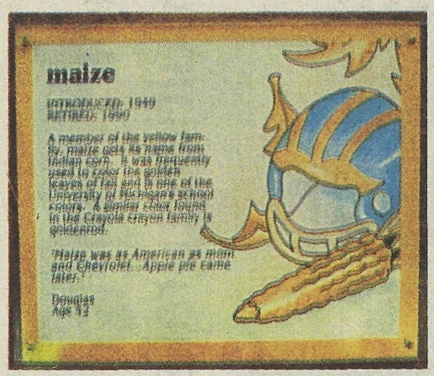


Photo by Donald Goings, U-M Photo Services

A maze of maize: On display at Crayola's Hall of Fame (left) in Easton, Pennsylvania, are an oversized maize crayon and this plaque honoring the Wolverine colors; maize was one of eight hues withdrawn from the crayon lineup last summer. At right is a maize still life composed of U-M's version of maize on the football jersey's sleeve; maize crayons by Color Art and Crayola; an ear of Calico Belle corn; maize yellow (light yellow 86 from the 1912 work **Color Standards and Color Nomenclature**); *Crayola's 'Dandelion' crayon (which replaced 'Maize'; and Crayola's 'Lemon Yellow,' the closest match to the stripe in the football jersey, and erased from Crayola's lineup. (See articles on color, pages 8-10.)*

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