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Don’t forget, says author: memory is a creative process

In the weeks leading up to November 22, 1988, the electronic and print media tirelessly paid tribute to President John F. Kennedy and the 25th anniversary of his assassination.

Question: How many of us recalled, with little hesitation, exactly where we were on that fateful Thursday afternoon? Answer: Nearly all of us. Why?

"The emotionally charged news aroused an entire society," says Edmund Blair Bolles, A.B. ’64, citing the most obvious reason. The author of the recently published Remembering and Forgetting (Walker Publishing Company), Bolles offers a lesser known explanation: "Most of us heard the news on the radio or from someone else. There was nothing to focus on visually. You received a piece of abstract information so you focused on whatever was concrete. You see the room you were in, the people you were with. It’s a flashbulb memory."

A New York-based full-time writer with six books and numerous articles to his credit, Bolles says he has often wondered at and been fascinated by the powers of imagination and the human mind. His most recent book, subtitled Inquiries into the Nature of Memory, undermines long-held beliefs regarding the process of memory. Drawing on studies documented in the past 30 years by psychologists, scientists, and physicians, he argues that the human brain houses no filing cabinets packed with stored information. Unlike a computer, it sports no silicon chip.

Has the notion of a memory bank suddenly become obsolete? In Bolles’ words, yes. ‘Memory is a creative process, not a fancy computer. It is a product of desire, attention, insight, and consciousness,’ he claims. ‘We do not retrieve memories but rather create them anew each time we remember. In the book, I talk about how people discover what they know as they go from the emotional, to the factual, to the interpretive, the three basic levels of memory."

“I graduated from Washington University taking human creativity and the intellect very seriously,” recalls the writer whose father, Blair Bolles, achieved wide recognition for writing How to Get Rich in Washington and other books exposing political corruption in the federal government. “When I came back to the U.S. in 1968 after two years in the Peace Corps, I was shocked by the way the mechanical view of humans had taken over while my back was turned.”

Bolles estimates that science will make more discoveries about memory in the next 15 years than it has in the past 100 and offers this prediction: "In a few years, it will be commonplace to say that remembering is an act of imagination, but what does that fact tell us about ourselves and our potential? My own judgment is that we have a much greater creative capacity than we ever suspected, and that we should actively encourage the development of this capacity."

— Cynthia Georges

Physicists at Washington University have fused two technologies into one package, providing scientists with a unique tool to examine matter under ultra-high temperature and pressure. Using a method of applying extremely high pressure to two tiny, opposing diamonds, physicists doctoral student Sam-Heon Lee and physicists Mark Conradi and Richard Norberg are the first scientists to combine nuclear magnetic resonance (NMR) with a diamond-anvil cell.

The work, supported by the National Science Foundation, is an outgrowth of research first described in a paper written by the trio with Kazimierz Luszczynski, professor of physics at Washington University.

A technique long used in physics and chemistry, NMR allows scientists to examine molecules by measuring magnetic fields detected by the nuclei of atoms. More recently, NMR has found many applications in medicine, where the tracking of molecules gives doctors a real-life picture on a computer screen of the body’s organs and the processes within them.

To avoid cracking the diamonds, the Washington University physicists use flawless gems, each one-quarter of a carat. They add another material, a ruby chip, to measure pressure. With these tools, the team has generated pressures over 100,000 times that of the earth’s atmosphere at sea level. Under the enormous pressure generated by the force exerted between the two diamonds, the electrons in the atoms of a substance become excited, and the atoms and the properties of the substance — color, density, susceptibility to a magnetic field, electrical resistance, for example — change significantly.

The diamond anvil-cell and its paraphernalia can fit into the palm of a hand; the apparatus is so small that when held between index finger and thumb, it resembles a crudely designed earring. Yet the device is 10 times more efficient than a several-ton hydraulic press.

— Tony Fitzpatrick
Feminist author proposes agenda based on motherhood

Author and critic Marilyn French, delivering the keynote address this fall for the 14th annual Mr. and Mrs. Spencer T. Olin Conference, “Mothering: Ideals, Imperatives and Choices,” dispelled the notion that the work of feminism might be finished and suggested a new agenda for the women’s movement. French is a Shakespearean scholar, a former Mellon Fellow at Harvard, and the author of several books, including *The Women’s Room*, and the current best seller, *Her Mother’s Daughter*.

“Feminism has been enormously successful in gaining entry for women into schools, professions, and well-paid jobs,” she conceded in her Assembly Series lecture, titled “The Politics of Motherhood.” “It has succeeded at the middle level. It has not yet succeeded in gaining entry for enough women in the highest echelons of government and busi-

ness to change United States policies. Nor in improving the lot of those women — which means most of us, at some time in our lives — who continue to perform traditional women’s work.”

French pointed out that mothers in the U.S. are not paid for raising children and that their work is therefore undervalued. “In a society that measures everything by money, unpaid work is literally not work,” she insisted. “The difficulty of the job is not unpleasant most of the time — it’s part of the challenge. But the intelligence, and patience, and understanding, and wisdom, and love, and sensitivity required to do it well go absolutely unacknowledged in our society. Those who reproduce and those who raise children create society,” she insisted.

By comparing U.S. policies to those in Europe, she suggested that our country consider a more general policy shift. “Most European states grant allowances to mothers with small children,” she said. “Many have programs that require fathers to contribute to their children’s support, even if they don’t live with them. What is it about the United States that keeps us from establishing such programs? Why must we endure raging debate about something as simple as free child care? Universal, free medical care? Look at the billion-dollar programs our government does pay for, and tell me what our priorities are.”

Thus, French’s new agenda: “A politics of motherhood would organize women to demand such programs, but would go even further. Mothers want their children to live. And so they want peace, security, clean air, nourishing food, decent education, which is to say they oppose war, armament races, nuclear installations, pollution, and the spread of drugs.”

French called the bond between a mother and child “the most profound bond on earth.” How should we treat this circumstance? “We cannot measure such a bond in terms of money,” French concluded, “but we can make it a little easier, a little more pleasant, to raise children, which would also make it easier to be a child. No, mother love is not absolute, but it’s the closest thing to absolute we know.” — Kate Berger

Zooarchaeology labs read messages written in old bones

A comparative collection of modern vertebrates, animal fossils, and bone artifacts from various cultures can now be found in two new zooarchaeology laboratories that the anthropology department recently dedicated in McMillan Hall.

Zooarchaeology, a branch of archaeology developed in the 1960s, deals with animal bones from archaeological sites and what these bones reveal about human culture.

Fiona Marshall, assistant professor of anthropology, is curator of the laboratories and in charge of developing the zooarchaeology program at the University. The laboratories will provide students the space and samples to develop zooarchaeological skills, she says.

“Zooarchaeology grew out of a need to collect information from animal bones at archaeological sites that neither a zoologist nor a paleontologist would be interested in,” Marshall says. The cut marks on tiny bone fragments might show the zooarchaeologist how people butchered their meat, she explains, whereas the zoologist or paleontologist probably would just throw those remnants away.

“The archaeologist wants to know what animal bones can tell about human diet and subsistence, and the way they have changed through time. For instance, recently it was revealed that humans first ate meat about two million years ago — that was the result of a zooarchaeology study.”

Fiona Marshall
Jules Feiffer's cartoonery hits political buffoonery

Politically prize-winning political cartoonist Jules Feiffer, speaking about U.S. presidents, political cartoonists, and the relationship between the two, managed to keep everyone in a crowded Graham Chapel smirking and laughing for more than an hour during an Assembly Series lecture and slide show this fall.

"Political cartoonists don't have the privilege of choosing their subjects," he began, "they are unique among artists in that their subjects are elected." Feiffer explained that this dependency on the uncertainties of politics is one of the hardest parts of his job.

"The day after he left the White House, cartoonists, quicker than anyone, knew how bleak those years without Nixon as our criminal-in-chief were going to be," he deadpanned. "Editorial cartoonists gathered in a network of saloons crisscrossing the country, checked their bank balances, assessed their mortgages, and openly wept."

Feiffer began his talk with the claim that "Ronald Reagan is, in my mind, some kind of genius...He has re-framed the acceptable limits of卡通ist Jules Feiffer, speaking about U.S. presidents, political cartoonists, and the relationship between the two, managed to keep everyone in a crowded Graham Chapel smirking and laughing for more than an hour during an Assembly Series lecture and slide show this fall.

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Sound method measures fetal oxygen painlessly

Obstetricians at Washington University are using a new method to determine if a fetus is getting enough oxygen during labor; the method, according to Roy H. Petrie, professor of obstetrics and gynecology, may both decrease brain damage in infants and reduce the number of unnecessary cesarean sections.

The new test, described in the October issue of Obstetrics and Gynecology, entails literally startling the fetus with a sound stimulator placed on the mother's abdomen over the baby's ear. When stimulated, Petrie says, the heart rates of fetuses getting sufficient oxygen go up in the same way as the heart rates of adults in response to a loud, unexpected noise. But if the heart rate of a fetus fails to increase, the infant is probably not getting enough oxygen and may be in danger of suffering brain damage.

Fetal oxygen deprivation is a problem in three to five percent of all pregnancies, according to Petrie. Fetuses not receiving enough oxygen must get energy from an alternative biochemical pathway that produces lactic acid—a byproduct that in effect fries brain cells.

Physicians traditionally have used blood analysis to distinguish fetuses with abnormal heart rates who are in distress from those who are not. Fetal blood is collected with a tube-like endoscope that is inserted into the birth canal and used to prick the baby's scalp. Once obtained, the blood is tested for acid-base content, or pH. While fetal blood sampling is accurate, obtaining the sample is difficult.

But because it is so much easier, the new method can be used more frequently, and therefore provide closer monitoring and better knowledge of fetal health—knowledge that can potentially decrease both the incidence of fetal brain damage and the number of unnecessary and unwanted cesarean sections.
Two grants establish biotech resource centers on campus

Jacob Schaefer, professor of chemistry, and Roy Curtiss, professor of biology and chair of the department, were each awarded grants last fall by the National Science Foundation to establish campus research centers in biotechnology.

Schaefer received a grant to establish the National Facility for Nuclear Magnetic Resonance (NMR) of Biological Solids. The award makes the Washington University NMR laboratory the world’s premiere research center in high-resolution NMR of biological solids. Scientists from several of the nation’s top laboratories already have arranged to work at the new facility. The research conducted at the facility is expected to contribute to advances in medical and industrial research.

The NSF grant totals $1.8 million for five years. In addition, Schaefer has received a three-year grant of $422,000 from the National Science Foundation to establish and equip a multidisciplinary Center for Resource Biotechnology. He also received a $147,000 grant from the National Institutes of Health to equip the department’s Integrated DNA Chemistry Facility. The facility, housed in Rebstock Hall, will contain a DNA synthesizer that provides synthetic DNA researchers can use for many different experiments and an automated DNA sequencer that rapidly determines DNA sequences.

The Integrated DNA Chemistry Facility will become a part of the new Center, most of which will be housed in the biology department’s recently dedicated Plant Growth Facility. New plant growth chambers will be purchased with NSF funds. These are computer-operated, enclosed compartments that allow researchers to control growth conditions such as temperature, moisture, and the photoperiod—a constant, recurring cycle of light and darkness.

The Department of Biology last fall also received a $500,000 grant from the Missouri Department of Economic Development to establish the new Center for Plant Science and Biotechnology to be housed in the department’s facilities. The Center is a collaborative effort involving the Missouri Botanical Garden and the University of Missouri-Columbia. Earlier this year, the Monsanto Company provided a grant of $18,000 to initiate the establishment of the Center.

Tony Fitzpatrick

and developing better industrial polymers, to tracking molecules in the human body for medical diagnosis, to examining cell walls of plants, bacteria, and insects for high-technology applications in agriculture.

The facility has recently opened with three NMR machines in operation and two more under construction and now nearly complete. Schaefer oversees the building of the NMR spectrometers with the assistance of electronics engineer Robert McKay, also a member of the Washington University chemistry department. The spectrometers under construction were supported by a 1987 NSF grant totaling nearly $300,000 and a supplemental 1988 NSF grant of $120,000.

Curtiss received a grant of $460,000 to establish and equip a multidisciplinary Center for Resource Biotechnology. He also received a $147,000 grant from the National Institutes of Health to equip the department’s Integrated DNA Chemistry Facility. The facility, housed in Rebstock Hall, will contain a DNA synthesizer that provides synthetic DNA researchers can use for many different experiments and an automated DNA sequencer that rapidly determines DNA sequences.

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Gift exchange prepares the way for good friendship

In an exchange of gifts last winter, the Mitsubishi Kasei Corporation of Japan, a chemical firm related to, but independent from Mitsubishi Motors, donated funds to the University that will be applied to Arts and Sciences, and specifically to the biology department. In return, the University asked the city of St. Louis to proclaim December 6, 1988, Mitsubishi Appreciation Day in a ceremony held in Brooking Hall recognizing Mitsubishi Kasei representatives for their generosity.

The proclamation scroll, held by Seiji Suzuki, president of Mitsubishi Kasei Corporation, above, standing in his Tokyo headquarters office, bears the seal and signature of the mayor of St. Louis. Though Suzuki had planned to do so because of the Emperor Hirohito’s grave illness.

Presenting a check for $500,000 to Chancellor William H. Danforth were: Sanae Ono, president of Mitsubishi Kasei Corporation; Nobuyuki Tanaka, executive vice-president of the company; and planetary sciences.

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Congressman writes law to promote more graduate study

Competing with a pool of some 400 applicants nationwide, Washington University emerged a winner last fall in qualifying for two graduate fellowships under a new, federally funded program offering “Graduate Assistance in Areas of National Need.” Forty-two institution-based fellowships in all were awarded to 30 universities, 10 of which received two grants each.

The graduate assistance program is the result of legislation authored in 1986 by E. Thomas Coleman, J.D. ’69, U.S. Representative from Missouri’s sixth congressional district, in an effort to encourage more American students to enter teaching and research careers in sciences critical to basic research and technological innovation. Coleman cited the $7.7 billion program as the only new federal educational spending program to come out of the last fiscal year.

“When the Higher Education Act came up for reauthorization, this growing problem of so many foreign nationals receiving advanced degrees in areas of national need was brought to my attention by the Association of American Universities and other institutions,” stated Coleman, a member of the Committees on Agriculture, Education and Labor. “It struck me as a valid concern, so we studied the issue.”

Their findings? According to Coleman, foreign students accounted for some 50 percent of the Ph.D.s granted nationwide in engineering; 40 to 50 percent of Ph.D.s in mathematics were awarded to foreign citizens. The committee found these figures disturbing, for they indicated a decline in those Americans pursuing advanced degrees in science and engineering. Moreover, studies revealed that many of the newly minted Ph.D. students return home, often finding employment with companies and governments that engage in fierce competition with the United States.

E. Thomas Coleman

Says Coleman, “What we’re seeing here is not necessarily a concern about having foreign students in our universities. The point is, where are the Americans in the American classrooms?”

According to Coleman, the goals of the graduate assistance program include supporting and maintaining the transfer of knowledge from one generation to another and bolstering the ranks of American professors. “Just from our own national security interest, it is important to look at the issue and do something about it,” he cautions.

In the face of higher education’s escalating and burdensome costs, the federal program provides for stipends to meritorious and needy American scholars, as well as grants to the institutions involved. The program’s structure calls for those institutions, in turn, to offer matching assistance. Congress already has appropriated $12.5 billion for next year’s awards, an increase of $5.1 billion over the previous year.

Marking 12 years of House service, four at the state level, Coleman champions this progress in the face of budgetary restraints under which Congress has been forced to work. Defending an eight-year administration criticized for cutbacks in education, he claims, “Education has fared better than most programs in the budget. It has not taken as many hits as people have perceived.” — Cynthia Georges

Quotables

“The challenge is how to steer technology to produce socially satisfactory outcomes, the futures that collectively we want. In the quest to tune and to tame technology, we begin a search for some process of human steering. Even though we may have already developed techniques to launch nuclear-tipped missiles automatically, on radar-tripped warning, we are certainly not yet ready to turn society over to autopilot.”

— Edward Wenk Jr., engineer and former policy adviser in the Kennedy, Johnson, and Nixon administrations, speaking last fall at the first annual Elvera and William Stuckenken Lecture in Technology and Human Affairs in a lecture titled “The Politics of Technology and the Technology of Politics: Portents for America’s Third Century.”

Flora Lewis

“I was just a couple of days ago told by some people in Moscow, ‘It is more interesting to read the papers than to live.’ In other words, the glasnost, the willingness to address subjects that have been taboo for 50 or 60 years, is very exciting, but it has nothing to do with how long you stand in a line to buy food for dinner. It has nothing to do with the dreary, exhausting problems of everyday life.”

— Flora Lewis, foreign affairs columnist for The New York Times, from the Woman’s Club of Washington University Lecture last fall, part of the Assembly Series.

“[Commercial architects] have to come up with a scheme very quickly, or they lose the job. They draw just enough to get it over to a professional model maker—who builds enough of a model to take it over to a professional photographer, who rolls out a sky and takes the photograph and polarizes it into the skyline of Cleveland, or wherever it’s going to go. Then it goes to a professional salesman, in a Giorgio Armani suit, who gets on an airplane and goes over to Denver with this glossy package and sells it to the developer... I think it would be difficult to achieve a building of the quality of, say, the Chartres Cathedral, under these conditions.”

— Steve Badanes, of Jersey Devil Architects, speaking last fall on “Alternatives to Traditional Practice” at the School of Architecture’s Monday Night Lecture Series.

“It is hard even for the staunchest defenders of the Reagan administration to claim that its policy in Central America has been successful. The Nicaraguan Sandinista government has survived the Reagan onslaught. Soviet and Cuban presence in Managua has grown. And the administration’s policy in Central America, particularly in Nicaragua, has run into a dead end; the policy of military aid to the Contras has come to be a kind of slow-motion Bay of Pigs.”

— Abraham Lowenthal, professor of international relations at the University of Southern California, and author of several books, including Partners in Conflict: The U.S. and Latin America, speaking at an Assembly Series lecture last fall.

“My way of collaborating is more lateral — working with other artists in disciplines that I can expand my own discipline with. Hitherto, designers have never been as well considered as authors. I treat designers as authors. I treat the design as a key element of a theatrical presentation.”

— Composer Philip Glass last fall at a discussion on 1,000 Airplanes on the Roof, part of Edison Theatre’s “Meet the Artist” series.
Let's help the FBI play 'Spy vs. Spy'

Either the FBI has run out of Soviet agents to track, or the usual American haunts of the KGB have failed to turn up enough Russian spies to make surveillance worthwhile. These must be the only plausible reasons the FBI decided to monitor research libraries, trying to enlist the aid of these institutions' librarians to spot Soviet agents who might be using the collections.

Unfortunately, the agency's Library Awareness Program blew up in its face when dismayed librarians, angry congressmen, and negative public reaction called the whole thing into question. This is distressing, because no one wants to see the FBI ridiculed, much less lose its spy-catching ability for want of imagination.

A few suggestions, then, are in order, about places where the FBI hasn't looked for Soviet spies but might reap a rich harvest of KGB agents trying to infiltrate the very heart of our society:

- The Russian Tea Room on East 57th Street in New York. Long known for serving the best borscht and piroshki (Russian beet-and-cabbage soup and meat-filled pastry) in the city, the restaurant has always attracted dangerous, unstable, even subversive elements such as writers, artists, actors, dancers, stockbrokers, and admen.

- Ballet schools and companies. The Russians are everywhere here, teaching Bolshoi and Kirov to innocent American youngsters, taking lead roles from our own dancers and, worse still, even directing some American dance schools and companies. How many of these people — on the surface defectors from the Soviet Union, or exiles, or emigres — are in fact double agents, trying to make American dance into a cultural satellite of the Evil Empire?

- Barber shops and hair styling salons. The Russian word for barber is parikhmacher, which not only sounds alien, but is derived from the German perückenmacher, or wig maker, which implies concealment and subterfuge. It turns out that Russian emigres have taken to barbering and coiffuring in some numbers, and in such strategic places as Ames, Iowa; Peoria, Illinois; Duluth, Minnesota; and Sepulpa, Texas. Barber shops and hair styling salons lie at the core of our society; where else do Americans openly reveal their innermost secrets and thoughts?

- The Daughters of the American Revolution. Here is an organization whose very name should irresistibly attract the KGB. How easy it would be to fake the genealogical credentials needed to enter this impeccably American institution, and how rewarding to the masters of Russian subversion to be able to turn it to the ends of “true” revolution! — Victor T. LeVine

Victor T. LeVine is a professor of political science at Washington University.
Detectives in the Marketplace

Experimental economist
Don Coursey uses laboratory techniques to study the economic effects of human behavior.

by George Hickenlooper

Traditionally, economists speculate on large-scale trends, analyze mountains of data to discern indications of economic movement, or construct abstract models of how economies do or should work. But recently a new breed of economist has been devoting itself to small-scale study based on real-life situations, either found or created, in which actual consequences can be assessed. Relying on data produced by the smallest-scale transaction (between a single buyer and seller, for instance), economists like Don Coursey, associate professor of business economics at the John M. Olin School of Business, are taking a new look at how economic transactions work.

Relying on what they refer to as "microeconomic" data, this new breed, who call themselves experimental economists, test the choices real people make in situations where responses are directly related to actual costs. In this way, say Coursey and his colleagues, the true dynamics of economic interaction can be more precisely determined.

"Let's say you have an old sports car," Coursey suggests. "You might tell your friends you'd never sell it, or you might say you'd sell it for some price nobody would be willing to pay. You're just saying that because you really don't want to sell it. But if one day you decided to sell it and went to the market, the market would soon enough force you to come to terms with how much money you would accept in return for giving it up."

According to experimental economists, the market reveals the true values that people assign to trade more accurately than any amount of theoretical speculation can. The market, then, is both mirror and magnet, reflecting patterns of economic decision-making as well as activating them by its presence, in much the same way a magnet sets up its own magnetic field.

Coursey and his colleagues believe their experimental techniques are uniquely capable of unraveling and understanding the forces that govern behavior in the marketplace. "Major business decisions are typically messy," Coursey says. "Experimental economics provides a controlled setting that strips away much of the confusion that can make 'real world' business decisions so difficult to measure."

Armed with analytic tools designed to arrive at hard-data insights, Coursey and the new generation of experimental economists feel they have a mission—to clarify decision-making processes, especially regarding the use of commonly held resources. Approaching an area of economic life typically shrouded in mystery and confusion, Coursey and associates apply their methods with zeal, promising wisdom like a bolt of lightning from the skies.

Much contemporary intellectual ferment is an effort to transcend the restrictions of ever-increasing specialization; sometimes the longed-for broader vision begins to dawn when research paths from different disciplines intersect. Such a convergence, specifically that between experimental psychology and experimental economics, has yielded new insights into human behavior. Finding out how people really behave under controlled laboratory conditions (as opposed to how theory prescribes they should behave) is the goal that drives this research.

Behind much of the confidence expressed by experimental economists in the ability of their techniques to elucidate human behavior in the marketplace is an almost 18th-century optimism regarding the even-handedness of the unfettered market. The marketplace is home of "homo economicus," Coursey tells his students. "Homo economicus is very smart and clever, knows what he wants, and exercises complicated strategic thinking," he says. The common denominator of economic man's rationality is, quite simply, his reasonable desire for gain and aversion to loss.
To market: Don Coursey, associate professor of business economics in the John M. Olin School of Business, wants to make economic decision-making more precise—especially where consensus and commonly shared resources are involved.

Behind him, one of 16 networked computers that constitute the Reuben C. Taylor Experimental Laboratory, devised by Coursey to simulate marketplace conditions in order to better understand human behavior as it affects economic decision-making.

The method of the experimental economists is probably best explained by example. A project recently completed for the Environmental Protection Agency, for instance, was designed to elicit honest responses from local citizens to a tree-planting project in Fort Collins, Colorado. Residents were asked what they would be willing to pay for the trees if they wanted to have them planted, or how much compensation they would demand if the trees were not planted.

To eliminate possible “free-riding” behavior (which occurs when people say they will pay less than they truly value an item), there was a twist: those surveyed were required to pay what they said they would (either in return for the trees or as compensation) to the winning majority.

Following the initial survey phase of the project, experimental sessions were conducted in a local high school. A “real life” marketplace environment was created by a group fund—a pot of real money, in effect—that was actually collected from or distributed to the group. The amount of money in the fund was determined by using actual per-household costs of either increasing or decreasing the number of trees. Participants in the sessions privately submitted willingness-to-pay or willingness-to-accept bids. If the bids equaled or exceeded the group fund level on the willingness-to-pay side, those bidders would actually have to pay their stated bids. When this happened, the money was contributed to the Fort Collins Parks and Recreation Department. Similarly, if the willingness-to-accept bids amounted to a total that was equal to or less than the group fund, the individuals would actually be compensated from money that would otherwise have been contributed to the Department.

What the bargaining sessions demonstrated was that where real money is involved and actual supply and demand forces operate freely, the “honest price” that the buyer is willing to pay and the
seller to accept can be arrived at accurately and efficiently. At the conclusion of the Fort Collins project, residents ultimately contributed $1,500 toward the planting of 20 full-size trees.

Coursey believes that controlled experiments in which the participants stand to gain or lose actual sums of money (up to $40) can provide a new venue for solving economic problems more reasonably. Real market forces tend to elicit more honest statements of value when responses are no longer hypothetical but have consequences. And the implications of these responses, particularly where the public good is concerned, can be profound.

While most people tend to think of the public good mainly in terms of the natural environment, Coursey would like to extend the concept to cover many other things as well. "Wherever a resource is used jointly, you have a 'public good,'" he says. "For a business it might be the advertising budget, the secretarial pool, or the xerox machine. The question is—Who uses it? Who pays for it? And how efficiently is it being used for the good of the company?"

On the smallest scale, a public good might consist of property held in common by two people. If the two people happen to be a couple on the verge of a divorce, the question of how to divide up the property becomes acute. In a typical situation, Coursey says, each spouse may feel vindicated in claiming ownership of more than half the property. One way to settle the issue is obviously in divorce court. By the time a settlement is reached, however, both parties will have sustained losses in the form of court costs and attorney's fees, and the settlement may still not be satisfactory to either spouse. An alternative would be for them to settle their differences by themselves. Coursey feels that when people understand what the alternatives to compromise settlement are, they will prefer the more equitable and efficient arbitration of the marketplace to institutions like the courts that subtly foster a "winner-take-all" mentality.

Coursey also would like to see more light generally shed on the interaction of economics and various institutions, including the legal system. One reason the courts are backlogged, he contends, is that plaintiffs and defendants too often fail to realize how much they stand to gain by settling out of court. To test the influence of property rights and the cost of trial on pre-trial bargaining behavior, Coursey and his research partner, Linda Stanley of the economics department at Colorado State University in Fort Collins, conducted an experiment in which the participants were given a certain limited time to bargain over chips, which had a real monetary value. No mention of "plaintiff" or "defendant" was made. If time expired before the subjects had settled on a way to divide up the chips, negotiations were terminated and the outcome was determined by a random drawing, which represented the judge's decision. Costs were assessed according to which particular judicial system was being modeled: the American, in which both parties bear their own legal costs; the British, where the loser pays the legal costs of both parties; and the federal statute and a similar California law that require a party who has rejected a pre-trial settlement offer to pay the legal costs of his or her opponent if the judge's award is less favorable than the pre-trial offer.

"Homo economicus," whose home is the marketplace, "is smart and clever, knows what he wants, and exercises complicated strategic thinking," Coursey tells his students. Economic man's rationality, he says, is based on a reasonable desire for gain and a reasonable aversion to loss.

To test just how much each particular law "shadowed" the bargaining that goes on outside the courtroom, the experiments were conducted with four pairs of subjects bargaining concurrently. Subjects were told that they and their respective partners would be jointly given 100 tokens in each negotiation period, and that their task was to divide the tokens (which were assigned a small monetary value) among themselves.

The results of the experiments confirmed the researchers' hypothesis that subjects would bargain according to a rational economic model, but only after gaining experience in the market following several trial periods. It was evident that cost allocation rules did indeed affect the pre-trial bargaining process. Coursey and Stanley concluded that not only do cost allocation rules induce varying possibilities of pre-trial settlement but, when settlement is achieved, the way the stakes are divided up reflects the particular rule that was shadowing the negotiation process.

Coursey is particularly interested in investigating psychological biases that cloud people's perceptions of their own economic interests. Recently he was awarded a three-year grant from the Russell Sage Foundation of New York to explore the subject.

The behavior of the insurance industry in earthquake-prone areas, for example, suggests a reluctance to utilize available earthquake data to maximum advantage. In a study funded by the United States Geological Survey, Coursey, together with colleagues Richard Bernknopf, David Brookshire, and a team of professional geophysicists, will attempt to explain how insurance firms incorporate information—technical and scientific data on earthquakes generated by experts but not specifically for economic reasons—into their decision-making process. Coursey's hunch is that insurance firms are not efficiently using available information to maximize their rate of return.

Still another area where Coursey feels rational behavior may be frustrated is the securities market. The Chicago Board of Trade recently invited Coursey and his colleague Edward Dyl to study whether trading interruptions and trading suspension rules were ultimately productive or not. Their findings indicated that neither of the two most commonly applied rules—invoking either trading suspensions or price change limitations as a kind of safety net for the investor—were as favorable to growth and stability as an unregulated marketplace, given the policymaker's goal of a fair and orderly market.

Experimental economics began in the 1960s, a decade in which institutional behavior generally came under intense scrutiny. It began with the pioneering work of Vernon Smith, Coursey's mentor and professor of economics at the University of Arizona. Acutely aware of discrepancies between theories of supply and demand and actual institutional behavior, Smith decided to take a fresh look at these primal market forces by using student subjects in controlled experiments with real money.

The results were startling. Smith discovered that a very competitive, vibrant market could be generated by as few as four buyers and four sellers. As computer technology developed, the experiments became increasingly sophisticated, providing the cleanest types of controlled
To tell the truth: These five panels were offered to residents of Fort Collins, Colorado, in the experiment funded by the E.P.A., as examples of how many trees might be planted in a new town park.

Residents could elect the 20-acre park as planned, with 200 trees (represented by the middle panel), or choose 25 percent more trees (panel 4), 50 percent more trees (panel 5), 25 percent fewer trees (panel 2), or 50 percent fewer trees (panel 1).

If residents voted for fewer trees, the town would receive payment in compensation. If they voted for more, each resident would have to contribute to the cost.

The experiment provided Don Coursey with an opportunity to examine real decision-making in a simulated marketplace as opposed to the hypothetical responses a survey without real consequences might elicit.

When all votes were counted, residents chose to plant almost 50 percent more trees in their park.

environments in which to obtain primary data. On the macro-scale Coursey sees, for example, the question of how countries allied to the United States should pay for their own defense as an international public good issue that could benefit greatly from a market analysis.

Knowledge about how markets actually work, Coursey feels, is becoming increasingly essential to economic survival. All kinds of applications are involved, from questions of where to locate hazardous waste facilities, to allocating scarce landing rights at overcrowded airports, to cost-accounting space stations. In each case a public good is involved for which there is an increasing demand and a market situation is consequently imposed. As resources become scarcer, it becomes more and more critical to allocate them efficiently.

The coming together of experimental psychology and economics would seem to be especially timely. In a world increasingly dominated by a single, and on occasion demonstrably jittery, electronic global market, one can be grateful that there are investigators taking a fresh look at the circuits to see how they really work—the external, more readily observable ones, as well as the internal circuits deep in our heads that turn on when we plug into a market. For the economic decision makers, what makes “homo economicus” run may be the $64,000 question of the coming decade.

George Hickenlooper is a freelance writer and editor based in St. Louis.
Standing at an exhibit in the newly built Living World education center at the St. Louis Zoo, hunched down so he is unable to see the TV screen above him, Chip Reav takes hold of a computer joystick that turns him into a night-stalking bat. Unable to "see" in the way he would as a human, he will have to sound out his prey, bouncing signals off objects. Coming upon a tree, the Reav-bat hears the bad news over his earphones: "Tree, tree, tree, tree." No moth there. Veering off in another direction, he hears himself being signaled, "Steeple, steeple, steeple." Then "Fence, fence, fence." But still no moth.

With a deadline to beat and smirking humanoid friends watching his lack of progress on the TV screen, the pressure is on, and Charles "Chip" Reav, B.F.A. '59 — graphic designer and senior vice-president at the architectural firm of Hellmuth, Obata & Kassabaum, Inc. (HOK) in St. Louis — throws himself into the task at hand like a kid working the Donkey Kong game at a video arcade. Avoiding obstacles, homing in on his prey, finally the moth is his, and Reav looks quite pleased with himself.

But not only at having captured a meal of moth. His real intent, making vivid the lesson that not all animals "see" the same way, has been accomplished with élan. Testing an installation that has existed for nearly four years mainly in his imagination, Reav is pleased at the visceral pleasure provided by just one of the bevy of exhibits included in The Living World — exhibits combined with a remarkable gathering of living animals, all meant to bring home an understanding of the natural world that until now has primarily been the terrain of scientists.

Opening this spring and built at a cost of more than $17 million, The Living World merges the aesthetic of computers and video technology with the information-packed, curiosity-provoking environment of the ultimate science classroom. The Living World's entire range of activities is being directed by George Johnson, professor of biology and genetics at Washington University for more than 15 years. As co-author of a best-selling biology text and teacher of a popular introductory biology course, Johnson is perfectly suited to head up what he describes as "the most complex educational enterprise ever attempted by any zoo."

Housed in a 55,000-square-foot structure, the architectural focus of The Living World is a 65-foot-high rotunda. Around the rotunda on the upper level are located two exhibit halls, a 400-seat, 4,200-square-foot theater auditorium, and a restaurant seating 150 with a spacious outside deck that offers a panoramic view of the Zoo. On a lower level are a gift shop, along with four modern classrooms, a library, a large lecture hall, and the offices of the Zoo's expanded education department. Throughout every inch of the structure, offspring of the marriage of communications and high technology present themselves from holograms of a 30-inch tarantula and a life-size Tyrannosaurus Rex skull to the first movie ever made with a scanning electron microscope. In the two exhibit halls alone, there will be something on the order of 85 three-minute films, 30 computer stations, 50 video screens, and a dozen interactive video-displays, not to mention more than 150 animals of various species — the living focus of The Living World.

Fusing high technology and living biology to deliver its message about the world’s vanishing species, The Living World clearly represents a new stage in the continuing evolution of zoos. About 20 years ago, when it had become clear to scientists that many of the world’s animals were beginning to drift toward extinction as human population pressures encroached on their habitats, zoos became sophisticated gene pools, sharing animals worldwide for breeding out of the wild. But until recently, zoos still hadn’t been seen as major educational

**State of the Ark**

Fusing high technology with living biology, The Living World at the St. Louis Zoo promotes education and sounds an alert for endangered species.

*by Greg Holzhauer*
centers. For all their animal resources and their vast reservoirs of public goodwill, little basic science was being taught to the general public, nor was the serious message about environmental destruction and animal endangerment getting through. No longer.

Upstairs, The Living World will be a fantasy-land of exhibits that brim with information about the animal and natural worlds. Downstairs, The Living World will house an ambitious, highly organized educational institution, headed by Zoo educational director Diane Hoedel, who, under Johnson's supervision, will assist in launching an aggressive science education program in the greater St. Louis area.

Clearing the way for The Living World has been the result of close involvement on the part of the St. Louis Zoological Park Commission, headed by Robert Hyland, senior vice president of CBS Radio in St. Louis. Also active was Virginia Weldon, vice president of the Commission and former deputy vice chancellor for medical affairs at the Washington University School of Medicine. With the Commission's support and combining efforts with the rest of the Zoo staff and with the architectural resources of HOK, Reay and Johnson—

Life-like: A 28-foot model of a great white shark (Carcharodon carcharias) swims above Living World Director and Washington University Biology Professor George Johnson as it is being installed in the atrium of The Living World. The shark is one of four models of undersea creatures created for The Living World by the St. Louis firm of Cassilly & Cassilly.

in a building designed by Gyo Obata, B.Arch. '45, president and chairman of the board of HOK—will be turning the St. Louis Zoo into a year-round educational institution, employing both a first-rate educational staff in traditional roles—in classrooms, before micro-
The Year of the Zoo

They may not be on W's annual in-and-out list yet, but zoos definitely have become a hot cultural institution of late. According to Robert Wagner, director of the American Association of Zoological Parks and Aquariums, last year set a record for the opening of new facilities, increasing the flood tide of 110 million visitors and topping the nearly $500 million spent in 1987 on building and renovating exhibits in the country's 140 facilities.

When the five-year, $35 million renovation of the Central Park Zoo opened in New York City in September (a project overseen by William G. Conway, A.B. '51, director of the New York Zoological Society), it rated cover stories in both New York magazine and USA Today. Joining the Central Park Zoo and The Living World at the St. Louis Zoo in the national spotlight are an ongoing, seven-year, $30 million renovation of Zoo Atlanta and the debut of a new 2,000-animal zoo in Indianapolis. The coming year also promises the opening of the 55-acre, naturalistic Wilds of Africa exhibit at the Dallas Zoo.

Increasingly, the emphasis in zoo activity around the country is on education and preservation. Working in close cooperation, zoos in this country have been successful in breeding and preserving endangered species, going so far as to be able to return them to their natural habitats abroad. Among recent successes: Balinese mynah birds, Pakistani black buck antelopes, Brazilian tamarin monkeys, and Arabian oryxes. Besides sending animals, zoos have also been exporting expertise to countries where wildlife and the environment are endangered by participating in programs like that run by the Wildlife Preservation Trust International to train and educate native zookeepers.

Even those who create these settings are getting caught in the spotlight. Last year, Esquire magazine's annual roundup of young talents to-watch included zoo designer Jon Charles Coe, architect of the Zoo Atlanta transformation. Among Coe's other projects: major improvements at the Brookfield Zoo in Chicago, a chimpanzee exhibit at the Detroit Zoo, and the establishment of a new zoo in Nashville, the largest city in the nation without one.

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What are you likely to see if you come to visit the new green-roofed, blue-tiled, festival-like building now located on the northern edge of the St. Louis Zoo? First, you might like to know the building's peaked-roof profile and octagonal-room design intentionally allude to the world of tents and fairs and banners, according to Obata, setting the tone for a facility that emphasizes fun and backs it up with serious teaching. "I wanted a design that would engage and stimulate visitors," Obata says, "a design so inviting it couldn't help but spark their curiosity and draw them into the building."

The design adds to an already impressive list of buildings displaying the Obata touch in greater St. Louis. These range from the terminal at the St. Louis airport to the new Southwestern Bell and Metropolitan Life skyscrapers downtown, and include the Science Center in Forest Park and the visitors center at the Missouri Botanical Garden.

To keep the large structure from overpowering smaller nearby structures, Obata's geometric roof design breaks up the building's mass and reduces its scale, while sculpted animal and insect heads jut from the center's exterior gables. Inside, the segmented spaces all flow into each other, creating a unified whole of exhibit hall and classroom, of public arcade and areas dense with information about the world of living things, of invitation and explanation—a whole described by Obata as "the most advanced communications tool" any zoo has ever had.

You can start exploring anywhere you like, but the most logical place is The Hall of Animals where a mechanical likeness of Charles Darwin welcomes you to the great family of life. Walking about the room, every square inch will be emanating information—via cartoons, live
creatures, movies, computers, video games, and, of course, the written word. The exhibits are based on Johnson's text, *Biology*—one of two biology texts he has co-written with Peter Raven, director of the Missouri Botanical Garden and Engelmann Professor of Biology, that are among the best-selling undergraduate texts in the country. The outer ring lays out the entire evolutionary journey of the animal kingdom, from the smallest one-celled creature all the way up to *Homo Nectus*, the "man of the future."

Johnson describes this outer ring as an evolutionary journey through the animal kingdom. "You can't preserve what you don't understand," he insists. "To understand animals you have to understand that animal diversity is the result of a long process of evolution. As you go around the room, visiting the entire animal kingdom, you're making the very evolutionary journey that Darwin described. There's nowhere else in the world where you can see this in one easy trip."

The tour consists of life as it evolved from one-celled creatures to jellyfish, worms, and insects, then to the parade of vertebrates (fish, frogs, reptiles, birds, and mammals). A wall of fish, for example, includes lamprey eels, the first to develop a spinal cord, a prerequisite for coming on land as amphibians.

An inner ring of exhibits is devoted to describing the various ways animals meet challenges imposed by their environments—through the senses, communication, social behavior, strategies of feeding, methods of defense, and reproduction.

Woven among the exhibits are references to the food chain as, for instance, millions of daphnia, the smallest link in the ocean food chain, get gobbled up by plankton, all on display via microscope. Sand dabs, which most of us know only from our plates in seafood restaurants, will demonstrate their methods of defense as they hide on the sea floor in their tanks, while other animals show their defense mechanisms, be they armor (such as the shell of a turtle) or camouflage (such as a lizard changing shade to blend in with his surroundings).

**Natural selection:** "I picked Charles Darwin as the host of The Living World," explains Chip Reay, B.F.A. '59, exhibit-maker and senior vice president of Helmuth, Otaba & Kassabaum, "because he gave form to the wonder and beauty in the animal kingdom. He told us of the great family of life."

As a Clark Kent-like host in one interactive video on survival techniques says, as he's being chased by tarantulas, it's a hard world out there, and you have to be prepared to survive. Then he gives the visitor a chance to play the game "find the animal," and to search for animals who have camouflaged themselves to avoid detection.

The final exhibit in the evolutionary journey is the computer game *Homo Nectus*, in which visitors make their guesses about what our species will become. A computer then builds a three-dimensional image based on those guesses. The game predicts, based on what we know of human evolution and on current ecological trends in the world (weather, pollution, pressures of population, ozone depletion, the greenhouse effect, etc.), how the man of the future will have to adapt to survive. Will he have a bigger head in the future (for a larger brain)? Darker skin (as protection against the sun, possibly, in a world where the ozone layer has further deteriorated)? Bigger arms? Smaller legs? You give your best estimate, while the computer suggests whether your theories are in line with scientific theory. (If you say we're going to become more light-skinned, the computer may suggest to you that you haven't been thinking enough about ozone.) In the process, you'll learn that evolution doesn't stop with us, and that man, just as all creatures, must continue to adapt to the world around him, even if it's by making more sophisticated survival tools.

The Hall of Ecology, the other major exhibit area in The Living World, demonstrates the interrelatedness of all animals with their environment. The focal point is a 60-foot-long, eye-level replica of a...
Active Guardians

Dr. William G. Conway, A.B. '51, can be considered the foremost zookeeper in the world. As general director of the New York Zoological Society, he directs not only the operation of the Bronx Zoo and the recently redesigned Central Park Zoo, but also the New York Aquarium and a wildlife survival center off the Georgia coast. He oversees, as well, 87 conservation programs in 34 countries around the world.

Highly respected by his peers and generally acknowledged as a pioneer in convincing zoos around the world to become active participants in the care and breeding of rare and endangered species, Conway first arrived at the Bronx Zoo in 1956, became director in 1962, and general director of the Zoological Society in 1966. This year, an estimated 4,250,000 visitors will pass through the turnstiles at the various facilities for which he has responsibility.

Since the age of four, when he presided over a collection of cigar-box cages, butterfly cards, and fishbowls, Conway has known he wanted to be a zookeeper. His father was the well-known St. Louis painter and Washington University faculty member, Fred Conway. By the age of 12, the younger Conway was out in the field hunting snakes with St. Louis Zoo reptile curator Moody Lentz, and working at the Zoo weekends and summers. The year before he graduated from college, he was running the bird department there, and remained until 1956, the same year he started at the Bronx Zoo.

When we spoke with him last winter, he was putting the finishing touches on a major position paper, heading out the door to attire himself in a tuxedo for a formal function, and making last-minute plans for yet another expedition in the field two weeks hence.

"It was a very different world," Conway observed, recalling the world of zoos 35 years ago, when he first began frequenting them. "The earth's population has doubled since I left the St. Louis Zoo—doubled! We didn't have any of the problems then that we do now. There was little perceived overpopulation, destruction of the world's rainforests, pollution in the Mississippi, smog in Los Angeles; there had never been a gasoline shortage. Now, within the next 20 or 30 years, we stand to lose, at the very least, 20 percent of the remaining plant and animal species on Earth.

"In those days, we tried to show what kinds of animals existed on the earth, and the goal was to show as many as possible. Then, in the early 1960s, the attitude of zookeepers began to shift, from simple guarding to active care. We wanted to show more than simply what animals there are, we wanted to show what animals do, how they live and behave with others of their kind. Our role became one of greater responsibility.

"We became involved in breeding and in species management, coordinating our efforts throughout the world. We realized we've got to take care of the animals of the world. In the process, we moved from a posture of being denigrated by conservation people to being seen increasingly as rescuers of some of the world's endangered species.

"Now we are deeply involved in 'restoration ecology,' which I believe will become one of the most important renaissance sciences of the 21st century. At the New York Zoological Society, we have the largest full-time overseas staff working at wildlife conservation in the world, with projects going on in countries from Kenya to Argentina. In breeding animals in captivity and attempting to re-introduce them to their natural surroundings, we have become interested, essentially, in how nature works.

"Education has always been a part of our vision. The Bronx Zoo's education department, which was started in 1929, is the oldest in the country. Zookeepers have always wanted to influence the perception of visitors about living animals, but now we have new ways of going about it, new and better tools. The Living World at the St. Louis Zoo is going to point the way for a lot of us, showing us how to accomplish this task more thoroughly, with new techniques.

"Education centers like The Living World are not only multimedia, they are multi-level—they work as well for adults as children. And they work because they aren't just preserving facsimiles. Mixed in with the video displays and the interactive computer exhibits are real animals, warts and all, animals just being themselves. We can drive home powerful messages with living animals that other organizations can't. I'm not so concerned that a visitor goes away knowing that Asian elephants have small ears and African elephants large ones. What I care about is getting people to care about elephants at all! Zoos are as close as we get in human society to portraying life itself, and what it means to care for life. Our role as educators should be in reminding visitors to zoos that life, in all its remarkable aspects, is worth working hard to preserve."

—Roger Hahn
Missouri Ozarks stream, with flowing waters that contain fish, amphibians, and reptiles. Microscopes at water's edge bring to life the beauty of creatures most of us have rarely seen before. Computers at the water's edge allow a visitor to investigate the effects of changes in population of creatures in the stream. Take away the smallmouth bass, the other creatures thrive, then suffocate from overpopulation.

Also within the Hall of Ecology are exhibits intended to illustrate different perspectives on the natural world. An interactive computer exhibit, for example, will allow visitors to browse Johnson's introductory text on biology, meandering by free association thanks to the technology of video discs and a program based on Apple Computer's latest invention, a computer language called Hypercard.

Two movies in the exhibit halls each present the visitor with radically different views of the earth, both for the first time. One is a satellite's-eye view, which has the effect of seeing the entire planet from orbit, the ultimate macro view. The other, a journey through a meadow that becomes a close-up, presents the ultimate micro view, the natural world seen in its tiniest detail.

The satellite movie, exhibited in a simulated space station, is composed of photographs of the earth taken by LandSat satellites and laid out end to end, with their overlapping parts smoothed. The movie was made by panning over the photographs in a specially constructed animation bed. The end result, with clouds painted in to simulate cloud cover, follows an orbit selected to fly over 11 different "biomes"—the desert, the deciduous forest, the tundra, the rainforests, etc.

The voyage proceeds from the American Midwest to Canada, on to Greenland and Iceland, down to Yugoslavia, Egypt, the Sudan, Kenya, and Tanzania, on to the remaining rainforest of Madagascar, across the Indian Ocean to Antarctica, on to New Zealand, then back to Mexico. As the "satellite" moves, the angle changes: moving over vast reaches of ocean, the camera goes higher (in order to cover territory faster), while over land, it moves closer to earth. You watch a hurricane form as the narration explains why more hurricanes are likely to occur in the future—as more CO2 becomes present in the atmosphere and the earth warms as a result, the conditions are created for more hurricanes.

The bee movie, on the other hand, begins in a meadow and is accompanied by narration written by Sue Hubbell, an Ozarks writer and beekeeper. Gradually, the movie focuses on the bee itself. "The remarkable thing about it, at least technically," says Reay, "is the images stay equally clear no matter how great the magnification. Through the scanning electron microscope we're able to see things with extreme powers of enlargement...and when coupled with the perspective that only motion pictures can provide, we can see them in the most intense ways.

"You can't see stuff like this anywhere else" says Reay, "and when you see them both, this macro and micro view of our Earth, you gain, in a new way, a greater sense of what we are celebrating."

Professor of Biology at Washington University since 1972, Johnson's participation in The Living World began with scripting the exhibits and various movies shown throughout the rooms. An undergraduate English major at Dartmouth before discovering science in his senior year, Johnson eventually earned his Ph.D. at Stanford, where he met his co-author, Peter Raven, then a junior faculty member. If Chip Reay's passion is for storytelling, Johnson's is for making vast reaches of scientific knowledge available to audiences with little scientific training.

For a dozen years, Johnson taught genetics to biology majors and medical students. Two years ago, however, Johnson began teaching an introductory biology course to non-majors in which he de-emphasized heavy science in favor of a series of lectures on broader social issues, such as the AIDS epidemic, that have a biological basis. The course went from an enrollment of 70 to 320, and Johnson found himself educating and influencing people who might otherwise have avoided science altogether.

The challenge of using The Living World as an educational tool is another step along that path. Johnson's goal is to create for the Zoo an educational program that will reach far into the surrounding community. "I think all cultural institutions," Johnson explains, "whether they're museums, or botanical gardens, or science centers, are essentially educational institutions. But the Zoo has never had the resources to do a comprehensive job. Now we've got the backing, and we've got the facilities to do a fine job."

With the experience gained from teaching in a top university, Johnson has set about organizing a small army of educators designed to bring the world of biology home to a wide range of audiences—schoolchildren, teachers, graduate students, senior citizens. While hiring talented staff members, he has begun integrating their activities with the technological opportunities made available by The Living World, creating an educational organism intricately intertwined with its physical environment.

A teacher resource center, available to local educators as well as Zoo staff, will house the Zoo's library, and a bank of computer terminals. Coupling computer-driven information to laser technology, the Zoo's collection of video information, stored on discs, can be accessed by a teacher looking for information on a given animal—giraffes, say—and image and film clips can be copied onto videotape to be taken back to the classroom—a custom-made lecture at no cost to the teacher.

Among the many educational programs being put into effect by Johnson are new hands-on biology curricula for
middle- and high-school classes in the St. Louis area.

One of the four new classrooms at his disposal will be outfitted with 40 stations, each equipped with a computer, microscope, and dissecting scope. The computers all will be connected by optical cable to the upper-level exhibits and interactive videos, and to the library's video collection. The classroom is intended as a place where inner-city teachers can learn class exercises on specific topics and then return with their classes to teach the same exercises. A 72-foot tunnel connects The Living World with the Children's Zoo and will be used to bring live animals into the building. More than 120,000 students are expected to take classes at the Zoo beginning this year.

Other educational programs instituted by Johnson include: adult programs that will bring the elderly and disabled to The Living World in the evenings, three-week "summer camp" programs for children that focus on different animals each day, weekend laboratory classes for gifted students, competitive scholarships for local high school students to do research with Zoo staff during the summer, linking the resources of the Zoo to other parts of Missouri via satellite transmission; and establishing links between the Zoo and colleges and universities in the St. Louis area that would encourage research by graduate students and allow mutual access to libraries and other facilities.

Specifically, Johnson is in the process of helping formalize a relationship between the Zoo, the Missouri Botanical Garden, and the St. Louis Science Center to coordinate curricula, perhaps publish a joint course catalogue, and eventually apply for National Science Foundation funds to develop courses designed for inner-city residents. He also has convened representatives of the Missouri Department of Education, the University of Missouri education department, the St. Louis school system, and superintendents of County school systems to establish a statewide network exploiting The Living World's resources. Already in the works are plans to film 24 half-hour lectures by Johnson given at The Living World for broadcast by satellite around the state and eventually on public television.

Of special interest to Johnson, obviously, is broadening the relationship between the Zoo and Washington University. He would like to see Zoo curatorial staff become eligible for faculty privileges (especially regarding the use of University research facilities like libraries and perhaps labs). And he would like the University to make fuller use of the Zoo's resources, by increasing graduate studies at the Zoo and having, for instance, Washington faculty teach oneday classes to gifted inner-city students. Already, the Zoo has enrolled Bruce Reed, curator of large mammals at the Zoo, in a Ph.D. program in conservation biology.

The key, according to Johnson, is cooperative learning, linking resources within the Zoo and linking the Zoo to other institutions within the St. Louis area. Integral to this are strong ties being developed between the Zoo and the universities of St. Louis and between the Zoo and other cultural institutions like the Missouri Botanical Garden, whose interests perfectly complement those of the Zoo. Cooperative programs, says Johnson, make the resources of the entire region that much stronger.

With Johnson's programs, the Zoo's educational budget will jump from 2.3 percent of its overall operating budget to over 10 percent. "No other number more clearly signals the Zoo's commitment to education," says Johnson, "and its intent to repay the St. Louis community for the strong support it has consistently provided over the years."

Sitting at his desk one day in late winter, Chip Reay is handing over picture after picture of random scanning-electronic-microscope photos taken for the movie of a bee. Reay is obviously lost for the moment in the majesty of the animal kingdom, oblivious to the last-minute pressures of seeing his carefully planned vision made real. The story of the natural world still holds power over him.

"Exhibit-making is essentially storytelling," Reay explains. "I learned from the architect and designer Charles Eames, whose exhibits were some of the best ever mounted, that you must give an idea form and get the best possible advice in executing it. The challenge here was to keep this amazing story of life from becoming fossilized. Most museums of natural history suffocate their subjects by approaching the task too soberly. That's not what we wanted. What we wanted was a place that would entertain and educate at the same time.

"There are very sophisticated levels of information here tucked away electronically," says Reay. "But while these technologies have been used to bring you information you might not otherwise have access to, I hope it will be invisible. The excitement of the exhibits is in the animals; the technology is only there to
allow you to see things you haven’t been able to see, in ways you haven’t been able to see before.

“When I look at nature I see an incredibly beautiful, marvelous, and diverse world. And I want others to see it, too. When you realize it for what it is, and how it is threatened, you have to do something. You become part of the problem if you don’t do anything. That’s a very personal agenda. But whenever you design anything, you carry your agenda into it.

“As you inform people, as you lay out the facts, you politicize them and hope they’ll become a force to affect public policy. They may not be able to save the rainforests in Belize, or the wild rhinos that are being poached in Africa, but they can have something to say about the future of the national parks in this country, or the quality of Missouri’s streams. The Zoo’s fundamental interest is conservation, and I hope we’ll inspire as many people as we can to take up that call, to help zoos function as conservators of species.”

Chip Reay the naturalist may have encountered sobering realities during this project (“I learned that the pace of the destruction is going on even faster than I had ever imagined,” he confessed), but Chip Reay the storyteller and technical whiz had a great time during the four years it took to develop The Living World. He visited places and treasures he would never have seen otherwise, from Darwin’s study to the basement of the British Museum where he studied a fossil with both a lizard’s body and feathers, the crucial missing link between reptiles and birds.

“I picked Darwin as the host of The Living World,” Reay explains, “not because he formulated the theory of evolution, but because he gave form to the wonder and beauty of the animal kingdom. He told us of the great family of life. And that’s what the exhibits in this building are all about—the great family of life, in all its many forms and connections. Zoos have traditionally shown 600 or 700 members of the animal kingdom. That’s a skewed view. There are really three to four million members, and what we’ve traditionally shown is just the tip of the iceberg. I hope that with the exhibits of The Living World we can give some sense of what the entire iceberg is like, to show how fantastic and beautiful the connections of the story of life really are.”

Going together through the Hall of Animals one day soon after the exhibits were beginning to be installed, Chip Reay and George Johnson stopped under the body of a giant, 45-foot-long sea squid. Created by local sculptor Bob Cassilly, the gigantic squid is true to life in all its alien splendor. “Isn’t it amazing,” Reay said as he circled under the creature, speculating on how the creature could “suck its prey in with its tentacles and then eat them up with its beak as sharp as a parrot’s.” The wonder-filled boy in him was once again imagining vivid stories about the world of animals.

Then Johnson talked about the squid’s larger relatives, huge sea squids with 18-inch-high eyes that existed so deep in the ocean they had never been seen by man— their existence is known by the scars their tentacles have inflicted on creatures that passed their way. “You know,” he said finally, “the amazing thing about these creatures is that they are totally different from anything we know, but they are perfectly suited to their own environment.” Then the two wandered off again, each listening to more stories of life playing in their heads.

At last they came to rest in the conservation theater that is a prominent part of The Living World. Here they discussed a movie commissioned for the project, containing images of animals that are threatened by man’s exploitation of nature—rhinos being poached by hunters, dolphins caught in tuna nets—a requiem for wild places and wild things. Standing in an empty room, staring at a blank screen, Reay was visibly moved. “This is the key exhibit,” he began saying quietly. “This is why the building is here, why zoos have been thrust into the business of conservation. It may be a wrenching experience for people to see this film. But in all requiems there is redemption. What we hope is that the audience walking out of this theater and into exhibits that alert it to the direction the natural world is heading will be moved to come to the aid of zoos in a new and dramatic way, and support them in their new role as conservators of the world’s precious species.”

—Greg Holzhauer is publisher and editor of St. Louis Dining, and a freelance writer based in St. Louis.
Praising Washington University as a shining example of his vision of a "thousand points of light," President George Bush addressed a crowd of approximately 4,000 on Friday, February 17, at the Field House, during his first visit to a university campus since his inauguration. It was also the first time in University history that a president has visited campus while in office.

The president, who came to talk about student volunteerism, recognized the efforts of the numerous student volunteers at Washington University, 680 of whom were given special seating at the speech.

"If we take this spirit evident in this gym here today and then multiply it by those thousands, we can do the job," he said.

"Most Americans believe that in the America of the 1990s, our challenges must be met in several ways-by government, by thousands upon thousands of other institutions, and by the people themselves working together—or they won't be met at all. The government's contribution is critical, but by itself is insufficient to solve all of our national problems. Most Americans believe that our efforts must reach beyond government, to care about our communities and to assist our neighbors.

"I think people are beginning to understand what I mean by 'a thousand points of light.' And if they would look at some of these signs in the Field House, and talk to some of you responsible for them, they would understand it without contradiction..."

"Together, we can show that what matters—in the end—are not possessions: what matters is engaging in the high moral principle of serving one another. And that's the story of America that we can write through voluntary service."

Calling Washington University a "university of excellence," President Bush also praised the University's academic achievements. "But there's another side of it, another side of the story that Washington University has to tell—a story from which all America can learn. It's a story about investing in America's future—how as students and faculty, administrators and alumni, you have shown that service and volunteerism can enrich education and enrich America."

He referred to the Washington students' volunteer work with the Special Olympics Basketball Tournament, which was held in the Field House two days after the president's visit, as "but one chapter in that wonderful story."

The president also spoke about his budget proposals to Congress regarding education: a $500 million program to reward America's "merit schools," the
**All rise:** A standing ovation of approximately 4,000 members of the Washington University community and their guests greets President Bush as he, in return, greets the enthusiastic, standing-room-only audience in the Field House.

Left: The President receives a warm welcome from Chancellor Danforth. Looking on are Chairman of the Board of Trustees Lee M. Liberman, Missouri Governor John Ashcroft, and, behind Bush, Missouri Senator Christopher Bond.
establishment of special presidential awards for the best teachers in every state, the expansion of magnet schools, and a program to encourage "alternative certification."

"We must bring more of our best minds back to the teaching profession," the President said. "And through a new program of National Science Scholars, we can inspire their students, also—giving America's youth a special incentive to excel in science and mathematics. In short, I wish to achieve nationally what this university has done historically—to make excellence in learning a national way of life. Education can ennoble the American story. It's the best way to invest in our future and to make this a better, more selfless, more tolerant world."

The president was introduced to the audience by Chancellor William H. Danforth. "What an honor it is to welcome the president to Washington University in St. Louis," Danforth said. "And what a privilege it is to introduce to the president a large sample of the Washington University community."

Danforth told the president that Washington University students are a "vital, energetic, and imaginative group," many of whom volunteer their time and efforts in service to others.

Danforth also commended the president's commitment to volunteerism, as he compared him to the only other president named "George." "Like President Washington, whose name our institution bears, President Bush comes to his responsibility from a background of service and brings with him a dedication to the nation and its people," Danforth said.

In addition to the chancellor, President Bush was joined on the platform by Governor John Ashcroft, Senator Christopher S. Bond, Representative Jack Buechner, and Lee M. Liberman, chairman of the University's Board of Trustees.

Six Washington University student volunteers also were seated on the presidential stage: Cynthia Homan, president of Student Union and head of the campus AIDS Task Force; Eric Berger, the founder of Washington University's Special Olympics; David Miller, a volunteer with Hillel's "Help the Homeless and Hungry" committee; Tiffany Mondy, program leader for Campus Y's Adopt-A-Grandparent program; Susan Margaret Culican, president of Alpha Phi Omega (APO), a coed service fraternity; and Arlena Ahluwalia, president of Chimes, a junior women's service honorary.

Following the president's speech,
Together, we can show that what matters—in the end—are not possessions: what matters is engaging in the high moral principle of serving one another.

Culican presented him with an honorary membership in APO.

Approximately 150 members of the national and local media attended the address, including representatives from all major network and cable television news stations. Locally, PBS Channel 9 broadcast the event live.

In addition to the crowd listening to Bush’s talk at the athletic complex, 700 more watched on a closed circuit television in Edison Theatre.

Prior to his speech, President Bush spent about 10 minutes visiting with Keith Croffoot, a 7-year-old Belleville, Illinois, boy who has AIDS. Keith’s mother, Deanna Croffoot, said Keith enjoyed his meeting with the president. “As soon as we walked into the room and saw the president, Keith’s eyes lit up,” she said. “He (President Bush) told Keith he was honored to meet him and had been looking forward to meeting him. He said he’d heard that he was such a neat kid.”

President Bush presented Keith with a tie tack and a stickpin bearing the White House insignia.

Following his speech, the president attended a small luncheon in Umeth Hall lounge, where he was given the opportunity—in between bites of a taco sandwich and pork rinds and sips of
A private audience: During his post-speech luncheon in Umrah Hall, President Bush declined to answer "press" questions, focusing instead on the dozen student leaders of volunteer programs and participants in those programs gathered at the table. Seated next to President Bush is John Yang, a Campus Y student volunteer.

diet Coke—to question 12 Washington University students about their personal involvement with volunteerism on campus and to talk with some of the recipients of those volunteer efforts.

Although some members of the media were allowed to attend the luncheon, President Bush declined answering any "press questions," giving his full attention instead to the students and those who receive their assistance.

Students attending the luncheon were: John Clark, winner of the 1988 Fraternity Philanthropy Award; Mark Davis, member of Alpha Phi Omega (APO) service fraternity; Mike Frand, student chairman for the Special Olympics Basketball Tournament at the University; Mary Hughes, co-chair of the Campus Y Cabinet; Melissa Jobe, APO member; Deborah Kaiz, who is active in several Hillel House volunteer efforts; Trent Miller, a volunteer with Kappa Kappa Gamma sorority; David Scott, president of Thurtene, the junior men's honorary; John Yang, Campus Y volunteer; and Jonelle Young, program leader for the Adopt-A-Grandparent program.

Others attending the luncheon included Special Olympians Patty Anderson and Jason Horn; Rae Arnof, a 77-year-old resident of Seltzer Building, a senior citizens apartment building; Brule Ayalew, a 9-year-old from Ethiopia who participates in the "English as a Second Language" program; Darren Politte, a 14-year-old student at St. Joseph Institute for the Deaf; Jeanette Bergman, 90, a resident of the Deaconess Manor nursing home; Llewelyn "Lew" Kohn, 91, a resident of the Delmar Gardens East nursing home; Robert Rucker, 12, a student at the Central Institute for the Deaf; Susan Stepleton, an administrator at the Salvation Army Hope Center; Lisa White, an 11th-grader at University City High School; John Sununu, White House chief of staff; Governor John Ashcroft; Senator Christopher S. Bond; and Representative Jack Buechner.

—Jill Weber
A Myriad of Volunteer Projects

From working with abused and neglected children, to combating illiteracy, racism, and world hunger, Washington University students recognize the importance of volunteerism.

"It's incredible to me that students take time out of their busy schedule to volunteer," says Kathy Almquist, the secretary for Campus Y, which sponsors 26 student-led volunteer programs this year alone. "They realize that volunteerism is such an important aspect of everyone's life. Communities can't survive unless people volunteer and do things for each other."

Harry E. Kisker, dean of student affairs, estimates that "at least 90 percent of our students are involved in some kind of altruistic activity during the year, much of it done with little fanfare."

Senior Angela Reed exemplifies the volunteer spirit of Washington students. As director of Outreach, a volunteer program of the Newman Center at the University, she has spent many weekends working in soup kitchens, dancing and talking with the elderly, and weatherizing homes for those in need.

She says weatherizing should be a required course for all students. "Everyone should see the homes these people live in and talk to the children living there," says Reed, a native of Kansas City, Missouri. "This is reality and we need to do something about it. You can get into your own little bubble in school. A lot of people think of the poor as just statistics."

Melissa Piascecki doesn't view individuals as statistics. The second-year

Up and in: More than 600 student volunteers participated in the Special Olympics basketball tournament this year, held the weekend of President Bush's visit, among them senior Barbara Dietrich, shooting hoops with 12-year-old Shane DeChristefero of St. Charles, Missouri.
"Communities can't survive unless people do things for each other," says Kathy Almquist of the Campus Y, which this year sponsored 26 student-led volunteer programs.

medical student works with an outreach program that brings health care and compassion to low-income pregnant teenagers. The Perinatal Project, which pairs medical students with public health nurses to visit patients at home, began last year as a local effort of the American Medical Student Association.

As part of the project, Piascecki, who hails from rural Indiana, spent eight weeks at a north St. Louis health clinic. She developed solid ideas to help the Perinatal Project in its goal of reducing infant mortality. She also has put together a package of easy-to-understand educational materials for expectant mothers.

"It's so important for medical students to get an idea of the community and reach out beyond the medical center," Piascecki says. "To be good doctors we're going to have to treat and communicate well with a wide range of people."

More than 300 of Washington's student volunteers work with Campus Y programs ranging from tutoring elementary school children who speak English as their second language, to breaking down the isolation of older adults through the Adopt-A-Grandparent project.

Through other Campus Y programs, students tutor high schoolers; work with abused and neglected children at the Salvation Army Hope Center; raise consciousness regarding racism and work toward its elimination on and off campus; and educate the community about hunger.

One of the University's primary student volunteer efforts this year occurred just two days after President George Bush's visit — the third annual Washington University Special Olympics Basketball Tournament held February 19 at the athletic complex. More than 600 student volunteers participated in the event for athletes with mental and physical disabilities.

Many students served as "buddies" to the athletes, spending the entire day with them. Some served lunch and kept score during the games. Others, through their various dorms, fraternities, and sororities, "adopted" a team and cheered members on. Several groups sponsored booths at the tournament's Alternate Activities Carnival.

Another major student-organized activity will be held on April 14 and 15, when more than 2,000 Washington University students will volunteer for Thurtene Carnival, the largest and oldest student-run carnival in the nation. Thurtene Carnival, sponsored by Thurtene, the junior men's leadership honorary at the University, attracts up to 100,000 residents of the St. Louis metropolitan area. Proceeds go to a different charity each year. This year's proceeds will go to the Judevine Center for Autistic Children.

Below is a partial listing of other student volunteer activities on campus:

- In the Adopt-A-Grandparent programs sponsored by Campus Y and Hilliel House, students provide companionship for residents at the Delmar Gardens East, the Seltzer Building, and other senior citizen centers. The students spend at least one hour a week with the residents talking, reading, playing games, and having parties.
- Alpha Phi Omega, a national coed service fraternity, has 100 Washington members who volunteer 3,000 hours a year, mostly at the Deaconess Manor senior center, where students sponsor Pet Therapy programs, Valentine's Day gift exchanges, and Christmas caroling.
- Chimes, the junior women's honorary, sponsors on-campus activities for children from the Annie Malone Children's Home; an agency for neglected and problem children. Chimes also organizes several other humanitarian events each year.
- Air Band, a lip-synch music contest run by students, raises funds for a chosen, agency each year. Air Band organizers raise several thousand dollars annually for charities such as Youth Emergency Service and the American Red Cross. Proceeds from the 1989 Air Band competition, which was held Feb. 17, will go to Operation Liftoff, a program that helps brighten the lives of terminally ill children.
- At the Annie Malone Children's Home, members of Alpha Kappa Alpha and Delta Sigma Theta sororities counsel and provide companionship for the children. The sororities also raise funds, tutor children, and sponsor recreational events at the Mathews-Dickey Boys' Club for boys from low-income households.
- The Undergraduate Business School Council organizes a Casino Night each year. Proceeds go to the Girls Club of
Each year 200 underprivileged and abused children are exposed to Halloween haunted houses, trick or treat escapades, Easter egg hunts, and barbecues along Fraternity Row, courtesy of the Interfraternity Council. Council members also conduct food and clothing drives three times a year and participate in K.I.D.S., a worldwide child literacy program.

- In the Kinloch (Missouri) Afterschool Program sponsored by the Campus Y, student volunteers become playmates, dance instructors, etc., to a group of youngsters age 6 to 12. The program is designed for children who have working parents and might otherwise return to an empty home after school. In a related program called Kinloch Tutorial, students tutor and play games with children.

- The Alpha Epsilon Pi fraternity raised $1,500 for the St. Louis chapter of Effort For Aids during the fraternity’s AIDS Awareness Week last March, while the Beta Theta Pi fraternity held a Bowl-a-thon for Diabetes in November 1988, raising $850 for the National Diabetes Association. Alpha Epsilon Pi also helps renovate the Salvation Army Hope Center for Abused and Homeless Children and takes neglected children to St. Louis Cardinals baseball games.

- The Youth Health Education Project comprises a group of Washington medical students who go into area schools to share what they’ve learned about preventative health care. The students also give talks and answer questions about AIDS, human sexuality, general health, and nutrition.

- The Sigma Alpha Mu fraternity raised $1,500 for the American Heart Association last year through the Bounce for Beats program, while more than 100 Alpha Phi sorority and Sigma Phi Epsilon fraternity members raised $700 for the American Heart Association in a “teeter-totter-a-thon.”

- During a three-day head injury awareness campaign on behalf of the National Head Injury Foundation, nearly 560 Pi Beta Phi sorority members raised $400 in donations from fellow students. Kappa Kappa Gamma sorority also has raised funds for multiple sclerosis and has staffed the St. Louis Holiday Cab Hotline, which provides free cab service (up to a certain number of miles) to intoxicated people so they won’t drink and drive.

- Students who are part of the Washington University Medical Center Hunger Project have established food-collecting sites around the medical school campus and encourage, on a regular basis, faculty, students, and staff to donate food and clothing for the needy.

- The group also works to raise community awareness about the economically disadvantaged.

- Among the humanitarian efforts of the Sigma Chi fraternity are weatherizing homes for the elderly with the North Side Community Center; sponsorship of Derby Days, which raises at least $1,000 every April for Cleo Wallace Village; helping Habitat for Humanity construct shelters for the homeless; and operating Casino Night, which raises $10,000 yearly for the Edgewood Children’s Home.

- Washington University law students working on the Journal of Urban and Contemporary Law collect aluminum cans around the law school, have the cans recycled, and donate the money to a charity that benefits the homeless. The students have been collecting aluminum cans since 1987.

- The Voluntary Action Council, a steering committee at the John M. Olin School of Business, helps assess community needs and locates students in the business school willing to give their time to meet those needs. Students have sponsored fund-raisers for numerous local charities, including programs that provide holiday toys and emergency heating for needy families.

- The Tau Kappa Epsilon fraternity will assist Habitat for Humanity in constructing shelters for the homeless this spring.

—Carolyn Sanford
CELEBRITY FASHION DESIGNER CAROLYNE ROEHM COMES HOME FOR A WHIRLWIND WEEKEND.

Life in OVERDRIVE

by Kathy Flood —photographs by Herb Weitman

The slim stylish brunette climbs out of the stretch Lincoln, parked in front of Bixby Hall, lamenting life in high heels. "Can I burn these shoes?" she asks no one in particular. Just inside, a freshman rolls clear across the corridor on a skateboard and brakes in front of her, identifying a visitor who seems out of place. "You here for Carolyne Roehm?" he asks. She is, she says, and he points the way.

But this visitor is, in fact, no stranger to Bixby. As she walks into a room she hasn't laid eyes on in 15 years, students and some of her former teachers fill the design studio with applause. "I remember this room," she says. "It looks the same. It smells the same. The only difference is, now I have gray hair and wrinkles."

Not a strand of gray nor a crease in her creamy complexion can be seen on the elegant 37-year-old, but the remark breaks the ice and gets a laugh. The Washington University design students, all women, warm up, and hope to hear what they've come for. The media figure, designer, and socialite obliges, telling, in a refined cadence reminiscent of Grace Kelly, the story of how she graduated 15 years ago, equipped with a bachelor of fine arts in fashion design from a Midwestern university, obvious talent, and fierce ambition, set her sights on Manhattan, the fashion capital of America, and never looked back.

Clearly, she has arrived, taking her place as a member of the self-created royal family of the financially fueled Roaring Eighties. An article in the January issue of New York magazine, for instance, describing the use of the Metropolitan Museum for private parties by the nouveau riche, says that Roehm is "a princess in the new social order, and the Metropolitan Museum is her palace."

It's not easy being a renaissance woman. If it were only a matter of mastering the fine and domestic arts, the right sports, and running four homes (in Manhattan, Connecticut, Southampton, and Aspen), then Carolyne Roehm, B.F.A. '73, would be home free. But any self-respecting renaissance woman in 1989 merely fits these challenges around a superhuman work schedule and social calendar. While Carolyne Roehm reaches farther into the upper stratosphere of commercial success, French lessons, opera-singing lessons, gardening, and horseback riding are put on temporary hold.

By day, her home is a 25-story power-address on Seventh Avenue shared with Ralph Lauren, Donna Karan, Bill Blass, Bob Mackie, and others—including her mentor and professional father, Oscar de la Renta. It's heady stuff,
and it can hurt a girl. For Roehm’s working world is the cat-eat-cat jungle of Seventh Avenue, a milieu that devours kittens for breakfast.

Roehm is a recent queen in that jungle, but she has enough kitten left in her to wince at the claw marks, as when *Women’s Wear Daily* gave a nasty thumbs-down to one of her collections. “This isn’t the greatest business to be in if you’re thin-skinned,” she says, coolly recalling painful snipes. “But I’m getting tougher as I get older. And anyway, if I weren’t doing fashion, I’d probably be completely neurotic.” Each year demands she reinvent her design, color, fabric, and accessory ideas four times, using her own lithe five-foot-nine-inch frame as the fitting mannequin. Yet, designing is a small part of her job description.

When she married for the second time (to Henry K.avis, principal in the Wall Street firm that launched the leveraged buyout craze) and debuted her own label in 1985, Roehm joined the membership of an elite and unusual club—the Hard-Working Rich, as *New York* magazine called it last year in a story that put her on its cover. October’s *Vanity Fair* dropped her name no less than three times, including her in a feature about the “acceleration syndrome” that spotlighted mega-A-types addicted to fast-track lives along with Malcolm Forbes, Donald Trump, Jesse Jackson, and *USA*
In the spotlight: At rehearsal and in performance, Carolyne is intensely focused for a showing of her work Saturday before a gala crowd to benefit the St. Louis Symphony at the Adam's Mark Hotel. Above, she scrutinizes one of the models recruited to wear the Roehm line, all of which is shown in Carolyne's size.

Today publisher Cathy Black. In November, the same magazine ran a photo spread of party pictures from the Roaring Eighties, featuring only one celebrity twice: Carolyne Roehm. The businesswoman and charity fundraiser who does it all, modeling for her own advertisements, succeeding at marriage to a Wall Street tycoon equally as celebrated, combining elegant style, pragmatic acumen, and unvarnished persistence in her own person, is creating in the process a symbol for an era.

Roehm landed in St. Louis for a weekend this fall after doing work for shows in Paris, New York, Philadelphia, and Chicago during the previous week. At the Adam's Mark Hotel downtown, she fitted models and choreographed a gala fashion show to benefit the St. Louis Symphony Orchestra. Later she met the public during two long sessions at Saks Fifth Avenue, which carries her label; did press, television, and radio interviews; talked with Washington students; and attended a cocktail reception in her honor afterwards. All the while, she conducted business with traveling companions Lisa Scheik and Peter Speliopoulos of her staff; stayed on the phone to doctors in California who were about to perform heart surgery on her father ("Pretend it's your father you're operating on," she told physicians); and visited with her mother, Elaine Bresee, a special education teacher who still resides in St. Louis and with whom Roehm remains close.

"I poured her into bed last night," Carolyne's mother said with concern at one point during the hectic weekend. "She is exhausted.

All this, and her spring collection for 1989 was due in seven weeks. The New York Times wanted a preview in three weeks. "The next two months are going to be a lulu," Roehm sighed. "Even 10 years with Oscar didn't prepare me for this."

THE ST. LOUISAN BORN CAROLYNE JANE SMITH (and known to friends simply as Jane) went to New York with gutsy perseverance, and talked her way into a job as assistant to Oscar de la Renta. "He didn't want to hire me, but was too polite to say so. He'd never had a female assistant before. But I kept calling back, and then one day, they said he had decided to hire me because he liked my personality. I was so excited! And then I thought: 'My personality? What about my sketches? Doesn't he like my sketches?' I went to work there, and I saw the sketches of his previous assistant. And I thought, 'I can't do this. Why did he hire me?' I called my mother every day that first week, telling her, 'I'm going to be fired.'"

"After the fifth call," Elaine Bresee remembers, "I almost hoped she would be fired." But sound maternal advice prevailed. "I told her, 'Make yourself so useful no one could imagine being without you.'"

She did, of course, and also soon became a regular "extra girl" at the sumptuous dinner parties for which de la Renta and his late wife, Françoise, were renowned. Roehm took to New York like Woody Allen to angst. "You should see her hail a cab," her mother says. "I remember the day right before her wedding. She was going to meet Henry's mother for the first time, for lunch. It was pouring down rain, and there was a line of people waiting for a taxi you wouldn't believe. Here comes Carolyne carrying her wedding veil. Guess who got the next taxi?"

"She who hesitates gets no taxi," Roehm says, with a certain Midwestern grit, revealing qualities of the classic steel magnolia — consummate femininity with hard-as-nails determination.

Marriage to German chemical heir Axel Roehm interrupted Jane Smith's lengthy stint as de la Renta's design assistant. She came back to Oscar when the marriage broke up, and then made the difficult decision to leave "the great god
of ruffles” for Carolyn Roehm, Inc., in 1984. The showing of her debut collection in April 1985 was so well-received by the media and VIPs in attendance she received a standing ovation. From a staff of two and first-year sales of $2 million, Carolyn Roehm, Inc. has grown to 75 employees and expects 1988 sales of $10 million. Customers, like chum Ivana Trump, snap up Roehm’s spare but luxurious and impeccably detailed salon clothing, the bulk of which retails for $1,000 to $2,500. (Separates start at $650, and a few gowns soar to $10,000.)

“THE MOST IMPORTANT WORD in the English language is ‘no,’” Roehm says, determined to master the word, as she looks into a mirror and too often sees dark circles forming under her eyes. She especially needs the “no” word at her lips in relation to her role as Mrs. Henry Kravis. She is married to one of Wall Street’s major players, whose company, Kohlberg Kravis Roberts, is the second-largest U.S. conglomerate (behind only General Electric in annual revenues) and was recently in the headlines as the winner in the $24.5 billion buyout of the RJR Nabisco Company, the highest-priced buyout in history. Carolyn Roehm brims with admiration at what she calls “a tender love” for the man she describes as “larger than life.”

The couple calls a $5.5-million Park Avenue duplex home, an apartment so magnificently appointed it seems the residence of royalty, which in commercial terms, it is. Fortune estimated KKR’s combined revenues, including the resources of all the companies it controls, at about $38 billion in 1987. Kravis recently made a gift of $10 million to the Metropolitan Museum of Art (partially underwriting the new Henry R. Kravis wing, Fortune reported) and a gift of $10 million to New York’s Mount Sinai Medical Center. His passion for art and his impressive personal collection, including Monets, Rennais, and Sargents, have led him to consider buying space above the couple’s duplex for a private museum.

But the couple is rarely at home, a function of their demand on the business, social, and philanthropic circuits. “We have so much,” Roehm says, “and Henry has taught me how important it is
to give something back." So, despite wearying business responsibilities and an exhausting schedule in general, she has headed up charity events like a gala for the New York City Ballet and a Metropolitan Opera benefit at which Pavarotti performed. While the projects she undertakes are always whopping successes, she has been concluding lately that something has to give. Perhaps the most incredible thing about the life of Carolyne Roehm is that she's basically a private person. "I am not a 'people person,'" she admits. "I don't get my energy from people."

But while being a renaissance woman may not be easy, it does have its perks. Asked if there were any pure thrills left in a life chock-full of grand moments, she thinks a moment. "Hearing von Karajan conduct in Salzburg. It gave me goose bumps." Before the Salzburg music festival, which she attended with de la Renta, she vacationed in Greece with Henry and his two children from a previous marriage, and spent time with her mother on Lake Como. The couple's private parties often make splashes, like the 1986 Salzburg dinner party they threw at the Hotel Goldener Hirsch, featuring flamenco dancers from *Carmen* performing between courses, or the more recent Scarlett O'Hara bash, with Roehm creating antebellum dresses for the women.

Overnight visitors to the colonial home they own in Connecticut, *Vogue* noted, awake to the aroma of brewing coffee and baking croissants, scents piped into guest bedchambers. And the kinds of parties to which Roehm and Kravis are now invited are changing. "A man of Henry's intellect and convictions naturally wants a say in important matters," Roehm explains. And their orbit is beginning to intersect political circles. Kravis was a major force in New York behind George Bush's campaign for the presidency.

While Roehm, a staunch Republican, won't say how far her husband's political ambitions run, they exist seriously. For now: "We're invited to more and more parties with intelligent people who have a point of view, and that's another thrill. To sit down with these people and enjoy good conversation is wonderful." Recently Roehm and Kravis attended a dinner party at the home of Nancy and Henry Kissinger. Kissinger and Roehm spent the evening discussing whether or not a Jew could be elected president of the United States right now. Kissinger thought not. Roehm, reporting the conversation, displays clear disappointment.

**AN OVERNIGHT SENSATION SINCE THE DEBUT OF HER OWN LABEL IN 1985, SHE KNOWS THE CAT-EAT-CAT JUNGLE OF MANHATTAN'S SEVENTH AVENUE, WHERE KITTENS ARE DEVoured FOR BREAKFAST.**
her parents enrolled her at Washington University, signed her up for dorm life, and watched as she learned to stand tall on her own two feet. The academic uniform then was jeans, work shirt, tie-dye, and love beads. Jane Smith wore piqué blouses and meticulously coordinated sweaters and miniskirts. She joined a sorority. She was a Young Republican, a conservative—with liberal roommates.

"Jane stood out as elegant," says Paula Poling Wepprich, B.F.A. '74, Washington fashion instructor and former classmate of Roehm. "And Jane always attracted important people, people who noticed her."

Dan Ruderer, B.F.A. '72, shoe designer and pal from the class one year ahead of Roehm, remembers, "When one student's design project was a vest made of paper clips, Jane's was a little black cocktail dress with huge, fat ruffles, ruffles so high she could rest her chin on them." The dress's colorpoint was a cabbage rose on the derriere. "Even back then," Ruderer says, "Jane said she'd marry well and design in the big leagues, so you really do have to hand it to her."

"Jane was a sorority girl when there was pressure not to be one," says Marian Harper, chapter adviser to Kappa Kappa Gamma when Jane was there. "It was not a kind time. The mood on campus was one of intolerance. Kappa Kappa Gamma stressed independence and individualism while teaching the values of organization and community. Jane was active and supportive, even when she was so busy with art school and dress design. She flourished. She had a gentle attitude and seemed to have a larger understanding of things."

Cathy Rodgers, B.F.A. '50, a lecturer and instructor in the fashion design program and one of Roehm's former teachers, is a big fan. "She was her own worst critic. She had an eye for quality and worked and worked till her designs were perfect. All her things were terrific, and then you put them on her and they were doubly terrific. The thing that strikes me most about her today is that she's remained the same warm, gracious woman she always was. She is a lovely person. And in light of all that has been written about her, her mother and dad have never gotten the credit that's due them for how they raised their daughter."

"Washington University was perfect for me," Roehm herself says. "I was interested in the broader picture, the world beyond fashion. History, the humanities, the whole liberal arts education was important to me. My mind was challenged here, and I think that has influenced my designs. I learned a lot, including independence—the ability not always to follow, to stand on my own."

Roehm tells the students who are gathered around her hoping for helpful hints that will bring them the keys to New York's fashion empire, "Sketch a lot. Develop lots of ideas. You can go to New York and show a beautiful portfolio, but what they want to know is, how do your mind and imagination work? How quickly can you do things, think on your feet? Sure, there are designers who are successful with just a design background. But a university education gives you more than just fashion. It gives you a broad education and a taste for all the facets of life."

Kathy Flood is editor and publisher of St. Louis Dining and a freelance writer based in St. Louis.
Vanishing Songbirds

by Christine Bertelson and E.F. Porter Jr.

The silent spring prophesied by biologist Rachel Carson more than a quarter-century ago may be drawing nigh.

From Missouri to Maine, the number of songbirds is dropping dramatically, several recent studies have shown. The decline is particularly pronounced among long-distance migrants that fan out throughout the eastern United States in spring and summer to mate and raise families, and then fly thousands of miles to spend the winter in Central and South America.

Besides gracing many of our woods, backyards, and patios with the music of nature, songbirds are valuable in the food chain as insect eaters. But perhaps more significant and disturbing to biologists, is that their decline suggests yet another irreparable rend in the great web of life of which humanity is only a small part.

Songbird populations have been declining for the past half-century, most biologists agree. But until about 10 years ago, the drop was because of the heavy use of pesticides, herbicides, and fertilizers, the fragmentation of forests, and competition from other birds for nesting sites and food.

In the last 10 years, however, the destruction of tropical forests for crops (including coffee and coca plants), cattle grazing, and firewood has dealt migratory bird populations a blow from which they probably will not be able to recover, according to some scientists; the hope of reversing the trend, they say, is dim.

Among the well-known and much-admired species whose numbers have been dropping most dramatically are the wood thrush and the parula warbler. The wood thrush is an inconspicuous brown creature slightly smaller than its cousin the robin. It is sometimes called swamp angel because of its preference for deep, moist woods and its sweet, slightly wistful song.

In Missouri, the numbers of some species, including many warblers, thrushes, flycatchers, and tanagers, have declined by nearly a third in the last eight years alone, according to a survey by Washington University biologist Richard Coles.

Coles' study, begun in 1980, consists of daily, year-round observations in a patch of woods at Washington University's Tyson Research Center, a wildlife refuge.

Under siege in both North and Central America, the migrating songbird population is rapidly diminishing.

in the United States. Indians in Central and South America traditionally practiced slash-and-burn methods to clear patches of jungle for crops. When the soil became depleted, and because the patches were small, they moved on and the scars were left to heal themselves. Modern methods, on the other hand, involve using bulldozers to clear vast tracts for cattle and crops such as coffee and coca. Since few tropical plants propagate through windborne seed, and since the rain forest soil is low in fertility to begin with, the scars may never heal.

The loss of deep woods habitat for North America and South America."

Other studies go further than Coles' in pointing the blame at the clearing of tropical forests. For example, a recent report by the U.S. Fish and Wildlife Service states that virtually all the migratory birds that winter in tropical forests, including many whose numbers were stable or increasing as recently as 10 years ago, are now declining.

"Until 1980, neotropical migrants [birds that winter in the tropical Americas] were doing well, but it looks as though deforestation has caught up with them," says Sam Droege, an ornithologist at the Fish and Wildlife Service lab in Laurel, Maryland, and one of the authors of the study.

"In the eastern half of the country (including Missouri), woodland birds, other than those that migrate to the tropics, are still increasing. The reason is that the forest cover is increasing because of abandonment of farms."

Although the rain forests have been cleared continually over the centuries, beginning with the first human settlement, modern methods are so destructive that there is a question whether the jungle and its residents can recover. According to the most pessimistic estimates, between one and three percent of the world's tropical forests are being destroyed annually—roughly equal in area to Britain. And the rate of destruction is accelerating.

Rain forest soil is, contrary to popular conception, poor in nutrients. The runoff is so low in minerals and organic material that the water in rivers like the Amazon is purer than most public water supplies.
Thirteen species have become extinct since the 1940s, the study found.

The implications of such studies could lead to a turn-about in philosophies of wildlife management policies. The dogma in wildlife biology for the last 50 years has been that fragmented habitats are good for wildlife, that forest edge is better than forest interior, Terborgh says.

"Forest edge has been better in the value system of wildlife biologists who think the sun rises and sets on whitetail deer, turkey, and quail," Terborgh says. "But by managing species the way they are, they are bringing about adverse consequences they hadn’t understood or imagined. They are making a strong value judgment on what purpose they want that habitat to serve."

At the Tyson Research Center, the hum of Interstate 44, which roughly parallels old Route 66, can be heard throughout much of the woods; suburbs slowly encroach from the east. The refuge, operated by Washington University since 1963, is devoted to the study, preservation, and rehabilitation of endangered native North American species—the Mexican red wolf, raptors, species of bats, rattlesnakes, and coyotes, among others. Inadvertently, the migrating songbird is being added to the list.

"Certainly it would be a tragedy to lose the birds," Coles says. "They are a part of the natural system of checks and balances. Without them, you could try to rely on chemicals to control insects, I suppose, but that’s risky business. It’s much cheaper and more appropriate to have a natural control."

"A basic law of ecology is that all things in nature are interrelated. We seem to have lost sight of that. Monitoring bird populations gives us a chance to keep a finger on the pulse of the ecosystem. While the pulse may appear steady at this moment, our bird surveys indicate it is not nearly so strong as it was just less than a decade ago."

Christine Bertelson and E.F. Porter Jr. are staff writers for the St. Louis Post-Dispatch, where this article, in a longer version, previously appeared. It is based on work done by Tony Fitzpatrick, science writer at Washington University, who also contributed to this version of the article. Jake Rosen, B.F.A. ’86, is a freelance illustrator whose drawings frequently appear in the St. Louis Zoo newsletter.
Between the Wars, Stravinsky led the neoclassicists, Berg the atonalists.

Then came the Sixties, and chaos.

Three Composers

by Don Crinklaw

Composer Michael Hunt, Ph.D. '74, was at home in his town house in St. Louis' historic Benton Park district one morning in late winter, displaying for a visitor the score of his latest effort, a piece commissioned by the Parkway West High School Band and due for its first performance the coming May. Hunt moved on hands and knees around the floor of his second-floor study, spreading out pages of staff paper the size of carpet samples, pointing and gesturing, explaining how it was going to happen.

"Cues are made by the conductor," he said, hearing his music sound in his head. "I can't give a full score of twenty-eight parts to a high school band and expect them to keep track, so I'm going to buy a set of those numbers on a ring, like you find in a store where you take a number to be served. The conductor will conduct, a number will flip over. This is cue six. Everybody in the band will look at cue six—Go! Flip over. Cue seven. That way I can get a huge number of cues, the players don't have to sit there and count, they don't have to keep track of the score. All they know is: When my number comes up, I do something!"

Hunt's visitor, proficient only on the phonograph, was reminded of Goethe's plea to a musician friend when confronted by a Berlioz score: "Calm the curiosity I feel at the sight of these patterns of notes which seem so strange and marvelous." But Goethe's friend would be at a loss with a Michael Hunt score. Thick arrows, almost the size of those on No Parking signs, run nearly the width of the page. Inky lines connect clusters of dots that would otherwise seem to have no connection. Mysterious black oval shapes sit like enormous eggs in the middle of pages.

"Anyone who reads music can look at a Beethoven score and re-create it in his head immediately," Hunt explained. "Open one of my scores and it's impossible. You have to hear it." Welcome to modern music. Or modern serious music. Or, if you wish, modern classical music.

This new breed of music developed after the collapse, early in this century, of old classical music, in which the relationship among notes was controlled by the key (C Major, D Minor, etc.). In this new music, the notes are related only in ways decided by the composers before they sit down to write—a workable amateur description, by the way, of atonal and serial music. For a time, between the wars, there was a sort of cultural coherence to musical composition, with composers divided into camps: Stravinsky led the neoclassicists while Schoenberg and Berg represented the atonalists. Then came the Sixties, and chaos. Composers took axes to grand pianos, musicians
Anyone who reads music can look at a Beethoven score and re-create it in his head," says Michael Hunt. "Open one of my scores and it's impossible. You have to hear it."

Hunt's "the best piece on this album."
The piece is scored for alto flute and various percussion instruments, but the listener is aware only of a long-breathing, mildly atonal melody from the flute, accompanied by the tinkling of chimes—real wind chimes, tapped with a mallet. Somehow it evokes a polar landscape: ice and snow and a cold wind blowing, and a pale sun without heat.

Michael Hunt, sitting at lunch in a restaurant right across the street from the town house where he lives with his wife, Patricia, and three small children, chuckles when he hears the bit about the icelocked land. "I don't object at all to those images," he says, "I think music has to speak to people emotionally and intellectually, and however it does it, if it does it, that's wonderful."

Other words come to mind while listening to Hunt's music, and he's heard them all. "The two most common are 'romantic minimalist' and 'impressionistic minimalist,'" he says. "I lean toward the latter; that's something I can live with. I think of romantic as huge forces and lots of angst, and my music is a little more restrained than that. I'm old-fashioned enough to be interested in the content of my music, but the process of composing it is a lot more enjoyable to me than having it finally performed. It's a process of building a world, of building structures, of building relationships."

"And sometimes I build things into my music that can spell disaster," Hunt says. "There's a high degree of danger, the possibility that in performance my music will fail. Because so many choices about when to enter are left up to the performers, I tell them every note to play, and what must or must not, about when to enter are left up to the performers. I tell them every note to play, and what must or must not, about when to enter are left up to the performers. I tell them every note to play, and what must or must not, about when to enter are left up to the performers."

"But I don't believe you can have a great success if it's a sure thing. Then everybody says, 'So what?'

Perhaps the most conventional of Hunt's works is the 1985 "St. Louis: Music for Brass and Percussion," commissioned by St. Louis' New Music Circle and performed at the opening of St. Louis Centre—it's a crowd-pleasing mix of brass fanfares and pounding drums. "A gorgeous noise," as conductor Sir Thomas Beecham liked to say. In "Songs of Tao," a mezzo-soprano floats an oriental-flavored vocal line above the pianist's exquisite, curling runs of notes. But the most Huntian of Hunt's works is probably 1982's "Other Realities," which can be heard on the album "Reflections," issued by New Music Circle Records. One John Shaefer, who hosts a show devoted to modern music on a radio station in New York City, calls
With his beard and thinning brown hair and metal-rimmed glasses and genteel, cerebral manner, the 43-year-old Hunt seems at first the sort who was so good at going to school that he stayed there. Then one looks closer, and notes a glint in the pale eyes, strength in the alignment of the features. The affable Michael Hunt, one senses, is a tough customer. Nor is he with a university. He's served on the faculties of Washington University, Foothill College, and Principia College in the St. Louis area, but that was in the past. "Now I'm totally freelance," he says. "I'm a composer-for-hire."

Hunt was born in New Castle, Indiana, to a non-musical family. "My interest in music came totally from outer space. I bugged my parents for banjo lessons for a long time before I finally started piano lessons at age seven. I never did learn how to play the banjo."

Was he a musical prodigy? "No, but I had aptitude."

By the time he was 12, he was playing piano in a grown-up country-western band. In grade school he asked the high-school band director if there was an instrument he could play right away; there was, and Hunt spent a summer teaching himself to play the tuba. In high school, he played trombone in jazz bands and wrote arrangements for them. In college in St. Louis, he was the only white in black jazz bands, and was occasionally tossed out of all-black clubs. Fellow musicians got him back in.

"There's always a way back in," he says, enigmatically.

Hunt says he knew sometime in grade school what he wanted to be: a composer. "Don't ask me why. I don't know why." And a serious composer, not a pop, jazz, film, or rock version; he's similarly unenlightening—or puzzled himself—about the why of that, too. "In grade school, I was good at reproducing styles," he recalls. "After graduation, I spent a couple of years basically unemployed. Doing odd jobs. Realizing that I'd focused my entire life on being a composer, and had no voice that was mine.

"One of the odd jobs was giving composition and theory lessons to people who were making a living in rock bands. They introduced me to some equipment, and one piece was a now-archaic machine called an Echoplex. It let you play back what you'd played before, then layer sounds on top of it. I was fascinated and devised a way of notating and writing music that would work for the Echoplex. Then I was able to write for live musicians and accomplish the same thing."

The music came, and performances followed—by the Los Angeles Philharmonic, the St. Louis Symphony, and by chamber ensembles around the country. As a recognized composer of contemporary music, Michael Hunt is of course familiar with the resistance—even hostility—his genre occasions. Audiences often complain when they hear it and frequently arrange not to. "Audiences are very seldom given a chance to hear anything other than what comes out of the radio," Hunt says. "Unfortunately, when they do hear something else, they aren't prepared to handle it."

Computer composer Gary Lee Nelson "isn't really a scientist," says a musician who attended his January 1988 concert in Steinberg Hall. "He's singing his songs in the grand old tradition. It's just that the voice he's using consists of digital information."

The life of a modern composer looks hard, and it is. "It's hard, and there are dry spells; I don't think that's changed much in 300 years," Hunt says. "But I also do spin-off living a lot of my income as a composer comes from talking about being a composer. I do workshops, involving people in the process and trying to teach them something about it."

Hunt admits that there's a question he's been asking himself lately: "Why am I trying to further this career against all the odds that are stacked up? I guess I'm stubborn. I find it hard to give up. There's this drive to be recognized for what I've already declared myself to be, from whatever the public is. And this public I'm interested in is extremely small and opinionated and ingrown.

"But the bills are paid until the end of the next month. I haven't thought beyond that. I'm optimistically pessimistic, always in the market for a good miracle. But what else can I do? I've managed to structure my life so I'm unqualified to do anything else."

Gary Lee Nelson, A.M. '68, Ph.D. '74, is talking on the phone from Oberlin College in Ohio, where he is associate professor of electronic and computer music. He is explaining his music, which is, strictly speaking, "computer music"—but only of a certain kind. "Some composers use the computer as a performance instrument," Nelson says. "They compose the piece in the conventional way, on music paper, then they transcribe it into numbers and use the computer to make the sound.

"I use computer programs to work out the notes. The rhythms. The pitches. I decide how the piece is to be composed, but rather than composing it I write the programs that describe to the computer how to put it together. 'Change the pitch here,' or 'Alter the speed at which the chords change.'

"It's hard to explain," Nelson says, as though we need to be told. And there's more: Nelson actually performs on top of all this. He appears on stage with his Apple Macintosh and his Yamaha digital synthesizers, and while they're doing what he's programmed them to do, he's playing them as well. He interacts with the computer using a device he developed and named the MIDI Horn (MIDI stands for Musical Instrument Digital Interface). It has push-buttons that act like valves on a trumpet, and its modules are sensitive to the player's breath.

"I play things on the MIDI Horn," Nelson says, "and the Macintosh 'listens' by seeing the MIDI signals come down. The computer program is composing 'on the fly,' taking stimuli from the horn and doing things with them. Say I've programmed a chord into the computer—the note that I play on the MIDI becomes the basis for the computer's choice of which chord to play. Then I can control the dynamic qualities of the chord with breath. That's the general idea."

Thirty years ago the conductor Antal Dorati listened to a scientist tell him that "someday engineers will be able to build a computer that composes music." Dorati shot back, "They'll have to build a computer to listen to it, too!"

Not so. Newspaper reviewers who have heard Gary Lee Nelson's one-man band use words like "lush" and "many-splendored" and even "romantic" to describe his music. One musician, who attended the concert Nelson gave at Washington University's Steinberg Hall in January 1988, spoke of hearing "very beautiful, lyrical music. Nelson isn't really a scientist; he's making music in the grand old tradition of singing his songs.
It so happens that the voice he's using consists of digital information.

Gary Lee Nelson started out playing the tuba. "I started a bit late. In junior high in Albion, Michigan," he says. "Apparently mine was a terribly latent talent. And it was for social reasons: all my friends were in the band." He asked the director which instrument would get him into the band the quickest, and got the same answer as Michael Hunt: tuba.

Nelson started chuffing the tuba in ninth grade, and even through his undergraduate years at Youngstown State University in Ohio. "I focused on performance. I'd taken up the string bass in high school, and did some playing and arranging for dance bands to make money, but I dropped it in college to concentrate on the tuba. I played tuba in the Youngstown Symphony. I really wanted to be a professional tuba player."

After Youngstown, Nelson spent a post-graduate year at the University of Michigan. "I wrote a lot of letters to orchestras in Europe. Eventually I got connected with the city orchestra of Amsterdam. I spent two years there, and that's when I became convinced that I didn't want to be a professional tuba player. It wasn't very interesting. You spend a lot of time sitting and waiting."

Nelson had begun composing at Youngstown, "piano pieces, fairly conventional music for choir and small ensembles, things like that." At Michigan, he developed an interest in electronic music, and it was a course at the University of Utrecht in Holland "that really brought a big change in direction, the one I've followed since then. Utrecht had opened up a place called the Institute of Sonology," he recalls. "Sonology was a word they made up to cover acoustics and psycho-acoustics, electronic music and computer music: anything that had a scientific orientation as well as a creative aspect."

After Utrecht, he came to St. Louis because his wife, Mary, whom he had met and married while at Michigan, had family there. Nelson directed a church choir, gave lessons to high school brass players, and eventually enrolled in the Ph.D. program in Washington University's department of music. Faculty members recall Nelson composing on the computer available at the time: the big IBM mainframe that could only print out his music. It still had to be performed by ensembles of musicians.

"When I left Washington University I taught four years at Purdue," he says, "and that's when I really got started in computer music. Purdue is a big technical school, with lots of facilities and lots of people who could answer questions." He's served, too, as researcher-

consultant at Bell Laboratories and at sound studios in Stockholm and Paris.

Nelson explains his attraction to computer music by rehearsing the bleak facts of life for modern composers:

"First, when you write a piece for an orchestra, it's unlikely that it'll get played," he says. "If you do, it will be under-rehearsed by musicians unfamiliar with the musical vocabulary, and performed before an audience whose ears are still in the 19th century and who think the piece sounds like background music for a horror movie. They won't have a chance to get to know the music, since this will likely be the work's only performance. Eternal silence follows."

"And often the musician's union has rules against recording," Nelson says, "so it's not possible to get even a rough tape to study and pick out what needs improvement."

"But with the electronic medium I was everything: composer, conductor, performer. When I finished a piece I had a tape of it and although it might never be performed again it was, like a painting on the wall, there. When I got deeper into computers there was greater control—I could work out complicated structures that would be impossible with live performers."

"To draw a comparison with the other arts: poets, novelists, painters, and sculptors all work directly with the medium. Composers traditionally have worked with paper, which gets turned over to performers, and then finally the sound comes out. There's quite a lot in between the composer and the sound. With computers one is able, like a writer or visual artist, to be in touch with the medium."

To some, the term "computer music" is contradictory: they see classical music as strong emotion carefully controlled, and while a computer might get the control part, it wouldn't have much feeling. "Except that most classical music—Beethoven, Mozart—is highly controlled music," Nelson answers. "Structurally it is very intellectual, in a way computer-like. It's the interpretation during live performance that adds emotion. I think I would have been at home in the Renaissance: I like the sound, the structure, of Renaissance music. Again, it's that combi-
nation of musicality and intellectualism. You start from a precise theoretical base, then mold it musically while keeping track of all those rules of counterpoint.

From reviews, though, one gathers that Nelson’s music sounds anything but chilly or forbidding; he doesn’t describe it that way, either:

“I don’t want to pander to audiences, but when I work I think, ‘Would I like to listen to this?’ So my audience is myself. I like things to change almost continually, even if only in small, subtle ways. I don’t like long pieces, so I rarely compose anything longer than ten minutes. I like large-scale gestures, I like to hear a concerted group of sounds moving toward a goal. I like sudden contrasts. I think of my music as, in lots of ways, very romantic. In gesture, in structure, these are tone poems.”

Nelson has been doing live performances for a year and a half now, and when asked if audiences respond more to music or machinery, he answers, “It’s as mixed as you can imagine. Some people only want to talk about what kind of synthesizer I have, or the programming language I’m using.

“But in the last year the response has been more musical,” Nelson said. “There aren’t many people doing what I’m doing right now, but I’m getting second concerts and recommendations. I expect that in another year or two I’ll be doing a lot of concerts. Because of the quality of the music.”

Olly Wilson, M.B. ’59, is doing well. A while back, a piece of his called “Voices” was performed at Tanglewood, conducted by the eminent Gunther Schuller. “It got some reasonably good reviews,” Wilson modestly told a reporter. There’s more: Wilson’s 1984 work for full orchestra, “Sinfonia,” takes up a full side of New World Records disc NW 331. It’s performed by the Boston Symphony Orchestra, no less, and the conductor is Seiji Ozawa, no less.

Natural selection: “The notion that music progresses in a straight line,” says Olly Wilson, “is a Darwinian one, and extremely limited. The point is, anything’s possible now.”

“Sinfonia” is drawn from the black composer’s interest in his African—and Afro-American—roots, mixing blues, tune-fragments and powerful drum rhythms into what strikes the listener as immensely “learned” music. The fellow who wrote this, one feels, is on speaking terms with all the harmonic developments of the century.

Well, Olly Wilson was born into music. “My father was a singer,” Wilson says, talking by phone from the University of California at Berkeley. “He had, as I’ve said on many occasions, the biggest and the best voice in St. Louis’ First Baptist Church choir. He sang in choral societies, too—one of them was named after Harry T. Burleigh, a black composer who was active in the early part of the century. I remember that one of my
father's groups was asked to perform in "Showboat" at the Muny Opera."

Wilson was born in St. Louis in 1937, and by the time he was seven years old his father had him taking piano lessons, "along with my three sisters," he says. "My father didn't play the piano, so I think he wanted to raise his own accompanists."

He took up the clarinet in grade school and, he says, "made rapid progress because I knew how to read music very early." By age fourteen he'd formed his own jazz trio and "wrote arrangements, imitating things I'd heard on the radio: be-bop and modern jazz, like Charlie Parker." In high school he was band president and first clarinetist.

"That was Sumner High School, an extraordinary place," he says. "Dick Gregory, the comedian-activist, was there when I was. So was Oliver Nelson, one of the outstanding saxophonists and jazz arrangers of our time. And three of the five Fifth Dimensions. And opera soprano Grace Bumbry—she was a friend. I remember that Washington University's music department established a Saturday morning theory class for high school students, and Grace Bumbry and I used to go there together."

By this time, Wilson knew that he would spend his life working with music: "I thought perhaps I'd be a band director. Then I was accepted as a scholarship student on clarinet at Washington University, and it was in the composition and theory classes—I think during the sophomore year—that I decided to be a composer. I realized that this is really where I feel most fulfilled."

Wilson took an M.A. from the University of Illinois and a Ph.D. from the University of Iowa. "I understood that in order to survive as a composer I would need a patron," he says, "and the modern patron of the arts is really the university."

In Bach's time, the composers' patron was the church. Later on it was the aristocracy: Haydn wore servants' livery order to survive as a composer I would need a patron," he says, "and the modern patron of the arts is really the university."

"There are moments," Wilson says. "Occasionally breakthroughs here and there. I consider myself fortunate and lucky and fortuitous and everything else to have had that experience with Ozawa. But that piece hasn't been performed since then. Now, there are possibilities, I'm working on several. They haven't happened. But if not today, maybe tomorrow. Or maybe the next day. I can understand someone saying, 'Look, you write this music, you really believe in it, and who cares?'"

"I say, I care. I write the music, and I've done what I can do. I hope it gets performed, at least once. I hope it gets performed many more times. But I'm also going to go on and do the next piece. I can't spend time worrying too much about what happens to that last piece because I'm too excited about the one I'm working on now."
Two for the show: Designer Carolyne Roehm (left), B.F.A. '73, prepares for a benefit fashion show that was part of her return home to St. Louis last fall.

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