Transplant Surgeon Wayne Flye
Sparing the Scalpel
How to live: In honor of the retirement of architecture professor Leslie Laskey this spring, the School of Architecture and the Gallery of Art gathered more than 300 pieces for a retrospective exhibit. Among the paintings, drawings, monoprints, sculptural assemblages, woodblock prints, jewelry, lights, tapestries, and needlepoint on display was this 1956 abstract, "In the Presence of Their Majesties."

Laskey’s influence as a teacher can hardly be underestimated. An imposing figure identified by his shaved head and a penchant for dark-hued clothing, he has traditionally taught freshman and sophomore students exclusively. Recently, he was the recipient of a Distinguished Professor Award from the American Collegiate Schools of Architecture, an honor reserved for influential designers like Charles Moore and Ivan Chermayeff. Through the years, he also has served as mentor to many budding artists.

As remarkable as his influence is the generosity with which he shared his creative energies, bringing students into close contact with his working life. "I try to share my inner creative life with my students," he told an interviewer, "because to me the idea of a university means educating the whole person. I try to show the students how you can live if you choose."
Frontrunners
The latest in research, achievements, and other adventures, from around the campus and beyond.

The Challenge of Biotechnology
After years of regulatory wrangling, this summer ushered in the dawn of a new agricultural age.

The Post-modern Illustrator
Mixing nostalgia and pragmatism, Walt Spitzmiller carries on an American tradition.

The Rise of Volunteerism
Altruistic activity is back in fashion on college campuses around the country.

Confessions of an Iconoclast
Being a woman has both helped and hurt her career, but psychologist Jane Loewinger has always been her own person.

Testing the Limits of Transplants
Surgeon Wayne Flye, by exploring the frontiers of laboratory research, hopes to avoid the necessity of transplant operations.

On Making Art in the Provinces
There are advantages, says Professor of Art James McGarrell, to being an artist outside New York City.
The Rules of the Game: Ratifying the Constitution

Between 1776 and 1788, Americans of every economic, geographic, social, and political persuasion shared an unprecedented opportunity to create and manipulate the rules by which their infant state and national governments would play.

Gary Miller, professor of political economy at Washington University, has co-authored a paper, "Constitutional Conflict in State and Nation," that surveys the motives and maneuvers of those in power, and those who wanted to be in power, in post-Revolutionary War America.

Miller's paper was delivered at a conference in March, at the University of California in Irvine, and is scheduled to be published in a book of readings about the U.S. Constitution.

Miller and Eavey survey each of the 13 states, pointing out how each one had its faction of residents who were pushing for greater egalitarianism, as opposed to a centralized federal government.

In Pennsylvania, for example, the Philadelphia merchants and elite class were outnumbered by the anti-federalist frontiersmen, who used violence as well as political strength to obtain a radical state constitution that protected local autonomy.

In North Carolina, radical democrats were so intent on majority rule that their state constitution did not allow for a gubernatorial veto. The conservatives there, as in Pennsylvania, did not like this excess of majority rule and hoped that a federal constitution would provide a strong central authority.

In this state, though, the radical delegates wielded the majority of votes at the convention; the federalists lost the battle, and North Carolina became the first state to reject the Constitution.

Maryland merchants, who, Miller said, might be expected to side with their counterparts in Boston, Philadelphia, and New York City, instead were opposed to the new Constitution because they were beginning to find chinks in the armor of Maryland's aristocratic leadership.

The process of formulating and ratifying constitutions, then, offered a ripe field of conflict between those who supported the status quo and those who saw the main chance in change.

J. Soete

Barnstorming: Among a string of exceptional performers appearing at Edison Theatre this past year was Molissa Fenley (above), who presented, with her troupe, an evening of African-influenced dance.

Russians Relaxing Censorship? Not So, Says Exiled Novelist

"Current American TV productions, in search of better ratings, have broken the record of mediocrity," said exiled Russian novelist Vassily Aksyonov during an Assembly Series lecture this spring. "Or maybe," he continued, "sunk lower than mediocrity, to a level of hackwork and embezzlement. Just recently I saw Monte Carlo with Joan Collins, and it looked like it was made for kids — and not for smart kids."

Aksyonov's comments on the influence of profit-seeking on popular culture in the United States — "the censorship of the dollar" — came near the end of his speech, "Censorship and Circumpection: The Writer in the Soviet Union." Among his observations:

"All things considered, the demand for unanimous adoration is still taken for granted in Soviet society. One must be in love with the regime. One might even secure a certain level of independent creativity, but under an indispensable condition: unconditioned love for the set of sacred notions — party, patriotism, Marxism, Leninism..."

"Now there is the policy of glasnost (openness)... The root, 'glas,' means 'voice' — that is, it has a lot to do with the nation's vocal chords and ability to articulate. Seven decades of adherence to the aesthetics of socialist realism cannot help but affect the gift of speech. Stuttering, lisping realism, itself symptomatic of a whole way of thinking, has developed in all strata of Soviet society, and sometimes it looks all but irreversible." — Jon Meyers
**Sociodrama Casts Some Light on the World of the Homeless**

"God, I do not want to be in this place," says an angry, hungry, and frightened woman about the New York City train station that has become her home. "I've got the same needs as everybody else. I don't want to be here."

These are pained words that could have been spoken by any of America's estimated 500,000 to two million homeless, a shadow society with addresses ranging from park benches to highway underpasses.

These same words, however, were spoken onstage by Maria Laskey-Childress, one of five first-year students in the George Warren Brown School of Social Work who helped create a sociodrama to bring the pathos — and humanity — of the homeless out of the shadows.

The students and their practicum instructor, Warren T. Brinckwirth, presented "Grand Central Connection" at the 45th annual meeting of the American Society of Group Psychotherapy and Psychodrama in New York last April.

"Grand Central Connection" depicts six homeless people: an alcoholic, a teenage runaway turned prostitute, a bag lady clutching a doll, an itinerant musician traumatized by the death of a friend, a borderline psychotic, and a little girl separated from her parents.

Each unofficial resident of Grand Central breaks a spell of silence and fidgeting to tell his or her story. Much of the time is spent wrangling with the alcoholic, whose panhandling, philosophizing, and insults become irritating. But the alcoholic brims with insight when he sees the bag lady leave her private world to share a prized doll, and lap, with the abandoned girl.

"That's all she had, and she gave it to her," he says. "Do you realize the possibilities?"

The other students besides Laskey-Childress taking part in the performance were Lori Ahrens, Peggy Duffield, Lori McClain, and Sara Zutavern.

Brinckwirth, a 1983 graduate of George Warren Brown now in private practice, is a veteran producer of sociodrama, a mixture of therapy, education, and theater (psychodramas engage individual maladies; he explains, while sociodramas engage societal problems).

Brinckwirth says he will use a videotape of the sociodrama to expose more students to the human potential of the nation's homeless. — Robert Lowes

---

**Significant Finds Complete First Phase of Odyssey Project**

Professor of Art History and Archaeology Sarantis Symeonoglou, whose search for the location of the home city of the ancient hero Odysseus was chronicled in the Fall 1986 issue of *Washington University Magazine*, announced this spring he has completed the preliminary phase of the Odyssey Project.

Revealing findings discovered last summer, the third year of the project, Symeonoglou said he will spend this summer cataloging previous discoveries and laying the groundwork for what he foresees as a 10-year effort to fully excavate the ancient city of Aetos on the island of Ithaca.

Two discoveries have convinced Symeonoglou the excavation site is indeed the city Homer identified as Odysseus' home. The first is of pottery dating to the 13th century B.C., evidence that the city on Ithaca existed both in Homer's time (8th century B.C.) and in the era described in The Odyssey. The second find, a substantial foundation wall indicating the presence of a temple built in the 6th century B.C., coincides with previous British finds to establish the temple as that of Apollo, a structure mentioned by Homer in his account of Odysseus' travels.

A mysterious grave, holding the skeletal remains of a male victim of a malaria-related disease, from the 6th century B.C. was among finds of last summer's dig.

In order to finance the remainder of the project, which includes purchasing the site and eventually making it an archaeological park, Symeonoglou said he will have to raise, from foundation, corporate, and private sources, approximately $2 million. — R.H.
No Rules + Too Many Rules = Dilemma, Says Teacher Trainer

The emphasis on teacher accountability in the schools could ruin public education, says Marilyn M. Cohn, director of teacher education and adjunct associate professor of education at Washington University. “The school as a workplace has become an oppressive environment,” Cohn insists. “Schools have become like factories and teaching has become uninteresting. Teaching is not easily measured in terms of output and input. There is no single formula or recipe that will guarantee results.”

In increasing numbers, she says, teachers are being graded according to their students’ test scores, lesson plans must be approved by principals before they are used, and teachers must submit detailed records of each day’s activities.

In an effort to highlight examples of successful teaching methods, Cohn has written a book, called To Be A Teacher, with Robert B. Kottkamp of Hofstra University and Eugene F. Provenzo Jr. of the University of Miami, published this spring by Random House. The book features five primary and secondary teachers representing a mix of schools in St. Louis and Miami.

Written as an introductory textbook for primary- and secondary-school teachers-to-be, To Be A Teacher also is useful for recruiting education students, Cohn says. To that end, she has been sponsoring recruitment seminars by the same name with teachers from the book as panelists. “We need to come up with means to portray teaching as the intellectual, complex, stimulating career that it can be, so people of intellect and knowledge will think it is respectable,” she says. “We are never going to improve the schools until we get those teachers.”

Teaching traditionally has included non-salary compensations, she explains. “It was never high-pay or high-status, but teachers had the sense that they were autonomous and could make the central decisions about teaching.” If administrators continue to legislate learning, she insists, teachers will continue to suffer low morale and on-the-job alienation.

All That Jazz

On a field trip to New Orleans last spring with his photography students, Stan Strembicki, associate professor of art, serendipitously found himself in the middle of one of the largest old-time funeral marches in the city’s recent history. Organized for the longtime proprietor of Preservation Hall, the march featured the New Orleans bands that have made the name of that jazz mecca well-known throughout the world.

Using a wide-angle lens and flash in daylight, Strembicki captured the intense feeling and otherworldly quality that permeates New Orleans jazz culture. The photograph shown here isolates the leader, or “king,” of the Olympia Brass Band.

The director of the New Orleans Historical Society has asked to purchase the original prints (which are 30 by 40 inches), and Strembicki plans to have a showing of them in St. Louis this fall.

“There is a real tension in society about progressive, child-centered approaches to education versus product-oriented, achievement-oriented places,” Cohn says. Although she favors the former approach, she recognizes that both methods have been carried to extremes since the 1960s. “We really went crazy in the Sixties and early Seventies. We took out all the grammar books and forgot about spelling.”

She finds the back-to-basics backlash equally inappropriate. “Kids come to school curious but are forced to survive a rote obstacle course,” she says. “They’re not, for instance, doing things in the community and writing about what they have learned. They’re filling out worksheets and taking tests. We have to find a synthesis of the more liberal approach and the current conservative backlash. That’s what good teaching is all about.”

— Regina Engelken
Laboratory to Study Ups and Downs of Balance Disorder

According to the Dizziness and Balance Disorders Association of America, 42 percent of adults over the age of 40 report episodes of dizziness or vertigo to their doctors. In about 85 percent of these cases, the problem lies in the vestibular system.

This system is made up of two types of organs. One is a series of fluid-filled, semicircular canals that monitor angular head movement. When the head rotates in the plane of a certain canal, the fluid presses against a neural sensor that dispatches messages to the brain about the size and velocity of the head movement in that plane.

The other type of organ consists of a disc weighted down by small stones, so that it is heavier than the fluid in which it is suspended. When the head is tilted, the disc falls in the direction of gravity, yielding specific information about head orientation in space. The disc also responds to changes in linear forces, such as the acceleration of a car.

The brain receives information from both types of organs and, in turn, sends messages to the muscles responsible for maintaining posture, balance, and eye position in space. The last assures a clear visual image despite rapid head movements.

When these organs are not functioning properly, a person may experience rapid or jerky eye movements, double vision, nausea, diminished hearing, or a spinning sensation.

Yet these organs are not the brain's only source of information about motion. Messages from the eyes, joints, skin, and muscles also help maintain balance. In lieu of vestibular information, these other sources—often enhanced by adaptive mechanisms—become extremely important.

Vital to the recovery of patients with vestibular disorders, these mechanisms are the primary focus of the new Vestibular and Oculomotor Laboratory. "Our goal," says its director, Gary D. Paige, assistant professor of otolaryngology and ophthalmology, "is to identify and measure the patient's adaptive capabilities."

The lab opened in 1986 and recently received a five-year, $700,000 grant from the National Institutes of Health to study mechanisms underlying disequilibrium and falls, particularly in the elderly, as well as to help people with inner-ear problems. For people who have lost some input from the vestibular system, the lab can reliably project how much time it will take for the remaining vestibular input and adaptive mechanisms to compensate for the deficit.

"Different people have different capacities for adaptation," Paige explains. "The immediate goal of this lab is to identify and measure this capability in people who are losing, or are about to lose, input from the vestibular system."

Paige spent much of last year outfitting his new lab with equipment that can evaluate and quantify vestibular function. A rotational chair that manipulates a subject's sense of angular motion, a platform that lurches back and forth under a subject's feet, a tiny tube that circulates warm and cold water through the ear—Paige's lab, for most people, resembles a high-tech fun house. But for those with balance disorders, it is much more than fun and games.

On The Future of the Arts: Here Come Poetry Videos

On a pleasant Thursday evening this spring five Washington University professors sat down to attempt what one, Burton Wheeler, called the "foolish and impossible" task of predicting the future of the arts. The April 9 panel discussion was part of a symposium, "The Future: Challenges Facing America as She Prepares to Enter the 21st Century," sponsored by the College of Arts and Sciences.

The panelists were: Robert Wykes, composer; Barry Schactman, painter; Barbara Jones, film critic; and Donald Finkel, poet. Wheeler, a professor of English, served as moderator.

The most optimistic predictions were offered by Wykes, who observed that "more composers than ever are producing at a furious rate, and scholars are recovering still more old music." The challenge to future composers will be to "assemble into a meaningful, coherent work all the styles we are exposed to." Barry Schactman, however, saw darker consequences in a similar multiplication of styles in painting. "Artists are now willing to settle for detachment and facile responses," he said. "Novelty has replaced the spiritual dimension."

Film critic Barbara Jones lamented the lack of diversity in popular cinema. Successful films require big budgets for production and distribution, she said, and studios and producers have refused to gamble on avant-garde directors. Instead, they have stuck to traditional storytelling—epitomized by the films of directors George Lucas and Steven Spielberg—and completely ignored experimental films. Jones predicted "the development of film will be retarded" compared to the other arts.

Perhaps the dimmest view of the future was taken by poet Finkel, who pointed to the many recent mergers of major commercial publishing houses, resulting in fewer opportunities for new writers to establish national reputations, and Americans' increasing reliance on pictures rather than words. We have become a visual culture, he said, attuned to the rhythms and images of television and films. "If the literary arts are to survive," Finkel said, "they must take cues from the visual arts." And in the future, he continued, we should not be surprised to see "poetry videos" similar to the music videos on MTV. —J.M.
World debt last March at $3 trillion, said. "Some of it also was contracted by government," Felix said. But when the debt crisis hit and a large part of the debt was not able to pay interest and that one paragraph about being loyal to your family is wonderful." Don Royse, professor of architecture, "The Post-Modern Aura," sponsored jointly by the University and the National Autonomous University of Mexico, and funded by the Ford Foundation. The foreign assets of the six largest debtor countries in Latin America probably equal or exceed their debts, Felix says. The only problem is that the debt has been mobilized, and the assets are private. "A large part of the debt was contracted by government," Felix said. "Some of it also was contracted by private banks or firms. But when the debt crisis hit and a country was not able to pay interest on its foreign debt, the governments of these countries assumed responsibility for the payment of the private debt, too. It was essentially socializing a private debt." In fact, in their study of six Latin countries, Felix and doctoral candidate Juana Sanchez discovered that the more the debt increases, the more capital flight increases. The alternative causes for this, Felix suggested, are that the influx of government borrowing increases the liquidity of the wealthy citizens, who then have more to invest outside the country. Or, the more citizens invest outside the country, the less capital the government has to pay off its debt and therefore borrows more. "Because the domestic investors do not invest, the economy remains depressed and their lack of confidence remains justified. It's a Catch-22," Felix said. Given this lack of confidence, Felix suggests a variation on France's and Britain's solution of 1915, when both countries had massive private investments outside their countries. The governments required that foreign assets be registered with their treasury departments so they could be used as collateral for war loans or even sold outright for cash. The original owners were paid in the national currency. They took a hit," Felix said, "but this is how they supplemented their weak balance of payments." Latin American countries would face more severe problems, but could finesse these by placing the mobilized assets in a foreign-based escrow account to be used to service the debt, and requesting the collaboration of major creditor banks and governments in building up the account by identifying foreign assets. "Why expect collaboration? Because the scheme is probably the only way the Latin American loans are ever going to be fully collectable." What was the conference attendees' response to such a solution for Latin America? "'Great idea, but it's politically probably too hot.'" — C.J.S.

**Summer Reading**

What book are you planning to read for recreation this summer?

Mary Parker, director, Student Health Service: *The Stories of John Cheever*, by John Cheever (Knopf).

"I've already started reading it, but I want to finish it this summer. The first story in the collection has a beautiful paragraph about family. I can't stand the rest of the story, but that one paragraph about being loyal to your family is wonderful." Don Royse, professor of architecture: *The Post-Modern Aura*, by Charles Newman (Northwestern University Press).

"Charles Newman (professor of English at Washington University) is a colleague, and I'm interested in what he has to say. The postmodern movement in literature has some parallels in architecture. Although they're discussed less concretely, the arts share some issues with architecture, and they're described in similar ways." John Degn Pener, senior, majoring in history: *The Lost Language of Cranes*, by David Levitt (Knopf), and *Enserfment and Military Change in Muscovy*, by Robert Helli (University of Chicago Press).

"I'll be reading Levitt's book because I'm interested. The other book was given to me by the history department for winning the First Annual Russian History Award." Allison Bell, 1987 graduate, majored in English and economics: *Man's Work*, by John Connelly (Algonquin Books).

"Connelly is a recent graduate from the Writers' Program. The stories I've read so far are really brilliant. They're about the kind of people who graduate from Washington University and spend the next couple of years in limbo, still living in apartments near Delmar."
Responsibility rests in the trust between patient and physician

Cutting Through the Myths and Misuses of Surgical Lasers

The intense, searing light of the laser has evolved into a remarkable medical instrument. It has revolutionized procedures in ophthalmology, plastic surgery, gynecology, and neurosurgery; it holds great promise for the diagnosis and treatment of a variety of human illnesses. Yet many specialists express a growing concern, not about the technology itself, but about the means being used to market and promote it.

The public’s captivation with laser technology—a fascination that began when the laser beam was first harnessed in the laboratory in 1960—is well founded. Surgical lasers cut through tissue with extreme precision, cauterizing blood vessels as they cut, minimizing bleeding. They virtually eliminate the chance of infection that exists with conventional instruments. They are fast and, in some cases, painless.

Until recently, only hospitals and medical centers, where procedures are monitored by peer review and credentialing boards, could afford surgical lasers. Major hospitals have established laser committees that doctors using the equipment are properly trained and that the procedures they use are accepted as beneficial and appropriate.

But newer, inexpensive lasers, costing as little as $20,000, may soon become common in outpatient clinics, ambulatory care centers, and doctors’ offices. In these settings, appropriateness of use becomes a fundamental issue.

Without question, lasers perform important functions in many medical fields. Numerous new applications are being examined, and some of these will eventually prove effective as our knowledge of the technology advances. But there is a tendency to overstate the part lasers play:

- The dermatologist who uses a laser to remove a simple wart from the hand or foot may not explain to patients that the wart can be removed at least as effectively by other, less expensive and more conventional means—the $3 disposable scalpel, for example.
- The public is already being swayed by advertisements touting “laser facelifts.” Yet in this procedure, the laser simply makes an incision.
- There is no medical evidence to suggest that it performs the task better than the old-fashioned surgical blade.

- Another recent application of the technology is laser circumcision. While the laser is certainly capable of performing the procedure, conventional methods are at least as good, perhaps better, and almost certainly less expensive.
- Some doctors recently have advertised “laser cataract surgery,” encouraging patients to believe that lasers have replaced conventional procedures. The laser does, in fact, play an important role in cataract surgery, but only after the clouded lens has already been cut away using conventional methods.

Society has bestowed upon physicians a high degree of autonomy through a social contract of mutual trust. The review and accrediting procedures now in place in the nation’s medical schools, hospitals, and medical societies have in general served the public well. And, in most cases, we can continue to rely on these checks and balances to ensure that medical professionals using lasers are trained properly.

Ultimately, responsibility for appropriate use of lasers rests, as in other areas of medicine, in the mutual trust between patient and physician. Before submitting to laser surgery, patients should be sure the doctor is board-certified in his or her specialty, a member of local and national medical societies, on a reputable hospital staff, and experienced and trained in laser procedures; when there is doubt, get a second opinion.

The use of lasers should and will continue to expand rapidly. Even those who use the laser daily marvel at its ability. But both physician and patient must acknowledge that, like other medical tools, the laser is nothing more than an instrument. True, it’s on the cutting edge of technology. But it must be used only when it is the most appropriate and effective tool available. —George M. Bohigian

George M. Bohigian is associate clinical professor of ophthalmology at Washington University School of Medicine and chairman of the Panel on Lasers in Surgery and Medicine of the American Medical Association’s Council on Scientific Affairs.
Following years of regulatory wrangling, this summer ushered in the dawn of a new agricultural age.

by Robert Brock

Here it is,” says Roger Beachy, professor of biology at Washington University, striding down the steamy greenhouse walkway, holding up a young tomato plant that looks like every other tomato plant in the world. “Looks completely normal, doesn’t it?”

Weeks before, Beachy had infected it with a plant virus that, under normal conditions, would have stunted its growth and turned the leaves yellow. But now, weeks later, the tomato is still healthy.

Deep inside the nucleus of the tomato plant’s cells, portions of its chromosomes have been changed, designed not by nature but by human hands: Roger Beachy’s custom-built tomato. Now it and its progeny resist a disease agent called tobacco-mosaic virus in a way that nature, throughout millions of years, may never have accomplished.

The compleat farmer: As part of a research project sponsored by the Monsanto Company project, Biology Professor Roger Beachy was on hand as about 300 genetically altered tomato plants were put in the ground on a plot in Illinois approximately 60 miles northeast of St. Louis. The “custom-built” tomatoes, technologically bred to resist a form of virus that results in significant crop loss throughout the world, are the first genetically altered food plants ever to be field-tested. Photo by Herb Weitman.
This is the world's first genetically engineered virus-resistant plant.

This summer, about 300 of Beachy's tomato plants, along with other tomato plants engineered by the Monsanto Company to resist insect devastation and the ill effects of herbicides, were for the first time put in the ground on a small plot of leased land near Jerseyville, Illinois, about 60 miles northeast of St. Louis, inaugurating what some are predicting as a new agricultural age.

Several weeks earlier and 2,000 miles away, Julie Lindemann, a plant pathologist with Advanced Genetic Sciences, Inc., steps into the field in Brentwood, California, and moves biotechnology another step closer to becoming viable agribusiness.

It takes Lindemann, only 20 minutes to spray 2,400 strawberry plants with genetically altered bacteria, called Frostban, which researchers believe will reduce frost damage to agricultural crops.

It is the first time a genetically engineered microorganism has been purposely released into the environment, and while some greet the event with wonder and excitement, others are filled with fear and apprehension. At least twice during the summer, protesters will break into the field-test plot and rip most of the strawberry plants from the ground.

The test, begun in April, and another like it in Tulelake, California, using potatoes, is the culmination of at least a three-year struggle. Dozens of scientists, environmental lobbyists, the California Appeals Court, and the U.S. Supreme Court had taken part in vitriolic debate over the proposed release of the bioengineered bacteria. But these are only the opening skirmishes in what many scientists believe will be a long and difficult road toward widespread acceptance of genetic engineering in agriculture.

Today, about 250 biotech companies have been formed in the United States alone, most of them since 1980, when the Supreme Court ended an eight-year court battle by ruling that newly created forms of bacteria could be patented. Some observers estimate as many as 500 biotech firms now exist throughout the world.

Chemical producing giants like American Cyanamid, Ciba Geigy, DuPont, Monsanto, W.R. Grace, and others have positioned themselves to develop chemicals, engineered microbes, and specially designed seeds for the farmers of the future. Other corporations are investing in biotech venture companies, particularly those developing genetically engineered agricultural products.

Already, genetically engineered bacteria are being used to manufacture conventional agricultural products like animal-growth hormones and pesticides. Bacteria-produced vaccines for veterinary diseases such as scour and pseudorabies are now available; those for rabies, hoof-and-mouth disease in cattle, and many other diseases will come soon.

One company is even planning to market a cloned bacteria to create fluffer artificial snow for ski resorts.

But biotechnology has a much more profound capability in agriculture: It can be used to produce newly bred crops and livestock that have characteristics not previously possible. It is these changed organisms that promise to alter the face of American agriculture.

At least a dozen companies, this year alone, are expected to request approval from the U.S. Department of Agriculture and Environmental Protection Agency to test genetically altered microorganisms and plants outdoors. But not everyone is pleased with the explosion of biotechnology. Several of these scientific transformations have caused a public outcry from those who believe humans were not destined to change what nature has wrought. The intensity of the challenge, spearheaded by activist Jeremy Rifkin and his Foundation for Economic Trends, has surprised and dismayed the biotechnology industry. It was a lawsuit brought by Rifkin that stalled the Frostban tests for six months.

Roger Beachy is the first to point out that his breakthrough in virus resistance in plants is not the product of a single, isolated laboratory. Virus resistance, he explains, resulted from an extraordinary collaboration between Washington University and the Monsanto Company. "The interest in the virus resistance work has been incredible," Beachy says, leading the way from the laboratory hothouse to his second-floor office in Rebstock Hall. He looks young to have orchestrated a major breakthrough in biotechnology. "I've made presentations all over the world in the last nine months," he sighs, settling in behind his small desk. "We're booked solid for two years with people waiting to study in our lab.

"There is no way any one of us could have achieved what we did working by ourselves," agrees Robert Fraley, director of plant science technology at Monsanto. "It took a magnitude of science and individual expertise that is available nowhere else.

"In plant molecular biology, these institutions have put together one of the most intimidating scientific teams on the planet," says Howard Schneiderman, senior vice president for research at Monsanto. "I won't say we're the best, but we'll be on everyone's list of the top three or four groups in the world."

In 1980 Monsanto made a corporate decision to become a world leader in biotechnology. By 1983, Monsanto scientists began to publish the results of what was to become a continuing series of breakthroughs in agricultural biotechnology. And, in 1984, Monsanto opened the doors of its $150 million Life Sciences Research Center on the outskirts of St. Louis where today more than 1,000 researchers work. During this period, Monsanto scientists began their exciting collaboration with Professor Beachy.

Leaning forward across his desk in Monsanto's world headquarters in St. Louis, Schneiderman's concern that public perception will delay the introduction of important new products for farmers is apparent. "I believe that genetic engineering is the most important advance in agricultural science of this century and can enhance both the productive efficiency of agriculture and the quality of our environment. It has the potential to increase vastly the economic competitiveness of American agriculture.

Future shock: "I believe that genetic engineering," says Howard Schneiderman, senior vice president and chief scientist at Monsanto, "is the most important advance in agricultural science since agriculture was discovered 11,000 years ago. It can vastly increase the economic competitiveness of American agriculture and enhance the quality of our environment."
One of the most important advances at Monsanto was the development of a technique for inserting foreign genes into plant cells. The method, which uses a bacterium, called Agrobacterium tumefaciens, is now used worldwide, and was developed by Monsanto researchers Robert Horsch, Stephen Rogers, and Robert Fraley (left to right, above) in 1983. This approach produced the world's first transgenic—genetically altered—plant, a tobacco plant whose progeny are still growing in Monsanto's rooftop greenhouses in Chesterfield, Missouri.

Yet there is an effort afoot to stop the application of genetic engineering to agriculture. The public has been encouraged to be apprehensive about genetic engineering and biotechnology, and to adopt the view that genetic engineering is dangerous, unnatural, and in some way infringes on “divine copyright.”

The few vocal opponents contend that insidious bacteria or a modified superplant will be loosed on the planet to wreak havoc with agricultural crops and nature. Once introduced into the environment, opponents say, these organisms might take over niches now occupied by other organisms, much like the kudzu plant did along highways of the South.

“Such fears are unfounded,” Schneiderman observes. Plant and animal geneticists, he explains, do not create radically different species. The economically viable plants coming out of today’s plant breeding laboratories, he says, are changed in only subtle and well understood ways. “There is no reason to assume, guess, or hypothesize that changing a single gene in a plant by genetic engineering and planting its seed in a field would cause an environmental problem.” And, he continues, “To convert a corn plant into a weed would require hundreds of genetic changes, because corn simply does not have a weedy personality.”

Genetic engineering, says Roger Beachy, Washington University professor of biology, “is nothing but plant breeding done with exquisite precision.”

Beachy sees his work following in the tradition of Gregor Mendel as simply a plant breeder, using sophisticated tools instead of chance. The frustration pops into his voice as he talks of public fear of biotechnology in agriculture: “I’ve given it a lot of thought and there are no realistic scenarios that I can envision that would result in a hazard from putting the transformed virus-resistant plants now possible into the field,” he says. “We know too much about these plants to be surprised.” Breeders, Beachy observes, have been altering the genetic pool of plants for centuries. “And those countless genetic crosses involved randomly moving hundreds, even thousands, of genes about which the breeder knew absolutely nothing.”

Genetic engineering, on the other hand, is an extremely precise breeding technique. “We know, for example, that virus-resistant tomatoes are identical to other tomatoes except for several
Ready to Market

Calgene Inc., of Davis, California, is currently developing tomatoes with a higher percentage of usable solids for the Campbell Soup Company. An increase of only one percent in the solids content of tomatoes could translate into $80 to $100 million per year for the food industry, according to General Foods Corp.

Another food company is altering genes to produce coffee beans that are naturally low in caffeine.

Scientists have successfully snipped the genetic template for a natural protein produced in the pituitary of cows, called bovine somatotropin, and inserted it into a bacterium. Cultured in vats, the bacteria produce large amounts of the protein, which is injected into dairy cows. The result is that Bessie produces 10 to 20 percent more milk, allowing farmers to reduce the size of their herds and increase their profitability.

Monsanto and others stand ready to begin manufacturing and marketing the protein when it receives approval from the United States Food and Drug Administration. Previous tests have shown that its use has no effect on the final milk product; tests now focus on long-term effects of the protein on animal health.

Biologists at Monsanto, for example, have inserted genes into tomato plants that bestow resistance to the company's Roundup herbicide, making the plants "immune" to the weed-killing chemical, which acts only on plants, not humans or animals.

Roundup, the world's largest-selling herbicide, is a particularly attractive crop chemical to both farmers and ecologists because it is believed to be environmentally friendly: it stays where you put it, and it breaks down quickly.

But because it kills any plant it touches, the herbicide presently cannot be applied to most crops during the growing season. If crops were resistant to Roundup, however, it could be used during the growing season to selectively kill the weeds, allowing only the desired crop to grow.

By using similar gene-transfer techniques, several companies have produced plants that are resistant to certain types of insects. Other biotech companies have successfully transferred genes that produce a protein poisonous to crop pests, like caterpillars, into a bacterium that colonizes around the roots of agricultural crops.

Something borrowed: Roger Beachy holds a petri dish with bacterial colonies that contain fragments of a plant virus. This process is the first step in isolating a gene that will later be implanted to induce resistance to the virus.

thousand nucleotides, we know the exact sequence of the genes, and we know what they produce and how they perform. The information we introduce into a plant is better and more precise than any breeder has ever dreamed," he says. "This is nothing but plant breeding done with exquisite precision."

American farming is one of the first industries to adopt high technology. Biotechnology, argue its proponents, will lower overhead and production costs, the way mechanization and hybridization, the great technological improvements of the first part of the century, did. But it will not require the huge equity investment of the technology of the past.

"The cost to the farmer," says Fraley, "is very small: disease-resistant seed, insect-resistant seed, injections of genetically altered proteins that show a return on investment in 30 days." For these reasons, he says, biotechnology will benefit the family farmer as much as large agribusinesses.

Opponents point to gluts in commodities, like milk and grains, that have severely depressed farm prices. Genetic engineering, they say, will only deepen the farming crisis by lowering prices further. But a focus on cost-cutting is a significant shift in how companies are marketing biotechnology. According to James Herbert, president of Neogen Corporation, of Michigan: "American agriculture has tried for many years to be more efficient by producing more per acre. The question now is how to produce the same quantity but produce it more cheaply."

The commodity surpluses of today, adds Schneiderman, are as ephemeral as current oil gluts. "In 30 years, the population of the Earth will double. To feed those people, we have two choices: either increase the tillable acreage now in production, or increase the productivity of the farms that already exist. I, for one, would prefer not to plow up the rest of the planet."

The real value of biotechnology will be proven in the Third World. Sophisticated agronomic techniques are unknown in most of these countries. In Thailand, for example, where Beachy recently gave a seminar at the behest of the United States Agency for International Development (US AID), between 40 and 80 percent of the tomato crops are lost to tomato-yellow-leaf-curl virus. "That's every year, every field," Beachy insists, "and it's the same all over the Mediterranean: Israel, Morocco, Italy. Research at Washington University and Monsanto now centers on identifying the mechanisms that cause viral protection and finding ways to make it more effective for different viruses. Beachy's methods have already been used by researcher Nilgun Turner, at Monsanto, to achieve genetic resistance to a second virus, alfalfa mosaic virus. "We've shown that the same genetic approach is successful with two different viruses," Beachy says. "We would someday like to provide protection against a number of different viruses with a minimum number of genes. If we are successful, it
will increase yields and produce more food for millions worldwide." Already, Beachy has had interest in his technique from scientists in Zimbabwe, Egypt, Indonesia, and China.

Using biotechnology, scientists have been able to address problems that cannot otherwise be solved by conventional means. "The beauty of Beachy's virus-resistance work," says Fraley, "is that it solves a problem for which there was no other good answer." But biotechnology is still a fledgling science. At present, roadblocks remain in identifying what traits are controlled by which genes. "We simply don't know enough about how plants work to just go in and start moving genes," says Fraley. "Characterizing the genetic structure is a difficult job."

Genetic engineering, for example, has only been achieved with a limited number of vegetable crops. The cereal grains, including important crops such as wheat, corn, rice, and oats, have not yet been transformed and regenerated. "In separate experiments, cereals have been regenerated from tissue cultures and individual cells have been transformed," says Robert Horsch, a senior team leader at Monsanto. "But no one has yet been able to put the two together. Tissue culture, the process of regenerating whole plants from individual cells, is still more art than science and is liable to stay that way for a long time," he explains.

But biologists have already identified goals that seem achievable within a few years. One of them is to alter plant genetic structures so that crops produce more balanced and nutritious proteins for human consumption. Dozens of biologists worldwide are also working on nitrogen-fixing potential to create plants that can use nitrogen from the environment instead of from nitrogen fertilizers. These plants would eliminate one of the farmer's highest production costs.

Many agronomists also worry that the developed countries are losing genetic variability in many crops. Ever since extremely productive hybrids have been available, less productive varieties have become rarer, and some have even disappeared. "Today, one variety of banana provides all the bananas in the Western Hemisphere," Schneiderman says. There are two varieties of garden peas in general use, only a handful of types of corn. When a disease strikes those crops, as happened in the corn blight disaster of the early 1970s, thousands of crop acres can be wiped out.

"But genetic engineering," says Beachy, "gives us virtually unlimited potential to develop brand new varieties that have special traits. It will expand the genetic pool of Earth and help us feed our expanding population without increasing the tilled land."

"We are closer to having one world in scientific research than in any other human activity. I see it as both natural and attractive that this nation's two great research communities - research universities like Washington University and research-driven companies like Monsanto - should join forces to help the nation secure scientific, technological, and economic competitiveness for the rest of this century and the next. The biotechnology assets that Washington University and Monsanto have developed in St. Louis are a national treasure," Schneiderman concluded.

Robert Brock is a Denver-based writer and editor specializing in science topics.
There is, at first glance, something old-fashioned about the art of Walt Spitzmiller. His painterly evocations of ballplayers and sportsmen, of riders at the rodeo and jockeys at the racetrack — for which he has gained a considerable reputation among magazine art directors around the country — display throughout an uncommon poise of composition, a pure and clean light.

The modern inclination toward reduction obviously is respected, but to the end of narrative content; Spitzmiller, B.F.A. '69, knows the techniques of design and impact but prefers to steer clear of what he dismisses as decoration, choosing instead an older tradition of illustration more closely associated with storytelling.

The overall effect is at once elegiac and immediate. But the role of the commercial magazine illustrator has changed greatly since the days of the classic storytelling illustrators, like N.C. Wyeth, a significant influence on Spitzmiller, and so has the publishing industry (or what used to be known as the publishing "business"). As Spitzmiller explains: "Being an illustrator now means learning more than how to make pictures that fit into magazines. You have to understand the language of the businesspeople, too. The dreams I had before coming to New York I've disp.
A romantic education: When Spitzmiller first came to New York, he intended to produce work for women's magazines. But, he discovered, the market had changed; and women's magazines were addressing "hard-edged" contemporary issues typically unsuited to Spitzmiller's more romantic style.

Far left: "Woman on Wall" was sold in 1984 to McCall's to illustrate a short story. It is one of Spitzmiller's rare sales to the kind of women's magazine for which he originally intended to work.

Top left: His portrait of operatic tenor Luciano Pavarotti, executed solely in graphite, served as the cover for the program of a 1984 Madison Square Garden appearance.

Bottom left: In what has now become a notorious incident, Spitzmiller produced four paintings to be used on four L.L. Bean quarterly catalogs. But on one, which pictured another Washington University alumnus and illustrator, Jack Unruh, (B.Ed.'57) and his dog, Slick, Bean changed the painting, removing the duck-hunter's beard and smoothing the shape of the dog's nose.

Spitzmiller sued, was written up in the national press, and settled out of court for an unannounced sum (with the understanding the offending cover, for the Fall 1986 catalogue, not be reproduced). The experience has made him a visible champion of artists' rights.

Above: Spitzmiller at work. Photo by Herb Weitman.
covered no longer exist. There are no rules any more."

Today's savvy illustrator, who must speak the language of commerce, needs to know about merchandising strategies and how to pursue desirable demographics when considering secondary markets. He should be, to use the current vernacular, pro-active.

As a result, Spitzmiller has taken a business partner who acts much as an agent, except that he handles no art directly. The two promote Spitzmiller's work, negotiating, for instance, a corporate program that might involve posters, a limited edition of signed prints, and, in one recent case, the distribution of calendars. In addition to being an accomplished artist, Spitzmiller insists, the post-modern illustrator must also be a marketing man. This leads to an existence Spitzmiller describes as "schizophrenic," but one he has come to see as necessary.

Still, his working methods remain traditional. Preferring to draw from experience, Spitzmiller relies heavily on firsthand observation and photographs. He works on canvas and aims for a state of spontaneous expression where the materials find a life of their own. Thinking of himself primarily as a painter, he says the most valuable lesson he learned as a fine arts student was "to react to the surface of the work and not get caught up in technique." His main interest, he insists, is the relationship of figure to landscape.

One of four children of a working-class family, Spitzmiller attended Northeast Missouri State Teachers College in 1963 for two weeks on a football scholarship, then changed his mind. Taking a job as a draftsman at Day-Brite Lighting, a division of Emerson Electric, in St. Louis, Spitzmiller was encouraged by the senior designer to pursue a fine arts education. After two years in junior college he enrolled at Washington University where, he recalls, "it was like the brightest light came on. For the first time, I was challenged to go beyond ideas I accepted too easily. It made me hungrier to understand and explore the world, which is what I think a university education should do."

After graduating, working in several St. Louis design studios, and teaching part-time in the School of Fine Arts, he decided to seek his fortune in New York. Today, he and his wife, Connie, and their two children, Jillian, 20, a Dartmouth student, and Bartley, 9, live in a secluded country house surrounded by tall pines north of Westport in Redding, Connecticut. In addition to 35 assignments for Sports Illustrated and numerous others for the likes of Golf Magazine, Golf Digest, TV Guide, Sports Afield, and People, Spitzmiller has to his credit several special projects, among them a 12-page spread on the 1984 Los Angeles Olympics (for Nissan) and the illustrations for The World of Figure Skating, by Carlo Fassi, a top Olympic coach. His portfolio brims, as well, with portraits and series of paintings, a specialty of his. Spitzmiller's white Porsche 944 attests to his success as a commercial illustrator, but its license plate, NUANCE, reveals Spitzmiller's sense of humor and some serious concerns of the artist.

"I'm still working on lessons I learned in school," he confesses, "still trying to find solutions to problems. I try in my paintings to get at the essence of what's going on rather than be distracted by what's peripheral. At the same time, I want the results to be subtle. I'm looking for a mode of expression that's controlled and spontaneous at the same time.

"I try to depict an idealization of the good life, a life without problems. My work is an attempt to address and isolate moments of pleasure in life. What I'm really trying to create is a world within my paintings in which I'd like to live."
At play in the field of sports: Based on frequent assignments for *Sports Illustrated*, Spitzmiller made his reputation first as a painter of players and games.

**Far left, top:** “The Last Out,” in which the catcher is composed from parts of three different photographs, was painted for the Major League Baseball Corporation and used as the cover for the World Series 1985 program. Spitzmiller also painted the cover for the 1986 All-Star Game program.

**Far left, bottom:** Although the magazine prides itself on action photographs as covers, *Sports Illustrated* has turned to Spitzmiller three times for cover illustrations.

**Left:** After winning the Cy Young award in 1985, New York Mets pitcher Dwight Gooden was signed to an exclusive contract by Spitzmiller and his business partner. As a result, this painting of the dynamic young pitcher was made, and a limited edition of lithographs produced, to benefit Save Amateur Sports.

**Below:** In 1979, *Sports Illustrated* asked Spitzmiller to do any assignment of his own choosing. For the next year and a half he followed the rodeo, producing over 40 paintings and sketches, several of which appeared in the magazine.

“Sunlit Palamino” is one of Spitzmiller’s “all-time favorite paintings. I love the feeling of active sunlight in it. It was one of those situations where the palette just really worked.” It hangs today in the American Museum of Illustration in New York City.

**Right:** Spitzmiller’s infatuation with the rodeo culminated in an exhibit in conjunction with the National Finals Rodeo in Oklahoma City in December 1980. This portrait of bronco rider Bobby Brown, done in crayon and oil wash, previously unpublished, was part of that exhibit.
Becoming a legend: With his interest in sportsmen and the outdoors, Spitzmiller was the logical candidate for a *Sports Illustrated* piece in 1982 that traced the Idaho streams and mountains where Ernest Hemingway once fished and hunted. With Hemingway’s son, Jack, as his guide, Spitzmiller waded in the same streams and tracked game across the same inclines.

Far left, bottom: The result of Spitzmiller’s seven-day trek into the past produced a portfolio that includes a depiction of Jack Hemingway casting for trout in clear Idaho water.

Bottom left: Spitzmiller painted these mule deer for an article on deer hunting in *Sports Afield*.

When *SI* published a portion of a posthumous Hemingway novel last year, Spitzmiller again got the call. Immersing himself in Papa’s writings, the illustrator produced 18 paintings, 14 of which were published and all of which were purchased by the magazine’s publisher.

Working extensively in sketchbooks layered with copious notes, Spitzmiller revised concepts sometimes several times until he captured the right feeling. “The challenge of illustrating Hemingway,” he says, “made me rise to a new level in my work.”

Top left: “Jama’s Terror” depicts a reminiscence of the charge of an enraged bull elephant.

Above: This painting of the story’s narrator and his father didn’t run in the magazine but illustrates a turning point in the text.

Top right: The illustration used for *Sports Illustrated’s* cover was suggested originally by the magazine’s editor to emphasize the importance of elephant hunting in the story.

Bottom right: The story’s narrator recalls an incident from his boyhood.
More than a thousand Washington University students this spring turned out to help with Special Olympics. Eight hundred made their way to St. Charles to last fall’s flood emergency, sandbagging, helping out in shelters, cleaning up. Students tutored, worked in hospital emergency rooms, gave time to the elderly, the abused, the lonely, helped with homework, played with children, painted houses. Many served once or twice in soup kitchens, or weatherizing projects, or cleaning up urban neighborhoods, in fraternity or sorority service projects, or through religious organizations such as Hillel or Newman. They gave skating parties, organized trips to the zoo, and raised money.

The received wisdom has been that the current student generation is solidly pre-yuppy, focused on grades and jobs and quality of life immediately after college. But that story is changing. This year Time magazine, The New York Times, and The Christian Science Monitor heralded the change with stories on the rise of volunteerism. According to Time, the best estimate is that 15 to 25 percent of collegians engage regularly in some kind of community service. All reported an increase in student involvement across a range of service.

What’s true at Brown and Stanford and Vanderbilt is also true at Washington University. It’s difficult to come up with tidy numbers on this highly diversified campus, but the 15 to 25 percent figure is undoubtedly correct for us, too. That’s heartening, but there’s more to the story. Harry Kisker, dean of student affairs, estimates that over the past year at least 90 percent of students on campus were involved in some kind of altruistic activity, at some level, sometime during the year — much of it done with relatively little fanfare.

Unlike the politically imbued community service of the Sixties, today’s volunteerism is more strictly altruistic, with individual students finding their own ways to involvement; this new form of direct action parallels, Kisker suggests, the decline of student interest in university decision-making.

The engine that drives volunteerism, now as in the Sixties, Kisker says, is youthful idealism. “Idealism is a constant for young people, idealism and energy. It gets battered, but it’s there. Students are looking for meaning, for the intrinsic rewards, for engagement with fellow human beings.”

Special Olympics, like many of the service projects on campus, began with one student, Eric Berger, a sophomore from Atlanta. Over the summer he learned how a friend had brought Special Olympics, a day of activities and recreation for the handicapped, to the University of Maryland, and Berger determined that he would do the same at his university. By early October, he had the support of the Office of Student Activities’ Justin Carroll and Director of Athletics John Schael, and he began pulling students together to help plan a February 15th Special Olympics basketball tournament.

They needed people and money. They needed buddies for athletes and cheering sections for teams. They needed people to help serve food; they needed entertainment. They wanted an Olympics with pageantry and excitement and vitality. Between October and February, Eric and a dedicated core of co-workers from his fraternity, ZBT, raised $8,000 in cash and $5,000 in donated food, and got commitments from groups all across campus.

The response was overwhelming. By the end of that Sunday in February, more than 1,500 students had come to the

Helping hand: More than 1,500 students pitched in last winter to hold a Special Olympics in the new Athletic Complex, among them junior Mark Oakland, who offered an impromptu trumpet lesson.
Athletic Complex to help. They did the work they had come to do—cheering and serving—but they did much more. They reached out and embraced those special athletes, aged 7 to 64, with an outpouring of care and attention. There was joy and contentment on every side.

Institutional support is as important as individual participation. Some of that support comes simply at the level of encouragement; some comes with direct help in solving logistical problems, critiquing plans, opening doors, identifying resources; and some comes by providing the necessary links to the community. It comes from the Office of Student Affairs, from organizations’ advisors, from the staffs of religious and service organizations.

The Campus Y has long been a reliable campus center for community service. This year close to 160 students gave time on a regular basis to 16 different service projects, while more than 200 worked on one-time programs—a 13 percent increase in activity from last year. “A difference,” notes Helen Davis, director of the Y, “is that students seem to be serving out of a greater sense of commitment. There’s more unselfish concern out there. They gave time and energy they could use for themselves.”

Sherry Taylor, a junior from Oshkosh, Wisconsin, recruited students to tutor once a week at University City High School. According to Herman Shaw, assistant principal, the program was an outstanding success. Close to 50 students, many of them on a continuing basis, were helped over the year by the volunteers. “The volunteers really kept track of the kids they were helping,” Shaw said.

Three times a week, Washington University students trekked to the Kinloch YWCA to give attention and supervision to children who would otherwise go home to empty houses. Kinloch has no library, no schools within its boundaries. There’s not a lot of attention at home. Amy Holtman, a sophomore from Wooster, Ohio, made the gift of her time to Kinloch youngsters twice a week all year.

Community service has always been the backbone of the Campus Y. But today programs are turning up all over campus. In the spring of 1986, a meeting called by the deans of the Business School to test interest in developing systematic opportunities that would capitalize on the special skills of business students drew more than 60 volunteers. The idea was to place students with nonprofit agencies or organizations too small to have accountants, marketing experts, or managers on their staffs, that could use a helping hand from students who were developing expertise in those areas.

“One students,” says Associate Dean Gary Hochberg, “have a fully developed sense of responsibility, a clear sense that giving something back to the community is something they ought to do. Others see volunteerism as a chance to work closely with business leaders, to have a level of responsibility and visibility they might not get on the job for quite a while. For many it’s simply intrinsically rewarding.”

Hillel, too, has seen a striking increase in volunteerism this year. “To be an undergraduate is a grim existence,” says Rabbi Jim Diamond, director of Hillel. “They’re under tremendous pressure to show performance results. Service allows them to transcend themselves. It’s part of their search for meaning, fulfillment, self-definition. In the total economy of life at the University, these activities are absolutely necessary.”

Thurtene Carnival expresses the spirit of community service in another way. The carnival, a campus institution since 1907, is the largest student-run carnival in the country. Its managers, the 13 members of the honorary society, spend the better part of the academic year getting ready for the April event. While individual groups—fraternities, sororities, residence halls, and student organizations—rent space for booths or entertainment attractions, all organization and management is handled by Thurtene. In the old days—before 1970, that is—Thurtene was primarily a Greek event, but since then both the breadth and diversity of student involvement has increased, and Thurtene itself has committed its profits to charity, this year choosing the Cystic Fibrosis Foundation. Two thousand or more students worked on the carnival this year; that’s a lot of spirit, and a lot of service.

There’s more, much more, to the story. Students from Newman Center went every week to serve dinner at a retirement home and then stayed to dance with the residents. Others paired with young women in a home for unwed mothers, learned the Lamaze technique with them, then stood by during delivery. Five from the Y drove to South Dakota to help on a Sioux Indian reservation over spring break. On the eve of final exams, at the tail end of reading week, more than a hundred came to a benefit film with donations of canned food.

“That kind of giving,” said Provost Max Cowan, at a recognition ceremony in April held by the Y to honor the campus-wide commitment to service and involvement, “never becomes obsolete.”

Trudi Spigel, Ph.D. ’69, is director of special projects in public relations at Washington University.
Being invited to contribute to a volume on "eminent women" has given me an occasion to reflect on how being a woman has contributed to and detracted from my career as a psychologist and to think about my life as a whole. If there is a single theme, it is iconoclasm. (That, if nothing else, makes me resist being cast as a "role model" for other women, and I can only hope this small piece will not be so misconstrued.) I have never been a True Believer in any cause, though I have often been accused of it, always by people unsympathetic to the cause they think I believe in.

This skeptical attitude, even toward ideas in the fields that most interest me, such as psychometrics, psychoanalysis, and the women's movement, would have made me a chronic outsider even if being a woman had not already marked me. There is no niche to be filled by a Socratic woman. A woman, even more than a man, had better be a conformist if she wants to get ahead in the world.
When I graduated with an undergraduate degree from the University of Minnesota in 1937, I was first offered an assistantship in the Institute of Child Welfare there, and then the offer was withdrawn. I do not think the fact that I was a Jew and that I was considered to have radical political sympathies. I had also applied for an assistantship in the psychology department, and as graduation approached, Richard Elliott, the department head, pointed out to me that their best graduate students were women, some of them Jewish, and the department found it almost impossible to find jobs for them.

The only academic openings available were in small denominational colleges in rural Minnesota. Such schools would not consider hiring either a Jew or a woman, he pointed out. He went on to say, "I wouldn't want you to become a clerk in a dime store." By the way, I do not think he personally was prejudiced against either women or Jews. Finally, he recommended that I marry a psychologist, that presumably being a solution to my professional aspirations. Quite apart from the fact that I was 19, very immature, and not interested in getting married, I was as outraged by the suggestion as a young woman would be today. (I hope young women today find a more direct expression of their outrage than I did.)

I seriously considered applying for a job as a proofreader at the University of Minnesota Press, whose editor, Margaret Harding, was a friend of mine. (That was a lowly job, but those were Depression days, Yuppies had not been invented, and I would not have qualified if they had.) Mrs. Harding refused to permit me to apply. "It's not for you," she said.

At the last minute, one of the men assistants in psychology moved up to another job, and I was given an assistantship for one graduate year, on the unusual condition that I go elsewhere at the end of the year. The following year I accepted a teaching assistantship at the University of California, which at that time meant only Berkeley. During my career there, I was never aware of prejudice against Jews, women, or sympathizers with left-wing movements.

These episodes are hardly fascinating, but they may give some perspective on today's hard times. Breaking into the academic world is extraordinarily difficult today, and seeing people at the peak of their careers, one may think they moved into high positions without all the setbacks and discouragements assailing the young today. Those whose careers go back to pre-World War II knew hard times indeed. Even men who later achieved international recognition often went from one postdoctoral assistantship to another until the war finally opened up jobs. The Depression and a variety of seldom-challenged prejudices, not only against women but against Jews, blacks, and people who openly cohabited without benefit of marriage license, were all problems. The obstacles for blacks were by far the worst. At Minnesota during the early 1930s they not only could not live on campus, there was no housing in any part of town anywhere near campus where they were permitted to live.

"I am grateful to the women's movement for making respectable many of my idiosyncrasies, which seemed for many years egocentric, selfish, or freakish. I may be all those things, but much of the problem was simply that I would not give up my career as a psychologist."

During World War II being a woman was an advantage. Even though I did not have a completed Ph.D. thesis, I was offered several relatively good jobs, academic and non-academic, that would normally have gone to a person with a Ph.D. and probably also to a man. Employers preferred women because there was no danger that a change in eligibility for the draft would mean searching for a replacement.

For me, however, the advantage was short-lived. I was an instructor for a year at Stanford, then for a little over a year at Berkeley. Then I quit in order to finish my dissertation — financially, the best investment I ever made. By then I was married to Sam Weissman, who had come to Berkeley as a postdoctoral fellow in chemistry. Before I finished my thesis, he left to work at a site known officially as "Box 1663, Santa Fe, New Mexico." That was Los Alamos, one of the home bases of the atomic bomb. I spent the remainder of the war years there.

It is difficult today to justify the reasoning behind "the bomb," as it is sometimes called today. Suffice it to say that it was generally believed by the scientists taking part in the project that Hitler's Germany was working on an atomic bomb, and it was "them" or "us." Very few scientists refused to work on the project, and it was unthinkable that a Jewish scientist would refuse.

One aspect of my experience there was unique in my life, though not unique for other women. The pressure on women to get some sort of job was intense, and so I proceeded to do so, though after the usual Ph.D. thesis hassle I would have been better off taking a vacation, something no one did at Los Alamos. I worked briefly and ineffectually in a computer lab, but then I had a protracted illness. By the time I recovered, I was about five months pregnant, and the doctor advised me not to go back to work. I know what it is to feel the sting of disapproval of working women, who think someone who does not have a regular job isn't "doing anything." The peculiar circumstances of life at that time in that place gave me the opportunity to enjoy a few months with my first child, Judith, uninterrupted by professional concerns.

After the war my husband, though many years past his Ph.D., found himself at the bottom of the academic ladder in the department of chemistry at Washington University. The situation for women had suddenly changed. Men denied adequate opportunity first by the Depression, then by the demands of war, were scrambling to resume their careers. The pressure upon women to retire from competition and just to be good housewives was immense. This is the era that my friend (and Berkeley teaching assistant) Betty Friedan has recorded eloquently in The Feminine Mystique.

For a number of years the only opportunities I had to work as a psychologist were as part-time substitute or as night-school teacher or as research assistant on Air Force projects at Washington University. These were unrewarding positions, and I soon abandoned them to follow my own star, to a considerable extent at my own and my family's expense.

In thinking about what being a woman does to one's career, one must separate intrinsic complications from extrinsic complications. There are difficulties ineluctably intrinsic to a woman's situation. Small children need and want mothering, or at least parenting (a word that hardly existed when my children were small). Also, on more than one occasion I was asked to apply for positions that were in distant cities, to which I could not move without breaking up my family.

The extrinsic difficulties included not only prejudice on the part of department heads and other employers, who are or
at least used to be comfortable with their "old boy network," but also the widespread social pressures, from women as well as men, to be a "good wife and mother," that is, to be subservient and self-effacing.

I have my own private honor roll of those who encouraged my career during the dark days after the war. Leaving out the members of my family, I want to mention my former teachers and colleagues at Berkeley and most especially Egon Brunswik. Secondly, I would like to mention the American Association of University Women (AAUW), which awarded me the Margaret Justin Fellowship for the year 1955-56. It was a small amount of money but worth a great deal in the way of validating my aspirations and my continuing interest in psychology. Finally, I must thank the National Institute of Mental Health, which for many years provided my salary and research funds.

During the period when I was employed as an assistant on Air Force projects (where, as I explained to my incredulous son, Michael, I was a test pilot), my major interest was in psychometric methods, an interest that is also reflected in my later work.

As women as subjects for psychological research are so prominent now that it is hard to remember that up to the early 1950s almost every paper in a psychological journal described its subjects as "native-born white American males." My own experiences and those of my friends, particularly two dear friends who became victims of post partum psychoses, led me to an interest in motherhood as an experience and to the traits of women as pertinent to the tasks of family life.

Thus, when I left the Air Force project, I set out to study women, and particularly mothers, by means of psychological tests. As it turned out, several other psychologists were doing similar research at the same time, including Robert and Pauline Sears, Joe Shoben, Dick Bell and Earl Schaefer, and others, but it was still a relatively novel endeavor. My studies were supported by a series of grants from the National Institute of Mental Health.

Local sponsors were, variously, Jewish Hospital, the department of child psychiatry at the Washington University School of Medicine, and the Social Science Institute of Washington University, which no longer exists. The study of women's attitudes toward problems of family life gradually broadened to include personality more generally and especially what I came to call ego development. How the study of ego development grew out of the study of mothers' attitudes I have recounted several times recently.

For many years I harbored the dream that someone would be favorably impressed by my research and by the recognition I had received outside St. Louis and therefore ask me to bring my research project to their department, or offer me a position, but that did not happen. Every position I obtained in St. Louis was obtained at my request, with the exception of my most recent one, as William Stuckenberg Professor of Human Values and Moral Development. It was other women who goaded me into asking that I be granted tenure at Washington University. Finally, in 1971, I

**"After World War II, men denied adequate opportunity first by the Depression, then by the demands of war, were scrambling to resume their careers. The pressure upon women to retire from competition and just be good housewives was immense."**

25 years after I arrived in St. Louis, I became professor of psychology, again on my initiative. I think I was the first woman full professor in the department, except for one woman who was for many years an associate professor and was promoted to full professor a year before she became emerita. I was not turned down for positions in the psychology department prior to that—I was never permitted to apply.

The atmosphere both in the department of psychology and in Washington University's administration is now different from the one that prevailed after World War II. At that time blacks were not even admitted to the University as students, much less as faculty. The post-war faculty and administration, under the leadership of Arthur Holly Compton as chancellor, began immediately to remedy that disgraceful situation. Women were never totally and conspicuously excluded from faculty, as blacks were, so it took longer for the subtle discrimination against them to be recognized.

At present I believe the commitment of Washington University to affirmative action is genuine and not just compliance with the law. How much of that change was brought about by change in the people at the top, how much by changing laws, and how much by civil rights and women's movements is hard to say.

If I seem to overemphasize the relation between discrimination against women and against blacks, let us not forget their ironic connection. Howard Smith, a representative from Virginia, wanted to make the Civil Rights Act of 1964 so ridiculous that it could not possibly be passed. To do so, he added sex to Title VII, Equal Employment Opportunity, which forbade discrimination on the basis of race, color, and national origin. Employees of educational institutions were exempt from the original act but were, I believe, included in an executive order a short while later. It was at that point that women began suing universities to rectify sex discrimination of long standing. The universities were threatened with cutoff of all their federal funds, which would have been fatal for some institutions and for an enormous number of projects in most others. They immediately began to look around for ways to be fairer to women.

Has it been a disadvantage to my career to be a woman? Yes. Some of the disadvantages are intrinsic to the twocareer family, and no laws can entirely change that. Partly I was just born too soon. I am grateful to the women's movement for making respectable many of my idiosyncrasies, which seemed for many years egocentric, selfish, or freakish. I may be all of those things, but much of the problem was simply that I would not give up my career as a psychologist.

Has it been an advantage? Yes, that too. Women bring to psychology experiences of half the species, experiences that men cannot totally share. Moreover, I was free to follow my own star early in my career, at a point when a man might have felt compelled to do what was popular or socially approved or what would gain support from colleagues. Life would have been easier if we had been wealthier, but it would have been much harder if my salary had been needed for survival.

To a large extent my circumstances are unique, just as everyone's are, and so generalizations fail. I had more inclination to work alone than some women do. Those with a talent for administration, for example, cannot exercise that talent in the splendid isolation that I endured. On the other hand, a highly efficient woman could have made much better use of her time than I have done, lacking the discipline of a regular job.

Being a woman has given me an advantage in a way that Else FrenkelBrunswik first called to my attention. I
have had the privilege of associating informally with some of the most distinguished scientists of our time by virtue not of my merits as a scientist but of being married to a well-known scientist. I am not in the least intimidated when the stimulus response behaviorists or the Skinnerians claim that they and they alone know what True Science is, because I know how far removed their approach to science is from that of eminent physicists, chemists, biologists, and mathematicians whose conversations I have been privileged to listen in on.

Returning to the theme of iconoclasm, no one has ever refuted in print my demonstration that there is no noncircular definition of test reliability, but that proof has not made me popular among psychometricians. (I have never quite got rid of the thought that if the same papers had been written by a man, they might have been taken more seriously.) By bad luck, I arrived with an interest in psychoanalysis at a university whose psychologists were mostly behaviorists and whose psychiatry department included some men who seemed determined to stamp out psychoanalysis. I never accepted some of the dogmas of psychoanalysis, such as the idea of cathexis or psychic energy, which did not make me particularly popular among local psychoanalysts either.

I have a great deal to thank the women's movement for, but I am not always popular with some members of that group, either. With regard to women's attempts to change the way we use language, I am of two minds. In the final revision of my book on ego development, undertaken at the behest of the editor, I found that eliminating sexist language was in most instances a boon. For example, in place of the trite word "man" I substituted variously "individual," "person," "human being," and so on, according to context. The meaning was clarified and the style was noticeably improved. But ideology and high principles are no excuse for bad writing. I am appalled at the barbarisms that some feminists, not always women, inject into their writing, such as "s/he" or "him/her." They can make a text almost unreadable.

I am deeply committed to the liberation of women, though not to everything done under that banner. I try always to keep women's issues in perspective. We are not the only oppressed group in this world; I hope I never forget the others. There are countries where, if a woman is seduced or even raped by a man, she is forever disgraced and cast out from society, even from her own family, while the man is unpunished. There are countries where little girls are taken from their beds in the middle of the night and brutally circumcised. I have no solutions to such problems, no suggestions for what we can do about them. But we should not forget that they are the real issues in the liberation of women. They cast a shadow over issues like the use of "he" as a generic pronoun and whether women are admitted to the Men's Bar and Grill.

Having begun my career in the shadow of "the little girls" I am ending it in the shadow of the "Star Wars" boycott. Many physicists, engineers, computer scientists, and other professional experts are refusing to accept grants, contracts, or employment related to the Strategic Defense Initiative (SDI or "Star Wars"), because they consider its aims impossible of achievement and its pursuit destructive of the best interests of the country. My interest as a psychologist lies in the moral dilemma posed for scientists seeing money flow easily to projects which they cannot approve of and simultaneously drying up for alternative research. Moral dilemmas are of course the core of contemporary research in moral development by Kohlberg and many others, and moral development is a part of or closely related to the field of ego development, where I have been working for many years.

What my students, Michiel Westenberg and Kathryn Henker, and I are working on is ways to tap people's thinking about such moral dilemmas of professional life by means of paper-and-pencil tests. There have been many times when I have thought, and more times when I have been aware that others were thinking, how can one justify working in psychology when the overriding and fateful things are taking place in physics and chemistry and biology? I do not apologize to my current subjects for my interest in the psychological aspects of nuclear war. For, as I explain to them, if nuclear war comes, it will have been made by people; if it is averted, it will have been averted by people. People, even scientists, are finally recognizing that not every problem has a high-tech fix. Psychology may assume new importance in the posttechnological age.

Jane Loewinger, William Stuckenberg, Professor of Human Values and Moral Development at Washington University, is an internationally recognized authority and pioneer in the field of ego development. Her most recent area of interest involves moral responses to living in the nuclear age.

This essay is excerpted from a collection, Models of Achievement: Reflections of Eminent Women in Psychology; Volume II, edited by Agnes N'Connell and Nancy Felipe Russo, to be published next year by Lawrence Erlbaum Associates, Hillsdale, New Jersey.
Testing the Limits of Transplants

by Mike Siesel — photos by Herb Weitman

The odds are Daniel Wagner won’t celebrate his first birthday. Six months old, he lies dying in St. Louis Children’s Hospital, the victim of a rare birth defect. Because one of his genes carries the wrong information, Daniel’s liver cannot manufacture an enzyme called ornithine transcarbamylase (OTC) that processes or breaks down ammonia molecules naturally produced by the body and carried in the blood. Unchecked, the ammonia builds up and acts as a slow but potent poison.

Daniel’s physician, Wayne Flye, a liver specialist and head of transplantation surgery at Washington University Medical Center, has coordinated the drug therapy used to moderate the excess ammonia; but gradually the treatment becomes less and less effective and Daniel’s condition — already critical — declines steadily as the hours pass. Early in the afternoon, Flye upgrades the boy to a Status Nine patient, indicating that Daniel has a life expectancy of 48 hours or less.

Close timing: Transplant operations require the smooth coordination of team members, all of whom must perform under strict time constraints. At left, Wayne Flye (third from left) directs a recovery operation while nurses prepare a vessel to hold the recovered organ.
This situation is not unusual. On any
given day in the U.S., there are 400
terminally ill patients whose one
remaining hope is a liver transplant; but
only one in five will receive the transplant
they need because of the scarcity of
donated organs. For children like Daniel,
the chances of finding a suitable organ
are even less likely—perhaps one in 10
or 20.

Physicians treating patients with liver
disease encounter a special problem.
Second only to the brain in complexity,
the liver performs hundreds of functions
for the body, producing, for example,
clotting factors that prevent uncontrolled
bleeding. No synthetic backup system
exists. A patient suffering kidney dys-
function can employ dialysis. A failed
heart can temporarily be replaced with a
mechanical pump. But without a func-
tioning liver, a patient is helpless and will
die in a matter of hours.

Advised of Daniel's new status, the
organ procurement team at Barnes
Hospital responds by notifying a nation-
wide network that matches donated
organs with recipients. Daniel already
appears in the listing, but a Status Nine
classification gives him priority over
others who are less critically ill. Though
this information will be communicated
to over 200 hospitals across the country,
each coordinator on the team begins
placing phone calls to key coordinators
in the various regions. Additional
medical data are punctuated with per-
sonal information about Daniel and his
family:

"We have a six-month-old boy suf-
ferring from a metabolic dysfunction of
the liver who was listed as Status Nine
this morning at 11 a.m. His name is Daniel
and he's the first-born child to parents in
their early 30s."

What the coordinators hope to over-
come through this dialogue is the natural
limitations of the computerized system.
By giving Daniel an identity they convey
to their colleagues a feeling of involve-
ment with the patient and a real sense of
urgency. Status Nine can mean 48 hours
to live or only a few minutes. The
computer doesn't say.

This appeal is but a part of the overall
strategy that has evolved since Wayne
Flye came to Washington University in
1985. In addition to selecting and training
a competent staff, he has consistently
worked to bring about a new level of
awareness in the community, and in the
Medical Center as well, regarding trans-
plantation. Too often the uninformed
public, and even uninvolved medical profes-
sionals, view transplantation surgery as experimental; but Flye's suc-
cess rate—70 to 85 percent depending,
primarily, on the age and health of the
patient—disputes this notion. Though
liver transplantation success rates
hovered around 50 percent at the turn
of the decade, new therapies involving
immuno-suppressants, or anti-rejection
drugs, have brought about dramatic
improvements in post-surgical care. What
has yet to follow, however, is a propor-
tionate increase in available organs.

W

ith his diplomas propped
against the wall on top of
the bookcase behind his desk and
his medical texts neatly placed on
the shelves below, Wayne Flye's inner office
seems at once orderly and unpreten-
tious. Open and accommodating, he
exhibits a youthful and contagious
enthusiasm as he talks about his work.
A soft accent in Flye's voice suggests the
rolling hills of North Carolina where he
grew up and went on to complete his
education at Duke University. One
quickly perceives from his convictions
and the research he pursues, that Flye
is a surgeon who would like, whenever
possible, to spare his patients from the
scalpel. Much of the laboratory work he
directs searches for a solution, an alterna-
tive to whole-organ replacement.

Because he holds a Ph.D. in immu-
o-logy and microbiology in addition to
his medical degrees, Flye possesses an
intimate knowledge of the immune
system as well as the liver. The advantage
that he enjoys over some of his surgical
colleagues is that while they are familiar
with surgical discipline, Flye is also well-
versed in the research approach to
examining the underlying patho-
physiology, or the causal agents and
effects of disease. But while Flye is
uniquely qualified in his own field, the
combination of research and clinical
expertise is not unusual at Washington
University Medical Center.

But what is becoming more and more
common each succeeding year is hos-
pitals and medical centers engaged in
transplantation surgery. Today, there are
over 100 medical facilities capable of
performing liver transplants, though only
six major centers like Washington Univer-
sity exist. The main reason for this
expanding popularity is the availability
of a drug called cyclosporine.

Prior to 1981, when cyclosporine was
introduced, the majority of transplant
patients died because their bodies
rejected the transplanted organs, but
medical scientists learned, after studying
the immune system's response, that the
culprits causing organ rejection were two
lymphocytes called B-cells and T-cells.
Organ rejection begins when the patient's
immuno-competent cells recognize the
foreignness of the donor tissue. Once
these foreign proteins are identified, the
recipient's immune system reacts by pro-
ducing B- and T-cells that, in turn, attack
the cells bearing the foreign markers but
consequently destroy other surrounding
tissue in the transplanted organ as well.

Though other drugs may be used to sup-
press the immune system, cyclosporine
has the advantage of selectively inhibiting
the production of B- and T-cells without
significantly reducing the immune
system's ability to ward off other infections.
"Cyclosporine has dramatically
improved the success rate in transplan-
tation," Flye says, "and a new generation
of drugs, like a murine monoclonal anti-
body called OKT3, promise specific
therapies for transplant patients suffering
rejection that cyclosporine is unable to
arrest."

But while scientists and surgeons
continue to improve the success rate in
transplantation, over 4,000 patients suf-
f ering from liver disease will die this year
because an organ wasn't available.
Opinion polls indicate that the majority
of Americans favor organ donation, yet
only one out of every 10 who die of
accidental injuries—and qualify as
donors—will actually become donors.
The disparity exists because most people
who favor organ donation do not inform
their spouse or next of kin. The tragedy
is that one donor can often benefit several
patients—in some cases, a dozen or more.

D

uring a call in the transplant
coordinators' office, the call
comes through. Shoving aside
her paperwork, Judy Dickens jots down
the information and transmits it to Flye.
A donor has become available in Tacoma,
Washington, who matches Daniel's
blood type. From the medical data, the
blood counts and enzyme levels, the
surgeon determines that the donor is
suitable and asks Dickens to make
arrangements for the trip to Tacoma.

Now the transplant team expands from
Flye's personal staff to include several
other departments in the hospital. The
pharmacy prepares a special potassium-
based preservative solution that will be
used during the donor-liver recovery; the
blood bank and clinical laboratories
arrange for special equipment to be in
the Operating Room at Barnes Hospital
so the necessary blood transfusions
can be given and emergency laboratory
tests performed while Daniel undergoes surgery; and the security office schedules an ambulance to transport the recovery team to the airport.

Flye’s own staff divides into donor-recovery and recipient-transplant teams. Because he must orchestrate the entire effort, Flye, assisted by Dickens, will recover the donated organ and surgeon Douglas Hanto, assisted by coordinator Stephanie Salsich, will begin the transplant operation. Salsich and Dickens work together, scheduling the operations and maintaining contact with both the hospital in Tacoma and Bob Thomas, president of Aero Charter at St. Louis-Lambert International Airport.

The distance between St. Louis and Tacoma—almost 2,000 miles—stretches the flying range of Thomas’ aircraft to the limit. The FAA controller at Lambert calculates the total air miles while Thomas hedges airspeed against fuel efficiency. Together they confirm that Thomas’ Sabreliner—if all goes well—can make the return trip without a refueling stop.

But the one factor that cannot be calculated or controlled is the weather. On this blustery November day, it’s snowing from Canada south to Kansas City, and the storm front is encroaching on both the St. Louis and Tacoma areas. Thomas calls Seattle for additional weather reports and passes them along to the coordinators at Barnes.

Because of the long distance, the time consumed transporting the recovered organ is more crucial to the success of the operation. Unlike a kidney which may be preserved for several days, a liver begins to deteriorate after six hours.

Beyond this time the chances the transplanted liver will fail to function properly increase exponentially. Yet, without a new liver, Daniel has no chance at all.

After considering all the factors involved, Flye informs Dickens that the recovery team will leave in the early morning hours—good weather or not.

The fourth floor of the Clinical Sciences Building is a maze of hallways and laboratories and deep within, on the south side of the building, Sam Yu, a research associate in surgery, sits in his office reviewing the results of some experiments he’s conducted for Wayne Flye. Possessing both patience and a quick sense of humor, Yu discusses the ongoing work that’s being done on organ preservation.

“Preserving the liver,” he explains, “begins with cooling, which slows the metabolic rate. Then we flush out the blood with a potassium-based solution to prevent clotting and keep the individual cells from swelling. All of this decreases injury to the organ.”

But when the blood supply is reestablished, two problems occur. Immuno-competent cells remaining in the donor liver trigger a rejection response, and a free radical called super-oxide forms in the blood. So the transplanted liver, just when it’s most vulnerable, is besieged not only by a swarm of attacking lymphocytes but by a corrosive chemical as well.

"Here in the lab," Yu continues, “we’re looking at ways to get rid of the immuno-competent cells, or lymphocytes, in the donor liver. Many of the lymphocytes are flushed out with the blood, but any that remain can trigger the rejection response. Of course, we can control the rejection by suppressing the immune system—the production of B- and T-cells—with cyclosporine, but it would be better if we could reduce, or eliminate the response altogether.”

The liver might be compared to a sponge, or more accurately a collection of porous tubes that allow the blood to percolate through the organ. Most of the immuno-competent cells collect along these tubular walls, protecting the organ from intruders, and are easily flushed out with the blood during harvest. But some immuno-competent cells are located within the structural tissue—the parenchymal cells—and are not so easily dislodged. The only way to get rid of these immuno-competent cells is to kill them by using a drug that can be injected into the donor prior to recovery, or mixed into the preservative solution, or added to the recipient’s medication. Two questions Yu and Flye would like to answer are how to eliminate the undesirable cells without affecting other liver cells and which of the three methods of delivering the medication—to the donor, in the preservative solution, or in the recipient’s medication—is most efficacious.

“In the laboratory,” Yu says, “we use an enzyme called dismutase to stop free radicals from forming superoxide. The dismutase interrupts the process by causing the oxygen molecules to combine with hydrogen and form water, which is not harmful to the body.”
Before Flye can apply this type of therapy in the clinic, additional work remains. Though dismutase stops superoxide production in laboratory animals, the human enzyme system may be different.

At the hospital in Tacoma, the staff prepares for the recovery team’s arrival. An elevator is held in reserve and security guards are posted at the Emergency Room doors to expedite the team’s passage. A nurse acts as a guide and escorts the team to the OR where the attending physician and the OR staff are making the final preparations for the recovery.

Flye knows that the people here have worked long hours trying unsuccessfully to save the child lying on the operating table.

His comments are brief, but Flye’s concern is apparent. As their attention is focused on the boy in St. Louis, spirits lift, and the resident staff wants to know more about Daniel and what his chances are if the operation is successful.

“Please ask the parents if they’d like to speak with one of us before we start,” Flye says to the resident coordinator. The answer is an appreciative “yes.” Dickens visits briefly with the couple, expresses gratitude for their gift, tells them a little about Daniel, then discreetly departs. The recovery begins.

The diminutive size of an infant’s liver complicates matters for Flye. Everyday it in miniature, the veins, arteries, and bile duct measure, at best, only a few millimeters in diameter. A spider’s web of tissue secures the organ and must be carefully cut away. After the liver is freed from its purchase, the team readies for the rapid removal of the organ.

A cold solution is flushed into the organ and ice is packed around it. When the temperature is low enough, Flye clamps the aorta and releases a valve attached to a cannula inserted below the liver allowing the ice-cold preservative solution to perfuse and further cool the liver, and the resident staff wants to know OR staff are making the final preparations for the recovery.

If the operation is successful.

Carefully cut away. After the liver is freed from its purchase, the team readies for the rapid removal of the organ.

Cross-clamp time—3:25,” a scrub nurse announces; and in the minds of the recovery team, an imaginary clock begins to tick.

They are in ice-time now— the period of time in which the organ is preserved — and the pace quickens. After carefully inspecting the recovered organ, Flye places the liver in a plastic bag and a nurse pours preservative solution down one side until the organ is covered. This bag is placed inside another and both bags are securely tied with umbilical tape; the whole package is nestled in a cooler filled with ice.

While the team’s equipment and surgical instruments are packed, Dickens calls St. Louis and indicates when Daniel should be taken to the Barnes OR, then alerts Taylor and Edwards, who are waiting at the Tacoma airport, that the recovery has been completed.

While liver transportation surgery presents a most formidable challenge for the surgeon, for the research scientist the liver offers a unique opportunity because the organ is capable of regenerating. If a portion of the liver is surgically removed, the organ begins producing a protein that causes rapid cell division until the removed portion is regrown. Then, as mysteriously as it appeared, protein production ceases. Though it has yet to be determined how the liver triggers the production of this Promethean protein, Flye believes that the response closely interacts with the immune system.

“What we’ve found so far,” Flye says, “is that the immune system is affected by regeneration and, perhaps in turn, the immune system provides a signal which influences the liver.”

At the same time the liver begins manufacturing the protein and regenerating, the spleen — which is home base for most of the body’s lymphocytes, or antibodies — enlarges as the number of lymphocytes in the organ increases. After the liver regrows and stops, the spleen remains enlarged for a period of time, then returns to its normal size. Though this compensation by the spleen suggests some type of interaction, no one understands why it occurs. While the regeneration protein induces liver cells to multiply rapidly — and, in fact, causes the cells to begin manufacturing large quantities of the protein — the lymphocyte cells do not multiply, in vitro, in the presence of the protein. So the regeneration doesn’t affect the individual lymphocyte cell, but does cause more lymphocytes to collect in the spleen.

“The regenerative protein seems to be regulated by a feedback system capable of inducing or restricting protein production, and the spleen apparently plays a role in this process,” Flye explains. “We’re pursuing this research because if we can understand the mechanisms involved, we may improve our ability to regulate the immune system, and possibly support regeneration in the acutely or chronically injured liver.”

Flye explains, “Children like Daniel might be spared the ordeal of an organ transplant if healthy liver cells, or cells containing DNA with the proper instructions, could be implanted into the defective liver. These healthy cells, of course, lack the deficiency and begin manufacturing the absent enzyme — in Daniel’s case, OTC. In this way the synthetic system of the liver becomes functional without a major operation.”

Using a process called enzyme digestion, Flye suspends donor-liver cells in a liquid solution and eliminates most of...
the immuno-competent cells, or antibodies, that trigger a rejection response from the recipient's immune system. The healthy cells that remain can then be transplanted, or injected, into the recipient using a hypodermic syringe and rejection controlled with immunosuppressants like cyclosporine.

Though this type of transplantation greatly reduces the risks encountered by the patient, Flye looks forward to the day when cells can be removed from the defective liver and they can be reprogrammed by inserting DNA with the correct instructions. By programming the patient's own cells to produce the deficient enzyme, the rejection response is circumvented.

Near their final approach, escaping Nebraska and crossing the Missouri River, Taylor radios the controller at Lambert Field and requests immediate clearance. Planes on the ground are detained; others stalled in their approach; a TWA carrier is diverted from landing and sent into a holding pattern. After receiving clearance to land, Taylor plunges the Sabreliner through the clouds, levels off, and aligns the plane with the landing beams, and the little jet glides onto the runway. Ice-time: four hours, 14 minutes.

Twenty-five minutes later, in the Barnes OR, a nurse snips the umbilical tape sealing the bag and the donor liver is lifted into the light and inspected for damage. Flye removes Daniel's defective liver and sets the transplant into position. After bringing together the severed ends of the vena cava and the portal vein, the blood flow is reestablished to the tiny organ and it immediately turns pink.

The operation will last another five hours as other veins, an artery, and the bile duct are reconnected.

The infant is monitored through the night and all seems well until, a few days later, a rejection response mounts and becomes unmanageable. The boy is again listed as Status Nine, but this time a replacement liver cannot be found.

There's nothing anyone can do—an infant's system, durable as it is, cannot survive the onslaught of continued rejection and deteriorating liver function.

Early in the afternoon, Daniel's immune system registers a small victory—the first indication he will overcome the rejection response and survive, to become the first child successfully treated for OTC deficiency through organ transplantation.

Daniel's victory is a comfort to Wayne Flye, but he knows the odds against which other children like Daniel, and other patients whose only recourse is transplantation surgery, must struggle. Flye would like to help save children such as Daniel without having to resort to the extreme measures of organ transplantation.

And so, his purpose reaffirmed, the scholar returns to his books, the surgeon to his clinic, and the scientist to his lab.

Mike Siesel is an agronomist and St. Louis-based freelance writer who specializes in science and biotechnology.
York artists are never Hoosiers, although America, especially in the '30s and '40s, New York twice—although only for about half a year on each occasion. In the art world it is only this last City which, if my status as a provincial. New

The state's largest city, prevents me from having spent most of my life in the provinces. These have even included a few that are more out of the way than Los Angeles, Paris, Rome, or my present venue, St. Louis; three years in Portland, Oregon, in the 1950s, and then 22 years divided between Bloomington, Indiana, and Polgeto, Italy, a tiny Umbrian village in the foothills of the Apennine Mountains.

It's not that living in these places prevents one from being aware of the looks that are current or were recently current in New York. Several times I have been astonished by how quickly undergraduates at hip provincial art schools can start making SoHo-looking art without ever having been to Manhattan. No, it's probably not ignorance of trends that may have protected the idiosyncratic character of the work of some of us who have developed in the outlands; but it may very well have been the lack of constant reinforcement of those drifts—ubiquitous in casual studio conversation as much as in gallery and museum exhibitions—that has allowed some of us to locate aesthetic pressure points with more indifference to those identified by the New York visual arts establishment.

New York City can be a wonderfully hospitable place for an artist. Because it has more artists than any other place in the country it has more good ones as well as more mediocre and bad ones. This sheer quantity also encourages artists to cluster in stylistically compatible groups. The city is bristling with the energy not only of mainstream obsessions but also of tributaries and eddies which have the potential to become cultural currents.

Over the years, I have seen friends, professional acquaintances, and former students attach themselves to discrete communities for ideological artistic nourishment. But these communities remain as unaffected by each other as the total community of artists in Seattle, let's say, is by that in Detroit. New York is large enough to allow groupings to develop into considerable size on the basis of stylistic rather than geographic proximity.

This phenomenon may often have had a benign effect in terms of positive reinforcement and support for the position of its adherents, but these artist/audience circles can be very sensitive to heresy and can foster an attitudinal orthodoxy which is most often a compromise between the ideas of the few dominant practitioners within the "family."

Unlike a young artist nurtured in New York, a young artist nurtured in New Orleans or Milwaukee is unlikely to benefit from the mutually reinforcing energy generated by a self-identified, stylistically compatible group—but neither will he or she risk being battered into conformity with its conventions.

I guess I am suggesting that we outlying artists have the best and the worst of it. Because the spectrum of directions from which we may draw sympathetic nourishment is so much narrower than that of our New York colleagues—if we can evade the seductions of current fashions—we may have a greater chance of throwing ourselves open to the whole of the body of world art from all times and places. I take it as a given that all important art is informed by a tradition and that, for any individual artist, the broader that tradition is, the greater the chance for an independent vision. For us visual artists who live in provincial places, there are two problems: seeing the work made by our peers who live in other places, and having our work seen by them.

It has been observed that every work of art is a criticism of the others in the aura of whose awareness it is made. So, even if our paintings can criticize, they also need to be subject to criticism before we can count ourselves participants in the larger dialogue that is contemporary art. We want not just to listen to that dialogue, but to speak in it. That means showing in New York, which is hard enough for artists living there but much more so for those who aren't.

James McGarrell is professor of art in painting at Washington University. This article has been excerpted from an essay that appeared originally in the Chicago-based New Art Examiner.
Seeing clearly: "I take it as a given," insists Professor of Art James McCarl, shown above in his studio, "that all important art is informed by a tradition and that, for any individual artist, the broader that tradition is, the greater the chance for an independent vision."
Love of light: Commercial illustrator Walt Spitzmiller, B.F.A. '69, created this painting for Charles Shipman Payson, a Long Island business magnate, art lover, and former owner of the New York Mets, at Payson’s training grounds for thoroughbreds near Palm Beach, Florida.

“I wanted to capture that early morning Florida light,” says Spitzmiller (whose work is featured in an article beginning on page 14). “There's no other light quite like it.”

The painting, which has never been published, hung, until Payson’s death, in his Stanford White-designed mansion at Sands Point — where The Great Gatsby reportedly was written — along with six other Spitzmiller’s and the world’s largest private collection of Winslow Homers.