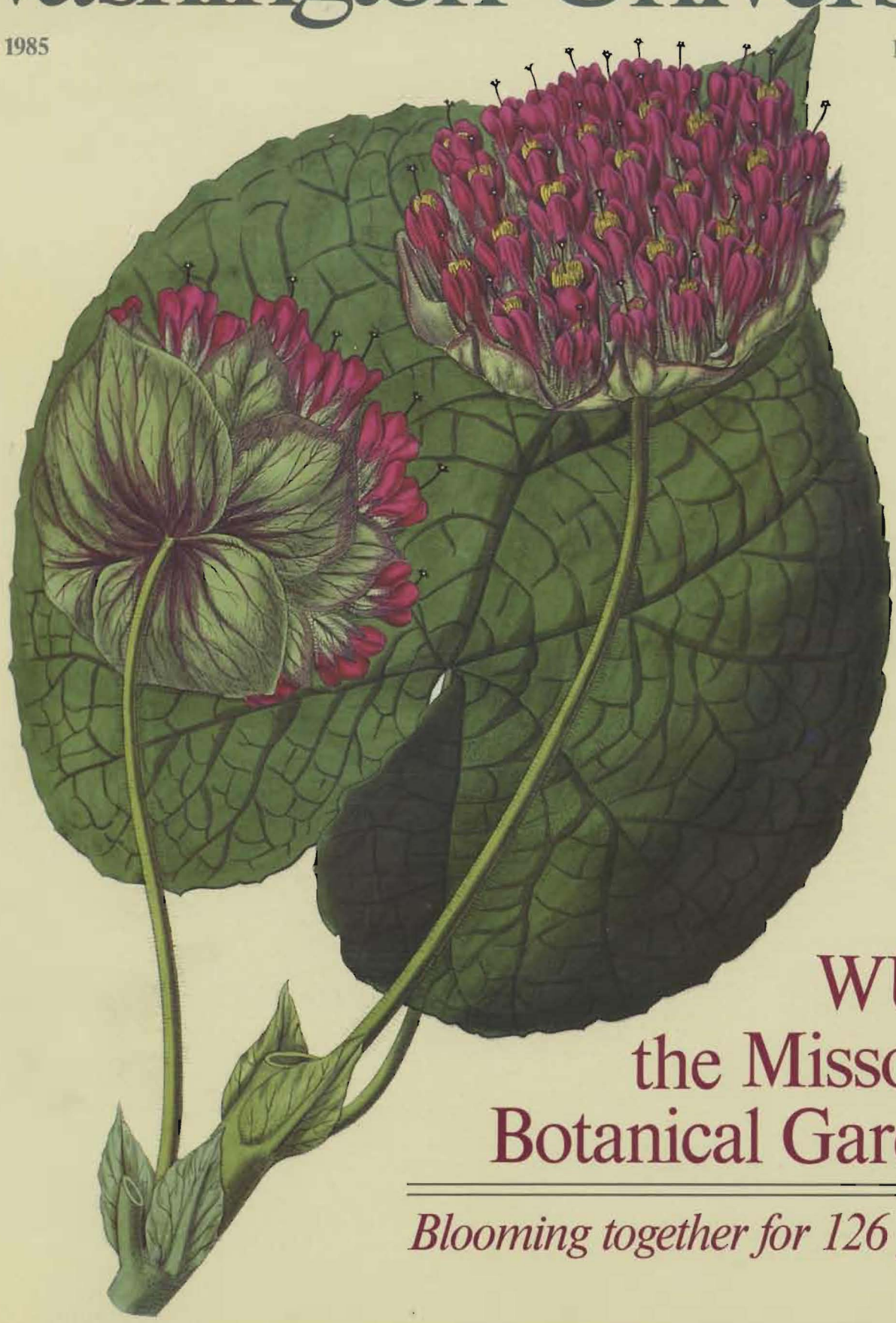
WASHINGTON UNIVERSITY IN ST. LOUIS

Washington University

Winter 1985

Magazine



WU & the Missouri Botanical Garden

Blooming together for 126 years.

Cooperation Makes It Happen

We hear a lot about the natural competitiveness of human beings, our inborn territorial and aggressive drives. Relatively little is made of an instinct that is equally inborn, equally natural, and, without a doubt, far more important in distinguishing us from the rest of the animal kingdom—namely our instinct for cooperation.

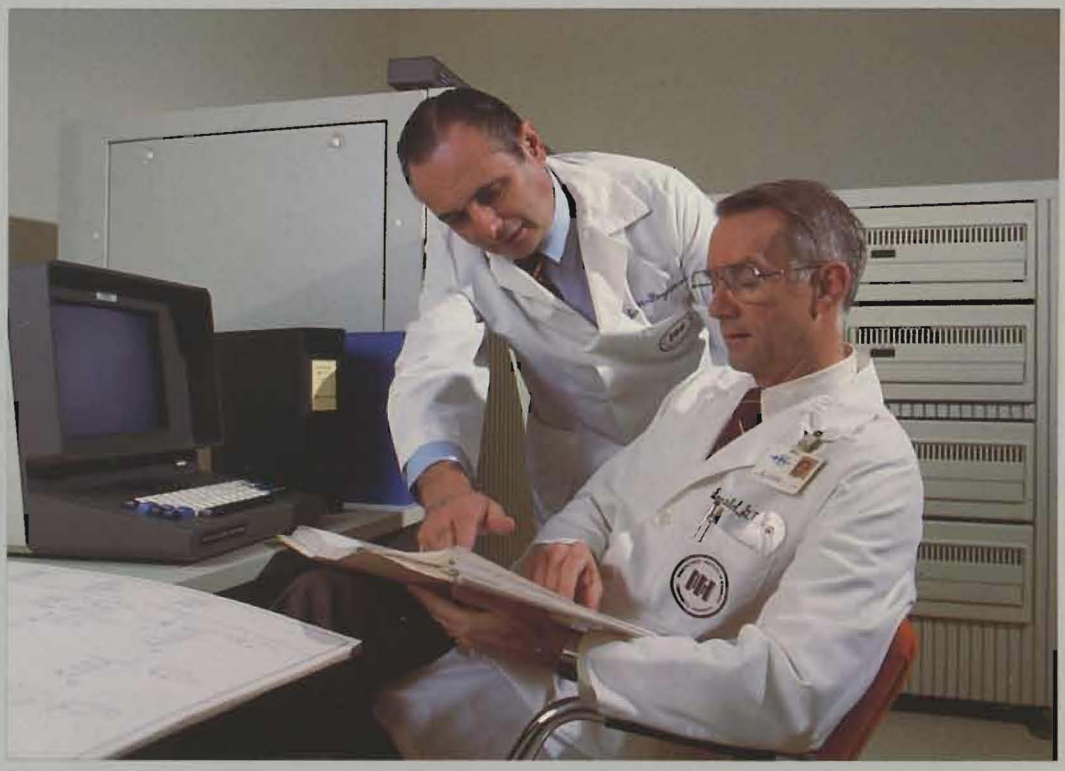
Civilization is more than a veneer over a substrate of passion and brutality; it is an inevitable consequence of our very human need to define relationships, set goals, apportion tasks, share resources, and govern ourselves according to commonly held standards of justice. Levels of technology may vary, but in every human community the cooperative instinct can be seen at work. We may not notice it at first because we take it so much for granted. And that in itself is a measure of its pervasiveness.

Cooperation is the dominant note of most of the articles in this issue of the *Washington University Magazine*. First, there is our cover story. The Missouri Botanical Garden and Washington University have been cooperating for most of the former's 125 years, and the results have been infinitely enriching to both institutions. Writer Joe Schuster shows how WU botanists, working in conjunction with the Garden, are gleaning precious knowledge from the world's rapidly vanishing tropical forests.

The new Clinical Sciences Research Building is a facility dedicated to cooperation—between different medical departments; between physicians and researchers in other disciplines like chemistry, biology, and computer science; between basic research and its clinical applications.

Finally, no major art exhibit would be possible without cooperation of a very high order, and the current retrospective at the University Gallery of the works of Jean Dubuffet is no exception. Valuable, irreplaceable, fragile pieces must travel long distances exposed to numerous hazards. Only through cooperation and trust can such an enterprise be carried out. But the end result is worth it, as we hope our feature on Dubuffet by Joseph Ketner and Sue Taylor will demonstrate.

And so, to alumni, friends, and fellow humans everywhere, we say: may the blessings of cooperation be yours throughout the coming year. Enjoy.



Michel M. Ter-Pogossian, Ph.D., professor of radiation science, and Ronald G. Evens, M.D., head of radiology, in the newly completed Clinical Sciences Research Building.

Washington University

Winter 1985 Vol. 55 No. 1 **Magazine**

On the cover:
An illustration from one of the Missouri Botanical Garden Library's many rare volumes.

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Washington University (ISSN 0162-7570) is published quarterly by Washington University, Lindell at Skinker, St. Louis, MO 63130. Second-class postage paid at St. Louis, Missouri.
Address changes: Send address changes and corrections to: Development Services, Campus Box 1082, Washington University, St. Louis, MO 63130.
Correspondence: Send letters to: Magazine Editor, Office of Publications, Campus Box 1070, Washington University, St. Louis, MO 63130.

Photos
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Michael Haynes: *page 3 & inside back cover*

OPENERS

Researchers Win Javits Awards

Two Washington University faculty members will receive more than $2 million in research funds over the next seven years, thanks to the Javits Neuroscience Investigator Awards.

The recipients are Paul J. De Weer, M.D., Ph.D., professor of physiology and biophysics, at the School of Medicine; and Charles E. Molnar, Sc.D., professor of physiology and biophysics and biomedical engineering at the medical school, and professor and director of the Computer Systems Laboratory.

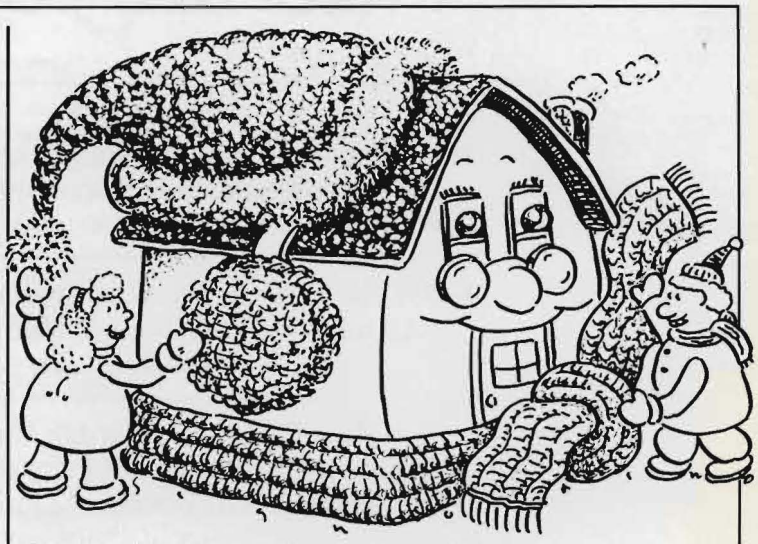
To date, Washington University faculty members have received six of the 86 Javits Awards presented since the highly competitive awards program began in October 1983. Award recipients are selected three times a year. In February, the first list of recipients included Gerald D. Fischbach, M.D., professor and head of anatomy and neurobiology; Dale Purves, M.D., Ph.D., professor of physiology and biophysics; and Barbara Bohne, Ph.D., associate professor of otolaryngology. Nobuo Suga, Ph.D., professor of biology, received a Javits Award in June.

The U.S. Congress gives the awards in honor of Sen. Jacob K. Javits of New York, on recommendation of the National Advisory Neurological and Communicative Disorders and Stroke Council of the National Institute of Health. Javits suffers from amyotrophic lateral sclerosis (ALS), more commonly known as Lou Gehrig's disease, after the famed New York Yankee first baseman whose record-setting achievement of playing in 2,130 consecutive games earned him the nickname, the "Iron Horse." ALS is a degenerative neuromuscular disorder that attacks the nerve cells that control muscles.

The awards, given to investigators who have submitted regular research grant applications for competitive review, encourage research and research training in communicative and neurological disorders.

De Weer uses squid as an experimental model to study the electrical and chemical nature of nerve cell excitation. His research concerns the sodium-potassium pump. Sodium and potassium flow across the cell membrane, forming the basis of a nerve cell's electrical impulses. Sodium-potassium pump dysfunction is implicated in a wide variety of human diseases, including heart disease, neuro-musculoskeletal diseases and neurological disorders.

Molnar has been investigating the auditory system for more than 20 years. His current emphasis is on the cochlea, or inner ear, where sound is converted into neural impulses. This research could lead to better understanding of auditory dysfunction and the design of more effective hearing aids.



Insulation for the Needy

"I didn't think we were going to pull it off—there was so much work to be done, so many contacts to make. But I think the general feeling of the group is the same—it worked, and we're glad we did it."

The speaker is a member of People Organized for Community Action (POCA), a volunteer outreach group consisting of 15 undergraduate members organized through the Campus YMCA-YWCA. This past November the group helped to weatherize 59 homes of elderly and disabled St. Louis residents.

POCA recruited an additional 72 student volunteers who carried out the temporary weatherization after undergoing a training program offered by Energy Efficient Technologies, Inc., a non-profit, St. Louis-based group.

The students selected the homes from a list of 290 addresses of people below the poverty level who had requested assistance from the Human Development Corporation of St. Louis. HDC also supplied weather stripping, duct tape, roll caulking, and plastic sheeting for the project. Dierberg's Markets kept the volunteers supplied with free lunches.

"The neighbors at the sites kept calling to the teams, asking them to come over and do their houses," says Sheri Dougan, staff adviser of POCA. "In some cases, there was nowhere to even tape plastic to the windows. The plaster fell off in our hands. It was so sad sometimes. But the houses were noticeably warmer. The people really appreciated it."

In response to POCA's project, the Human Development Corporation has had numerous requests for assistance with temporary weatherization. As a result, HDC, which normally concentrates its efforts on permanent weatherization, now has materials available for low-income families in need of supplies. "Before POCA's project, there was no rationalization for such purchases by HDC," said Dougan. "Now there is a demand."

OPENERS

Voting and Gender

"We made history," Walter Mondale said after picking Geraldine Ferraro as his running mate. Certainly the selection of the first female vice presidential candidate by a major political party is an historical event, but now that the Mondale-Ferraro ticket has lost, many people are wondering what the historical lesson of Ferraro's candidacy has been. Did the Democrats lose partly because the country was not ready for a female candidate on the national level? Did people vote against Ferraro because she was a woman? A study by a Washington University sociologist sug-

US voters: ready but not willing.

gests that the answer to these questions is no.

John F. Zipp, assistant professor of sociology and a specialist in electoral behavior, and graduate student Eric Plutzer are the first to analyze gender differences in voting for female candidates.

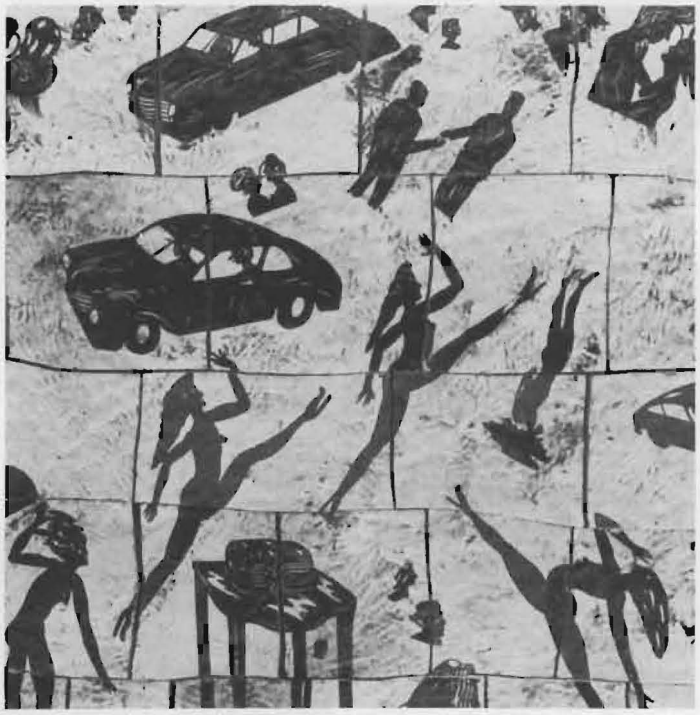
Their findings, based on analyses of five 1982 gubernatorial and U.S. senatorial elections, indicate that voters seem to ignore the sex of a candidate and vote on the basis of more politically relevant factors—party identification, issues, and candidate evaluations.

The only voters who tend to be influenced by the sex of a female candidate are independent females when the candidate supports issues important to women, the study says. The results will be published this spring in *The Public Opinion Quarterly.*

The five candidates in the study were: Millicent Fenwick, Republican candidate for U.S. Senate from New Jersey; Harriet Woods, Democratic candidate for U.S. Senate from Missouri; Roxanne Conlin, Democratic candidate for governor of Iowa; Madeline Kunin, Democratic candidate for governor of Vermont; and Florence Sullivan, Republican candidate for U.S. Senate from New York.

The study shows that generally neither the sex of the candidates nor that of the voters influenced the outcome of these elections, although all five candidates lost for reasons unrelated to their gender.

Zipp explains: "We found that strong candidates can gain votes from both men and women, weak candidates can lose votes from both, and a strong candidate who is pitted against equally strong opposition can win some and lose some. In other words, voters treat female candidates as they treat male candidates," he says.



A section of Patrick Siler's wall mural "Pastoral #1" from "Architectural Ceramics: Eight Concepts."

Ceramics Conference

"The stage is set for the rebirth of architectural ceramics," says Mark Lyman, a lecturer in ceramics in the WU School of Fine Arts. Lyman is the chairperson of the 19th annual conference of the National Council on Education for the Ceramic Arts (NCECA) to be held April 3-6, 1985, at the Chase-Park Plaza Hotel in St. Louis. The School of Fine Arts will host the conference.

The conference, which is expected to draw participants from around the world, is titled "Ceramic Arts and Architecture: Past, Present and Future."

According to Lyman, "St. Louis is an appropriate host city for this conference because of the incredible mix of ceramic art and architecture here. Louis Sullivan's Wainwright Building is an outstanding example."

There will be two exhibits at the School of Fine Arts coinciding with the conference. At the Gallery of Art in Steinberg Hall, "Architectural Ceramics: Eight Concepts" will run from March 24 to April 28. It will include a number of "environments" constructed chiefly with ceramics.

At Bixby Gallery in Bixby Hall, an NCECA midwest invitational student clay and glass show will run from March 17 to April 6.

The St. Louis Art Museum, Craft Alliance, Laumeier Sculpture Park, and the Missouri Botanical Gardens also plan to hold ceramic exhibits during the conference.

Setting Mark to Music

This year is the 150th anniversary of the birth of Mark Twain, and Hannibal, Missouri, Twain's boyhood home, is going all out to commemorate the event.

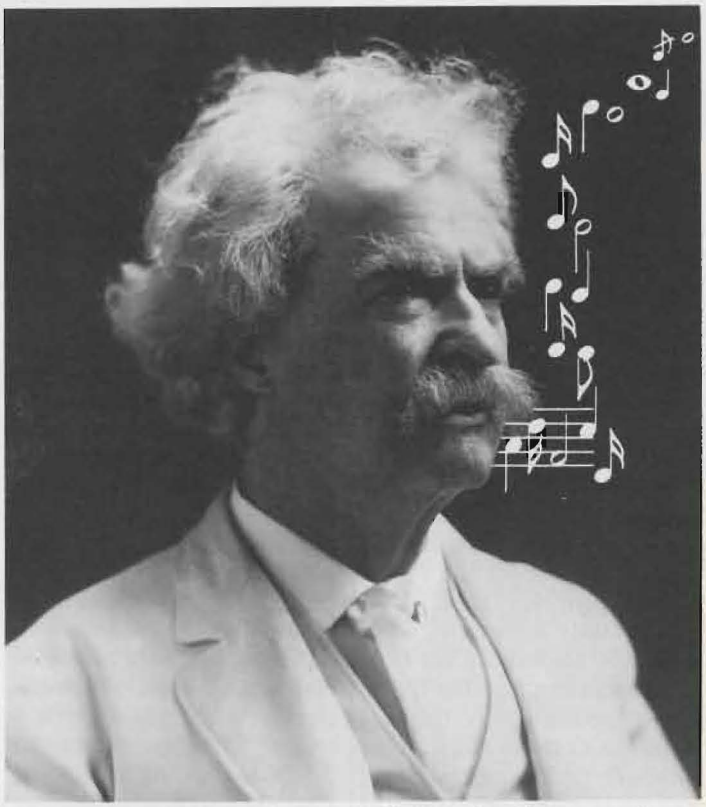
From May to November the small river city will be transformed into a Mecca of festivity, where steamboats and storytellers, musicians and movie stars, fireworks and frogs will contribute to the birthday fanfare for this great American writer. And Washington University is going to be right in the thick of things, staging a theatrical presentation that will be one of the centerpieces of the festival, a new musical comedy by Broadway veteran Joshua Logan.

Logan, who won a Pulitzer Prize for his work with Oscar Hammerstein II on "South Pacific" and has been associated both as a writer and director with literally dozens of successful plays and movies, wrote the book and lyrics for "Huck and Jim." The music is by Bruce Pomahac, noted for his orchestration of such Broadway hits as "I Remember Mama" and "Fly With Me." The choreography is by George Faison, best known for his spectacular dance sequences in "The Wiz."

How did WU get involved with this legion of luminaries? The Sesquicentennial Commission wanted to hand the production of the play to a local university whose facilities and talent could most successfully incubate the new production. WU attracted the attention of the Commission as a result of the Playwright's Workshop Summer Program directed by Joe Roach. Roach accepted the project and turned it over to the Performing Arts Area's artist-in-residence David M. Kruger.

"The housing of the show here, the use of the facilities will give the students the opportunity to work on a more professional level than is normally possible," said Kruger. After closing in Hannibal, the play will come to Edison Theatre for a one month run. It will then move on to Chicago and New York.

But in the meantime, the Sesquicentennial Festival will be offering plenty of other activities. In addition to weekly fireworks and numerous music festivals, Hannibal will be the destination point of the Smithsonian's traveling Mark Twain exhibit, the historical first-time docking place of both the "Delta Queen" and the "Mississippi Queen" steamboats, and the lift-off point of a nine day hot air balloon championship. On November 30, the date of Mark Twain's birthday, Hal Holbrook will present his nationally known tribute to the man of honor in "Mark Twain Tonight."



In addition, there will be a ragtime dance performance directed by WU dance professor Annelise Mertz, a minstrel show, and a one-act opera based on Twain's short story, "The Celebrated Jumping Frog of Calaveras County."

Infrared System Helps Hearing Impaired

"Heard melodies are sweet, but those unheard/Are sweeter," wrote John Keats.

But not if you've just popped for concert tickets and can't make out the sound of the woodwinds.

A hearing disorder can be a drag to any music lover, but from now on hearing disabled concert-goers will have less of a problem when they listen to music at Edison Theater in the Mallinckrodt Center, thanks to an Infrared Listening System that has been installed there.

The system, which was made possible by the Irving and Bea Goldman Charitable Annuity Fund, will allow individuals seated anywhere in the theater to hear performances with increased intelligibility and amplification through a wireless, lightweight headset that can be worn with or without a hearing aid. The system is 100 percent effective for persons with up to a 75 percent hearing loss.

The system works through infrared emitters that are placed throughout the theatre. These devices broadcast invisible infrared light which is picked up by the "magic eye" on the headset and converted back into sound. It was designed and developed by Richard Fitzgerald of Sound Associates Inc. in New York City.

OPENERS

WU basketball coach Mark Edwards (left) looks on as members of his team proudly display their trophy after winning the Lopata title. Players are (from left): Joe Mayberger, Kevin Suiter, Darren Hacker, Tom Weeks, Brent Rueter, Fred Amos (named most valuable player of the tournament), and Joe Polizzi. Amos and Suiter were both named to the Lopata Classic all-tournament team.

WU Wins "Brain Bowl"

The "Brain Bowl" is what Channel 2's sportscaster Zip Rzeppa called it, and the Los Angeles *Times* snickered that "Each player in the tournament has an IQ large enough for the average family of four," but in spite of its atypical emphasis on academic achievement the first Lopata Basketball Classic was a resounding success. And best of all, we won.

The four-team double-elimination tournament, held November 30 and December 1 in the newly constructed WU gymnasium, promises to be the start of a trend in college athletics. The tournament, which brought together John Hopkins, Massachusetts Institute of Technology, California Institute of Technology, and WU—all teams from schools with high academic standings—was an exciting two-day sporting event. The Bears clinched their victory on December 1 with a 72-64 victory over the Johns Hopkins University Bluejays.

"It was a great weekend for WU," said Mark Edwards, WU basketball coach. "Playing in the Fieldhouse and having the tremendous crowd support was terrific. Winning the tournament was an extra for us and we couldn't have been more pleased with the start of this new era of basketball at WU."

More than 3,300 spectators attended the Lopata Classic. The event is made possible by a gift from Stanley Lopata, a WU alumnus and trustee.

"All three teams thoroughly enjoyed the tournament and each has expressed a desire to return." said Chuck Gordon, WU associate athletic director and tournament director.

"Our goal was to develop an event for the players and students and I think we can successfully say we reached that goal."

The Graying of America

It is projected that by the year 2020, 45 million people in the country will be 65 and older.

As the number of elderly persons in the United States increases, a new professional role—geriatric social worker—is emerging to care for this population. A social work professor at Washington University has received an Administration on Aging grant to establish a model for training students for this new role.

Joel Leon, an assistant professor at the George Warren Brown School of Social Work, has been awarded the grant to establish a curriculum and to teach social work students to focus on improving self-care and home maintenance for the elderly. The program is the first of its kind in the country and is expected to serve as a model for the development of similar programs nationwide.

With life expectancy increasing, more problems arise for the elderly—coping with retirement, adjusting to nursing home life, dealing with physical problems. Poor elderly can turn to public agencies for help, Leon points out, but middle-income elderly don't qualify for those services and are left to fend for themselves.

Moreover, as more women enter the work force, and more families relocate, a gap in care for the elderly develops. Older parents no longer can depend on their children for immediate support.

Dr. Leon's goal is to help produce the first geriatric social workers with the skills and knowledge to help the growing number of elderly deal with their problems.

Inside the CLINICAL SCIENCES RESEARCH BUILDING

It's a researcher's dream—10 stories of lab space. The tenants are moving in, and it's time to get acquainted.

From the artificial heart to the Heimlich maneuver, from the Salk vaccine to amniocentesis, the great majority of modern medical procedures have been developed through controlled laboratory research. To keep medical science moving forward, to maintain the hope that someday the diseases and afflictions that trouble the human race will finally be eliminated, the medical profession must give research a high priority. It was with these goals in mind that the Washington University School of Medicine committed itself to the building of the Clinical Sciences Research Building, which, at $55 million, is the largest construction project ever undertaken by the University.

The School of Medicine's involvement in front-line research is nothing new. As early as 1910, Ralph Mills and Russell Carman developed some of the earliest medical applications of what was then a brand new technological breakthrough—X-rays. Since those years, the most talented medical researchers have continued to be attracted to the WU School of Medicine. Fourteen Nobel Prize winners in medicine have either been educated at the medical school or have served on its faculty; this figure represents no less than 18 percent of all the Nobel Prizes in medicine that have ever been awarded. (See William H. Danforth's memorial address for Nobel laureate Carl F. Cori, page 30.)

Today, WU School of Medicine ranks fourth in the nation in the number of National Institute of Health peer review grants awarded to medical researchers. Another indication of the school's involvement with research is the fact that 116 members of the faculty hold editorial positions on 194 major scientific journals; moreover, 15 of these journals are edited on the WU medical campus.

One reason for the medical school's success as a research institution has been the interdisciplinary orientation of

The second floor lobby area of the Clinical Sciences Research Building—glass, steel, and sunlight; a meeting place for minds.

the faculty and the extensive collaboration which exists across disciplinary boundaries of research and especially the cooperative work of clinical researchers and basic scientists.

This cooperation between astute and curious minds eager to multiply the applications of their findings has allowed the School of Medicine's research effort to grow and flourish in the manner of a living organism. But like any healthy, growing organism, research efforts at the medical school eventually confronted an inevitable problem—shortage of space. This is the problem that the new Clinical Sciences Research Building with its 10 stories containing approximately 375,000 gross square feet is expected to solve.

Designed by the prestigious architectural firm of Hellmuth, Obata and Kassabaum, Inc., the new building is an elegant solution to a puzzling problem. The land available for the project consisted of two lots on either side of Audubon Avenue, a short thoroughfare connecting Kingshighway and Euclid. The architects created a structure in which a central core building forming an overpass over Audubon Avenue connects two towers on either side. Seen from above, the structure resembles three staggered blocks.

Passageways connect the Clinical Science Research Building with Children's and Jewish hospitals, and there are aorta-like glass-enclosed walkways connecting the CSRB with Wohl Clinic at the second and fifth floors. If we see the research that will take place in the new building as medicine's lifeblood circulating through the surrounding hospitals where actual patient care is carried out, then the CSRB can truly be called, as Robert Hickok, the School of Medicine's Assistant Vice Chancellor, has termed it, "the heart of the medical center."

An unusual feature of the CSRB, which is not apparent in the elegant stone and glass facade or the spacious, well-equipped laboratories, is the way in which the building was financed. Fully half the cost came from savings accumulated by the dean and departments of the School of Medicine, an achievement believed to be unprecedented. Certainly, it is an indication of the importance with which the medical school and the researchers themselves regard the project. A large portion of the money was provided by the University's $300 million ALLIANCE FOR WASHINGTON UNIVERSITY capital campaign.

For some departments, the building represents a chance to expand well-developed research programs. For others, the facility offers a chance to do what was impossible before, due to lack of space: build a growing, excellent corps of researchers. And the building's second floor contains an open, light-filled conference area and lounge that will invite all who pass through to pause, providing an environment to nurture the interdepartmental collaboration for which the medical center is famous.

The building's physical resources, and its membership within a prestigious family of medical facilities, have been an undeniable help in recruiting topnotch researchers.

The building's physical resources, and its membership within a prestigious family of medical facilities, have been an undeniable help in recruiting topnotch researchers. Many of them are young scientists and clinicians who show great promise early in their professional careers. David M. Kipnis, M.D., head of the department of medicine, says, "We are looking forward to recruiting additional well-trained physician/scientists to expand our research horizons."

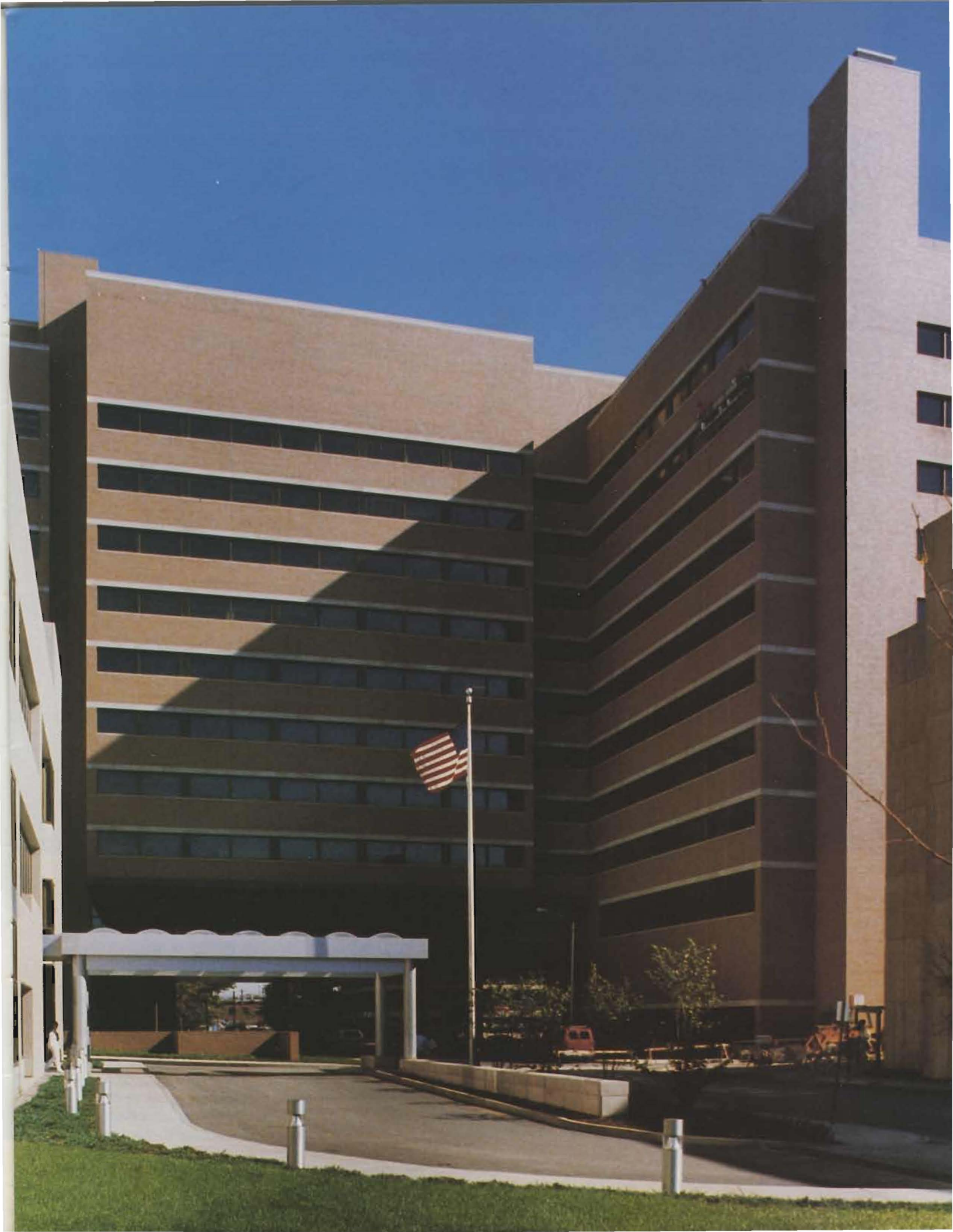
He believes that by 1986, another 10 to 12 young, sought-after investigators will be carrying out research in the new facility.

The Clinical Sciences Research Building was dedicated on October 17, 1984, in an outdoor ceremony in the plaza area on the west side of the building. The weather was crisp and breezy as the audience listened to speeches commemorating the building's opening. The speakers included: Samuel B. Guze, vice chancellor for medical affairs; Gyo Obata of the architectural firm Hellmuth, Obata and Kassabaum, Inc., that designed the building; Chancellor William H. Danforth; M. Kenton King, dean of the School of Medicine; David M. Kipnis, Busch Professor and head of the department of medicine; W. L. Hadley Griffin, chairman of the Board of Trustees; Thomas F. Eagleton, U.S. Senator from Missouri; and John C. Danforth, U.S. Senator from Missouri.

Several times speeches were interrupted by ambulances driving into the emergency room entrance behind the speaker's podium and once by a helicopter landing on the roof of nearby Children's Hospital. Members of the audience began exchanging looks of concern, and more than a few were no doubt wondering about the wisdom of staging the event out of doors, regardless of how nicely the weather was cooperating. Chancellor Danforth, who was speaking at the time, interrupted his prepared remarks to bring the situation into perspective.

"It's exciting to see emergency cases being brought in for treatment," he said. "Swift and effective medical attention for those in need—that's the whole reason for this project, you know."

The Clinical Sciences Research Building



Research Highlights at the CSRB

Department of Medicine

Under the direction of head of medicine David Kipnis, M.D., protein chemists, connective tissue chemists, cell biologists, and others in pulmonary medicine will explore the basic mechanisms of diseases like asthma, chronic obstructive lung disease, and smoking-related pathologies. Investigators in gastroenterology will use cell biology and recombinant DNA technology to study the regulation of gene expression and immune dysfunction responsible for such diseases as hepatitis, regional enteritis and ulcerative colitis. Correspondingly, the division of cardiology plans to increase the scope of its application of the physical and biological sciences to unravel the molecular events responsible for cardiac arrhythmias, heart failure and various forms of myocardopathy.

Much of the research in hematology, oncology, and rheumatology will be supported by the University's $23.5 million research agreement with the Monsanto Company.

Department of Surgery

James L. Cox, M.D., chief of cardiovascular surgery, and Burton Sobel, M.D., chief of cardiology and developer of the breakthrough anti-heart attack drug, Tissue Plasminogin Activator, will merge their respective research interests to investigate disturbances in cardiac rhythm.

The bone and mineral metabolism group at Jewish Hospital, which Samuel A. Wells, M.D., head of surgery, labels "one of the best in the world," will collaborate with surgeons like Paul Manske, M.D., whose research specialty is tendon healing.

Jeffrey Marsh, M.D., associate professor of surgery in pediatrics, will continue his research on craniofacial surgery by collaborating with Michael W. Vannier, M.D., assistant professor of radiology.

Paul Lacy, M.D., Ph.D., former head of pathology and a pioneer in the treatment of diabetes, will continue his collaboration with David W. Scharp, M.D., and Joseph M. Davie, M.D., Ph.D., in the development of techniques for obtaining and transplanting insulin-producing cells to relieve diabetes symptoms.

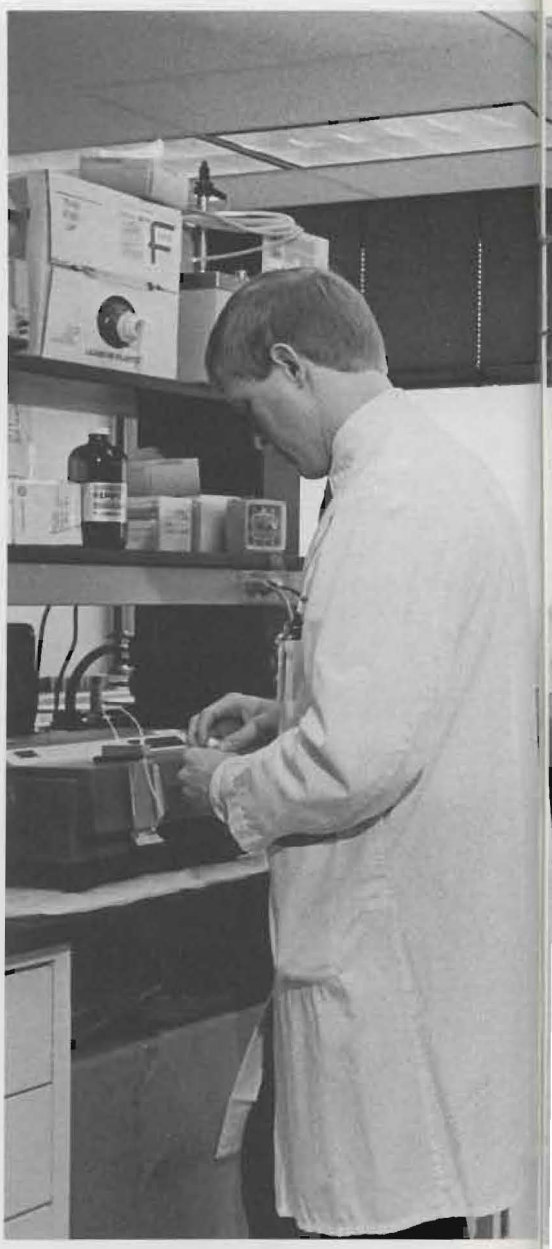
Department of Psychiatry

Samuel B. Guze, M.D., head of psychiatry, and Felton Earls, M.D., director of the division of child psychiatry, plan to develop research programs to parallel those in general psychiatry. Recruited from Stanford, Richard Todd, M.D., will be, according to Guze, "the first person on our staff who's been trained in neuroscience research as related to child psychiatry." Sheldon Preskorn, M.D., a psychiatrist from the University of Kansas, will explore brain mechanisms that account for the therapeutic action of psychoactive drugs. Preskorn's expertise complements that of Boyd Hartman, M.D., professor of psychiatry and neurobiology. Additionally, their research team will benefit from new faculty member Gene Rubin, M.D., Ph.D., and his knowledge of pharmacology. "We will have several new young faculty members who will spend about 80 to 85 percent of their time working on research, made possible by the additional space in the CSRB," says Guze.

Department of Pathology

New head of pathology Emil Unanue and his colleagues will study the cellular basis of the immune response. They have shown that a number of crucial cell-to-cell interactions take place when the immune system responds to the presence of microbial invaders or other proteins which it recognizes as foreign.

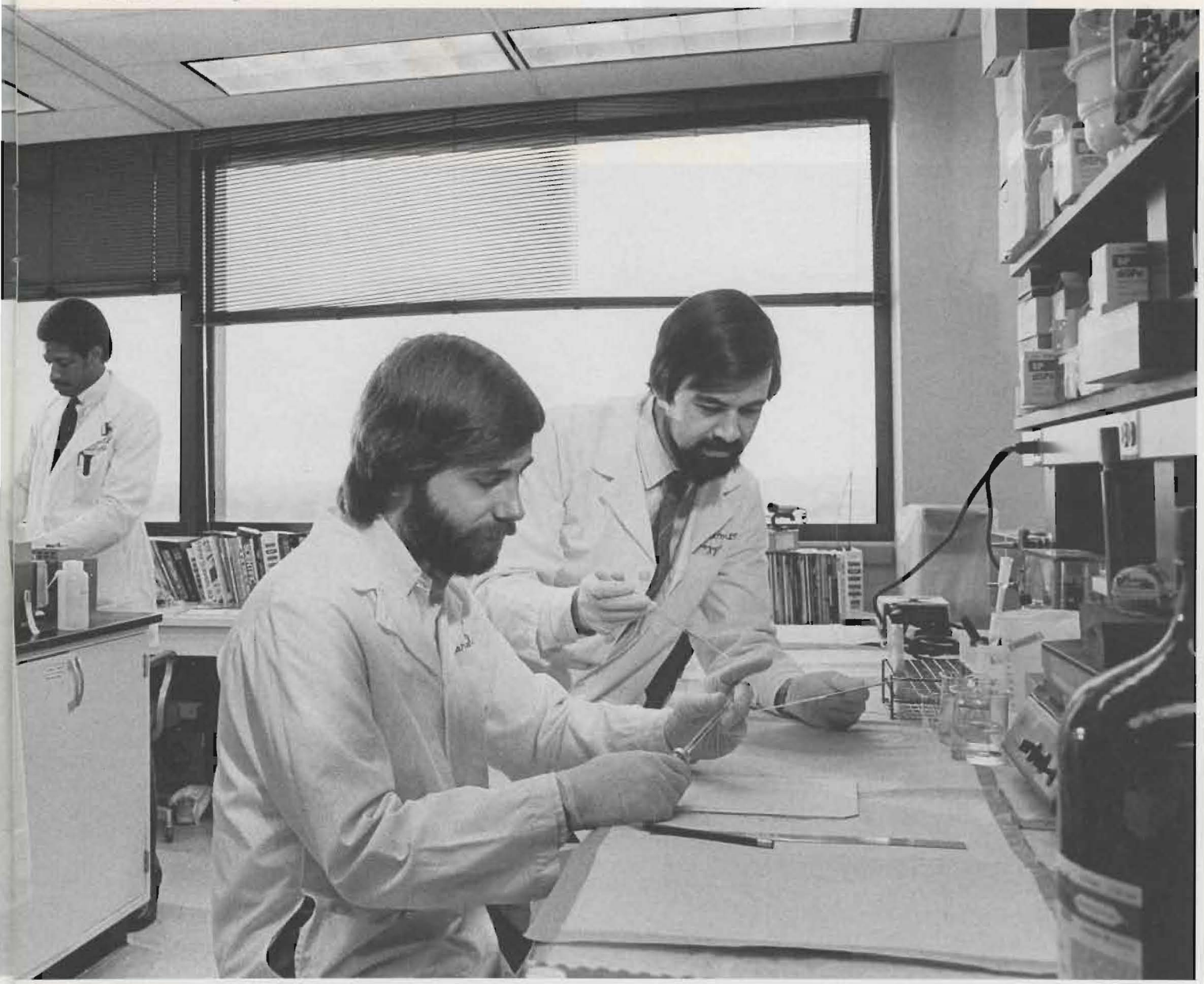
In addition to individual cell's responses, there is also cellular cooperation. Unanue and colleagues have shown that in some experimentally induced infections, these cellular interactions are interrupted, resulting in uncontrolled responses.



Department of Radiology

In addition to expanding research efforts in radiation therapy, the department's division of computer science is embarking on an exciting new activity: "We'll be able to look at X-rays without having to use X-ray film," says Ronald Evens, M.D., director of the Mallinckrodt Institute of Radiology. PACS—Picture Archiving Communications Systems—can send digitized data directly from the X-ray machine to a TV screen for viewing. Data can be stored in the

A laboratory in cardiology under the direction of assistant professor of medicine Keith Fox, M.B., Ch.B. At extreme left is fellow in cardiology Thomas Rosamond, M.D. At right, medical technologist James Bakke, B.Sc., and Fox.



computer, allowing the image to be called up anytime.

There will also be an expansion of the PET projects in collaboration with the division of cardiology and the department of neurology. A pneumatic tube from the Mallinckrodt Institute's cyclotron will send radioisotopes to the CSRB's nuclear imaging machines, including a new $750,000 positron emission tomography (PET) scanner being built by Michel Ter-Pogossian, Ph.D., professor of radiology.

"We'll be trying to develop better radioisotopes to use in PET and in the study of various blood diseases—clots, stroke, and myocardial infarction—to try and understand why they develop," Evens says.

Department of Anesthesiology

Joseph H. Steinbach, M.D., will be collaborating with Gerald Fischbach, M.D., on research projects involving the neuromuscular junction. "This work ties in very well with anesthesiology because of the mechanism of muscle relaxants," says William D. Owens, head of anesthesiology. "Eventually, we would like to build a complete research effort, which no other institution in this country is doing."

Owens has recruited Alex Evers, M.D., from Massachusetts General Hospital, who will be working in the laboratory of Philip Needleman, Ph.D., head of pharmacology. Evers will study the mechanisms of stress response in critically ill patients.

Owens has also recruited anesthesiologist Mark Poler, M.D., whose research area is renal physiology. "Very little basic research has been done concerning the effects of anesthesia on renal function," Owens says.

Henry Shaw's house—now part of the grounds of the Garden he founded.

HOW DOES YOUR GARDEN GROW?

The Missouri Botanical Garden and Washington University have enjoyed 125 years as active research partners. Today, much of their joint activity centers around the Garden's tropical botany program, an effort to catalog the world's magnificent—and doomed—tropical forests.

by Joseph Schuster

The Missouri Botanical Garden has been sending botanists to the tropics, principally into South and Central America, for more than 50 of its 126 years. The Garden was founded in 1859 and its scientific program was established at the same time.

But if it had a single focus in its earliest days, it was the American southwest deserts, since the cacti and succulents found there were the special interest of the man credited with starting the Garden's botany program, George Engelmann.

In the late 1920s, Garden botanists began visiting Panama, and by the end of the 1930s several papers on the flora of Panama were published.

While the work in Panama continued over the next 30 years, the Garden's scientific program did not grow (and, in fact, was in a period of decline through the 1950s and into the early 1960s) until the early 1970s, with the arrival of its current director, Peter H. Raven. Under Raven, who is also Engelmann Professor of Botany at Washington University, the Garden's research staff grew from a handful to its current size of 60.

Today, the Garden has the largest, most active program in tropical botany in the world with active projects going on in Colombia, Bolivia, Venezuela, Peru, Nicaragua, Costa Rica, Ecuador, South Africa, Madagascar, Cameroon, and New Caledonia in addition to the half-century-old work in Panama. The largest single chunk of the Garden's annual budget is the money it spends for its research programs; most of the more than $1 million spent for the program comes from various grants, primarily from the National Science Foundation.

An indication of the growth in the Garden's program is that its herbarium (collection of dried plant specimens for scientific study) increased from 2 million to its present size of 3.2 million since 1972. The herbarium is the third largest in the United States and among the dozen largest in the world.

One of the more remarkable aspects of the Garden's extensive tropical program, however, is that it started almost by accident; in the first quarter of the century, the Garden had a reputation of possessing the finest and most

The Ridgeway Visitors' Center, designed by the St. Louis architectural firm, Hellmuth, Obata & Kassabaum, Inc.

Garden director Peter H. Raven.

Bruce Stein with part of the Garden's collection of insect-eating plants. The one he is holding was collected in the Sierra Neblina.

extensive collection of orchids in the United States. In large part because of that reputation, a Panamanian botanist gave his rather considerable collection of orchids to the Garden, and the Garden left several hundred of them in their native Panama for the purposes of experimentation. The Canal Zone government set aside a tract of land for an orchid garden, and Shaw's Garden established a Tropical Research Station there. Because of the presence of that station, Garden staff botanists began making expeditions to Panama.

But, while the Garden's endeavor in the tropics began as a chance occurrence, it continues today as almost a sacred mission.

In a paper he published in *Natural History* Magazine in 1981, Raven wrote, "Of the estimated 3 million species of plants and animals in the tropics, only about 500,000 have been recognized and catalogued. In comparison, the temperate regions of the world contain about 1.5 million species, of which more than a million have been catalogued. A large majority of virtually every known group of organisms occurs in the tropics. About as many kinds of plants exist in the tiny country of Panama, for example, as in the entire continent of Europe. The diverse kinds of plants and animals in the tropics represent a potentially inexhaustible source of raw materials, only a minute fraction of which has been utilized or tested up to this point."

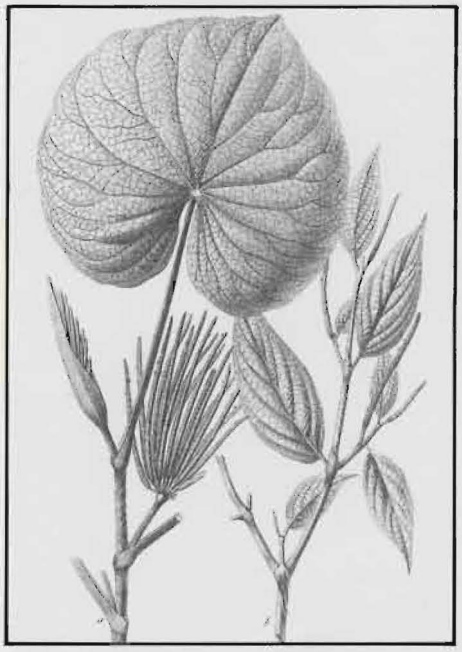
The flora of the tropics have more of a bearing on our lives than most of us would suspect. Alwyn H. Gentry, a botanist who, like Raven, holds joint appointments at the Garden and at Washington University*, says, "Just about all the families of plants we have in the temperate zones originated in the tropics; the tropics were the source of the ancestors of most all temperate plants. If you want to look at life on earth and know how things have evolved, what they mean, how they came to be, you have to look at the tropics."

And yet, he goes on to say, despite

*See page 17.

A Bounty of Botany Books

The Missouri Botanical Garden's library is the oldest botanical library in the United States. It contains about 80 percent of the world's printed literature on systematic botany, rare volumes going back to 1474, and original editions of every botanical work by Carl Linnaeus, the father of scientific classification. The plates below are from one of the Library's rare volumes, Flora Peruviana, et Chilensis by Hippolyto Ruiz and Joseph Pavon. Printed in Madrid between 1798 and 1802, it records the observations of the first botanists to conduct field research in western South America.



Piper peltatum, *now classified as* Pothomorphe peltata, *and* Piper gracile.

Gunnera scabra *and* Peperomia scutelaefolia.

Costus argenteus.

this richness, "We know less about the canopy of the tropical forests than we do about the moon."

For an idea of how important the plants of the tropics are to the lifestyle of us residents of a technological culture—a culture that gives the mistaken impression of being self-sufficient and self-contained—consider this list of products that began as tropical plants: corn, potatoes, rubber, coffee, chocolate, and vincristine, a drug used in the treatment of certain cancers. And the list includes only a tiny fraction of the uncountable number of foods, medicines, and materials that have come from tropical forests.

But aside from the biological richness of the tropics and the fact that little scientific work has been done there, there is another reason the Garden has increased its efforts to study the tropics over the last decade.

One hundred years ago, at the time the Garden and the University began their cooperative effort (through the establishment of the Henry Shaw School of Botany at WU and the endowment of a professorship by Shaw, the Garden's founder, in honor of George Engelmann) the tropical forests of the world covered a total area equal to twice that of Europe. In the ensuing century, those forests have been destroyed—because of economic development in the tropics and by native farmers clearing land for cultivation—so that they now cover only half the area they did in the 1880s.

According to Raven, one of the world's most widely recognized and respected spokesmen for the study and preservation of the tropics, each week a forest area equal to the size of Delaware is destroyed; annually, the total

Two insectivorous plants. Below: Drosera dielsiana. *Inset: a South African species of the same genus,* Drosera capensis, *in the process of getting its breakfast.*

destruction equals the area of the island of Great Britain.

A large part of the problem in the destruction of these tropical areas is that tropical forests are such delicate ecosystems; most tropical soils are poor and the rich life in the forests is sustained by an intricate biological mechanism. When that mechanism is disturbed and the forest is cut down, the area often becomes a wasteland within only a few years.

In this *Natural History* article, Raven said, "Regardless of whether they are developed wisely or unwisely, tropical forests are being cut down, and if their destruction... is indeed irreversible, approximately one million kinds of plants and animals, or one quarter of all that exist, will become extinct during the next thirty years, and possibly another million during the course of the twenty-first century.

"The loss of biological diversity in the tropics as a result of these extinctions will have serious consequences for the human race. Every species is genetically unique. We cannot study an extinct species; we cannot use it; and we cannot develop it into something more useful."

Although the Garden and University botanists cannot halt the tide of destruction, the knowledge they gain is being used to develop more rational approaches to tropical forest management. Perhaps there is still time.

Joseph Schuster is a writer living in St. Louis and is on the staff of St. Louis Magazine.

THE STRANGE WORLD OF THE SIERRA NEBLINA

The Sierra Neblina, or Mountain of the Mists, is a remote tepui* rising abruptly to the height of 10,000 feet out of the Venezuelan tropical lowlands. It is so isolated, that only three scientific expeditions have visited the region since its discovery in the 1950s.

In fact, it seems that time itself has been forced to leave Neblina alone. Evolution has been arrested or drastically slowed so that, as a scientist who visited there in the summer of 1984 estimates, as much as 98 percent of the plant species found on the tepui are found nowhere else on the planet.

In 1984, a large-scale expedition descended on the tepui. Among the 125 scientists from 25 world-wide institutions were two representatives of Washington University's biology department, adjunct professor Alwyn H. Gentry and graduate student Bruce Stein. The two also hold appointments at the Garden—Gentry as an associate curator and Stein as a graduate research associate. (The Garden and the University have had a century-long cooperative arrangement with formal ties going back to 1885.)

Gentry and Stein arrived in Neblina by helicopter. "To give you an idea of how remote it is," Stein said, "when the helicopter was unable to pick us up (because of the weather), we had to leave by dugout canoe. It took five days (on the Rio Negro) before we came across the first habitation."

In Neblina, Gentry and Stein found a world different from any other they had been in; they characterize it as a rigorous environment. At higher altitudes temperatures are low with extremely heavy rainfall. Lower down, the soil is sandy with few nutrients.

According to Gentry, the diversity of plants was much less than is usually found in the tropics, though still far greater than in the temperate zone. In a tree survey covering one hectare, Gentry and Stein found only ten different species in flower. Most similar surveys in the tropics will show more like 65 fertile species in the same area.

He and Gentry studied more than 650 individual trees, representing over 100 species. It took them two weeks of working 11 to 12 hours a day. Such a survey, he said, will tell scientists the composition of a particular forest, its relative diversity, which plants are dominant and which are rare in the area.

Similar surveys are being conducted throughout the world's tropical forests. Data from these studies should enable scientists to answer longstanding questions about tropical ecosystems: What determines species diversity? What causes the greater number of species usually found in tropical areas? Perhaps these insights will help us to manage tropical forests more effectively.

Photo by James Blair *National Geographic Magazine*

Alwyn H. Gentry collecting botanical specimens in the Sierra Neblina area.

*a type of isolated, flat-topped, sheer-sided mountain peak in southern Venezuela and northern Brazil.

Jean Dubuffet's *Art of the Irrational*

In 1942, during the Nazi occupation of France, a 41-year-old Parisian wine merchant left the family business to become an artist. His inspiration? Not Michaelangelo or Rembrandt or even Picasso, but the art of primitives, children, and the insane.

Today this intransigent champion of L'Art Brut is recognized as one of the world's most important living artists. From January 19 to March 3, the Washington University Gallery of Art will hold a Jean Dubuffet restrospective, the first in 12 years. WU Magazine brings you a selection from that exhibit, with the story of Dubuffet's obstinate quest, as told by Joseph Ketner and Sue Taylor.

In 1951 the Arts Club of Chicago hosted the first non-commercial exhibition in America of Jean Dubuffet's art. Dubuffet's introductory lecture for the exhibition must have come as a shock to the audience. Speaking with a thick French accent, he proclaimed: "Personally, I believe very much in the values of savagery. I mean instinct, passion, mood, violence, madness." Such a radical statement was in startling contrast to the appearance of the trim gentleman attired in a black suit and tie, drawing smoke through his cigarette holder. His aristocratic presence surely made Dubuffet seem all the more provocative as he proceeded to defame the Western aesthetic values of beauty that were associated with the visual arts since the Renaissance.

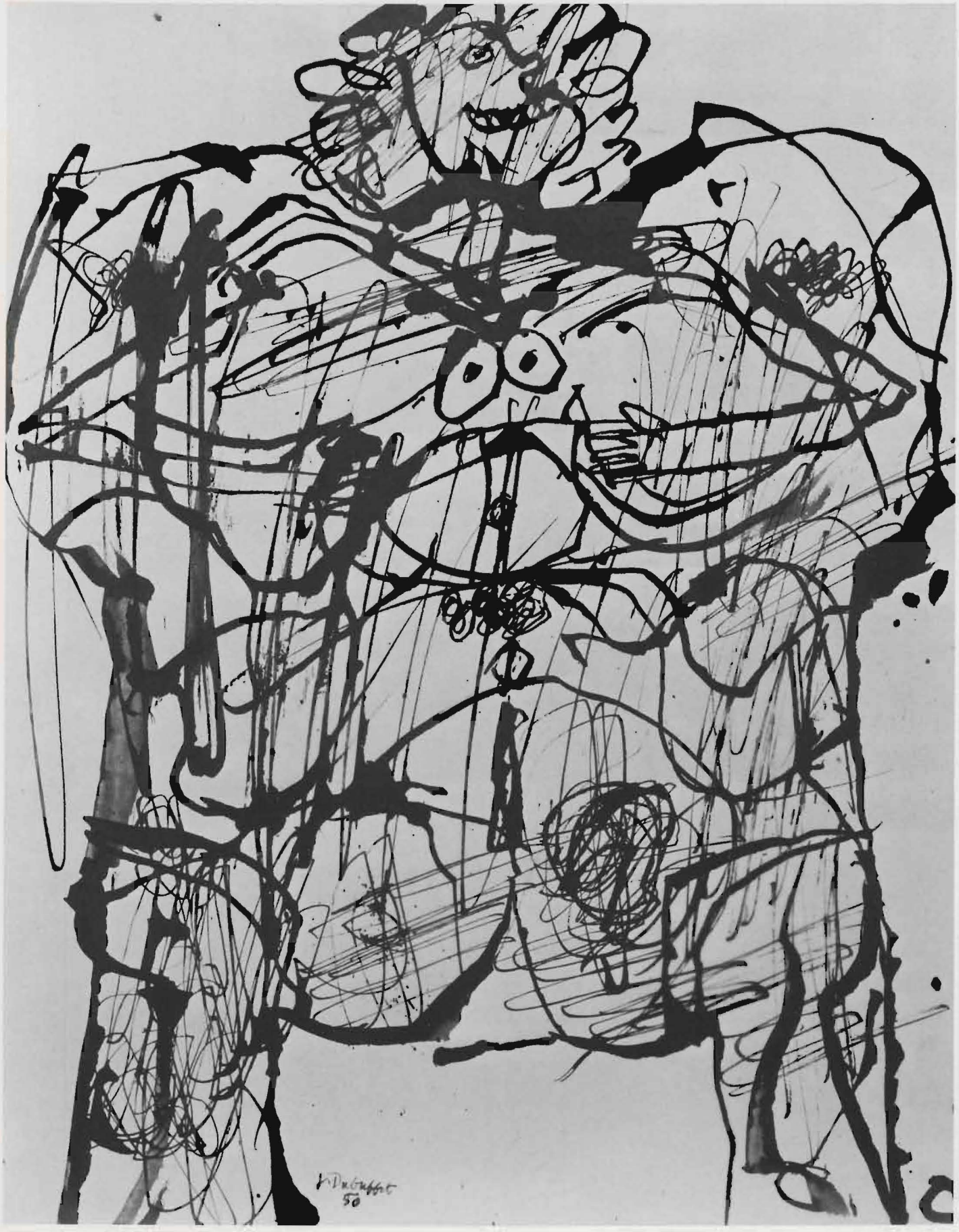
Raised in a wealthy family of French wine merchants, Jean Dubuffet entertained the possibility of pursuing careers in literature, linguistics, music, and painting before returning to the wine business. Only in 1942, while Paris was occupied, did Dubuffet decide to abandon the family trade to devote himself to art. His earliest figure paintings point to sources in the art of children and the insane, which Dubuffet regarded as untainted by the stifling regulations of academic codes or acquired tastes. The search for a primeval pictorial expression led him to an investigation of what he called *L'Art brut* in 1945.

Accompanied by his friend, Jean Paulhan, the artist visited mental asylums in Switzerland, studying the paintings and drawings of the patients. The effects of these works on Dubuffet are seen in the early portraits of his artist and author-friends Jean Paulhan, Henri Michaux, Francis Ponge, and Antonin Artaud. In the portrait *Antonin Artuad aux houppes* (1947) Dubuffet used a medium that incorporated plaster, sand, tar, and other detritus from the urban world and which he called *hâutes pâtes.* Applying it thickly to the support, Dubuffet then carved, incised, scraped, and troweled the image of his subject in the paste. Working from memory, Dubuffet created a fantastic image of the poet gesturing emphatically with tufts of hair flopping over his ears.

The *hâutes pâtes* paintings begun in 1945 gave way in 1947 and 1948 to more thinly painted gouaches and watercolors during Dubuffet's three extended trips to North Africa. This shift was necessitated by the difficulty of obtaining materials in the remote Sahara. Figures, formerly isolated against undifferentiated backgrounds in the early portraits, now inhabit desert landscapes dotted with palm trees and traversed by camels and donkeys. Unlike many artists who traveled to North Africa, Dubuffet did not heighten his colors to convey the brilliant light of the desert. Instead, he worked with very dark colors, almost as though he were deliberately trying to frustrate viewer expectations.

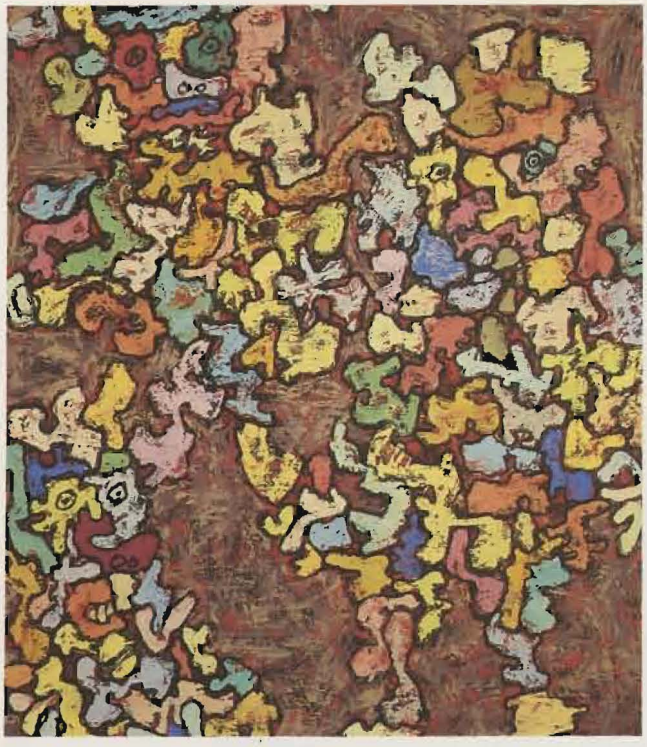
The *Corps de dame* pictures of 1950

Corps de dame (Woman's Body), *1950, ink on paper, lent by St. Louis Art Museum, gift of Mrs. Katharine Kuh.*

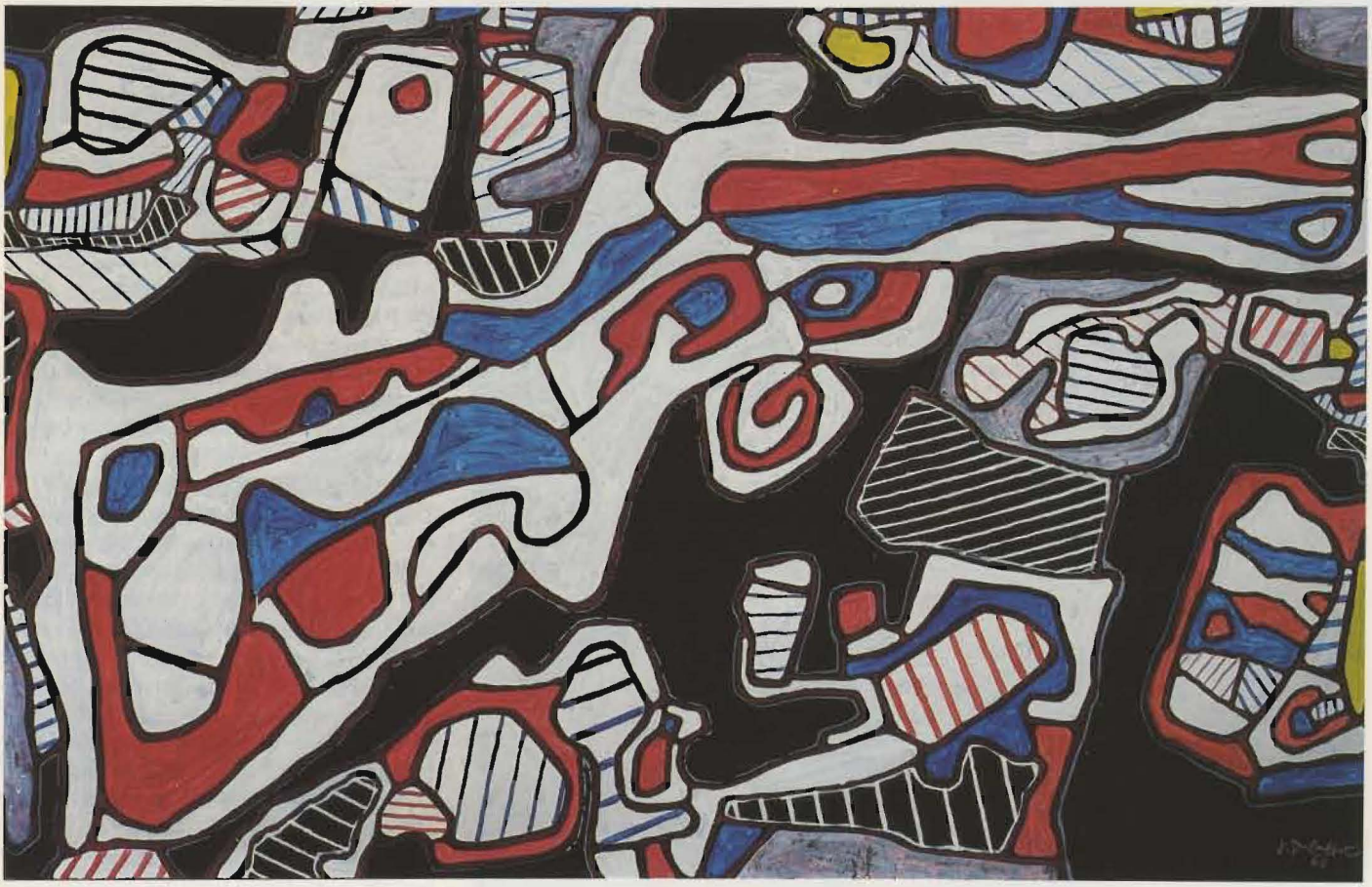



Dubuffet
mars 44

◀ Petit ricaneur (Small Sneerer), *1944, oil on canvas, lent by Mr. and Mrs. Edwin A. Bergman, Chicago.*



◀ Actes légendaires (Legendary Acts), *1961, oil on canvas, Washington University Gallery of Art, gift of Mr. and Mrs. Richard K. Weil.*



▲ Fusil à deux coups (Double-Barrelled Shotgun), *1966, vinyl on canvas, Lent by Mrs. Leonard Horwich, Chicago.*

and 1951 are often described in terms of landscape. In each case, the female figure, reminiscent of some ancient fertility goddess with stumpy limbs and a tiny head, is flattened out across the surface to become a kind of map.

Dubuffet made about fifty ink drawings on this theme in which the anatomy is described by a network of pen and brush lines, blots, and spontaneous drips. The nervous, almost frantic activity of the strokes seems simultaneously to define and violate the figure it calls into being. Important among these works is the *Corps de dame* (1950) that was donated to the Saint Louis Art Museum by Katherine Kuh and which was also in the 1951 show at the Arts Club of Chicago.

Antonin Artaud aux houppes (Antonin Artaud with tufts), *1947, oil and mixed media on canvas, lent by Mr. and Mrs. Morton Neumann, Chicago.*

After 16 years of exploring the potential of figurative images, Dubuffet created his first seemingly abstract works, the "Texturologies." They are at once abstract and representational, and can be read as patches of earth, dense clouds of gas, or vast galaxies of stars. They can also be interpreted as landscapes in which the artist has eliminated the horizon, looking down upon the ground rather than across it. One is immersed in a textural field that provides no focal point, but allows the eye to travel freely across the surface and beyond it.

From a study of inert matter, Dubuffet turned his attention to the hustle and bustle of urban life. Using Paris as a model, he has created an imaginary world of colorful shops, crowded thoroughfares and crude figures. In lively street scenes and panoramic views these figures loiter, stroll, or drive funny cars around the busy boulevards. The figures in *Trime buriné* (1961) are deployed across the picture surface in a random fashion, demonstrating Dubuffet's disregard for conventions of composition or spatial perspective.

The compartmentalizing or patterning evident in *Actes légendaires* becomes one of the hallmarks of the extensive *Hourloupe* cycle that preoccupied the artist for a period of 12 years. According to the artist, *"L'Hourloupe* calls to mind some object or personage of fairytale-like and grotesque state and at the same time also something tragically growling and menacing." Beginning with ball-point pen doodles that Dubuffet made in a distracted moment in the summer of 1962, *Hourloupe* became a principle, an obsession, and ultimately an overarching system embracing painting,

Trime Buriné (Engraved Drudgery), *1961, oil on canvas, collection of Mrs. Harry Franc, St. Louis.*

sculpture, architecture, and even theater. A kind of pictorial script characterized by discrete meandering contours and parallel hatch marks, *Hourloupe* was the basis of a new and totally artificial world of Dubuffet's creative imagination.

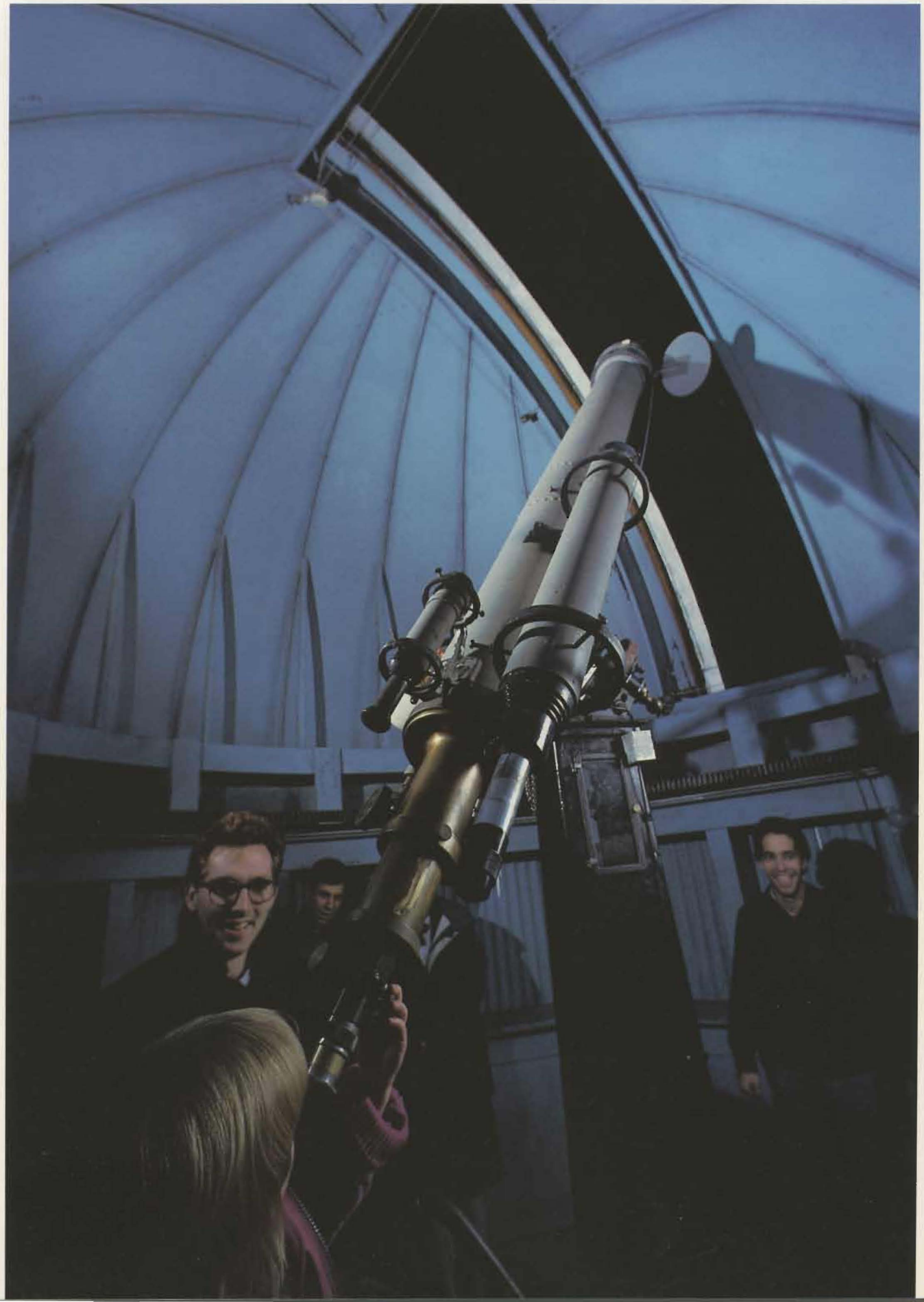
Dubuffet's difficult, challenging art found a ready reception among St. Louis collectors almost as soon as it was introduced. Perhaps this receptivity was due to the enthusiasm of William Eisendrath, the organizer of Dubuffet's exhibit at the Arts Club of Chicago. In 1952, the year after that exhibit, Eisendrath moved to St. Louis. He served first as assistant head of the St. Louis Art Museum. Then in 1960 he became the first director of the new Washington University Gallery of Art in Steinberg Hall.

Eisendrath's early years in St. Louis parallel the local collecting fever for Dubuffet's work. Although Joseph Pulitzer, Jr., had purchased one of Dubuffet's Morrocan watercolors "El Golea" from Pierre Matisse in 1948, the acquisition was an isolated incident. The painting remained the only example of Dubuffet's work in St. Louis until the late 50s, when collecting of the artist's work began in earnest and continued through the next two decades. Daniel Cordier, then Dubuffet's Paris dealer, and Pierre Matisse were the main avenues through which most local collectors acquired his work. Several collectors, including Richard K. Weil, Joseph Pulitzer, and Harry Francs, would visit Cordier on their European excursions and return enriched with new works from the master's hand.

The enthusiasm of these pioneer collectors continues to this day. Indeed over the past several decades, the Midwest has amassed substantial numbers of Dubuffet's works, and it was the recognition of this fact that was the catalyst for mounting this show.

The exhibition was organized by the David and Alfred Smart Gallery of the University of Chicago and co-sponsored by the Washington University Gallery of Art through the Hortense Lewin Art Fund. The St. Louis presentation of this exhibition is entirely due to the benevolence of Tobias Lewin, who in 1983 established the Hortense Lewin Art Fund in memory of his wife. This fund will realize, in perpetuity, Hortense Lewin's dedication to the arts at Washington University.

Joseph Ketner is the acting director of the Washington University Gallery of Art. Sue Taylor is a graduate student in art history at Washington University.



No Plans for Retirement

Feel like taking a closer look at the rings of Saturn or the Andromeda Galaxy? At the Washington University Observatory you don't even need an appointment.

by Paul Dusseault

Look at the stars! look, look up at the skies!
O look at all the fire-folk sitting in the air!

—Gerard Manley Hopkins
"The Starlight Night"

Much of the continent was "hostile Indian territory," a transcontinental railroad was only a pipe dream, and Abe Lincoln was still practicing law in Springfield, Illinois, when James Erwin Yeatman donated a brand new "superior" telescope to Washington University in 1857.

For decades, it perched atop a small brick building in downtown St. Louis giving 19th Century astronomers a privileged peek at the ancient heavens. Today, it's the *telescope* that's ancient, but amateur astronomers still find the view sensational.

"The optical quality is still remarkably good," says Michael Friedlander, professor of physics and director of the Washington University observatory. "The lens is in excellent condition and the detail you see of planets compares with modern telescopes. We have no plans to retire this instrument. None at all."

The antique telescope, complete with the original six-inch lens by H. Fitz Company, now sits atop Crow Hall on WU's hilltop campus in a tarnished though perfectly functional observatory shell. Every clear weekday night during the academic year, astronomy buffs climb the physics department's stairway to the stars to study the flickering mysteries of space. Albireo, Epsilon Lyrae, the Ring Nebula, the Hercules Cluster...words in a textbook burst into glorious shades of the spectrum before the unblinking eye of Yeatman's legacy.

Inside the Washington University observatory—a young visitor's first acquaintance with the immensity of space.

Photo courtesy of W.U. Observatory

The Moon through the WU telescope

Star Time

But at one time, the observatory was far more than a curator's curiosity. Beginning in 1883, WU's determinations of longitudes formed the basis for countless topographical maps of the United States Geologic Survey. And in 1885, calculations from WU astronomers settled a long-running border dispute between the Republic of Mexico and Texas.

But genuine stardom came to the observatory during this period because of time measurements. Railroads, hotels, watchmakers, and others needed accurate time signals to efficiently conduct business and, with the acquisition of a three-inch zenith transit telescope in 1882, the observatory began supplying time signals to subscribers throughout the Mississippi River Valley. WU soon became the center of one of the world's largest time services, sending nightly signals across 50,000 miles of telegraph wire.

But anyone could erect an observatory and tell time with astronomical

observations, and in the late 1880s, somebody did. WU was muscled out of the lucrative time signal market when Western Union began carrying time signals supplied by the U.S. Naval Observatory in Washington D.C. These tense years saw a heated and sometimes acrimonious exchange of letters in the journal *The Sidereal Messenger* between Capt. R.L. Phythian, superintendent of the Naval Observatory and Professor Henry S. Pritchett, then director of the WU observatory. Pritchett wrote of the "injury inflicted" by the Naval Observatory which sought to "crush out private observatories." Phythian reeled at the "uncalled for-attack" from the director of this "rival service" and called the charges "absolutely without foundation."

Unable to compete, the WU time service folded.

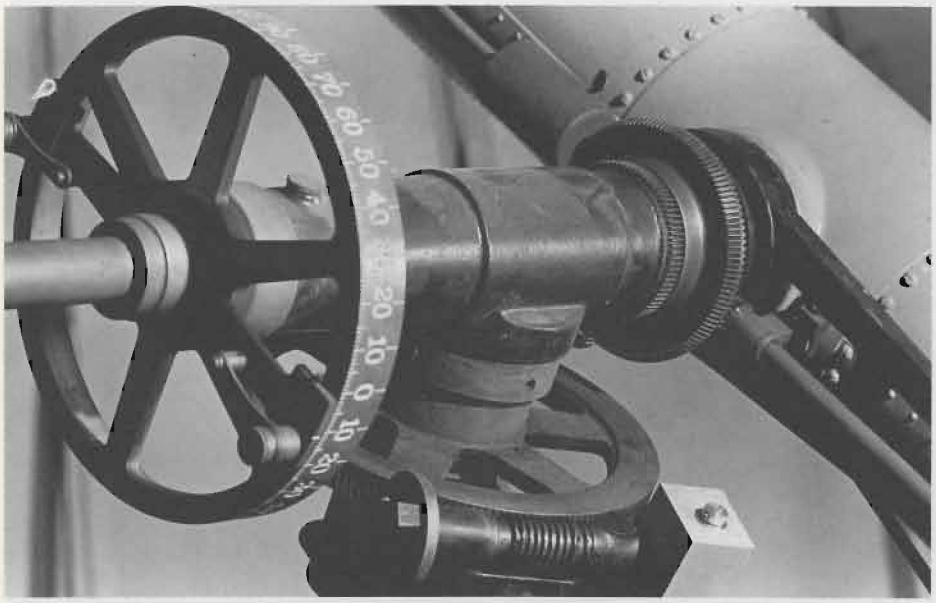
Bad Sky

Coal-burning industries and bright night lighting may have been hallmarks of a booming St. Louis economy during the late 19th century, but to astronomers, the city's growth meant only "bad sky." So the observatory moved out of town, to the University's new west St. Louis campus.

"The sky is still lousy," says observatory director Friedlander. "You're in a river valley so you frequently get a humid haze, then there's the crud in the air from town, plus the reflection of the city lights...It's a heck of a place to put an observatory in the first place." But Friedlander is quick to label these gripes as minor and fiercely defends the telescope as a window to some of the sky's greatest treasures. "On a frosty autumn night," he says with a wistful smile, "when the air is good, really clean and crisp, you can clearly see the Andromeda Galaxy. That's two million light years away." Imagine.

On weekday nights, the observatory is staffed by student volunteers who act as astronomical tour guides for visitors. "The moon is probably the most popular sight, followed by Saturn, Jupiter and some nearby stars," says Rich Fefferman, a five-year veteran of the observatory's student staff. "People are sometimes surprised by what they see. Cub Scouts look at a star and ask where the five points are."

The observatory draws an average of 10 visitors per night from both the WU community and the greater St. Louis area. Except for a lens that was refigured in 1882, these amateur astronomers use the exact same instrument that was used the year of WU's state charter. The historical value of the 125-year-old telescope was brought home a few years ago when Friedlander received a letter from the Smithsonian Institution offering to "rescue" the device from "dead storage." "I wrote them back and told them we're still using it," recalls Friedlander. "I hope they believed me."



A setting circle for adjusting the telescope's declination, or degrees above the celestial equator.

Beautiful

Of course, WU's six-inch lens telescope pales in comparison with contemporary devices like Mt. Palomar's 200-inch lens telescope. But that doesn't mean WU has fallen behind in the space sciences. "The field of astronomy has split into several different disciplines like astrophysics, astrochemistry, etc.," explains Friedlander. "Washington University does an enormous amount of work in astrophysics, for example, and that just does not require a state-of-the-art telescope."

Still, for the sake of providing the curious with a star's-eye-view, the University plans to maintain the observatory indefinitely. Besides, the WU telescope is more than a light-refracting lens in a metal tube; it's an echo of the University's origins, a shadow of astronomy's younger days, a reminder of how far science has come. Look into the eyepiece and see not just Venus or Mars, but see also the same steady colors seen by the institution's first astronomers. And know that as they gently brought into focus the light from distant stars, as they counted the restless rings of Saturn, as they studied the blood-red stain of Jupiter, they whispered to themselves the same word you find on your lips. "Beautiful."

Catching Cosmic Rays

Up, up, and away: SOFIE's going after one of the universe's most mysterious phenomena.

by Paul Dusseault

A high-altitude balloon similar to the one that will hoist SOFIE into the upper atmosphere.

Cosmic rays are named for the cosmos, which is where they are from. In other words, they are not of terrestrial origin. It's hard to be more specific than that.

We do know *what* they are—atomic nuclei, mostly hydrogen, which at some time during their mysterious existence become charged with incredible amounts of energy. As a result, they come zinging through earth's upper atmosphere at nearly the speed of light.

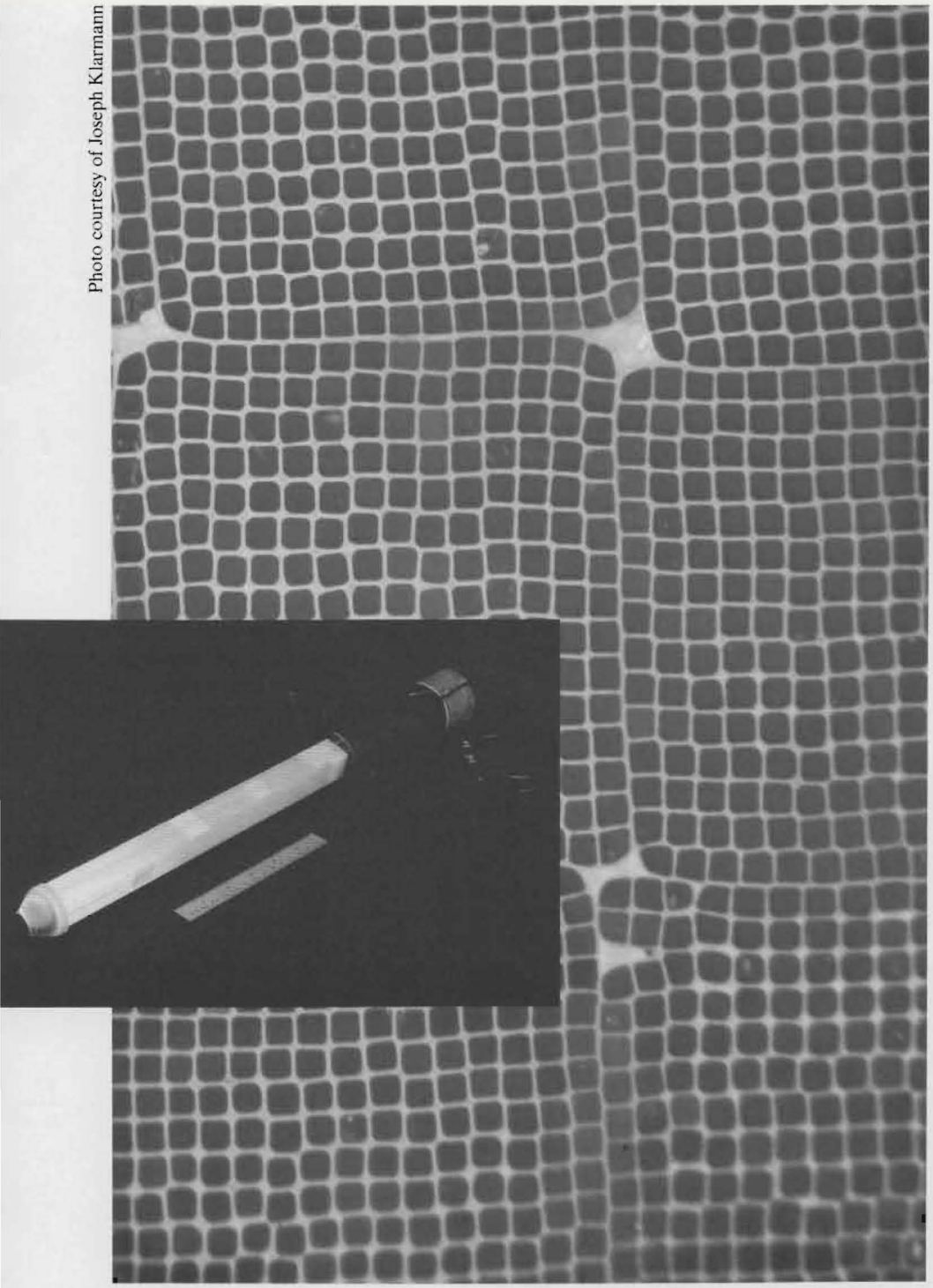
Scientists want to know more about cosmic rays, and for years they've been searching for detection methods that will help them expand the phenomenon's dossier.

Early detectors consisted of high altitude balloons carrying sheets of special film called nuclear emulsion. When a charged particle whizzed through the sheet, it left a microscopic track. Scientists examined these cosmic ray "footprints" one by one, gleaning clues about the nature of cosmic rays.

But there were many disadvantages. Nuclear emulsion experiments had to be retrieved before tedious, micron-by-micron analysis could begin. And resolution was far from ideal. "You could easily confuse one charge for a neighboring charge," recalls Joseph Klarmann, professor of physics. "So we had to settle for identifying ranges or groups of particles."

Electronic detectors were a big step forward. They used a sheet of plastic laced with a complex organic molecule

Photo courtesy of Joseph Klarmann



Cosmic eye: a cross-section of SOFIE's scintillating optical fibers. Inset: another view of the optical fiber block.

or "scintillator." Atomic particles entering this special plastic lose some or all of their energy, causing the scintillator to flash. Because these light bursts are directly related to the ionization of the particle as it passes through the plastic, and because these measurements can be transmitted immediately to earth for computer analysis, scientists learned much more about the charges, energies and relative abundances of cosmic rays.

Finally, the particles could be characterized according to element. Scientists discovered that most of them were hydrogen, with smaller percentages identified as helium, carbon, nitrogen, oxygen, silicon, and iron.

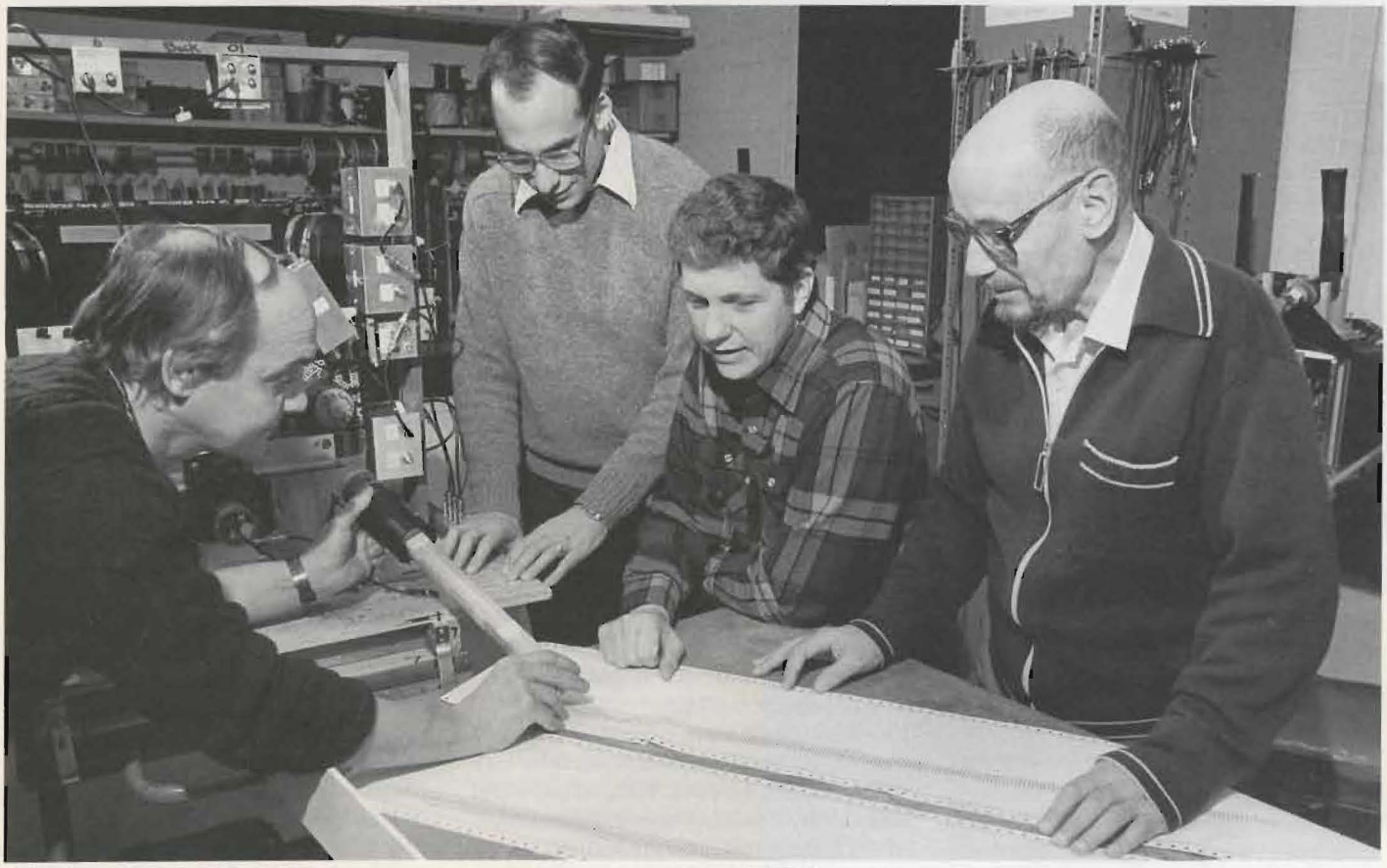
But one thing that electronic detectors could not provide was an image, a graphic representation of the digital data.

That is, until SOFIE.

SOFIE stands for Scintillating Optical Fiber Isotope Experiment. It was designed by Klarmann and three other Washington University scientists—Robert Binns, senior researcher at the McDonnell Center for the Space Sciences; John Epstein, project manager in the department of physics; and Martin Israel, professor of physics at the McDonnell Center.

A multi-stage electronic detector, SOFIE pushes the study of cosmic rays toward unprecedented specificity. Once SOFIE is put into active service—either on a high altitude balloon or in earth orbit, scientists will be able to learn not just the identity of the element, but also its isotope—that is, the number of neutrons and protons in the nucleus of the particle. This means better characterization of the particles and enhanced understanding of their origins.

"It's important to have something visual—an image—in addition to a numerical measure," says Binns. "That lets us see how the energy is deposited when the particle slows down and stops. We've never had that specific a measure in an electronic detector before. If you put that together with other data, you



John Epstein, Martin Israel, Robert Binns, and Joseph Klarmann discuss SOFIE.

can determine the velocity, the charge, even the isotope of the cosmic ray."

Aboard SOFIE, several detectors work in unison. But the featured attraction is a block of scintillating optical fibers. Optical fibers are hair-thin conduits, usually glass, that transmit light. Epstein, working with a California fiber optics firm, created optical fibers made of scintillating plastic—the material that sparks when excited by cosmic energy.

The WU scientists fused about 100,000 of these special optic fibers into a block and attached a television camera to one end. When a cosmic ray enters the bundle, it deposits energy that excites the scintillating plastic. The resulting burst of light travels down the block to a television camera where it is recorded as a video image. The image is then telemetered back down to earth for immediate analysis along with the corresponding data from other detectors aboard SOFIE.

"For the first time, we have a clear picture of a particle coming in and stopping," says Israel. "It provides an image, just like the old emulsion detector, but it's recorded electronically and immediately on magnetic tape. It gives you more than a single pulse and a single number; it gives you an actual picture. This is the first time we've had that in an electronic detector."

The key to SOFIE is the marriage of fiber optics and scintillating plastic. The light bursts emitted by a simple block of scintillating plastic would be too faint for a television camera to record, but when fiber optics pipe the flashes down to one tiny "screen," the light can be trapped, amplified and preserved on video. "So instead of trying to devise a camera that focuses on everything at once," says Israel, "you can train the focus right smack up against the end of the bundle and see it all."

A SOFIE prototype has already been tested at the nuclear accelerator at the Lawrence Berkeley Laboratories in California, and the WU team reports encouraging results. The next step is a high altitude balloon flight tentatively scheduled for 1986. Barring any major problems, NASA could launch SOFIE into earth orbit before the end of the decade.

TOUCHED BY GREATNESS

A tribute to Carl F. Cori

by William H. Danforth

Carl Cori died on October 20, 1984, at his home in Cambridge, Massachusetts. He was 87.

From 1931 to 1964, Cori was a faculty member at Washington University School of Medicine, first as professor of pharmacology, later as head of biochemistry. In 1947, Cori, along with his wife Gerty, also a medical school faculty member, received the Nobel Prize in medicine.

The Prize was awarded for the isolation of phosphorylase, an enzyme that helps trigger conversion of glucose into glycogen. The Coris' discovery has furthered understanding of the body's metabolism and shed light on metabolic disorders such as diabetes.

Born in Prague, Carl and Gerty Cori worked as colleagues until Gerty Cori's death in 1957. Evarts A. Graham, Jr., writing in the St. Louis *Post-Dispatch* in 1948, said "their mental processes mesh so well that they think and speak in collaboration. When one broaches an idea, the other picks it up, embroiders and expands it, and passes it back to the first for further additions. A visitor, after listening to them explain something, is likely to leave with the strong impression that two voices have been expressing an idea in one brain."

Carl Cori married again in 1960. In 1964, he retired from WU. He and his wife, the former Ann Fitzgerald Jones, left St. Louis and settled in Cambridge, Massachusetts. Cori taught and conducted research at Harvard University until his death.

In 1961 a young colleague at the WU medical school named William H. Danforth joined Cori's research team as a postdoctoral fellow. In this address, given at a memorial service for Cori on November 16, 1984, in Cambridge, Chancellor Danforth commemorates one of the most distinguished scientists ever to serve on the faculty of Washington University.

It is a privilege to honor a great and talented man who changed biologic science and left his indelible stamp on the people who worked with him, and on one university about which I happen to care deeply.

Like so many, I remember vividly my first meeting with Carl Cori. Ernst Helmreich, with whom I had done a little work, was joining Washington University's Department of Biological Chemistry. After Ernst had paved the way, I made an appointment with Dr. Cori to ask to be a fellow in the department. I prepared thoroughly, as if for a two-hour grilling. It was not just that I stood in awe of Carl F. Cori, but I stood in awe of the chairman of my department and I knew his admiration of Carl F. Cori was unbounded. As those who knew Carl might guess, the meeting lasted less than five minutes. No time was wasted on questions or plans or arrangements or even where I would work. I would start on July 1, as requested, and there would be some interesting scientific problems. The impression was left that the science was important, the ancillary details trivial. That is how the Cori department began to affect my view of the world.

No one ever said what to do. The problem was laid out and a few suggestions were made; I felt I was on my own, to sink or swim. But in that environment sinking was unthinkable. The departmental history was too great. I looked to see what others did. The Cori department was no research factory with people following detailed protocol laid out by others; it was a collection of extremely talented individuals doing their own work with their own hands.

The departmental brown bag lunches taught me more. I was quickly captivated by Carl Cori's broad intellect and powerful memory which ranged over science and literature, mushrooms and Sumerian artifacts, school and national affairs. He could think hard about a subject or a person and then express the essence in one or two sentences, with wit and style. To listen to his use of the English language was a treat. I learned from friends that his command of other languages was excellent as well.

At those lunches I began better to understand the origins of the departmental strength, for Carl Cori displayed unerring and profound insight into people as well as into scientific problems. In fact, he had a marvelous knack of pointing people to appropriate problems. His breadth served him well in this regard. My background fit into his longstanding interest in enzymatic regulation within the living cell, so I began working on the interconversion of phosphorylase B and A in intact frog muscle.

The 4:00 P.M. seminars set an extraordinarily high standard. I have heard ill-prepared remarks delivered on every other conceivable occasion, but never at a Cori seminar. No member of the department, no visitor would have that much courage. Besides, there was too much pride in just being asked to present before such a distinguished scientist. After the talk, the quality of the discussion was superb. I felt privileged to be present, realizing that eight Nobel Prizes had come to those who had been regular participants. It was at these seminars that one realized the brain power of the group and understood that, in a real sense, the department existed as a democracy of ideas. Carl's leadership, even dominance, came through his superior intellect and the respect in which he was held by everyone present. We struggled to meet his standard.

Perhaps, though, it was in writing a paper with him that one grasped most clearly the analytic power of his mind.

Photo courtesy of W. U. School of Medicine Archives

Gerty and Carl Cori in their laboratory at the Washington University School of Medicine.

He pored over the data, rearranged ideas, and probed the strengths and weaknesses of arguments. His sense of how far one should push interpretations was unerring. Every sentence, every clause, every phrase, every footnote was crafted to say exactly what Carl Cori wanted to say—no more, no less. His papers are masterpieces of science and of expression, restrained and exact. Each was designed to be a part of the Cori scientific edifice, an integral fraction of the totality of his life's work to which he would return again and again for data and ideas to form the platform for his next projects.

It is not surprising that in that atmosphere the research went well and that a mild suggestion from him, or even a seemingly off-hand question, could lead to months of concentrated work.

The parties at the Cori home on Lay Road were a great fringe benefit. Ann was always kind, gracious, and charming. One immediately sensed the warmth of the home and of the high quality of the relationship between man and wife. One of the most touching aspects was Ann's enthusiastic admiration of Carl (she felt about him the way I did) and his love and affection for her. It was in their home that I first came to realize that Carl Cori was a happy man as well as a successful man, and that Ann and his family were major parts of that happiness.

Carl's impact on Washington University, and especially on its medical school, cannot be overstated. Just having an enterprise of such quality within the institution set the standard for everyone else. Carl's breadth, combined with vision, gave him great influence on the selection of his fellow departmental chairmen, the most effective method of setting the direction for the school. The Coris' interest in the living system, of course, led to the description for the first time of the relation of specific enzymatic defects to clinical disease, thus in a direct way involving clinicians. Other departments copied the Cori style of assembling talented people who did their own work, and frequently called upon him to help judge talent.

I might add that Carl's political and organizational insights and skills, when he chose to use them, were legendary. In times of trouble and difficulty, professors, deans, and chancellors visited his office. His help and counsel to them helped shape the institution.

Today Washington University is peopled by graduates of his department: Luis Glaser is now chairman of the department of biological chemistry and director of the division of biology and biomedical sciences, providing an overview of all the biologic sciences at Washington University. David Kipnis is chairman of our largest department, internal medicine, and a key intellectual leader of Washington University. Finally, the institution's chancellor bears the Cori stamp. At a symposium honoring Carl on his 80th birthday, people spoke of his many scientific children and grandchildren and of their major contributions to science. Of me he said wistfully, "I didn't raise that scientific son to be a chancellor." Of course, he was joking for it would never have happened without his influence, both on me and on important decisionmakers.

It has been a special privilege to have been touched by the life of this great man.

William H. Danforth has been chancellor of Washington University since 1971.

by Richard Walter

Learning From History: The U.S. and Latin America

The Reagan Administration's policy toward Central America has a peculiar relationship to history. On the one hand, the Administration wants the American public to ignore certain aspects of the recent past. On the other hand, its own actions draw on dubious historical models with dubious results for the best long-run interests of the Americas.

First, it wants us to overlook the centuries of oppression and poverty that have produced twentieth-century revolutionary movements in Latin America. It wants us to forget the numerous direct and indirect U.S. interventions in Central America over the past century. In Nicaragua, it wants us to forget the brutal and unpopular Somoza dynasty, which in many ways we helped to create and sustain until almost the very end.

Most of all, the Administration would like us to forget the experience of Vietnam. That, however, is too tall an order, even for an administration so skilled in the use of public relations and the manipulation of public opinion.

The Vietnam analogy is useful in understanding current policy toward Central America. But, as an historical precedent, it is perhaps not the most appropriate. Instead, we should consider the cases of Guatemala in 1954 and Chile in 1973.

It comes as no surprise to the historian that the Reagan Administration seeks the destruction of the Sandinista government in Nicaragua. The pattern was set in 1954 when the Central Intelligence Agency combined with dissident groups to bring down the reform-minded regime of Jacobo Arbenz in Guatemala. A combination of pressures, including employment of mercenaries and the standby stationing of Marines offshore, was used to effect the coup.

An even more sophisticated plan was developed first to "destabilize" and then to encourage a military coup against Salvador Allende in Chile. Pressures there included clandestine financial aid to opposition elements, a credit squeeze, and clear signs to the military that any action which would undermine Chile's elected government—including political assassination—would be condoned by the United States.

Both cases have important similarities. In both instances the U.S. placed itself in opposition to democratically elected regimes committed to significant social and economic change, encouraged domestic opponents to use extra-constitutional means to bring down existing governments, and helped snuff out the possibility for reform, leaving armed revolution as the only alternative.

And what have been the results? Since 1954 Guatemala has been ruled by a series of repressive governments which annually chalk up one of the worst human rights records in the world. In Chile, since 1973, the dictatorship of General Augusto Pinochet has sought to destroy the political culture of what was, at one time, Latin America's oldest and most stable democracy. The present governments of Guatemala and Chile, in large measure the creations of U.S. policy, are today international embarrassments, condemned and shunned by much of the world, including many of our staunchest allies.

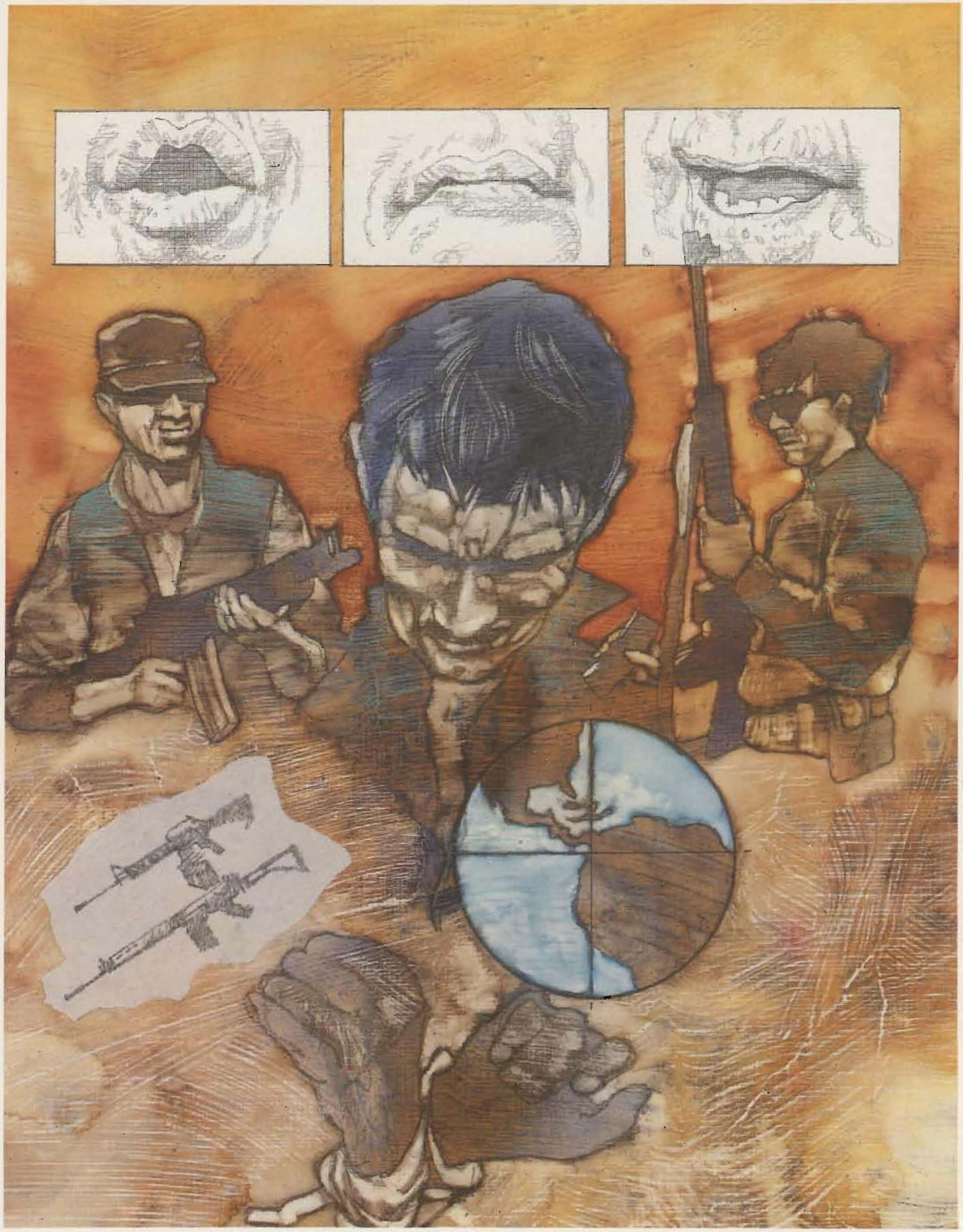
The examples of 1954 and 1973 are directly relevant to present-day Nicaragua. Extraordinary pressures are again being brought to bear. Honduras has been turned into an armed camp, the "contras" are operating freely from across the border, and the CIA is helping to mine Nicaragua's harbors. The goal is the same—to overthrow the Sandinista government and to replace it with one more amenable to U.S. interests and influences.

But this time it might not be so easy. First, the Nicaraguan regime, despite alienating some in the broad coalition that overthrew Somoza, clearly enjoys the support of most of the Nicaraguan people. The fact that the Sandinistas have been able to arm and organize a large popular militia is a measure of that support. Therefore, there is no ready-to-hand disaffected military establishment within the country to serve U.S. policy. Indeed, if there is a model to be kept in mind for Nicaragua, it should be the abortive Bay of Pigs operation in 1961, which served only to strengthen the already-entrenched Castro regime in Cuba.

Second, the level of public concern with and opposition to U.S. policy in Central America is much higher today than it was with regard to Guatemala in the 1950s and Chile in the 1970s. A more skeptical press and public, and a more cautious Congress, have made the subversion of foreign governments more difficult. Too, in the Central American context, the changed role and position of the Catholic Church should not be underestimated. The Church had little to do with events in Guatemala and Chile. It has much to do with events in Central America in the 1970s and 1980s.

The Reagan administration and the U.S. public should ponder the lessons of history. U.S. interventions in the affairs of Latin America, be they covert or overt, direct or indirect, have achieved short-term goals, but also have led to long-term catastrophes. Intervention in Guatemala in the 1950s and in Chile in the 1970s produced regimes with which few U.S. citizens would care to associate. The same should not be allowed to occur in Nicaragua and the rest of Central America. New policy alternatives should be considered, including increased diplomatic efforts aimed toward negotiation, alternatives which would better serve our national interest and at the same time be more consonant with the goals of democracy, freedom, and justice which are the great legacies of our own revolutionary experience.

Richard Walter is chairman of the Washington University history department and is considered an expert on Latin American culture.



Washington University Magazine
(USSN 0162-7570)
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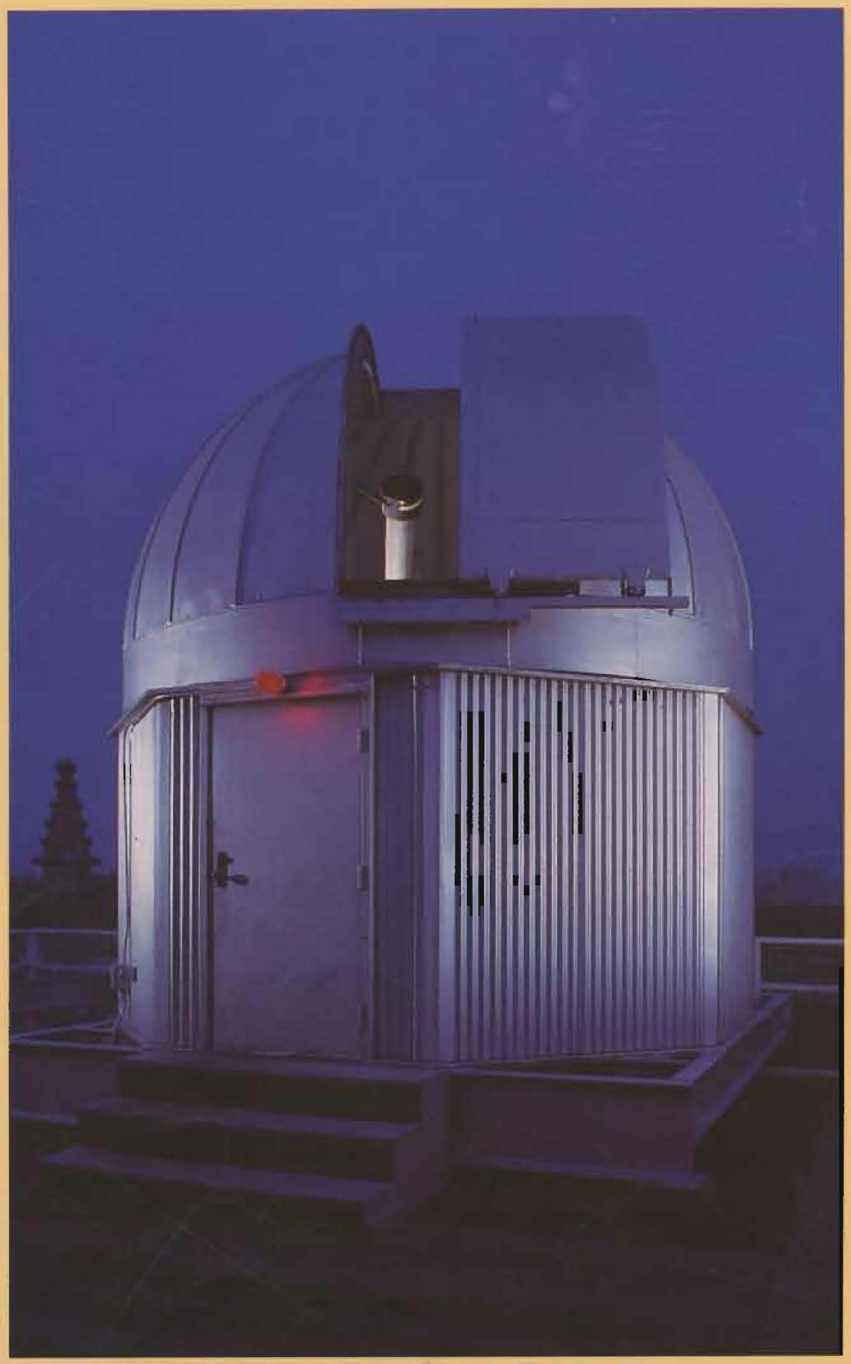

The Washington University observatory on Crow Hall