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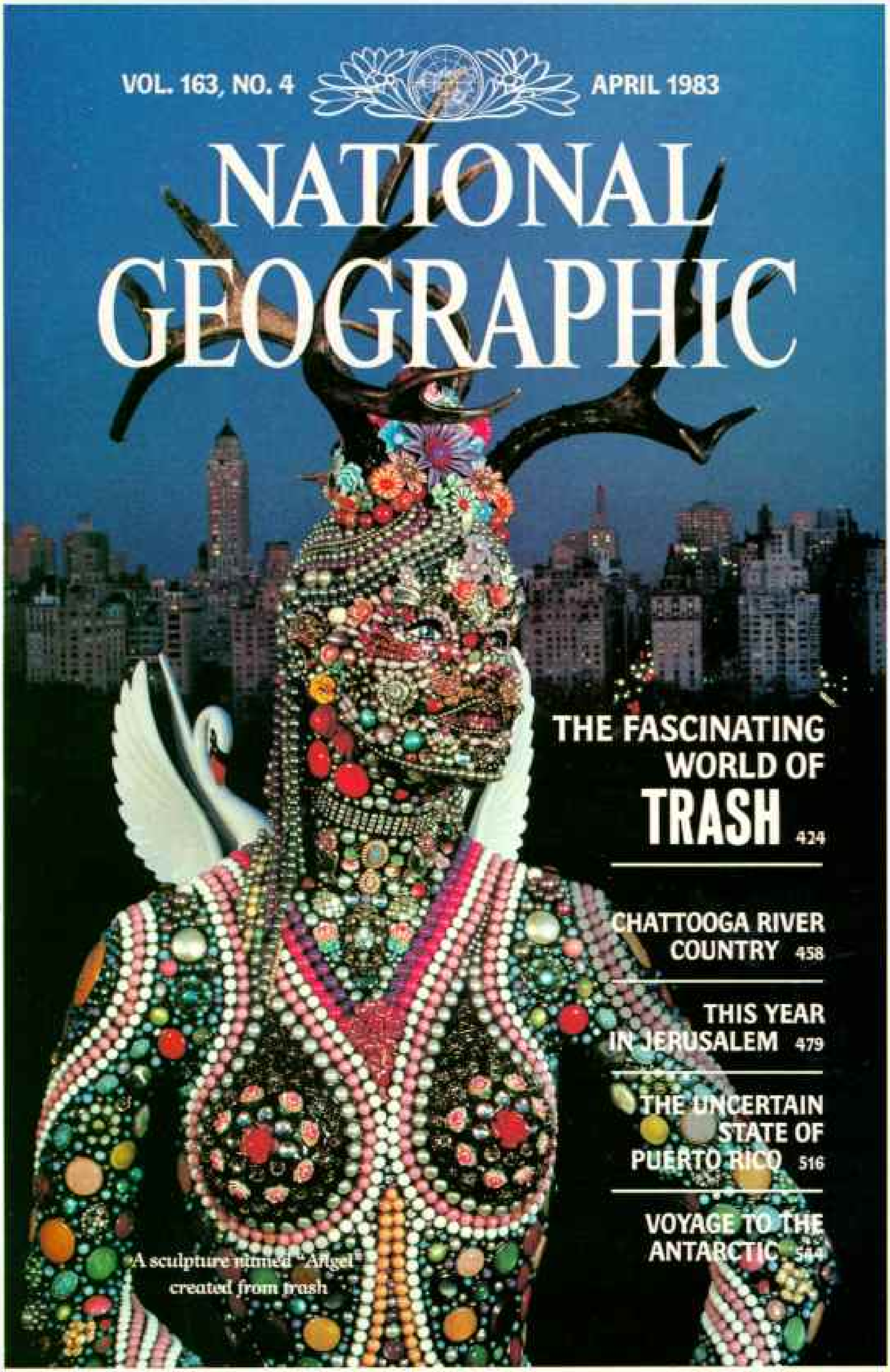

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A sculpture nimed "Angel" created from trash

SEE "BORN OF FIRE" WEDNESDAY, APRIL 6, ON PBS TV

IT IS WINTER, and I am making my first visit to the old and holy walled city of Jerusalem. Barely have I passed through St. Stephen's Gate and onto the Via Dolorosa when a young boy smilingly greets me, snatches my pen from my pocket, and runs up a steep path and out of sight.

Forget the pen. The real loss is the fine edge of joy, of celebration—even of innocence—I have honed for this long-awaited little pilgrimage. Cynicism quickly dulls the excitement and turns my thoughts to pickpockets and thieves. I resent the hustling merchants who now jam Christ's tortuous path to Golgotha with their trinkets and souvenirs. They evoke for me the story of the money changers Jesus chased from the Temple. Historical markers remind me that this holy city has always been home to a succession of very human protagonists. Probably more of its citizens have been robbed, uprooted, and slaughtered over the centuries in the name of religion than those of any other city of comparable size on earth.

And yet it is Jerusalem: sacred to three religions and a crossroads of caravans and conquerors throughout history.

In only minutes I walk from a visit to the great golden Dome of the Rock mosque, past Jewish Sabbath worshipers at the Western Wall, to join a Christian service in the Church of the Holy Sepulchre. All the petty pickpockets and assassins of the centuries cannot dim the magic of this ancient city.

The pen is soon forgotten, the thief as well. And the emotional experience is probably all the deeper for having grown from a quick flash of cynicism.

In "This Year in Jerusalem" in this issue, National Geographic photographer Jodi Cobb brings us a sensitive look at both the old and the new city. Associate Editor Joseph Judge distills his long association and fascination with Jerusalem into a beautifully written and passionately objective account of an area that once again is the focus of a festering religious and political confrontation.

Wilbur E. Garrett

EDITOR

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COVER: *Creating art from recycled trash, Larry Fuente fashioned a figure he calls "Angel." Photograph by Louie Psihoyos.*

The Fascinating World of TRASH

By PETER T. WHITE
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by
LOUIE PSIHOYOS

Star-spangled refuse—including even a kitchen sink—
is barged past the Statue of Liberty for burial on
Staten Island. Though energy, materials, and even treasure
are extracted from garbage, the major problem
remains: Nobody wants a dump next door.

WHEN I FIRST HEARD of it, I could hardly believe it—that after the garbage is collected twice a week in the city of Tucson, some of those big plastic bags are opened and the contents painstakingly examined, classified, weighed, and recorded by students from the University of Arizona.

"Why not," said William Rathje—an anthropology professor with a doctorate in archaeology—when I got there. "Archaeologists study ancient garbage to learn about past civilizations. Here we look at our own refuse to learn about our own civilization, in terms of the behavior that produces the things we throw away. Our trash is the unvarnished imprint of our life-styles."

And now I'm at a sorting table in the Tucson Sanitation Division's maintenance yard with apron and rubber gloves, the Garbage Project's code list, a scale, and a cheerful senior named Amy. It's the beginning of my months-long inquiry into refuse and its role in contemporary societies that will reach, eventually, around the globe.

But for the moment I'm sticking to garbage made in the U.S.A. Amy calls out code numbers and cryptic descriptions, and I write these on a recording sheet for the Garbage Project's computerized data bank.

"033, crackers . . . one item, brand Sunshine, type saltines, composition D." It's an imprinted plastic wrapper, hence D for plastic. "095 . . . one item, brand Wendy's, type hamburger, composition A." This wrapper is paper, and 095 stands for takeout meals. Along with other 095s—a plastic cup, a wrapper for French fries—it's evidence of a trend: People increasingly bring home meals from fast-food places, says Professor Rathje. Tucson households now do so an average of twice a week.

After a while Amy and I switch jobs, and I get my hands on a baby-food jar and a ballpoint pen, a tuna can, a plastic toy duck, a few maggots. And a rotting dill pickle—Amy says whew, only diapers and spoiled chicken smell worse. The pickle produces an entry of 123 grams in the column marked waste; similarly lettuce, dark bread, longhorn cheese—not scraps but chunks of food, even beef. "When beef prices were rising sharply," says Professor Rathje, "even more of it was wasted." Any reason? "People experimented with cheaper cuts and didn't like them, or didn't fix them properly. Or they stocked up too much and the meat spoiled."

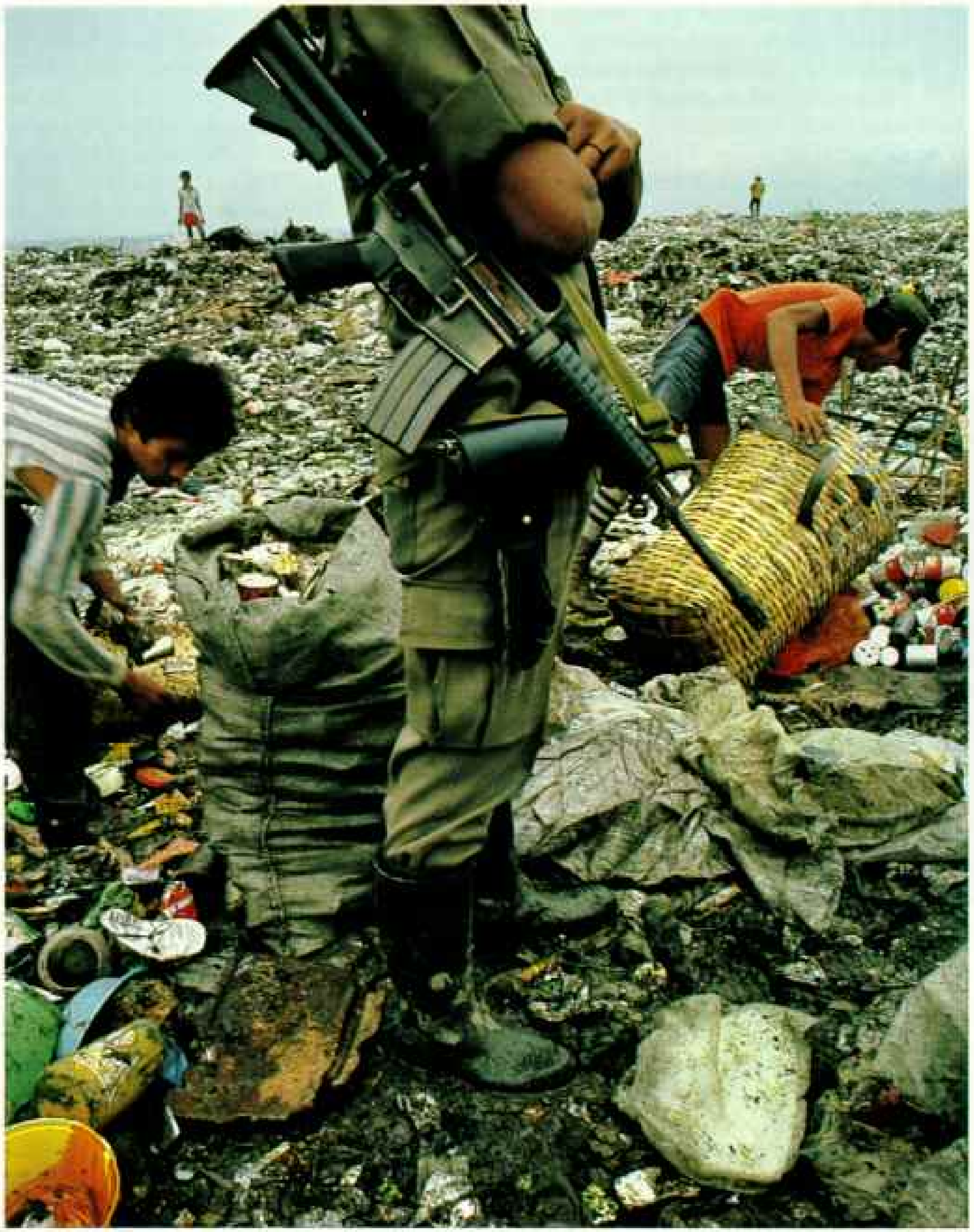
The garbage we examine is grouped by individual households, but, for the sake of individual privacy, these are never identified by name or address; instead, the recording is done by census tracts, carefully chosen because they are inhabited by identifiable socioeconomic groups. Thus it was possible to report that some low-income Mexican Americans in Tucson buy more vitamin pills and educational toys than middle-income Mexican Americans and Anglos. Or—after interviews with householders in a specific area—that while only one family in four admits to drinking beer at home, beer cans turn up in the refuse of three out of four.

And so I can see that what Amy and I have been doing, when it's done systematically and long enough, can provide social scientists with solid evidence of patterns of behavior. As Professor Rathje puts it, "People will tell you what they do or think they do, or what they want you to think they do. Garbage is the quantifiable result of what they actually did."

Garbage in—sociology out. *Sorting trash from Marin County households in California (**left**), students participate in the emerging discipline nicknamed "garbology," which seeks insight into human behavior from an analysis of what people throw away. Studies in California and elsewhere are directed by Dr. William L. Rathje (**above**) of the University of Arizona, who says, "What people say they throw out and what they actually do can be two different things."*

Discard a button, *bead, or other bauble, and Larry Fuente of Mendocino, California, may use it. "Angel," at right and on the cover, wears dolls' heads, bands of beads, a deer-antler tiara, and porcelain swan wings. Scouring dumps, beaches, junk shops, and surplus stores, he created, from top left: a*

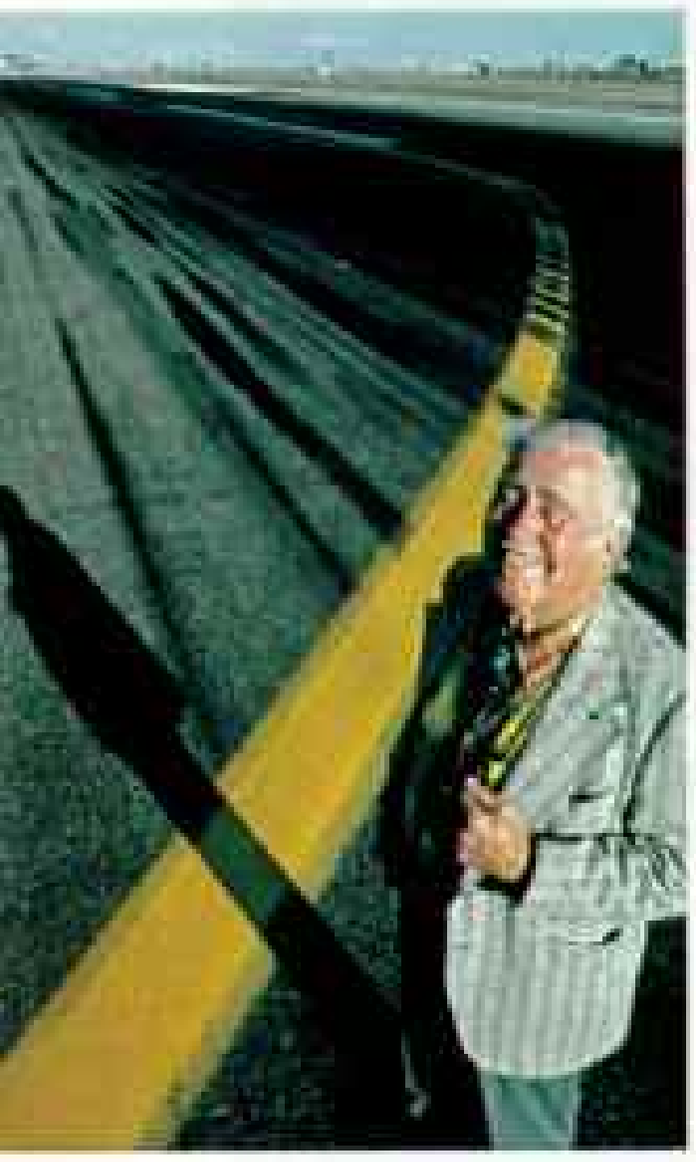
sculpture of shoe soles, a sailfish with Indian Army Gurkha knives tipping its sail and a samurai sword in its mouth, a refrigerator covered with ceramic tiles, and a lamp made from a bomb casing. The "Holy Cow" pokes its nose through the doorway. Fuente's eclectic creations sell for thousands of dollars.



Scavengers *look like fire fighters as smoke from spontaneous combustion billows from Manila's Balut Island refuse dump* ***(left)****, a mountain of household trash 200 feet high that is gradually edging into Manila Bay. Municipal authorities, who plan to close the dump in the next few years, are searching for alternate sites.*

Meanwhile, scavengers who make their living from the dump fill bags with cans ***(above)*** *for sale to contractors who have obtained salvage rights to the dump. A Philippine Army soldier with an automatic rifle and a pistol stands guard.*

DICTIONARIES define garbage as food waste, refuse, trash, material that's useless or unwanted; the mayors and county officials responsible for dealing with what their constituents throw away call it municipal solid waste. Trucks haul it to be buried in what used to be dumps but now are sanitary landfills—so-called because each day's addition is to be covered with an odor-and-vermin-preventing layer of earth. Once such a landfill is full, another must be found, or some acceptable alternative. That's become a nationwide headache lately, and how American communities have been striving to alleviate it—how we deal with our garbage—reflects notable national traits, as we shall see. Also a certain penchant for the lighthearted approach. Where but in America would a town spray its garbage cans with disinfectant carrying a subtle scent of lemon or vanilla, as Beverly Hills does? Or build floats for an annual trash parade and pick a garbage-bedecked beauty to be Miss Dumpy, as in Kennebunkport, Maine?



Alas, the basic problem has long been serious enough. Americans increasingly cluster in big cities with burgeoning suburbs—two in five now live in 39 such metropolitan complexes housing a million people or more—and while nobody can say precisely how much municipal solid waste these turn out, it's clear that each complex must contend with at least a thousand tons of it day after day. Increasingly, too, those garbage trucks must go farther afield as suburbs become more crowded, and the last thing suburbanites want is a new landfill nearby.

In 1971 Max Spendlove, a research director with the U. S. Bureau of Mines, popularized the term "urban ore." All the tin cans, wire coat hangers, bottle caps, pots, alarm clocks, electric knife sharpeners—almost everything the housewife chucks out, he said, is rich in iron, aluminum, copper, zinc, tin, lead, brass. "We can mine all that stuff. Our refuse is richer than some of our natural ores." Spendlove called it a phenomenal resource. Soon widespread publicity asserted that there was indeed treasure in trash, gold in our garbage.

Enthusiastic engineers adapted ore-processing machinery, conveyor belts, screens, huge hammers, shredders, and magnets to separate ferrous metal. Also blowers, to waft lightweight material—paper, plastic, leather, rags, leaves—up and away so it could be made into fluffy RDF, or refuse-derived fuel, for burning alone or with coal in conventional power plants, precious energy! Also oxygen-starved, high-heat combustion chambers, where a process called pyrolysis would break down organic waste into solids and gas; as the gas cools, some of it condenses into an oil-like fuel, highly viscous and relatively low in sulfur—more energy. Best of all, the need for new landfills would be drastically reduced.

Fired-up salesmen from chemical and aerospace companies envisioned a major new growth industry and made bold promises: If we can get to the moon, we can help you get rid of your trash, and you'll make money at the same time! Local government officials were eager to be convinced; squeezed between growing garbage-disposal costs and pressure from landfill-resisting voters, as well as from ecology-minded people worried about a scarcity of resources, they could see "resource recovery" as a politically attractive way out. Pliant consultants supplied encouragement

Brittle as a windowpane, *a tire frozen in liquid nitrogen shatters under a blow by Dr. Norman R. Braton of the University of Wisconsin* ***(right)****, dramatizing the experimental cryogenic pulverization technique for reclaiming rubber. The nation junks some 200 million tires each year. Recycled rubber reacting with hot asphalt in a process developed by Charles McDonald* ***(above)*** *lends elasticity to an airport runway surface in Phoenix, Arizona, thus preventing cracks.*


THE COWBOY
FILING SUPPLIES

—after all, wasn't Washington financing feasibility studies and demonstration plants? It was the American dream in action. Optimism, faith in big-scale technology, due consideration for wishes of the electorate. . . .

The reality was sobering. Big resource recovery plants suffered delays, breakdowns, and continuing financial loss. In Milwaukee the RDF from its 1,600-ton-a-day plant produced too much slag in the electric company's boiler; operation was suspended, and the matter wound up in court. The 1,800-tonner for the Bridgeport area in Connecticut couldn't consistently turn out enough of its Eco-Fuel II; the operating company went bankrupt. Baltimore's 1,000-ton pyrolysis plant never functioned properly; it was abandoned.

BY 1981 nobody talked much about gold from refuse any more. (For a notable exception, see page 441.) What had gone wrong? I thought, well, first I'll go see something that went right, after years of trying, in Saugus, Massachusetts.

"It's unique—it works and it's making a profit," says a vice president of RESCO, the Refuse Energy Systems Company, in his 13-story-high building painted sky blue with smokestack to match. He gets refuse from 850,000 people, two districts in Boston and 16 suburban communities (Stoneham, Malden, Revere . . .) and burns it all as it comes along. Out of an average 1,200 tons a day, he says, only 200 tons go out in solid form—ash residue and scrap metal. The rest is steam, sold for cash. Isn't that wonderful?

From the cab of a crane operator high above the 200-foot-long receiving pit, I look down on a veritable Grand Canyon of trash where the trucks disgorge their loads. The crane man carefully chooses what he transfers, about seven cubic yards at a time, into the feeding chutes of the two refuse boilers. He seeks a good mix. A truck just dumped a very wet-looking load, so his next swing will include a lot of paper. "We're getting buried today," he says. "Boiler number two is down now for annual inspection."

Through a thick glass porthole I peer into boiler number one at a flat and fiery landscape, dark orange, yellow, silvery white. Black particles swirl up, float down. Periodically there's a jerky movement, a little earthquake—it's the grates making the burning mass move, on a gently downward slope, toward me. A disquieting shape jerks closer. What *is* this?

Must be a shopping cart from a supermarket, says the plant manager. A store detective was here looking for carts, they cost $100 apiece; people walk home with them and eventually get rid of them in one of those big communal collecting bins. More jerkings, and the mangled cart drops out of sight. Here comes a refrigerator. . . .

The boiler's 60-foot-high walls and ceiling are a mass of steel tubes. The heat turns the water inside them into steam, and that's piped to a General Electric plant less than a mile away, across the Saugus River.

How much does RESCO get for the steam? Sorry, I'm told, can't discuss that, but it would barely cover expenses. And for the scrap metal? "Very little, there's no dependable market." The plant's revenues come primarily from what the trash trucks must pay—the so-called tipping fee, $17 a ton, 7.4 million dollars a year. Herein lies a hard-learned truth: Whatever the treasure in trash, it isn't the materials or the energy one might get out of it—it's mainly what one can collect for just getting rid of the stuff.

LIKE DATING BEHAVIOR and the price of gasoline, the ways and costs of getting rid of garbage in the United States have changed considerably within living memory. A small-town former fireman tells me: "We had a dump and we lit it every Saturday afternoon. You got good volume reduction, and it sterilized a lot of what was left. You got a little smoke, but it was safe." You can't light dumps any more—too many people object, including

Blemishes on the Big Apple. *When teamsters who pick up New York City's commercial garbage went on strike in December 1981, disposal bags filled the streets. Seventeen days and some 150,000 tons of garbage later, the strike was settled in time for a litter-free Christmas.*

the Environmental Protection Agency.

The New York City apartment house I lived in 30 years ago, like thousands of similar buildings, had a chute with an opening on each floor and a little incinerator in the cellar. Most of these had to stop—too much smoke. New York built 13 big incinerators, enormously efficient. But by 1981 the Clean Air Act had closed all but three; to meet the prescribed emission-control standards would have cost too much.

And now I'm driving in New York City's Borough of Richmond—that's Staten Island—past a housing development called Village Greens. Those houses were built around 1970 and bought in the belief that the gigantic landfill nearby, known as Fresh Kills, would soon be full and therefore closed. The real estate salesman said so. But no. Fresh Kills—3,000 acres, the biggest landfill in the world—still is fed around the clock by its remarkable garbage transportation system.

Trucks at special piers in the Boroughs of Manhattan, the Bronx, Brooklyn, and Queens dump into barges. Tugs pull these to Fresh Kills. Wagon trains hitched to tractors lurch to the "active face"; bulldozers push wave after wave over the edge of a trash cliff 20 feet high—some 10,000 tons every day except Sunday. "We advance a hundred feet a day, on a 200-foot front," says Arthur Fama, the man in charge. Two stars on his cap denote his rank as a Sanitation Department assistant chief.

To my nose, this repeatedly compacted garbage exudes surprisingly little odor—if anything, it's slightly acid, as if coming from dusty pickles. Spots of color stand out in the brown-gray mass: deep blue, scarlet. I take a closer look—those are bits of cloth. Probably from the garment center, says Fama, in lower Manhattan. A good deal seems to be organic matter, mostly food waste. Sea gulls pick at it. What's the best thing he's ever found here?

"Three thousand dollars," he says. "A lady phoned from Chinatown, she'd hidden her money in a Kleenex box and threw it out by mistake. We knew what truck must have picked it up, so we could tell the barge, and from that more or less where it went. She sure was happy."

Fama is testing a possible replacement for his bulldozers—an extra-heavy vehicle on big steel wheels with spikes that bite into the

Pride in his work *and a passion for pigs characterize Leonard Stefanelli* ***(left)*** *of Sunset Scavenger Company, which collects San Francisco garbage. In addition to this plaster pig, Stefanelli keeps two live pets in a pen behind his office.*

"I was never ashamed to be a garbage man," says Stefanelli, who began working on a garbage truck after high school and eventually became president of a company regarded as a model in the industry. Sunset offers shares to its workers, who thereby reap profits as well as job satisfaction. Sunset also contributed to a landfill on a 700-acre site in nearby Mountain View, now landscaped as a park with a golf course, riding trails, and lakes.

Cocooned in heavy butyl-rubber suits, employees of Ecology and Environment, Inc., play volleyball ***(right)*** *at a training course in Atlanta. The game helps them get used to the cumbersome garments, worn in such health-threatening situations as the cleanup of toxic wastes in dumps or landfills.*

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refuse, to compact it further. "With those we should get 30 to 40 percent more life span."

How long, then, can Fresh Kills take it? From the senior city official closest to solid waste, deputy sanitation commissioner Paul Casowitz, I get another revelation. "Landfill is like soft luggage, you can always put in a little more."

At Fresh Kills it looks as if it will be a lot more. Another landfill—8,500 tons a day, in Brooklyn—must close because the site belongs to the National Park Service and the lease is up in 1985. A 226-million-dollar refuse-burning plant designed for the old Brooklyn Navy Yard has been approved—for the moment at least—but opposition from upset residents nearby continues. Before long, Fresh Kills may have to absorb 22,000 tons a day.

It'll take some fancy engineering; the more weight on top, the more liquid seeps out below—so-called leachate, potentially a most unsavory brew. It must be intercepted and neutralized, lest it contaminate the groundwater. Poisoned aquifers and endangered drinking water are now emblazoned on the battle flags of anti-landfill forces across the country.

"We may have to spend 200 million dollars at Fresh Kills," says Casowitz, "but we could go to 500 feet." That ought to take care of all New York City refuse at least until the year 2000. What to do eventually with a garbage mountain 50 stories high? Who knows, maybe my grandchildren will practice downhill skiing on Staten Island. . . .

PROPERLY COVERED garbage serving as a foundation, so to speak, for healthful recreation is not, in fact, all that unusual.

In New Jersey the once notorious Hackensack Meadowlands, a wasteland of awesome extent, has been turning into a huge sports complex as well as apartments and offices; the latest addition is a three-million-dollar environmental study center. And should you be driving into the city of Virginia Beach, Virginia, on Highway 44, you'll pass a sign marked Mount Trashmore. That's become a recreation spot too: on top of old Trashmore the Cape Henry Women's Club lights its Christmas tree.

Just the same, I was astounded by the combination of garbage-generated benefits along San Francisco Bay.

World's largest *compost pile, the Netherlands' VAM, or Waste Treatment Company, facility at Wijster* ***(above)*** *receives about a million tons of refuse a year. Piled in long windrows* ***(facing page)****, some of the refuse gradually decomposes into compost. After inert items are separated, the compost* ***(below)****—totaling approximately 125,000 tons a year—is sold for farm and garden uses.*

A prototype recycling plant at the site separates raw refuse into its constituent materials. When functional, the plant will produce annually 20,000 tons of paper, 3,000 tons of iron, 6,000 tons of plastics, and provide 70,000 tons of organic material for composting.

Why is the affluent city of Mountain View (population 60,000) happy to receive all the garbage of San Francisco, 32 miles away—some 2,250 tons a day? "We're paid $3.32 a ton," says the mayor; the filling of former floodplain is extending the city's desirable open spaces by hundreds of acres.

What about those thick clay dikes within the landfill, enclosing four irregularly shaped depressions into which no garbage has been dumped? Those, said the man from public works, will form the four lakes of Mountain View's new 6,755-yard, par-72 golf course designed by Robert Trent Jones II. They'll tee off this spring.

And what's that bunch of steel cylinders and struts nestled into another depression near the 13th fairway? It looks like a tiny oil refinery. Ah, that's for the gas: more revenue for Mountain View.

Thereby hangs a tale of biochemistry. Landfill gas is mainly methane—CH_4; so is the so-called natural gas from fossil sources, but here the CH_4 is produced inside a covered-up landfill by bacterial decomposition of moist organic matter in the absence of air. Pure methane is odorless, but landfill gas can have a bit of a rotten-egg smell. It's flammable. When mixed with air in 5 to 15 percent concentration, it's explosive. And it can migrate through soil. In Cherry Hill, New Jersey, it killed vegetation in the backyards of 28 houses, accumulated in basements, and caused two fires in 1971. An explosion of methane that had seeped from a landfill killed two men working in a tunnel after one of them had struck a match to light a cigarette.

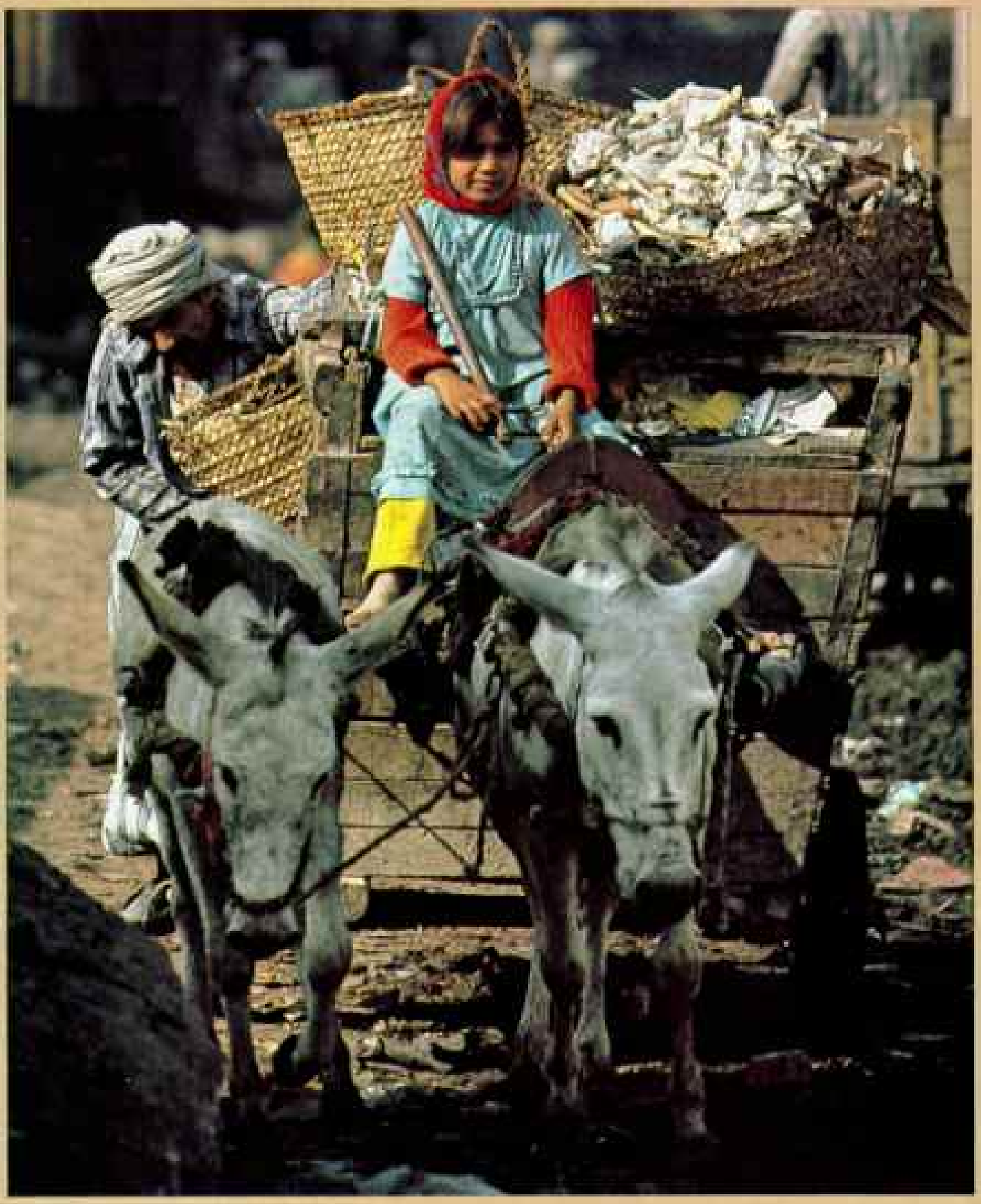
Proper venting of landfills does away with such danger. Moreover, gas wells can extract methane by applying a vacuum to draw it out, in the manner of a drinking straw. After removal of moisture, purifying, and compression, it can be piped into existing commercial networks that bring natural gas to customers for cooking, heating, and air conditioning. This is already being done in a dozen places; at least 1,000 of the 15,000 sanitary landfills in the United States are big and deep enough to yield sizable quantities of methane. Mountain View feeds into the Pacific Gas and Electric (PG&E) system, which supplies numerous bay communities including San Francisco.

"Please stress that our biogas is as clean and good as required by industry standards," says the expert from PG&E. He also supervises experiments at Mountain View to learn how to increase the gas yield. Separate landfill cells are injected with varying mixtures of moisture, antacids, and sewage sludge to help bacteria break down more garbage faster. Each cell is monitored, and the garbage enhancement outlook is bright. "But it's like an oil field; you can't be sure how much you've got or how long it'll last." Mountain View should be good for at least 20 years.

And so, while San Francisco's dumping contract expires in late 1983 and won't be renewed, its old garbage will go on bringing income to Mountain View. Now picture this: A lady on Nob Hill enters her kitchen to make tea; she turns on her gas stove. Those little flames, that gas, could conceivably come from garbage she threw out herself.

SOMETHING SIMILAR and less farfetched is in fact occurring on a gigantic scale in the People's Republic of China. My GEOGRAPHIC colleagues Mike Edwards and Bruce Dale glimpsed it recently in *(Continued on page 447)*

Urban ore *at its richest, sewage in Palo Alto, California, yielded a million dollars' worth of precious metals in 1981—a nine-year residue from electronics-plant waste, here represented by its equivalent in gold and silver bars (**right**). Some see more promise in converting trash to energy. At the National Bureau of Standards scientists study the combustion characteristics of refuse-derived fuel (**above**) to formulate guidelines that industry needs to exploit this neglected resource.*



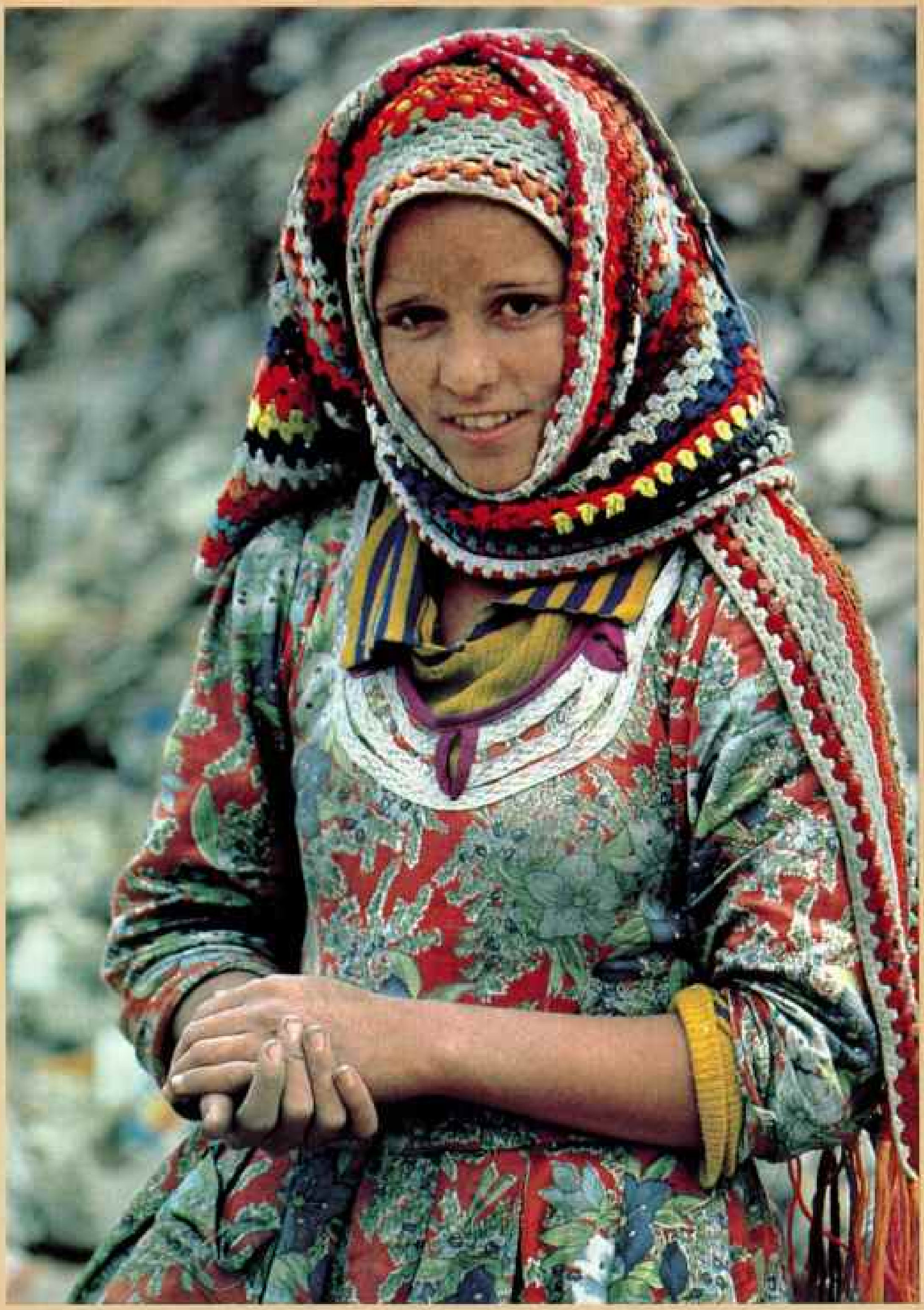
A Cairo community lives on trash

PURGATORY of human debris greets Cairo's traditional garbage collectors, the zabbaline, *as they return home each evening, their donkey carts overflowing with trash* (**above**). *As happens in many developing countries, these rural immigrants, mostly members of Egypt's Coptic Christian minority, accepted the lowly task of urban scavenging for a livelihood and raised their trade to a vital public service. Living with their rubbish* (**right**), *which they sort for resale, Coptic zabbaline draw spiritual sustenance from their faith. This Coptic cross* (**left**) *was made from appliance parts.*

COMMODITY MARKET, zabbaline style, returns Cairo junk to the consumer in a highly efficient system that costs the city nearly nothing. Flattened and baled, cans ***(left)*** *are sold to craftsmen for recycling into gleaming new wares* ***(below)****. The zabbaline actually pay garbage brokers for exclusive rights to certain collection routes, high-income neighborhoods being the most desirable. Men and children collect, while women stay home sifting and sorting the booty into great piles of paper, glass, textiles, bones, and metals. Food waste is reserved for feeding to the broods of pigs that Coptic families raise for their main cash crop.*

THE HUMAN COST for Cairo's low-priced waste disposal is high. Since inflow exceeds outflow, the live-in zabbaline dump yards consume ever more land, forcing the squatters periodically to overstep their borders to erect new homes. When that happens, government bulldozers may leave angry crowds ***(left)*** *and grieving families* ***(right)****.*

Objects of scorn by most Cairenes, the zabbaline suffer not only exposure to disease but also a lack of schools, health care, and other municipal services. A World Bank study has encouraged civic action to provide such basics as water lines and a composting plant to relieve waste buildup.



RAGS TO RICHES, the recycling of discarded fabrics into new products, such as this colorful shawl worn by a young Copt, is another contribution of the Cairo system. Though Egypt's relaxed import policies are diminishing Cairo's appetite for certain recycled goods, a trash-weary world might take a lesson from the zabbaline devotion to resource recovery.

(Continued from page 440) Shanghai: Garbage from an apartment-house bin is conveyed by a miniature tractor to the outskirts and into an agricultural commune's digester, a methane-producing pit already stocked with weeds and rice stalks as well as animal and human wastes; out go thin, clear plastic pipes to little ring burners in individual kitchens. A man turns the spigot, strikes a match, and puts the kettle on. Different society, different technology.

In Denmark the refuse is collected in moisture-resistant paper sacks. "Better than plastics," I'm told. They allow moisture to evaporate—less weight for the garbage man. He brings a new sack when he takes the full one away to one of the ubiquitous incinerators; the heat they generate makes steam to keep houses warm within a 15-mile radius.

Big garbage-burning plants function in cities across Europe, and quite a few supply heat to residential areas, notably in West Germany, the Netherlands, Sweden, Switzerland, and France. On the southeastern edge of Paris I visit the plant at Ivry; it looks just like the one at Saugus (actually the plants employ technology licensed respectively from Germany and Switzerland), but Ivry is bigger. Along with two smaller plants, it burns all the garbage of Paris and sends steam to an area covering more than half the city.

Steam pipes were laid not long ago beneath several streets near the Opéra, and in a cellar a chatty concierge proudly presents the shiny red gadgetry now servicing her six-floor apartment house. "Our hot water is much hotter than before," she says, "and it costs no more than the coal did." Nearby the trash chute disgorges into a big plastic bag—the trashmen, she says, come in to pick it up before seven every morning, including Sunday.

Really? I tell her that where I live, in northwest Washington, D. C., they come only once a week. For a moment the lady says nothing. But my notebook records: "Odd look—'Oh, you poor barbarian.'"

MORE notebook jottings from abroad:

• West Berliners grumble, say city paying too much to East Berlin under current agreement with Communists to accept Western garbage; it's trucked through special crossing point in Berlin Wall at Kirchhainer Damm. No East Germans yet sought escape to West through garbage gate, but 19 trucks found fitted for cigarette smuggling; buying in East Berlin's hard-currency shops yields profit of about four dollars a carton.

• Moscow garbage drops from apartment-house chutes through disk valves into underground vacuum pipeline, moves at 60 to 80 feet per second to central collecting station. Department of Municipal Purifications won't say how extensive this system so far; six-mile version under construction in Leningrad. A similar system operates in Walt Disney World, Florida.

• Japanese ways with trash impress visiting Americans. Walter Cronkite, CBS: They've developed what they call the technologically most advanced recycling plant in the world. . . . Harvey Alter, solid waste and recycling expert, U. S. Chamber of Commerce: They don't just experiment with pilot plants, they build the full-size thing—if it doesn't work they retire it. . . . Flip side of Japan's high-tech resource recovery: Small Tokyo entrepreneurs collect newspapers, magazines, cartons door to door, in exchange for rolls of fresh toilet paper. They call themselves *chirigami kokan*, toilet-paper exchangers.

TRAVEL IN ASIA, South America, and Africa sooner or later brings striking encounters with refuse and what's done with it. I'll never forget what I've seen in Calcutta—half-naked men toiling through the night to boil carefully collected animal bones in great vats, to get the fat out; in a cavernous shed bursting with boiled bones, noisy machinery grinding, sifting, and grinding again, exceedingly fine, for fertilizer. . . . And people sitting on the sidewalk patiently washing used coal, so they can sell what's left; it can still be burned.

A solid-waste consultant back from Sri Lanka tells me what he saw when the trucks reach the dumps of Colombo, the capital. The people rush forward first. Then the cows—ahead of the pigs and the goats because they're bigger. Last, the crows.

A miserable way of life? Undoubtedly, in many ways. But these scavengers of all ages,

Something fishy *is happening in Kennebunkport, Maine, where young women are lowering their standards of dress to vie for the title of Miss Dumpy in the town's notorious Dump Festival. Turned out in fishnets and grapefruit skins for the 1981 event, Jane Bergeron* ***(above)*** *placed second, after Frederica Foley (****facing page****), the most repugnant of all in a seafood sash of questionable vintage.*

"We're honoring the importance of the old-fashioned town dump," says festival founder, Ed Mayo, "and spreading the word that litter belongs at the dump, not along the road."

scrambling to find something useful in the garbage of Manila, Jakarta, or Lahore, are basically different from those lone and furtive "bag ladies" haunting the urban centers of the United States and Western Europe. These people move with self-assurance; they do have a place in their societies—a far from desirable place, but not necessarily one to be ashamed of.

The administrator of UNDP, the United Nations agency aiding developing countries, estimates that in many Third World cities "one to 2 percent of the population is supported directly or indirectly by refuse from the upper 10 to 20 percent." He adds: "Present systems frequently provide the only entering level of employment for new urban dwellers emigrating from rural areas."

Samples of present systems: In Medellin, Colombia, every morning hundreds of scavengers converge on the "third mountain"; from a daily trash input of some 500 tons, about 30 tons of paper, clothing, cans, and glass jars are picked out, cleaned, and sold. In Mexico City thousands reportedly pay to belong to the scavengers union headed by a member of the Mexican Congress; some pay again to overseers at the big dump, to get a good spot.

And in Cairo certain communities made up primarily of Coptic Christians make their living by collecting, sorting, and variously using much of the city's household garbage. These people literally live amid the refuse they work with (pages 442-6). "Unhealthy," says an observer from the World Bank, "but one of the most efficient human endeavors anywhere."

BACK HOME I look with renewed interest at what's in American garbage cans. By weight, experts say, it's about 30 percent paper, 10 percent glass, 10 percent metal, 6 percent plastics; no more than 15 percent is food waste. When you add it all up, and allow for perhaps a quarter of the paper being newsprint and magazines, roughly 40 percent of the American household refuse turns out to be packaging material.

About 16 percent is yard waste—grass cuttings, leaves; nobody gets too excited about that. It's all that discarded packaging that makes the conservation-minded among us deplore our throwaway society, our

wastefulness in the face of limited resources. We must change our life-style, says the League of Women Voters; let's raise our recycling consciousness.

We certainly do throw away a lot of potentially useful stuff, quite irretrievably. But what also impresses me is how much we are already recovering and how widely it's reused. Consciously or not, most Americans live literally surrounded by recycled material. In the home, it's the gypsum board for the inside walls, tar paper for the roof, thick waxed paperboard under hardwood floors so they won't squeak. In the car, it's the glove-compartment panels and stiffening for the sun visors, door panels, and backs of the upholstered seats—50 to 200 pounds of it.

All this is partly or wholly manufactured from wastepaper. From what was in the wastebaskets of business offices. From cardboard cartons out of the storage rooms of supermarkets. A big proportion of the supermarket packaging on display is recycled paper too: Open a cereal box; if the inside is gray, it's largely from old newspapers.

Take glass. Of the 46 billion bottles and jars produced in 1981, one in 15 was eventually crushed to bits and melted down along with fresh material to make new bottles and jars. And if you buy beer or a soft drink in an aluminum can, chances are better than fifty-fifty that your can was made from other cans; the time between its leaving the factory and dropping into the melting furnace once more may be only three months.

Two rules apply to recycling American style. Material had better be collected *before* it can get into garbage bags. And the operation must make sense in dollars and cents. For the fund-raising civic or church groups collecting old newspapers, for instance. For the dealers or brokers buying from them, to sell to a manufacturer. Especially for the manufacturer, if his orders are down or if he can't get waste material cheaper than so-called virgin material, he won't buy. And if somewhere along the line recycling doesn't pay enough, it won't be done, at least not for long. That's why the Environmental Action Foundation emphasizes to prospective collectors: Know your local markets.

You can, easily. Classified telephone directories in urban areas list dealers under "Recycling," usually also under "Wastepaper." I check wastepaper dealers around Washington, D. C. How much for a hundred pounds of old newspapers? That's a stack three feet high. One says 30 cents. Two others say sorry, don't want any now.

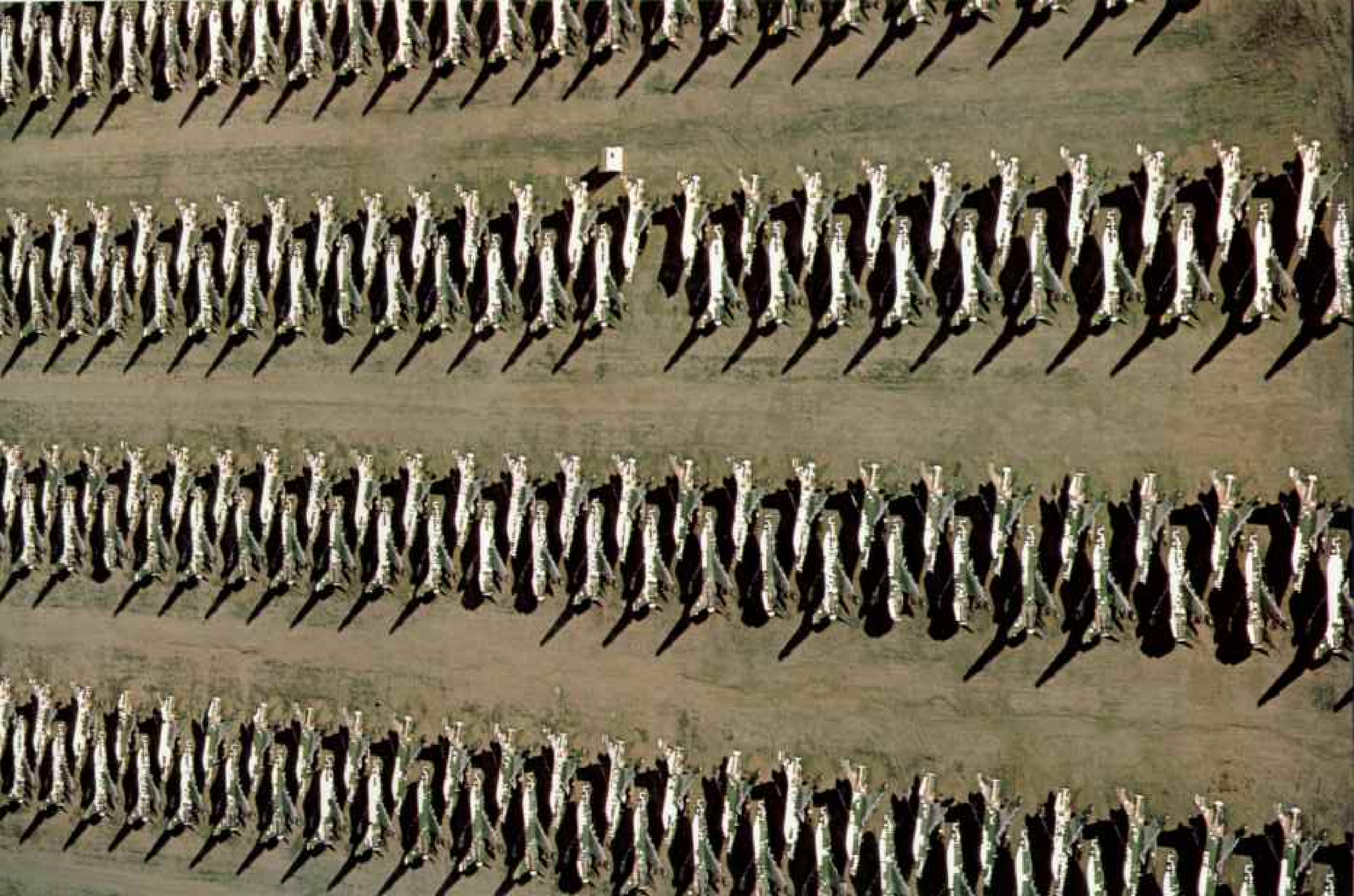
I make three calls to San Francisco: "62 cents. . . ." "$1.25. . . ." "$1.50, just went up." How come? Big order from Japan. I shouldn't have been surprised—that's how the market works.

One more suggestion—Don't throw out confidential records carelessly. Crooks rummage through garbage cans for carbons of credit-card transaction slips and use the information on them to order merchandise by telephone.

Conversely, law-enforcement authorities try trash surveillance on suspected crooks. It happened to Joseph C. Bonanno, Sr., of Tucson. From 1975 to 1979 his garbage yielded numerous incriminating handwritten notes. These led to a five-year prison sentence for obstruction of justice and provided clues for several major investigations of organized crime.

By the way, have you wondered what happens to refuse of the highest sensitivity,

***Ghost squadrons** of F-100 fighter-bombers crowd a storage facility for discarded military aircraft at Davis-Monthan Air Force Base near Tucson (**right**). The dry desert air preserves the airplanes as repositories for spare parts or even for recall to active duty. Some obsolete items, from C-47s to protective helmets (**above**), are sold to civilian contractors. In 1982 the sales and spare-parts programs returned $28 for every dollar spent in the base's storage budget.*



Monument *to our throwaway society, "Worlds Apart" provoked a storm of controversy during its four-month stay near Washington's Watergate Apartments.*

Thousands of appliances compose the work by sculptor Nancy Rubins.

from the White House and the CIA? It's shredded, reduced first to pulp and then to powder, and buried with assorted municipal solid waste in landfills in Maryland and Virginia.

THE U. S. LANDFILL headache is getting worse—so I learn when I ask the mayors of two dozen populous core cities about their refuse problems. For Philadelphia, Cleveland, Seattle—for the majority—the necessary new landfill sites are ever harder to find, ever more expensive. No problem, though, in Dallas: Within its gigantic perimeter lies a Texas-size landfill, presumed good until the year 2050; the tipping fee is $1.50 a ton.

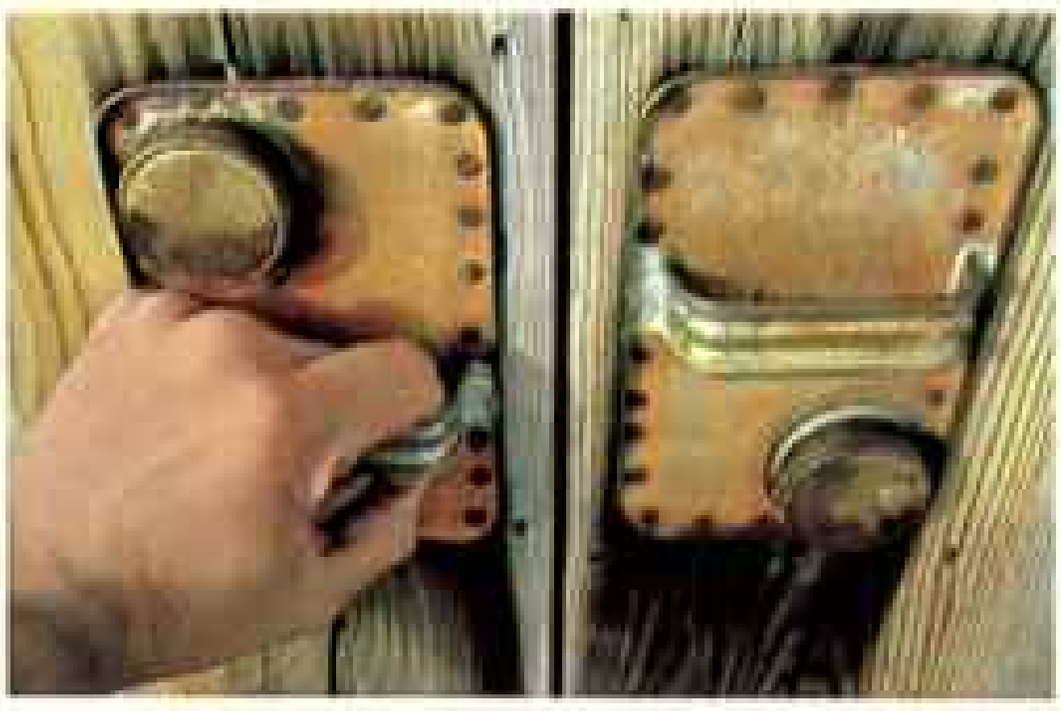
The mayors talk about a new wave of resource recovery plants, most of them on the Saugus model, to burn garbage and make steam or electricity—not to make money but just to keep disposal costs down. Those plants will be expensive to finance at current interest rates; tipping fees may go to $70 a ton. But the biggest stumbling block seen by a good many mayors isn't financial or technical—it's political. People want neither a landfill nor a resource recovery plant nearby; they'll fight the idea with passion. As Mayor Kathryn Whitmire of Houston puts it, "They fear they're being dumped on, and that their largest personal investment, their home, will be devalued."

I've sat through endless county council meetings—angry citizens versus planners and politicians. It's always the same, a county planner tells me. "The technical staff suggests a site, the citizens there oppose it. So the council says well, surely there must be a better place. . . ."

From the local politicians' perspective, garbage may be a good bargaining chip behind the scenes—take this landfill and you'll get a nice school.

"And while it's always tempting to use the siting decision for any public facility for personal political advancement," says Mayor George Voinovich of Cleveland, "when the facility in question involves garbage, the temptation is almost overwhelming." What could be a surer vote-getting gimmick than to champion the cause of people who're already fighting mad? Garbage can be a demagogue's delight.

***Symbols** of our consumer culture, disposable beverage cans represent a vast quarry of building material, according to architect Michael Reynolds, who uses them like bricks (**below**) at Rolor, a community of low-cost, experimental homes near Taos, New Mexico. His own house (**above**), built largely of cans and mud-packed tires, receives all its electricity from a rooftop wind turbine and photovoltaic cells. Constructed much like an Eskimo igloo, one of his skylit dome houses (**facing page**) provides a warm environment for community resident Diane Skurky and her son, Morgan. A 50-gallon drum forms the porthole window, while the tops of turpentine cans make convenient door handles (**below**). Designed for maximum economy, Reynolds' houses demand less than professional masonry skills and seem perfect for the do-it-yourself home builder.*



On the federal level our refuse is subject to certain political dynamics too. A veteran of environmental protection efforts during the late 1960s recalls: "Every publication we sent out said we'd be swimming in garbage by the year 2000. I believed it; I was out to protect America. Were those figures padded? Sure—you want to get your budget increased, so you talk about imminent peril, health hazards, whatever is sexy at the moment. Municipal solid waste was sexy for a while, then resource recovery. . . ." The sexy thing now, he says, is hazardous waste.

THIS IS a very special segment of the national refuse spectrum. The Environmental Protection Agency defines it as waste that's toxic, reactive, ignitable, corrosive, infectious . . . ; not a week passes without headlines about some old dump or landfill found contaminated with something presumed dangerous. There are incessant scientists' warnings, public protests, toxic-waste editorials, legislative initiatives, government directives.

Will this last? The old environmental warrior thinks not. Government can't pay attention to one problem for very long, he says; and industry has been quietly working to drastically reduce those dangerous waste products. With disposal costs sky-high, partly because of new legislation and court orders, it pays to produce less of the stuff and get rid of it efficiently.

Looking back at garbage in America over the past hundred years, one can see similar ways of dealing with it emerging again and again—bits of history seeming to repeat themselves, as Professor Martin V. Melosi of Texas A&M has documented: An insistent theme in influential periodicals of the 1880s and 1890s was that garbage is threatening public health, we must reform, ingenious engineering will help. Municipal refuse incinerators were the rage in American cities by the mid-1890s. In New York in 1903 useful items were picked from garbage passing by on conveyor belts. A trash-burning plant in Milwaukee produced electricity in 1913. . . .

As I write, there is news about that exceedingly dangerous refuse of our civilization—millions of gallons of radioactive sludge left when plutonium and tritium are made for nuclear weapons. For 30 years it has been pumped into underground steel tanks. Some of the tanks have leaked and must be replaced.

The newest solution is the world's most expensive refuse and processing plant: A billion-dollar furnace to combine that sludge with powdered glass; then let the molten mixture solidify in ten-foot-high canisters of stainless steel. Construction is to begin next year. *Where* will those canisters be buried? That has not yet been decided; in any case, it'll be thousands of feet underground.

What about garbage-disposal methods of the future? Two former Atomic Energy Commission scientists, William Gough and Bernard Eastlund, propose a "fusion torch": a gigantic plant employing nuclear fusion to reduce trash to its basic chemical elements, to ultrapure raw materials.

HIGH IN SPACE, mostly unseen by the naked eye, some 15,000 man-made objects are circling the earth. About 5,000 are constantly tracked by sophisticated technology: pieces of exploded satellites, nose cones, separated bolts, what NASA calls space debris. It's the refuse of man's most advanced endeavor—trash that may last longer than the pyramids of Egypt, longer than the human species, longer than anything else we know.

Or maybe not. I could hardly believe it when I heard it just now—an imaginative American aerospace engineer, Marshall Kaplan, envisions a scavenger satellite with mechanical arms controlled from the ground, to pick up orbiting junk that could be hazardous to space travel. A space shuttle would bring it back to earth from time to time so it could be emptied.

Imagine, a garbage truck in space. . . . □

***Civilizations clash** along the Nile, where the flotsam of our age mocks the timeless presence of the Great Pyramid of Giza, erected 4,500 years ago to carry the spirit of a pharaoh through eternity. Rude companions of progress, such scenes remind us that we have not yet completely come to terms with our trash.*

CHATTOOGA RIVER COUNTRY

Wild Water, Proud People

By DON BELT

Photographs by STEVE WALL

JULY WAS DRY as a handful of dust, and August just burned up and blew away. Now September is reeling off one clear, cloudless day after another, and folks around here are getting edgy. Mountain preachers are talking Judgment Day and breaking out old-time prayers for rain. Moonshiners can't get enough water from their streams to make whiskey. Wells are going dry.

Even the mighty Chattooga, a 50-mile torrent of mountain white water and one of America's most spectacular rivers, is tame and dispirited, a mere trickle of its former self. So any death-defying trips I might take down this wild and scenic river will have to wait, at least until we get a good hard rain.

Meantime, let me introduce you to some folks who are just as wild and maybe even more scenic than any piece of real estate. They live in the rugged country surrounding the Chattooga River, an area roughly 25 miles long and 15 to 20 miles wide that includes parts of the Blue Ridge in North Carolina, South Carolina, and Georgia.

Until recently, many of these people made a living as had their ancestors for more than two centuries—hunting, raising livestock, growing corn, apples, and cabbage by the signs of the zodiac, and generally minding their own business. But that way of life has all but disappeared within the past 20 years, leaving the latest generation of mountaineers to scramble for their livelihood in such nontraditional pursuits as textile manufacturing and tourism. They're trying to hang on to the remnants of their culture amid a whirlwind of change that threatens to blow them and their mountain heritage away like so much dust.

Let me say here that these are not the easiest people in the world to know. They're hard as nails and gentle, complicated and simple, religious and irreverent—a straight-faced, Bible-reading people, fearsome in anger and exceedingly slow to forgive. Yet they're the friendliest, most hospitable people you could ever hope to meet—folks who'll do anything in the world for you except give up their pride.

And that's a mighty precious commodity here these days, thanks to a modern world that has come roaring into these hills and endangered traditions like the homeplace,

With a hug at harvesttime, *cabbage farmer Kenneth James and his 17-year-old daughter, Sonya, celebrate a good crop in a dry year. Their family and those of their neighbors have lived for generations along the Chattooga—a wild river that rushes through Blue Ridge country where the Carolinas and Georgia converge.*

Groceries take a back seat *at Cuzzins General Store every Saturday night, when young and old gather near Mountain Rest, South Carolina, to listen, play, or munch along with traditional mountain music.*

That's just fine with guitar-picking 71-year-old E. E. Nichols (**above**) *of nearby Walhalla. A retired textile worker and jack-of-all-trades, Nichols learned to play at 11, taught by a father who "played the banjo so good it made the hair stand up on my head."*

He calls the weekly session at Cuzzins "the high spot of my week," and especially enjoys passing along traditional melodies to youngsters like Walhalla's Melissa Knight, here sharing a snack with her friend Juan Fowler.

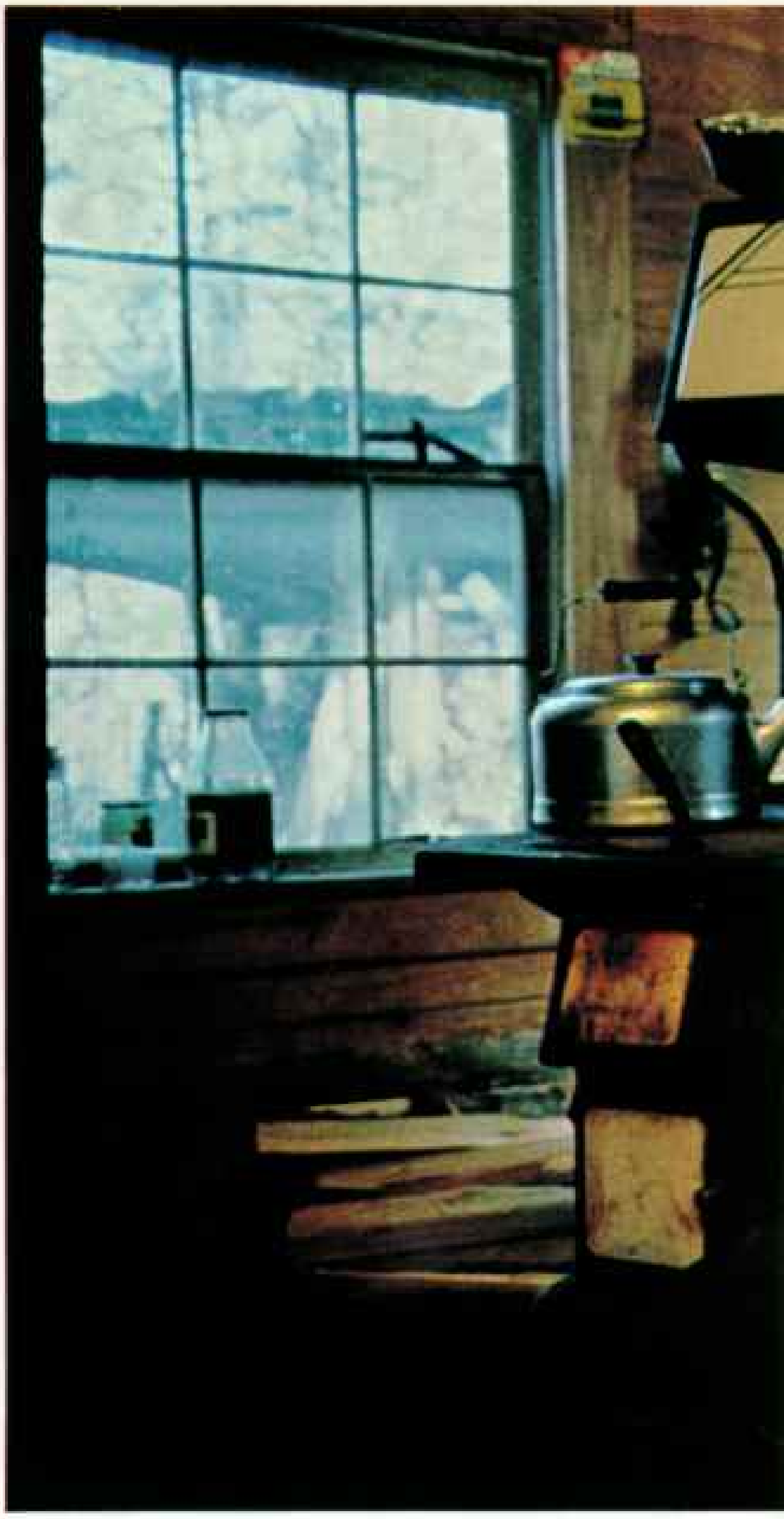
Cuzzins owner Robert Lowery (**right**) *carries a little of everything in his store, but admits that free bluegrass music and neighborly visiting are by far his most popular items.*

"We sure don't pump much gas on a Saturday night," says Lowery, himself a fine bluegrass musician and singer.


pepsi
pepsi
3 BEARS
STORE
STORE
FIREWORKS

That old-time religion *seems good as new to many in Chattooga River country. "The Lord has blessed me with His strength every day of my life," says 76-year-old Martha Swafford of Mountain Rest (**right**), whose typical day includes splitting her own wood with a wedge and sledgehammer.*

*Mainly Baptist, mountain congregations accept the hardships of this life and pray for salvation in the next. Hyman Brown of Commerce, Georgia (**below**), lifts a faithful voice at the 99th Rabun County Singing Convention.*

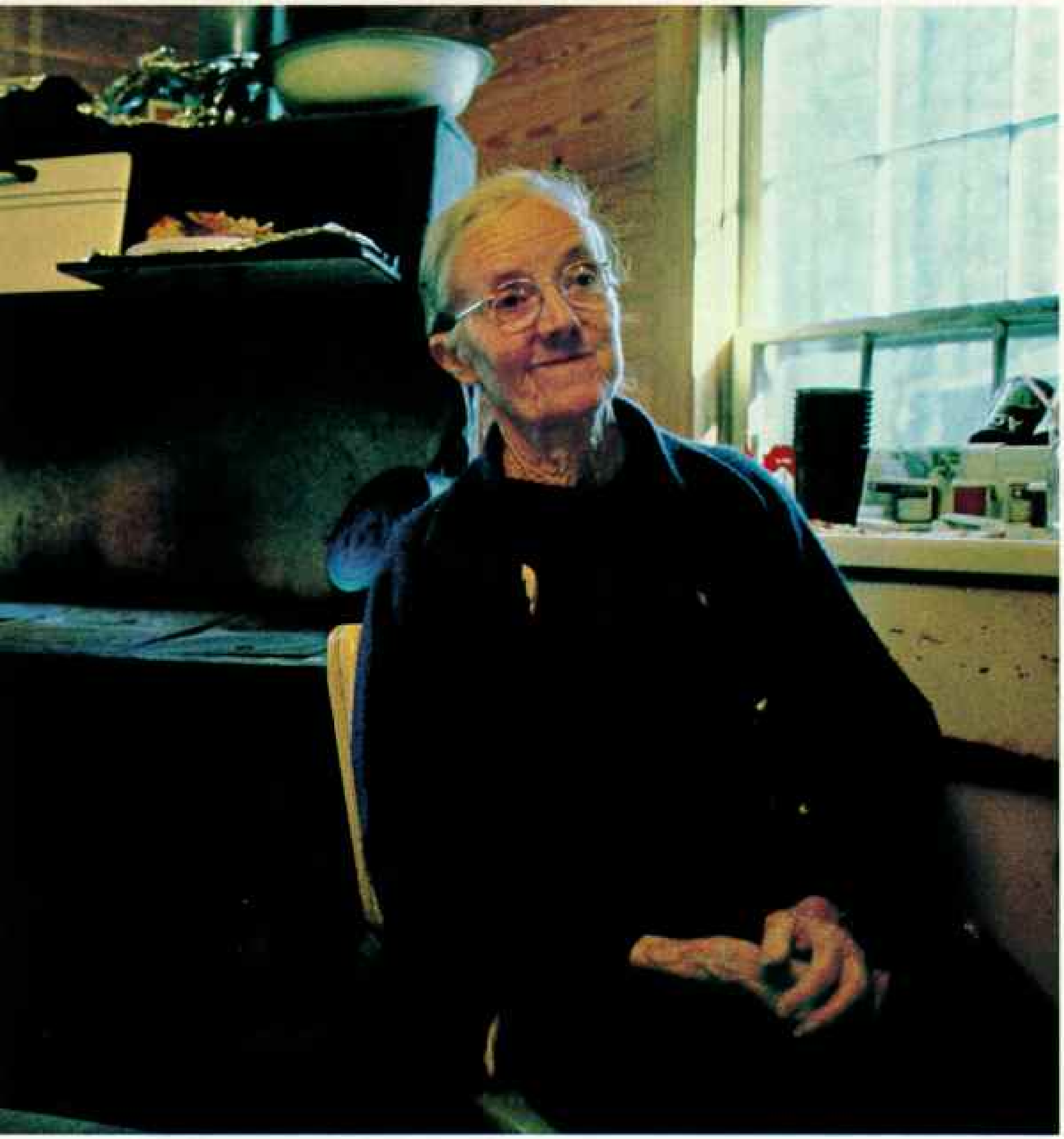


the small farmer, and living off the land.

For many of them the story began with another dry spell—the drought that crippled northern Ireland from 1714 through 1719 and drove its Scotch-Irish population, already smarting from a variety of political, religious, and economic injustices, across the Atlantic.

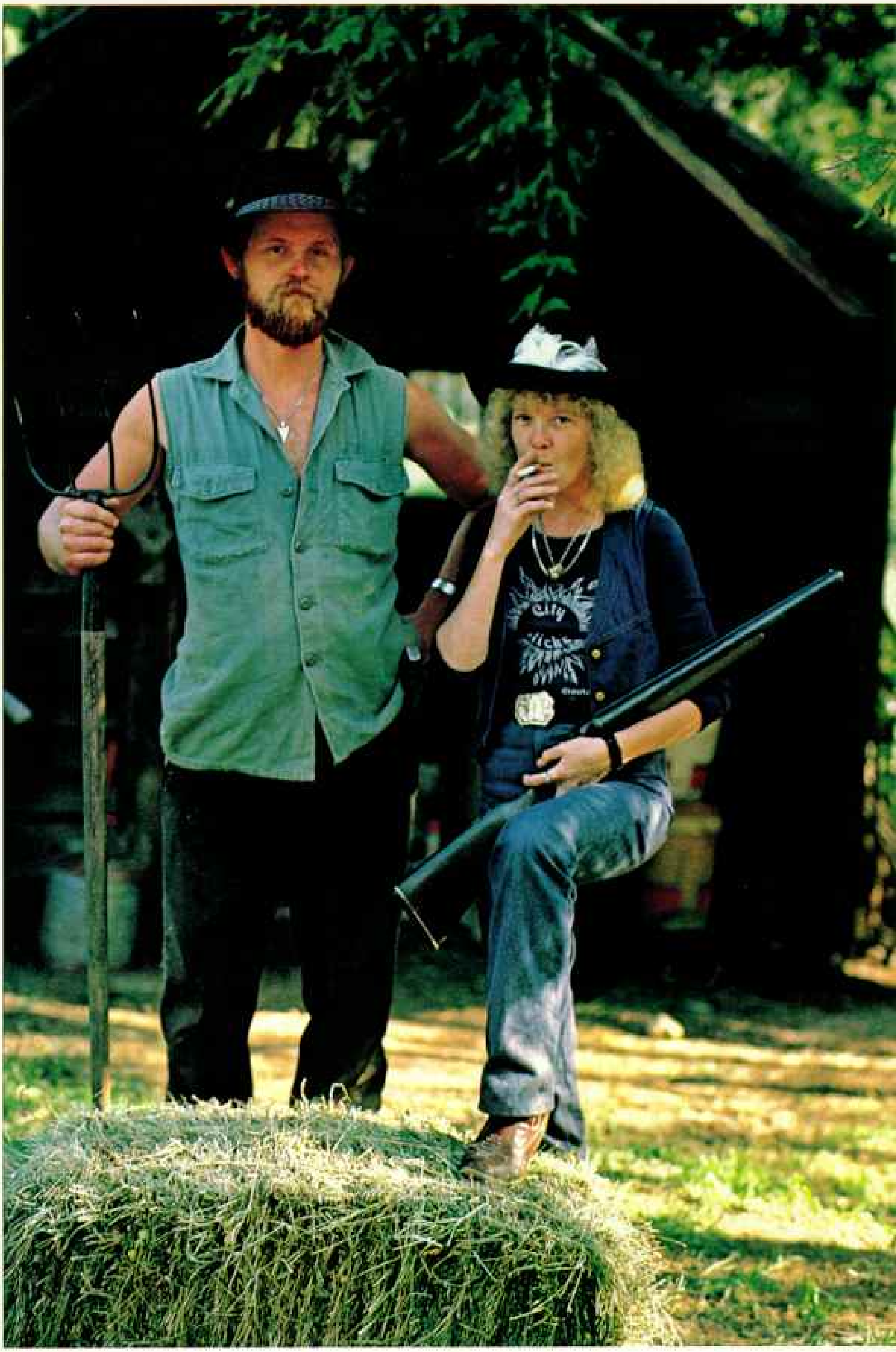
They came to America by the hundreds of thousands throughout the 18th century, entering at Philadelphia or nearby ports, then setting out along the Appalachian valleys of Pennsylvania, Maryland, and Virginia in search of suitable farmland.

Many of those tough settlers took to the mountains, choosing to endure the isolation and hardships of the backcountry in return for the freedom to do as they damn well pleased. That included living by a hard-scrabble code of conduct based on physical courage, honesty, neighborliness, thrift, and loyalty to the family. It also meant building and farming and praying the Scotch-Irish way—without frills.



Since the turn of the century, roughly 75 percent of the land in the Chattooga drainage basin has passed from private owners and power companies to the U. S. Forest Service, and recent demand for land has driven the price of what's left sky-high. Taxes inevitably have risen, forcing cash-poor residents to sell property that had been in their families for generations. Those who buy are usually well-to-do retirees or Florida people seeking relief from the chaotic social conditions of south Florida. The newcomers will gladly pay $100,000 for the rustic mountain hideaway some vacation-home developer has carved from a family farm.

"For all practical purposes, the possibility of economic survival in the traditional Appalachian way is gone," says Rabun County, Georgia, high-school teacher Eliot Wigginton. The editor of his students' best-selling *Foxfire* books, which document mountain culture and folkways, he teaches the kids how to cope with a world their ancestors never dreamed of.



I talked with the late Leonard Webb, then 91 and one of *Foxfire*'s favorite contacts. He looked bleakly at new homes being built near his cabin on Scaly Mountain and expressed a common sentiment of his generation. "It breaks my heart to see these mountains gettin' all skint up like this. If I'uz a younger man, I'd be on my way to Montana right this minute."

Mountain Spirit Weathers Change

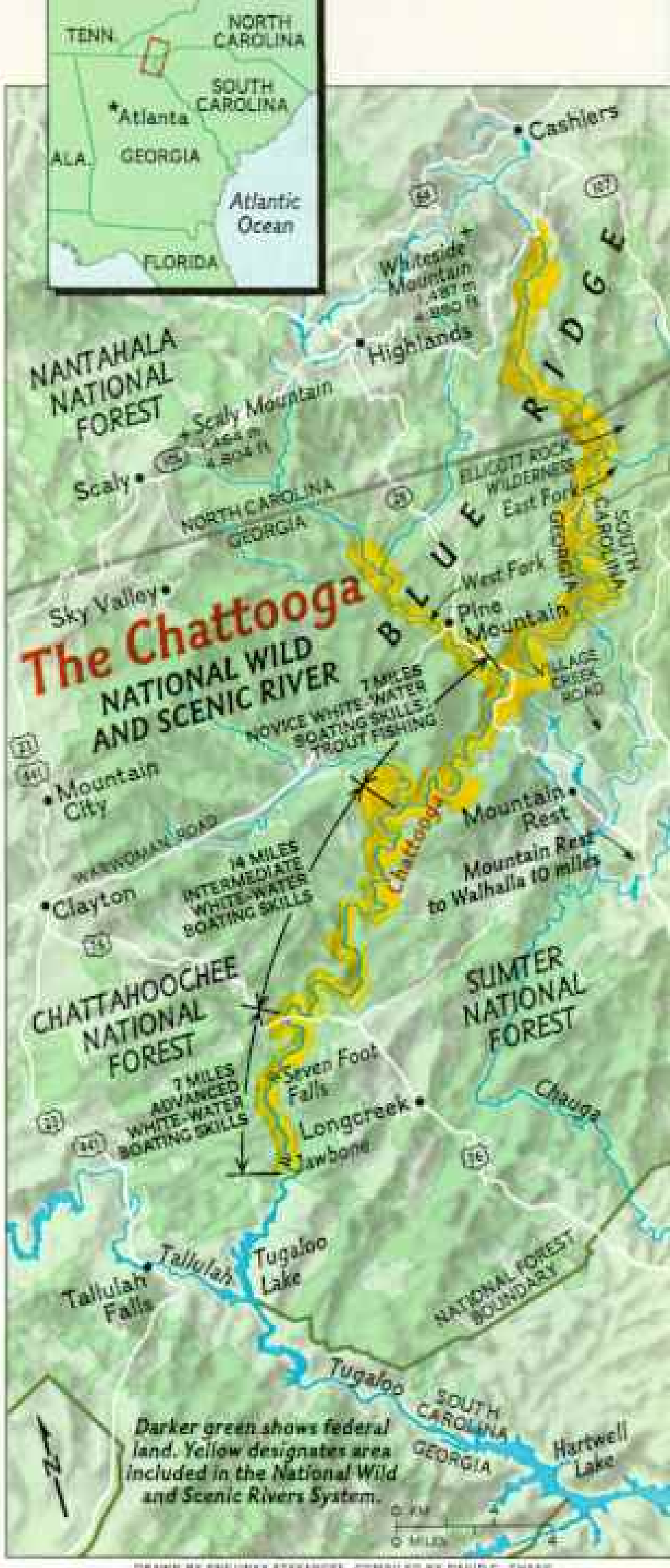
Yes, many aspects of the mountain culture are passing away, just as surely as abandoned log homes back in the dark Appalachian forest are crumbling slowly to the earth. But I've also found the spirit of that culture alive and well and being handed down all over Chattooga River country.

It's alive in the traditional love for the land of men like Jack Lombard, a 55-year-old farmer from Mountain Rest, South Carolina. Jack's an old-time turkey hunter who can cover more rough ground in an hour than anyone you'll ever see. Yet he's also an avid conservationist who will thrash through tangled underbrush all day long to show you scenery he considers unique.

It's alive in the sturdy resilience of families like the Burrells, of Warwoman Road outside Clayton, Georgia. Wife Mavis puts in a nine-hour day sewing seams into men's pants at Empire Manufacturing nearby, and husband Coyl is a carpenter hustling to feed his family during a prolonged recession. "We mountain people," he says, "have seen our share of hard times over the years. Mavis and I think all this is just bringin' us back in closer to the Lord."

And the spirit's alive—as just about anyone in Rabun County can tell you—in the old-fashioned mountain smarts of a fellow named Frank Rickman.

Rickman doesn't look much like a cultural ambassador, political kingpin, or red-clay Michelangelo—all of which he's been labeled for his role in grafting mountain culture onto the 20th century. With his stout,



DRAWN BY SNEJINKA STEFANOFF, COMPILED BY DAVID C. ZHANG
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

Free-lance writer **Don Belt** recently moved to Washington, D. C., from his native South Carolina. This is his first article for NATIONAL GEOGRAPHIC. **Steve Wall**, of Rutherfordton, North Carolina, is also a free lance. He photographed "Troubled Odyssey of Vietnamese Fishermen," which appeared in the September 1981 issue.

Mountain Gothic *is more than a pose to proud Chattooga residents. "Just take us the way we really are," insist Winfred Speed and Brenda McConnell* ***(facing page)*** *of Rabun County, Georgia.*

The 50-mile-long Chattooga ***(above)*** *was declared a national wild and scenic river by Congress in 1974.*

broad-bellied swagger, graying red hair and mustache, hobnailed boots, rattlesnake-skin belt, and big fierce face that always seems half asleep, Frank looks more like the brawling, stomping, storytelling, wild-hog-hunting mountain boy that he also is—or, as he calls himself, "just an ol' bulldoze man."

Indeed, it was while running a bulldozer up and down the steep slopes of north Georgia that Rickman began to see creative possibilities in the inevitable meeting of old and new. Speculating against everyone's advice, he and his associates sculpted a country club from the red clay hills and woods east of Clayton—followed by a combination golf and ski resort, Sky Valley, north of town.

Films Provide Cash and Jobs

Then Walt Disney came to film *The Great Locomotive Chase* and was so impressed with Frank's troubleshooting that he made him a Hollywood-size offer to join his crew.

"Walt offered me so much money I wouldn't speak to him for two weeks," Frank recalls with a roar and a slap of his knee. "I thought he was makin' fun of me!"

Next came *Deliverance*, the movie version of James Dickey's best-seller, filmed on the Chattooga. Rickman was hired to oversee locations, sets, extras, and general logistics—a role he's now played in a dozen films and a hundred commercials, many of them drawn here on the strength of his reputation.

More important, Rickman has fought every step of the way to include "his people" in the bargain—hiring local men to build movie sets for more money than they've ever dreamed of, contracting mountain carpenters to build Sky Valley the old-time way.

Thirty-year-old Ed Page is another example: He learned building, blacksmithing, mule skinning—you name it—while working with Frank on his various projects. Now Ed's putting that knowledge to work on the old stables near Clayton that he and his wife, Jill, have renovated and opened for tourists.

"We need development to give people work and keep them here—as long as it doesn't go too far," he says between hammer blows on the shoe of his prize Appaloosa stallion, Mano. He pushes his straw cowboy hat farther back on his head and turns his

Putting or praying—*or both—are available to visitors at Sky Valley, a golf and ski resort outside Clayton, Georgia. Built by local businessmen and craftsmen, the resort provides 135 full-time jobs and more than $35,000 a year in taxes to Rabun County.*

Tourism is the county's largest single industry, followed by textile and clothing manufacturing and farming.

*Do-it-yourself remains a popular approach here, not so much from necessity as from a sense of pride and cultural continuity. Besides, "water-ground cornmeal just tastes better," say those who keep Darnell's Mill (**right**) grinding after generations of service to Rabun County.*

Many here also favor the taste of whiskey made the old-time way, from recipes and techniques dating back to the earliest Scotch-Irish pioneers.

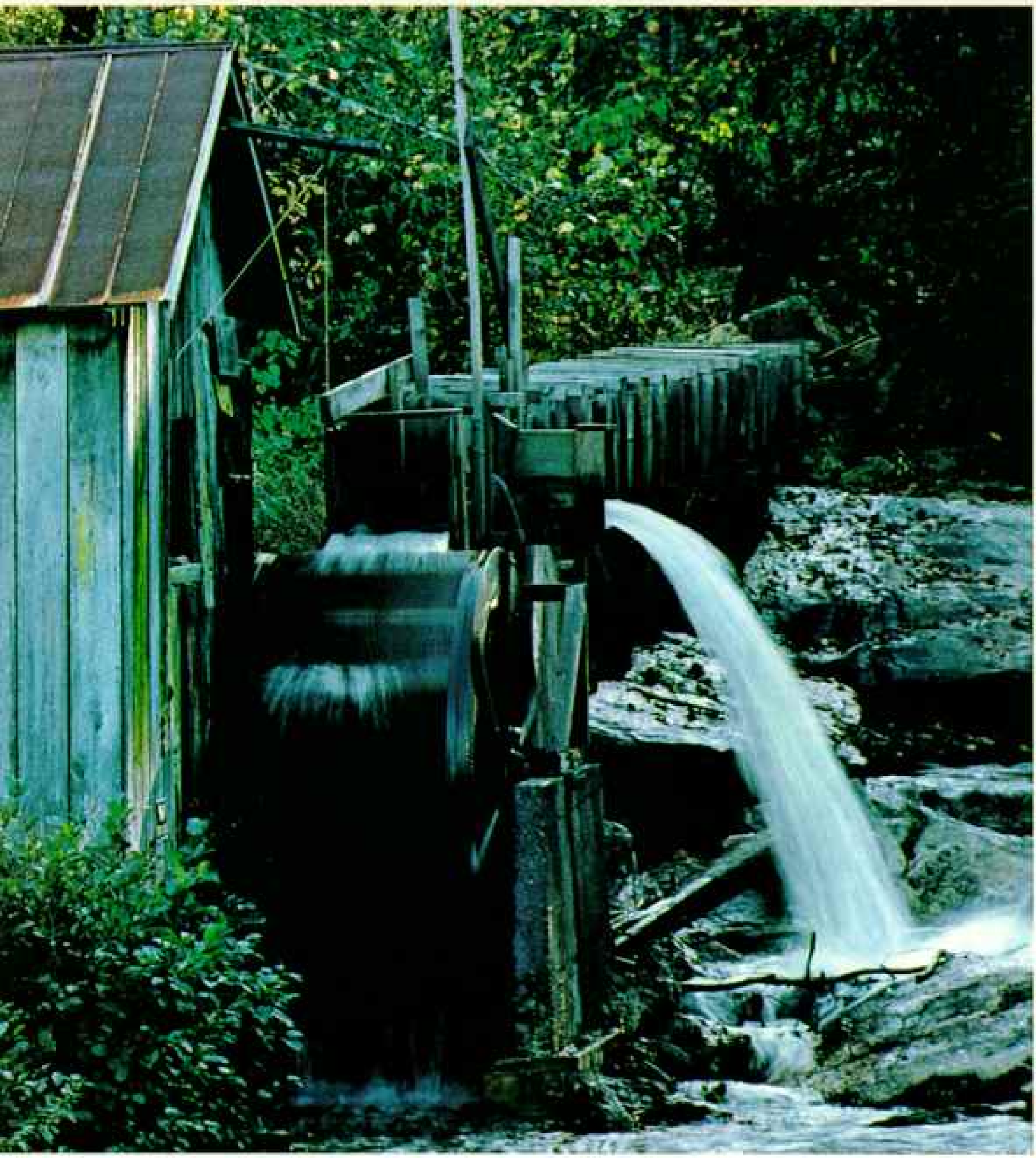
*A modern-day moonshiner uses drops of water (**below**) from his thumb to test the proof of his product. Whiskey that first comes out of the still at 170 proof is tempered to around 110 and tested using this method.*

Rabun County accent up a notch. " 'Cause us mountain boys gotta have woods to run to once in a while."

Development is needed. So is rain. These past few days the water shortage in Chattooga country has taken a turn for the worse. Clayton, county seat of Rabun County, is sandbagging creeks to provide its 2,000 residents with an emergency supply of water. People are putting bricks into commode tanks. Ministers are urging everybody—Baptist or not—to get right with God and pray, pray in their homes for rain. Just yesterday the county prayed in unison at a prearranged hour, twelve o'clock noon—and doggoned if this morning it doesn't look like rain. I may be taking that river trip after all.

I confess, however, that my thoughts now are not much on rafting the Chattooga. They are on lawyers and juries and the mountaineers I'm with, deep in the woods.

The last time the red-faced old fellow



standing next to me was in court, the judge asked him, half jokingly, when in the world he was going to stop making whiskey. The old-timer had gone to some trouble to spruce up for court—combed his hair, put on his Sunday shirt, done his best to appear in a manner befitting his day in an American court of law—and his reply was significant, considering all the trouble he'd gone to: "When my toes turn up or water quits runnin' downhill, Your Honor," he said.

It hasn't rained in a month, and the stream 30 feet away is about dry, but what little water there is runs downhill. And the old boy's toes have definitely not turned up. He's alive and kicking, just like the recipe his granddaddy gave him for the purest applejack ever made in these parts. Moonshining may be a dying art, but it's not dead yet.

It's been alive in these mountains since the first settlers brought it with them from the hills of Scotland and Ireland, along with a

fiery hatred for government tax on whiskey. Until 30 or 40 years ago moonshining was one of the few ways a poor mountain farmer could raise cash. It also provided the active ingredient in many of his wife's home remedies. Nowadays, making "drinkin'" whiskey (as opposed to "sellin'" whiskey, which has given the whole business a bad name with a dangerously impure product) is rare, practiced only by the boldest and most independent of small businessmen.

Moonshiners Need to Be Fast

"Looks like rain," I say to no one in particular, scanning the first cloudy sky we've seen in a long, long time.

"Yeah, boy," the youngest of the moonshiners says, looking at the woods around us instead of the sky. Nobody else is looking at clouds either. They are nervously watching the woods for movement, any sign that lawmen are sneaking up on their still, which stands before us in full operation. If the law came, they would run like deer. Come to think of it, so would I.

The old fellow has been "run" so many times that he now leaves the actual work around the still to his two helpers and spends most of his time keeping his eyes peeled.

The elder of the two is about 35 and is wearing overalls. He started helping out when he was 10, had been run by the time he was 14. His still was "cut down" once (he suspects he was turned in by a rival), but he's never been caught. Even so, he stops work abruptly and listens, startled, whenever a limb falls back in the forest or a car passes on the nearest road, almost a mile away.

The younger one is a fresh-faced kid just out of high school. He hasn't been run or caught or cut down, and it shows. He is the only calm one among us.

Even without this kind of mental strain, moonshining would be a mighty tough way to make a living.

The still consists of a five-foot copper kettle filled with ground, fermented apples and sprouted corn, mounted in a concrete furnace and heated with propane gas to produce steam. The steam is piped to a series of three wooden barrels, then through a four-by-four-foot plywood "heater box" and a 50-gallon drum of cold stream water—where the steam condenses and trickles out into a catch barrel to wind up as 110-proof white lightnin'. Bear in mind that all this had to be hauled in after dark and built by hand.

The moonshiners' day begins in darkness with a long and tortuous hike over steep hills, carrying 50-pound bags of sugar on their shoulders to the still. A careless footprint, a piece of litter, the slightest trace of a trail could mean capture and imprisonment.

Their day ends in darkness, too, as they retrace their steps with all the whiskey they can carry. It is brought out in plastic milk jugs tied together—to be sold secretly, for a small profit, to people they hope they can trust. No wonder the old man looks weary.

"Moonshinin's just about the hardest work a man can do," he says. "First chance I get, I'm a-goin' to quit."

"It's a way to survive and all, but it ain't really the money," says his helper, the older one. "It's the tradition."

Bluegrass Pickers Gather at Cuzzins

It finally began to rain later that night, and I'm happy to report I was a free man when it did. In fact, I was about as free as a fellow can get in this world—a few miles from the river near Mountain Rest, South Carolina, in a warm, dry country store full of happy people. I was sitting comfortably on a case of canned corn, listening to bluegrass pickers from all over Chattooga country and picking along on a borrowed guitar.

The rain came suddenly, drumming the roof of Cuzzins store like an instrument.

"That wouldn't be *rain*, would it?!"

"Praise the Lord!"

"Ayyyyyyyyyyymen!!"

"Prettiest song I've heard all year!"

Backed into a corner of the brightly lighted store, the dozen or so musicians appeared to have little in common—old-timers in overalls, long-haired kids, mechanics in oily uniforms, college cowboys from Clemson and Western Carolina—but most of them drive long distances every Saturday night to share the magic in this room. Some, like me, just hang around the edges and keep time. Others, like Chris and Jody King of Mountain Rest, are stars.

Chris started coming here from his home over on Village Creek Road six years ago, at 16, dragging along the banjo his father gave him before he died. At first he was just a shy,

dark-eyed little picker who stayed on the fringes and plunked along with the rhythm. His sister, Jody, then 15, did much the same on guitar. But the old-timers took a shine to them, mainly because they stayed after to ask questions and were able to learn songs in a week that others took months to master.

"What Jody and I did back then was to break those songs into little parts," says Chris, now an agriculture student at Clemson. "Then we'd practice each part over and over until we were ready to put them back together as the song."

"The first thing they did when they got home from school was pick up those instruments and play," says their mother, Betty. "And it didn't stop until they went to bed. It's a wonder I'm not crazier than I am now!"

Lately, little brother Greg has gotten into the act and usually manages to grab his share of attention. The sight of a skinny 13-year-old kid in overalls and baseball cap playing a stand-up bass fiddle twice his size and clogging at the same time is something folks around here find downright comical.

Rain Restores the River of Nightmare

Music rang out into the rainy night, where the fields were soaking it up. Later, at home, I tossed and turned through a night of imaginary wild scenes from the river trip that had become more certain with every passing hour of rain. Up in North Carolina, rain was pouring down the south face of Whiteside Mountain, and the little creeks around Highlands and Cashiers were rapidly rising. The Chattooga was becoming a river again.

In the course of its 50 miles, the Chattooga grows from a halfhearted trickle to a river gone berserk, crashing headlong down the gorge. It butts heads with massive boulders, plummets from high cliffs, chews at banded gneiss bedrock, and drops more feet in an average mile than the Colorado. The upper Chattooga, especially, is a land of splendid isolation. You can hike there all day with only your own tracks among those of mink, deer, and raccoon. Or you might glimpse the solitary figure of a bearded mountain man, squirrel hunting, who materializes on a distant hillside and disappears in the brief moment you look away to avoid staring.

"The Chattooga is a place for lonely, brave, resourceful people," says poet James Dickey, the author of *Deliverance*, who discovered the rivers of north Georgia on weekend canoeing trips while working as an Atlanta advertising writer. "The fact that it was my own story that popularized the Chattooga is a crowning irony."

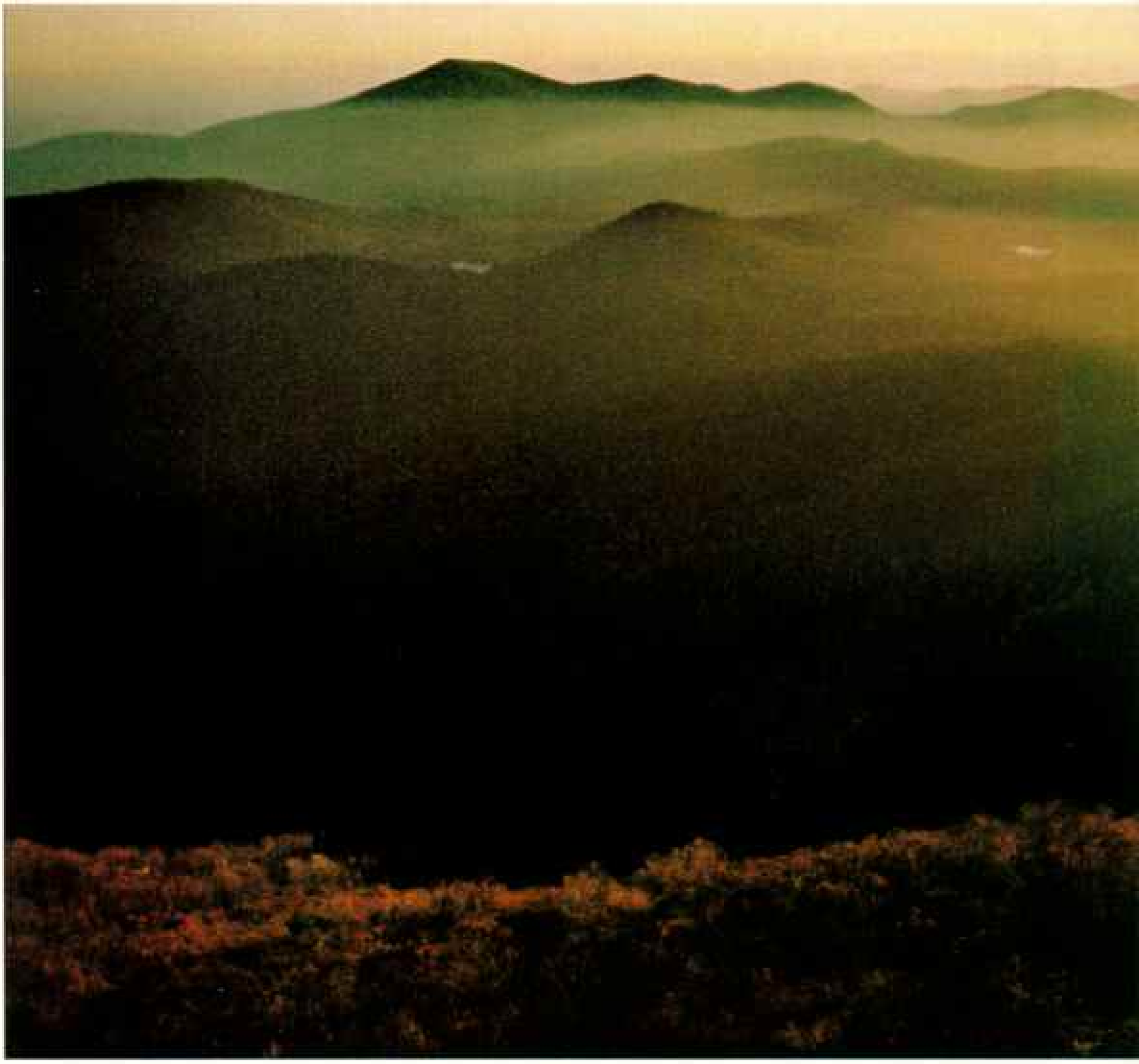
Feeling neither brave nor particularly resourceful, I rose before dawn and set out into the clear, rain-washed morning. I was meeting the fellow who had offered a month earlier to guide me through the Chattooga's wildest rapids, a seven-mile stretch at its very end I've been hearing horror stories about since I first came here in 1973.

The U. S. Forest Service estimates that some 21,000 people visited the river that year (up from 800 in 1971, the year before the movie version of *Deliverance*), and I remember thinking then that the commotion was taking its toll. Riverbanks were littered with beer cans and the wreckage of canoes. Vendors were hawking hot dogs on the rocks below the Highway 76 bridge. Local people, already angered at what they considered an insulting portrayal in *Deliverance*, had lost patience with having their baptisms, picnics, and fishing trips disturbed by exuberant rafters. Worst of all, an average of four careless, ill-equipped, or just plain unlucky people were dying on the river every year.

Congress solved many of these problems in 1974, when it protected the Chattooga under the Wild and Scenic Rivers Act. Jurisdiction was given to the Forest Service, which had acquired most of the land along the corridor and began regulating river use. Now, although the Forest Service expects some 40,000 to 50,000 visitors a year, there are fewer deaths on the river, thanks to rules on equipment and river conduct.

Even so, paddling a boat anywhere on the Chattooga remains a dangerous proposition. Once on the river, for one thing, there's practically no way out except by water. Bridges are few and far between, riverbanks are often too steep to scale or portage, and the nearest side road is usually miles away, through rough mountain wilderness guaranteed to confound all but the most experienced woodsman. Then too, the river is littered with rapids. There are hundreds of chances to turn a canoe into tinfoil on this river, and at least that many ways to die.

All this dawns on me as I stand in cold,



Misty foothills *of the Blue Ridge, as seen from near Highlands, North Carolina, looked like home to early settlers. Many were Scotch-Irish, an especially prickly breed that emigrated from northern Ireland's Ulster Province in the 1700s. They migrated through more populous Pennsylvania, Maryland, Virginia, and most of North Carolina before settling the dark mountain hollows and river bottoms along the Chattooga.*

Within this century some 75 percent of the land in this basin has been acquired by the U. S. Forest Service, and the price of what's left has soared as newcomers and real estate developers scramble for scenic mountain property. The acre of land that sold for $150 twenty years ago now costs as much as $5,000, tempting local residents off family farms and away from the life of their forefathers.

*Even so, Chattooga country—especially at the headwaters—remains a land of splendid isolation and wilderness, with brooding cliffs, waterfalls, and quiet pools like the one where Margie Crisp (**facing page**) of Highlands cools off on a hot summer day.*

Taking the plunge *on a river that has killed 25 people since 1970, raft passenger Mary Outlaw (**right** and **below,** forward) spills in Seven Foot Falls, one of ten heavyweight rapids within the seven miles of the Chattooga reserved for advanced white-water paddlers. Guide Mark Wagstaff (at rear) retrieved her unharmed, maintaining the outstanding safety record of the river's commercial rafting companies.*

Popularized by the 1972 movie version of James Dickey's Deliverance, *which was filmed here, the Chattooga has attracted visitors by the tens of thousands in the years since. This year alone the Forest Service expects some 50,000—up from 800 in 1971—raising new questions about maximum use of the river and environmental impact.*

And although the Forest Service's strictly enforced regulations have reduced deaths, the Chattooga remains a dangerous river for the careless, the unsupervised, or the unlucky.

soggy tennis shoes, paddle in hand, with a professional raft guide named Lamar Hudgens. We are perched on a boulder overlooking Jawbone, one of five heavyweight rapids occurring within 600 yards that deliver the Chattooga's final knockout blows before it flows out into Tugaloo Lake.

Swollen with the runoff from last night's downpour, Jawbone is a real monster—tons of water roaring through a twisting roller-coaster drop of some 15 feet, with a huge sunken boulder in the center and a rapid below it the size of a cement mixer. A slab of sharp rock jutting out over the water—Decapitation Rock—complicates things further on the right, and fully half the river seems to drop steeply away and disappear into the black hole beneath it.

Lamar tells me that several years ago an expert river guide made a slight, yet crucial, paddling mistake here and slid down the steep trough of water running under "Decap." Tons of water pouring in after him ripped his life jacket off and folded his kayak around a submerged log, pinning him inside. It took five hours to get his body out.

Lamar is a taut, wiry 32-year-old with white blond hair tied down by a headband and a reckless reputation for doing things like running the Chattooga at night.

"Aren't you afraid?" I ask him.

"Man, I love this river like a wife," he says. "But I'd have to be *real* crazy not to be scared of it."

On that happy note, we hike back upstream and rejoin the anxious pair waiting in our raft, a vacationing couple from Florida who've come here, like so many, "to run the *Deliverance* river." The husband has the frame and bulk of a football lineman; she, the softness, fair skin, and horn-rimmed glasses of someone who doesn't get outdoors much. I also have the impression she's not enjoying this trip—her discomfort is apparent as she sits rigidly on the shoulder of the raft, grimly practicing paddle strokes in her oversize helmet and life jacket.

"Now don't worry, y'all are gonna do just *fine!*" Lamar says as he shoves us off from shore, and I search his face for signs of sarcasm as the current quickens beneath us.

We went through Jawbone like drunken monkeys in a bathtub. Bodies slammed into one another. Water crashed in. The husband's paddle flew through the air like a missile and cracked me in the mouth. And his wife, sitting too far out on the edge of the raft, did a quick backflip and was gone. I glimpsed her a second later—mouth open and gasping for air, her body small and pitiful as the river swept her like a leaf over the boulder and down through the huge rapid.

Luckily, another river guide positioned downstream threw her a rope and pulled her to safety. She was shaking uncontrollably when we beached our raft, and her husband embraced her until she was warm and steady enough to continue.

Pride and Prayers on the Chattooga

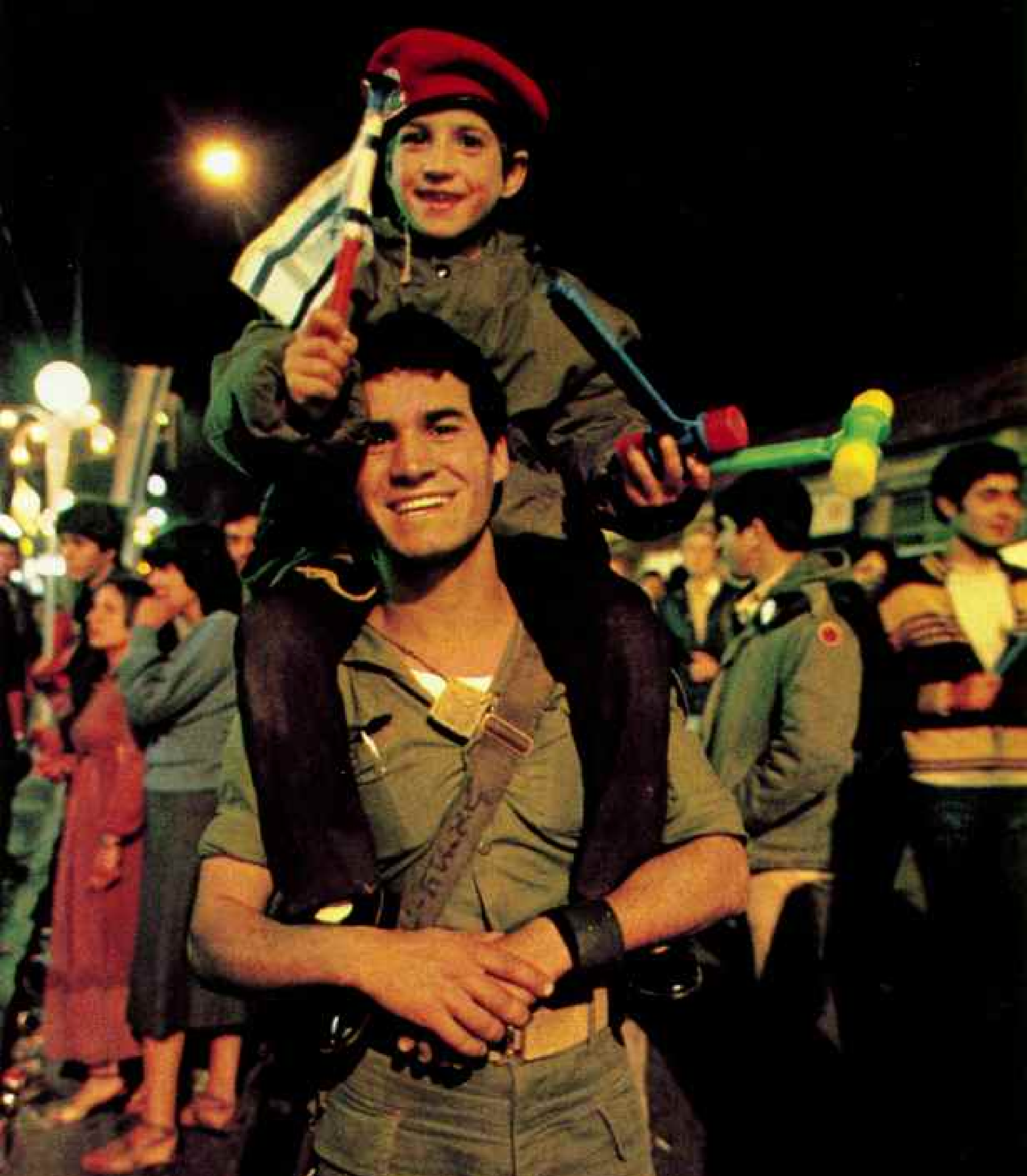
And then the strangest thing began to happen. As we twisted our way through the remaining rapids without mishap, it seemed that her confidence grew with every stroke of her paddle.

"I can't believe I made it through that rapid," she said with a laugh. "I don't quite understand why, but I'm really glad that happened back there. I don't think I've ever felt this alive in my whole life."

Mountain folk admit they're baffled by all this—by the craving city people have for risking their lives on this river and by the world of fast food and concrete and glass they come from, where people buy things instead of building them and beans come from a can. And since that world is steadily closing in on them, they're concerned.

But for now, there are more important things to worry about. Last night's rain soaked into the ground like a sponge; the roads are already kicking up dust. Tomorrow's forecast is clear and hot. And tonight, unless I miss my guess, the proud mountain folk of Chattooga River country are going to be praying, once more, for rain. □

***Like shooting stars** on an autumn night, droplets from a waterfall scatter past the maple leaves of a long, dry fall. For the farmers and mountaineers who live here, every change of season presents a new challenge as they struggle to preserve their ways in a world ready to run them over, buy them out, and pass them by.*



This Year in
JERUSALEM

By JOSEPH JUDGE
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Photographs by JODI COBB
NATIONAL GEOGRAPHIC PHOTOGRAPHER

THE SKY over blessed and accursed Jerusalem sometimes seems on supernatural fire. Thunder explodes through gusts of snow. Darkness whelms the deep Valley of Kidron, from which will rise the many dead on the last of all days—and yet beyond, a light of stars, space, and time sets distant Abu Tur aglow, as though truly elsewhere.

When the Old City of golden stone puts on its magic act, one does feel that it is the hill nearest heaven, where a man can cup his hand to the wind and hear the voice of God. Faith: Here an angel stayed the hand of an obedient father about to slay his son. Faith: Here the Prophet of Allah arrived on a winged steed and climbed to heaven, into the presence of God. Faith: Here the Son of God was killed on the Cross and rose from the dead to save us all from sin. Faith: Here the Ark will be found, the Temple rebuilt, and the true Messiah come at length to lead mankind toward Paradise.

So they say.

And as long as men believe what they believe, and act, piously or with cold cruelty, upon that belief, the dream and the tragedy of this unique city will go on and on.

From its ancient gates, roads lead away as they have for millennia, down toward the Mediterranean seacoast westward, steeply down to the Dead Sea eastward, south along mountain ridges toward Bethlehem, where Jesus and David were born, and to Hebron, where lies Abraham, and north toward the home of the old empires, Assyrian, Persian, Roman, Byzantine, that periodically smashed Jerusalem and enslaved and slaughtered its devout people.

But the true road *to* Jerusalem is passion; the gates are faith; the streets are memory; the inner sanctuary is the yearning soul. It is a place where myth may be reality and truths are mendacious, where men who remember persecution walk in narrow, safe paths of their own careful making; a city of walls within walls, of locked gates, bolted doors, of windowless first stories, of iron and stone, stone and iron.

And yet when the sky clears over the highest of all peaks, that to the northwest called in Arabic Nebi Samwil, the Prophet Samuel (who, it is said, is buried there), one remembers its other name—Mount of Joy, thus christened by Crusader King Richard the Lion-Hearted for the emotion he felt at his first sight of the distant city of Jesus.

The Christian kingdom the Crusaders erected in A.D. 1099, over the bones of the Jews and Muslims they exterminated after their victory, lasted only a century before Arab armies took the city back and Muslim

Celebrating their nation, *a soldier and his son join crowds on the eve of Israel's Independence Day. After victory in the Six Day War of 1967, the country occupied Jordanian East Jerusalem, including the Old City, and confirmed the whole as her capital—an ancient Jewish goal, but one lacking international recognition.*

The golden heart *of the Old City holds Islam's Dome of the Rock (gold) and El Aqsa Mosque (silver, foreground), the plaza before the Jews' Western, or Wailing, Wall (just*

beyond El Aqsa), and the Church of the Holy Sepulchre (to the right of tower, center left), making it a focus of the world's three great monotheistic religions.

Warm talk *and cold ice cream fill a July afternoon at a sidewalk café* ***(left)*** *as a street musician entertains city shoppers* ***(below)****. Thus the life of the city goes on despite the international turmoil that surrounds it. The city of Jerusalem, spiritual capital of the Jewish people throughout the ages, has claimed a Jewish majority since the mid-19th century.*

The future *is the theme of a fashion benefit for the Israel Museum* ***(above)****, which as a repository for the past houses many artifacts of the ancient Near East, including the Dead Sea Scrolls.*

potentates—from Cairo, Damascus, Istanbul—ruled on until 1917, when a British army, under Gen. Sir Edmund Allenby, entered the Old City. Allenby, in a memorable moment in Jerusalem history, chose to walk humbly through old Jaffa Gate as a sign of respect for the sanctity of the place.

The British Mandate came to a confused and bloody end after decades of Arab revolt and Arab and Jewish guerrilla war that erupted into open combat in 1948. The British flag was no sooner pulled down from the staff before Government House and the last lorry had barely rolled away from the barbed-wire compounds that set off large sections of the city when Jewish and Arab forces opened fire. Jerusalem was the prize. Jerusalem, the holy, the sanctified, demanding again the blood sacrifice.

Lt. Abdullah Salam, leading an armored column of the Arab Legion down the height of Sheikh Jarrah, stopped his sand-colored command car and threw himself down to kiss the ground when he first saw the city sacred to Islam. (He was dead before he reached it.)

The Arab Legion held on to the Old City. A United Nations cease-fire left it divided, with a wide no-man's-land running under the walls, and thus it remained for 19 years.

Bones of contention *pit Israel's government against a part of the nation's religious community. Here members of an ultra-Orthodox Jewish sect* ***(right)*** *confront police at a demonstration against excavations of the ancient city that King David chose as the capital of Israel about 1000 B.C. The protesters believe that a medieval Jewish cemetery is being disturbed in violation of religious law. Despite repeated assurances by dig director Yigal Shiloh* ***(below,*** *center) that no bones have been unearthed, Israel's chief rabbis ordered digging to stop. Government rulings closed, then reopened the dig—a victory for supporters of separation of secular and rabbinic law.*

In those years, Israel built a modern city in West Jerusalem while Jordan held the east, a land of pastoral villages. Until June 7, 1967—the third day of the Six Day War.

On a wintry day last year a former colonel of the Israel Defense Forces sat with me in a warm bar and remembered.

"Who forgets such a thing?" he said. "We rushed St. Stephen's Gate. In the Israeli Army, always the officers first. We thought the Arab Legion would be there in force. In an hour, I was at the Wall. I wept."

On that day, for the first time in more than 1,800 years, a Jewish state and a Jewish army commanded all Jerusalem, and the prayers of Passovers beyond recounting had been answered in gunfire.

For the numberless Jewish dead of the centuries, for whom persecution flowed with their mothers' milk, and especially for

the victims of the Nazi Holocaust, this moment at the Western, or Wailing, Wall—Judaism's most sacred site, all that remains of Herod's magnificent temple—was one of redemption, of a bursting pride and resurrection of self-respect. It was the closing of a long contract: The Lord had led them into this land always promised to them.

I asked my friend if it had turned out the way he thought it would.

"No," he said. "Our hopes were too high." Then he opened his left palm, bobbed his head a bit, shrugged, and said: "But . . . not so bad. We said we would build a Jewish state in the Land of Israel. And we built it."

WHEN I RETURNED to Jerusalem last year after a long absence, I knew that she was in another period of anguish. I also knew that I would find

The coveted sanctuary of three faiths

FEW STRUGGLES have so transfixed the world as those that have swirled from Sinai to Lebanon since the end of World War II. Few have carried greater danger of growing into worldwide conflagration. At the eye of the storm sits Jerusalem, on the spine of the Judaean Mountains at a crossing of major north-south and east-west routes. Among the world's oldest continuously inhabited cities, the site was settled by at least 3000 B.C. in a mountainous setting as dramatic as the events for which it was to be the cradle.

After capturing the fortified city from the Canaanites about 1000 B.C., King David made his capital here to unite the tribe of Judah with the northerly tribes of Israel on neutral ground. Jerusalem would never again be neutral to any Jew.

A 50-year exile in the sixth century B.C. presaged a longer exile in the diaspora ordered by Rome in A.D. 135. Jews were allowed to return some 500 years later, but not until the 19th century did Jerusalem again have a Jewish majority. From Roman times until the mid-20th century, the city was ruled by Byzantines, Arabs, Crusaders, Mamluks, Ottoman Turks, and British.

A 1947 United Nations plan to partition British-mandated Palestine into Arab and Jewish states failed to take effect as bitter fighting broke out between Jews and Arabs. Proposed as an international zone, Jerusalem was left instead a divided city when cease-fire lines drew the borders Israel knew from 1949 until 1967. The Six Day War then reunited the city under Jewish rule for the first time in 18 centuries.

Declared the capital of Israel in 1949, Jerusalem had its boundaries redrawn in 1967 to include nearby villages, fields, and open land. In 1980 the Knesset reaffirmed it as the capital "united in its entirety."

Originally made capital by King David, Jerusalem was destroyed by Babylonian conquest in 587 B.C. but restored under Persian rule a half century later.

Following defeat of the Turks in World War I, Britain administered Jerusalem, allowing Jewish and Arab immigrants to surge into the city.

The United Nations proposed separate Arab and Jewish states for Palestine, with Jerusalem under UN control, a plan made moot by war in 1948.

The State of Israel, secured by arms in 1948, claimed West Jerusalem; it remained divided from Jordanian-held Jerusalem for 19 years.

In 1967 Israel overran East Jerusalem and greatly enlarged the united city's borders. Since then the population has grown by half.

Eternal Jerusalem

Victoriously rampant, the Lion of Judah on Jerusalem's seal (left) states well Israel's command of the city. Mammoth housing developments—eventually totaling 40,000 units—are now ringing its approaches. All are homes for Jews on what was once Arab land. Within the Old City—less than one percent of the municipal area—new construction has given rebirth to the Jewish Quarter, shelled by the Jordanians in 1948. The city government has brought in water, sewers, and electricity, and fringed the walls with parkland.

her mood of sanctity and her memory somehow intact despite the galling human misery that comes with occupation, the political dominance of one faith over the others.

Like most other pilgrims, I made my way to the hills—Mount of Olives, Abu Tur (Evil Counsel), Scopus, Nebi Samwil—for the glory of old Jerusalem is its setting: "Get thee up into the high mountain; O thou that tellest good tidings to Jerusalem," sang Isaiah —a feeling echoed in this century by Israel's Nobel laureate S. Y. Agnon: "Bare are the hills of Jerusalem. . . . the hills spread their glory like banners to the sky. . . ."

But for those who loved the old open landscape, the tidings are not good—the banners are being furled in concrete, as massive new neighborhoods rise like fortress walls on the commanding heights in every direction from the Old City.

Following the 1967 war, Israel unilaterally drew the municipal boundaries for a new Jerusalem, Israel's "eternal and undivided capital," encompassing territory conquered from Jordan and increasing the city area from 44 square kilometers to 108. Neither the United Nations nor the United States has acknowledged the annexation, or the capital status. Ten rural Arab villages found themselves within the new city limits (maps, pages 486-7). There followed a series of major confiscations totaling some 5,000 acres of Arab land, for "public purposes" that proved to be housing of extraordinary scale. This open seizure of private property has been the most rankling cause of present-day enmity between Arab and Jew.

After the new neighborhoods of Gilo, Ramot, Neve Yaacov, and others on taken land have been completed, 40,000 apartment units will be home to 150,000 Israelis —a third again as many as the Arab population of East Jerusalem.

In only five years the Jewish population of united Jerusalem has increased by 33,000—to a total of 292,000. Arabs increased by 18,000, to 113,000. With 407,000 people, Jerusalem is now Israel's largest city. The historic Old City occupies less than one percent of Jerusalem's total area.

Ancient lessons *of sacred Jewish writings and traditions are passed on to yet another generation of boys at a yeshiva, a private religious school, in the old and ultra-Orthodox neighborhood of Mea Shearim.*

FOR MOST of the world's people, the Old City *is* Jerusalem, that square kilometer within the magnificent walls of Suleiman, of such spiritual density that its magnetic field covers a planet, a neutron star of the human need to believe.

From atop the ancient wall near Damascus Gate, where tourists now walk, it seems one organic structure that grew, stone by stone, wall by wall, house by house, roof by roof, dome by dome, tower by tower. It is a labyrinth of 120 named and countless unnamed narrow paths and lanes, only a few of

which—those that trace the Roman streets of the second century A.D.—run straight, and these are the ones lined with more than a thousand tiny shops and stalls. It is a dense human habitation of 29,000 people. Woven into it are the bits and pieces of its turbulent past: Crusader arches shadow the steep steps to Ramban Synagogue; a Roman square forms the basement of the Convent of the Sisters of Zion; the city wall of King Herod holds up an Ottoman Turkish wall at David's Tower; Byzantine paving stones catch rain in their rippled surface near the Mosque of Omar. Maps traditionally divide it into four quarters—Christian, Muslim, Jewish, and Armenian—but in reality it has three centers of gravity (map, page 499).

For almost 2,000 years, Jews have struggled to live close to the Western Wall. In today's Jewish Quarter (largely rebuilt after being destroyed during the fighting of 1948 and Jordanian occupation) are left ten of the seventy old synagogues and dozens of religious academies.

For 2,000 years, Christians have wanted to live close to the Church of the Holy Sepulchre, site of Christ's death on the Cross, burial, and Resurrection. In the Christian Quarter today are dozens of churches and scores of monasteries and other religious institutions belonging to the more than 20 Christian sects here, among them Roman and Greek Catholic, Greek and Armenian Orthodox, Anglican, and Coptic.

For 500 years, Muslim devout have wanted to live near the Haram esh Sharif, the great platform on which the Temples of Solomon and Herod once stood and where now stand the glorious Dome of the Rock, Islam's oldest religious structure, and El Aqsa Mosque, the third holiest in all Islam. Their mosques and madrasahs, or schools of religion, clustered along the old retaining walls of the Temple Mount, along with the Governor's House, the courts of law, and libraries.

It took a good 1,700 years to make the Old City; one small piece of it would be the glory of any congregation on earth. And this not to mention the surrounds: Mount Zion on the southwest, where is located the reputed tomb of David, and, just above, the room of the Last Supper; or the Mount of Olives to the east, paved with the tombstones of devout Jews and the reputed tombs of Mary and Joseph, and the church built over the rock where Christ agonized in the garden. All in a stunning setting of hills below racing clouds, plunging valleys, rolling brown desert, and spectacular vistas. As the Talmud says, of the ten shares of beauty in the world, Jerusalem has nine.

I MUST ADMIT I like the place in foul weather, in spitting snow and cold. The few tourists huddle in damp coffee shops, pressing their noses against frosted windows. A few Orthodox Jews march resolutely to the Wall, but in general the Old City is quiet, cold as a tomb. Arabs in shops crouch over charcoal braziers and wrap their hands around small coffee cups. Outside the walls, the traffic of West Jerusalem churns around one-way streets, blowing horns as though an expectant mother were in each car.

Then is the time to set your foot upon the Via Dolorosa, the Way of the Cross, going into the Old City by Damascus Gate, not St. Stephen's. For if you go in by way of St. Stephen's, you will have to consider the veracity of this way and its Stations of the Cross.

"Christ did not go that way," a scholar once confided in me. "He was tried by Pilate near where the Armenian church is today. He then carried His Cross—just the crossbeam, not the whole thing—down St. James and up Habad, the Cardo Maximus of the Romans, and out the Garden Gate, which stood where David Street hits the bazaars today. That's the true Via Dolorosa."

"Can you prove that?" I asked.

"No. I only have archaeology, history, and common sense on my side."

Whereas, if you go in Damascus Gate, you can cut straight through to Abu Shukrei's small but warm restaurant (four tables), where his sons carry on the reputation for Jerusalem's best *hummus*, and look in on the antiquities shops, which sell museum seconds. A Canaanite goddess. A pot from Hebron. A coin from Jericho.

On this day, though, I stopped in a shop in the Christian Quarter near New Gate, which Sultan Abdul-Hamid II had permitted to be punched through the wall in 1889 so Christians could have easier access to their holy places from the hospices like Notre Dame, then going up outside the walls.

The father I met there held his feet toward

***Fortresslike walls** underscore the dual purpose of suburban housing complexes like Gilo **(left)**. They settle Jewish populations in former Arab areas and dominate strategic heights **(preceding pages)** above Palestinian Arab villages. Israel built the complexes largely on land confiscated from such villages, declaring the seizures were for a public purpose and legal under Israeli law.*

*While losing two acres of olive trees to bulldozers at Gilo, the Salameh family **(below)** kept their home; they were one of four Palestinian families to remain after the complex was built. Their forebears came here in 1948, refugees from the fighting in West Jerusalem.*

a small charcoal stove while young men, Christian Arabs, drank brandy and the wind blew thin snow against the door.

"How many Christians are there now in Jerusalem?" He pondered the question. "If by 'Christian' you mean one who loves those who persecute him, who turns the other cheek and lives by the precepts of Christ . . . none.

"You must realize that nine out of ten Christians here are Arabs, educated in missionary schools identified in the past with Arab nationalism. When the clouds of war between Muslim and Jew began to gather, the Christians began to leave—to Jordan, the Persian Gulf states, the U. S. There are perhaps 12,000 Christians left of the 25,000 of 1948, and counting down. It is possible there will not be a living Christian community in the Holy Land in another few decades, for the first time since the time of Christ. Well, it is not the land that is holy but the people who inhabit it."

Attempts at dialogue between the faiths, both formal and informal, have not gotten very far. As Anglican Bishop Kenneth Cragg has written: "Sadly circumstances have greatly reduced the opportunities of Jerusalem as an intellectual centre for both [Islamic and Christian] faiths."

One of the sticking points for Jews is the 19-year silence of the Christian community while Jews were denied access to the Western Wall under Jordanian occupation.

"The Christians clamor for their rights now," an Israeli official told me, "but you didn't hear a peep when Jewish rights of access were being openly violated."

Relations between Christian and Christian in Jerusalem, on the other hand, have traditionally been the worst advertisement of their mutual faith—the Greeks, first on the scene, shouldering out the Latins, then both of them snubbing the Syrians and Armenians, then all of them being cool to the Protestants. The White Russians on the Mount of Olives call the Red Russians across town "Soviet atheists" and worse, while the Egyptian Copts and the Orthodox Ethiopians have been disputing, sometimes with fists and sometimes in court, for possession of the mud huts that crowd the roof of St. Helena Chapel at the Church of the Holy Sepulchre itself.

Frustration and fury *boiled over after Alan Goodman, an American-born immigrant serving in the Israeli Army, opened fire in the Dome of the Rock on April 11, 1982. Two Muslims died, and many more were wounded. Arab youths clashed with police in the compound of the mosque and in the streets. Despite the threat of a prison term, a young Arab raised the forbidden Palestine Liberation Organization's flag (**above**).*

*A few weeks before the shootings, during a shopkeepers' strike in East Jerusalem, a woman vented her rage at the arrest of a Palestinian by hurling a rock at Israeli police (**right**).*

Then there are those like my agnostic friend whom I met one day in the courtyard of the beautiful old American Colony Hotel, a truly Jerusalem house of stone and orange trees heavy with fruit in a warm spring sun.

"I avoid commitment," he said. "I have neither the strength nor the years left for it. I see the drama unfold, the human comedy pass. It's all such a second-rate burlesque, isn't it? I have not met Yahweh here, nor Allah, nor God. I think they moved to Palm Springs a long time ago. It's a rather nicer desert, isn't it?

"You can make history go whichever way you please in Jerusalem. It's like an obedient little donkey; switch it this way or that, it doesn't seem to care."

IN A CITY of so many places, everyone sooner or later finds one special. For Protestants, who came on the scene so late they enjoy only minimal privileges at the Holy Sepulchre, it may be the Lutheran Church of the Redeemer in the ancient district of Muristan, from the belfry of which is one of the Old City's finest views, or Christ Church, a sober, appealing Anglican establishment of 1849 across from David's Citadel near Jaffa Gate—the first Protestant church in the Ottoman Empire.

Beyond is the Armenian Quarter, a small city within a city behind thick walls and a strong gateway that is locked and bolted each night at ten.

There is something especially poignant about the Armenians, because this Jerusalem compound is in fact the spiritual capital of a stateless nation of people living in their own diaspora. They were in Jerusalem in the fourth century, and their Cathedral of St. James is the Old City's most beautiful and authentic—a Crusader survival, a vast cave of a place hung with gleaming golden lamps, smoky with incense, spread with magnificent rugs, filled with the baritone chanting of the priests. James, the brother of Jesus and the first bishop of Jerusalem, rests under the main altar.

For a visiting Jew, a special place has to be Rivca Weingarten's house because she is still sitting in it.

"The army called me in 1967," she told me. "I was the first person back into the Jewish Quarter. I came immediately to this house, where so much history had happened."

This house is at No. 6 Or Ha-haim Street, in a neighborhood now completely rebuilt in lovely but heavy stone. In 1948, though, it was the residence of Rivca's father, Rabbi Mordechai Weingarten, the patriarchal figure for the 25,000 Jews then living in the quarter, and the man who surrendered it to the Arab Legion.

"What could he do? They were women and children and an army of boys," Rivca said. "Afterward, my father's heart was broken. He never again laughed or smiled. We could not play the radio, not even the piano, in his presence."

***Riding out storms** of criticism from both left and right, Israel's Prime Minister Menachem Begin (at left) fiercely defends East Jerusalem's annexation and the controversial new settlements on former Jordanian territory. Representatives of the ultra-Orthodox Agudat Israel Party with whom he confers support the coalition of Begin's Likud and other parties.*

Despite its slim four-seat majority, the Likud coalition has been in power since the 1977 elections.

With the help of the Jerusalem Foundation, Rivca has converted the old house into a museum of Jewish life as it was lived in the quarter long before the destruction of 1948. It is a compelling and beautiful memory—a bedroom with many beds, including two sizes of cribs; a kitchen where one can all but smell the baking and the cooking that went on in small, tin, coal-burning stoves; the guest room with its gilded mirror and couch made from boards and crates; the inner courtyard where most of life was lived.

In a separate room, the worn but lovely objects by which men earned their bread—the reeds and quills of the scribe, the copper shoeshine stand, the wheel of the knife sharpener, the stake and lasts of the cobbler.

Simple and fundamental, this series of rooms touches any human heart, for it reflects the endurance of the small against the mighty forces of history.

"We called it the Old Yishuv Courtyard Museum," Rivca continued. "The term is used to designate the group of Jews that came to Jerusalem around 1700, mostly from Spain, long before the so-called First Aliyah, or wave of immigration, which came in 1882. Ours is the fifth generation of Jews to live in this house.

"There were always riots, it seems, when I was a girl here. Always trouble, and the house was bombed more than once.

"At the same time, between the troubles, there was a common life. Many Jews had Arab landlords. I remember that at Passover our Arab friends brought us food, and we did the same for them during Ramadan."

THERE IS ANOTHER special place that touches the heart, but this one with rue. It is the Khalidiya Library on the Street of the Chain, that ancient thoroughfare that carries the Muslim pilgrim to the precincts of the sacred Haram.

The Khalidi family came to Jerusalem with Sultan Omar ibn al-Khattab, the second caliph of the Prophet Muhammad, in A.D. 638. It was Omar who built a small mosque where the Dome of the Rock would rise 50 years later.

Scholars, lawyers, government officials, the Khalidis assembled over the years a magnificent library on Arab history. But now the door is shut and bolted. A few doors away Dr. Haidar Khalidi admitted me to his house, some yards from the main passage to the Western Wall from the Old City. We went upstairs to a room that overlooks an open courtyard, its roofline ringed by barbed wire put up by the Israeli authorities. This I took to be an unsubtle reminder that perhaps Dr. Khalidi should move to where he would be more welcome.

"I will not discuss the present situation," he said in a kindly but firm tone, "because you are an American, and because it is too complicated." We had strong coffee and spoke of Arabic history. But downstairs, in the Street of the Chain, waited a man perfectly willing to discuss the situation.

He said:

"When the word came to us in 1921 that the British, who had been only four years in this land, were going to give it away to the Jews, my eyes were opened. We ran into the streets with the madness of young people, thinking to end this injustice with a club.

"Why must we Palestinians continually pay for the sins of you Christians? If your conscience was stricken, why didn't you take the Jews out of the gas chambers? Why did you send them here with guns, tanks, and planes to take our land?

"The Zionists want me to go away, but I will die and be buried in the land of my fathers and grandfathers."

A FEW DAYS LATER I called on a young Jewish couple recently moved into the new neighborhood of Ramot. It occupies the lower slope of the highest hill (875 meters) in the entire region—Richard the Lion-Hearted's onetime Mount of Joy. From the approach road across the deep Valley of Soreq, the four- and five-story apartment blocks in rank after rank loom like a fortress.

Tamy and Joseph Koren's apartment is well furnished, comfortable, warm with rugs and wall hangings. Though she can see French Hill, in "downtown" Jerusalem, from Ramot and can get there in ten minutes, Tamy still feels that she is somewhat isolated, perhaps because she was born in a comfortable and secure suburb of Jerusalem. Ramot, new, big, and still only half finished, has a feeling of being not really a part of anything.

"Our families helped us," Joseph said, when I asked him about the cost. He makes a good living as an environmental designer, but . . . "If you don't have families to help, it is very difficult to find a good place to live."

A flat in Ramot, or Gilo, or Maale Adumim on the way to Jericho now costs the equivalent of $50,000. The government will lend a qualified buyer as much as two-thirds; the rest has to be negotiated with the seller. With inflation now at 130 percent a year, prices keep rising.

Still, it is far more difficult to find an apartment to lease. Some so-called key-money flats are held by longtime tenants who cannot be dislodged while alive if they meet the rent payments.

The lucky ones live in the old sections of Talbeiya (formerly middle- and upper-class Arab houses, the best in town) and Rehavia, a pleasant, shady, Jewish section where establishment types years ago found large, comfortable places at low monthly rentals and are fixed in them for life. They can even pass on the lease as part of their inheritance.

Like other young Jerusalemites I met, the Korens were weighed down by the air of tension that inhabits the country, the recurrent warfare, and the lack of upward mobility in Israeli society.

"Until very recently, the average age of the Knesset," he told me, "increased by one year during each year of its existence."

What makes it all bearable is to live in Jerusalem. "If I couldn't live in Jerusalem, I wouldn't live in Israel!" is a remark I heard a dozen times.

A deep attachment to the place, some feeling that it is truly important, begins to deepen in the soul, and then you know that Jerusalem will stand in the door some spring morning, with her golden stones and flowers, her intimate friendship with God and Allah, her vivifying beauty and melancholy ruin, and call your name.

FOR CENTURIES before the British captured it in 1917, the city was a Turkish backwater, a place of poor sanctuaries, poorer pilgrims, dirt streets, and garbage dumps.

Outside the walls, the tsarist Russians started to *(Continued on page 506)*

The Old City

SACRED CITY, Jerusalem is a focus of faith for a third of the world's population. Within walls built by the Ottoman Sultan Suleiman the Magnificent in the mid-1500s, the city's four quarters reflect both the commonalities and divisions among Jewish, Christian, and Muslim beliefs.

For Jews, Yerushalayim is both Holy City and symbol of nationhood. Here Solomon built the first Temple, and, in Roman times, King Herod aggrandized the second on the site now occupied by the Dome of the Rock.

In Islamic belief, the ascension of Muhammad to heaven took place from the same spot, making Al-Quds, The Holy, the third most revered city in Islam, after Mecca and Medina.

To Christian faithful, the Old City is filled with reminders of the life of Christ. He entered Jerusalem in triumph; through its streets, along the Via Dolorosa, He carried the Cross to Golgotha, the place of Crucifixion, believed to have been where the Church of the Holy Sepulchre now stands.

Armenian Christians have held residence in the city since the fourth century, considering Jerusalem a spiritual haven for a people who have no sovereign territory of their own.

In A.D. 136 the Roman Emperor Hadrian built what he called Aelia Capitolina on the ruins of Jewish Jerusalem. The main roads of his city persisted and later became the defining boundaries between the Muslim, Jewish, Christian, and Armenian Quarters.

From the site where Jesus was condemned (1), thence along the Via Dolorosa to Golgotha, the place of Crucifixion (10–13), and the place of entombment (14), pilgrims may follow what has been established by tradition as the Way of the Cross.

ROCKEFELLER MUSEUM
HEROD'S GATE
CHURCH OF ST. ANNE
DAMASCUS GATE
NOTRE DAME DE FRANCE
PARK
MUSLIM QUARTER
ANTONIA FORTRESS
Site of condemnation
CONVENT OF SISTERS OF ZION
EL WAD
VIA DOLOROSA
ST. STEPHEN'S GATE (LIONS GATE)
TOMB OF MARY
Garden of Gethsemane
CHURCH OF ALL NATIONS
Haram esh Sharif (Temple Mount)
SUQ KHAN EZ-ZEIT
NEW GATE
CHURCH OF THE HOLY SEPULCHRE
CHRISTIAN QUARTER
DOME OF THE ROCK
GOLDEN GATE (CLOSED)
MUSLIM CEMETERY
CHURCH OF THE REDEEMER
Site of Crucifixion (Golgotha)
MURISTAN
Main roads of Aelia Capitolina in yellow
KHALIDIYA LIBRARY (CLOSED)
DAVID'S TOWER
DAVID ST.
STREET OF THE CHAIN
WESTERN WALL (WAILING WALL)
EL AQSA MOSQUE
JAFFA GATE
THE CITADEL
CHRIST CHURCH
Garden Gate of Christ's time
JEWISH QUARTER
HABAD
ARMENIAN QUARTER
RAMBAN SYNAGOGUE
ST. JAMES
OLD YISHUV COURTYARD
HEROD'S PALACE
CATHEDRAL OF ST. JAMES
DUNG GATE
Valley of Kidron
JEWISH CEMETERY
Mount of Olives
Mount Ophel
Gihon Spring
PARK
ZION GATE
CHURCH OF THE DORMITION
CHRISTIAN CEMETERY
ANCIENT CITY OF DAVID
LAST SUPPER ROOM AND TOMB OF DAVID
Hezekiah's Tunnel
Pool of Siloam
Mount Zion
CITY WALL IN CHRIST'S TIME A.D. 30
Valley of Hinnom

On a steep, rocky, defensible outcrop just south of the walled city, archaeologists have uncovered remains of the Canaanite city that David conquered and Solomon adorned, as well as a massive water-supply system with extensions for irrigating the Valley of Kidron.

At the time of Christ, Jerusalem's walls were more extensive to the south than those now bordering the Old City. To the north, they were less extensive, and Golgotha, the place of Crucifixion, lay outside them.

▲ ARCHAEOLOGICAL EXCAVATION
● STATION OF THE CROSS

0 KILOMETER 1/4
0 STATUTE MILE 1/4

DRAWN BY IBRAHIM BADR AND DOROTHY MICHELE MORSE
COMPILED BY DAVID A. MILLER
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

Jerusalem
The Old City

MARKETPLACE BUSTLE interjects a strain of down-to-earth life in the Old City, ever dominated by the music, chants, and prayers of religious fervor.

*In shops of the Suq Khan ez-Zeit (**facing page**), along the ancient Roman road that now separates Christian and Muslim Quarters, residents of Jerusalem can buy vegetables and housewares.*

*At Damascus Gate (**above**) vendors spread goods for crowds drawn to the city for worship during the Muslim holy month of Ramadan. Near St. Stephen's Gate, shouldering an elaborate dispenser, Muhammed Halowani serves tamarindy, a cooling fruit drink (**right**).*

*ANGUISH overwhelms an Arab bystander (**above**) as shots ring out from the Dome of the Rock compound (**right**, center) during Alan Goodman's onslaught.*

*In an investiture ceremony, Israeli paratroopers are drawn up before the Western Wall (**right**, foreground). The courtyard had been an Arab neighborhood until cleared of houses by Israelis in 1967.*

Access to the Wall had become an issue supercharged with emotion, for when Jordan ruled the Old City, Jews were forbidden to visit this and other shrines.

*FROM THE TOMB OF CHRIST in the Church of the Holy Sepulchre (**left**) during Easter observances, the Greek Orthodox Patriarch emerges and passes along the holy fire to others to celebrate the Resurrection.*

*The Western Wall (**below**) draws Jewish faithful from around the world. The Temple Mount above it remains under Muslim jurisdiction, and Jews are proscribed by rabbinic law from praying there.*

(Continued from page 498) improve things with their massive compound, a fortress that rose in 1864 on the hill called el-Meidan where the Assyrians, the Roman Tenth Legion, and the Crusaders had all camped. Large bits and pieces of it, including the cathedral and the former hospice that became the British military prison, are still there.

Bits and pieces of everything are still there in West Jerusalem; the landscape harbors the ironic, the pathetic, the bloodcurdling. In that old prison stands the cell where young Meir Feinstein and Moshe Barazani blew themselves up with a hand grenade smuggled inside an orange rather than allow the British to hang them as terrorists; it seems as if the event happened yesterday rather than four decades ago; the walls are pocked with the blast, and Feinstein's heroic speech—"the Holy Land, the land predestined to serve as the lighthouse for mankind"—echoes there still. Just beyond is the execution chamber with its gallows and its noose.

The building is now the Hall of Heroism, documenting in photograph and exhibit the struggle between the British government and the Jewish underground groups Lehi, Etzel, and the Haganah. The first two, commonly known as the Stern Gang and the Irgun, left a trail of blood; the Haganah, supported by the great majority, developed into the modern Israel Defense Forces.

On the wall of one of the cells is a poem by Vladimir "Ze'ev" Jabotinsky, terrorist turned hero:

Carry a torch to burn, to ignite.
Since quietude is like mire
Risk your blood and your soul. . . .

It is a deeply moving place—horrible and heavy with past atrocity and mayhem. Equally moving, and far more majestic, is the tree-shaded northern slope of Mount Herzl, where Israeli military dead sleep beneath blankets of flowers, their names written on pillows of stone. But more moving, still, is Yad Vashem, where the Nazi Holocaust is enshrined in black memory. An eternal flame flickers in a darkened chamber, the floor of which is graven with the names of concentration camps—graven forever in the memories of all Jews. Outside, a black sculpture: writhing, emaciated figures in a bramble of iron thorns. The sun that shines on the graves of Mount Herzl does not penetrate Yad Vashem.

IS JERUSALEM ALL CHANGE and discombobulation and madmen? I went to see Yehuda Amichai, who observes a higher calling than politics; he makes poems out of Jerusalem's stone, a profession best described in his own lines:

All the generations before me
donated me, bit by bit, so that I'd be
erected all at once
here in Jerusalem, like a house of
prayer. . . .

He writes often of places like Damascus Gate and of the tourists who throng that portal. In fact, he had a new poem titled "Tourists" in his pocket when we set off for a walk to Mahane Yehuda, the marvelous old Jewish market that occupies several blocks off Jaffa Road.

Yehuda Amichai looks like his poetry, as Byron looked like his. He is deceptively humble, short and round and rhymed chin to elbow to knee. His mobile face beams with sadness or frowns with joy.

I asked him how it was possible to live and write in Jerusalem without falling into the abyss of political agonizing.

"I am a working poet," he shrugged. "I am attached to no institution. I must make poems for my bread."

And, I soon discovered, for his cheese and lettuce and candy and beef, for before long we were within the mobbed confines of the market, streets and lanes lined with hundreds of shops, stalls, carts, stands, and counters selling foot-wide heads of lettuce, two-pound radishes, whole barrels of olives, great wheels of cheese, blocks of rich chocolate, heaps of cashew nuts and pistachios, stacks of still warm bread, baskets of apples, apricots, tangerines, and oranges, shoes, cigarettes, and taped American music, and, of course, hummus.

I was reminded of his new poem:

. . . you see that arch from the
Roman period?
It's not important:
But next to it . . . there sits a man who's
bought fruit and vegetables for his family.

For those who prefer the Roman arch, Jerusalem has a wonderful new one on display, just beneath and to the north of Damascus Gate, the most impressive of the 11 (4 closed) that pierce the Old City walls. It was uncovered during construction of a new amphitheatered entrance to the old gate.

Yitzhak Yaacovy was admiring the ancient arch when I met him there. He is the municipal officer responsible for East Jerusalem, and to him has fallen the task of continuing the public works that began in 1967: replacing the antiquated sewer system of the Old City with a new one, putting in electricity, replacing the forest of ugly television antennas that defaced the low skyline with cable, and repaving the lanes and streets.

"It is a tedious and boring job," Yitzhak said as we made our way toward an Arab coffeehouse. "We work hole by hole, street by street, and plan to have water and electricity in every shop and house. We have completed the Jewish and Christian Quarters and are working on the Arab section."

The city has yielded up treasures during the renewal—great paving stones from the time of Christ found during sewer construction along the Via Dolorosa and now incorporated into the living street.

"Why put them in a museum?" Mayor Teddy Kollek later asked me. "This should be a living city; there is a certain feeling to walking on 2,000-year-old stones."

The only mayor that Jerusalem has had since reunification is a stocky man now nearing 72 but with undiminished energy (page 510). Often called the only world statesman who operates out of a mayor's office, Teddy is credited with an evenhanded approach to problems that would drive other men to an extreme—and denounced by those for whom he has not kept his promises.

His comfortable but modest office in West Jerusalem, near New Gate, is a small gallery of old prints, lithographs, and watercolors of Jerusalem.

"We must do many things quietly," Teddy told me. "Everything works as long as it is not publicized. The Arabs are apprehensive. If they cooperate, they do so at great risk from Arab terrorists. One lawyer was willing to run for office in the city, but he was told he would have to drive around in an armored car for the rest of his life."

In the elections of 1978, Teddy won in a landslide that included 9,000 Arab votes—twice the number cast in 1973, but still less than 20 percent of eligible Arab voters.

"Jerusalem must maintain its traditional mosaic," he told me. "I'd like to see Arabs treated here the way we would like to see Jews treated in the Soviet Union, or anywhere else."

He is praised for accomplishing some important negatives—cutting a planned hotel by several floors and keeping the Hilton tower in far West Jerusalem. Six of seven tall buildings on drawing boards disappeared.

Teddy's international reputation comes in part from his ability to raise significant sums of money from Jews around the world to improve the amenities of life in Jerusalem. His instrument is the Jerusalem Foundation.

Since its inception in New York in 1966, the tax-exempt (in the U. S., Britain, and Canada) foundation has poured 80 million dollars into more than 400 city programs, ranging from reconstruction of the earliest Jewish housing outside the walls to presentation of Arab plays in the Old City.

The Jerusalem Foundation is also helping archaeology come ever closer to finding the palace of that renowned first king of biblical Judah and Israel, David. They are looking along the flank of Mount Ophel, which runs southeast from the city wall and overlooks the Kidron Valley and the Gihon ("gushing") Spring.

THAT GUSHING SPRING is where Jerusalem began, more than 5,000 years ago; Canaanite pottery that old has been found nearby. The first settlement was handy to the spring but located, for purposes of defense, on the bulge of ground above it.

The Jerusalem that David captured and made his capital, it turns out, had begun as a tiny mud-brick village plastered to the hog-backed hill. The Bible tells us how he finally took the place from its Canaanite defenders by subterfuge, sneaking his soldiers in through a cistern, in all probability a network of tunnels leading to Gihon Spring and upward into the village.

For the past five years, Dr. Yigal Shiloh has led a small army of 120 volunteers, supervised by 35 graduates and students of

Hebrew University's Institute of Archaeology, in a massive excavation along the eastern ridge.

They have found what Dr. Shiloh believes is a portion of the defense system belonging to the royal precinct, King David's fortresslike palace. It is a stepped-stone structure 60 feet high and 50 feet wide. At one level the diggers found a Canaanite citadel of 1300 B.C. and, above that, Israelite kilns of 1000 B.C., David's era.

It was left to David's son Solomon to expand the town northward and build the famous cedarwood, gold-sheathed Temple.

In 1981 Dr. Shiloh had an unwelcome group of volunteers, ultra-Orthodox Jews who leaped into his excavations, earlocks flying, to protest the possible desecration of Jewish graves. After an ugly fray, police dragged the protesters away, but the end was not yet. A bill already introduced in the Knesset would require archaeologists to stop digging immediately if they come upon a human bone. If an official from the Chief Rabbinate declared the bone Jewish, excavation would cease.

To protest the measure, a group that numbered most of Israel's leading archaeologists assembled on a hill opposite the Knesset, milling about with placards and bullhorn. Yigael Yadin, who excavated Masada among other famed sites and once served as deputy prime minister, was still fuming after the meeting.

"This will be the end of archaeology in Israel," he said.

"How can you tell whether a 2,000-year-old bone is Jewish?" he was asked.

"You're asking me? This is a minority of fanatics trying to exercise its will. Well, they will leave me no choice. I will dig, and I will go to prison!"

That evening I consulted with my old friend David Rothschild at his small,

The lens of events *has refocused the perspective of Amos Elon* **(above)**. *He is revising his book* The Israelis *to incorporate his present alarm over the policies and actions of Israel under Prime Minister Begin.*

A debatable question: Is Isaac Stern greater as a violinist, a teacher, a fund-raiser, or a warmly responsive human being? At the music center he helped found **(right)**, *he works with pupil Roy Shiloah, 12, who might be another virtuoso such as Israelis Pinchas Zukerman and Itzhak Perlman.*

popular restaurant Fink, an oasis for many a correspondent over the troubled years of Israel's existence. A good cup of goulash, a bottle of superb Israeli wine, and the dispensing of old wisdom are welcome events at the close of a hectic day.

"He will dig," said David, "and he will not go to prison. One never sups the soup at cooking temperature. In Jerusalem one man closes the door and another opens it."

The same Orthodox minority behind the "bones bill" was caught last year doing some archaeology of its own—into the Temple Mount itself, under the great shrine of the Dome of the Rock! A group of fanatics was presumably searching for the holy of holies, containing the Ark of the Covenant—Israel's most sacred object, not seen for 2,000 years. A secret tunnel was discovered when Muslim worshipers above noticed the water had mysteriously drained out of a well. Amid a roar of protest by indignant Arabs, police reacted quickly, and the tunnel was soon walled up.

THE DIVISION between secular and orthodox in Jerusalem is paralleled by a growing division between the Central European Ashkenazi Jews and the Oriental Sephardim.

Israel was built by those to whom the Holocaust had left no other choice. The 19th-century founders of Zionism were European intellectuals; the first settlements in Palestine were made by Russian and Polish socialists reacting to the repressions of tsarist regimes. The Holocaust survivors were European.

Under the doctrine of the ingathering of the exiles, the doors of the new state in 1948 were thrown open to all Jews; many began to arrive from Yemen and Iraq, and large numbers from Morocco and Tunisia. These Oriental Jews were of the Sephardic persuasion and came from a different background of persecution, chiefly Arab. They dressed in a Middle Eastern fashion, ate Middle Eastern food, and took up their first residence in tents, living like the Bedouin. Illiterate, unskilled, flat-out poor, they fell upon the struggling new state expecting miracles of education and wealth.

The Oriental populations have leaped upward and now represent a majority, as much as 60 percent. Yet they are proportionately underrepresented in the Knesset and hold relatively few positions of power, wealth, and influence. And social frictions have grown.

"Listen," said a computer mathematician. "If we ever get peace, we'll have a civil struggle around here that will make us wish we had the Arabs back as enemies. European Israelis are concerned that they may find themselves members of a poor Middle Eastern state in the midst of others like it. The demographics here are a matter of real concern to the Europeans, believe me."

In Jerusalem the Orientals crowd into places like the old Arab district of Musrara, next to the former no-man's-land near Damascus Gate, and into Katamon and other pre-1967 neighborhoods.

They live in large families crowded into few rooms. Half of the city's population lives in families with four or more children, and

***Evenhandedness** has characterized the administration of Teddy Kollek (**above**), mayor of Jerusalem since 1965. Unofficial mayor of the Arab population, pediatrician Amin Majaj (**left**) directs the Makassed Hospital. Former Jordanian Defense Minister Anwar Nusseibeh (**right**) confers with his son, Sari. He persuaded the Supreme Court that his East Jerusalem electric company should not be taken over by Israel. Yet overall he sees local conflicts as "a gloomy picture getting out of control."*

almost all of that population is Sephardic. It seems certain that in Jerusalem the majority population will someday have decisive impact on the political arrangements.

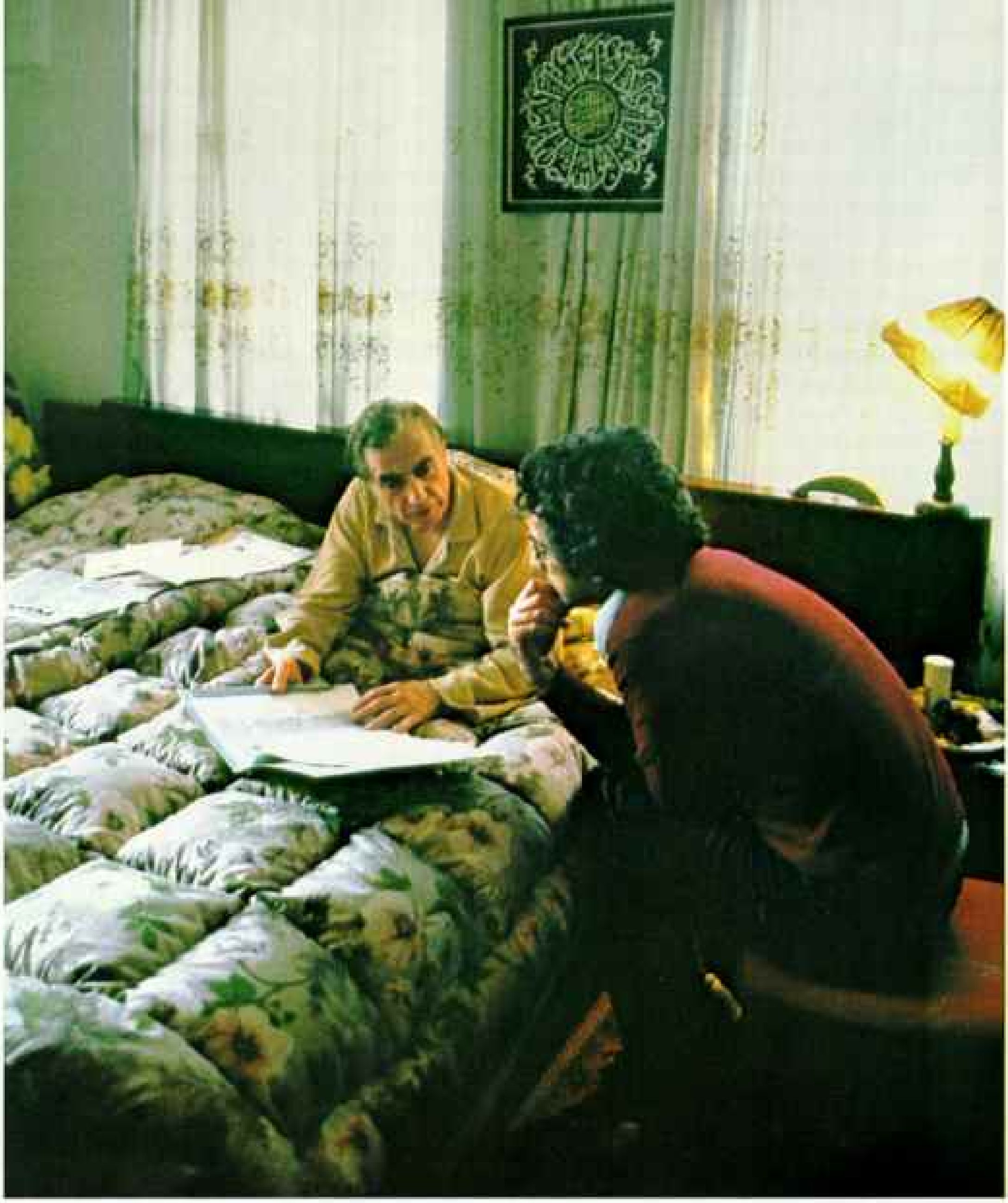
"Our turn with the ball is how you say it in American baseball talk," said Moshe, a bright, lively Sephardic Jew who had approached me in Katamon with hellos in French, German, and English, flying the languages like flags.

"I have been in America! In Dallas, Texas! I love the telephones!"

In his late 20s, Moshe was born in Morocco and—by dint of desire and hard work—is prospering ahead of his compatriots.

"I have a good job in a restaurant," he said. When I remarked on his command of languages, he told me: "I taught them to myself word by word, word from word. From the time I was small, hours and hours spent with any book I could find.

"This is not an easy country. One must work. Unless you are a recent immigrant. Then they give you everything. Or unless you are one of the lucky ones who got into the ball field early and had some friends and got a nice house at very low interest. Then you are sitting lovely."



ONE PRODUCT of the annexation of East Jerusalem has been increasing economic dependence upon the State of Israel by the Arab populations, especially those who have lost their land and rural occupations.

Each day 28,000 Arab workers stream into Jerusalem by taxi from nearby villages, on foot from East Jerusalem, by jam-packed bus. Most work as day laborers, especially in construction, building the new Jerusalem on property taken from them earlier.

"Slavey jobs," is what the Arabs call them, and the former no-man's-land outside Damascus Gate, where the buses and taxis arrive with the work force, is called the "slave market."

It is a mad scene early in the morning as a hundred and more men seeking a day's wages mob the Israeli cars that arrive. A person looking for a single worker for a day suddenly finds four of them piling into his back seat and struggling among themselves to be the one who stays.

At some point, a tidal movement sweeps through the crowd as a mounted police officer arrives to disperse it. He hands out fines for loitering to those he runs down and

catches—50 Israeli shekels, paid at the post office. A man who finds no work and is caught by the horseman is unlucky indeed.

Most of the Arab labor force comes to work in a more orderly way, through private contractors who erect housing on land given to them by the government in exchange for accepting a set mortgage rate.

It is possible to do well in Israel. Businessman Abner Perez has a lovely home in Talbeiya, perhaps Jerusalem's most sought-after neighborhood. Like many other members of the establishment, he served with the British Army in World War II, a member of the Jewish Brigade stationed in Italy.

"I love this country," he said. "My father was a Jewish engineer who worked for the Arab mayor of Jerusalem years ago.

"I have a lot of Arabs working for me, and there is no trouble. They are good workers if you treat them fairly. Arabs and Jews have lived together in Jerusalem for a long time. My every hope is that it will be that way again someday."

I WENT OUT to one of the villages that had lost much of its land to a new neighborhood. It was Friday, and the muezzin was singing of Isaac and Abraham from the minaret. Around me a rampart of apartment houses closed off the view.

"The Jews live like bees," said an old

Just married: *Although of two nationalities and two traditions, Helene and Shaltiel Yefet unite in one faith. After their Orthodox wedding, they dance Western style (**left**). Earlier, at his parents' house, they celebrated in the Yemeni manner (**lower left**). Helene, an American, sitting between Shaltiel and his grandmother, wears nuptial jewelry made by a Yemeni smith (**below**) and rented for the occasion. His wife, the woman in the white shawl, keeps a sharp eye on the family property.*

Such private acts of union help lessen tensions between Central European and Oriental, or Sephardic, Jews, often at odds because of cultural and historical traditions. Sephardim—a growing proportion of Israel's

population—tend to be more prolific in childbearing, orthodox in religion, conservative in social behavior, and intransigent in politics, refusing to seek accommodation with Muslim policies and states.

man. "They have no land with their house. But maybe we have changed their minds about land, because they are always trying to take ours."

He pointed to several detached houses on a hill: "Captured by the Jews," he said, using the universal term in Jerusalem for land that has been confiscated.

"They came there in 1967 and told the owners: Go away from this place! This land has been taken!

"This was once a peaceful green valley, with green fields and orchards and strong young people. Now the young people leave to go to Jordan and America, and the village is old men who are laborers for the Jews. We are living in a hard time."

Jerusalem's litany of terror has many passages, Jews dead, Arabs dead—Passover 1920, May 1921, August 1929, the 1936 Arab rebellion. The bombing of the Semiramis Hotel, the Jewish market—again and again, the blood sacrifice.

Two events especially have seared themselves in the city's memory so deeply they are neither mentioned nor forgotten.

At four o'clock on the morning of April 9, 1948, 132 Jewish terrorists from the Irgun and Stern Gang fell upon the peaceful, sleeping Arab village of Deir Yasin, west of Jerusalem. For eight hours, terrible murder occurred until more than 200 men, women, and children lay dead, 15 houses dynamited. The corpses were piled in a nearby quarry and burned, and that pillar of black smoke has darkened the Jerusalem air ever since.

Today a hospital for the mentally ill covers the site; many think that use appropriate. Irgun leaders like Menachem Begin (who was not present at Deir Yasin) have denied the accusation of atrocity; the deaths were a result of what he considered, then and now, a legitimate military action.

Five days later, on Wednesday, April 14, thousands of enraged Arabs ambushed the weekly convoy taking supplies and personnel to the Jewish university and hospital on Mount Scopus, which had been cut off from Jewish Jerusalem by Arab irregulars. On the road to Scopus, near the Orient House Hotel, dynamite stopped the convoy at 9 a.m. An intense battle went on until dark, while the British did little or nothing to intervene. There were left 78 dead in the smoking hulks of armored cars and buses—doctors, nurses, scholars, a dreadful waste.

Why remember such things? Are they not too horrible to remember, when the memory brings no redemption, no salvation, no forgiveness? It is not stones you see in Jerusalem, the most permanent of all of man's artifacts; it is the living and fragile web of memory, as enduring as hatred, as deep as love. Memories there are millennia old; they reach to the root of human life and nature, and man stands naked before them, fully revealed as animal and angel.

TOWARD EVENING, there were few lights in old East Jerusalem. The shops had shuttered in another strike following more violence in the West Bank. The city was quiet and somber. Prayers were going up to heaven from mosque, church, and synagogue—seeking the justice of Allah, the salvation of Christ, the coming redemption of the Messiah.

So it goes this year in Jerusalem—the Arab despondent in his Palestine, the Christian uncertain in his Holy Land, the Jew triumphant in the Land of Israel, yet all summoning will and courage to survive this history, to preserve the ancient commitment to the most revered of man's cities, which like a vast sundial of golden stone counts down the years to the final one when all bargains are sealed and promises kept.

In that final time, then will every man take the hand of his brother in love and understanding and forgiveness; then will love bloom like a million spring flowers on the desert slopes of Kidron; then will mankind come into its inheritance of peace—peace forever, peace everlasting, peace without end.

So they say. □

Tears are not new *to the military cemetery on Mount Herzl, where young women in the Israeli Army mourn at the funerals of three of the first soldiers killed in last June's fighting in Lebanon. Nearby is the tomb of Theodor Herzl, whose work as a Zionist laid the foundations for the State of Israel.*

The Uncertain State of Puerto Rico

By BILL RICHARDS
Photographs by STEPHANIE MAZE

THE NIGHT is the sweet stuff of tropical fantasy. A soft wind ruffles the palms overhead; the sea, both dark and luminescent, pounds the beach beyond the lights of San Juan. A dozen couples, caught up in the Latin rhythms of Héctor López's 12-piece band, whirl and sway in the shadows of a small beachfront night spot, while Héctor sings:

What will become of Borinquen
My dear God
What will become of my children
Of my home,
Borinquen land of paradise . . .
*pearl of the seas. . . .**

The notes fade, but the bittersweet words of the 1930s *lamento* by Rafael Hernandez for the island the Indians once called Borinquen and the Spanish eventually renamed Puerto Rico seem to hang in the night air.

What will become of Borinquen. . . .

"The songwriters back then, they wrote to inspire people to love their island," Héctor said, joining me after the set for a beer. "Just like them, I love it here too, but perhaps it has been too easy living in such a beautiful place. Now we are facing some hard decisions about our future. Puerto Ricans are afraid of the changes they may bring. We argue endlessly. Why can't we just make up our minds?"

Strange conversation amid such lulling beauty. Yet during weeks of crisscrossing the Cordillera Central, the mountainous crown of this bullet-shaped island, and exploring miles of its reef-combed Atlantic and Caribbean coastlines, I heard the same doubts repeated with impatience.

After nearly five centuries of absentee direction—first by Spain, then by the United States—Puerto Ricans are wrestling with themselves to resolve, in their own way, the uncertainties of the future.

Lying at the eastern end of the Greater Antilles, Puerto Rico is a stepping-stone to the rest of the West Indies, to the U. S. mainland, and to Central America (map, pages 522-3). Caracas is closer than Miami. This

*Used by permission of Peer International Corporation.

Holding tight to their pride as Puerto Ricans, young islanders face a difficult question: What does it mean to be both Latin and American? Pulled in both directions by powerful social and economic forces, Puerto Ricans struggle with this dilemma as they debate the choices before them: statehood, commonwealth, or independence.


PUERTO RICO

Symbol of Spanish rule *over four centuries, El Morro fort stood guard on San Juan Bay during the Spanish-American War, which in 1898 gave the U. S.*

sovereignty over the island. Made U. S. citizens in 1917, Puerto Ricans elected their own governor in 1948 and became a U. S. commonwealth in 1952.

proximity to the Latin world is strengthened by bonds reaching back to 1493 when Columbus claimed the island for Spain.

"Emotionally, our ties are Latin," a coffee grower in the mountain town of Lares told me. "But economically, we are bound to the United States."

Politics With a Latin Twist

Though newspapers regularly carry broadsides in both Spanish and English from those favoring statehood, independence, or a continuation of the island's current U. S. commonwealth status, the spirit of Puerto Rican politics is strictly Latin. I found signs posted in downtown San Juan bars and back-roads *colmados*, general stores, advising patrons not to talk politics. ("Otherwise they sometimes end up shooting each other," a wary owner explained.)

Politics even shoulders its way into Puerto Rico's traditional winter pastime—baseball. At a night game in Ponce, the island's third largest city, the contest between the Santurce Crabbers and the Ponce Lions was all but overshadowed by the arm-waving political debate that broke out in the stands around me. The man in the next seat broke away from the verbal melee long enough to explain: "Politics, you know, is really the national sport here these days."

Then, remembering the always crucial nationhood-statehood-commonwealth debate, he quickly corrected himself. "No, I can't say *national* sport. That in itself is a political statement, no?"

But there is more to the ferment than politics. In rural villages, which were dominated in the past by colonial hacienda-style agriculture, Puerto Rican *jíbaros*—countrymen—are sharpening new high-technology skills. In urban art studios and at isolated archaeological sites, other islanders struggle to knit the threads of the past into a single Puerto Rican identity.

With 3.2 million people jammed onto an island roughly 110 miles long by 36 wide, Puerto Rico is nearly as crowded as New Jersey. Sometimes this population pressure flashes into violence. One January night in Old San Juan's Plaza de San José, I watched a squad of police suddenly appear and without warning pour pistol and shotgun fire over the startled heads of a crowd of young

"Down with statehood," *shout supporters of the commonwealth party (**below**) as a caravan of rival statehood-party members rolls by in the 1980 election campaign. Colors held high, commonwealth backers (**left**) whip up partisan spirit at a preelection rally in San Juan. Puerto Ricans take politics seriously. On election day 80 percent of the voters turn out. Evenly split between candidates favoring statehood and commonwealth—with a much smaller vote for independence seekers—the 1980 election left the island's future still dangling. The next plebiscite is not expected until at least 1985.*

Puerto Rico

FOURTH LARGEST ISLAND in the Caribbean, Puerto Rico is predominantly mountainous, with steep slopes falling to gentle coastal plains.

GOVERNMENT: United States commonwealth. **AREA:** 3,515 sq mi (9,104 sq km). **POPULATION:** 3,197,000. **MAJOR CITIES:** San Juan (capital), 435,000; Bayamón, 196,000; Ponce, 189,000. **LANGUAGE:** Spanish, English. **RELIGION:** Roman Catholic, Protestant. **CLIMATE:** Tropical, average temperature 77°F, rainfall light on southwest plain, heavy in northeast rain forest. **ECONOMY:** Industries—pharmaceuticals, electronics and machinery, food products, clothing and textiles, tourism. Agriculture—dairy products, sugarcane, fruit and vegetables, coffee, livestock.

people milling peacefully around the statue of the island's colonizer and first governor, Juan Ponce de León.

When the smoke cleared, I asked a young policeman what was going on in the now scattered crowd.

"Too many people," was the reply. "We had to break things up."

"There is a frontier element to our character," Dr. Ricardo Alegría told me, when I mentioned the incident to him in his office at Casa Blanca, an airy, whitewashed building near the bay in Old San Juan. Anthropologist, author, and perhaps the foremost curator of the island's cultural heritage, the soft-spoken Alegría is director of the Institute of Puerto Rican Culture.

"In pre-Columbian times," he said, "Puerto Rico was the frontier between the Taino Indians of the Arawak group and the more warlike Caribs. When Spain ruled the Caribbean world, we were the frontier where other great powers like England and France sought to make inroads into the Spanish Empire.

"Even after the United States acquired Puerto Rico in the Spanish-American War in 1898, Congress endowed its prize with the indeterminate status of an unincorporated territory—a sort of political limbo that we are still in today."

Being a frontier and military post for so long has left its mark in many ways. "In fact," Alegría said, "the buildings right here were the garrison for American troops that used to be stationed in San Juan. And where we are now sitting was the jail."

View From a Venerable Mansion

A few mornings later I climbed the steps of another, far older garrison on my way to breakfast with Puerto Rico's Governor, Carlos Romero Barceló. La Fortaleza, the governor's office and official residence, a 16th-century Spanish stronghold, is the oldest executive mansion still in use in the Western Hemisphere.

Through the dining-room windows of the old fortress the morning sun sparkled off the waters of San Juan harbor, highlighting the

line of tall, white cruise ships nosed up to the old city's waterfront. Beyond, a new San Juan stretched toward the surrounding cordillera, a spreading pool of suburbia and high rises, filling abandoned sugarcane fields with neat grids that house nearly one-half of the island's population.

Kathleen de Romero, or Doña Kate as nearly everyone calls the governor's attractive, dark-haired wife (following page), greeted me warmly at the door. Puerto Rico's first lady was Kathleen Donnelly when she first arrived here on vacation from New York's Long Island in 1961. She fell in love with the island, came back to stay, and then fell in love with the island's governor-to-be.

"I've never been disappointed in the choice I made to come here," she said. "I'm where I want to be and perhaps where I was destined to be."

A week earlier I had heard Governor Romero recite a bleak litany of the island's problems during his annual message to the legislature. Unemployment was the worst worry, he said, at 21 percent. Some 60 percent of Puerto Ricans qualified for food stamps (due to federal budget cuts the government abandoned the stamps in July 1982 and now sends out checks to those eligible). The governor noted that the island is extremely vulnerable to changes in federal spending policy.

Perhaps it was the day—a near-perfect Caribbean specimen—but the governor seemed more optimistic as we sat sipping aromatic Puerto Rican coffee. He conceded that the island faces serious problems. "But still," he added, "we can be thankful that no one here goes to bed hungry."

Future Island Status Undecided

An ardent statehood advocate, Governor Romero blamed many island problems on commonwealth status, established by Congress in 1952. "Under this system we have no vote. We're neither fowl nor fish," he said. Eventually, he believes, the solution can only be statehood or independence.

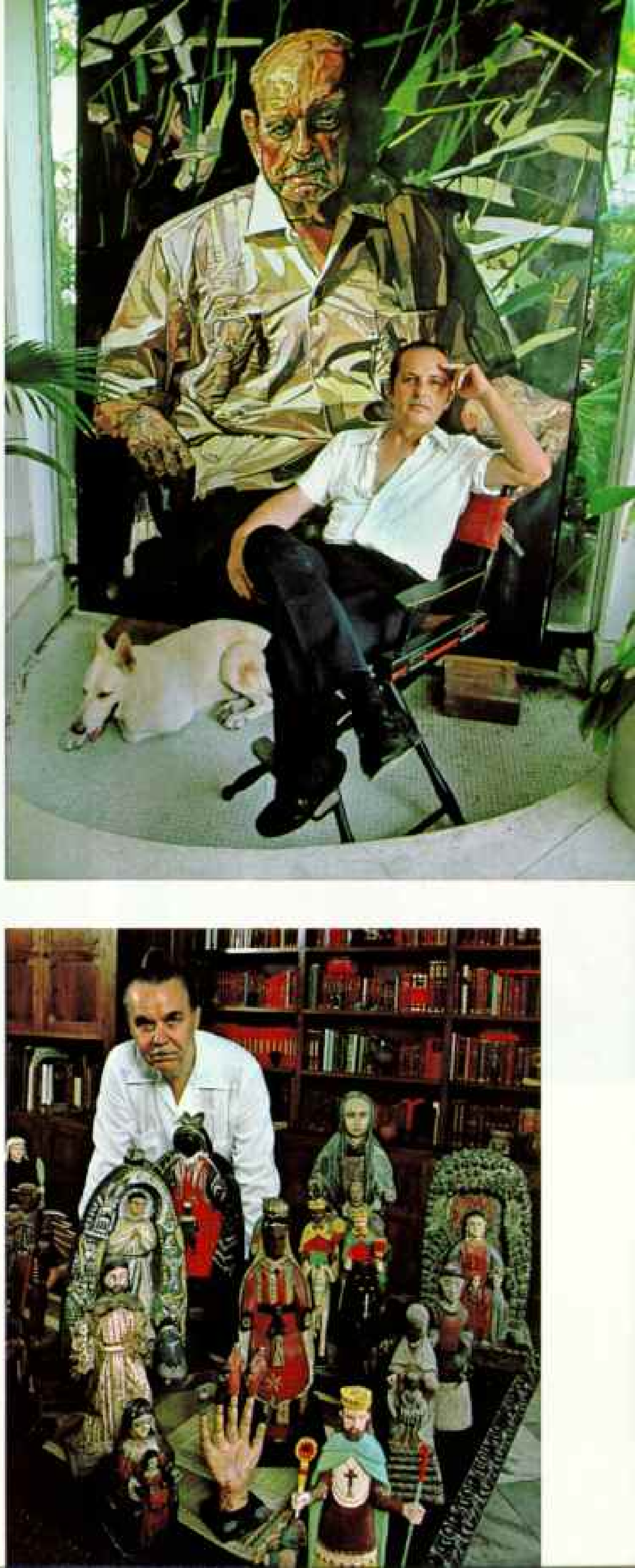
Puerto Rican voters now seem evenly split between a future as a commonwealth or a

Art has a friend at *La Fortaleza, the oldest executive mansion still used as such in the Western Hemisphere. She is the governor's wife, Kathleen Donnelly de Romero (**below**). A vigorous advocate for the handicapped, the elderly, and needy children, Doña Kate tries her touch on a canvas in a quiet moment away from official duties.*

*The father of modern Puerto Rico, Luís Muñoz Marín, looks over the shoulder of artist Francisco Rodón (**right**). A founder of the Popular Democratic Party and first elected governor of Puerto Rico, in 1948, Muñoz guided the rapid development of the*

island's industrial economy.

*A desire to preserve Puerto Rican national heritage led Dr. Ricardo Alegría (**below right**) to study the folk arts and to collect carvings of saints used for worship by rural families. Alegría organized the Institute of Puerto Rican Culture in 1955.*



Princess for a day, *a regally gowned youngster* ***(above)*** *gathers courage for her march through the streets of San Juan in an annual Carnival parade.*

The flavor of colonial days is still strong along the narrow roads of Old San Juan ***(right)****, where carefully restored buildings house many art galleries, museums, and historic churches. The oldest, San Juan Cathedral, begun in the 1520s, is the burial place of Ponce de León.*

state (only 6 percent favored independence in the 1980 election). But, as U. S. citizens, they have another choice as well. During the 1950s and '60s, when 150,000 low-paying agricultural jobs were abandoned, more than 600,000 Puerto Ricans headed for the barrios of New York, Chicago, and other mainland cities. For a $60 ticket north, 30 percent of the island elected to trade desperation for uncertainty.

Not until the early 1970s did emigrants begin returning in any great numbers. The

balance between departures and returnees now fluctuates with the economy. But many of those who came back chose to settle around San Juan, with its mainland-style look and hustle, instead of heading back to the farm.

By telephone I arranged to meet one of those returnees. José Muñiz spent 16 of his 53 years working on Chicago's South Side before deciding to bring his family back here in 1968. He bought a house in Levittown—Levittown, Puerto Rico—and went to work for the firm that built the development.

We agreed to meet Saturday morning. But where would I find him in all that suburban sprawl, I asked.

"No problem," José assured me. "We'll meet in front of one of the busiest places in Levittown—Kentucky Fried Chicken."

Momentarily, as I drove through Levittown's busy weekend streets, it seemed as if I were back home in Washington, D. C. Despite its predominantly Puerto Rican population, this community of 43,000 was like an

extension of a mainland suburb. Housewives in hair curlers popped in and out of Japanese-made station wagons cradling armloads of grocery bags and children.

"Here we are an island within an island," said José, as we sipped Coca-Cola in his living room. He decided to come back to Puerto Rico, he said, because Chicago's barrio had grown too tough. But his children barely spoke Spanish and had to enroll in special bilingual classes. A month later the youngsters approached their parents. "They said they wanted to go home—to Chicago," José said.

Most of Levittown's residents are returnees from the mainland. Shuttling between two cultures has left many with no culture of their own. "In Levittown we live half American, half Puerto Rican," José told me. "My wife and I talk about it, and to be honest, we're both still homesick for the mainland. So are our friends. The first thing you hear when someone loses a job is 'I'm going back to the States.'"

Beyond San Juan—a Change of Pace

It would be unfair to judge Puerto Ricans by the standards of Levittown or San Juan only. A few minutes beyond the suburbs' reach, the island performs a dramatic physical change, which portends a change in the pace and style of human life. The mountains begin to catch the cool ocean breezes that ride above the coastal plain. Tropical vegetation closes in along the roadsides, and the

Safety net *for more than half the population, food stamps like these being distributed in Bayamón (**below left**) were replaced by cash payments last July, when program funds were cut by 25 percent. A new noncash plan may begin in October 1983. Among the wealthiest Caribbean islands, Puerto Rico still has the lowest per capita income in the United States—about half that of the poorest state. Unemployment reached 24.5 percent last July as the recession gripped the island. Seven of eight petrochemical plants closed down at a huge complex in Peñuelas (**below right**). The skeleton of an east coast sugar mill (**right**) symbolizes the slow death of that industry.*

Reaching out *with compassion to a resident of Nuestra Señora de la Providencia, an old people's home in San Juan, Mother Superior Milagros Palací* (**left**) *carries on the traditions of her order. About 75 percent of Puerto Ricans are Roman Catholics, but the church's role in daily living is said to be less dominant here than in other Latin American societies.*

A strong influence on the island's life-style has come from the steady migration of families back and forth to the U. S. mainland, a balance now tipping northward. Many of the shoppers at Plaza Las Américas (**right**) *in San Juan have lived on the mainland, where they embraced the American way of buying.*

hills are streaked with scarlet by the royal poinciana and African tulip trees.

In Bayamón, on the fringe of the capital, I squeezed on board a *público*—one of the fleet of public vans that carry Puerto Ricans around their island. Fourteen of us swayed in unison as the packed vehicle negotiated the cordillera's breathtaking switchbacks. Suddenly a woman tapped me on the shoulder. What was a stranger doing on a rural público, she asked. Conversation in the van halted expectantly.

In my broken Spanish I attempted to explain. "Traveler from Washington, D. C., on my way to see the countryside."

"Ah, *americano*," she said, all sympathy at my fractured efforts. Perhaps, she inquired politely in flawless English, I knew her cousin who is a doctor in my hometown. Others in the van chimed in with their own relatives' names. A lesson: No matter how remote it may seem, you are never far from the mainland in Puerto Rico.

Naranjito, a community of about 3,000, snoozes in a cleft in the mountains south of San Juan. As my público rolled off, no one seemed to be moving on the sunbaked plaza. A hawker or two halfheartedly peddled oranges from the back of a pickup truck. No one even looked up from the domino game strategically placed in the shade of a broad-leaved tree.

Bringing Success Back Home

Juan López moved home to this oasis of tranquillity in 1968, after 13 years in Brooklyn, New York. "I was born here, I wanted to die here," he said. But between those two momentous events he had a living to make.

If Naranjito seemed sleepy, López veers toward the other end of the energy scale. Proudly he led me toward a low concrete building at the edge of town. The sign at the door read Johanna Lingerie. "Johanna," he said, "is my youngest daughter." His wife and four dozen other women were inside sewing pastel-colored ladies underwear.

Pushing aside a pile of yellow panties, López cleared a place for us to sit and began telling the homegrown success story of how

Juan López, Brooklyn floor sweeper, became Juan López, Naranjito factory owner.

Johanna Lingerie began, he said, in his bedroom with a couple of used sewing machines. He worked the machines with his wife, Luz, and her sister and canvassed the island in his spare time, seeking orders. Four years ago he obtained a bank loan, built his plant—and Naranjito got 48 badly needed new jobs.

"Now the big companies come in and ask me how I did it," López said. "I tell them these are my friends here. They helped me; now my success is helping them."

Puerto Rico's industrial revolution —Operation Bootstrap—has drawn nearly 2,600 plants to the island since the early 1950s, using the twin incentives of low wages and big tax breaks. But today there are mixed feelings about Bootstrap's effects.

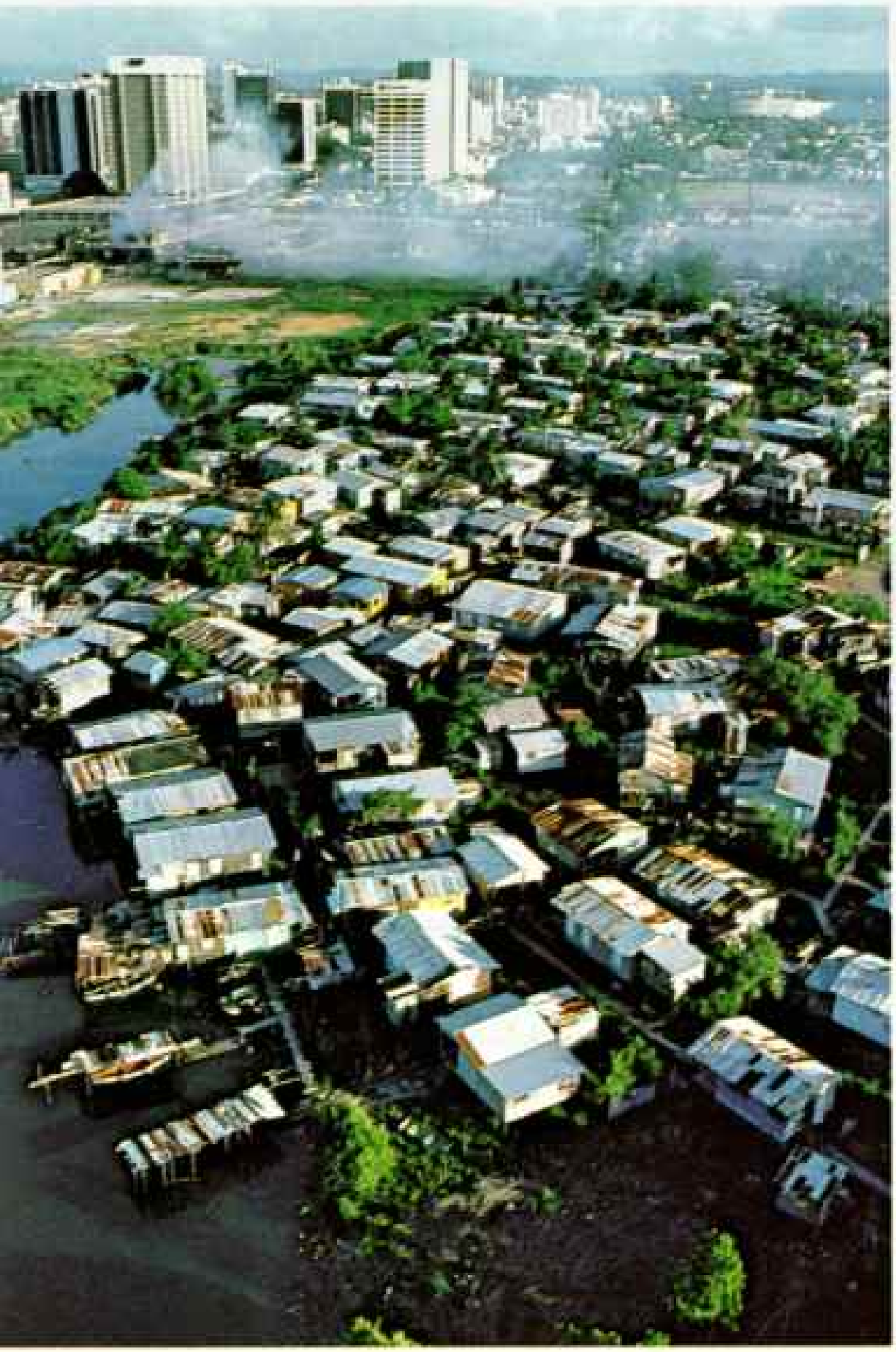
"It gave us more than we had, which was nothing," said José R. Madera, Puerto Rico's economic-development administrator. But most of the new plants were subsidiaries of off-island companies with limited capital investment in Puerto Rico. Many took advantage of the benefits, then left when wages rose. Madera called the results "demeaning and bankrupting" for the island.

Diversified Industries Come to Stay

Puerto Rico is now going through a painful rebuilding of its industrial dream. Fomento, as Madera's agency is called, is wooing drug and high-technology companies to build and invest here and create a skilled work force, which will tie them firmly to the island. As we clattered by helicopter across the cordillera, he pointed out new industrial buildings that had sprung up in mountain valleys. In all, 87 pharmaceutical plants are now operating on the island, producing everything from artificial kidneys to most of the world's supply of Valium.

At Humacao, a small east coast town, we landed near a modern one-story building that draws ailing pilgrims from all over the world. This is no religious shrine but Medtronic, Inc., a Minnesota-based firm that makes heart pacemakers here. Heart

Poverty has loosened its grip *on La Perla (**below right**), a famous barrio in Old San Juan. The close-knit neighborhood still has its problems, but food stamps and cash payments have given much relief, and the city and commonwealth have*



patients sometimes travel thousands of miles to Humacao just to meet the workers whose hands, literally, hold their lives.

Inside a large sterilized room I watched Puerto Rican technicians in surgical gowns assemble the devices. Medtronic has produced 150,000 pacemakers here since 1978, with an excellent record of reliability.

Thirty-five years of industrial growth has pushed development into nearly every corner of the island. Operation Bootstrap has spread factories into many formerly unspoiled areas and has built up population in previously low-population regions. Efforts to preserve unspoiled space must inevitably face off against this wave of humanity. Yet there have been some successes.

One of the most famous is a small bay rimmed by mangroves near the south coast fishing village of La Parguera. Here billions of microscopic dinoflagellates set the water glittering with darts of pale green light when

*provided sewers, electricity, and a community center. In a mangrove swamp on San Juan's Martín Peña Channel, a shantytown (**left**) still sprawls in stark contrast to the bright high rises of Hato Rey, the financial district.*

stirred up in the dark. Land around this Bahía Fosforescente has been purchased by the private Conservation Trust of Puerto Rico and turned over to the commonwealth to prevent human encroachment.

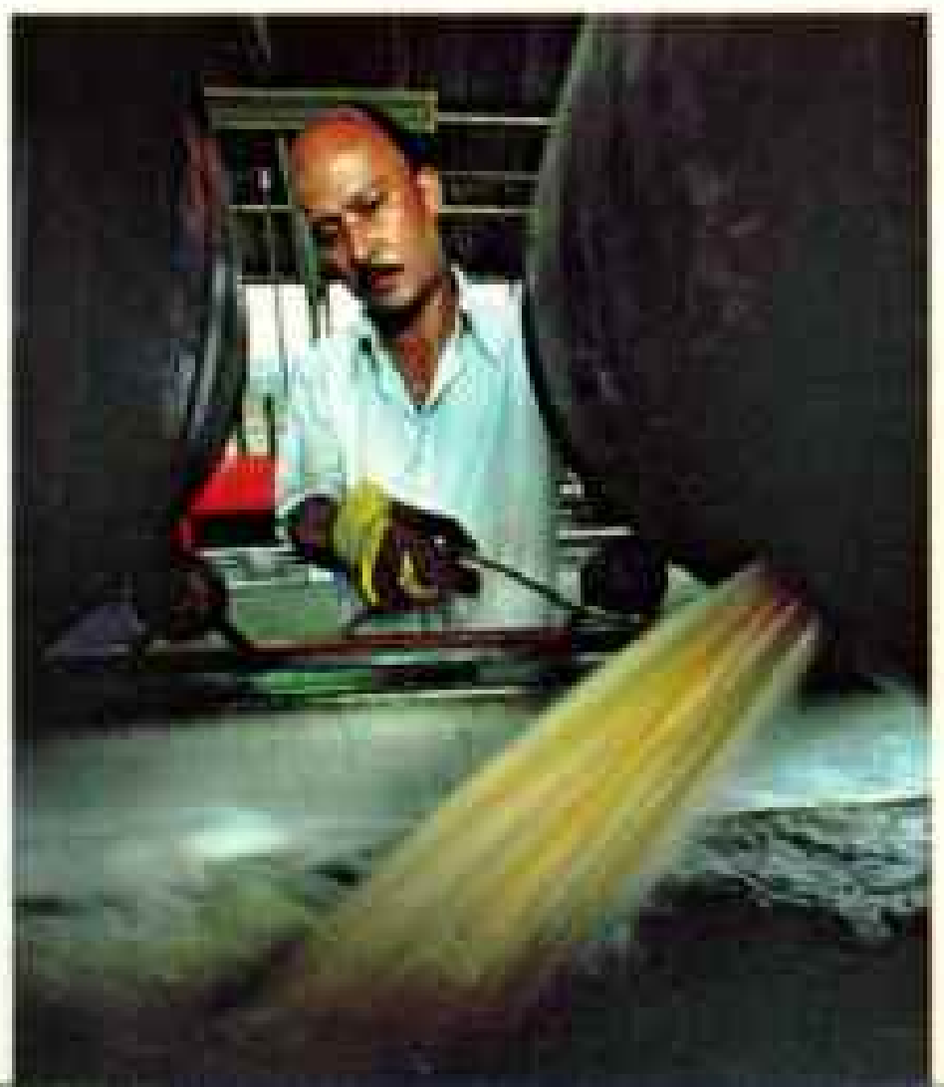
On a moonless night I watched the light show flare and flicker round my boat. But my companions, marine biologists Gilberto Cintrón and José González-Liboy, told me that the bay's fire has dimmed. The cause may be anything from sewage pollution to tourist traffic, but probably is "night shine"—housing and industrial development in the area reflecting off the atmosphere. "We've polluted the sky with light," Gilberto said.

A more promising environmental development is taking place in a rain forest to the northeast, beneath the sierra palm canopy that shrouds the side of 3,494-foot El Yunque. Here, deep in the Caribbean National Forest, a team of biologists is fighting

Rebuilding a dream of prosperity

*MILLIONS OF TRANQUILIZERS a year are manufactured at the Roche Products Inc. plant in Manati (**left**), which produces the entire U. S. supply of Librium and Valium. The facility is one of dozens built by drug companies since the early 1970s in Puerto Rico's trend toward high-technology industries. Attracted by tax breaks, these pharmaceutical firms—along with manufacturers of electronics, medical products, precision instruments, and computers—are the island's best new hope to become less dependent on the U. S. economy, a dream that slipped away in the late 1960s as Operation Bootstrap ran out of steam.*

*Conceived 35 years ago as a means to lift the island from its then miserable state of poverty, Bootstrap used tax incentives and low wages to bring labor-intensive industries such as textiles and apparel to Puerto Rico, whose agriculture-based economy still relied upon crops of the colonial period: sugarcane, coffee, and tobacco (**left**). As wages on the island began to rise, however, rapid industrialization slowed. And efforts to build a petrochemical industry as another economic base in the 1970s were cut short by oil crises. Throughout those decades the migration of Puerto Ricans to San Juan and the mainland continued, and the number of farm workers declined. Today the government is trying to restructure the island's agriculture through improved techniques in rice growing and vegetable farms. Livestock and dairy farming, as well as pineapple growing, have already become important producers. Industries such as tuna processing and rum distilling are weathering the current recession reasonably well. The Bumble Bee plant in Mayagüez, where workers unload a frozen catch (**right**) for cleaning and processing, is one of five tuna companies on the island that give employment to 6,000 people. Rebates on federal excise taxes from the sale of rum, such as Don Q (**left**), contributed 210 million dollars to the commonwealth in fiscal 1982, 10 percent of its revenue.*



to save the endangered Puerto Rican parrot.

Once nearly a million of the stubby little birds filled the island skies. But predators—human and avian—cut the flock to just 23 birds by 1975. Some scientists consigned the species to extinction, but a task force assembled by the World Wildlife Fund, the U. S. Forest Service, the U. S. Fish and Wildlife Service, and Puerto Rico's Department of Natural Resources set out to save the parrot.

The team designed an artificial parrot nest too deep for predators to get at the parrots' eggs and young. In addition, they were able to transform the parrots' most aggressive predator, the nest-stealing pearly-eyed thrasher, into a defender of the endangered parrots' nesting grounds.

By providing a nest for thrashers several feet from each parrot nest, the biologists discovered the nesting thrashers would ignore the parrot's nest and also drive all other thrashers out of the area. In one brilliant move the thrasher was converted from predator to watchdog.

Jim Wiley, a U. S. Fish and Wildlife biologist who led the team, had just counted 46 parrots—a gain, but far from a win. "This will be one of the closest calls we've ever had if we save this species," he said.

Disappearing Man of the Land

Along the *autopista*, the high-speed highway that crosses the island between San Juan and Ponce, I stopped my car one afternoon to visit another reminder of Puerto Rico's vanishing past. "The jíbaro," said the plaque under a statue of a rural farming family, "is the man of our land, the cultivator of our soil, genesis of our life, and an authentic expression of Puerto Rico."

Sadly, the jíbaro, this revered countryman, achieved his mythical status only after most of his kind were displaced by Puerto Rico's industrial revolution. In 1950 the farm-based work force was 36 percent of the island's total; today it is about 5 percent.

On an island that imports two-thirds of its food, the monument's inscription appears ironic. "Industrialization carried people away from the countryside," agronomist José Vicente Chandler told me. "Life changed with cars and televisions. Now people don't believe that they can make a good enough living as farmers."

Vicente Chandler's 105-acre finca near the mountain town of Aguas Buenas is proof they can. Instead of laborious and costly hand picking, Vicente Chandler uses an innovative system of ground nets to catch ripe coffee beans when they fall. His finca makes a nice profit where others lose money.

"The trade-off is jobs for profit," Vicente Chandler said. "One man does the work of three. It won't help solve our unemployment problem, but this way a good farmer with high-yielding coffee can make $1,200 an

Beyond the hustle and bustle, a

acre, compared to $300 with hand picking."

Such creative farming holds promise for other crops too. But in the west, near the coastal town of Aguadilla, a once powerful arm of Puerto Rico's agriculture is withering. Under a searing sun a dozen men stripped to the waist were hacking 12-foot-high sugarcane with long machetes. Greasy tar from the cane stalks, burned earlier to eliminate dead leaves, smeared the cutters from head to foot.

"This is the worst job I've ever had," said José Rivera. His eyes glittered like a coal miner's in his smudged face.

Why not try something else, I suggested.

"I've looked," he said with a sigh. "I've filled out all the applications, but no one answers. Unemployment is nearly 40 percent in this area, and I've got five kids, so I'll keep cutting cane."

Cane cutters start at $3.35 an hour, the federal minimum wage, and there is a long waiting list for jobs in this part of the island. But sugarcane, once the backbone of Puerto

stretch of the northwest coast bathed in sea mist invites a peaceful interlude.

Rico's economy and still a major crop, has become an expensive economic drain. The government buys most of the island's crop and owns all its sugar mills, but, even with subsidies, Puerto Rican sugarcane growers cannot compete with producers like those of the Dominican Republic, where labor is cheaper. With a net loss on every pound of sugar, the government-run industry is criticized as little more than a costly, outmoded public-employment program.

Sugar's Successful By-product

Will sugar ever make a comeback, I asked Pablo Illas, a leader of the west coast cane cutters' union. "Never," was his blunt reply. "In ten years, maybe sooner, the sugar business will be gone forever from here."

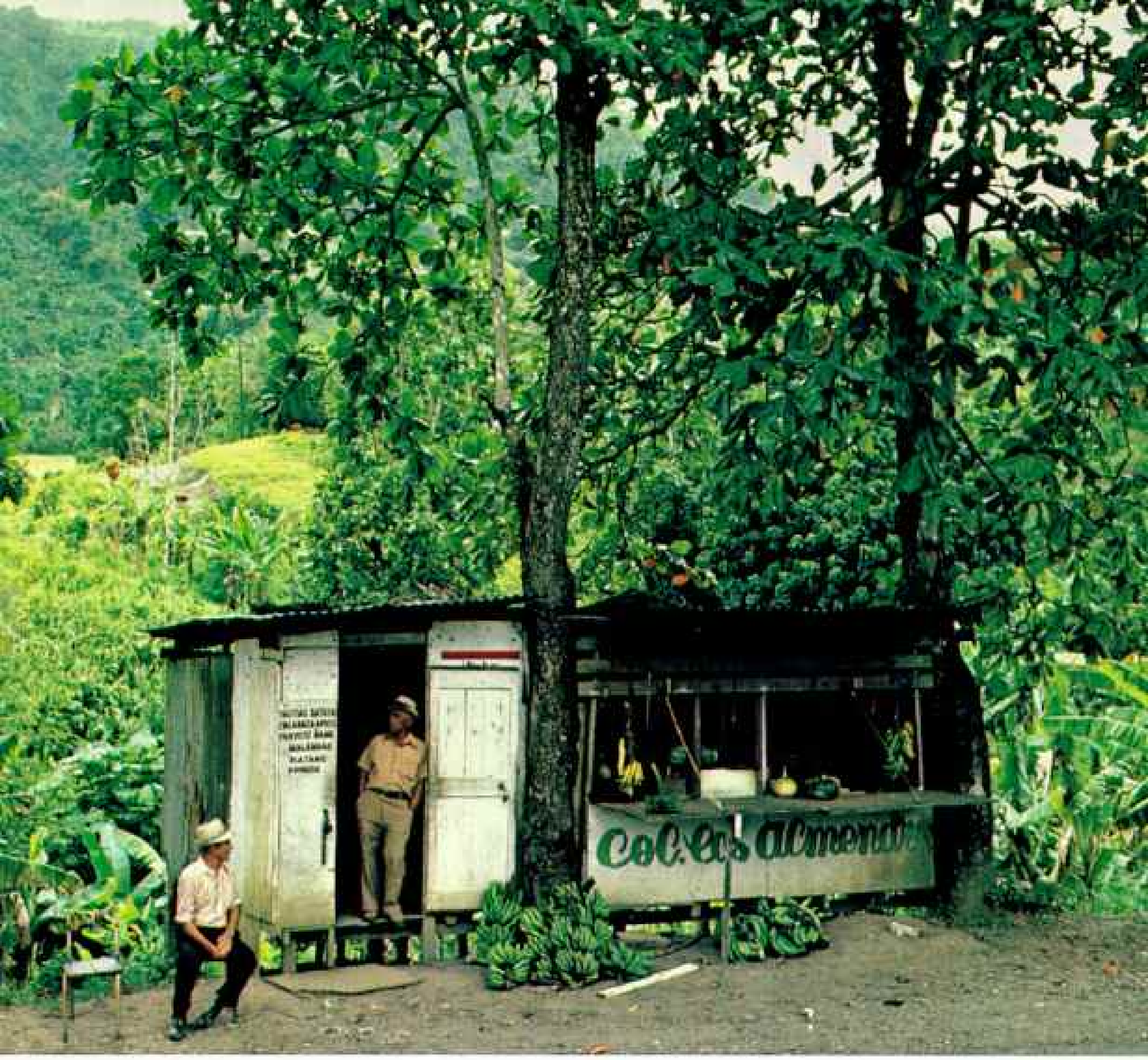
But Puerto Rico's huge rum industry, which uses molasses from both local and off-island sugar, will stay around. Puerto Rico is the world's largest rum producer. By law, federal excise taxes on each case of Puerto Rican rum sold in the U. S. are rebated to the island treasury—a 210-million-dollar sum in fiscal 1982 that accounted for 10 percent of the island's revenue.

Sixteenth-century Spaniards began making rum here. But gold was what interested most early Spanish visitors to the island. When placer gold petered out, treasure still brought them. San Juan's protected harbor proved an ideal stopping point for gold- and silver-laden galleons bound for Spain from richer lodes in Mexico and South America.

Spain constructed a massive redoubt—Castillo de San Felipe del Morro—to protect its treasure harbor. Safe behind El Morro's towering walls, Spain's lonely garrison fought off Sir Francis Drake's privateer fleet in 1595 but succumbed three years later to a siege by the third earl of Cumberland, George Clifford. Heat and disease quickly drove the British out, but in 1625 a Dutch force laid siege to the Spanish outpost.

The Spanish held on to the fort tenaciously, though the Dutch sacked much of Old San Juan. Refortified, El Morro appeared invincible to the British in 1797. They attacked elsewhere but were defeated. It then withstood an artillery barrage by U. S. warships during the Spanish-American War. Not until Spain ceded Puerto Rico to the United States at the end of the war did the

Time slows down *in the countryside. Along the highways that wind through the subtropical forests of the Cordillera Central, roadside fruit and vegetable stands* ***(above)*** *double as meeting places for a bit of conversation or a game of dominoes. On Jobos Beach, as in the larger villages, a dance hall* ***(right)*** *serves the same purpose to music with a Latin, African, or American beat. For an increasingly urban population, the figure of the jíbaro—the independent-minded, straw-hatted countryman—has become a compelling symbol of the island's traditional, rural spirit, even as he disappears in fact.*


Cocos alemanes

Spanish flag over this resilient bastion come down permanently.

Yet a mystery remains. Where did the Spaniards find the stone for all of the city's fortifications, including El Morro's 20-foot-thick walls? Some scholars speculate that the native Tainos trustingly led the Spanish to rocky areas near their ceremonial sites, and were then forced to quarry them. The walls of one such site near Arecibo, 40 miles west of El Morro, are marked with Taino petroglyphs 700 years old.

The invasion of their sites was the least of the Tainos' worries. All but wiped out within 50 years of the Spanish arrival, tens of thousands of these Indians disappeared with few traces.

Near Utuado, in a misty valley high in the Cordillera Central, I saw a tantalizing remnant of this elusive culture. A dozen ceremonial "ball courts," small dirt plazas called *bateyes*, are clustered at the site and marked out with petroglyph-covered stones. According to Spanish accounts, Tainos gathered here for ceremonies that included the use of hallucinogens, and the playing of a rough soccerlike game with a hard ball of resin. Dozens of similar bateyes have been uncovered around Puerto Rico since the first were found here in 1915, but comparatively

few have been discovered elsewhere in the Caribbean.

More enduring than the Indian influence has been that of Puerto Rico's blacks. Blacks have played an important role in Puerto Rican culture since Juan Garrido, an African who sailed with Ponce de León, arrived here in 1508. Art, literature, dance, and music styles all bear an African imprint.

More than anyplace on the island the little town of Loíza, 15 miles east of San Juan, has kept its African roots. Felipe Sanjurjo Lanzot, an amateur historian, showed me around. Loíza, he said, began as a sugarcane plantation with black field slaves.

Picking up the mood *of a relaxed Sunday picnic, a guitar player* ***(above)*** *strums a tune at Luquillo Beach, east of San Juan. Like all of the island's beaches, Luquillo is open to the public.*

Lured by its tropical beauty, more than two million people a year visit Puerto Rico, spending some 600 million dollars. Many visitors stay in the Condado district of the capital ***(left)****, where a dozen large hotels offer luxurious seaside accommodations. Among vacationers, the second largest group, after U. S. mainlanders, are Venezuelans, who share a taste for fine sailing, skin diving, and fishing.*

When Spain abolished slavery here in 1873, many of Loíza's residents stayed on.

Loíza's isolation helped keep its past intact. Its week-long festival here in July is so loaded with traditional color that it has become an islandwide drawing card. The town's *bomba* dancers, so named for the wooden barrel drum that provides their frantic beat, are celebrated throughout the Caribbean. Loízan coconut masks, grotesques whose designs have been preserved by generations of local craftsmen, are now collected by San Juan art galleries.

Before his death in 1980, the preeminent mask maker in Loíza was Castor Ayala. His widow, Pastora, showed me some of his masks in a shop she runs near the ocean. A tiny gray-haired lady of 72 years, she looked even smaller surrounded by the leering eyes and devil horns that filled her shop.

"Oh, they don't frighten me. I have this for protection," Pastora said, reaching into a corner and pulling out a small black doll. It was her *resguardo*, her protector, she said. "It keeps the bad people away and makes business flourish."

To Tend the Spirit—An Ancient Art

Charmed by the mask maker's widow, I felt less at ease when Felipe led me to a wooden shack whose walls were papered down to the last inch with pictures of saints. A round Buddha meditated on a shelf.

Casimira, an *espiritista* in a flowered dress, works here. Loízans and others—businessmen, lawyers, even doctors, it is said—have been coming to her with their cares and their pains for more than half a century. In predominantly Roman Catholic Puerto Rico, espiritistas are a well-accepted, if slightly sub-rosa, second line of defense.

"I get my power from the saints," the 70-year-old spiritualist told me. "But it is hard work taking care of all these things. I tried to stop years ago because I was tired. But so many people needed help I couldn't quit."

At my request Casimira obligingly read my future. She shuffled a deck of worn cards and began laying them out on a table. My birth date please? A few more cards were slapped down. She reached into a glass bowl filled with water and sprinkled a little on me. Then she looked up and smiled.

The rest of my stay in Puerto Rico was sure to be filled with good luck, she said—buy a few lottery tickets, who knows? . . . I would find great beauty . . . and then, a blonde with green eyes. . . .

I never found the green-eyed blonde, but Lillian Fonseca, a dark-eyed social worker in Old San Juan's La Perla slum, led me to the promised beauty. La Perla, "the pearl," clings to the hillside running down from San Juan's old city wall to the ocean. In 1965 anthropologist Oscar Lewis depicted the barrio in his book *La Vida* as a classic melting pot of Latin urban poverty, where drunkenness, prostitution, and violence were often a way of life.

Lewis died before outraged La Perlans could mount a threatened lawsuit. In any case the overcrowded neighborhood is still wrestling with its problems. But at Lillian's suggestion I arrived on a day when this aging slum was flying its best colors.

It was February 2—Candelaria Day—when tradition on the island dictates that you toss a piece of wood into a community bonfire to keep your house from burning down for a year. Under a flawless blue sky, with the ocean as a backdrop, a small bonfire sputtered on an empty concrete basketball court. Old men and women, a pack of children, and an assortment of other La Perlans drifted to the site, each bearing a chunk of wood. A basket of small meat pies, *empanadillas*, appeared, and soon everyone was dancing to a portable radio.

The sounds of the *salsa* music and laughter soared above the thundering ocean. The future was forgotten. For one beautiful afternoon at least, it seemed La Perla and Puerto Rico had put aside their troubles. This sun-washed island—the songwriter's "pearl of the seas"—had found more important things to think about. □

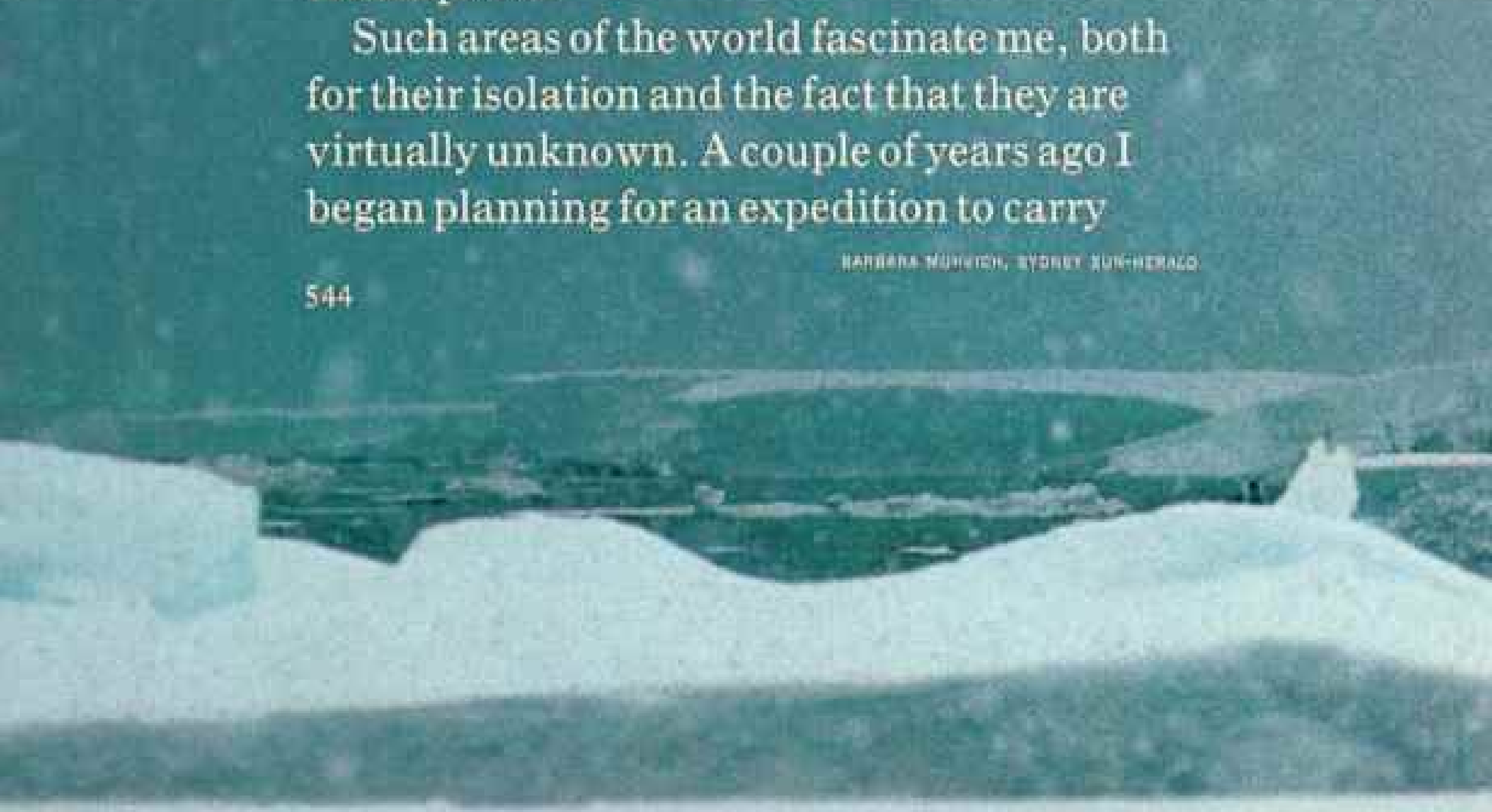
***Patriotism runs strong** among Puerto Ricans, whose sons and daughters took part in four wars under the American flag. At a Memorial Day ceremony in Bayamón, one citizen pays his respects to the fallen—those who gave their lives for both the nation of their citizenship and the island of their birth.*

VOYAGE TO THE ANTARCTIC

By DAVID LEWIS

I HAVE TO CONFESS an unusual addiction: I am hopelessly drawn to Antarctica. That vast polar continent with its immense reaches and boundless extremes has attracted me ever since I saw my first chart of the Southern Hemisphere.

Such areas of the world fascinate me, both for their isolation and the fact that they are virtually unknown. A couple of years ago I began planning for an expedition to carry



out biological and earth-sciences research relating to Antarctica.

The expedition involved sizable risks, and my fellow members and I were aware of them. In retrospect I believe all of us consider them worthwhile. But that takes a little explaining.

For all our advanced technology and the immense sums spent on antarctic research, we still know relatively little about the southern polar seas. Over the past ten years I have explored Antarctica's waters in small sailing craft, once with a crew and twice on solo voyages.* Those experiences taught me that small, well-organized, self-sufficient research expeditions can contribute greatly to our knowledge of the antarctic region. Such information is vital, for the current international Antarctic Treaty is subject to review in 1991. By then we must have both the knowledge and the wisdom to chart the future of the polar continent for years to come.

In 1981, with the experience gained from my three previous voyages, I organized an expedition to one of the most inhospitable regions of the world—an area of the antarctic coast known as the Home of the Blizzard (see map, right). The name stems from powerful winds that funnel down off the high central Antarctic Plateau over Cape Denison into Commonwealth Bay, part of the area I proposed to explore.

THE NAME Home of the Blizzard was coined by a fellow Australian, the great antarctic explorer Sir Douglas Mawson, who wintered over at Commonwealth Bay in 1912 and 1913. Since Mawson's time there, only a handful of people have explored the Cape Denison area.

Mawson estimated that the winds at Cape Denison averaged 50 miles an hour year round. Our own measurements were later to confirm Mawson's observations and to record regular gusts of more than 80 miles an hour. One of the consistently windiest spots on earth, Cape Denison under extreme conditions can experience gusts as high as 185 miles an hour.

Weather was only one aspect of Cape Denison that interested me. The Adélie penguin population of the cape and nearby Mackellar Islets was another. Though believed to be large, the penguin population had never been counted. The data are important, for penguins are major consumers of krill, the key food for virtually all Antarctica's marine life. Our studies would aid an international program, Biomass, which seeks to increase man's knowledge of the food web in the southern ocean.

We were also interested in ice movement. Mawson's party had made some measurements and taken photographs of the margin of the continental ice sheet at Cape Denison. New photographs could show whether the ice is advancing or retreating, a factor in Antarctica's future climate.

*See NATIONAL GEOGRAPHIC's "Alone to Antarctica," December 1973, and "*Ice Bird* Ends Her Lonely Odyssey," August 1975, both by Dr. Lewis.

BARBARA MUNDICH, SYDNEY SUN-HERALD

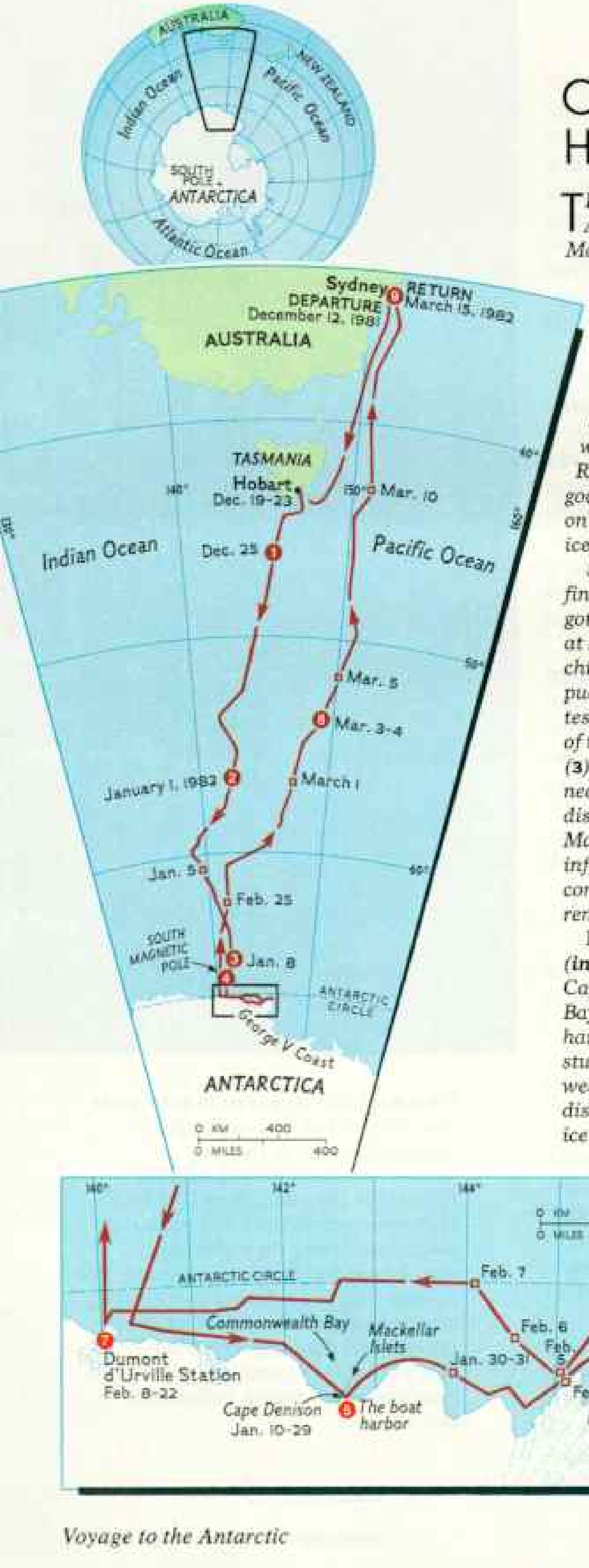
Veteran navigator *of many seas, author David Lewis displays an improvised sun compass. His standard compass was incapacitated by the continually shifting south magnetic pole. Knowing both local time and that the sun circles the horizon near the poles in summer, moving 15 degrees an hour, skipper Lewis found his way.*

Course to the Home of the Blizzard

THUS CHILLINGLY NAMED by Australian polar explorer Douglas Mawson, a forbidding stretch of Antarctica's George V Coast drew 12 hardy Australians and New Zealanders. To arrive during the 100th anniversary of Mawson's birth, they set out in the Dick Smith Explorer, a 65-foot steel-hulled schooner designed as a fishing trawler, bound for one of the windiest places in the world. The Oceanic Research Foundation supported their goals: to compare data with Mawson's on climate, wildlife, and the coastal ice sheet, and to study icebergs.

Sailing from Sydney, the crew loaded final provisions at Hobart, Tasmania, then got under way to spend Christmas (1) at sea, where they relished a feast of ham, chicken, roast potatoes, wine, and Christmas pudding. The New Year (2) brought the test of the first gale, and a first glimpse of the southern lights. About a week later (3) the sailors sighted their first ice and neared the south magnetic pole (4), discovered in a different location by Mawson in 1909. While under its influence, the crew relied on their sun compass, though overcast skies once rendered it useless for ten hours.

*Explorer reached the George V Coast (**inset below**) on January 10, anchoring at Cape Denison in an arm of Commonwealth Bay that Mawson had called the boat harbor (5). There, mapping and other studies were performed—along with a wedding. But fierce weather caused a near disaster, and down the coast dangerous pack ice near Mertz Glacier Tongue (6) thwarted measurements, finally made at the French station of Dumont d'Urville (7). Homeward bound, the crew battled a farewell storm with 30-foot seas (8), returning on March 15 (9) after a 4,500-mile odyssey.*



DRAWN BY JOHN A. WEBER
COMPILED BY JOHN R. TREIBER
CARTOGRAPHIC DIVISION, N.G.S.

Finally there were the icebergs. Many scientists believe these huge floating fragments of ice shelves and glaciers could supply precious water to arid areas of the earth if a practical method for towing the bergs long distances could be devised. The waters around Cape Denison abound with icebergs, offering ideal conditions for study of the effects of wind and wave action, important information should the bergs ever be towed to distant places.

BY EARLY DECEMBER I had gathered a team of 11 scientists, expert sailors, and general crew members. Six of the team had had previous antarctic experience: Harry Keys, a geochemist; Karen Williams, field assistant; Jeni Bassett and Paul Ensor, both marine biologists; Dick Hefferman, a geophysicist and mountaineer; and Dot Smith, a veteran crew member from one of my earlier expeditions.

The newcomers to Antarctica were Don Richards, my first mate and radio operator; Garry Satherley, a newspaper deputy editor who was to be ship's handyman and mechanic; Barbara Muhvich, Garry's wife and fellow journalist; Malcolm Hamilton, a television director and cameraman; and Margaret Huenerbein, a sailor and veteran trek leader in the Himalayas.

The team was divided almost evenly between Australians and New Zealanders.

As in the past I chose a sailing vessel for the expedition, to demonstrate that even in navigating through hazardous seas conservation of energy is possible.

Our vessel was a 65-foot three-masted schooner with a quarter-inch-thick steel hull capable of withstanding the inevitable collisions with ice. I named the ship *Dick Smith Explorer* after a fellow Australian and principal supporter of the expedition. Sponsor of the project was the Oceanic Research Foundation, a nonprofit organization I had established in 1977 for study of all aspects of earth's seas.

On December 12 we cast off in Sydney Harbour and headed south for what was to be a 4,500-mile voyage lasting three months. We had organized a ship's pool on when we would spot the first ice, and with unaccustomed luck *(Continued on page 556)*

It's a mild day *compared to some gales they endured but still too rough to measure icebergs, so the crew reconnoiters them instead* ***(above)****. Relaxing in the galley, from left: Dick Hefferman, geophysicist and justice of the peace, who during the expedition married geochemist Harry Keys and field assistant Karen Williams; Jeni Bassett, marine biologist; Dot Smith, antarctic veteran; and Paul Ensor, marine biologist. Author Lewis had made three prior antarctic voyages, including two solo trips.*

BARBARA MUHRICH, SYDNEY SUN-HERALD (BELOW): KAREN WILLIAMS

Statuettes in a stark tableau, *Adélie penguins off Dumont d'Urville were among the species censused by the expedition for an international program called Biomass. It seeks to*

National Geographic, April 1983

KAREN WILLIAMS

learn the relationship between krill—shrimplike crustaceans that form the main link in Antarctica's food chain—and the other marine animals that prey on them.

Racing against hypothermia, *the author, left front, and Dick Heffernan haul in the rubber dinghy they used to rescue Harry Keys, left rear, his wife, Karen Williams, helpless on the floor, and Margaret Huenerbein, right rear, after heavy*

National Geographic, April 1983

MALCOLM HAMILTON

waves swamped their catamaran. Its fourth passenger, Jeni Bassett, clad in a flotation suit, reached the Explorer herself. A video camera preserved the moment. "It took about three months for my fingers to come back," says Lewis.

Whipped to a frenzy *by a phenomenon called katabatic winds, roaring down from the Antarctic Plateau, Commonwealth Bay feels gusts of 80 miles an hour, keeping the cruise ship* Lindblad Explorer *offshore* ***(above)****. The* Dick Smith Explorer *rides mooring lines from shore near the battered hut that Mawson's party built in 1912. On that expedition, his second to the Antarctic, he saw two companions die*

PAUL ENSOR (ABOVE); FRANK HURLEY (FACING PAGE), FROM THE MAWSON EXPEDITION; BARBARA MUNYON, STORES SUPERVISOR

and had to endure two winters before rescuers arrived. During Mawson's ordeal, colleagues brave a blizzard outside the hut to gather ice for water ***(facing page)****. Vividly he described "A plunge into the writhing storm-whirl. . . . We stumble and struggle through the Stygian gloom. . . ." Tunneling into the hut through ice and snow, the Explorer crew found such memorabilia as condiments* ***(right)****.*

(Continued from page 548) I won: The first ice appeared almost exactly where I had predicted, at 65° South. Soon icebergs were a common sight, and the smaller they were, the greater the danger they presented for us. The larger masses of ice were easy to see and avoid, but the low-lying bergy bits, as they are called, were practically invisible in white-capped seas until we were right on top of them.

As we pushed steadily southward, the nights gradually dissolved into perpetual daylight. Though the sun dipped below the southern horizon for several hours in each circuit, there was always enough light to steer by.

Upon entering the antarctic environment, we took great pains not to contaminate it with foreign substances. For instance, we were very careful to dispose of our garbage by burning, to avoid infecting sea life with unaccustomed diseases.

On the morning of January 9 we encountered the phenomenon known as iceblink—the reflection of unseen ice fields below the horizon against an overcast sky. That night we crossed the Antarctic Circle amid choppy seas, and despite an icy spray sweeping along the deck, Margaret Huenerbein stationed herself in the bow.

MARGARET'S DISCOMFORT paid off, for within less than two hours she sang out, "Land!" There was a scramble toward the bow, and Margaret pointed to what appeared at first to be a thin line of cloud along the southern horizon. The cloud quickly materialized into the looming slopes of the vast antarctic ice sheet, which overlies the polar continent with as much as three vertical miles of ice and which contains more than 70 percent of the earth's entire supply of fresh water.

Harry Keys is neither an emotional man nor a newcomer to Antarctica; in fact, he has spent considerably more time there than I have. Yet as *Explorer's* bow swung east by south in the direction of Cape Denison, Harry said to me quietly, "This is the happiest day of my life."

We were all delighted with our landfall. We had reached the antarctic coast dead on target, at a point just west of Cape Denison and Commonwealth Bay, and we had done it on schedule in less than a month's voyage from Sydney.

Dropping sail and motoring eastward against a brisk headwind, we passed the gleaming ice cliffs of George V Coast, threaded our way through an offshore flotilla of towering icebergs into Commonwealth Bay, and entered a narrow arm of water at Cape Denison that Mawson had called simply the boat harbor. Here Mawson and his party had erected a small hut in which they lived and worked for nearly two years.

In preparation for anchoring, we had to chip away a three-inch-thick coating of ice on the bow gear and the main anchor. Since there were no charts of the harbor, I stationed Paul Ensor in the bow with our homemade sounding device—a length of string with a weight on one end and a knot at the seven-and-a-half-foot mark representing *Explorer's* draft.

After anchoring in the harbor, we ran several mooring lines ashore to hold the ship in place and to serve as guide ropes for our inflatable dinghy as well as a catamaran tender on trips to and from the shore. As it turned out, the lines were to prove the margin between life and death for Harry and Karen.

During the days following our arrival, the Home of the Blizzard belied its name: The skies were sunny and clear, and only light winds ruffled the surface of Commonwealth Bay. We took full advantage of our good fortune. Paul and Jeni immediately began a census of penguins and other marine life at Cape Denison and the Mackellar Islets. Karen and Margaret Huenerbein joined in the count, and the list of species began to grow—Adélie penguins, Weddell seals, elephant seals, leopard seals, skuas, Wilson's storm petrels, and snow petrels.

Harry began photographing the extent of the coastal ice and other features at a score of points where Mawson had previously taken photographs.

Dick Heffernan, Malcolm Hamilton, and Don Richards explored the cape area, assisting Harry to measure the depths and levels of ice-covered freshwater lakes in the vicinity of the coast. In addition, we established a network of safety routes among the various

scientific work sites in preparation for the inevitable return of bad weather.

WITH THE HELP of his wife, Barbara, and Malcolm, Garry Satherley tackled Mawson's hut, which lay choked with ice and drifting snow. The hut had been partially cleared four years previously by a visiting team of the Australian National Antarctic Research Expedition, known as ANARE. The team had also erected a small prefabricated hut of their own, which we used as a temporary shelter and storehouse ashore.

Garry took over where the ANARE team had left off, clearing and tunneling his way into Mawson's hut until he finally reached the explorer's bedroom and study. There Garry and Barbara found a wooden bunk with three broken slats, a still serviceable deck chair, and several mildewed volumes, including a Victorian romance entitled *The King and the Countess (Or Lovers' Trials)*, a battered copy of *The Memoirs of Sherlock Holmes*, and a book entitled *Raffles, The Amateur Cracksman*.

One item spoke eloquently of the simplicity and faith that marked an earlier, and perhaps happier, age than ours. On a shelf near Mawson's bunk Barbara found a bottle of liniment labeled Elliman's Royal Embrocation. Plainly no antarctic explorer should have left home without it, for according to the label Elliman's patent formula worked miracles "for sprains, rheumatism, sore throat, sore shoulders, backs; for capped hocks and elbows; for broken knees, lacerated and punctured wounds, bruises and overreaches; for cracked and sore heels; for simple wounds; for cats, horses, cattle, dogs, birds."

As the initial run of good weather stretched to a week, I grew increasingly uneasy. Such luck was too good to last. Mawson's journals make clear that his term Home of the Blizzard was no mere figure of speech. Time and again he referred to savage winds and plummeting temperatures that developed within minutes. At such times, as experienced antarctic hands know, the penalty for carelessness can be death.

We took all possible precautions, but they failed to prevent the disaster that befell Harry, Karen, Margaret, and Jeni late on January 20. The weather had finally broken a day or two earlier with a gale whose winds reached a peak of 60 miles an hour before slacking off in midafternoon of the 20th. At 10 p.m., with plenty of daylight still left, Harry and the three women started ashore in the catamaran to stay at the ANARE hut.

Jeni and Margaret wore their insulated flotation suits, but Harry and Karen had on only waterproof parkas over woolen clothing. As usual the catamaran was attached to one of the mooring lines with a rope and snap link. The system allowed passengers to haul themselves hand over hand along the line a distance of 50 yards between ship and shore.

When the catamaran reached the halfway point, waves whipped up by a savage gust of wind swamped it and threw all four of its occupants into the water, whose temperature was just below freezing. Buoyed by their flotation suits, Jeni and Margaret quickly popped to the surface, but Harry and Karen were barely afloat, being drenched with freezing spray.

BARBARA AND MALCOLM had been watching the catamaran from the pilothouse, and they instantly gave the alarm. With no time to don gloves or extra clothing, Dick and I jumped into the rubber dinghy and hauled ourselves toward the scene of the accident. Jeni meanwhile caught hold of the mooring line and pulled herself back to the ship, where she was lifted aboard. Dick and I hauled Margaret into the dinghy, then reached for Karen and Harry, who were on the verge of sinking from the paralyzing cold and the weight of their sodden clothing.

Dick and I grabbed them and pulled them into the dinghy, though by then Karen was a helpless deadweight. Somehow we hauled the overloaded dinghy back to the ship, but I have no recollection of it.

Once aboard *Explorer*, Jeni and Margaret quickly recovered, but Karen and Harry had lost dangerous amounts of body heat. They had been immersed in below-freezing water for four minutes, more than enough time for hypothermia to set in. We quickly poured hot liquids down them and took

Tow an iceberg? *The idea has been proposed to bring water to desert lands. But what would happen to the ice en route? Studies by Harry Keys show that melting is only the tip of the iceberg's problem; wave action causes undercutting erosion at the waterline* ***(left)****, leaving rounded fingers to shear away. A proposed remedy: Wrap a plastic skirt around a berg's windward edge.*

Fresh water was also precious to Explorer, *as Dick Heffernan shows by scooping up overnight snow* ***(below)****.*

HARRY KEYS (LEFT); BARBARA MUHVICH, SYDNEY SUN-HERALD

Ice palace turned upside down, *a berg's rounded pinnacles were smoothed when underwater, before it became severely unbalanced and upended. To continue*

them below to their bunks, where each was bundled into heavy blankets with a fellow crew member to supply body heat. Within hours, both had been restored to health.

ONCE THE WEATHER turned bad, it remained that way. Two days after the accident another gale swept down off the Antarctic Plateau with winds as strong as 80 miles an hour. No one could move in such weather, and for the next three days Paul was marooned ashore in the ANARE hut.

Fortunately most of our scientific observations had been made, and it was simply a matter of analyzing the results. I set January 29 as the tentative date for our departure from Cape Denison.

I planned a brief exploratory voyage eastward along the coast to the Mertz Glacier, a distance of some 100 miles. There we would reverse course, following the coast west as far as the French antarctic station Dumont d'Urville, then turn north and head for Sydney.

By noon on the 29th the wind had eased enough for us to weigh anchor from the boat harbor. Despite Paul's expert handling of our trusty homemade sounder, we charted an unknown submerged rock with our keel as we departed Commonwealth Bay. Our spirits rose as we made sail once more and felt the familiar rhythm of ocean swells beneath us.

Like several other coastal glaciers in Antarctica, Mertz Glacier extends far out to sea in a great floating tongue of ice that rises 150 feet above the water and reaches down some 700 feet under the surface. The Mertz Glacier Tongue measures 40 miles in length by 25 miles across, giving it an area of 1,000 square miles, or roughly two-thirds the size of Long Island.

We reached the cliffs of Mertz Glacier Tongue on February 1 and followed them northward to the tip. At its seaward end the

HARRY KEYS

his studies, the author with a different crew has now returned on the Frozen Sea Expedition, with the goal of remaining through an antarctic winter.

tongue is in effect a vast iceberg factory, calving huge bergs that shed occasional avalanches of ice.

Harry was pleased, for in the lee of the great ice tongue the sea was calm enough for us to approach the bergs through fringing floes of pack ice with reasonable safety.

"But we really need," Harry told me, "a berg we can study at close range for several days, so we can measure the exact rate of melting and erosion."

I would have been happy to oblige him, but our situation was precarious. After we had spent two days in the pack, the wind swung around to the northeast, so we were no longer in the lee of the glacier tongue.

The floes began heaving and grinding together, and it was only a matter of time before we would get caught between two of them. Moreover, during the past week we had begun getting an hour or more of darkness each night, and I didn't really relish navigating blind through moving pack ice.

We turned back in the direction of Commonwealth Bay, but the voyage to the glacier tongue had been well worth it. Paul and Jeni were particularly pleased, for in the course of a few days they had observed, in addition to the birdlife they were censusing, a variety of marine life, including emperor penguins, a crabeater seal, and several pods of minke and killer whales.

AFTER OUR TWO MONTHS aboard *Dick Smith Explorer*, the large French research station Dumont d'Urville seemed a luxury resort. It had unbelievable things like hot showers, clean tablecloths, and superb French cuisine, the latter accompanied by wine.

With barely enough room for its own staff of 67, the station couldn't put us up, but the French kindly made their showers available and regularly invited two of us to dinner on a rotating basis. Our women crew members exchanged impressions of Antarctica with

Dumont d'Urville's lone female, a young glaciologist.

The commander of the station, Robert Guillard, had seen more polar service than all of us put together. At the age of 62 he had spent 34 consecutive seasons doing scientific research in Greenland and the Antarctic.

AT DUMONT D'URVILLE, Harry finally got his chance to study a single iceberg over a period of several days. From among dozens of bergs trapped in Dumont d'Urville's small anchorage, he chose a small, 40-by-40-yard specimen that Dick had seen roll over, exposing formerly submerged surfaces.

From that moment on Harry and the iceberg were inseparable. With several willing helpers he spent many daylight hours with the berg, measuring it, sampling it, analyzing it, and, I suspect, even talking to it. To anyone who would listen, Harry carefully explained the dynamics of wind and wave action on icebergs and how one might minimize their effects.

During the next eight days the team monitored the development of horizontal grooves at the berg's water line. These grooves were formed faster on the upwind side of the berg than on more sheltered sides, and caused undercutting, leading to fracturing and collapse of the overhanging ice. Melting and subsequent collapse on the lee side were slower because there the wave action was virtually nonexistent.

At the end of our study, Harry and Dick, armed with crampons and ice-climbing gear, reached the berg's peak and planted a penguin flag. Made by Karen and Margaret, it bore the words *Merci Beaucoup, Dumont d'Urville*. The next day we headed north.

Antarctica struck a final blow at us on the way home. Ten days out of Dumont d'Urville we encountered a storm with winds up to 60 miles an hour and waves nearly 30 feet high. *Explorer* took a beating along with the crew, but both performed superbly and we emerged none the worse for wear. On March 15, just three months and three days after our departure, we sailed back into Sydney with pennants flying.

All in all we felt we had achieved some useful science on the expedition. The *Dick Smith Explorer* and the small inflatables had given us the unique opportunity to make a detailed study of icebergs at close quarters. We found that the submerged portion of an iceberg, because it is so extensive, melts more slowly than the exposed part. If an average-size iceberg were to be towed to southern Australia over a two-to-three-month span, then there should still be one half left on arrival, assuming it had not split apart en route. The delivered ice could then be melted in conjunction with a power-generation scheme to yield both water and electricity at competitive prices.

Our ice-margin photographs at Cape Denison showed that there had been little change over the past 70 years. An emergence of bedrock under one ice cliff suggested that a small retreat of about six feet had occurred there, but elsewhere in the area a retreat was not evident. This would suggest that the ice sheet in this area is close to a state of equilibrium.

As for our census of penguin colonies, the real benefit will not be seen for some years. Future counts will be compared with our baseline census to give an indication of population trends as they respond to changes in the marine environment.

UNBEKNOWN TO THE CREW, I conducted my own private study involving 11 people of widely varying character, age, background, and experience. I observed the subjects over a period of three months under conditions of overcrowding, stress, danger, and continual discomfort. I have analyzed the data from that study and reached a conclusion:

Australians and New Zealanders are bloody fine people. □

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WASHINGTON, D.C.

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GILBERT HOVEY GROSVENOR
Editor, 1899-1954; President, 1920-1954
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How will it work after we take it apart?

We know you've been hearing about changes coming to the Bell System. Changes that require reorganization. Even divestiture.

So let's talk.

First, let's talk about divestiture. What is it? When will it take place? What will happen to the Bell System when it does?

And, most of all, what will it mean to you?

Divestiture refers to the separation of the local Bell telephone companies from AT&T. This is scheduled to take place next January 1, as the result of an agreement reached last year between AT&T and the Department of Justice. The agreement ended an antitrust suit, freeing the Bell System to develop its technologies to the fullest and to apply them to new markets.

After divestiture, local Bell telephone companies will be grouped into seven regional holding companies, each about the same size in terms of assets and personnel. They'll be grouped this way to maximize their financial strength and service capabilities.

Although organized differently, your local Bell telephone company will continue to give you dependable local service at affordable rates. It will still connect you to the worldwide communications network, so you can call across the ocean about as easily as you call across the street. And it will still be your gateway to all the new technologies of the Information Age.

What about the units that will stay with AT&T?

This past January 1, a new and separate subsidiary of AT&T opened its doors. American Bell. It competes in the deregulated market of telephone equipment and computerized services. We expect American Bell to bring an enormous new array of products into the marketplace, from "smart" telephones that can keep track of your schedule to advanced information systems for all sorts of businesses.

The Bell Network will continue, under regulation, to provide the highest quality, and most widely available communication services. Our network will continue to offer the most innovative and reliable ways to move information throughout the United States and the world.

AT&T International will meet international customer needs with Bell System technology, products, and skills in world markets. Bell Laboratories will continue the research and development that has made America the world leader in communications.

Western Electric will work with Bell Labs to turn these ideas into the world's most reliable products for your home and business.

How will it work after we take it apart?

We intend to make sure it works very well. Because we intend to preserve the quality of service our customers expect.

And the performance our investors expect.

We want you to understand all the changes coming to the Bell System.

So we'll continue to tell you about them in ads like this.

In each one, you'll find a number to call.

It's 1-800-555-5000. And it's an important part of our "Let's Talk" program.

So call us. There'll be somebody to talk to.

Somebody to help you.

Somebody to get you information.

We'll be talking to you. **Let's talk.**

Bell System

This car does not have a fireplace. BUT it does have living room. Elbow room. Head room. Toe room.

Family room!

It's for families of five. For families who are a cut above average. For families who like to spread out. There's more feet for your feet. Adjustable seats for your seats. More living room for your family. And a tough, new, responsive, electronically fuel-injected 2 liter SOHC engine that gives great gas mileage (44 Estimated Highway MPG, (32) EPA Estimated MPG!)* That beats the mileage of any import compact today.

But that's not all Camry offers. There's front-wheel drive traction. An impressive, new, electronically controlled 4-speed automatic overdrive that lets you set the pace—"Normal" for most everyday driving conditions; "Economy" for improved fuel efficiency; "Power" for added performance. There's variable assist power rack and pinion steering, cruise control, power windows, power door locks. Two glove compartments—Yours and Theirs.

OH WHAT A FEELING!

TOYOTA

The Toyota Camry. Whether you buy the 4-Door Sedan or the 5-Door Liftback, it's not just the family car. It's The Family Camry.

*Camry Deluxe 5-speed. Remember: Compare this estimate to the EPA "Estimated MPG" of other cars with manual transmission. You may get different mileage, depending on how fast you drive, weather conditions and trip length. Actual highway mileage will probably be less than the "Highway Estimate."

BUCKLE UP—IT'S A GOOD FEELING!

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THE FAMILY

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John Deere owners last longer.

Once a John Deere owner, always a John Deere owner. Or so it seems.

Bill Hendrickson, for instance, has been riding his 110 Tractor since 1965. And when he does eventually replace it, he, like most John Deere tractor owners, will probably stay with John Deere.

But that's not surprising when you know how they're built.

Even the smallest John Deere lawn and garden tractors have features like solid steel frames and cast-iron axles with heavy-duty spindles and bearings. Their dependable 4-cycle engines, ranging in size from 10 to 16 hp, are enclosed and isolated for a smoother, quieter ride.

And John Deere offers dozens of durable power-matched attachments including center-mounted rotary mowers with 38- or 46-inch cutting widths.

John Deere lawn tractors also have a loyal following. With five models to choose from, you can select mowing width, drive system and power size from 8 to 16 hp. All feature electric start, smooth 4-cycle engines and efficient deep-tunnel mowers. And all offer year-round performance with optional front blades, snow throwers, dump-carts and rear baggers.

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In fact, the John Deere 68 may be the finest rider you can own. Just ask any of the folks who do.

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Members Forum

WASHINGTON, D. C.

It is certain that L'Enfant couldn't map it. Washington couldn't command it. Neither Hoban nor Thornton was able to build it. No committee has power to decide it, and no reflecting pool can mirror it. Yet it exists. Thank you for confirming that you *can* find a real heart in an imaginary city—Washington, D. C. (January 1983).

A. Wayne Adam, Jr.
Toronto, Ontario

THE MEDITERRANEAN

Rick Gore's place-ambience-science-history prose in "The Mediterranean: Sea of Man's Fate" (December 1982) is a work of literary art. Not only was the depth and breadth of his research stunning, but the artful way in which he put separate pieces of his complex jigsaw puzzle together made the reading as live and absorbing as a first-rate mystery story.

George I. Polakov
New York, New York

In your superb article about the Mediterranean, you mention the topless bathing suit as a "monokini." The name bikini is for the Pacific Ocean's Bikini Island, not for the Latin prefix "bi," meaning two. Two kinis? The proper name is monobikini, or just topless bikini.

Edgardo Báez
Mexico City, Mexico

In the world of fashion, names are coined without regard for etymology.

GAZA ARCHAEOLOGY

If Trude Dothan rejects the biblical reference to a Philistine existence in the Holy Land during the Exodus (December 1982), how about the earlier reference (Genesis 21:34) that even "Abraham sojourned in the Philistines' land many days"? As a Palestinian, I am puzzled by the unexplainable, rather wishful thinking that the Israelites came first to Canaan.

Yolanda Ramadan
New York, New York

Most scholars agree that the account of Abraham was written long after the time of the patriarchs, and that the term "Philistines' land" was used for geographic identification. The Philistines did not reach the region until about 1200 B.C., half a century after the probable time of the Exodus.

I am surprised that the National Geographic Society would support and give magazine space to an archaeological dig that is illegal under international law. I am appalled at your insensitivity in stating that the artifacts from this dig "are now safe in the Israel Museum." Residents of the militarily occupied Gaza Strip probably do not consider them safe there.

Mark Siemens
Fresno, California

International law does allow for salvage or rescue archaeology, and the artifacts found in Gaza were subject to destruction by looting and agricultural development. Certainly they are safer in the Israel Museum than on the black market.

I am most grateful for that issue of NATIONAL GEOGRAPHIC. Dr. Dothan is a creative and productive scholar, and her report of archaeological discoveries in the eastern Mediterranean is outstanding. The photographs and artwork complement the text in a beautiful way and provide a most informative article.

Robert E. Cooley
South Hamilton, Massachusetts

NEW HAMPSHIRE

High stacks do help disperse the odors from the steam and sulfides of the pulp and paper mills in Berlin, New Hampshire (December 1982), thus reducing the pollution in the Androscoggin Valley. But it is mixed with pollution from hundreds of other similar industrial plants, and it then comes down on distant valleys, states, and nations as acid rain (November 1981).

Albert A. Bartlett
Boulder, Colorado

SOUTHWEST MAP

Your Southwest map (November 1982) gives a height of 8,366 meters for Hualapai Peak in Arizona. It must be one of the earth's highest points. I am, of course, joking. After all *errare humanum est* and *Geographicum* too.

Ricardo C. Iglésias
Porto, Portugal

Please substitute 2 for 8, as our map editors should have.

KUBLAI KHAN

In "The Lost Fleet of Kublai Khan" (November 1982), you fail to mention the off-center bow of the Japanese. This weapon was decisive in that it allowed the Japanese to have the firepower of a very powerful bow with the mobility of cavalry; this bow could be used on horseback, while the regular bow of similar power could not.

Sidney Harris
Alexandria, Virginia

THE CHIP

Allen A. Boraiko's excellent article "The Chip" (October 1982) missed one important technological fact. The chip was not invented by Robert Noyce or Jack Kilby, but by Austin Stanton, founder of Varo Manufacturing. Shortly after the Soviet Sputnik flew, Stanton came to my office to inquire about raising capital for what he termed a scientific breakthrough. At lunch one day he raised a saltcellar and exclaimed, "I can reduce the IBM 1401 to this size as a result of my invention." A phone call to the Office of Naval Research confirmed that Varo, under contract to the Navy, had made this discovery. Unfortunately his report was in the public realm and was made available to all of Varo's competitors. Stanton is one of the modest, unsung heroes of the technological age. He deserves a place in history.

H. Stanley Krusen
North Palm Beach, Florida

There is seldom a runaway winner in the race to develop—and earn credit for—a new scientific idea or invention. Evolutionary theory ripened simultaneously in the minds of Darwin in England and Wallace in Malaysia. Bell's invention of the telephone was challenged by other men. There are, regrettably, unsung heroes in all fields, but patent law recognizes Kilby and Noyce as inventors of the chip.

In your article "The Chip" we were pleasantly surprised and flattered to find a picture of the GaSonics HiPOx (High Pressure Oxidation System). Customers and friends have expressed dismay at our *apparent* involvement in illegal export. Please make your readers aware that our company took the initiative to notify the U. S. Department of Commerce of the irregularities involved in this purchase, worked with the Department of Commerce in all ways requested, and was in no way involved with the "false papers" used by the purchaser to attempt shipment of the machine to the Soviet Union.

Monte Toole
President, GaSonics
Sunnyvale, California

In the article about silicon chips, on page 443 there is a caption with the picture showing a vacuum tube and an early transistor for comparison. At two places, the *noun* phosphorus is spelled as phosphorous. The latter is the *adjective* form of the chemical element.

George F. Holloway
Clifton Park, New York

You're right. A computer that spells would have caught this one.

SILICON VALLEY

Those of us in the industry certainly recognize the innovative leadership and infinite variety of Silicon Valley (October 1982). But take note of the fact that in 1981 more semiconductors were made east of the Mississippi than west, including California, Texas, and Arizona.

John P. Defandorf
Lynnfield, Massachusetts

According to the 1981 statistics of the Semiconductor Industry Association, well over half of the semiconductors in the U. S. were manufactured west of the Mississippi.

THAILAND

It was quite offensive for a Muslim to read what you chose to name "Mecca of pleasure," commenting on a picture showing a place where "R and R" is practiced ("Thailand: Luck of a Land in the Middle," October 1982). Would it not have been offensive if you had written, for example, St. Peter's Square of pleasure, or Jerusalem of pleasure?

Jihad H. Moukalled
Jiddah, Saudi Arabia

It is unfortunate that "mecca" began the sentence, and was hence capitalized. The word has become a widely used synonym for "a place sought as a goal by numerous people," as all dictionaries state. We meant no disrespect to the holy city of the Muslim faith, covered in the November 1978 NATIONAL GEOGRAPHIC.

HUDSON BAY

On page 404, this excellent article (March 1982) says that in 1782 "a French naval force seized" what was then Fort Prince of Wales. This cannot be, because Canada became a British colony in 1763 and there have been no French forces in Hudson Bay since then.

Léon Lalande
Montreal, Quebec

Although conflict officially ended in 1763, competition for the northern fur trade continued for several decades. In 1782 the Count de la Pérouse, a French sea captain and explorer, appeared off the fort with three ships and 400 men. Since the British forces there numbered about 40, the fort was given up without resistance.

Letters should be addressed to ***Members Forum,*** *National Geographic Magazine, Box 37448, Washington, D. C. 20013, and should include sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.*

Photographed by George W. Frame. *Cheetah: Genus: Acinonyx Species: jubatus*
Adult size: Approximately 70cm high at the shoulder Adult weight: 45.5—54.5kg Habitat: Open semi-arid grasslands, scrubland and various types of savannah woodland in Africa and the Middle East
Surviving numbers: Less than 15,000

Wildlife as Canon sees it: A photographic heritage for all generations.

The cheetah, the fastest mammal on earth, has vanished from much of its range and appears to be slowly headed for extinction. Despite its swiftness and killing efficiency, this gorgeous animal is largely defenseless and outnumbered by enemies, a victim of hunters and loss of habitat.

The cheetah could never be brought back should it vanish completely. And while photography can record it for posterity, more importantly photography can help save it and the rest of wildlife.

As a valuable research tool, photography can aid scientists in learning every possible aspect of cheetah life, as only careful study and protection can guarantee the cheetah's survival.

In addition, photography makes it possible for people throughout the world to appreciate the special beauty of the cheetah in its natural habitat. A photograph of cheetahs showing the fierce protectiveness of a mother for her cubs contributes to a better understanding of not only the cheetah but nature itself.

And understanding is perhaps the single most important factor in saving the cheetah and all of wildlife.

New F-1

New FD300mm f/2.8L

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Images for all time

The potential is boundless.

Potential. In many people it goes unrecognized, undeveloped and unused. That's tragic. Because when a person's potential is never developed a terrible thing happens: nothing.

In the Air Force, we look for potential. And we challenge our people to explore and discover that potential for themselves. First with skill training, then with valuable experience.

We're happy to say it works. For them. For us. And for our country. Because as our people grow, we grow.

Developing potential is part of what aiming high is all about. If we all live up to our potential as individuals, there will be no limits to the potential of our nation.

The Air Force encourages young people to continue their education. Then, with diploma or degree, to accept the challenges of modern technology. For information about these challenges in the Air Force, call 1-800-423-USAF (in California 1-800-232-USAF) or contact a local Air Force recruiter.

AIR FORCE

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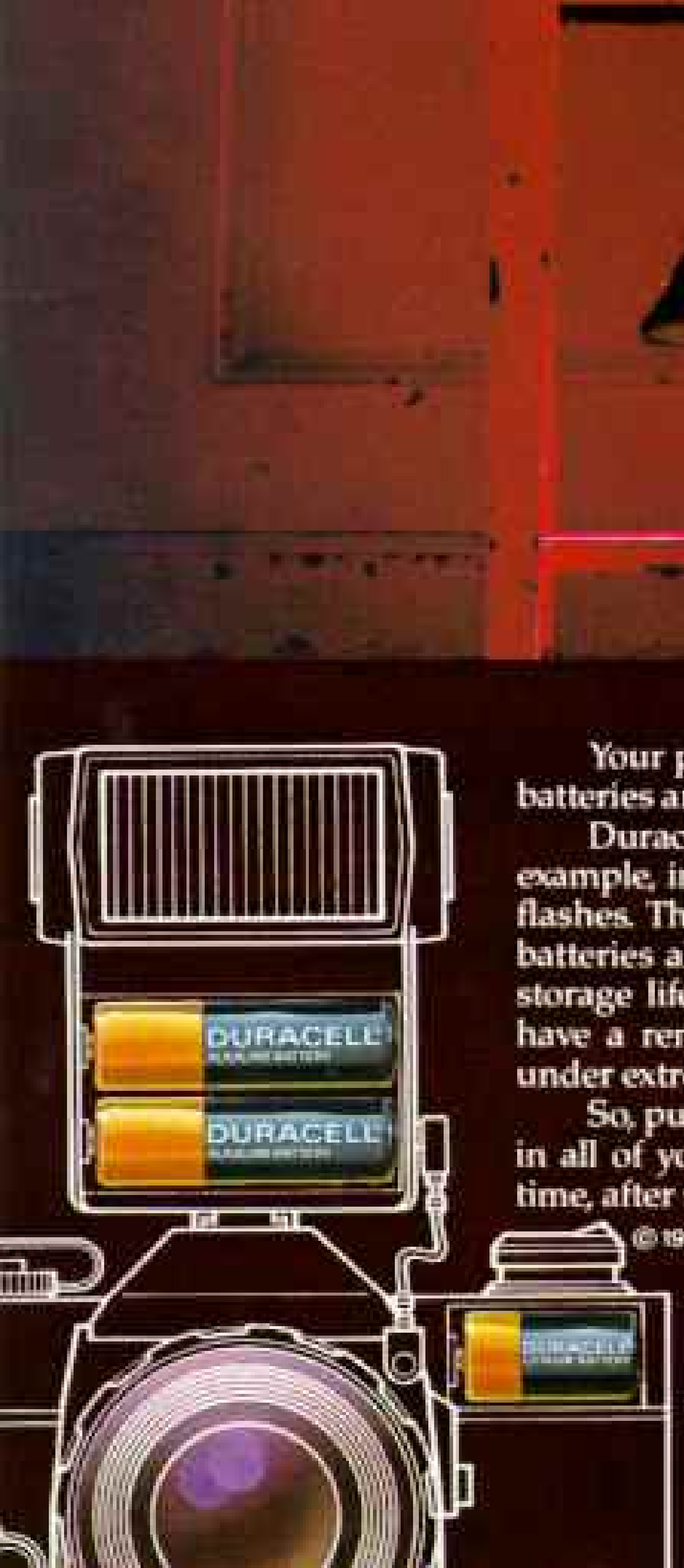
Depend on Duracell to get the picture.

Photo by: Phoebe Dunn



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Duracell makes a full line of high performance, long-lasting batteries. For example, in your flash unit DURACELL alkaline batteries will give you up to 200 flashes. That's 4 times more than regular carbon batteries. DURACELL alkaline batteries also have a shorter recycling time between flashes and a 2-year storage life. In your 35mm camera, Duracell's new lithium batteries have a remarkable 5-year storage life and work exceptionally well under extreme temperatures.

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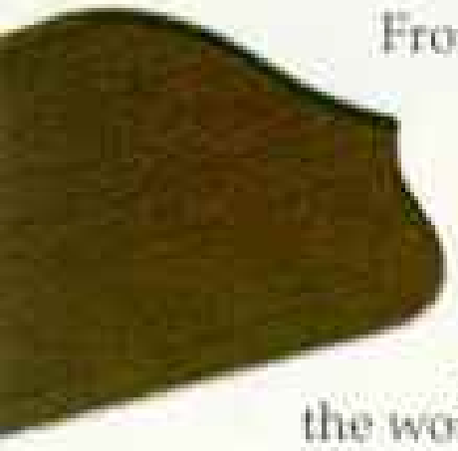
Take the world's finest fans for as tough a test spin as you would an exotic automobile.



From torque to tail-end contours, you expect a high performance automobile to deliver on its promise of excellence.

You should expect the same from a superior ceiling fan. And, of all the ceiling fans in the world, none stands up to scrutiny as well as a CasaBlanca.®

Versatility of speed

Whereas most fans limit speed adjustment to two or three speeds, CasaBlanca fans feature a variable speed control device. This device allows you to fine tune your fan's speed according to such factors as room size and shape, air flow patterns, and, most importantly, individual comfort.

Listen closely for nothing

The uncommon comfort of totally silent operation is also yours with CasaBlanca.

With respect to noise, the downfall of many variable speed fans is a "phase" or "chopped" control of incoming electrical current. This turns the motor on and off 120 times per second, causing a relentless, buzzing vibration. CasaBlanca's unique Slumber Quiet™ System eliminates this problem by electronically smoothing the power flow to the motor.

Other fans claim quiet operation, but only CasaBlanca offers total silence.

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CasaBlanca accepts nothing other than Grade A wood for its renowned blade veneers. The judicious selection of this premium wood is made by Mr. Paul Mooney, a wood grader by profession for more than 50 years.

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No other ceiling fan in the world mounts as easily and efficiently as a CasaBlanca. Its Hang-Tru™ Mounting System allows direct attachment to existing ceiling wiring boxes, saving you the added cost of an electrician.

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Crown Victoria for 1983. Quiet. Smooth riding. Full size. With comfort and luxury for six passengers. Standard this year is a 5.0 liter Electronic Fuel Injected engine with automatic overdrive transmission. Rich velour fabrics, thick carpeting and warm woodtones create a quiet place for you to relax. While a solid steel frame and remarkable sound insulation make it clear you're riding in a truly fine automobile.

LTD Crown Victoria for 1983. In two- and four-door models. It's so rewarding to own one. Isn't it nice to know you still can?

Get it together — Buckle up.

HAVE YOU DRIVEN A FORD...LATELY?

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FORD DIVISION

For the first time —
an internationally renowned floral artist
creates an original sculptured bell.

The Sonia Rose

BY JEANNE HOLGATE

Life-size sculpture of intricate beauty
in hand-painted bone china . . .
at the very attractive price of $60.

Entirely hand-painted.
Hand-decorated with pure 24 karat gold.
Issued in limited edition.

Fresh and arresting, *The Sonia Rose* is a triumph of two great traditions. Combining the beauty of floral sculpture . . . and the lilting grace of a bell . . . in an enchanting new work in fine bone china to enjoy and treasure always.

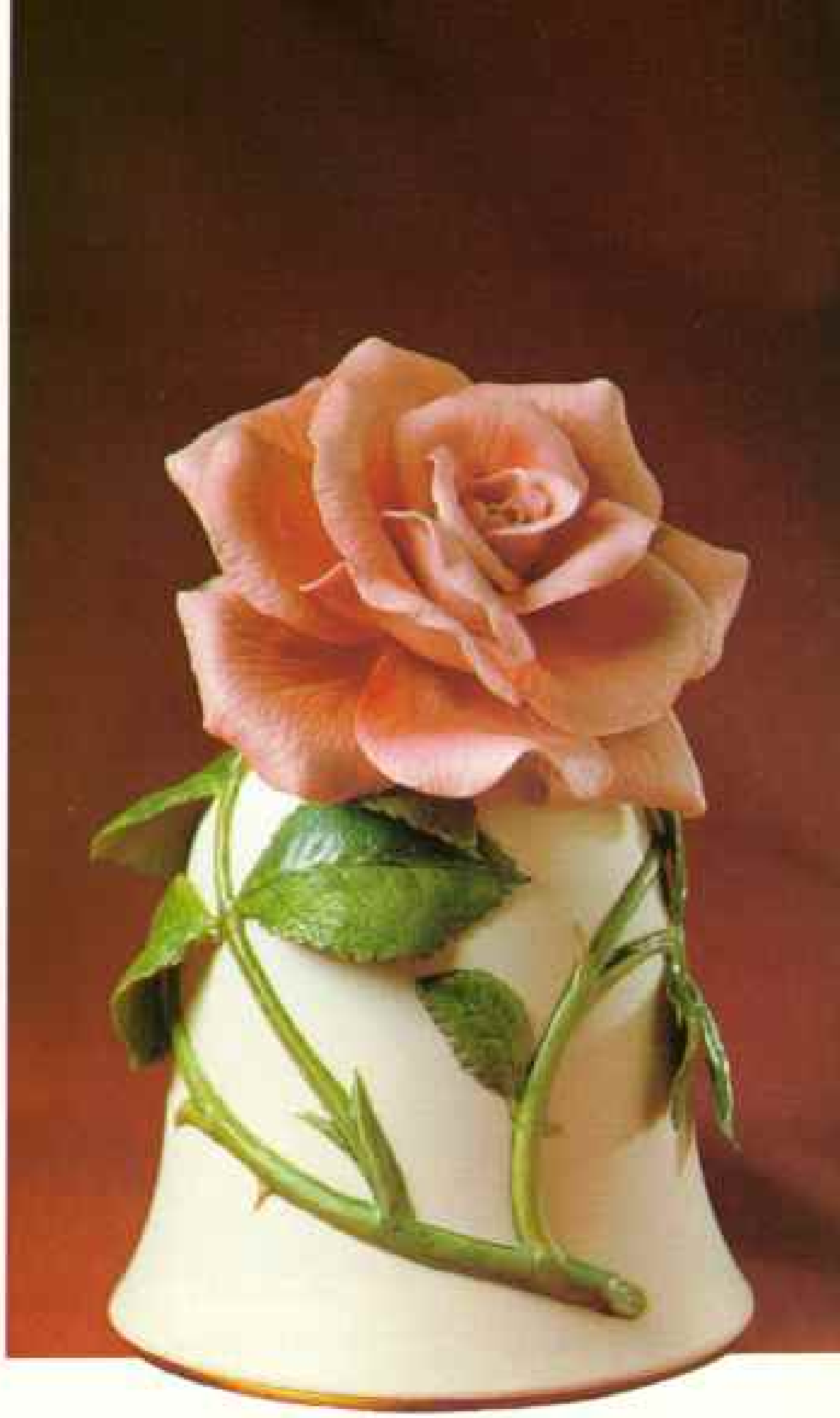
The creator of this delightful sculpture, Jeanne Holgate, has been acclaimed as America's finest floral artist. Internationally admired, her work is represented in the great floral art collections of the world, including that of the British Museum, America's famous Hunt Collection, and the private collection of Her Majesty Queen Elizabeth, the Queen Mother.

Here, the artist has captured a rose in the radiant blush of first bloom. With entrancing precision, the sculpture portrays every vein of each leaf, every curve of each petal—even the tiny thorns growing out of the stem. The colors are of a subtlety that rivals nature itself. And the composition is superbly united by the bell of white bone china, which is hand-embellished with *pure 24 karat gold.*

In the tradition of the finest floral sculptures, *The Sonia Rose* is depicted fully life-size. Each imported bell will be individually handcrafted under the supervision of Franklin Porcelain. As an indication of the care that will be taken, the sculpture will be assembled by hand. And this intricate work will then be hand-painted —leaf by leaf—petal by petal.

Importantly for collectors, this is the first sculptured bell by Jeanne Holgate. It will be issued in a single, limited edition. A restriction of just *one* sculptured bell per person will be enforced, and the total edition will be limited forever to the exact number of individuals who enter orders by the end of the issuing year, 1983. Then, to insure the edition remains permanently closed, the bone china molds will be *broken.*

To brighten your home with this work of beauty . . . and to acquire a future heirloom for your family . . . you need only return your application no later than the expiration date it bears: April 30, 1983. No payment is required with your reservation. Please be sure it is postmarked by April 30th.



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THE SONIA ROSE

Valid only if postmarked by April 30, 1983.
Limit: One per person.

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Franklin Center, Pennsylvania 19091

Please accept my reservation for *The Sonia Rose* by Jeanne Holgate. This original sculptured bell will be crafted for me in fine, hand-painted bone china.

I need send no money at this time. I will be billed in three monthly installments of $20.*, with the first payment due before the work is sent to me.

*Plus my state sales tax and a total of $3. for shipping and handling

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On Assignment

LOUIE PSIHOYOS BY LUIS F. DIAZ

ALL IN ALL, not the most attractive of subjects, the world of trash. But it seemed an appropriate assignment for senior writer ***Peter White,*** who admittedly hates to throw anything away. A favorite office story concerns the cleaning staff that threw away a huge box marked "Trash," not realizing it was part of White's research materials. A painstaking collector of evidence to document his articles, he has more than 100 cartons stored in GEOGRAPHIC archives at last count.

White sorted through other people's garbage at the Tucson Sanitation Division (***right***) when he pitched in on the University of Arizona's Garbage Project, which seeks to learn more about the life-styles of Americans by delving into what we throw away.

Viennese by birth, and a refugee from Nazi-held Austria, White began his journalism career 40 years ago as a copy boy for the now defunct International News Service. He became one of the *New York Times Magazine*'s most frequent contributors, before joining the GEOGRAPHIC staff in 1956. Since that time he has covered war in Southeast Asia, bathed in a gold bathtub for a story on that precious metal, and most recently reported on Angkor, war-ravaged Kampuchea, and the world of the tropical rain forest.

Treading the muck of a Manila garbage dump in the Philippine Islands, contract photographer ***Louie Psihoyos*** (***left***) fell into a pothole, soiled his clothes, and ruined his shoes. "I went all over town looking for a pair of size 13s, and there weren't any," he says. "Finally I had to have a pair made."

During his nine months on the "urban-ore" assignment, Psihoyos also traveled to France, the Netherlands, Thailand, India, Egypt, and across the U. S. "There is beauty and utility as well as energy in garbage," he says.

Born in Dubuque, Iowa, Psihoyos became intrigued by photography in high school and sold his interest in an ice-cream company to buy more cameras. He later studied photojournalism at the University of Missouri and interned at the GEOGRAPHIC in 1980. His first assignment, the coalfields of Gillette, Wyoming, was published in the special Energy issue of February 1981.

PETER WHITE BY LOUIE PSIHOYOS

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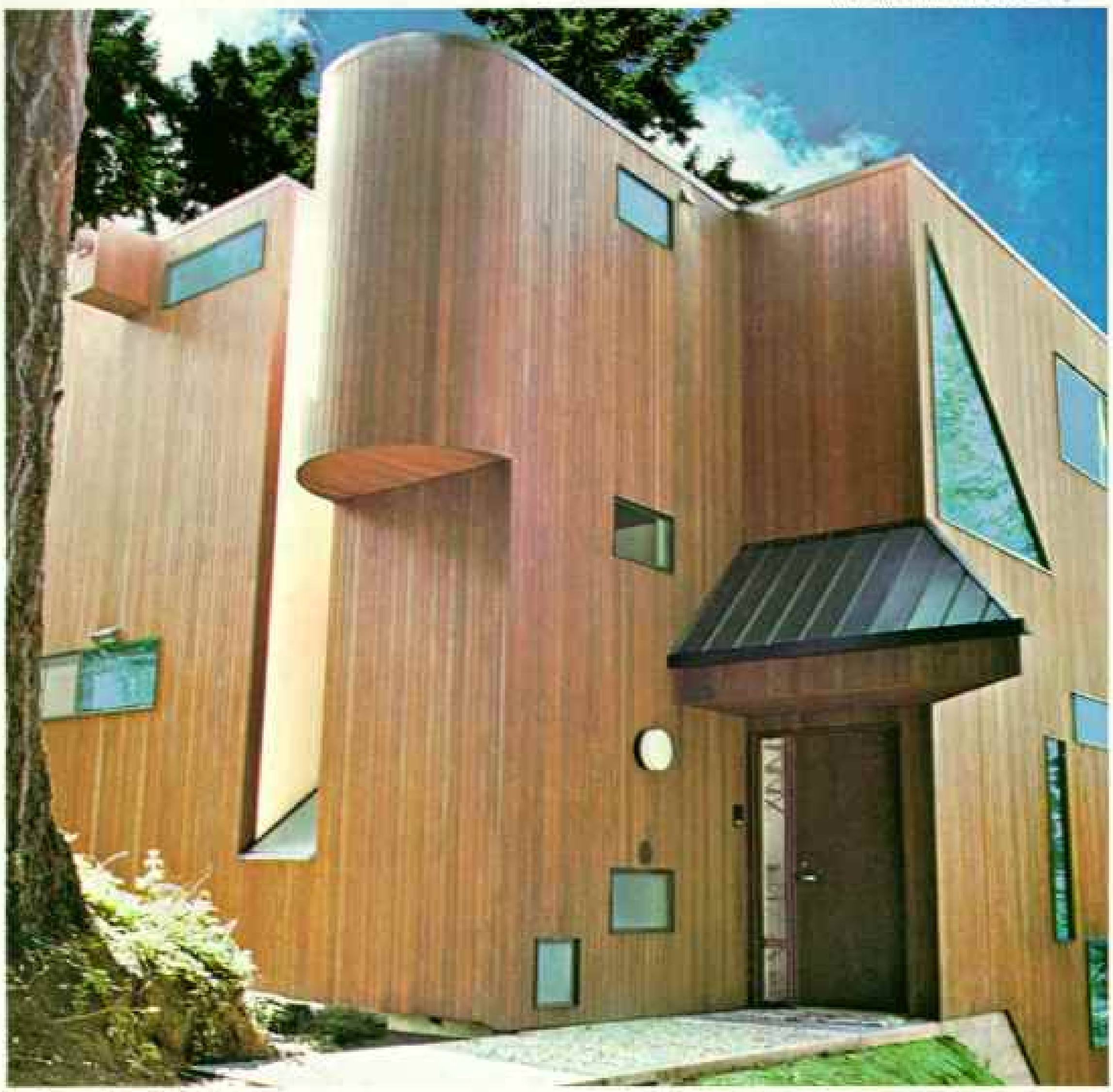

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