

VOL. 152, NO. 1

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# NATIONAL GEOGRAPHIC

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**I**N ANCIENT ATHENS, this time of mid-summer marked the beginning of the New Year, counted from the new moon after the summer solstice. That seems not the least bit odd to those of us in the business of producing a monthly journal; at the moment we are working on articles that will appear in January of 1978.

Each day an extraordinary number of letters arrive at National Geographic headquarters—among them requests for previews of what is coming. "If only I had known that you were going to publish that magnificent article on the Celts, I would not have written my term paper on the Etruscans," mourned one lad. Another member asked how we were able to deliver the issue containing our North Sea story a month before the Ekofisk oil well went wild. Had we planned it that way?

A crystal ball is not standard equipment for our editorial staff, but we do try to cover topics of current interest. We have, for example, been working many months on an energy story that will reveal startling new advances in the technology of conservation. We began work on it long before President Carter was elected.

We will be reporting on the continuing search for even greater air safety. A magnificent presentation on the life and works of Leonardo da Vinci (attention, term-paper writers) and a look at one of the most extraordinary excavations in history, at the tomb of the first emperor of China, will be arriving at your home this autumn. The ways of the wolf and an account of life among the giraffes of East Africa are among the natural history features scheduled for the remaining months of 1977.

We will also be reporting on nations and peoples in all parts of the world—an increasingly difficult task. At the end of World War II, the United Nations was launched with 51 member countries. Today there are 147, many of them erected on the ruins of colonial empire. And, sadly, in wide areas of the world the idea of free press inquiry into any aspect of national life is regarded with hostility and misgivings.

Nonetheless we persevere, and will be bringing you timely reports in coming months on nations in turmoil as well as on those enjoying peace and stability. I don't want to give it all away, however, and there will be more than one surprise in the issues ahead. Meanwhile, with a glance at the moon, we will wish the old Athenians and ourselves a happy New Year.

*Silvestre M. Brown*

# NATIONAL GEOGRAPHIC

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July 1977

## Preserving Our Wild and Scenic Rivers 2

*Dams, dredges, cities, and factories have forever altered many of our once pristine waterways. The nation's effort to save others, still flowing free and unspoiled, is described by Society President Robert E. Doyle and portrayed on a double map supplement.*

- *Montana's Flathead is explored by Douglas H. Chadwick and Lowell Georgia. 13*
- *Jack and Anne Rudloe find tranquillity on the Suwannee. Photographs by Jodi Cobb. 20*
- *David S. Boyer reports on the historic St. Croix where it flows between Wisconsin and Minnesota . . . 30*
- *. . . and visits the Pacific Northwest, where controversy rides the glacier-fed Skagit. 38*
- *Nathaniel T. Kenney and Bank Langmore raft the Rio Grande's spectacular gorges. 46*
- *John M. Kauffmann and Sam Abell canoe Alaska's lonely and unsullied Noatak. 52*

## The Rat, Lapdog of the Devil 60

*Through the ages a small but implacable enemy has brought man disease, starvation, and terror. Thomas Y. Canby and James L. Stanfield survey today's global war against the resilient rat.*

## Turkey Faces Another Crossroads 88

*Beset by political unrest, international tensions, and the woes of a changing economy, a nation pointed West by Kemal Atatürk looks in new directions. By Robert Paul Jordan and Gordon W. Gahan.*

## Rituals and Spells Shape Gimi Lives 124

*A New Guinea village gives anthropologist Gillian Gillison and her photographer husband, David, vivid insights into primitive concepts of life and death.*

**COVER:** *Undine Falls in Yellowstone National Park typifies the splendor of our nation's unspoiled waters (pages 2-59). Photograph by Ed Cooper.*

CLEAR AND PURE they ran, out of the hills and mountains of a new world toward the sea. And men driven by vision, by lust for wealth, or by religious conviction followed the shining pathways—the St. Lawrence, the Penobscot, the Connecticut, the Hudson, the Potomac, the James, the Savannah, the Mississippi.

Always it was the river that beckoned onward through the deep and shadowed forest, toward the mountain pass, and later across the plains—the Missouri, the Platte, the Arkansas, the Snake, the Columbia, the Colorado.

These were living streams, sometimes raging with destructive floods, sometimes blocked by treacherous rapids, sometimes so shallowed that Meriwether Lewis's party in 1803 "walked almost as much . . . on the Ohio's bed as they had floated on its bosom."

If they represented difficulty and danger, the grand, clean rivers of what would become the United States were also highways to a destiny considered manifest. Flatboats carried settlers from old Fort Duquesne, later Pittsburgh, to Cairo on the Mississippi in twenty days. Of the Missouri—Old Misery—it was said that it "follows you around like a pet dog with a dynamite cracker tied to his tail." But it also opened the way to the great northern plains and beyond.

The rivers also offered the priceless gifts of economical power and water. The first dam for a water-powered grinding mill was built in Milton, Massachusetts, in 1634. By the 19th century the old millstream had become a part of every New England town.

Since that time there has been a continuous development of our rivers as a matter of public policy—to aid navigation, generate power, control floods, provide fishing and recreation, irrigate fields, and provide water for growing cities and industries.

Old Misery now is contained by seven major dams, and we would pay a terrible price in some years if it were not. And we would expect a great working river like the Ohio to feel the

# Rivers Wild and Pure: A Priceless Legacy

By ROBERT E. DOYLE  
PRESIDENT, NATIONAL GEOGRAPHIC SOCIETY

"We simply need that  
wild country.... For it  
can be a means of  
reassuring ourselves  
of our sanity  
... a part of the  
geography of hope."

—Wallace Stegner

LOWER FELLE, YELLOWSTONE RIVER, WYOMING  
PHOTOGRAPH BY DAVID MUECHY







constraints of 21 navigational locks. Most of our other major rivers have also been altered and manipulated to various degrees. In short, there are probably few of them left across the entire country that flow pure and free from head to mouth.

Today, writes John M. Kauffmann, an author who knows and loves rivers, "Much of the damming and industrialization of riverine beauty in the East is already an accomplished fact." And ecologist Kenneth W. Cummins adds, "due to the activities of engineers in concert with power companies and agronomists, most of the large . . . American rivers are now only a series of impoundments. . . ."

As with so many other resources, we have taken our rivers for granted. No one, no federal agency, has made an overall assessment of the free-flowing rivers that are left. Statistics are seldom comprehensive, and river conservation is usually a defensive campaign.

The U. S. Army Corps of Engineers, which has been in the dam-building business for more than half a century, says that about 50,000 dams restrain U. S. rivers. But they also estimate that only 38 percent of all sites with hydroelectric potential in the continental United States have been dammed.

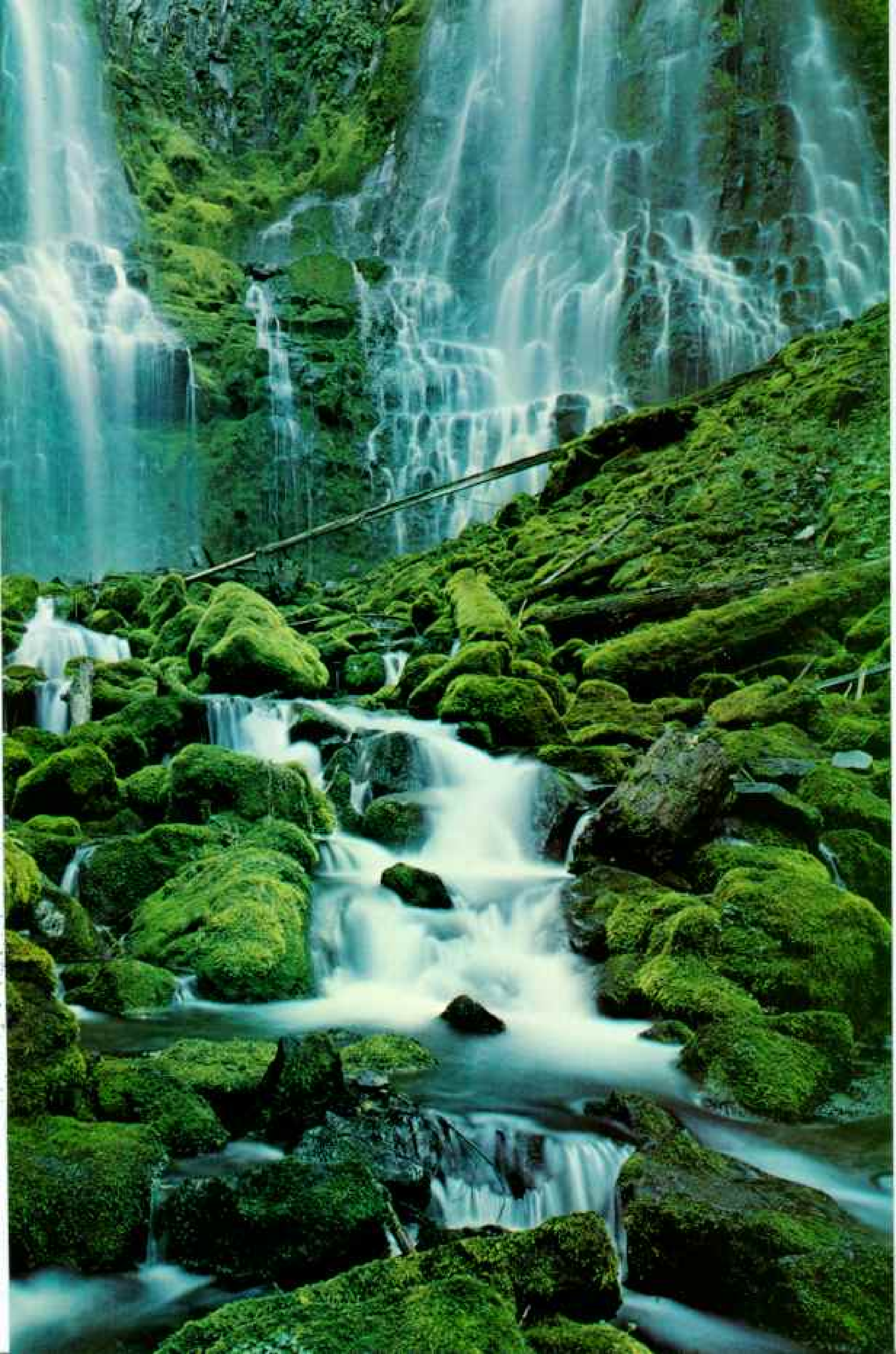
The U. S. Geological Survey has other figures—on the discharge of rivers and on their water. (Continued on page 9)

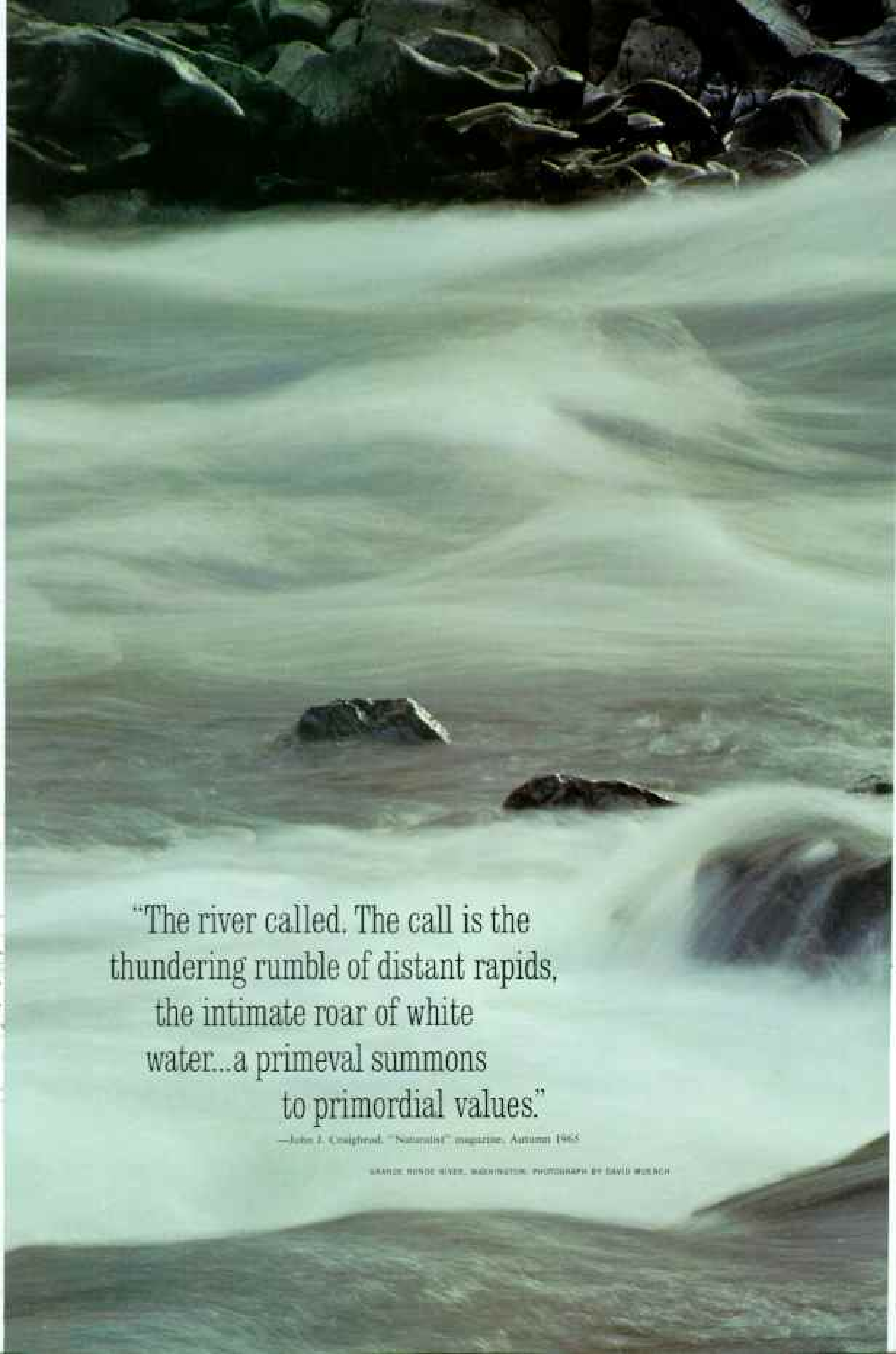
“Every ripple and eddy of this lovely stream seemed solemnly to feel the presence of the great Creator.”

—John Muir, "A Thousand-Mile Walk to the Gulf"

LOWER HIBBY FALLS, HIBBY CREEK, OREGON  
PHOTOGRAPH BY ED COOPER







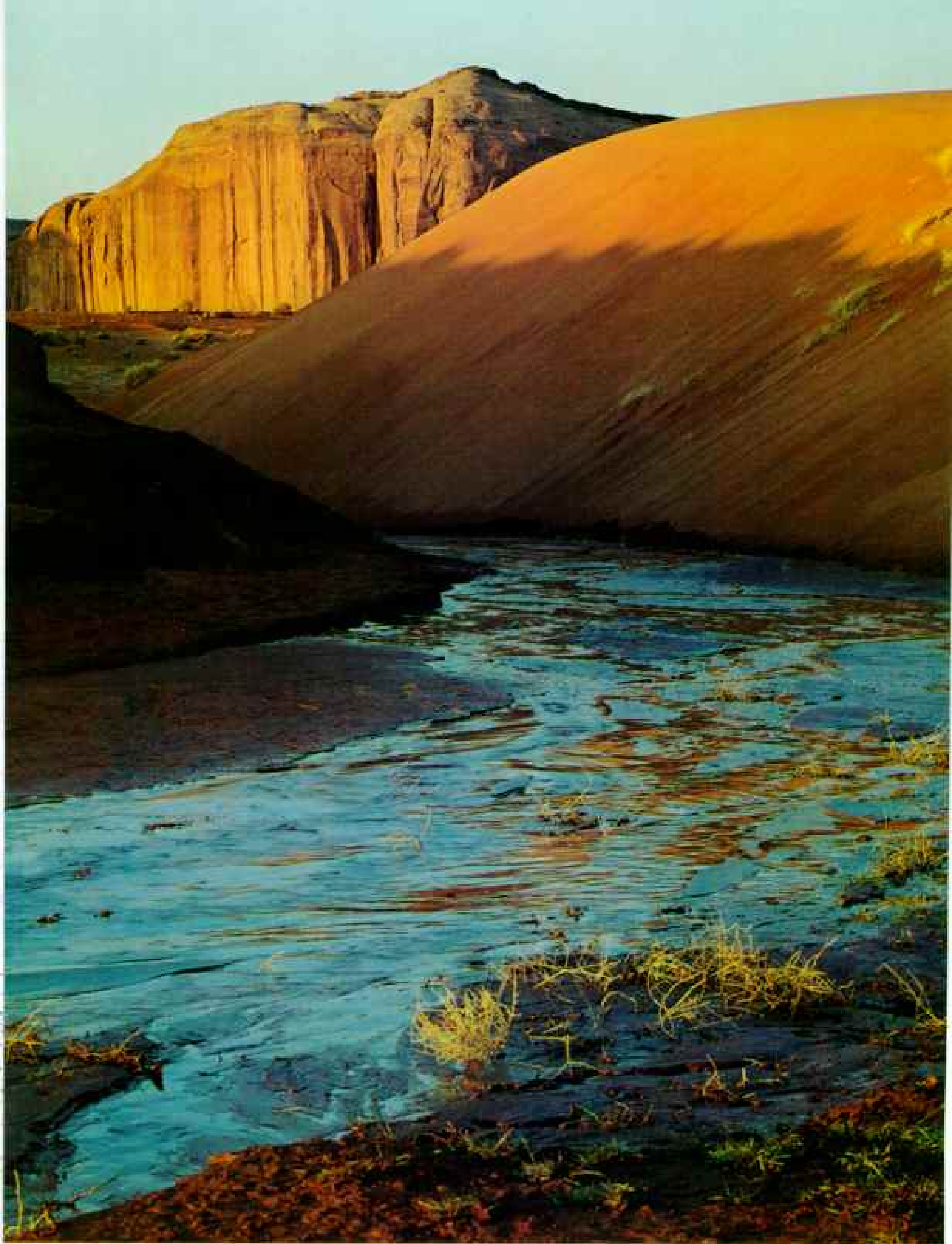
“The river called. The call is the  
thundering rumble of distant rapids,  
the intimate roar of white  
water...a primeval summons  
to primordial values.”

—John J. Craighead, “Naturalist” magazine, Autumn 1965

SANDE RIVER, WASHINGTON. PHOTOGRAPH BY DAVID MURCH







“Water and life are two threads woven intrinsically



MONUMENT VALLEY, ARIZONA. PHOTOGRAPH BY GACE DIETRICH

together.”

—David Cavagnaro, “Living Water”

(Continued from page 4) quality. But much information on the nation's rivers is widely spread among agencies.

In 1968, in the spirit of a new awareness that some of our beautiful rivers should be preserved, Congress passed the Wild and Scenic Rivers Act. The legislation finally provided the incentive and the money to begin.

Eight rivers were immediately selected. They all seemed to qualify under the act's terms as rivers that “with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values...” The act named 27 other rivers as candidates and set a ten-year limit to determine if they qualified.

It was time to take stock of our river resources, but there was no nationwide inventory. The efforts toward river conservation had been too fragmented. Proponents of the act believed that a total of a hundred rivers might be included in that first decade, but now, nine years later, only 19 rivers or segments of rivers have received the act's protection.

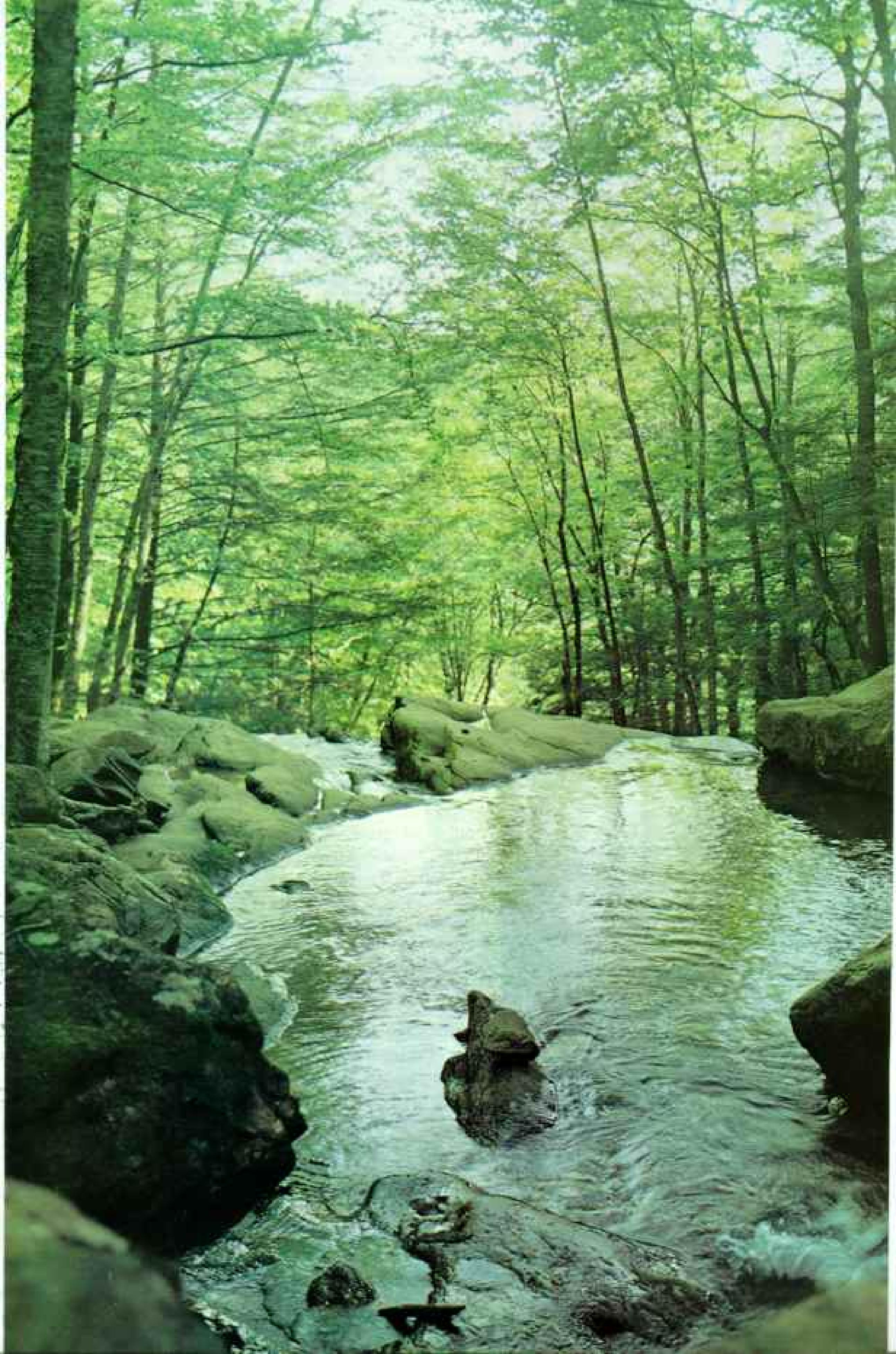
**I**N 1975, in order to systematize the selection, the Bureau of Outdoor Recreation began a comprehensive study, screening every river of 25 miles or more in length. The bureau has recently narrowed its choices to 300,000 miles of river, representing perhaps 4,000 separate stream segments.

Within the next year they should be able to tell us how many miles of free-flowing river are left in the United States. We should have a more accurate measurement, in other words, of our obligation to posterity.

Under the act, rivers or sections of rivers are classified as either (1) Wild—unpolluted, undammed, with primitive surroundings, accessible only by trails; (2) Scenic—undammed, with shoreline largely undeveloped, accessible by road; or (3) Recreational—readily accessible, with some development and preexisting dams allowed.

There seems to be general public acceptance of the need to keep some of our





rivers undeveloped, but compromise often seems impossible. After a disastrous flood, the cry for dams goes up—and conservation takes the rumble seat. In the middle of a drought like that now afflicting our West, we hear earnest entreaties for impoundment.

And although conservationists point out that the majority of economic hydroelectric power sites are already dammed, today's energy crunch provides incentives to develop more. Hydroelectricity now provides only 14 percent of the nation's generating capacity.

Though spiritual, recreational, and economic needs continue to conflict, there seems little question that most people in the United States still regard their rivers as an ever flowing resource. It is symptomatic of this relaxed attitude that the latest official figures for withdrawal and consumption are seven years old.

Yet even the picture of water use in 1970 is quite enough to give us pause. Our streams provide 67 percent of all the water used by the population. In 1970 the number of gallons funneled through the nation's water pipes, turbines, and irrigation systems was 3.17 trillion gallons a day, or eight times the average daily flow of the Mississippi River. That huge volume included 1,800 gallons daily for every person in the country. The average home used a hundred gallons a day per person. Total water consumption in the country is expected to increase 220 percent by the year 2000.

As water use rises and our rivers are pressured by an energy-hungry nation, the inevitable decisions will have to be

made, case by case. At what price do we exploit our rivers? What will be left for others? The next four or five years are "absolutely critical," warns Bill Painter, former executive director of the American Rivers Conservation Council.

The National Wild and Scenic Rivers System can make a difference. Dams and dredging will be prohibited on protected rivers, development curtailed, water quality assured.

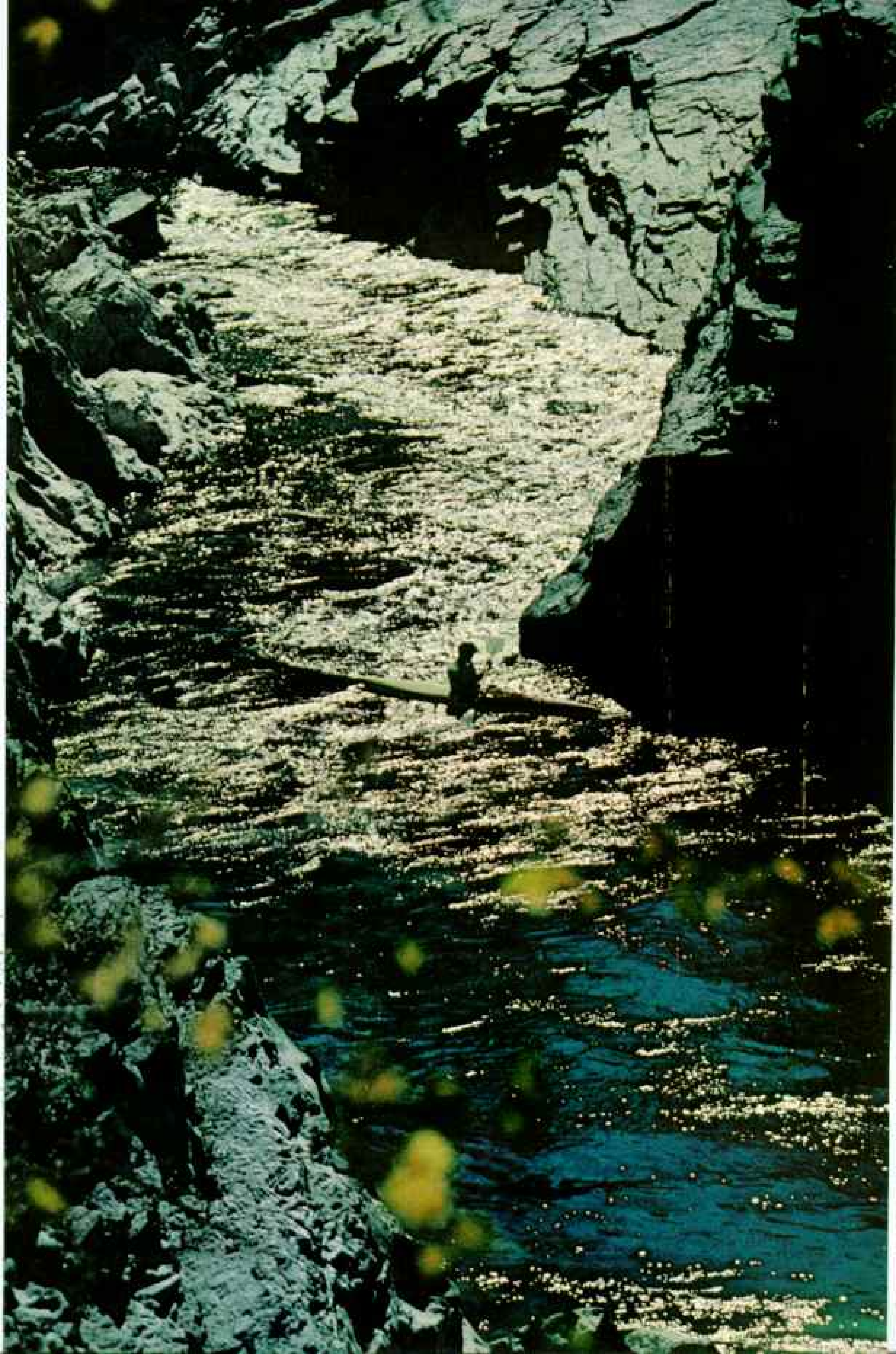
In time this river system will preserve portions of our geography and our history, and, in a way, indicate our character as a people. From Maine's Allagash to North Carolina's New, from Wisconsin's Wolf to California's Feather, from Idaho's Salmon to the upper Rio Grande in New Mexico, the nation is assembling living portraits of the beauty of our streams. The double map supplement to this issue shows the extent of the effort.

**T**HE NEEDS of our people have been great indeed, and the rate of river use for navigation, irrigation, and industry has paralleled the remarkable growth of our economy. Yet one remembers the lament of Washington Irving more than a century ago: "The march of mechanical invention is driving every thing poetical before it."

There are rivers running clean and free, as of old, and others that offer a respite to the modern soul. In places, that purest poetry of nature, the chiming of a mountain stream, may still be heard. There are dark-shadowed rivers that evoke our past. Surely this is a legacy we will have the wisdom to preserve for generations to come. \* \* \*

"Rivers have what man most respects  
and longs for in his own life and thought—a  
capacity for renewal and replenishment,  
continual energy, creativity, cleansing."

—John M. Kauffmann, "Flow East"





**M**ORNING SNOW LIGHT the color of pearl was in the south window. I lay for a moment more beneath the quilt, listening to the jays at the feeder, then rose and shivered into my wool robe. Outside, the mercury huddled at ten degrees below zero F. A northwest Montana morning at my home along the North Fork of the Flathead River, three days after Thanksgiving.

Later I went to the river to draw water and found the ice was four inches thick on the channel that sweeps around the island by the house—perfect for my fiancée, Karen, and me to take a quick skate before lunch.

We were gliding along, when Karen suddenly called, "Look!" pointing to the brush bank where a moose was trotting through shoulder-high willows. We curved to a stop to watch.

Exhilarated, we decided to take off our skates and walk across the island to where the main current of the North Fork flows. Stepping out onto a ribbon of sand, we could see in all directions: mountains, forest, sparkling water, a huge country of green and white.

To the east of the river lies Glacier National Park, established in 1910, and at its core towers the Livingston Range, which carries the Continental Divide north at elevations of more than nine thousand feet. From the river we could see where the top of the continent marches past the border into Canada and where the remote headwaters of the North Fork begin. (For a detailed map of the Flathead see *Wild and Scenic Rivers of the United States*, a supplement to this issue.)

The North Fork reaches some 70 miles south before joining the Middle, and then the South Fork of the Flathead, which have coursed a hundred miles each to their confluences. All three forks move between tall mountains, sometimes pouring through limestone chasms so deep and narrow the sun seems never to touch the water. In places like the Chinese Wall near the headwaters of the South Fork, a solid band of white limestone a thousand feet

## OUR WILD AND SCENIC RIVERS

# The Flathead

By DOUGLAS H. CHADWICK

Photographs by

LOWELL GEORGIA



DOUGLAS H. CHADWICK

*High above Montana's Flathead Basin, a Rocky Mountain goat eyes his domain: one of the newest additions to the National Wild and Scenic Rivers System. The author (facing page) kayaks the river's South Fork.*



*Mountain stillness and midmorning fog blanket Bowman Lake, one of*

thick and ten miles long emerges from the unbroken green of forested hills to sweep across the broad landscape like the crest of a gigantic wave.

The wild lands drained by the Flathead contain perhaps two-thirds of the threatened grizzly bear population and most of the wolverines south of Canada, the endangered northern Rocky Mountain wolf, cougars, fishers, otters, mountain goats, ospreys, bald eagles, and other rare and wonderful creatures.

During summer this interacting community of animals expands its range into the high, flower-filled alpine meadows and tundra of the Flathead, while during winter it contracts to a narrow strip along the rivers.

Once the waters of the three forks join, however, they enter the human sphere. For forty miles the river meanders through rich farmlands, past the growing towns of Columbia Falls and Kalispell, and south into Flathead Lake, the largest natural freshwater lake west of the Mississippi. The river emerges from the lake to flow through tribal lands of the Flathead Indians, then turns west to join the mighty Pacific-bound Columbia River system.

**I**N THE NORTH FORK and other sparsely inhabited parts of the Flathead's tributaries, enough remains of the American frontier to demand self-reliance and initiative from those living



*many lakes in Glacier National Park that feed the Flathead's North Fork.*

there. Among my North Fork neighbors, many from other parts of the country, the openness and individuality of the frontier thrive.

If you were to drive the long, winding North Fork road along the narrow banks high over the river, the first people you might meet are John and Karen Gray, proprietors of the Polebridge Mercantile. Virtually unchanged since early homesteaders came to purchase flour and salt, the mercantile is store, saloon, gas station, post office, chain-saw repair shop, motel, social center, and goose farm all in one.

Unlike most merchants, however, John and Karen have little desire to expand and increase profits. "We make

enough to live the way we like," John said, petting the sleepy orange cat that sprawled across the counter. "Sure, we could put more commercial developments on our land here to keep up with the demand from summer park tourists. But then we'd be busy day and night managing the place."

Karen shares this casual approach to business. "Oh, don't buy that, for Pete's sake," she admonished as I reached for a can of preserves. "You can get that for two-thirds the price in town. We have to keep the prices high on a few things because we sell so few."

From talking to the Grays and other North Forkers, I heard about Tom Reynolds and the early days of the valley.





Tom, now 80, had not been to town for three years, so I went to find him.

A deer watched with curiosity as I drove up to Tom's remote homestead. When I arrived at the door, I was surprised to find not a dour hermit but an engaging host with an English accent.

Tom told me he had emigrated from England to Canada, where he found work on a farm for ten dollars a month. He moved south to the North Fork Valley in the early 1930's. There had been a promise of better work with all the oil and coal exploration going on then. Plentiful wild meat and fur-bearing animals along with expectations of an early-day energy boom had enticed many others into the North Fork, until the population grew well beyond what it is today, enough to support two post offices and three small one-room schoolhouses.

As it turned out, the fuel reserves proved disappointing, and the cost of transporting supplies from distant towns and raw materials to market became too great. The human population in the area soon depleted the supply of wild meat and furs through unregulated hunting and trapping. One by one, except for Tom and a few hardy families, the settlers left.

In back of the house Tom's woodshed held enough dry tamarack wood for three or four hard winters. "I chop a little now and again to keep active," he said. Tom is always busy at one project or another, and he can't understand how some older people he has met can be so sedentary.

No one could describe Mary McFarland as sedentary. A charming woman in her 70's, and one of Tom's longtime neighbors, she lives by the river in a house full of windows. When you sit in her home, you can often see elk, coyotes, and hawks in the open grasslands of Big Prairie, and there are mountains wherever you turn. Her homestead is one of several private parcels of land within the boundaries of Glacier National Park, a holdover from early park days when hunting, trapping, and stock raising were permitted.

*"This is civilization!" says the author. Happy without plumbing or electricity, he bathes outdoors. A fortnight later his fiancée, Karen, sweeps snow off his unfinished toolshed.*



BRUCE H. CHADWICK

I stopped to visit her en route to fjordlike Bowman Lake (pages 14-15) with my canoe. She greeted me with cookies and an aromatic herbal tea served with fresh whole milk.

Mary studied entomology at the University of Paris many years ago, then went on to a school of veterinary medicine. There she developed a keen interest in nutrition and health and also in another veterinarian. "When you go to a school with three girls and eighty boys, you end up getting married," she explained. Her husband, now deceased, brought her to the North Fork, where they first took over the farthest north of all the homesteads in the park. Later they ranched at Big Prairie.

**A**LATTER-DAY PIONEER lives on the river not far from Mary. At Bill Atkinson's there is fresh bread, and butter from his small herd of goats. The fence of Bill's pasture

extends into the river so his horses and goats can reach the water when they are thirsty.

Bill's cabin, dark and warm inside, smelled of smoked hides. Across from me as I ate my bread was Bill himself, a robust, alert, young man with a full beard and long hair, dressed from head to foot in beautifully handcrafted buckskin. Sometimes he sat, sometimes he paced about like a wolverine.

Bill works hard to emulate the ways of the early mountain men and the Indians before them. He likes to dwell on the fact that at his threshold the North Fork still contains virtually every predator and prey species that has been here since the Ice Age.

Disillusioned with civilization—he pronounces it “shrivelization”—in his home state of Florida, Bill came west. After a tour of duty as a medic in Viet Nam, he returned, determined to recreate a frontier life.

He is indeed self-sufficient, supplementing food he raises with wild meat and fish. All his clothing comes from hides and furs that he tans himself, and he buys the few things he can't make with money earned from selling engravings done on antler. He has spent only \$38 on home improvements since 1969, and averaged \$11.50 a year for his energy needs: one tank of propane gas for two lamps in the cabin.

How long can Bill endure as a deliberate anachronism in the modern world? His independent ways have sometimes run counter to park regulations. And he already is competing with too many trappers, poachers, and nonlocal hunters for the same animals. Yet Bill's way of life remains direct and unfettered. If the wilderness can last, perhaps Bill can last too.

The region is still something on the order of an African game reserve, where animals can range freely over a vast area with a minimum of human disturbance. The wild lands drained by the Middle Fork, some of which are under study for a national Great Bear Wilderness area, connect the same kind of country in Glacier Park with the Bob

Marshall Wilderness of the South Fork. Moose, grizzlies, mountain goats, even a rare timber wolf can be seen by the Middle Fork. Elk cross from summer ranges in the Great Bear to winter on south-facing hillsides in Glacier National Park, overlooking U. S. Highway 2 and the Middle Fork.

**T**HE GREAT THREATS to the conservation of the wildlife habitat of the Flathead are subdivision of land ownership, logging, mining, and oil and gas exploration. Timber harvesting can lead to erosion of riverbanks and siltation of streams, with particular damage to the spawning success of such fish as the rare westslope cutthroat trout and the Dolly Varden, a type of char. But logging may soon be the least of the fishes' worries.

Several years ago Rio Algom, a Canadian subsidiary of a giant international corporation, announced plans to study the feasibility of mining large coal reserves near Cabin Creek, a tributary of the North Fork just eight miles over the border in Canada.

The company envisioned opening the sides of two mountains to extract high-grade coal for Japanese markets. The original plans included a townsite for 3,000 people, a new highway, a railroad spur, and a coal-fired power plant, all in the uninhabited region.

Although Rio Algom is examining every means of avoiding environmental damage, Flathead residents have joined in nearly unanimous concern over the proposed mine. Dr. Lawrence Sonstelie, a biology professor at Flathead Valley Community College, pointed out that such large-scale mining could lead to accelerated erosion and siltation, pollution from fine coal particles in the air and water, and introduction of bentonite, a clay harmful to aquatic life, into the water. And of course whatever happens to the North Fork will eventually affect the heart of the region, Flathead Lake itself.

“Let me show you why we're so worried,” said Loren Kreck, a Columbia Falls dentist whose home overlooks the



Flathead River. Loren held up a bottle of water with a layer of fine coal particles settled on the bottom.

"We took this sample from the creek below a similar mining operation in British Columbia," he said. Then he shook the bottle. The water turned a dark, sooty color and remained gray long after he put it down.

"It will stay like that for two or three days," he said, shrugging his shoulders. "Imagine what the rapids on the North Fork could look like."

Fears that the Flathead's spectacularly clear waters would turn black led residents to form the Flathead Coalition. Among the 28 different groups represented in the coalition are not only homeowners along the lake, but two chambers of commerce, organizations not always associated with conservation efforts. The coalition's goal is simply "zero pollution of the Flathead, because," as one member told me, "that is all the system can take without losing its special qualities."

Whatever happens to the Cabin Creek coal-mining project could well set a precedent. With millions of tons of coal at the headwaters of the North Fork, Cabin Creek may be only the first of the area's large open-cut mines.

Not long after controversy over Canadian coal mining began, Texas Pacific Oil Company applied for leases on some 200,000 acres of public lands in Flathead National Forest to explore and develop deep oil and gas deposits. Since these initial applications, other companies and speculators have applied for leases on thousands of acres.

There has been a reprieve of sorts. Congress has made the Flathead tributaries part of our National Wild and Scenic Rivers System, a compact to limit development on the American side. By this action the United States sent a strong unspoken message to the Canadians about coal-mining pollution.

**WE ARE A NATION** sometimes obsessed with progress, but we are also a nation that has never forgotten its frontier heritage—one that



*High-grade coal—like this from an old North Fork mine—underlies the river's headwaters in Canada and clouds the future of the Flathead's clean waters.*

still counts beauty and wilderness among its most precious possessions. Flying one day with photographer Lowell Georgia over immense forest tapestries, we came to the river, my river, my home. Suddenly Lowell turned and asked, "Isn't that your place down there?"

I looked below at a tiny wooden cabin partly concealed by trees, and I could barely make out the garden clearing. The river sparkled past it all, and I imagined Karen walking to draw water. I imagined the river always shining like that, our home always hidden amid the natural shape of the land and us being able to kneel and drink the cold, sweet water, to look up and perhaps see an elk with her calf wading across it, and I said, "Yes, yes, that's where I live." There by the river. □

OUR WILD AND SCENIC RIVERS

# The Suwannee

By JACK and ANNE RUDLOE

Photographs by JODI COBB

*Lazy as a summer day, the  
Suwannee slides around a bend,  
wandering from the Okefenokee  
Swamp to the Gulf of Mexico.*

“PEOPLE THINK there’s something awfully magic about the Suwannee River,” Al Head, director of the Stephen Foster Center at White Springs, Florida, told us. “They come and want to touch it, hold it, or take it back in a jar.”

The center is a state-operated park that honors the composer of “Old Folks at Home,” better known as “Way Down Upon the Swanee River.” A native of Pittsburgh, Foster never saw the river but chose the name from a map, shortening it to fit his tune. Fortunately it replaced an earlier choice, “Way Down Upon the Pedee River.”

Foster couldn’t have chosen a better river to immortalize. It has mood, variety, and grandeur. Emerging from Okefenokee Swamp in Georgia, the Suwannee slices through Florida’s sand hills and limestone cliffs, rushes over



shoals, and widens into vast coastal swamps before flowing into the Gulf of Mexico (map, page 23). The water begins the color of overbrewed tea as the result of tannic acid leached from the bark and fallen leaves of cypress and other swamp trees. During its journey, the dark waters are nourished by numerous crystal-clear springs, creating transparent pools where shells gleam twenty feet below the surface.

Launching our canoes in the Suwannee just below Okefenokee Swamp, we began our journey of 230 miles to the Gulf. It was August and hot, and we were allowing a leisurely three weeks.

As the Suwannee leaves the Okefenokee, it gradually coalesces, flowing through an eerie wilderness of stunted Ogeechee tupelo trees and scattered cypresses, giving little shade from the brutal sun. Only the occasional splash

of a bowfin or the bellow of an alligator breaks the silence.

In this region Okefenokee swampers first settled in 1853, and their descendants still live along the river, their lives closely tied to its wilderness. Swamper Allen Sirmans, a sandy-haired teenager who worked for the Youth Conservation Corps at the Okefenokee National Wildlife Refuge, pointed to a huge alligator on the bank of the boat canal. He chuckled: "They got onto me the other day about grunting up that old gator. He's crazy acting. I got him rocking, slapping the water with his tail. They said I had to quit, I were a bad influence on the turrists." "Grunting" is an old technique used by hunters to attract gators by imitating their calls.

Allen lives in his family's original pre-Civil War log cabin near the banks of the river (Continued on page 25)







Way down upon de old plantation  
 Way down upon de Pedee ribber  
 Far far away  
 Dere's where my heart is turning ebbin  
 Dere's wha my brodders play  
 Way down upon de <sup>Swanne</sup> Pedee ribber



*"Way down upon de Swanee ribber," a homesteader awaits a catch of bass or catfish. Such a restful scene plays back the wistful notes of Stephen Foster's "Old Folks at Home," the ballad that made the Suwannee one of the most celebrated rivers in America. Truth is, Foster never saw the Suwannee. Searching for a river name befitting a new song about the South, the composer in 1851 first chose the Pee Dee,*

*a stream in the Carolinas. He later scratched it out (left).*

*Despite its fame, the 265-mile-long Suwannee remains uncrowded and largely undeveloped. In earlier times Spanish soldiers splashed across its fords, Seminole Indians and gator hunters roamed along its banks, and moonshiners toiled furtively in its swamps. Today conservationists are active, trying to preserve the river's antique quiet.*



*His calling card could read: "John L. Colson, Sr.—crabber, sturgeon fisher, turtle trapper, and bulkhead builder." Juggling river jobs since childhood, Jake, 45, still fashions a living almost entirely from the Suwannee. On a warm day he might load his boat with traps (left) and search for logs where cooters—turtles—bake in the sun. A catch of 40 can bring \$100. Jake also fashions concrete slabs that brace shoreline in the town of Suwannee. His offspring and in-laws lend muscle (below). At times as many as ten crowd the Colsons' tiny cottage. After a full day, Jake sinks into exhausted reverie (right).*







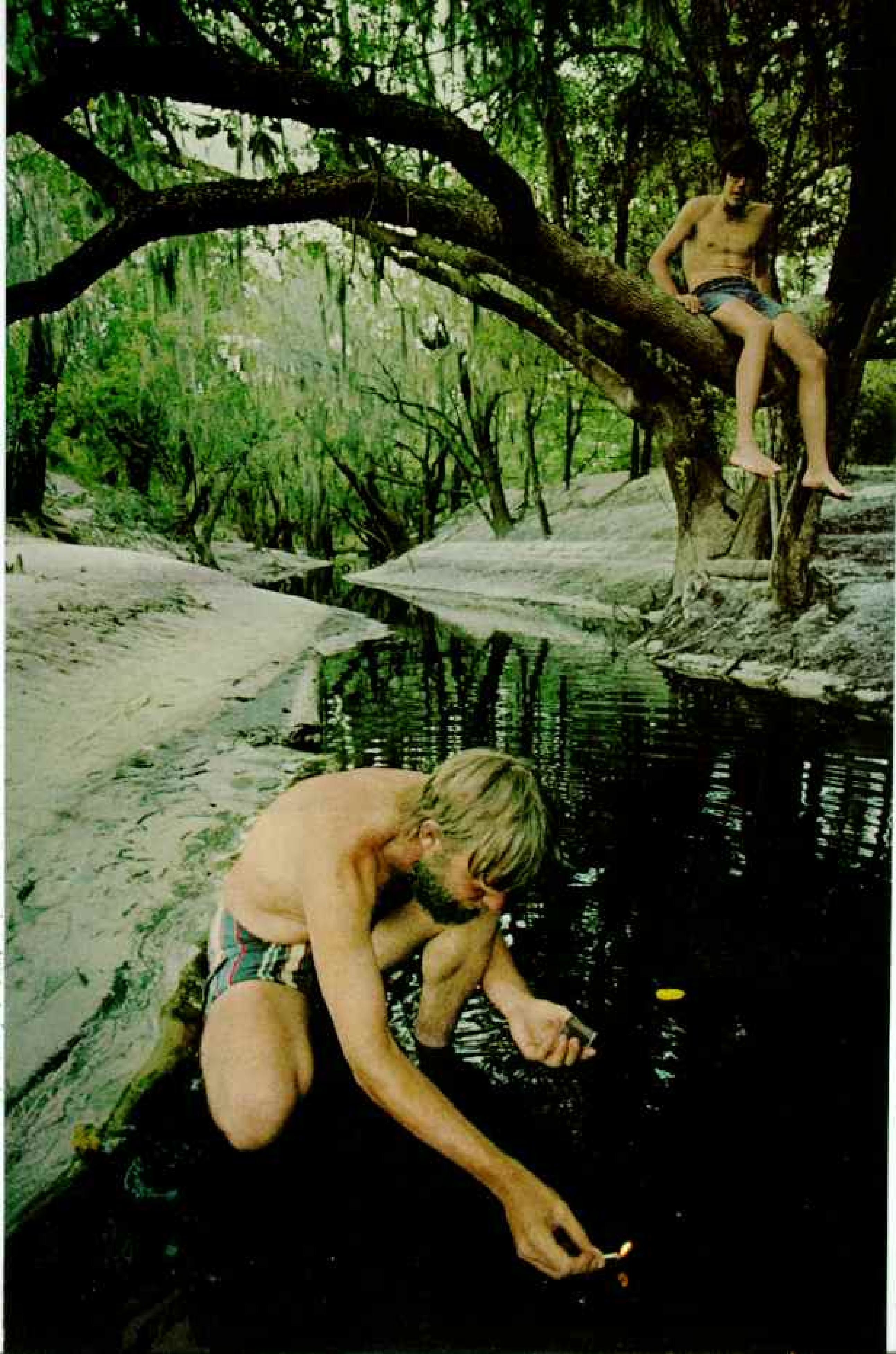
above Fargo. He earns pocket money from the swamp by collecting snakes for hobbyists and crayfish for fish bait. The porch is often covered with drying deer's tongue, a plant that he and his father pick in the woods and sell.

Rube Altman was the local buyer until his recent death. A sprightly old Georgia cracker, Rube sat in his garage surrounded by piles of the fragrant drying leaves, which are used as flavoring for pipe tobacco and as medicine. "The poor people, they'll go out and get deer's tongue when they ain't got nothin' else to do," Rube said. A hundred pounds of dry deer's tongue can be produced in a week of hard work and brings as much as eighty cents a pound.

Like many other people along this section of the river, Rube was also a beekeeper. "Gallberry blossoms, that's where you get your best honey," he informed us through a chaw of tobacco. "Palmetto and tupelo's good too. My granddaddy used to have a bunch of bees in old log hives, and he got them out of the woods."

Beekeepers along the Suwannee are frequently unwilling hosts to the honey bear, a black bear that has learned to demolish hives for their sticky golden treasure. "The bee man and the bear don't get along good," Rube laughed.

We paddled on, ducking low-hanging branches, watching for snakes among the contorted tree roots, and wondering



if the occasional abandoned shack hidden in the foliage wasn't a defunct moonshine operation. Stills were once as common as cottonmouths in the swamp, but high sugar prices and the efficiency of lawmen and revenueurs ended most moonshining.

**B**ELOW FARGO the river loses its swampy character, cutting through sand hills covered with pine-and-oak scrub. As we drifted in the late afternoons, we began looking for campsites on the stark white sandbars that rose along the river bends. We swam in the cool waters of the Suwannee and built our fires with "fat-lighter" pine knots. Even on damp rainy nights the resin-soaked wood blazed cheerfully.

Outside our campfires the eyes of wild creatures gleamed, owls hooted, and bats swooped. On one sandbar near the Georgia-Florida line, we camped near a wild-bee tree, listening to the ominous buzzing that came from the monumental oak. About thirty miles across the Florida border, the Suwannee roared, if only briefly. Even before the sign, "DANGER—SHOALS 500 FEET AHEAD," we could hear the sound of rushing waters.

We paddled ashore just above the shoals and made camp. Only the thunderstorm that descended on us could obscure the noise of the water.

We awoke in sunshine, and in the morning light the white water boiled magnificently over rocks and ledges. Who could have thought that this peaceful stream that filtered through tree roots and swamps a few miles up-river was capable of such violence?

Portaging our gear around the rapids, we pushed our lightened canoes off the bank, and were sucked up and swept along. Fighting desperately to retain control, we saw we were approaching rocks, swerved, plunged nose first into

the water, paddled through air, and swamped. Laughing and exhilarated, we swam our canoes to shore to reload and press on past water-sculptured white limestone outcrops to White Springs, several hours downstream.

A picturesque small town with well-kept Victorian mansions rising above the river bluffs, White Springs is also the Florida headquarters of Occidental Chemical Company, which operates an extensive phosphate strip mine and holds mineral rights along miles of Suwannee shoreline. Five miles inland, towering draglines rip holes into the earth, extracting phosphate for shipment as fertilizer for overseas as well as for domestic use.

Occidental has agreed not to mine to the shores of the river, but it was cited by Florida State pollution-control officials in 1975 for excessive turbidity and runoff resulting from construction and dredge-and-fill operations around a Suwannee tributary.

The citation was withdrawn when the company signed an agreement to alleviate the problem, but a bigger concern remains: Occidental's 20-year plan for strip mining will destroy thousands of acres of swamplands and pine plantations in the Suwannee Basin.

Even with land reclamation, this will greatly influence the future of the Suwannee River Basin. Under present Florida law, little can be done to stop strip mining on private lands.

The Suwannee was recommended for inclusion in the Wild and Scenic Rivers System in 1974 by the Department of the Interior, which suggested that it be administered by the states. The proposal was opposed by property owners who fear loss of their land and development rights, and by those who want local control. Now the Florida government is working closely with several local agencies to provide protection

*Surefire proof of marsh gas requires only a match, as Andre Clewett, botanist at Florida State University, demonstrates in a Suwannee Basin stream. The match briefly ignites bubbles of methane rising from decaying vegetation below.*



from uncontrolled development for this nationally acclaimed river.

Downstream at Suwannee Springs, the river speeds around and through the remains of the Suwannee River Authority's damsite, abandoned in the early 1960's. The porous limestone banks proved an engineer's nightmare. The bulk of the dam was removed, but unsightly piles of debris were left.

Except for remnants of the dam, the Suwannee shows few traces of its past. Several early Spanish missions were located along the river. During the Second Seminole War in 1835, the Army introduced steamboats, and they remained the major means of travel until the early 1900's, carrying lumber, passengers, and farm products. The remains of the steamer *Madison*, sunk in 1863 in Troy Springs, are still visible.

Before the turn of the century and with the coming of railroads, White Springs and Suwannee Springs became

major health spas. People came from all over the South for the mineral waters. Little remains of these resorts except massive stone walls built around the clear springs to keep dark river water from flooding in.

SEVERAL MILES below Branford the river widens, and the Sante Fe joins it. Our canoe glided through marshes of water hyacinths, lily pads, and quaking maiden cane. Scooping a net under the vegetation, we found it swarming with crayfish, snails, insect larvae, transparent grass shrimp. Here, too, the first signs of the coast appeared. Sturgeon splashed, gars gulped air, and a mullet leaped before our boat.

As we paddled mile after mile to the Gulf, the high sandy banks and levees gradually subsided into vast freshwater swamps. The river more than doubled in width, with endless red bay, river cypress, tupelo, and ash trees rising



from mats of water lilies, wild rice, and maiden cane along the shore.

At the town of Suwannee near the river mouth, we met Jake Colson, a commercial fisherman whose sons help him net sturgeon and mullet, trap blue crabs, and gather oysters. "I got that river from here to the Santa Fe right here," he said, tapping his head. "I ain't got to think of it. I know every crook and creek."

Suwannee River turtles, commonly known as cooters, are a great delicacy, and Jake sells them to restaurants. "You see a log that's loaded with ten or twelve cooters. Well, you just go up and run your cooters off, put your basket trap beside it, and be gone for thirty or forty minutes and then come back. The cooters climb back onto the log, and when your boat comes up the second time, they jump into the basket."

We asked him how he knew which side of the log to set the basket on, and

he replied, "You got to think like a turtle, that's what makes a good hunter."

The vast swamplands at the mouth of the Suwannee are also good alligator habitat and were once a center of gator poaching. Some Suwannee residents still boast of their past exploits in hunting the big reptiles.

"I'll tell you the truth," one man declared. "They wasn't nearly as extinct as they figured down there. They said there was only about five hundred gators in Florida, and some months I was killing five hundred. I got caught, and it cost me a thousand dollars."

The game wardens never managed to stop the poaching, but elimination of domestic markets and laws prohibiting interstate transport of hides did. Alligators are now increasing, adding to the wonder of one of the few undammed, free-flowing rivers in the Southeast, a river of swamps and springs, of history and legends. □

*tributary of the Suwannee, which is nourished by more than fifty springs.*



OUR WILD  
AND SCENIC RIVERS

# The St. Croix

ARTICLE AND PHOTOGRAPHS BY  
DAVID S. BOYER  
NATIONAL GEOGRAPHIC STAFF

**T**ODAY they are not nearly so wild, of course—not the river, nor life, nor love—as they were in Jacques' time.

But today we have stepped backward in time into the early 1800's, into the log stockade of a reconstructed North West Company trading post on a tributary of the St. Croix River.

Inside the rough fort and beneath its fluttering Union Jack, things seem as they were nearly two hundred years ago, when French-Canadian voyageurs were exploring the wilderness west and north of the Great Lakes. Ax-hewn tables. Beaver pelts drying, and fox and mink and otter. Guns, traps, skinning knives, gunpowder, fire steels, tobacco twists, blankets and glass beads, and wooden kegs of "high wine"—a potent mixture of rum, brandy, and sherry.

And here is Jacques, the voyageur, in costume, playing his historic part with dramatic fidelity. Voyageurs were known to be filthy, obscene, superstitious, drunk whenever possible, yet tough as an Indian, cheerful under trials that would try the heart of a Jesuit martyr. Many voyageurs were, in fact, half Indian. Their fathers, voyageurs before them, had taken Indian brides.

"We voyageurs, we eat from a brass



*Whisper of a canoe breaks the silence of the St. Croix Basin as*





*two Ojibwa Indians scout for wild rice. The St. Croix divides Minnesota and Wisconsin for 127 miles, finally spilling its waters into the Mississippi.*



*Fancy footwork and uncanny balance determine who stays up, as Tina and Robert Scheer, both world logrolling champions, square off in a practice match at Hayward, Wisconsin. The sport began in the 19th century, when daring lumberjacks rode logs downriver during spring timber drives. Log jams would often choke the river, as at Taylors Falls, Minnesota, in 1884.*



pot. And sleep three in a bed, wearing our clothes and huddling together under our blanket to keep warm.

"I am here alone today. The others are upriver with the Indians, who are trapping beaver and otter. If they return with enough pelts, we may all share a small keg of high wine.

"In the spring we load our birchbark canoe with beaver pelts. We paddle up the St. Croix, down the Brule to Lake Superior, and across to Fort William in Canada. There we meet the *mangeurs de lard*, the pork eaters, from Montreal. They're voyageurs, but weaklings who cannot manage our rough life in the interior. Cannot carry 180 pounds over the long portages. Cannot drink ten flasks of wine. Cannot live on pemmican, or Indians' dogs, or perhaps nothing at all, having to chew on their moccasins when there is no game.

"They eat only salt pork and grits. And, like messenger boys, ferry our beaver pelts back to Montreal, for the felt hats of Europe."

**I**N REAL LIFE, Jacques is Dennis Hoffa, a young historian. He rides a circuit of schools, smoking his voyageur clay pipe, wearing voyageur clothes, entrancing young people with his lively and authentic reincarnation from the romance of the American northland. This morning he has played his role at the trading post built by the Minnesota Historical Society on the Snake River near its confluence with the St. Croix.

The St. Croix today separates, for 127 miles, the states of Minnesota and Wisconsin. Together with its longest tributary, the Namekagon, it was among the first rivers to be set aside



COURTESY MINNESOTA HISTORICAL SOCIETY

under the Wild and Scenic Rivers Act.

They are wild again today, these rivers. But for modern paddlers with aluminum canoes, they are wild in ways that are luxurious beyond all notion of primitive wilderness.

Though his name is unexpectedly English, Richard Smith is a vagabond voyageur and poet who has paddled many of the ancient waterways of Minnesota and Wisconsin and beyond. Now, together, we are canoeing down the Namakagon, pronounced *Na-ma-KAW-gon*, a litling Indian name that means "place of the sturgeon."

We drift through the yellow shimmering of birch trees along the shore, the burnt-orange fluttering of oaks, the crimson flaming of maples, and the rainbow medley of their reflections in the rippling pools.

A doe cocks its incongruously large

ears to listen to our coming. A great blue heron, with its keen, almost telescopic eye, spots us a hundred yards away, then levels its long neck for a downriver takeoff. It wings low over the water like a flying boat ponderously struggling for altitude.

Almost at our elbows we watch mink skittering along the shoreline, hunting food. We surprise a trio of otters happily sliding down a grassy groove in the bank, then splashing, gurgling and bubbling into the water. They swim around us curiously, urchin-size sea lions.

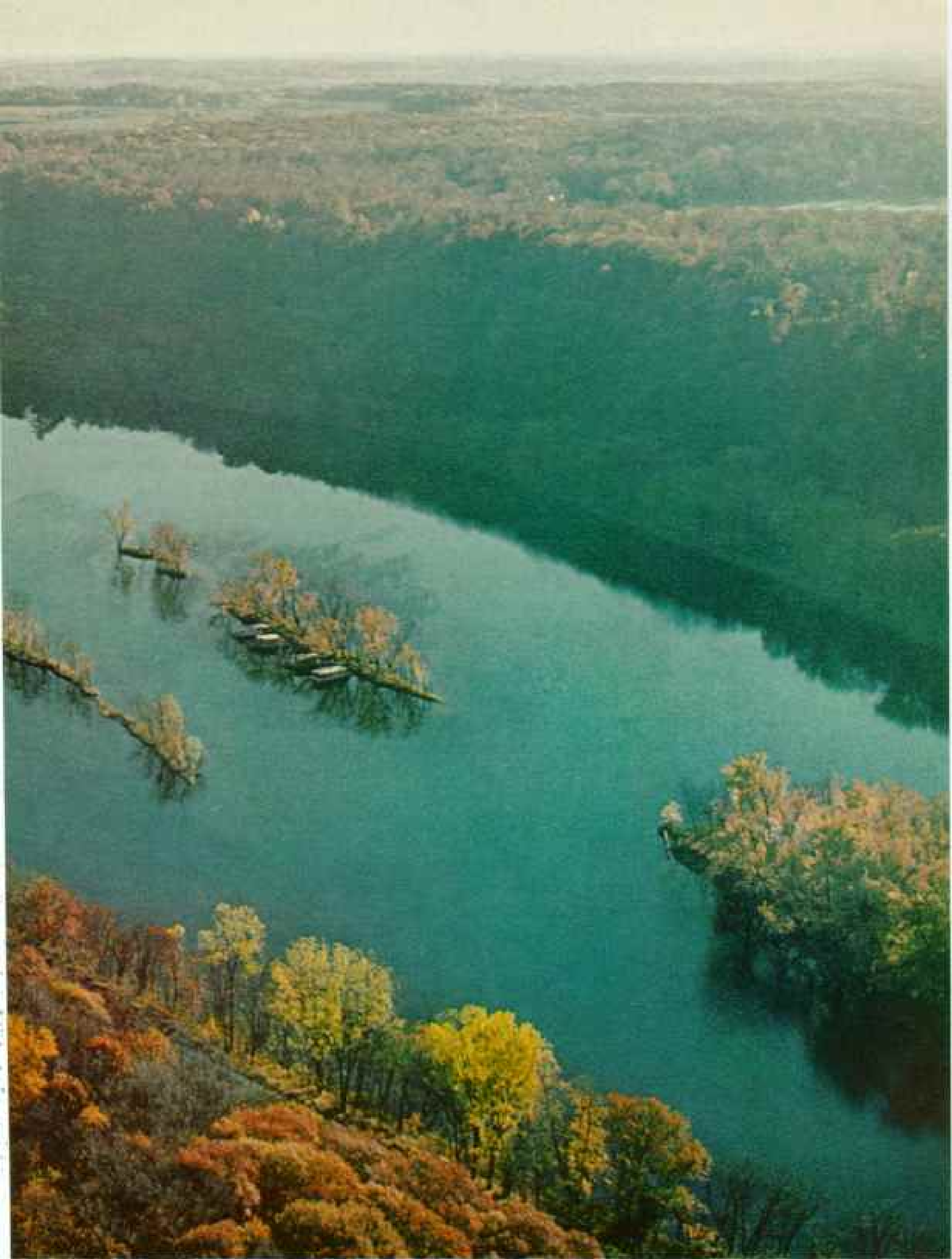
**A**T NIGHT, in the darkness outside our tent, the coyotes howl. There is the staccato chirping of the little saw-whet owl, and the grandfatherly hoot of the great horned owl.

Richard has almost forgotten that this river is not truly wild, that it flows





*Born of glacial torrents, the St. Croix today carves a gentle path between Minnesota, left, and Wisconsin. The river's history crackles with accounts of Indians, fur*



*traders, lumber barons, and Scandinavian immigrants. Canoeists, anglers, and houseboaters write the latest chapter on this waterway, which is now under federal protection.*

through Wisconsin's vacationland and is surrounded on all sides, and sometimes not far away, by roads and villages and lakeside resorts.

"You have to be involved with this river all the time," he says. "Not because of any danger, for it's truly a river for a boy and girl in a canoe, or a man and his wife and children. The trauma is in the very effort of seeing and feeling so much."

**T**HE WILD and Scenic Rivers Act allows hunting and trapping—but Wisconsin and Minnesota have provided some state game refuges. And forested parks as well, where only canoeing, camping, fishing, and photography are permitted.

Wisconsinites and Minnesotans are both proud that here, scarcely twenty miles from the two largest cities of the upper Midwest, Minneapolis and St. Paul, they have an unpolluted scenic and recreational river for people to enjoy.

Even so, along its shores some are disturbed, even angry—landowners having to sacrifice their cabins or resorts to the condemnation proceedings of the Federal Government.

"People in the Midwest don't have many national parks or wild rivers," Lyle Lieffring told me. "Sure, they've had land condemned for such things as roads. But cabins and homes and riverfront? Their own recreational land for the recreation of other people too? That's more traumatic."

Lyle, who owns and rents summer cabins at Upper Webb Lake, showed me one day where his own little hide-away cabin on the river used to be.

"The feds bought it and had it dismantled," he said. "They would have let me keep it for 25 years. But maybe I like it better this way." There was nothing left to be seen but a little clearing in the forest.

"I still come here, like a visitor. To fish or hunt, or just to be here. But today kids from the cities are camping where my cabin used to be, enjoying my scene."

The Indians, first the Dakota Sioux, then the Ojibwas, or Chippewas, lived on these rivers for untold generations.

Mrs. Lolita Taylor, widow of a chief of the St. Croix band of Ojibwas, today lives in a comfortable home near the river. She is an author, and retired after 30 years of teaching in the Wisconsin public schools.

"The wise old chiefs persuaded our people to move westward, away from the white man, as early as the 1600's," she told me. "They first settled at the confluence of Lakes Superior, Michigan, and Huron.

"My ancestors, the St. Croix, migrated down the rivers from Lake Superior. Because they had guns, they pushed the Dakota Sioux west onto the plains, and the forests and the wild rice of this river country became vital to our way of life."

After the Indians came white men, for the beaver. And later, more of them, to level the vast forests of giant white pine. And finally, farmers, to burn the stumps and homestead the land. Thousands were immigrants—from Ireland, England, Sweden, Norway, Finland, and central Europe.

To reach their goals, they came across the Great Lakes and up the rivers in steamboats. Others traveled cross-country in prairie schooners.

Back down the rivers, sometimes jamming them, they floated logs for their sawmills, and sent their farm crops to the growing towns and cities of the upper Midwest.

The Ojibwas sold their land in compliance with treaties forced on them by white newcomers. Wisconsin and Minnesota came into being, with the St. Croix River dividing them. The Ojibwas were split into tiny reservations on opposite sides of the river and under two differing state governments.

For years they have been fighting the jurisdiction of state laws and courts in their lives, maintaining that they are subject only to federal laws.

"But what we are fighting for primarily," Lolita Taylor told me, "is our culture and our land, and its fish and



game and rice—the freedom to live and worship in the Indian way. The St. Croix and Namekagon Rivers are becoming wild again. And it is our hope to become one united tribe again, across the two sides of our river, as we once were.”

**T**ODAY THE ST. CROIX is an asset for its own sake—no longer for its wild rice or furs or timber, nor for other purposes of man’s pocketbook, but now for his silence and his soul.

Many citizens actively help the cooperating governments to improve the quality of wilderness experience. The St. Croix River Association is a collection of people who cherish the river’s beauty and solitude.

One member, Mary Jane Leonard, told me: “The St. Croix Valley is like peace. One comes to resent even an airplane whining overhead, though those of us on the lower river, where motorboats and water-skiers are allowed, must learn to live with noise.”

Mary Jane has retired to a two-level chalet on the river, and on weekends she canoes its quiet upstream waters, plying a paddle in a way that belies her 77 years.

Sigurd Olson, also 77, has had such thoughts since he first came here with his canoe in 1916, and found and married a farm-girl named Elizabeth Uhrenholdt, who lived near the bank of the Namekagon.

He found, as well, some of the early inspiration that impelled him to become an eloquent voice for wild-water canoeing and a force for river conservation. Eventually, as an author, he became a high priest of wilderness.

“Wilderness can be appreciated only by contrast, and solitude understood only when we have been without it. . . . One can live with people traveling the wilds in primitive ways, but not with aircraft, snowmobiles, or outboards, no matter how muted they may be.” Sig had written that in *Reflections From the North Country*, an inscribed copy of which he presented me.

“Silence is one of the most important parts of a wilderness experience. . . .” □



BOTH BY RICHARD SMITH

*Wings of a dragonfly sparkle like gossamer on the St. Croix. A saw-whet owl plays peekaboo.*

OUR WILD AND SCENIC RIVERS

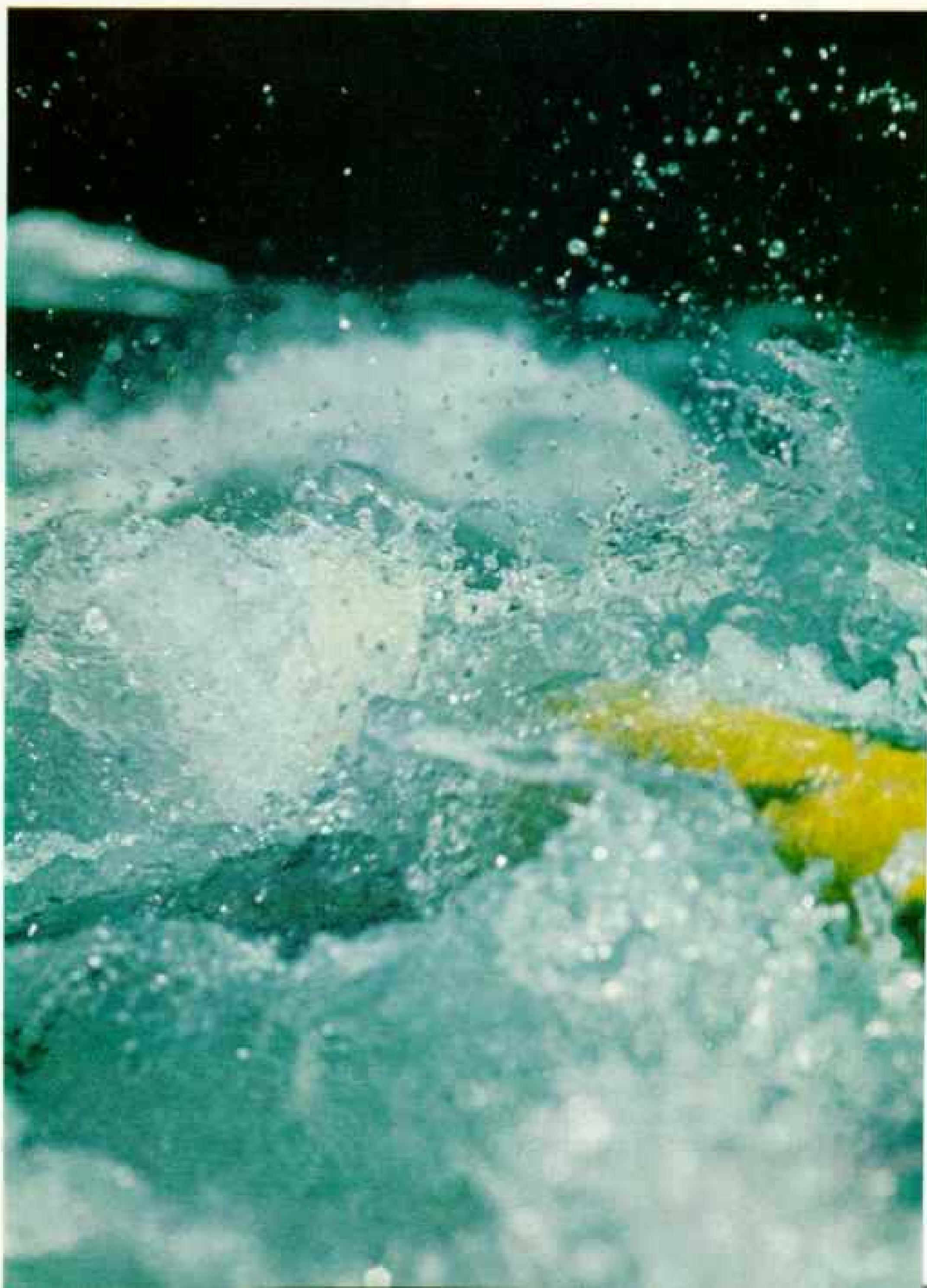
# The Skagit

ARTICLE AND PHOTOGRAPHS BY

DAVID S. BOYER

NATIONAL GEOGRAPHIC STAFF

*Raw river power puts man to the test in the stormy rapids of the Skagit in Washington State, where kayaker Bruce Furrer strains for leverage amidst an explosion of water. Hundreds of glaciers feed this icy flow.*



**T**HE PEOPLE of the Skagit love the alpine scenery where their river is born. They climb the mountain peaks, hunt in the hills, and fish in the icy streams—and mourn the passing of the days when the river almost overran its banks with steelhead and salmon.

"When I was a lad," old-timer Rudy Clark told me, "I used to have to whip the horse to make him cross. He was

terrified, trying to walk through the fish. But when we reached the other side, the spokes would have thrown enough salmon up into the wagon to last the family for days. But what fish are left today, well, the Indians get 'em."

The controversy surrounding fish and Indians is only one of many on Washington State's Skagit River, which flows from the high wilderness of the Cascade Range into Puget Sound and the







*Tracking a glacier in the Cascade Range, U. S. Geological Survey worker Mindy Brugman bores a hole for a marker stake. South Cascade Glacier advances about three feet each month.*

Pacific (map, facing page). Its year-round ice-ridden tributary valleys are deep and cold. Yet, where its glacial waters reach the sea scarcely a hundred miles away, the Skagit delta is one of the most fertile gardens of the globe.

Five million pounds of vegetable seeds were harvested here in 1976, including two-thirds of the best spinach, beet, and cabbage seeds in the country. Lush dairy lands share the delta with loamy fields sown with tulips, irises, daffodils, and strawberries.

From the mountains that slope down from the feet of Skagit glaciers come hundreds of millions of board feet of prime fir and cedar and hemlock.

Yet the Skagit has been proposed for

federal protection under the Wild and Scenic Rivers Act. The questions, then, if not the answers, are clear: How does one declare a river scenic or recreational when the people of its floodplain, with their farms and homes and highways, need more dams for flood protection? When it already turns turbines at five major hydroelectric dams, and a higher one is on the drawing board?

How does one elect to preserve even more of the river's forests as wilderness when those already reserved are coveted by the timber industry? When a thousand square miles of its mountains and lakes have recently become national park, national recreation area, or federal wilderness? When the secrets of its fishing and boating and climbing and camping have leaked out to a world hungry for recreation?

And add to that the controversial coming of nuclear power to the Skagit. And the specter of a horde of foreign homesteaders, from such places as California, Connecticut, and Canada— anxious to buy, along with Skagit drizzle and fog, some peace and quiet to calm the soul.

**B**IG BEAVER VALLEY is a forested cathedral, its columns giant cedars; its nave leads the eye upward toward such altars as ice-mantled Mount Shuksan, and the white cone of volcanic Mount Baker, its crater smoking as if with incense.

If Seattle City Light is to obtain another 270,000 kilowatts of peaking power for what is already one of the most electrified cities in the world, it must flood part of Big Beaver Valley by raising Ross Dam another 121 feet, adding to its already very high 400-foot waterhead.

Paul Kraabel and Tim Hill, councilmen of the city of Seattle, are trying to decide whether they really want more power for Seattle at such expense.

"Our city," Tim told me, "owns the electric company and is made up of people who constantly use more power. But also of people who love these mountains and valleys. Besides, if the Federal



Power Commission and City Council vote to raise Ross Dam, the flooding would swallow up seven square miles of recreation land in Canada. That could provoke a lot of anti-Americanism."

I knew. An irate Canadian had already told me: "We made a bad bargain with City Light ten years ago. Traded miles of the Canadian Skagit for a pitiable payoff of \$34,566 a year."

But that was before the environmental revolution of the late '60's. In 1974-75, Norman Pearson, then British Columbia's deputy minister of lands, tried to reverse the agreement.

"The entire thing," he told me, "is tangled up in politics. The best hope for the Skagit is for your Federal Power Commission to heed the environmentalists and other agencies, kill the high-dam project, and get our two national governments off the hook."

However that international wound may fester, City Light is proposing to construct Copper Creek Dam on the main stem of the river entirely within Washington State. Hundreds of Skagit

floodplain farmers would applaud.

"In 1975, on this river, we lost more than 100 cattle in a flood," said Bob Hulbert, a supervisor of the Skagit Conservation District. "No loss of human life, thank God. But it was bad enough.

"The Copper Creek Dam wouldn't really help all that much, though. Two Skagit tributaries are the real problems, the Sauk and the Suiattle. And they'd be kept free of dams if they became scenic rivers.

"If we can't get a dam on the Sauk, we'll have to build a major diversion channel for floodwater, and raise and strengthen our dikes. Either way, it's going to cost a lot of money."

**N**EAR THE MOUTH of the river, another controversy has flared. Puget Sound Power and Light is on the verge of constructing a nuclear plant and using Skagit water for cooling two reactors to produce more kilowatts than all the river dams combined.

Or is it on the verge?

Not according to Seattle's Roger

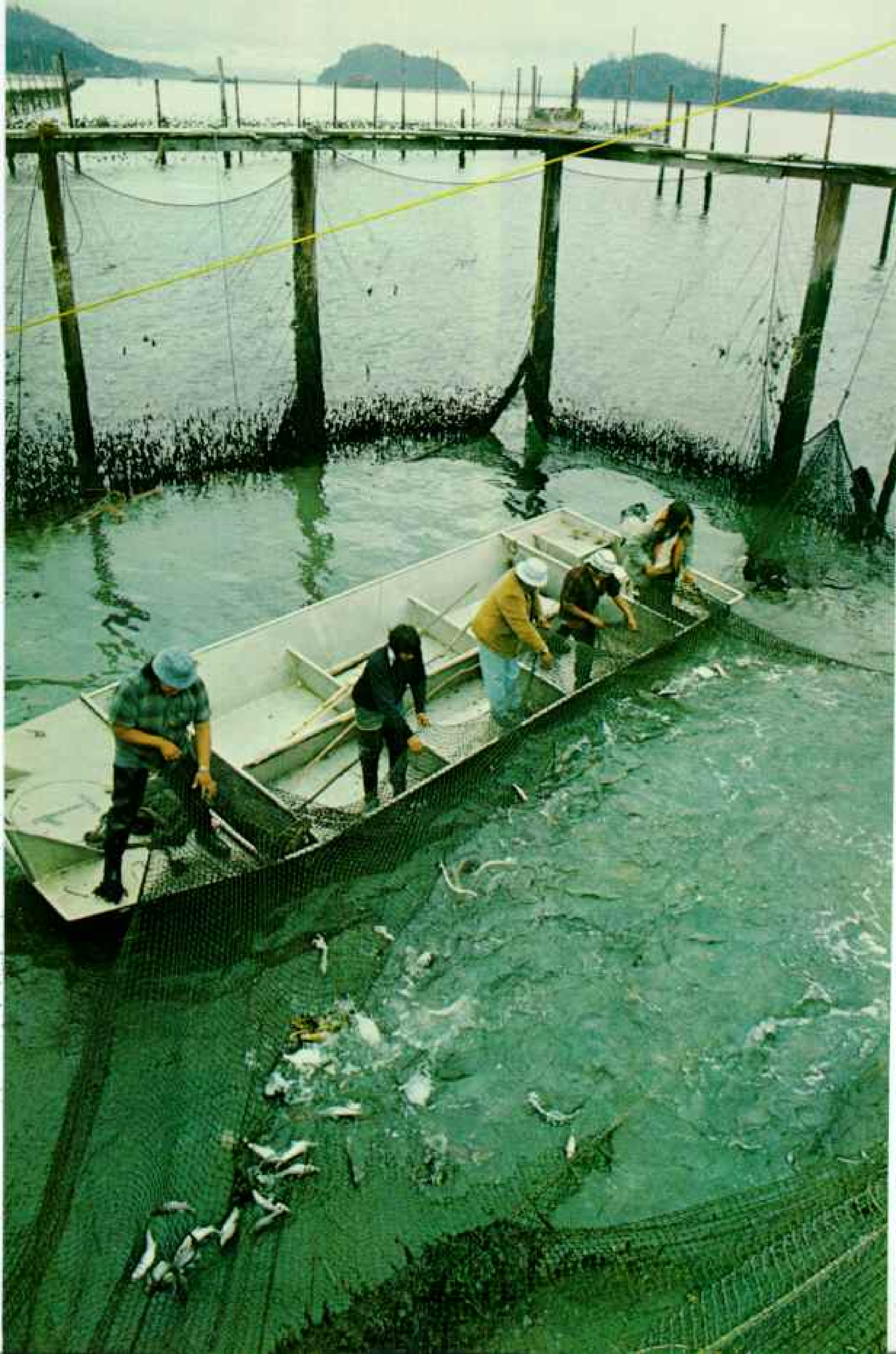


*Wilderness means more profit for the spirit and less for the pocket in the dispute-ridden Skagit Basin. Should the Skagit win inclusion in the nation's Wild and Scenic Rivers System, commercial interests would have to temper plans. The timber industry, whose bounty fills an off-river channel at the Skagit's mouth (above), would have to curtail operations on the waterway.*

*New dams would be forbidden on protected stretches, a concern to farmers whose land (above, right) often floods. Seattle City Light now wants to raise Ross Dam 121 feet, which means flooding land in Canada. To avoid unsightly low-water vistas such as this left by clear-cutting for Ross Lake (right), the utility plans to remove stumps from future reservoir sites.*







Leed, attorney for SCANP, Skagitonians Concerned About Nuclear Plants

"Puget Power," Roger says, "has agreed with Skagit County to pay advance taxes, to soften the impact of three thousand construction workers coming into the valley. But we're concerned with nuclear safety and pollution of the river. Also with earthquake danger. A geological fault runs almost beneath us.

"Primarily, though, we don't want ten years of boomtown activity and traffic jams and skyrocketing land values and new industry in this beautiful pastoral valley."

This is not the view of the Skagit County Board of Commissioners. Howard Miller, the chairman, told me:

"We approved the plant because we can't go on getting tax blood out of our farmers or from retired people. A nuclear plant would double our tax income and allow us to be very selective about other new industry we let in."

Before he got into politics, Howard was a fishing guide on the Skagit for 17 years. "It's tough to make a living guiding fishermen these days," he said. "Pollution and fluctuating water caused by the dams have cut down on the fish populations. And with the Indians—it's a real mess."

In 1974 a federal court upheld the treaty claims of 14 Washington State Indian tribes to half the salmon and other migratory fish in traditional tribal fishing grounds. Opinion on the ruling is vigorously divided.

Mrs. Celia Campbell, 74 years old, invited me into her little home and calmly, but passionately, told me how the controversy looks to an Indian.

"Until the '30's and '40's we could net fish anywhere. Then the state closed us out. You could only use a hook and line on the rivers. At least then you could still catch fish. Today you can't catch

one all day. And now they blame us!

"But how about those fishing guides and all those rich fishermen from Seattle, and all those commercial netters out in Puget Sound and in the ocean? They were nearly all white men till recently.

"Now that Federal Judge George Boldt has given us back our right to net fish and sell them, the white people are so mad they talk about impeaching the judge. But he knows the problem is not really how to divide the few fish that are left, but how to make rivers produce like they used to. He's going to make more rulings about fish, about dams, and about river pollution by logging and industry."

**G**ENE SLONIKER, a U. S. Forest Service silviculturist, has a few words on change in the logging world: "There *have* been mistakes in our logging. But some environmental purists think any logging is a disaster, and clear-cutting a case for capital punishment. The timber interests think trees are for cutting, and for some the crime is in preserving too much of Skagit country for parks and wilderness.

"Our job is to see that forests serve everyone—from the backpacker in the high country to the wage-earning Skagit logger. They should all realize that the art and science of growing and harvesting trees includes some clear-cutting as a tool we have to use.

"Before we offer any Skagit timber for harvesting in the future, we'll present an overall timber management plan at public hearings. Everyone will have his say in advance."

That's probably the best part about the Skagit River Valley. All kinds of Skagitonians are in on the act of resolving its problems. Maybe they can no longer think of it as their very own, but at least they are helping to shape the heritage for those to come. □

*Persisting at their oldest industry, Swinomish Indians haul in a net of salmon and steelhead near the mouth of the Skagit. A bitterly contested court decision recently upheld the rights of certain tribes to half the total catch of migratory fish in traditional Indian fishing waters.*





*Quiet for a stretch between Big Bend's*

OUR WILD AND SCENIC RIVERS

# The Rio Grande

By NATHANIEL T. KENNEY

Photographs by BANK LANGMORE

**I**TS BOULDER-FANGED RAPIDS wreck boats and drown people. In spate it shifts channels, roaring at will over dry floodplains. Its spectacular canyons, some with sheer walls reaching 1,500 feet to the sky, can hold river runners prisoner for days in times of stormy weather.

If this 250-mile stretch of river is wild, the country through which it runs is yet wilder. Virtually trackless even today, it is a land of cactus, desert shrubs, and myriad arroyos. When the West was new, this was called the *despoblado*, the "unpeopled place," where only Indians could long survive.



*canyon chutes, the Rio Grande offers cool relief to border-straddling horses.*

And what river is this? Surprisingly, the Rio Grande, known in most of its reaches as a stream enslaved, drained, and diverted until often it even disappears beneath its sandy bed. But from where it enters Big Bend National Park until it reaches Langtry well downstream, the Rio is free. And the country is still very much despoblado.

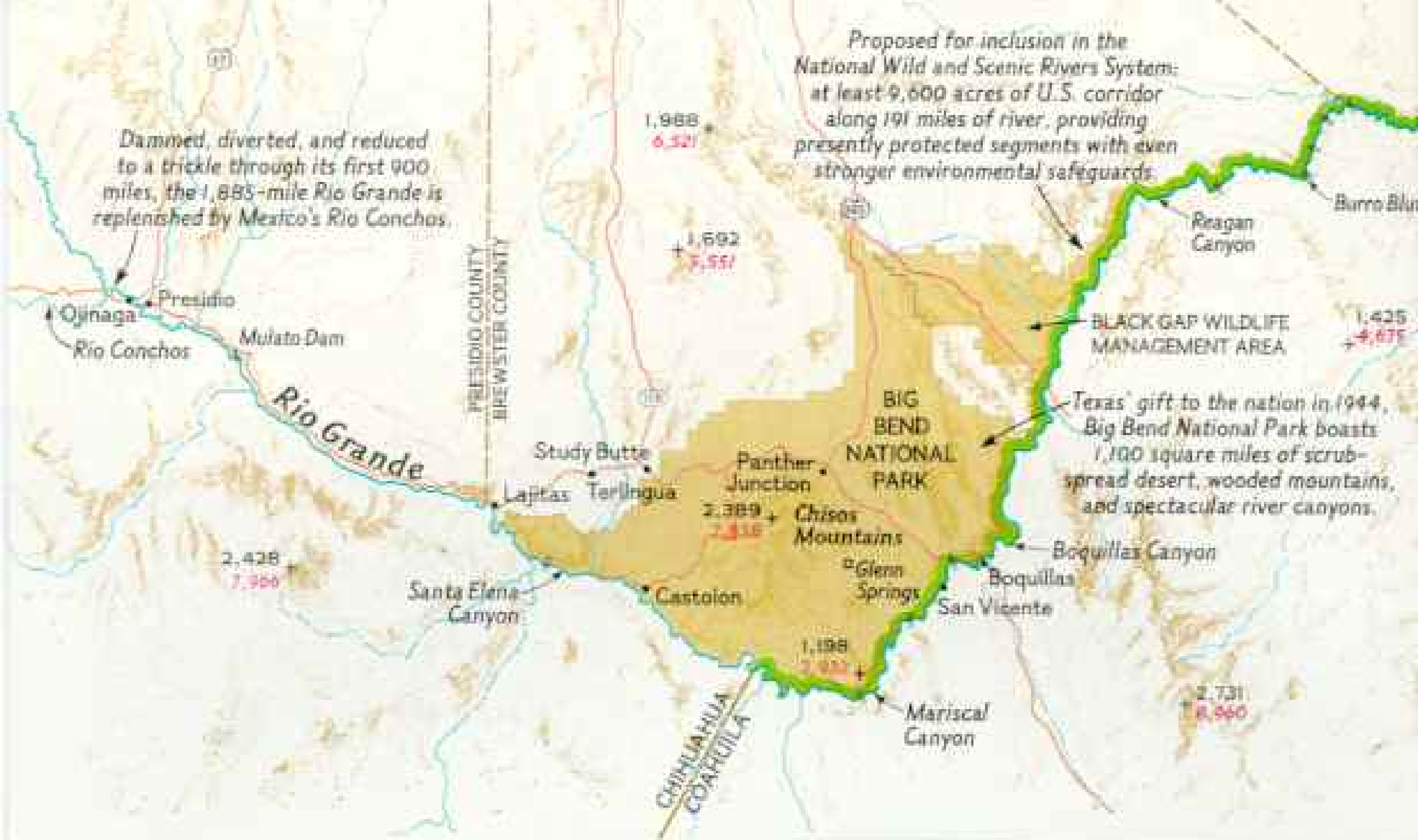
On the Texas side there are a few hard-scrabble ranches and a 100,000-acre game-management area. In Mexico, mestizos live in a handful of dusty adobe villages and riverside camps where wax is boiled from the spiky candelilla plant.

Should you be hardy enough to run

this part of the Rio in a canoe or rubber raft, you might not see a dozen people in a week once you come out of Boquillas Canyon and leave the park. A canoeist or two, perhaps. A man wading, boots and trousers atop his head.

Or, high on a cliffside trail, men afoot, twenty hard miles from the nearest settlement in Texas or Mexico. Who are they? You hesitate to find out, for on this isolated frontier, now as more than a hundred years ago, not every traveler is on a legitimate journey.

Because people are few, animals survive. Mule deer drink from the river at eventide. So do javelinas, the little



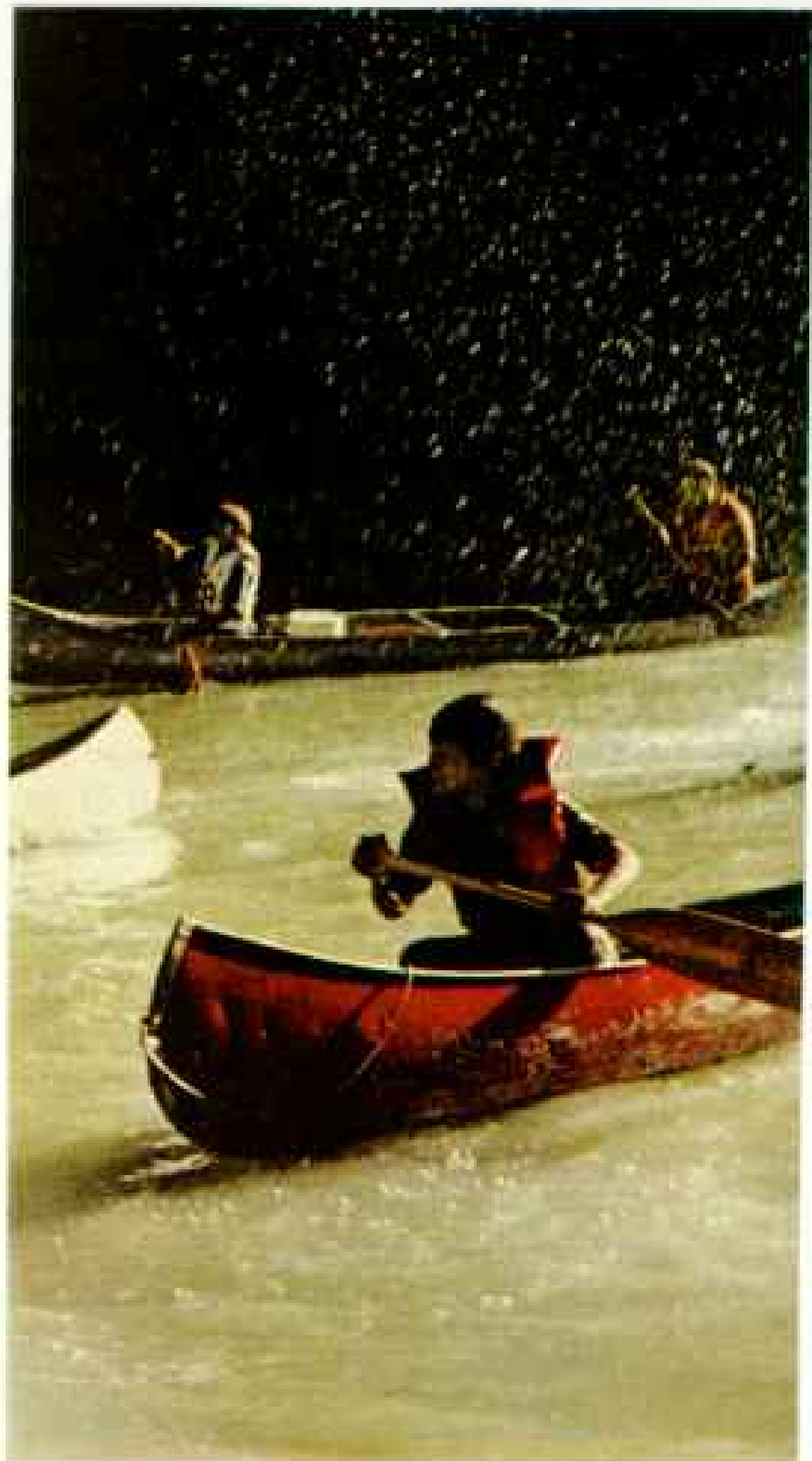
collared peccaries. Here are coyotes, the great voices of the western wilds, and cougars. Beavers and raccoons thrive; the numbers of blue catfish, the best sort of eating, are legion.

Even creatures rare in these times may still exist in the mysterious despolado. A Mexican friend swore he trapped a jaguar only a few years ago. Another claimed an ocelot. Federal wildlife scientists say a few Mexican wolves, near extinction, have been spotted north of the river.

As for birds, I have counted six golden eagles in a single day and seen the aeries of peregrine falcons high on canyon walls. Down near the muddy flow, countless swallows paste their tiny adobe houses to the painted cliffs. In every river gorge, canyon wrens, the prima donnas of the Rio, sing liquid songs a nightingale might envy.

From pioneer times until well into this century, few from the outside world ever heard the music of these canyon wrens. Not only was travel difficult in

*Serious canoeing gives way to a water fight as Boy Scouts from Midland, Texas, negotiate Mariscal Canyon.*



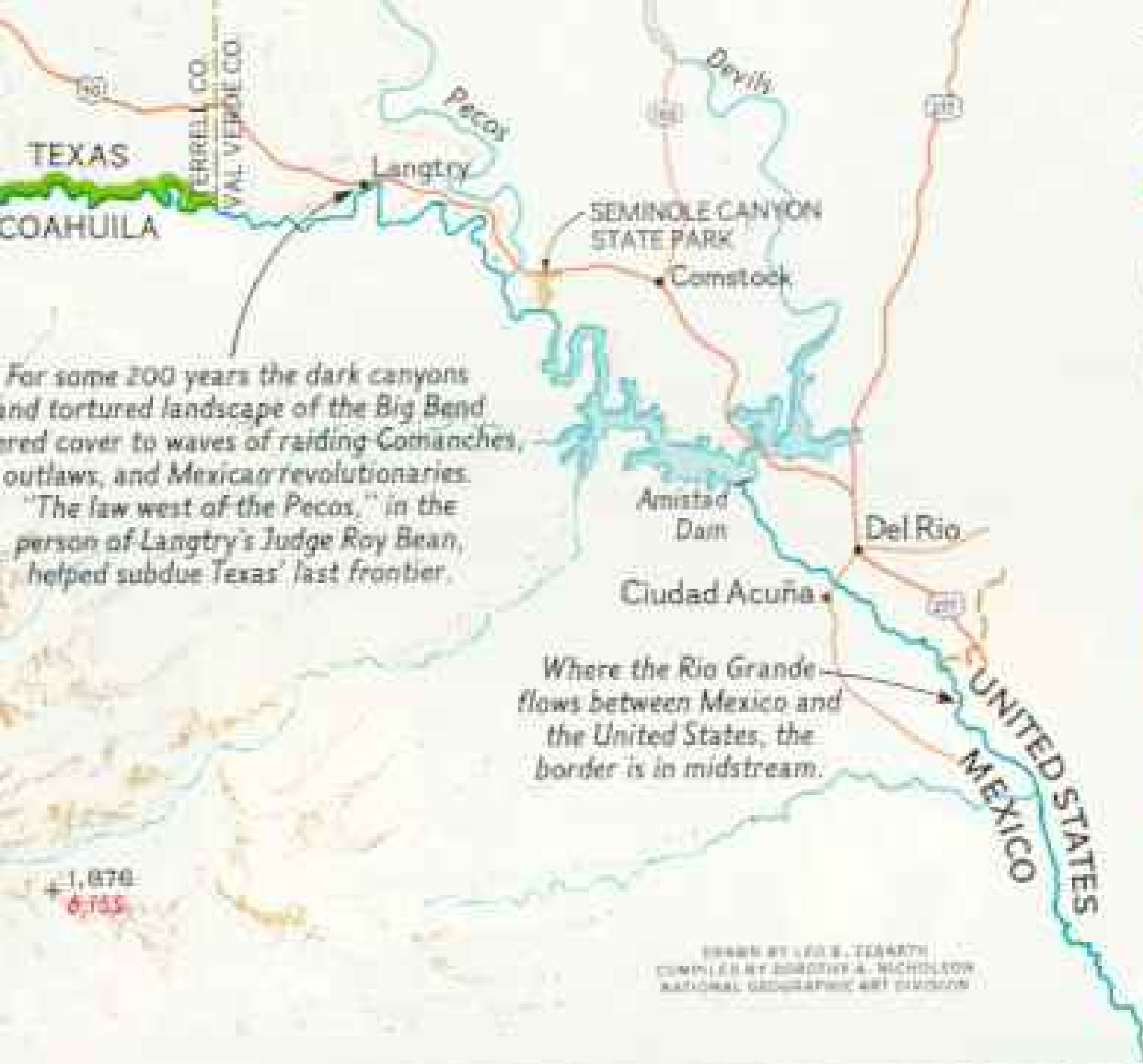


# Rio Grande

PROPOSED FOR FEDERAL PROTECTION

1 Rapids

Elevations in meters (black)  
feet (red)



For some 200 years the dark canyons and tortured landscape of the Big Bend were cover to waves of raiding Comanches, outlaws, and Mexican revolutionaries. "The law west of the Pecos," in the person of Langtry's Judge Roy Bean, helped subdue Texas' last frontier.

Where the Rio Grande flows between Mexico and the United States, the border is in midstream.



DRAWN BY LEO S. ZIEBARTH  
COMPILED BY SIBOTTE & NICHOLEY  
NATIONAL GEOGRAPHIC ART DIVISION



DAVID WISSE



BY GUYTON





*A wade away from Texas—and work—Manuel Carrillo of San Vicente, Mexico, once helped support his family by fording the river for odd jobs on the U. S. side. Illegal crossings are easier in dry months, when much of the riverbed is parched (left). U. S. border patrols must often overlook this practice in order to concentrate on those who attempt to stay.*

itself, but the Comanche, Kiowa, and Apache Indians, whose raiding trails into old Mexico passed through the despoblado, were rarely friendly to intruders. And when these warriors were gone, American outlaws and Mexican bandidos made the country one to be avoided.

No Indian war party has ridden the trails in this century. No bandits have shot up a Big Bend border town since the time of Pancho Villa, when a gang of hungry caballeros looted the store at Glenn Springs in 1916.

**T**ODAY, although smuggling and illegal border crossings vex authorities of two nations, more and more wilderness lovers boat down the Rio Grande without worrying about desperados. Most of them float only Big Bend National Park's three magnificent canyons, Santa Elena, Mariscal, and Boquillas (map, pages 48-9).

For 191 miles, beginning above the head of Mariscal, the Bureau of Outdoor Recreation proposes to keep the Rio and a slice of adjoining land in a natural state under terms of the Wild and Scenic Rivers Act.

I explored this rugged area with friends last year. It was not an easy trip. Our rubber rafts swamped in rapids. Occasionally we fell overboard. Once we ran out of food, and until a friend in a plane dropped us emergency rations, lived mostly on fried catfish. But only once did we meet a man we thought might do us harm.

We found him on the Mexican shore one day as we pulled in for lunch, a ragged man with the dark features and stocky build of an Apache brave. Unsmiling, taciturn, he refused a cup of coffee and a cigarette.

"Then is there something else we can do for you?" I asked.

"Sí, señor," he said, fishing a hundred-dollar bill out of patched jeans. "Could you change this?"

We went on downriver without trying to solve the mystery of where, in the despoblado, a man might come across a hundred-dollar bill. □





*Breaching a cloud-swept sky, the*

OUR WILD AND SCENIC RIVERS

# The Noatak

By JOHN M. KAUFFMANN  
Photographs by SAM ABELL

**T**HE NOATAK flows wild and pure out of the heart of the Brooks Range in Alaska, and courses 435 miles westward to the Arctic waters of Kotzebue Sound (map, page 56). Far more than a wild river, the Noatak is an entire mountain-ringed wilderness basin, the last of its kind and magnitude in the United States.

Save for a few wanderers, a few hunters' camps, and one Eskimo village downriver, Noatak country is empty of humankind. There is nothing here but pristine America—12,000 square miles of it—unblighted and beautiful. Can it last amid all the development in prospect for Alaska? My companions and I,



*Arctic sun brightens broad Alaskan waters east of Noatak Canyon.*

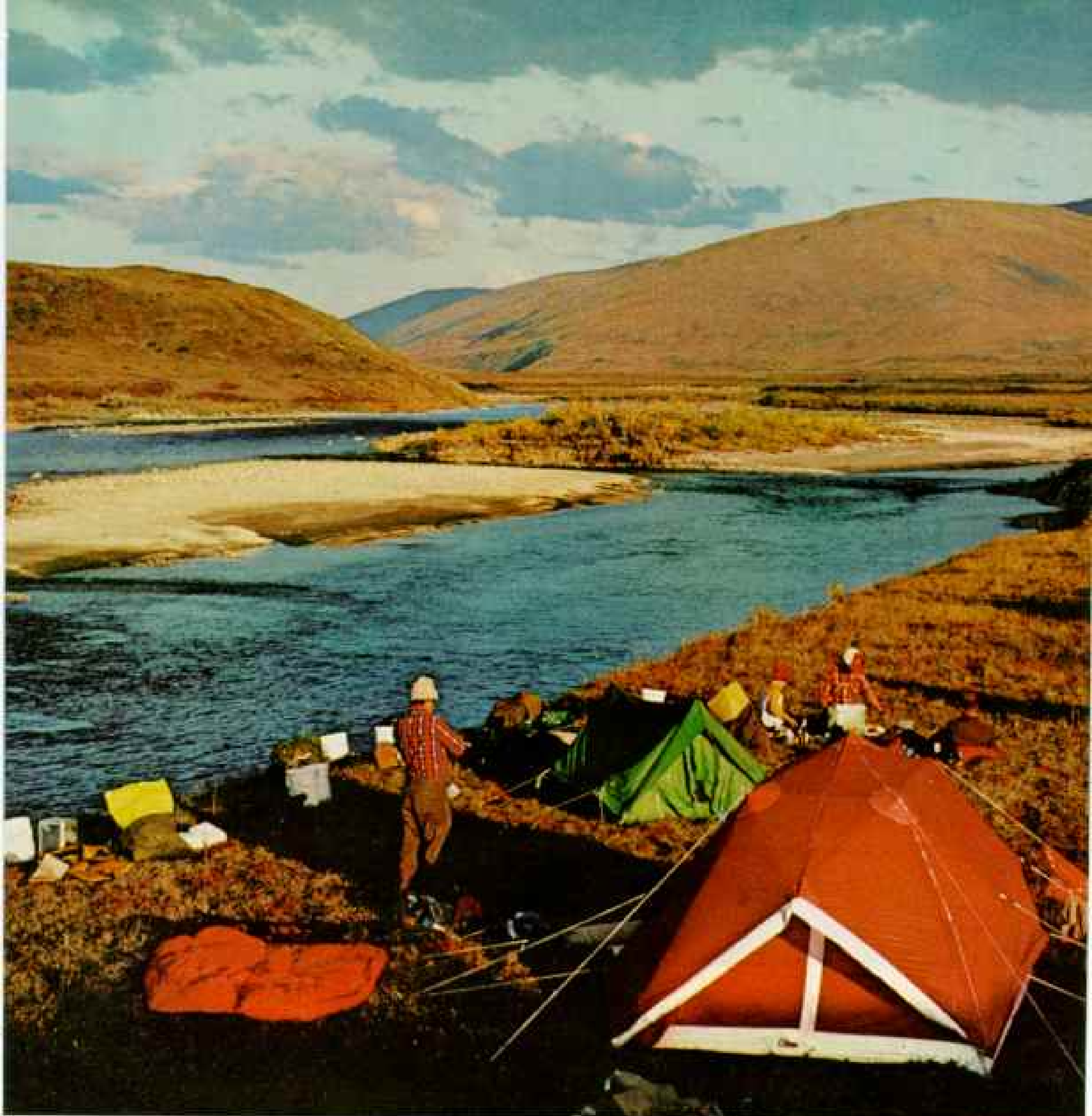
here on vacation to see this wild country, surely hope so.

My college-age partner, Kip Dalley, and I are the last to arrive at our starting place, 30 miles downriver from the Noatak's sources. Shadowy peaks reach up at us as our floatplane, with our canoe lashed to a pontoon, drones through the Brooks Range gloaming. We drop toward a campfire pricking the blackness and splash down on a quiet lake near the river. Tents are already pitched. Those who had flown in earlier welcome us with hot chocolate to ward off night's deepening chill.

Next morning we climb the ridge behind camp to view the upper Noatak

country deep in the Schwatka Mountains. We see a broad U-shaped glacial valley with ramparted sides, looking wholly untouched—until, as if to shatter the feeling that this is undiscovered territory, a helicopter floats into view. Government geologists are looking for possible mineral potential. After all, copper prospectors are staking claims across the mountains to the south. To the north, oilmen are probing the Arctic slope. Wounded by exploitation, this valley would heal slowly if at all.

My own hope, as a National Park Service officer, is that the upper Noatak will remain wild, protected within a great 200-mile-wide area to be called



*Sparkling air, water, and autumn hues greet the author and his party in the trackless, unpeopled Noatak wilderness. Along the river's upper reaches, they camp on springy tundra (above). Downstream they feasted on char and salmon—standard fare for area grizzlies. In summer, blueberries are plentiful (right). Nearing the end of the 350-mile trip, the author braves a snowy September (left).*





DAVID R. CLINE (ARTIST), RIP GALLERY (BELOW, LEFT)



Gates of the Arctic National Park. What an opportunity to preserve the kind of wilderness that nurtured America!

Far up the valley we can see the spectacular hub of this land—double-turreted Mount Igikpak, highest peak in the central Brooks Range at 8,510 feet, whose glaciers feed the river.

**A**ND IT IS TIME we were off, for warm weather does not linger here. We portage our canoes and commit them to the river's fast flow, a sheet of crystal gliding over clean stones. Ahead, Dave Cline, wildlife biologist with the U. S. Fish and Wildlife Service, is paddling with his son Eric. Caribou! The Clines slip ashore, cameras ready, and creep up the hill: 100 yards, 50, 25, before the bull bounds away.

Then Bob Weeden warns quietly, "Bear." Bob is a professor of resource management at the University of Alaska and a trained biologist. We all freeze, fascinated, our paddles jammed into the river bottom to hold the canoes. On the hillside the grizzly is digging out a ground squirrel's burrow. He glares at us, huffs, and goes back to his digging.

The Noatak itself growls at us next day. The river enters an ominous cut, and rapids, I remember, brawl ahead. On a previous trip they sank and battered one of our canoes. I feel apprehensive, but my sternman, veteran outfitter Dave Schmitz, spots the safe route, a small channel opening on our left. Dave swerves, I draw hard right, and we sweep around the abrupt, rock-filled bend I had feared. From then on it's a glorious ride, through rip after rip, though water often splashes into our heavy-laden craft.

With the sun low on the skyline, we pitch our tents on tundra that forms an Oriental carpet of scarlet, bronze, and yellow. But even that beauty cannot match the aurora borealis, filling the night sky with curtains of tinted light.

As we progress down the river, Ted Swem, our specialist in birds of prey, persuades Dave Schmitz to stop at every bluff to check on falcon and eagle aeries. A falcon in flight is, to Ted, a





*Unfazed by rarely seen human intruders, a porcupine (above) stands pat on the riverbank, while a red fox explores willow thickets.*

BOB BALDWIN



supreme beauty, and he points excitedly as two gyrfalcons slash the air above us. "Already a perfect day," he exults. "Northern lights, caribou plunging across the river, now gyrs!"

Much of the Noatak has been proposed for protection in our Wild and Scenic Rivers System. But the Noatak has significance far beyond the river itself. As we leave the mountains, we gaze across an undulating tundra valley that has broadened to 40 miles. The De Long Mountains, which form the Arctic divide, stand blue on the north horizon. Almost as far to the south are the Baird Mountains. The river is but a slim silver ribbon looping through that vast landscape.

"This is what the Noatak country is all about," says Dave Schmitz. "There's no road over there—just miles and miles of streams and lakes and mountains. That's what the wildlife requires—far more than the river corridor alone."

Dave hopes that much of the basin not preserved as a park will be protected for research and environmental education. There is nothing comparable to it in the rest of the nation. Already the area has been recognized by the United Nations as a biosphere reserve, where studies can be undertaken to show how plant and animal systems relate to each other and to man's activities.

Although the Noatak is virtually unpeopled, a scattering of Eskimos and their predecessors have used the region for ages. At one of their old hunting camps on Okak Bend we see antler sled runners and a wooden berry picker half buried in the tundra. Downriver we come upon an earlier habitation: flint chippings, stone tools, the blackened remains of ancient campfires.

**R**APIDS AGAIN. A heavy chute, we know, lies ahead. We plan to check it carefully, but it surprises us nonetheless. Dave Schmitz and I, trailing, watch angry white waves swallow Kip and Ted. When they reappear, their canoe is awash. Soon we see only their heads as they struggle in the 58-degree F. water to swim their canoe





toward shore. Then we too are caught.

We dodge a rock and plunge into the tossing white mass of water. The first wave slams gallons over our gunwale, and we are whirled around as the current grabs our stern. We sweep on, backward. As the force slackens, we turn and glide to a gravel bar. We find Kip dolefully searching his sodden gear for a lost fishing rod. Ted holds a soggy sleeping bag and a dripping bag of snacks, his entire supply.

**A**S WE JOURNEY ON, we sense a scenic rhythm—from mountains to open plain to ruggedness again when highlands close in ahead to frame the big handsome valley called the Grand Canyon of the Noatak.

At New Cottonwood Creek we fish in a pool full of sail-finned, iridescent grayling. We glide through a scenic narrows, autumn bright, where the riverbed is inlaid with veins of quartz over which we see the big dark shapes of salmon running.

The Grand Canyon offers us a beautiful two-day float: caribou on the mountainsides, golden eagles overhead, storms and rainbows alternately threatening and promising, sunset-fired cloud formations. Then we come at last to spruce trees. A welcome sight after so much tundra, this small grove represents the northwesternmost extension of boreal forest in North America. Wolf tracks dint the shore, and swans call as they wing southward.

Now we canoe for six spectacular miles through Noatak Canyon. This is truly a cut, its sheer cliffs rising more than 200 feet above the water. It particularly impressed the river's first white explorers, who in 1885 paddled and dragged a hide-covered boat up the flooding Noatak for hundreds of miles.

With our modern equipment we and the Eskimo family motoring upriver

have it easier. "Seen any moose?" asks a young man, as the family swings in for a chat. They are seeking winter food supplies, fishing and hunting out of a camp a few miles below. We have come to an important subsistence area for the people of Kotzebue and Noatak village. Under provisions of the Alaska Native Claims Settlement Act, much of this region, with its broad forested valley and ponds important to swans and other waterfowl, will henceforth be under Eskimo stewardship.

Sleet spattering on our tents awakens us next morning. Mittened and gloved, we paddle through a blinding storm to camp in a sheltering spruce grove. In a nearby river pool young Eric fishes for arctic char. One four-pounder nearly doubles up his light spinning rod, but soon five char lie gleaming on the shore. Cousins of the brook trout, they make a delicious dinner.

On the last day of our journey motorboats ply the river and, ahead, the roofs of Noatak village gleam atop a high bank. Eskimos' fish racks hung with drying salmon line the strand. Children are casting for char. We stop to chat, and a young Eskimo couple say, "Come up for supper." Soon we are enjoying caribou stew, fresh-caught salmon, good stories, good songs.

Pleasant as it is to be among folks once more, to feel the warm touch of civilization after nearly three weeks of wilderness travel, we all share a wistful regret for what we have left behind. We have glimpsed original America and tasted a first sacrament of the New World. As we make our last camp, on a river bar, cloud banners glow with moonlight, geese call, and the Noatak flows by "from deep within"—the meaning of its ancient name. We feel its purity and strength, its constant renewal, and we know that deep within us the Noatak now also flows. □

*Arctic heiress, Amelia Sherman greets visitors at Noatak—the river's only village. Thanks to the Alaska Native Claims Settlement Act, she and the state's other native peoples can now profit from their wilderness legacy.*

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# THE RAT

## Lapdog of the Devil

By THOMAS Y. CANBY

Photographs by  
JAMES L. STANFIELD  
WITH NATIONAL GEOGRAPHIC STAFF

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**Man's worst enemy?** The rat plunders a fifth of the world's crops each year, carries a score of diseases to man, even attacks him. Yet in laboratories the rat has contributed more to the cure of human illness than any other animal. A wild rat glares from its cage in a Pakistani pest-control center.

**F**OR THE RATS OF ENGEBI, the years following World War II were the worst of all times—a bitter foretaste of the way the world could end.

Blinding explosions rocked Engebi and other islets of Eniwetok Atoll in the western Pacific, gouging mammoth craters, flattening all vegetation, engulfing them with mammoth waves. With each blast, palls of lethal radiation spread beneath telltale mushroom clouds as the United States tested its atomic arsenal.

A few years after the nightmare ended, biologists visited Engebi. They found radioactive substances in plant life, reef fishes, the soil itself. Of Eniwetok's battered islets, Engebi had taken one of the greatest poundings.

"We set out some traps," recalls Dr. William B. Jackson, a member of the scientific task force, "and rats quickly filled them. The island abounded with rats. Not maimed or genetically deformed creatures, but robust rodents so in tune with their environment that their life spans were longer than average.

"The rats' burrows shielded some from direct effects of the blasts," concludes Dr. Jackson, Director of the Environmental Studies Center at Ohio's Bowling Green State University (page 69). "But any way you look at it, their survival was uncanny."

Will rats inherit the earth?

This resilience of rats amid nuclear holocaust dismays but does not surprise those familiar with what one 19th-century writer called, with grudging admiration, "the Devil's lapdog." Your average rat can:

- wriggle through a hole no larger than a quarter;
- scale a brick wall as though it had rungs;
- swim half a mile, and tread water for three days;
- gnaw through lead pipes and cinder blocks with chisel teeth that exert an incredible 24,000 pounds per square inch;
- survive being flushed down a toilet, and enter buildings by the same route;
- multiply so rapidly that a pair could have 15,000 descendants in a year's life span;
- plummet five stories to the ground and scurry off unharmed.

Little wonder that rats, endowed with such physical prowess, have flourished despite our unremitting assaults through the ages. Since ancient Egyptians put out the first rodenticide, we have fed them poisons by the thousands







ENGRAVING BY PAUL THUMANN, HEDWIGSMUSEUM, HAMELIN, WEST GERMANY



SCULPTURE BY MASANARI A., VICTORIA AND ALBERT MUSEUM, LONDON

Wherever man goes, the rat is sure to follow. By medieval times the Asian rodents had overrun Europe. Exterminating them became food for legend: With magical notes the Pied Piper lured Hamelin's rats to watery doom (left). Today *Rattenfänger* Wilhelm Klimasch, emerging from a sewer (below), keeps the German town mostly rat free.

A Japanese work, "The Thwarted Rat Catcher" (above), attests the frustration of rat fighters. Today man concocts super poisons, but "super rats" survive.



of tons. We have set innumerable and ingenious snares, from simple snap traps to elaborate devices that guillotine the rat or drown it in beer. We have fumigated, flooded, and fired rat burrows. We have tried sterilization and electrocution, resorted to germ warfare, even tried breeding a better cat. In desperation we have burned down houses to drive out the rats. Yet each day we awaken to the certain knowledge that our implacable foe is still our inseparable companion.

### Rodents Create a Worldwide Menace

If our tactics have been drastic, our cause has been just.

This year in the United States alone, rats will bite thousands of humans, inflicting disease, despair, terror. They will destroy perhaps a billion dollars' worth of property, excluding innumerable "fires of undetermined origin" they will cause by gnawing insulation from electrical wiring.

In a world haunted by threat of famine, they will destroy approximately a fifth of all food crops planted. In India their depredations will deprive a hungry people of enough grain to fill a freight train stretching more than 3,000 miles.

Around the world rats and their abundant parasites will spread at least twenty kinds of disease, from typhus to trichinosis to deadly Lassa fever. In Asia, Africa, and the Americas—including the United States—people will die of plague, the dread Black Death that destroyed no less than a quarter of the population of medieval Europe.

In several tropical nations rat populations will suddenly explode, and rodent hordes will devastate the land. Last year they overran vast areas of the Philippines, Venezuela, and the African Sahel, ravaging crops, chewing up irrigation pipes, even girdling trees in reforestation projects.

"When we speak of rats," explained Professor Jackson as we strolled before hundreds of beady black eyes at his Bowling Green laboratory, "we're dealing with the most numerous and successful mammals on earth, excepting only man himself. Unfortunately for us, the rat's success is almost invariably at our expense.

"Like man, the rat is a generalized animal, able to eat almost anything and live almost anywhere, not specialized like the anteater,"

he continued. "Generalization is the key to the rat's extraordinary adaptability.

"The same species that lives in a burrow here and in an attic in Europe may inhabit the crown of a Pacific island coconut palm and not descend to the ground for generations. In a West Virginia trout hatchery, officials found rats diving in and competing for food with the fish. To vary their diet, they simply seized fingerlings. That's adaptation."

Dr. Jackson paused before a bank of cages labeled with names of a score of U. S. cities. "These are the notorious 'super rats,'" he said. "Oh, they don't *look* super. But they are, in terms of survival: They've inherited a genetic resistance to common anticoagulant poisons. Some can withstand a hundred times the dosage that would kill a normal rat."

Dr. Jackson introduced other occupants of his cages. "This is the 'bare-tail squirrel' of California," he said, indicating specimens from San Diego. "Rats love California's lush suburbs, with their abundance of fruit and nut trees. They also nest in the trees—literally filling the niche of the squirrel.

"These," he moved on, "came from Eniwetok. Their ancestors survived the atomic tests—real super rats."

### The Villains—a Fearsome Foursome

Of the hundreds of kinds of rodents around the world, four main species of rats have intimately linked their destinies with man's (pages 66-7). These nocturnal scavengers, along with the common house mouse, wear the label "commensal," meaning literally that they share our table. From their common homeland in Asia, they have hitchhiked on camel caravans and covered wagons, on ships and airplanes, and with us they have conquered the world.

Meet them:

- Norway rat (*Rattus norvegicus*). Overrunning Europe in the 1700's, the "huge mouse" stowed away on vessels of every maritime nation, including Norway, thus unfairly acquiring the name of that lovely land. This burly burrower is the principal rat of the United States and is regarded by many experts as the most destructive mammal on earth.
- Roof rat (*R. rattus*). Bearer of the plague that decimated Europe, the daintier, agile roof rat inhabits both burrows and above-ground nests, often (Continued on page 68)





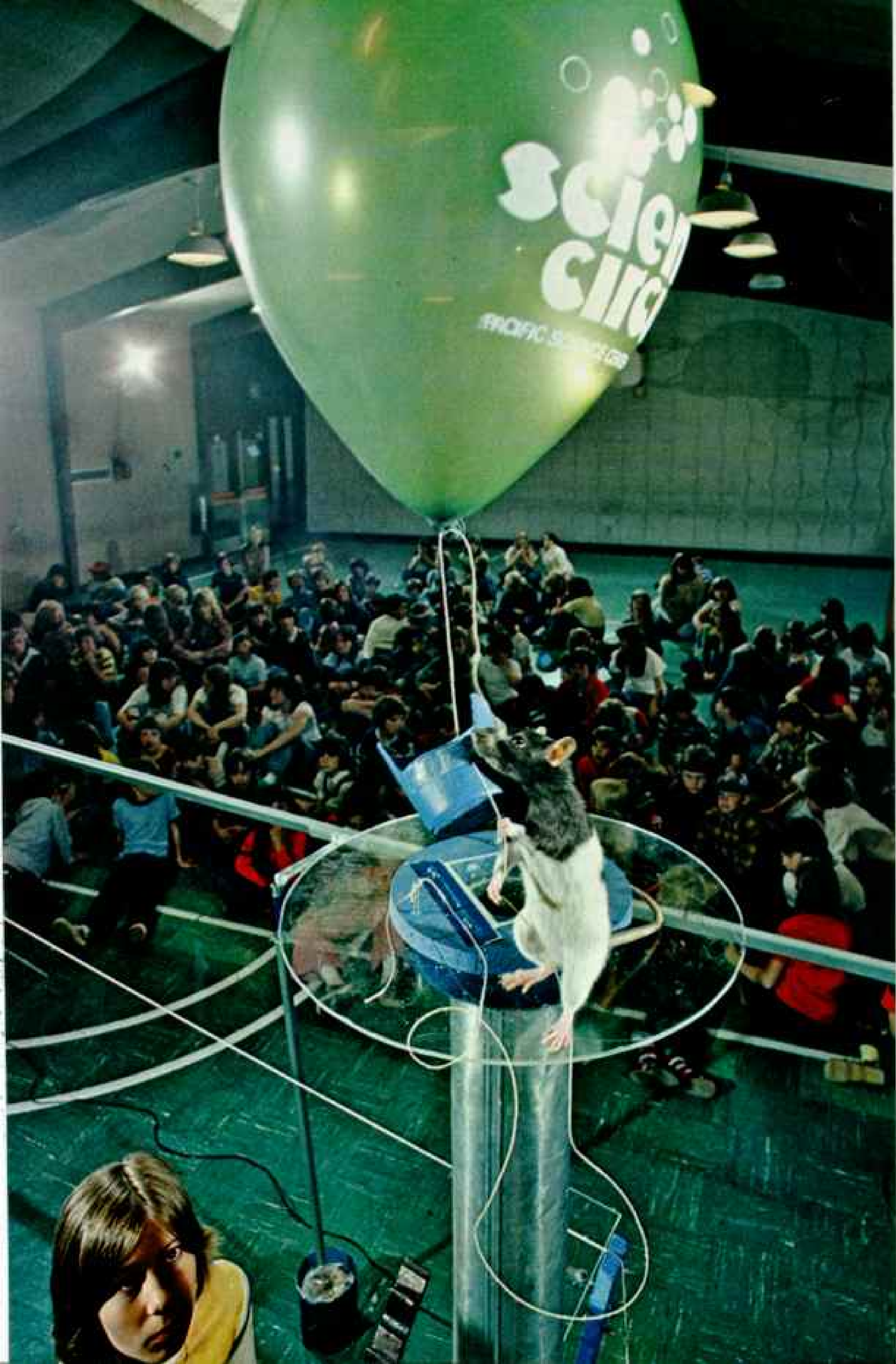
"Best-educated rats in the world," boast the sixth-grade students of Artondale School at Gig Harbor, Washington. Their stunting, problem-solving trainees perform in public in a program called "Rats Galore."

Guarded by Eric Pedersen, a domesticated Norway rat named Madame Curie creeps along a tightrope, using her tail for balance (above). Like most other rats, Squeaks (above, right) traverses the rope in more pedestrian fashion, paw over paw. Superstar Madame C., possessor

of superior coordination and rat acumen, pushes a ball up a ramp (below) and, for the finale, climbs the inside of a stovepipe, pulls down a tethered balloon, and sniffs at her reward, a peanut-butter sandwich in a blue cup (right).

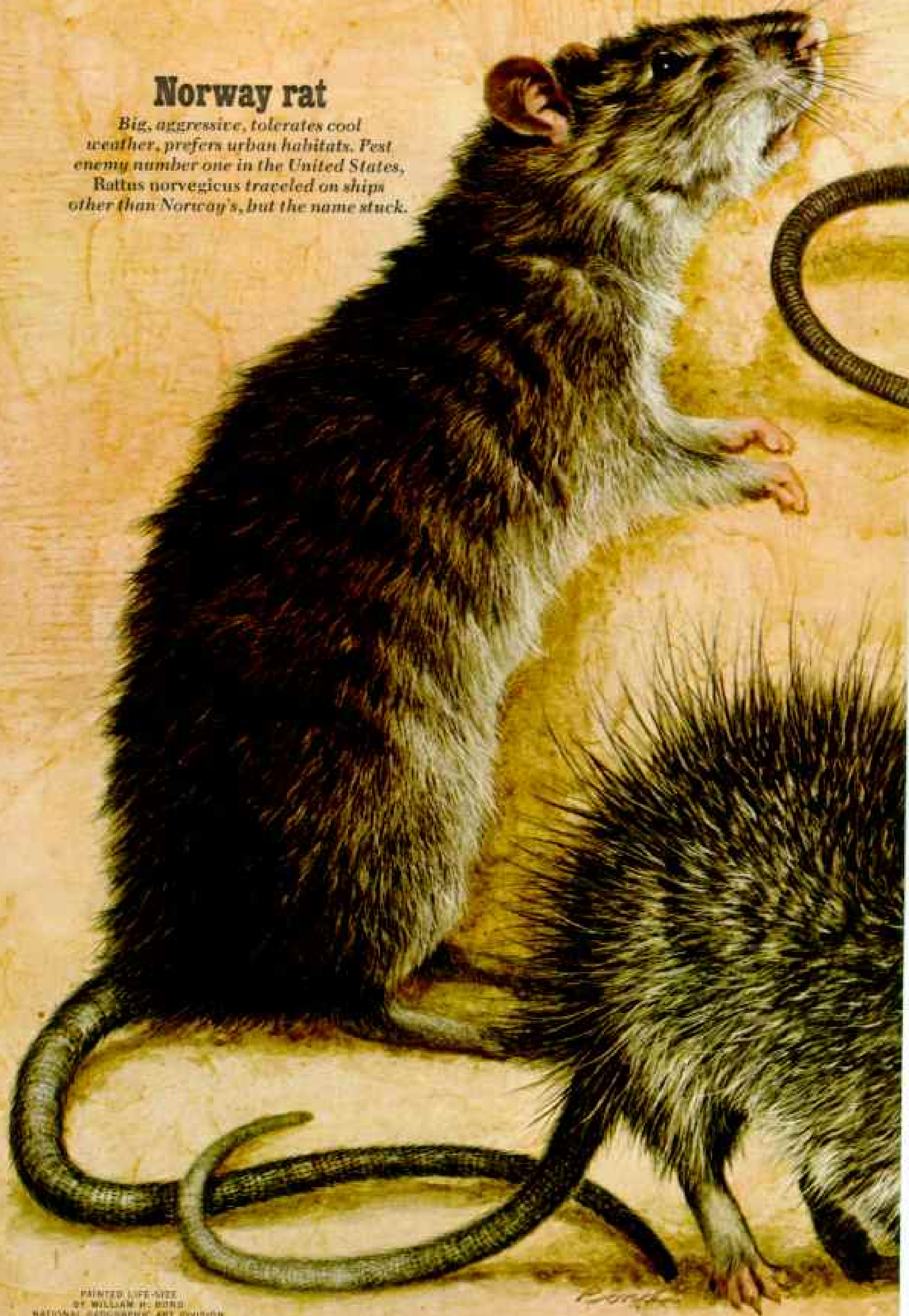
Tractable, small, possessing body tissues and feeding habits similar to man's, domesticated rats make ideal animals for research into human diseases. One laboratory study suggests that the human condition may not be limited to humans—subjected to stress, some rats turned to alcohol.





## Norway rat

*Big, aggressive, tolerates cool weather, prefers urban habitats. Pest enemy number one in the United States, *Rattus norvegicus* traveled on ships other than Norway's, but the name stuck.*







## Roof rat

*Fleet, nimble climber. Dwells in rural areas and seacoast towns. Rattus rattus ferried the Black Death bacillus to Europe.*

## Polynesian rat

*Accompanied Polynesian and Micronesian voyagers from Southeast Asia. Tiny Rattus exulans has been observed to attack and kill nesting albatrosses.*

## Lesser bandicoot

*Plunderer of grain in India's warehouses. Prolific – a female Bandicota bengalensis can begin bearing young at two months and produce seven pups every month thereafter. Here shown in agitated state, fur standing on end.*

(Continued from page 63) in ceilings and attics. Only it and the Norway species make their homes in the continental U. S.

- Polynesian rat (*R. exulans*). When daring mariners colonized Pacific islands three thousand years ago, they carried rats with them, perhaps as a self-replenishing source of food. Today the destructive little "Poly" is found from its native Southeast Asia to New Zealand and Hawaii.

- Lesser bandicoot (*Bandicota bengalensis*). Scourge of southern Asia, the shaggy bandicoot gorges in grainfield and granary, hoarding in its burrow four to eight times as much as it devours on the surface. In recent decades bandicoots have spread from the fields to become the dominant rat in many of India's villages and cities—commensalism evolving before our eyes. No other rat equals their staggering reproduction rate—a litter a month for each female, seven pups per litter.

#### The Heroes—a Small Band of "Rat Men"

These are earth's most destructive four-legged creatures. And against them, a small and beleaguered fraternity of "rat men"—affiliated with universities and governments, pest-control companies and sprawling United Nations agencies—wage a silent, almost anonymous struggle around the globe.

As photographer Jim Stanfield and I embarked for front-line coverage of the struggle, we mulled a friendly word of warning from biologist Michael Fall, a U. S. Fish and Wildlife Service specialist who has helped combat cropland rats on four continents.

"To someone who lives in the temperate zone," Mike Fall cautioned, "the rat problem in the tropics defies comprehension."

Comprehension dawned beneath a blazing Philippine sun as an airboat whisked us across a vast swamp on Luzon. Our pilot was Russell F. Reidinger, a Fish and Wildlife Service biologist assigned to the Rodent Research Center (RRC) at Los Baños, a project of the Philippine Government and the U. S. Agency for International Development (AID).

"The marsh is a great place for growing rice," explained Russ. "Unfortunately, it's also a great place for rats. You can have a population of one per square yard in a place like this."

Dozens of rodents—a subspecies of the roof rat—scattered before our speeding vehicle,

scurrying into mats of water hyacinths, leaping like frogs from lily pads.

"You really see them at dusk," Russ yelled over the airboat's roar. Neighboring farmers see them too, pygmy hordes stealthily advancing to raid their rice fields.

Rats lie like a curse on the life of Pablo Marinay, a dignified, impoverished farmer who lives near the swamp. "Every year they destroy more than half my rice crop," he said in his simple, tidy home above a pen of squealing pigs.

Pablo told us he had requested special Masses to ask protection from the rats. He and his neighbors had paraded a life-size wooden image of their patron saint around the fields, beseeching him for help. In desperation Pablo had secretly run a wire from a public power line to rig an electric fence around his field. The high voltage had killed a neighbor's water buffalo, and Pablo had gone to jail. Now he was experimenting with baiting and had fresh hope.

"Tomorrow," said Russ, "we'll visit a harvest in a heavily infested area. Then you'll understand his problem."

#### Children Reap a Grim Harvest

Dawn found us balancing along tops of paddy dikes toward a group of 20 harvesters, men and women of all ages. Bandannas shaded their faces to ward off the merciless sun.

The harvesters surrounded a plot of rice the size of a basketball court. Sickles flashing, they bent to their timeless task.

Slowly they closed their circle around the shrinking rice plot. A handful of children, each armed with a stick, now deployed expectantly behind them.

Suddenly a rat burst from between two harvesters. "Yee!" exulted a small boy, taking off in hot pursuit. Stick flailing, he connected, and placed the body atop a sheaf of rice stalks.

Rats boiled from the rice into a melee of shouting, stick-wielding children. Harvesters joined in, pinioning rats with bare hands and feet, slashing with sickles, whooping when a bite drew blood.

A bleary-eyed man approached—the field's owner. "I've been out here every night," he explained wearily, "banging on a tin can to scare away the rats. Even then, I had to harvest ten days early to beat them to what was left, maybe a third of the crop." Still his efforts

had paid. He pointed to a nearby field that had been wiped out, abandoned to the rats.

With the last stalk cut, the last rat killed, the harvesters moved on to another plot, while youngsters skinned the catch and placed the little carcasses on sheaves to dry in the sun. A body count showed 93. By day's end the group had a thousand rats—ample for lunch, for dinner, for market. In many parts of Asia and tropical Africa no squeamishness is attached to the eating of rats found in the wild.

"You'd think it would take years for rats in this area to recover from such a slaughter," said Russ, as we followed a harvester carrying rats to sell in the market at nearby San Antonio. "But the survivors will easily rebuild the population before the next planting. Anyway, there are countless more in neighboring fields, ready to move in."

#### A Tasty Answer to Protein Deficiency

At the edge of town we stopped while a stranger purchased two rats for five centavos each. We advanced a block and watched the sale of two more rats. Long before the market came in sight, the last was gone.

"Rats can help provide much-needed protein," said Russ, "but the farmers pay a high price in lost rice; rodents are inefficient in converting vegetation to meat."

That evening we gathered for dinner in the rice-storage house of Mrs. Eufemia Perez, a gracious and vivacious San Antonio planter. Except for our table and a huge, idle rice-polishing machine, the warehouse was empty: Rats had devoured most of Mrs. Perez's crop.

"A few years ago," Russ said as we sat down, "a local businessman tried to market canned rat meat. He gave it the trade name STAR—'rats' spelled backward. It didn't catch on. We're hoping to do better with a new rat sausage developed here."

A bowl of steaming coconut oil passed before us. From its depths we each speared a deep-fried rat. Surprising ourselves by enjoying three apiece, Jim and I agreed they had the pleasing gaminess of squirrel or rabbit.

Next day at the research center, biologist Jess Sumangil, chief of the Philippines' rodent-control program, outlined the formidable task facing his nation and region.

"Each year," he said, "rats in Asia consume at least 48 million tons of rice—enough to



Free for the moment: Dr. William B. Jackson of Bowling Green State University in Ohio releases a rat in a chicken farm to see if it is deterred by high-frequency sound. Result: rat unfazed.

In an experiment conducted by Dr. Rick Meeker, also of Bowling Green State, a rat voluntarily presses a bar, transmitting brief electrical pulses into its forebrain (below). Why does it do it? The answer may help unravel the complex threads of motivation in rats, and possibly in man.







Rats by the thousands inhabit the temple of Hindu goddess Bhagwati Karniji in Deshnoke, Rajasthan, where two worshipers bow to the goddess's image in an inner sanctum (right). Rats at their feet dine on a bowlful of sweets, grain, and milk called *laddu*.

Sculptured rats flank the goddess on a silver door (above) and adorn a marble archway at the temple entrance (left). A live rat peers from a hole in the sanctuary wall (below). "They were all around me," says photographer Stanfield. "While I was shooting pictures, the rats gnawed holes in my camera bag and even chewed the insulation from my strobe lights, shorting them out."

Devotees explain that the rats, like all living creatures, are welcome. Some Indians criticize the cost of \$3,500 a year to feed the rats, when the country is woefully short of food for people.





feed a quarter of a *billion* people. When we talk about rodent control, we're talking about human survival."

Can Asia's rice farmers hold so pervasive a foe at bay?

United States and Philippine experts believe they have found a way, based on thousands of hours of painstaking experimentation by scientists at the RRC and the U. S. Wildlife Research Center in Denver, Colorado. By placing poison-bait stations at strategic points in the field and increasing their number as rat pressure mounts during the growing season, the scientists have shown they can slash rice losses by a dramatic 95 percent.

Skeptics fear the scheme asks too much of poorer farmers: Ironically, to make the bait they must mix some of their own scarce grain with the poison—feed their rice to rats. But the Philippine Government has enthusiastically adopted the baiting as a nationwide program. And already AID and CARE fieldworkers seek to transplant the technique to islands of rat-plagued Indonesia.

On many smaller Pacific islands, free from

hogs, dogs, or human beings, rats reign as the dominant mammal—truly king rats. Often Norway and roof rats, introduced by mariners such as the great English navigator Capt. James Cook, have joined the indigenous Polys. Finding his vessel "a good deal pestered with rats," Cook anchored at an island near Tahiti, "and made a path for them to get to the land, by fastening hawsers to the trees."

All too frequently the rodents have wreaked havoc with island economies and ecologies. For a briefing, I paid a visit to the U. S. Wildlife Damage Research Station in Hilo on the "Big Island" of Hawaii.

"Rats maraud almost everything we grow here, from coffee to orchids to macadamia nuts," explained station director Larry Pank. "They're worst in the sugarcane—11 million dollars' worth of damage last year alone. And cane is one of our major industries after tourism."

We plunged into a jungle of cane towering ten feet overhead. Surely, I thought, here was enough food for both rat and man.

"See those red stalks?" asked Larry. "That's



Conscientious objectors in the war on rats, grain dealers in Bombay bargain while half a dozen guests take a drink (right). Members of the Jain religion, the merchants refuse to harm rats that infest their warehouses, gobbling grain by night with a sound like the clacking of a roomful of typewriters. Responding to government encouragement, a man builds a ratproof grain-storage bin in a home in Ganeshpura (above). Barrel-like bins made of dung, at right, are easily pierced by gnawing rodents.







In primal Edens snakes and other predators probably kept the rat at bay. An Indian python in the Madras snake park demonstrates: crush (left) and gulp (right). But pythons don't patrol city streets, where the rat's main enemy, man, is also its greatest benefactor. Scatter garbage helter-skelter, reap a harvest of rats.

rat damage. A single bite lets in fungi that cause the sugar to ferment, ruining the entire cane. Polynesian rats will nibble one stalk, then go on to the next. Norway and roof rats are almost as bad. Fantastic destruction.

"Here comes the counterattack," said Larry. With a roar, a biplane skimmed low over a nearby field, trailing a diaphanous plume of tiny particles that pattered down. Searching the ground, Larry pointed with his toe to a small grain. "Oats mixed with a rodenticide," he yelled as the plane made another pass. Seven of them can kill a Poly. "In 1975," he continued, "when sugar prices were high, every dollar that was spent on baiting saved

approximately forty dollars' worth of cane."

This kind of chemical warfare is proving far more successful than an effort nearly a century ago to introduce a natural enemy of the rat into Hawaii. I learned of it from Dr. P. Quentin Tomich, who came in 1959 to help combat plague.

Often as we drove on the Big Island, supple, catlike animals vanished into roadside cover before us. "Mongoose," explained Quentin ruefully. "Cane planters brought in 72 of them in 1883 to get rid of the rats, and they thrived." The trouble was, the mongoose hunts by day and the rat feeds by night, and their paths don't always cross. As a result,

the mongoose, like the rat, supplemented its diet with ground-nesting birds. What followed was an ecological nightmare. Mongooses preyed on petrels, a flightless rail, and a type of shearwater. They also helped reduce the unique Hawaiian goose, or nene, to near extinction. Meanwhile the rats flourished.

### Selective Rodent Devours Cash Crop

At best, it remains a seesaw struggle, this war against the rat. In India I sought out another key battleground. The scene: a sun-drenched village in the State of Gujarat.

"Karli is typical of our villages," explained Dr. G. C. Chaturvedi, the tall, spectacled, very serious commander of the battle. "During Karli's last campaign"—he referred to a voluminous file—"the villagers killed 8,296 rats, 2.43 per person. A great success.

"Then they stopped putting out bait, let down their guard. The rats returned. One got into a grain bin where the *sarpanch*, the mayor of Karli, hides his money and chewed up 800 rupees. Another bit an old lady. . . ."

Commotion erupted beside us. It was Jaggu Dossi, the old lady, explaining her experience in a torrent of Gujarati: "I heard the rat as soon as I went to bed. All night I lay clapping my hands to scare it away. I must have dozed, because suddenly it got me—here!" She thrust her head forward and parted her hair so I could feel the welt.

"Now Karli has come to us for poison," said Dr. Chaturvedi approvingly. "Whether the villagers clear out the rats and keep them cleared, only they can decide."

Karli and some eighty other villages in Gujarat arouse worldwide interest among those who battle hunger and disease. Here a Catholic Relief Services project with support from U. S. AID tests whether a largely Hindu people—with their reverence for life—will accept a program of mass poisoning.

Chief architects of the project were former AID official Kenton L. Harris and N. S. Rao, energetic president of one of India's largest pest-control companies.

"Our soaring population already was straining our capacity to feed it," the portly entrepreneur recounted in his New Delhi office. "Shiploads of grain flowed in from America, but some U. S. Senators were complaining that the aid merely made up what our rodents ate—that America's grain was

simply feeding India's rats. The loss was intolerable. We had to act."

Mr. Rao and Mr. Harris contacted Dr. Ishwar Prakash, an eminent Indian authority on rodents. Together they devised a village-level plan calling for baiting in houses and fields and replacing traditional grain bins made of mud and dung with new ratproof bins.

"Religion was our greatest problem," concedes Dr. Chaturvedi. "The Hindu reluctance to kill is very strong—that is why so many of us are vegetarian. Women feel this especially strongly; if someone in the family is taken ill, the wife may blame it on the husband's killing rats. Further, the elephant-headed god Ganesha, symbol of prosperity to many Hindus, traditionally is carried by rats."

I knew. The night before, dining with Dr. Chaturvedi, I had watched his mother reverently dust off a little shrine holding a golden rat-borne Ganesha.

To surmount the problem of religion, the program was launched in the few partly Muslim villages. Workers showed films of how rats spread disease and damage crops and stored foods. They also offered free bait.

The other villages soon took note of the food that was being saved and the reduction in rat bites. Religious objections, according to Dr. Chaturvedi, proved to be much less of an obstacle than officials had feared. Of 84 villages in the project area, 20 are virtually rat free, and 60, like Karli, have achieved at least some degree of control. Only four rejected the program outright.

Can this drop in the bucket be meaningful in a nation of half a million villages?

The answer came just last year. In a response similar to that of the Philippines, India launched a national rodent-control program, coordinated by Dr. Prakash. Borrowing heavily from the Gujarat experience, it even beams satellite TV and radio messages to mobilize man against rat.

### Urban Rats Have Shrewd Street Sense

Until worldwide fear of famine focused attention on cropland rats, most of our combat experience was with their urban cousins. They have proved exasperating adversaries.

"For one thing," notes Bill Jackson of Bowling Green State, "the rat is street smart. In fact, it's smart enough to stay *off* the street, where it might get picked off by a dog, cat,







THE TIMES LIFE/SCIENCE

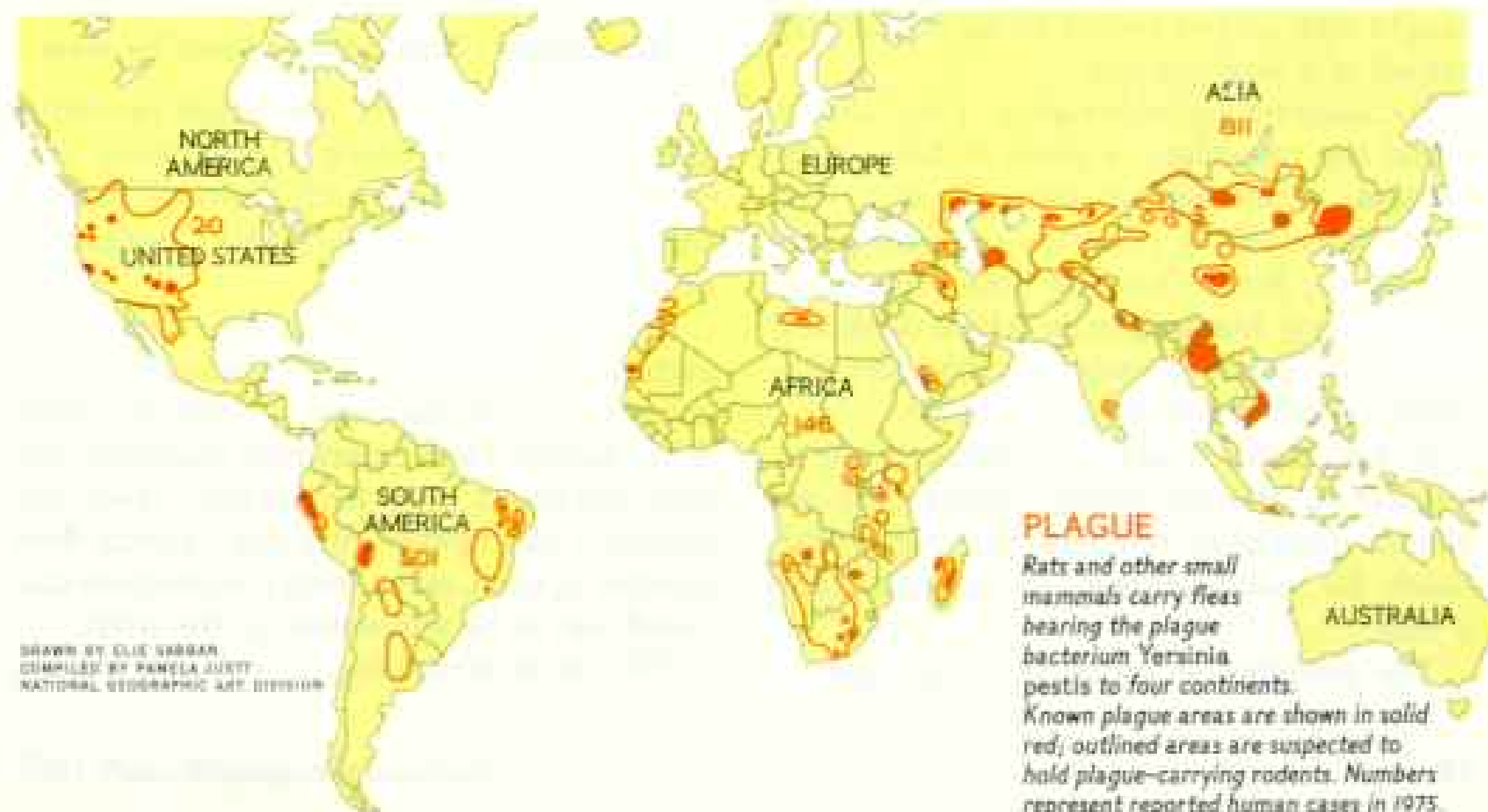
On the watch for plague, technicians at the Haffkine Institute in Bombay (left) examine the previous day's city-wide kill of 3,500 to 4,500 rats, sorted into piles from different neighborhoods. Three *Xenopsylla* fleas, a genus known to harbor the Black Death bacillus, are magnified (above) at the Vertebrate Pest Control Centre in Karachi, Pakistan.

History's most calamitous plague, the Black Death of the Middle Ages, killed an estimated 25 million people. Though plague had struck before—and still occurs today (map, below)—not until 1908 was its carrier conclusively identified: fleas residing on rats and other rodents.

Scholars speculate that plague was the disease recorded in the First Book of Samuel, but the presence of rats on the victims in a 13th-century illustrated Bible (right) is viewed as the artist's literal rendition of "mice that mar the land" (I Samuel 6:5).



ALFRED WOODMAN LIBRARY



DRAWN BY ELIE YARBAN  
COMPILED BY PAMELA JURY  
NATIONAL GEOGRAPHIC ART. DIVISION

owl, or automobile. Early studies in Baltimore show that while hundreds of rats may occupy adjacent blocks, there's almost no travel between them."

The Baltimore research began during World War II, with the fear that the Axis powers might attempt a blitz of rat-borne germ warfare. The U.S. Government launched an intensive, long-range study of urban rat-control methods under the direction of a renowned Johns Hopkins University psychobiologist, Dr. Curt P. Richter.

### Cats and Poison Prove Ineffective

Setting out traps and poisons, Dr. Richter and his aides were astonished at Baltimore's abundance of Norway rats. "Many a block within good residential districts harbored 300 or more," he recalls. Trapping, marking, releasing, and recovering rats, he observed their habits and movement patterns.

A Hopkins colleague, naturalist John T. Emlen, Jr., selected rats for studying the dynamics of animal populations. Others joined him—David E. Davis, John B. Calhoun, A. W. Stokes. Their data helped paint one of the most detailed animal portraits ever made.

The scientists found that while poisoning depletes a population, as soon as the poisoning stops, the rats' relentless reproductive powers quickly restore their numbers. "Poisons or traps," noted Dr. Davis succinctly, "merely make space for more rats to grow."

Natural predators prove equally ineffectual. The average cat kills only 25 to 30 rats a year—far too few to affect a colony's numbers. Dogs, with their sloppy eating habits, sometimes encourage rats; the scientists caught their largest rodent living beneath the kennel of a well-fed dog.

Focusing on social behavior, Dr. Calhoun found the rat colony a scene of fierce competition. A mother rat living near a food source successfully rears ten pups for every one by the female farthest away. Males develop colony hierarchies, in which dominant rats stake out claims near the food and subordinates are driven to the outskirts.

In lean times weaker rats either starve or migrate to another colony, where they are almost invariably rebuffed and die. Fortunately for mankind, few rats live more than a year.

The scientists formulated a basic axiom:

Except when temporarily depleted by poisoning or other predation, rat numbers will increase to the capacity of the environment, as determined by available food, water, and shelter (which rodentologists call "harborage"). Only by altering the environment, primarily through better sanitation, can you permanently reduce the rat population.

This seemingly simple concept, which Dr. Davis labels "environmental manipulation," shapes most urban "wars on rats," at least in theory. In practice, cleaning up the environment can prove frustratingly difficult. So it is in many of the nation's old and often neglected inner cities. Here, where rats so often abound, their shadowy presence has become a symbol of urban blight and despair.

Recognizing this, the U.S. Government administers a rat-control program through the Center for Disease Control in Atlanta, Georgia. This year it will distribute 13 million dollars among 67 communities.

"Considering the size of the problem, federal funding is peanuts," says Dr. Vernon Houk, the program's blunt-speaking director. "But the results are nevertheless impressive. Since 1969 combined federal and local programs have produced essentially rat-free environments for about four million inner-city residents whose neighborhoods were once more conducive to rats than people."

Before the Federal Government stepped in, New York State launched a pioneer program that would virtually banish rats from such cities as Utica and Schenectady. Even in New York City, noted Dr. Houk, there have been gains, "and that's the most difficult environment in the country." I went to see.

### "Airmailing": Rats' Manna From Heaven

Bitter winter winds sent trash bounding like tumbleweeds along 119th Street as I entered East Harlem with Elwood "Randy" Dupree, head of New York City's Bureau for Pest Control.

Debris of every description—cans, raw garbage, old newspapers, discarded appliances, worn-out mattresses—piled like snowdrifts against bleak apartment buildings. My gaze zigzagged up a fire escape. Trash festooned it like clothes on a line. A sixth-floor window opened, and a fresh contribution cascaded out, to be winnowed by the wind.

"We call it 'airmailing,'" explained Randy,



**Gnaw or die.** Fast-growing teeth require perpetual gnashing. With lower incisors splayed, this rat (right) may eventually find its underground uppers curling into the roof of its mouth. Rats gnaw even at leisure; they can fit cinderblock, thin sheet metal, and lead pipe (below) into the daily grind.



a tall, slender man with a master's degree from Columbia University. "It's a way of life in many of the poorer, high-rise sections. For a variety of reasons. Criminals may lurk in an apartment basement where the incinerator is. Tenants are afraid to go down, so they airmail their trash. Maybe there's no elevator, and people won't walk down. In transient neighborhoods tenants often simply don't care. Anyway you look at it, the rats come out ahead."

We pulled to a stop in front of Number 326, an abandoned, once elegant apartment building. Inside, Randy's workmen shoveled knee-deep trash into huge paper bags and carried them outside to a truck. "Next we'll empty the basement," he said. "It's filled to the ceiling. Then we'll put out poison. People living nearby use these empty buildings for trash bins. Perfect for rats."

In Randy's office in lower Manhattan a wall map designated 2,084 infested central-city blocks that qualified for federal aid. "About 1.3 million of our poorest people live there," Randy explained. "Periodically we inspect every lot on each one of these blocks, and where we find rat signs, we order the landlord to clean up. If there's no compliance, then we do the cleaning ourselves and bill the landlord, at the same time putting out poison.

"Today more than three-fourths of those 2,084 blocks are virtually rat free. The trouble is," he added, "people tend to relax, and the rats spring back. When we talk about sanitation, we're talking about human behavior. That's our real problem."

A wall graph labeled "Rat Bites" showed a declining curve: 246 in 1974, 233 in 1975, 221 in 1976. "There's a stigma about reporting rat bites," Randy told me candidly. "I think the real figures are probably triple these."

#### **Brazen Bandicoots Live the Good Life**

Randy Dupree's challenges—staggering though they are—pale before those of another urban official, halfway around the world.

"We, too, have an airmailing problem," P. B. Deobhankar, rodent-control officer for the Municipal Corporation of Greater Bombay, had said to me earlier. "I will show you what I mean."

The courteous sanitarian guided me to the Bora Bazar, one of the city's oldest areas, then stopped and pointed. Ahead of us a yard-wide alleyway divided two decrepit, four-story apartment buildings.

"We call these 'gullies,'" Mr. Deobhankar explained as my eyes grew accustomed to the shadowy depths. "They're alive with rats, even in daytime. People throw their garbage



When rains returned at last to Senegal, ending a severe drought, crops prospered. So did rats, their burrows leaving some farms "cratered as if by saturation bombing," one observer reported.

The country fought back. Rice farmers stand by with picks and shovels (above) as water is poured into a rat burrow in an irrigation dike near Guédé. When the rats come up for air, a thumping melee ensues.

A farmer of Kassak Nort (right), swathed in a net he used to trap rodents, holds rat tails that he will exchange for grain offered as bounty by the government.

The pest fighters also set out poisoned bait, smoke rats from their burrows with sulfur wicks, burn them with flamethrowers, and attack them with toxic gas. The battle isn't over yet, but the farmers are winning.





out the windows, and the rats wait below. This is one reason why Bombay suffers 20,000 cases of rat-bite fever a year."

Soon I saw them, at least half a dozen bandicoots leisurely inspecting mounds of garbage. Splat! More rained down from an open window. The rats retreated momentarily, then sauntered forward to inspect.

At the far end of the gully, a white and yellow cat padded in. Mingling with the rats, it busied itself with the garbage.

"There are 6,921 gullies in the old part of the city," Mr. Deobhankar said. "Each day we clean away the garbage, but next day more comes down. Only a mighty effort can stop this habit."

#### Night Killers Make Their Rounds

That evening we returned to the gullies, trailing two men armed with wooden sticks. These were night killers—one a tallish, lean youth, the other short and grizzled. "We have 85 night killers," Mr. Deobhankar told me. "Each clubs at least 25 rats a night."

Stepping between people sleeping shoulder

to shoulder along the curb, the grizzled veteran played his flashlight into a gully. Transfixing a rat in the beam, he raised his cane and struck. Then he moved a bare foot forward, picked up the corpse with his toes, and dropped it into a sack. Twenty-four to go.

A street sleeper awakened and eyed the night killers. "That's why I'm sleeping out here," he volunteered—"rats would chew me up indoors."

"Night killers account for half the 4,000 rats we kill daily," said Mr. Deobhankar. "The rest we take with traps and poisons." Mentally I calculated the annual kill: about one and a half million rats. Weighed against the bandicoot's prodigious reproductive powers, the toll would make no dent in the city's permanent rat population.

"I know the numbers are against us," he acknowledged. "But Bombay has not forgotten the plague epidemic of 1898 that killed 12½ million Indians. It was centered here. Our last plague victim was in 1952, but we cannot take chances. Every day we examine some of our rats. If we discover plague, my slender program



can serve as the nucleus for a crash, city-wide control campaign."

In Rome it was all-out war—Eternal City against eternal enemy. The Zucchet company, Italy's largest pest-control firm, had won a \$1,500,000 contract to suppress the rats that were harassing the citizenry—gnawing insulation and causing vast blackouts, ruining food and property. The Lord Mayor himself exhorted the populace to report the whereabouts of rats, and to tolerate the Zucchet vehicles parking along busy streets while crews searched out the enemy in the city's venerable sewers.

On D day a parade of Zucchet equipment advanced in stately procession: vans crammed with fumigators, bait bags, and ladders; motorboats for retrieving dead rats from the Tiber; helicopters and an airplane for fast deployment. Television cameras whirred as a crew descended into a manhole to place the first bait.

#### Gourmet Rodents Get Parmesan Surprise

Donning hard hat, coveralls, and hip boots, and masked against the fumes, I trailed a team into a 16th-century sewer bordering the Vatican. Inside the great vaulted tunnel, we threaded a narrow ledge above the dark flow. Methodically the men collected dead rats and tossed out packets of bait. "*Il pranzo è pronto, venite a prenderlo,*" they muttered. "Lunch is ready, come and get it."

"We estimate 15 million rats in the city," ventured courtly, hard-driving Edvino Zucchet behind his desk at company headquarters. "Correction. There *were* 15 million. By the end of the year-and-a-half campaign we hope for 60 percent eradication."

Mr. Zucchet led the way to a nearby building where gleaming machines of his own design mixed and packaged the lethal baits. One resembled link sausages. "That's a floating paraffin bait," said Mr. Zucchet, "for sewers where there's no ledge to rest it on." He followed my eye to stacks of disk-shaped cheeses. "Parmesan," he shrugged. "Their favorite. When your main course is poison, you must make it palatable to your customers."

Striking northward, I paid respects to a storybook north German town of medieval churches and half-timber homes where rats enjoy obvious affection. Pastry rats with bristly whiskers peered out from bakery

windows; rat-shaped bottles lined shelves of spirit shops. Twice a day, as bells rang in an old stone *Rathaus*, a glockenspiel reenacted the timeless and probably mythical tale of the ratcatcher who—cheated of his wages by stingy town burghers—lured away Hamelin's children with his piping.

An abundance of plump, blond *Kinder* attested to Hamelin's demographic recovery. And the rat population was still in check: An important-looking document reposing in the new *Rathaus* certified the town as *praktisch rattenfrei*—practically rat free.

But Hamelin's thrifty burghers, I discovered, were still reluctant to pay the piper.

Well aware of the town's publicity value for ratcatchers, they had driven a hard bargain with bushy-browed Wilhelm Klimasch, Hamelin's *Schädlingsbekämpfermeister*, or master pest fighter (page 62).

"I would earn twice as much in any other city this size," he lamented. Only because of sentiment did he accept Hamelin's terms.

Suppose the town reneged on his skimpy fee; would he lure away the children?

"I would be tempted," he said somberly, then grinned. "But I cannot play the pipe!"

#### For Scientists, a "Super" Headache

Journeying across northern Europe, I found rats definitely *rodentia non grata*. North Germany boasts a cluster of rat-free cities—the legacy of a zealous health official named Hans Telle, whose work in Germany and in the Philippines lives as legend among rat fighters. Neighboring Denmark enacted pioneer laws requiring rat-free premises and today generously assists poorer nations in the struggle. And in the London suburb of Tolworth, a low brick building of the Ministry of Agriculture, Fisheries and Food embraces a leading laboratory dedicated to the rat's undoing.

Startling news issued from Great Britain in 1960. From a Scottish farm came rats that were seemingly unaffected by normal poisoning. A series of tests confirmed the worst: The rodents had developed genetic resistance to anticoagulant poison—the world's first known super rats.

"Resistant rats now occur in several places in Great Britain," I heard from biologist David C. Drummond, rangy, articulate director of the Tolworth lab. "But we shouldn't exaggerate the problem. Here at Tolworth we



If you *could* smell a rat, the diminutive nocturnal animals would be easier to track. Kim Taylor (right) of the Pest Infestation Control Laboratory outside London uses an antenna to lock onto signals from transmitters placed on collars around test animals' necks to plot their movements. A fluorescent tube (above) helps in visual tracking. Taylor homes in on a hay pile (below) to recover a rat killed by poison.



*The Rat, Lapdog of the Devil*

have helped develop two effective new substitutes. I'm confident science can stay ahead of the rats' ability to acquire resistance.

"Our best source of new toxins," he added, "is the pharmaceutical companies. Sometimes a prospective new drug kills the rats it's tested on. This may be disconcerting to the drug company, but it interests us. That's one way we come upon our new poisons."

Anticoagulant poisons, which cause fatal internal bleeding, have formed the first line of defense against rats since their development at the University of Wisconsin nearly three decades ago. Investigating why cattle that eat spoiled hay often hemorrhage and die, scientists finally isolated a chemical called dicoumarol. From this came the synthetic compound warfarin, deadly against rats but relatively safe with other animals.

In their search for safe new rodenticides, scientists must contend with the rat's frustrating bait shyness, an almost supernatural ability to detect harmful food—as little as one part in a million. And once shy, a rat will starve rather than eat food it distrusts.

Trapping presents similar problems. Rats exhibit an almost paranoid suspicion of the new and different. Set out a trap—or even a harmless brick—and rats may vanish for a night or two. This wariness gives rise to much of their reputation for cleverness.

To overcome these defenses, scientists experiment with a host of other potential weapons: chemicals and radiation devices for sterilizing rats, high-frequency-sound generators to create sonic barriers, gluey surfaces to mire down trespassing rats. A rambunctious device already on the market grabs the victim in steel jaws, electrocutes it, then dumps the body into a plastic bag.

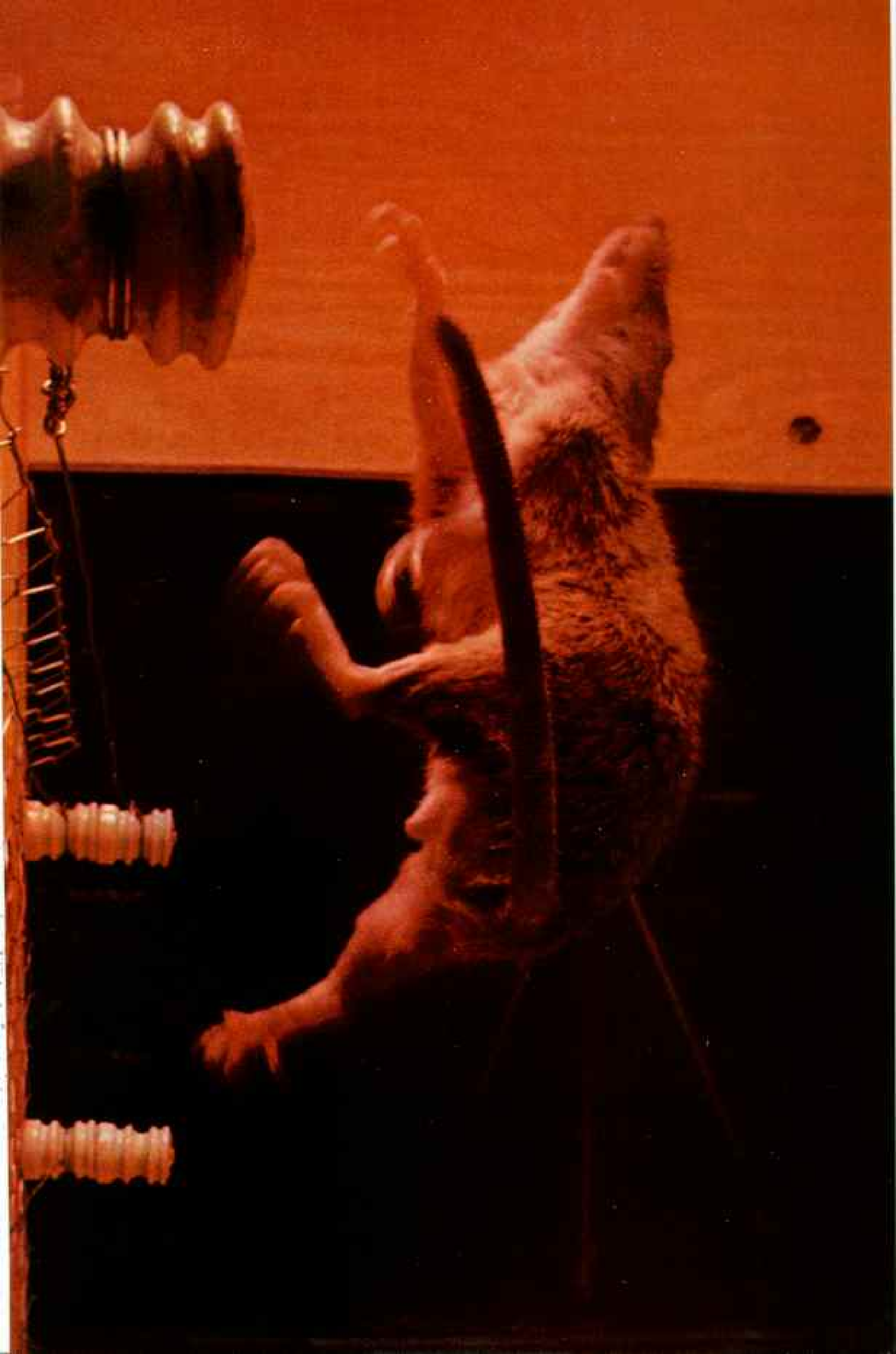
In light of our age-old hostility toward rats, it is strange that we have known of their most destructive role—as a carrier of disease—only since the turn of the century.

Certainly Italian merchants felt no alarm in 1347, when ships laden with spices from

**Shocked but alive,** a rat decides it's had enough of a new sublethal electric fence developed by the U.S. Fish and Wildlife Service in Denver for use in farm areas. A mild shock deters rats and spares livestock and other animals.







Black Sea ports tied up at Genoa's busy wharves, and roof rats clambered ashore.

Soon bewildered citizens were stricken with a painful swelling of the lymph glands—the buboes of bubonic plague. With horror they saw their skin erupt in dark blotches—the dread stain of the Black Death.

Soon all Europe writhed in the grip of the "great dying." Papal records tell of 200,000 towns depopulated. Physicians suspected "corrupt vapors" caused by a malign conjunction of the planets.

When this greatest calamity in human history subsided, only three years after it began, it left 25 million dead.

### Deadly Legacy Still Haunts the World

For centuries plague flared intermittently, hammering Venice seventy times, killing a hundred thousand Londoners in the dreadful siege of 1665, striking worldwide—including San Francisco—in the 1890's. In 1894 two doctors independently discovered the plague bacillus. Others observed dead rats wherever plague flared. Soon they discovered the bacillus in two species of rat fleas. By 1908 the picture was complete: When a plague-infected rat dies, its disease-carrying fleas seek new hosts, including man.

Today pockets of plague persist in Africa, Asia, and both Americas (map, page 77). A large fraction of each year's 100 or so deaths occur in Burma, scene of a concerted control effort by the World Health Organization. In 1975 20 Americans contracted the disease and four died—victims of contaminated fleas harbored by ground squirrels in western states.

Western health officials continuously trap rats so their fleas can be tested for the bacillus at the federal plague center in Fort Collins, Colorado. When the bacillus surfaces, warnings go out to area physicians and residents.

"Our big worry," says Dr. Allan M. Barnes, chief of the Fort Collins facility, "is that infected fleas on field rodents will make contact with urban rats and squirrels. In the past 15 years they've reached San Francisco, Denver, and Tacoma, Washington. Prompt eradication programs saved the day. But we *can* have plague in western cities."

Once they trained their microscopes on the rat, scientists uncovered a catalog of other diseases spread by its bite, vermin, and filth. Some, such as salmonellosis and leptospirosis,

normally take the form of nonfatal fevers. Rat-borne Lassa fever is among the deadliest diseases known.

Ironically the gray-brown carrier of many contagions has a blood brother who wears a white hat, and more—the amiable albino rat of the research laboratory. "Few people," asserts Dr. Curt Richter of Johns Hopkins, "have not benefited in some way—even been kept alive—by studies made on the rat."

Albinos probably trace their ancestry to the grisly 17th-century pastime known as rat baiting. Spectators wagered on how fast favorite terriers could kill rats tossed into a pit. When rat breeders for these events chanced upon occasional albinos, they kept them as pets or curios, and their tribe increased.

In the U. S. alone, some 18 million rats will be used this year in medical and psychological studies. Their credentials as guinea pigs are impressive. Hear Dr. Richter:

"The dietary habits of man and rat are almost identical, except that we eat by day and the rat by night. Its short life span aids in studies of growth and aging, and in following inheritance through many generations in a short time. Also, it is stable, reliable—and just the right size to work on. Given the power to create an ideal lab animal," concludes this still-active octogenarian, "I could not possibly improve on the Norway rat."

### War on Rats—a Continuing Struggle

Thumbing through the notes of his travels, an itinerant rat writer finds two themes recurring among the experts. Appalled by the enormous annual loss of food to rodents, they feel the world is letting the rat get away with too much too easily; helping hungry nations ratproof fields and granaries could dramatically alleviate world hunger. Regarding the urban rat problem, the authorities agree that poisoning campaigns are simply a holding action, a way to buy time until we clean up conditions in which rats thrive.

"When we fight the rat," observes Joe E. Brooks, a former New York State control specialist who now wages the struggle in plague-ridden Burma, "we fight ourselves and our own degradation of the environment." Many, indeed, believe this helps explain our loathing of the rat: Its presence serves as a reproach, a reminder of failures we would rather ignore. □

## Rat lore: true and false

Over the centuries rats have woven themselves into our lore and language, often fancifully, always pungently.

- **The dirty rat:** With so degrading a life-style, can rats be other than filthy? Would tough-guy actor James Cagney angrily hiss, "You dirty mouse"? Yet this does the rat injustice. It is man's environment that soils the rodent; when caged, it spends a large part of each day grooming.
- **The rat race:** Running, running, running in the treadmills of their cages, sometimes twenty miles a day, rats epitomize those frenetic times when action seems more important than results. But even the swiftest rat is no racer: The Guinness book of animal records logs the top speed at six miles an hour.
- **Rats as big as cats:** Never; they just seem so. Even the largest Norway rats weigh less than two pounds; house cats average eleven.
- **Rats leave a sinking ship:** Probably true. Not through occult prophetic powers, but because their homes in the bilges flood first, driving them to safety.
- **A cornered rat will fight like . . . well, a cornered rat:** True, and beware. With escape blocked, a desperate rat may spring at its attacker, be it cat, dog, or man.
- **Rat armies wage war:** Perhaps rat population explosions spawned the myths of rodent "nations" marching into battle. In reality, rats rarely cooperate; a pair struggling to carry away food usually tug in different directions. The murderous rat masses that swarmed on their human victims in the movie thriller *Willard* were actually after the peanut butter smeared on the actors' bodies.

They fed on his rice, now he will dine on them. After a day in the fields near San Antonio, Luzon, a Filipino farmer heads for home, his supper in his hand.





# TURKEY

# Cross Fire at an Ancient Crossroads

By ROBERT PAUL JORDAN

Photographs by

GORDON W. GAHAN

BOTH NATIONAL GEOGRAPHIC STAFF

Eager recruits in the battle for education, pupils in a rural Turkish school display portraits of Mustafa Kemal, called Atatürk, "Father of the Turks." A revolutionary who in 1923 replaced the shattered Ottoman Empire with a secular republic, and a visionary who prodded Turkey into the modern world, Atatürk proclaimed: "It is schoolmasters, and they alone, who can save the people." Since the 1920's teachers like Osman Özer have raised the literacy rate from 10 to 70 percent.

*Remain yourselves, but learn how to take from the West what is indispensable to an evolved people. Admit science and new ideas into your lives. If you do not, they will devour you.*

—MUSTAFA KEMAL ATATÜRK

**A**NKARA, EARLY SPRING. The rains had come now, a mixed blessing, settling the dust but not the smog. I stood in the perfect composure of an immense mausoleum overlooking Turkey's capital. Mustafa Kemal Atatürk single-handedly revolutionized this land, and in the nearly four decades since his death, his people have paid him increasing honor. They journey to the sepulcher of the great reformer as pilgrims to a shrine.

It did not seem strange that the old man next to me brushed his eyes. "He was the George Washington of our country," my neighbor whispered. And so most Turks still view him. But the revolution Atatürk wrought is not yet ended.

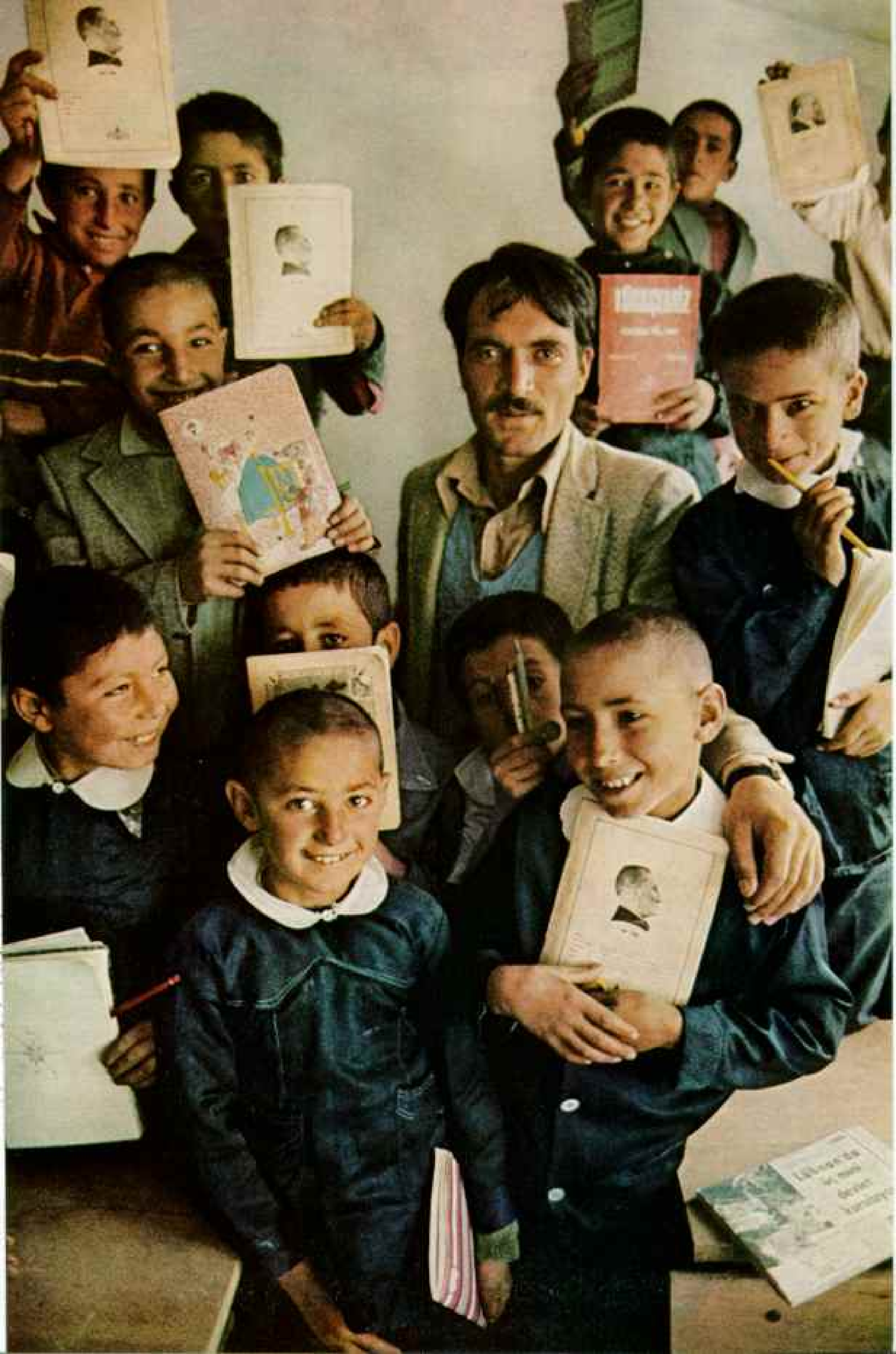
I looked out beyond the colonnade to the hills rimming Ankara. Shantytowns edged the steep slopes—warrens of stone laced by twisting dirt lanes. I had walked those lanes. Though sturdily built, many houses had no electricity, heat, or plumbing. Water was sold from cans on donkey backs. All this too stemmed from forces Atatürk set in motion.

More than half of Ankara's 1.8 million citizens dwell in such habitations, in sight of gleaming skyscrapers and elegant residences. In this society of haves and have-nots, some new flats were selling for sixty thousand U. S. dollars. Yet the squatter houses were not slums of despair but fortresses of hope. The peasant was invading every city in the land, seeking relief from greater discontent.

Families huddling on the periphery of a metropolis cannot live on hope alone. I made my way through a crush of petitioners to the office of Mayor Vedat Dalokay, expecting the shrugs and headshaking of a harassed official. Instead, I met an enthusiastic pragmatist.

"They are not slums like the human silos in your country," the mayor told me bluntly. "These people have transplanted their culture and folklore, their village life, to the city. They are much better off."

An unwritten law, he explained, aids the peasant: Once a man puts a roof on four walls, he has built a castle from which he may not





be dispossessed. Knowing this well, the countryman locates a piece of vacant land in a squatter village. With help from friends—some likely preceded him from the old village—he erects his walls. Then, overnight, the roof goes on.

Life begins anew. He and his wife raise their family, adding rooms as necessary. She tends her garden and looks after her cow and chickens. He seeks work as a laborer, door-keeper, shoeshine man, waiter.

I asked the mayor what he was doing to help the newcomers. Bureaucracy can move as slothfully in Turkey as in the United States—I have heard government officials wryly refer to Ankara as “Yavaşington,” *yavaş* meaning “slow.”

Mr. Dalokay snorted. “I do not have much money,” he said, “but I do have 6,500 workers and many bulldozers. With these I am by far the largest contractor in the city.

“As fast as we can, we bring electricity and running water to the *gecekondu*—meaning

‘built overnight.’ We put in streets and schools. Some schools already are on two and three shifts. Other cities are growing rapidly.”

Today Ankara is the country’s fulcrum, as Atatürk intended. He created the Republic of Turkey in 1923 and made Ankara the capital. Then a sleepy little city of about 25,000, it rested in the heartland of the Turk, Anatolia (map, above). He ruled out cosmopolitan Constantinople, now Istanbul, with its heritage of Byzantine intrigue and Oriental ways.

Atatürk was a man for his time. A soldier, he came to the fore as World War I struck his vulnerable homeland. He defeated invading Greeks in 1922, preserving Turkey’s independence and restoring its pride.

The savior of his country then worked to point it from East to West. He would—he sounded the word as a clarion—“civilize” his people, linking them to Europe economically, culturally, and diplomatically.

Atatürk led the movement to depose the sultan and broke the Muslim clergy’s hold on





# TURKEY

**S**IRE OF EMPIRES, the territory that comprises modern Turkey has seen the rise of three major and many lesser kingdoms. At its zenith in the 14th century B.C., the Hittite Empire in Asia Minor rivaled Babylonia and Egypt. From the 4th to the 11th century A.D. the Byzantine Empire dominated. Three centuries later the Turkish Ottoman Empire began its sweep from Anatolia around the Mediterranean.



Once vigorous, the Ottoman Empire gradually, then rapidly collapsed, until by 1918 it had shriveled into a powerless remnant. Mustafa Kemal Atatürk led reborn Turkey as a republic modeled on Western society. Yet now the conflict over Cyprus and Ankara's disappointment over lack of Western support have made Turkey wary of its traditional allies.

**AREA:** 301,381 sq. mi., 97 percent in Asia. **POPULATION:** 41,000,000. **LANGUAGE:** Turkish; Latin alphabet replaced Arabic in 1928. **RELIGION:** 99 percent Muslim. **ECONOMY:** Agriculture; livestock; manufacturing; mining. **MAJOR CITIES:** Istanbul (pop. 3,100,000); Ankara (pop. 1,800,000), capital; Izmir (pop. 635,000). **CLIMATE:** Temperate along seacoasts, wide temperature variations on the central plateau.

civil affairs. He outlawed the fez, discouraged women from wearing the veil, and in other ways curtailed the influence of Islam in secular life. He established new codes of law, replaced the Arabic script with the Latin alphabet, and made people take surnames—his own means "Father of the Turks."

For all Atatürk's broad vision, I think that today's Ankara would startle him as it did me when I first saw the city (pages 96-7). Heavy traffic was charging along its broad avenues with horns in full cry, and pedestrians fled the crosswalks like gazelles. In coffeehouses, redoubts of the male, cowboy movies flickered on black and white television—TV was still something of a novelty.

Street vendors peddled lottery tickets, and boys sidled up to you on crowded walks, hawking smuggled Western cigarettes. Occasionally a young couple strolled past arm in arm, a displeasing sight to many in this Muslim land, my interpreter among them. But he could console himself, mindful of sweet,

swift justice. "If you kiss a girl in a taxi," he promised, "the driver will throw you out."

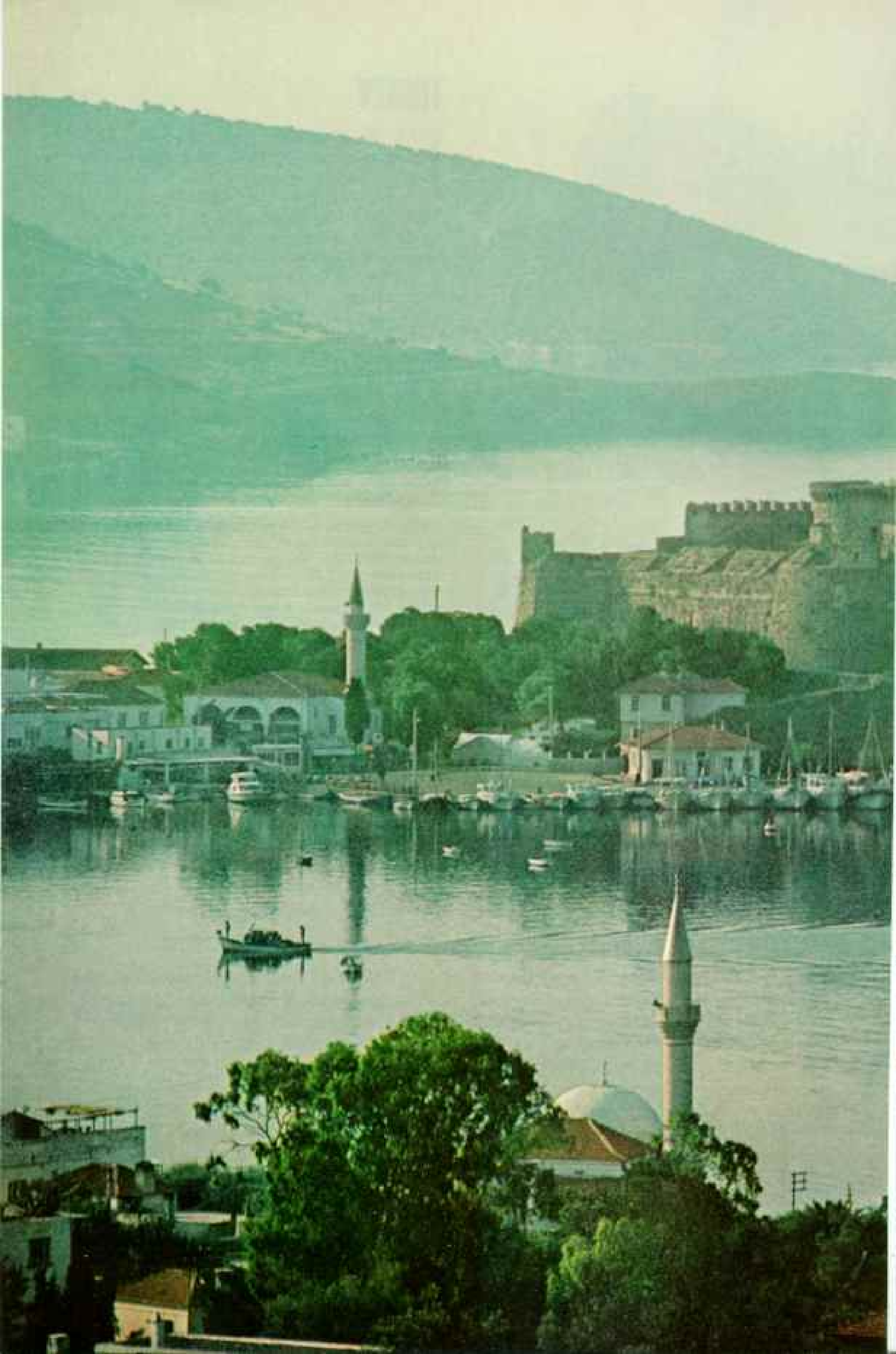
We paused before a shattered shopwindow, crunching jagged shards underfoot. Minutes earlier, bullets had sent glass flying in another display of student violence. Standing beside an armored vehicle, a policeman scowled. "It has become a daily engagement."

## NATO Shaken in Rift With U. S.

In Ankara, in Istanbul and other cities, and across thousands of rugged miles, I had ample opportunity recently to observe this proud and courageous nation struggle with its daily engagements—and its future.

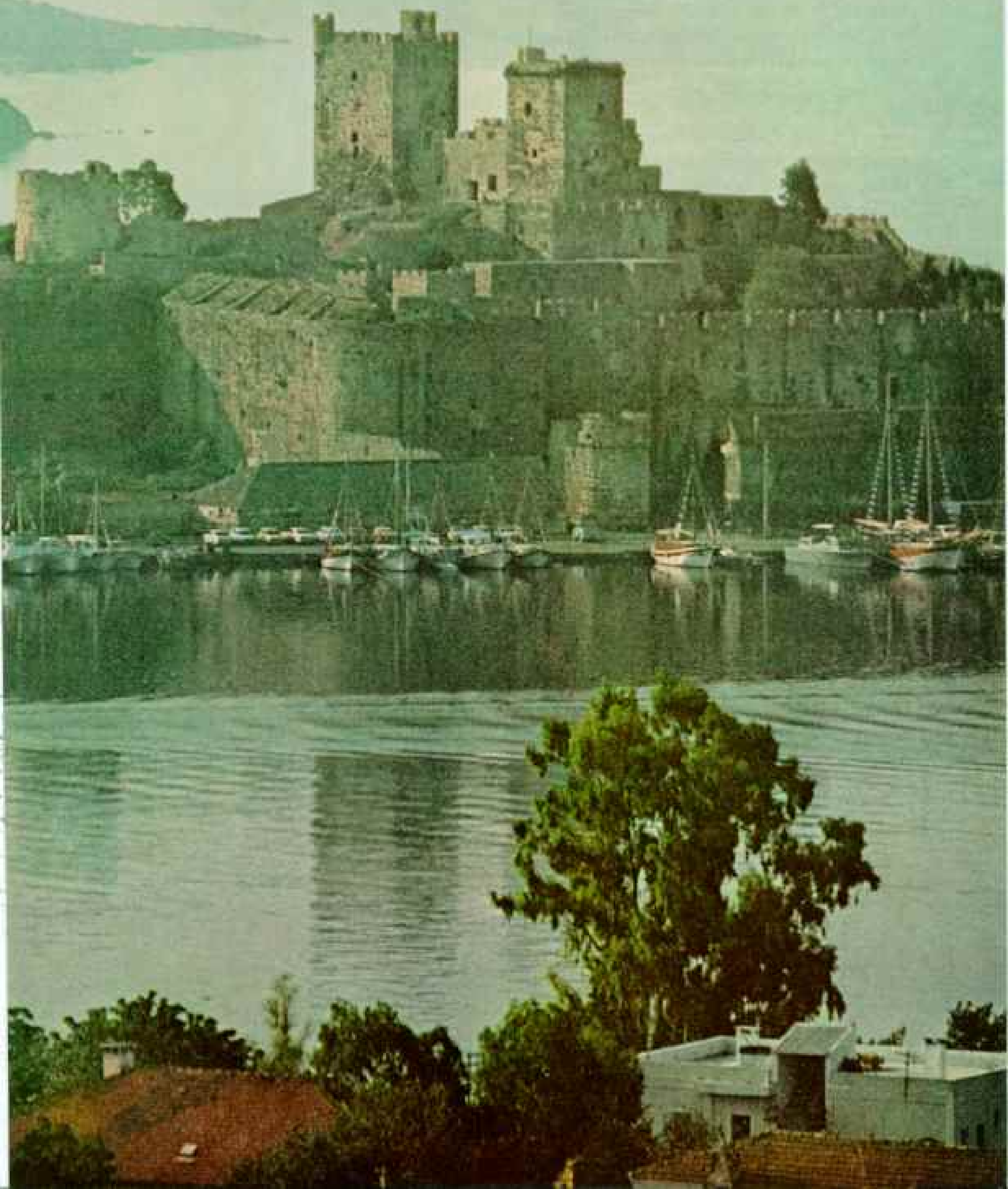
In half a century Turkey had undergone profound changes, throwing off its Oriental cast and moving ever closer to the West. Now it seemed a loner, looking in new directions.

Since 1952 Turkey's 500,000-man army had anchored the North Atlantic Treaty Organization's southeast flank. But a rift had grown with a longtime friend, the United



RAMPARTS DESERTED, a medieval castle  
confronts only sunshine at Bodrum  
along the Aegean's shore. During the  
Crusades such fortifications were built  
as strongholds for Christian knights.

95





States, precipitated by Turkey's 1974 military intervention in Cyprus. The U. S. had cut off arms aid; Turkey suspended operation of bases manned by Americans; NATO's southeast defenses became a question mark. Confidence in the U. S. was badly shaken; relations with the Soviet Union seemed to thaw.

Too, Turkey and Greece were at odds on the Cyprus issue, over air space, and on their respective rights in disputed waters of the Aegean Sea, under which oil may lie. At the national level the country was plagued with high unemployment, inflation, and other problems of an evolving industrial nation.

#### Parade of the Mighty Fills the Past

I own to a special fondness for the Turks. Beneath their reserve I know them to be gracious, generous, hospitable, and sensitive—hypersensitive, at times. They are the creatures of their precarious geographic location, bridging Asia and Europe. It shapes them, sets their mood, and motivates them. If they can be touchy, they have reason.

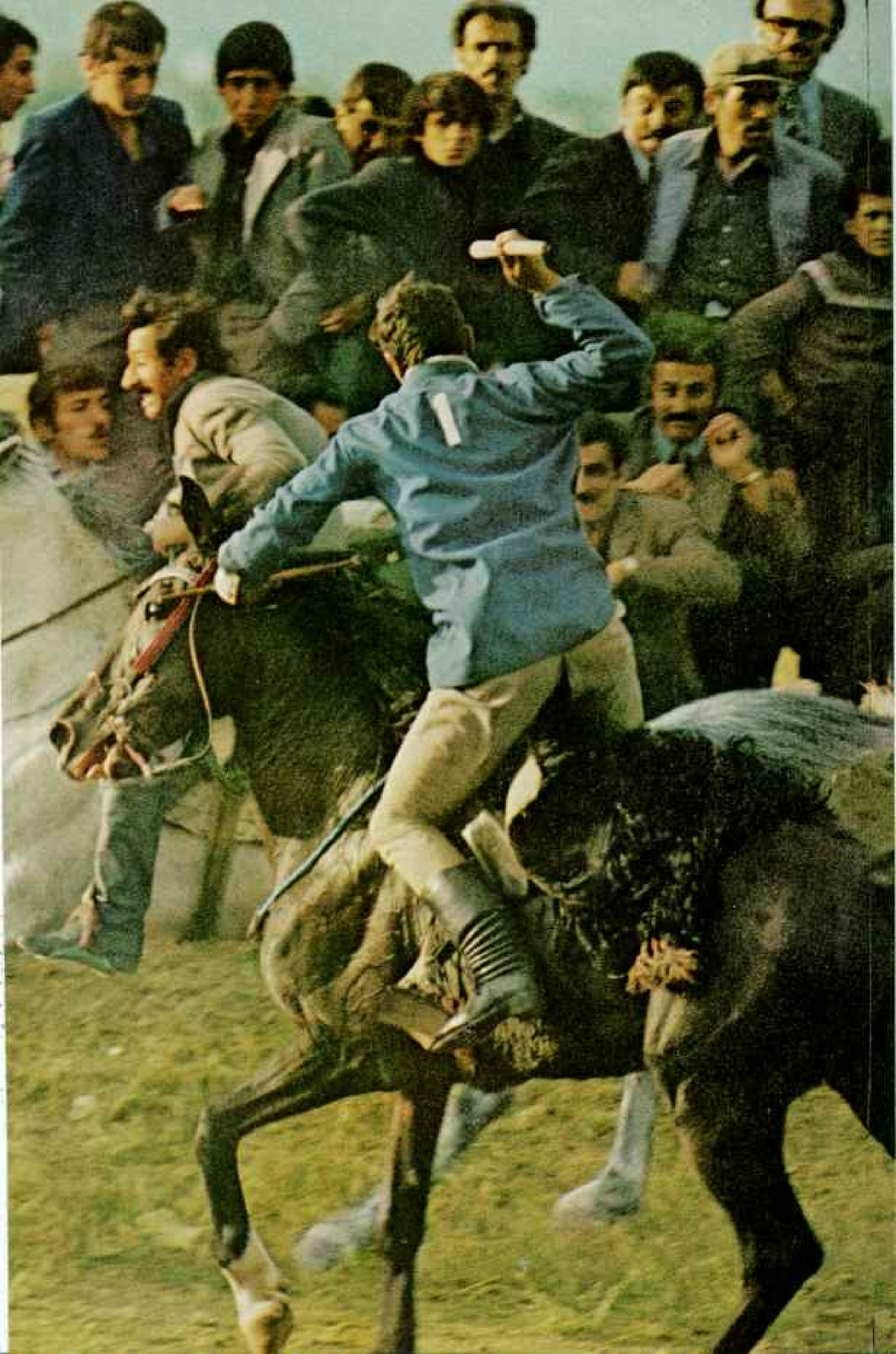
Mighty peoples with magic names have risen, only to fall: Hittites, Phrygians, Lydians, Persians. Alexander the Great imposed the Greek culture; the Roman Empire superimposed its own. Paul and Barnabas spread the Gospel of Christianity; the Byzantine Empire flourished in its turn.

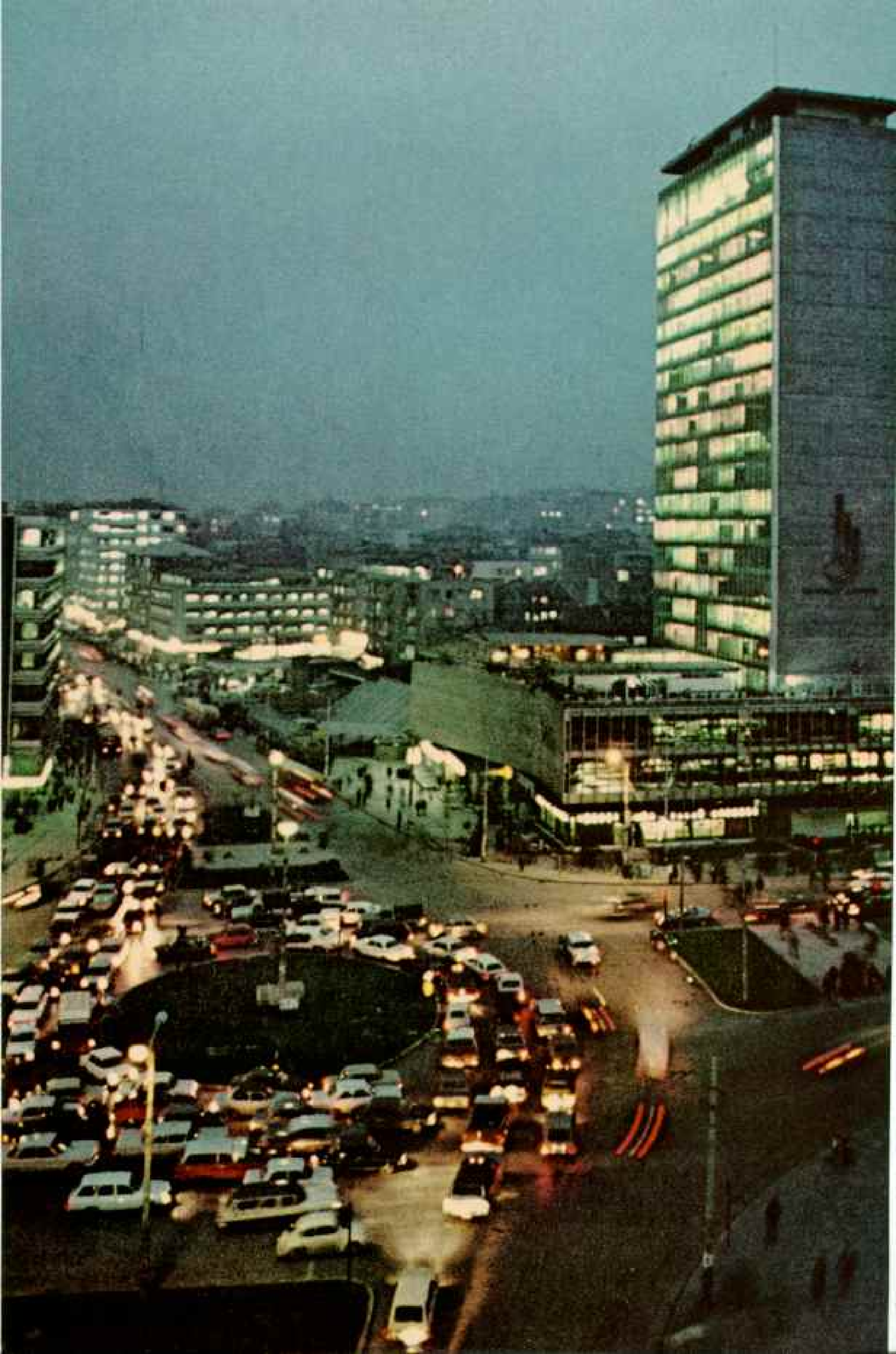
As the 11th century waned, the Seljuk Turks from Central Asia were carving out a huge domain while carrying Islam's banner, battling the Crusaders, losing in 1243 to Mongol invaders. Then arose another tribe, the Ottoman Turks. The Ottoman Empire lasted 600 years; it once extended from the Persian Gulf to Austria, and from the Caspian Sea to Morocco. Decadent and exhausted, it collapsed after World War I, and Turkey assumed its present dimensions.

Celts, Kurds, Greeks, Jews, Armenians—I found the impress (Continued on page 98)

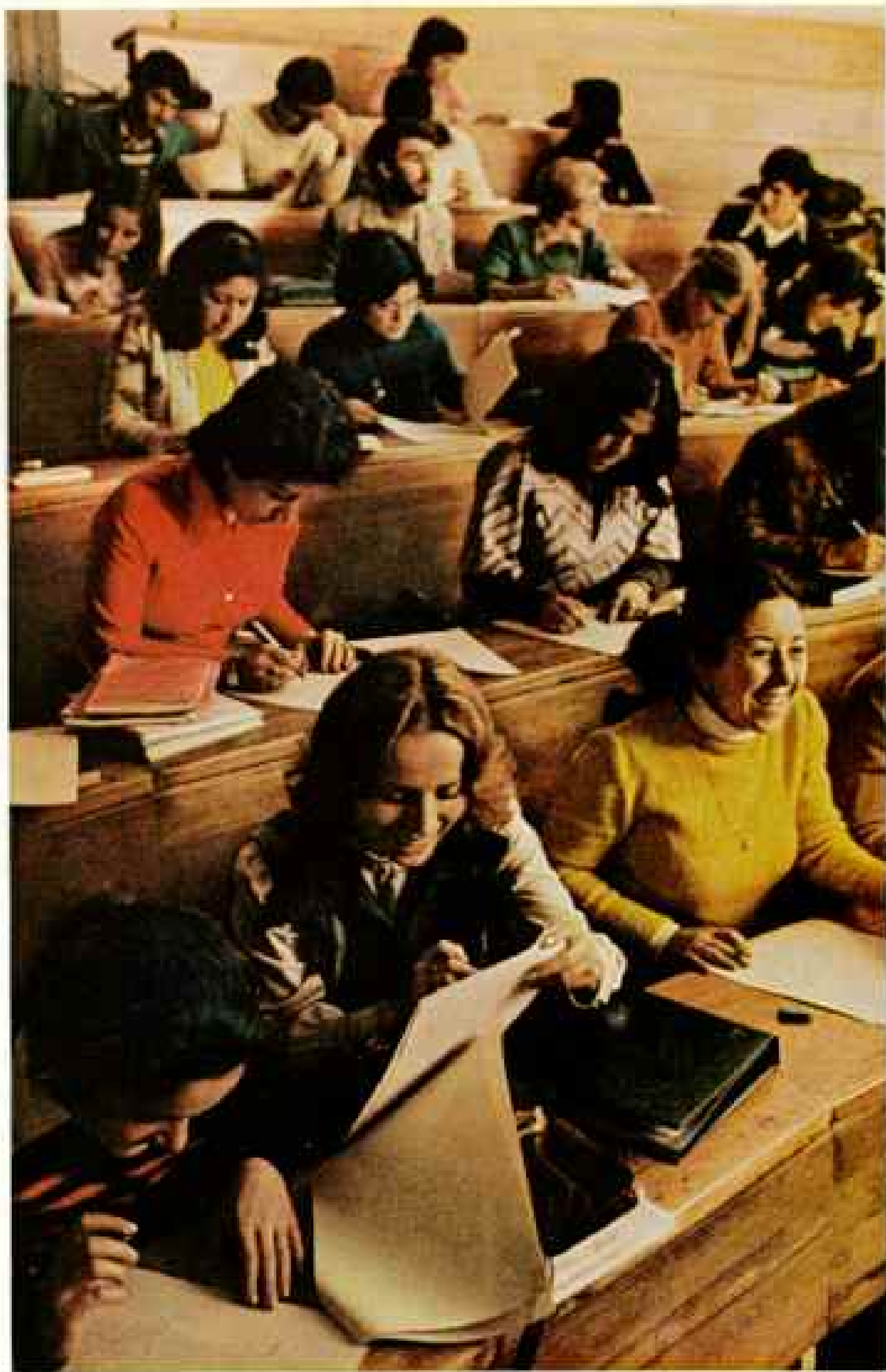
**Joust among friends**, a mock cavalry battle enlists two teams who hurl sticks in place of lances. Called *cirit*, the game was first played some 900 years ago by the seminomadic Seljuk Turks, who had ridden out of Central Asia. Their lessons well learned, they subdued most of the Asian lands of the Byzantine Empire.











Twilight *grand prix*—the thoroughly Western rush hour—gluts the streets of Ankara (left), where minarets stab the skyline beside high rises. A provincial town famous for its Angora wool, or mohair, Ankara became capital of the new republic in 1923. Its central location provided security from Western European powers and from Greek troops who attempted to dismember Turkey following World War I.

Atatürk's dictum that "the road of progress must be trodden by both sexes" seems fulfilled at Ankara's Middle East Technical University (above). So too is the road of turmoil. In both Ankara and Istanbul, men and women students joined in the overthrow of the government in 1960, and left- and right-wing factions continue to battle for power.

of all on this contested peninsula. The Celts, long absorbed, live on in the occasional sight of a freckled face.\* The three million Kurds, Turkey's largest minority group, Muslims all, till the soil and drift with their sheep in remote eastern areas.

Relatively few Greeks, Jews, and Armenians remain; most reside unobtrusively in Istanbul. In an enormous tragedy during World War I, as the Ottoman Empire neared

its end, an estimated million and a half Armenians were killed or dispersed for fear of their collaboration with Russia. Perhaps 70,000 Armenians now live in Turkey.

Modern Turkey—tiny Thrace in Europe, vast Anatolia in Asia, long known as Asia Minor—is the product of the stormy centuries, its people the rich inheritors of many civilizations. The warrior-farmer tradition lingers.

As ever, conflicting forces and ideologies buffet the nation. Islam meets Christianity here. East encounters West. Old bumps into new. The Communist world looms on the north, the Arab world on the south. Cross-currents tug at this global crossroads. One constant prevails: Turkey is for the Turks.

### Campus Politics Spills Into the Streets

But Turks often disagree bitterly on how their country should be run.

I drove one afternoon to Middle East Technical University on Ankara's outskirts. A progressive institution whose courses are taught in English, the international language of science, it was a semester behind schedule.

Most of its 8,600 students range left of center politically; only 10 percent or so are rightists. Each side detests the other, and extremists have asserted their political beliefs in pitched battles. Here, as at other universities, agitators have infiltrated to stir this ugly brew—sometimes into a deadly one.

Throughout Turkey in recent years scores of students have been killed and many more wounded, on campus and off. Demands for a larger voice in university affairs and political disputes on campus have escalated into militant protest against the government. And higher education repeatedly has been shut down by disturbances or class boycotts.

In a sunlit room, surrounded by a handful of fellow undergraduates, a dark-haired girl spoke softly to me in remembered horror of sudden death. It had happened a month earlier. Her friend had been "killed by gun."

"How?"

"They attacked us our buses began leaving from downtown for the university. They fired at us through the windows."

"Who were they?"

"There were many rightists from this university in the group of killers." Her small voice trembled. "The killers are still free."

\*See the May 1977 NATIONAL GEOGRAPHIC.



**Pacified but nervous,** a cloaked boy awaits his turn for the ceremony of circumcision, a rite for every Muslim male.

Although church and state were separated by Atatürk, sentiment grows for greater public expression of Islamic beliefs.

The cause of such agony is clear, if not the cure. As in the United States in the late 1960's, demonstrations by extremist students and urban terrorists reflect national stresses. Turkey is a constitutional parliamentary democracy; its electoral system results in numerous antagonistic political parties, making it virtually impossible to form a strong one-party government. An ineffectual coalition, centered around one of the major parties, governs at a time when the republic's role in the world has never been more important.

National elections, originally scheduled for next October, were pushed ahead to June. From the continuing turmoil, some foresaw intervention by the army; it happened as recently as 1971, when the military forced the resignation of the prime minister, and a new government was formed.

I visited the university's president, Professor Dr. Ilgaz Alyanak. He spoke candidly. "Many students feel," he said, "that the problems of the country come first, that it does not matter if they lose a semester or a year if they can improve Turkey by their demonstrations."

#### Economic Surge Has Its Problems

The search for improvement takes better forms. As I traveled, I talked with young teachers carrying education to remote villages. I saw a steel mill go into production here, a dam rise there. Factories were expanding, exports booming, new hotels poking into the sky. The under secretary for tourism told me of ambitious projects, including a string of restored caravansaries for visitors through Anatolia. A multibillion-dollar highway for international trucking is to be built along an ancient silk route across the land.

An economist summed all this up with a tidy statistic. The gross national product grew about 35 percent from 1971 through 1975, he said. That was impressive growth among the nations of the Common Market, of which Turkey is an associate member.

Expansion has had its woes, however. The population is increasing 2.4 percent a year. Annual per capita income totals less than \$1,000, and inflation is eating into this at a rate of more than 20 percent. At least 13 percent of the labor force is jobless; perhaps 700,000 Turks are working in distant European countries, particularly in West Germany. Many people still cannot read or write.

"As long as the peasant is not master of the country," said the man who would become Father of the Turks, "there can be no real progress in Turkey." One brisk morning I headed out from Ankara to meet the country's master, if master he was.

Turkey's economy remains largely agricultural, and almost two-thirds of its 41 million people are rooted in the soil. They live in the primitive stone or mud-brick villages of their forebears. Though tractors find increasing use, many men and women still walk behind the plow and harvest by hand. Between harvesting and planting, little work turns up. For children in remote areas, education is often nonexistent, but Turkey is sending more and more teachers into the countryside.

#### Crossing Paths With Abraham

Pointing my rented car southeast, I soon traveled nearly 4,000 years backward in time. I followed a trade route that in another age linked the rugged Anatolian plateau with Mesopotamia. Across a treeless, sun-scoured plain my car brought me to Harran, a village near the Syrian border.

From here, the Old Testament says, departed the wayfarer who would become known forever as Abraham, the Friend of God: Abraham who would symbolize God's covenant with man.\* The concept of a single almighty Divinity would serve as the foundation rock of Judaism, Christianity, and Islam. Now almost half the world holds dear the simple and sublime faith that drove Abraham.

The track I rode ran out at Harran, and emptiness unrolled to the far meeting of earth and sky. Two thousand years before Christ, Harran had been a thriving caravan crossroads. As I looked about, it occurred to me that Abraham might still feel at home:

... Weatherworn shepherds lean on their staffs, keeping the ageless vigil. Women with averted faces gather at the well; they watch, but seem not to. Grinning boys fit stones to slings and practice marksmanship. Stone-and-mud beehive houses such as Abraham may have known cluster in ranks (pages 108-109)—in this wood-scarce region, only a man of wealth can have a roof with beams.

I pulled up at the town hall. "You are welcome," declared Harran's administrator, a

\*Kenneth MacLeish followed the path of Abraham in the December 1966 GEOGRAPHIC.



personable anachronism named Ekrem Özyavuz. He greeted me beside his shining Renault sedan, a 20th-century man in sport shirt and jacket, puffing on an English cigarette.

An aide wearing a head scarf and long gown—the Arab world lay just beyond us—poured perfumed water on my hands, a courtesy. I rubbed it on my face, completing the ritual. Tea was served in tulip-shaped glasses. We took our ease in the carpeted hall; Atatürk gazed sternly down on us from every wall, as he does from walls throughout the land.

"My people do not change," Mr. Özyavuz,

45, said. "They are quiet, like lambs. For them there are no jobs, only agriculture. If we could get a factory, there would be work for all. Ankara does send people at times to ask about our problems. But it seems to me that the government is mostly fighting with itself and forgetting us."

The townspeople, he went on, had elected him since 1962. A wealthy man by Harran's standards, he was proud. "My grandfathers for twenty generations have been born in Harran. They all lived"—his fingers arched in a cone—"in the old-style houses. My house has a beamed roof, a telephone, and the only electricity in town. Come."

I followed him into a sparsely furnished room whose central feature was a small generator made in Japan. He started it with a flourish. Overhead a naked light bulb suddenly glowed fitfully.

"Soon we will have television," observed a solemn member of our retinue.

#### Smuggling Is a Way of Life in Kilis

I thanked Mr. Özyavuz and departed, wondering what Abraham would make of TV, or, for that matter, the dust-spewing motorcycle, ridden by a couple of jaunty Turks in flowing robes, that led me out of Biblical Harran. My destination was a city overflowing with illegal worldly goods: Kilis, a smugglers' marketplace bordering Syria.

Back into the 20th century my car sped, past groves of olive and pistachio trees, green fields and vineyards, past sheep and goats wearing necklaces of blue beads to ward off the evil eye. Along the way I was startled to see a peasant woman riding the family donkey while her husband walked, reversing the usual order in this land of male dominance.

"Yes," I said, "times are changing."

My interpreter disagreed politely. He said, "Perhaps she is not well."

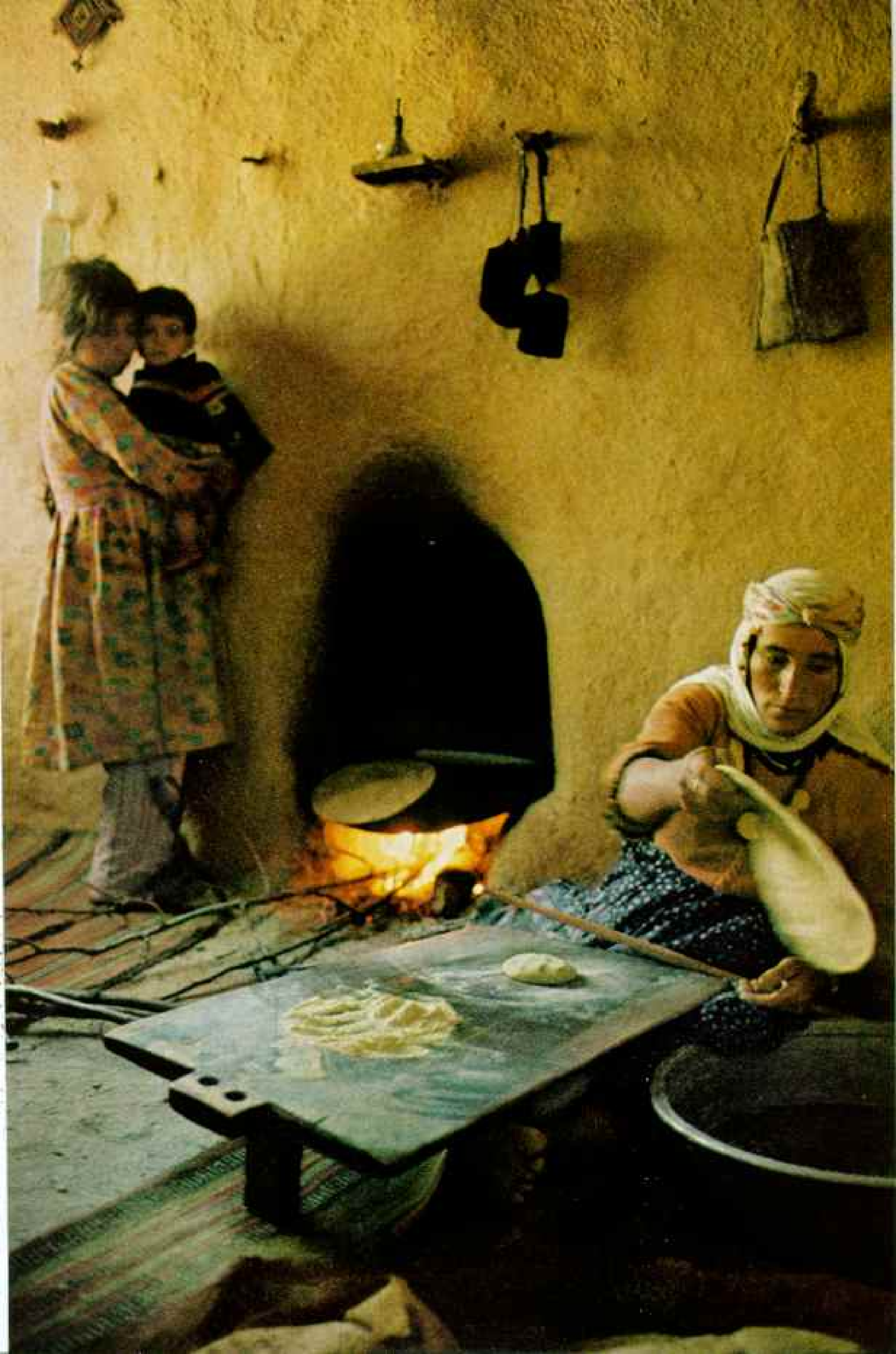
At Kilis I poked through a bazaar crammed with goods that normally are hard to find because of Turkey's high customs duties. Demand creates black markets in the cities, and merchants flock here to replenish their shelves. While police look the other way, the shopkeepers sell Japanese watches, French perfumes, transistor radios, glassware, woolens, bathing suits, blue jeans.

Smugglers pursue a high-risk, high-reward profession. Turkish Army patrols maintain



Showing off their prize kid, two girls near Gaziantep (above) inherit a life still largely bound to land and flocks.

Traditionalists who bake flat bread in clay ovens, Kurds (right) comprise the largest ethnic minority in Turkey. They have no country to call their own, and live divided by Middle Eastern borders.





**METERLESS, MOTORLESS TAXI**  
*glides through the frozen streets  
of a village near Ağrı, close to  
the Soviet and Iranian frontiers.  
Although the birthrate has risen  
sharply in eastern Turkey, the  
high terrain with frigid winters  
remains sparsely populated  
and little modernized.*





constant vigilance, and shoot to kill. Minefields parallel the border at strategic points.

I moved on to Barak, a community not far east. Taking the warm sun outside a coffeehouse, jobless men talked of smuggling. One casually estimated that a tenth of the population had been maimed by exploding mines. He inclined his head toward a road where watchtowers rose darkly and Turkish sentries carrying automatic rifles were limned against barbed wire.

### Minefield Crossing Poses 7 to 3 Odds

A little later I walked that way a mile or so, escorted by Şükri Yıldız, 21, a soldier, slim and taciturn. When I stepped from the muddy track we were hiking into the flowery meadow beside it, he motioned me back furiously. "*Mayınlar!*—mines!"

The minefield, he said, was two hundred yards wide. I asked why people risked death to cross it.

"They drive sheep into Syria," he replied. "Here a sheep brings 500 liras [U. S. \$30]. There it is worth twice as much. With such a profit they buy and smuggle in the goods you saw in Kilis."

"What are the odds?"

"Seven times out of ten they are successful." He watched me impassively. "Three times out of ten they are killed." His face seemed to soften. "They shoot back, but not at us. In the air. They know we are only doing our duty."

It came to me that soldiers had done their duty here long before now. Turkey is a necropolis of civilizations, and often—as at fabled Troy, near the western entrance to the Dardanelles—they rest one atop the other. Where we walked, archeologists had unearthed Arab huts, then Armenian structures, then Byzantine ruins, a Roman fort, Greek works, an Assyrian fortification.

At the next level they uncovered the richly carved remains of imperial Carchemish, an important Hittite bastion a thousand years and more before Christ. In 605 B.C., Pharaoh the Lame, King of Egypt, lay encamped

here beside the River Euphrates. And here Nebuchadnezzar of Babylon, soon to be king, fell on him, bringing "slaughter in the north country," according to ancient Aramaic texts.

If you come to this place now, on a mild day in early spring, it tells you its own melancholy story. Anemones nod among the tumbled building blocks of antiquity, and pale daisies dance on the horrid greensward where a mere footstep may abrogate your contract with life. The prattle of children tending cattle on a hillside rides gently to your ear. "They know about the minefield," the soldier reassures you. Scarcely a sling's throw away, the Euphrates glints in its timeless hurry down the valley of Mesopotamia.

### Turn of the Seasons Sets Rural Tempo

Months mean little in the Turkey beyond the cities; only seasons matter. Spring has done its work in the south with the end of March and is advancing north across the mountain-rimmed high plains. As you drive into the heartland, patches of snow are shrinking on the hillsides, and streams run high with melt. Old men are pruning the vineyards; skeletal apple and apricot orchards show a tinge of promise. A horse, an ox, a mule, perhaps a machine pulls the plow; in its wake, women scatter ammonia fertilizer on the poor soil and bend low to plant potatoes and onion sets.

In the countryside, once the crops are in, there is time to spare. Even clocks are of little consequence. Five times in 24 hours—at dawn, midday, midafternoon, sunset, and nightfall—the muezzin ascends the minaret and calls the faithful to prayer, often assisted by loudspeakers, and so marks the round of day and night.

One listens, and recalls Atatürk's efforts to curb Islam's role in daily affairs. A Westerner wandering in the hinterland today soon perceives that Islamic conservatism remains strong; it grows stronger every day, some Turks claim, in the old fatalism and hostility to change, putting a brake on progress.

**It's still a man's world** in Turkey's coffeehouses. In Konya, members of a hunting club enjoy water pipes and friendly refuge. An oasis on the sere Anatolian steppe, Konya was capital of the Seljuk Turks and, in the 13th century, saw the rise of whirling dervishes. Such mystical Islamic brotherhoods were ordered abolished in 1925 during the reforms to reduce Muslim influences on the life of the nation.





I myself wondered many times how it could be otherwise, quite vividly the morning after my arrival in the pious little central Anatolian city of Nevşehir. Ululating cries from 29 minarets keep time here. I have heard no pealing of bells in the great cathedrals of the West to match the commanding summons that rends Nevşehir's stillness at first light.

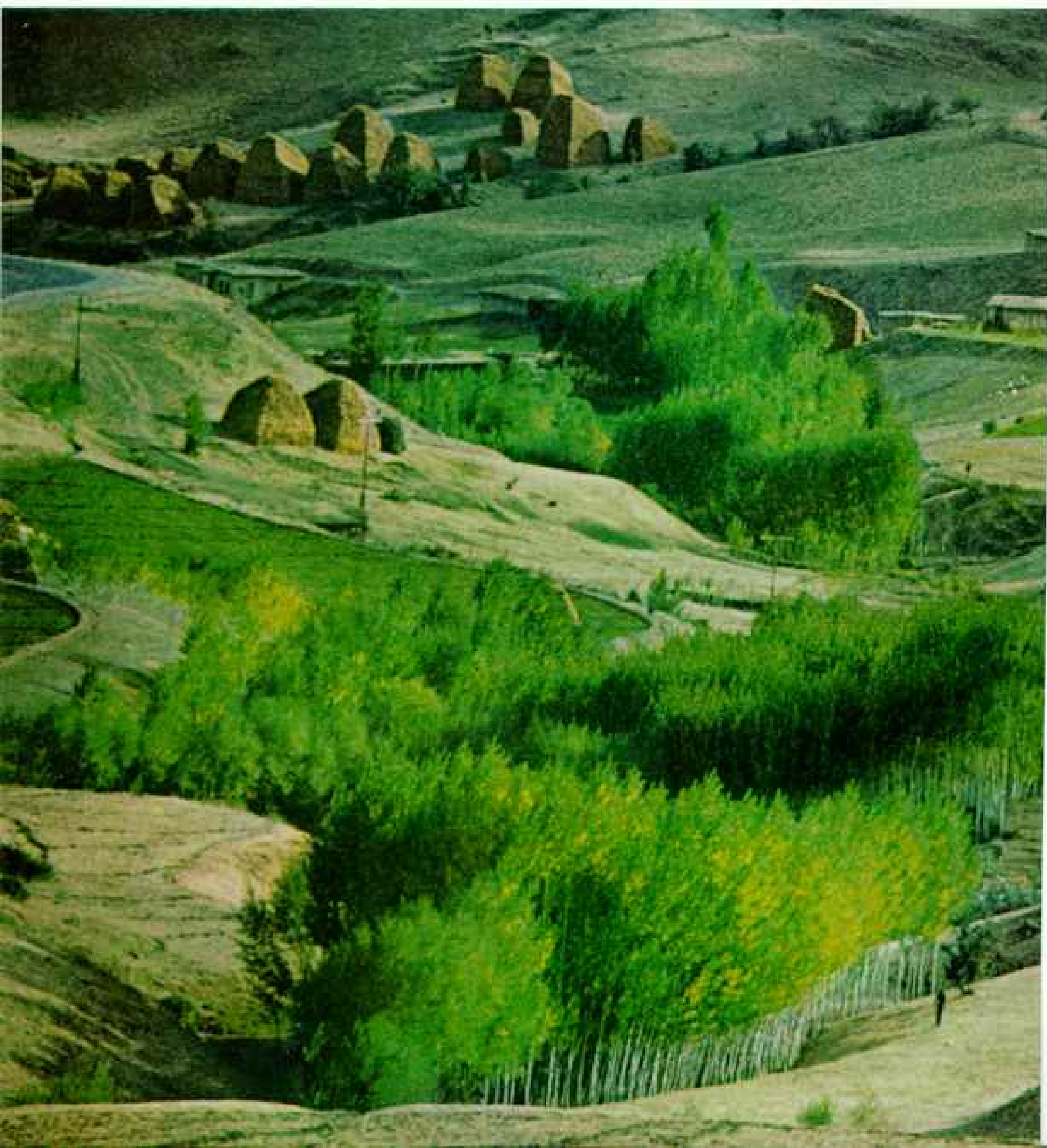
Thoroughly awake and humble, I headed east through the eerie lunar world of Cappadocia, where nature and religion, and fear

of slashing scimitars, cohabited for centuries.

In another time, erupting volcanoes buried part of this region deep in soft, porous rock. Wind and water eroded the landscape into pastel cliffs and terraces, giant pinnacles and toadstools. Early Christians carved churches and dwellings into the easily worked rock, adorning the sanctuaries with paintings depicting scenes from the life of Christ.

The Christians and their descendants are gone—in Turkey, around 99 percent of the

**Hordes of haystacks** cluster in a pastoral valley of the Anatolian plateau, where cereals predominate among crops. With great diversity in climate and terrain,



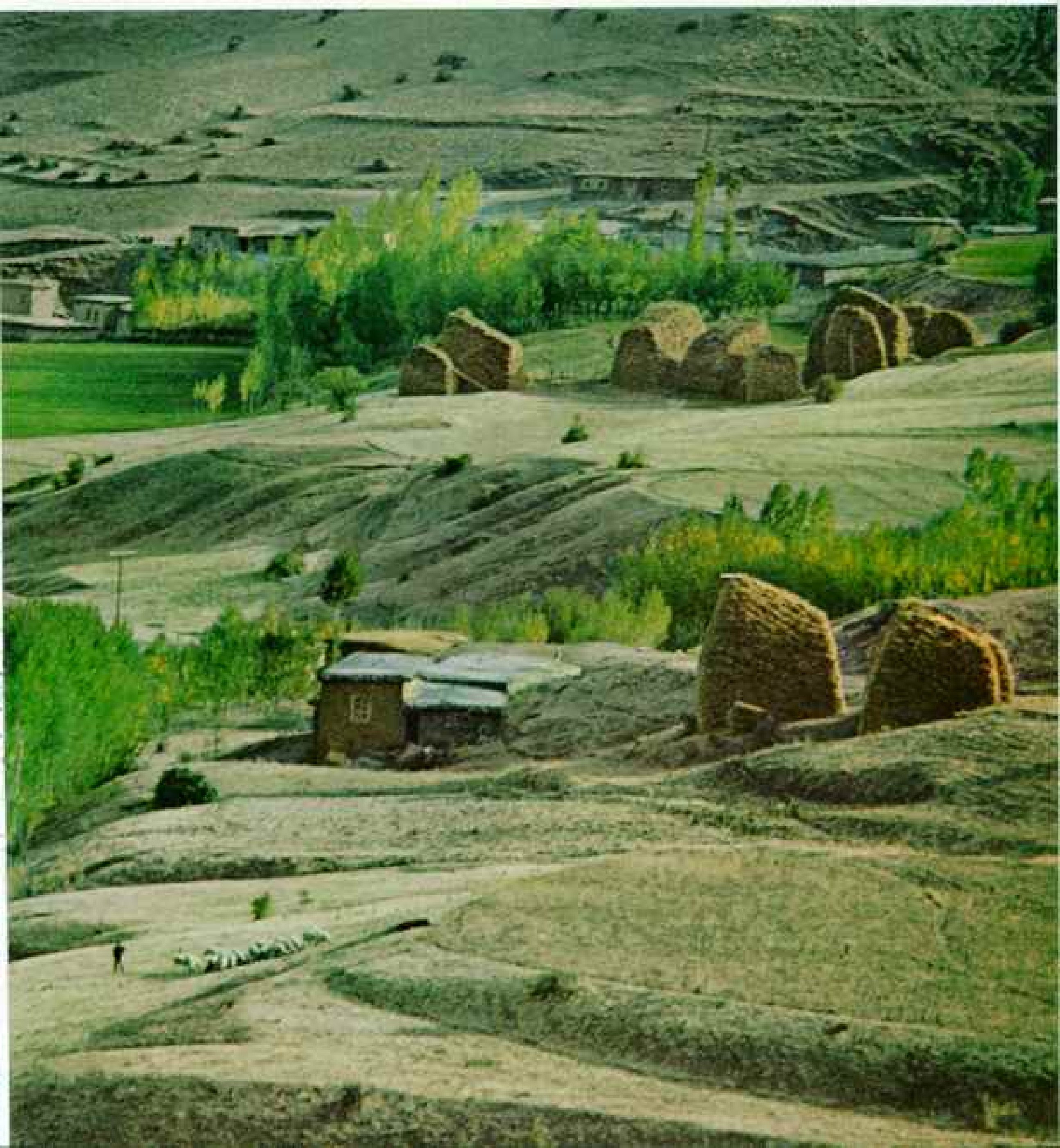
population prays to Allah. The hand-hewn churches remain, I saw, as do the paintings in various degrees of preservation. Here and there, peasants live in the old cave dwellings. They store wheat, apricots, and raisins in some rooms and keep livestock and chickens in others. I have seen a winery carved into living rock, and a hotel.

And the ancient fear? I vow that I felt it still, though the invading legions that inspired it vanished long centuries ago. To escape

Arab marauders and other invaders, people tunneled deep into the earth, sealing the entrances behind them with huge stones. In their zeal they dug several underground cities, which have survived to this day. You can detect no sign of them from the surface.

I explored the grim labyrinthine ways of one city as deep as possible, and had enough. Down seven stories I descended in chill air, thankful for the sullen lights that guided my steps and pushed back the darkness of

Turkey is suited to a wide variety of agriculture. Intensive efforts to improve livestock and crop yields are designed to increase a profitable export trade.

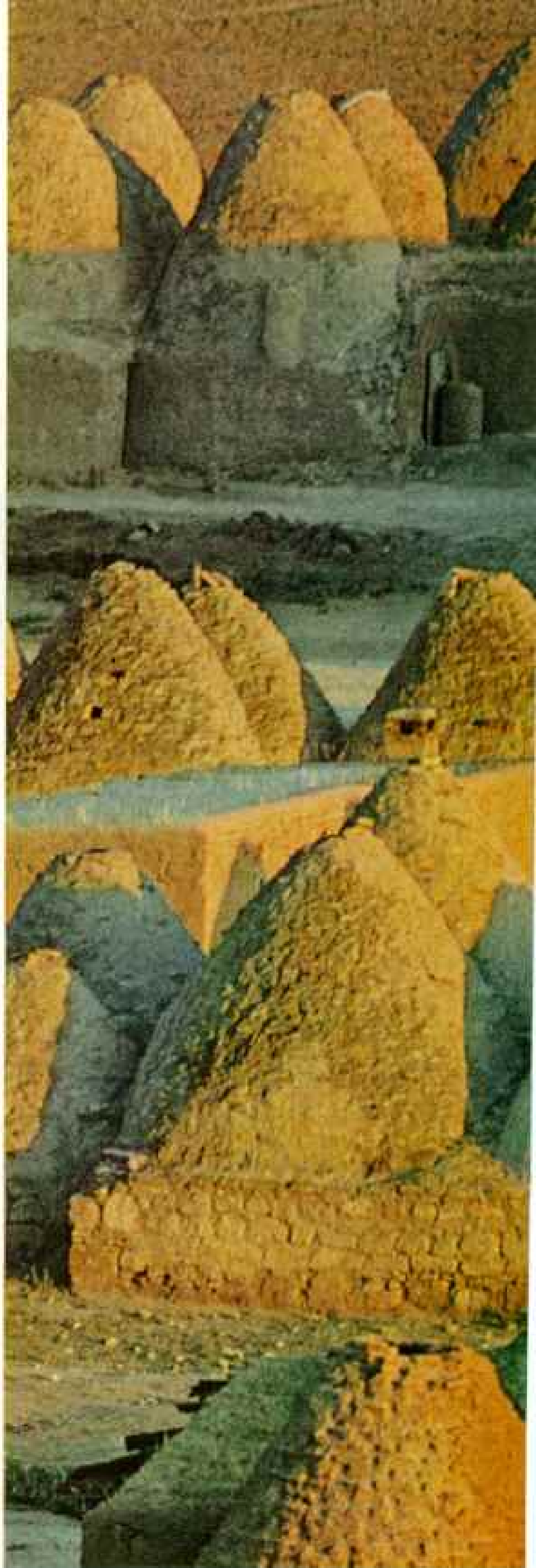




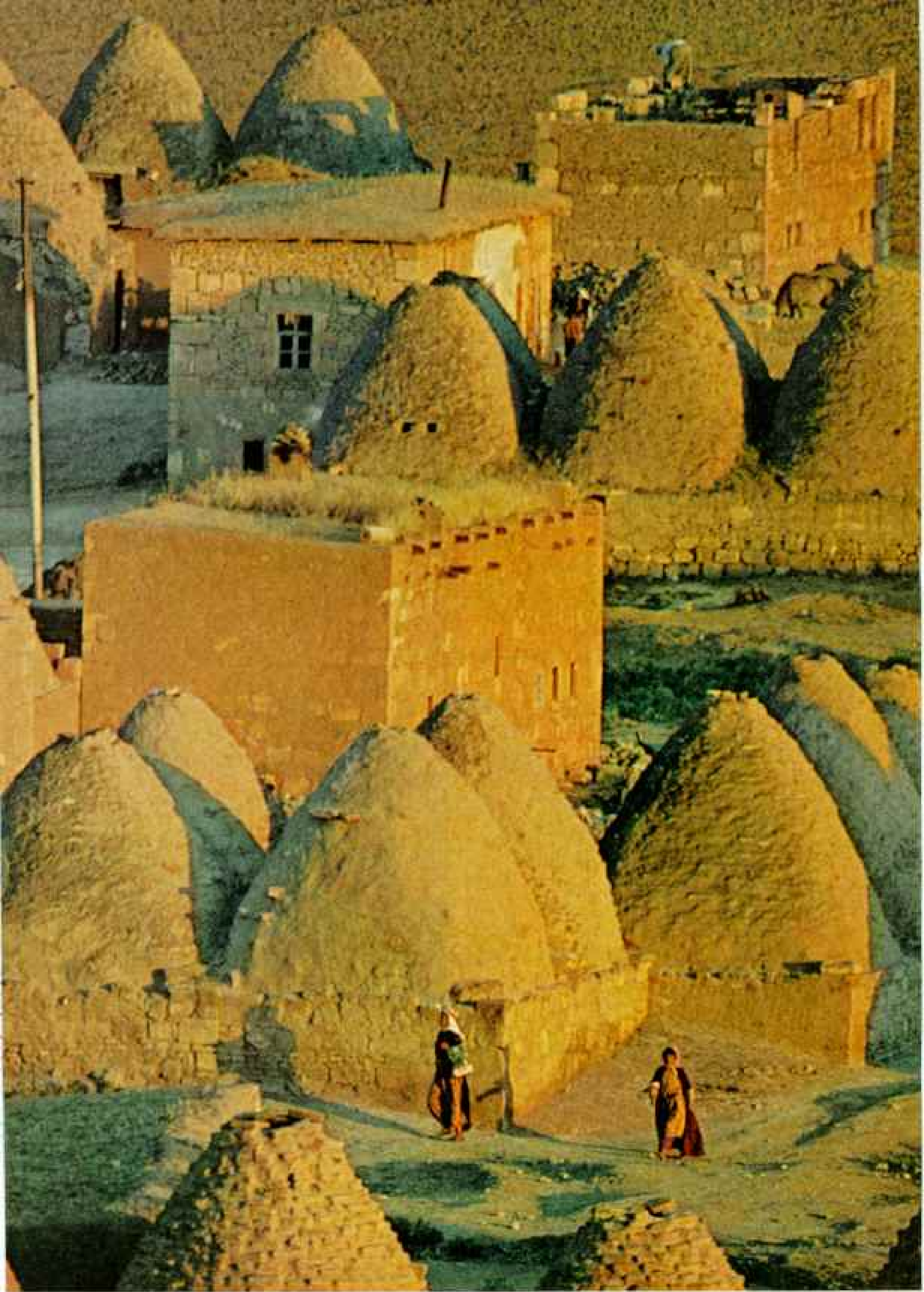
**Vault of faith and victory**, the nave of a Byzantine church (above) was carved from the soft rock of the eroded Cappadocian landscape near Çavuşin. The church commemorates the visit of Emperor Nicephorus Phocas, who in the tenth century rolled back the frontiers of Islam.

**Promise of a great nation** was given to Abraham during his sojourn in Harran (right), in southeastern Turkey. The Lord commanded him to journey from here to Canaan to become the chosen patriarch.

The distinctive igloo-like buildings, little changed from Abraham's time, derive from a scarcity of wood; builders use mud bricks without internal support.







countless rough rooms where thousands had sought security. But I felt no reassurance here. Beyond every shadowy turn waited the ghosts of the burrowers . . . and burnoosed men with curved blades.

Ghosts of far greater antiquity linger in this moonscape terrain, as they do in many places in Turkey. The lovely name of Cappadocia itself conjures up the Assyrian merchants who were doing business here four thousand years ago. *Katpatuka*, they called it.

#### Highway Follows Ancient Caravan Track

A major trade route to the east led across Cappadocia in the old days. Where the camel caravans plodded, a two-lane highway now unfurls. I followed that road through Kayseri—the ancient Roman *Caesarea*, subsequently an outpost of the Byzantine Empire, later a stronghold of the Seljuk Turks, today a textile center known for its fine carpets. I drove on for leisurely hours through mountains and barren plains. Once a vicious sheep dog, all teeth and longing, gave my car a run. He wore a steel-spiked collar, to disabuse the wolf who would go for his throat.

I stopped to slake my thirst at a roadside coffeehouse, haven for the men of a small village. Driven from their plows by rain, farmers in caps and shabby clothes hunched over tables, playing cards, conversing in Kurdish. Mehmet Yanik, a friendly man of 50, obliged my interpreter by using Turkish.

"What does it matter, the rain?" He shrugged. "In the entire year we have but a month or two of work. We are sitting like this the rest of the time. To this part of Turkey the government does not pay enough attention. Only since 1967 have we had a school."

Mehmet Yanik paused, declined to let me pay for our tea, ordered more for both of us, and proffered a plate of raisins.

"I have learned to read and write a little. Our village has no electricity. Water comes from the well. But life was harder for our fathers. They lived in tents." He looked at me thoughtfully, and pride inflected his voice. "I have three wives. How many do you have?"

Though officially prohibited, the Muslim practice of polygyny is not unknown. Neither is a certain ruthless tradition that dies harder than people in some parts of rural Turkey, and we talked of it. Over a land dispute, over an insult to one's honor, a shot rings out in



Waiting out a blizzard, three generations of a Turkish family calmly accept delay of the snowbound train carrying them east toward the Province of A $\text{g}$ ri. Although overland routes through Anatolia had long



been used by caravans, Crusaders, and invaders, not until the establishment of the republic were concerted efforts made to stitch the country together with railroads and highways. These have reduced the isolation of rural areas and stimulated commerce. Yet despite considerable progress, hundreds of thousands of Turks have traveled to industrial centers in Western Europe, where jobs and high wages are easier to find.





The two-faced opium poppy can be made into painkillers such as morphine—or into the stronger, more addictive heroin. Turkish inspectors (left) measure a square meter to estimate the harvest of a given tract. Turkish opium, via the “French connection,” once accounted for much of the illegal heroin smuggled into the United States. Today strict regulations control the poppy crop that supplies pharmaceutical firms.

Vineyard fresh, table grapes picked near Izmir (right) will be rushed by refrigerated truck to the fruit stands of Europe.



the blackness of night, and a man is dead. A blood feud ensues, for sons must avenge their fathers. The vendetta perpetuates itself.

“The families may be neighbors,” said Mustafa Yanık, 40, a grizzled sheep trader and the nephew of Mehmet. “But they do not speak. They look for the opportunity to kill. When you have an enemy like this, life is very dark.”

He had been only 2 years old, he reflected, when his father was killed in such a way. Justice had never been served, because Mustafa could never learn who did the deed. A question occurred to him. “In your country. . . ?”

In my country, I replied, such matters were the business of the police and the courts.

“That is unbelievable,” he said.

#### Wolves Prowl the “Paris of East Turkey”

Some will tell you that Turkey’s outback begins at the city of Malatya. I found Malatya itself a hive of urban civilization, living by cotton textiles, tobacco processing, and agriculture. People were complaining about food prices, traffic problems, sewage disposal, a newspaperman told me. He indicated a page-one story in his journal—*Horizon*—about poor airline service to Ankara and Istanbul: Repair work had closed the civilian airport, and the military field was congested by air-force training.

For my part, the real outback began at gray and graceless Erzurum—the “Paris of East Turkey,” as someone described it with a straight face. Hungry wolves sometimes steal into this city when cold lies on the land, which is half the year. Snow had been gone only a few days when I arrived early in May.

Erzurum serves as headquarters for the Turkish Third Army, which stands over the old invasion routes from the east and guards the border with the U.S.S.R. But I saw more scholars than soldiers—students of Atatürk University, learning to be doctors, dentists, scientists, and specialists in agriculture, literature, and languages.

I enjoyed their company one afternoon in an open-air café; in them lay the hope of Turkey. And I wondered how their hearty humor might seem to the shapeless women in black who scuttled through the street beyond our tables. Women of the ages they were, going about their errands swathed in voluminous folds, faces completely masked as if furtively retreating from life.

I hired a taxi in Erzurum, directing it toward the mountain named Ararat, beside the Soviet Union and Iran, on which many believe Noah’s Ark came to rest. The taxi’s owner, a man of seriousness, asked Allah’s blessing as we headed out, and settled a pistol

in his belt. Seeing my perplexity, he explained firmly, "It is written that the camel should be tethered with care." Woe betide the miscreant who would tamper with that taxicab.

### Trucks Roar Through a Silent Land

A winding two-lane international highway conveyed us over low mountains and through rocky valleys. The Aras River rushed alongside, swollen with runoff, bound for the U.S.S.R. Tractor trailers roared over the road with us, some from as far as Britain, some going all the way to Pakistan. Except for an occasional farmer plowing behind a yoke of oxen, the land was lifeless.

Passing time, my driver discussed the Koran's strictures. Then he inquired, "What is your book of religion?"

The Bible, I answered.

His words were intoned with certitude:

"You will go to hell, because you are not a Muslim. I am sorry to tell you this, but it is my duty to try to convert you."

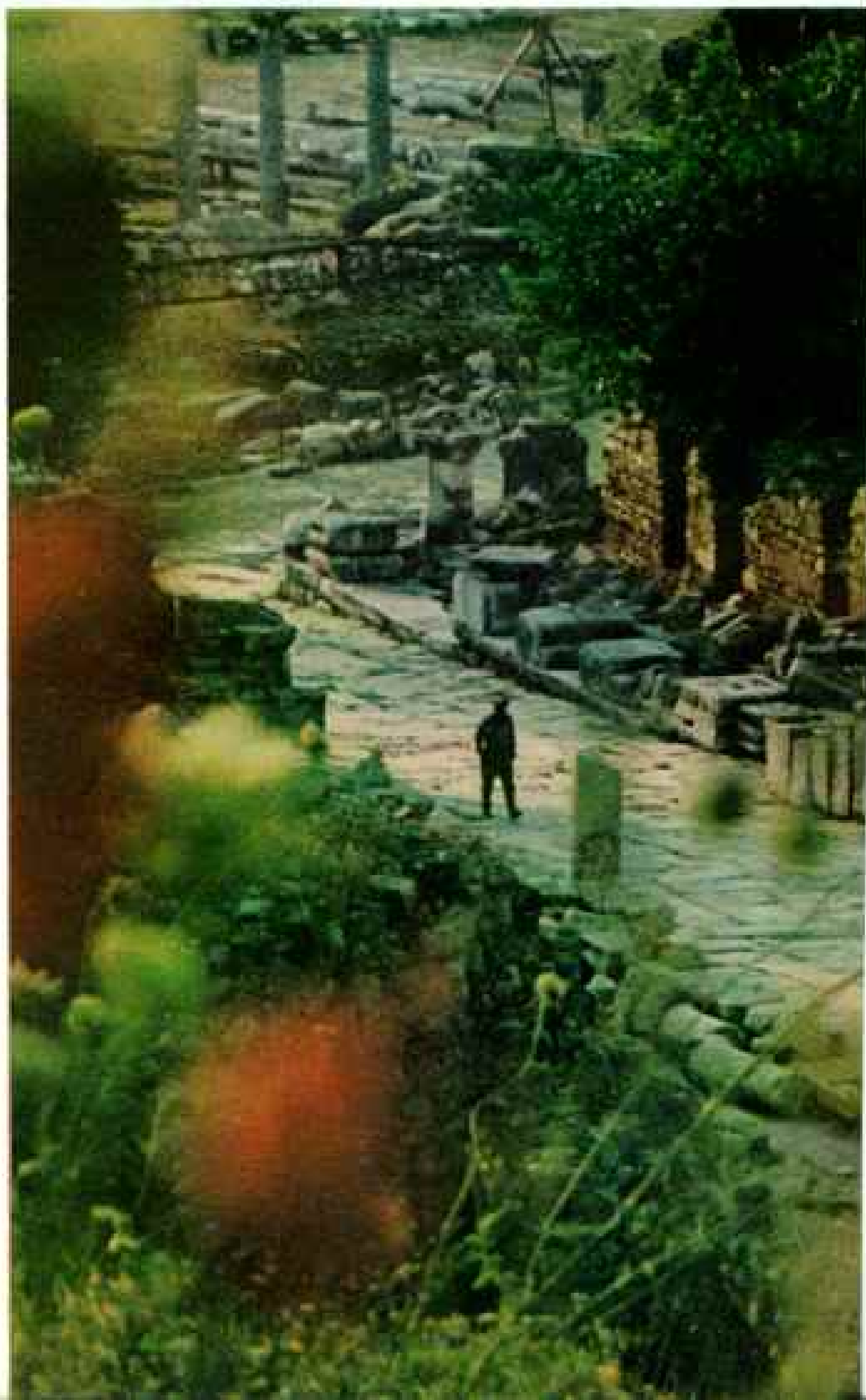
Mount Ararat's message was more appealing. For all its majesty—at nearly 17,000 feet it is Turkey's highest peak (pages 122-3)—it revealed itself almost imperceptibly as we approached. Haze and low clouds cloaked it. Suddenly they lifted, and the snow-covered volcanic cone, long dormant, appeared, dominating the land, elevating the mind.

The traveler who comes thus to Ararat will not take his eyes away as he skirts the massive presence, and he will ask anew: Can it be? Is it so? Does Noah's Ark lie hidden on this perfect mountain, set here millennia ago by the cataclysmic waters of the Old Testament Flood? Many will answer yes.

To me, it is a personal thing, to be taken, if taken, on faith. A number of expeditions have



Ancient advertisement in stone (above) solicited clients for a brothel in Roman Ephesus. A major port on the Aegean for centuries, Ephesus was governed in turn by Ionians, Lydians, Persians, and Greeks before Romans constructed marble streets (right). The city reached its height in the second century A.D. as the capital of the Roman Province of Asia. Earlier the Apostle Paul preached in Ephesus, and legend brings John and the mother of Jesus here, a tradition recalled by an annual pilgrimage to the "House of the Virgin."





searched Ararat's eternal snows. Tantalizing claims have been made, none proved. I find Ararat's message in its mystery. Mystery has its own sustenance.

The Turks, sadly, have immediate and terrible knowledge of cataclysm in this isolated region. The Anatolian Fault, one of the world's most active seismic fractures, extends across the country. Last November an earthquake struck south of Ararat, its epicenter near the northeast shore of Lake Van.

The earth shuddered, and mud-brick villages collapsed; 5,000 died, and thousands more were left homeless in freezing cold. U. S. planes ferried food and supplies, part of an international effort to relieve the suffering. The devastation only added to an old and cruel story. The year before, a quake had taken 2,300 lives. There had been others. The worst, in 1939, claimed 30,000.

When my time came to leave eastern Turkey, I traded gladly for the west, a gentler realm caressed by the waters of the Mediterranean and Aegean. Nature smiles, as much as nature can, on humankind along these coasts, and the warm earth brings forth bananas and oranges, figs and grapes and olives, rice and nuts, tobacco and cotton.

#### To the Earliest Days of Christendom

I journeyed never far from the sea all the way to Istanbul, finding the rub of old and new strong everywhere. At Antakya, ancient Antioch, I lingered in a dark and dreary cave where, legend says, Peter spread the faith from A.D. 29-40. Accept this as truth, and you perhaps stand in the first Christian church. A short drive distant at Iskenderun, once Alexandretta, loomed the sprawling complex of Turkey's third and newest steel mill—





built with Soviet technical help and money.

Adana, the country's fourth largest city, was making no pretensions. I found it dusty and full of sound and motion, as befits a prosperous cotton and textile center. In front of my hotel an old shoeshine man flashed the Turkish spirit as he cleaned my boots with the vigor of a blacksmith.

I aroused him by suggesting that a dab of mud still remained. Slowly his eyes rose to mine, and held, and Whitebeard spoke:

"If this is an art, I am a very good artist. I am the best shoeshine man in Adana. My wallet is always full. Say nothing to me of my work. When I finish, I will rub a white paper on your shoes. If the paper shows black, I will not charge you."

It was a magnificent shine.

#### Visitors Included Cleopatra and Friend

I took the road to Tarsus in a pandemonium of traffic; only the placid camels folded beside the road showed any sense. And Tarsus was another strident city, an agricultural and industrial hub, with faint memory of glory it had known. What a spectacle it must have been when Cleopatra, Queen of Egypt, arrived here to meet Marc Antony of Rome.

"She came sailing up the river Cydnus," writes Plutarch, "in a barge with gilded stern and outspread sails of purple, while oars of silver beat time to the music of flutes and fifes and harps. She herself lay under a canopy of cloth of gold, dressed as Venus. . . ."

Except for a few Roman ruins, there was nothing to resurrect this resplendent pageant. The Cydnus had vanished, diverted to a new channel. Time had even swallowed the city where St. Paul was born, though he might recognize a nondescript well that bears his name. My guide sent history's rich image shimmering when he noticed a prickly cactus plant. "We call it *kaynana-dili*," he volunteered, "tongue of mother-in-law."

All along Turkey's lovely coast one reads

the record of civilizations in their monuments. The old port city of Side thrilled me with its spreading profusion of Greco-Roman and Byzantine works—temples, baths, basilicas, excellently excavated. High over all rose the theater, where gladiators once fought before howling mobs of 15,000.

#### City's Woes: From Here to Antiquity

Side was wicked in those days—haven for pirates and dealer in slaves. Its niceties included running water, carried from distant mountains by an aqueduct that still stands. Neither water nor anything else availed 1,100 years ago when earthquakes and Arab raids reduced Side to ashes and rubble.

Now a village lives among the ruins, and running water recently was restored via the pipes of our civilization. Sipping tea in the square, I watched tour buses come and go, suffered snarling beer trucks, and left before the din of *diskos* made the soft night hideous. And left thinking that Side is marvelous, and damned again by our times.

Still, there is much to salute along these shores. Kuşadası, a friendliness of alabaster dwellings on a curving hillside above the blue Aegean, beckons the traveler, and good rest awaits at a hotel named Kismet. Nearby, the marble grandeur of ancient Ephesus sets the heart to singing, as perhaps it had for Paul, who preached in this city that called itself "first and greatest metropolis of Asia." Has a more beautiful city existed?

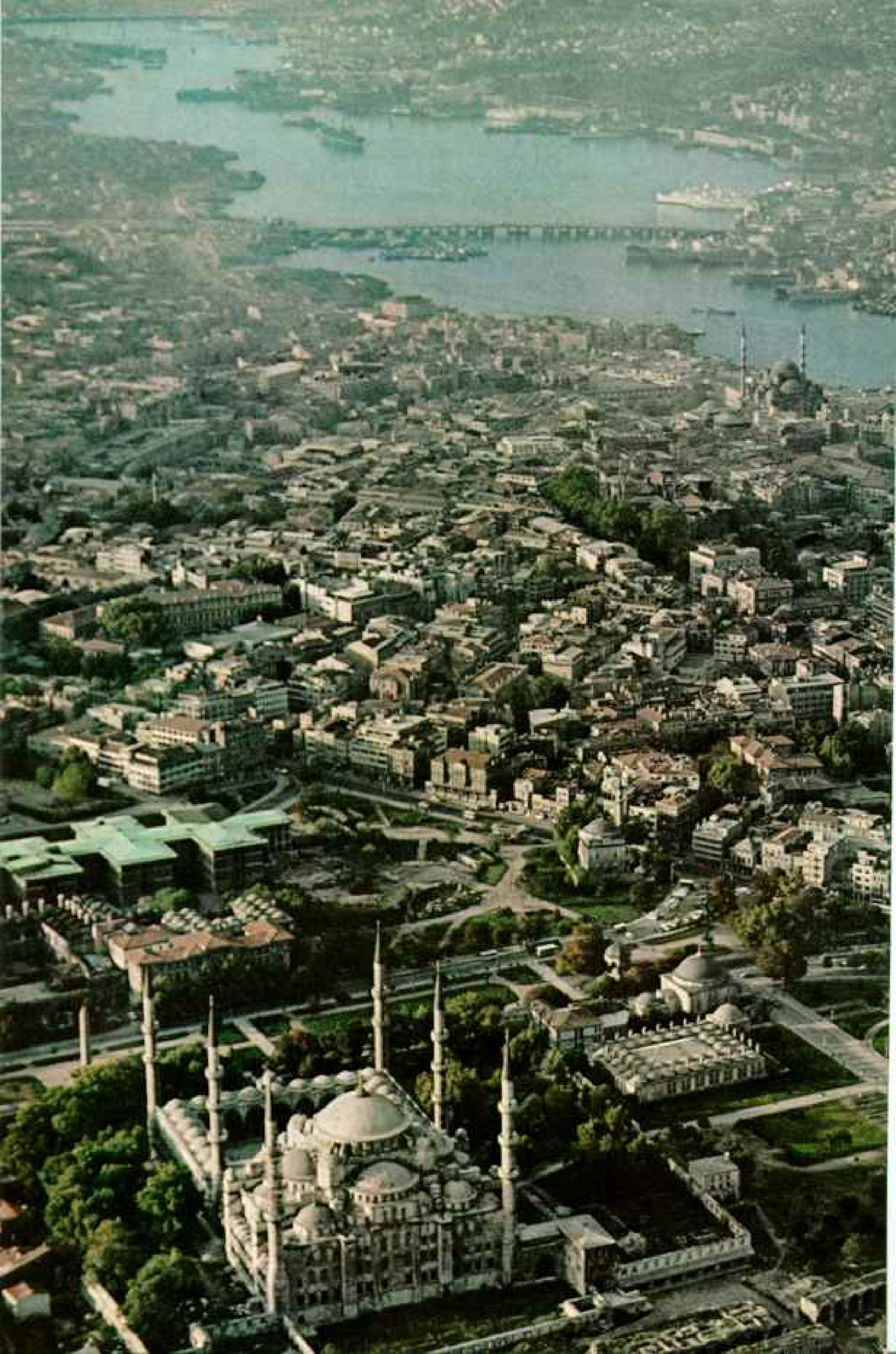
In today's world I could nominate one—but only as it revealed itself in the lifting mist of dawn. When at last I came up to Istanbul, magic rays shone down the slopes and hollows of the sleeping metropolis to weave an ethereal tapestry of the communion of man.

It was good, I soon concluded, that Istanbul had this brief moment of peace. With full light it erupted into the most chaotic vitality of any city I have known. Other cities also are great ports, financial centers, traders,

**Life is a cabaret** for a table-wandering musician in Istanbul (left). Famed as a city of intrigue and mystery, Istanbul must now decipher more prosaic municipal complexities—soaring population, strangling traffic, and housing shortages.

**A tale of two continents** is written in both the architecture and geography of Istanbul (following pages). The Blue Mosque, left foreground, and Hagia Sofia, right, rise near the Golden Horn—an inlet of the Bosphorus, the strait between Europe and Asia. ►











Ferocious reputation that the Turkish soldier has earned over centuries shows as quiet confidence in the faces of a young tank crewman on NATO maneuvers (left) and a parading veteran of Atatürk's day (right).

Spearhead of the Ottoman Empire, elite troops called Janissaries were boys and young men forcibly recruited from Christian minorities. Converted to Islam and rigorously trained, they achieved great military prowess and domestic power, even overthrowing various sultans. The modern Turkish Army has also intervened in politics, but in the name of preserving democracy.

manufacturers. None goes about the pursuit of happiness with Istanbul's commotion.\*

All Turkey comes together here, where the Bosphorus divides Europe and Asia. Smartly dressed men and women throng the modern hotels and restaurants of European Istanbul—while a few blocks away, folk music swells in a shantytown where peasant women in pantaloons sit at their doors peeling potatoes. On a Saturday morning in the old section, shoppers pack the tiny streets leading to the 500-year-old Covered Bazaar so tightly that movement can halt. Inside the vast mall 4,000 merchants will, to a man, gladly show you their wares—over tea if you like. Prices are negotiable.

Equally enterprising are Istanbul's cabdrivers. Imprisoned in traffic snarls, I cringed as they sounded their skull-splitting horns. I wondered how those instruments produced such compelling noise.

In a one-room shop on a back street—an establishment dealing only in horns—the simple answer was eagerly disclosed. The horn wire is removed and replaced with one twice as large, to carry a much stronger impulse. For supreme satisfaction it may be hooked directly from the battery to the horn.

Beneath photographs of pleased cabdrivers from as far away as Ankara, I asked the chief mechanic why Istanbul, most plangent of places, needed his particular services. He smiled. "Many people don't understand a low voice," he replied.

With such ingenuity, I was puzzled that the city's long-standing shortage of telephones persisted. A Turkish friend sighed. "Everybody wants one," he told me. "I filed my application in 1969. I understand that 1968 applicants now are being taken care of." He paused. "If I *had* to have a phone, I could get it in the black market."

Another problem, my friend went on, was the short supply of potable water. "In my apartment house," he said, "the first floor gets water at 11 a.m. It reaches me on the fourth floor about 1:30 p.m. and goes off at 9:30 p.m. We collect it for next morning."

#### Kinship Sensed in a Time of Worship

I roamed Istanbul for days, to learn that knowing the city would take years. Perhaps I came closest to its people on a Friday as they worshiped.

It was an important mosque, not one of the hauntingly beautiful relics that adorn Istanbul but a living, working temple. Long before the call to prayer, the faithful converged on its twin minarets and filled the courtyard, waiting solemnly in their Friday best. A stork stalked grandly among them, and fat pigeons pecked at corn tossed by children.

The call to prayer began, rising and falling over the loudspeakers: "*Allah akbar*—God is most great. . . ." Suppliants touched their foreheads to the ground, facing Mecca. Inside the

\*William S. Ellis reported on Turkey's teeming metropolis in the October 1973 *GEOGRAPHIC*.







Matching ribs with the mountain, a team pulls a carriage before the great massif of Mount Ararat near the Soviet and Iranian borders. According to Genesis, Noah's Ark finally grounded on a range of that name. Numerous expeditions to search for the Ark

mausoleum of the holy man Eyüp, Muhammad's standard-bearer, people stood with palms outstretched, asking the saint's blessing. In return they promised to sacrifice a lamb, a goat, or a cock.

At the place of sacrifice nearby, a father, mother, and son prepared to offer thanks. The son had done well at his examinations, and now they would redeem their pledge. An attendant made a lamb lie down before them. He knelt beside it with an ease that came of long practice. Swiftly he drew the

edge of his knife across the animal's throat.

It remained to butcher and cook the lamb; tomorrow it would be given to the poor.

In Turkey tomorrow always comes. One considers what it might bring. "Admit science and new ideas into your lives," Atatürk had urged his countrymen. On my last day among these indomitable people, some small segment of their future seemed to come clear.

That day I climbed high over Istanbul to visit the lookouts in Bayazit Fire Tower, which since the 1830's has kept continuous



have been made to Turkey's Ararat, at 16,946 feet the country's highest mountain. Although bits of wood and photographs have been offered as evidence of discovery, none have proved conclusive. But, as authorities permit, the search will surely go on.

guard over the far-flung city. The soaring stone tower is valuable beyond calculation; countless fires have been detected from it and the alarm sounded by direct line. Istanbul has no fireboxes, and firemen often reach a blaze while people are still trying to phone them.

The two lookouts considered themselves fortunate men—fulfilled by their responsibilities. One proudly recalled that he had given the word that sent apparatus charging to the city's handsome new cultural center. That was in 1970; unfortunately it was

destroyed, sabotaged by political terrorists.

I bade the lookouts farewell, descended nearly 300 steps faster than I had climbed them, and returned to my hotel. On the way I passed the cultural center. Shiny limousines pulled up to it, depositing dignitaries. It had taken years, but once again the center was handsome and viable—and reopening to all.

A bit of wisdom attributed to Muhammad came to mind: Haste is of the Devil; it is best to take one's time. Turkey progresses slowly but surely. Atatürk would be proud. □



# Fertility Rites and Sorcery in a New Guinea Village

By GILLIAN GILLISON

Photographs by DAVID GILLISON

Magnificent feathered jewels, male birds of paradise are prized in rituals of New Guinea's Gimi people as symbols of masculinity. Barida (right) believes this shimmering trio, here courting demurely garbed females, to be the guardians of his dead brother's spirit. To ease the ghost's fear of the photographer, Barida strips a branch, just as these male birds demude their courting area, letting sunlight illuminate their golden splendor.



**H**IS NAME WAS FOBORA, his skin was a golden brown, and for special occasions, to look his most manly, he put through his pierced nose a two-foot-long plume of a bird of paradise.

It took Fobora and most of the Gimi-speaking villagers of Ubaigubi quite a while to decide who we really were. Our skins, our Primus stove, our flashlights—we were so different in so many ways from the primitive peoples who live in the Eastern Highlands Province of newly independent Papua New Guinea (map, page 129). In the end one explanation came closest.

We were from another world, whose inhabitants need not dig in their gardens every day nor carry heavy loads of firewood; where one

gets all one needs in life without effort. To the Gimis only one other world exists. It is the land of the dead.

We three—my husband, David, and I and our 6-year-old daughter, Samantha—were not quite like other white-skinned outsiders who had been in Ubaigubi before. They were patrol officers and missionaries, on brief visits with a clear purpose—to inoculate people and settle disputes, or to give a sermon. But we had come to stay, and all we seemed to do at first was look around and ask questions. Why, the Gimis wondered, and why here?

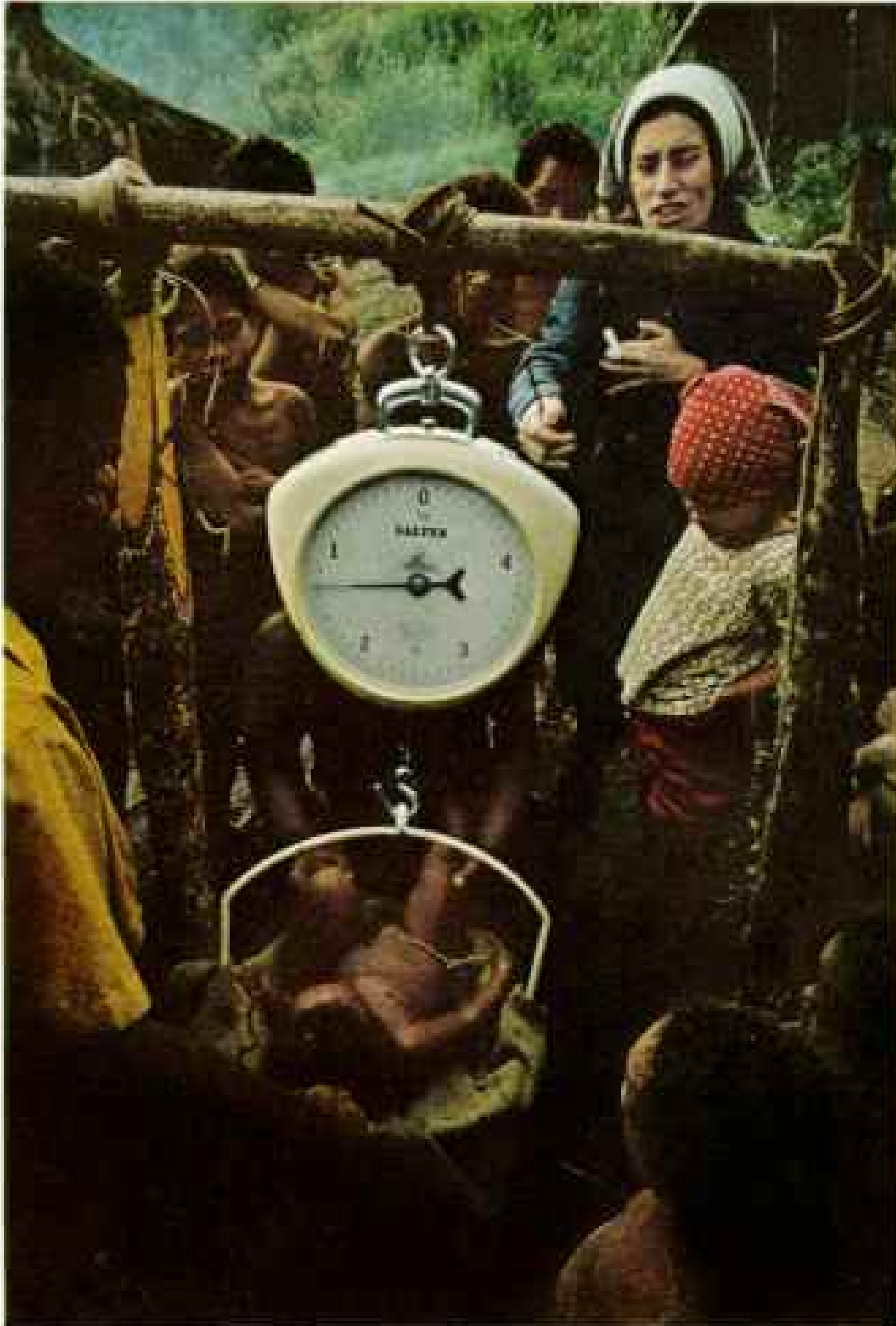
Obviously we must have been anxious to find out about our past lives—to relearn in our own village what we forgot on the long journey to that other world. And the people



To learn the ways of the Gimis, anthropologist Gillian Gillison and her family spent nearly two years in New Guinea, in the remote Eastern Highlands village of Ubaigubi. Here she found a community still living in a Stone Age culture, whose fabric of life is woven with elaborate ceremonies reflecting concern for fertility—both of the land and of the people. The author, who learned to speak their language, made one of the first studies of the region's women. To gather data on child development, she weighs a baby (**below**). "They were very puzzled by what I was doing," she notes.

Her husband, David, an artist and photographer, tends the vegetable garden beside their thatch-roofed house (**right**). Recording sorcery trials and ritual theater, he witnessed ceremonies rarely seen by outsiders.

Six-year-old Samantha (**below, right**), who quickly made friends with the village children, often learned Gimi customs before her parents.







OLLIAN BILLION



we spent so much time with most of course have been our kinfolk. Like Fobora. Like the Big Man and his wife Bate. . . .

Such things were not talked about easily. In fact we had no inkling of all this until we had been in Ubaigubi six months.

**D**AVID, an artist and photographer, had been attracted by accounts of Highland societies that produce no ornate carvings, as New Guinea's lowlanders and coastal people do, but express themselves most creatively in body decoration, in dancing, and in ritual theater. He had a grant from the City University of New York.

I, an anthropologist with a grant from the U.S. National Science Foundation and its Canadian counterpart, the Canada Council, planned to study the lives of women through a woman's eyes—a recent departure in anthropology. Until now the reporting of indigenous cultures, even when done by women, was mostly about men. Where women were included, what emerged was usually men's ideas about women.

One reason for this, in New Guinea, has been that fieldwork tended to be done through male interpreters or in pidgin English, which is spoken by some of the young men but practically never by women. I managed to learn enough of the Gimi language to work with women directly. Eventually I realized that, even in a society where men blatantly look down upon women, female creativity—as symbolized in myth and ritual—is regarded as the ultimate source of power.

And Samantha? Before long she was teaching her parents some basics of Gimi behavior. I recall an instance:

At a premarriage ritual for women only, in a dim, crowded hut, I worked hour after hour with my lantern, tape recorder, and note pad, feeling painfully hot and thirsty. At last sugarcane was passed around. I could hardly wait. But I was passed by. I was hurt, and said so later to David and Samantha.

She said, "Mommy, were you smiling?"

I said yes, of course, in anticipation of the refreshing sugarcane.

"Well, that's why you didn't get any. Nobody has to give you anything to please you when you are already pleased. When I want something, I frown and look away. Then I always get a lot, so I won't be angry."

Ubaigubi occupies an undulating shelf along the steep and heavily forested southern slope of the New Guinea cordillera. The village is strung out in compounds for about five miles, with a total of some six hundred people, many still holding to traditional ways. Men live together in a few large oval houses; around these are many small round houses for women and children and the highly prized pigs.

Women tend the sweet-potato gardens and the pigs. The men hunt, make fences, and clear land—a garden will produce for only a couple of years. Steel axes were first traded from the coast some thirty years ago, so the Gimis technically no longer live in the Stone Age, though they wield the metal tools as they did their stone tools.

Ubaigubi is still relatively untouched by the outside. From Goroka, the provincial capital, it is a two-hour drive to Lufa, and after an additional, more tortuous three hours there is only a trail—six hours of up-and-down hiking. A patrol officer had brought us here. A helicopter ferried in our possessions, and, while David and the villagers built us a house, we lived in a small, cramped hut.

It was disconcerting. When I sat at my typewriter, children poked at the bamboo walls and stared in. When I went out with Samantha, we were immediately surrounded by children, who pulled at her and stroked her hair. She hated it.

**B**UT AFTER THREE WEEKS we moved into our own thatch-roofed house. We had plenty of running water from 50-gallon drums collecting the rain. It rained a lot, from November to May nearly every afternoon. We had a wood-burning stove for the chilly nights. And constant company.

Interior partitions afforded little privacy, since anyone might drop in anytime and inspect everything, occasionally watching David and me argue. They didn't understand our words, but it helped break the ice.

Samantha soon found several girls she liked. She loved to swim with them in the swift icy streams and play at adult life in her own little hut, planting a garden, cooking, and collecting leaves, ferns, and colored clay to decorate herself. On the day of a marriage ceremony Samantha and her friends even joined in the adults' ritual theater (pages 132-3).

The public part of the wedding included

nightlong singing in one of the women's houses, with the bride's and the husband's clans hurling mock insults.

"We give you the sweetest flowers of our forest, and we get so little in return."

"But the pigs we pay are fat, and the feathers fine and brilliant."

"Rubbish, your pigs are skinny, the plumes are pale and ragged..."

The hut was crowded and hot, people drowsed. Someone burst in. Dry sticks were thrown on the fire, the light brightened. A woman in the guise of a warrior, with bow and arrow, was followed by another, with a net bag on her head, indicating femininity because it is for carrying food and babies.

Their choreography, and even more explicit dialogue, amounted to parodies of relations between the sexes.

An old woman said they did them better in

her day. The performers backed out the door, and the singing picked up again. And so it went all night long, except that some acting interludes burlesqued recent village events. For instance, a man goes to his garden to settle a fight between his two wives. Instead, they turn on him and beat him.

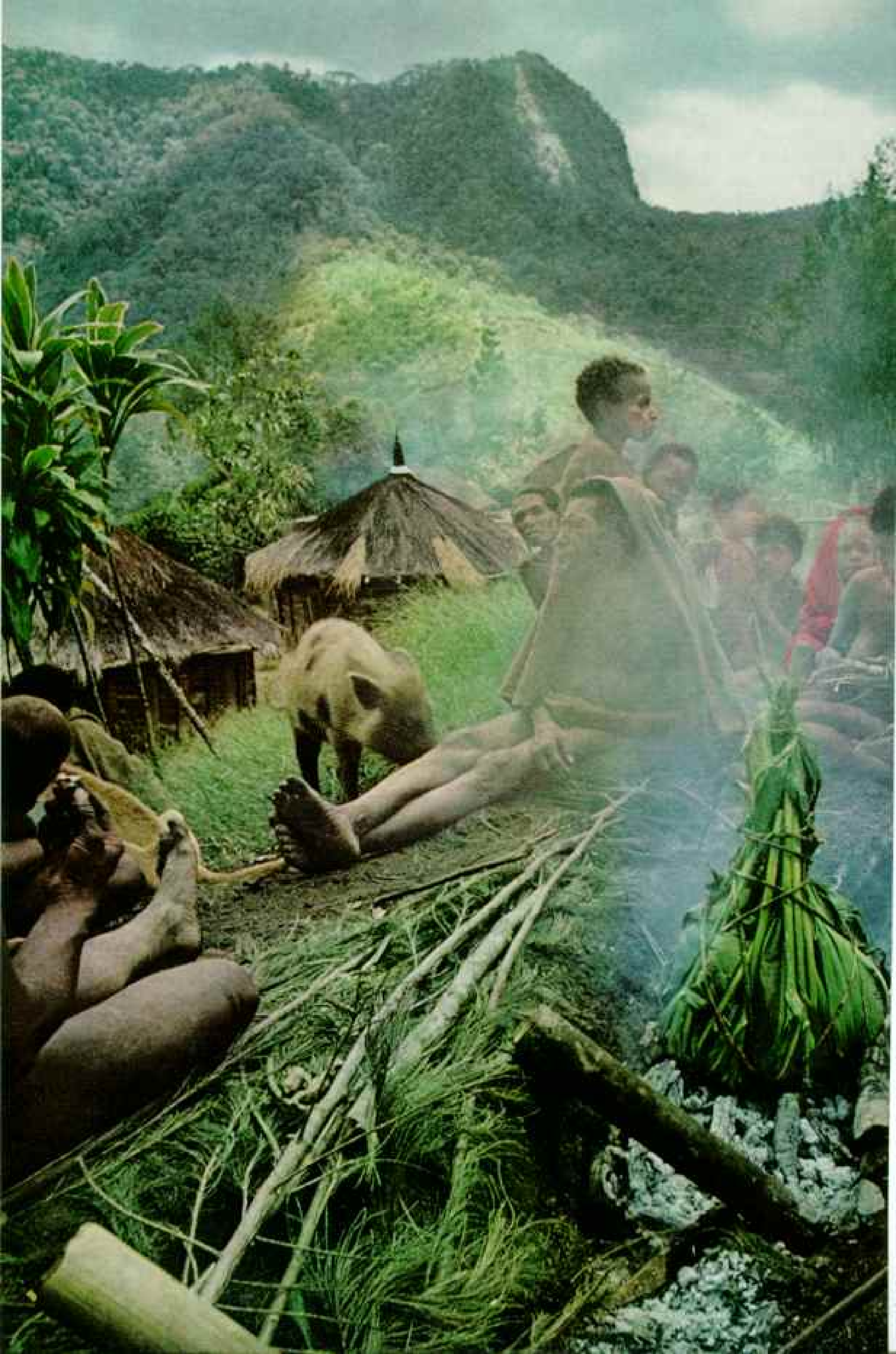
The audience laughed, shouted, and commented with gusto. I was seeing an improvisational art form that is passed from one generation to another. It also releases tensions between the sexes and builds up new ones. As in most Gimi ceremonial, much of it is concerned with fertility.

**V**ILLAGERS from many parts of the Gimi-language area converged on Kuasa, a 13-hour walk from Ubaigubi, for a three-week cluster of ceremonies that may occur only once in five years or in a decade. It



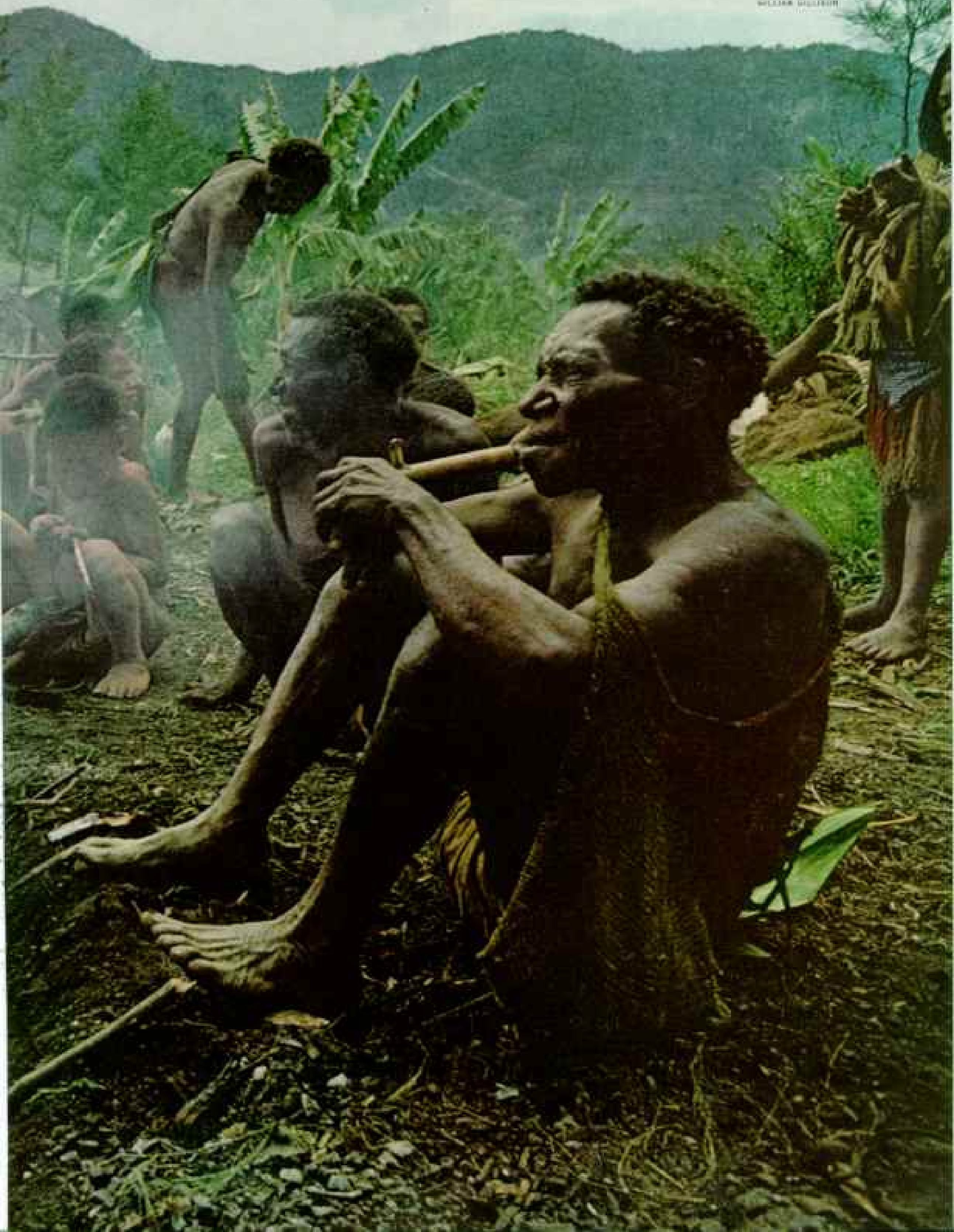
Smoke seeps through the roof of an Ubaigubi hut, helping keep the thatch dry and thus more water-repellent. The five-mile-long mountain village of 600 residents is one of sixty communities in the 700-square-mile Gimi-language area of Papua New Guinea. Nearby Australia administered the territory until it became a nation in 1975.





POSSUM, LEAVES, AND MEDICINAL BARK, *traditional meal for a new mother and her midwives, are cooked in a shallow pit by a pipe-puffing elder. Wild creatures and plants of the deep forest are considered potent sources of fertility by the Gimis.*

WILLIAM GALLERIE



requires much planning and a great investment in pigs for the necessary distribution of pork to participants.

Many marriages were to be performed, having been contracted years before. Night after night women's houses throbbed with singing and ritual-theater pieces by the score. Amid this constant activity we got little sleep.

At dawn on the morning of a big pig kill, I saw a woman grieving over her pig and carefully painting red circles around its eyes. Soon it would be clubbed on the head. Some pigs managed to dash away, and warriors gave chase, bows drawn. Near them were dancers, whirling with colorful wooden *gerua* boards strapped to their backs.

The warriors shouted, "Whoh . . . whoh . . . whoh." Arrows flew. Wounded pigs squealed and ran on, smashing through fences as if they were matchwood. But in vain.

The *gerua* boards, meant to absorb the spirits of the dying pigs, would be left to rot in the gardens. The decomposition would return their fertile spirits to the earth, to ensure good crops and healthy pigs.

**F**ROM ANOTHER PART of the village, dancers now came shouting and singing. They joined those present—women, warriors, *gerua* bearers, and children—to converge into a gigantic spiral.

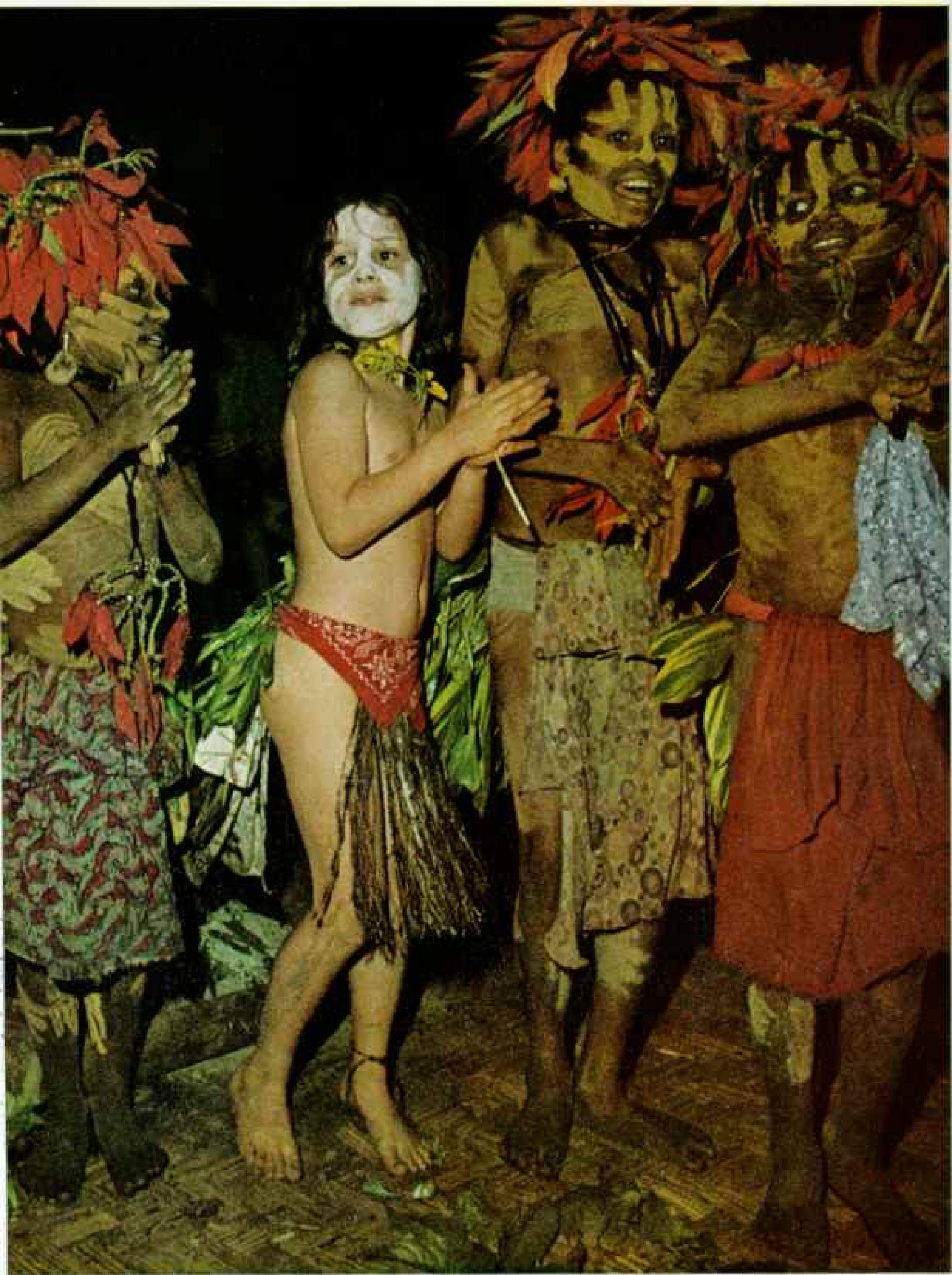
In the hubbub Fobora told David that this dance formation is known as *raumwara*—pidgin for "round water." The Gimi phrase is *kotu onek*, meaning "river eddy" or "still, deep pond." It refers to mountaintop pools where the First People were believed to have resided. This representation of the home of the original fatherless beings symbolizes the ultimate fertility—nature's ability to produce life spontaneously.

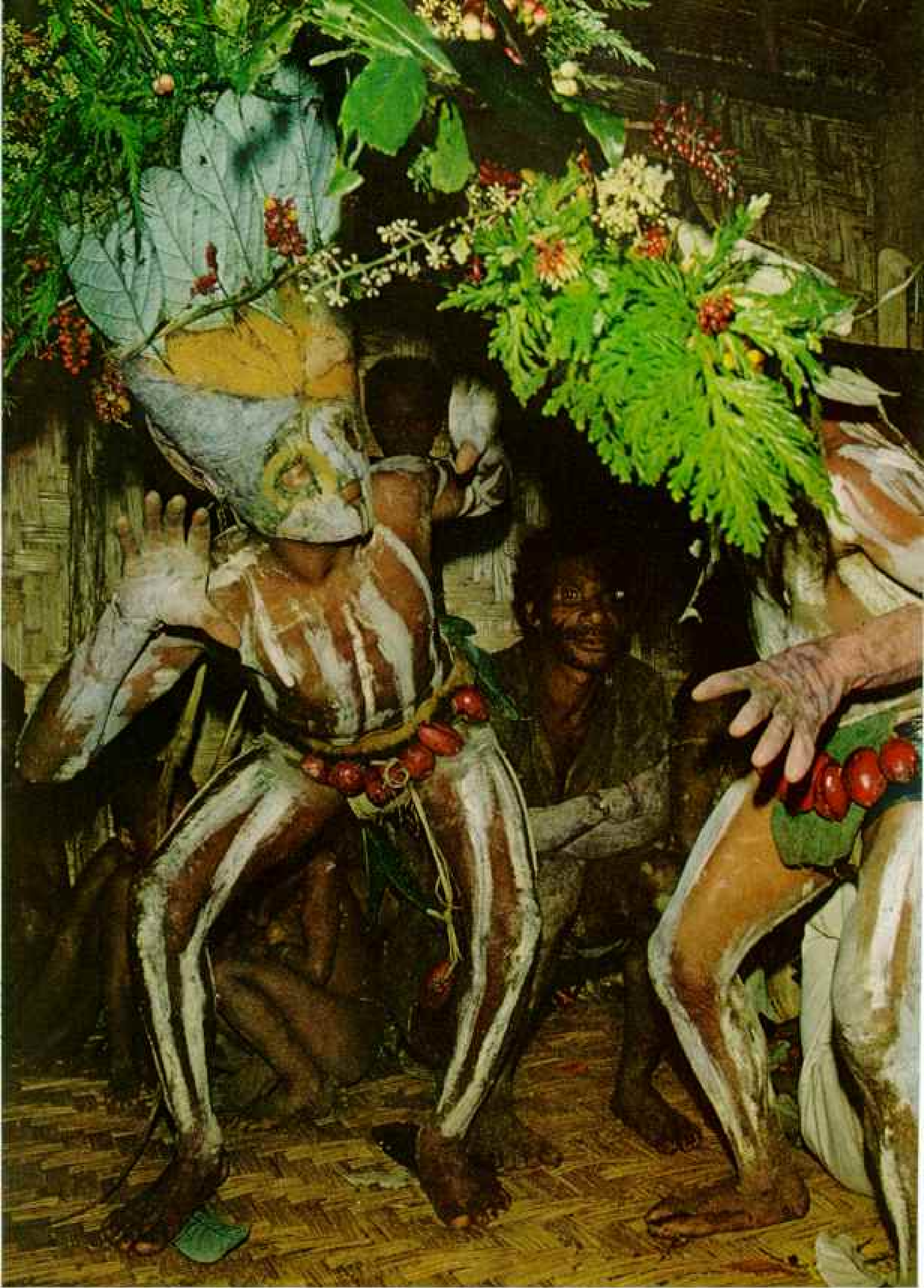
The dance ended, and village visitors ceremoniously received. (Continued on page 137)

**Timeless ritual of youth:** Dressing up like adults. With an eye to detail, Samantha and her friends mimic a fertility dance that women perform before a marriage or during male initiation. Decorated with clay and wearing poinsettias in their hair, the girls imitate the undulations of a rain-swollen stream. Split bamboo rolled between their palms produces a rhythmic clicking.













Boasting of male superiority, agile dancers in a prenuptial rite portray the sun and moon (left). Just as the celestial bodies loom above all, so do men see themselves as dominating Gimi life. Light radiated symbolically by gestures and body decorations represents men's knowledge of the world, for they often travel beyond the village while women remain at home. A bark mask worn by the sun highlights the eyes, center of awareness; a cast-off rubber glove draws attention to a moonbeam hand. Another dancer, dressed as a huge bird, the flightless cassowary (right), dramatizes the mysteries of the forests.

Preparing their own performance, women in bark-string skirts decorate themselves with clay (above). Weaving sensuously, they will impart advice to the bride.

During the all-night gala, dancers and actors visit from hut to hut, staging sudden entrances to rouse sleepy-heads. Skits ridicule everyday life; women particularly enjoy the theme of husband beating.







(Continued from page 132) pork. Carrying their allotments, they filed past the gerua boards that had been lined up in a row behind the meat. Fobora said this was to ensure that they didn't walk off with the spirits of the dead pigs as well.

David realized later that the spiral pattern of the raunwara dance was similar to a design he had often seen on warriors' shields and in body painting and tattoos. Other frequent motifs on bellies, legs, and forearms were circles, squares, diamonds, and zigzag lines. They formed abstractions of centipedes and spiders, of bird beaks and serrated leaves, of the moon (pages 134-5). There also were necklaces of bright yellow bamboo, headbands of green iridescent beetles, and caps of possum fur with feathers in brilliant magenta and deep blue. All these images and materials—drawn from the richness of the forest, from nature—were symbols of fertility.

**W**HILE GIRLS were being married off from one clan to another (pages 138-9), boys of 10 to 13 or so were taken into the men's houses and kept sleepless and thirsty for days. It was part of their ordeal of initiation. I was excluded from these proceedings, but David recorded much of them.

On the first night boys sit by firelight, transfixed. Figures shrouded in rustling leaves and masked in hideous mud-caked gourds snake through the crowd, hissing. Men steal up behind the boys and put stone axes to their throats, while the monsters lunge . . . and are stopped short. Revealed behind them are men playing flutes.

To the boys this is a big revelation indeed. All their lives they have heard those wondrous sounds, and been told they come from fabulous birds, hidden from women but associating with men.

The sounds fade, and the instructor, a Big Man, speaks:

"It is not a bird, as you can see. Men, and not other creatures, make these sounds. The flutes once belonged to the women, but we *men* took them away forever. We tricked

them. If you go blabbing to your mothers or sisters, we will kill you!" The monsters hiss, the axes touch the boys' throats. . . .

David returned to our sleeping platform impressed and moved: "What child wouldn't be overwhelmed by this?"

Day after day the rituals continued for the boys, until one noon they emerged dazed—borne on the shoulders of soot-blackened warriors, each boy gleaming red from head to toe. The red was an oil pressed from the seeds of a pandanus nut, to simulate the blood of birth. Feathers bobbed on their heads—bright red ones from parrots and golden plumes from birds of paradise. Decisively separated from their mothers, the boys had been symbolically reborn as independent men.

**A**FTER OUR LONG WALK back to Ubai-gubi, we nursed our sore legs and resumed our daily routine. Even before breakfast as I walked, still in my pajamas, through our vegetable garden to the outhouse, women would be there to wish me good morning, ask where I would go that day, and gossip. "Kagopa is about to be married, you know, the lazy one. . . ." Sometimes we would talk for half an hour or more.

Men came early to talk to David of many things until they would get around to what they wanted, such as a ride in our Nissan jeep. We kept it in a hut at the roadhead, six walking hours away. Every six weeks or two months, we'd drive for supplies to Goroka.

I usually did not ask point-blank questions either. I got explanations little by little, in long conversations, and sometimes did not realize until much later that I had been given an important clue. I recorded many conversations and village occurrences on tape, and then went over them carefully. What was being said might have meanings that weren't in the words at all. For example:

One day I paid my respects to a family whose son had recently died. In the course of my visit the dead man's mother unexpectedly turned to me and said: "You come here and sit with us as we talk of many things, but

Linked by an "umbilical cord" at a ritual, a young man and his mother dramatize maternal influence, rarely acknowledged publicly. The author traces much of the antagonism between the sexes to women's pervasive role in raising male children and to fathers' attempts—through initiation rites—to transform the boys into men.



you do not tell us what we long to hear.”

I was dismayed. Not knowing how to respond, I managed to evade her question. After I left, I tried to discover what she wanted of me. In a roundabout way I found that she meant to convey something like this:

You are able to see and speak to my son, but do you talk to us of him? Do you give us his messages as he asks you? No! You hide your knowledge from us!

The woman's insinuation seemed reminiscent of ideas from the cargo cults I had read about as a graduate student in New York. In these cults, which have been described as local occurrences in many parts of the southwestern Pacific, industrially manufactured

goods are associated with a perfect life to come.\*

By now the Gimi has seen and thought about tinned food, metal axes and cooking pots, knives, blankets, watches, radios, helicopters. All these desirable items that Europeans bring he calls *kago* (pidgin for “cargo”). And in his view all the *kago*—meaning everything the white man has—originates, like everything else, with the Gimi ancestors.

All things from the forest—bamboo for arrowheads, black palm for bows—are gifts from the ancestors in the other world, for their surviving close relatives. So too must be the

\*See “Tanna Awaits the Coming of John Frum,” by Kai Muller, NATIONAL GEOGRAPHIC, May 1974.





Five pigs and a hundred dollars was the bride price in the just-completed marriage of this woman from Kuasa, being led away by the groom's uncle (left). Like many Gimi matches, this one was arranged by the parents of the bride when she was a child. Before the ceremony, clan brothers of the bride powder themselves with ash (below) to mourn the departure of their sister.

Traditionally husbands and wives live apart—men in communal houses, women with their children and pigs in small huts. Wives grow the food, but husbands cook their own.



blankets, the watches, the helicopters. But in some unknown way *this* kago, unlike those things obviously derived from something grown in nature, has been acquired by the white men. And so they must have traffic with the dead, must themselves be some kind of ancestors too.

On first reading, these notions may sound farfetched. But they are central to Gimi thought. Indeed, they come into play whenever an outsider makes a gift to a Gimi, no matter how casually. For example:

Two prospecting geologists leave, making parting gifts of soap and rice. These actions are open to the interpretation "that a dead relative is sending these valuable things

specifically to me! How else can I explain how I got them?" And so it is not a casual act, it is a meaningful communication!

The geologists were around only a few days. But with us, people had time to sort out whom we associated with most, and so our relationships, in their view, became more and more specific. David was Fobora's brother. I was Bate's daughter. And my father was Kuabe, the Big Man.

**W**HEN OUR HOUSE was being built, we noticed a man in the background who seemed to keep his eye on everything. When disagreements arose, a word from him settled things. That was Kuabe. Among Big



Flames of revenge cook a banana-leaf packet (left) of poisonous bark and an intended victim's "essence," such as nail parings or feces. The Gimis attribute most death and illness to rituals similar to this, initiated by men seeking to avenge the death of another.

Although a new law forbids sorcery, the practice continues. Kuabe of Ubaigubi (below) defends a seated relative accused of causing illness in nearby Maiva. Men from that village had been invited to answer charges that *they* inflicted sickness on an Ubaigubian. Onlooker Kegebi (below, right) adds his opinion.



Men in the village, he was the big Big Man. After we moved in, he visited us regularly. Often one or two of his four wives brought us food from their gardens. Thus developed a close association with Kuabe and his clan.

He was charming and sensitive, a consummate politician. Men who have lived in the same village all their lives have long histories of interactions and antagonisms. Kuabe's true strength lay in his skill at getting things done with a minimum of friction, through his intricate knowledge of past relationships and individual character. His talent was especially apparent in frequent meetings to deal with ever-present suspicions of sorcery.

Such problems begin with gossip. Who is sick or has had an accident? Who might have caused it? The assumption is that an adult's sickness or mishap must be caused by someone through sorcery.

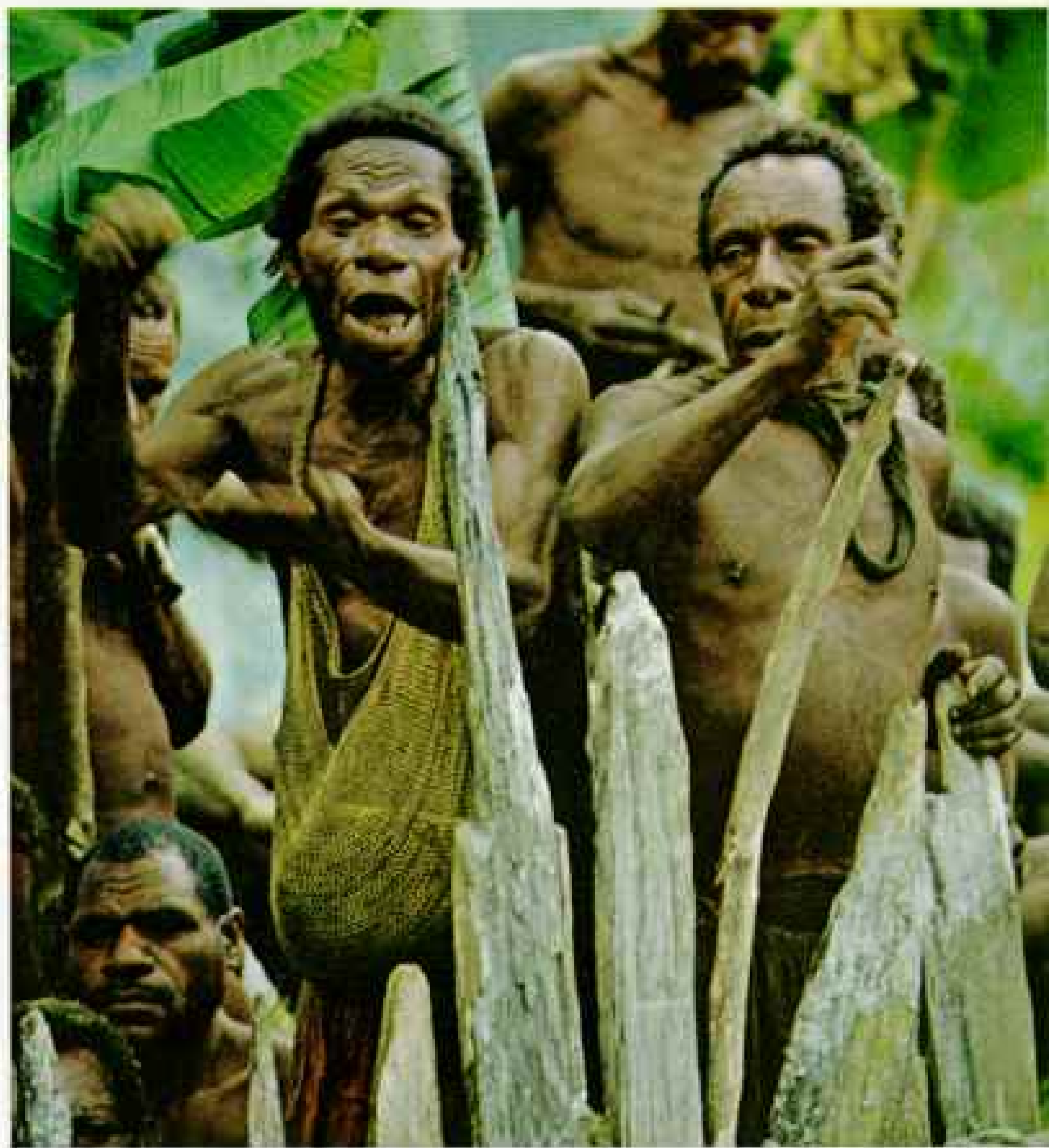
If someone is very sick, some fifty men may stand around, rehashing that man's life and involvements. He is closely watched. Is he

getting better or worse? If better, then the vague spreading of suspicion had a good effect, the malefactor has been frightened and induced to desist.

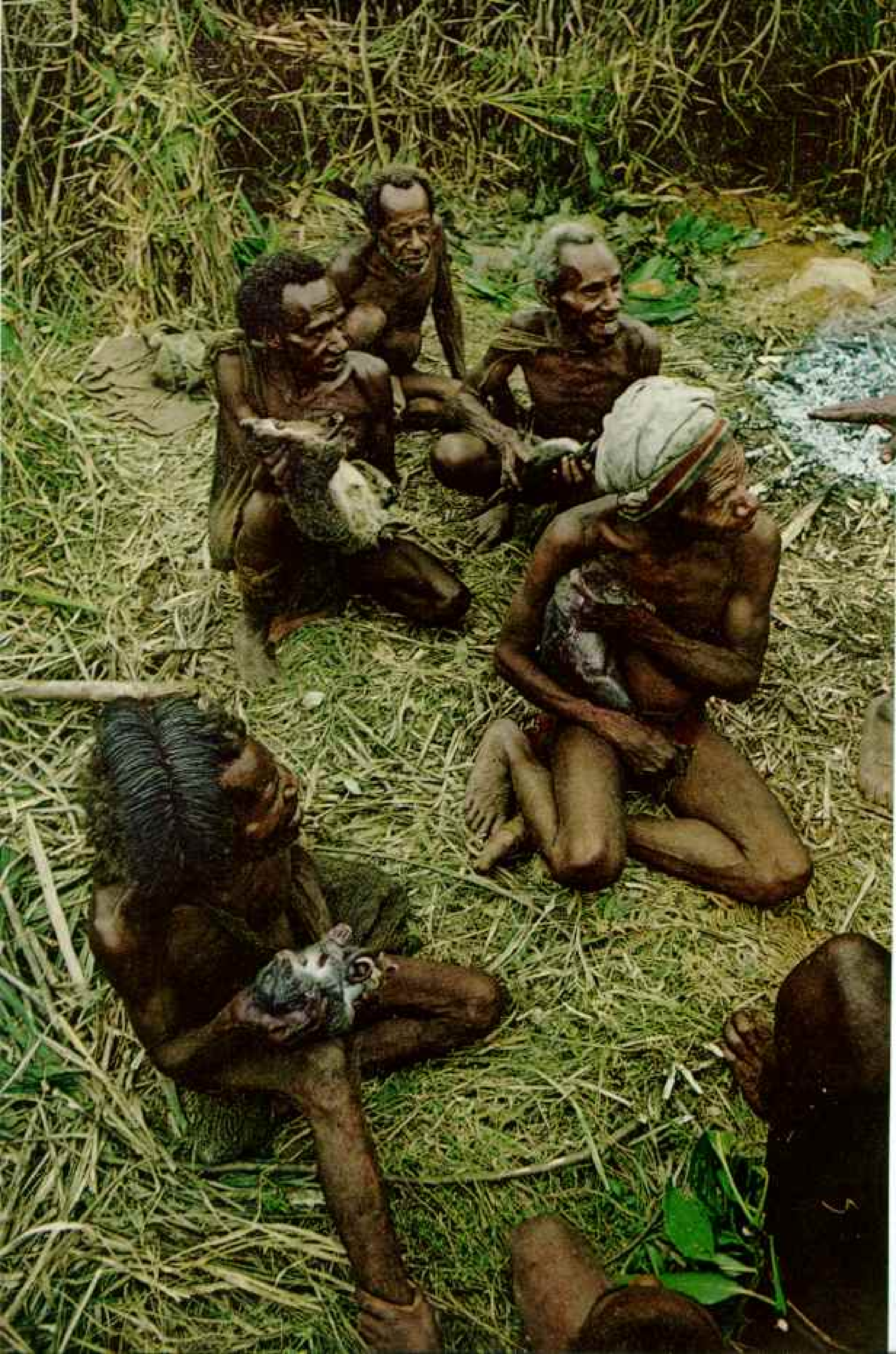
If the sick man gets worse, more specific hints will be aired. "I saw you leading a pig on a leash on the path to Maiva..." The sinister implication is that you were delivering something: hair, or nail clippings, or feces—an "essence," so to speak, stolen from the intended victim—so that someone in the other village might perhaps insert it into a rotting banana tree. That would make the victim sicken. The pig would be the sorcerer's pay. On whose behalf might you have done it?

Eventually the Big Man and the victim's close relatives will try to enumerate everyone who might conceivably hold a grudge. These men must all go through the motions of undoing whatever harm they possibly might have done. There is much ritual, both in private and in public. The aim is that the victim's

*(Continued on page 145)*









To catch a killer, elders gather in a secret clearing with wild possums (facing page). The Gimis believe a dead man's spirit takes refuge among the marsupials, waiting to name his enemy.

A sweet potato is offered to a caged possum (left) as a name is whispered. If the animal takes a bite, potential guilt is indicated. Next the possums are killed, and live caterpillars, representing suspects, are wrapped in leaves, attached to their limbs, and cooked. Then the dead man's relatives examine each insect (below) for any signs of life—proof of guilt. But when none moves, suspicion is left hanging. Eventually the possums are eaten.











essence be returned, so that he can recover.

But if he dies, the number of suspects must be drastically narrowed down. The aim now is revenge. To find the killer, there may be divination, involving possums and caterpillars (pages 142-3).

One day an important man died, and his corpse was placed in a doorway. There was a lineup of suspects. Each in turn had to hold the dead man's right foot. Would the dead man give a sign?

Some thirty men—age-mates who had been initiated along with him and others of his clan—stood with bows drawn. . . .

The sign never came.

While we were there, most sorcery proceedings ended inconclusively, breeding more bitterness and suspicion. That is the aftermath of every death. Months or years later someone from a suspected clan falls ill, and others say, "Ah, we know where to look!" Another sequence of sorcery proceedings begins.

**I**N NEARLY TWO YEARS with the Gimis I analyzed not only dozens of ceremonies with hundreds of songs but also scores of myths. In most Gimi myths I collected, there tended to be a reversal of what occurs in daily life, where women are consistently overshadowed by men.

While men participate in large collective activities, such as sorcery trials, women are alone or in little groups, grooming each other or quietly weaving net bags, suckling their children or weeding the gardens. Men consider them mentally inferior and dangerously contaminating, to be openly held in contempt.

In myth women hold a far different place. There is a story women tell their children, one that especially fascinated Samantha.

A man traps a cassowary, a huge emu-like bird, and crawls into it to eat the meat inside, leaving his eyes on a leaf outside. He doesn't tell his wife. He traps more of the birds and

**Haunting and mysterious symphony** fills the forest as elders play secret flutes—imbued with the power of creativity. Females and young boys, forbidden from seeing the bamboo instruments, are taught that huge birds cause the eerie songs. To ensure enough food at rituals, the flutes sound in advance, sometimes as much as two years.



**Favorite of the Gimis,** young Samantha wins admittance to a no-stakes game resembling hearts. Women are barred from such sessions—as they are from most male activities.

More than a pastime, card playing for money is a problem in Papua New Guinea. Gimi men gamble intensely, with games often lasting 48 hours. Fights at times result when players lose the money they earned harvesting coffee, laboring on plantations, or erecting huts for government patrols.

does the same. His wife follows one day, snatches the eyes, and goes home. The man staggers home blindly, his wife scolds him and gives his eyes back. The idea is that men who deceive women have much to lose.

In another tale a dead boy's bones are buried in the hollow of a tree trunk. His sister learns this, and is told she can hear fabulous sounds from the tree but must never approach it. She hears the captivating sounds and cannot resist tapping the tree with a stick. The tree bursts open, and all the birds of paradise fly out. She has resurrected her brother's bones in the form of magnificent birds—she has set the male spirit free to soar!

In sum: In myth woman sees herself not only as the essential mother but also as the bestower of greater male awareness.

**THE MEN'S RITUALS** David observed closely go further, enacting myths that exalt women's creative powers even more dramatically. The flutes appearing in the initiation rites for boys are prime symbols of creativity—of all fertility—and they once belonged only to women, until men stole them. Now that men possess them, they too have the power to give birth. This is demonstrated at the climax, when the boys are symbolically reborn. Indeed, the pandanus oil smeared over the initiates to represent blood imitates female physiology.

For months David sought to photograph

the display of male birds of paradise, on which male Gimi ritual is patterned. All birds, so men tell the boys, are created female, but some decorate themselves with bright feathers, and so become gorgeous males. When a boy becomes a man, he puts on plumage. The bird of paradise feathers are worn proudly for pig kills, for courting, for ritual theater—whenever a man wants to attract women.

Now David told me what he and Fobora saw when, after many frustrations, they were successful at last.

In dense forest, in the darkness before dawn, they climbed to the blind they had built 150 feet up in the crown of a tree.

By dawn there were four male birds of paradise—preening, calling, waiting.

After half an hour two dark shapes came flitting close. Two females, each a dull brown. The males burst into movement: up their individual perches, each extending several feet, and down again. They moved up and down many times, and on the way down they threw their magnificent golden plumes over their heads. As the plumes expanded into a glorious amber spray, the birds fanned their wings slowly. It was dazzling.

One female remained unimpressed. The other hopped onto the perch of one of the males. She had picked herself a mate.

For among these birds of paradise in New Guinea, it is the female of the species that decides. □

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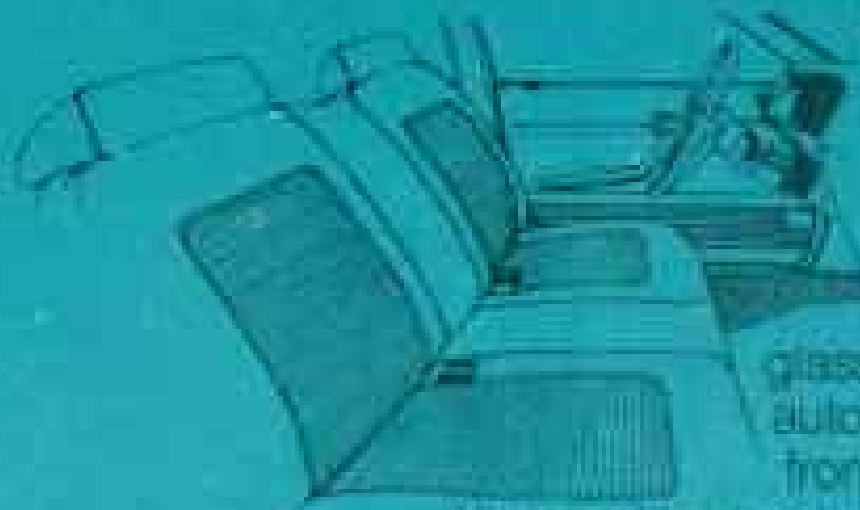
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The new 1977½ Toyota Corona offers attractive new styling loaded with comfort and convenience comparable to cars costing much, much more. It's the culmination of Toyota quality and engineering. That's why we say, "If you can find a better built small car than a Corona... buy it!" incidentally, there are four different



models to choose from, including a 5-Door Wagon and a special "Luxury Edition" 4-Door Sedan featured.

### **Beauty, full of comfort and convenience.**

Features that run the gamut from an electric "tuning fork" clock to wall-to-wall carpeting and tinted glass all around. In the "Luxury Edition," equipped with automatic transmission, the comfort includes a full-width front seat in rich velour-type upholstery. This Corona is the roomiest, best equipped sedan in the entire Toyota line.

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Corona 4-Door Sedan Deluxe with Luxury Edition option.

THE NEW 1977½ CORONA **TOYOTA**



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...and ask your dealer about the new Firestone Steel Belted Radial 721.<sup>TM</sup>



NATIONAL GEOGRAPHIC PHOTOGRAPHERS JOE BAILEY (ABOVE), GURDIP W. SAGAN (UPPER RIGHT), AND JAMES L. STANFIELD (LOWER RIGHT)



## They cover the world . . .

**A**ND THE UNIVERSE AS WELL. National Geographic staff writers Peter T. White, Kenneth F. Weaver, and Thomas Y. Canby (above, left to right) have won prestigious science-writing awards for such Geographic presentations as White's "Behold the Computer Revolution" (November 1970), Weaver's "The Incredible Universe" (May 1974), and Canby's "Skylab, Outpost on the Frontier of Space" (October 1974). Continent-hopping John J. Putman (above, right), seen here on assignment in Moscow, recently won the Overseas Press Club award for best magazine reporting for his article "The Arab World, Inc." (October 1975). William Graves (right) interviews a fisherman for his article "Living in a Japanese Village" (May 1972), recipient of the Pacific Area Travel Association award.

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*At Last!*  
*Bells of Fine English Bone China*

*The American Rose Collection*

*A limited edition of 12 Fine English Bone China Bells to be  
issued under the auspices of The American Rose Society*



*Approximate size of bell is 4 1/8" in height and 3" in diameter.*

*Fine English Bone China stands alone as representing the absolute finest of the china maker's art. And in the world of beautiful flowers, roses are the most beloved. To portray the exquisite and delicate beauty of America's most beloved roses in a limited edition collection of Fine English Bone China bells is an accomplishment worthy of worldwide collector interest.*

## *At Last — Bells of Fine English Bone China*

Fine English Bone China has become known as the rarest and best of all the fine china available throughout the world. By every standard used to judge excellence, it is unsurpassed. Its ivory-white color cannot be duplicated. Its light weight gives an impression of delicacy found in no other china. Yet, its strength gives it a durability that belies its delicate appearance.

To produce Fine English Bone China is an art that has been mastered by only a few master china makers. The home of most of these master craftsmen is Stoke-on-Trent, England, truly the Fine English Bone China capital. And it is in Stoke-on-Trent that the beautiful bells that make up this limited edition will be crafted.

Because Fine English Bone China is so difficult to make, and because the demand for the limited quantities that can be produced is so

Approximate size of bell is 4½" in height and 3" in diameter.



great, it is rare to find an exclusive, privately commissioned, limited edition bell collection made of this precious material. Literally years of careful planning and diligent work are required to make such bells a reality.

But, such bells are now, at last, available. The opportunity to acquire these bells is here, but for only a limited time.

### *Each Bell a Beautiful Work of Art*

To create a bell collection worthy of Fine English Bone China, a specially designed bell shape was created. To produce this unique shape, each bell will be individually cast by hand. Then to complement the delicacy and exquisite beauty of each bell, original paintings of 12 of America's most beautiful roses were commissioned. In this way, each of the 12 bells in the collection colorfully portrays a different rose from the gardens of America. Therefore, the complete collection creates a bouquet of beauty that can be displayed proudly in your home.

Continued on next page ▶

### *Each Rose Beautifully Captured In Full Color*

Each rose design is an original work of art created expressly and exclusively for this collection. The commission for the rose designs was awarded to two highly respected rose artists: Norman Langford of England and Allianora Rosse of the United States. Two artists were chosen so that a variety in artistic style could be given to the designs. Yet styles were chosen that were compatible with one another so that the 12 designs combine to make a unified collection. Each artist has captured in

his and her own way the elegance of the roses with their beautiful array of colors. The efforts of these artists have combined to create a spectacular collection of America's most beloved roses.

To insure that the full beauty of the artist's original painting is faithfully captured on each bell, the fine skill of old world craftsmen, using techniques involving 20 separate colors, will be called upon. Each bell will be hand decorated and, as a final touch of luxurious elegance, precious 22kt. gold will be applied, by hand, to both the handle and base of each bell.

*Approximate size of bell is 4½" in height and 3" in diameter.*





## *Issued Under The Auspices of The American Rose Society*

Because of the significance of this limited edition collection, it will be issued in the United States by the Danbury Mint under the auspices of The American Rose Society. The Society is the oldest and most prestigious in the United States. For the first time since its founding in 1899, this distinguished horticultural organization has agreed to the issuing of a bell collection under its auspices.

### *A Strictly Limited Edition*

To maximize the heirloom value of this collection, it will be issued in a strictly limited edition, available only by advance reservation. *In the United States, reservations for this collection of Fine English Bone China Bells will be valid only through July 30, 1977, and then the edition will be closed forever.*

### *Convenient Acquisition at a Guaranteed Price*

You can reserve your subscription to the *American Rose Bell Collection* by simply completing the reservation application. You need send no money now. You will be billed for each of your bells prior to shipment.

The *American Rose Collection* consists of 12 individual bells to be issued at a rate of one bell every two months. Subscribers are guaranteed the same price for each new bell throughout the entire collection.

### *Guaranteed Satisfaction*

Should you receive any bell that you are not completely satisfied with, you may return it upon receipt for replacement or refund. Naturally, you may cancel your subscription at any time.

### *Please Act Promptly!*

Please keep in mind that subscriptions can be guaranteed only until July 30, 1977. So please act promptly. Do not miss this rare and valuable collecting opportunity.



Approximate size of bell is 4 1/2" in height and 3" in diameter.

#### RESERVATION APPLICATION 11-60

The Danbury Mint  
47 Richards Ave.  
Norwalk, Conn. 06856

Must Be  
Postmarked By  
July 30, 1977

Please accept my subscription reservation to the *American Rose Bell Collection*. I understand that this collection is a limited edition of 12 Fine English Bone China bells each depicting a different American rose. The bells will be issued at a rate of one every two months at a guaranteed price of \$25 per bell (plus \$1.50 postage and handling).

I understand that I need send no money now. I will be billed for each bell prior to shipment. I may cancel my subscription at any time, and any bell that I am not completely satisfied with may be returned upon receipt for replacement or refund.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Signature \_\_\_\_\_

Check here if you want each bell charged, as it is shipped, to your:

Master Charge  BankAmericard

Credit Card No.

Expiration Date

**L**ast night after dinner I told my family the bad news. I had this class assignment to monitor our use of energy at home for a week. Our family got an F.

Tuesday night my brother watched the same two hour movie on his TV set that we were watching in the living room. Not too smart. Thursday Mom ran an entire dishwashing cycle for three cups, two plates, a knife and three little spoons. That's a lot of electricity and hot water down the drain.

Dad drives twenty-eight miles back and forth to work. Alone. When two men he works with live right nearby. They could carpool and save about a thousand gallons of gas a year. And me. I'm guilty too. I went out and left the radio blaring in my room all Saturday morning. Dummy.

So last night at the dinner table we all agreed to do everything we could to conserve energy. Faster showers. Lower thermostats. Fuller cars. It's a fact that this country's using up energy faster than we produce it. I read where we may run out of oil – forever – in thirty years. Pretty scary. Unless every person in every house on every block does his part, the future looks pretty dim.

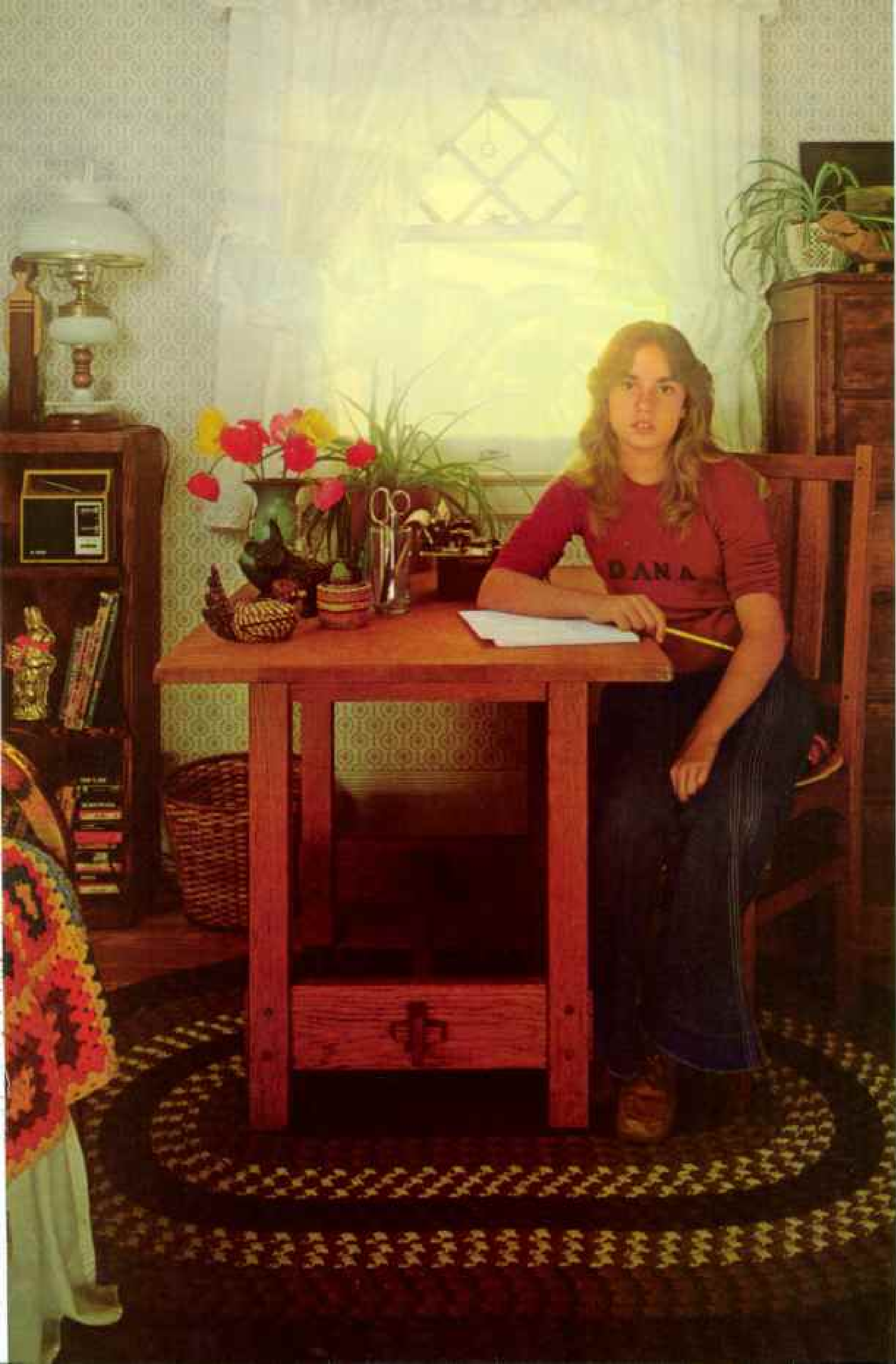
I'm getting more and more concerned about the future. Because that's where I'm going to be.

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FIGUREHEAD OF JOSEPH CONRAD  
AT MYSTIC SEAPORT, INC.  
MYSTIC, CONN.

## Woodcarver's art rode with captains courageous in the days of sail.

bowsprit. The carver marked out the design on a block of seasoned wood and shaped it with mallet and chisel. Some figureheads he drew from live models, perhaps the shipowner's daughter.

Often a carving personified the ship's name—*Twin Sisters*, for example. Or *Joseph Conrad*, whose figurehead is portrayed here.

A tribute to the renowned writer-seaman by another of the same breed, the magnificent head came into being shortly after Capt. Alan Villiers acquired the old Danish square-rigger *Georg Stage* and renamed her in honor of Captain Conrad.

"A sailing ship had to have a figurehead," he declared. "The lovely sweeping lines of her cut-water looked wrong without one." So he asked his friend Bruce Rogers, the renowned typographer, to carve the bearded likeness.

Captain Villiers sailed *Joseph Conrad* around the world—a 57,800-mile voyage that lasted 555 days. He followed in the wake of early navigators, rounding Cape Horn under sail, as they did, and with their zest for exploration.

Villiers described the voyage

in the February, 1937, *GEOGRAPHIC*, echoing a haunting passage from an even earlier issue: "The unchangeable sea preserves for one the sense of its past, the memory of things accomplished by wisdom and daring among its restless waves."

The writer? Joseph Conrad. To Conrad those restless waves were peopled "with unforgettable shades of the masters in the calling which . . . was to be mine, too."

And so they also are to Captain Villiers, as witness his many adventure-filled narratives about men, ships, and the sea. In August, 1968, he took *GEOGRAPHIC* readers to Mystic Seaport, Connecticut, living museum of America's sailing past.

"I rubbed my eyes and looked again," he wrote. Among a maze of spars and rigging he had spied the jutting figurehead of the *Joseph Conrad*, now permanently moored as a training vessel.

It was a memorable moment he shared, this sequel to a saga that appeared more than 30 years ago. But such moments have come to be expected in the pages of *NATIONAL GEOGRAPHIC*.

Figureheads are almost as old as sailing itself. Early Egyptians used them. So did Phoenicians and Vikings. They decorated prows of their ships with carved heads of horses, birds, and wild-eyed dragons. These, the ancient mariners believed, invoked the protection of guiding spirits.

Dawned the age of exploration, the spirits were largely forgotten. But not the figureheads. In England trained hands carved everything from Poseidon with his trident to St. George in wooden armor.

Colonial craftsmen brought the skills to America. In a vacant sail loft near the wharf the ship-builder would chalk on the floor full-scale plans for the figurehead he envisioned below the

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High-prowed Viking ships adorn coins of a realm that dominated most of the known world a thousand years ago. Warriors' shields rim a longship (upper), scourge of the seas. The stockier *knarr* carried cargo. Lusting for gold and glory, Norsemen went *viking*—plundering—from Ireland to Asia Minor. The Rus, Swedish merchant-colonists, left their name on a vast land—Russia. Vikings led by Eric the Red sailed westward, to Greenland. Eric's son Leif discovered



"choice" land beyond and called it Vinland. On the present-day Island of Newfoundland, Norsemen stepped ashore five centuries before Columbus.



When their settlement was unearthed, a saga unfolded. Readers shared the thrill of discovery—as they often do—in the pages of NATIONAL GEOGRAPHIC.

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## NATIONAL GEOGRAPHICS kept neat, clean, handy

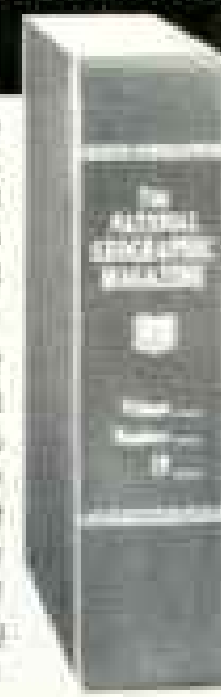
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Beechcraft Duke H60



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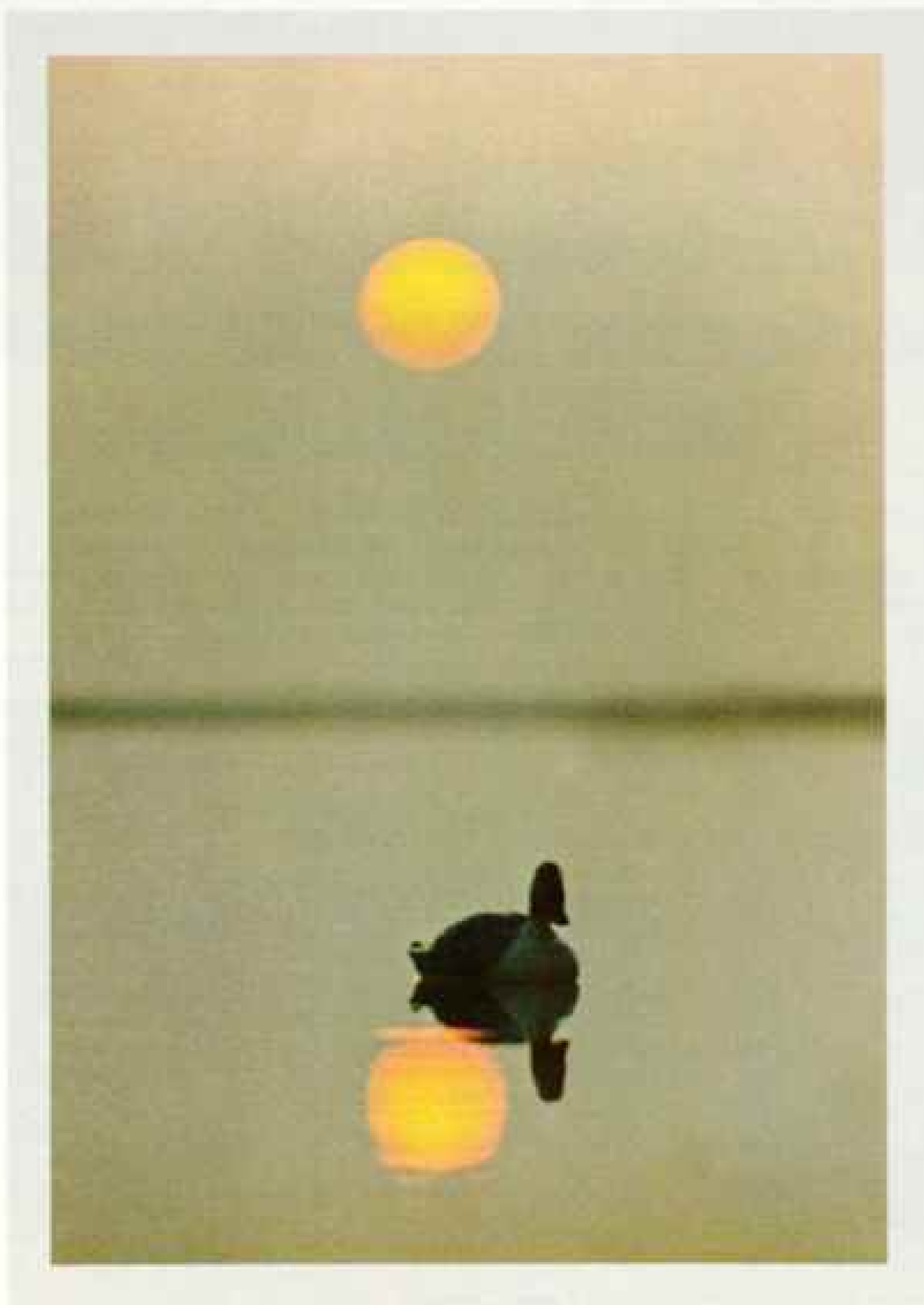
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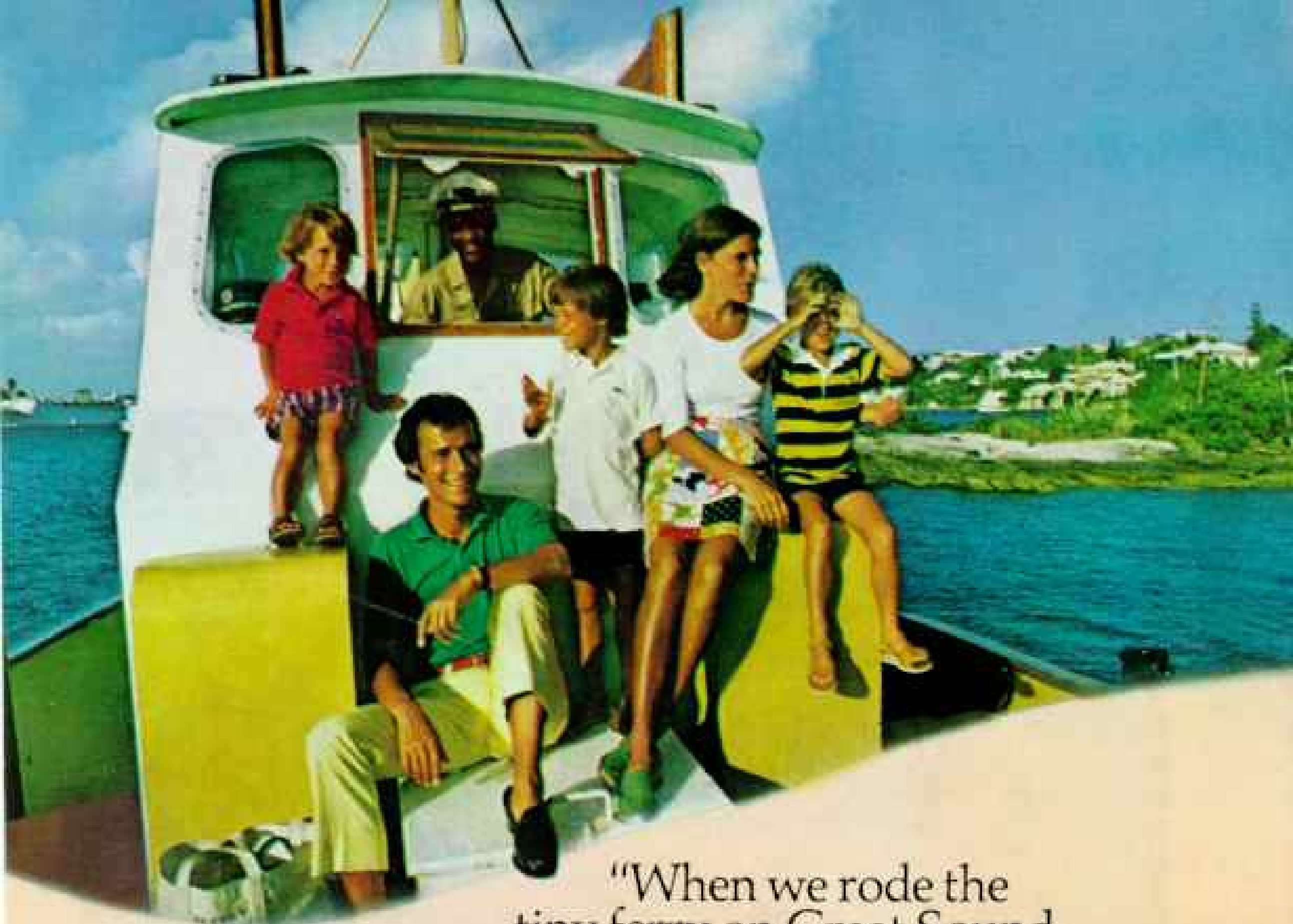
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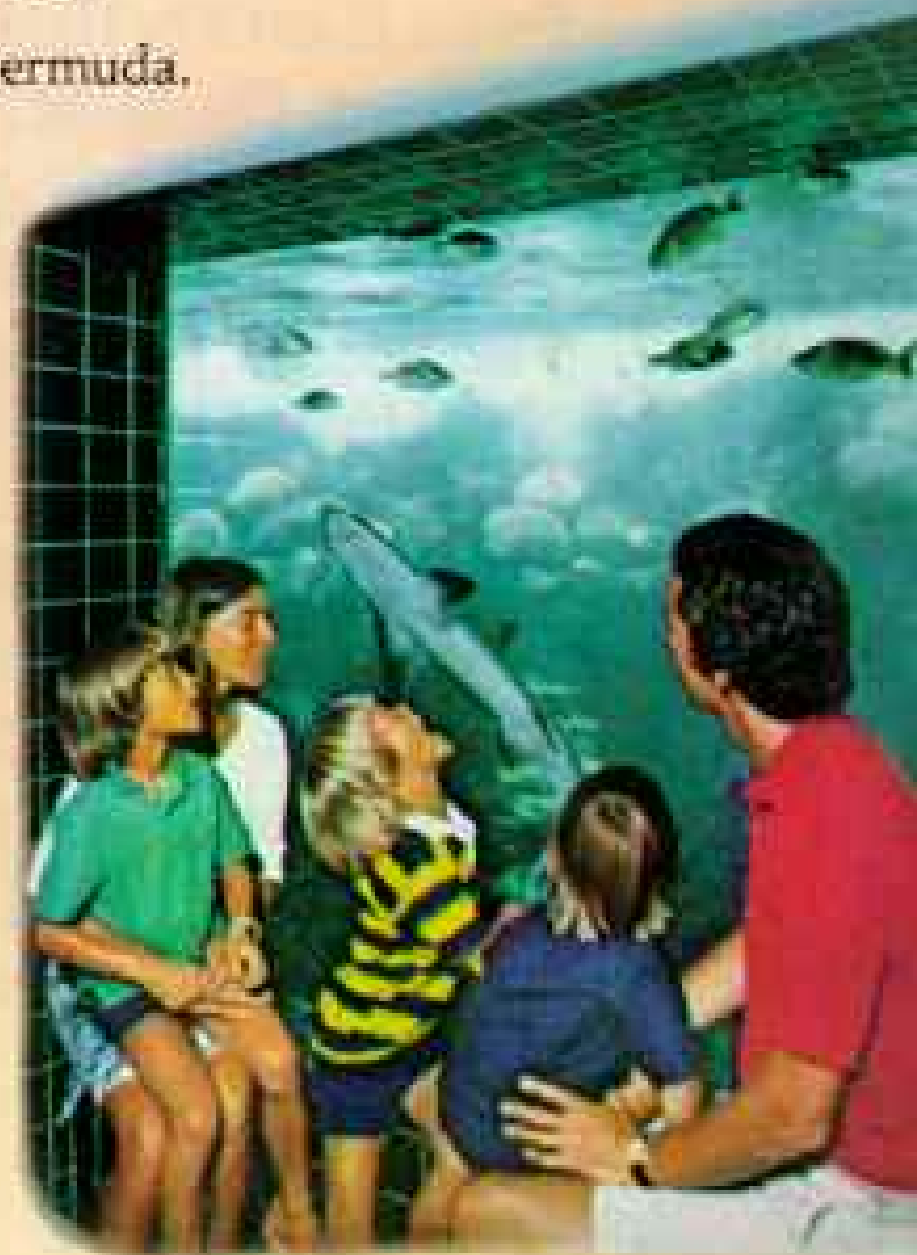


"When we rode the tiny ferry on Great Sound, the captain said 'Come on in kids, and steer the boat.' The people here are just so nice."

Paul and Betsey Horovitz talk about their fifth visit to Bermuda.

"It was so exciting at the aquarium, watching the children learn, sharing all their little discoveries."

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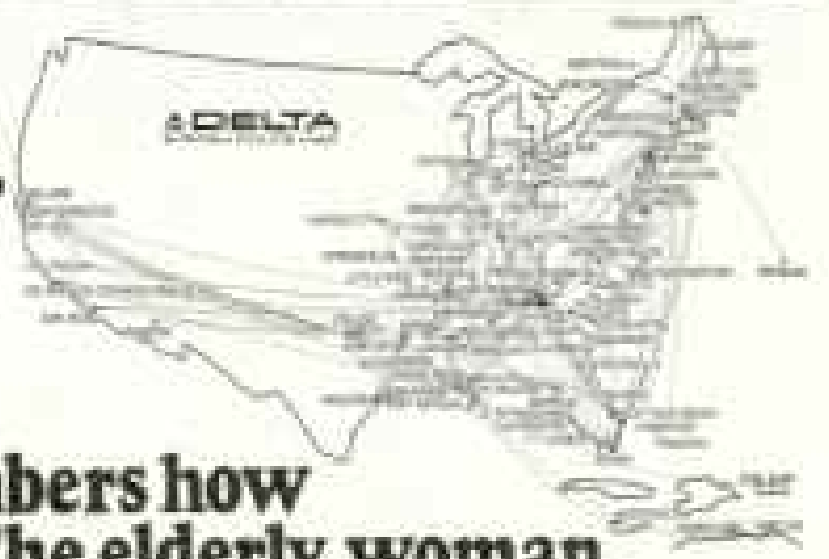


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**"THE REDS ARE RED,  
THE BLUES ARE BLUE,  
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"When my wife and I want to go out, I know our kids can stay at the Inn. Holiday Inn will get us a sitter. I get the feeling Holiday Inn is looking out for us.

"I can really unwind at Holiday Inn. The pool is free. (But they should charge admission to see me dive.)

"Another thing I like about Holiday Inn is the restaurant. It always seems to be open when we're hungry. The food is good, so is the service.

"Holiday Inn is always at the top of our vacation list. We know we can leave our hassles behind us. And that's a great start for any vacation."

*\*Children under 12 always stay free with their parents at all Holiday Inns. And now, at over 1,250 participating Holiday Inns, Teens stay Free when they share their parents' room, and the two person, two-bed rate is paid.*



**AT EVERY HOLIDAY INN,  
THE BEST SURPRISE IS  
NO SURPRISE!**



**"THE POOL IS FREE, BUT THEY  
SHOULD CHARGE ADMISSION TO SEE ME DIVE!"**