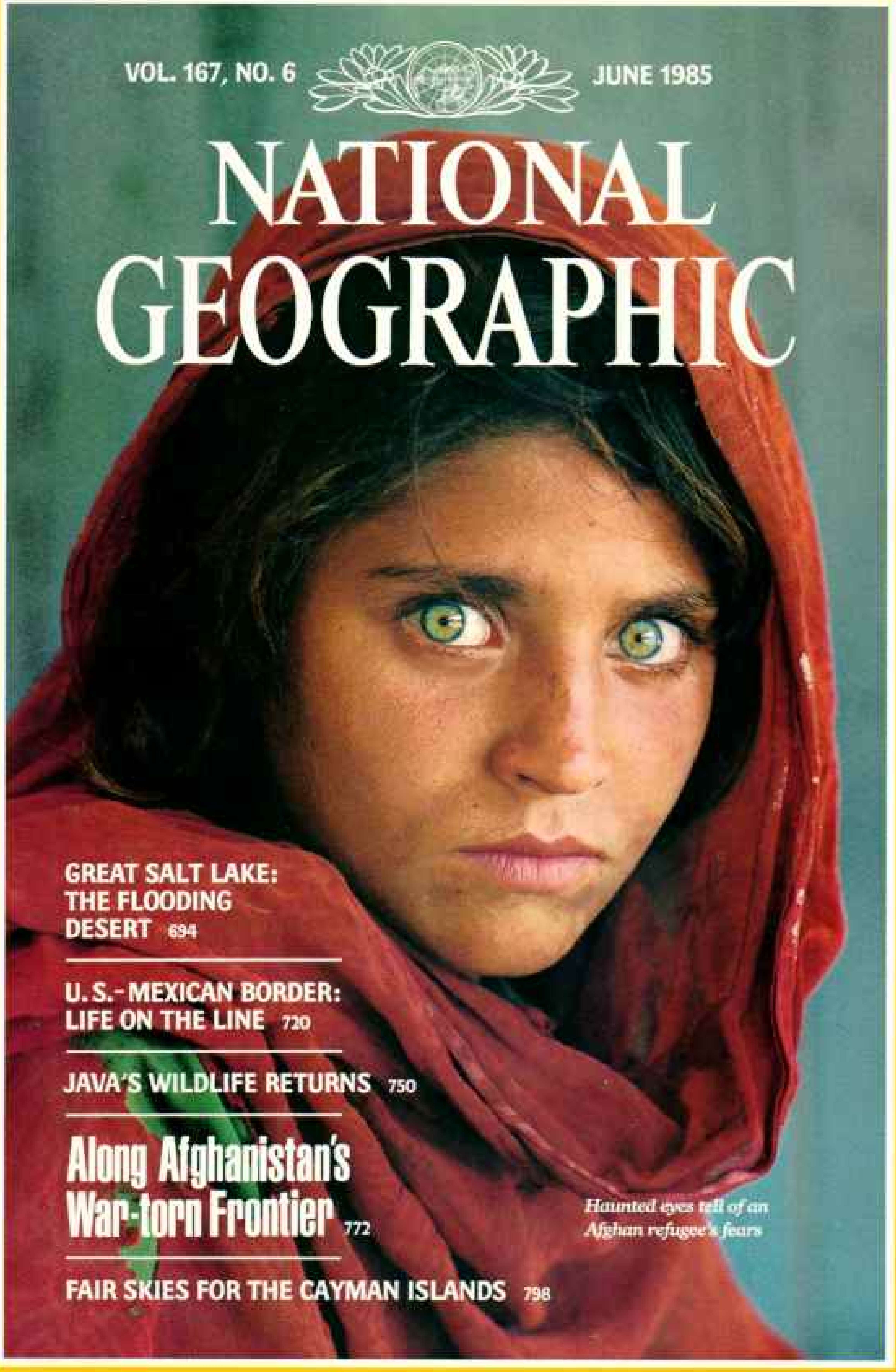


*Haunted eyes tell of an Afghan refugee's fears*

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WHEN WE BEGAN a gradual, methodical conversion to the metric system eight years ago, beginning with scientific articles and supplement maps, we expected resistance but not the vehemence of some of the complaints. We were called "pinko Commies, un-American, and traitors," as well as "just plain stupid."

Not everyone was against us, but as usual our critics were more vociferous than our supporters—by a wide margin. Since 1981 we've received close to 400 letters of complaint, versus only 29 in support of metric. In that same time 73 members (out of more than ten million) have resigned in anger.

It was a case of shooting the messenger who brings bad news. Few of us were thrilled by the need to learn new ways of measuring, but it was obvious that change we must.

Every nation in the world has adopted or is now committed to metric except three—Burma, Brunei, and the United States. The Olympics, as in Los Angeles last year, are run entirely in metric. Our national parks now use both miles and kilometers on signs. Because of NATO, our Department of Defense is moving to full metric standardization.

As is usually the case when our purses are endangered, we listen very carefully. What we are hearing is that the European Economic Community has set a 1989 deadline for all imports to be entirely metric. In Japan metric must now be used in all commercial transactions. Sixteen percent of the 1,000 leading U. S. firms have reported losses for failure to supply in metric.

The result: "Pinko Commies" aren't the only ones hearing the metric message.

General Motors cars are almost 100 percent metric, Chrysler 70 percent, Ford 50 percent. Seventy-one percent of the *Fortune* 500 companies manufacture a metric product. Forty percent of the wrenches now sold by Sears, Roebuck are metric.

For those like myself who still haven't fully converted their brains to metric, the GEOGRAPHIC will continue to use metric where appropriate and give customary U. S. equivalents when feasible.

Despite claims to the contrary, the dinosaurs did not go away overnight, nor will the older standards. The world has learned to live without dinosaurs. In time we'll all learn to live with metric.

Wilbur E. Garrett

EDITOR

# NATIONAL GEOGRAPHIC

## June 1985


### No Way to Run a Desert 694

*Fed by successive seasons of record snowmelt and rain, the Great Salt Lake overspreads its desert basin, threatening the handiwork of man. Rick Gore and Jim Richardson report on a continuing crisis.*

### U. S.-Mexican Border: Life on the Line 720

*Despite illegal crossings, drug smuggling, and neighborly tensions, life along the border brings benefits to both nations. Mark Kramer and Danny Lehman travel the line from the Pacific to the Gulf of Mexico.*

### Return of Java's Wildlife 750

*A century after the eruption of Krakatau devastated a wide swath of the Javanese mainland, Dieter and Mary Plage find that plant and animal life has returned in abundance to an area left desolate, now a national park.*

### Along Afghanistan's War-torn Frontier 772

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### Fair Skies for the Cayman Islands 798

*In a Caribbean mecca for scuba divers, financiers, and tourists, Peter Benchley and David Doubilet meet an island people in touch with their past and planning a bright future.*


**COVER:** *Haunting eyes and a tattered garment tell the plight of a girl who fled her native Afghanistan for a refugee camp in Pakistan. Photograph by Steve McCurry.*


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FOUNDED 1888

## THE RISING GREAT SALT LAKE

# No Way to Run a Desert

By RICK GORE
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by JIM RICHARDSON

IN FEBRUARY OF 1985, as below-zero temperatures grip Utah's Great Salt Lake, I drive out from Salt Lake City on Interstate 80 until I see the Moorish spires of Saltair emerging like an improbable mirage. Over the past year I have made this drive often. For one thing, Saltair symbolizes a bygone glory on the Great Salt Lake. Born in 1893 as an immense amusement palace on piers, Saltair for decades drew trainloads of day-trippers out from the city to bathe unsinkably in the lake's super-salty water, ride a roller coaster, and dance to the best of the big bands. That Saltair is gone, a victim of decay and disinterest in the 1950s and finally fire in 1970.

The new Saltair, which held its grand opening in May 1983, has become both victim and symbol itself. Since mid-1982 nature has rampaged inexplicably across the Salt Lake basin. Sieges of storms in the watershed, including the Wasatch Range, which rises so audaciously behind the valley, have sent unprecedented surges of fresh water into the Great Salt Lake. Saltair has been my barometer of the altered state of the lake.

I have watched the lake rise steadily around Saltair's perimeter, as its developers struggled to dike and protect their 2.5-million-dollar nostalgic dream.

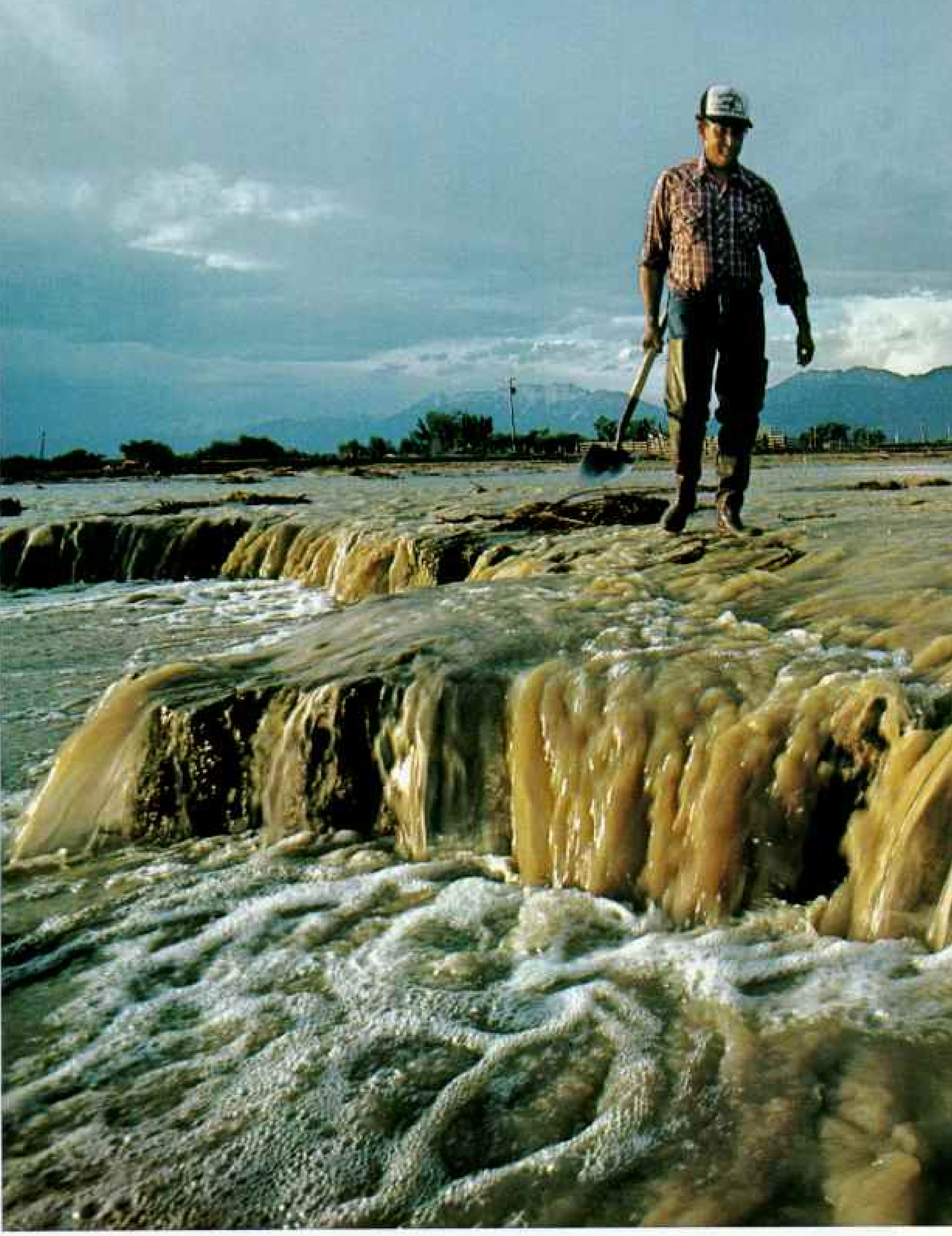
In April 1984 storm tides toppled Saltair's water slide and flooded its dance floor. By midsummer the water had come within three feet of the lake's 1873 historic high mark of 4,211.6 feet above sea level. *(Continued on page 700)*

***In a scene from Noah,*** *record rain and snowfall in northern Utah flood into Great Salt Lake, which has risen an alarming 8.5 feet in two years. Swamping beaches, the overflow inundated Saltair resort, background. Roads have been diked and lifted, but the water remains, and no one knows what's next.*

Great
CLOSED
Lake
Magna
NO PARKING ANY TIME

***A seagoing interstate** resulted when the Great Salt Lake overran its southern shore and threatened I-80, the major east-west highway, here angling east to skirt the Oquirrh Mountains, at right, and enter Salt Lake City at the base of the Wasatch Range, at left. On six miles of that stretch, built at 4,207 feet above sea level in the 1960s, when the lake was lower, crews worked day and night last year to raise roadbeds to 4,214 feet (**right**). Last July the lake peaked at 4,209.25. Just offshore, the Union Pacific Railroad elevated its tracks three times to stay above the rising waters; the railbed protects the highway from windblown storm surges from the north. Elsewhere along the shore, septic tanks backed up, salt evaporation ponds filled, and freshwater marshes were destroyed.*

STOP



**Helpless against disaster,** *farmer Jon Beck watches the Spanish Fork gully his pasture on its 1984 rush from the Wasatch, beyond, to Utah Lake and Great Salt Lake. The flow destroyed a $10,000 leveling job completed after a similar washout*

*in 1983. Normally the waterway meanders through his 150 acres, providing irrigation for land his Mormon grandparents first farmed in 1872. Awaiting what this spring will bring, Beck has left these 30 acres to weeds and driftwood.*

Since 1982 the lake has expanded from 80 to 110 percent the size of Delaware. Now, on this frigid afternoon in February, I see the shoreline at Saltair locked in ice. Ice in a lake that once was eight times saltier than seawater seems most unlikely. But then "unlikely" is one of the gentler descriptions one hears these days of the Great Salt Lake's behavior.

"She's a mean old gal," said state legislator Fred W. Finlinson, after describing how Utahns will reluctantly start spending more than a hundred million dollars this year to dike and better manage the upstart lake.

"It's always been an eyesore," stated Kent Bateman, a volunteer I met while passing sandbags to contain a flooding tributary to the swollen lake. "Nobody likes it there. It's brutally hot in the summer. It smells bad, and the brine flies swarm all over you."

But the late historian Dale Morgan said it best: "Lake of paradoxes, in a country where water is life itself and land has little value without it, Great Salt Lake is an ironical joke of nature—water that is itself more desert than a desert. Moody and withdrawn, the lake unites a haunting loveliness to a raw desolateness. Not many have achieved a sense of intimacy with it. It is intolerant of men and reluctant in submission to their uses."

THE LAKE had seemed particularly intolerant of human enterprise a year earlier, in March 1984. With hydrologist Ted Arnow of the U. S. Geological Survey I drove out beyond Saltair on Interstate 80. The lake lapped on both sides of the highway. In places water flooded onto the road, and at times we found ourselves driving *through* the lake. Teams of bulldozers worked hurriedly to build dikes and elevate the road several feet. They worked as well to raise the tracks of the Union Pacific Railroad, which also skirts the south shore. A passing train seemed to skim across the water. A "closed" notice had been posted across exit signs for the Great Salt Lake State Park beaches. Nearby beach facilities sat half submerged offshore.

Moreover, any swimmers in that water would have had to tread water. In the days when a person could read a newspaper floating on his back, the lake's salinity exceeded 20 percent. In 1959 the Southern Pacific Railroad built an earthen causeway across the middle of the lake, cutting off its northwest arm from the freshwater flow of the three main tributaries: the Bear, Weber, and Jordan Rivers. Thus the northwest arm grew saltier, while the south, flush with river flow, grew fresher. The Great Salt Lake is shallow—no deeper than 34 feet in normal times. So the recent inflow of fresh water has been able to mix in quickly, dropping salinity in the southern arm to less than 6 percent. Seawater averages about 3.5 percent.

"There's water flowing into the lake 365 days a year," said Arnow. "It's like a big bathtub without a drain. Water can only get out one way. It evaporates, mostly in the summer. The lake is salty because evaporation leaves behind the salts and minerals that runoff has leached out of the mountain rocks. When evaporation can't keep up with precipitation and runoff, the lake rises."

I asked Arnow how high the lake could rise. He pointed back toward the Wasatch, at two terraces in the foothills. The upper terrace was the shoreline of ancient Lake Bonneville, which 16,000 years ago, during the last glacial era, covered an area almost the size of Lake Michigan. Lake Bonneville peaked at 5,090 feet above sea level. Then it burst its bounds at Red Rock Pass in Idaho, dropping within a year 350 feet to the second, so-called Provo terrace. By 8,000 years ago the lake had evaporated to its modern size (maps, pages 702-703).

"If Lake Bonneville were to recur," said Arnow, "downtown Salt Lake City would be under nearly a thousand feet of water."

No one thinks the basin will see Lake Bonneville depths again soon. Evaporation would have to be severely inhibited for centuries. That would require the prolonged low temperatures of an ice age.

"But twice in the past 8,000 years," said Arnow, "the lake has risen above the 4,230-foot level. That's the elevation of the office building where I work. Our airport runways are at 4,220."

However, so many homes, roads, waste-treatment plants, and public facilities have been built in recent years on the lake's floodplain that, even should the lake reach its historic high of 4,211.6 feet, damage could start becoming disastrous.

RECORD RAINFALL in September 1982 triggered the basin's ordeal. Then winter brought unprecedented snows, as great as 835 inches, to the Wasatch. A sudden May heat wave sent torrents of snowmelt down the slopes toward the lake. For two weeks a sandbagged river rampaged down Salt Lake City's State Street, and the lake level that year surged 5.2 feet—almost twice the previous record rise.

In March of 1984, as Arnow and I drove the lakeshore, the level had reached 4,206.7 and was rising. One glance at the glowering Wasatch underscored why anxiety was mounting. Even more snow than the previous year had accumulated in those peaks. The odds against two such record-breaking years occurring back to back were almost incalculable.

"We thought the first winter was a once-in-a-hundred-year event," said Salt Lake meteorologist Mark Eubank. "Then nature turned around and did the same thing again. You'd never predict that, never expect it."

Ironically, the state of Utah has a trademark on the source of its woes. "The greatest snow on earth," they call it. I have often skied Utah and know how deliriously deep, light, and powdery Wasatch snows can be.

As Pacific storms approach the Wasatch, winds often kick up dust from the salt flats laid down to the west by the old Lake Bonneville. This salt-enriched dust, many believe, seeds the storm clouds, encouraging them to dump phenomenal snows as they hit the abrupt 11,000-foot wall of the Wasatch Front. Some think those salty dust particles put magic in Wasatch snow crystals,

***Headed for high ground,*** *Allen Worthington of Murray carries his neighbor Susan Shippee to safety after the Big Cottonwood overflowed its banks, seeped through sandbag dikes, and rose to the doorsteps of their trailer homes. "Ordinarily, it's a lovely creek off my backyard," she said. "But the last two Junes it's been terrible."*

LARGEST LAKE west of the Mississippi, the Great Salt covers an area larger than Delaware; since 1843 its maximum depth has ranged between 24 and 45 feet.

# Salt Lake basin: No way out

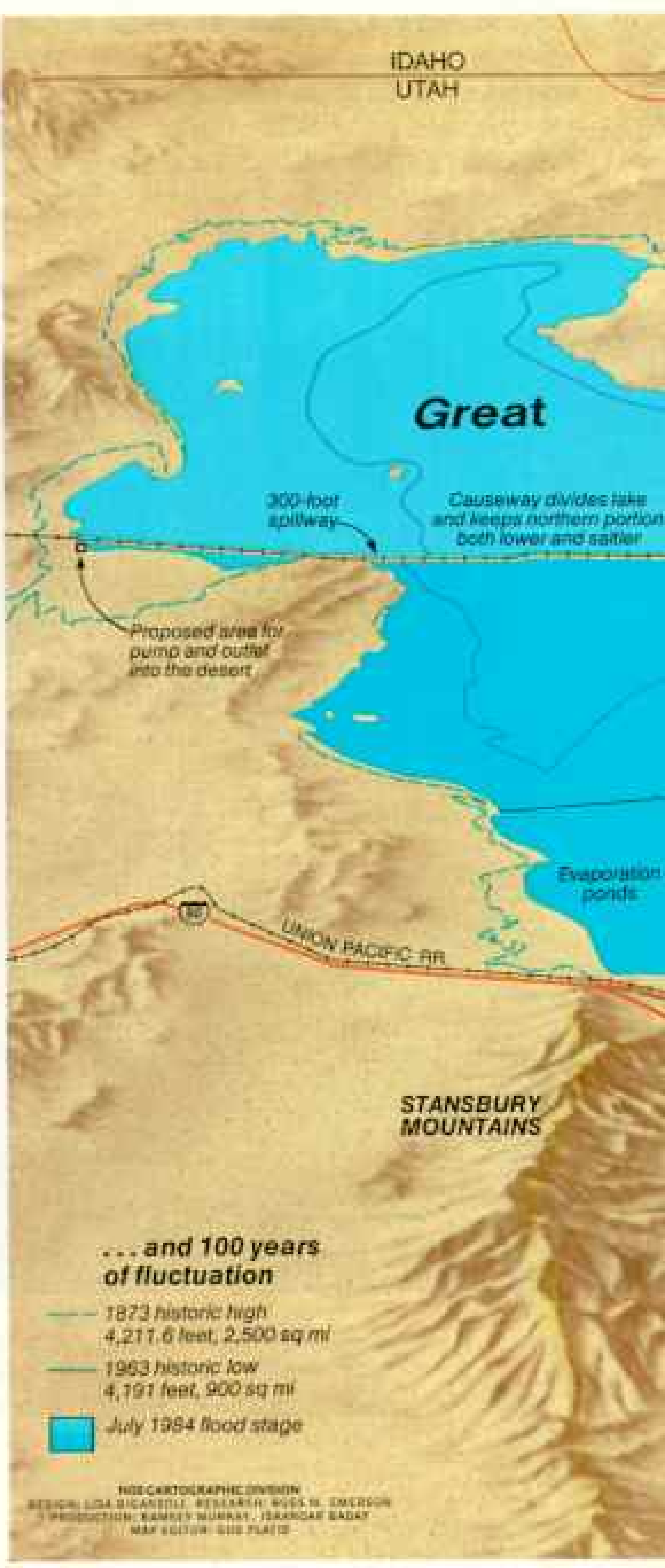
IMMENSE CATCHMENT for a 21,540-square-mile watershed, the Great Salt Lake has seen water rise and fall intermittently for millennia. The process occurs annually as spring runoff raises the lake and summer sun evaporates water. Fresh inflow—primarily from the Bear, Jordan, and Weber

**16,000 years of evaporation**

16,000 years ago
5,090 feet, 19,800 sq mi

Late 1600s
4,217 feet, 3,700 sq mi

July 1984 high Great Salt Lake
4,205 feet north of dividing railroad;
4,209 feet south of railroad;
total area 2,300 sq mi




**. . . and 100 years of fluctuation**

1873 historic high
4,211.6 feet, 2,500 sq mi

1963 historic low
4,191 feet, 900 sq mi

July 1984 flood stage

*Rivers—brings in two million tons of dissolved minerals, accounting for the lake's salinity, now fallen from above 20 to below 6 percent in the south arm.*

*During the past glacial age, inflow exceeded evaporation, and about 16,000 years ago water rose to its maximum, forming Lake Bonneville (**below left**). When Mormon settlers arrived in 1847, the lake stood at 4,200 feet elevation. By 1873 it had risen to its historic high of 4,211.6, causing Brigham Young to propose spilling its waters into the desert, an idea revived today.*

*When the lake sank to its historic low in 1963, some Utahns believed it would dry up. But wet winters and cool, cloudy summers have since put it on the rise, increasing its surface area from 900 square miles to 2,300 square miles. Some experts see a rise to an elevation of 4,217 feet as a conceivable high in the near future; that level occurred in the late 1600s, judging by flooded Indian campsites.*

instilling their exceptionally dry fluffiness.

Wasatch snows have been discovered by masses of skiers in the past decade. In 1970, when I first visited Alta, one of the country's oldest ski resorts, it seemed a rustic secret stashed away at the top of Little Cottonwood Canyon. Now, posh resorts such as Park City and Snowbird have risen in the Wasatch. And in the winter of 1984, as the valley below was beginning to drown, skiers—mostly from out of state—were adding 162 million dollars to Utah's economy.

The elegant new Deer Valley resort epitomizes this flip side of flooding. Deer Valley's developers plan to spend almost three times as much to create what they unabashedly consider the Rolls-Royce of the ski industry as the state of Utah needs to spend on dikes and pumps to control the rising lake. Rooms at Deer Valley start at $170 a day and escalate rapidly. "We bake our own croissants and smoke our own trout and groom many of our ski runs like country-club fairways," boasts marketing director Russ Veenema.

While the storms of 1984 were giving most of Utah's ski areas their best season ever, Alta's ski-lift manager Chic Morton complained of too much snow. Morton, who recalls single storms that dumped as much as 120 inches on Alta, cannot remember one year, let alone two in a row, with 800-plus inches. Business actually suffered at Alta, which orients itself to local skiers. "Anything that distracts Salt Lake people from recreation—like closed roads and lots of snow to shovel—hurts us," said Morton.

Nor did 1984 bode well for basin farmers, who usually relish heavy snow years. Already runoff had forced Utah Lake, which flows via the Jordan River into the Great Salt Lake, over its banks, claiming thousands of acres of pasture and cropland. Utah is the country's second most arid state, and its farmers are used to conserving every gallon of water. Practically the first thing the Mormon pioneers did after they arrived here in 1847 was to dam and divert mountain streams for irrigation.

THROUGHOUT THE SPRING nature continued its onslaught. By mid-May nearly 800 inches of snow had fallen at Alta. In late May I returned for the anticipated flooding.

"We don't have flooding here," I was informed curtly. "We have controlled runoff."

Indeed, all winter long, community groups, especially members of the Mormon Church, had been filling more than a million sandbags to keep swelling creeks in their banks. For the most part such preparation did forestall flooding. But on the afternoon of May 31, a severe thunderstorm struck the Wasatch Front. By 7 p.m. Big Cottonwood Creek had surged over sandbagged railway-tie dikes and into the Cottonwood Cove Mobile Home Park. As residents evacuated, I joined some 40 volunteers trying to fend off the creek. Soon I was wading thigh-deep through the same melted crystals I had skied a few months earlier.

"We're holding our own, but we're not winning," said one voice in the dark.

"I think we're just throwing sandbags into the river," said another.

"This has become an annual social event," quipped Dave MacMeekin, coordinator of the operation. "Every May we stand in line and do this. I'd like to go on record saying that Utah is no longer a desert."

These volunteers illustrated why people call Utah the Beehive State. Mostly Mormon, they had been drafted via a chain of telephone calls.

"We can put thousands of people in the field on short order," said MacMeekin. "Last Memorial Day morning I sent out a call at 6:45, and by 7:45 I had 350 volunteers ready to work. One hour. That's all it takes."

A few miles away, along the engorged Jordan River, Mormon brethren had also come to the rescue of Boise Evans, helping him build a four-foot-high dike around his farmhouse. Normally the river is a quarter of a mile away. Now it encircled his home, lapping three feet deep against the dike.

"We have a moat!" said Evans's wife, Carole. "We may not have a castle, but we sure have a moat."

"Our backyard and pastures have been underwater for more than a year now," said Evans. Although several neighbors had abandoned their homes, Evans was fighting back. His great-great-grandfather had pioneered this area with Brigham Young. He had had seven wives and 41 children.

"I think the high water's going to last a while," said Evans. "The experts say we'll

need a couple years of normal weather before it's gone. I'm sure by then everything on the land will be dead."

"We'll stay as long as we can," said Carole. "We've brought up six children here."

Evans nodded. "I can raise that dike a little higher. We'll stay."

Earlier that day I had driven the south shore of Utah Lake with Ralph Horne, Utah County agriculture agent. "This whole country seems to be eroding and falling apart," he said, heading for Glenn Holt's farm. In the past few weeks a creek-turned-wild-river had carved a small canyon out of Holt's alfalfa field.

"I've lost about two acres, but I can't complain. Others have been hit much worse," Holt told me as we walked through his alfalfa with his grandson Todd and his dog Snooper. "Two or three years ago we wouldn't have dreamed of this. I don't know what we'll do if it keeps up."

"A couple of acres is quite a loss," he continued. "This is choice farmland. Some of the best in the state. It's our living. But when I look at this gullying, it's not so much the financial loss that gets me. It's a feeling deep inside—like losing one of your best friends."

WHILE GLENN HOLT'S two acres were being eroded, Peter Behrens, president of the Great Salt Lake Minerals and Chemicals Corporation, was watching more than 19,000 acres of a very different crop disappear. The surging lake had burst through a dike, inundating most of the company's 30 square miles of evaporating salt ponds. The ponds, under development since 1966, use solar energy to evaporate the rich brine of the lake's northeast arm. They produce about 200,000 tons a year of sulfate of potash.

"It'll be at least two years before we recover," said Behrens. "If we get eternal sunshine, we'll come back by then. But I think the probability of this lake turning around anytime soon is small."

The company was continuing to elevate and repair its dikes, even though the lake was now 10 to 12 feet higher than most of its salt ponds. "What else can we do?" Behrens shrugged. "We have to stay alive so we can make a living tomorrow and hope that somehow the problem will be solved."

Meanwhile, the lake had been gradually reclaiming some of the most valuable wildlife refuges in the West. A mosaic of dikes and impoundments along the east shore, constructed mainly in the 1930s, used to retain a shallow sheet of fresh runoff on top of what had been sterile salt flats. Thus wastelands were converted into 400,000 acres of fertile, managed marshes. Some 40,000 hunters and untold bird lovers from

**Twentieth-century alchemy** *converts salt water into metal at Amax Magnesium Corporation. Since flooding has reduced salinity, blue dye has been sprayed into evaporation ponds to increase heat absorption and speed evaporation of brine to be processed into 38,000 tons of magnesium metal annually. Salt scooped from the bottom forms dikes.*

**Deep under the Great Salt Lake basin,** *an unusually hot zone in earth's upper mantle causes the brittle top crust to stretch—about four inches a century—and to fracture in a north-south direction (***diagram, right***). During the past 15 million years in the Great Basin, enormous blocks thus formed have tilted along the fractures, or faults (small arrows), creating valleys like that filled by Great Salt Lake and leaving escarpments that compose such heights as the Wasatch Range and Oquirrh Mountains.*

*Utah's major seismic zone, the Wasatch Fault, runs along the Wasatch Front, where 80 percent of Utahns live and where an earthquake as great as 7.5 on the Richter scale has occurred every 400 to 1,000 years.*

*Hot springs, bubbling along the fault, were long used by Indians and early pioneers. Thermal springs at the bottom of Capitol Hill have been diverted, and the Wasatch Springs municipal baths have been turned into a children's museum.*

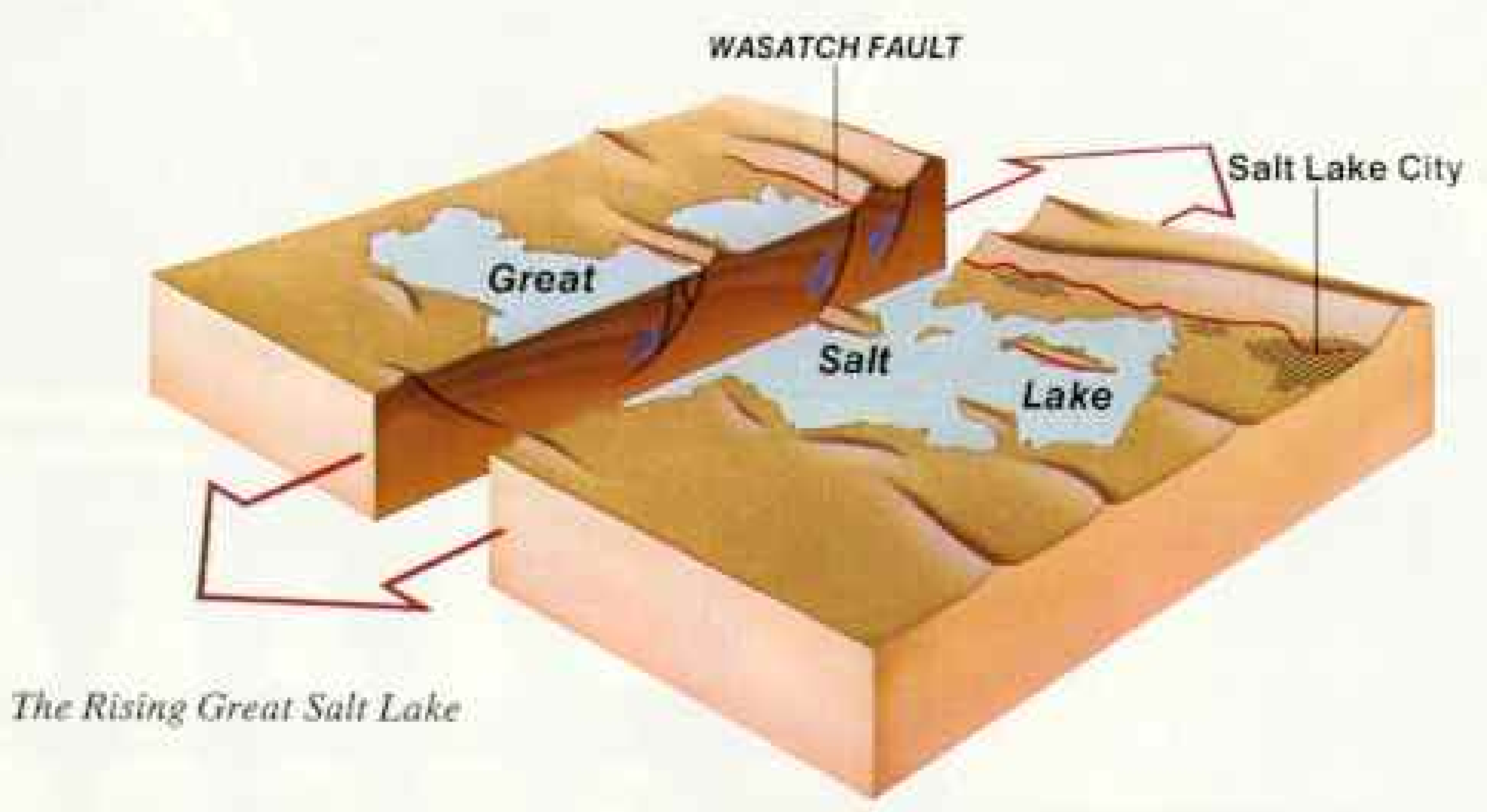
◀2

◀3

◀1

***Ancient beaches** behind Utah's copper-domed capitol reveal the lake's fluctuations in prehistoric times. During the past ice age, water began to rise but stalled 22,000 years ago at 4,500 feet, creating the lowest terrace, at far left— the Stansbury level (**1**). By 16,000 years ago water had climbed to 5,090 feet, the Bonneville shoreline (**2**), before overflowing into the Snake River. The diversion lowered the lake to 4,740 feet, the Provo level (**3**), where it remained until 14,000 years ago. The lake has since declined as climate turned warm and arid.*

*In 1847 Brigham Young sent a party to Ensign Peak, upper right, to survey the topography. Nearly 70 years later the capitol was built on an ancient delta of City Creek, which swept through the downtown in 1983.*

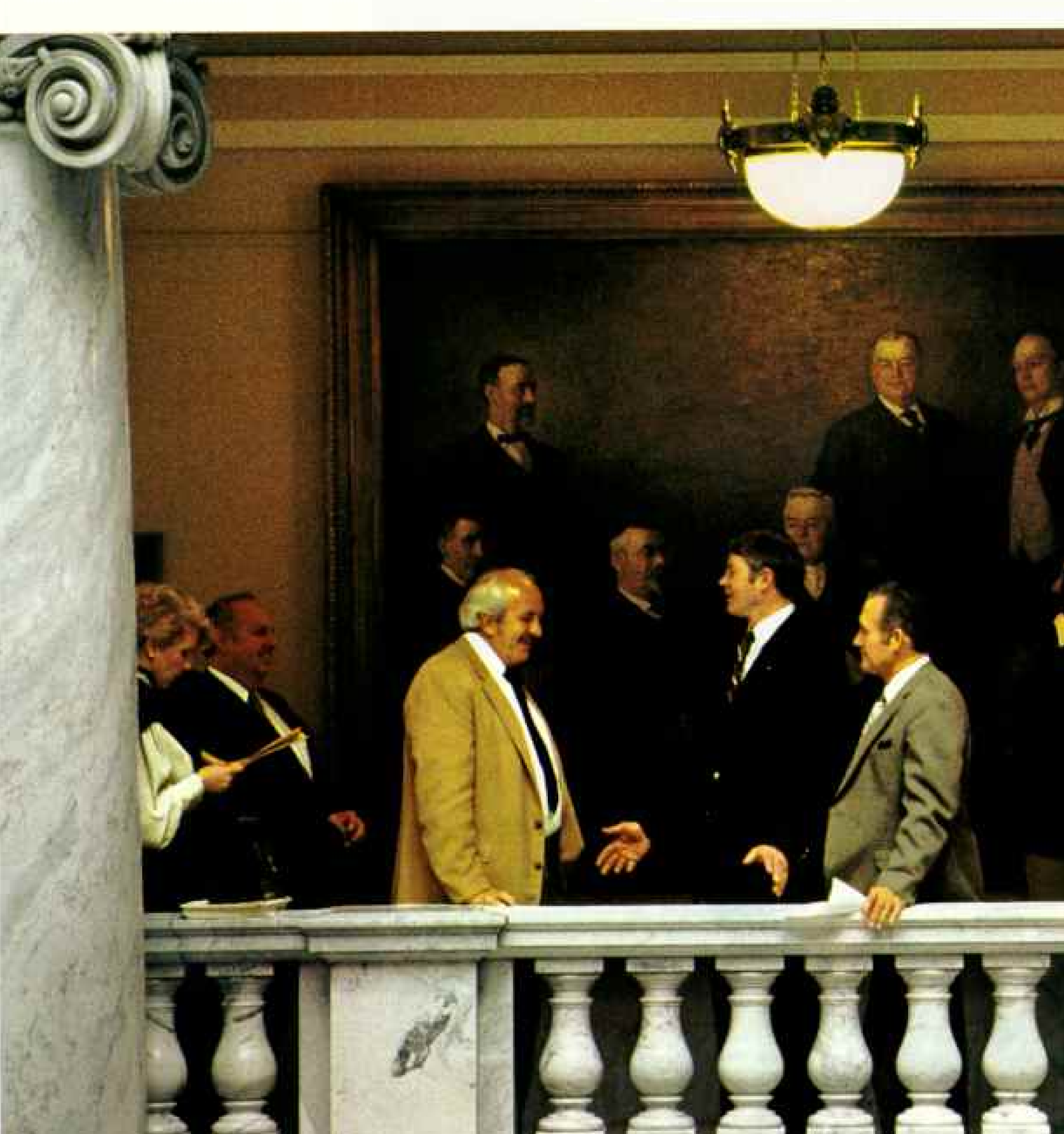


across the country relished these wetlands.

"We've lost almost all our marshes," said Tim Provan, who worked for 17 years in the state's waterfowl program. "They are just acres of salty waves. Millions upon millions of migrating birds used to linger here for months, feeding and resting. Now I'd say 90 percent of them bypass us. They put greater stresses on marshes in California and Nevada. Many have no place else to go."

The lake has claimed some 50 million dollars in wildlife dikes and facilities. But even when lake levels recede, rebuilding will require more than money. "It takes time for salt to leach out and bulrushes to come up. We won't be able to put ducks and hunters together for a long time."

DAMAGE from the snowmelt of 1984 ran more than surface deep. I flew by helicopter to a 6,900-foot peak overlooking Emigration Canyon, from which the Mormon pioneers first laid eyes on the Great Salt Lake. Bruce N. Kaliser of the Utah Geological Survey showed me a 12-foot-long crack where the waterlogged mountainside was beginning to give. Below lay the homes in Johnsons Hollow. "We've got



three potential slides—three loaded guns—pointing right at Johnsons Hollow," said Kaliser.

"Never, ever, in historic times have the slopes of Utah been so waterlogged," he continued. "The ground is so saturated that the slide hazard will persist at least ten years."

Kaliser was setting up a remote-control sensor, which will sound an alarm in Johnsons Hollow should it detect a major slippage of the mountainside.

But in May 1984 even an alarm system did not comfort terrified homeowners below.

"We thought we were safely tucked away up here in our canyon," said resident Colleen Wood. "Then one day this man from the county tells us we might be covered with a wall of mud and tries to evacuate us.

"With this alarm we still only have three minutes to get out of our homes and onto the side of the canyon. What if it goes off in the middle of the night?"

All across northern Utah such sodden landmasses were detaching from mountainsides, creating nearly 2,000 potential landslides. What worries Kaliser is that some slides may develop surprisingly fast. He was proven right last Halloween. That night earth avalanched off a bluff with no warning, demolishing a house in a populous Salt Lake suburb.

"The owners had gone out to dinner," said Kaliser. "Had they been home, they would have surely been killed."

MOST WORRISOME OF ALL in this soggy era is the Salt Lake basin's little-publicized vulnerability to a major earthquake. Studies show that some segment of the Wasatch Fault, which runs for about 250 miles along the base of the mountains, fails every 400 to 1,000 years. The resulting quake, says University of Utah seismologist Bob Smith, could well measure 7.5 on the Richter scale. By comparison, the 1906 San Francisco earthquake measured about 8. Since the Wasatch Fault has not failed in recorded history, it may be ripe for a break. One consultant put the probability of a major earthquake along the fault at 80 percent within the next 50 years.

Should even a moderate quake occur while the basin is so waterlogged, it would trigger untold landslides. And few buildings

***Wrestling with imponderables,*** *legislators and lobbyists confer in the capitol under a painting of the men who built it in 1916. The legislature approved designs for dikes and a pumping station to the west desert, but postponed a funding decision until this month. They reason that if flood prevention costs more than possible damage, or if flooding ruins prevention projects, money is ill spent. And if water stops rising, flood control money goes down the proverbial drain.*

*A mountain moved,* and two major highways, a vital railroad, and the tiny village of Thistle paid the price. On April 10, 1983, after a year of high precipitation and rising groundwater, an ancient landslide began to dam the canyon where two creeks converge to form the Spanish Fork. By the fifth day **(below)** bulldozer crews were furiously stabilizing the earthen plug to prevent a breach that could endanger the town of Spanish Fork downstream. Up canyon, center, the water backed more rapidly than predicted, and residents had only hours to evacuate. Evan and Evelyn Nelson **(right)**, who carried out some belongings in paper bags and bed sheets, inspect their beloved retirement home, lost under tons of mud.

*For weeks the earth kept sliding, and the dam rose, creating a lake three miles long and 200 feet deep. Some in the area liked the lake, but the state, unable to guarantee its stability, drained the water gradually by tunneling through Billies Mountain, at left. Meanwhile, the Denver and Rio Grande Western Railway blasted two tunnels through the mountain. U. S. 6 was rerouted across the peak, and U. S. 89 was reconstructed. But Thistle is no more. The catastrophe brought the first presidential declaration of a disaster area in Utah.*

BILL G. FRANCIS (BELOW)

are designed to withstand severe quakes.

The Salt Lake Valley has earthquakes for the same reason it has the Great Salt Lake. Bob Smith took me up the Snowbird tram to the top of the Wasatch. Below lay a panorama of what geologists call the Basin and Range province. About every 15 miles, for as far as sight permitted, rose small mountain ranges, separated by basins.

"Fifteen million years ago a plateau as high as the Wasatch may have extended from here to the Sierra Nevada," says Smith. "The Sierra was much closer then."

Gradually a zone of hot, partially molten rock began rising beneath western North America, forcing the plateau to stretch and crack. As those cracks, or faults, developed, blocks of earth's crust began to collapse, creating the many basins that now accent ranges all the way to California. The Wasatch Fault marks where the Salt Lake Valley is slipping ever farther downward.

THE FAULT also creates a worrisome new hazard from the encroaching lake. When major quakes have struck Basin and Range faults similar to the Wasatch, the ground has tilted downward 10 to 22 feet. One branch of the Wasatch Fault, says Smith, runs just northwest of downtown Salt Lake City. He estimates that should it fail, sections of the city that already are becoming vulnerable to the rising lake could abruptly find themselves several feet lower in elevation.

In July 1984, before summer's evaporation set in, the lake level peaked at 4,209.25 feet above sea level. Then in October the Wasatch was pounded once again with snows. When I returned to Salt Lake City in

***Taking the speed out*** *of Speed Week, a desert rainstorm last August brings the famed amateur races at the Bonneville Salt Flats to an early end, but not before racer 1376* ***(above)*** *had set a class record at 193.223 miles per hour. After the deluge, trucks carry race cars to the pit area, where a biker proves the worth of pedal power* ***(below)****. Once the bottom of prehistoric Lake Bonneville, the desert normally receives runoff in spring that, in evaporating, draws up fresh salt, rejuvenating the flats—reputedly the world's best racecourse. But abnormal cloud cover and late rains have made the flats almost useless since 1981.*

midwinter, state legislators, faced with potential damages as high as a billion dollars, were adopting a siege mentality.

"We've got to move like hell to protect against a possible level of 4,212," said Senator Fred Finlinson. At that level, the lake would begin to inundate parts of Salt Lake City, flood sewage plants on the shore, and swamp another stretch of I-80. Officials were pressing for a 52-million-dollar system that by 1986 could begin pumping excess water into the desert west of the lake.

"The west-desert scheme will pull almost two feet of water off the top of the lake," said Finlinson. "It would increase the evaporation rate another foot a year by spreading the water over 400,000 more acres."

But without west-desert pumping, said Finlinson, the Southern Pacific Railroad would have to shut its line, and the Union Pacific would have to relocate. I-80 would likewise have to be rerouted onto higher ground. What if the west desert fills up? "Then there's no management," said Finlinson. "All we do is build big dikes to save our airport, the 500 homes in the low-lying Rose Park area of town, and our waste-treatment plants. Then we run away from the lake."

HOW LIKELY is the lake to reach such catastrophic levels? For one thing, as the lake expands in area, it takes ever more runoff to raise it a foot.

"Given normal precipitation," said U. S. Weather Service hydrologist Gerald Williams, "the lake would probably continue to rise for another year or two, because soils are so saturated. That means the lake would peak around 4,211 to 4,212, its historic high, and then start to drop a foot a year. If we get 120 percent of normal precipitation, levels could rise above 4,212."

However, no one really knows what constitutes normal precipitation in Utah. Records go back only 110 years. "If the lake keeps rising," said Williams, "there's a good chance we're seeing a climate change."

"We are right on the margin," agrees University of Utah geographer Don Currey. "Are we experiencing fluke weather, or are we returning to a little ice age?"

Earth periodically has such mini-glacial periods. About 2,500 years ago, during such a cool spell, now barren North Africa was

*Threatening livestock and wildlife alike, the rising lake caused havoc on many fronts. For a decade cattlemen from Utah and nearby Wyoming had leased Antelope Island as a mild winter pasture, trucking 1,500 head of cattle here on a causeway. But in 1983-84 heavy snow covered the grasses, and the lake covered the causeway. In June cows and newborn calves (**right**) were barged out.*

*Where the Bear and other rivers enter the lake, the Civilian Conservation Corps in the 1930s began to dike and create 400,000 acres to assure freshwater marshes as a major stopover on the Pacific flyway. Most marshes are now totally underwater, and migrating birds stop elsewhere. With loss of habitat these molting Canada geese, rounded up for banding by a state wildlife team (**below**), have reduced progeny.*

the lush granary of Rome. At that time the Great Salt Lake rose to 4,230 feet for several centuries. The last little ice age peaked around A.D. 1700 and supposedly ended around 1850. But Currey speculates that we might be entering a new spike of that epoch.

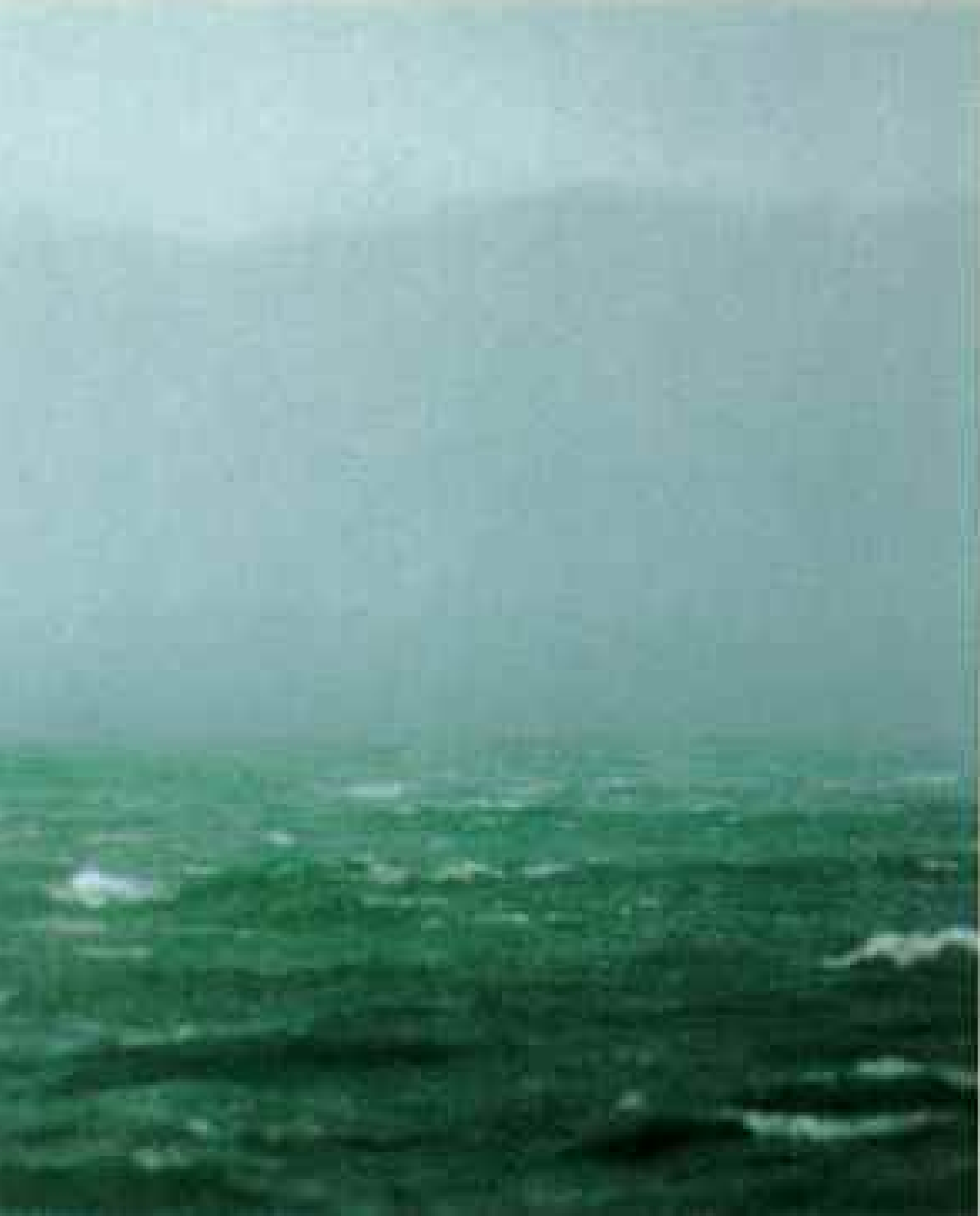
On the other hand, climatologist J. Murray Mitchell, Jr., of the National Oceanic and Atmospheric Administration says that on average the Northern Hemisphere has actually been warming dramatically in the past few years, due in part to a buildup of atmospheric carbon dioxide in recent decades. That $CO_2$, from industry and automobile exhausts, acts like a greenhouse, holding in the solar energy that strikes the earth.

Another likely agent in the recent dramatic warming, and perhaps in the excess precipitation in the Salt Lake watershed, was the infamous El Niño of 1982. El Niño is a periodic warming of equatorial waters, and subsequently the atmosphere. El Niño of 1982 was severe; its surge of warmth provoked global meteorological turmoil.*

Others dispute the El Niño connection, pointing out that history shows no correlation with high precipitation years in the Great Basin. Moreover, El Niño has ended, while Wasatch weather remains disturbed.

IN LATE MARCH 1985, as the lake level rebounds past last summer's high mark, I return to Salt Lake City to attend a University of Utah-NOAA workshop on predicting what the lake will do. While no consensus is reached on the causes of the lake's current wet cycle, Genevieve Atwood of the Utah Geological Survey summarizes at meeting's end: "We should anticipate that

*See "El Niño's Ill Wind," by Thomas Y. Canby, in the February 1984 NATIONAL GEOGRAPHIC.



***"My liquid assets,"*** *developer Wally Wright jokes as he paddles across the dance floor of the latest incarnation of the famed beach resort Saltair. Built from a salvaged airplane hangar, it began to flood within weeks of its 1983 opening. High waves ultimately burst the walls and destroyed the water slide* ***(left)****. Undaunted, Wright has since surrounded the site with a dike and plans to fill in the first floor, open a restaurant on the second floor, and make the place a marina.*

***Total joy** to skiers, deep snow in the Wasatch Range last February may bring havoc for valley residents below, since spring runoff from here will contribute significantly to the lake's annual rise.*

*Helicopters lift vacationers and guides from Snowbird resort to this ridge with its view to the Oquirrh Mountains and, at upper right, the slumbering lake.*

the lake can rise to the threshold level of 4,217 feet, where it previously overflowed into the west desert, and plan accordingly."

While the experts ponder, a spring storm pelts the Wasatch with snow, and ice floes shear several electrical transmission towers on the lake. I join a snowpack survey by Ray Wilson of the U. S. Soil Conservation Service and Dan Schenck, Salt Lake City's hydrologist. On snowmobiles we buck our way up to Parleys Summit, where snow depths have been measured for decades. At more than a dozen sites Schenck and Wilson burrow long coring tubes through the snow.

"Sixty-nine inches deep," says Schenck, after pulling out and measuring one snow core. He then weighs it to determine how much moisture it represents. "Twenty-one inches," he calls out.

"That means we are standing on top of 21 inches of water waiting to run off this mountain this spring," says Wilson.

"Right now we've got 112 percent of average snowfall at Parleys Summit," Schenck calculates. "Normally, five or six inches of that water would go into the soil. But since the ground is saturated, almost all of it will run off. That means the snowpack's equivalent to about 140 percent of normal. A lot can still happen. But I don't think 1985 is going to be easy for the Salt Lake Valley."

The next day a new storm drops 18 inches of snow. And more is bound to come.

Clearly, down by Utah Lake, Boise and Carole Evans will have to maintain their moat a bit longer. However, as Carole sees it: "This flooding has not been all bad. It's brought people together; I know now I have first-class neighbors. And I've never seen pelicans and whistling swans out my window before. If this water will just go away, it will have been a very interesting experience." □

## U.S.-MEXICAN BORDER

# Life on the Line

By MARK KRAMER

Photographs by DANNY LEHMAN

IN THE CALIFORNIA starlight high above Spring Canyon, I make out the silhouette of a truck, and on the truck a turret, and behind the turret, the shadow of a member of the U. S. Border Patrol. His speech echoes the language of the hunt: "They're half a mile up still—not ready to be worked . . . they're cutting for the road at the bottom of the dome . . . they'll bush. . . ."

The speaker, operating a $70,000 night scope that evolved from a Vietnam combat model, is inspecting the no-man's-land that straddles San Diego County, California, and Tijuana, Mexico. In the canyon below, other Border Patrol agents close in on their quarry—illegal immigrants from Mexico, or maybe Central America, who are attempting to slip across the border by night.

The operator invites me to take his place. The view through the night scope is thrilling, as miraculous as flying, in the sense that

LIGHTS OF THE SAN YSIDRO PORT OF ENTRY AND TIJUANA GLOW BENEATH A BORDER PATROL NIGHT SCOPE

it allows me to do the impossible—see in the dark. The distant scene, hatched by cross hairs, plays out on a six-inch TV screen. Hills roll across the monitor in shades of amber, scrub trees and bushes clearly outlined in darker hues.

The images of the border crossers glow brightest, almost sun yellow, a quarter of an inch high. I can see the beckoning arm of their "coyote," or professional guide, as he motions half a dozen paying customers to dash downhill behind him to the next bush. Six gold blurs, bent double, dart forward, then nest within the shrubbery, then move on again.

This is the eagle's view of the mouse. The operator, behind me, talks into the radio. Solid yellow horses and riders descend into the television picture. The group clusters. "Capture," says the radio.

I re-aim the turret westward. Five miles away the sea, polluted by sewage, laps at Mile 1 of the 1,950-mile border that separates Mexico and the United States. Along this invisible political line, running through urban centers, desert, and wilderness from the Pacific Ocean to the Gulf of Mexico, the drama that I have just witnessed is commonplace.

Last year, a typical year, there were some two million illegal border crossings from Mexico into the United States. Almost all the people came in search of work and with the idea of sending money home to help their families. Most intended to return to Mexico, and many did so. Over time those who remain have become a peaceable, hardworking, illegal multitude—perhaps six million strong—who are probably indispensable to the economy on the U. S. side of the border.

In a sense the Mexicans are repopulating their own lost territories—in 1848, under the treaty that ended the Mexican War, Mexico ceded nearly half its land to the victorious United States. However one chooses to look at it, this march out of the Third World of poverty and unemployment into the First World of industry and opportunity is the most vivid fact of border life.

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BORDER PATROL agent Randy Williamson, who deals with this fact for a living, surprised me when he talked about his job. He likes most of the scores of Mexicans he arrests every day. "It takes guts to do what they do," he says. "I hope I'd try the same thing if I lived where they do and had a wife and kids to feed."

For most who head north, to try is to succeed. Often, just eight or nine agents patrol the 5½ busy miles of Williamson's Chula Vista border sector, and "once you get one in each hand, the rest just rumble on by."

Border Patrol agents tell great-catch stories—two of them took a group of 107 Mexicans into custody. ("One got away," one partner says modestly.) An agent on horseback describes his job: "I've been told to stand knee-deep in the ocean, bail, and spill back each pail. When the Border Patrol wants their numbers to look better, they put another guy in and hand him a pail too. The numbers of arrests look twice as good—but it's the same guys we're arresting."

The Border Patrol knows that its mission is hopeless. "Eventually, virtually 100 percent will make it," says Williamson. "We may catch 75 percent tonight, but we turn back everyone but the OTMs—that's the other-than-Mexicans, 6, 7 percent, who go to detention centers, and eventually get flown home." The Mexicans, bused back to Mexico by U. S. authorities and released, are free to try again. Most do.

Gene Smithburg, Williamson's supervisor, has a more traditional vision of his agency's mission. "We have a sovereign right to protect our borders," he told me. "We're protecting jobs for Americans. We arrest illegals earning nine, ten dollars an hour. Illegal aliens burglarize houses, steal cars to get out of the area. They drink beer, proposition schoolgirls on their way to school, and drive away customers at malls if they wait for employers there."

Not everyone who lives along the border shares Smithburg's opinion. Studies show that undocumented workers, who have more reason to fear arrest than fellow workers who are U. S. citizens, are more law-abiding and less likely to use welfare than the average worker. In fact, as payers into the Social Security and tax systems, as laborers willing to undertake menial jobs, and

as consumers, they actually add far more to the economy than they remove.

A few afternoons after my night on border patrol, I cross behind rows of shacks with lush green gardens in Tijuana's impoverished Colonia Libertad. Little boys play with scraps of lumber. Dogs bark. At a food stand, a large cordial woman fries *sopaipillas* on an oil-drum stove. Her customers are tonight's border crossers.

When word gets passed about that I am a journalist, men come up shyly with suggestions: "Tell them we are poor and just want to work." "Tell them we are not afraid of *la migra* [U. S. Immigration], but our own police demand payment from us." Others say they are only going to America for a while. They are Mexican, and they feel Mexican. None wants to give up his past for a new home. Most say they have made the crossing before and have jobs awaiting them on the other side.

Eventually, a short restless man in a pressed business shirt, out of earshot of the others, says he is a coyote—a man who guides Mexicans and others across the border for pay. I'll call him José. José will guide a threesome tonight.

We sit down on two shoe-box-size stones. Spiders run from underneath them as José tells his story: He has been a coyote for four years. He goes out several times a week. He has had close calls and has had to stay away from his family for several nights without sleep. "I always get my clients through," he claims. Like other coyotes, he delivers his customers to keepers of safe houses or to drivers headed past the U. S. highway checkpoints to Los Angeles.

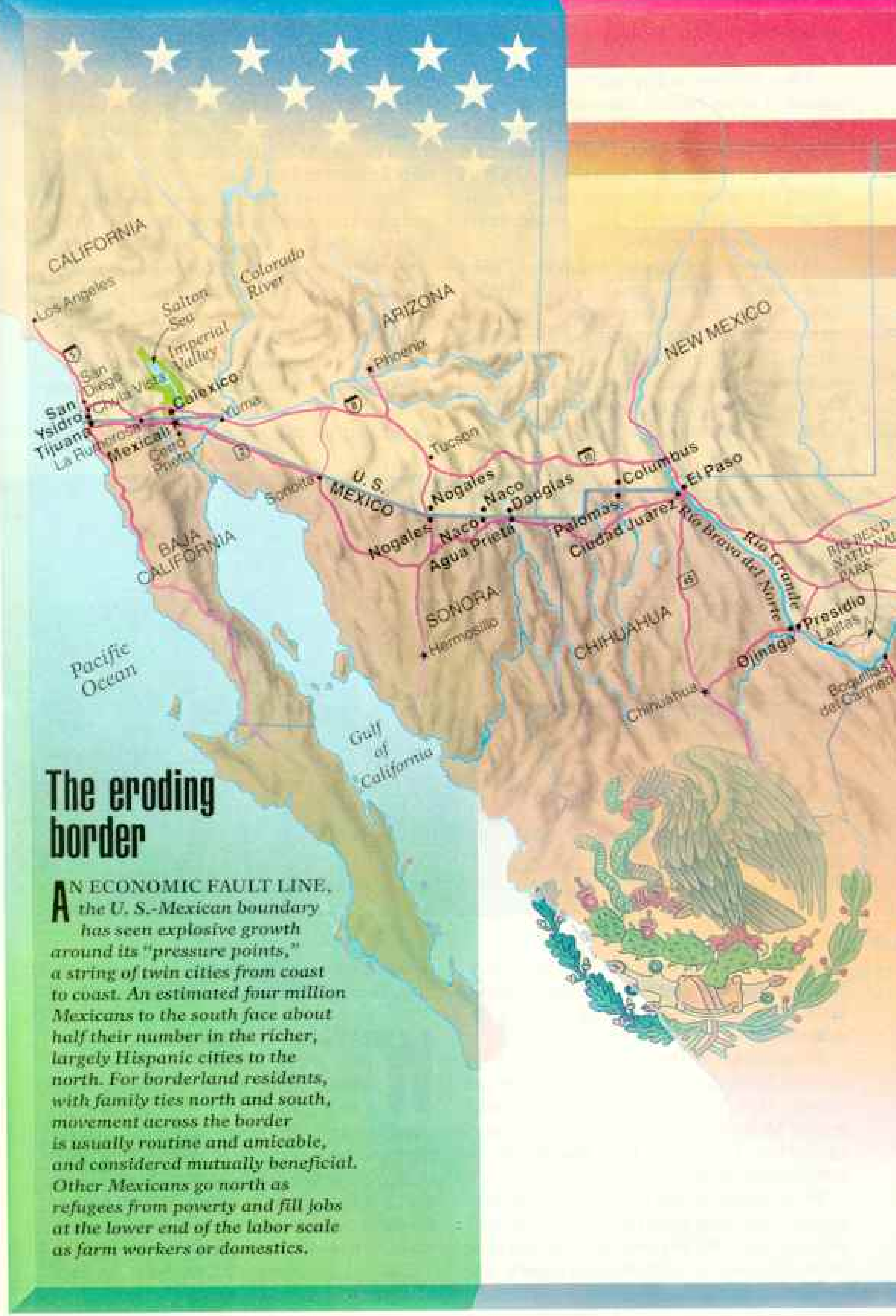
José believes that his work benefits both nations and ruefully wishes that it could be legal. Under U. S. law he is liable to a $2,000 fine and five years in prison for every alien he smuggles in. To stay in business on his own side of the border, he says, he must pay about half his earnings to Mexican officials. He feels embattled, useful, professional, overworked, underpaid, and misunderstood. José says he has encountered bandits in the canyon only once and never carries a weapon for fear someone might turn it on him. He says this is a place with rules.

***Going abroad*** *to play futbol, Yankee soccer, boys from Mexicali, Mexico, slip through a border fence into Calexico, California.*

*Crossing is not a lark, however, for the thousands who slip through the often porous 1,950-mile border each year for jobs and welfare in El Norte, the North. U. S. factories on the Mexican side, drawn by a favorable tariff policy and low labor rates, may keep more at home in the future.*

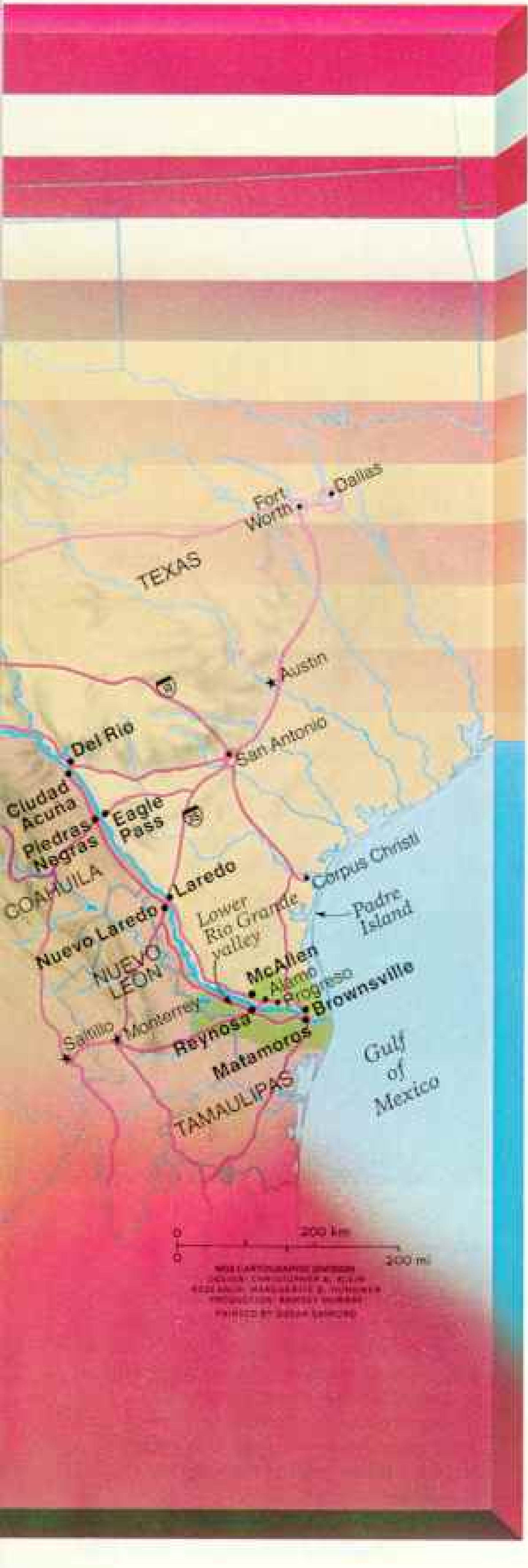
WHAT must it feel like to cross the border? Along the Tijuana fence line, within sight of the Pacific, I spot a tear about a yard high in the tall, sturdy barrier. No official is in sight. I duck through. I am in the U. S., above Smuggler Gulch, in the Border Field State Park. I peer about. I have been watched by two young Mexican women on the beach. I wave. They wave. We are in this together.

The squat stone obelisk next to me




# The eroding border

AN ECONOMIC FAULT LINE, *the U. S.-Mexican boundary has seen explosive growth around its "pressure points," a string of twin cities from coast to coast. An estimated four million Mexicans to the south face about half their number in the richer, largely Hispanic cities to the north. For borderland residents, with family ties north and south, movement across the border is usually routine and amicable, and considered mutually beneficial. Other Mexicans go north as refugees from poverty and fill jobs at the lower end of the labor scale as farm workers or domestics.*




commemorates the stability of the border. Tumbleweed blows past my feet. Juan Rodríguez Cabrillo was the first European to see this place, in 1542, says one placard in the park. People have dwelled here for at least 10,000 years. The earliest known inhabitants were the San Dieguito; then, about 7000 B.C., came the La Jolla people, who ate shellfish and had a winter village here. Then came. . . .

Then came a green pickup truck with police lights on top and a big decal of a badge on the door. The driver wears a uniform and silvered sunglasses and a nameplate: C. E. JONES. I realize I've left my credentials across the border, back in my car. I'm nervous. I try to sound nonchalant: "You looking for people crossing illegally?"

"That's a federal matter," C. E. Jones says to me. "I'm state. Try defacing one of those placards and see what happens!" We have a friendly chat. He tells me that because he is black, he never goes across the line into Mexico. "What would I want there?" he says. "Here, I'm the *man*. There, I'm the pushee. I know my boundaries."

IN THE NEXT three months I try to learn my boundaries better, traveling the whole length of the border by van, crossing the frontier frequently, becoming familiar with a vast quarter of the United States to which, as a New Englander, I have previously paid little heed. Here the wealthiest nation in the world butts up against a poor and dependent neighbor, and the interplay of U. S. prosperity and Mexico's struggling economy creates a special domain, almost a third country, with unique happenings and arcane rules.

"Asymmetric interdependence," is the resounding term that Mexican border scholar Jorge Bustamante gives to this phenomenon. Bustamante compares the relationship between the U. S. and Mexico to that of diner and waiter in a fancy restaurant. "They need each other, but one has more money and power than the other." Equality fades. The rules of the adjacent cultures overlap and sometimes cancel out.

On the U. S. side, depending on the place, people of Mexican ancestry constitute a quarter to three-quarters of border city populations. *(Continued on page 730)*

*The Tortilla Curtain, as the Mexican-U. S. border has been called, acquires added pungency in Spring Canyon, a barren gulch visible just below the horizon in this aerial view (**below**) of the San Ysidro U. S. Customs station—the border's busiest. Around 4 p.m. each day, vendors from Tijuana cross the border to sell tortillas (**right**), U. S.-style clothes, and courage-bolstering shots of liquor to crowds of hopeful border sprinters. Of the majority evading the U. S. Border Patrol, most head north to Los Angeles for jobs and anonymity. Mexicans who cross legally or with forged documents may face hours of delay as Customs officers check for drugs, contraband, and stowaways.*

*Normal border frustrations were intensified this March after the unprecedented abduction and murder of a U. S. drug enforcement agent in Guadalajara; Mexican police have been implicated. Responding to an alleged lack of cooperation by Mexican officials and threats of further violence by Mexican drug traffickers, U. S. Customs increased inspection activity all along the border, causing massive backups on the Mexican side. Here at Naco, Arizona (**right**), U. S. and Mexican inspectors discuss the temporary closing of their port of entry and eight others—the first such closings since President John F. Kennedy's assassination in 1963.*

PORT·CLOSED
NEAREST CROSSING
DOUGLAS AZ.
CAUTION

***Darkness is no cover*** *on the California border, where night-vision goggles, powered by starlight, help U. S. Border Patrol agents riding all-terrain*

*three-wheelers cope with a flood of illegals northbound from Tijuana. These men will be bused back promptly to Tijuana—probably to try again.*

Hardworking, religious, family-oriented people, their culture is Hispanic, but their lives and outlook have more in common with those of Irish- or Chinese- or Swedish-Americans than with the current rush of newcomers from Mexico.

MY TRIPS into Tijuana dramatize issues of economic power. To drive into Mexico is truly to enter the Third World, where labor is cheap, people are plentiful, and commerce on even the smallest scale has an air of urgency because it is connected to survival. North of the border, upscale shopping malls sell quality goods manufactured in the U. S., especially appliances and stylish clothing. But Tijuana greets you with signs in glaring yellow and green, offering auto bodywork, dental repairs, embroidered clothing, intricate glasswork, leatherwork, jewelry and statuary, tiles, wood carvings—everything cut-rate. Street vendors hawk food, paper flowers, comical birds fashioned from pipe cleaners and fluff, foam-rubber alligators—all made with much hand labor.

Labor is what frontier Mexico has that U. S. consumers buy. An hour of work south of the border brings a fifth to a tenth of the wage it commands in the United States. "This is not the relationship of friends, exactly," Jorge Bustamante explained to me in Tijuana, "but of business partners. You have more money, but you need us."

In Mexico I buy comfort, idle time, good food, uncrowded housing—distant dreams to many who sell them to me. But I am kept at a distance. I am indeed a customer. Prejudice is distrust, and it goes both ways. I hear Americans make callous jokes about Mexicans and overhear equally rude comments in Spanish about Americans.

Yet here too asymmetry prevails. They welcome us, if only as bearers of money. We depend, throughout the Southwest, on Mexican labor for the smooth running of farms, factories, restaurants, motels. But we accept the cheap labor of the Mexicans grudgingly, secretly, hiring it on only after it has run an obstacle course we have set up.

***Born in the U.S.A.,** a child whose parents are of uncertain resident status becomes an instant U. S. citizen, thanks to Margarita García, a midwife in Brownsville, Texas. If the boy's parents are Mexican citizens, he will have to choose between countries at age 18. For fees of up to $150 she delivers about 15 babies a month, most to women who she suspects cross the bridge from Matamoros, Mexico, with easily obtained visitor's permits. For the record most of her customers give Brownsville addresses.*

TIJUANA is a hilly, spread-out city of a million residents. Economically, it is booming. For every Mexican who crosses the border, dozens are gainfully employed in Tijuana. It's the only major city in Mexico (and perhaps in the Americas) to achieve virtually full employment. Streets are obstructed by fresh scaffolding, road projects, rising shopping areas, and even a sewer-improvement project to pump south the 13-million-gallon daily overflow that is now piped north across the border to San Diego for treatment. A sewage-treatment system for Tijuana is in the works.

The biggest reason for the upscale economy of Tijuana is the factories known as *maquiladoras*. Agreements worked out in the past two decades allow materials to be sent duty-free from the U. S. Products assembled from these materials go back to the U. S. with duty levied only on the value added by the work done in Mexico.

American manufacturers clearly benefit from locating factories where labor costs are low. The maquiladora program provides jobs, so the Mexican government likes it too. More than 680 maquiladoras along the border now employ 290,000 people.

Much electronic equipment for sale in the U. S. is at least partially assembled in such factories. At PLAMEX, managed by Tijuanan Enrique Mier y Terán, workers assemble headsets for switchboard operators. Inside the long, low plant, ranks of women—most 16 to 24 years old—work at brightly lit assembly stations. One worker, peering into a microscope all day long, winds wire fine as spiderweb into coils. Another tweezes dot after dot of solder onto a tiny metal plate, then lowers a hot stamp to melt each dot. Vacuum wrenches blurt mechanical sneezes and yelp like dogs. The women are paid about 125 pesos an hour—82 U. S. cents at the time of my visit.

I ask Jorge Carrillo, an economist who has studied Mexico's maquiladoras, about the problems of these factories that stand between two worlds. Wages, safety, management opportunities—especially for women—all these cry out for much improvement. But, Carrillo says, "There is no alternative. Mexican industry is not interested in trying to compete up here by the border, and our workers would not be paid better if they were producing these same goods for Mexican consumption—the same problems affect domestic manufacture too."

On the border the workings of the international labor market are more obvious than they are elsewhere—no ocean separates rich from poor here. I talk to a young farm girl who works for 50 cents an hour, sorting mountains of grocer's coupons. She is one of several hundred workers doing the same thing. She says, "It's a clean job—but the work is drastically boring." Remembering the words of Carrillo, I harden my heart some. What is the alternative for her?

INLAND a few hours from Tijuana, at La Rumorosa, the greenness of farm valleys gives way to sandiness. Here in the desert, as night falls, the temperature crashes to near freezing; no cloud cover holds the heat. Coyotes howl to each other from horizon to horizon. In the morning I catch the glint of white lizards amid the rocks. When bruised, the desert plants smell of tarry essences. They sting and grab. This is piñon pine country—here the Kumeyaay Indians harvested pine nuts for centuries. Last season's cones lie underfoot, invaded by feeding insects.

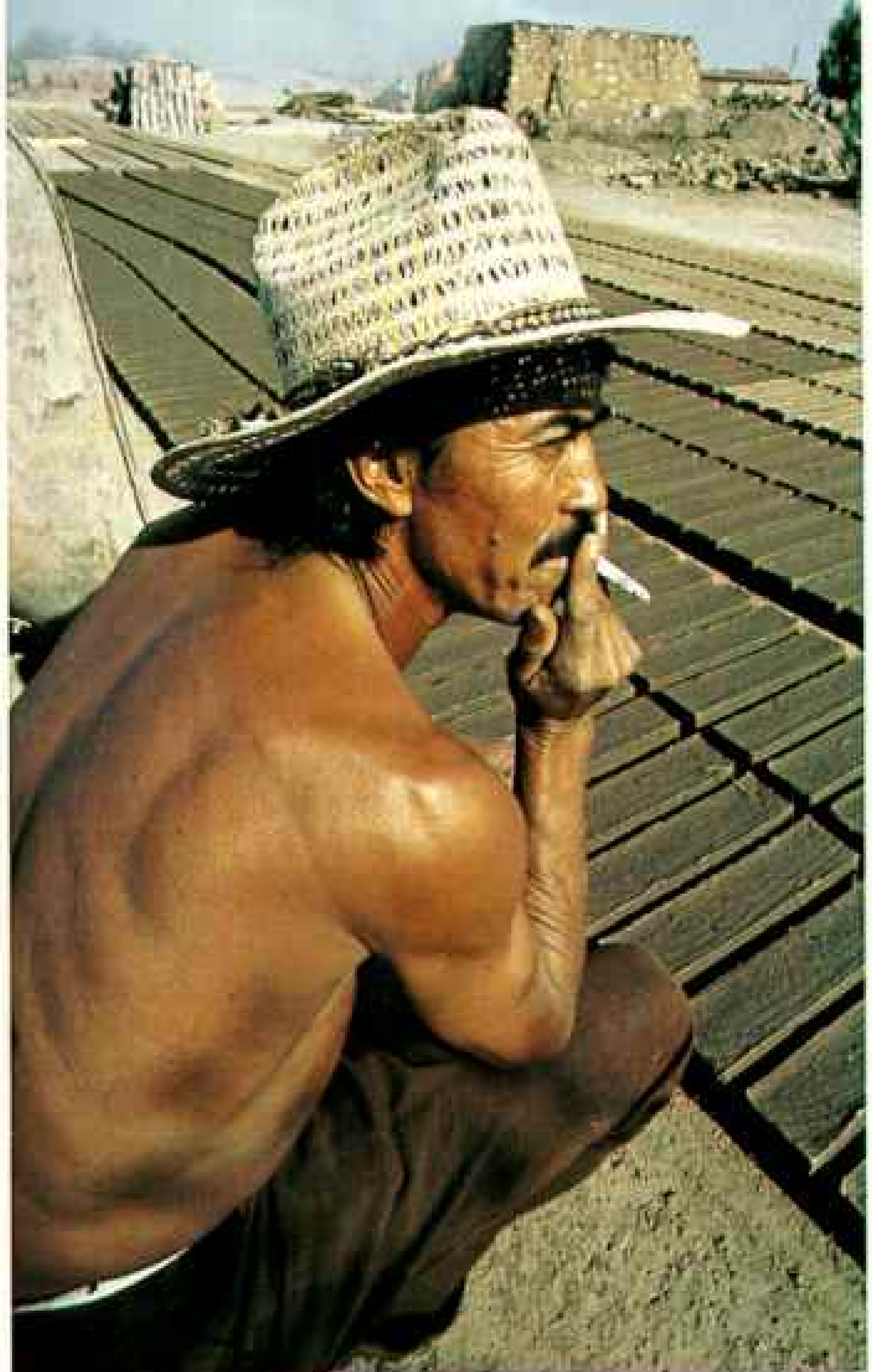
A few days later, heading east on Interstate 8, I see a sign: "Check brakes. 9 miles 6% grade." Shuddering in the wind, my van drops through high fog downward toward pink mountaintops that glow like a vision of heaven. Then a sign says "Sea level." And then, "100 feet below sea level."

I am approaching the Salton Sea, almost as low as America gets. I'm on the hinge, where the Pacific plate, including the Baja Peninsula and California nearly up to Cape Mendocino, attaches to the rest of the continent. This is earthquake country, volcano country: The San Andreas Fault slices northwestward from the Gulf of California to San Francisco and soon juts into the Pacific. The extensive faulting lets earth's interior heat rise near the surface.

At Cerro Prieto, half an hour's drive south of Mexicali, I walk on a broad plain that is riddled with mud volcanoes, some a foot high, some as tall as a person. This landscape stretches northwest toward Signal Mountain near the border. I step carefully between craters on hot, sulfurous ground that burps and chuffs like a thick stew on a stove. A startled sandpiper flies up.

With a boom as loud as thunder, the ground shakes. In 1981 an earthquake just north of here registered 6 on the Richter scale. It broke highways. Aftershocks kept people out of their homes all night, sleeping in their driveways on lawn chairs.

The wind is still with me as I drive into Calexico. The air is brown. It is afternoon, but it appears to be dusk. Traffic lights on the main drag flap like flags. I can't tell green from yellow from red. "Goes on like this for a week, sometimes," shouts the motel clerk, smiling *(Continued on page 738)*



***Low- to high-tech,*** *business is booming south of the border, because of continued peso devaluation and government policies designed to attract foreign investment. Traditional industries, like adobe brickmaking near the Colorado River* (**right**)*, have long held sway in northern Mexico. Today the region bustles with factories whose products are assembled from U. S.-made components and primarily for U. S. consumption, duty free, except for a value-added tax. These maquiladoras, as they are known, employ some 290,000 Mexicans—a figure that is expected to rise to a million by the year 1990.*

*At a General Electric plant in Ciudad Juárez, an engineer from Singapore trains a new worker to inspect semiconductors* (**right, bottom**).

*Across town* (**opposite**) *workers process 14 million American discount coupons a week at CPA, Inc.—one of several such companies now parlaying nickel-and-dime profits from Mexico's abundance of cheap labor. Though wages here are relatively high for Mexico, runaway inflation along the border causes constant job-hopping, as workers seek better wages and benefits, such as day-care centers. Bane of U. S. labor unions, the maquiladora program is Mexico's second greatest source of U. S. dollars, after oil.*

35¢

***"We know where we are headed now** and have stopped speculating on U. S. dollars," says Mexican businessman Eduardo Longoria about the beleaguered Mexican peso, which is still losing value against the dollar, though now at a slow, controlled rate. Señor Longoria lives with his wife, Dorothy Louise (**above**), in Nuevo Laredo—with its Texas twin, Laredo, the border's busiest import-export center. He and his four brothers are being compensated for their Banco Longoria, recently nationalized with other Mexican banks in a government effort to regain control of the economy. Mexico's darkest economic plight in 50 years, the 1982 debt crisis followed a spree of government borrowing, inspired by a heady string of oil-reserve discoveries and abetted by complaisant U. S. banks. All Mexicans have suffered, in their own way, from the 900 percent peso devaluation that followed. But businesses along the northern border, like those in downtown Reynosa (**right**), reaped some benefits, as Mexicans were forced to spend their devalued pesos at home. In the largest cities, new shopping malls, like Plaza Río Tijuana (**above right**), cater not only to Mexico's large and growing middle class but also to hordes of U. S. bargain hunters.*

CREAM
FARMACIA
DOLARES
VALDES
ESTRADA
JOYERIA
PALACIOS
Justicia
NACIONA

*__Hardball politics__ on pollution can easily contaminate relations between Mexican and U. S. neighbors. Great mockers of political boundaries, air and water pollution are pervasive and reciprocal along most of the border. But nowhere has pollution aroused more passion than at the Pacific shore, where ocean-borne sewage from Tijuana plagues San Diego beaches, forcing their closure. At Border Field State Park, less than a mile from a*

*Tijuana untreated sewage outfall, San Diego County inspector Getachew Alemayehu (**left**) holds a sample of water that, if ingested, might cause gastrointestinal disorders. The risk does not deter crowds along Tijuana's crowded beach, where storm erosion has undermined a hotel, and a pitched ball sails across the unfenced border (**above**). By a 1965 agreement Tijuana has been piping millions of gallons of raw sewage daily to San Diego for treatment. But as Tijuana's population doubled in the last decade to almost a million people, additional millions of gallons flowed directly into the Tijuana River. With its nation's gargantuan international debt a top priority, money for improving municipal services was nowhere in sight. Finally, years of acrimony between the two cities was resolved with an Inter-American Development Bank loan, which will enable Tijuana to build a new sewage-treatment system.*

(Continued from page 731) proudly.

Small industrial and market cities run in pairs all along the border: Calexico/Mexicali, Nogales/Nogales, Douglas/Agua Prieta, Columbus/Palomas. And then, past the sprawl of El Paso/Ciudad Juárez, more pairs, now divided by the Rio Grande: Del Rio/Ciudad Acuña, Eagle Pass/Piedras Negras, Laredo/Nuevo Laredo, McAllen/Reynosa, Brownsville/Matamoros.

The Mexican city is always the larger and the more poverty-stricken. But, paradoxically, U. S. border towns are poorer than similar U. S. towns elsewhere, and Mexican border towns are richer than similar Mexican towns. To many Mexicans these twinned towns are havens of opportunity, and they are growing rapidly.

"Una nación . . . *indivisible. . . ." Familiar lines in an alien tongue are being heard in U. S. schools all along the border, thanks to a 1981 Supreme Court ruling that allows children of illegal aliens to attend U. S. public schools. At the Robert L. Martin School in Brownsville, Texas, where Mexican-American students are the majority, two temporary buildings handle the overflow. Many students from Mexico maintain post office boxes in U. S. towns in order to commute to U. S. schools.*

IN CALEXICO, on the California side, everyone talks to me about Mexico's repeated peso devaluations that have kept our border cities reeling for several years now. "Eighty percent of our business comes from Mexicali," I'm told by grocery-store owner Frank Moreno, who bought out Calexico's A & P after he'd managed it for 19 years. "We dropped 60 percent of our business after the devaluation of '82. The markets on the Mexican side boomed." Devaluations keep Mexican spending at home and attract foreign investment. But they also lower most Mexicans' standard of living and tempt Mexico's wealthy to invest their capital outside the country.

U. S. merchants all along the border told me the same disheartening story: Fewer Mexican customers show up because their pesos won't buy as much. "Unemployment here went to 30 percent last year," a banker in Laredo reported. "Frankly, we were trying to lend our money out of town—up in San Antonio. Even now, a help-wanted ad for a teller might get me 100 applicants."

Across the sheet-steel, chain-link, and barbed-wire fence (two creep-through holes to the mile) from Calexico, Mexicali is lively and industrious. Its shops are crowded, its streets jammed with commercial traffic. The Mexican state of Baja has a university here, and 20,000 students attend it—at a yearly tuition of about two dollars each. Construction projects are under way—a new hospital, a new bullring. Workers' housing pushes out the edges of a city that already has nearly half a million residents.

Carlos Ogden of Columbus, New Mexico, calls himself a border rat, a term people hereabouts understand and honor. A border rat forages for scraps of opportunity along this strange poverty line. A border rat is bicultural and knows canny ways to get around complicated obstacles. Ogden was not born "Carlos" but "Kyle." "People here feel easier with the name Carlos," he says.

Kyle/Carlos Ogden is the mayor of Columbus (population 500). Across the line is Palomas, Mexico (population 4,500). Here too the air is brown with blowing sand. Pancho Villa raided Columbus in 1916, when it was a railhead and a boomtown. Ogden is the town's only attorney ("devaluation slowed business down so much I had time to study—passed the bar last year, at age 47"), tax adviser, customs broker, and "connoisseur of beer."

He is the most outspoken mayor I've ever met. He calls the town's right-wingers Nazis. He says, "Only one or two of the Customs and Border Patrol people here are officious." He says Palomas has two maquiladoras and 13 bars—"and 11 of the bars are houses of ill repute." He tells about his friend Gordo, now in jail for heroin smuggling, and says, "Gordo was very virtuous, except for the smuggling.

"The only real money in this part of the world," Ogden tells me, "comes from dope smuggling."

DRUGS are an important fact of border economic life. In a bar, in the tiny town of Caseta, Mexico, just 30 miles southeast along the border from El Paso, a friendly young man buys me a beer—and then offers to sell me marijuana by the bale. He says, in Spanish, that he can get anything else I want. I resist temptation—my interpreter is "Marty" Martinez, a U. S. Customs officer stationed at El Paso. Marty, who was born nearby, has volunteered to show me what he calls "the real border."

Martinez drives me down the Rio Grande levee road. He shows me footprints on a mud dike that nearly bridges the yardwide stream. " 'Mules' [men with sacks of marijuana on their backs] probably came through here last night," he says.

Martinez works at the busy bridges separating El Paso from Juárez. In early March of this year, as this article was going to press, traffic passing through the Customs booths there and all along the border slowed to a crawl—the U. S. response to the murder of Drug Enforcement Administration agent Enrique Camarena Salazar in Guadalajara. "At the bridge we found some big-time loads—tanker trucks full of marijuana," Martinez says. "We're finding cocaine and heroin too. But because of this crackdown the risk is up, so Mexican opium poppy and marijuana growers will want more money. Bribing the officials will cost more. The smugglers will want more. The dealers in Chicago and L.A. will want more. The cash flow through the system will go *up*."

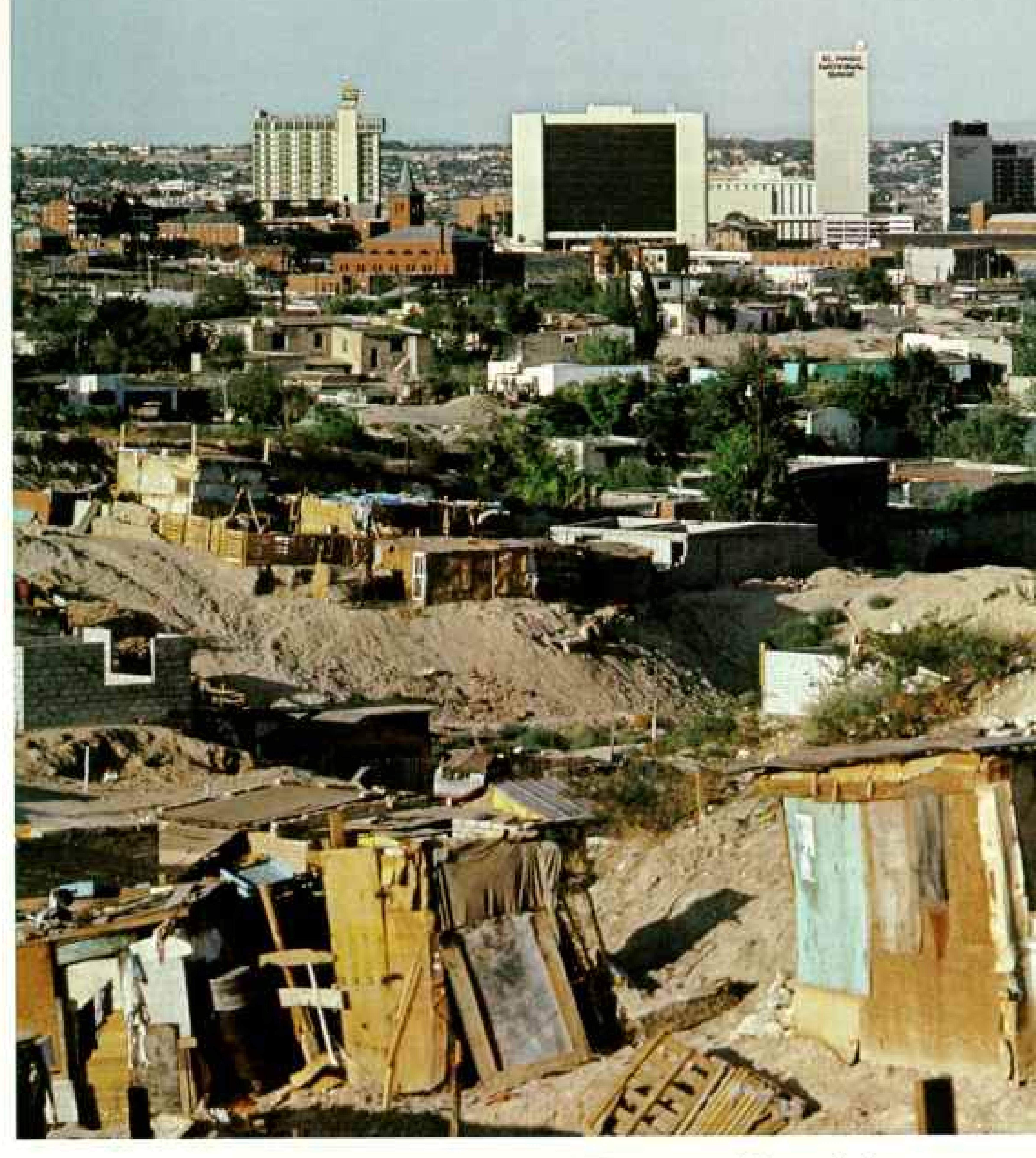
Says Professor Jorge Bustamante, "That result is paradoxical but true. If a plan designed to curb drugs turns out to increase the money in the drug system, something is wrong with the plan. You need to attack demand—in the U. S.—at the same time you attack supply in Mexico."

According to the U. S. Department of State, joint Mexican-American programs to destroy marijuana plants and opium poppies have made inroads in trafficking. In 1976, 87 percent of heroin came into the U. S. from Mexico; today Mexico's share is down to about a third. "But the problem is still severe," says spokesman Rayburn Hesse. "Of the four tons of uncut heroin coming into the country, 1.3 tons comes from Mexico. That's a lot."

Marty Martinez goes to work at the bridge every evening and looks at the situation with an experienced eye. "Things will be back to normal soon," he tells me. "We do what we can."

EVERY DAY 100,000 Mexicans cross the border here legally, and many thousands more cross without documents. With Martinez at the Customs station on the Bridge of the Americas, I watch young men and women run through the park next to the Customs shed: Such international sprints by undocumented workers go on all day long. Martinez explains: "Customs is responsible for the ports of entry—the Border Patrol has jurisdiction for the space between them."

Many of these crossers work as domestic servants in El Paso homes; the opinion, expressed to me by El Paso surgeon Sol Heinemann that "we gain, and they gain," seems widely held all along the border among citizens and in official circles as well. Maids, paid under the table, earn $45 to $80 for six-day weeks, and many of them like these meager wages well enough to stay with employers for years and then pass their jobs on to younger relatives. "El Paso wouldn't

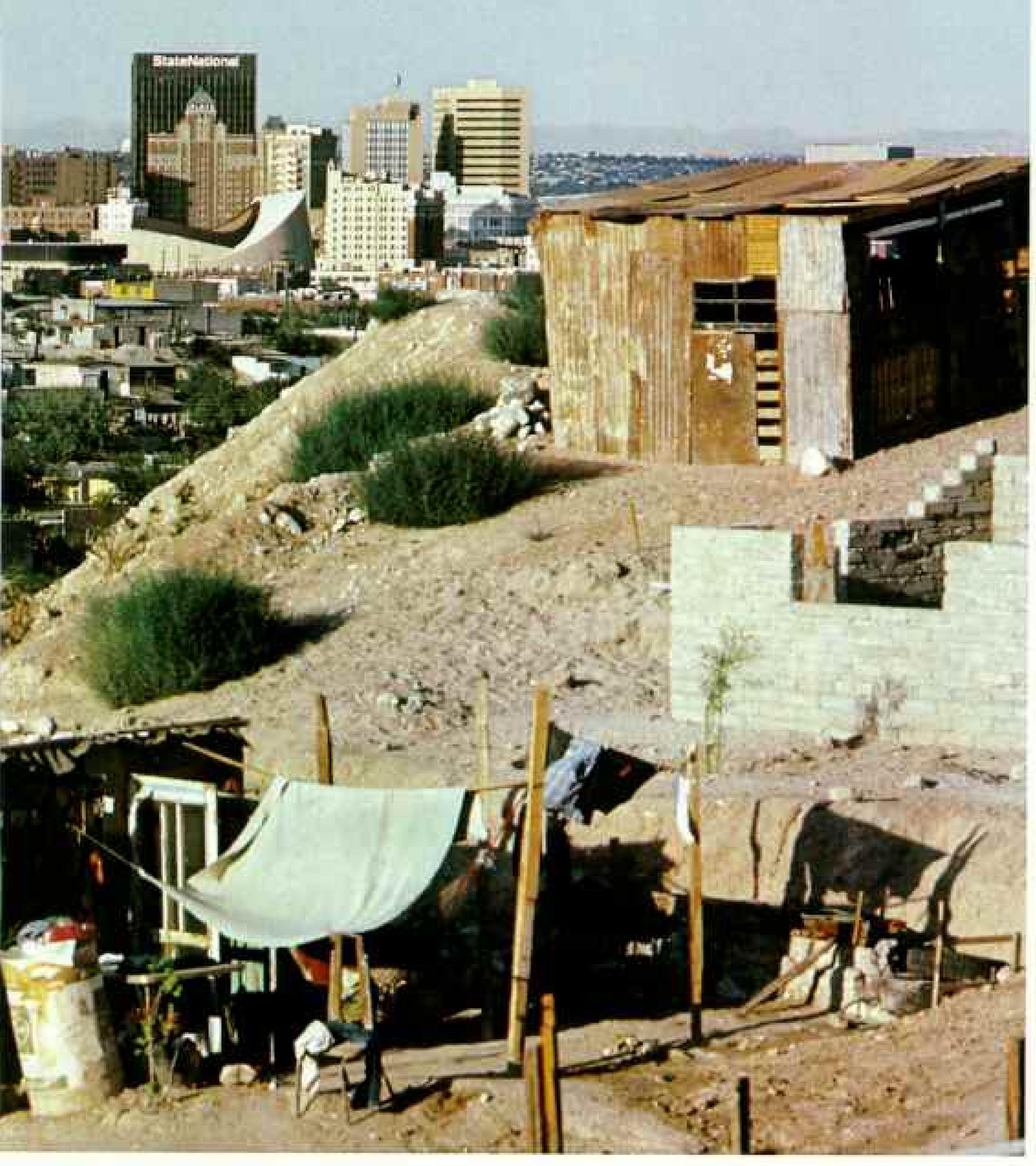


***Study in north-south disparity,*** *El Paso's crisp skyline overlooks a squatter settlement across the Rio Grande in Ciudad Juárez. Nonetheless, the border's*

work without these women—all the U. S. teachers and nurses would have to stay home and take care of their own kids," Dr. Heinemann says.

IN JUÁREZ'S STREET MARKET the maid's $45 to $80 in El Paso wages will support a large family. This is not the tourist street where paper flowers and embroidered dresses are hawked. And it's not far from an exclusive development called Rincones de San Marcos, where I watched builders completing a home for the wealthy—a Disneyesque, quarter-scale replica of a German castle.

Everything that anyone ever purchased, it seems, is for sale again in this street market—reluctant toasters, lamps that want rewiring, rusted hammers, and wrenches with heads half-chewed off from hard use. Another stall displays worn-through sneakers; yet another, darned shirts. A sign over a




*largest twins are viewed as a single entity by much of their combined 1.5 million population, so culturally and economically are they entwined.*

footwear display reads *Semi-Nuevos Zapatos*—Semi-New Shoes.

Freight-hauling bike carts shove through shoulder-to-shoulder foot traffic to replenish the stalls. There's much looking and little buying. The odor of raw poultry wafts over the crowd from food stalls. A silent mariachi band walks by, trumpets and guitars dangling. A teenager in a rivet-studded jacket struts past the stalls in time with the metallic rhythms from the big chromed radio on his shoulder. A blocky old woman spits and begs, working the shoppers systematically.

At the poor box in the vaulted Juárez cathedral, a block behind the market, my guide, Miryam Bujanda, who went to school nearby, whispers to me, "How many people should you help? There are surely enough to help here."

And more coming. Stepping from the church, we see a Tarahumara Indian begging, her smiling sleeping infant bound

*Pacesetter, the Tony Lama Boot Company—El Paso's largest bootmaker—continues a tradition begun in 1911 by an Italian-American cobbler. Here the founder's heirs, Louis, Tony Jr., and sister Tere Bean, show off favorite models, including their Dallas Cowboy boot and the Tenny-Lama, favored by country singer Willie Nelson. About a third of their 1,100 employees are "green-card" workers from Juárez. Documentation for work in the U. S., the card is often not requested by small businesses and farmers, contravening the law.*

*Legal or not, farm workers in Texas and California's Imperial Valley (**below**) are overwhelmingly Mexican. Farm lobbies in these two states, source of nearly half of U. S. fruit and vegetable crops, helped defeat last year's proposed immigration reforms.*

*Once a field hand, Arturo Ramirez (**above**) upgraded the American dream by wresting success from good works. Distressed by Brownsville housing developments that lacked water—the homes of many Mexican-Americans—he built from scratch a nonprofit corporation that now supplies water to 5,500 homes.*

tightly to her back. A pregnant teenager strolls dreamily by; another trudges slowly behind her mother, followed by a toddler in a white cowboy hat. There are kids everywhere, enough to go around, and enough to spare; Marty Martinez told me that the Customs Service and the Immigration and Naturalization Service occasionally apprehend people involved in the alleged sale and transportation of babies for the U. S. adoption market.

A dozen years ago Pentecostal minister Luciano Avitia Ramos founded a small orphanage in Colonia Libertad—in Juárez, as in Tijuana, an impoverished neighborhood.

A wooden church with red plastic windows stands in the corner of the orphanage's dirt compound. Inside is a lovely primitive mural of the Jordan River and the tree of life. Here the old minister preaches daily to the children. They eat. They study some. The children answered my questions with great seriousness. Why do you live here? "My family is too big." Are you happy to be here? "Jesus loves me."

AFTER EL PASO the border drops southward toward the tropics, following the Rio Grande. Route 170, from Presidio to Lajitas, may be the prettiest drive in all America. Until 25 years ago it was just a trail, one so tortuous that some called it Muerte del Burro—death of the burro. Here the bank of the Rio Grande is the rarest of southwestern colors—the blue of water and the yellow of sun have combined to make green.

Marcos Paredes is a riverman, a professional guide who leads raft trips through the Rio Grande's remote canyons—Boquillas, Mariscal, and Santa Elena in Big Bend National Park. He is border-savvy and seems to be everyone's friend—the millionaire developer of the cowboy-stage-set resort at Lajitas, the illegals who scamper off when the Border Patrol van drives up, the agent who drives the van. On the river he charms his charges back aboard his raft after lunch. "Not all good times are had by dry people," he says.

***Border crossings** are a natural right for wild creatures like the ocelot, an endangered species whose greatly diminished range extends into the subtropical brushlands of south Texas. In an international effort to study and safeguard the animal's habitat, biologist Mike Tewes of Texas A&I University and his Mexican colleague, Daniel Navarro, at left, fit a 16-pound female with a radio collar for tracking in Texas' Laguna Atascosa National Wildlife Refuge.*

Rowing through Santa Elena Canyon, he points out a canyon wren, a green heron, a rare peregrine falcon, a phoebe, nests of cliff swallows, a pair of great blue herons that struggle aloft into the evening wind.

We camp at the head of the canyon. It's too hot on the sandy island for tent or sleeping bag. A city boy lying awake, I think about snakes and scorpions. I want to die alert. The night fills with sounds—bat squeaks from overhead that seem to come from inside my own ears, bug cackles and bird cries that join in dissonant low chords. And most menacing of all, a single fluting

peep once every three minutes or so. The Big Dipper whirls around the sky, then dives below the horizon dragging its tail behind it. At dawn I hear cattle. I stagger up with an hour's sleep, wander into a mesquite tree, and crown myself with long thorns. I bleed.

The palisaded walls of Santa Elena Canyon rise 1,500 feet above the river—five upended New York City blocks. The walls are rough, shades of tan and brown, vertically streaked, layered, pocked—the saw marks of the Rio Grande. Always we hear the rush of water as the raft passes beneath narrow vistas of blue sky, through narrow water-floored rooms. We see sunlight from the shade, then the river twists, and we see shade from the sunlight. Chunks of canyon as big as a two-car garage lie below the cliff, and you can see where they've fallen from, high above. Green strips of foliage grow on the ledges they've left behind.

We haul the raft over a barrier Marcos calls the "rockslide," which fills the river with rubble. We're in a rush. We have put ourselves here; now we have to get out. It's not play any longer. You must travel far to find physical adventure in our tamed land, but it's wild enough here. Those who have adventured before us have named the obstacles over which we haul the raft: "Puppy nose" and "dog nose" are the most challenging. The density of beauty is high here—vistas atop vistas, with vistas underfoot. And then none.

After 18 miles the river spreads, flattens, veers. We load the raft on a truck. "The border is a special state of mind," Marcos says. "Move north, even 50 miles, and it's gone. This seems like a movie set."

THE BORDER, this state of mind at the overlap of cultures, this zone of adjacent contradiction, invites reflections on our national differences. The Mexican poet and diplomat Octavio Paz wrote, from a manifestly Mexican point of view, that Americans "believe in hygiene, health, work and contentment, but perhaps they have never experienced true joy, which is an intoxication, a whirlwind. In the hubbub of a fiesta night our voices explode into brilliant lights, and life and death mingle together, while their vitality becomes a fixed smile. . . ."

On the fifth of May I attend fiestas during the day in Ciudad Acuña, Mexico, then at night across the Rio Grande in Del Rio, Texas. In Acuña wandering mariachi bands forage for listeners. Their laments, called *corridos*, tell of workers who cross the border, get caught, and have to try again, of a criminal who steals from border crossers and murders them and is seized and burned at the stake. A boy in an oversize hat urges the whirling crowd to buy his slush margaritas. Another boy for some reason busies himself sawing the head off a clumsily cast porcelain dog, while two bands within earshot of each other sing different corridos. There's no center to this fair. It is an intoxication, a whirlwind.

Crowds in Del Rio face a central outdoor stage, hear speeches, bands, choruses—all rehearsed. There's no alcohol for sale outdoors. Teenagers wear prepackaged messages on their T-shirts: Welcome Back Kotter. Coors. Suzuki. Dallas Cowboys. Future Ballerina. DANGEROUS.

Music blasts from loudspeakers; everyone yells to be heard. My host and hostess, cordial, well-established second generation Mexican-American business people, are embarrassed to say that they do not recall just why the fifth of May is celebrated. They are *norteamericanos*.

DROUGHTY COUNTRY stretches on for hundreds of miles, troubling ranchers from Eagle Pass clear past Laredo to the lower valley. But the 50-mile stretch of border before the Gulf of Mexico is productive and as green as California's San Joaquin Valley. Here the farmer's main problem is not water scarcity but the fact that using it builds up salt, which gradually degrades the soil. Large-scale growers like to plant crops in such arid, hot places and to irrigate, because they can then regulate planting, ripening, and harvest, and control weeds and pests with precision. Farmers invest heavily in this land because such predictable conditions lower their yearly risks. But when the weather is unpredictable here, the results are disastrous.

"Until Christmas Eve 1983," recalls citrus farmer Peter Bachman, whom I find sawing limbs off his grapefruit trees in a field near Alamo, Texas, "we were making

$5,000 a month selling fruit out of the garage. Then it froze for a week. We felt like a duck whose pond had dried up. We lost everything—navels, ruby reds. Half our trees will be dug out. Half may come back, but it'll take years." Bachman's neighbor, Tommy R. Morin, said he couldn't even sell me a pound of fruit—"but I'll sell you all the pruned-off wood you want."

"Milo," says Arturo Ramirez, identifying a field of plants growing close to the ground. We're in the lower valley just south of Alamo, near El Gato, next to acres of dead citrus trees. "Milo gives you the itch when you harvest it." Ramirez has done every field hand's job in the valley—driving combines, hoeing onions, spraying citrus, moving irrigation pipe. "As a baby I'd play at the end of the row while my parents picked," he says, "but by the age of four, I'd joined them. I used to go to a Mexican school, while the next-door neighbor's kids, who were Anglo, were bused for free to a different school."

Today Arturo Ramirez, slight and soft-spoken, heads the ten-million-dollar-a-year Military Highway Water Supply Corp. at Progreso, piping water for drinking and sanitation to 25,000 customers, mostly poor farm workers who had been sold houses without running water or sewers.

The company Ramirez founded oversees 400 miles of pipeline, stretching through about 70 miles of the valley. Its workers and clients own the company and manage it in meetings that include secretaries and the janitor. Ramirez keeps probing for ways to help, taking a hand in others' victories: a youth center at Santa Maria, a swimming pool at Ranchito. He helped organize a purchasing cooperative for small local farmers, usually Mexican-American. In 1982 he was awarded the Winthrop Rockefeller Freedom Prize.

THE GULF OF MEXICO: After nearly 2,000 miles of desert, I long to see it. I speed past the big steel yards of Brownsville, where Marathon Le Tourneau makes offshore-drilling platforms (a business depressed by the world oil glut), and past the Brownsville shrimping fleet, slumping lately because Americans are prohibited from working inside Mexico's strictly enforced 200-mile territorial limit.

***Far from the clamor*** *to the east and west along the border, the Mexican village of Boquillas del Carmen slumbers in the shadow of Big Bend National Park, across the Rio Grande. Here, little has changed since Pancho Villa and his renegade revolutionaries patrolled the region 70 years ago. Mexican contempt for the border ran high in those days, with memories still fresh of the disastrous Mexican War and Mexico's humiliating loss of its vast northern territories to the U. S.*

*Upstream, in San Antonio de Bravo, the family of Jesus José and Manuela Ornelas* **(right)** *relies heavily on eldest son Celedonio's earnings as an itinerant Texas oil worker to supplement a hard-scrabble existence.*

**Betwixt and between,** *the Kickapoo Indians have a problem. Some fear that if they accept a U. S. offer of land and citizenship, they will lose long-standing residence rights in Nacimiento, Mexico, a traditional tribal center. Here, Antonio Salazar ponders the offer in the tribe's U. S. camp—a cluster of reed and cardboard*

*huts near the International Bridge at Eagle Pass, Texas. Nuisance or barrier, the U. S.-Mexican border is a cultural watershed, seeping with human drama.*

The beach is mottled with the black splotches of an oil spill. I run into the Gulf, just behind the South Padre Island Hilton, and splash about in a wet celebration dance, because it's been a long journey and I have finally arrived. When I emerge, the soles of my feet are black with tar.

In my mind I go over the parched ground I have traveled. Just yesterday in the Brownsville courthouse, Judge Moises Vela assured me that Brownsville, this economically poor and racially stratified place, doesn't "have gambling, prostitution, the Mafia, or unions—it's virgin country. Our South Padre Island is the last paradise." I doubt the judge. I study the tar on my feet.

Then I realize I have seen something just a few hours ago that suggests that there is substance to the judge's claim. I had toured the federal detention center near South Padre Island, just a few miles from this beach, where 472 male and 90 female detainees, about 35 percent of them from El Salvador, awaited probable deportation.

The detention center is the end of the road for other-than-Mexicans caught on the border trying to enter paradise. Every other day 20 or 30 are shipped back. More trudge northward to replace them. Paradise is a relative term. In the huge, stark men's dormitory a detainee had written on his pillowcase a dream of home: the word LUISA. And yet he had come north, left Luisa, grabbed for the brass ring across the border.

IN EL PASO, Professor Oscar Martínez of the University of Texas, who himself had started life in the U. S. as an undocumented alien, had taught me some history. "The problems of the border," he said, "are a small price for the U. S. to pay, considering what it got when it took its Southwest from Mexico in 1848. It got land, harbors, gold, silver, copper, oil, labor."

One-fourth of what is now the United States used to be Mexico. That is one of the reasons why the U. S. became a world power and the symbol of wealth and hope. "It's important to keep that history lesson in mind and not just look at the problems of the moment," said Professor Martínez.

I glance once more at my tarred feet, shrug, and take a long swim in the Gulf of Mexico. □

IN THE SHADOW OF KRAKATAU

# Return of Java's Wildlife

Text and photographs by DIETER and MARY PLAGE

PANTHERA PARDUS MELAS, 1/2

A *ROSETTED HIDE* melting into the rain forest in the flash of a second was all we saw. Yet despite our trackers' skepticism we were certain that the 40-foot tree had held a leopard, one of the shyest of cats, almost never seen in the wildlife reserve of Ujung Kulon Peninsula on the large island of Java.

We never got a better look, in the flesh. Instead we outwitted the leopards with remote camera and strobe lights (diagram, page 765) to let them photograph themselves, as did this lithe female, revealed in the night just after descending a tree.

She indirectly owes her habitat to a world-famous volcano. Thirty-five miles across the sea from Ujung Kulon, the island of Krakatau ripped itself apart in 1883. Tsunamis reaching the Javanese shore washed away the few villages that dotted this isolated outpost. The people never returned; the wildlife did, and is protected today by the Ujung Kulon National Park. We spent a year there, examining the regeneration of life on both the peninsula and Krakatau a century after the eruption.

*IN A TANTRUM*, Anak Krakatau, or "child of Krakatau," erupts on November 18, 1981 (***left***), ash of a previous burst settling out, at left, as a new one rises. In 1927 this cinder cone began emerging from the submarine caldera into which Krakatau had collapsed 44 years earlier.

On August 27, 1883, "that unhappy day which will be written in history with such sanguinary letters," a survivor wrote, the volcano unleashed a series of titanic detonations heard 2,900 miles across the Indian Ocean, the largest of them more than twice as powerful as the biggest nuclear blast. Massive pyroclastic flows avalanched into the sea, one of the forces loosing tsunamis—here echoed in miniature by a wave spawned by Anak Krakatau that reached 20 feet before breaking (***above***). The 1883 waves raced toward Java and Sumatra, hurling a steamship nearly two miles inland. Forty miles from Krakatau in the Javan town of Merak, European homes stood near a quarry and railway (***right***). Waves 115 feet high erased all (***below right***), killing some 2,700 of the more than 36,000 who died in the shadow of Krakatau. The crew of a ship 140 miles from Ujung Kulon found floating corpses of humans and of tigers.

The catastrophe astonished the world. Barographs across the globe quivered at the shock wave. Volcanic mist circling the earth turned the sun blue and green, creating effects that moved Tennyson to pen: "For day by day, thro' many a blood-red eve . . . The wrathful sunset glared. . . ."

ILLUSTRATED LONDON NEWS (ABOVE); ROYAL INSTITUTE FOR THE TROPICS, AMSTERDAM (BELOW)

# *Krakatau: three violent generations*

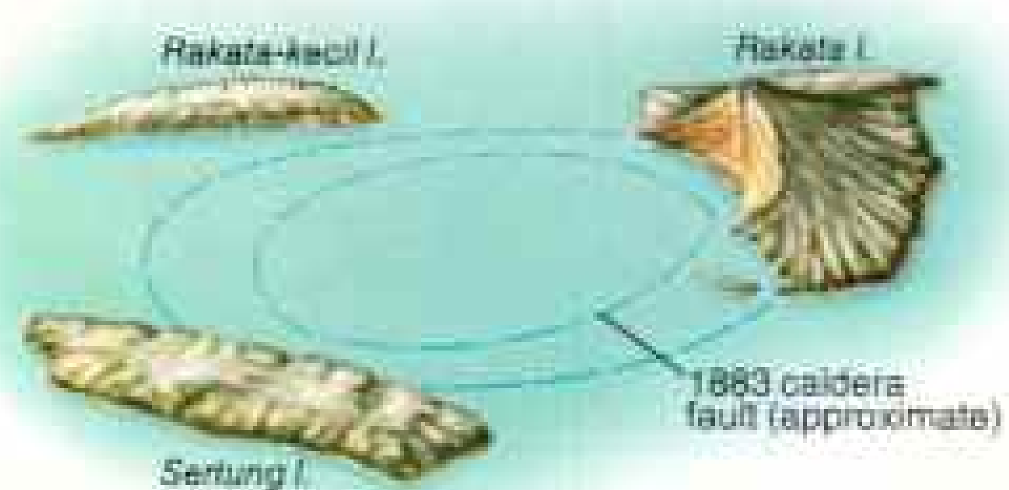
*Phoenix-like, this volcano repeatedly has arisen from the sea and explosively collapsed, only to be born again. It lies in the collision zone of two tectonic plates on the great firing line where the Indian Ocean's crust dives beneath Asia, feeding a chain of burning mountains that sweeps nearly 2,000 miles. Indonesia thus ranks first as a nation of volcanoes, with at least 132 active in the past 10,000 years.*

**1 ANCIENT KRAKATAU**
*Submarine flows of andesite created the original cone. A legend in the Javanese Book of Kings refers to a mountain about 6,500 feet high called Kapi – very likely Krakatau – and describes an eruption in A.D. 416, with effects that uncannily foreshadowed events nearly 1,500 years later.*

**2 FIRST COLLAPSE: A.D. 416**
*"The noise was fearful, at last the mountain Kapi with a tremendous roar burst into pieces and sank into the deepest of the earth. . . . Inhabitants . . . were drowned and swept away with all their property," say the royal chronicles. The cone's center crumbled, with several small islands remaining on the rim of the caldera.*

**3 REGROWTH: Before 1680**
*Festering like a boil over the centuries, a new cone made of basalt grew from a southeast island fragment, Rakata, erupting lava and injected with swarms of dikes dramatically exposed in perfect cross section by the 1883 eruption. Its neighbors, known today as Sertung and Rakata-kecil, remained quiescent.*

**4 MENACING TRIO: 1883**
*By 1680 two smaller andesite cones had united with Rakata to form a 17-square-mile island. After an eruption that year left it "burned and barren," according to a passing ship, two centuries of silence ensued. In 1883 the craters of Perbuatan and Danan, shown ejecting ash, vented early in the upheaval that began in May and climaxed in August.*




**5 CATACLYSM AND COLLAPSE**
*Suddenly spewing forth nearly five cubic miles of matter, Krakatau depleted its magma chamber. The weakened roof gave way, and the volcano caved in, creating a caldera 4.3 miles in diameter. Only about a third of Rakata remained above sea level, although both nearby islands gained size from pumice and ashfall. Said a terse telegram from Batavia (now Jakarta) to Singapore: "Where once Mount Krakatau stood the sea now plays."*

**6 FULL CIRCLE: 1985**
*The precursor of a cinder cone named Anak Krakatau began spewing from the seafloor in 1927 between the old sunken cones of Perbuatan and Danan. For three years the surf repeatedly swept away fitful attempts at birth; finally the volatile island emerged permanently above sea level, and today it is about 650 feet high.*

NGS CARTOGRAPHIC DIVISION
PAINTING BY CHRISTOPHER A. KLEIN
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PRODUCTION: DENISE EGOLF

DIAGRAMS BASED ON KRAKATAU 1883: THE VOLCANIC ERUPTION AND ITS EFFECTS, BY TOM SIMKIN AND RICHARD S. FISKE, SMITHSONIAN INSTITUTION PRESS, WASHINGTON, D. C., 1983

*LITTLE DID DIETER KNOW* what was brewing as he explored Anak Krakatau's summit (***below***) on November 17, 1981. Beyond lies Rakata Island, largest remnant of Krakatau, where the next day he set up a camera and joked, "All we need now is a good eruption." Twenty minutes later the mountain obliged. Months later a crater yawns (***right***) where Dieter had stood. The active offspring has erupted at least once in all but 18 years of its 57-year life.

Scientists continue to study the

PHOTO BY WOLFGANG WEBER

aftermath of the parent volcano, whose paroxysmal blasts virtually sterilized the islands and thus created a benchmark to measure the return of life. Krakatau's waves had heaved ashore 600-ton blocks of coral reef; a century later, corals festooned with Meyer's butterfly fish adorn the caldera (***below, far right***). On Rakata nine months after the 1883 eruption, only "one microscopic spider" could be found. Yet within three years 28 plant species had arrived, increasing to about 200 today. In 1923 a biologist recorded 573 species of animals on Rakata. Life continues to come, by air and by sea, such as a log sprouting with seedlings (***right***). Some life-forms ride winds and currents from Ujung Kulon, in a sense thus repaying a debt to the volcano. In 1883 Java's population was about 20 million. Today one of earth's most crowded islands, it teems with more than 90 million people—nearly 1,800 per square mile. Had it not been for Krakatau, Ujung Kulon's wildlife, after regenerating, would surely have been overrun.

BY ALAIN COMPOST (ABOVE). BUTTERFLY FISH, CHAETODON MEYERI, SHOWN BELOW

WHERE KRAKATAU'S tsunamis raged, the little Cigenter today flows placidly through Ujung Kulon. In our rubber inflatable (***right***), which is camouflaged with canvas and silently powered by a solar-charged electric motor, we made 113 trips up and down the river, filming for Survival Anglia Ltd.

A banteng bull (***below, far right***) peers from the riverbank. Today numbering about 400, these wild oxen were one of three species the reserve was created to protect in 1921. Of the others, the Javan rhino clings to survival, but, tragically, the Javan tiger is now extinct. Early protection existed only on paper for this isolated area, and poachers, virtually unchecked, wrought disaster. With tenacious efforts by the Indonesian government and the World Wildlife Fund, the 294-square-mile reserve is now managed as a national park. Rangers patrol vigorously year-round; some live on offshore islands, where two guesthouses offer lodging for visitors.

We were entranced by the river and felt it laced with more than a touch of the prehistoric. The bankside jungle, drenched by an average annual rainfall of 106 inches, is draped with exotic fruits, tangles of lianas, and long gnarled roots that creep over the ground. At dawn great clouds of flying foxes—the world's largest bats, with a five-foot wingspan—blacken the sky. Along the banks swarms of insects attract appealing birds such as blue-throated bee-eaters, Asian fairy bluebirds, olive-backed sunbirds, scarlet-headed flowerpeckers, and gray-cheeked bulbuls.

In our tent on a meadow at the river's mouth, we subsisted comfortably on Indonesian fried rice and curried fish cooked in a makeshift kitchen under an observation tower. Home after a hard day, we often found more wildlife waiting for us. After dinner one evening Dieter quietly said to Alain Compost, our assistant, "Alain, slowly raise your feet just a little." Beneath them slid a black-and-yellow snake—the highly venomous banded krait. On another occasion Dieter caught a sudden glimpse of motion inside the tent and ominously told Mary, who was just returning, "I think you'd better leave." Piece by piece he removed everything in the tent until he came to a woven palm mat. He pulled it up, and there lay a cobra. He regrets having to kill it, but it came straight for him.

BOTH BY ALAIN COMPOST; BOS JAVANICUS SHOWN BELOW

*FACE TO FACE* with one of earth's rarest and most endangered species, Dieter edges to within 30 feet of a Javan rhino. Browsing the vegetation, the big bull waggles his ears, searching for the source of an intrusion he senses but cannot quite locate. Tense and excited during this unprecedented photography, Dieter later recalled, "In the total silence the camera's shutter seemed like a pistol shot."

This image cost six months of work. Usually, like the old story about blind men examining a pachyderm, which the rhino is, we got only tantalizing bits—the glimpse of an ear here, a backside there. But enduring the rainy season, the only time the animals can be tracked, rewarded us. So did the two shrewd trackers the government insisted we travel with. Beset by mosquitoes and leeches, we slogged through knee-deep mud until one of the trackers spotted fresh rhino dung. He followed it into a tall, dense stand of our familiar nemesis, rattan, a formidable palm armed with thorns like treble fishing hooks. It would truly be a nightmare to be caught between a wall of this stuff and a charging rhino. Then, beyond it, we saw a tree move—and there was the magnificent bull. As we watched, he sprayed the surrounding undergrowth with urine, and a cow appeared, following his spoor.

These rhinos were two of only about 60 of their kind. Yet even this minuscule number is encouraging, because in 1967 the estimated population was about 25. The species' original range included parts of India, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, Malaysia, Sumatra, and Java. The history of human depredation is long and sad. In the mid-18th century the rhinos in Java were so numerous and caused so much damage to agriculture that in less than two years the government paid high bounties for the killing of 526 animals. Hunters, both with and without scruples, took a disastrous toll. One so-called bona fide hunter shot nine rhinos around 1900.

By 1930 the rhino's once vast territory had withered to a few scattered pockets, including Ujung Kulon. In the next four decades in Java alone more than 40 of the animals were poached, condemned by the notorious Asian market for rhino products, chiefly the horn. In Indonesia it is prized as a cure for high fever and typhus, and as an anti-poison agent. Although the export of rhino horn has long been illegal, more than four million Chinese live in Indonesia, and their traders easily beat the competition in Hong Kong and Singapore. Asian horn is favored over African because its smaller size is believed to concentrate medicinal properties. One of the world's costliest illegal substances, rhino horn sells for nearly $50 a gram in Malaysia—a price approaching that of cocaine on the street in the United States.

Five feet tall and averaging 3,500 pounds, the Javan species is slightly smaller than the Indian rhino and somewhat larger than the Sumatran rhino. It is distinguished by its small horn—about ten inches long in the male, often absent or a small bulge in the female—and a prominent fold in the hide in front of the shoulder. It inhabits the most inaccessible parts of Ujung Kulon, and few details of its natural history are known.

Vegetarians, the rhinos feed primarily on the shoots of a variety of young trees. To reach their forage, they frequently walk over the saplings, forcing them down between their front legs. The beach commonly bears their tracks; one observer saw them knee-deep in the sea and believed they ate drifting mangroves. Inland they often wallow in mudholes to cool off, soften their skin, and relieve it of parasites.

Females probably mature sexually by three years of age, males about twice that. Frightful roaring and aggressive behavior by bulls may be associated with the rut, which apparently occurs nonseasonally and sporadically. Gestation may take 16 months, and the cow probably accompanies her calf for about two years. Rhinos are wonderfully long-lived beasts, and it would not be surprising for some of Ujung Kulon's old-timers to have been there for 40 years.

With the extinction of the Javan tiger, only man remains as the rhino's predator. A fascinating story exists regarding this deadly triangle. When tigers still lived, Javanese in these parts believed that their ancestors' souls reposed in the cats and thus refused to help poachers kill them. After World War II a group of poachers planned an operation to wipe out all of Ujung Kulon's rhinos. When they entered the peninsula, one was killed by a tiger. Since none of the nearby villagers would help them against the tigers, the poachers gave up. How strange if one species that ultimately perished had inadvertently saved its equally rare neighbor. RHINOCEROS SONDAICUS

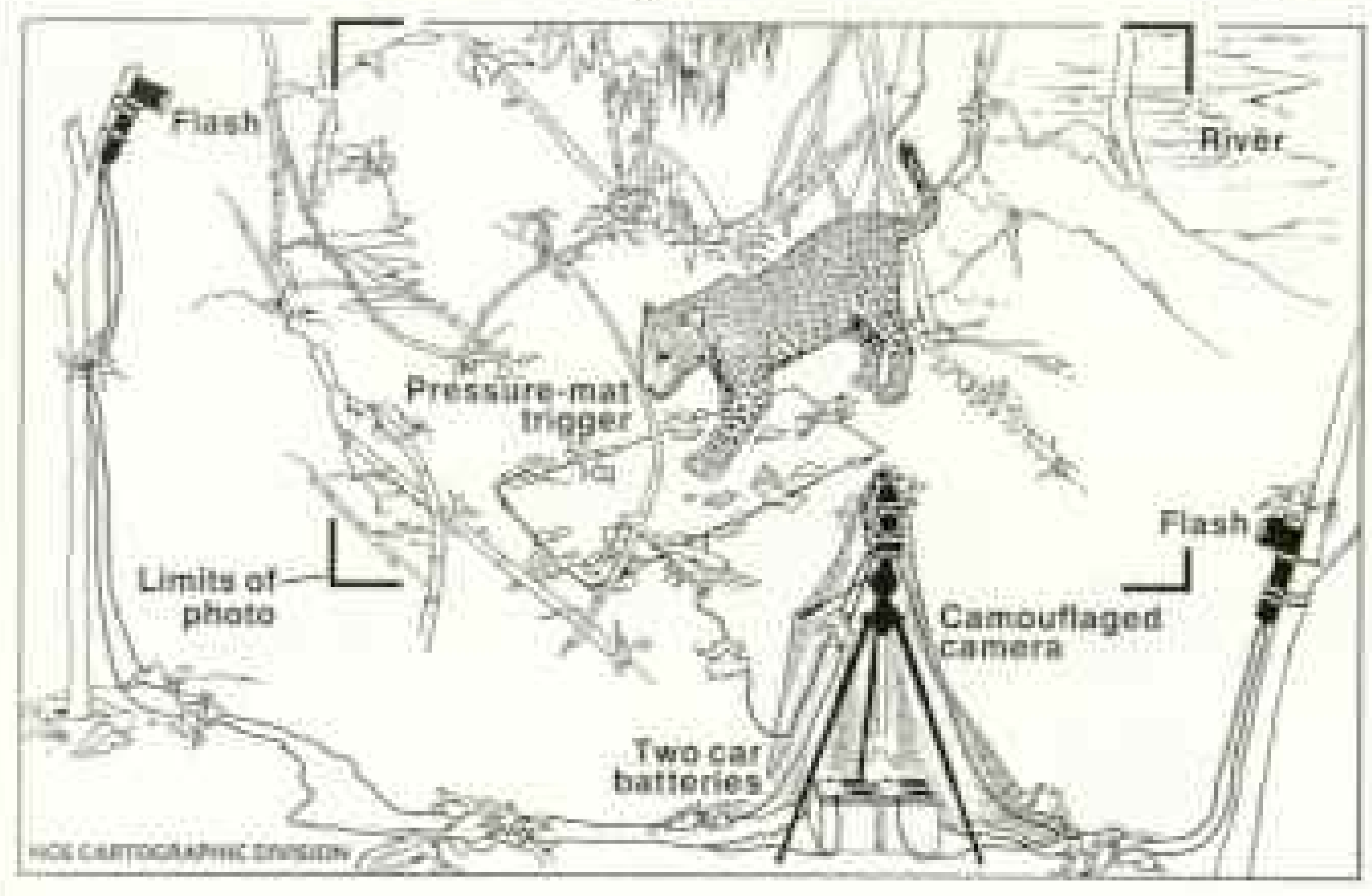
*IN A CLOSE ENCOUNTER* we surprise a cow feeding along the riverbank (***left***), using her prehensile upper lip to seize small branches. Hearing Mary's camera, she looked up, then charged across the river—to a point 30 feet behind us.

When another cow came toward Dieter and turned, he thought he was seeing things. She had too many legs. Then he realized that she had a calf tucked behind her (***below***). Here is heartening evidence that an endangered animal is reproducing. Nevertheless, rhino authority Rudi Schenkel cautions that a second sanctuary must be established to prevent a deadly disease from wiping out the population.

PECULIAR SPOUTS often erupted from the river, signatures of a clever little hunter, the archerfish. We collected several and re-created the scene in our aquarium. Contracting its gill covers, a fish fires at ants with a barrage of water drops channeled through a groove formed by the tongue and the roof of the mouth (***below***). Another scores a bull's-eye on a cricket (***right***). On the river Dieter measured one shot at 10½ feet. The blasts so shower the prey that even if it doesn't fall right away, the weight of the water drags it down. Somehow, perhaps by trial and error, the archerfish solves the problem of refraction, which bends its line of sight as the fish aims through the different densities of water and air. If the chance permits, it will leap clear to snare a bankside morsel by frontal assault.

TOXOTES JACULATOR, BY ALAIN COMPOST (RIGHT)

# A leopard's self-portrait




*TO CATCH A CAT in a photographic ambush, we had to find one of its daily haunts. Leopards usually patrol a network of trails in search of food such as small deer, monkeys, and wild boar piglets. Not far from where we had glimpsed the cat, small trees on both sides of the river grew into an arch. Only two were big enough to support a leopard. At the base of one tree we found pugmarks, and there we laid our trap.*

*We first took a Polaroid picture of the site in order to restore every last twig after setting up our equipment* **(above)**. *The key was a pressure mat, similar to those used in home security systems, camouflaged near the tree and cabled to the camera, also concealed with cloth and debris. One strobe was mounted on a pole tied with leaves, another on a small tree. Two car batteries powered the system. To minimize our scent, we had covered our hands with mud.*

*After arranging everything, we waited a week before returning, hopefully, to check the camera's frame counter. For two weeks, nothing. Then suddenly the counter showed several advances. It had been tripped once by this male.*

*A cat of quintessential symmetry, grace, strength, and agility, the leopard has also been adaptable enough to survive in Java, where the tiger, because of poaching and loss of habitat, could not. Leopards prowl relatively confined ranges, shadow villages to raid domestic stock, and possess great climbing skill, often storing partly eaten carcasses in trees.*

PELARGOPSIS CAPENSIS, 14.5 IN. BY ALAIN COMPOST

***Stork-billed kingfisher*** *feeds on shrimp, crabs, and dragonflies among mangroves, swamp forests, and paddy fields.*

CEYX RUFIDORSUS, 5.5 IN

***Rufous-backed kingfisher,*** *tiny and shy, nests in earthen banks or roots of fallen trees. Its diet includes spiders and grasshoppers.*

HALCYON COROMANDA, 10 IN

***Ruddy kingfisher*** *favors groves of nipa palms in the reserve to hunt for insects, lizards, crustaceans, and fish.*

F*LYING GEMSTONES*, eight species of kingfishers work the Cigenter area. A female blue-eared kingfisher (***right***) prepares to dive for a meal. We discovered, quite literally, how one fish has learned to stay off the birds' menu.

Sitting on the bank one day, we idly watched three leaves drifting by. All at once one of them began behaving very strangely. It stopped. Then it went backward. Then sideways, then backward again.

Dieter grabbed his net and in an instant had a leaf and a fish. In the aquarium the mystery was solved (**below**). The three-inch fish, upside down, uses its fins to maneuver the leaf as a screen to hide from predators. The leaf may also serve as a hunting blind. The fish, spotting minnows below, quickly righted itself, flashed down, gobbled the prey, returned to the leaf, and inverted.

This behavior is new to scientists, who place the fish within the genus *Butis* and the family called sleepers.

ALCEDO MENINTING, 8 IN

FAMILY THERAPHOSIDAE, 4 IN (ABOVE); PERIOPHTHALMUS ARGENTILINEATUS, 3 IN (BELOW LEFT)

*LIFE OF THE RIVER:* Across the placid surface skitters a huge bird spider (***above***), buoyed by hairy legs and named for its reputed habit of filching nestlings.

Sentinel on the shore, a great-billed heron (***above right***) stalks fish and other prey.

A pair of mudskippers sun themselves on a branch (***left***). Truly fish out of water (they can climb trees), mudskippers often forage ashore but periodically must return to the river to replenish a reserve in their gill chambers. Besides the medium implied by their name, we often saw them on the river itself, bouncing along like skipped stones.

Fiddler crabs of every conceivable hue abounded; a male waves his massive claw to defend his burrow (***right***).

ARDEA SUMATRANA, 4 FT (ABOVE); GENUS UCA, 1.5 IN (BELOW)

*TAPESTRY UNFURLED*, an Atlas moth pumps fluid into its wings shortly after emerging from the cocoon (***above***), ingeniously lined with outward-pointing hairs to allow the insect to leave while preventing predators from entering. We had found the cocoon near the river and brought it home to film the climax of the metamorphosis, taking two-hour observation shifts for six exhausting nights. Then, under a glorious full moon, the moth appeared. Ready to mate, this male will find an egg-bearing female by following upwind the scent of a pheromone she emits. Neither feeds during this final week or two of their life cycle. To help ensure its completion, they employ a bit of deception. Birds may think twice about attacking a snake, which the moths' wingtip pattern resembles, evoking a venomous species such as the golden-banded mangrove snake (***right***).

Had it not been for that monstrous mountain, all this natural splendor would surely have been overrun by a tide of humanity. How fortunate we are to find ourselves living in a time between Krakatau's awesome outbursts. □

ATTACUS ATLAS, WINGSPAN 8 IN (ABOVE); BOIGA DENDROPHILA, 5 FT

# Along Afghanistan's

By DEBRA DENKER

I WILL NEVER KNOW this woman's name. Among Afghan villagers it is the custom for women not to tell their names to strangers. On this cold November night she is busily preparing food for the six *mujahidin*, Afghan freedom fighters, who have escorted me across the Pakistani border to Afghanistan's embattled Paktia Province and into this small village in the Jaji region.

But in the darkness and snows of December, sometime around the fifth anniversary of the Soviet invasion of Afghanistan, she will give birth to her tenth child. If the child comes in the safety of the night, it will be born here, in this earthen house warmed by an iron stove. If her baby comes in the day, she is likely to be in the damp bomb shelter hewn into the ground under the fields outside the village, her birth pangs accompanied, perhaps, by the roar of jets and bombs.

She pauses to pour me a glass of steaming black tea. "When the planes come, I can't run very fast to the bomb shelter any more," she says. "I am too big and heavy. What can I do?" She speaks in a lilting accent, the rhythms of her native Pashtu carrying over into the Dari, or Afghan Persian, that she learned in Kabul before the war.

Few families remain in this region, where frequent bombings have destroyed both villages and crops as the Russians attempt to close this important route to the interior. Most of those who remain share food and shelter with the mujahidin ("holy warriors") who pass through, many from across the frontier in Pakistan.

**The wounds of war.** *A father and son suffer the pangs of homelessness in a refugee camp in Pakistan's Chitral Valley. After five years of fighting, some three million Afghans have fled to safety across the Pakistani border.*

# War-torn Frontier

Photographs by STEVE McCURRY

When an April 1978 coup brought a Marxist regime to power in Kabul, armed resistance began within months. The conflict was both nationalistic and religious, but devout Muslims regarded it as a *jihad,* or holy war. By December 1979 the central government was in danger of collapse, and in a three-day operation beginning on Christmas Eve, thousands of Soviet troops invaded the country, claiming to have been invited under the terms of a 1978 friendship treaty. While the invasion was still in progress, President Hafizullah Amin was executed and replaced by Babrak Karmal, a political rival Moscow summoned back from Czechoslovakia, where he had been sent as Afghan ambassador.

Soviet troops, estimated at about 80,000 in 1980, now number more than 100,000.

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**Debra Denker** reported on "Pakistan's Kalash: People of Fire and Fervor," in the October 1981 NATIONAL GEOGRAPHIC.

They have mounted frequent offensives to stamp out resistance, at great cost in lives to Afghan civilians. The economy has also been damaged. The 1984 harvest in eastern Afghanistan was less than half that of 1978, and prices of many staple foods have tripled.

BUT THE MOST VISIBLE effect of the war has been the flight of the Afghan people, a multilingual population of mixed tribes and ethnic groups, from

***Their village destroyed*** *by Soviet aircraft, Afghan mujahidin—"holy warriors" fighting for Islam—and their families trek across a mountain pass into Pakistan. Trouble in Afghanistan began in 1978; successive coups have resulted in a pro-Soviet government so unsteady that it has required the support of more than 100,000 Soviet troops.*

their homeland. One-quarter of Afghanistan's prewar population of about 15 million has been forced into exile in neighboring Pakistan and Iran. At least another million are "internal refugees," driven from their homes by bombing and other military action. An unknown number have been killed or wounded.

After more than five years the war remains in a violent stalemate. The mujahidin claim to control as much as 80 percent of the countryside, while Soviet troops and an army of Afghan conscripts defend parts of major cities, a few main roads, and fortified posts in some rural areas.

Abdul Wahed (not his real name), husband of the pregnant woman in this Jaji village, comes in out of the cold and darkness, letting in a gust of icy wind. The light of his lantern reveals the graceful geometric designs his children have daubed on the walls with the red earth of the mountains.

"This house we have built new in the past two years, after our other house was bombed," Abdul Wahed explains. "This area is free as far as the Communist post at Ali Khel, but the planes come and bomb the villages nearly every day. They are trying to drive us all to Pakistan, so no one is left to feed the mujahidin." Rolling up the sleeve of his long shirt, he shows me a deep puckered scar on his upper arm: "I was wounded two years ago and was three months in a hospital in Pakistan. By the grace of God I recovered, and now my brother and I take turns going out to fight."

After dinner Abdul Wahed's wife sits down next to me, adjusts her veil over her shiny dark braids, and pours me another glass of tea. She is happy to talk to me, as it has been a long time since the family has had a female guest. Around me the children prepare for the night. A fluffy gray kitten slumbers under the stove, and for a moment I forget that we are in a land at war.

JUST AFTER DAWN the rumble of distant artillery fire shatters the frosted crystal morning. To my surprise, no one reacts. They have grown used to the sounds of war. But Abdul Wahed's eldest son, a handsome quick-minded boy of about 12, begins drawing on the side of the black metal stove with a piece of chalk: a jet, looking rather like a paper plane, and short dashes representing the bombs it drops.

My escorts take a chance, and we cross the open valley by day. Walking through the wide, flat valley is like walking in a bad dream of a deserted land. At this time of year the land is all gray and brown, except where odd patches of snow lie, and the trees are bare but for a few limp yellow leaves. Large bomb craters pock fields that this year bore no harvest. In deserted villages a few houses stand among heaps of rubble.

I walk with the two men who have been specially detailed to accompany me by Syed Ishaq Gailani, a mujahidin commander who has for several years been a close friend of my family. One of the fighters, Bahram Jan, is perhaps 40, a big man with a commanding voice who used to buy cars in Kabul and sell them in Jaji. He is a font of war stories: These ruins were an Afghan government post till the mujahidin took it last year. Over there, in the field, are three tanks the mujahidin destroyed. And don't step back for that photograph, the area is mined!

His friend Mustafa's manner is quieter, though at 29 he has been a fighter for six years. He is a Tajik from Jalalabad, a city on the road from Kabul to Pakistan. Until he joined the mujahidin, he was a clerk in a government ministry in Kabul.*

On this dusty dirt road, one of the main supply routes of the mujahidin, we pass several parties of men coming from distant fronts. They exchange greetings with my companions and stop for a few moments to tell news of Kabul, or Kunduz in the north. Near the battlefields the mujahidin seem relaxed, unconcerned with the rivalries and disunity that plague Afghan parties in exile in Pakistan. Later Bahram Jan will tell me the story of Commander Mohammed Naim, from the nearby village of Ali Khel, who one week before had been severely wounded while leading an attack that had resulted in the capture of 50 Afghan government soldiers. Naim belongs to a different party, but, says Bahram Jan, everyone loves the legendary young hero who began fighting when he did not yet have a beard.

Outside a village, near a bomb crater, we talk to a group of battle-weary men from

*Mike Edwards described life in present-day Kabul in the April 1985 GEOGRAPHIC.

# Afghan border

*More than 200 passes thread the border between Afghanistan and Pakistan, conduits for the stream of refugees.*

*Many of the fleeing Afghans return to fight in strikes across the border. The village of Teri Mangal in Pakistan (bottom), used as a staging area for such raids, was nearly demolished last August, reportedly by Soviet bombers.*

1 REFUGEE SETTLEMENT AREAS
Figure denotes number of camps in each area as of June 1984.

NGS CARTOGRAPHIC DIVISION
DESIGN: NANCY SCHWEICKART
RESEARCH: SUNARE RUTINS, LINDA KRIETE
PRODUCTION: ROBERT CRONAN

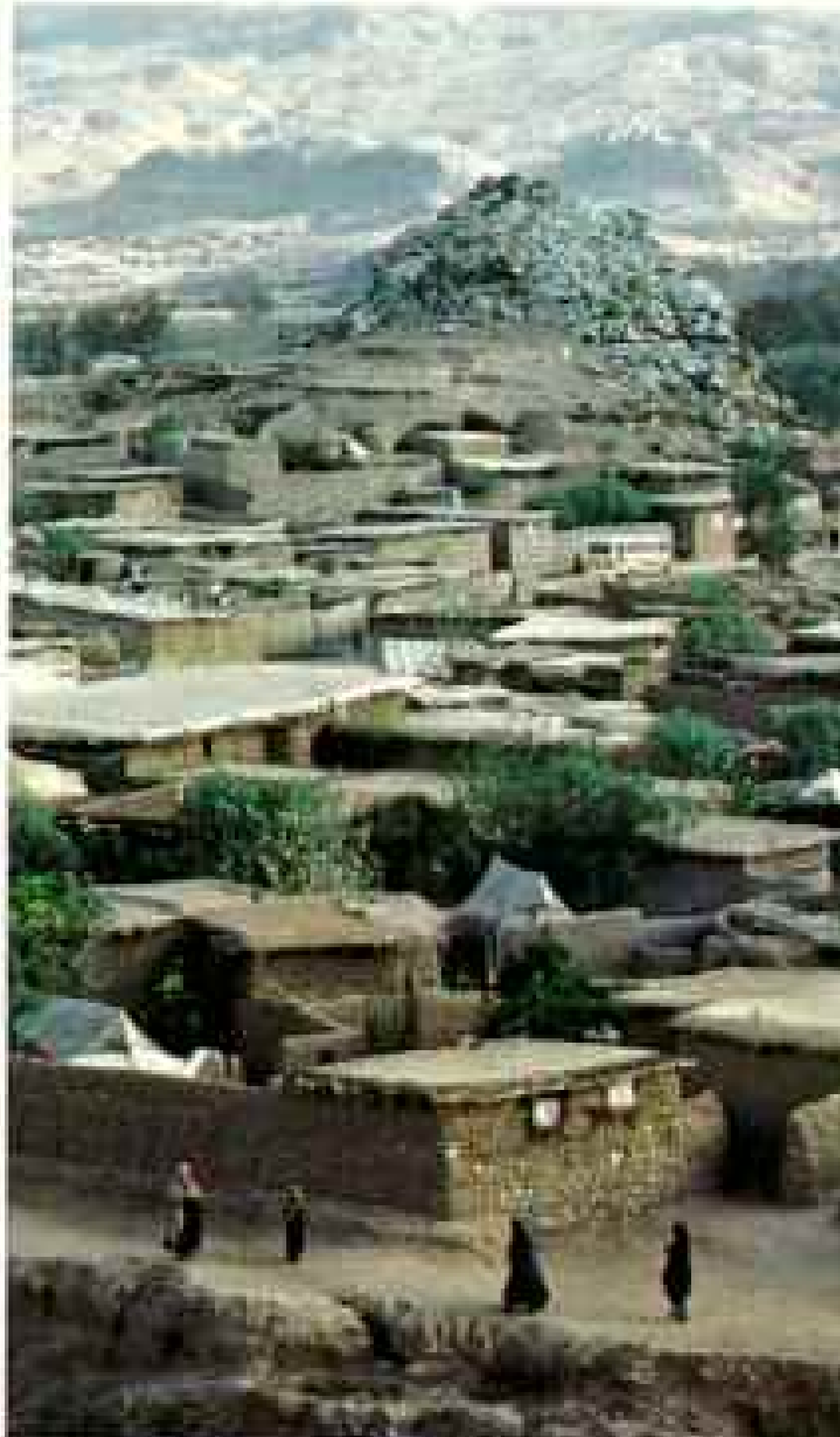
Kabul. The bombing is on the other side of Ali Khel today, one says stoically, but just two days ago this area was heavily bombed. Round a bend in the middle of the road are the fly-encrusted remains of a camel. "See, they are killing even the animals," says Mustafa angrily, "everything that they see, everything that can feed the mujahidin or carry supplies for us."

In the refugee camps of Pakistan I had heard reports of destruction of food supplies, and of fears of a famine in the spring. Refugees from the Panjsher Valley, a center of resistance, told me how their walnut and mulberry trees were systematically cut down by the enemy during Soviet offensives. Here in the unplanted fields of Jaji I see the confirmation of these stories.

Farther on, in another village, a gray-and-white cat prowls delicately along the

*Randomly placed tents characterize temporary quarters for new arrivals at Mohammed Khoja near Thal, with 22,000 inhabitants one of the largest camps in Pakistan.*

*Eager to return to their homeland, Afghans elsewhere nevertheless build permanent mud-and-straw dwellings. Such houses, along with a couple of tents, afford more adequate shelter for Afghans at the Katakanra camp* **(below)** *near Hangu in the Kohat District. Many residents operate buses, trucks, and taxis.*



top of a ruined wall. In a roofless room a carved wooden chest lies askew on a tilted floor. Under our feet are bedposts, scattered grain, and a single shoe, very small.

The mujahidin climb up a rickety ladder to the upper floor of the ruined mosque. Though the back wall gapes and half the floor is missing, the mosque is still sacred, and someone has strewn fresh straw on the floor. In the shadow of carved wooden columns, the men turn away from the destruction behind them, face the niche that marks the direction of Mecca, and pray.

Later, in a field of grass stubble under an opalescent autumn sky, we find shattered pieces of dull green plastic, one with a detonator still attached. These are the remains of small mines shaped like butterflies, which can take off the hand or foot of an unwary person or injure livestock. Designed to

maim, they are scattered from helicopters on inhabited areas and important routes. Many Afghans have learned to explode the mines, usually by throwing stones from a safe distance. But two weeks later, in a Pakistani border town, I will watch a doctor bandage the mangled hand of a scarlet-veiled woman from Jaji who had been unwary enough to pick up the strange green plastic object.

THE SUN is nearly on the edge of the sharp, snow-covered peaks and ridges that mark the far limits of the valley when Mustafa stops and points to a cluster of nondescript mud buildings on a hilltop about a kilometer away. The fort at Ali Khel appears deserted, but inside are Afghan government soldiers and some Soviet officers. Mustafa tells me to stay behind the wall, out of direct line of sight and fire. "Every night the mujahidin attack the post," he says. "We will be in a rain of bullets. Do you want to go with us?"

After dark we make our way to the house of a man loyal to my friends' party. Mustafa is relieved that the man's family has not yet left for exile in Pakistan. At night, he says only half jokingly, mujahidin factions are less trustful of one another.

A couple of hours later the attack on the government post begins, and Bahram Jan leads me up the stairs to the square tower with a picture-window view of fiery parabolas of tracer bullets arcing from the mountainsides toward the mud fort. The fighting goes on for hours in the frosty night, the mujahidin firing Kalashnikov automatic rifles and a heavy machine gun or two at the solid walls of the fort, the enemy post answering with machine guns, mortar fire, and occasional flares. The 120 rounds issued to each of my escorts will not last the night, and some must be conserved for the journey back to Pakistan. They cannot aim for victory, only for harassment.

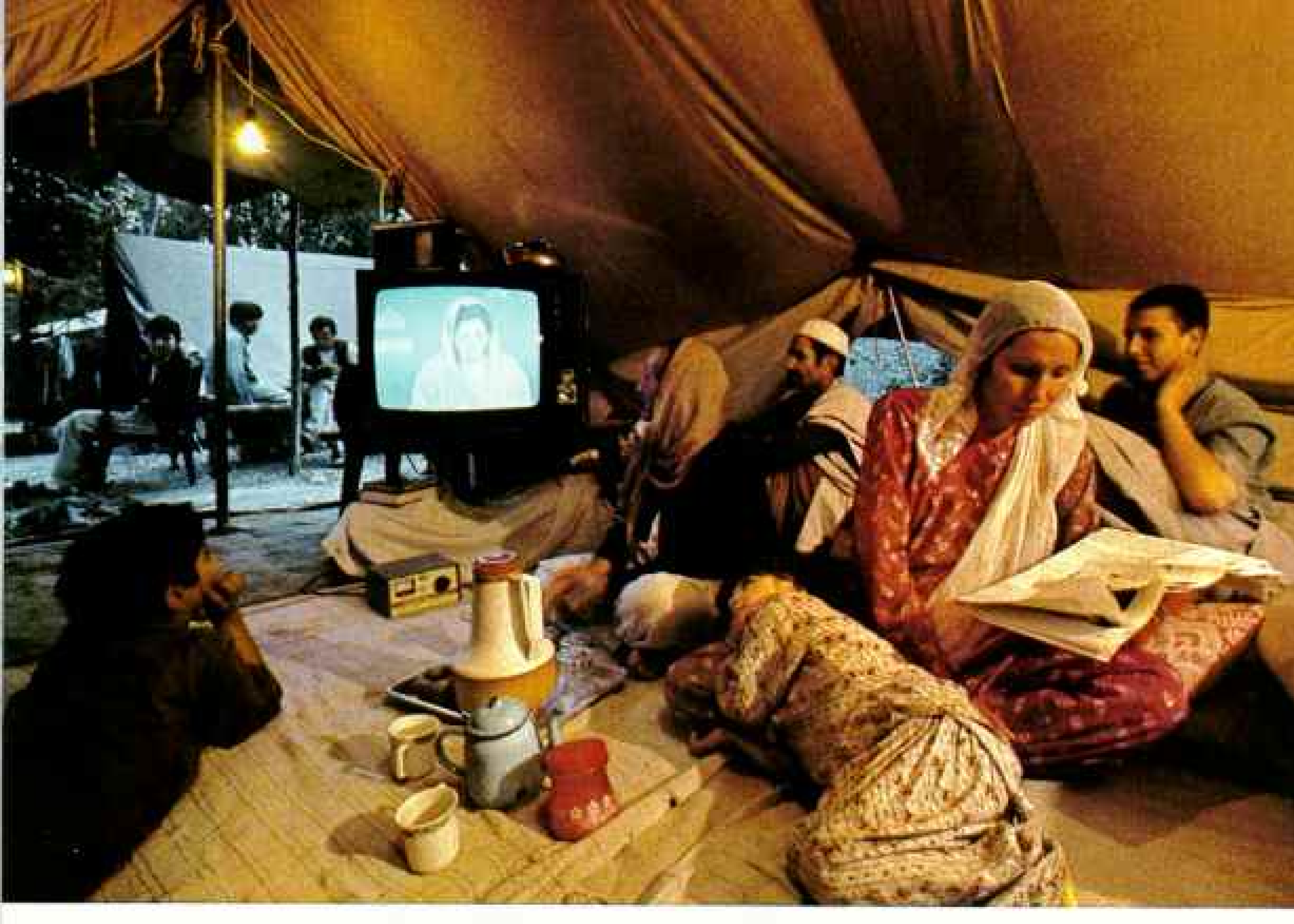
Over the past five years 325 million dollars in covert U. S. aid has reportedly been channeled to the mujahidin, mostly in the form of smuggled Soviet-made small arms, along with a few antitank missiles and SAM-7 antiaircraft missiles. But there are questions as to how much of this aid has actually arrived inside Afghanistan. Commander Abdullah of Helmand Province said

***Fresh from the oven,*** *bread goes home with a refugee in Pakistan's Munda camp. It is traditionally served with korma, an Afghan stew.*

with more passion than realism: "We fight tanks with Kalashnikovs. Nowhere else in the world do they do this. Send us antiaircraft guns, and the mujahidin, with the help of God, would get the Russians out within one year." Certainly there are few effective antiaircraft weapons. The surface-to-air missiles are notoriously unreliable. When asked about the SAM-7, Ishaq Gailani grimaced. He and other mujahidin representatives would prefer portable, lightweight British or Swedish missiles.

At 3 a.m. we leave the battle behind and by the light of a crescent moon file silently up a riverbed that cleaves the rugged mountains. At dawn the Muslim call to prayer sounds from the village, now well behind us. The gunfire, which had continued unabated, stops. The mujahidin, and perhaps the government soldiers inside the walls of the fort, are now at prayer.

In this narrow, uncultivated valley some



***Getting together for the evening,*** *members of the Farani family watch Pakistani TV in their tent in Peshawar. Like other Afghans from urban areas, they eschew the camps if they have the money to do so. A constant flow of guests, relatives, and mujahidin keeps the women busy with the teapot.*

of Afghanistan's internal refugees have built crude houses of earth, wood, and stone. They live on what they have salvaged from their fields or imported from nearby Pakistan. It is still early when the roar of the first jet fills the sky. Though it is high overhead, we scatter, hiding under scrawny pine trees, covering our heads and bodies with *pattu,* camel-colored blankets that blend with the earth tones of the land. The noise of bombing echoes through the brown and snow-whitened hills. Beside me, Mustafa's face is grim and set.

IN THE LATE AFTERNOON we reach a house high in the mountains. I am invited to sit with the men, and I join them in the nightly ritual of listening to the BBC World Service for news of the outside world and news of their own war. Entering the separate women's world when it is time to sleep, I read, in Persian, a poem called "Autumn of Blood," by Afghanistan's Ustad Khalilullah Khalili:

> *Each red leaf in the meadow*
> *Reminds me of those killed for*
> *the homeland. . . .*

When I return to Pakistan, I learn that the United Nations General Assembly has passed yet another resolution calling for the withdrawal of foreign troops from Afghanistan. The Soviet Union has ignored five previous resolutions, claiming that they constitute interference in Afghanistan's internal affairs.

In a refugee camp at Sateen, not far from the Afghan border, I find some of the last people to flee from Ali Sangi, the village where the gray-and-white cat walked along the ruined wall. Against the counterpoint of a nearby wedding, where women chant and bang hand drums, the survivors recount their stories.

***Carpet merchants,*** *Turkoman refugees from Afghanistan's north parade their wares along the stalls of Peshawar's Qissa Khawani Bazaar, the famed "storytellers bazaar"* **(right)**. *Lacking stalls of their own, the Turkomans keep moving to find their customers.*

*Many of the Turkomans have returned to join their fellows in the mujahidin, becoming some of the more fierce warriors and battle-smart commanders. Others prefer to remain in Pakistan, pursuing their skills as carpetmakers, the trade of their ancestors. At Swabi refugee camp near Mardan* **(below)** *wool is dyed and dried. Thereafter a carpet begins to take shape on a loom* **(below right)**.

*Carpetmaking is a family affair, with everybody participating around the horizontal loom. It can take three months to make a wool rug, a little longer for one of silk. The majority of the carpets are for prayer, but some larger ones are made for use in homes.*

*Thousands of Turkoman refugees equal thousands of carpets—in addition to those locally produced. The Pakistani weavers feel they are being hurt by Turkomans, who pay no taxes and no shop rents, selling their wares in the markets.*

***The fellowship of pain*** *unites a freedom fighter and 12-year-old Abdul Ali* ***(above)****, both from Qandahar, who lost their limbs to Soviet explosives. Here at the orthopedic center in Peshawar, run by the International Committee of the Red Cross, victims learn to reassemble their shattered lives. In a Red Crescent clinic* ***(left)*** *at the Kachaghari refugee camp, an Afghan nurse tends an old man who made the long journey from northern Afghanistan.*

Hazrat Bibi is probably in her 40s, but her face is thin and worn with grief and the trauma of her journey with six children into exile. She breaks into tears at the memory of her husband, killed only a month before.

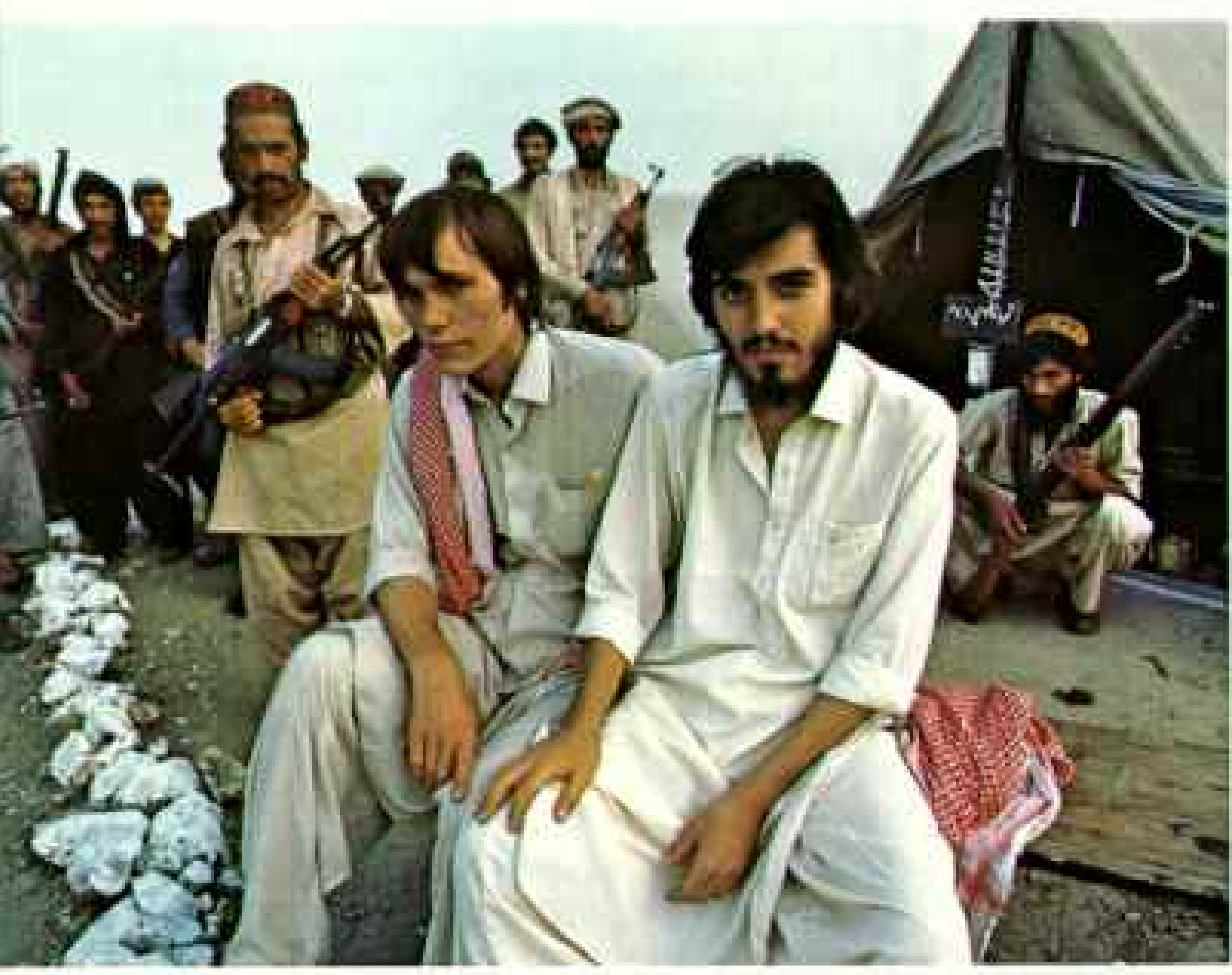
As the men gather, she turns away toward the wall, hiding her face from them but always watching me. Akbar Khan, a middle-aged man who used to be a farmer and a driver in Kabul, speaks for himself and his village. "We came here about a month ago. Now there is not a single family living in Ali Sangi. Everything was destroyed, everything inside the houses, our clothes and possessions buried under the earth, our children buried under the earth."

PESHAWAR, capital of Pakistan's North-West Frontier Province, homeland of the Pashtun, or Pathan, tribes that inhabit the border areas of both Afghanistan and Pakistan, has two faces. The old face is that of an exotic crossroads, a wild frontier town near the foot of the Khyber Pass. The modern face is that of a noisy, congested, polluted city that is estimated to have doubled in size in five years since the Soviet invasion.

Some say that Peshawar is now the largest Afghan city outside Kabul. Most of Pakistan's refugee population of about three million is concentrated in this province, though refugees are settled in a long crescent from Chitral in the rugged Hindu Kush range of northern Pakistan to the deserts of Baluchistan Province.

In August 1984 all mujahidin party offices were ordered out of Peshawar because of an escalating climate of violence, including bombings of the offices and attempted assassinations of prominent Afghans. Mujahidin and Pakistani intelligence sources blame much of the violence on the Afghan government intelligence service, but it is also true that there are ongoing feuds between mujahidin factions, some of which occasionally spill over onto the battlefield.

Now based just outside the city limits are a number of political parties, mostly grouped into two alliances. One consists of the three parties regarded by Western observers as moderate. Its leaders, though seeking an Islamic government for Afghanistan, have closer ties to the West than the



**"The helicopters hovered,"** *says Jalad Khan* (**right**), *"and they picked out their targets." Salvo after rocket salvo later, the Soviet helicopters had destroyed Khan's village of Doubandi, about 30 miles from the border with Pakistan. Frontier villages have served as refuges for the freedom fighters and, as a consequence, have been increasingly subject to aerial attacks. With World War II vintage guns, the mujahidin brought down a Soviet helicopter gunship* (**top**).

*Now held at a mujahidin training camp, Soviet Army deserters Nikolai Vasilovich Balabanov and Garik Moradovich Dzhamalbekov* (**above**) *began supplying weapons to the Afghan guerrillas when they doubted the Soviet cause. Garik told the author the conflict was "a bad war, a dirty war." Both men are from Soviet Central Asia.*

opposing group of fundamentalist parties.

Many disillusioned mujahidin say that the parties fail either to supply arms or to achieve political unity. "I will join whatever party gives me arms," said one fighter in Baluchistan. "I am here in this refugee camp only because no party will give me arms." Some mujahidin look hopefully toward leadership evolving inside Afghanistan, such as the loose "internal alliance" of young regional commanders who communicate and coordinate by courier.

Beyond the refugee camps that fringe Peshawar is the Khyber Pass, the historic passage between the uplands of Central Asia and the plains of the Indo-Pakistani subcontinent. Today the Khyber, except for a strip 50 feet wide on either side of the road administered by the Pakistani government, remains under the control of local Pashtun tribes. Tribal areas are generally off-limits to foreigners, but photographer Steve McCurry and I get special permission from the governor. We are accompanied by two local officials and an escort of 15 *khassadars*, members of a tribal militia. The officials grow increasingly nervous as the afternoon wanes. They inform us that if we do not reach the settled districts by dusk, the government cannot answer for our safety.

On the way through the pass, on a winding dirt road beyond the limits of

government control, a pickup truck bounces along in a cloud of dust, while a train of camels lopes on unconcerned. They may be smuggling cloth, untaxed cigarettes, whiskey, or raw opium to be processed into heroin. Pakistan, despite government efforts to reduce poppy growing, is among the world's major exporters of heroin.* Much of the opium, 400 metric tons in 1983, comes from beyond the border in Afghanistan, where it is the most profitable remaining cash crop. Before the Islamic revolution in Iran, most opium was exported to Iran. With that market restricted, growers have set up labs in Pakistan, and more recently inside Afghanistan, to make more profitable heroin for export to the West. According to the U. S. Drug Enforcement Administration, most of it passes by the town of Landi Kotal, near the head of the Khyber Pass.

Poppy cultivation is a tradition in certain families, and a source of income tribesmen are reluctant to give up. In previous years, both in Afghanistan and in Pakistani tribal areas, I saw fields of poppies, which many here referred to jokingly as "tulips."

THERE IS A CHANGE in the air in Peshawar this year, and I sense a turning point. Pakistan is saturated with refugees, and compassion is drying up. Pakistanis, who opened their country in the name of Muslim hospitality and the Pashtun tradition of *panah*, or asylum, are now faced with the largest refugee population in the world.

Despite the number of refugees and their length of stay, there has been little tension between refugees and locals. These refugees are the freest in the world. They are allowed to come and go, even to work and trade, as long as they own no immovable property. Nonetheless, there are anxieties about the long-term effect of so many refugees on the culture, economy, and security of Pakistan. The administration of 2.4 million registered refugees, at a cost of a million dollars a day, is an enormous undertaking. The Pakistani government says it pays nearly half the cost of refugee assistance, with the United Nations High Commissioner for Refugees and other countries and international agencies absorbing the rest. The United States is the largest contributor to the UNHCR program in Pakistan (some 20 million dollars in 1984).

Each refugee is supposed to receive a daily ration of 500 grams of wheat, 30 grams of edible oil, 30 grams of dried skim milk, 20 grams of sugar, and 3 grams of tea. Each family is allotted 20 liters of kerosene monthly. In theory, a cash allowance of 50 rupees (about four dollars) per person per month is also provided, though in fact it is rarely received.

Most who arrived before 1984 have been officially registered and receive close to their allotted rations. Older camps have become sprawling villages as refugees have built houses out of earth, as in their native villages. Though idleness still plagues the camps, where there are many farmers without land, shepherds without flocks, and shopkeepers without shops, some men have found work on the roads, in refugee-camp bazaars, or driving three-wheeled taxis leased from Pakistanis or buses and trucks brought from Afghanistan.

At the time of my visit, in late 1984, new arrivals typically faced delays of as long as four months in registration and issue of rations. The reason for the delay, according to Pakistani refugee officials, was the process of recounting previously registered refugees. For example, on the theory that children are too guileless to exaggerate the number of family members, teams of checkers questioned children from each family. They uncovered cases of double registration and instances in which more family members were claimed than actually exist.

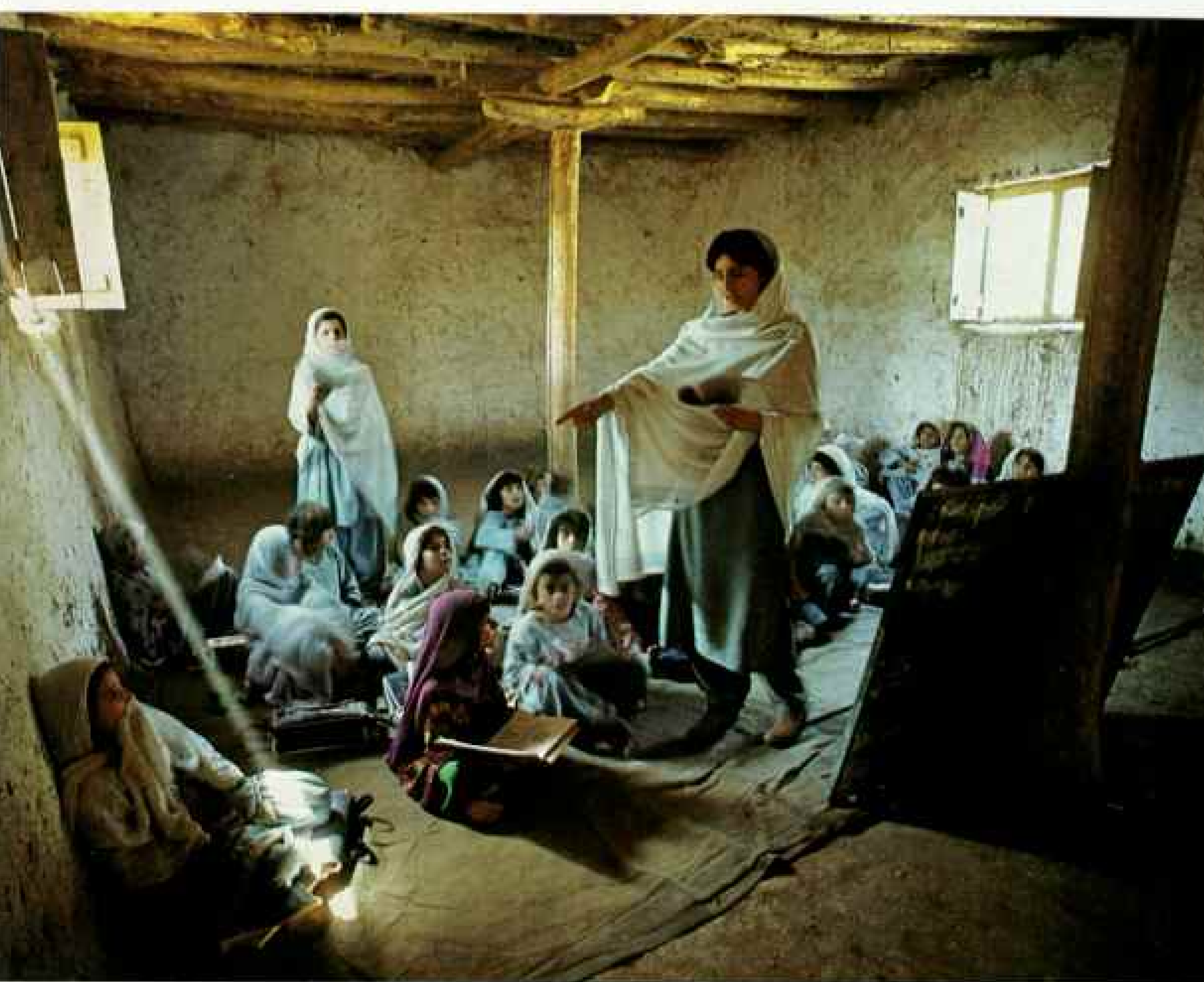
New arrivals, hungry and dazed from their long and dangerous journey across the border, often could not comprehend the reason for the delay. A group of 150 families from Baghlan, in Afghanistan's north, had walked for more than a month. Now they camped by the huge Kachaghari refugee camp outside Peshawar under makeshift tents made of blankets. For another month they waited until the provincial Commissionerate for Afghan Refugees sent them to a camp for newcomers. In Munda camp, about 25 miles from Peshawar, 380 families from Baghlan and Kunduz shared 180 tents. At Khapianga, on a desert hillside in

*See "The Poppy," by Peter T. White, NATIONAL GEOGRAPHIC, February 1985.

Kurram Agency, 700 families from Jaji camped in borrowed tents or bought ragged ones, their only water source a tiny spring that was in danger of drying up.

Poverty does not diminish Afghan hospitality. In Munda, refugees offered to kill and roast a sheep for us; in Khapianga, I ate flat wheat bread and tasteless spinach with an impoverished woman, who then offered to cook me an egg; outside Peshawar, I drank weak, sugarless black tea with a group of women who had arrived from Kabul the night before and were camped on the bare ground among the mattresses, blankets, and pots that were their only remaining possessions.

THE GREAT MAJORITY of Afghan refugees in the North-West Frontier Province are Pashtuns, a robust, handsome people. In the camps of the north, near Chitral, are light-skinned Tajiks from Panjsher Valley, Badakhshis from the high Hindu Kush, and rugged, sharp-faced Nuristanis. In Baluchistan are more Pashtuns, the Baluch, and the Mongol-featured Hazara. In many camps one encounters Turkic-speaking Uzbeks and Turkomans from the north. One of the best places to see the variety of Afghans is Peshawar's famous Qissa Khawani Bazaar, the "storytellers bazaar." Here the tales were once of caravans and trade, of wandering saints,



***The wheel of war** spins a peculiar benefit for country girls in Kachaghari camp—education. Unless they live in a city, Afghan girls don't ordinarily go to school. The children's teacher, Zarghuna Ghumkhor, however, studied science at Kabul University.*

*__Maimed by the conflict,__ paraplegic and quadriplegic mujahidin and refugees tilt their heads toward Mecca during sunset prayer at an International Red Cross hospital near Peshawar.*

*Prostrate in front of them are relatives of the injured men, who often serve as their attendants, and members of the hospital staff.*

poets, and holy men, but now all the stories, among Afghans at least, are of war and survival.

Near Qissa Khawani, down the narrow lane of the gold bazaar and across from the delicate mosque of Mahabat Khan, is an even narrower lane that leads to Murad Market, the heart of the refugee bazaar. Perhaps half the shops here are rented by Afghans, mostly carpet sellers, silver-

smiths, and dealers in antique goods. Here young Syed Sher Agha sells antique silver jewelry from his tiny shop. On the wall is a small, framed, formal black-and-white portrait of a young man in a turban—Sher's eldest brother, a mujahidin commander killed in battle near Jalalabad in 1982, at the age of 20.

One day I accompany Sher and his younger brother to their camp, where I am welcomed by their mother and two young aunts. They have lived here for three years but have been unable to build a mud house because the camp lies on sand. Unable to satisfy the Afghan urge to build, they have satisfied the twin urge to beautify by planting gardens; tall reeds create an illusion of privacy, and marigolds and sweet basil color and scent the refugees' small plot.

While his young wife cooks outside the

*__Grief's bitter tide__ washes over a widow whose village was rocketed by helicopters. Together with other widows and children totaling some 4,000, she lives in a special section of Nasir Bagh camp near Peshawar.*

tent, pulling her yellow-embroidered black veil over her face modestly, Sher tells me of his wedding, only three months ago, to this girl who lived in the tent next door. "There was no music," says Sher, "because we are still in mourning for my brother." Sher's mother brings out a tattered copy of a mujahidin magazine and shows me a picture of her fallen son. I remember Sher's words: "There is not one family that has not eaten the bitterness of this war."

Abdul Ali, 12 (pages 784-85), went out to play one morning, stepped on a mine, and lost both his legs at the thigh. He sits in his wheelchair at the orthopedic center of the International Committee of the Red Cross in Peshawar, laughing and badgering me for a picture. Later I hear that he has learned to walk on the two small artificial limbs the center made for him and has returned to Afghanistan.

Simeen Musharaf, widowed mother of four children, is a teacher at a girls school in Nasir Bagh camp. When she was fleeing Afghanistan, she stepped on a mine and lost one leg. She was refused admission to Afghan hospitals on grounds that her husband, then in prison and later executed, was a "terrorist."

Five teachers teach 350 girls, crowded under a large tent. The mud roof of the school building has fallen in because of heavy rain one night several months before. The colorful maps of Afghanistan and the world, which someone has carefully painted on the walls, are sadly mud-streaked.

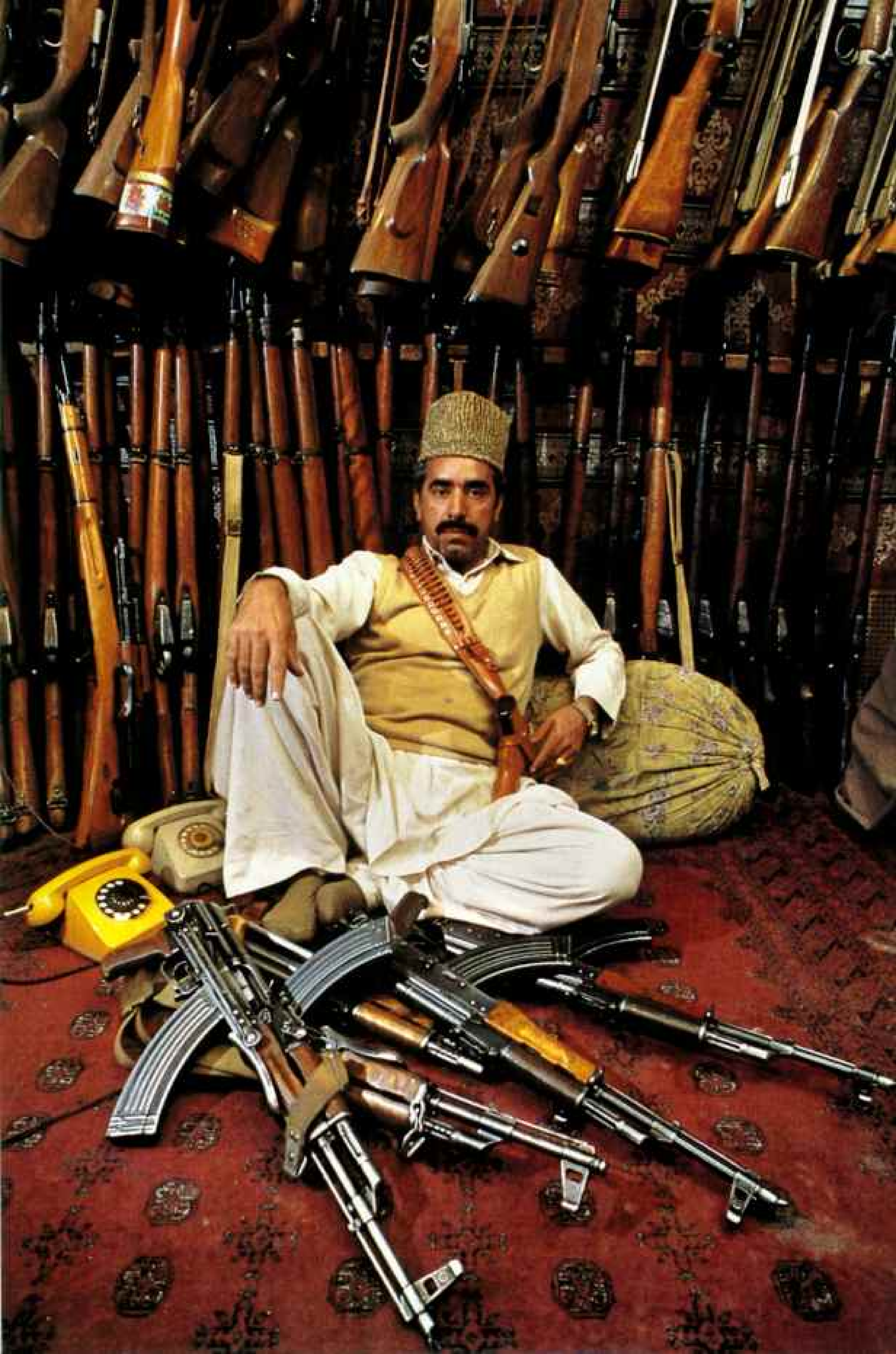
AT THE NEARBY widows camp I visit with Noor Jehan, whom I had met the year before. On the orders of the provincial refugee commission, several men are busy building a high mud wall around the camp to screen the widows from the eyes of men. I ask the officials why these workmen are not rebuilding the roof of the girls school instead of a purdah wall, but my question is left unanswered.

Noor Jehan, a sprightly widow with bright eyes, expressive face, and hennaed gray hair, runs to embrace me. "Life is much more difficult this year," she tells me. "Now my daughter is also a widow, and all her children are here. We are 16 people living on seven people's rations." She leads me to her tent and introduces me to Noor Taj, her eldest daughter. Eagerly the women make sweet milk tea for me and insist that I drink several cups. I know this is a sacrifice, using up their precious rations of dried skim milk and sugar, but in courtesy I may not refuse.

Noor Taj has her mother's strong face and forthright manner: "What could we bring, coming on foot? Nothing but a few things we could carry on our heads. We were forced to come, because the unbelievers come into our houses to take away the boys, and open our cupboards, and take away little girls by the hair. How could we live like that?"

IN A HOSPITAL BED in Lahore, far from the Afghan border, lies Commander Mohammed Naim, age 22. It is not hot on this late November day, but Naim is sweating with the effort of his body to fight off the effects of its injuries, and his voice is weak and halting. One side of his face is wounded by the artillery shell that took away his left leg and broke his right leg and left arm during an attack on the fort at Ali Khel. He was carried on horseback to Pakistan. "By the grace of God, I had no pain at all during the journey," he tells me. "Everything I have done, I have done for our faith."

A few days later I deliver a letter to Naim's father, Khan Mohammed, who lives in a camp in Kohat District. We listen to a cassette of my interview with Naim, while men



*Haji Baz Gul Arms Store No. 1, presided over by the owner (**left**), is just one of perhaps a hundred shops in Darra, Pakistan, where a purchaser can get anything from rifles to mortars and even ground-to-air missiles. "I believe in the Afghan cause," says Haji Baz Gul, who has two telephones, one for long-distance inquiries, the other for local.*

*At his feet are AK-47 Kalashnikov assault rifles, which sell for around $1,200 apiece. The Kalashnikov, a weapon that makes up in volume of fire for what it lacks in long-distance accuracy, has become the shoulder arm of both sides in the conflict. A boy (**right**) comes to port arms with a wooden version during a school exercise. A large zipper slung around his shoulder simulates a bandolier.*

*Such indoctrination of children into the Afghan cause starts at an early age and proceeds to small-unit tactics (**below**), where 18-year-olds leap fire ditches. Meanwhile, the Russians have taken thousands of children from their parents in Afghanistan and sent them to the Soviet Union for education, military training, and indoctrination.*

and children gather in the small oblong guesthouse. Someone brings in a pot of green tea and a bowl of walnuts. When it is time to go, Khan Mohammed insists I take a sackful of walnuts. "These are from our own trees, in the homeland." Not long before Naim was wounded, he explains, his two mujahidin sons had gone to their home village and picked as many walnuts as they could, practically under the eyes of the Soviet and Afghan soldiers in the fort at Ali Khel. "When we taste these," Khan Mohammed says, "we remember our home."

In a mujahidin training camp near the border I meet two Soviet defectors. Like most of their mujahidin counterparts, Garik Moradovich Dzhamalbekov and Nikolai Vasilovich Balabanov (page 786) are young, in their early- to mid-20s.

I do not at first recognize them as Russians, as they wear Afghan dress. A mujahidin commander orders them to come closer. I look into their wary faces and sense that they do not want this interview; they have seen too many journalists. They speak Persian but tell me they prefer to speak Russian through a mujahidin interpreter.

Both men were born in Soviet Central Asia. Garik, a light-complexioned, bearded man, is a Tajik from Dushanbe, the capital of the Tajik Soviet Socialist Republic; broad-featured Nikolai, half Kazakh and half Russian, is from Alma Ata, capital of the Kazakh S.S.R. Eyes downcast, they

*Instant personnel carrier, a Peshawar taxi ferries mujahidin to the border. Though faced with daunting odds, the freedom fighters continue their relentless program of ambush, interdiction, and hit-and-run strikes in a bitter war.*

chain-smoke as they narrate their story. "They said we would fight Americans, Chinese, and Pakistanis," says Nikolai.

After some months they began supplying weapons to the mujahidin, because it was "a bad war, a dirty war," according to Garik. They were caught and jailed, but escaped and deserted to the mujahidin.

Under some willow trees by a stream, former enemies sit side by side with me, sharing an incongruous picnic lunch of unleavened bread and a tomato omelet. The two defectors, who speak to me in Persian when we are left alone, have heard that several Soviet soldiers have gone to England and the United States, and they are hoping Canada or the United States will accept them. They have made a cruel and difficult choice, from which there is no turning back. "We were happy as children," Garik says, "but then we grew up."

MOST OF THE TRAINEES in this camp are little more than boys. Enthusiastically they run through the dusty obstacle course, climb swinging ladders, rappel down cliffs, scale sheer walls, and run through fire, their plastic shoes falling off as they leap. They are laughing, enjoying this game, but in a moment of quiet they gather round to talk and become serious, speaking of families left behind in Afghanistan and of their commitment to the jihad.

On another occasion I visit this rugged spot with Ishaq Gailani. At 32, this charismatic young leader is revered by his followers as much for his reputation for honesty and bravery in battle as for his membership in a family of hereditary religious leaders.

Ishaq Gailani has spent much time at many fronts and tells me he hopes to go back again soon. As we watch the men receiving instruction on captured Soviet weapons, I ask him the meaning of the black flag that flies over the camp.

"When the Prophet and his companions used to go to jihad, they carried black flags, because war is not a good thing," he explains. "When we go to jihad today, it's not because we want to fight, but because we are compelled to fight for the sake of Islam, and for the freedom of Afghanistan."

As a heavy dusk deepens over the craggy hills, a muezzin's voice calls the men to prayer, and once again the mujahidin put aside their study of war. The holy warriors, Ishaq among them, spread their pattu on the ground, their weapons before them, and stand and bow and stand again. In the silence I feel their strong and quiet faith, and wish only for a swift and happy end to the struggle forced upon them. □

FAIR SKIES FOR THE

# Cayman Islands

*Window on an aquamarine abode, a transparent rowboat designed for crystalline waters brings its co-creator, Gretchen Allen, in focus with a parade of sergeants major. Slivers of coral rock, the three devoutly British Cayman Islands have parlayed natural wonders and tax-haven status into a Caribbean success.*

*By* PETER BENCHLEY

*Photographs by*
DAVID DOUBILET

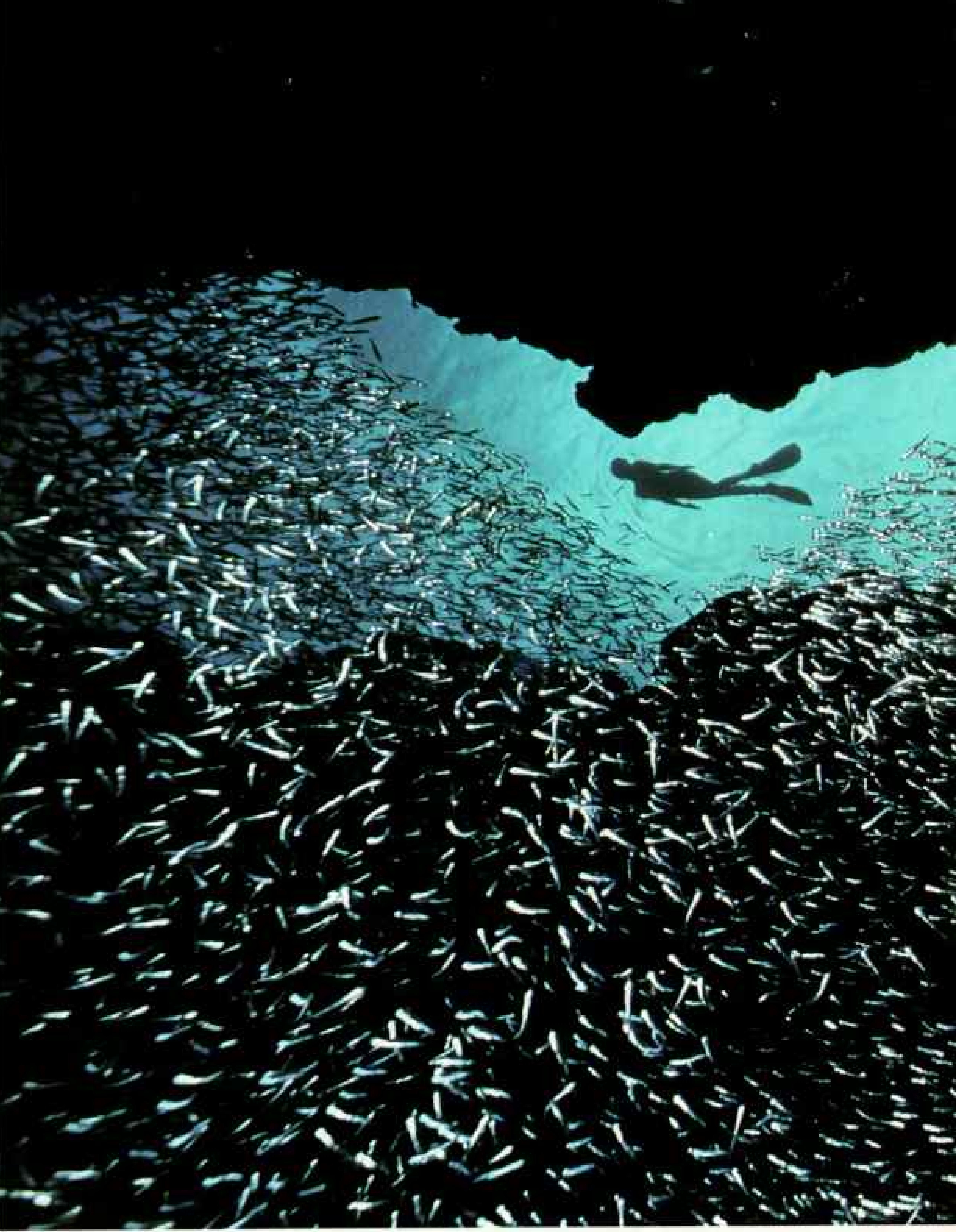
DIVER

# *The Cayman reefs: bonanza for pleasure and profit*

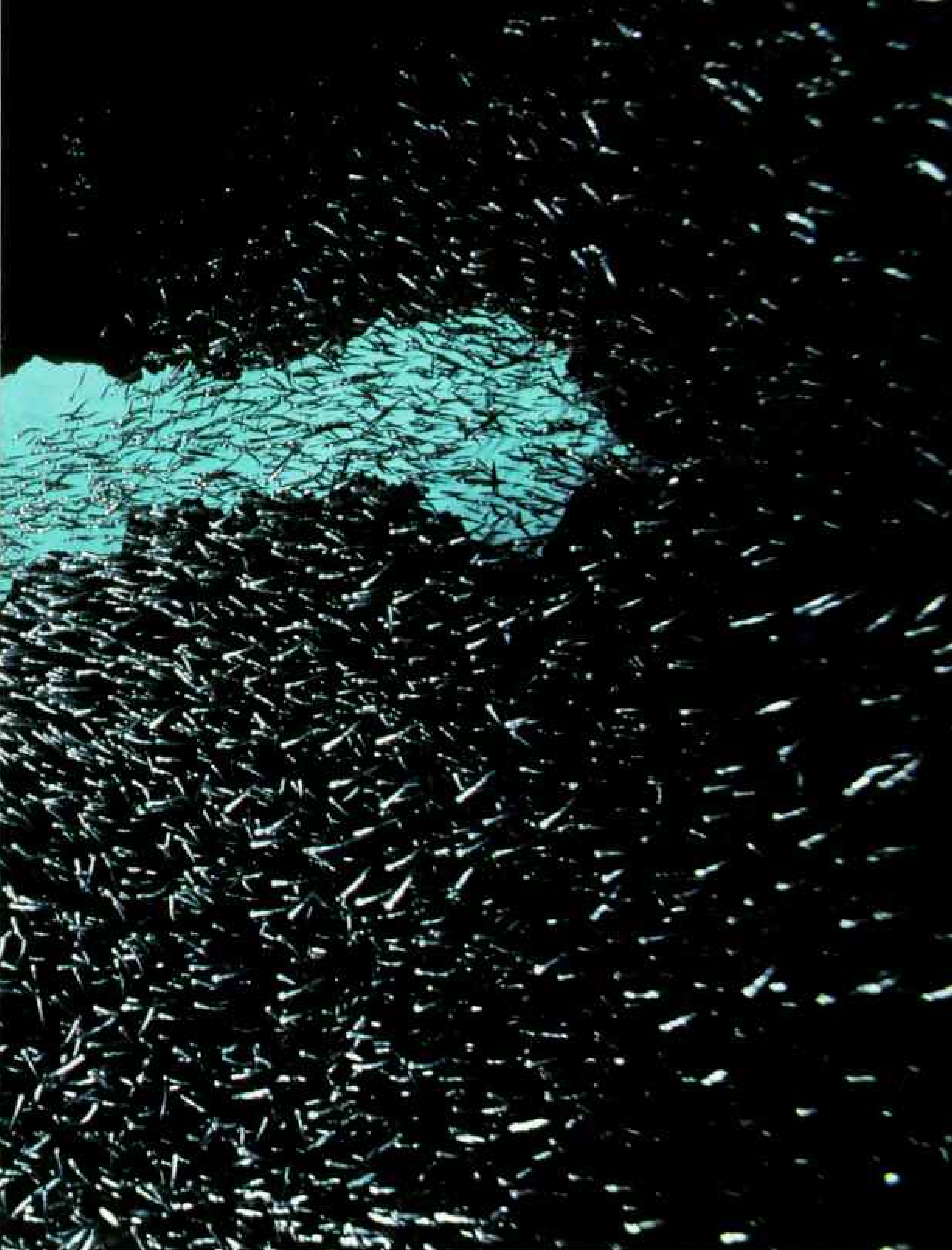
*LURE for scuba divers and snorkelers, the Cayman Islands support an underwater recreation industry exceeded only by that of the Florida Keys. Much of the country's astounding increase in tourism—from 55,600 visitors in 1974 to more than 352,000 last year—rises from its submarine splendor.*

*A 60-passenger boat* (**left**) *from George Town, the colony's capital on Grand Cayman, lowers its bow to release a crowd of snorkelers* (**upper right**) *at one of dozens of quickly accessible, close-to-shore dive sites.*

*Water visibility, often extending 150 feet, enhances the experiences of scuba divers exploring the islands' famed walls. Massive faces of coral rock, these walls begin some 50 feet below the surface and, to the south, drop into the Caribbean's deepest waters, the Cayman Trench. A hundred feet down at Sand Chute, a barrel sponge brings out a diver's sense of humor* (**right**).



***"Like diving in a silver waterfall,"*** *says photographer David Doubilet of his work amid massive schools of silversides in Devil's Grotto, a maze of caves and tunnels off western Grand Cayman. Proliferating in summer, silversides nourish*



*larger reef species such as jacks, whose numbers have fallen in recent years through overfishing. Such a decline may be one reason why sharks—predators of the larger fish—have become a rare sight on this side of the island.*

**Bedding down** *in a shipwreck off George Town harbor, a queen parrotfish blows up its own protective sleeping bag* (**above**) *from a secretion gland in its mouth. The bag may mask the fish's scent and, flecked with sand, help in camouflage. Also bent on safety, a yellowhead jawfish* (**upper right**) *emerges from its sandy burrow to regroup piles of coral rubble that fortify its lair. Mystery rider on a night-feeding foray, a parasitic crustacean known as an isopod mounts the head of a blackbar soldierfish* (**lower right**).

*While nature has equipped such creatures for self-protection, Caymanians now furnish legal safeguards. They began with the 1978 Marine Conservation Law, which prohibits divers from collecting living organisms such as sponges, precious black coral, and tropical fish, while*

*setting catch limits on once abundant conchs and lobsters. This year the government plans to go another step by banning fish, lobster, and conch harvests in selected areas and establishing marine parks—a move applauded by Bob Soto, who pioneered the islands' diving industry in the late 1950s. "We have always lived off the sea here, in one way or another," he says. "This is our only natural resource. If we lose it, we're lost."*

***In narrow canyons** cut in a submarine wall off north Grand Cayman (**following pages**) juvenile tarpon find shelter from predators as well as fishing lures. But the fighting game fish, which can reach 200 pounds in open sea, tolerate divers in the spot known as Tarpon Alley. "This is one of the most magical sights in diving," says the photographer. "There's hardly another like it in the world."*

*OUR SWIM FROM SHORE* had taken less than five minutes, but now my wife, Wendy, and I were in 50 feet of water, surrounded by animals desperately enamored of our guide, big, burly, amiable Wayne Hasson—or, at least, of the stash of ballyhoos (small, silvery, needle-nosed baitfish) he had secreted in his vest pocket. Swarms of ravenous sergeants major and schools of silvery southern sennets, frenetic yellowtail jacks, Nassau groupers. Enormous black groupers brazenly shoved me and allowed Wendy to hold them, one under each of her arms.

We settled down beside the reef, and Wayne placated the milling throng with bits of ballyhoo. And then, from their lairs deep within the reef, like performers emerging languidly from their dressing rooms, came the stars of Wayne's circus: two of the biggest green moray eels I have ever seen—Waldo, seven feet long, and his blushing bride Waldeen (anthropomorphism, I decided, is forgivable at times like this), who measured six feet.

The eels nudged Wayne, coiled around my legs, nibbled tentatively at Wendy's fingertips, never biting, never threatening, never aggressive or afraid. Wayne opened his vest pocket and handed a ballyhoo to each of us, and the eels plucked them from our fingers with surgical delicacy.

We fed the eels until they would accept no more. Then, with sinuous grace, they ambled off to their cleaning station amid the coral, where infinitesimal silvery gobies cruised over their pulsing bodies and removed parasites from their skin.

Back ashore that evening Wendy and I sat on the patio on Grand Cayman, watching the sun squash down into an orange oval, a picture-postcard Caribbean sunset. Behind us a band played calypso music, and men and women in striped slacks and pretty dresses cavorted across the floor. In the distance a small plane wheeled against the western sky—the mosquito plane on its evening patrol to subdue the island's only pests. Overhead, a Boeing 727 flew toward the Grand Cayman airport, bringing tourists—or perhaps some of the legion of wizards attracted to this unlikely world-class financial center.

"I wonder what Columbus would say," mused Wendy, gesturing vaguely at the band, the dancers, and the planes.

"He wouldn't believe a word of it," I said. But then, we wouldn't have believed it either, when we first came to the Cayman Islands 18 years ago.

As two of a mere 10,000 hardy tourists to visit these three mountaintop islands sandwiched between Cuba and Jamaica in 1967, we watched sunsets from the shelter of a screened porch. If we ventured out in the morning or the evening, we didn't swat mosquitoes; we wiped them off, for they attacked in squadrons so thick that they smothered cattle in the fields and caused poultry to pine away and die.

Then we rented one of a handful of tiny houses on Seven Mile Beach, a band of white sand that makes up the western side of the main island, Grand Cayman (map, pages 812-13). Waterfront land, useless for planting crops or grazing cattle, could then be had for $50 a running foot.

For diversion we wandered through the dusty little capital village, George Town, or went scuba diving with a young man named Bob Soto.

*NOW*, thanks to a combination of foresight, hard work, and common sense, the congenial Caymanians have transformed their country from a backwater colony of Great Britain into a thriving tourist resort, diving mecca, banking center, and tax haven.

Office buildings sprout like tropical weeds in George Town. Twelve-foot dish antennas, aimed to pluck TV signals from orbiting satellites, are as common in backyards as poinciana trees. The downtown Burger King franchise serves some 25,000 customers a month. Seven Mile Beach is packed with hotels and condominiums, and what little beachfront land

*"**Waldo's like a big dog**—he's fun-loving and loves to be scratched," says professional diver Anne Davis of this green moray eel, warmed to human companionship by daily feeding and handling at a reef near George Town.*

remains now costs $10,000 a running foot.

The three islands—Grand Cayman, Cayman Brac, and Little Cayman—together contain only about a hundred square miles of land, and the total population (all but 10 percent of whom live on Grand Cayman) is only 19,000. Yet the islands are home to 460 banks, 465 insurance companies, and more than 17,700 other companies and corporations. As one of the world's most desirable tax havens, the Cayman Islands process 350 million dollars every day—very little of which ever actually enters the colony.

More than 203,500 cruise-ship passengers visited the islands in 1984, and 148,500 other visitors came for longer stays. Many of them arrived on Cayman Airways, this colony being one of the smallest political units on the planet to own an international jet airline. There is virtually full employment, very little poverty, no visible social unrest, and almost no sentiment for independence from Great Britain.

And crime? There were no murders in 1984. Crimes against property—mostly burglary and theft—accounted for nearly half of all reported offenses. Manslaughter, attempted murder, rape, and grievous bodily harm totaled only 13 cases.

Was there any theory as to why there is so little serious crime in the islands? Michael Rowling, Q.P.M. (Queen's Police Medal), the islands' police commissioner, believes that the small-town atmosphere is the major deterrent: Detection and harsh penalties are a strong likelihood.

But many people believe it goes beyond that. They feel they share a spirit of true community—that the islands are populated by kind, good people.

THESE good, kind people have come to the Cayman Islands from all over the globe, from England, Scotland, Ireland, Bermuda, the Americas, Africa, India, and Europe. They are the descendants of buccaneers, pirates, sailors, slaves, and Maroons, who scratched and fished a living from the barren soil and the bountiful sea as farmers, fishermen, seafarers, and boatbuilders. They have names like Ebanks (six columns in the telephone directory), Bodden, Kirkconnell, and Jackson. All are long-rooted and proud Caymanians.

***Fought by land and air,** Grand Cayman's winning battle against mosquitoes has paved the way for economic development. Mangrove swamps covering two-thirds of the island once bred swarms so thick that people stayed indoors at night, and cattle died as insects clogged their windpipes. Today the Mosquito Research and Control Unit claims a nearly 100 percent control rate by spraying at dawn and dusk (**above**), when mosquitoes swarm, and by using canals to speed transfer of water through the swamps. Here researcher Mark Latham (**far right**) monitors conditions and counts bites (**right**) to help decide areas to be sprayed. Mastermind of the program, Dr. Marco Giglioli was given a state funeral as a national hero in 1984.*

In 1503 Christopher Columbus sailed past two of the islands. Christened Las Tortugas for turtles spied on their shores, they were known as Las Caymanas—the Caymans, possibly after iguanas mistaken for crocodilians of that name—when permanent settlers arrived two centuries later.

Despite Columbus's role in their past, many locals insist that it was Bob Soto who really discovered the islands. Thirty years ago Bob began, developed, nurtured—invented, in fact—the Cayman Islands' scuba-diving industry and thus gave the islands a focus that would attract visitors from around the world. His was the first diving operation in the Caribbean, and under new ownership it remains the largest, most diversified, and arguably one of the best not only in the Caribbean but in the world.

Leathery and weathered, with hands that could drive spikes, Bob is courtly, soft-spoken, and devoid of braggadocio. Sitting at a table with Wendy and me and his wife, Suzy, Bob pointed into the dark distance. "When they were building some new condominiums way over there," he told us, "they came upon a big stone slab in the ground. Lying on the slab were some skeletons. One had a cutlass at its side, one had a knife buried in its ribs, one had a musket-ball hole in its forehead. I asked 'em what they found under the slab. Nothing, they said, 'cause they hadn't picked it up to look. Too much trouble. They just built the condos on top of it." Bob grinned. "Suzy wants me to get a jackhammer and start to work on the floor of the condos."

Like many islanders, Bob served in the British military in World War II and then went to sea. Generations of Caymanians have gone to sea for other nations, the only way they could earn a living.

In the mid-1950s Bob returned home and started to dive. He converted a couple of old oxygen bottles, even a couple of fire extinguishers, into scuba tanks.

Quickly word about the wonders of the Cayman underwater spread throughout the small, close-knit scuba-diving fraternity: miles of virgin reefs, spectacular coral canyons, abundant wildlife unaccustomed to, and thus unafraid of, human beings, and, rarest of all, sheer coral walls descending thousands of feet into an abyss within several hundred yards of the shore.

And no sharks, apparently. I mentioned to Bob that in the dozens of dives I had made all around the islands at all seasons of the year, I had never seen a shark.

"They used to be here," he said, "thick as flies, when there was food for them. But there's been no conservation of fish or of conch or lobsters, no real effort. As the food supply dwindled, so did the sharks. I'm worried that the government won't get up and do something till it's too late. I recommended no more lobster fishing for five years, no more conch fishing for four years. But they put stupid limits on them instead—15 lobsters per boat, 20 conch per boat. Well, one morning they're going to wake up and there'll be *no* lobsters, *no* conch, *no* fish."

In recognition of this threat, the government is introducing new regulations to create marine parks, and the diving community is lobbying hard for them—none harder than Ron Kipp, the genial, curly-haired, former IBM branch manager to whom Bob Soto sold his diving operation in 1980.

At the moment, Ron's six boats and staff

***A tropical backwater** 20 years ago, the Cayman Islands now enjoy a standard of living among the highest in the Caribbean. Wooing investors as well as tourists, the tiny colony has become a leading offshore banking center, daily processing 350 million dollars—confidentially and without tax. Residents pay virtually no direct taxes, but import duties make living costly since 95 percent of their food and goods must be imported.*

*Twenty-two miles long and at most eight wide, Grand Cayman is home to 90 percent of the colony's 19,000 people. Most live around George Town and on the island's northwestern tip (**above**). Some 75 miles east, Little Cayman and Cayman Brac increasingly draw tourists for game fishing, diving, and solitude.*

*Ceded by Spain to Great Britain in 1670, the islands were administered jointly with Jamaica until 1962, when that country gained independence and Caymanians chose to keep colony status. Centuries of intermarriage have made them a model of racial harmony. A resident explains, "Twenty percent are black, 20 percent are white, and 60 percent aren't quite sure—and don't much care."*

of 28 handle roughly 15,000 divers a year, about a third of the annual total who visit the Cayman Islands.

"I think that only three things can stop this place," Ron said. "A really bad hurricane, if Fidel Castro closes the air corridor over Cuba—increasing the airfare from Florida—or the unlikely event of a really stupid act of terrorism.

"In fact," he added cheerfully, "if I had to predict, I'd guess that in eight or ten years the Cayman Islands will be receiving about half a million visitors a year."

*SOME* government officials believe, however, that Ron's rosy forecast fails to take into account the islands' scanty population.

"We have 2,000 rooms here," said Eric Bergstrom, the American-born Caymanian who serves as the islands' director of tourism, "and to accommodate more people we would need many, many more rooms. The accepted ratio is one service person for each new room. Right now we're three islands of 19,000 people with full employment. We can't grow like that."

I suggested that labor could be imported, but Eric shook his head. The prosperity of the Cayman Islands is a magnet now for the poor, unskilled, and illiterate from Jamaica, and illegal immigrants are already burdening the economy—burdening the school and medical systems and bringing with them drugs that they sell to keep themselves in food and lodging.

"It's the old question we deal with every day," Eric had said. "How much development is enough, and what's it going to do to traditional values? We've had a tenfold

***Seals of approval*** *bear the names of some of the 18,000 companies attracted by the absence of tax laws to register in the Cayman Islands. They emboss transactions handled for these largely absentee firms by the colony's 460 banks. Captains of finance (**below,** from right): corporate lawyer William Walker; Vassel Johnson, former government financial secretary and now head of development and natural resources; banker John Collins; and insurance executive Donald Westmoreland.*

**With a dash of British style,** *Cayman Islands Governor Peter Lloyd travels by Princess Daimler to his George Town office in the "Glass House," the capital's main executive building. Appointed by the Queen, Lloyd presides over the 15-member Legislative Assembly* **(below)** *as it directs most of the country's internal affairs. The assembly's representatives belong to no political parties.*

increase in the number of visitors over the past few years. When do we stop?

"There's a rule of thumb that I believe in: When your ratio of visitors to locals has risen above eight to one in a small island society, you're heading for trouble. There are several examples elsewhere in the Caribbean of social upheaval and violence when the ratio rose too high. A great influx of foreigners subverts the local culture. The locals undergo a genuine culture shock. In the mind of the man in the street, outside influence is running his country and ruining his country. If we get up to the 200,000 level of overnight visitors, we'll see serious social problems."

After talking to Eric, I calculated that at 200,000 visitors, the ratio of foreigners to Caymanians would be above ten to one.

And yet the Cayman population is hardly fertile soil for the seeds of revolution. Caymanians are God-fearing (there are 60 churches, one for every 322 people), hard-working, relatively affluent, conservative, and so racially intermixed that bigotry is as rare as snowfall.

"*THINGS GOOD* today, yah!" said a man who ought to know. Tollie McLaughlin, born in 1903, sat in the kitchen of his tidy white limestone house in the tidy town of East End. Wendy and I had driven out from West Bay, through the town of Hell, then south around Pull-and-be-Damned Point, past Bodden Town, Breaker Point, Frank Sound. Each community was a gathering of clean pastel houses, some with picket fences, some with satellite dish antennas.

Tollie sat on an upturned crate and toyed with palm fibers with which he would repair his "wampers," sandals fashioned from old truck tires and secured to his feet with thatch cord.

His wife puttered around in the background. "He be from Irish people," she said of Tollie, whose skin was so dark that he might have been of direct African ancestry. "I from Scotch people. But they were all pirates back then, and when they couldn't go home, they settled here."

In his fourscore years Tollie has done everything a Caymanian can do to earn a living. Until 39 years ago he went to sea. "Then," he said, "I took to burnin' rock, limestone rock, to get the lime to wash [whitewash] the house. You get the grape-tree wood and build a hot fire—a *hot* fire—and melt the rock, and in the end there's a white dust, and that's lime, and you use it to wash the house."

When lime went out, Tollie "took to makin' thatch rope, from the thatch tree [the silver thatch palm, whose fibers are resistant to salt water]. But that died out too, so now I catch jacks."

"Things was plenty worse back then," he said, not lamenting the passing of his several livelihoods, "and '32, she was worst of all." In 1932 the last major hurricane struck the islands. Remembering, Tollie nodded. "All was sea, all. Waves crested on the road and broke on the house, hundreds of coconut palms goin' down the road."

Tollie shook his head and smiled. "Yah. Times is good now. Good."

*BUT* during the late 1950s the islands were on a slide into the marsh of idleness and neglect. The traditional Cayman livelihoods—seafaring, making thatch rope, turtling—were in decline. Tourism was a feeble trickle, and Bob Soto had barely begun to plumb the depths of the sea.

"We took a look at our resources," says Thomas Jefferson, financial secretary of the colony, "thinking, 'How can we build Cayman? What do we have?' The conclusion was, we have no basic resources."

What the islands did have, however, were location, climate, political stability, and intelligent people—four ingredients that combined to make possible the creation of today's international tax haven.

I asked Mr. Jefferson to define the ideal tax haven. "It is a country that has no tax legislation or tax treaties on its books," he said, "but has all the services—legal, accounting, communication, transportation—to handle international financial affairs." And, he might have added, secrecy laws that ensure a depositor that all his transactions—wherever he or they may come from—will be private.

The secrecy laws have been an irritant in relations between the Cayman Islands and the United States government, which

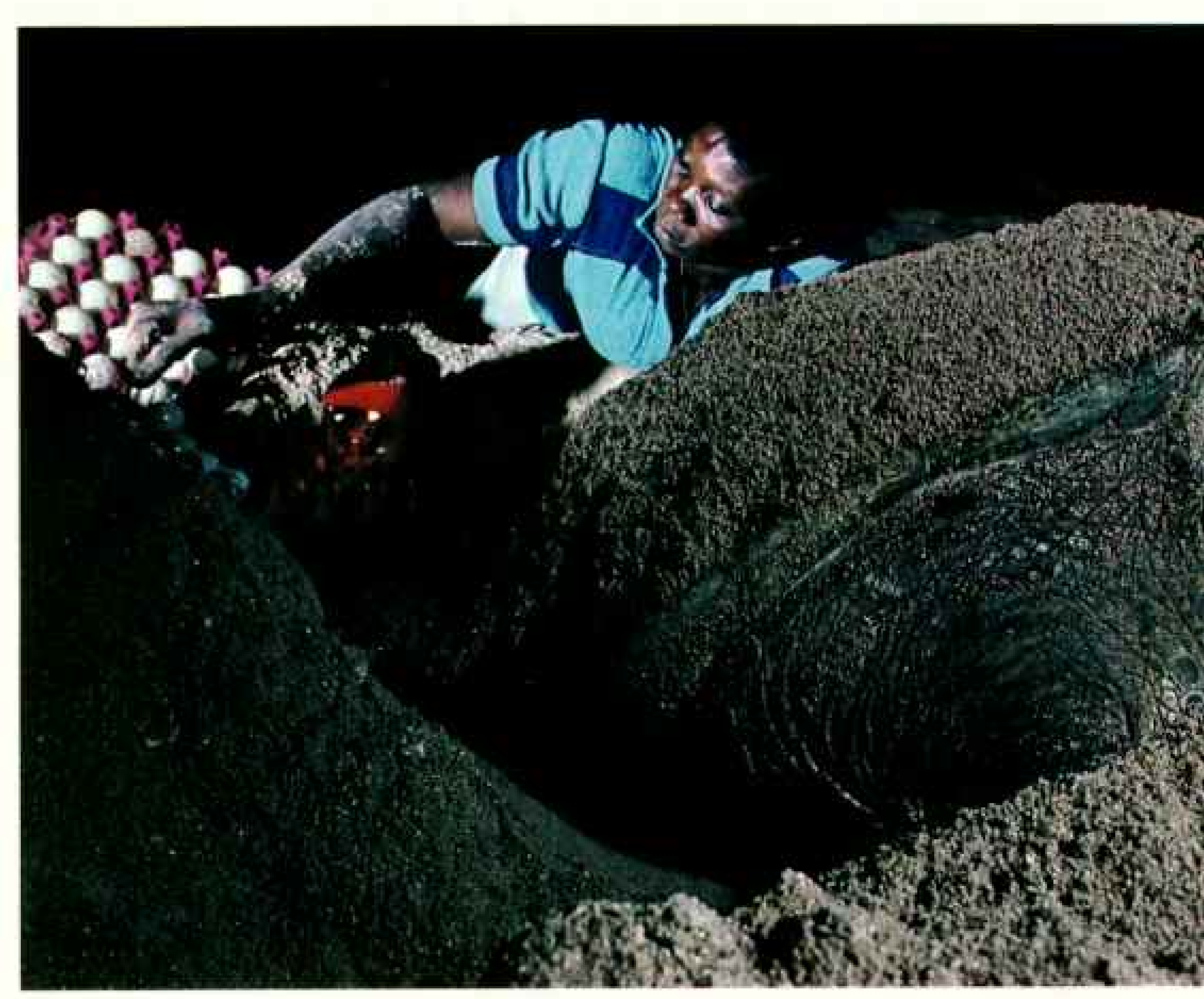
believes that the islands are a sanctuary for tax evasion and other shady dealings. "The secrecy laws provide an opportunity for laundering money," I was told by Jay Dehmlow, then a Caribbean expert in the State Department's Office of Regional Economic Policy. "Illegitimate money, from illegal enterprises."

The Cayman Islands now cooperate with U. S. investigations involving narcotics but maintain secrecy in other cases.

Regarding U. S. irritation, Mr. Jefferson protested that "in the U. S. the tax-haven issue is grossly distorted. There is nothing devious about it. For example, if the U. S. wants access to an individual's account here, all they have to do is produce proof of a crime that is an offense under the laws of the Cayman Islands. Has he committed fraud? Fine. Prove it, and you have access. But if a man is just avoiding U. S. taxes, that's not a concern of ours. After all, tax avoidance is a respected activity. It makes many a lawyer rich." He smiled wryly. "It is very important to distinguish avoidance from evasion. It is a very thin line."

Another Cayman government official who is exercised about U. S. efforts to crack the islands' secrecy laws is Jim Bodden, former head of tourism, aviation, and trade. Mr. Jim—his nickname is an honorific and a way of distinguishing him from the other Boddens in the government—is a tough, white-haired ex-seaman who has become one of the colony's leading real estate developers. Mr. Jim said he keeps telling the Americans, "Don't use us to try to catch a man after he's gotten away with a crime. You catch him up there."

*BEFORE IT WAS POSSIBLE* for them to become an international tax haven, the Cayman Islands had to provide a haven from those



voracious mosquitoes. And on the outskirts of George Town, in an unprepossessing gray building, is the government office that is truly responsible for the country's astonishing progress—the Mosquito Research and Control Unit.

An earnest young Briton named Fred Burton took me on a tour of the laboratory. "We got our first plane in 1971," he told me. "Before then it was hard to convince people to come here—bankers or tourists—if they knew they had to carry smudge pots with them wherever they went." He stopped at a colored map showing that fully two-thirds of Grand Cayman consists of mangrove swamps. "Now," he said, "we try to contain the mosquitoes in the swamps, so we spray around the perimeters and throughout populated areas."

I wondered why they didn't try to eradicate the mosquitoes altogether. "The fear is," he explained, "that before we killed them all, some would become resistant to the spray. At the moment, things are fine. We maintain better than 96 percent control. But who knows? In 1973 the mosquitoes suddenly became resistant to malathion, and the next year was awful.

"Look. 1974. One trap. One night: 793,103 mosquitoes." He pointed to a series of black dots indicating the locations of nearly 30 traps placed around the island to pinpoint trouble spots. "For comparison, nowadays a night of as many as 50 mosquitoes in a trap is rare."

Spraying is conducted at specific times because, as Fred explained, "the black saltmarsh mosquito, which causes most of our problems, swarms only twice a day, at about 15 minutes after sunset and again just before dawn. We have to get them while they're flying. Non-target insects, like bees, aren't flying then, so they're unaffected."

I asked whether there was any worry

**Rescue mission or exploitation?** *First and only breeder of the endangered green sea turtle, the Cayman Turtle Farm has stirred controversy since its founding in 1968. Eggs gathered as they are laid on an artificial beach* **(left)** *incubate for 60 days before hatching* **(above)**. *Of the farm's 18,000 turtles, 2,000 were released to the wild this past year and 800 killed for meat, now only eaten locally. Hit financially after the U. S. banned import of all turtle products in 1978, the farm lobbies for exemption of its output.*

***Gardening with broom strokes,*** *Ada Henning daily tidies the Grand Cayman home built by her family in West Bay in 1913. Her island roots date from the early 1800s, when her great-great-grandfather, a Scottish missionary originally bound for Jamaica, survived a shipwreck on these shores. Capt. Callan Ritch of Cayman*

about environmental effects of Dibrom, an insecticide in current use, and Fred shook his head. "We use about half the amount recommended by the U.S. Environmental Protection Agency," he said, "and we don't seem to have a problem."

SO FAR, aerial spraying is carried out only on Grand Cayman. The other islands must rely for protection on localized spraying from the backs of pickup trucks. I had heard murmurs that some outislanders felt resentment toward the powers on Grand Cayman. The residents of Cayman Brac, for example, fewer than 2,000 in number, reportedly refer to themselves as the Republic of the Brac—and I wondered whether mosquito control, or the lack of it, might be a factor.

Denise McDermott, a former Miss Cayman Brac, met me at the airport and offered to show me the island. She and her husband, Winston, ran diving operations for the three hotels on the island. As we drove along, Denise admitted that Brackers can indeed be fiercely independent.

"Sometimes we do feel like outcasts," she said. "When Brackers wanted a hospital, they darn well raised all the money and built it themselves. Here's another example: Over there [in Grand Cayman], they say the last bad hurricane was in 1932, right? Well, in 1980 we got a bad one here."

At the small Cayman Brac Museum, Will

*Brac (**above**), who shipped out at age 14 aboard his father's merchant schooner, spent his working years at sea, as did most Caymanian men until recent times. Proud to be a naturalized U. S. citizen, he returned to his birthplace 12 years ago "because I'm proud to be a Bracker, too. We're an independent race out here."*

Ryan, the young caretaker-curator, showed us old farming and boatbuilding tools, old radios, a not-so-old alarm clock, and a bear trap—bought from Montgomery Ward in 1927 by a Mr. Tibbetts.

"Bear?" I asked. "On Cayman Brac?"

"No," Will laughed. "Mr. Tibbetts used it as a mantrap inside the front gate of his plantation. If his neighbor come to steal something, he reach his hand inside to open the gate, and the trap get him."

Denise's aunt, Gwendolyn Bodden, pointed out that the museum was on the site of the old post office. "Hurricane blow down the post office. When? Let's see." Mrs. Bodden calculated. "Year after my toe was cut. I on a hillside watchin' a man chop wood, and I slip and tumble down the hill, and my foot go right under the ax, and *chop!* Well, they slap it back on and it grow back. Then the post office blow down. Yessir, lots of memories here, pirate times and all."

AS *INDEPENDENT* as the Brackers may feel from Grand Cayman, and as independent as all Caymanians may feel from anyone, the islanders seem unanimous in their attachment to Great Britain. Steadfastly they remain a loyal colony. Colonial status has its advantages. Four complex functions of government are handled by Great Britain: external affairs, defense, internal security, and police.

*The peace of Sunday pervades George Town when Caymanians, strongly church-minded, close their shops. Weekdays see invading throngs as cruise ships deliver as many as 3,000 passengers. Socially as well as fiscally conservative, the country enforces some of the toughest drug laws in the Caribbean, and newspaper editorials warn against the dangers of promiscuity.*

But there is genuine affection among Caymanians for Mother England, 4,500 miles away, to which they have been wed since 1670. During the Falkland Islands crisis, they contributed nearly one million dollars to the Mother Needs Your Help Fund—$49 for every man, woman, and child.

"There is no real move for independence," Jim Bodden told me. "Of course, there is some agitation for change. There always

is. But I don't see anything that will upset the applecart over the next 20 years."

I waited for him to knock wood, but he didn't. And, to be sure, although there are problems, they are few and thoroughly acknowledged: illegal immigration, recessions that interrupted a decade-long building boom, and a drug problem—albeit minor indeed when compared to other islands closer to mainland United States.

ONE of the most pressing long-term problems is the preservation of the islands' marine resources—its coral reefs and spectacularly abundant wildlife. After our dive with Wayne Hasson, I complimented him on the patience, gentleness, and understanding that has created his wonderful underwater petting zoo. Wayne grinned and said simply, "I hope it lasts."

"What do you mean?"

***Off the ground*** *for a catch, a visitor will land on the talcum-fine sands of Seven Mile Beach, Grand Cayman's most expensive real estate frontage. But even on this developed strip, a five-story building limit ensures a quiet profile suitable to islands that value serenity.*

"One of those big black groupers has a new spear hole in him. Almost every day I have run-ins with the spear fishermen. I ask them to move, try to explain that these fish are tame, that people pay to come and feed them. They say to me, 'You keep feedin' 'em, we'll keep killin' 'em.' What they don't understand is that those fish aren't just a meal. They're jobs. If we wipe them out, a whole industry will collapse."

IT WAS on another dive on another day that I thought of a possible reason why the alarms of the conservationists fall on many deaf ears. I dove with Harry Ward, the dive operations manager of Spanish Cove, one of the finest of the pure diving resorts in the colony. We went far from George Town, far from all human traffic, almost to Rum Point on the north side of Grand Cayman.

We descended in 80 feet of water clear as gin to coral canyons that looked like a prehistoric city on the edge of the abyssal wall. In one canyon were scores—hundreds—of huge tarpon swimming lazily in loose formation, their silver sides glinting in the dim sunlight from above. We swam easily among them, and the formation parted like a silver curtain and closed again behind us.

To the tarpon we were neither predators nor prey. Human beings were accepted members of their environment—clumsy perhaps, noisy certainly—deserving of neither fear nor aggression.

Beyond the tarpon, on a broad sand plain, big stingrays took off and flew and landed and took off again, like fighter planes practicing touch-and-go drills. Jacks followed us curiously, and the ubiquitous sergeants major hovered around in hungry hope.

I thought then, surrounded by so many wild creatures, how difficult it must be to convince a populace that the specter of scarcity looms just around the corner, how hard to make credible a warning of extinction amid such manifest plenty. How do you tell people who have known nothing but abundance from the sea that shortages can become a reality?

Tollie McLaughlin's words rang in my ears: "Yah, times is good now. Good."

And all I could do was hope that good times would remain. □

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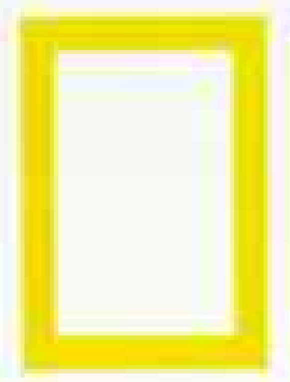

# Geographic ignorance: time for a turnaround

HONOR OR EMBARRASSMENT? There was some of both recently when I accepted an award from Kappa Delta Pi—an honor society for professionals in education—given by the chapter at Columbia University. The award recognized the National Geographic Society as "Educator of the Year," citing our role as "a vital force in the continuous education of mankind."

My pride in that award was dealt a blow a few weeks before the presentation. Results of a questionnaire on geography given to 2,200 North Carolina college students were announced.

The informal quiz compared dramatically with one sponsored nationwide by the *New York Times* in 1950. That year only 46 percent of the college students tested could name all the Great Lakes. Last year, in North Carolina, the result was 12 percent. This is not to pick on North Carolina. The state showed considerable courage in releasing the study, and, in any case, recent tests elsewhere tallied the same sort of results.

Here are some other questions asked. In what country is the Amazon River mainly found? In 1950, 78 percent correctly named Brazil; in 1984, 27 percent did. In what country is the city of Manila located? In 1950, 84 percent knew it was the Philippines; in 1984, 27 percent. In 1984, how many could name three countries in Africa between the Sahara and South Africa? Out of 30 countries—*30!*—what percentage of students could name three? Eighty percent? Fifty percent? No, *seven* percent—and 69 percent *could not name even one*.

Overall, 95 percent of the students scored below a passing grade of 70. Three-fourths scored below 50 percent. No wonder that in his introduction to the results, Richard J. Kopec, chairman of geography at the University of North Carolina at Chapel Hill, made such comments as "amazingly uninformed . . . geographic ignorance . . . depressing statistics." And worst of all: "The dismal results met our expectations."

In fairness to the students, 71 percent said they had no geography courses in elementary school, nor had 65 percent in junior high, nor 73 percent in high school. Geography, once required in most schools, is now being covered—perhaps I should say buried—in social studies and history, assuming that it is being taught at all.

How this coming generation will make any sense of a world increasingly tied together by communications, transportation, trade, and international relations, I cannot imagine. Nor can North Carolinian Walter B. Beeker, Jr., who wrote me on the subject (see MEMBERS FORUM in this issue).

When I accepted our Society's award as "Educator of the Year," I said it would be better given for "Non-educator," considering the low state of geography in our schools. I reaffirmed my personal commitment, as well as the Society's, to help improve the education of our citizenry in geography.

Mine is not an idle promise. We are increasing our efforts in developing learning materials for schools, and we are exploring joint efforts with others in the private sector. You will hear more from me on the subject of geographic education, and I would like to hear more from you. I am angry; I am embarrassed; I am determined.

Gilbert M. Grosvenor

PRESIDENT, NATIONAL GEOGRAPHIC SOCIETY

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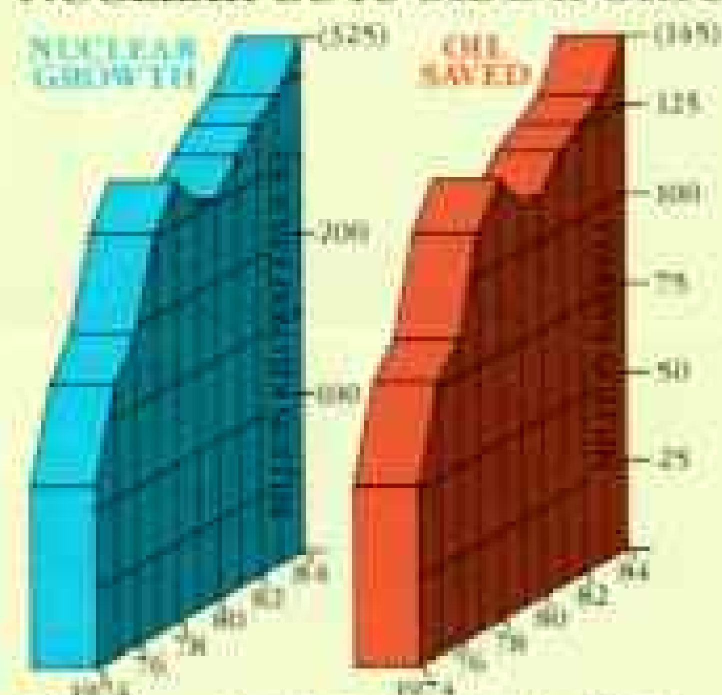


*Nuclear electricity has helped U.S. utilities cut their oil consumption. This has taken some of the pressure off foreign oil demand.*
*Source: Science Concepts Inc.*

Some of the new plants, however, will generate more expensive electricity because they cost a lot more to build. Regulatory changes and delays along with high-interest rates have swollen construction costs, and are making it impossible for utilities to plan for the future.

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BY JEANNE HOLGATE

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

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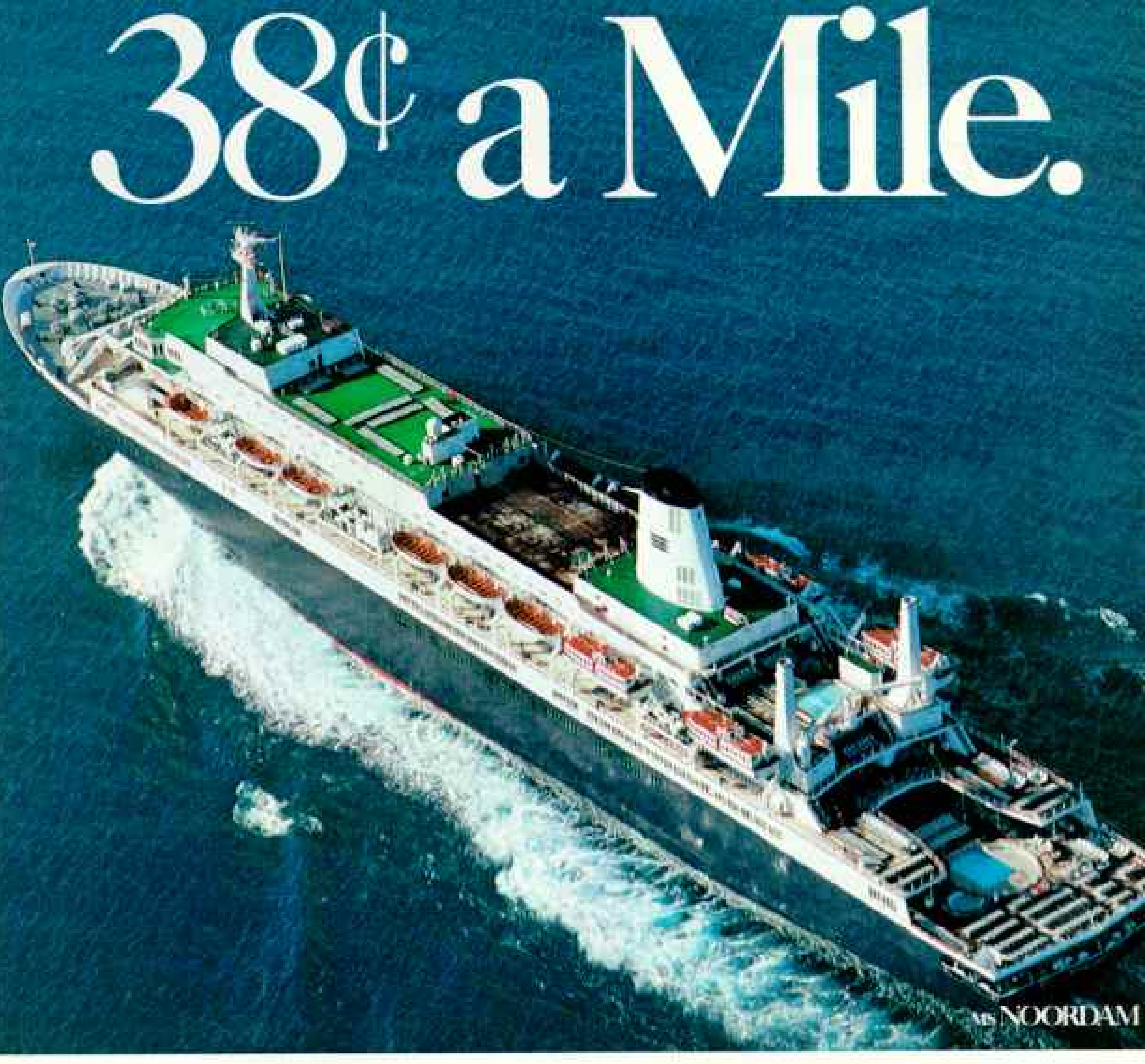


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## The Poppy

I am in charge of the drug program in Orange County, California, and really appreciated the article "The Poppy" in the February 1985 issue. It was excellent.

William L. Edelman
Santa Ana, California

The piece on opium was engrossing but left me wondering whether female narcotics addiction is a problem—or indeed if it even exists—in the countries that grow and export opium. The photos show women growing poppies and processing and selling opium, but nowhere do we see them using, abusing, or being treated for addiction. The implied absence of female users raises fascinating sociological, economic, and cultural questions.

Karen Jescavage-Bernard
Selden, New York

*Author Peter White reports that opium and heroin addiction appears to be largely confined to males in poppy-producing countries, with some exceptions in urban slum populations.*

## Mummies

I was deeply touched by the article in the February 1985 GEOGRAPHIC, especially by the statement that the scientists found the child "too haunting to be probed and examined like some corpse in a medical laboratory." Even after 500 years there is something sacred about life, so early cut short.

Eunice Voortman
Escalon, California

As a geologist I can appreciate the significance of Hansen, Meldgaard, and Nordqvist's studies, but as a Native American I find the use of a photograph of a mummified corpse of somebody's ancestral kin to illustrate the cover of our magazine to be in the worst taste imaginable.

Frank-Ti Neff
Trinidad, California

As the father of six children (two died in infancy) and the proud grandfather of eleven others, I was repelled, at first glance, when I saw the February cover. My repulsion disappeared quickly as I devoured the authors' story. Their devotion to their work is nothing short of inspirational. I thank them all for sharing their discoveries with me.

John F. Lepine
Livonia, Michigan

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NATIONAL GEOGRAPHIC certainly is a family-oriented periodical. This was evidenced by your February 1985 issue containing two excellent articles—one on "Mummies" and another on "Poppies." Can hardly wait to read about the rest of the family.

Harry Martinbianco
Burton, Michigan

## Mongolia

Thomas B. Allen's fascinating article (February 1985) seems unclear regarding the condition of Buddhism. The lamas pictured on page 256 are described as "guardians of a dwindling faith," yet in the same caption it is said that only one in five applicants to the monastery is accepted. Moreover, later in the article we are told that Buddhist images are frequently encountered in people's homes. These facts suggest that there is still significant interest in Buddhism among the Mongolian people.

Peter H. Howe
London, England

*This is the only monastery allowed to remain open. The government reports that, while Buddhism is still practiced by the elderly, most of the younger generation profess atheism. Matters of faith often defy government statisticians.*

## Balloon Solo

While reading of the transatlantic balloon flight

by Joe Kittinger (February 1985), my thoughts went back to the early '40s, when he was a student in a private school where I was on the staff. One sunny spring Saturday afternoon Joe came to me and said he was bored. At my suggestion he planted some Australian pines near the dormitories. After he finished, I remarked that the trees would grow very tall. The skinny, red-haired youngster countered by saying that they would never grow as high as he planned to fly. Truly he has done just that.

H. V. Bullock
Berea, Kentucky

Your footnote on Joe Kittinger states that he holds the world's high-altitude parachute-jump record. I believe his record was broken in 1966 by Nick Piantanida, who parachuted from a balloon at an altitude of 123,500 feet.

Lee Van Camp
Irving, Texas

*Piantanida did not jump from his balloon. He descended in his gondola, free-falling to 97,000 feet before its parachute opened. Kittinger jumped with a backpack parachute from 102,800 feet.*

## Maine

I've always appreciated the NATIONAL GEOGRAPHIC's clear expository prose. As a teacher of writing and a champion of stylish

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writing, I'd like to compliment author David Jeffery on his masterful use of the extended analogy ("If you look at it as theater . . .") as a method of developing "Maine's Working Coast" (February 1985). Who says exposition has to be dull?

Suzanne C. Cole
Houston, Texas

### Northern Approaches Map

There is a rather misleading dash of purple on one of the insets entitled "1950-Present: The Cultural Imprint" (February 1985). The purple is supposed to indicate a French-speaking area and has been placed over Labrador City, on both sides of the Labrador-Quebec border. It is true that there are about 3,000 French speakers in Fermont on the Quebec side, and that there are a few French speakers in Labrador City. However, of a total area population of roughly 18,000 people in the towns of Fermont, Labrador City, and Wabush, the percentage of French speakers is probably 17 to 20 percent at the most.

David A. Renwick
Pamplin, Virginia

*This predominantly English-speaking area will be shown on future reprints of this map.*

### President's Page

President Grosvenor's announcement of the Society's role in supporting advanced study in geography (February 1985) is heartening. I presented a slide show to junior-high students on our national parks. I mentioned that there were five parks in Utah. A student asked, "What state is Utah in?" It took only a moment to clear it up by explaining that Utah has statehood like Alabama, and it is where Donny and Marie Osmond live. The lack of emphasis in studying this land we live in is bringing us a generation of kids who have not the foggiest idea where they live or the identity of another state in our own country.

Arthur F. Irwin
Montgomery, Alabama

As one who finds geography essential to understanding economics, science, and foreign affairs, the North Carolina geography test results concern me [*See this month's President's Page*]. Geography was basic to my undergraduate study in comparative politics and foreign affairs. I often see political and economic issues discussed, particularly in an election year, without basic understanding of the people, places, resources, and institutions of a given society. I ask National Geographic to undertake a larger role in teaching geography. There is opportunity to focus attention on the issue, push for curriculum changes where needed. North Carolina has become aware of the problem, but has the country?

Walter B. Beeker, Jr.
Lexington, North Carolina

### Tigers

Congratulations on "Lord of the Indian Jungle" (December 1984). My attention was caught by the words, "she [Kulu] walks over to Snarl, who purrs in pleasure and friendship." Do tigers purr? I read in another publication that, whereas the small cats purr but do not roar, the big cats roar but do not purr.

Richard L. C. Hunting
Nova Friburgo, Brazil

*Tigers and some other big cats do indeed purr, but they must stop to catch their breath. Small cats can purr for extended periods, but cannot roar.*

I have just returned from a trip to Bangladesh, where I spent some time in the dense mangrove-swamp forest in the extreme southwest of the country, among the last footholds of the royal Bengal tiger. I'm thrilled to read that in Kanha the tigers are coming back from extinction, but unfortunately I fear desperately for the great tigers of Bengal. The government has proclaimed the area a national wildlife reserve, but the tigers' numbers have dwindled to 400. Even more alarming and depressing is to witness, as I did only three weeks ago in Dhaka, a rich Arab purchasing the skin of a freshly killed tiger!

Gregory Wait
Cazals, France

### Index

This past spring I had a stroke. I did not have any motor damage, but it left my memory in bad shape. While I was in the hospital, the new *National Geographic Index* came. When I got home, I could not read, and my math skills were gone too. I felt lost. My wife showed me the new book, but I just wanted to send it back. She said just take a look at it for a while.

After a few days I started to recognize some of the pictures and the stories that went with them from reading years ago. It was wonderful. I had found a new key to read again. Little by little, the picture and the caption under it started to make sense again. I would take a picture, then find the issue, and build on that until I could make the story out. It was a great adventure.

My short-time memory is still very poor, but many of my old friends from your pages are opening things for me again.

John Malarkey
Lansdowne, Pennsylvania

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# On Assignment

"CAT RED. Gorilla me Koko." That is what Koko—a 230-pound gorilla versed in American Sign Language—signed when Dr. Francine "Penny" Patterson (***below***) showed her pictures of kittens drawn by California schoolchildren. They were previews of Koko's new kitten, a red mackerel-tabby Manx donated by breeder John Markley to replace Koko's first pet, tailless All Ball, killed by a car at Christmastime.

An unlikely couple, Koko and All Ball had stolen hearts by the millions when they were introduced in our January 1985 issue. When All Ball's death was widely reported in the news media, millions shared Koko's loss.

But Koko twirled with happiness in late March when the new kitten arrived at the Gorilla Foundation in Woodside, California. Her stuffed-cat toy still underfoot, Koko entertained the kitten with a doll's bottle (***right***). Tickled by his tiny claws, she seemed greatly amused as he crawled on her stomach (***bottom right***). She often signs "baby" while cradling him.

ALL BY RONALD H. COHN

Photographed by Richard Malenky ***Pygmy Chimpanzee:*** ***Genus:*** *Pan* ***Species:*** *paniscus* ***Adult size:*** *Length, 115cm* ***Adult weight:*** *Males, 45kg; females, 33kg* ***Habitat:*** *Dense, humid rain forests south of the Zaire River, Central Zaire Basin* ***Surviving number:*** *Unknown*

Africa

Atlantic Ocean

ZAIRE

Pygmy Chimpanzee Habitat

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

First discovered in 1929, the pygmy chimpanzee is the smallest of the great apes and also the least known. Although it is only slightly smaller than the common chimpanzee, differences in appearance and behavior are evident between the species. These differences have evoked great interest in the evolutionary biology of these animals. Many scientists believe the pygmy chimpanzee is an untapped reservoir of information about evolution. But like all of the great apes, the pygmy chimpanzee is threatened with extinction in its native forest habitat.

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

Photography plays an important role in field studies by recording aspects of the pygmy chimpanzee's behavior such as feeding, social interaction and locomotion. Knowledge acquired through these observations contributes to a better understanding of this unique ape of the rain forest.

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

F-1

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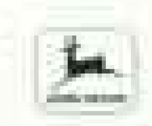

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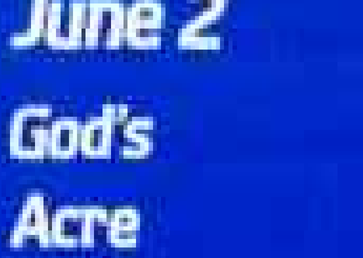
# Sundays on Nickelodeon Cable TV: National Geographic

*BELOW ARE ONLY A FEW HIGHLIGHTS; TURN PAGE FOR FULL PROGRAM LISTING*



## June 2

### God's Acre

Havens studded with tombstones, thousands of churchyards serve the crowded island of Britain as unofficial nature reserves. This film looks into one such sanctuary, a thousand-year-old parish in the heart of the New Forest in Hampshire. Here, amid giant yews and oaks, communities of small creatures—including the aptly named coffin fly and deathwatch beetle—are secure from disturbance. Bats and barn owls haunt the belfry, and wildflowers sprout in nooks and corners.

## June 9

### Stranded

Suicide or confusion? Each year, in one of the saddest mysteries in nature, large numbers of whales fling themselves on beaches to die. Beginning with a mass stranding on the coast of Oregon, the film explores various explanations for this warm-blooded mammal's most baffling behavior. Does shallow water create havoc with the whale's sonar system? Are weather and infirmity factors? Or, most intriguing, could this be the purposeful act of a keen but mysterious intelligence?

## June 16

### The Sky's the Limit

A balloon safari in East Africa and a tranquil flight over the castles and vineyards of France are two scenes from this National Geographic production celebrating the bicentennial of a lofty sport. At Annonay, France, townsfolk reenact the first hot-air balloon flight by the Montgolfier brothers here in 1783. Aeronauts from nine countries go to Paris for the Gordon Bennett Race—the last for U. S. record-breaker Maxie Anderson, who would crash and die in a West German forest.

## June 23

### Korup-An African Rain Forest

Worlds within worlds unfold in Korup—a remarkably rich rain forest on the coast of Cameroon. Travel from the twilight of the forest floor, where fearsome predators like the driver ant coexist with hardy survivors like the pygmy chameleon, through the airy middle world of the monkeys, and on to the realm of the crowned eagle in the canopy above. See also the ingenious defenses adopted by the plants of this misty world in order to survive hordes of hungry residents .

## June 30

### African Hunters

A safari in Zimbabwe explores a stunning paradox of African wildlife conservation: Animals are sacrificed to the big-game industry that provides important foreign revenue for the preservation of national parks and economic development. Safeguarded by strict quotas and rules, Africa's most prized species thus retain the habitat so vital to their survival. In the Zambezi Valley, join elephant hunters willing to spend $50,000 each in expenses and trophy fees.

*TEAR OUT AND SAVE THIS PAGE AS A HANDY GUIDE*

# Three hours every Sunday: Your June guide to EXPLORER

## Sunday, June 2

**5:00 ON ASSIGNMENT**
Join wildlife photographer Yann Arthus Bertrand on a photo safari through Kenya's magnificent Masai Mara Natural Reserve.

**5:15 OUR GOD IS A WOMAN**
On an island off the coast of West Africa, visit a culture where women are in complete control, and men are passive, charming, and seductive.

**6:00 SPECIAL FEATURE: GOD'S ACRE**
(See front of guide.)

**7:00 IRVING JOHNSON, HIGH-SEAS ADVENTURER**
A lifetime love affair with the sea has taken this sailor, filmmaker, and teacher many times around the world.

**7:45 ON ASSIGNMENT**
It's not a bird or a plane; it's a human-powered vehicle—a shell-enclosed bike whose pedaler may ride prone. In England, see whose design is flashiest and fastest.

## Sunday, June 9

**5:00 ON ASSIGNMENT**
A jubilee of irreverence, the festival of Las Fallas in Valencia, Spain, celebrates the working class with music, fireworks, and giant sculptures satirizing everything from local politicos to Hollywood stars.

**5:15 ARCTIC PARADISE**
A family of modern-day pioneers in the Yukon hews a living built on love of the land and self-sufficiency.

**6:00 SPECIAL FEATURE: STRANDED**
(See front of guide.)

**7:00 AMATEUR NATURALIST: THE OTHER NEW YORKERS**
Amid the glass and concrete of a great city, Gerald and Lee Durrell discover a complex ecosystem, including communities of feral dogs, rats, and migrant birds.

**7:45 ON ASSIGNMENT**
Emory Kristof and his high-tech crew probe mid-ocean depths off Bermuda, revealing bizarre life-forms.

## Sunday, June 16

**5:00 ON ASSIGNMENT**
For 17 years, Harold Bates traveled about Devonshire, England, in a methane-fueled car fitted with a special converter that earned the late inventor international attention.

**5:15 OVER ICE**
With hand picks, spiked boots, and safety ropes, a team of Frenchmen gives us a dramatic, unnarrated glimpse into the world of ice climbing.

**5:30 SPECIAL FEATURE: THE SKY'S THE LIMIT**
(See front of guide.)

**6:30 THE SHARKS**
A classic National Geographic Special, probing the secrets of an ancient and little-understood animal, includes a caged encounter with the great white shark.

**7:45 ON ASSIGNMENT**
Journey to the heart of Italy's marble country, where quarrymen risk their lives supplying artisans with the "holy stone" of Carrara.

## Sunday, June 23

**5:00 ON ASSIGNMENT**
A contagious disease threatens Australia's beloved koalas. Join scientists as they study them and seek a cure.

**5:15 THE SAMURAI FROM TWICKENHAM**
Master of the samurai's art, Michael Jay, a 35-year-old pilot from England, becomes the first foreigner to participate in Japan's ancient Soma Festival.

**6:00 SPECIAL FEATURE: KORUP – AN AFRICAN RAIN FOREST**
(See front of guide.)

**7:00 HERCULANEUM: VOICES OF THE PAST**
Entombed for 2,000 years in volcanic debris, a Roman coastal resort and the remains of 150 victims help scholars re-create a glorious past.

**7:45 ON ASSIGNMENT**
Visit Bucks County, Pennsylvania, where George Nakashima "releases the spirit of the tree" as he builds his unique furniture.

## Sunday, June 30

**5:00 ON ASSIGNMENT**
Along Panama's northeast coast the Cuna Indians protect their heritage while preserving 5,000 acres of pristine tropical rain forest.

**5:15 BEYOND THE WALL**
On the vast plains of China's Inner Mongolia, the descendants of the fierce Mongols, who once breached the Great Wall, hold fast to seminomadic traditions.

**5:45 SPECIAL FEATURE: AFRICAN HUNTERS**
(See front of guide.)

**7:00 BIRTH OF A SHIP**
Master of an endangered craft, French marine carpenter Yvon Clochet works with lumberjacks and sailmakers in the construction of a 19th-century vessel.

**7:45 ON ASSIGNMENT**
Travel to Patagonia in southern Argentina, where volunteers capture penguins for a study aimed at protecting these curious birds.

*Enjoy National Geographic EXPLORER every Sunday on the Nickelodeon cable TV channel. Air times may vary considerably between Eastern, Central, Rocky Mountain, and Pacific time zones. For program times in your area, consult your local cable listings or call your cable television operator. Each week EXPLORER offers an exciting three-hour selection of films from around the world. Themes range from adventure and exploration to natural history, high-technology, and anthropology. Discover the wonders of the world on National Geographic EXPLORER.*

# Five important things to know before you buy a home appliance.

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# How to avoid paying your bills.

*by Alan Greenspan*

*Alan Greenspan, Famous Economic Advisor*

"The other day, a prominent politician in the executive branch of our government phoned me up.

'Alan,' he said to me, 'the budget is a mess.'

'No joke,' I said.

'Not that budget,' the prominent politician continued. 'My budget. My checking's overdrawn. They're threatening to disconnect my phones. I even got into a shouting match with my wife when I tried to lay off the servants.'

'Civil?'

'Not very.'

At this point, we were disconnected. And although it was too late to teach proper money management to this prominent politician, there is a lesson all of us can learn from his misfortune: if you want to avoid paying your bills, let an Apple® II Personal Computer pay them for you.

And now, I'd like to turn the page over to those nice people at Apple, who will explain, in their own excruciating detail, just what I'm talking about."

## The Apple II and the Home Budget.

With programs like The Home Accountant™ and Dollars & Sense,™ the Apple II makes it easy to set up household books. First, it will ask you some questions about how much money you bring in each month, and how much you pay to credit card companies, mortgage holders, and any other surly characters. Then, it will ask you about some of your bills whose prices may vary: phone, utilities, and the like. Then, it will ask you for the numbers of your various checking and savings accounts.

*An Apple II will take care of everything from your household budget to your taxes with software programs like Dollars & Sense, The Home Accountant, and Tax Preparer.*

After that, an Apple II can automatically write checks for all your fixed expenses each month and tell you what other bills you can expect. It can

even help you plan to buy a new car. Or a home. Or an early retirement.

## How to avoid your banker.

After the Apple II writes your checks, it can call your bank with the help of your telephone and an Apple modem. You can find out all your balances, enter deposits, see what checks have cleared, transfer money from one account to another, and even pay off some of your credit cards and other bills electronically—without ever writing a check.

With your Scribe® color graphics printer you can automatically print out your own checks — not to mention reports, papers, almost anything. Except money.

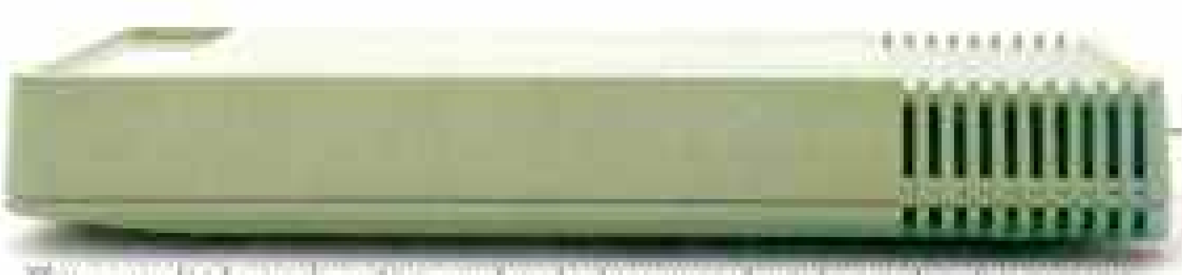
So you can have all your banking done faster than a teller can say, "Next window, please."

## The Apple II and making money.

An Apple II can do wondrous things for your personal finances. Several different programs let you become your own

It can manage your entire stock portfolio with programs like Dow Jones Investor's Workshop™ and Charles Schwab and Company's The Equalizer.™ It can even show you what's going on in your bank account.*

stockbroker. Again, by using an Apple modem, you'll gain instant access to financial news sources like *The Wall Street*



This is an Apple modem. Not much to look at, we admit. But it does let you pay bills and trade stocks by phone. It also connects your Apple II to a wealth of information services, like THE SOURCE™ and CompuServe.®

*Journal, Barrons*, and Dow Jones News/Retrieval.® And get up to the minute price quotes on over six thousand stocks, options, and other securities.

An Apple II lets you buy and sell securities right in your home or office, at the moment you want to make the trade. It automatically updates your portfolio and gives you detailed holding reports. It even produces charts and graphs, so you can see how you and your investments are doing.

## A little tax relief.

With programs like Forecast™ and Tax Preparer,™ an Apple II can calculate your taxes for you, store your records, and plan for the coming year. You'll be alerted to bills you've paid that may be tax-deductible. It will even print out completed tax forms that the I.R.S. will accept.

And it can do about 10,000 other things totally unrelated to taxes or this ad. So there's no telling how far an Apple II can take you.

"Well, I think that about covers it. And what if, after all of this, you still have some money left over?

Congratulations. You're doing a lot better than the government."

*A note to Dr. Greenspan's relatives: He says, "Don't get excited. This isn't my real bank account." © 1985 Apple Computer Inc. Apple and the Apple logo are registered trademarks of Apple Computer Inc. The Home Accountant is a trademark of Continental Software. Dollars & Sense and Forecast are trademarks of Monogram. Dow Jones News/Retrieval and Dow Jones Investor's Workshop are trademarks of Dow Jones and Company, Inc. Tax Preparer is a trademark of Howard Software Services. Scribe is a registered trademark licensed to Apple Computer Inc. THE SOURCE is a service mark of Source Telecomputing Corporation, a subsidiary of the Reader's Digest Association, Inc. CompuServe is a trademark of CompuServe Corporation, an H&R Block Company. The Equalizer and Equalizer are trademarks of Charles Schwab & Company, Inc. Spectrum is a registered service mark of the Chase Manhattan Corporation. For an authorized Apple dealer near you call **(800) 538-9696.** In Canada, call **(800) 268-7796** or **(800) 268-7637.**