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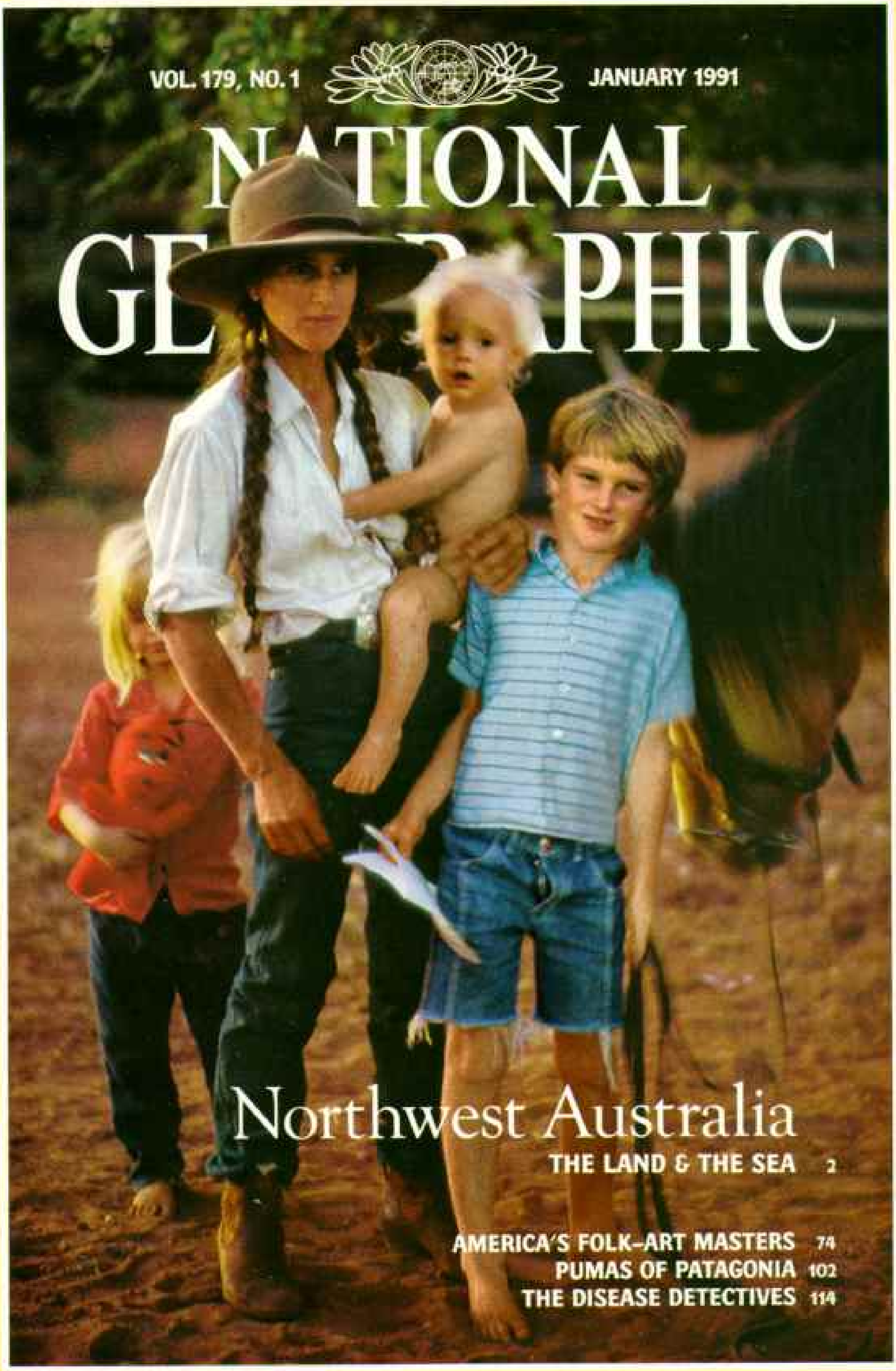

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NATIONAL GEOGRAPHIC

JANUARY 1991

NORTHWEST AUSTRALIA

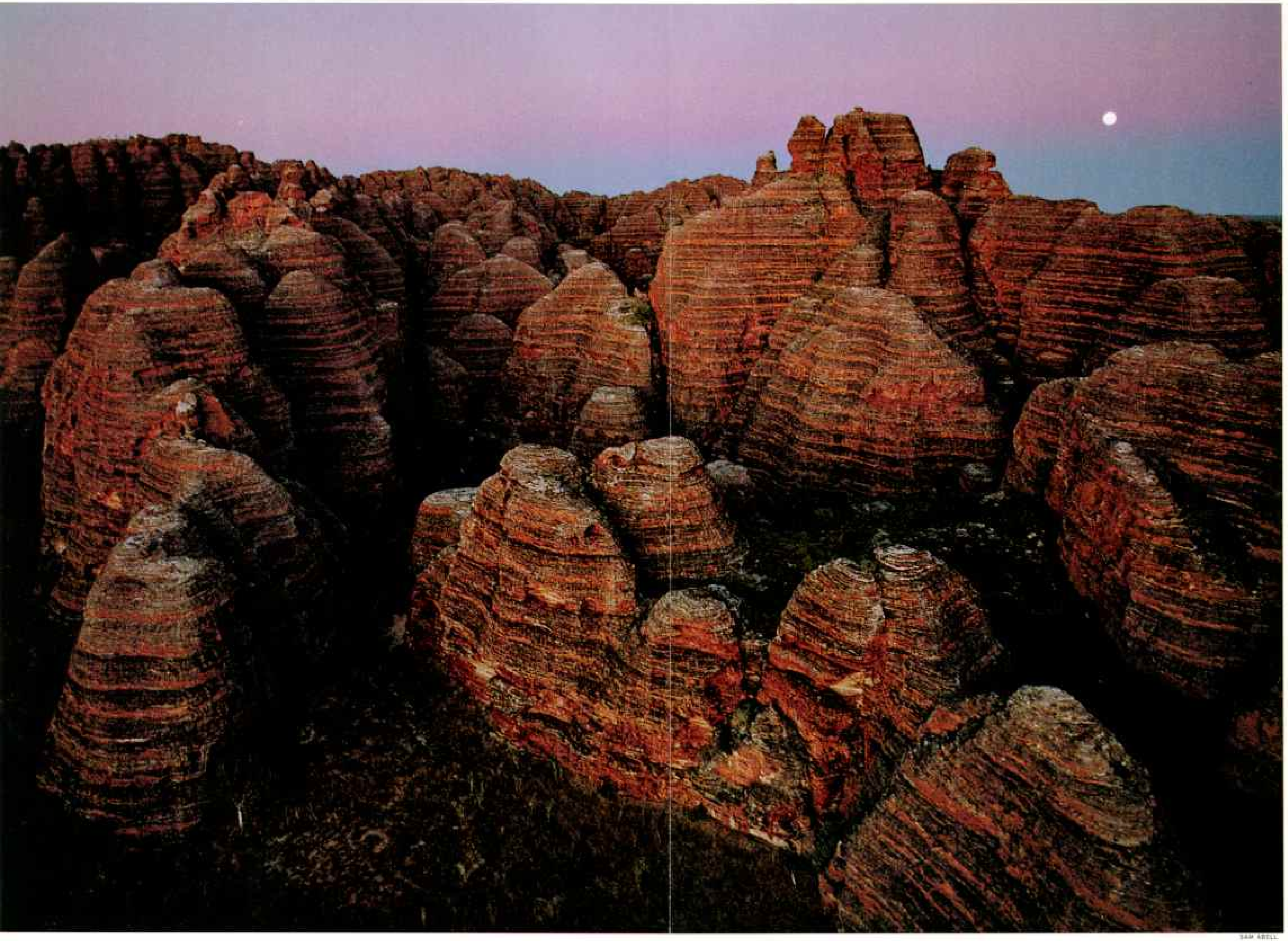
A portfolio of land and sea introduces this two-part presentation. *Page 2*

COVER: Rancher Janice Bell, with her three children, waits to take part in the Kimberley Championship Rodeo at Derby in Australia's Nor'west. Photograph by Sam Abell.

The Mystical Faces of Northwest Australia

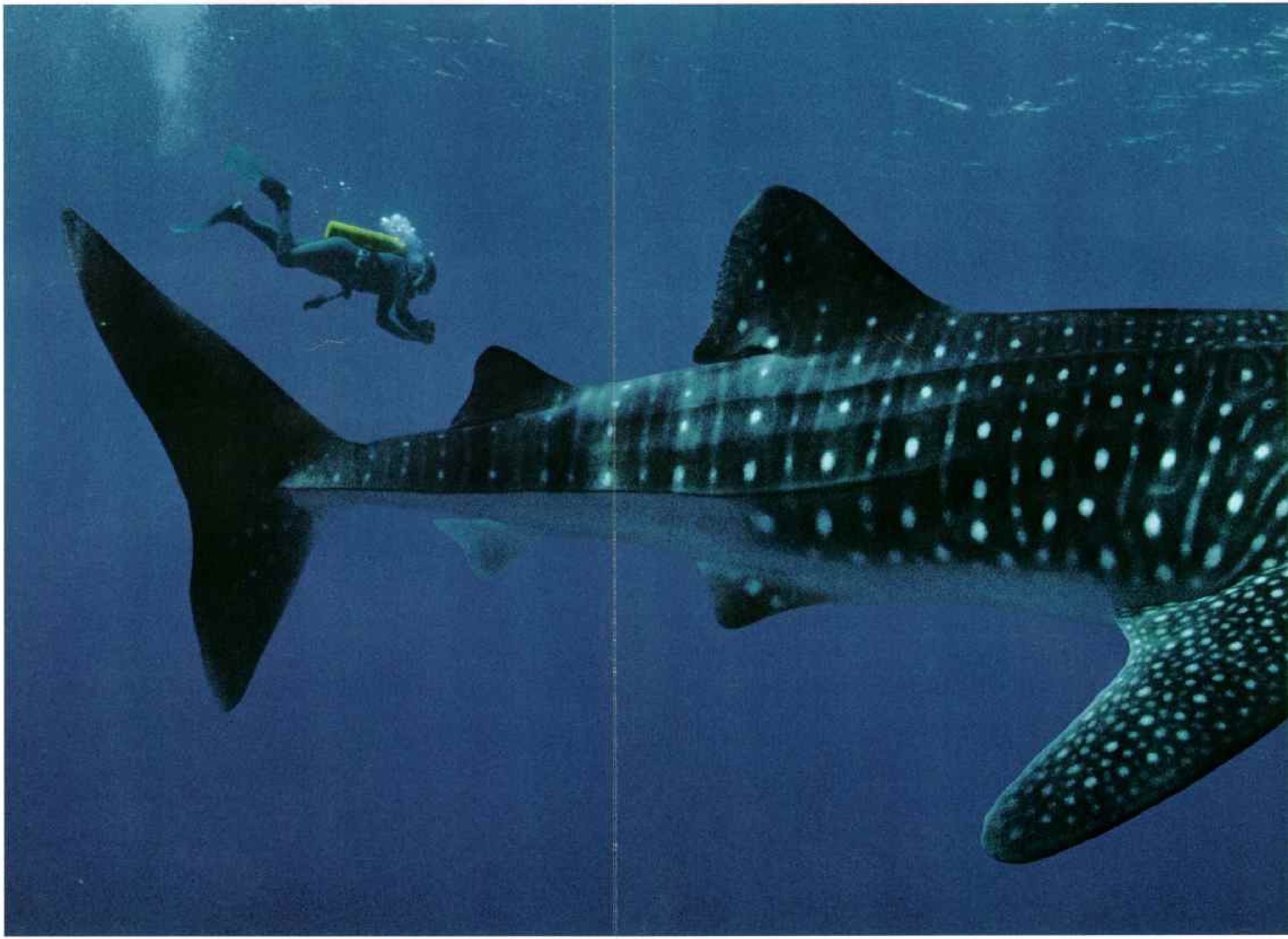
LAND & SEA

Leave all things familiar as two
National Geographic teams journey
to the far outback and beyond of
Australia's remote and otherworldly
Nor'west—a territory as wild and
primordial as it is improbable.
First: an exploration into the
Dreamtime world of some
of earth's most ancient terrain.
Then: a voyage along the
magnificent coastline, with rare
glimpses into the blue-shadowed
underwater world offshore.

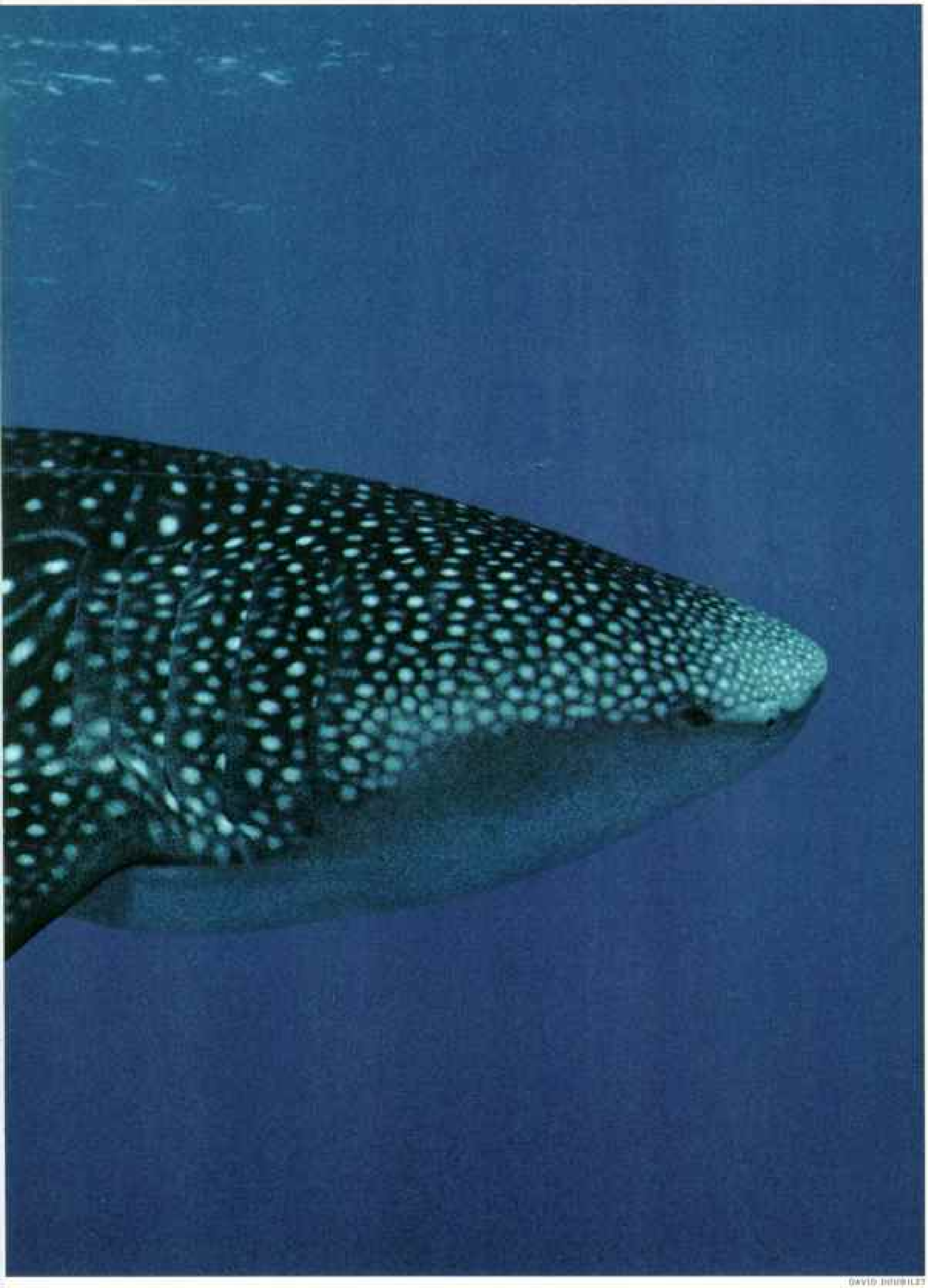


SAM ABELL

TIME WHITTLED 370-million-year-old sandstone to create the extraordinary beehive domes of the Bungle Bungle Range south of Lake Argyle.



SUPREMELY INDIFFERENT to its escort, a 35-foot-long whale shark, the world's largest fish, cruises off Ningaloo Reef. Its distinctive markings are a puzzle;



DAVID DOUBILET

with no known predators, this shy plankton feeder has no apparent need for camouflage.

THE LAND OF
NORTHWEST AUSTRALIA

Journey into Dreamtime

By HARVEY ARDEN
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by SAM ABELL

WE ALL HAVE some of the outback in us—a deep interior where thoughts blow free and the soul goes walkabout on an endless Dreamtime journey. Call it, if you will, the inner outback. It lies just the other side of never-never in the land beyond good-bye.

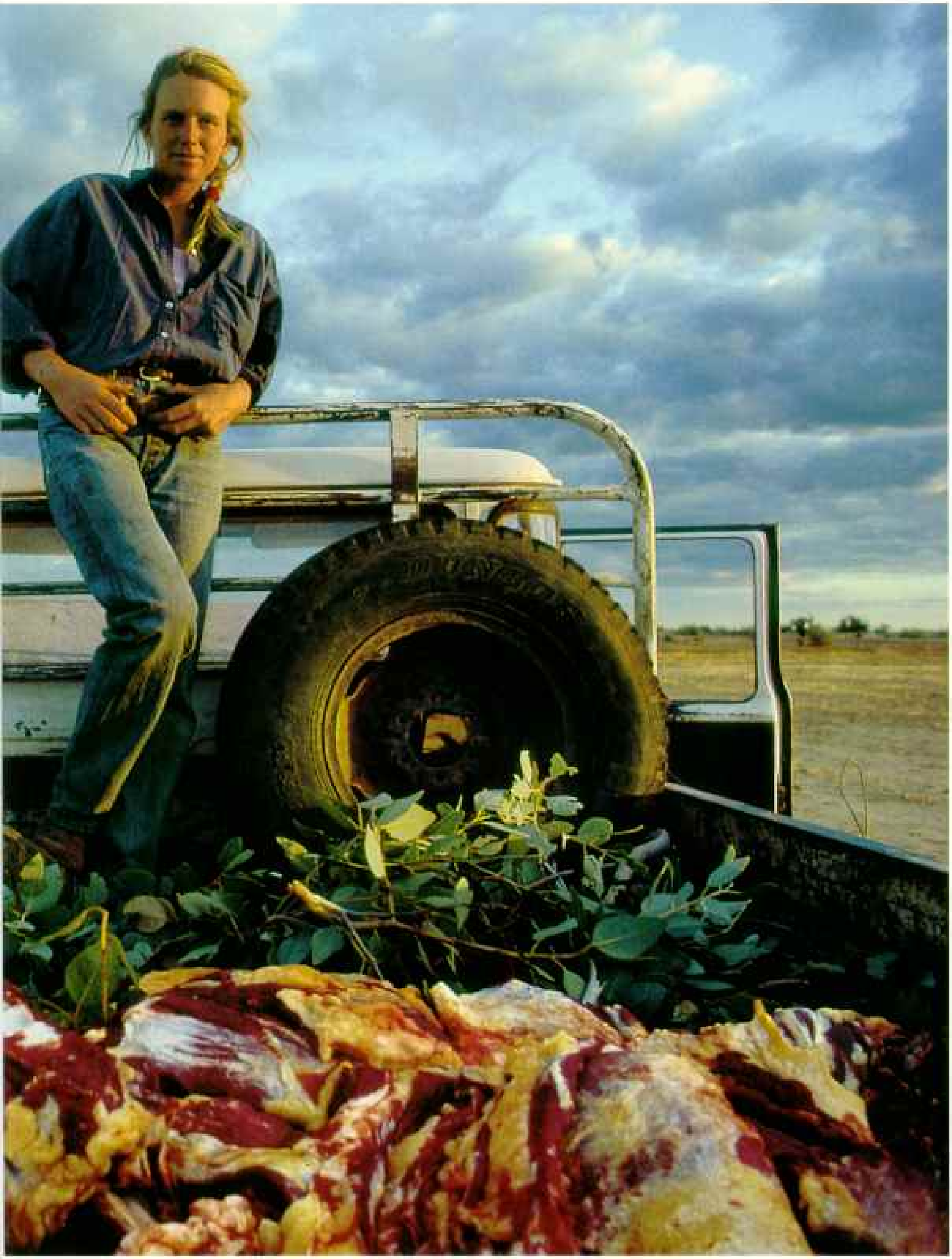
No, it's not an imaginary place. Just drop down under to the Tropic of Capricorn, skirt the waterless shores of Lake Disappointment, and—taking a fix on the Southern Cross—follow the Aborigines' tracks of the ancestors into the Great Sandy Desert and beyond. There you'll find the inner outback—and perhaps yourself as well.

But there are risks. Shortly before I arrived in northwest Australia a group of 11 Aborigines met disaster when their truck conked out amid the Great Sandy Desert's shadeless hell of undulating red dunes; the temperature was nearly 130°F. On level ground a thermometer would have registered even higher. By the time help arrived, only three of them remained alive—and those only barely.

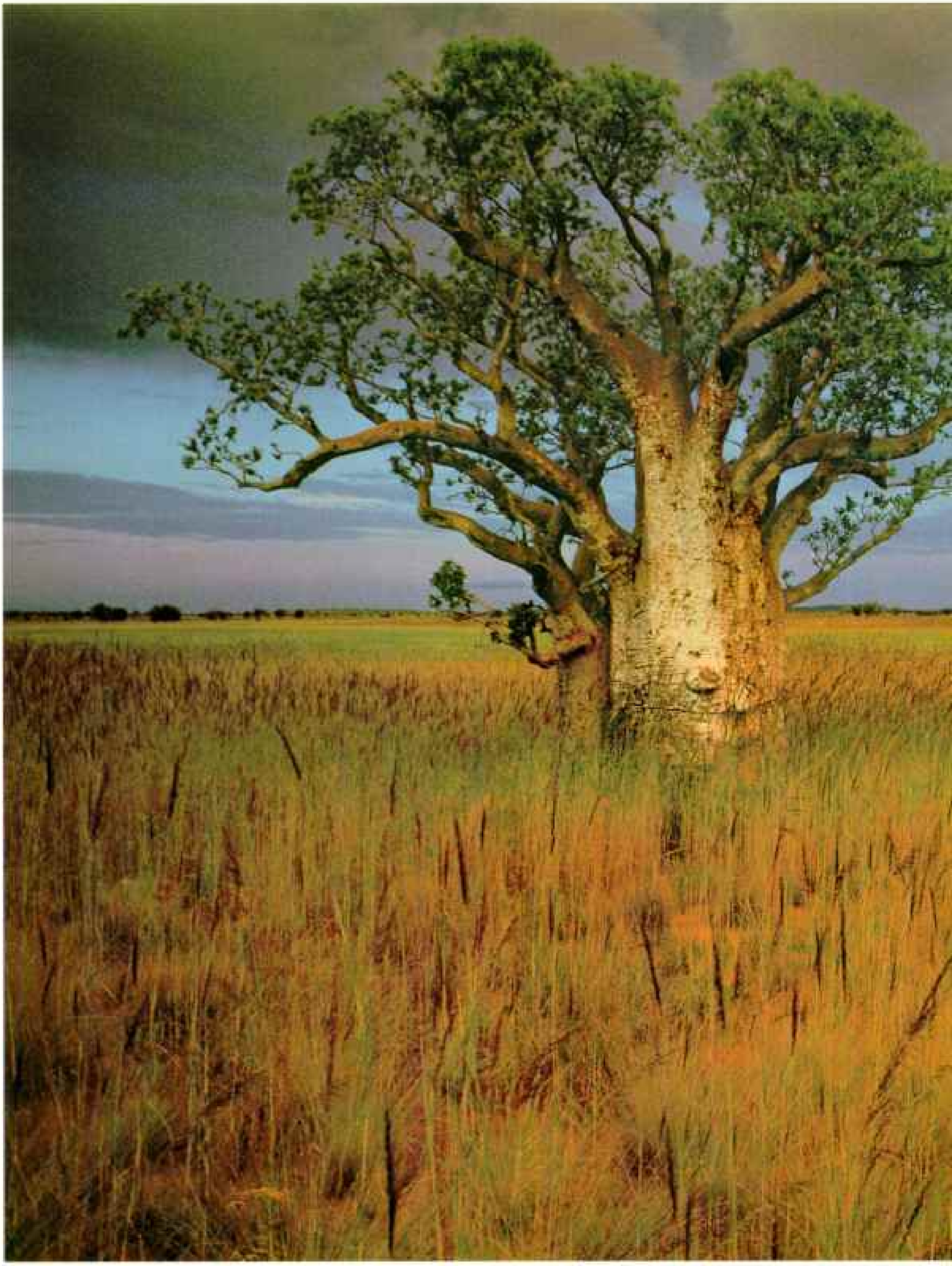
Some weeks later, after heavy thunderstorms up north in the Kimberley region—where they can get a foot of rain a month from January through March of a typical "wet"—two travelers in a four-wheel drive tried to cross a rising river along the *(Continued on page 14)*

TRIUMPHANT with his kill—a wild turkey—Mark Moora leads a small group of Aborigines who have returned to some of the old ways of their nomadic ancestors in the Great Sandy Desert.

"BARBIE" BOUND: A truckload of beef will soon be sizzling outback style. Served in huge chunks, blood rare, the barbecue at a cattle station near Halls Creek in Kimberley bush country will feed the crew



during the yearly muster, or roundup. With stations averaging more than half a million acres of wild terrain, helicopters are called in to drive cattle into pens for shipment to market.



LORD OF THE BUSH, a massive boab tree, close relative of the African and Madagascan baobabs, stands solitary near Wyndham in the Kimberley region. Scientists conjecture that baobab fruit rafted

on flotsam from Madagascar about 75 million years ago, taking root on Australia's northwest coast, where they are largely confined, growing both singly and in immense forests.

(Continued from page 8) remote Gibb River Road. Their car was later spotted, three-fourths submerged and empty. Volunteers risked drowning to search the roiling waters. The travelers, it developed, had swum ashore and wandered the bush before turning up, dazed and embarrassed, at a nearby cattle station.

Visitors beware: Dream quickly turns to nightmare in this world of wild extremes.

DESPITE ITS DANGERS, here's a land for the soul to expand into: Bigger than California, Oregon, Washington, Idaho, and Nevada combined, Australia's Nor'west—comprising the northern and central portions of the state of Western Australia—encompasses roughly 600,000 square miles with barely 89,000 residents, including 16,000 Aborigines (map, pages 16-17).

In the far north sprawls the huge Kimberley region—Australia's "Alaska"—a geographer's feast of lonely coasts, rugged mountains, barely accessible plateaus, deep gorges, secluded rain forests, vast cattle stations, and rivers that overflow in staggering abundance during the wet.

It's a land of archetypal Australian fauna: crocodiles and dingoes, kangaroos and emus, goannas (iguana-like lizards) and king browns (one of the world's deadliest snakes)—but no koalas or platypuses (those are eastern Australians). Here too, amid miniature mountain ranges of termite mounds, grow the marvelous boabs, or baobab trees—almost comical in their individuality—one as stout as a sumo wrestler, another as slender as a ballerina, adding a special wonder to the Kimberley landscape.

Southward stretch the endless red dunes of the Great Sandy Desert and the arid immensities of the western Gibson Desert. Maps often show blue "lakes" flung across this deep interior, but—as an early explorer's name for Lake Disappointment suggests—they are dry depressions that fill with rain only when a cyclone strays inland from the sea.

South and west of the low-lying deserts rise the spectacular highlands of the Pilbara region—among the oldest landscapes on the planet—fissured by gorges containing fossils 3.5 billion years old. Rocks bearing crystals 4.3 billion years old have been discovered nearby. Rust red mountains of almost pure iron ore—some of the world's largest known deposits—are literally being mined out of existence by huge earth-gobbling machinery. Some of the ore, exported to Japan, returns to Australia as the vehicles that make modern outback travel possible.

South of the Pilbara the landscape turns half civilized in the sheep country and wheatlands sandwiched between the Gascoyne and Murchison Rivers.

Across all this landscape, erosion has planed the ancient rocks to make accessible mineral riches almost beyond imagining: not only iron, zinc, and bauxite but also gold, uranium, and diamonds—the stuff of dreams for the legions of prospectors and entrepreneurs who come here to strike it rich . . . and do.

With the paving in 1986 of a road through the Kimberley and the building of modern motels in most of the score of small towns spaced some 150 miles apart, tourists in ordinary cars can now travel up into this once utterly isolated country. Four-wheel drives, however, remain the vehicle of choice for outback travelers who come here to get away from it all—like me.

I found myself camped by a billabong in the Kimberley one night

LAST PICTURE SHOW?
At a walk-in "picture garden" in the Kimberley town of Derby, a sparse audience takes in an early evening film. Built in the 1920s, the naturally air-conditioned outback theater—another survives in nearby Broome—was a focus of local entertainment until the recent advent of satellite TV and home videos turned it into an unprofitable exercise in nostalgia. The owner—who attended the picture garden as a boy—has kept it running for sentimental reasons.

Since completion of a paved road through the remote Kimberley region in 1986, visitors can savor a time-capsule world once barely accessible. To handle the ever increasing tourist incursion, many outback towns now feature modern motels with the latest amenities. There is even an exclusive resort complex adjacent to a nude beach outside Broome. The region's rough-and-tumble history is no museum piece—not yet, anyway. It is still alive and kicking vigorously, saloon brawls and all.

with Mike Osborn, my guide and companion for weeks through much of Australia's Nor'west. Mike is a real-life Crocodile Dundee. For years he was the only wildlife officer in the Kimberley—stalking croc poachers, illegal fish netters, and bird smugglers through an area the size of California. Among local Aborigines he earned the nickname "Turkeyfoot" for his knack of coming and going as unseen and silent as the wild Kimberley turkey.

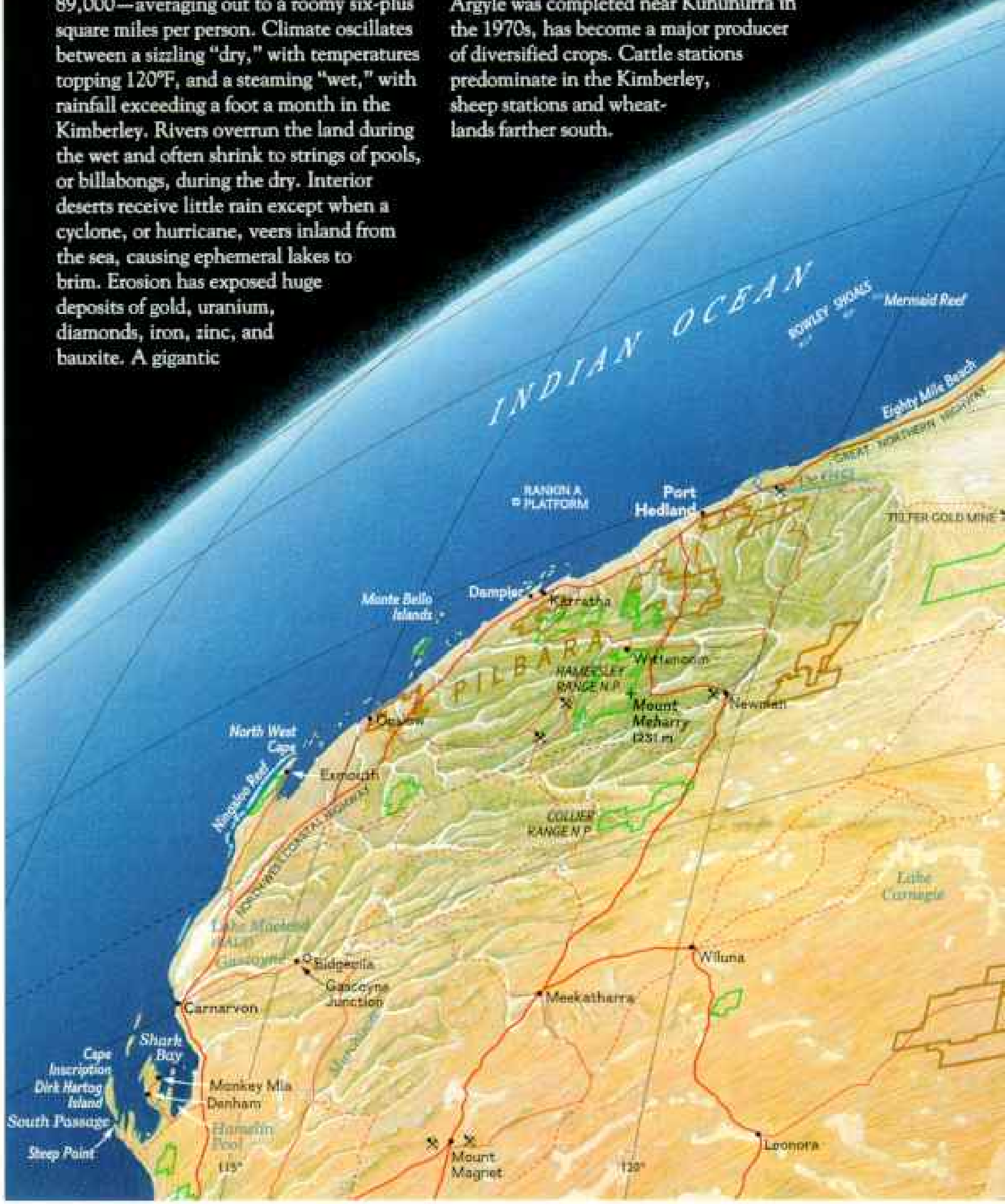
The talk around our campfire had turned to crocodiles. Mike—who these days runs outback safaris from Kununurra when he isn't catching rogue crocs on contract—was musing over a scene in a Crocodile Dundee movie in which the Aussie hero, armed with only a knife, bests a big saltwater croc.

"Bloody nonsense," he scoffed. "Outwrestle a big saltie? Can't be done. They can weigh as much as that four-wheel drive over there. Once they get past twelve, fourteen feet, they suddenly broaden out, double in size . . . you wouldn't believe how massive they are." He held his arms out full. "They get that wide. Once they've got you in their death roll, you're finished."

He described his closest call.

NORTHWEST AUSTRALIA
The far side of down under

AT THE END OF THE PLANET, the Nor'west's 600,000 square miles supports a population of barely 89,000—averaging out to a roomy six-plus square miles per person. Climate oscillates between a sizzling "dry," with temperatures topping 120°F, and a steaming "wet," with rainfall exceeding a foot a month in the Kimberley. Rivers overrun the land during the wet and often shrink to strings of pools, or billabongs, during the dry. Interior deserts receive little rain except when a cyclone, or hurricane, veers inland from the sea, causing ephemeral lakes to brim. Erosion has exposed huge deposits of gold, uranium, diamonds, iron, zinc, and bauxite. A gigantic offshore natural gas project recently began operation out of Karratha. The Ord River Irrigation Area, for which man-made Lake Argyle was completed near Kununurra in the 1970s, has become a major producer of diversified crops. Cattle stations predominate in the Kimberley, sheep stations and wheat-lands farther south.



TIMOR SEA

BONAPARTE ARCHIPELAGO

Cape Londonderry

Cambridge Gulf

Kununurra

Wyndham

Lake Argyle

ARGYLE DIAMOND MINE

Bungle Bungle Range

Mount Wells 920 m

Old Halls Creek (abandoned townsite)

Halls Creek

Hunter Creek

One Arm Point

BUCCANEER ARCHIPELAGO

King Sound

KIMBERLEY

TUNNEL CREEK N.P.

GEIKIE GORGE N.P.

Derby

Beagle Bay

Broome

Fitzroy Crossing

WINDJANA GORGE N.P.

WOLF CREEK CRATER N.P.

Balgo

GREAT SANDY DESERT

Yagga Yagga

Mount Liebig 1524 m (5000 ft)

RUDALL RIVER N.P.

CANNING STOCK ROUTE

TROPIC OF CAPRICORN

Gibson Desert

Lake Disappointment

GIBSON DESERT NATURE RESERVE

Warburton

WESTERN AUSTRALIA

Ayers Rock 868 m

NORTHERN TERRITORY

SOUTH AUSTRALIA

VEO LAKE NATURE RESERVE

NEALE JUNCTION NATURE RESERVE

Great Victoria Desert

PLUMRIDGE LAKES NATURE RESERVE

GREAT VICTORIA DESERT NATURE RESERVE

Aboriginal land

National park, nature reserve

Primary road

Secondary road

Track

Homestead

Selected mining area

Scale varies in this perspective

20°

25°

30°

125°

130°

THICK WITH FLEECE, sheep await shearing in a holding pen at Bidgemia Station in the Gascoyne —an area south of the Pilbara region.

Cranes swing 400-pound bales of wool aboard trucks bound for market (right). Though sheep raising has declined in the north, the animals thrive in the Gascoyne, sustaining a tough breed of sheepmen who know no other way of life.

"I was wading out from a riverbank to cut some fish from a poacher's net. Heard a splash behind me and turned to see this thing coming right up at me out o' nowhere. WHOMP! Jaws missed me by an inch. Got back to the bank just in time, but I'll never forget the sound of those jaws closing. Nothing like it in the world.

"You don't want to be tucker for a croc, mate. They'll stick you under a submerged log and let you rot. That's because they can't chew too well. When you've ripened enough, they'll tear a chunk off. Strange how people think we're the top o' the food chain. More bloody nonsense. Crocs are."

"Any crocs in this billabong?" I asked, eyeing the darkness. "Maybe a freshie or two," he said, referring to the less dangerous, narrow-snouted freshwater species. "They'll take a dog or small calf, but chances are they'd only snap at you if you stepped on'm."

"But no salties?" The deadly saltwater crocs swim up estuaries and

rivers from the sea: They're the true nightmares of this Dreamtime land—like grizzlies in Alaska or Bengal tigers in India.

"Could be salties," Mike said matter-of-factly. "Floods'll strand'm in billabongs during the wet. Got to keep an eye out. . . ."

He pitched a stone into the inky-dark billabong. PLOP! I admired his throwing style. As a teenager he'd played baseball on an adult Perth team—"Had a helluva fastball, pretty good curve and change-up." An American businessman who had contacts with the Chicago Cubs thought he was good enough for a baseball scholarship in the States. "Trouble was, I'd also been offered a fauna warden's job. They'd had 400 applicants and chose me. I had to pick between dreams. Took the warden's job, but sometimes I wonder. . . . My dream now's to explore America outback style . . . and see the bloody World Series!"

I lay back in my swag—the Aussie bedroll, a canvas sheet folding around a thin mattress—and looked up at the stars. From out in the

billabong came an oboe-like birdsong, mournful, infinitely lonely.

"Curlew," Mike said.

The flies had blessedly gone down with the sun, and the mosquitoes—with their tiny dentist drill whines—were not yet up in force. A warm wind soughed through the gum trees. On my harmonica I blew a few notes of "Waltzing Matilda," the words running through my mind:

Once a jolly swagman camped by a billabong,
Under the shade of a coolibah tree;
And he sang as he watched and waited till his billy boiled—
"Who'll come a-waltzing Matilda with me?"

Here we were, two swagmen camped by a billabong. No coolibah grew there, but that silver ghost gum over there would do. The billy—or water pot—had gone cold. Mike was already snoring softly in his swag—dreaming, no doubt, of some fantastical World Series. And Matilda! Well, the Matilda of the famous verse refers to a bedroll, like the one under me. To go "waltzing Matilda" was to "go bush" with a swag. I could have been *inside* that song.

Far in the distance a dingo howled. Lying back and looking at the night sky, I felt pulled upward into that shimmering immensity. Anyone who swags out beneath these Australian stars knows a special affinity for them. There's something reassuring about seeing the Southern Cross tilting on its side, knowing it points ever northward, giving you a kind of personal fix on infinity.

Laserlike, a shooting star cuts the sky . . . and you suddenly understand how the Aborigines, who slept out here beneath these same stars for 50,000 years before the white man came, could devise their wonderful mythologies of the Sky Heroes who came down from the stars in that mystic Dreamtime and shaped the landscape.

Aborigines on walkabout sing Dreamtime songs as they go, each verse corresponding to some physical landmark—a hill, a rock, a water hole—created by the Sky Heroes in that time beyond time. Following the verses from point to point, they keep to preordained routes—called "song lines," or the tracks of the ancestors—through the otherwise trackless bush.

With constellations wheeling in my mind, I fell into a dreamtime of my own.

EXPLORERS of northwest Australia in the mid-1800s knew nothing of the tracks of the ancestors, of course. Launching their expeditions from Perth (itself founded only in 1829), they coasted the shores along the Indian Ocean on the west and the Timor Sea on the north. Some of the beaches are among the world's most beautiful and untrammeled even today. You still find only an occasional community along the 5,000-mile coast, like the industrial and mining ports of Dampier and Port Hedland in the Pilbara and, farther north, the old pearling town and modern vacationers' mecca of Broome (see article beginning on page 43).

The early explorers struck inland through some of the most difficult topography on earth. Not surprisingly, nomadic Aboriginal inhabitants speared more than a few of them, but there was no stopping these white intruders, who came not just to explore but to settle.

One explorer, land developer James Martin, reconnoitered the Kimberley coast in 1863. He promoted it as "essentially a wool-growing country . . . luxuriantly grassed and watered. . . ." Settlers quickly moved in only to find the tropical climate and vegetation unsuited to sheep grazing. Three early settlements had to be abandoned—though parts of the Kimberley would later be found suitable not only for sheep but also for cattle and agriculture.

By the 1870s and 1880s, small towns appeared along the coasts of the Pilbara and the Kimberley, supply centers for the stockmen who drove their herds of sheep and cattle hundreds of miles into the deep interior, winning free leases on vast tracts of land from a government eager to open up this terra incognita.

A huge irrigation scheme begun in the 1960s in the northeastern part of the Kimberley—the Ord River Irrigation Area—has recently shown signs, despite colossal problems, of creating an agricultural cornucopia. Man-made Lake Argyle, impounding the Ord River's wet-season flow, covers an area nine times as large as Sydney Harbour—flooding hundreds of square miles that were once the domain of huge Kimberley cattle stations.

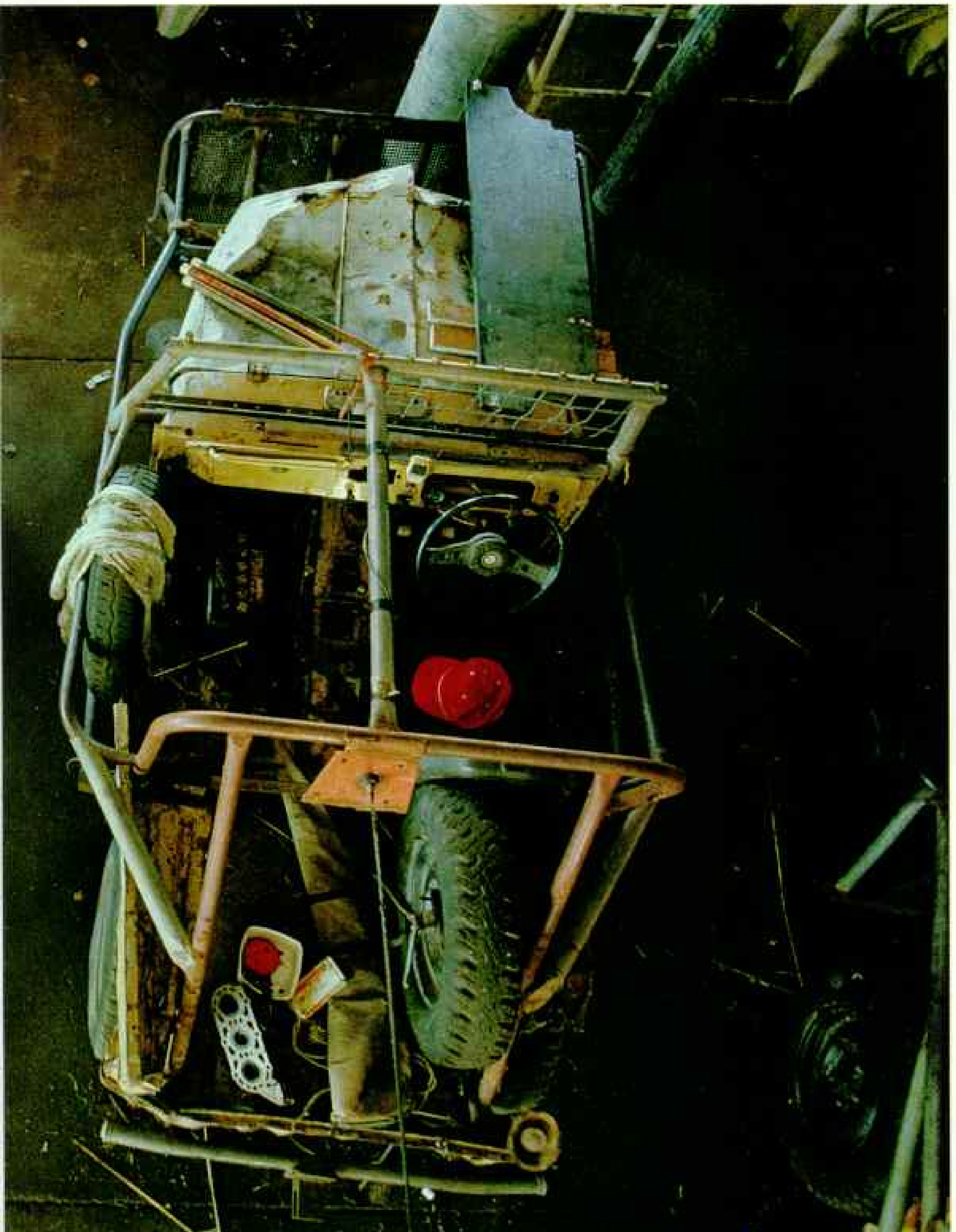
The wild-eyed bull obviously didn't like me. His quivering nostrils seemed about to blow smoke. His curving foot-long horns shook with

BULL CATCHING, Aussie style: On his 680,000-acre cattle station in the Kimberley bush, John Koeyers (facing page) rounds up stray bulls with a "bull buggy"—a stripped-down four-wheel-drive Suzuki with a reinforced chassis and frame. Spotting a young bull, he guns the motor and gives chase across the rugged terrain, driving the vehicle right into the startled animal.

"It can be done without even bruisin' 'm," he says.

Avoiding slashing horns, he ropes the pinned bull's forelegs, then pulls back until the animal can be winched aboard a following truck. Kimberley cattle provide a tough but tasty beef—much of it export bound as hamburger for fast-food restaurants.

CUED UP with constant chores, Drysdale River Station homesteader John Koeyers relaxes over a game of pool with his children in their garage—part auto-repair shop, part playroom. More than 200 miles from



any school, his three youngsters pursue their studies via the School of the Air, beamed each morning by radio from Derby. Periodic visits by the Royal Flying Doctor Service keep their shots up-to-date.

rage. I clung precariously to the roll bar of a stripped-down little four-wheel-drive Suzuki while a ton of snorting Kimberley beef writhed under the front end, trying to buck the vehicle—and me—off his quaking back.

Why was a car on top of a bull, and why was I on top of the car?

I'd come to Drysdale River Station to partake of a bizarre ritual: bull catching. In the Kimberley, station owners let stock wander the rugged outback to feed on sparse vegetation—producing a tough but tasty beef bound mostly for export as hamburger. Once a year or so they have a muster, or roundup—bringing in as many head as they can catch.

"Don't know exactly how many head we have out there," station owner John Koeyers told me. A former Port Hedland businessman ("fencing construction, made heaps o' dough, but it was boring"), he and his wife, Anne, saved up and bought this station a few years back. In Australia you buy the animals and machinery outright and lease the land and buildings from the government.

"It's the life-style," John said. "Do everything yourself. Water. Plumbing. Electricity. Isn't easy, but we love it. . . .

"This season we'll ship maybe 600 head. We've got 680,000 acres—could handle 10,000 head. But how do you bring 'm in? Used horses in the old days, but today we hire helicopters to drive 'm. Stray bulls we catch with these Suzuki bull buggies.

"You get in there," he said, pointing to the passenger seat of the well-dented buggy—except, there was no seat, only a floor space padded by thin foam rubber. Soon we were bouncing through tall cane grass at high speed—or what I thought was high speed—until we spotted a lone bull eyeing us from under a gum tree.

Now I would learn about high speed.

John let out a hoot and gunned the motor. The bull was off and we were after it, charging breakneck through the cane grass, mowing down small gum and wattle trees, caroming off termite mounds—one of which spewed its living contents all over us. The bull swerved madly, but the Suzuki kept on its tail. At last, bull and vehicle converged. There was a terrific bump, and all was still. We'd stopped cold. Had we hit a rock? And where was the bull?

"Got 'm!" John yelled. "Come look!"

He leaped out and ran to the front of the car. I peered over the roll bar. There was the bull—his wild eyes staring up at me in fury. The bull buggy was parked right over him!

John grabbed a rope to tie its feet but backed off from a nasty swipe of a horn.

"You sure he can't get loose?" I asked. "No worries, mate!" John replied, laughing.

OUTBACK IN-JOKES

Rigorous life on a cattle station homestead—where amenities are rigged up by hand—breeds a rough-hewn and highly individualistic brand of bush humor.

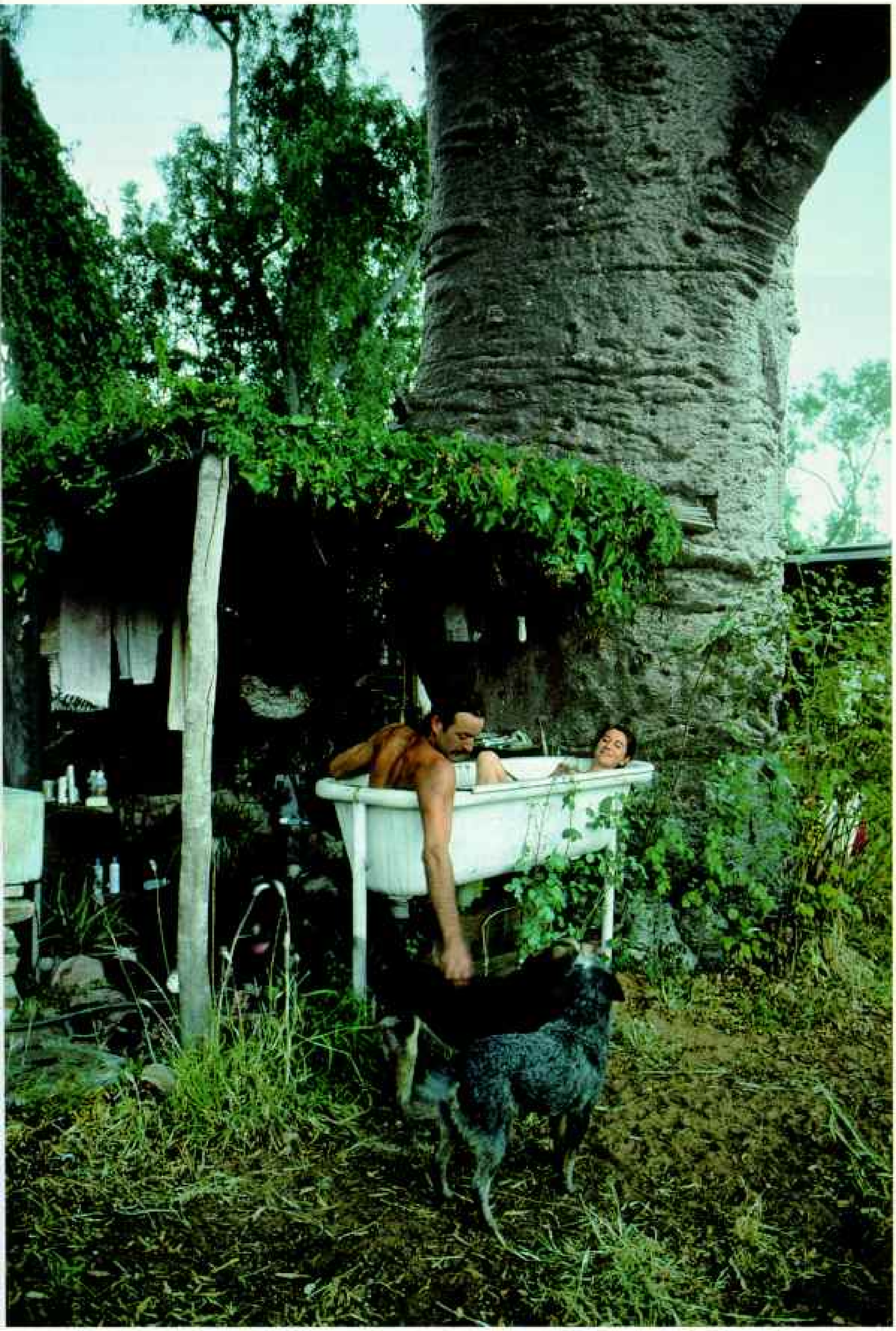
Visitors asking to use the phone at Drysdale Station (above) are told:

"It's there in the fridge, mate."

What's it doing in the fridge?

"Keeps it from meltin'!"

At nearby Ellenbrae Station (facing page), where a New Age life-style prevails, an outdoor tub's plumbing has been whimsically built right into a fat-trunked boab tree.



The bull bucked, the buggy lurched. Suddenly, somehow, the animal stood up free, eyes shooting fire. "Watch yourself!" John yelped, cautiously retreating behind a termite mound.

Lowering its head, the bull charged straight into the side of the little Suzuki . . . with me inside. Again and again he charged, horns whanging against the metal. With an agility born of terror, I climbed atop the roll bar to steady myself.

WHANG! . . . WHANG! The bull rocked the buggy.

Angry now, John grabbed a swatch of cane grass.

"Hey, you! Stop denting my bloody car, you bloody beast!" he yelled. There was absolute authority in his voice. The bull blinked.

"Go on, get outa here!" John walked right up to the dumbfounded animal and tossed the cane grass contemptuously in its face.

The fight drained from the bull. With a last malignant look at me, it trotted off. "We'll get him later," John announced.

Bouncing back to the homestead—it didn't seem so fast to me now—we picked cane grass, yellow wattle blossoms, and, yes, termites out of our clothes.

John's face beamed with utter satisfaction. "I love it!" he said triumphantly. "Damn, I really do love it!"

CARATS: *The Argyle Diamond Mine in the eastern Kimberley, opened in 1985, yields some 34 million carats a year—more than a third of world production.*

Discovery of alluvial diamonds in a nearby creek in 1979 led geologists to the source in these mountains near Lake Argyle. Earthmoving machinery literally dismantles the mountain to get at the pipe of diamondiferous ore within.

Only about 5 percent of Argyle's diamonds are gem quality—but they include occasional rare pink diamonds that may sell for 50 times more than the usual white brilliants. Argyle also produces rare diamonds of other exquisite hues—from champagne to cognac to apricot.

"HERE'S WHERE THE WATER STARTS," my guide Mike Osborn announced, flipping off his sandals. "Take off your shoes, or you'll get 'm wet."

We had clambered down a rocky defile into the darkness of Tunnel Creek, where, in the 1890s, the Aboriginal outlaw-hero Pigeon hid from his pursuers, staging hit-and-run attacks on the settlers who had stolen this Dreamtime land from his people.

"Plenty of places for Pigeon to hide out in here," Mike said.

Our flashlights cast feeble beams into an underground chamber strewn with limestone boulders—remnants of what was, some 360 million years ago, a tropical reef rivaling today's Great Barrier Reef off Australia's east coast.

Raised hundreds of feet above sea level by tectonic forces, the huge limestone outcrop—now far inland—created the Napier and Oscar Ranges that wall off the southern Kimberley. Eons of wets have scoured these uplifted ramparts, carving stunningly beautiful gorges, such as nearby Geikie and Windjana, and also Tunnel Creek, which cuts into the limestone massif to create the 2,500-foot-long cavern through which I now slogged, barefoot, in knee-deep water.

Half-tripping, I stubbed a toe on a submerged rock. That it was 360 million years old was no consolation. I considered going back to get my shoes but thought better of wandering around alone in the darkness.

We came to an area where the cavern's ceiling had collapsed, leaking daylight into the subterranean gloom. Through this opening,

according to local legend, the mighty Rainbow Serpent disappeared into the earth after assisting the other Sky Heroes with the creation. Just beyond, millennia-old Aboriginal wall paintings depicted stenciled white footprints and red ocher crocodiles. I could understand the import of the footprints if the artist, like me, had just waded barefoot through these toe-stubbing rocks.

I knew better than to ask Mike if there were crocs here—I'd get the same answer I always got in the Kimberley: "Could be, mate."

I could picture Pigeon and his small band hiding from search parties in here—perhaps eating mutton from a settler's station. Whites came in and killed any game they wanted, but when an Aborigine speared a sheep or calf he was an outlaw. Pigeon himself had been a tracker for the police before he'd killed a constable and fled into the bush, there to rouse other Aborigines to a small-scale rebellion called Pigeon's War. He loved to track the trackers who were tracking him, then stand high above them, waving spear and rifle in the air, taunting them. For three years, 1894-97, he held out. Finally, near the entrance to Tunnel Creek, he was shot dead in an ambush by fellow Aboriginal trackers.

Perhaps it was he who had retouched the ancient cave-wall paintings, for he was known as a "clever man"—a formal initiate into the sacred mysteries of the Dreamtime. To retouch the paintings assured that the Rainbow Serpent and Lightning Brothers would bring the life-renewing wet each year.

I limped back to the entrance of the cave, retrieved my shoes, and slipped them gingerly over my tenderized tenderfeet.

"Said you wouldn't need'm," Mike said.

KARATS: A worker pours molten 24-karat ingots at the Telfer Gold Mine, the nation's largest, in the Great Sandy Desert. Soaring gold prices in the 1970s and '80s led to an unprecedented boom in exploration and production in Western Australia, which accounts for more than two-thirds of the country's gold output.

Exempted from taxes in the past to encourage production, Australia's gold-mining industry faces a new and highly controversial 39 percent tax on corporate profits.

AMONG PIGEON'S own people, the Bunuba, his exploits are passed from generation to generation by a keeper of the Pigeon story. We found the current keeper, Banjo Woorunmarra, sitting on the veranda of his government-built house in an Aboriginal neighborhood in Derby. He spoke of Pigeon's epic feats:

"He was no bad man. Killed only when he had to. Worked as a tracker for the police, but he got tired of killing his own people. Being free, that's what he wanted. Constable Richardson, he shot Pigeon's uncle in the back, so Pigeon shot Richardson. Richardson was the bad man, not Pigeon. Pigeon had magic. He could disappear. They think they killed him, but they didn't. They say they took his head to Derby, but that's wrong. His spirit's still out at Tunnel Creek today. He won't talk to you, but he'll talk to us. I talk with him many times. . . .

"White fellas come lookin' to find his head. I don't know why they want it. I tell'm, 'He done the best for his people. Let him rest in peace.'" Well into his 70s, Banjo has been training his great-grandson Sammy, now eight, in the Pigeon story.

"When I pass on, Billy Oscar over in Fitzroy Crossing will be the

keeper. When he goes, Sammy will be ready. . . . Pigeon ain't be forgotten, mate. Not forever!"

Banjo Woorunmarra—keeper of dreams. . . .

YOU MEET A GALLERY of dream keepers in this outback—people who conform only to nonconformity, who come out here to push the edges of possibility, each in search of his or her own particular dreamtime.

I think of Ric Steele, the beekeeper, who hauls his humming hives by truck some 2,200 miles from Perth to Kununurra to pollinate sunflowers in the Ord River Irrigation Area. Rarely sleeping, he roars along at 75 miles an hour, charging through the great open spaces between outback towns. Walk into any pub or roadhouse along the way and, it seems, you'll see Ric—or one of his counterparts—belly up to the bar, a stubbie of beer in his fist, loudly spinning some tale of misadventure. Ric's got powerful hands—massive, rock hard, acquainted with many an unfriendly jaw. Smile when you talk to him.

Or there's Brother John, the man-of-all-jobs at Kalumburu Catholic Mission in the Kimberley's far north. Forever rushing about in his battered pickup, tailpipe spewing black brimstone, he sows smiles and good deeds among local Aborigines when he isn't sowing seeds in his

wondrous garden with its huge cabbages and succulent melons. Somehow, amid his infinitude of tasks, he manages to brew the delicious beer that brightens talk at the mission's dining table.

I remember Helmut Schmitt, the affable recluse—now in his 70s—living in his metal shack out in the bush. A former *Luftwaffe* pilot, he lived awhile in Philadelphia after the war. Now he supplements a modest pension by swapping the fish he catches ("poaches," some say) for beer and cigarettes. He points near the ceiling where stains mark the high point of a recent flood. "That's when it gets lonely, mate," he says. "No bloody way to get in or out. Gotta live up in that bloody second floor room with the dogs and chickens. You can go troppo times like that, mate. Start talkin' to yourself. . . ." He laughs—a wheezy, delightfully wicked laugh. "But, no, I don't think o' leavin'. Hell, I live where other people go for their holidays. I'm free, y'understand?"

And there's Bev Ozanne, mother of three, who was drifting around Australia with her husband when they fell in love with the Kimberley and bought a house in Kununurra. Now she works at Chopsticks, an open-verandaed Chinese restaurant. One night during the wet she was waiting on photographer Sam Abell and me just before closing. We finished our meal as a thunderstorm moved in. The sky let loose; suddenly we were awash in wind and rain sweeping across the veranda.

ROLLING DARKLY over the Kimberley coast, an ominous squall line sweeps in from the Timor Sea during the January-to-March wet season. Moments after photographer Sam Abell took this picture, his single-engine airplane—with Sam at the open door—was pinned underneath the quick-moving cloud, with another black cloud moving in fast from behind. Buffeted violently in high winds, the plane barely managed an emergency landing in intense lightning at a mining-camp airstrip on a small island.

Bev turned out the lights, and the three of us—the only ones there—drank in the wildness of it all. Above the thunder and lightning we could hear the cockatoos singing joyously from their cages in the garden. "They're singing the storm into existence," Sam said. "I know how they feel," Bev sighed. "They're like me. Happy . . . but caged. Sometimes I want to let them out. . . ."

THERE'S A WHOLE TOWN of dream keepers—Wittenoom, tucked away high amid the spectacular Hamersley gorges of the Pilbara. Back in its heyday as a center of blue-asbestos mining in the 1950s, Wittenoom had 1,500 residents. Barely 45 remain, and the government wants them to go so that the entire town can be bulldozed because it's a health hazard.

Wittenoom, alas, is the site—along with the now closed asbestos mine in a nearby gorge—of what may be Australia's worst environmental disaster. By the end of the century, it's estimated, 2,000 former workers and residents will have died from asbestosis and mesothelioma—caused by breathing the fibers of asbestos, huge tailings of which still loom above the mine site. Though some areas have been covered with topsoil and roads with asphalt, microscopic blue fibers—even deadlier than white asbestos—still blow about in the wind.

IN THE NICHE OF TIME, tour guide Dave Doust of Wittenoom leads the way on a perpendicular "gorge walk" into the depths of geologic history in Hamersley Range National Park. Scoured by eons of torrential runoff from cyclonic storms, deep gorges of the Pilbara region plunge into bedrock dating back more than two billion years—among the oldest exposed rocks on earth.

You'd think every last soul would flee this "Town of Death," as the tabloids call it. But, no. Sipping a glass of white wine in the still lively hotel pub, octogenarian Ruby Francis—a 40-year resident—snorts at a visitor, "Me, I'm stayin', mate!"

Why would anyone want to stay here?

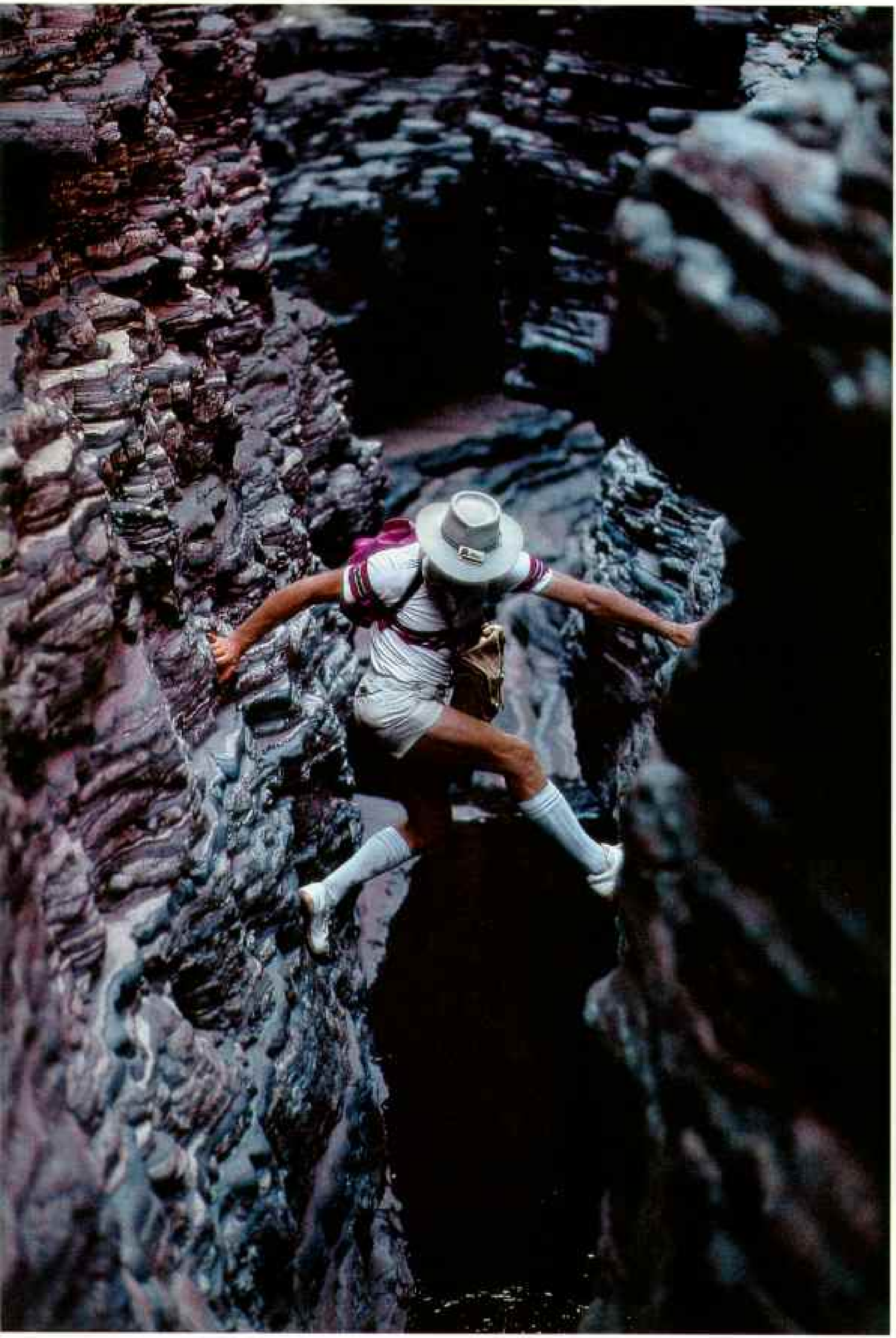
"Because it's the most beautiful place in the world," replied Lee Hare, an American who runs the local deli. "We get 60,000 visitors a year. The gorges are one of Australia's greatest spectacles. But there's something more—the place has a spirit, a soul. It's downright mystical. We can't just let it die."

Hungarian-born Frank Soter came from the displaced-persons camps of World War II to Wittenoom, worked in the mine, became postmaster, and now leads the political battle to save the town.

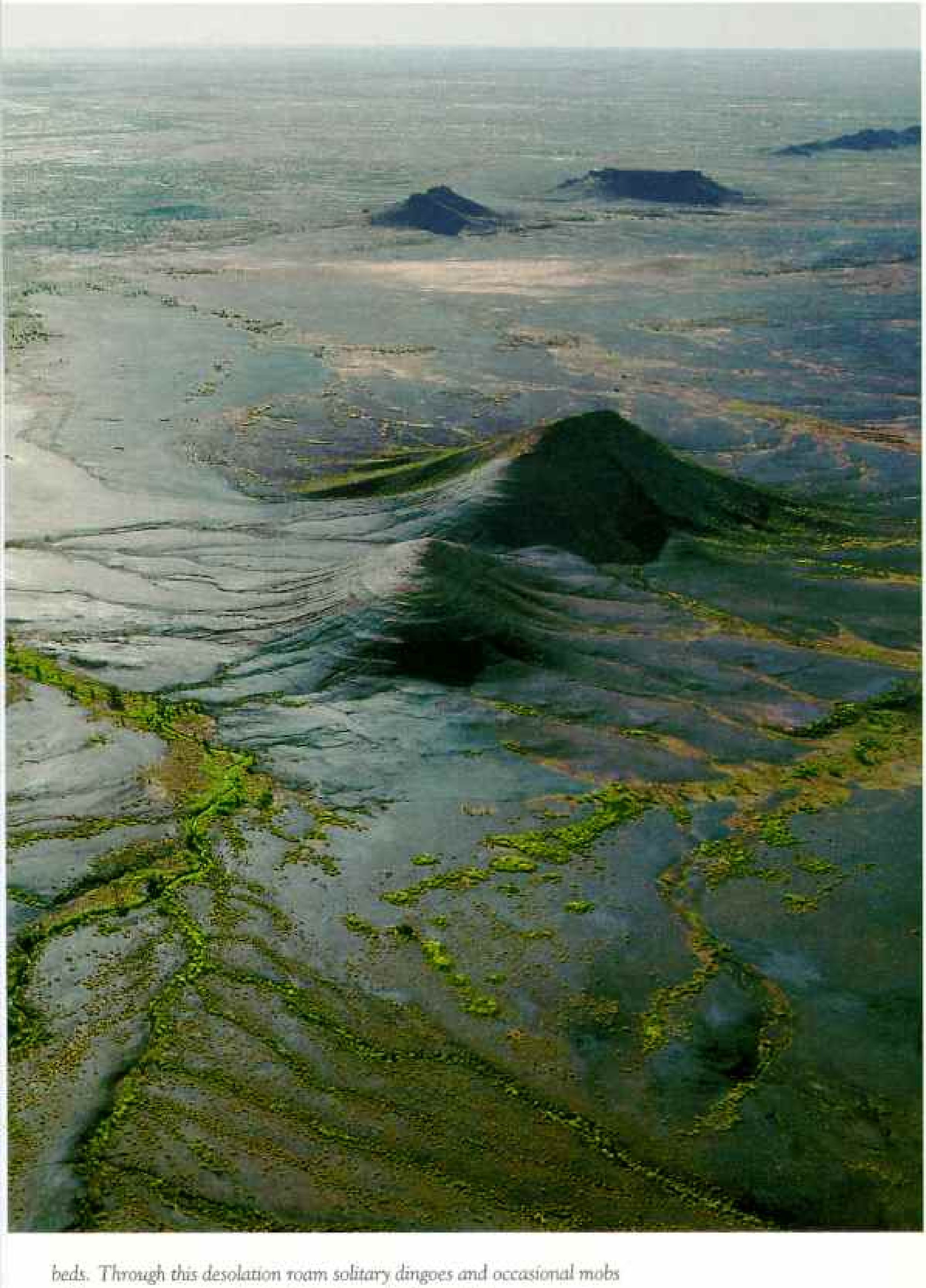
"I'll fight as long as I have the strength," he vowed. "Wittenoom will be here long after I am. 'Course, you don't want to breathe the air too deep . . . but the pollution's just as bad for you in Perth. I lost 60 percent of my lungs—asbestosis—but I'm here to stay. Government people think we're crazy, but if they stop the power and water, why, we'll just put'm back in ourselves. This is a good country. Where else could a handful of blokes like us stop a whole government from destroying something when it has a mind to?"

Yes, dream keepers all.

One afternoon, as we drove along an outback road, Mike abruptly braked the car. "Hit a bird," he said. He backed up for a hundred yards



SURREAL LANDSCAPE of the Balgo Hills in the Great Sandy Desert reflects sunlight off its rock surface, polished by wind and water over the millennia. Vegetation greened by recent rains lines dry creek



beds. Through this desolation roam solitary dingoes and occasional mobs of kangaroos as well as herds of feral camels descended from packtrain animals of a century ago.

and stopped. He got out and returned with the fluttering creature.

"Crested pigeon," he said, handing it to me. "Looks like we've got a new pet for a while, mate. . . ." Still dazed, it quivered in my hands. I felt its heart jump. It was the size of a city pigeon but had exquisite silvery feathers, a silver-crested head, and such eyes . . . concentric circles of yellow and brown framed by a pulsating flash of bright orange-red.

"My God, it's beautiful. . . ."

"Hold her gently," Mike said. "Maybe we can get her well." As he returned to his seat, the bird started flapping and fluttering violently. Alarmed, I thrust it into his arms.

He took the pitiful form and stroked it, holding it to his chest. We watched helplessly as the wings and body convulsed and finally went still. A gray membrane slid slowly over its eyes—those wonderful eyes with their pulsing red perimeter.

"She's had it, mate," Mike said. He carried the silvery little bird to the side of the road and placed it gently on the ground. We drove on.

That hard-bitten Aussie stared straight ahead. I noticed *his* eyes were glistening too.

DREAMTIME ECHOES
in a twine-bound bark coffin of Aboriginal origin (above) beneath a rock overhang on a Kimberley cattle station. Australian law prohibits disturbance of such relics.

An Aboriginal performer smears his body with pigment for a corroboree, a ritual of songs and dances recalling the Dreamtime when spirit Sky Heroes shaped earth's features.

MIKE THOUGHT the "mob" at Yagga Yagga would take us out roo hunting, but leader Mark Moora shook his head: "Already got all the roo meat we need in there, mate." He pointed to a solar-powered freezer the government provided to this tiny Aboriginal outstation deep in the Great Sandy Desert. "Shoot roos only with cameras today. But maybe we get a turkey."

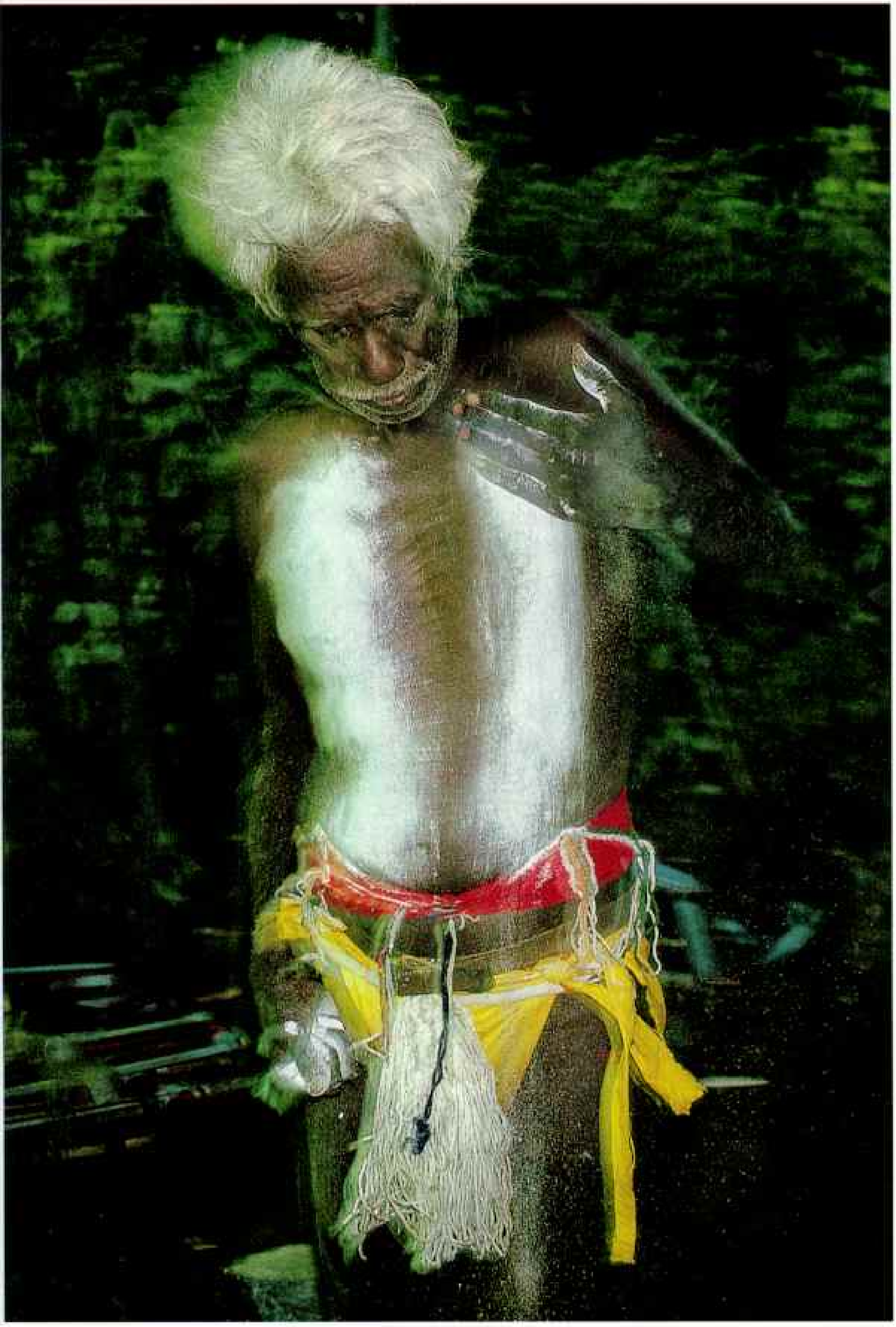
Barely a scratch in an oceanic vastness of red sand dunes and black gravel flats, Yagga Yagga consists of a handful of shacks and frayed tents. Bedsteads stand askew, sheets tousled, open to the sky. They sleep in open view of the Sky Heroes here.

Here Mark Moora, a powerfully built Aborigine in his 40s, has led a handful of his people away from trouble-plagued Balgo, an Aboriginal community 50 miles to the north.

"We're going back to the old way," Mark says. "Had to get away from Balgo. Too many people there. Too noisy. And too busy. So about 30 of us came here. We call it Yagga Yagga. When a child is noisy, we say 'Yagga yagga.' It means 'Quiet quiet.'"

At a fire pit two old men crouch, poking at a bloated kangaroo in the red-hot ashes. With broken files they strike at some thin charred bones—roo forelegs—sucking out the marrow with smacks of delight. One of them throws a fresh goanna on the coals.

Our four-wheel drive rumbles off, Mark in command, to find a turkey to add to the fire. We lay down new tracks across a phenomenal landscape of cone-shaped, blackish hills, almost reptilian in appearance. You expect some prehistoric beast to lurch into view at any moment. We climb a hill for a 360-degree view of the unearthly vistas on every side. An arrow-shaped cairn of rocks points mysteriously into that almost inconceivable enormity of space.



"Travelers left it," Mark says. "Maybe to help rescuers find'm if they got lost."

He tells of two white stockmen who were driving through on their way to Alice Springs. "Dumb blokes didn't ask the way. Took a wrong turn. A geologist found their bones a few years later."

We drive on in search of the turkey. A mob of red kangaroos bounds through the scrub at high speed, but we don't follow.

"They're our brothers," Mark says. "We only kill them when we have to."

At last—a turkey in a stand of brush. The car stops. Mark aims his rifle out the window. One shot. The turkey falls, hit through the neck. He poses with it, spreading the great wings wide so that he and the bird seem like some winged man-creature about to take flight. No Sky Hero ever looked nobler.

Nearby we stop for tea at a rare water hole. A screaming cloud of white cockies explodes out of the trees at the sound of our approach. Mike makes tinned-beef sandwiches and boils some water for tea. He tells me how, during an earlier visit, he'd asked if they'd like him to "boil up a billy."

"Turns out a bloke named Billy'd just died. I'd violated a taboo against naming the recently dead. They clammed up, wouldn't look at me all day." Mark joins us. "My great-great-grandfather is buried here," he says. "He was a big tall man. He could carry a kangaroo in his hand like a little rabbit."

He recalls a flight he'd taken to Perth. "We came in to land at night, and I saw the lights. I thought we were flying upside down and that was the sky!"

On our return we stop at Mark's garden. In a plastic greenhouse lovely rock melons are fed by tiny tubes dripping water drop by precious drop. His pride shows. "But I must do it all myself. The others don't understand. If I go away, they forget to turn on the water."

He asks us if we know where he can get some mango seeds. "That's my dream," he says, "to have many, many mango trees. They give good fruit—but, more important, they give plenty shade. No shade at Yagga Yagga!"

He shows us the spot a few miles away where some of the Yagga Yagga mob are planning a still newer, smaller community.

"See, the sand is clean and soft," he says. "Better'n Yagga Yagga. Yagga Yagga's too crowded, too big! We're movin' on!"

Mark Moora—Aboriginal dream keeper.

YOU MIGHT SAY I dreamed the nugget into existence. Months before my trip, I had conjured it in my mind after seeing an ad in an old treasure-hunters journal:

"AUSTRALIAN GOLD. . . . It Could Be Yours!"

Packing my metal detector, I dreamed of making that imagined nugget real.

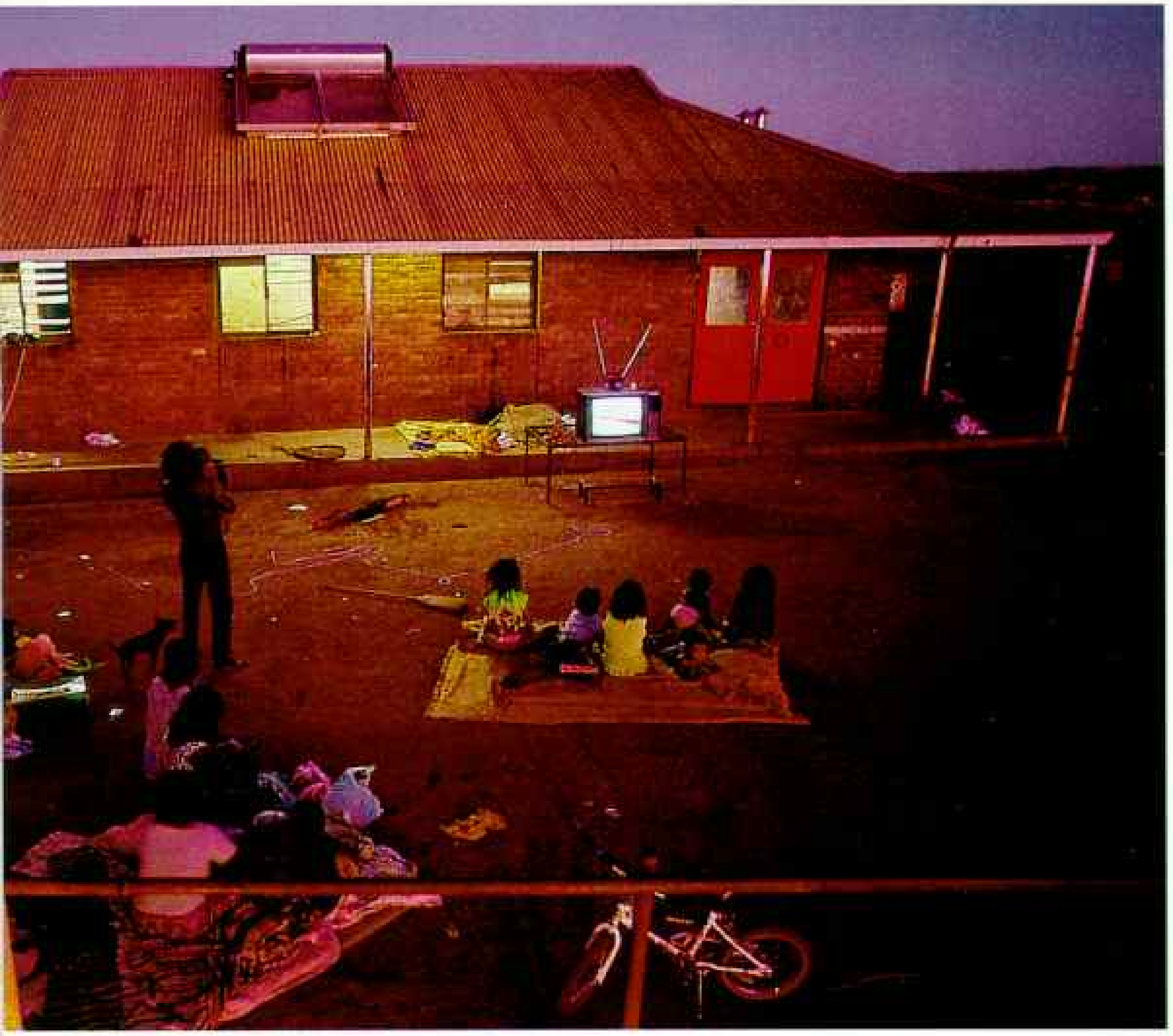
At Old Halls Creek—site of Western Australia's first gold rush in the 1880s—Mike and I bought a permit to prospect amid old diggings. Several days won us only rusty nails, tin cans, mouthfuls of flies, and burning ankles scratched by sharp spinifex leaves.

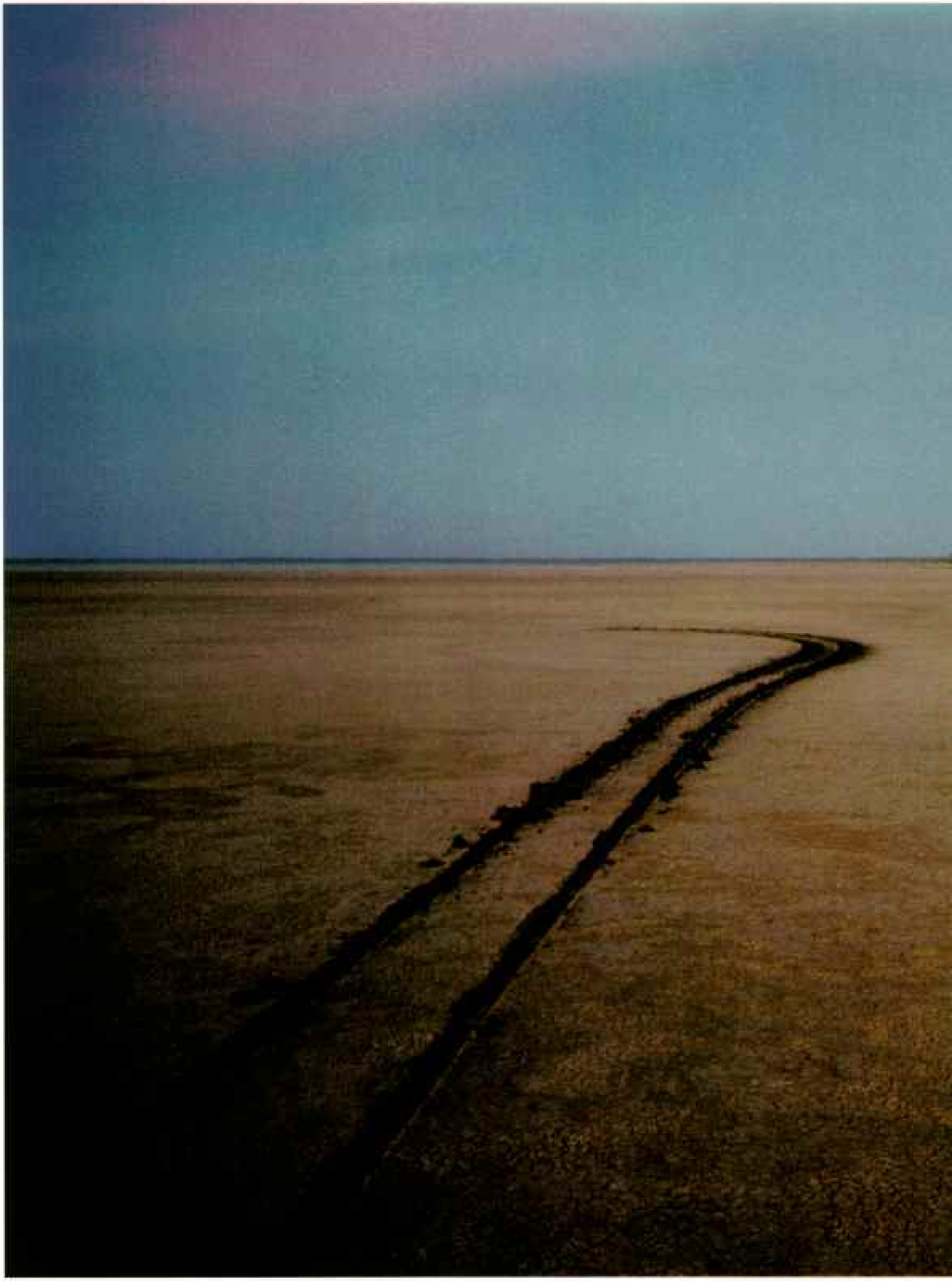
Near the town of Meekatharra—site of another gold rush in the 1890s—we were shown around a large private gold mine that was still in operation.

"But, please," a spokeswoman said, "don't identify the mine in your

AT HOME OUTDOORS, residents of the Aboriginal settlement of Balgo in the Great Sandy Desert pass the evening watching television. The government provides them with houses, but many still prefer to live in the open air and, except during winter, relegate their houses to storage.

The tiny Aboriginal encampment of Yagga Yagga, barely visible from the air (right), was formed by a small breakaway group from Balgo. Australian law permits groups of Aborigines to reclaim their ancestral lands in certain areas.





TRACKS TO OBLIVION terminated abruptly when the author's and photographer's four-wheel-drive vehicles began to bog down in tidal flats near Derby. Rather than risk being trapped in the

notoriously fast-rising 35-foot tides of the Kimberley coast, they backed cautiously out—leaving behind these wheel tracks to puzzle other passersby until the tide rolled in.

article. We have to chase off nugget hunters as it is. Gold theft is a very serious crime, you know!"

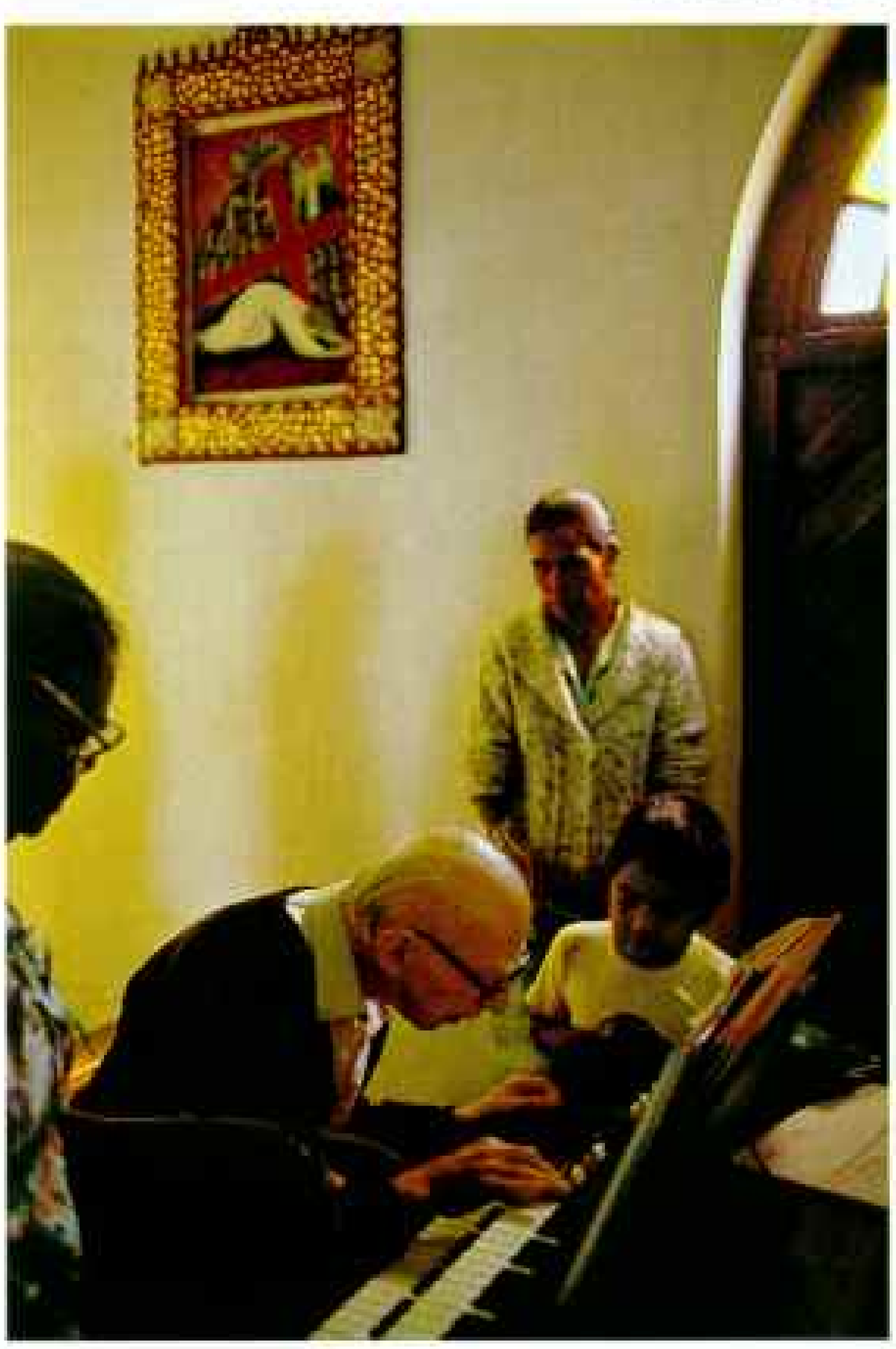
We watched caravans of trucks haul ore to a crusher the size of a building.

"We average only three grams of gold per ton of ore," she said. "It takes a lot of tons to make a profit."

At the end of the tour, I made a request: Might I, the ultimate amateur, poke about some old diggings with my metal detector?

She eyed me. "Not likely you'd find anything. The easy nuggets have been found. But . . . I suppose it's OK. One thing—any nugget you find over an ounce you'll have to turn in."

We were directed to a worked-out site where overburden was about to be dumped. For an hour our detectors probed the ground. When mine barely gave a signal, I replaced its batteries.



LIFE IS A CALLING at Beagle Bay Roman Catholic Mission on the west Kimberley coast. There octogenarian Father Francis (above) goes over organ music with his Aboriginal parishioners before being honored by them for his 60 years of service. At Kalumburu Mission on the north coast (facing page), an Aboriginal lad bears mission-baked bread as he walks the long road home.

I TOOK HARDLY A DOZEN STEPS when my machine went BONG! Two inches down I dug out a gleaming nugget half the size of a hen's egg! For another hour, until darkness fell, we searched the area. Not another BEEP much less a BONG. Still ecstatic, we took the nugget back to our motel room; the mining office had closed until morning. We fondled it, caressed it, cleaned it with a toothbrush, examined it with a magnifier. It was absolutely beautiful! A streak of red-tinted quartz ran through it—otherwise it was pure gold.

"How much do you think it weighs?" Mike asked, tossing it in his palm. "Remember, anything over an ounce we have to turn in."

In the motel kitchen we weighed it on a meat scale: THREE AND A HALF OUNCES! That night I dreamed of nuggets spewing out of the ground. Ah, yes . . . gold does something to you. My better intentions were being buffeted. Give it back? Never!

But, on waking, I knew what I had to do.

"It shouldn't have been there!" the mine spokeswoman snapped. "We combed that place." Without a word of thanks, she took the nugget. I told her I would gladly buy it.

"I'll have to talk to the owner. He's in Europe right now. Call us in a couple of weeks."

When we at last reached the owner, he shouted, "They had no authority to let you prospect on my property!"

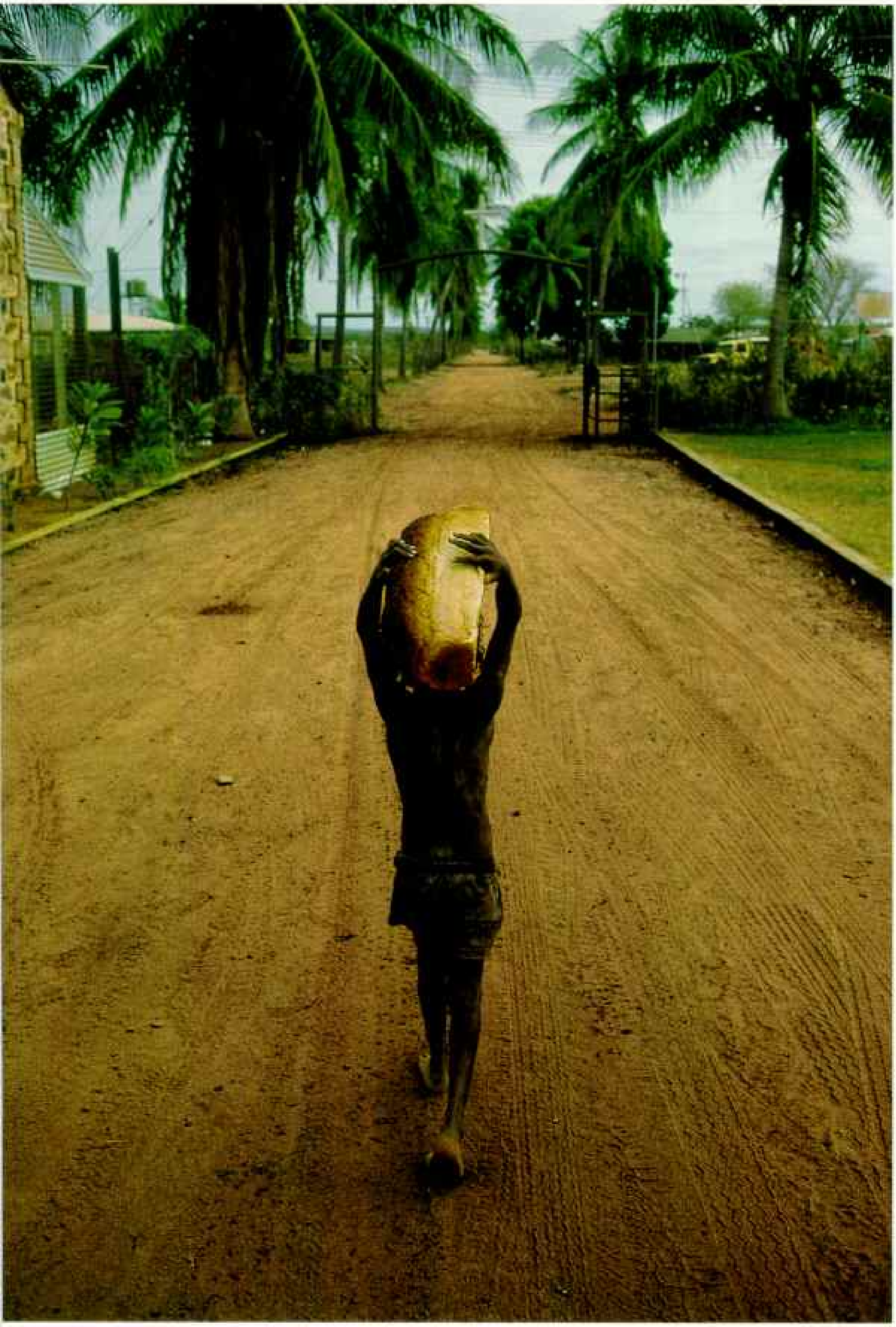
Again I asked to buy the nugget.

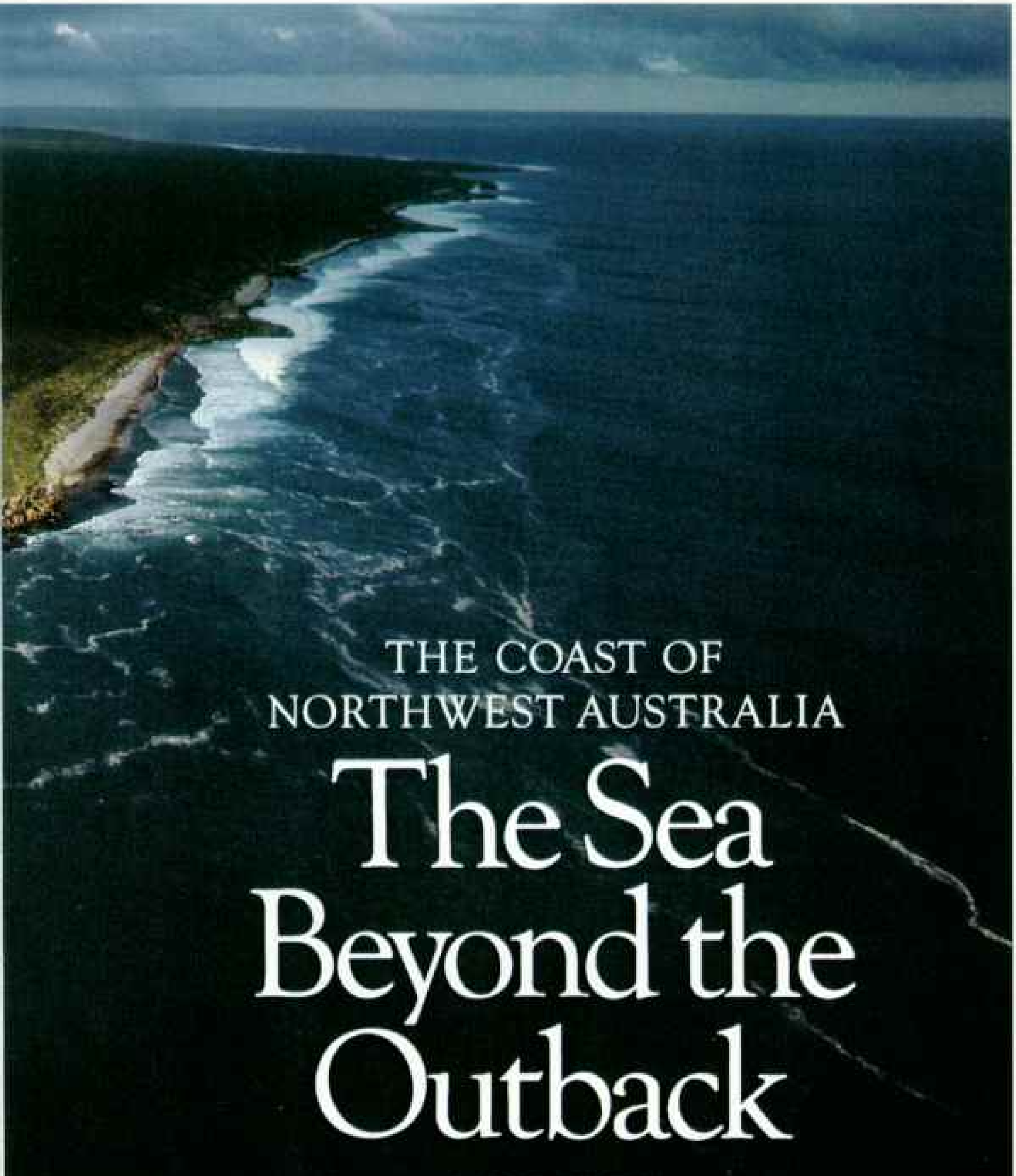
"Too late. We put it through the crusher. Do you know we have to process thirty tons of ore to get that much gold? Sorry, the nugget doesn't exist any more."

Ah, well. . . . I'd dreamed it out of nothing and to nothing it had returned. There was a certain purity to it. You may get your wishes in this Dreamtime land, but not always in the way you'd anticipated.

In any case, the real value of the nugget, it seems to me, is in the heart—my heart—where that gleaming piece of the inner outback still exists, bright as ever.

They can never crush that. □





THE COAST OF
NORTHWEST AUSTRALIA

The Sea Beyond the Outback

By RODNEY FOX

Photographs by DAVID DOUBILET

Luminous atolls, frightful storms, beaches with no footprints, and inky caverns of sea creatures great and small: All lie waiting for those with the daring to go and see. Nearly 375 years after a visit by Dutch sea captain Dirk Hartog, a schooner carries adventurers toward the island that bears his name.

HUNGER IMPELS a pair of manta rays outside Shark Bay, named for their more fearsome kin. The rays are constantly accompanied by a school of yellow-striped jacks, which feed on debris stirred up by the rays with their head fins as they

forage for plankton. Embracing 11,580 square miles of water, peninsulas, and islands, Shark Bay lies at Australia's far western end, drawing a small but growing stream of visitors since access was improved by a paved road in 1986.

THESE REMOTE WATERS were not truly explored until 1818-1822, when Phillip Parker King made the first comprehensive charts for the Royal Navy. The region is still unknown to many who live in Australia's more populated east.

IT CAME AS A SHADOW IN THE SEA, a large creature that blocked the path of the sun and for a heartbeat turned the water from blue to gray. I looked up through my diving mask and relaxed. It was not a shark but a manta ray.

Then there were two . . . three . . . no, five manta rays, birdlike devilfish with wings of angels, that flew along the edge of the reef. Each creature emerged like a mother ship, with remoras clinging to it, and one had an escort of small, yellow-striped jacks massed around its head like a halo. They paused one by one at the tip of a small coral outcrop that jutted off the reef edge.

I held my breath so my bubbles wouldn't frighten them, but my diving partner, photographer David Doubilet, did something strange: He pulled the regulator from his mouth and made a toothbrushing motion with his forefinger.

What did he mean? Then it struck me: The mantas were being cleaned. As the first one hovered over the outcrop, a team of blue-striped wrasses darted from the coral. The manta opened its mouth until it formed a white cavern. The wrasses swam inside and began to pick out bits of food, retreating quickly as the manta closed its jaws. Then it flexed its huge wings and flew slowly off, and the next one took its place. In moments the cleaning was over, and the creatures had disappeared, one after the other, into an evening sea.

When we emerged from the dive, full of wonder, the wind and swell had picked up over a tough Indian Ocean. Our boat, the schooner *Willie*, was anchored off Dirk Hartog Island, the long and dun-colored westernmost outrider of the continent of Australia. The sky was hung with gray clouds whose bottoms glowed red from the setting sun.

Tony Larard, the schooner's skipper and a seasoned guide, pointed toward the island, where the arid cliffs blushed crimson. "That's called Cape Inscription," he said. "That's where the first European set foot on Australia."

It was October 25, 1616, when Dutch Captain Dirk Hartog's trading vessel *Eendracht* sailed in from the west, discovering the island continent. To commemorate his landing, Hartog inscribed his name on a pewter plate and nailed it to a post.

"He probably thought the country was bloody awful," said Tony. "Windy, hot, dry, not much water. Useless."

Hartog headed north to Java and the lushness of the Spice Islands of Indonesia, leaving Australia to grow and prosper from its east coast. This northwest shoulder of the continent was all but forgotten. Even today it remains the ultimate frontier in a land thick with frontiers, one of the least known parts of Australia, lapped by a mysterious and mighty sea.

In part, it was the bigness of the northwest coast that fascinated me. I grew up in southern Australia and had already spent many years diving and leading underwater expeditions. In 1963 I almost lost my life to an 11-foot-long great white shark, which gripped me in its jaws for a moment . . . a moment that seemed like a lifetime. Perhaps that shark inhabited my psyche, for I have been fascinated ever since with its deep and intimidating world.

RODNEY FOX, an Australian diver, shark expert, and former spearfishing champion, writes and lectures on undersea adventure and marine biology. Photographer DAVID DOUBILET has roamed the underwater world for 20 years for the NATIONAL GEOGRAPHIC, contributing 29 articles, most recently a report on Suruga Bay, Japan, in the October 1990 issue.

The northwest held that kind of mystery and grandeur. Over the years, I had heard tales of its huge sharks and other fish, man-eating crocodiles, and 35-foot tides. And when I read that the only road through this remote territory was finally being paved, easing the way for developers and tourists and threatening to change the coast unalterably, the call became irresistible.

It would be a journey of almost 2,500 miles along a winding, empty, and dangerous edge of land. It would be no place for strangers. We would need help. The best help came from Tony Larard and his first mate and companion, Eve Adams, and, of course, the schooner *Willie*, a steel-hulled, 67-foot copy of a 1901 pearl lugger. For most of the expedition we would sail this sturdy ship; on land we would use four-wheel-drive vehicles.

Our small group was composed of me, my wife Kay, David and Anne Doubilet, their five-year-old daughter Emily, and diver and camera assistant Gary Bell.

We met *Willie* on a cold Australian autumn day at Shark Bay, 550 miles north of Perth. The schooner, with its black hull and buff-colored tops and masts, rode uneasily in the shallow anchorage off the town pier in Denham. The water, churned up by 20-mile-an-hour winds, was brown-green and milky. The wind blew harder, and the heavy clouds spat rain.

Little Emily looked at *Willie* and said in a solemn voice, "It looks like a pirate ship, a real pirate ship."

So we patiently sat on land, waiting out the weather. "The worst in living memory," a local weatherman announced cheerfully a few days later. When the wind stopped and the sea sparkled once again, we boarded *Willie* and chugged off westward across the bay and straight to the westernmost tip of Australia, called Steep Point, across from the southern end of Dirk Hartog Island. We were off.

A PERIOD PIECE afloat, the schooner Willie served as mobile base for the author and photographer on their journey of nearly 2,500 miles along the coast. Though diesel powered and made of steel, the vessel was inspired by turn-of-the-century pearl luggers that served a once flourishing industry. A red sky presaged tough going for Willie, which pitched like a rocking horse in rough weather. Although on average the coast receives only meager rainfall, cyclones can bring torrential rains.

AROUND FOUR O'CLOCK one afternoon we heard a shout from Gary Bell, perched high in the rigging. "Monkey Rock ahead!" he bellowed. "There's a cave! Excellent! Great diving!"

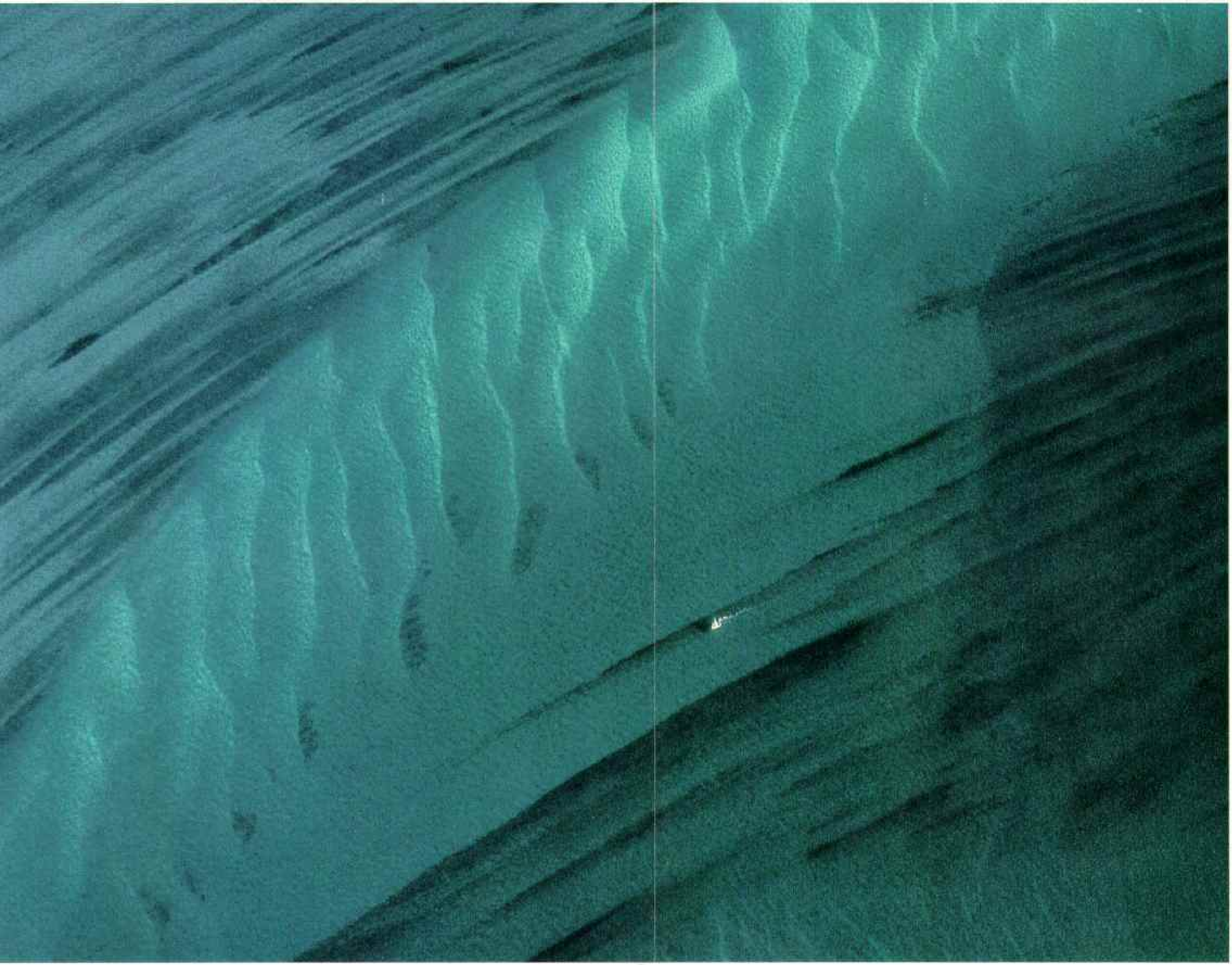
Donning scuba gear and slipping overboard, we swam over the lip of a deep hole and drifted into darker, deeper water. The entrance of the cave was about 60 feet wide, but it opened into what seemed like a spacious ballroom, and it shone with a full blue light from its two entrances. Thousands of hatchetfish swept back and forth in the surge, forming silvery curtains. The ceiling was a hanging garden of sponges, corals, and encrusted marine life. A large, orange slipper lobster wandered through the garden, upside down.

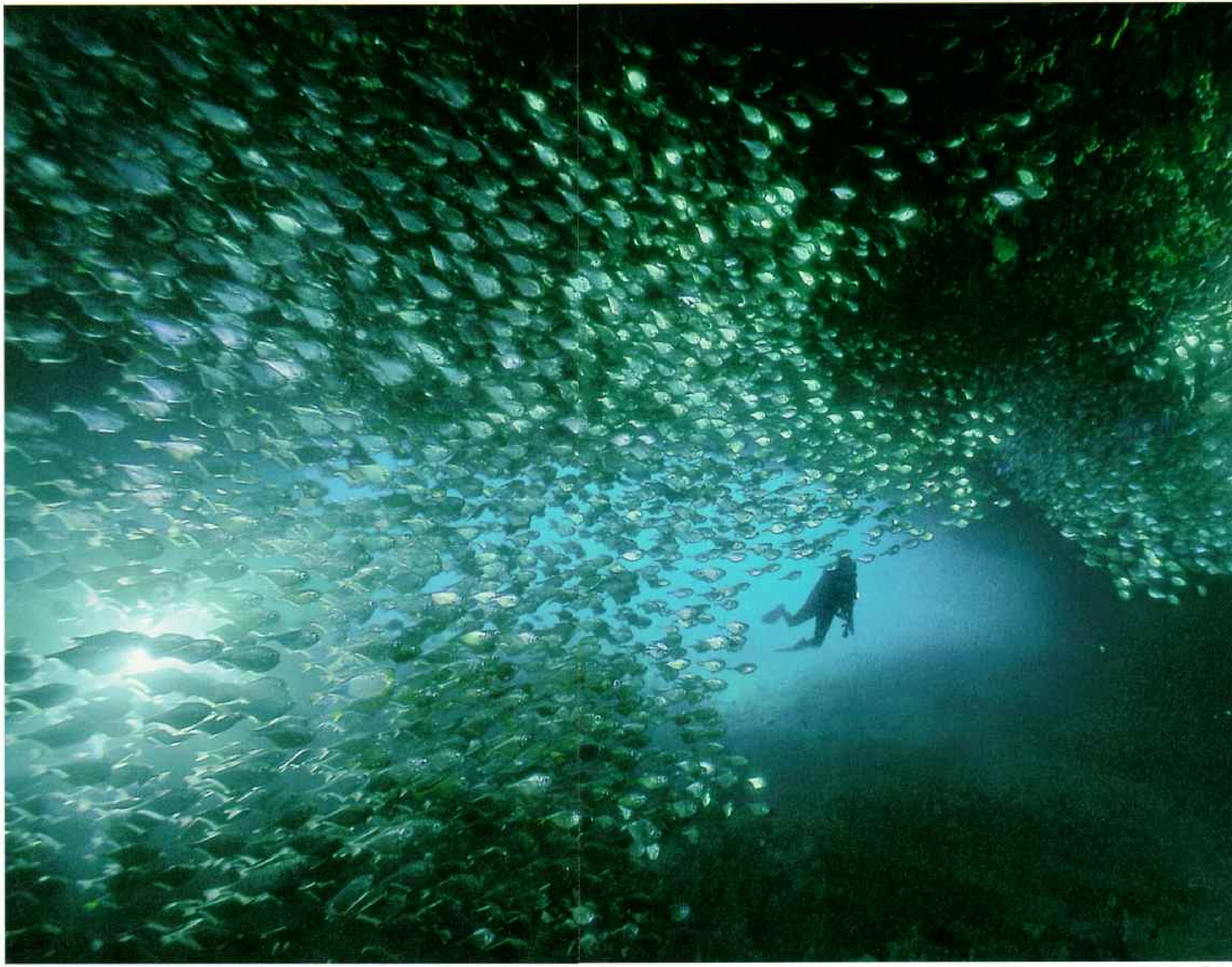
In this twilight world I saw an enormous shape detach itself from the ceiling and become a silhouette. I stopped, held my breath. It was a giant grouper, nearly six feet long, the biggest I had ever seen, about the size of a Volkswagen bug. Its pectoral fins were as big as my flippers, and its firm, dark body was heavily scarred. *(Continued on page 54)*

STARK WHITE SPECK *of a sailboat heads toward a rippled swath of dunes shaped by the tide near Steep Point in Shark Bay (right). Beneath the chubby bulk of a dugong, patches of sea grass sprout from the floor of the bay (above), home to more than a dozen varieties of the flowering plant. The grass forms a fundamental link in a food chain that includes shrimp and some 30 varieties of edible fish, basis of an important fishing industry.*

These underwater meadows also provide forage for the dugong, distant cousin of the manatee. Although Aborigines may legally hunt them, the number of dugongs in Australian waters has been relatively stable, and Shark Bay's population of 10,000 is among the world's largest. Elsewhere throughout their range dugongs are under siege for their meat, fat, and tusks; the creatures are easy prey for poachers equipped with power boats, nylon nets, and even dynamite. Compounding the threat is the dugong's slow reproduction rate. Females usually don't mate until after age nine and produce but one calf every three to five years.

The dugong's skittishness presents monumental problems for researchers. Working with a National Geographic Society grant, biologist Paul K. Anderson of the University of Calgary recently discovered that males stake out barren pieces of territory called leks. They vigorously defend their leks in hopes of attracting females, which venture forth only to mate. The intrusion of a challenger can mean violent combat between males, behavior that contradicts the popular image of these mammals as gentle giants.





SILVERY NEBULA of bull's-eye fish swirls about near Monkey Rock off Dirk Hartog Island in a cavern lit by hand-held lights.

"The fish spend the day inside the cave hiding out from predators, then explode out of the cave at night like bats to feed," says photographer David Doubilet.

He had his own quick trip out of the cave when a sudden tidal surge carried him, helpless, 50 feet to the surface. Then another surge carried him back down, depositing him exactly where he had begun.

Inside the cave an orange-spotted grouper strikes a defensive pose, exposing the opening to its esophagus and rows of gill rakers, used to direct food away from the gills. Cleaner shrimp and tiny fish called wrasses watch for such a yawn as a signal to enter and pick parasites from inside the carnivore's mouth.

(Continued from page 47) I badly needed to breathe, but held on.

With hardly a movement of its tail, the grouper slid forward to expose another enormous grouper, even larger than the first. Both fish regarded me coldly, their big, black eyes moving nervously, their fins slowly backwatering and their huge mouths twitching. But I finally had to breathe, and the bubbles broke the spell. The two old-man groupers turned abruptly and swam, with great dignity, out of the cave and down the reef.

Above, on the surface, the wind picked up, and the swell from the open Indian Ocean grew in mass. Hovering at a depth of 50 feet near the entrance to the cave, we were setting up to shoot a wide-angle vista. Just when everything was set, I felt a pressure on my eardrums. A huge swell had coursed down the reef, pushing an enormous amount of water through the cave, turning it into a kind of giant expansion tank. Instinctively Gary and I held on, but David, in mid-water, had nothing to hold on to except his camera and was flushed out of the cave.

"One minute I was taking a picture," he recalled later, "the next I was being pushed by a giant, invisible hand to the surface. I exhaled like a steam whistle so I wouldn't burst my lungs. The sea seemed to pause to take its own breath, and then that enormous hand, the backwash of the swell, returned, and down I went. It deposited me exactly where I started in the first place."

LOCAL DRIFTER floats above stromatolites in a shallow and salty area of Shark Bay called Hamelin Pool. Discovered by a team of Australian and French scientists in 1989, the jellyfish was christened Phyllorhiza peronlesueuri; *it has been found nowhere else.*

Tucked between the mainland and a peninsula and hemmed in by sandbars, Hamelin Pool gets negligible freshwater runoff and little tidal action, leaving the pool with water too salty for most marine life.

These conditions are ideal for the

growth of stromatolites, which lie on the sandy bottom like boulders. Stromatolites are built with monumental slowness by threadlike algae that trap sediment as they grow.

Among the oldest evidence of life on earth, stromatolites originated some 3.5 billion years ago. Most stopped growing with the appearance of algae-eating organisms, surviving only as lifeless architecture. But with few algae-eaters, the Hamelin Pool's stromatolites began growing 4,000 years ago when the bay was formed, and they are growing still.

These great swells ended the dive; they were humbling. On this fault line between a continent and an aggressive and unpredictable ocean we were, after all, intruders.

Denham, the main town of the shire of Shark Bay, has a permanent population of 450, but the annual tourist migration is already 160,000 and growing fast with the new road. Almost everyone visits Monkey Mia, where for nearly 30 years dolphins have come regularly to the same beach, apparently to make contact with humans.

When we arrived, the beach looked normal—towels, children, suntan lotion. Then came the loud cry: "The dolphins are in!" People waded thigh deep into the water, and a group of dolphins glided past them only inches away, letting themselves be touched and rubbed underwater. The people seemed elated; the noise they made was a mixture of sighs and murmurs that came out as a soft lullaby.

David, with special permission, was snorkling and photographing in the shallow water. "I heard only creaks and clicks," he mused later, "the sounds of dolphin sonar. These were wild creatures that were visiting human beings. And I wondered, who was entertaining whom?"

Sometimes a dolphin paused to lift its head from the water to regard a human face, staring sideways with that mild and enigmatic dolphin smile. The smile, of course, is permanent, and the skin around a dolphin's eyes is crinkled, giving the deceptive but irresistible impression of constant warmth and humor.

One Japanese woman could not restrain herself. With a choking cry of "I love you, I love you," she leaped at a dolphin and threw her arms around it. The dolphin shrugged and slipped away.

Said ranger Tom Pepper, who keeps an eye on things at Monkey Mia, "A couple of years ago a lady was standing right here when Puck, a young female dolphin, swam up toward her with a fish in its mouth. Puck was nodding its head as if to say, 'Take it! Take it!'

" 'What am I to do?' she says to one of the rangers.

" 'It's a present,' he told her. So she took the fish—a nice-size bream, still alive, with a few teeth marks on it. 'Once they bring in a fish like that, you should take it,' the ranger said. 'It's only polite.' "

SHARK BAY is a large, secure sanctuary for the dugong, one of the world's most elusive marine mammals. Dugongs are related to manatees; both creatures are popularly known as sea cows. Dugongs graze on sea grasses and thrive here, because in this shallow area grow some of the largest sea grass beds known. There are as many as 10,000 dugongs in Shark Bay, but with the combination of wind and rough water they can be very hard to find.

But one glorious morning the sea around the southern end of Dirk Hartog Island flattened to a plate of glass, and we could see clearly to the bottom. I put on a warm sweater and with binoculars in hand climbed the mast of *Willie* and scanned the surface. In the distance two brown, lumpy bodies rose and took a breath. Dugongs!

We launched the dinghies and motored out toward the sea grass bed. We cut the motor and drifted over the edge of the grass in silence. Not more than ten feet away, a pair of dugongs hung suspended, like blimps, just under the water surface, then glided slowly away. They were at least eight feet long, with skin as tough looking as that of an elephant, their distant cousin.

"Tiptoe with your fins, Daddy," said Emily. "Please don't scare them away."

David slid silently into the water with his camera. Not many divers have ever swum with these shy but powerful animals. He began to snorkel quietly toward the brown humps; the noise of a scuba system would have scared them. Carefully, he dived and swam slowly underwater. We could see this quiet ballet—David and the dugongs wavering together as the water surface rippled.

Occasionally the dugongs would stick their heads up to breathe with piglike snouts, peering about with small and beady eyes. One surfaced near the other dinghy, in front of Anne. "He had such a kind face," she reported later.

The dive was exhausting. David climbed back into the boat, muttering in excitement and frustration: "I think I got a shot," he said, "but they're shy, very shy."

It is hard to believe that this creature figured in the origin of the legendary mermaid. Voluptuous mermaids have been part of sea mythology for centuries. But how, even after months at sea, could the dugong look desirable? It was just a legend, after all.

Little Emily had never heard the mermaid legend, but that evening she sang a small song she had just made up, over and over. With our engines off and drifting, her voice carried across the water:

She married a dugong, she married a dugong.
The dugong died, and she cried.
She married a dugong.

FROM SHARK BAY we took to the coastal road, while *Willie* followed our route by sea, to meet us later. We drove north to North West Cape, an 85-mile-long arm of the continent that hooks into a very blue and wild Indian Ocean. Its west coast holds a great Australian secret: a clear-water reef that stretches the full length of the cape and rivals that other reef on the opposite side of the continent, the Great Barrier Reef. But the Great Barrier forms anywhere from 40 to 150 miles offshore; the Ningaloo Reef here is only a step away from land. Park your car; you don't have to lock it. Put your fins on, and "Bob's your uncle"—you're all set.

Along this coast, seven to nine nights after the full moon each March, a mass spawning of coral occurs in a sudden explosion. "This is one of the most spectacular shows in nature," Australian coral scientist Chris Simpson told us at Coral Bay.

Thousands of bundles of eggs and sperm are ejected together (pages 58-9), and the night sea swirls in potent pink clouds. Fertilization occurs about an hour or so after the release, and about 36 hours later larvae are formed that drift with the current for four to five days. Those larvae that don't end up in deep water, or are not eaten, will settle down to form new coral colonies.

"Do you realize," Chris reflected, "that this little polyp has built continents of life beneath the sea? We know so little about our oceans. The knowledge that the coral reefs of the eastern Indian Ocean mate and reproduce in two or three nights is less than ten years old. And this is the life cycle of one of the largest living things on our planet."

North of the cape the land took on an unfinished look. Red iron-ore-bearing rocks thrust out of the ground. Hills and small mountains seemed built up by bulldozers, not molded out of time and weather as on the rest of the planet. Ninety miles inland, the great Hamersley iron-ore range begins. From the red-dust coastal towns of Dampier and Port Hedland, this vast mineral wealth is shipped out to the world.

A DAY AT THE BEACH for a dolphin named Holey Fin includes a look at the humans and excellent prospects for a free fish dinner. She and a half dozen or so companions show up daily at water's edge off Monkey Mia. Several hundred tourists show up too, eager to feed and pet one of the visitors. The regulars usually include five female dolphins, some of them with calves by their sides.

The dolphins seem to come for human contact as much as for food, since there are ample fish in

surrounding waters. Some develop preferences, relishing herring, for example, but rejecting butterfish. "I believe it's up to the regular dolphins whether to allow others to accept food," says ranger Sharon Gosper. "They appear to have some sort of pecking order, a social structure."

Human proximity is not without a price. In 1989 a dead calf was found in the water. Six other dolphins failed to reappear and were presumed to have died. Tests implicated pollution from a septic tank, since removed from the beach.

The waterfront of Dampier looked wrecked when we arrived. An ocean tugboat perched dry on a rock. There were buildings without glass, stores without signs. Two months earlier a cyclone had raged through the town.

At low tide I spotted a 325-foot-long, 15-foot-tall steel cage, high on the sandy-muddy beach. It was not some mangled piece of offshore oil-well gear; it was an antishark swimming cage for the municipal beach. Here the swimmers, not the sharks, are caged.

"Not exactly a tropical paradise," Kay said slowly, shaking her head.

Dampier is headquarters for the Woodside Offshore Petroleum Company, a monumental industrial complex surrounded by emptiness and fed by one of the world's largest gas-production platforms, the Rankin A (pages 60-61). The platform stands on giant legs in 435 feet of water, tapping natural gas from beneath the continental shelf 85 miles offshore.

David and I would be the guests of Woodside as we attempted to dive under the Rankin A platform, a site said to hold lush coral growth and prolific sea life. When we arrived, public-affairs officer Cliff Leggoe rolled off mind-boggling statistics in an everyday tone of voice.

"There are 11 trillion cubic feet of natural gas under the North West Shelf," he recited. "Woodside Petroleum has signed 20-year contracts with both the state of Western Australia and *(Continued on page 64)*

Like clockwork, coral spawn floods the sea

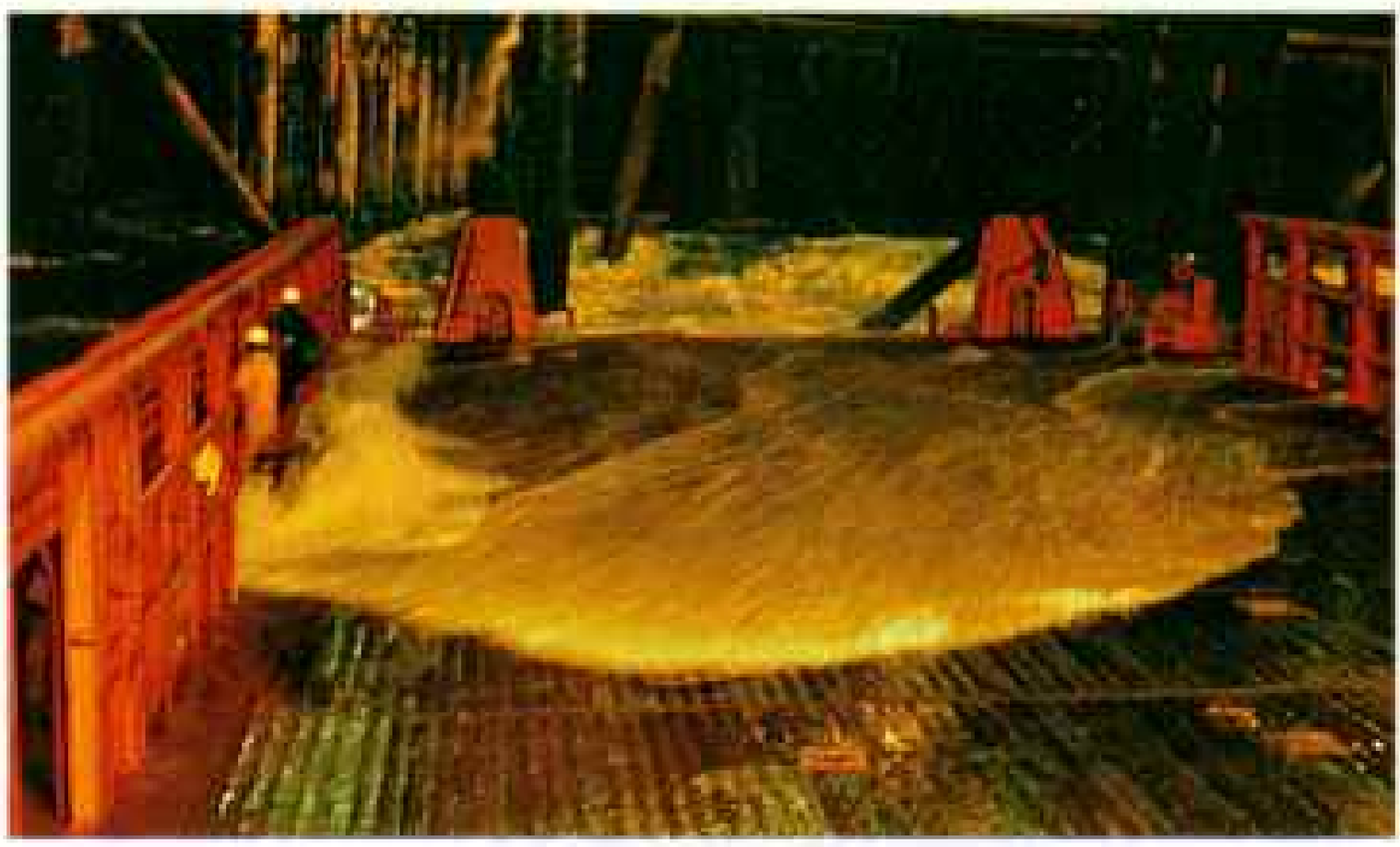
AS IF CELEBRATING NEW LIFE, branches of a hermaphroditic coral eject a flurry of spawn that swirls like confetti off Ningaloo Reef (above right).

Bundles containing both eggs and sperm show through the translucent bodies of polyps of another colony (top), then burst forth as pink globules (above). Massed on the surface (right), coral spawn forms a slick that gives off a sickly sweet aroma.

In its timing for the release of eggs and sperm, the coral seems to conspire with the moon, the tides, and the dark to increase the chances of its progeny's survival. Globules are released on a neap tide, when water levels vary little, and at night, when few predators are hunting.

Spawning occurs each autumn in the Southern Hemisphere, usually after the March full moon; in March 1989 it began three days early. A spring high tide carried the spawn to the coast, where it formed massive slicks. Mistaking them for industrial pollution, observers called radio stations demanding to know the source.

The coral larvae that survive drift along and attach themselves to dead coral or other hard surfaces to establish new colonies.

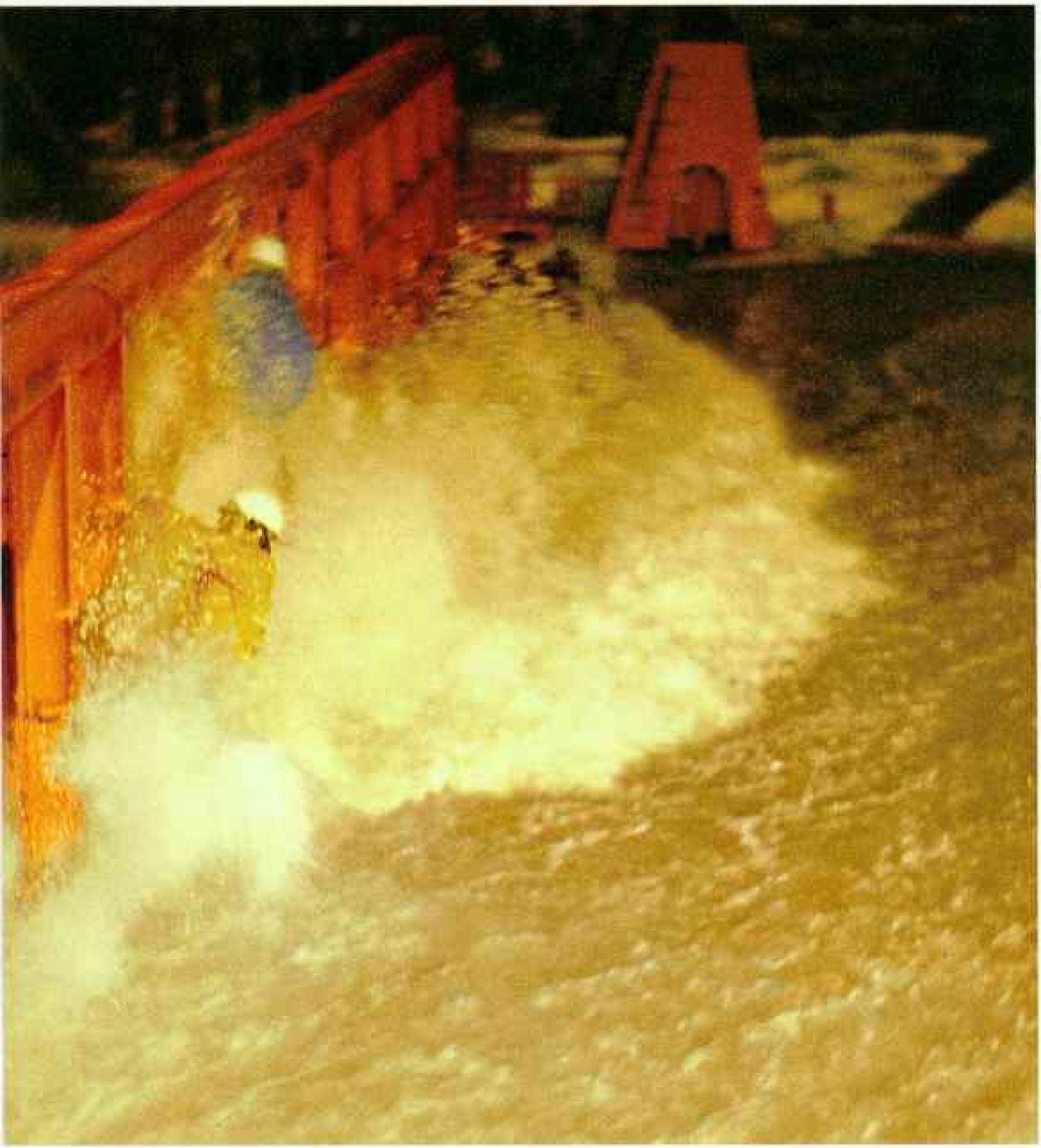


Tapping natural gas from a storm-lashed rig

DOCKING at a steel island, the supply ship *Shelf Supporter* eases toward a mammoth natural gas rig on the North West Shelf (top). Ready to transfer supplies, two workers were caught by a surging wave (above) and fought to keep a handhold (above right). The unloading resumed four nights later on an evening of routine hazard.

The Rankin A rig represents a huge investment in Australia's bid to become self-sufficient in energy. Sitting in 435 feet of water 85 miles from the mainland, the platform was built to withstand the winds of an area called Cyclone Alley, where devastating storms rush in from the north. Even in milder conditions, gale-force winds can blow for weeks on end with little respite. Inside, living quarters house a crew averaging about a hundred workers, rotating off and on in six-week shifts.

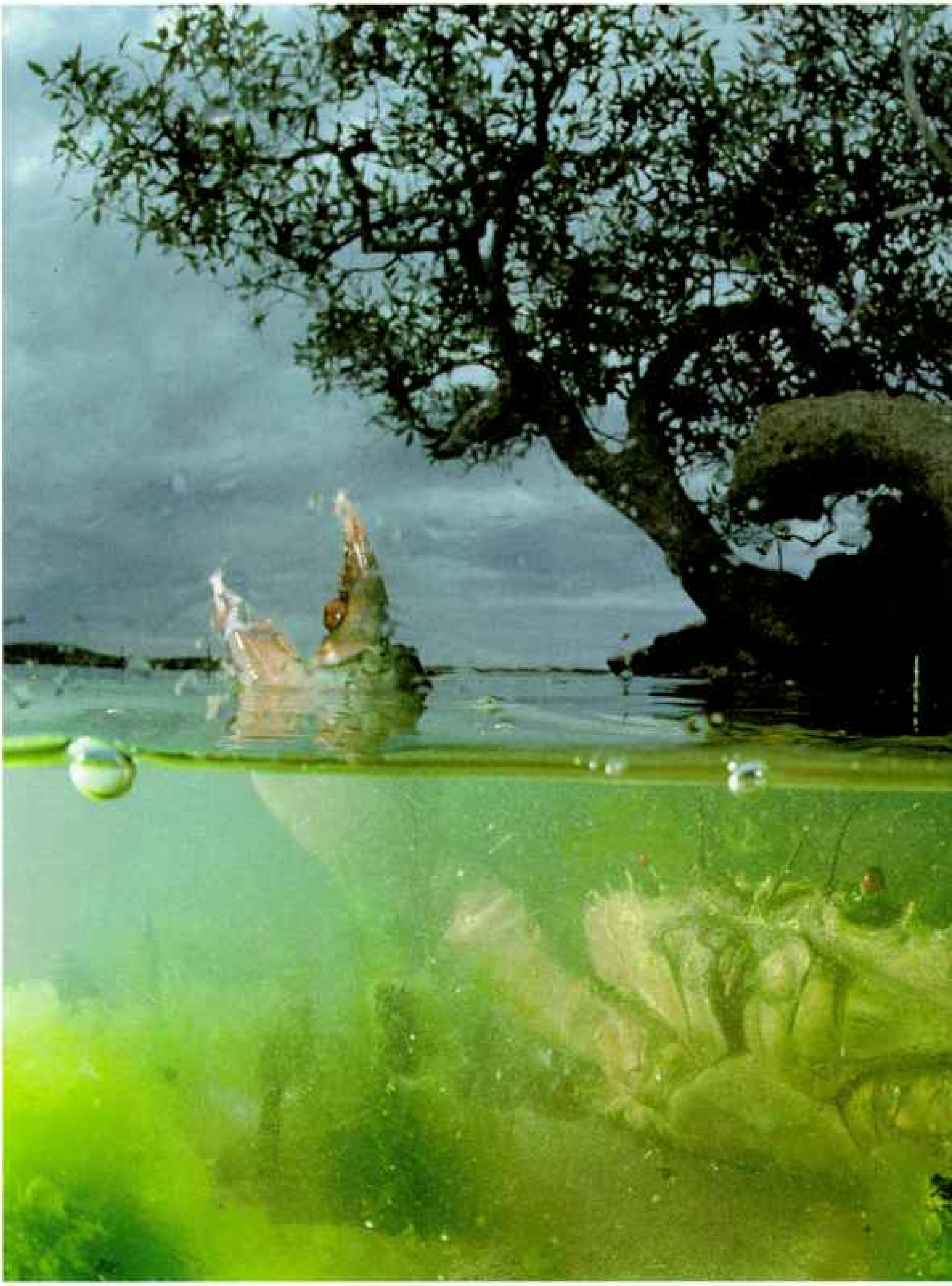
When the Australian firm of Woodside Offshore Petroleum first explored the North West Shelf in 1963, it hoped to strike oil. Eight years and 11 dry holes later, the company had found no oil but the first of a chain of



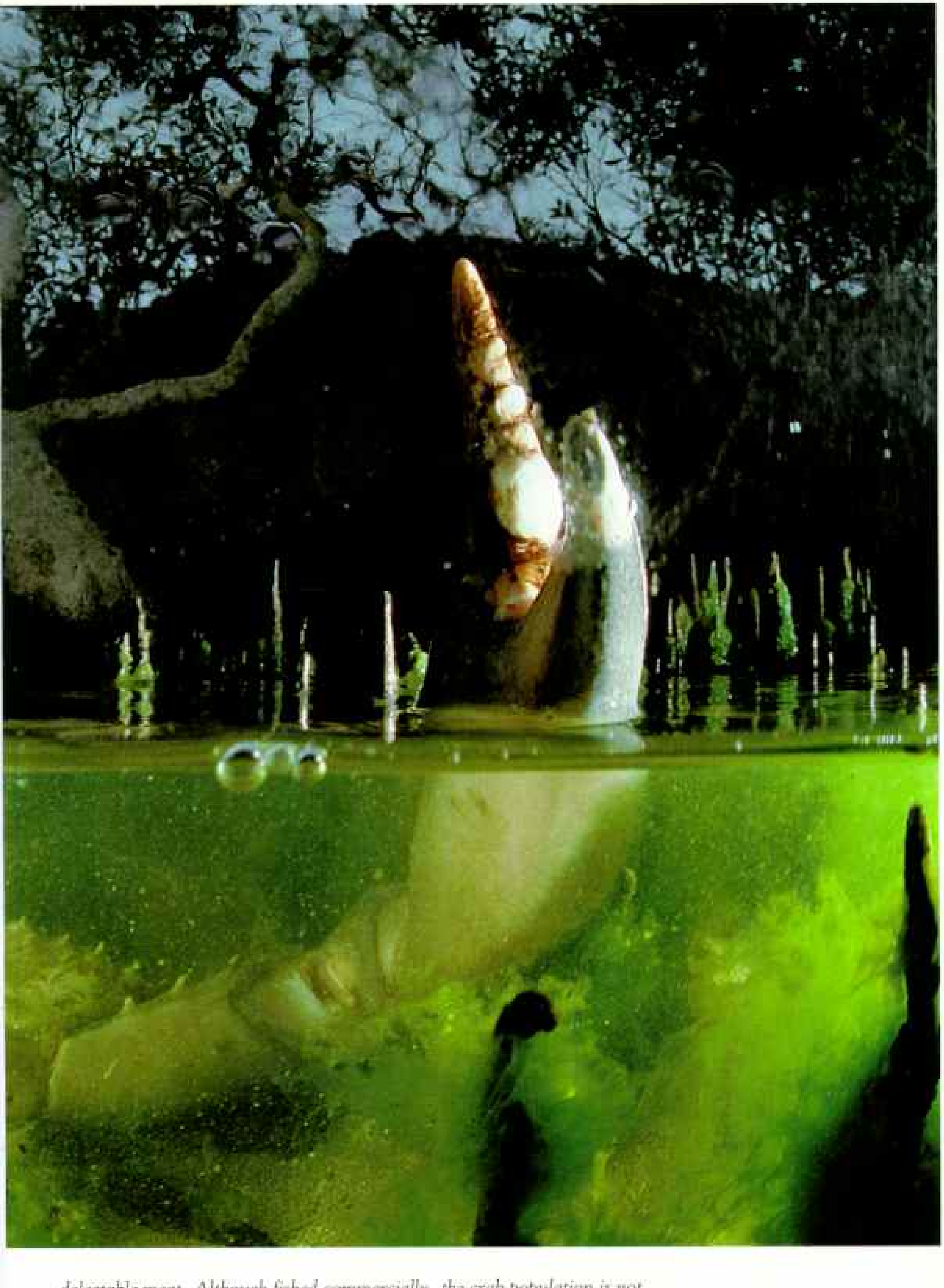
fields that hold an estimated 11 trillion cubic feet of recoverable natural gas. Production is now marketed by a consortium of companies.

A pipeline on the seafloor takes the gas to a plant near Dampier. Some of the gas is reserved for iron ore plants in the Pilbara region. An overland pipe carries an allotment south to Perth, Western Australia's only metropolis. The Dampier plant also cools gas to minus 322°F to produce liquefied natural gas (LNG).

Much of the production is shipped to Japan. Australia remains a net energy importer, especially of petroleum, but is counting on the North West Shelf project to lessen dependence on foreign producers.



AN IRRITATED MUD CRAB rears up when approached near a clump of mangroves in the Monte Bello Islands. With a reach spanning as much as four feet, the giant is armed with nimble claws that are filled with



delectable meat. Although fished commercially, the crab population is not threatened on these remote, uninhabited islands, off-limits to humans since British atomic tests in the 1950s and still periodically tested for radiation.

(Continued from page 57) eight gas and electric companies in Japan. When gas comes ashore here, it is chilled to minus 161°C—minus 322°F—and shrinks down to about 1/600 of its normal volume."

On Woodside's tender ship, *Shelf Supporter*, so big that its giant after-deck could have held four *Willies*, David and I headed for the platform. The sky was mild, empty, and blue, but as we passed the harbor the wind began to blow—howling easterlies off a hot, dry, desert continent, blowing over an empty ocean at 40 miles an hour.

On the oversize bridge, Captain Jim Kinniburgh told me with a trace of a Scottish burr: "Our job is to supply the platform with drilling equipment, food, everything. But we also have to stand guard 24 hours a day in case something goes wrong and they have to abandon the platform in a hurry."

AT DAWN WE REACHED the Rankin A platform, towering 15 stories above the sea, hissing and venting plumes of steam. Fifteen-foot seas smashed into its massive legs, and the place where we were to dive was bursting in spray against the rising sun like a boiling caldron. Captain Jim slowly shook his head. "Not today, lads," he said, "not today."

And not the next day. As the sun rose out of a cloudless horizon, the wild easterlies blew harder. The seas swelled to 20 feet. The cook had to put the pans, hot from the oven, on the floor; they were too dangerous anywhere else. We waited; four days passed. I paced and slept, restlessly. It was too rough to unload our supplies, let alone dive.

"It's like being in a steel prison on a roller coaster," I said to David.

"Uh-huh," he granted, "but in prison you can't drown."

But the supplies had to be delivered, and one restive night Captain Jim cautiously backed *Shelf Supporter* to the platform to unload a few ten-ton steel boxes. The wind shrieked, the gas flame roared, and the Rankin A platform itself loomed above us. The ship's deck heaved, awash with water. Riggers lurched about in the dark, keeping one eye on the wildly swinging 2,000-pound crane hook being lowered from the platform.

On the bridge Captain Jim jiggered the controls with athletic

artistry, and the big ship pivoted and turned on the waves like a dancer. "We don't use a wheel any more," he said calmly. "This joy stick is like the one they have in a fighter plane."

Our turn came, too soon, to transfer from the ship to the platform in what looked like a basket that dangled and spun on a cable winched across the roiling ocean, and up 15 floors to the top. We were clinging to the rope netting on the basket. David's eyes were urgent. Our knuckles were very white.

The Rankin A platform had been severely tested when tropical cyclone Orson stormed through in 1989. It was the most intense ever seen in Australian waters, with winds gusting as high as 158 miles an hour.

Officer Ivan McMillian remembers emerging from the building when the storm was over. "We stepped out into a weird world," he said. "What seemed like a purple curtain shrouded the platform, and we were surrounded by neon flashes of lightning. Hundreds of birds—exhausted and bedraggled looking—had taken refuge on the platform. Huge swells rushed around in all directions. But there wasn't a breath of wind."

We never did dive around the imposing legs of Rankin A, and our departure in a big helicopter seemed like a luxury. We could see *Shelf Supporter* hundreds of feet below, still dipping and bowing into the big swells, still rocking, still on station.

A RAGGED COASTLINE washed by stupendous tides defines Western Australia's northernmost reaches (map, opposite). Anchored on the continental shelf, a trio of atolls at Rowley Shoals, including Mermaid Reef (above left), keep their heads above water. They continued to grow upward as the shelf began subsiding ten million years ago. Fringed by white breakers, the reef is broken by a gap through which receding tides rush at up to ten miles an hour.

Poised above a sea fan inside the gap, the potato cod embodies Aussie camaraderie in the extreme—a fish so gregarious that it eats from divers' hands, follows them like a dog, and becomes ridiculously easy prey for fishermen.

BEYOND DAMPIER, the great shoulder of the coast curves around toward the east to the rugged but beautiful Kimberley region—with its coastline as complex as the lines of a brain coral—and the 200 islands and reefs of the Buccaneer Archipelago. This was familiar ground for Tony and Eve, who had guided *Willie* through this maze many times before. We visited islands thick with boobies and caves with ancient Aboriginal paintings. We even went fishing with an Aboriginal family from the Bardi group.

The Bardi are perched on One Arm Point, at the outer end of King Sound, where roaring tides are a way of life. They survive, like most Aborigines, with a blend of modern technology and age-old tradition.


IC02

HARM'S WAY lay every which way when Willie was sent spinning about in a churning passage leading to Secure Bay on the coast of the Kimberley region. Perched in the rigging, author Rodney Fox looks out for whirlpools born of 35-foot tides rushing through the narrow entrance, safely negotiated after several heart-stopping turns.

Down the coast, the corrugated terrain of the Kimberley extends into the sea as fingers of land flanked by drowned riverbeds.

One of their few surviving elders, 68-year-old David Wiggins, told us something of the past after we had anchored *Willie* in their harbor.

"We used to use rafts made of mangroves pinned together," he explained, "and float from island to island on fishing expeditions, using ingoing and outgoing tides. But when the white man introduced us to dinghies and outboard motors 40 years ago, we never looked back. It made our travel and fishing much easier."

The water off the Kimberley was a milky blue-green, a color that I'd never seen anywhere, and it lapped a coastline made of red rock, green-gray gum trees, and coastal barriers of mangroves. It was neither jungle, nor rain forest, nor desert. It was a place that looked like no other on earth.

The outrageous height of the tides—as much as 35 feet between high and low—had been unimportant while we were under way. But now at night we had to anchor in at least 40 feet of water, or we might wake up stuck in the mud.

"In a place called Secure Bay," said Tony, "there's a narrow outlet where the outflow of tidal water is so intense that some developers were looking at it for hydroelectricity."

We motored inland among the mud flats, as sage green water drained from mangrove swamps in discolored swirls, and into the entrance of Secure Bay through an opening called "the funnel." We came out into a magnificent natural harbor, nearly a mile wide.

"But this is not a harbor," insisted Emily. "There are no houses. We haven't seen any houses for days." She was right: no signs of human habitation, not even wheel tracks. We were totally alone. We slipped through one more bottleneck entrance and anchored.

It was a calm, warm evening, and we enjoyed a thick barbecued steak and a flavorsome Australian cabernet sauvignon followed by crepes, fried bananas, and maple syrup. Lounging on deck that night, Eve noticed something odd. "I've been looking at the Southern Cross," she said, "and it keeps changing position on me."

Willie was turning at anchor.

PREDAWN, we were awakened by the crunching sound of our dragging anchor echoing through the chain lead. Tony leaped to start the engine, shouting, "Pull 'er up! Pull 'er up!"

The anchor was hog-tied by twisted knots in its own chain. The tidal movement through the night had created a continuous circular eddy where we had moored.

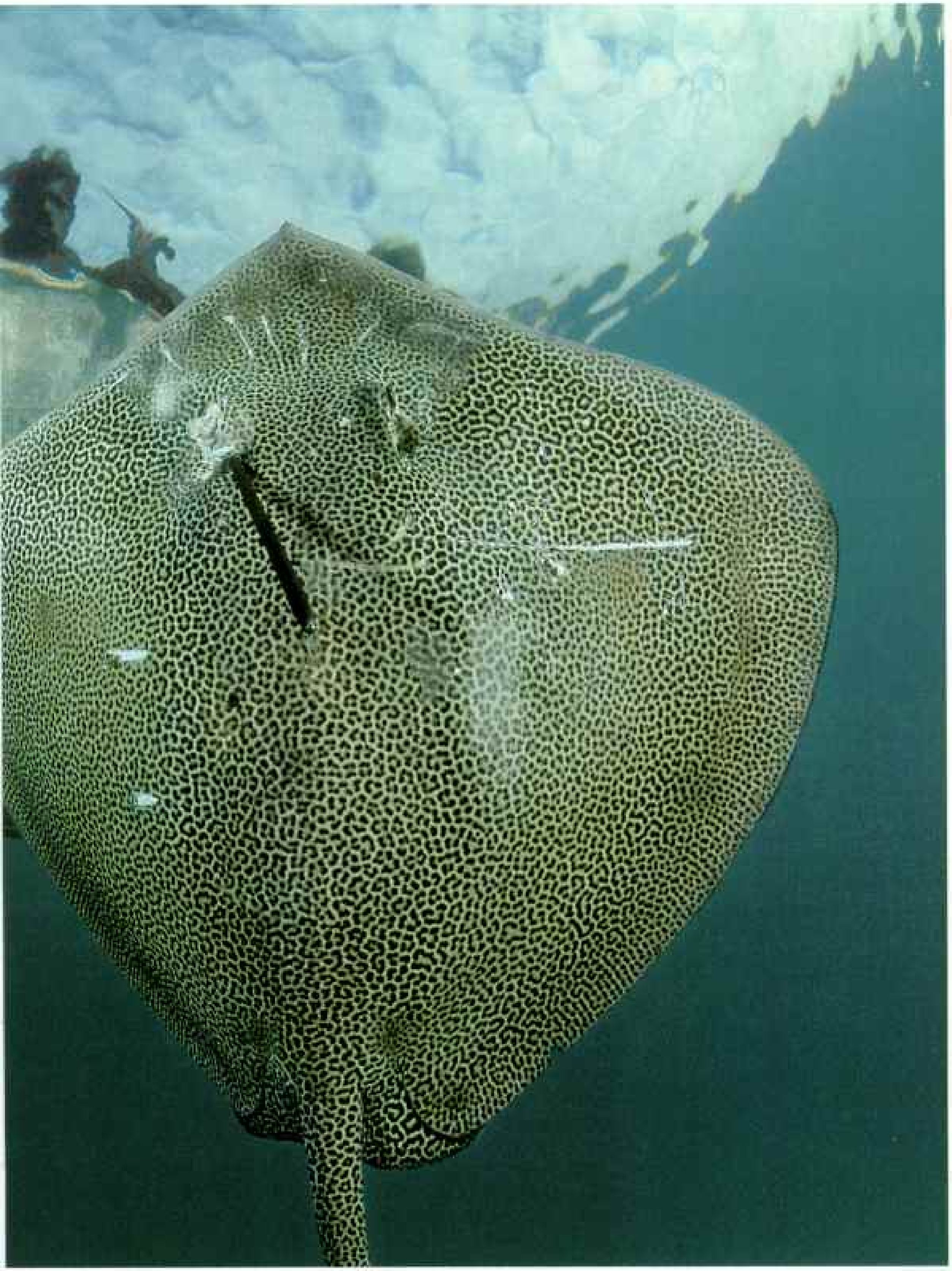
A floating, full-size mangrove tree, nearly 15 feet long, sped by and was sucked out of the entrance to the bay with the falling tide.

With nerves jangling but anchor aboard, we edged *Willie* into the current and were swept into the center of the funnel-shaped outlet, tearing through the water faster than I had ever traveled in a sailboat. High red cliffs raced past. We neared a rocky outcrop that choked the flow, and I could see white, swirling water.

Whirlpools began to form around us like mini-cyclones. *Willie* lurched into the turbulence, shuddered, and took a large wave of white foaming water to the starboard bow. One massive whirlpool snagged us, forcing us straight at the cliff. Suddenly we were going sideways down the stream.

Tony fought with the wheel, grinning broadly as if this was great fun. "Don't worry," he exhorted his schooner, "don't worry. Watch 'er come around now! Hang in there! Hang in there!"

A *FINAL SPEAR THRUST* *by a member of the Aboriginal Bardi group bags a stingray bearing the wounds of earlier attempts. The Bardi once hunted these waters of Hunter Creek from rafts made of mangrove logs. The*



700 members of the group are legally permitted to hunt rays and turtles, as they always have, although their traditional ways have been amended by metal-tipped spears and motor-powered aluminum boats called tinnies.

For a paralyzing moment we lost steerage. Tony throttled off, and we spun completely around, ending up with the bow pointing in the right direction. He shoved her into full throttle, and we were off again.

Moments later we slid into the wider expanses and calmer water of the bay.

"First time I was here," Tony told us, "Bob Richards from the Western Australian Museum was going through in a 12-foot dinghy with an outboard motor. A whirlpool sucked the entire dinghy down, and all you could see was the peak of the bow going round and round. There was nothing we could do to help him. Nothing. Then the dinghy popped out of the whirlpool, full of water but with just enough buoyancy to keep it afloat. Bob was still sitting in it. His face was as white as a sheet."

DAPPLED LUSTER of the trochus (below) inspired a cottage industry among the Bardi, who sell the mollusk's meat and make jewelry from the shell. Demand for the shells in the Orient has led to unlicensed harvesting by Indonesian and Malaysian fishermen—and a headache for authorities. A confiscated boat sits aground on a beach crossed by stranded fishermen.

DIRK HARTOG had been right in one thing—the place wasn't fit for man. Or, maybe man wasn't fit for the place. Sailing northeast, we passed the site of a trial settlement first explored in 1838 by Sir George Grey. Almost nothing remained but a couple of crumbling stone walls and a rusting old plow.

"Three shiploads of settlers from the eastern coast of Australia got here in December 1864," Tony told us. "After every possible natural disaster—flood, drought, extreme heat, insects, crocodiles, sharks, sickness, shipwrecks—they had had enough. The settlement was abandoned within ten months of its beginning. They called it Heartbreak Harbour."

On tiny Sheep Island, used as the burial site for the lost souls of the settlement, I found the stone grave marker of one Mary Jane Pasco, who died at the age of 30 on June 14, 1865, from infection following childbirth. Another stone plaque, faded and difficult to read, was in memory of a 29-year-old man who died after he was speared by Aborigines.

I set out alone to walk around the island between the high and low water marks, but this tidal belt is a treacherous no-man's-land of mud flats, slippery rocks, and swamps, almost impossible to walk on. Halfway around the island I slipped and fell heavily. For minutes I lay there, stunned, in pain and unable to walk. God, it was a lonely feeling! Nobody knew where I was. I was overwhelmed by the absolute isolation of this place.

And my heart ached in memory of those pioneers who lived, struggled—even had babies—and died in a land of such uncompromising bleakness that ten months was all they could withstand.

Back on *Willie*, with all its comforts of modern living, we set sail up Prince Regent River and without the motor running enjoyed the peace of our isolation. Three and a half hours later we arrived at King Cascade, a waterfall flowing from a 160-foot rocky cliff and splashing off five or six ledges on its way to the tidal river below (facing page).

Tony moored *Willie* against a rocky ledge redolent with hanging ferns and lush green tropical bushes. Within arm's reach of our deck was pure, clean water—thousands and thousands of gallons rushing down! We had been on water rations for most of the voyage, so we gleefully topped our tanks and washed our dirty laundry.

Anne and I, in our bathers, stepped off the boat onto a rocky ledge and shampooed our hair under the cascade. Green, brackish tidal water was lapping only inches below our feet. Anne looked at me with a start.

"This has to be the ledge," she said, shuddering. "The one where Ginger Meadows was standing when she first saw the crocodile that took her."

It was on March 29, 1987, that an American woman, Ginger Faye Meadows, and her friend Jane Burchett were swimming to this same ledge when someone standing on the high cliff above shouted, "Crocodile! Get out of the water!"

The two women scrambled onto the ledge, but the water was waist-deep at that time, and there was no way out. The crocodile was closing in, cutting off their escape to their yacht. Ginger dived and strained to make a stretch of dry bank, 25 yards away. She never got there. Crew members desperately tried to distract the beast, but they could only stand, mesmerized, as it reappeared with Ginger in its massive jaws.

LOW TIDE leaves Willie skipper Tony Larard inching his way toward the waterfall at King Cascade. Six hours later the water had risen 20 feet up the cliffs. Such tidal rivers are prime hunting grounds for "salties," saltwater crocodiles that can reach more than 20 feet in length. Australia's crocodile population, which once shrank to 7,000, grew to 70,000 after hunting was banned in 1970.

A young American woman was attacked and killed by a saltie at King Cascade while on vacation in 1987. The incident followed a fatal attack in the Northern Territory two weeks earlier, leading the federal government to renew warnings to tourists and residents alike.

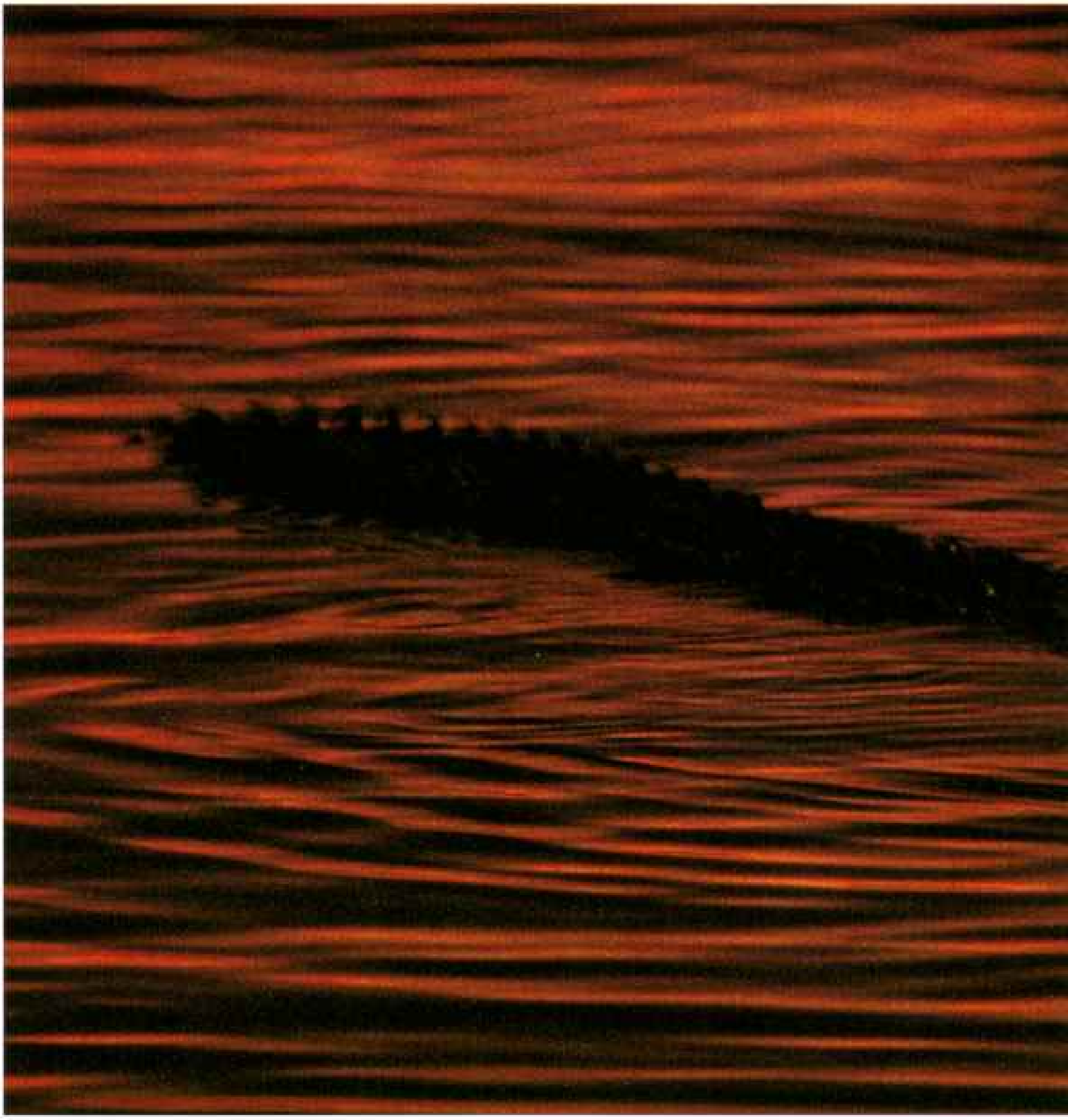
WE LEFT the Prince Regent River and sailed through the islands and the inside passages into the open sea around Cape Londonderry. With bad luck we met our old nemesis, the easterlies.

The wind shifted slightly to the north and increased in strength, and the seas grew higher and steeper. *Willie* could not hug the shoreline because of hidden reefs, and the schooner became a wild thing. She pivoted and plunged and corkscrewed. David was nearly impaled by a frozen leg of lamb as he opened the refrigerator door just when *Willie* lurched.

But we sailed on and finally, after days of pounding, entered Cambridge Gulf, a 50-mile-long passage that snakes south to the town of Wyndham. The carnival ride was over, but the wind still blew against us, and the outgoing tide tugged us back toward the sea. The coastline inched by. *Willie* pulled as if winched.

"Look at this," said Tony in disgust. "We're doing a screaming two and a half knots!"

Wyndham used to be the center of the Kimberley cattle industry. Tony told us: "It had an enormous meat works that closed in 1985. In winter hundreds of butchers would arrive to slaughter the cattle. The meat would all be shipped to England, and the blood and offal would run into a drain that emptied directly into Cambridge Gulf



COLD EYE of a saltie glows white above ripples bloodied by the setting sun near Wyndham, where the water once actually ran red from the outflow of a beef slaughterhouse, closed in 1985. The crocs stayed on and now get occasional handouts of fish and chicken tossed from a wharf by those who, while keeping their distance, get a thrill from contact with the untamable.

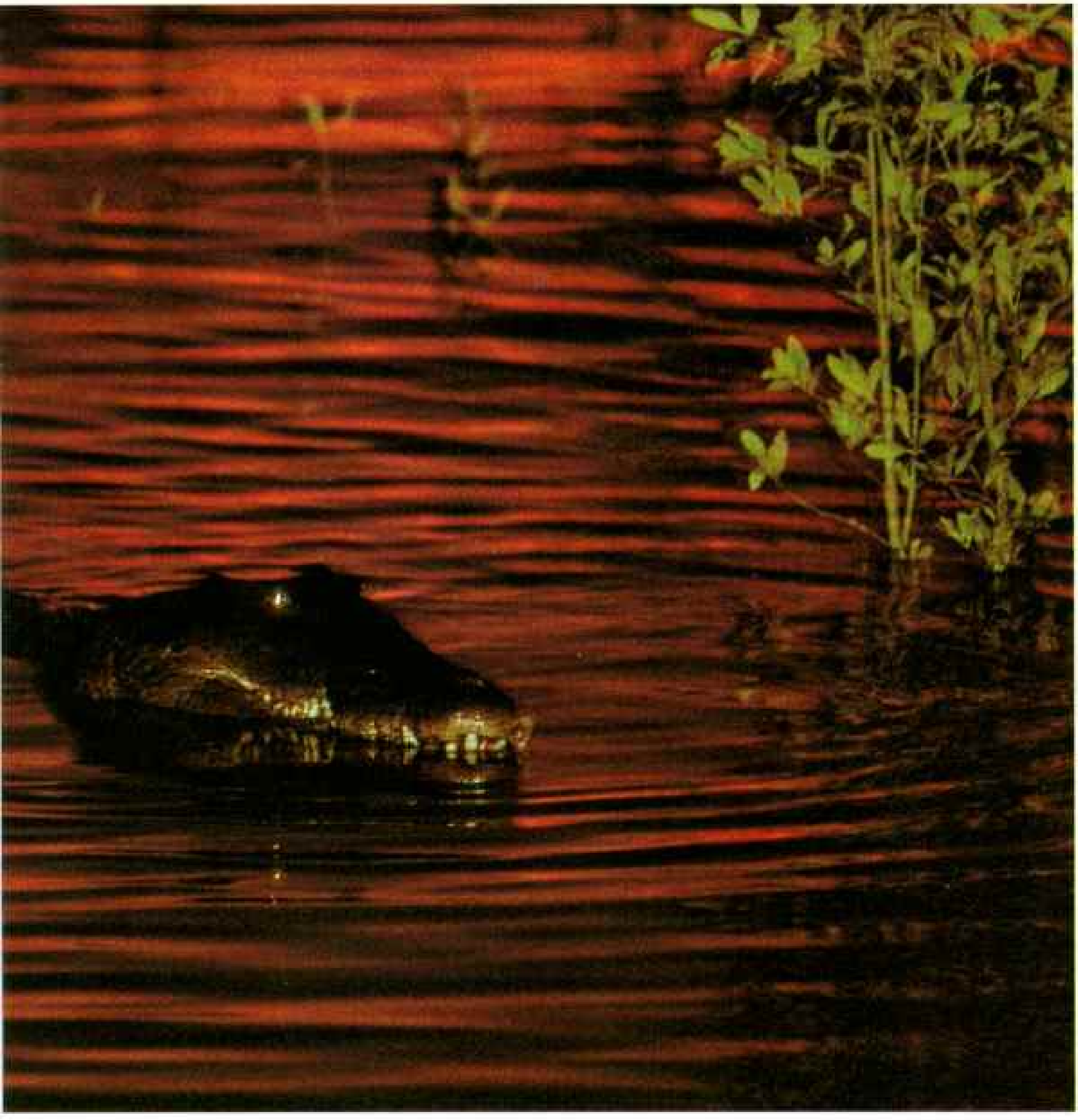
just north of town. The gulf became a paradise for crocodiles."

We anchored off the Wyndham boat ramp in a withering sauna wind. *Willie* was swinging violently back and forth on her anchor as we began the unloading process, an onerous chore at the end of an expedition.

The boat ramp was nearly a quarter mile long and as slippery as a swamp. We brought the final load in after dark, and just as the bow of the dinghy scraped the concrete ramp, a Wyndham policeman pulled up in his four-wheel-drive cruiser. He leaned out the window: "You boys got any guns?"

We shook our heads. "Well, you'd better be careful. Two days ago some blokes were unloading their tinny [an aluminum dinghy] right here, and a croc took their dog."

With that he reached up and swung his spotlight around. The light



speared into the night water and picked up two enormous orange-red eyes staring at us, only 20 yards away.

"That's a big one," said the constable. "Well, good luck to ya, be careful." And he drove off into the Wyndham night.

BIG. THIS ENTIRE LAND WAS BIG. I looked back at *Willie*, her masthead light burning, swinging on anchor under a star-carpeted night sky. We had left a wake of memories along this silent coast, nearly 2,500 miles around this ancient landmass, a world of giant shadows and fantastic creatures.

I know the magic of the northwest coast will fade, soon, as development moves into Australia's last frontier. But I will always remember the little voice tinkling off the stern: "She married a dugong, she married a dugong. . . ." □

Come celebrate fiddlers and pickers, weavers and potters,
singers and storytellers, dancers and carvers,
the joyful crazy quilt made by America's

MASTERS of TRADITIONAL ARTS

By MARJORIE HUNT and BORIS WEINTRAUB
Photographs by DAVID ALAN HARVEY

Vermont quilter, Appalachian storyteller, Kiowa Indian regalia maker, black Philadelphia tap dancer, Maryland decoy carver: All these folk artists have something more in common than being Americans.

They and more than a hundred others have been named National Heritage Fellows by the National Endowment for the Arts. Every year since 1982 the endowment's Folk Arts Program has recognized, with $5,000 grants, exceptional artists who have preserved the traditions in which they were nurtured, despite clamorous competition from the mainstream popular culture. Taken all together, they emphasize the astonishing diversity of American life. Bess Lomax Hawes, director of the Folk Arts Program, who oversees the fellowships, calls them "an incredible picture, one more look at the range of human creativity."

Awards honor not just a weaver but a Cambodian weaver or a Tlingit weaver; not merely a wood-carver but a Norwegian wood-carver or a Puerto Rican wood-carver. Each artist is rooted in his community; each tradition has a vitality worth celebrating.

There's Christy Hengel (above right), who has lived his 68 years in or around New Ulm,

Minnesota, a bastion of German-American culture, and become a legend. The concertinas he assembles are the standard by which the instrument is judged by those who love German polkas and waltzes. As one admirer wrote: "Stradivarius made a great violin, but Hengel makes an even better concertina."

As a boy, Hengel earned the $14.95 to buy his first instrument by trapping skunks and weasels. He later toured the Midwest with polka bands like the Six Fat Dutchmen and the Jolly Brewers. On his own Hengel tinkered with concertinas, improving their sound by shaping and tuning the reeds more precisely. "That's the heart of the concertina, the reeds," he says. "You got to get them just right."

Getting it just right and holding to the tradition. Dewey Balfa, a Cajun fiddler, puts it this way: "If you plant a tree and you don't water it, it's going to die. I'm watering the roots of this tree called Cajun culture so it can be preserved and grow."

The following pages show a few of those who, by diligently tending their own traditions and passing them along to the succeeding generations, have kept the big tree of American culture flourishing.

A lifetime of devotion is reflected in the eyes and art of George López, a 90-year-old carver of *santos*, saints and other religious images. Born in Cordova, New Mexico, high in the Sangre de Cristo Mountains, López learned to carve santos from his father, José Dolores López, a farmer, furniture maker, and renowned *santero*. "My father was a great carver," he says with pride. "I'm following in his footsteps."

Santos carving in northern New Mexico dates back more than 200 years to early days of Spanish settlement, when local artisans began crafting brightly painted devotional images for use in Hispanic homes and Roman Catholic churches in this isolated mountain region northeast of Santa Fe. By the turn of this century the once vital art had all but vanished; handmade images were replaced by mass-produced religious goods.

José Dolores López helped revive the art in the 1920s, but he shaped a new style out of his ancestors' tradition by making saints of unpainted cottonwood and cedar.

Devoted to his family and his faith, George López has kept his father's art alive. "It's in the blood," he says. "It's part of my name."

Working with a sharp pocket knife, sandpaper, and a few other tools, he creates figures of powerful simplicity, bold form, and intense spirituality—like this image of St. Raphael the Archangel depicted with pilgrim's tunic, cross, and fish.

López has passed his skills on to younger family members. "He leaves a beautiful gift for all the family," says his niece, Sabinita López Ortiz. "We want to keep it going."

George López

Hispanic Wood-carver/Cordova, New Mexico

Adorned with mountain ferns and flowers, Kaui Zuttermeister chants in honor of the gods. Her daughter Noenoe beats ceremonial *pahu* and *hilu* drums, her granddaughter Hauoli dances, and her great-granddaughter Kahula watches, eagerly absorbing the hula tradition of her Hawaiian forebears.

At 82, Kaui Zuttermeister, known as "Auntie Kaui," is revered as an expert in traditional hula. As a young woman she was encouraged by her husband, a serviceman of German descent, to study hula with her uncle, Sam Pua Haaheo, a fisherman and famous hula master. She learned the old chants and dances of *hula kahiko*, a dance form rooted in pre-European Hawaiian culture.

In the kahiko tradition the chant is what counts. "Without the words there is no hula," explains Noenoe. Dancers interpret the poetry of the chants, keeping the rhythm of the drums with their feet and hips, telling the story with their hands and face.

"Chanting is the language of the gods," says Auntie Kaui. "When you go fishing in the ocean, you chant to the sky and the water; when you walk in the mountains, you chant to the birds and the fragrance of ferns. You express your love for nature, for the beauty around you."

A *kumu hula*, or master teacher, since the mid-1930s, Kaui Zuttermeister has taught hundreds of students to dance modern and ancient hula. When she watches her daughter and granddaughter dance with three-year-old Kahula, Auntie Kaui feels proud. "I am happy I have lived long enough to dance with all the generations," she says.

KAUI ZUTTERMEISTER
Hula Master/Kaneohe, Hawaii

Missionary with a fiddle, Dewey Balfa roams the Louisiana prairies, preaching the importance of preserving the Cajun culture he learned as a boy.

Balfa was a sharecropper's son. His parents spoke no English; he remembers being punished at school for speaking French. The family would sing heartbreaking ballads and play gentle waltzes after the day's chores were over, and the Balfa Brothers band performed in nightclubs and dance halls, at parties and weddings.

"You'd play four hours and make five dollars; good work, because you worked in the fields for a dollar and a half a day," he says.

They played only for local people. "We were so isolated, we didn't know we had a special culture."

In 1964 folklorist Ralph Rinzler took Balfa and other Cajun musicians to a folk festival in Newport, Rhode Island. To their amazement an audience of 17,000 stood and cheered them. "That's enough to change a man's mind," Balfa says. He went home with a mission: to break through Cajun isolation and foster pride. He spoke out at festivals and concerts, in schools and on the radio. His message was simple: "Don't be ashamed of your daddy and granddad, don't be ashamed to eat your crawfish or gumbo. It's your way of life, your identity."

At 63, he still plays fine Cajun fiddle—with musicians 30 years younger. While Balfa fears that people today will buy anything "if you stick the word Cajun on it," he is proud that his decades of work and the efforts of those he inspired have helped true Cajun culture live on.

Dewey Balfa

Cajun Fiddler/Basile, Louisiana

"Listen to Mother Clay," says Pueblo Indian potter Margaret Tafoya. "Mother Clay is the one who is shaping that pot." Heir to the 1,500-year-old pottery tradition of her Anasazi ancestors, she uses ancient methods to create earthen celebrations such as this lustrous wedding vase.

Like generations of Santa Clara potters before her, Tafoya and her family dig clay from nearby hills, offering prayers to Mother Earth.

"We get the clay where our ancestors used to take it," she says. "My girls are still doing work from the clay that my great-great-grandparents used."

She shapes the clay, coil by coil, into strong, graceful forms. Inspired by old myths of her people, stories told to her by her parents and grandparents, she decorates her pots with water serpents, rain clouds, buffalo horns, and bear paws—symbols of survival for the Santa Clara people.

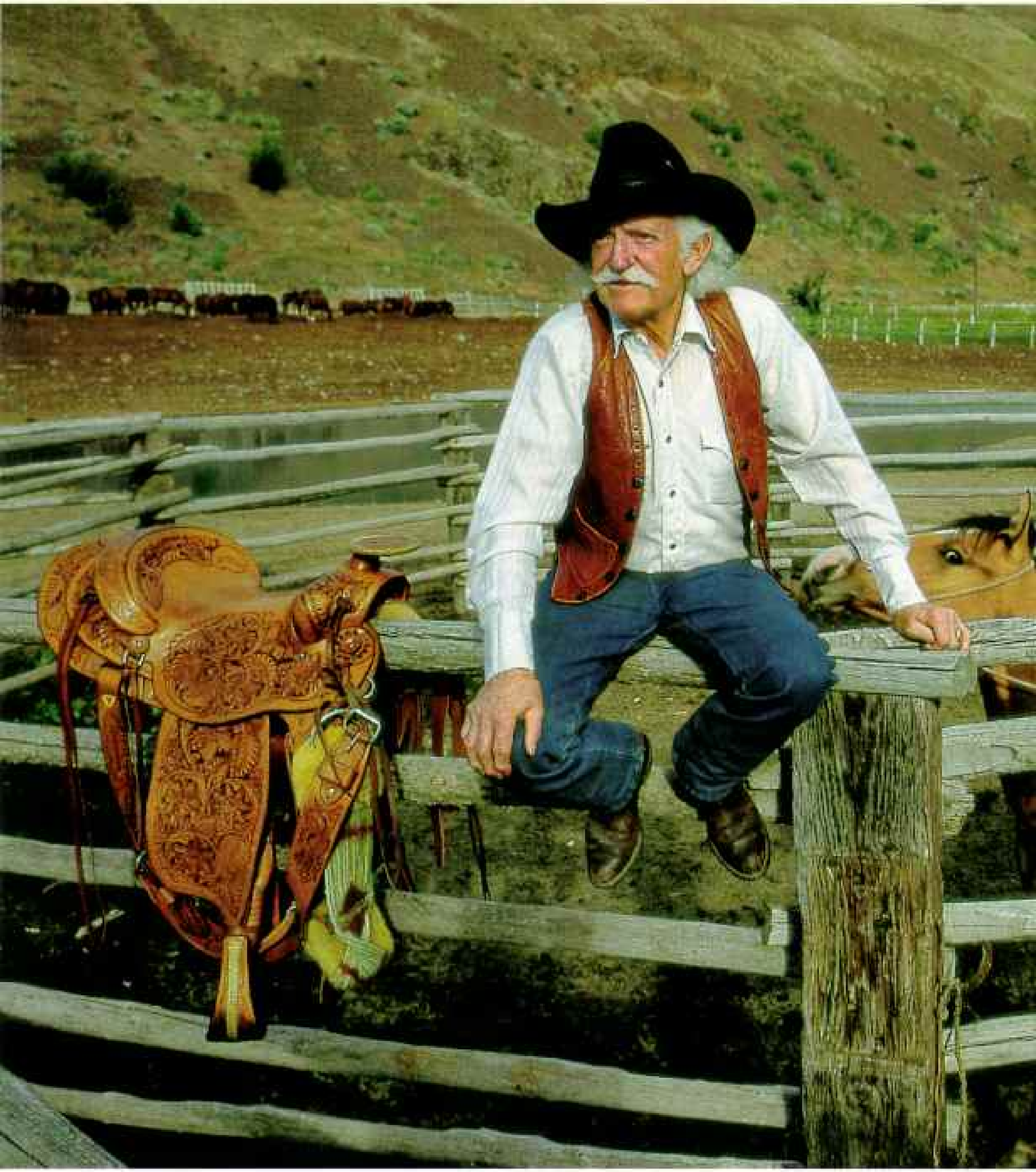
"We're carrying on the designs from way back," she says. "We do it so that we will remember."

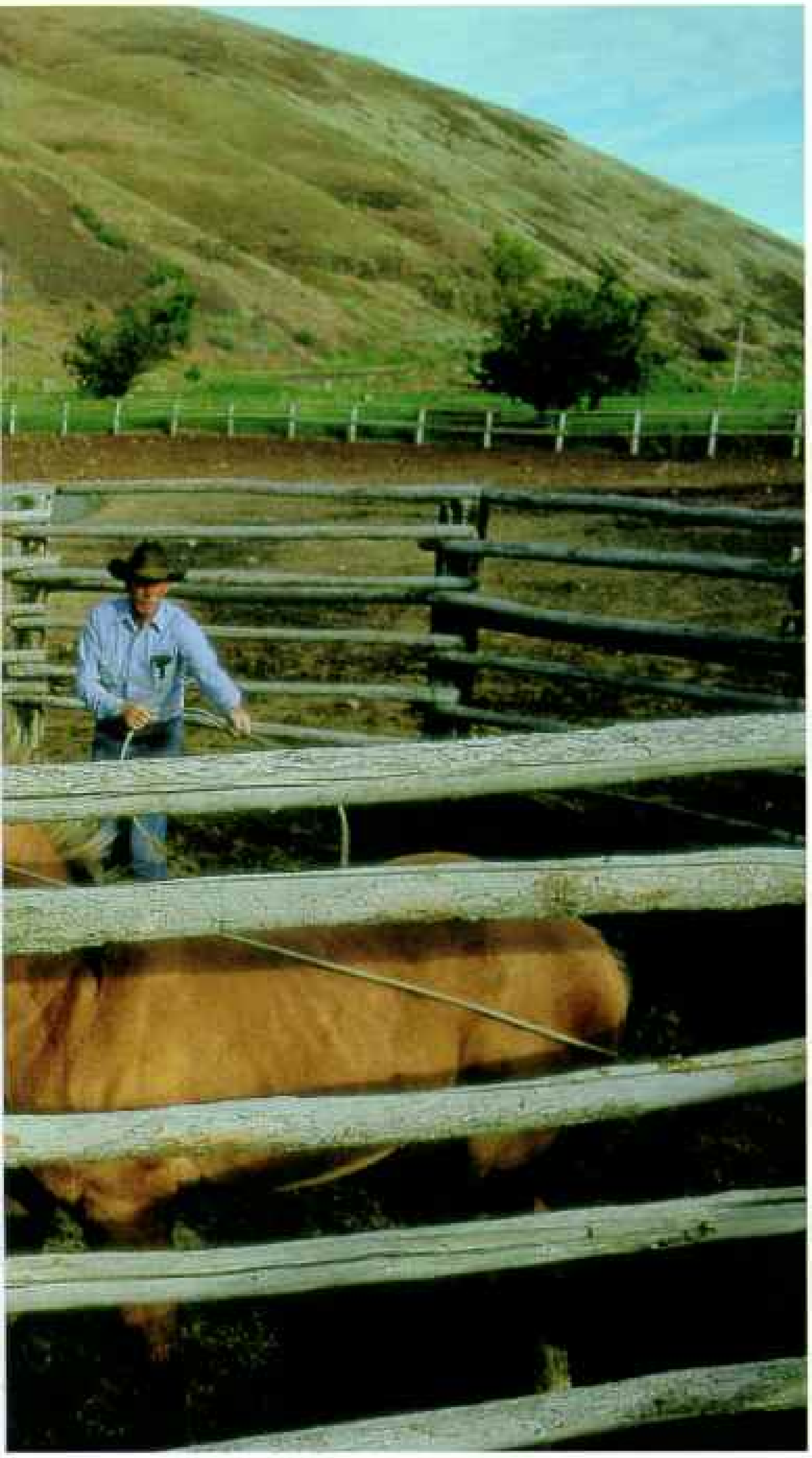
Tafoya's large, deeply carved blackware and redware vessels are prized for their form and finish. The secret, she says, is in the polishing. Before baking the pieces in the open air in a fire of cedar-wood, she spends hours rubbing her pots with smooth stones to achieve a brilliant shine.

Her polishing stones—family heirlooms passed down from mother to daughter—are more precious to her than gemstones. "I value them like my heart," she says.

Today four generations of the Tafoya family form the earth of their ancestors into vessels that carry forward the past.

Margaret Tafoya
Pueblo Indian Potter/Santa Clara, New Mexico





"Ninety percent of the bronc riders are using Severe saddles," says a rodeo cowboy. "They're the Mercedes-Benz of the business!"

Born on a ranch in southern Idaho, Duff Severe grew up working with horses and watching his father and other cowboys craft rawhide gear. "They'd take an old, bloody, hairy hide and clean it up, and pretty soon they'd have something beautiful braided out of it," he says. "That really impressed me."

In 1946 he apprenticed with a saddle company in Pendleton, Oregon, learning his trade from old-time masters. Ten years later he and his brother Bill started Severe Brothers Saddlery. Orders have poured in ever since. "We've been so busy, we never do get caught up," Duff Severe says. "And we've never spent a single dime for advertising."

Surrounded by scraps of leather, old tools, and photographs of rodeo riders, Severe crafts saddles valued for quality workmanship and strength. Using his brother Bill's hand-carved trees—the saddle's wooden skeleton—he cuts and shapes the leather, fitting the saddle to conform to both rider and horse. "The hardest part is that big main seat," Severe says. "The cows just don't grow hides that shape!"

With swivel cutters, veiners, shaders, and scores of other specialized tools, he carves and stamps intricate designs. The finished saddle shines with leather relief, silver inlay, and braided rawhide.

Duff Severe keeps on striving to perfect his craft. As one cowboy puts it: "There's no 99 percent in that man's life when it comes to working leather."

Duff Severe

Saddle Maker/Pendleton, Oregon

Bristling with color, Juan Alindato's fearsome papier-mâché masks come to life in the barrio of Playa de Ponce, Puerto Rico.

Every year during Carnival, costumed revelers, known as *vejigantes*, take to the streets of Ponce. Wearing devil-like masks and wielding *vejigas*, inflated cow bladders, they chase people through the streets, hitting them with the vejigas and making scary merriment. "When you see vejigantes coming," Alindato says, "it sends you running."

When Juan Alindato was a small boy, his father and uncle wore frightening Carnival masks; later he and his friends masqueraded through neighborhood streets and marched in Carnival parades.

He learned how to make the masks from his mother-in-law, Francisca Salvador. "I've been making masks ever since—45 years."

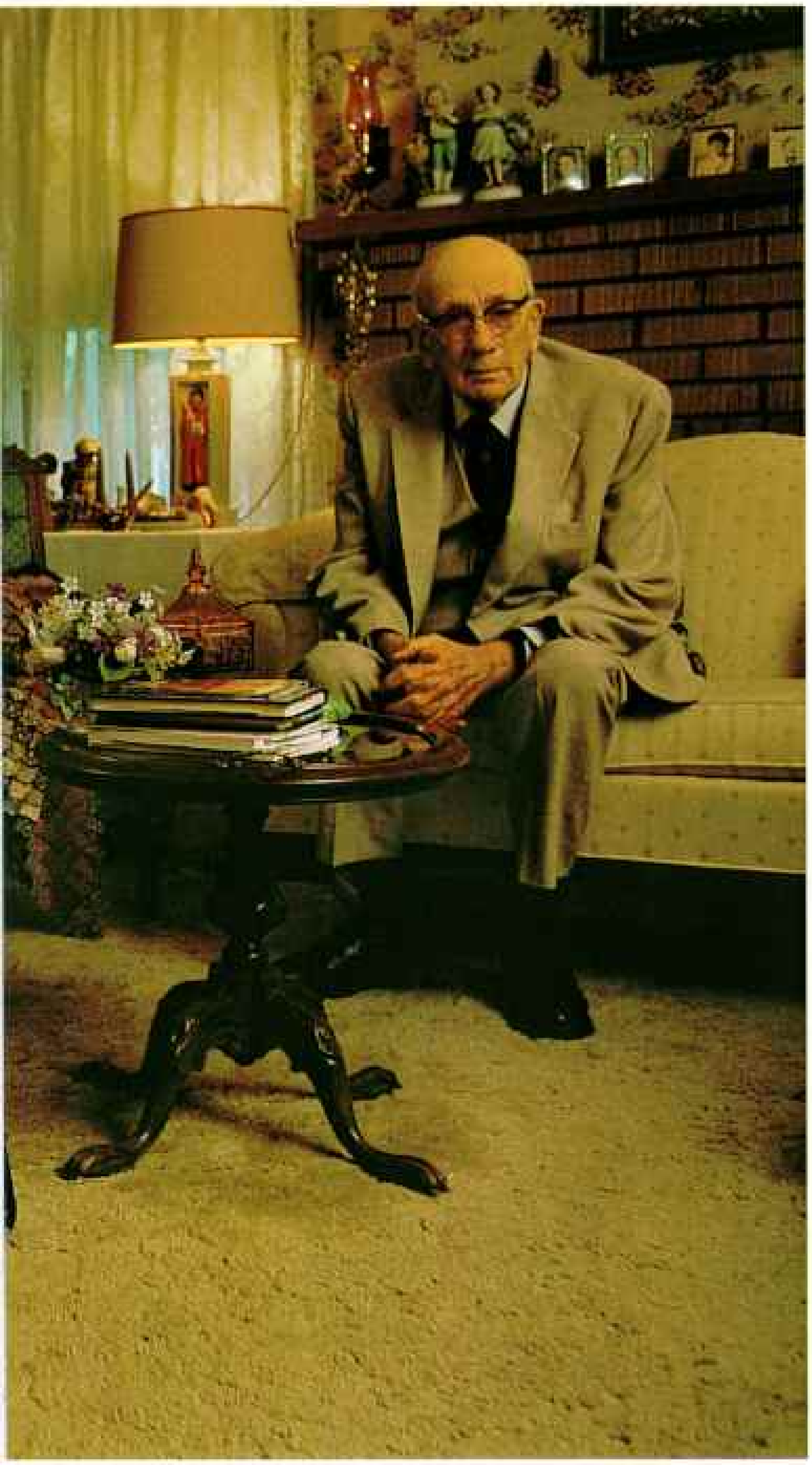
Working in his kitchen with the help of his wife, sons, daughters, and brother-in-law, Alindato applies strips of brown paper coated with a homemade flour-and-water paste to cement molds. Layer upon layer he builds masks with multiple horns, pointed teeth, and large animal-like snouts, then paints them in brilliant primary colors.

"When I first started," Alindato says, "I made masks with only two horns and sold them for 25 cents." Today his masks may have 30 or 40 horns and sell to collectors, tourists, and Carnivalgoers for as much as several hundred dollars.

But Alindato is worried, for rubber masks are increasingly replacing traditional ones. Still, he and his family persist in preserving the old Ponce tradition. "I grew up with it," he says. "It is a matter of love."

Juan Alindato

Carnival Mask Maker/Ponce, Puerto Rico



Mabel Murphy's quiet living room turns into a community center every Thursday and Friday as dozens of women gather to piece quilt tops under her watchful eye. To Mabel Murphy, quilting and community go together like needle and thread.

Her family has been in Callaway County, Missouri, since 1818; she has lived there for almost all of her 83 years. She has been a Sunday school teacher in her Baptist church for more than half a century, and she was an elected member of the school board. She still bakes her own bread, cans her own preserves, and is locally famous for her iris garden. Her husband of 63 years, William Clark Murphy, at right, was mayor of Fulton. "I had seven quilts in my hope chest when we were married," she recalls.

Mabel Nevins first learned to piece a quilt as a "little barefoot country girl" of eight and has been making quilts ever since. She hews to traditional patterns, endowing them with an exquisite color sense.

She was taught to strive for "nine stitches to the inch," and holds to it. Would she ever consider using a sewing machine? "Oh, if you don't care what your quilt looks like, that's all right," she scoffs. "But if you want something real nice, you're going to do it by hand."

Mabel Murphy has never sold a quilt, but the homes of friends and family members are filled with her creations. She gives away quilts when loved ones turn 21, graduate from college, or get married.

"Every quilt has a story," she says. "I praise the Lord that I can see to piece a quilt, and that I can sew."

MABEL MURPHY
Quilter/Fulton, Missouri

Tickled pink at being a Mardi Gras Indian, Big Chief Allison "Tootie" Montana prepares to lead the members of his Yellow Pocahontas tribe into the streets of New Orleans.

New Orleans blacks have been "masking Indian" on Mardi Gras since the 1880s. Some say the inspiration was a touring Wild West show; others say it was to honor Indians who aided runaway slaves. No one really knows. Montana's great-uncle and father were Mardi Gras chiefs. He himself has been masking for 42 of his 67 years. "I guess it was in my blood," he allows.

In the old days, violence sometimes resulted when tribes met. Today the challenge is different: to create the "prettiest" costume. Tootie Montana excels at crafting legendary "suits" out of beads, stones, sequins, feathers, canvas, thread, and cardboard, with three-dimensional shapes that jut out front and back. The crown alone can weigh 50 pounds.

Designing and creating a costume is serious business. As soon as Mardi Gras is over, he thinks about the next one. "You sit down and concentrate on what you want to see, and it comes to you," Montana says.

He is highly competitive, angry at those who have stolen his ideas, contemptuous of those who take shortcuts and don't work to look as pretty as they can.

The Mardi Gras Indian ritual includes songs and dances, fellowship and rivalry. But what matters to Chief Montana is his "mission."

"I want to meet every tribe on the street, and when day is done, say I'm prettier than everyone I met. That's a feeling you can't explain."

ALLISON "TOOTIE" MONTANA
Mardi Gras Costume Maker/New Orleans, Louisiana

Giant of a storyteller, Ray Hicks puts all of his six feet seven inches into tales about Jack, a wily "cousin" of another Jack, the lad who climbed the beanstalk. Hicks's English ancestors brought the Jack tales with them when they settled in the western North Carolina mountains some 200 years ago.

Hicks and his wife, Rosa, live in the frame house on Beech Mountain where he was born. Ski resorts thrive nearby, but electricity only arrived in their home in the 1950s, and running water and indoor plumbing haven't shown up yet. He grew up walking barefoot through the woods and picking plants such as galax to sell to florists. "Money grows in the mountains," he says.

Ray Hicks gets out of bed in the morning talking and rarely stops. His accent can be impenetrable to outsiders until he begins a tale; then his rich, expressive voice is clear and mesmerizing. He learned the tales as a boy from his grandfather. "One's just got it in him to tell stories," he says. "Maybe I was one fixed by the Creator to keep it. Once you learn a tale, you never forget it."

He has heard it said that the stories will die when he does, but he doubts it. "It won't get gone," he says, "not as long as there are people here on earth."

To make sure, he tells the tales every chance he has: at storytelling festivals, in schools, or to any passing stranger who stops by to visit.

And just who is this Jack? Hicks grins: "Anybody could be Jack, if you got in the situation he was in." And he's off on a tale. Like Jack, Ray Hicks lives by his wits and his talk.

Ray Hicks

Appalachian Storyteller/Banner Elk, North Carolina

Wrapped in tradition, Eppie Archuleta carries on a legacy of weaving that spans seven generations in her family, including her mother, Agueda Martinez, and two of her granddaughters, pictured here at Doña Agueda's *ranchito* in Medanales, New Mexico.

Hispanic families in the Southwest have been weaving textiles since the mid-1600s. Born and raised in northern New Mexico, Archuleta grew up surrounded by weavers. As a small child she helped to card wool and wind yarn for bobbins. When she was six, her mother taught her to weave on an old hand-hewn treadle loom that had belonged to Eppie's grandfather. "I've been weaving ever since I could reach the loom," she says.

More than half a century later Eppie Archuleta continues to weave. "It's part of my soul," she says. "I just can't keep off the loom."

In her studio she cards, spins, dyes, and weaves wool into rugs and blankets: "From the sheep to the weaving, I do it all." She dyes much of her wool with native plants gathered from the countryside. Recently Archuleta bought a wool mill; by supplying local wool and yarn, she hopes to strengthen the Hispanic weaving tradition.

Working on massive wooden treadle looms built by her husband and sons, her hands fly with the shuttle, creating elaborate geometric patterns in a dazzling variety of colors. Archuleta's standards are high. A weaving must have straight edges, even texture, and tight weave. "It has to be perfect," she says. "I want to be proud when I point to a piece and say, 'I made that!' "

Eppie Archuleta

Hispanic Weaver/Alamosa, Colorado

"There's nothing that can take the place of Sacred Harp music when it comes to praising the Lord," declares Dewey Williams, 92-year-old patriarch of black Sacred Harp singers. A retired sharecropper, he has touched the hearts of many with his passion for music whose roots in America go back two centuries.

Sacred Harp, or shape-note, singing, takes its name from the *Sacred Harp* songbook of 1844. An unaccompanied style marked by vibrant four-part harmony and steady rhythms, it uses geometric shapes to represent musical notes.

Son of a sharecropper, grandson of a slave, Williams first learned to sing Sacred Harp as a boy of six, listening to his parents, grandparents, and neighbors in the evenings.

"The house would be full of singers," he recalls. "People would get to singing, and glory would shine all around!"

For more than 70 years he has kept the glory shining, gathering with family and friends in homes and churches throughout southeastern Alabama to sing the old songs and share covered-dish dinners.

Williams can lead all of the more than 500 songs in the *Sacred Harp*, including his favorite, "Amazing Grace." "If you follow me, you won't get lost," he says. "I know right where I'm going."

Dewey Williams continues to work tirelessly, trying to keep his beloved music alive—teaching children, performing at festivals, attending singing conventions.

"If I could just live to see the day when people realize that singing is the coming of angels," he says, "then I'd have done a job!"

Dewey Williams

Shape-note Singer/Ozark, Alabama

Soaring across the skyline of his native Chicago as he invents new ways to dance, Michael Flatley displays the athleticism and creativity that made him the world champion Irish dancer in 1975 at age 17. He was the first non-European to win the title.

His flying feet have carried him to stages all over the globe, and his flamboyant, intricate steps have invigorated the art of Irish dance.

He also found time to win the all-Ireland flute championship three years in a row and to gain recognition as the world's fastest tap dancer: 28 taps a second.

"I'm a competitor," he says.

Flatley, the son of Irish immigrants, was ten and living in Chicago when he first saw Irish step dancing, a highly disciplined art in which the hands are held straight at the sides and the upper body does not move. "It seemed so masculine," he says, "it got my attention immediately."

A truly great Irish dancer, says Flatley, "looks as if he's floating across the stage and reaching down to touch it."

When he was 11, he tried to take lessons, but teachers said he was too old. He began to practice on his own and soon was beyond what any teacher could show him. By 13 he was creating his own steps. When he stopped competing in 1979, he "put the word out that I planned to teach a few kids the way Irish dancing should go." The first night, 300 showed up.

Though he now seeks new forms of expression, Flatley retains a love for the dance tradition in which he began. "Irish dancing has been done for centuries," he says. "What I've done is give it a modern-day form."

Michael Flatley

Irish-American Dancer/Palos Park, Illinois

National Heritage Fellows 1982-1990

1982

Dewey Balfa
Cajun Fiddler
Basile, Louisiana

Joe Heaney
Irish-American Singer
Brooklyn, New York

Tommy Jarrell
Appalachian Fiddler
Mt. Airy, North Carolina

Bessie Jones
Sea Island Singer
Brunswick, Georgia

George Lopez
Hispanic Wood-carver
Cordova, New Mexico

Brownie McGhee
Blues Guitarist
Oakland, California

Hugh McGraw
Shape-note Singer
Bremen, Georgia

Lydia Mendoza
Mexican-American Singer
Houston, Texas

Bill Monroe
Bluegrass Musician
Nashville, Tennessee

Elijah Pierce
Black Carver/Painter
Columbus, Ohio

Adam Popovich
Tamburitza Musician
Dolton, Illinois

Georgeann Robinson
Osage Ribbon Worker
Bartlesville, Oklahoma

*Duff Severe
Saddle Maker
Pendleton, Oregon

Philip Simmons
Ornamental Ironworker
Charleston, South Carolina

Sanders "Sonny" Terry
Blues Musician
Hollis wood, New York

1983

Sister Mildred Barker
Shaker Singer
Poland Springs, Maine

Rafael Cepeda
Bomba Musician/Dancer
Santurce, Puerto Rico

*An *EXPLORER cable TV segment will feature National Heritage Fellow Duff Severe on Sunday, February 3, at 9 p.m. eastern time on TBS SuperStation.*

Ray Hicks
Appalachian Storyteller
Banner Elk, North Carolina

Stanley Hicks
Appalachian Instrument Maker
Vilas, North Carolina

John Lee Hooker
Blues Guitarist/Singer
San Carlos, California

Moe Mantio
Sicilian Marionettist
Staten Island, New York

Narciso Martinez
Mexican-American Accordionist/Composer
San Benito, Texas

Lanier Meaders
Potter
Cleveland, Georgia

Almeda Riddle
Ballad Singer
Green Forry, Arkansas

Simon St. Pierre
French-American Fiddler
Smyrna Mills, Maine

Joe Shannon
Irish-American Piper
Chicago, Illinois

Alex Stewart
Cooper/Woodworker
Sweetville, Tennessee

Ada Thomas
Chitimacha Basket Maker
Clarendon, Louisiana

Lucinda Toomer
Black Quilter
Columbus, Georgia

Lem Ward
Decoy Carver/Painter
Crisfield, Maryland

Dewey Williams
Shape-note Singer
Ozark, Alabama

1984

Clifton Chenier
Black Creole Accordionist
Lafayette, Louisiana

Bertha Cook
Knotted Bedspread Maker
Boone, North Carolina

Joseph Cormier
Cape Breton Fiddler
Waltham, Massachusetts

Elizabeth Cotten
Black Singer/Songwriter
Syracuse, New York

Burlon Craig
Potter
Vale, North Carolina

Albert Fahlbusch
Hammered Dulcimer Maker/Player
Scottsbluff, Nebraska

Jane Hunter
Black Singer/Storyteller
Johns Island, South Carolina

Mary Jane Mangaoil
Black Seminole Basket Maker
Mt. Pleasant, South Carolina

Genevieve Mougin
Lebanese-American Lace Maker
Bettendorf, Iowa

Martin Mulvihill
Irish-American Fiddler
Bronx, New York

Howard "Sandman" Sims
Black Tap Dancer
New York, New York

Ralph Stanley
Appalachian Banjo Player/Singer
Coeburn, Virginia

Margaret Tafoya
Pueblo Indian Potter
Santa Clara, New Mexico

Dave Tarras
Jewish Klezmer Clarinetist
Brooklyn, New York

Paul Tiulana
Eskimo Mask Maker/Dancer/Singer
Anchorage, Alaska

Cleofes Vigil
Hispanic Storyteller/Singer
San Cristobal, New Mexico

Kalu Zuttermeister
Hula Master
Kaneohe, Hawaii

1985

Ernie Archoleta
Hispanic Weaver
Alamosa, Colorado

Pericles Halkias
Greek Clarinetist
Queens, New York

Jimmy Jausoro
Basque Accordionist
Boise, Idaho

Mealii Kalama
Hawaiian Quilter
Honolulu, Hawaii

Lily May Ledford
Appalachian Musician/Singer
Lexington, Kentucky

Leif Melgaard
Norwegian Wood-carver
Minneapolis, Minnesota

Boua Xou Mua
Hmong Musician
Portland, Oregon

Julio Negron-Rivera
Instrument Maker
Morovis, Puerto Rico

Alice New Holy Blue Legs
Lakota Sioux Quill Artist
Ogiala, South Dakota

Glenn Ohrlin
Cowboy Singer/Storyteller
Mountain View, Arkansas

Henry Townsend
Blues Musician/Songwriter
St. Louis, Missouri

Horace "Spoons" Williams
Spoons/Bones Player/Poet
Philadelphia, Pennsylvania

1986

Alphonse "Bois Sec" Ardoin
Black Creole Accordionist
Eunice, Louisiana

Earnest Bennett
Whittler
Indianapolis, Indiana

Helen Cordero
Pueblo Indian Potter
Cochiti, New Mexico

Sonia Domsich
Czech-American Bobbin Lace Maker
Atwood, Kansas

Canray Fontenot
Black Creole Fiddler
Welsh, Louisiana

John Jackson
Black Singer/Guitarist
Fairfax Station, Virginia

Pichu Khatna
Cambodian Dancer/Choreographer
Silver Spring, Maryland

Valerio Longoria
Mexican-American Accordionist
San Antonio, Texas

Joyce Doc Tate Nevaquaya
Comanche Indian Flutist
Apache, Oklahoma

Luis Ortega
Hispanic Rawhide Worker
Paradise, California

Ola Belle Reed
Appalachian Banjo Player/Singer
Rising Sun, Maryland

Jenny Thlunaut
Tlingit Chilkat Blanket Weaver
Haines, Alaska

Nimrod Workman
Appalachian Ballad Singer
Mascot, Tennessee
Charleroy, West Virginia

1987

Juan Alicnato
Carnival Mask Maker
Ponce, Puerto Rico

Louis Bashell
Slovenian Accordionist/Polka Master
Greenfield, Wisconsin

Genoveva Castellanoz
Mexican-American Corona Maker
Nyssa, Oregon

Thomas Edison "Brownie" Ford
Anglo-Comanche Cowboy Singer
Hebert, Louisiana

Kanesma Fujima
Japanese-American Dancer
Los Angeles, California

Claude Joseph Johnson
Black Religious Singer/Orator
Atlanta, Georgia

Raymond Kane
Hawaiian Slack Key Guitarist/Singer
Waianae, Hawaii

Wade Mainer
Appalachian Banjo Player/Singer
Flint, Michigan

Sylvester McIntosh
Crucian Singer/Bandleader
St. Croix, Virgin Islands

Allison "Tootie" Montana
Mardi Gras Costume Maker
New Orleans, Louisiana

Allen Moore, Sr.
Blues Pianist
Dallas, Texas

Emilio and Sebastia Romero
Hispanic Tin Worker and Embroiderer
Santa Fe, New Mexico

Newton Washburn
Split-ash Basket Maker
Littleton, New Hampshire

1988

Pedro Ayala
Mexican-American Accordionist
Donna, Texas

Kepka Bielton
Czech-American Egg Painter
Ellsworth, Kansas

"I try to make them as real as possible," says wood-carver Emilio Rosado, 1990 National Heritage Fellow from Utuado, Puerto Rico, who specializes in crafting lifelike fighting roosters from cedar.

Amber Dedmore
Quilter/Needleworker
Chelsea, Vermont

Michael Flatley
Irish-American Dancer
Palos Park, Illinois

Sister Rosalia Haberl
German-American Bobbin Lace Maker
Hankinson, North Dakota

John Dee Holeman
Black Dancer/Musician/Singer
Durham, North Carolina

Albert "Sunnyland Slim" Luandrew
Blues Pianist/Singer
Chicago, Illinois

Yang Fang Nhe
Hmong Weaver/Embroiderer
Detroit, Michigan

Kenny Sidle
Anglo-American Fiddler
Newark, Ohio

Willie Mae Ford Smith
Black Gospel Singer
St. Louis, Missouri

Clyde "Kindy" Spidaf
Hawaiian Cowboy Singer
Kapaau, Hawaii

Arthel "Doc" Watson
Appalachian Guitar Player/Singer
Deep Gap, North Carolina

1989

John Cephas
Piedmont Blues Guitarist/Singer
Woodford, Virginia

Fairfield Four
Black A Cappella Gospel Singers
Nashville, Tennessee

José Gutierrez
Mexican Jarocho Musician/Singer
Norwalk, California

Richard Aviedis Hagopian
Armenian Oud Player
Visalia, California

Christy Hengel
German-American Concertina Maker
New Ulm, Minnesota

Ilias Kyriazides
Pontic Greek Lyra Player
Norwalk, Connecticut

Ethel Kvalheim
Norwegian Rosemaler
Stoughton, Wisconsin

Vanessa Paukeigope Morgan
Kiowa Regalia Maker
Anadarko, Oklahoma

Mabel Murphy
Quilter
Fulton, Missouri

LaVaughn Robinson
Black Tap Dancer
Philadelphia, Pennsylvania

Earl Scruggs
Bluegrass Banjo Player
Madison, Tennessee

Harry V. Shourds
Wildfowl Decoy Carver
Seaville, New Jersey

Chesley Goseyun Wilson
Apache Fiddle Maker
Tucson, Arizona

1990

Howard Armstrong
Black String Band Musician
Detroit, Michigan

Em Bun
Cambodian Silk Weaver
Harrisburg, Pennsylvania

Natividad Cano
Mexican Mariachi Musician
Monterey Park, California

Giuseppe and Raffaela DeFranco
Italian Musicians and Dancers
Belleville, New Jersey

Maude Kegg
Ojibwa Storyteller/Bead Worker
Onamia, Minnesota

Kevin Locke
Lakota Sioux Flute Player
Mobridge, South Dakota

Marie McDonald
Hawaiian Lei Maker
Kamuela, Hawaii

Wallace McRae
Cowboy Poet
Forsyth, Montana

Art Moilanen
Finnish Accordionist
Mass City, Michigan

Emilio Rosado
Wood-carver
Utuado, Puerto Rico

Robert Seicer
Flatfoot Dancer
Dickson, Tennessee

Doug Wallin
Appalachian Ballad Singer
Marshall, North Carolina

Marjorie Hunt is a folklorist and Academy Award-winning filmmaker based in Washington, D. C. Boris Weintraub is a member of the magazine's senior editorial staff. □

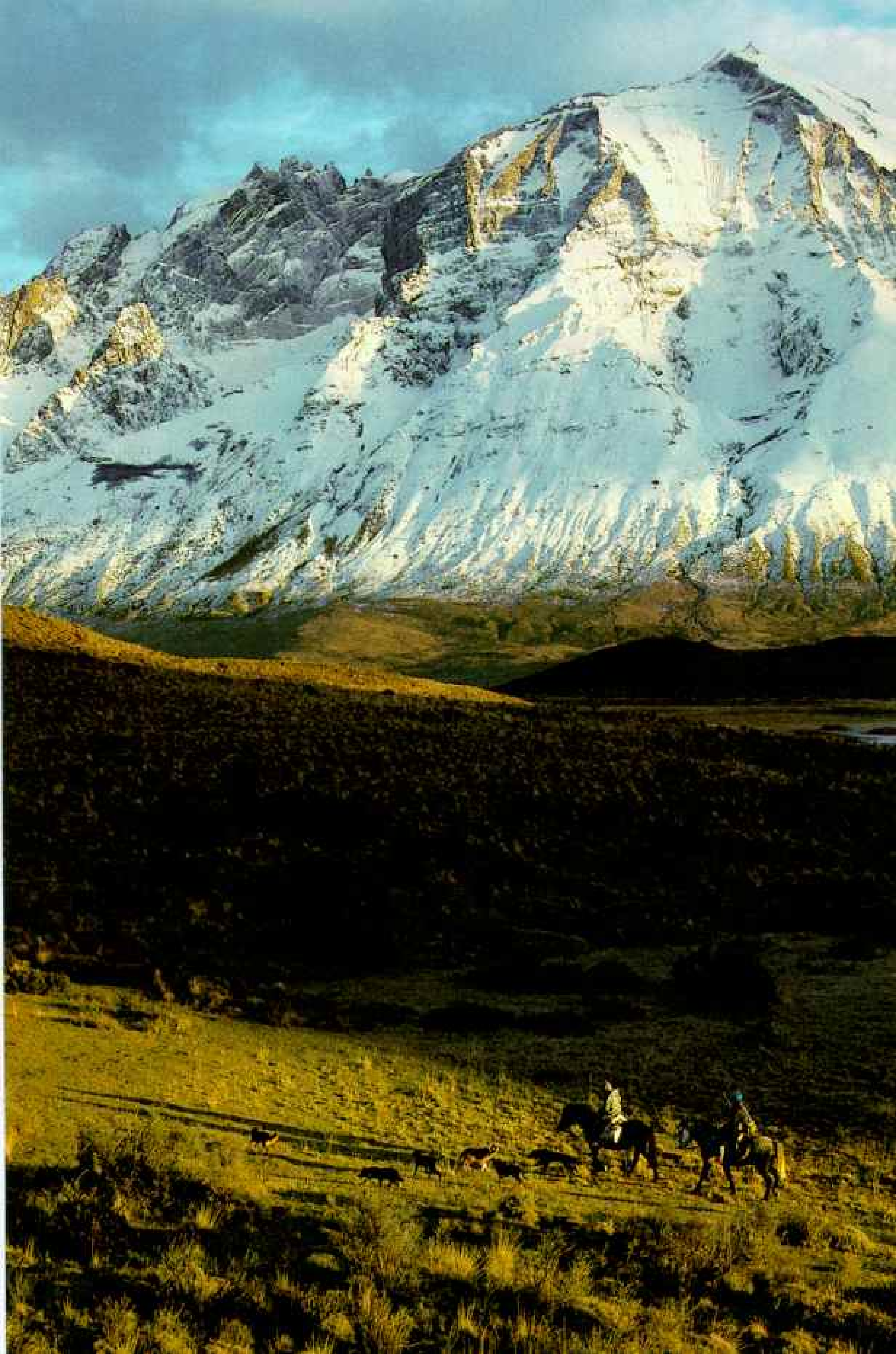
PATAGONIA PUMA

THE LORD OF LAND'S END

WARNER E. JOHNSON

A penetrating stare reflects the power of this magnificent carnivore. Beneath the soaring Andes near the tip of South America, the author's research party tracks these big cats to study their predatory ways.

Text and photographs by
WILLIAM L. FRANKLIN
WILDLIFE ECOLOGIST, IOWA STATE UNIVERSITY



The sky is full of mountains in this country. I often get a sore neck from admiring these Andean peaks as we trek on foot and horseback over the plains and hills. The wind is our constant companion; locals advise that if you want to see Patagonia, just stand still and it will all blow past you. Often our trail is cloaked by the snows of winter. It is then that we can best track our stealthy and elusive quarry—the Patagonia puma.

For six years we have studied these wonderful cats in breathtaking Torres del Paine National Park (right), a United Nations biosphere reserve in southern Chile's portion of Patagonia. Within the park's 935 square miles, ecosystems converge. Beneath towering peaks lie a huge ice field and glaciers, which melt to feed iceberg-strewn lakes. The high country drops down to the plains of the Patagonian steppe. The result: a remarkable diversity of wildlife. While South America is conspicuous for its paucity of large mammals, in Torres del Paine we have identified more than 40 mammalian species, including two types of foxes, Geoffroy's cats, European hares, and guanacos,* the wild progenitors of domestic llamas. The guanacos and the hares are the major prey of the pumas, which patrol a zone along the foot of the mountains and the edge of the steppe.

The puma ranges more widely than any other terrestrial mammal in the Americas, from the Canadian Yukon south to the Strait of Magellan (map, left). This predator is highly adaptable and occupies a variety of habitats. A puma prefers dense cover or rocky and rugged terrain, but as pioneering North American puma biologist Maurice Hornocker has noted, it is at home "from deserts to swamps, from tropical jungles to subalpine forests." The puma has become the cat of many names: mountain lion, cougar, panther, painter, catamount. The Patagonia puma, *Felis concolor patagonica*, is one of 27 subspecies now recognized, based upon size, color, and cranial-dental characteristics. It also is the southernmost subspecies and one of the largest.

We concentrated on a 40-square-mile finger of land flanked by lakes, which we dubbed the "peninsula" and which has large numbers of guanacos that attract many pumas. Primarily by tracking the cats on horseback with dogs, tranquilizing them, and attaching radio collars, we estimate the peninsula's puma population to be between 13 and 18, one of the highest densities documented. Occasionally a puma will wander onto adjacent ranches and kill sheep. In general, though, we found a tenuous balance between the needs of this wild predator and local ranchers' livelihoods.

Funded by the Organization of American States, Patagonia Research Expeditions, the National Wildlife Federation, and the National Geographic Society, our project has not collected data easily. Tracking a fleet, 150-pound bundle of muscle, claws, and teeth can be a hair-raising experience, especially when it holes up in a cave, which pumas often do. Such are the hazards we have encountered to better know one of the most persecuted, yet least understood, large predators in the Americas.

A Research Project Supported In Part By Your Society

*See the author's article on guanacos in the July 1981 Geographic.

LANDSAT IMAGE (OPPOSITE) PRODUCED BY NASA'S JOHN C. STENNIS SPACE CENTER FOR A GLOBAL AIR-POLLUTION STUDY; THE PARK HAS ONE OF THE WORLD'S CLEANEST ENVIRONMENTS

Ice field or glacier
Exposed rock
Forest
Mixed forest and steppe
Steppe

ARGENTINA
CHILE

ARGENTINA
CHILE

Laguna Azul

Río Paine

Torres del Paine
2800 m (9186 ft)

Patagonia Wildlife Research Station
100 m (329 ft)

Península Paine

Lago Nordenskjöld

Lago Sarmiento

Cerro Paine Grande
3050 m (10007 ft)

TORRES DEL PAINE

Lago Pehoé

Lago Grey

NATIONAL PARK

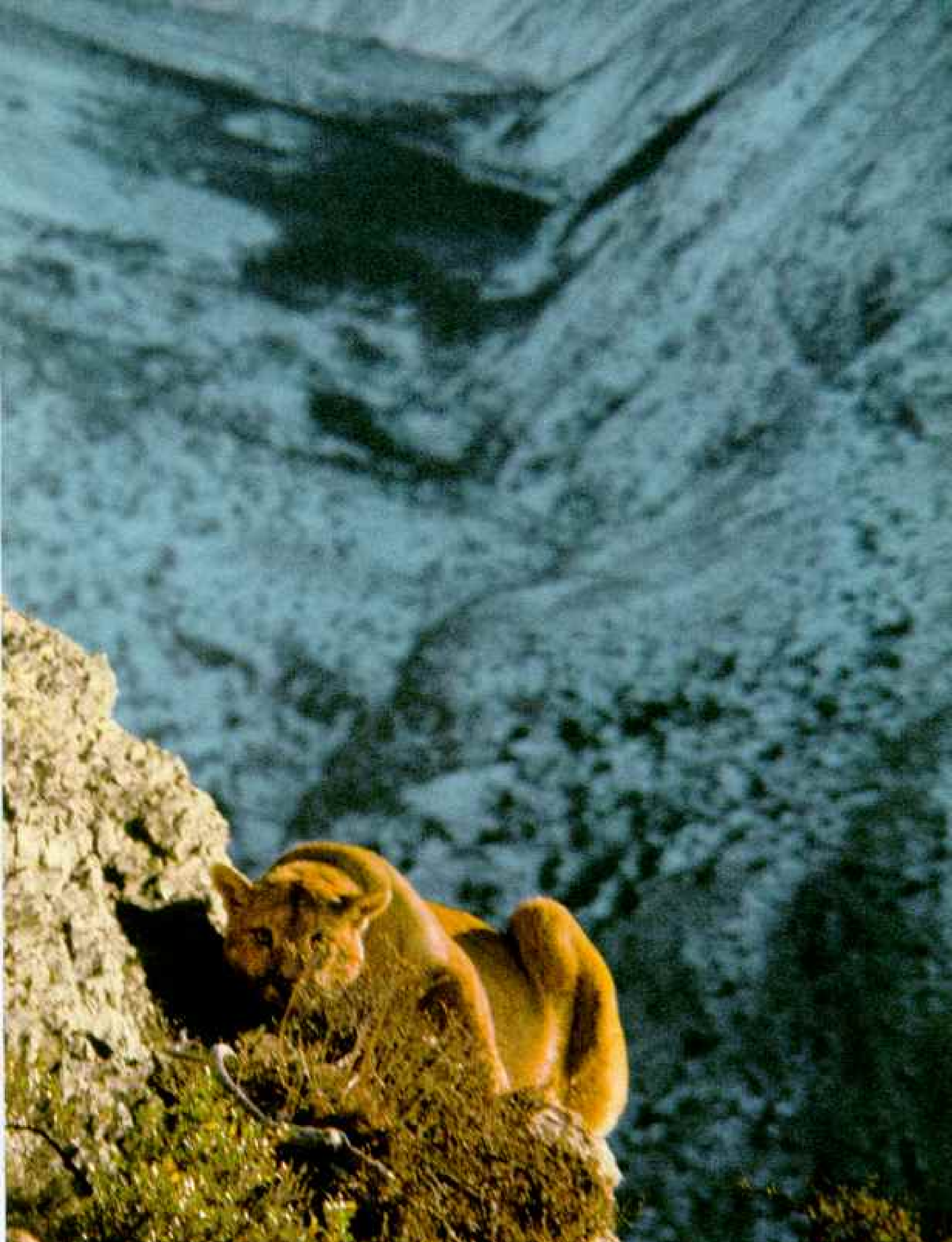
Park Headquarters

Lago del Toro

Image color enhanced

0 2 km
0 2 4 mi

Eye to eye with a cat trapped on a ledge, graduate student Warren Johnson, in charge of the fieldwork, contemplates firing a second tranquilizing dart after the first had little effect. Before he could shoot, the puma, named Margarita,



OSCAR BURRIEL

lost her balance and rolled 20 feet. She appeared unconscious when Warren reached her. As he began examining her tongue to check blood circulation, "She jerked her head and snarled! I felt fear both for myself and for the situation," Warren says. "How was I going to react so this cat didn't get away?" Another dart, and Margarita took a siesta.

A guanaco comes feetfirst into the world in early summer after a gestation of nearly a year. Guanacos make up 55 percent of the diet of pumas, which tend to go after young guanacos, known as *chulengos*, and also hunt European hares and flightless rheas. Prior to ear-tagging a chulengo as part of our mortality study, a student assistant keeps the animal's mother away by returning her threat display (top right). Near our research station, Warren, at left, and I examine part of our collection of more than a thousand guanaco skulls. They help us determine cause of death, as well as age. Puncture wounds from pumas' canine teeth mark a third of the skulls; of those, 60 percent came from animals less than two years old.

Male and female guanacos bunch up in winter, when grazing is patchy (below). For pumas, pickings are abundant.

After a harrowing chase an old friend, a puma named Commando, lies safely tranquilized (below). Warren records the cat's weight and other data, while park superintendent Guillermo Santana, at right, checks his heart rate. This was our second capture of Commando; our main task was to replace the radio collar we had attached two years earlier. We also collected blood and semen samples for an ongoing genetic study of puma subspecies.

A dental examination highlights the puma's killing tools—four daggerlike canines. We had just seen what such teeth can do. Our tracking dogs had brought Commando to bay in a narrow cave at the foot of a cliff. Scrambling down it, I nearly jumped into a pool of steaming blood. Crimson dog tracks led to the mouth of the cave. There, Chilindrina, one of our best dogs, staggered out. Her chest was covered with blood, wounded by Commando's powerful jaws. Our field veterinarian stitched her

CARL BLUMRELL

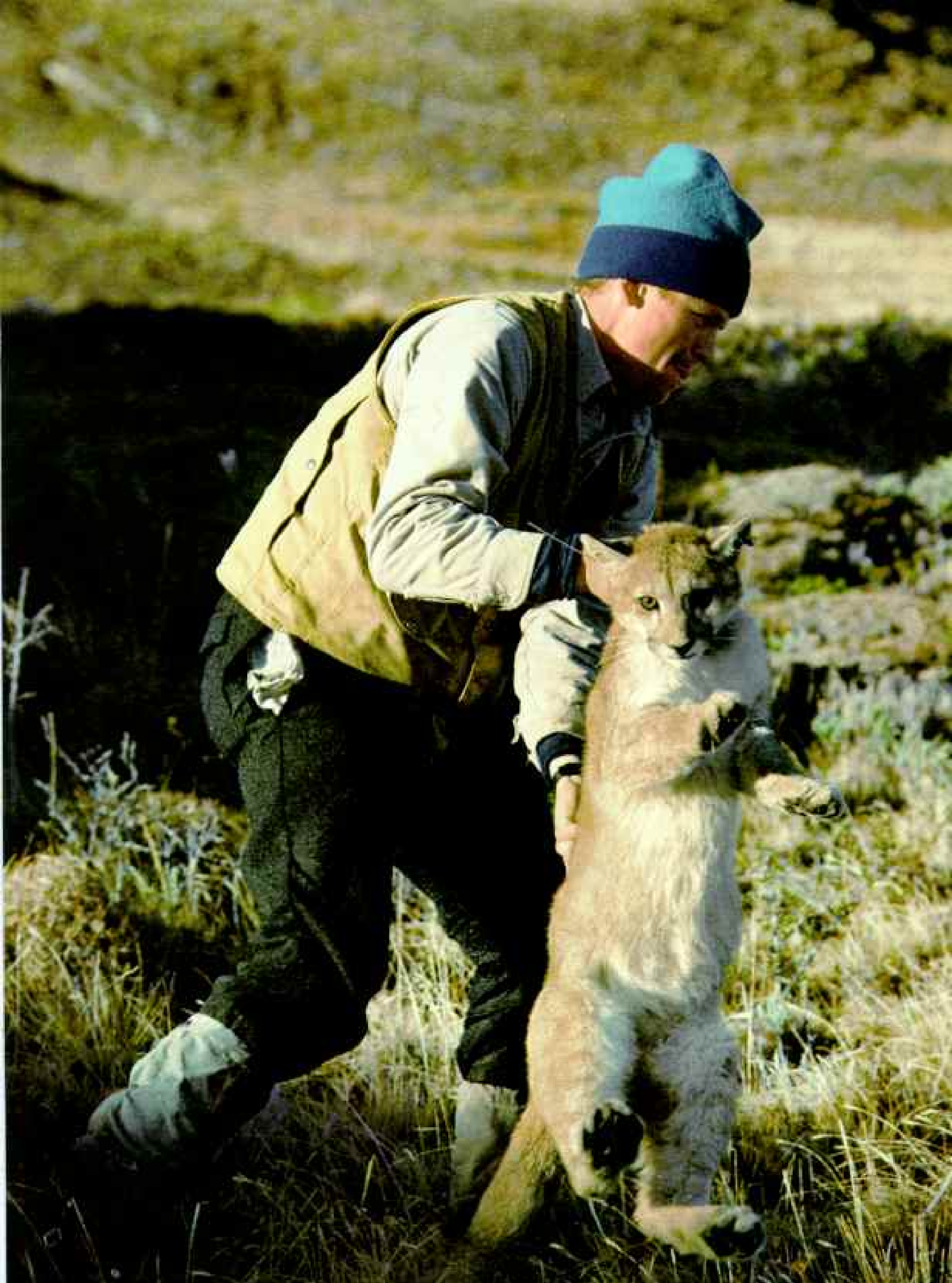
up (happily, she survived) as Warren and I entered the pitch blackness that vibrated with the steady, strangely purrlike growl of a furious puma. Once Commando had been successfully darted, we carefully dragged him out into the sunlight.

A few days earlier Commando had played a part in our capture of a little female, four or five months old, that we named Melody. We caught her during a wild chase that became more like a wrong-way posse going in circles than a puma hunt.

It began when we picked up Commando's radio signal. The dogs started tracking a scent that we assumed was his. Suddenly half the dogs went one way, half went another. So did we. As the dust settled, someone spotted an adult puma wearing a radio collar that wasn't transmitting—Margarita, we thought. Then the dogs followed a scent to some rocks. This, we figured, had to be Commando. Instead, we found a small surprise—Melody! We had blundered into a three-cornered cat circus of Melody, Commando, and Margarita, who we believe is Melody's mother.

Finally radio collared, Melody began to regain consciousness (right) as Warren carried her away from a nearby lake. In her disoriented state, she could easily have drowned.

The first 1991 National Geographic Television Special, "Cats: Caressing the Tiger," airs Wednesday, January 9, at 8 p.m. eastern time on PBS.



With a final glare at his captors, Commando is free. His new radio collar will allow us to stay in touch. By taking readings from two different points along a puma's journey and triangulating, we can fix its location almost precisely. Our studies show that both males and females stake out large, overlapping home ranges, often as much as 40 square miles. We have tracked cats that move ten miles across rivers and rough terrain in a few hours.

Sometimes our collared animals wander beyond park boundaries onto a nearby ranch, and sometimes that means trouble. Pumas have been making easy meals of sheep since the latter were introduced here in the late 1800s. By the early 20th century most of far southern Chile was covered by huge ranches, including what is now Torres del Paine National Park. Each ranch employed one or two *leoneros*, or lion hunters, to keep the puma population in check. By the 1970s these large ranches had been broken up into much smaller ones that could not each afford its own leonero. And with park protection, puma numbers rose.

In 1980 the killing of pumas in Chile was prohibited by law. More than 50 sheep ranchers in our study region, hard hit by puma depredations, have switched to cattle. And occasionally ranchers take the law into their own hands. Several of our pumas have disappeared; they doubtless had become problem animals. While it's regrettable, the situation has more than one side. What's important is that Torres del Paine and its park personnel have enabled the magnificent cats and their natural prey, guanacos, to recover and thrive—a shining example of how Chile is a pacesetter for South American wildlife conservation. □

WARREN E. JOHNSON

STALKING THE

THE DISEASE

Searching for clues to Lyme disease, researcher Sam Telford drags a blanket to snare infected ticks on Nantucket Island.

WORLD'S EPIDEMICS

DETECTIVES

By PETER JARET

Photographs by
MATTHEW NAYTHONS and
STUART FRANKLIN MAGNUM

King cholera dispenses contagion with drinking water in George John Pinwell's sketch documenting the 1866 London epidemic.

During an outbreak in the city 12 years earlier, physician John Snow had demonstrated that cholera could be transmitted by water, though no one at the time realized that bacteria caused the disease. In a now classic study Snow plotted cases on a street map to find the source of the outbreak: contaminated water that flowed through the Broad Street pump. Removal of the pump handle halted the epidemic.

Today someone infected with a disease can travel thousands of miles by air and broadcast contagion even before noticing any symptoms. Medical detectives, known as epidemiologists, follow close behind. The evidence they collect about the spread of age-old scourges, such as cholera, and those newly identified, such as AIDS, helps break the chain of transmission.

STUART FRANKLIN (PREVIOUS PAGES); PHILADELPHIA MUSEUM OF ART, SMITHKLINE BECKMAN CORPORATION FUND (FACING PAGE)

"WE LIVE in muck and filthe," they wrote to the London *Times* on July 3, 1849, in a letter signed by 54 of that city's poor. "We aint got no priviz, no dust bins, no drains, no water-splies, and no drain or suer in the hole place. . . . We all of us suffur, and numbers are ill, and if the Colera comes Lord help us." Five years later, in 1854, cholera came with a vengeance.

A man waking in good health, it was said, could be dead by sundown. Within 250 yards of the intersection of Cambridge and Broad Streets, more than 500 people died in little more than a week. Carts groaned under the weight of corpses carried away for mass burial. Those who could, fled. Others locked themselves away in fear.

No one knew how or why contagions spread. Some blamed foul vapors. Others saw the work of divine retribution. Decades would pass before medical scientists accepted the idea that microbes too small to see were the cause of infection.

But a 41-year-old physician named John Snow believed he had found the source of the Broad Street contagion. On a map of London, Snow marked where victims died. Nearly all the deaths, he saw, had taken place near the Broad Street pump—one of many public water pumps in London.

But before he could be sure, Snow had to understand why ten deaths had occurred nearer another street pump. Amid the growing panic Snow visited the families of the deceased. Five of the distant victims, he learned, regularly sent for water from the pump at Broad Street, preferring its taste. Three others were children who attended a school near Broad Street's pump.

That was all he needed. On September 7, Snow appeared before the vestry of St. James's Parish, meeting in solemn consultation on the causes of the epidemic. His request astonished them. He asked that the Broad Street pump handle be removed. It was. Within days the outbreak of cholera ended.

Although Snow did not discover cholera's cause—a bacterium called *Vibrio cholerae*—his methodical work helped establish modern epidemiology, "the art and science," as one of his present-day counterparts would put it, "of chasing epidemics."

Today the Broad Street pump is gone. In its place I find the John Snow pub. I've come here to inaugurate a journalistic adventure. I am setting out to explore the nature of today's epidemics as well as the scientists who chase them. I've taken a crash course in epidemiology at the federal Centers for Disease Control (CDC) in Atlanta, Georgia, headquarters for the world's most famous medical sleuths. My honorary diploma in hand, I'm ready to follow in the footsteps of John Snow. Even as I raise my glass in the pub that bears his name, the CDC receives word that his old enemy, cholera, has struck again, this time in the small West African nation of Guinea-Bissau.

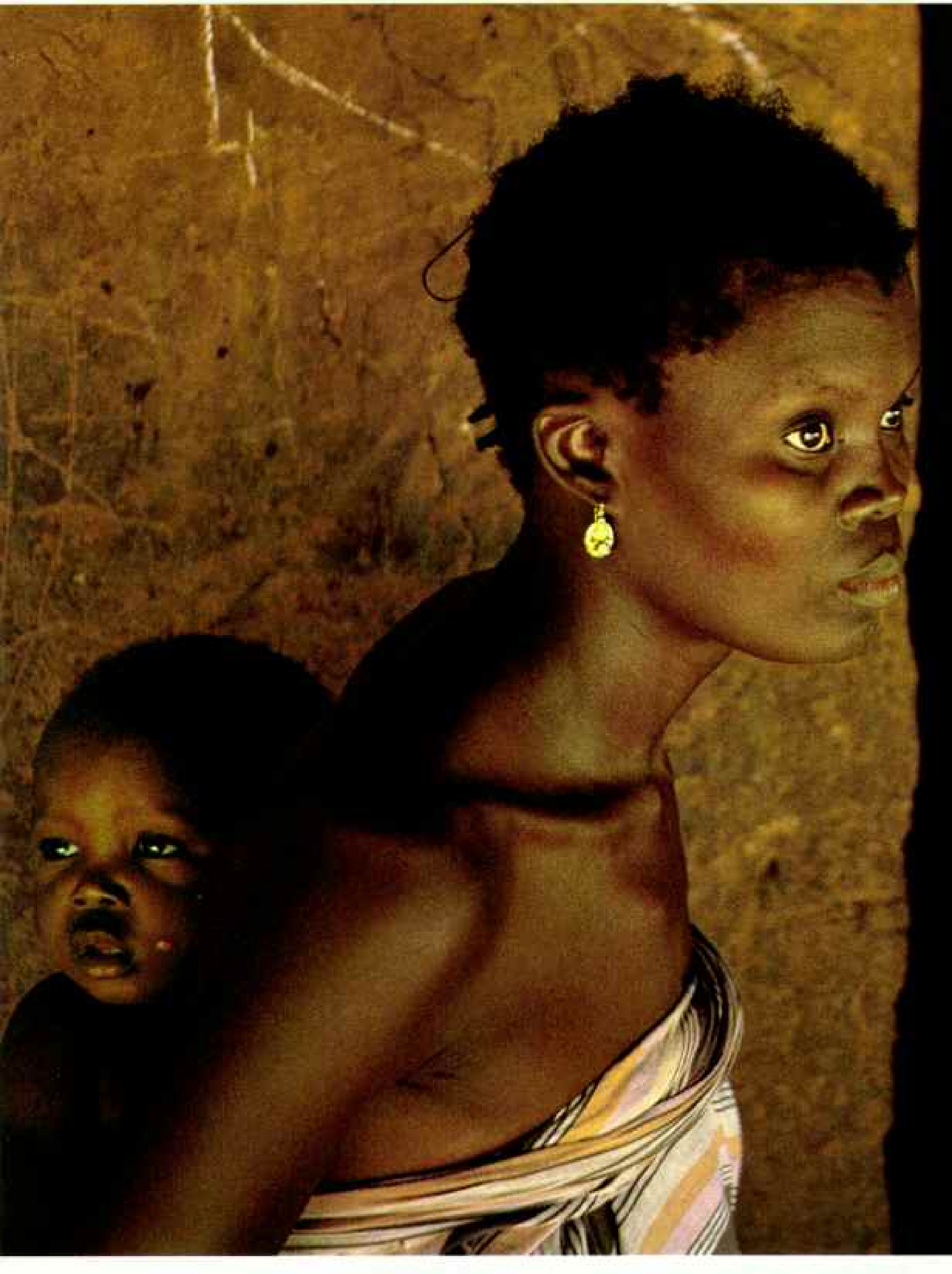
"STOP! ZONA INFECTADA CÓLERA," warns the handwritten sign strung on surgical gauze across the courtyard of Simão Mendes Hospital in Bissau, the nation's capital.

"Not very long ago this courtyard was crowded with cholera victims. Scores of new cases were arriving each day," says my companion, a young physician named Nathan Shaffer.

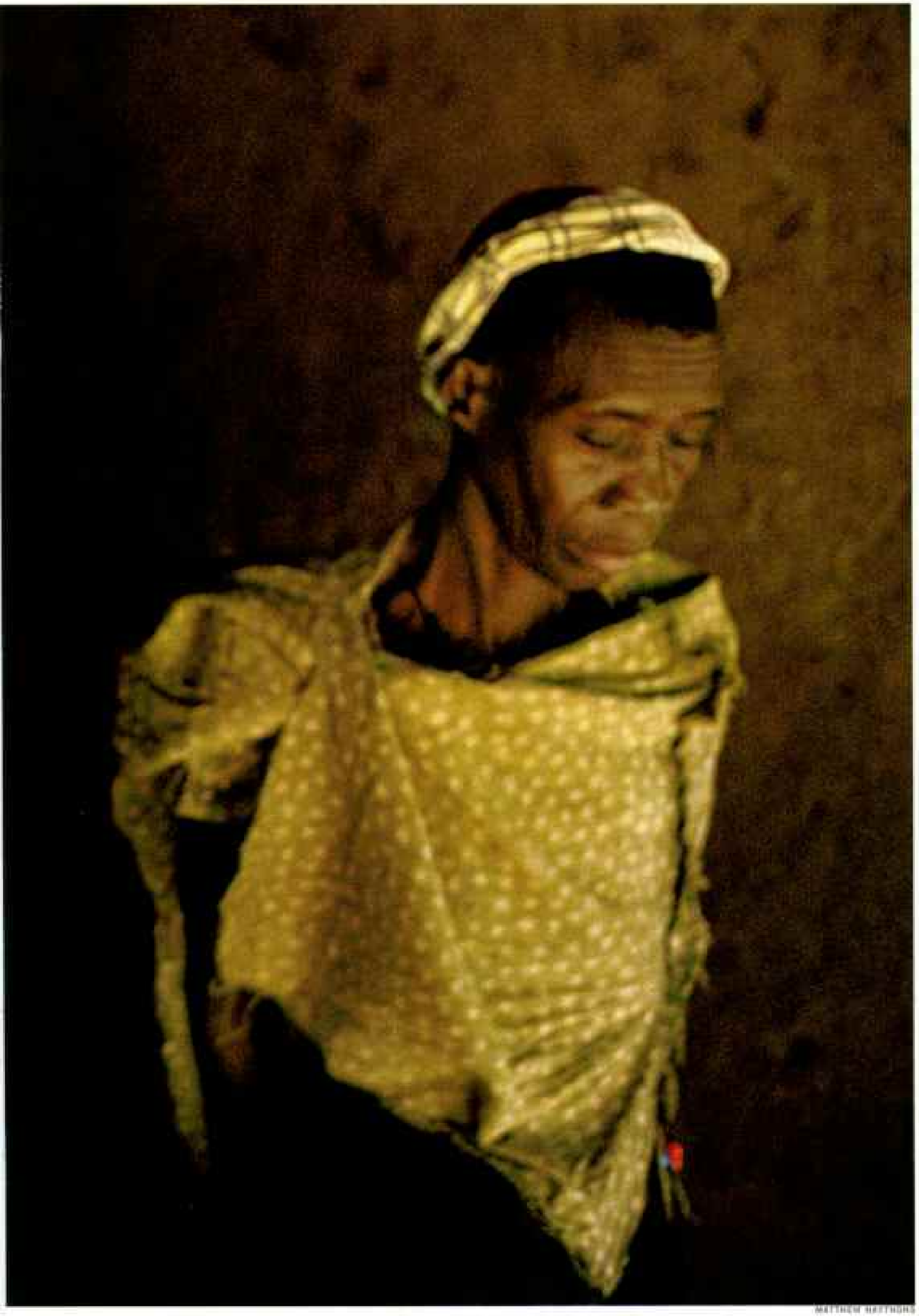
He is an officer with the Epidemic Intelligence Service (EIS), a corps of CDC disease detectives—some 65 doctors, nurses, and other experts in public health on call 24 hours a day for two years, ready at the first alarm to chase down an epidemic.

Vibrio cholerae infects the intestinal tract, releasing a toxin that causes severe diarrhea. Untreated, patients can become rapidly dehydrated and die. But drinking a simple solution of water, salts, and sugar usually heads off severe dehydration, giving the body a chance to eliminate the infection. So though the faces we pass in a cholera clinic are gaunt, these victims are safe. And the epidemic is ebbing.

Shaffer fills me in on his investigation. "Of course, I wondered about water—especially in a country that lacks even basic water sanitation. But the outbreaks didn't seem to be associated



As cholera assails Guinea-Bissau, villagers come to the elder's hut to consult with local public-health officials and specialists from abroad. Having little experience



MATTHEW MATTHEWS

with the disease, the country worked hard to control the 1987 epidemic, keeping the fatality rate among the lowest ever reported for a cholera outbreak in Africa.

with particular wells. Here, you can see for yourself. . . ."

He unfolds a map of Guinea-Bissau. Black marks indicate reported outbreaks of cholera. "The epidemic was spreading up and down the coast. Right away I suspected shellfish."

Like John Snow, Shaffer went door-to-door through the hot, dusty streets of Guinea-Bissau. "An epidemiologist, like any good detective, begins by asking questions," he tells me. "Who are the victims? What sets them apart from those who remain well? Where do they live, what do they eat and drink, when did they fall ill?"

Shaffer and I tour local markets, gathering shrimp and crabs to be tested for cholera. But even if the specimens harbor the cholera bacteria, one mystery remains.

Shaffer points out three black marks on his map—places where cholera has flared up far inland. Contaminated shellfish could have been carried from the coast. But there's a more macabre possibility. The bacteria may have traveled in bodies carried home for traditional funeral rites. Washing the bodies and preparing funeral feasts, often in unsanitary conditions, relatives and friends of the dead could have spread the disease.

We set out for the village of Quinsana, where cholera had claimed more than 80 victims. There we learn that a dockworker named Ocanti Te fell sick after returning from the capital. He died two days later. So did his 15-year-old son.

Villagers gather in the shade of the dockworker's porch.

"Who cared for the sick man and his son?" Shaffer asks them. "Was a funeral feast held? How were the victims buried?"

We learn little. The government has banned traditional funerals, and the village leader forbids talk about the burial.

Shaffer is disappointed. "An epidemiologist is part historian," he explains. "We depend on people's memories and their willingness to tell what happened."

"To understand the dynamics of the outbreak, you can't just concentrate on sick people coming to the hospital," says Nathan Shaffer, here interviewing villagers in Guinea-Bissau to investigate how cholera was spreading. Then an officer in the Epidemic Intelligence Service, an arm of the Centers for Disease Control (CDC) in Atlanta, Georgia, Shaffer had to be ready around the clock to track down epidemics anywhere in the world.

For the next three weeks Shaffer continues his investigation. I visit him in Atlanta several months later, near the end of his EIS term, to discuss his findings. He has been seriously ill, not with cholera but with a rare parasitic infection he picked up in Guinea-Bissau—one risk of medical detective work.

But his persistence paid off. In another inland village where 11 had died, he proved his suspicion. The body of a dockworker

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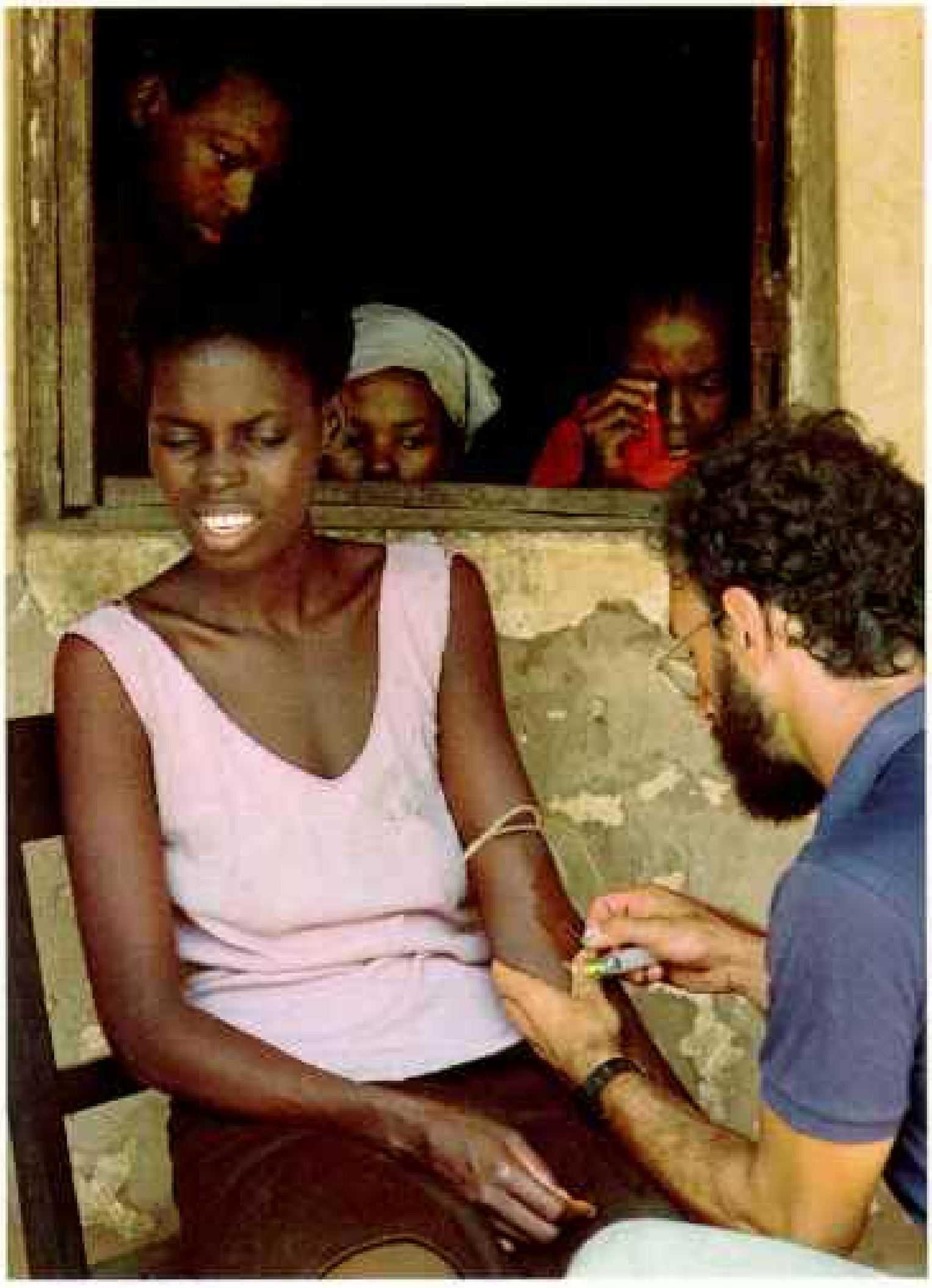
Free-lance medical writer PETER JARET reported on the human immune system in the June 1986 GEOGRAPHIC. He lives in Petaluma, California. This is the first appearance in the magazine of the work of photographers STUART FRANKLIN of Oxford, England, and San Franciscan MATTHEW NAYTHONS, a medical doctor by training.

had been smuggled home for burial. More than half the people who ate the funeral feast came down with cholera.

Shaffer adds a footnote. "When I went back through the data I gathered going door-to-door through the capital, I found an unexpected pattern. Families that possessed hand soap were far less likely to become infected than those without soap."

Could something as simple as soap have slowed the epidemic? Almost certainly. John Snow himself wrote that "nothing has been found to favour the extension of cholera more than want of personal cleanliness. . . ."



"STRICTLY SPEAKING, an epidemic is any unusual outbreak of illness," Lyle Conrad of the CDC tells me. As director of field operations for the Division of Epidemiology, he has seen plenty. "There are as many as 3,000 outbreaks each year in the U. S. alone. No one knows how many more occur around the world."

He shows me a list: hepatitis in a Washington, D. C., day-care center; measles at a small college in Colorado; an unexplained surge of tuberculosis in New York; Legionnaires' disease in Michigan.

Each year the CDC's laboratories receive hundreds of thousands of specimens—blood, tissue, puzzling microbes—illnesses in search of a diagnosis. Many are permanently stored here, part of a huge archive of maladies. Some are so deadly that scientists must don helmets and contamination-proof suits to enter the air lock of the maximum containment laboratory, where killer microbes reside.

"The same new technologies that have revolutionized modern medicine have also given us amazing powers of detection," says Conrad. For instance, new instruments can search a single drop of blood for signs of dozens of diseases.

"But the science of epidemiology still owes much to John Snow," he adds. Maps remain crucial. A pen and paper often come in handier than the fastest computer. The epidemiologist's laboratory is still the human community.

In the 1970s that laboratory was the wooded areas near Lyme, Connecticut.

A young mother named Polly Murray was among the first to notice. One by one her family had developed a baffling array of

A needle's quick sting provokes a wince, as Shaffer draws a blood sample to determine whether cholera bacteria have infected this woman without producing symptoms. Such information allows a better estimate of the epidemic's scope.

BOTH BY MATTHEW MAYHORN

symptoms: rashes, headaches, pain and stiffness in their joints. "By the summer of 1975 my husband and two of the children were on crutches," she recounts. "Meanwhile I kept hearing about other people, most of them children, with the same symptoms." Alarmed, she contacted state health authorities.

At the time, epidemiologist Allen Steere had just settled down at Yale University to pursue a fellowship in rheumatology—the study of arthritis-like diseases. "Juvenile arthritis is rare," Steere tells me. "And arthritis isn't known to be infectious."

But in the Lyme area he found 39 children and 12 adults with swollen, painful joints. Along four rural roads, one in every ten children was affected. "I was astonished," he recalls. "It seemed almost certain that we were looking at a new disease."

But what was it? And how was it spreading?

All of the victims lived near wooded areas. Many first noticed their symptoms in summer or fall. Summer is insect time, and the woods around Lyme are a perfect breeding ground. Steere began to wonder if an insect could be transmitting the illness.

When he interviewed his patients, some mentioned an unusual bull's-eye rash that appeared weeks before their symptoms began. It was similar to a rash reported in Europe, thought to be caused by a tick bite.

"In 1977 one of my patients who happened to be an ecologist actually brought me the tick that had bitten him," Steere remembers.

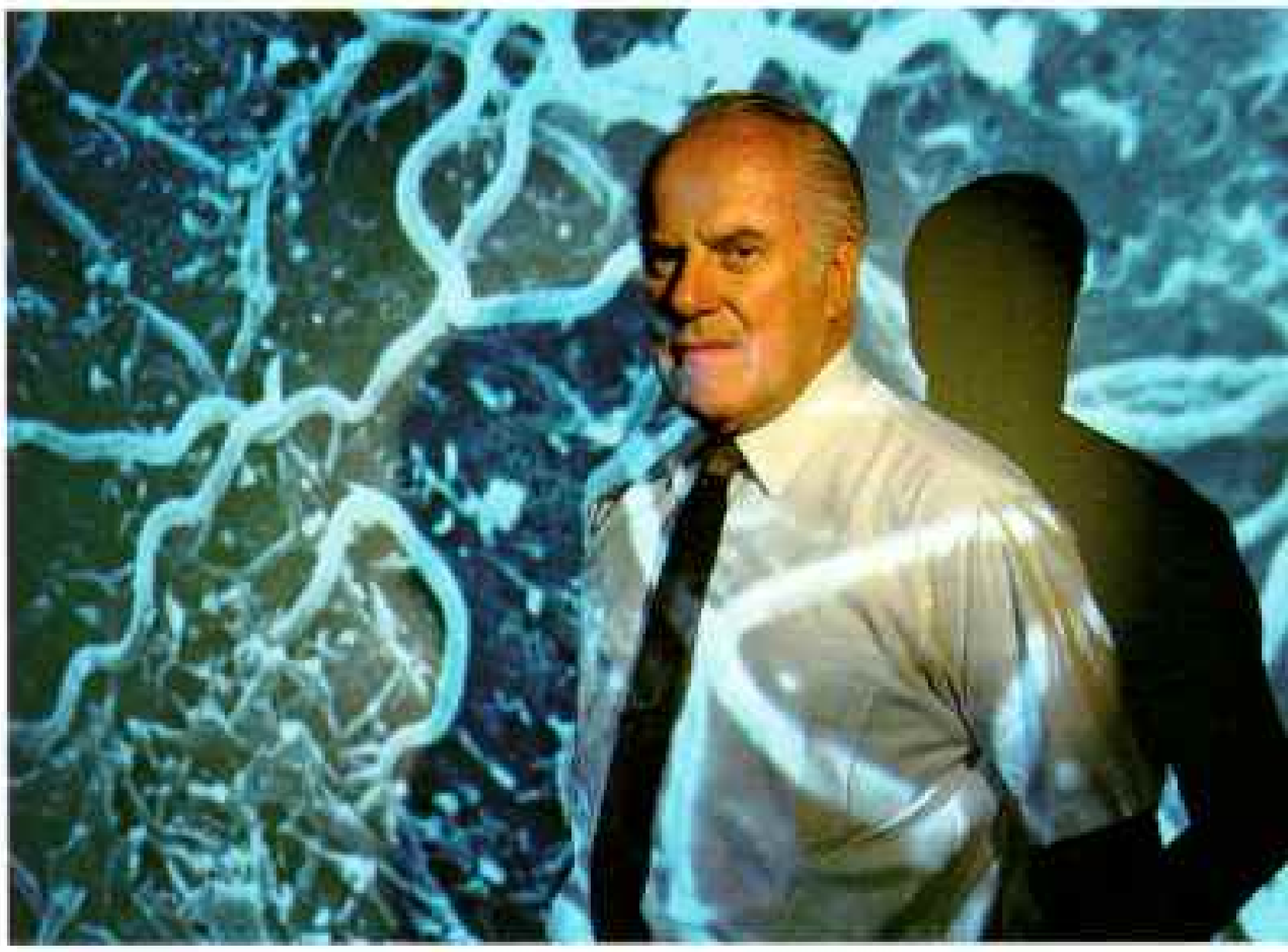
That tick was *Ixodes dammini*. And where it occurred—mostly on the east side of the Connecticut River—people were getting sick. To the west, where the tick was much rarer, the puzzling illness was far less prevalent.

In 1981, while studying tick-borne diseases with pathologist Jorge Benach, entomologist Willy Burgdorfer discovered that *I. dammini* was infected with a corkscrew-shaped bacterium called a spirochete.

"We still don't have a dependable test for the early diagnosis of Lyme disease," says tick expert Willy Burgdorfer, illuminated by an image of the bacterial pathogen, which he identified in 1981.

Recalling her ordeal with anguish, Carole Lee (facing page) suffered from crushing headaches, profound fatigue, hearing problems, and disorientation for seven years before being diagnosed as having Lyme disease. Intravenous antibiotics have reduced these and other symptoms.

BOTH BY STUART FRANKLIN



"The Lyme disease spirochete has probably been infecting ticks for a long time," contends Andrew Spielman, the Harvard University entomologist who first described *I. dammini*. A recent study noted that museum specimens of ticks collected on Long Island in the 1940s were infected. Since then tick populations in the Northeast have increased dramatically, triggering the epidemic.

Why are there more ticks? Many of the forests that had been felled in the region have returned. And deer populations, especially in the past few decades, have exploded. So have the numbers of *I. dammini*, which feed on deer.

Deer themselves do not become ill. But when a tick bite infects a human host, the result can be devastating disease,

Clues from a number of fields of scientific research, collected in this simulated epidemiologist's notebook, built the case against the tick-borne bacterium that causes Lyme disease.

PAINTING BY CHRISTOPHER A. KLEIN, RAS

LYME DISEASE TRAIL

1. Fall 1975 Rheumatologist Allen Steere receives phone call: mysterious outbreak of arthritis around Lyme, Connecticut. 39 children and 12 adults examined; arthritis in large joints, usually the knees.

2. Steere puts red dot on map for each house with arthritis case; some streets have many dots. Cases cluster in summer and early fall. Is this contagious? Spread by an insect? Insects fell area's dense woods in summer.

3. Some patients remember a frightening bull's-eye rash followed by arthritis, headaches, fatigue, other symptoms. 1976 A colleague mentions similar rashes in Groton, Conn.—resemble erythema chronicum migrans (ECM) condition known in Europe. Steere looks up ECM—bite of European sheep tick is possible cause.

4. Researchers drag cloths through underbrush to collect ticks. Tick related to European sheep tick far more common on Lyme's side of Connecticut River, where disease is concentrated.

5. 1979 Medical entomologist Andrew Spielman describes suspect tick as new species, Ixodes dammini, and works out its two-year life cycle.

Larvae hatch in late summer, take one blood meal - usually from white-footed mice. Next spring larvae become nymphs, which take a second blood meal, sometimes biting humans. In fall ticks, now adults, favor white-tailed deer. Take final blood meal, mate, and lay eggs.

6. 1981 Medical entomologist Willy Burgdorfer dissects Ixodes dammini from Long Island, finds spirochetes (spiral-shaped bacteria). Knows about Lyme disease and ECM. The bacteria - later named Borrelia burgdorferi - are proved to cause Lyme disease. Injected mice transmit bacteria to tick larvae; nymphs pass infection to mice - or to humans - keeping bacteria in circulation. Booming deer population promotes more ticks.

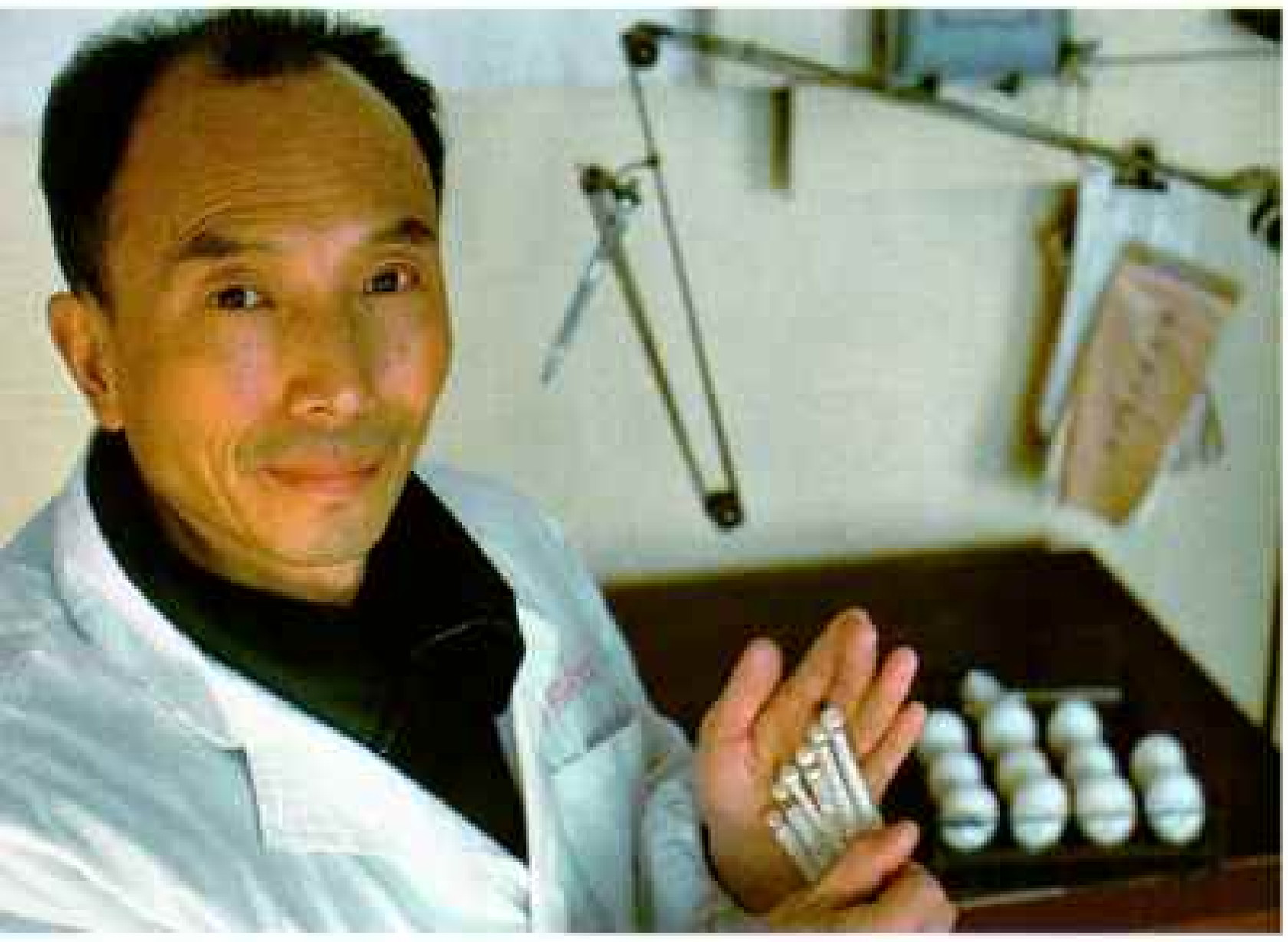
including crippling arthritis and memory loss. Last year more than 7,000 new cases of Lyme disease were reported. Efforts to find a vaccine are under way, but the infection continues to frighten much of the country each summer.

EACH FALL the CDC epidemiologists brace themselves for one of nature's most reliable epidemics—influenza. "Believe me, we have every reason to be afraid of this virus," warns Alan Kendal, head of the CDC's influenza branch. "Every year it claims thousands of lives in the U. S. When a new strain appears, hundreds of thousands of people may die around the world."

Periodically, devastating global epidemics develop. During the 1918-19 pandemic, flu killed at least 20 million people. "We don't know what made that flu so deadly," Kendal admits. "And there is always the chance that another one will strike."

Influenza viruses constantly evolve. And spread fast. A new strain emerging in Asia can circle the globe within months. Vaccines can protect, but a vaccine must be created for each strain. That means spotting mutations early.

"For flu hunters China is the most fertile ground," Kendal tells me. "Virtually all new strains arise there. Pigs and ducks, common on Chinese farms, harbor the virus. Perhaps they serve as mixing vessels for new strains."



Strains of a mighty virus lie in the slender vials held by influenza expert Shen Fang-zheng at the Shanghai Hygiene and Anti-Epidemic Center. The CDC analyzed these samples from China and identified one strain spreading to the West. It was used to prepare the vaccine for the 1989-1990 U. S. flu season. The composition of the flu vaccine must be changed frequently to keep up with mutations of the virus.

Mutations may enable animal viruses to infect humans. Not just flu but also such diseases as tuberculosis and measles may have originated in animals.

"The sooner we spot a new strain of influenza, the sooner we can prepare a vaccine against it," says Kendal.

He describes a flu-hunting mission to China he is planning for December. "Want to come along?" he asks.

Such a strange safari is irresistible, and a few months later we are touring the country in search of the latest virus. To our chagrin we can find none. In Beijing and Xian, to the west, we are told that 1987 is an unusually light year for flu. But the CDC has already reported the first outbreak of influenza back home—among a group of American tourists returning from China!

Persistent, we head to China's largest city, Shanghai. Our taxi ferries us through its crowded streets, past the bustling harbor filled with ships from around the world. We pass farmers with carts of produce from the countryside. So many people. So many comings and goings. So many opportunities to catch the flu.

We reach the Shanghai Hygiene and Anti-Epidemic Center, housed in a dilapidated building of European design—a

reminder of this city's past. It is not heated, and for several very cold hours, while we warm our hands around cups of tea, Kendal tells the Chinese scientists that he hopes to procure freeze-drying equipment for them. That way they could mail specimens back to Atlanta, eliminating the need for trips such as this. He proposes an exchange with the CDC, to train students in genetic analysis techniques. Eventually their labs might simply telefax a sheet of paper with information about the genetic structure of new viral strains. Still, for now we need live viruses.

We tour overcrowded laboratories, wearing down jackets beneath our medical gowns. I am convinced we will go home empty-handed. The meetings are finished. We are getting ready to leave, when Huang Yu Shun, deputy director of the center, holds out a shiny stainless-steel canister. Kendal opens it to find just what we came for: a dozen glass tubes filled with flu specimens from local hospitals.

A month later, back at the CDC, the viruses have been analyzed. We have caught a new strain: A/Shanghai/11/87. It has been transformed into a map of sorts.

Microbiologist Nancy Cox points to a sheet marked by rows of numbers and strange codes—Asn, Phe, Gly, Leu, Ser, amino acids that make up the proteins of a virus.

"Because the unique identity of a virus is determined by the specific order of amino acids in its proteins," Cox explains, "we can use maps like these to compare different viral strains. And when a new strain like A/Shanghai/11/87 appears, we can alter the current vaccine to protect against it."

What would John Snow have made of such a map? A simple street plan of London had helped him track down cholera. Now molecular epidemiologists are using genetic maps to extend the search for patterns deep into the building blocks of life itself.

And disease detectives have stretched the boundaries of epidemiology in other directions, taking on new illnesses like heart disease and cancer, diseases that may develop over a lifetime.

"The whole point of Framingham was to begin when people were healthy," physician William Castelli tells me at the Framingham Heart Study clinic. In 1948 epidemiologists descended

The killer flu that first struck in the spring of 1918 landed this soldier in the Army hospital at Fort Porter, New York. In Europe troops of all World War I armies fell to the disease before bullets could bring them down. The epidemic's toll has been estimated at 20 million dead worldwide.

MATHEW BRADY (ABOVE, PAGE 1); CULVER PICTURES

Is household current dangerous? Data on the electromagnetic field it generates will help epidemiologists find out. Industry researchers in a Massachusetts skeleton house measure the fields emitted from a variety of electric wiring schemes and appliances.

on Framingham, Massachusetts, population 28,000. Some 5,000 volunteers were recruited for the initial study. Every two years since then they have undergone physicals and answered dozens of questions. "As our subjects developed heart disease, as some inevitably did, we began to understand what factors put people at risk."

Indeed, much of what we know about the risks of heart disease—high blood pressure, elevated cholesterol levels, cigarette smoking, lack of exercise—has been learned here.

But ending the epidemic of heart disease, says Castelli, won't be easy. "The causes of chronic diseases like cancer and heart disease are complex, rooted in how we live. It would be nice to think that all we have to do is locate the pump and remove the handle. But our job is much tougher."

Nowhere is the challenge greater than in an epidemic that runs wild through the streets of the nation's inner cities. One Saturday night in an emergency room at Atlanta's Grady Memorial Hospital, I witness its toll.

Just after eleven o'clock the call comes. An ambulance is on its way, carrying a black male, 18, shot through the back.

I watch from the corner of the operating room while doctors and nurses try to save him, connecting IV tubes, transfusing blood, probing the wound. "I'm not getting a pressure on him," someone says.

The flow of blood can't be stemmed. The bullet has torn his heart. Forty minutes later Edward Smith is dead.

"A black male born in the U. S. today has a one-in-27 chance of being murdered," CDC epidemiologist Mark Rosenberg tells me. He shakes his head in outrage. "One in 27. And most of those victims will be young."

Traditionally, violence has been a matter for the police, not medical sleuths. But Rosenberg believes classic methods of disease detection can help curb violence.

"If we can find a pattern," he says, "we can find ways to intervene. Kids who are at risk can learn to stop arguments before they escalate into violence. Public-health people can begin

Electromagnetic fields may promote cancer, suggests research begun in the 1970s by epidemiologist Nancy Wertheimer and physicist Ed Leeper, here surrounded by a network of power lines near an electric substation in Boulder, Colorado.

BOTH BY STUART FRANKLIN

to recognize behaviors that lead to spouse abuse. Communities can learn to spot the warning signs of teenage suicide."

Rosenberg is no dreamer. He knows the causes of violence and suicide—poverty, drugs, hopelessness—run deep. "But it wasn't long ago that smallpox was considered a fact of life in most parts of the world, something that people simply accepted," he reminds me. "We've eradicated smallpox, wiped it off the face of the earth. Today people think violence is a fact of life. I don't believe we have to accept that."

With measured steps Jake McIntyre takes the treadmill test under the eye of R. Curtis Ellison, a physician directing a study on diet and physical activity in Framingham, Massachusetts. Since 1948 physicians here have used epidemiological methods to study factors relating to heart disease.

Six-year-old Joni Williams and her mother give Ellison a blood sample during a periodic check-up. Joni's grandmother and great-grandmother, at back, participate in an allied study.

BOTH BY STUART FRANKLIN

IN TRUTH smallpox remains, sequestered in two laboratories—one in Atlanta, the other in Moscow. Scientists still debate whether to exterminate these last viruses or preserve them for study.

But there's no doubt that the end of smallpox represents one of the greatest triumphs in public health.* Indeed, until this past decade, it seemed as if most infectious diseases were being tamed, at least in the developed world. Until 1981—when we first realized that a new, appallingly destructive disease was silently spreading. That disease was AIDS.

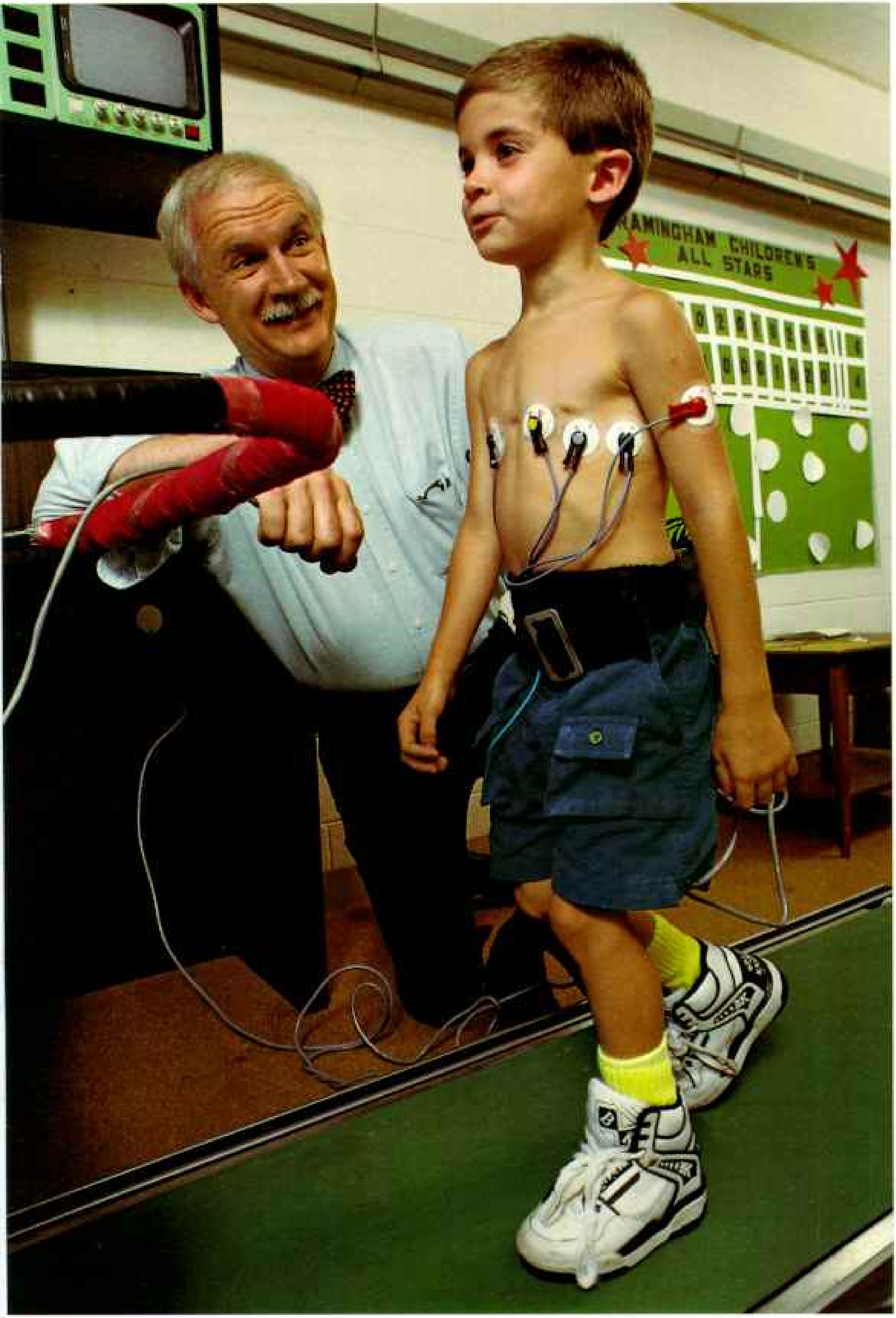
"Classic epidemiology was all we had to go on," recalls James Curran, who directed the CDC's first investigations in the early 1980s and now leads the agency's continuing battle against AIDS. "Week by week the reports came in of a bewildering array of puzzling infections. An unusual and often deadly form of pneumonia. Skin cancer so rare that most physicians had never seen it."

Epidemiologists quickly traced the disease to sexual contact. Then the first hemophiliac with AIDS was diagnosed, and it became clear that contaminated blood could also transmit the illness. Soon an infant was born to an infected mother, proving the disease could spread from mother to child. Researchers also realized that it could lurk in the bloodstream for years before producing any symptoms.

In July 1981 Curran and his staff reviewed local medical records for rare cancers and infections going back to 1976. "Nothing showed up in 1976 or 1977," he remembers. "Then in 1978 we began to find isolated cases of the symptoms we are seeing now. No one knew what to make of them back then. Now we know we were looking at the birth of a new disease."

Recently medical detectives have tracked AIDS surprisingly deeper into the past. At the Manchester Royal Infirmary in England, British physician Trevor Stretton still recalls vividly

*Donald A. Henderson reported the successful global campaign against smallpox in the December 1978 issue.


AMINGHAM CHILDREN'S
ALL STARS

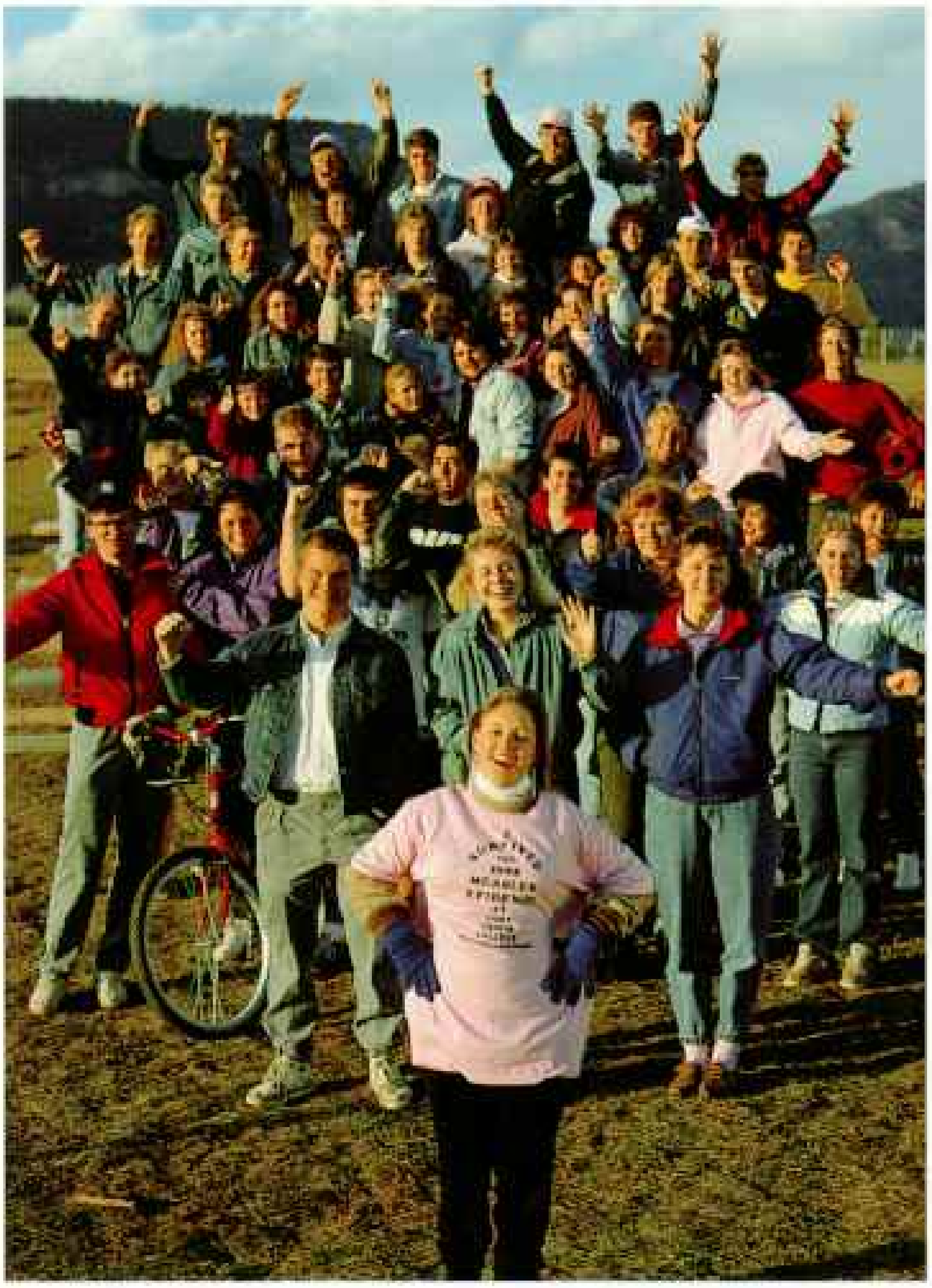
the 25-year-old sailor who appeared in the clinic in 1959. "He was feverish, losing weight, wasting away," says Stretton, who was himself a young physician in training at the time. "Sores covered his skin. Nothing we could do seemed to help. He died before our eyes. We hadn't the slightest idea why."

The customary autopsy was performed. Tissue samples from different organs were preserved in blocks of paraffin and stored—but not forgotten. The unsolved case haunted Stretton and his colleagues.

Then in the early 1980s young men in San Francisco, New York, Los Angeles began to sicken and die—wracked with fever, gasping for breath, bodies often covered with strange sores.

Could the sailor, Stretton wondered, have died of AIDS? No one dreamed AIDS was afoot in the 1950s. If so, could it be proved? No blood samples had been saved. Pathologist George Williams, who performed the original autopsy, located the tissue specimens. But when virologists at nearby University of Manchester examined them, they found no sign of the AIDS virus.

And there the case might have ended. But in the 1980s American scientists developed a disease detection technique of extraordinary sensitivity. Called polymerase chain reaction (PCR), it allows researchers to detect a mere fragment of a virus lurking within tissue and then make millions of copies to analyze. Using PCR, the Manchester virologists identified the AIDS virus in four of the six tissue specimens. Thus, three decades after he had helplessly watched the young sailor die, Stretton was able to make his diagnosis.



Up from a real downer, these students have recently recovered from measles, brought to Fort Lewis College in Durango, Colorado, by Lydia Scoville, at center. Surprisingly, most who fell ill had been vaccinated. CDC investigators rushed to the campus during the 1988 outbreak to trace what had gone wrong.

BOTH BY MATTHEW HAYTHORN

The CDC estimates that by 1991, 165,000 Americans will have contracted AIDS. Nearly 100,000 have died—far more lives than the nation lost in the Vietnam War. Researchers estimate that more than a million Americans and at least ten million people worldwide are infected with the virus. Most will develop the disease.

In 1989 the CDC began random and anonymous testing of blood samples from 26 hospitals around the country. One out of every 75 patients was found to be infected with the AIDS virus.

Some areas of the nation are harder hit than others. In one

New Jersey hospital one in every four men admitted between the ages of 25 and 44 years old is infected.

And AIDS continues to spread. Based on a military study, the CDC estimates that as many as 40,000 adolescents and young adults become infected each year. It also reports that some 2,000 babies were born in 1989 carrying the virus.

"It's exciting being part of an outbreak investigation. There's a lot of adrenaline flowing," says CDC physician Bradley Hersh. But fatigue catches up with him back at the hotel as he analyzes the Colorado measles cases. Data from these and other measles vaccine failures led the CDC to recommend two childhood vaccinations instead of one.

WHAT SPAWNED AIDS?

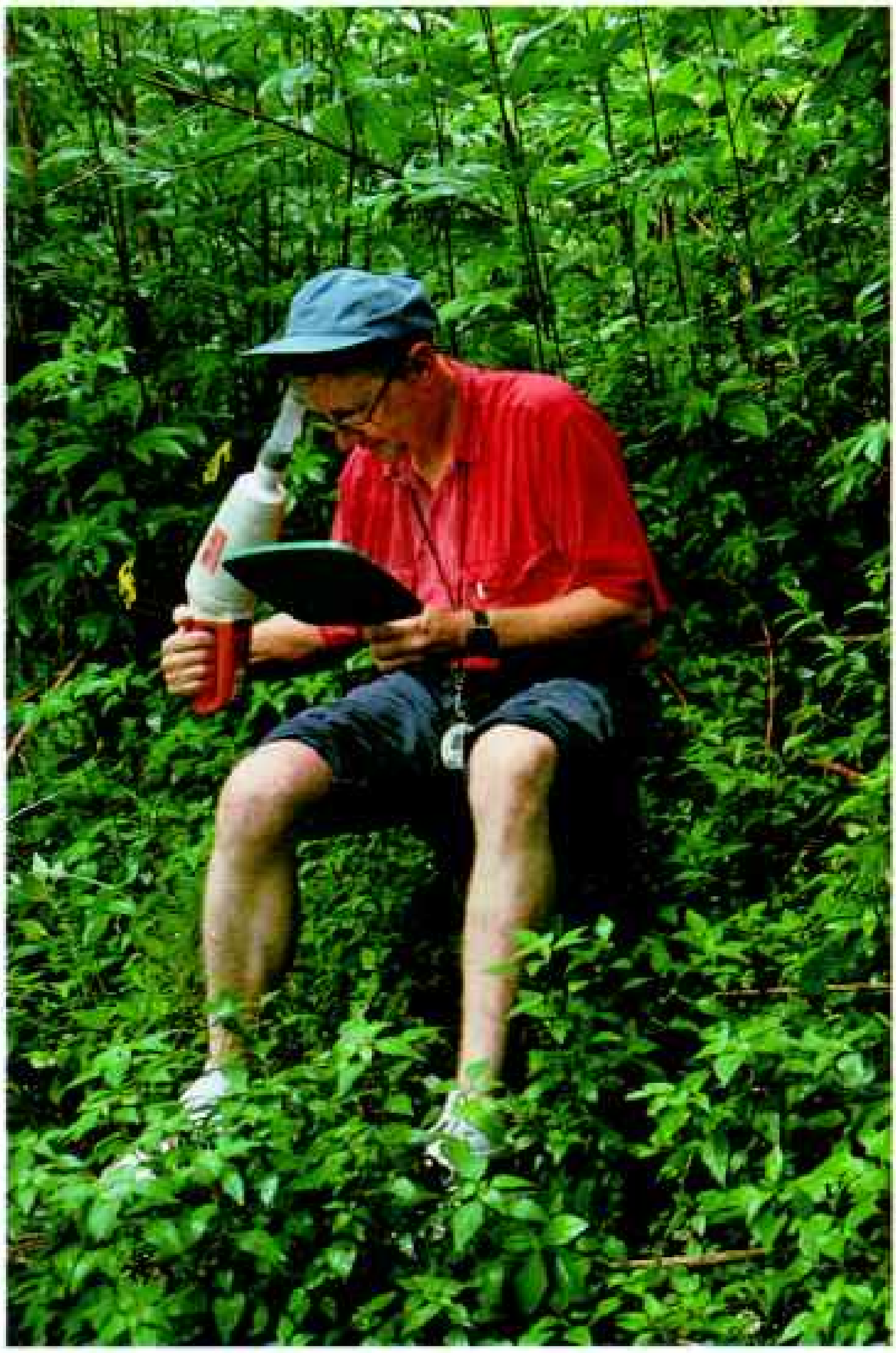
I put that question to Max Essex, director of the Harvard AIDS Institute and one of the world's leading experts on the origins of the AIDS virus. "One possibility is that AIDS has been around for a long time, hidden away in some remote human community," he explains. "Then, as travel and contact increased, the virus began to spread. But I think there's a more likely explanation."

The AIDS virus, called human immunodeficiency virus, or HIV, may have existed for centuries in African monkeys and apes.

"African chimpanzees can be infected with HIV, but they don't develop the disease," Essex tells me. "That suggests that chimpanzees have developed protective immunity."

Then, perhaps as recently as 40 years ago, this virus crossed from monkey into man. Was there a small genetic change in the virus? Or was there simply more contact between monkeys and people as human populations encroached on jungle areas?

"When a new disease infects a previously unexposed population, the impact is often devastating," says Essex. "Smallpox, carried to the New World by European explorers, decimated the native peoples.



"But it never pays to kill off your host, even for a virus. Evolution favors a truce. Viruses become less virulent. Hosts eventually develop immunity. Explosive epidemics are often just the first stage in the evolution of a new disease. Eventually AIDS too will probably evolve into a milder, even harmless disease," says Essex. "But that will require centuries."

LONG BEFORE THEN, some researchers worry, new diseases, perhaps even deadlier than AIDS, will emerge. "An epidemic is an experiment of nature," explains virus expert Stephen Morse of Rockefeller University. "Like all living things, viruses and bacteria are constantly evolving. At the same time, human communities are changing, creating new ways for diseases to spread."

Morse believes we may be inadvertently creating ideal conditions for new epidemics. Rapidly increasing human populations provide a fertile breeding ground for microbes. And as the planet becomes more crowded, the distances that separate us seem

smaller. "Today it takes a matter of hours to travel by plane from Sierra Leone to New York," Morse points out. "In the rush to get from here to there, we're opening up unprecedented highways for viral traffic."

In some cases, literal highways. "The recent completion of a major road through the Amazon rain forest of Brazil led to outbreaks of malaria in the region," he says. "In Kenya, AIDS almost certainly traveled the Mombasa-Nairobi highway."

Commerce too provides routes for new disease agents. In 1985 used tires imported into Houston, Texas, from eastern Asia carried larvae of the Asian tiger mosquito. Virtually unknown in this country until then, this mosquito can be a dangerous vector for serious tropical diseases—including dengue fever, which kills as many as 5,000 children worldwide each year. Today the Asian tiger mosquito has established itself in 17 states.

Ironically, even lifesaving medical technologies pose a threat. Blood transfusions have provided an unforeseen path for viruses, spreading both hepatitis and AIDS.

Legs bared as bait, CDC medical entomologist Jerome Freier sucks an Asian tiger mosquito into a hand-powered vacuum. In the same overgrown lot near New Orleans, Freier and an assistant collect larvae from the water in old tires. Fluorescent powder marks an adult for identification after release (left). Imported from eastern Asia by accident in the 1980s, this insect can transmit viruses to humans but has not yet done so in the U. S.

ALL BY STUART FRANKLIN

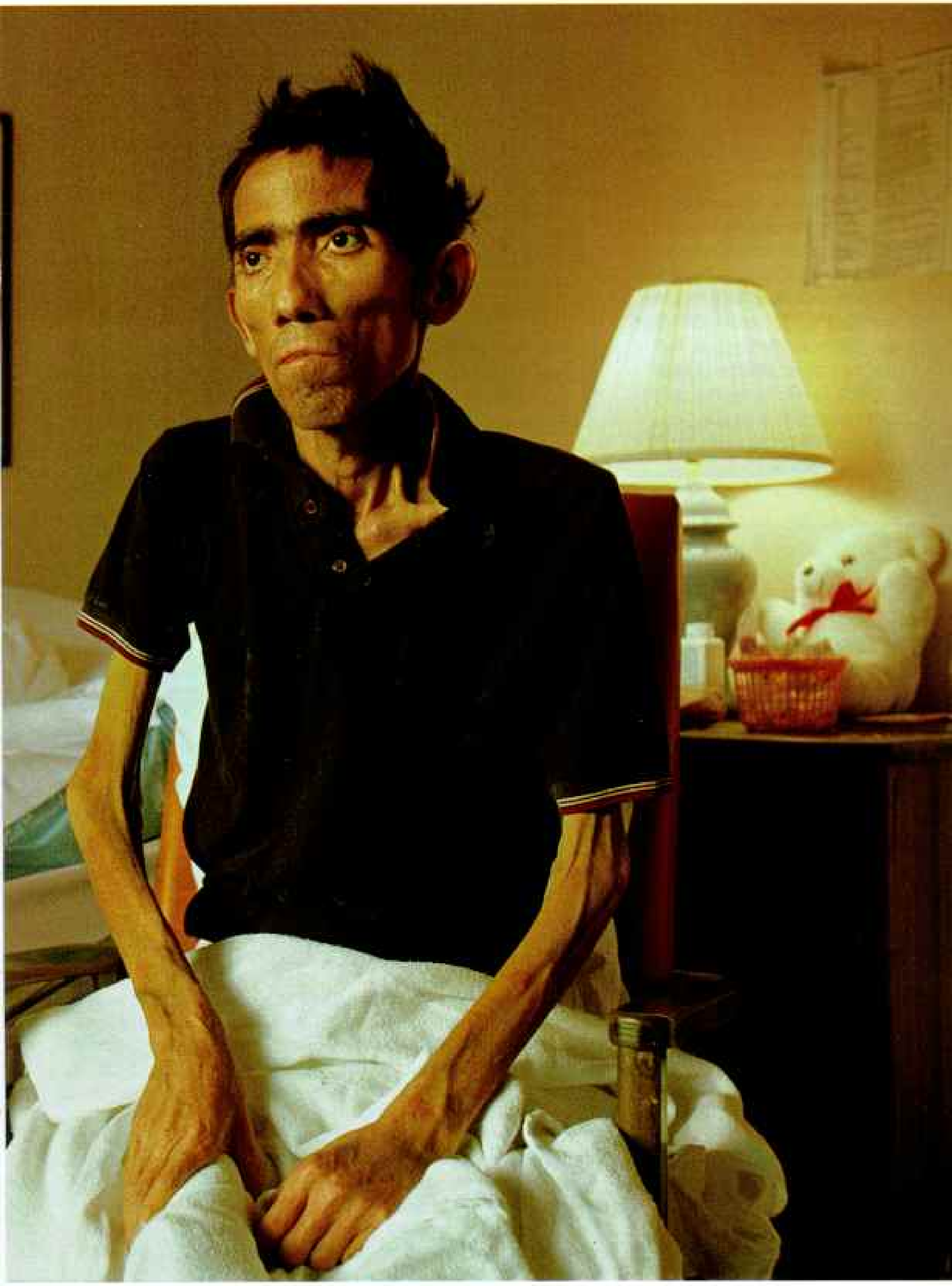
Wasted by AIDS, Jose Renteria died in a Los Angeles hospice soon after this photograph was taken, victim of a disease that has exploded from a few scattered cases in the early 1980s to a global epidemic today.

Recent evidence suggests that the AIDS virus has been infecting humans for at least four decades. At the Manchester Royal Infirmary in England, Trevor Stretton, a physician (below, at

STUART FRANKLIN (ABOVE); ALON REININGER, CONTACT PRESS IMAGES (PHOTOGRAPHED AT CHRIS BROWNLIE HOSPICE)

right), and George Williams, a pathologist, examine a tissue sample from a 25-year-old sailor who died in 1959.

"Neither of us nor the other consultants involved could provide an accurate diagnosis," says Williams. "We just couldn't understand why this man had impaired immune response." In 1990 a new test detected the AIDS virus in the sailor's tissue samples, which had been stored in paraffin.



"No matter what room he walked into or who he spoke with, you would hear laughter," says Lourdes Blanco, supported by friends as she grieves beside the AIDS memorial quilt panel she designed for Raul Cabello of New York City. On that October 1988 weekend 8,288 panels blanketed the Ellipse in Washington, D. C. (facing page). With more than 13,500 panels today, the quilt represents only a fraction of the nearly 100,000 lives lost to AIDS in the U. S.

BOTH BY KEVIN F. GILBERT

But perhaps most worrisome, says Morse, is disruptive environmental change. "We know already that deforestation and sweeping agricultural changes can unleash epidemics. Major outbreaks of Rift Valley fever followed the construction of the Aswan High Dam—most likely because breeding grounds were created for mosquitoes, which spread the disease. In Brazil the introduction of cacao farming coincided with epidemics of Oropouche fever—a disease linked to a biting insect that thrives in discarded hulls."

Will the destruction of tropical rain forests release viruses that have long remained isolated? Will the sweeping changes predicted because of global warming alter animal habitats in ways that encourage the spread of new lethal diseases?

"ISOLATED OUTBREAKS of exotic diseases are constantly occurring," says Morse. Seven years ago, for instance, a mysterious epidemic of a swiftly fatal hemorrhagic fever killed a dozen children in rural Brazil. Other isolated outbreaks have followed. Researchers linked the disease to a common bacterium long known to cause conjunctivitis, a mild eye infection. A slight evolutionary mutation, they suspect, has transformed it into a killer. If the disease should reach densely populated São Paulo, it could prove disastrous.

"Ebola fever, swine flu, Marburg fever, Rocio encephalitis—these are all deadly diseases that have appeared and then, for no reason, disappeared again," says Morse. "Any one of them, given the right circumstances, could break out and ignite global epidemics. That's the lesson of AIDS."

Such lessons will have little meaning to a small boy I'll call Jerome.

Jerome is a Christmas baby, born December 25, 1985. But he has had few blessings. He began life infected with AIDS. Most of his short life will be spent here on the 17th floor of Harlem Hospital Center. Except for a few halting words, he has never learned to speak, and probably never will. His fingers have become clubbed, a sign that his lungs aren't taking in enough oxygen. His doctor tells me that he probably won't see another Christmas.

AIDS continues to spread fast among intravenous drug users. The epidemic of crack cocaine, which encourages prostitution and indiscriminate sexual behavior, has worsened the situation. Inadequate medical care in our country's inner cities allows other sexually transmitted diseases to go untreated, fostering an environment that may also speed the spread of AIDS. Warns Phyllis Kanki, a researcher with the Harvard AIDS Institute,

"We are creating the conditions of poorest Africa right here in our own backyards."

What is there to feel but despair?

FOR MICHAEL TALBERT, however, despair is a waste of time. I meet him one afternoon in Steve Swanson's senior English class at San Francisco's Riordan High School, six weeks before graduation. Today these students will learn a lesson as important as any they will take into the world.

Talbert, 37, has come to tell them about AIDS—which will eventually claim his life.

They seem wary at first, embarrassed. Talbert tells them that it has been three years since he was diagnosed with AIDS. "My hobby then was weight lifting," he says. "I was pressing 350 pounds."

The kids look startled. Talbert's body is so frail that he sometimes needs a cane to walk.

"I always thought bad things happened to other people. Other people got mono. Other people's girlfriends got pregnant. Then I got mono. My girlfriend got pregnant."

The kids laugh. He has touched a nerve.

"That's what I thought about AIDS too," he says quietly.

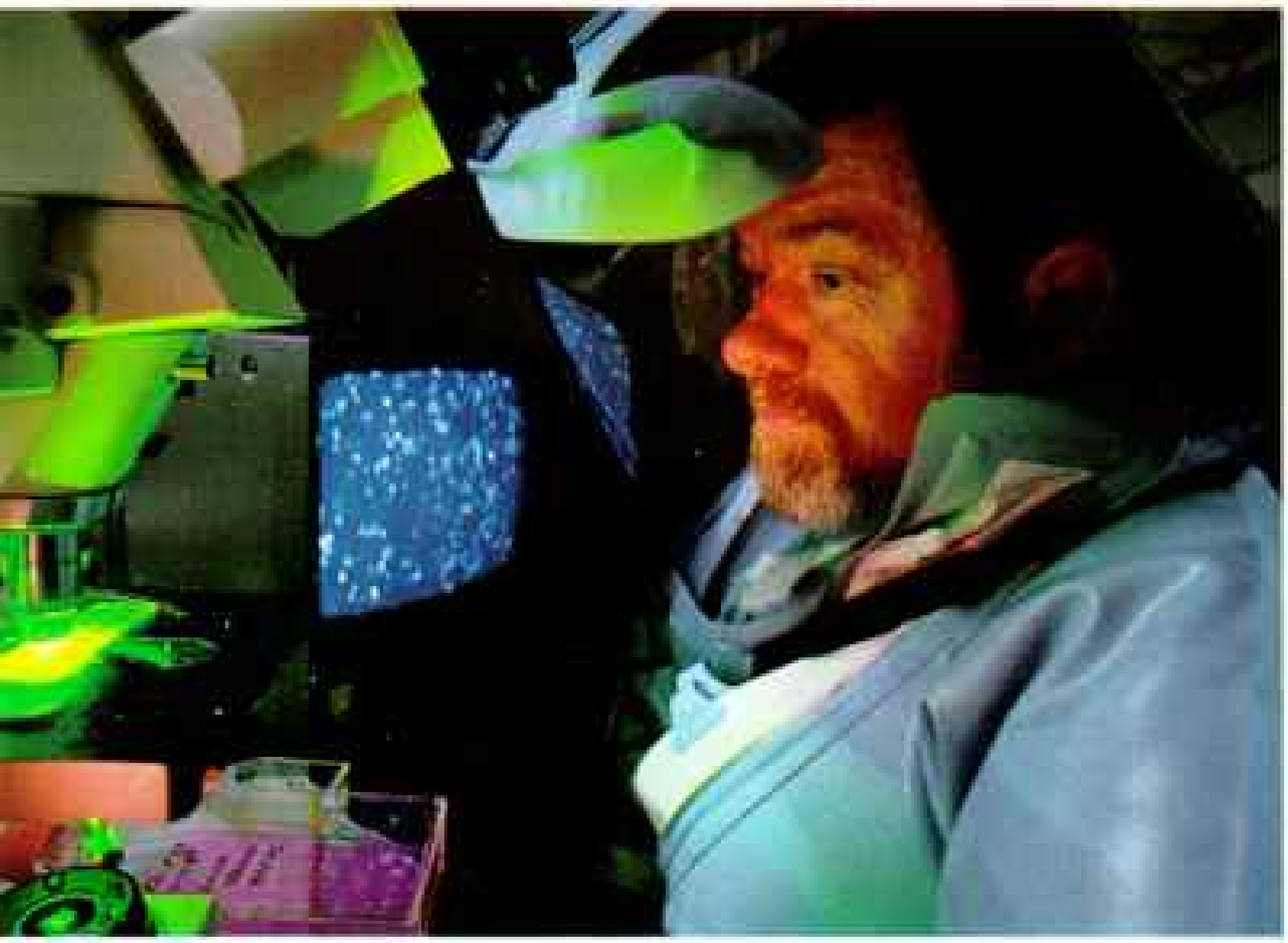
Later the students ask questions. "How do you think you got AIDS?" "Most likely through sexual contact," Talbert answers. "What did your friends say when you told them?" "Some of them were very caring. Some of them were afraid," he replies.

"Back when I got infected, people didn't know how to protect themselves," he says. "We didn't have a chance. You do. You don't have to let this happen to you."

In his small, determined way, I realize, Talbert is removing the pump handle.

A deadly puzzle from West Africa, the Lassa fever virus tests the skill of virologist Michael Kiley, well protected in the CDC's maximum containment laboratory in Atlanta. The visor will not allow him a good look through the microscope eyepieces, so a monitor displays the image. Kiley seeks the same solution as scientists working with less dangerous agents of disease around the world: a vaccine and an effective treatment.

MATTHEW NEWCOMB



Perhaps that is the most important lesson of AIDS. For if this devastating disease has taught us that epidemics will always threaten, it has also shown us that we are not helpless. Day by day, knowledge about AIDS is winning out over ignorance. Fear is giving way to compassion. Medications are slowing the disease's progress. Hopes for a vaccine grow. Moreover, in recent months intensive research has identified 13 ways the AIDS virus may be vulnerable to medical counterattack.

And around the world there are people like Michael Talbert.

"If I can keep just one of these kids from becoming infected," he tells me after class, exhausted by the effort of speaking, "I've made a difference. I've won one small victory against this terrible virus." □

Report from the Editor

DAVID ALAN HARVEY

American Legacy: Folk Arts and Crafts

We Americans take pride in our country's historic role as a melting pot—a living crucible of varied cultures distilled into a special blend we call American. Fortunately many of the ingredients of that blend survive in the distinctive folk arts we have brought with us from other lands and times. The article beginning on page 74, "Masters of Traditional Arts," pays tribute to that priceless American heritage.

Since 1982 the government-funded National Endowment for the Arts has named more than a hundred outstanding folk artists and craftsmen National Heritage Fellows, a designation accompanied by a $5,000 grant. The program is similar to one in Japan, whose recipients, like their American counterparts, are often proudly referred to as Living National Treasures.

The U. S. program emphasizes the cultural or ethnic origin of a particular craft; thus, Margaret Tafoya of Santa Clara, New Mexico (above), is celebrated not simply as a gifted potter but as the creator of highly distinctive Pueblo Indian pottery.

Authors Boris Weintraub and Marjorie Hunt and photographer David Alan Harvey crisscrossed the country for months to record the memorable work of 14 National Heritage Fellows. The result is a unique portrait of artists whose talent and dedication give fresh meaning to the definition of art offered by painter Robert Henri: "Art when really understood is the province of every human being. It is simply a question of doing things, anything, well. . . . When the artist is alive in any person . . . he becomes an inventive, searching, daring, self-expressing creature. . . . He does not have to be a painter or sculptor to be an artist. He can work in any medium. He simply has to find the gain in the work itself, not outside it."

On the subject of art versus craft Jonathan Fairbanks, a curator at Boston's Museum of Fine Arts, once wrote: "There is no distinction between fine arts and fine crafts. And in the end it is not the material but the spiritual essence of things that fills us." The National Heritage Fellows are living proof of that fact.

WORLD Readers Become Junior Society Members

Since National Geographic WORLD began publication in 1975, the magazine's young readers have enjoyed a special bond with the Society. Many receive WORLD as a gift from friends or relatives who are members of the Society, and a great many go on to become Society members themselves.

As readers of WORLD our young associates have achieved a number of memorable goals. They have saved a redwood grove in California, designed grotesques for Washington Cathedral in our nation's capital, and taken part in WORLD's annual geography scholarship contest. In addition, WORLD readers have studied some of our planet's major environmental problems and launched environment projects of their own, many of them later reported on in the pages of WORLD.

In recognition of those achievements the Society's Board of Trustees has designated all readers of WORLD official junior members of the National Geographic Society. Young members will receive junior membership cards, certificates, and other benefits.

All of us on the magazine staff welcome these junior members to the Society.

SUSIE BRIMBERG

William Graves

National Geographic, January 1991

Forum

Old-growth Forests

As a tropical biologist I was inspired to see the coverage of a neglected crisis: our own North American forests (September 1990). Economics and wilderness will never be reconciled. If the Pacific Northwest lumbermen persist unchecked, they deserve the eventual fate of unemployment and an even worse insult, having their natural heritage served up to them in paper products from Japan. Long live the spotted owl!

DAVID GRIMALDI
Pompton Plains, New Jersey

If we don't get the spotted owl out of our eye and let the 10,000 trained, dedicated professional foresters in government and industry do their job, our forests will go the way of the cedars of Lebanon. The passing of the old-growth forest is sad, but we have already preserved the remnant and taken large steps toward renewal.

R. W. FREVERT
Douglasville, Georgia

My small town and many others like it in the Pacific Northwest are fighting for survival after the decisions to set aside tremendous amounts of timber for owl and other animal habitats. I firmly believe in setting aside portions of our forests. However, preserving such vast amounts of land is not reasonable. I recommend *balance* in providing for animal habitat and economic realities.

MARILYN SULLENS
Sweet Home, Oregon

Congress has been considering legislation ranging from H.R. 4492, which would preserve much remaining old-growth timber, to H.R. 5094, which would override the Endangered Species Act so as to permit destruction of the spotted owl by continued logging of old growth. Readers across the U. S. should realize that the national forests belong to all Americans, not just those in the Northwest who are cutting the trees.

WILLIAM K. STEELE
Spangle, Washington

As a forestry worker who has spent years planting and thinning trees from northern California to southeastern Alaska, I see the issue as a simple one: We have cut more forest than our ecosystem can replace, and we must now pay for our mistakes. It is true that trees are a renewable resource. But a forest is not. Forests are organisms whose countless life-forms have complex symbiotic relationships that, once destroyed by clear-cut logging, may never recover to support the variety of species originally there. Tree farms are not forests.

MICHAEL MAAS
Forest Farm Association
Grants Pass, Oregon

I grew up in northern Wisconsin, a major focus of the lumber industry at the turn of the century. So-called industrial forests, started in the 1930s, are even today a far cry from a true forest. I recommend that those advocating heavy cutting visit the upper Midwest to see what is left of what were once some of the greatest forests in the U. S.

WILLIAM A. ROSENKRANZ
Alexandria, Virginia

Broadway

"Heere Straat" means not High Street but Gentlemen's Street. It was probably meant to honor the 19 members of the board of directors of the West Indian Company that owned New Amsterdam and were designated as "heeren."

S. WIEGERSMA
Voorthuizen, Netherlands

Broadway in the Bronx is not a bland street. Every Sunday in Van Cortlandt Park as many as 20 cricket games go on, while farther up the field vigorous Central Americans play soccer. This section of Broadway is fascinating because of the many West Indians of both African and Indian (India) heritage.

VIRGINIA SCOTT
Bronx, New York

Manila Galleons

Spanish charts refute Eugene Lyon's statement that "the Hawaiian Islands were never discovered by the Spaniards." A Dutch globe made for Spanish clients in 1613 places a cluster of islands in the latitude of Hawaii, but 9 to 12 degrees east—an error of longitude explained by the westward flowing ocean current. Galleons had been passing Hawaii annually for two centuries before Cook arrived. Hawaiian legends told of light-skinned strangers, one story going back eight generations before Cook's "discovery." One reason the Spanish failed to establish a station there was that the galleons needed capacious harbors, which Hawaii didn't have. Thousands of documents at the Archive of the Indies in Seville have never been opened. Someday the story of Spanish discovery of Hawaii may be found there.

HERB KAWAINUI KANE
Captain Cook, Hawaii

It may be interesting to note that Andrés de Urdaneta, after years of service to the Spanish

crown, joined the Augustinians in Mexico City in 1552. It was seven years later that he was summoned by Philip II to find the return (eastbound) route across the Pacific after leading the first missionaries to the Philippines, his fellow Augustinians. Their principal church is shown on page 15.

ARTHUR J. ENNIS, O.S.A.
Augustinian Novitiate
Racine, Wisconsin

I enjoyed especially the part about Commodore George Anson because I live in the Ansonborough section of Charleston. Anson spent 1724 to 1735 patrolling nearby waters for pirates. He bought a plantation, Bowling Green, and in 1745 laid out streets and lots there for Charleston's first suburb.

LAWRENCE MILLER
Charleston, South Carolina

As a Filipino-American I was gratified to learn that the Mangyan of Mindoro still use the ancient script, written on bamboo (page 21). Historical accounts show that the early Filipinos read and wrote in their own alphabets before the Spaniards came. In many areas half the people could read and write and were more literate than their colonizers. Overzealous Spanish priests considered the literature pagan, destroyed manuscript libraries, and forced Filipinos to use the Latin alphabet. I hope that the Mangyan pass on this precious heritage and that Filipinos realize how rich their precolonial culture was.

BEN DE LUMEN
El Cerrito, California

Concepción

The article glosses over the disturbing fact that the project was sponsored by a commercial salvage firm and that the artifacts recovered were doubtless destined to be sold for profit. This glorification of treasure hunting, despite the supposed "rigorous archaeological standards," can only lead to further destruction of underwater sites.

RICARDO J. ELIA
Director, Office of Public Archaeology
Boston University, Massachusetts

The story of the study of the wreck is an example of the exception that proves the rule. Organizers Bill Mathers and Hank Parker asked me to help find reputable American underwater archaeologists to work on the project. Each one I approached told me American archaeologists have agreed never to participate in a project sponsored by treasure divers. They cited many tales of woe, in which the bulk of the archaeology (artifact conservation and complete reports) was abandoned as soon as the salvors grabbed their treasure or went bankrupt. I feel they are right. Yet every so often a Bill Mathers comes along and does a good job.

JOHN FITZHUGH MILLAR
Williamsburg, Virginia

This is one part of world history that we seldom hear about—the Manila-Acapulco route. Where did all the exotic *Concepción* treasures go?

DELIA T. LERIT
Huntington Park, California

The Concepción collection was sold in July to a Japanese resort-development company, which is building a museum to exhibit it in Saipan. The salvage company little more than broke even after five years of effort. The archaeological reports are on file with the Northern Mariana Islands government.

Ellis Island

How pleased I am that this piece of our heritage is preserved. My grandfather Itzchak Teif came to this country from a small Russian village in 1910 with less than $25 in his pockets, according to the information recorded on the ship's manifest. The family name Teif became Horowitz when an official suggested that it sounded too much like "thief." How do I contribute to the Wall of Honor in my grandfather's name?

RUSSELL I. MOORE
El Paso, Texas

Write to Statue of Liberty–Ellis Island Foundation, Inc., 52 Vanderbilt Avenue, New York, New York 10017-3808.

I was disappointed that the reference to the fund-raising omitted chairman of the foundation Lee Iacocca. Without his dedicated work, raising the monies would have been impossible. Mr. Iacocca's parents came from Italy through Ellis Island, and his efforts are a tribute to them.

LAURA BARON
Clearwater, Florida

Immigration Today

As an African and an immigrant myself, I can identify with everything said in your September article. No one could imagine the sort of perils we face in Third World countries that force us to leave, and the hardships we face here just trying to make it and support our families back home. We are here not to take over America but to contribute in making it a greater nation.

ELIZABETH QUAGRAINE
Burke, Virginia

You say the "search for the most equitable formula continues." The most equitable formula is simple. Let them all in.

TOM ALCIERE
Nashua, New Hampshire

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

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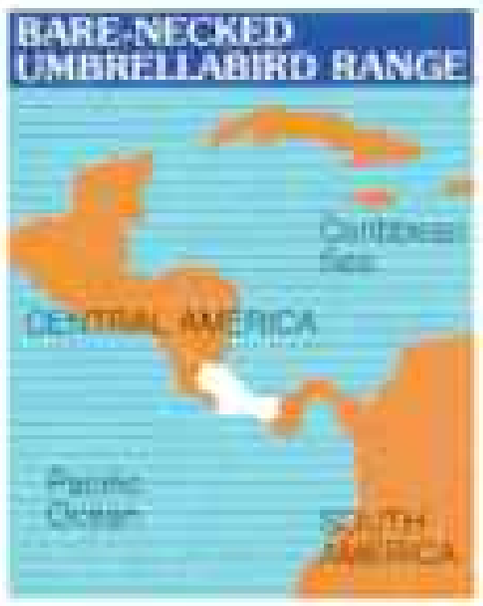
WILDLIFE AS CANON SEES IT



Bare-necked Umbrellabird

Genus: *Cephalopterus*
Species: *glabricollis*
Adult size: 36-41 cm
Adult weight: 320-450 g
Habitat: Tropical rain forests in Costa Rica and Panama
Surviving number: Unknown
Photographed by Michael and Susan Fogden

The male bare-necked umbrellabird descends to the lower canopy of the cloud forest to perform its courtship display. There, on a selected perch, it spreads its "umbrella" crest and emits resonating calls as its throat sac inflates and turns a vivid scarlet. Like many other tropical birds, the bare-necked umbrellabird is threatened by the destruction of its forest habitat. To save endangered species, it is essential to protect their habitats and understand the vital role of each species within the earth's ecosystems. Photography, both as a scientific research tool and as a means of communication, can help promote a greater awareness and understanding of the bare-necked umbrellabird and our entire wildlife heritage.

RECYCLING TIME

This watch is a piece of junk. Its metal workings are made entirely from recycled cans. In fact, the everyday "tin" can is made of 100% recyclable high grade steel. And if we all recycle, cans will provide the best means to build our bridges, skyscrapers, automobiles—even precision watches. The time to recycle is now.

FOOD FOR THOUGHT

Del Monte Quality

*Del Monte supports steel can recycling. For information about recycling in your area, please contact the Steel Can Recycling Institute, 680 Anderson Drive, Pittsburgh, PA 15220.

Geographica

To a Latvian Collector, GEOGRAPHIC Is the Goal

NATIONAL GEOGRAPHIC collectors are a determined breed. But even among that hardy lot, Barbot de Marni Evalds is something special. Evalds lives in Rīga, Latvia, and has been collecting the magazine for more than 40 years.

"For years Communist officials made it difficult to obtain GEOGRAPHICS," Evalds recalls. Yet he persevered. He wrote letter after letter to collectors inside and outside the Soviet Union, placed classified ads in local and regional newspapers, haunted stores that sold old books in Rīga, Moscow, and the Estonian capital, Tallinn. Sometimes the cover of an issue would be torn off; sometimes an article would have been cut out. "It's better to receive half an issue than no issue at all," Evalds says philosophically. The government was especially sensitive about articles dealing with aviation, high technology, nuclear energy, and, of course, politics, he explains.

By now Evalds, a translator who speaks eight languages, has accumulated 838 issues of the magazine, plus dozens of maps and books. He credits the NATIONAL GEOGRAPHIC for helping him perfect his English. "As an evening prayer, each night I look through my list of missing issues," he says, hoping the next day will bring a new find. "It's like a chess game. I'm always figuring how to search."

LARRY C. PRICE

For Mount Rushmore, a Belated Dedication

Fifty years late, Mount Rushmore National Memorial will finally be dedicated July 4.

Sculptor Gutzon Borglum started work on the massive sculpture in 1927 (GEOGRAPHIC, October 1956). Four small ceremonies were held as the heads of Presidents Washington, Jefferson, Lincoln, and Theodore Roosevelt were completed in the 1930s. But Borglum died shortly before work ended on his South Dakota masterpiece in October 1941, and then World War II intervened, and things just slipped. So a formal dedication will be held this summer.

The dedication will be part of a yearlong celebration that will include the beginning of a major upgrade of the memorial's visitors facilities. Part of the cost will be met by proceeds from the sale of a three-coin commemorative set authorized by Congress.

Meanwhile the Mount Rushmore National Memorial Society, a support group that raised funds to pay for the sculpture's construction, has funded a detailed structural analysis designed to tell, for example, if a crack in George Washington's head poses any threat to the stability of the memorial. "We've never had such an analysis before," says the group's president, Carolyn Mollers. "We never even had the technology to do it before."

PAUL HORSTED

Burst Water Pipe Floods Canadian Maps

Ed Dahl says he is happy he was working late the night water began gushing into the map vault of the National Archives of Canada in Ottawa. Because the archives' specialist in early cartography was still at his job, he was able to call for help, dash into the vault, and begin to save priceless atlases and maps dating from as early as the late 15th century.

Geographica

The deluge started when a pipe burst between the fourth and fifth floors of the archives building at 6:15 p.m. last July 4. Though many rare items were allowed to dry naturally, nine early atlases—including 1607 and 1608 editions of Mercator's *Atlas Minor* and Ortelius's 1584 *Theatrum Orbis Terrarum*—were placed in a freeze dryer to speed the process and avert mold. Among the many items Dahl was able to rescue was a 1508 map, the archives' oldest showing Canada. Also saved was a detailed military survey of Quebec from the early 1760s ordered by Governor James Murray—one of just five hand-drawn copies in existence.

Archives specialists estimate that it will take professional conservators 3,000 hours to restore all the water-damaged items, at a cost of $650,000 Canadian ($565,000 U. S.). Jean-Pierre Wallot, Canada's national archivist, says the trove of old maps of North America is "one of the jewels of our collection. This was a major disaster."

GARY BRASCH

Family Reunion Recalls an Oregon Trail Trek

Five families held an Oregon reunion last July, the hundredth year in a row that they have gathered together. They also celebrated a typically American epic journey.

Hanson and Lavina Stevens and their children left Iowa in a covered wagon in 1852 and eventually traveled the Oregon Trail (GEOGRAPHIC, August 1986) to settle and farm in Mount Angel, Oregon. In July 1890 the five children and their families joined to celebrate the 50th birthday of Hanson and Lavina Stevens' son, Isaac. They had such a good time that they decided to do it again the next year. And the five families—named Stevens, Ringo, Mount, Esson, and Smith—have gathered every year since.

The three-day hundredth anniversary reunion took place on the 370-acre farm of Evanell Esson Ewing near Mount Angel. Some 350 people showed up; many still live nearby, but others came from as far as Hawaii and Boston. Each of the five branches contributed a chapter to the Stevens family history. There was a barbecue and a band, swimming in the old family swimming hole, and a ceremony in the family cemetery. There were family Bibles and steamer trunks and, says one family member, "lots and lots of old photographs." And there was the original ox yoke used by Hanson and Lavina Stevens on their trek west.

The youngest among those present was four months old. The oldest was Eva Stevens, born in 1902; she is the daughter of Isaac Stevens, whose 50th birthday prompted the first reunion a century ago.

Using Tradition to Find the Asante's Origins

In their 18th- and 19th-century heyday, the Asante people ruled from their homeland in what is now central Ghana. Though much has been written of the Asante since Europeans arrived, little is known about their origins and their pre-17th-century history except through oral traditions passed down from generation to generation. A University of Calgary archaeologist is trying to learn more by using those traditions to locate Asante archaeological sites.

During three field seasons Peter Shinnie has collected folktales that describe the first Asante emerging from a hole in the forest floor. Then, at a place in the forest called Asantemanso, where the tales say this happened, he found a group of small, low mounds. In those mounds was pottery more than a thousand years old. Not much else, however: "Under the soil conditions in this hot and humid climate, nothing else survives," he says ruefully.

Shinnie believes that by A.D. 1100 Asantemanso was a town with a few thousand residents, who were raising crops, yams and perhaps sorghum. Today there are about two million Asante among Ghana's 13.8 million people.

National Geographic, January 1991

Earth Almanac

MICHAEL NICHOLS, MAGNUM

Gold Rush Destroying a Primitive Culture

One of the dark dramas of human history, the trampling of native cultures by modernization, is being replayed in the rain forests of Brazil and Venezuela. There 20,000 Yanomami Indians, the largest primitive group left in the Americas, still hunt with bow and arrow and farm with slash-and-burn methods. But their world is being assaulted by gold miners, who ravage the environment and spread diseases.

In Brazil thousands of miners have spilled out of sanctioned mining areas and on to Indian reserves. When the government dynamited airstrips, the gold seekers ferried supplies by helicopter. Many miners have crossed into Venezuela, which has promised to create a reserve for the Yanomami.

Perhaps a thousand Indians have

died from introduced illnesses such as influenza, measles, and venereal disease. Also the loud, bustling mining camps frighten away animals the Indians hunt. Some Yanomami are reduced to begging food from the miners. Even villages not touched by miners are affected by gold-mining techniques. Hydraulic dredges and high-pressure hoses destroy riverbanks. Silt is dumped into once pristine streams. Mercury used in processing gold also pollutes the waterways.

"It would be tragic to lose these people, who have fine-tuned their use of the rain forest," says Kenneth Good, an American anthropologist who has lived with the Yanomami.

Las Vegas Improves Odds for the Desert Tortoise

Two years ago the city of glitter and fast living threatened to overtake one of its plainest, slowest residents. Las Vegas construction was invading the burrows of desert tortoises, whose numbers had already been cut by stock grazing, off-road vehicles, and disease.

Then in 1989 the U. S. Fish and Wildlife Service declared the tortoise endangered. Harming it or its habitat became a felony. Multimillion-dollar projects ground to a halt. Developers challenged the turtle's endangered status in court.

The lawsuit ended in compromise. Developers agreed to contribute 2.5 million dollars toward a conservation center to study the reptile, whose designation has since been changed to threatened. The center will become home to nearly 900 tortoises removed from 7,000 acres in Las Vegas Valley, which builders can then develop. Also, a habitat-preservation plan is being hammered out by developers, environmentalists, officials, and ranchers to secure half a million acres of federal land for tortoise protection.

TOM BEAN

National Geographic, January 1991

Earth Almanac

JAMES P. BLAIR, NGS (TOP RIGHT); JULIA SIMS, PETER ARNOLD INC. (BOTTOM RIGHT); ALICE KINZIE

U. S. Students Kindle a Small Soviet Revolt

Testing the waters of *glasnost* took 20 Vermont high school students to Leningrad last summer. Testing the waters of Soviet lakes and rivers put them in the middle of a media maelstrom.

During a three-week ecology exchange the teenagers spoke before Soviet audiences about U. S. pollution problems—solid waste, tainted groundwater, and auto emissions. Using basic chemistry equipment, they also sampled water at popular bathing beaches along the Neva River and Zerkalnoye (Mirror) Lake, 60 miles away.

"We found high levels of nitrogen and phosphorus, indicating inputs of raw sewage," said Toby Sheppard Bloch, age 15.

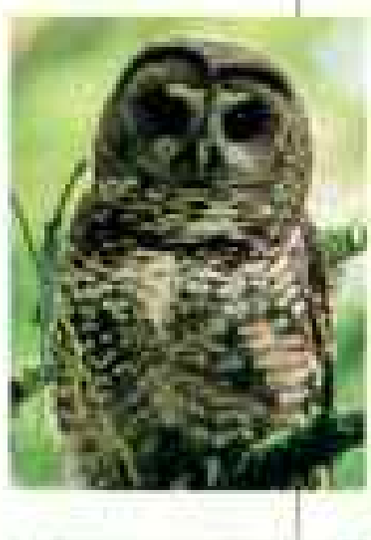
Soviet officials insisted the water quality was fine. "But the Soviet media, formerly a rubber stamp for Communist Party policy, fired questions at the students," said Vermont writer Rebecca Brookes, who was with the group. State-owned television warned bathers away from the polluted waters. And *Pravda*, the official party newspaper, made the water testing page-one news.

Soviet students who attended the U. S. presentations had never seen disposable diapers or heavily packaged products. But Soviet life opened American eyes as well.

"They recycle everything," observed 16-year-old Aysha Peltz, who bunked for ten days in a Soviet home. "I couldn't find a waste basket anywhere." A return invitation will bring Soviet students to Vermont this summer.

Its Roving Eye Threatens Spotted Owl

Bird of contention between environmentalists and loggers, the northern spotted owl (upper) has been listed as threatened because of its shrinking habitat, old-growth forests in the northwestern U. S. Now the bird may mate itself into extinction. In two cases it has bred with the more common barred owl (lower). The offspring is called—unofficially—a "sparred owl."



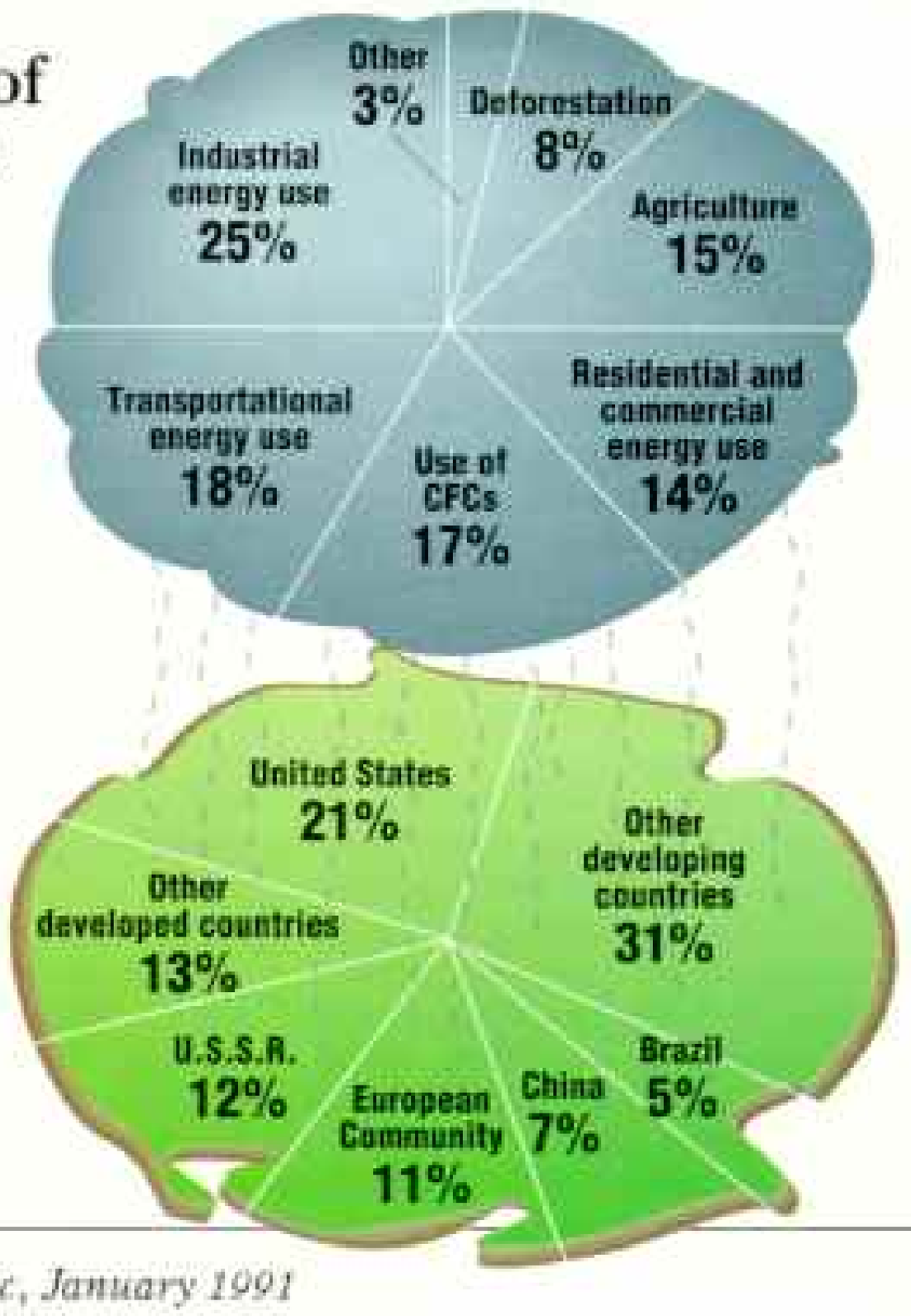
The barred owl seems to adapt easily to logged areas and has expanded its range from the East Coast to the West. Sparred owls may be quirks of nature. If not, they could mean the disappearance of the spotted owl.

The origin of greenhouse gases

The cloud at right represents greenhouse gases released into the atmosphere as a result of human activities during the 1980s.

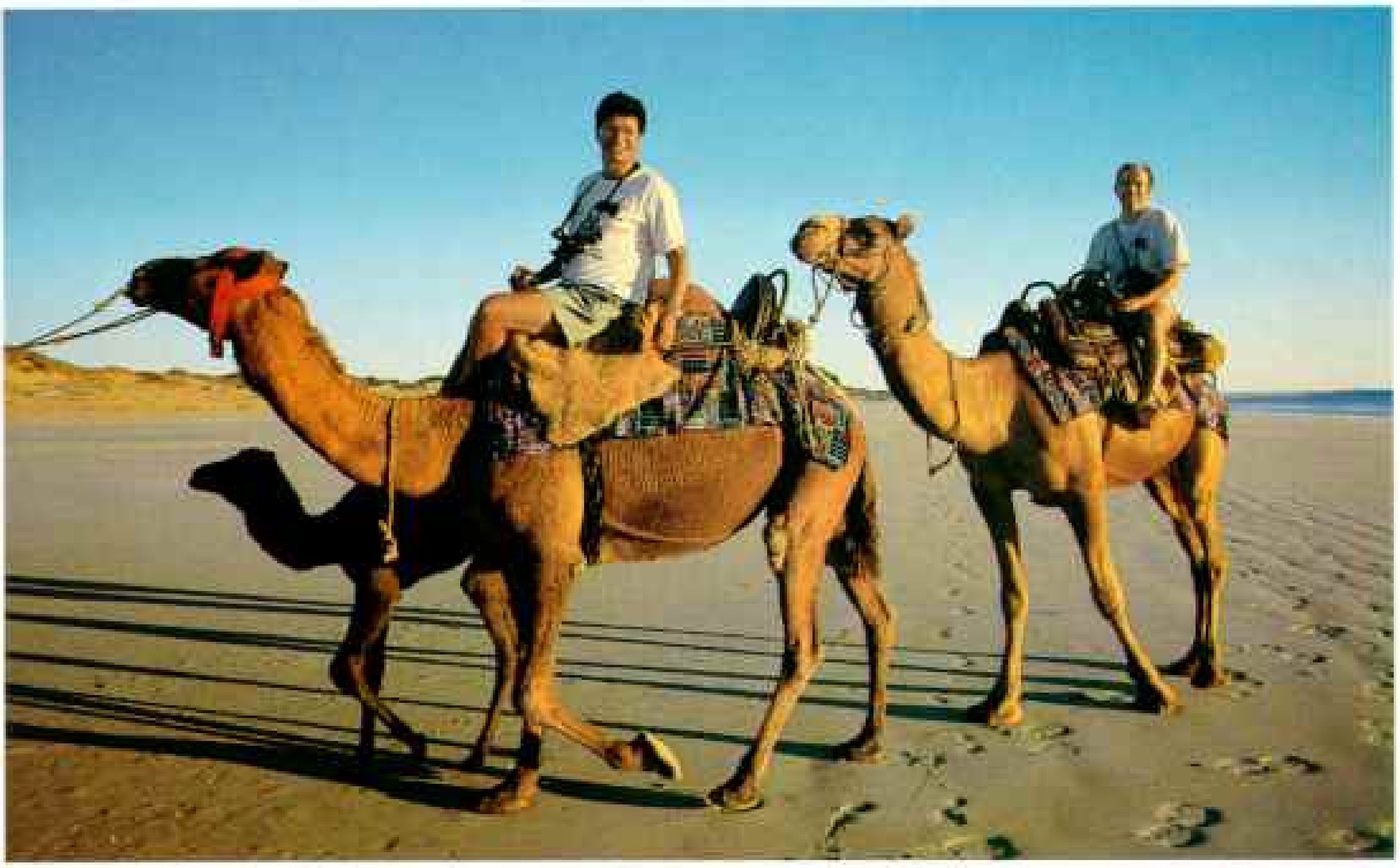
The landmass at right represents the percentage of warming gases pumped into the atmosphere by region during the 1980s.

SOURCE: IOF INCORPORATED; ART BY MARY HOLMES, NGS



National Geographic, January 1991

On Assignment



"A camel is preferable to walking," says underwater photographer DAVID DOUBILET (above, at left), "but not by much." The beachfront ride, a tourist attraction in Broome, Western Australia, was a lark for David and fellow photographer SAM ABELL, who met to coordinate their coverage for the land and sea articles on northwest Australia in this issue.

It was the first trip for both men to the region—600,000 square miles of brutally hot, hard-muscled country and equally rough-and-tumble coast. "Some oceans breathe deeply," David explains. "If you're on the surface, you sense it beneath you. The Indian is one of those rumbling oceans of heroic scale. Everything about it is big: waves, tides, fish."

He should know. As a 12-year-old, David took his first underwater photograph off the New Jersey shore and has since dipped cameras into most of the world's major bodies of salt water during his 20-year association with the GEOGRAPHIC.

For Sam Abell, whose lyric photographs have illustrated magazine articles on Tolstoy, the Appalachian Trail, and Shakers, the assignment meant a chance to confront terrain rarely photographed. "It's a place where the architecture of the earth is laid bare," says Sam, who also is a 20-year GEOGRAPHIC man. "We traveled to spots where we made the first tracks and along shores that a few hours later were submerged by 35-foot tides."

DAVID DOUBILET (TOP); WARREN E. JOHNSON

Close cousin to the camel, the guanaco once roamed Patagonia's plains in the millions. Depleted by hunters for pelts and food, the ungulates now are increasing in southern Chile, where wildlife ecologist WILLIAM L. FRANKLIN began studying their behavior in 1976. After nine years Bill and his Iowa State University team changed their research focus to guanacos' chief predator, the Patagonia puma, which Bill reports on in this issue. Here he bottle feeds young guanacos, still his first love.

Bill and graduate student Warren Johnson maintain a running ecology joke. "I claim that pumas are important because they eat guanacos," Bill says, "and Warren claims that guanacos are important because they are eaten by pumas."

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