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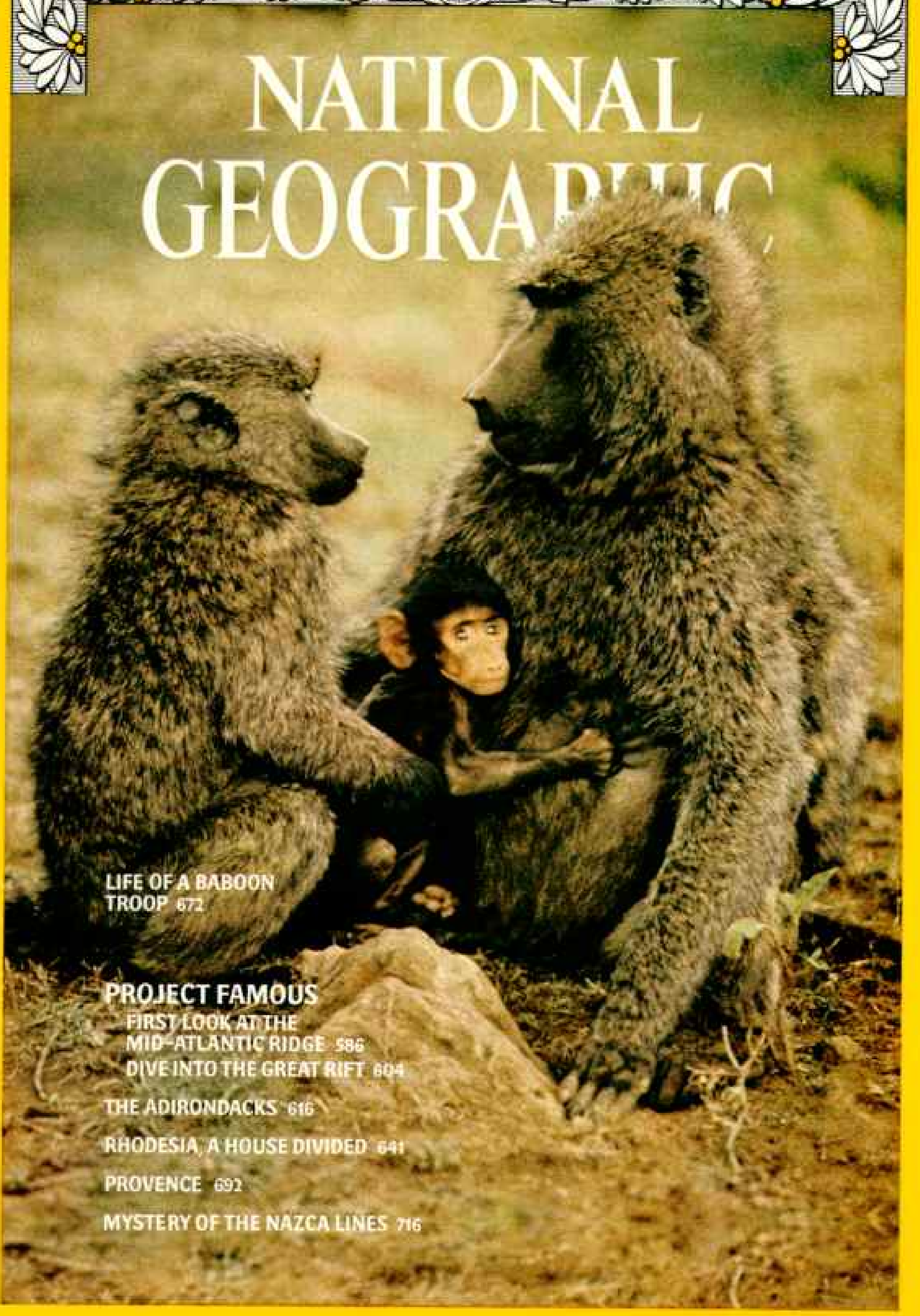
NATIONAL GEOGRAPHIC



OFFICIAL JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D.C.

BIG BANG, charmed quark, continental plate, hominid, quasar . . . the terms of modern scientific inquiry resemble a conversation from *Alice's Adventures in Wonderland* and, like many passages in that masterpiece of topsy-turvy logic, often convey more assurance than actually exists. To name something is not always to understand it.

The other night, while watching the moon climb over the Potomac River, I was struck by the cautionary nature of advancements in knowledge. Although men have walked upon the surface of that "inconstant moon," science still has no undisputed idea of how it got there.

Given this lack of certitude, it should not surprise us that the intellectual treasures of one generation become the rubbish of the next, and vice versa. Such is the case with the theory of continental drift. A few years ago any scientist espousing that theory would have been hooted out of the seminar. Today there is hardly a scientist who doesn't believe it, so persuasive is the evidence based on use of new geophysical techniques, satellites, submersibles, and computers.

In this issue we present a spectacular look at one of the places where the theory becomes fact. It is a huge cleft on the Atlantic Ocean floor, where crustal plates are slowly being formed, carrying Africa and the Americas farther apart every year. The GEOGRAPHIC is privileged to be first to publish in color some of the findings of Project FAMOUS.

No less powerful, it seems, are the forces of ideology, economics, and nationalism that separate and move and join together human societies. In Africa, for example, the establishment of national governments is an agonizing drama still in progress. It centers now on Rhodesia, where the question of who will rule—the white minority that developed the country with African labor, or the multitude of blacks who enjoy only nominal political representation—erupted into grinding guerrilla warfare. The conflict has involved others with their own interests: The guerrillas are aided both by Communist nations and by Christian church groups; the United States has continued to import Rhodesian chromium and other commodities as strategic materials, despite United Nations economic sanctions.

Just how deeply into the emotions this issue cuts became clear when we subjected Senior Assistant Editor Allan C. Fisher, Jr.'s article to exhaustive scholarly review prior to publication. One expert accused us of "partisanship toward a dying cause." Another charged us with showing white Rhodesians "in as poor a light as possible." Still others detected "nuances" that clouded the facts—as they saw them.

It has been 15 years since Nathaniel T. Kenney contributed "Africa: The Winds of Freedom Stir a Continent" to the September 1960 GEOGRAPHIC; we have since visited Uganda, Zaire, Zululand, Tanzania, and other African lands in articles that we hope emit light without generating heat.

Here, in like manner, is a look at contemporary Rhodesia, as accurate and objective as journalism and scholarship can make it. In Rhodesia, as in Southeast Asia, Korea, Cyprus, the Middle East, one man's fact is another man's propaganda, and what is pejorative to one is persuasive to the other. Like the origin of the moon, the key to human understanding still eludes us.

Gilbert M. Grosvenor

NATIONAL GEOGRAPHIC

THE NATIONAL GEOGRAPHIC MAGAZINE VOL. 147, NO. 5

May 1975

COVER: *Clinging to its mother, a baboon baby resists the overtures of a curious juvenile. Picture by Timothy W. Ransom.*

PROJECT FAMOUS—MAN'S

Where the

By J. R. HEIRTZLER, Ph.D.
WOODS HOLE OCEANOGRAPHIC INSTITUTION
U. S. CHIEF SCIENTIST, PROJECT FAMOUS

Photographs by EMORY KRISTOF
NATIONAL GEOGRAPHIC PHOTOGRAPHER

"Ready to dive!" In the oceanographic equivalent of the space program, scientists launch a great adventure in exploration, the first manned probe of the awesome Mid-Atlantic Ridge. Aboard a submersible, here given a final check by a diver, geologists begin a two-mile descent to a rift where new sea-floor rock is formed.

WORKING IN UTTER BLACKNESS and awesome pressure nearly two miles below the surface of the Atlantic Ocean, scientists have been exploring one of the unique geologic areas of the world—a place where new crust of the earth is constantly being born.

For the first time in history, men have gone down in the sea to prowl and study first-hand the largest mountain range on this

FIRST VOYAGES DOWN TO THE MID-ATLANTIC RIDGE

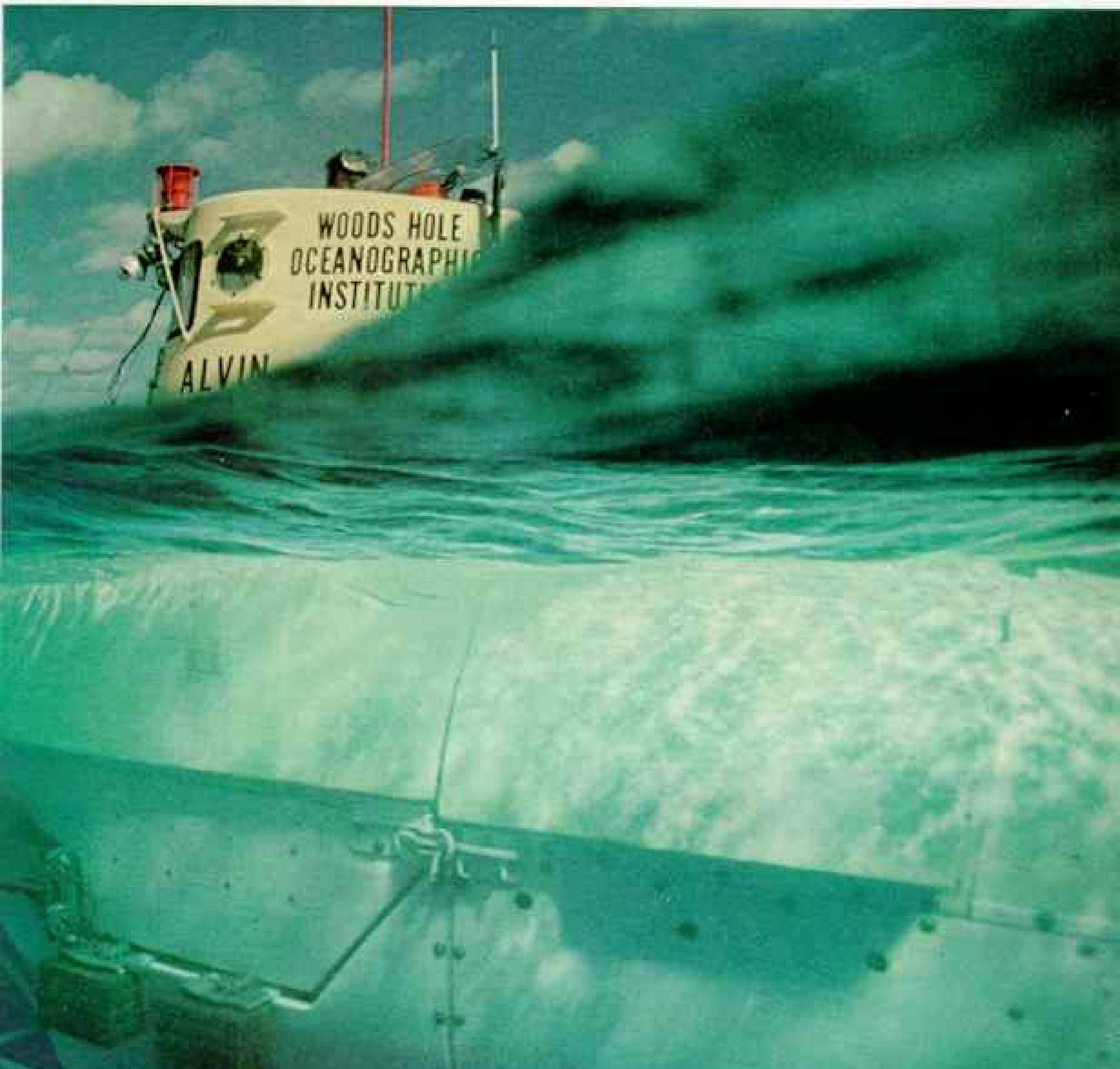
Earth Turns Inside Out

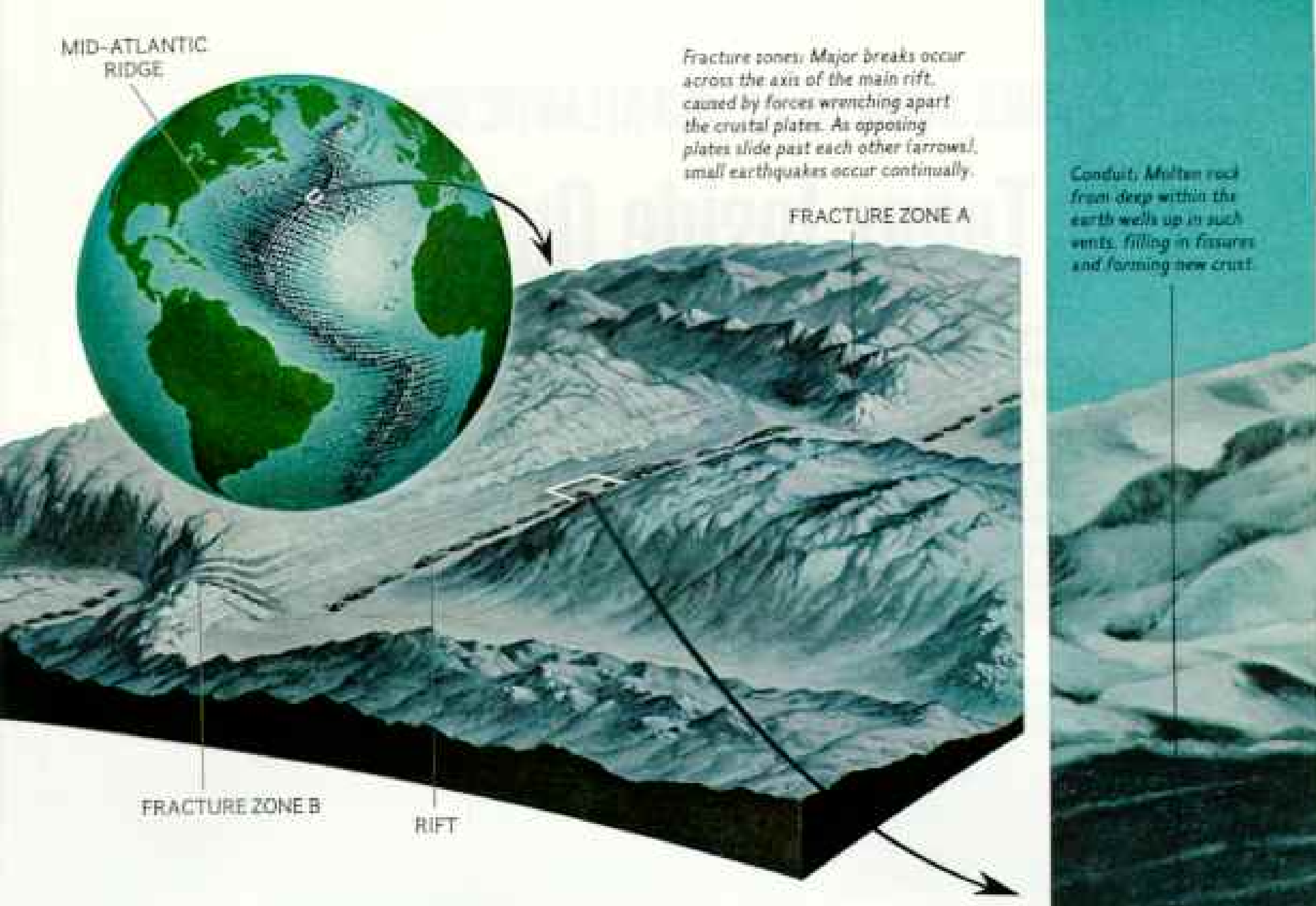
planet—a system greater than the Rockies, the Andes, and the Himalayas combined.

That mammoth range is the Mid-Atlantic Ridge, the most rugged part of the 40,000-mile Mid-Oceanic Ridge system that winds its way around the globe on the bottom of the seas. Along its crest in the North Atlantic runs a great central rift or crack. Here new ocean floor is continually being formed and slowly carried away with the drifting continents.

For the past three years some twenty ships have crisscrossed a carefully chosen area of this rift valley southwest of the Azores. They have systematically mapped, sampled, and photographed the sea floor—and felt its tremors—with the best and most sophisticated tools of marine science.

This project, dubbed FAMOUS for French-American Mid-Ocean Undersea Study, was conceived by *(Continued on page 596)*





The Mid-Oceanic Ridge: crucible of creation

FAR BENEATH an ever-widening ocean, dynamic forces for nearly 200 million years have forged the 12,000-mile-long Mid-Atlantic Ridge, the planet's largest mountain range (**above**). Here, according to the revolutionary new theory called plate tectonics, huge rafts of crust diverge, carrying the American continents away from Europe and Africa at about an inch a year. Where plates converge, they form deep ocean trenches as one edge slips beneath the other to be reabsorbed into the earth.

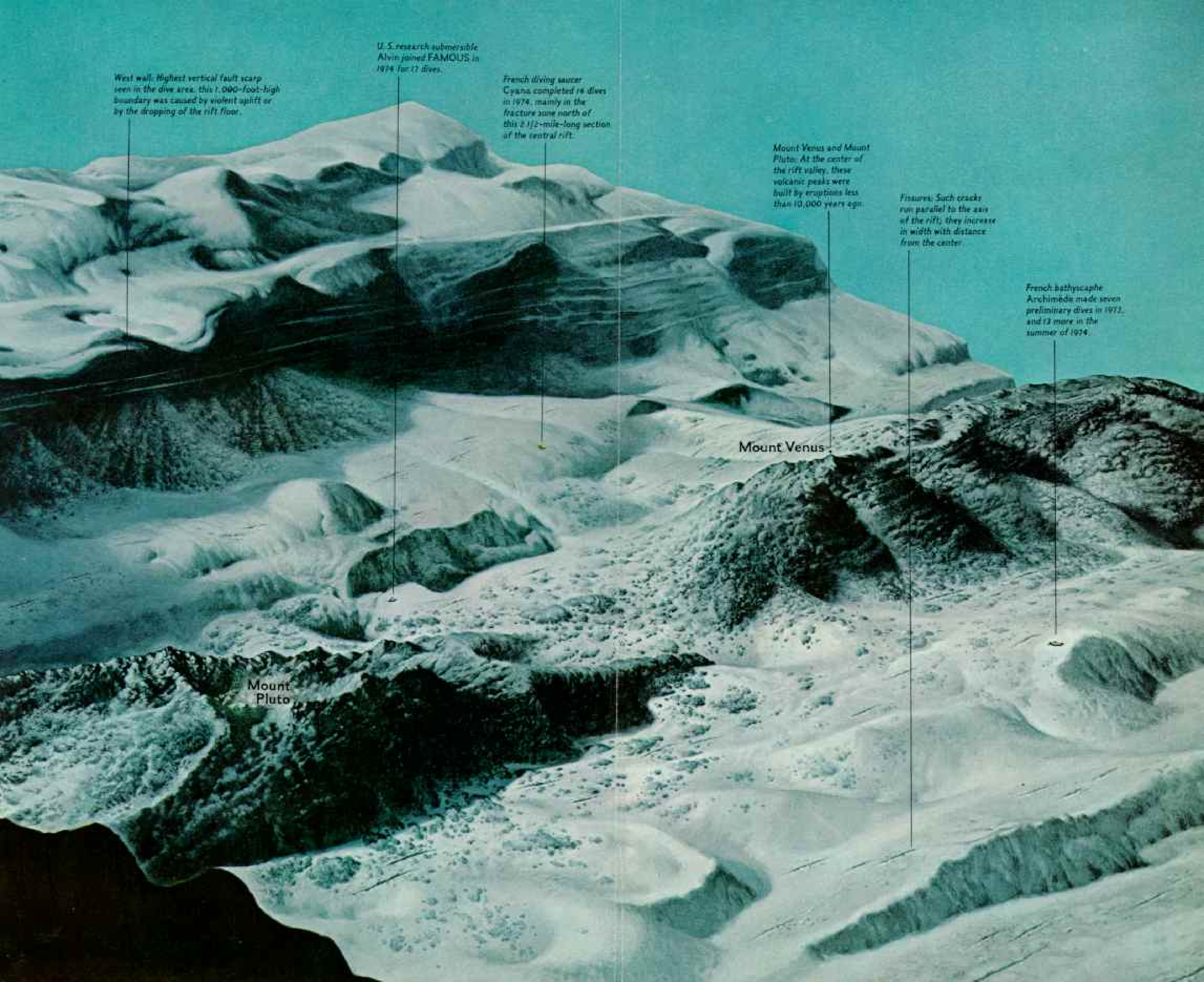
The plates separate amid earth-wrenching quakes that leave not a single crack but a crevviced zone three to 30 miles wide. Sporadically, lava wells up like hot tar to heal the scars and build on the parting edges of the plates. The Icelandic volcanoes of Heimaey and Surtsey provide dramatic above-water proof of the ridge's activity.

In a three-year project called FAMOUS—French-American Mid-Ocean Undersea Study—scientists and ships probed a carefully chosen section of this new frontier. Within a 60-mile square southwest of the Azores, enlarged above, they mapped, photographed, and sampled a region on the scale of the Grand Canyon.

For two years international teams attacked the area from surface ships and airplanes. Echo sounders determined depths of the sea floor; side-scan sonar portrayed details of its slopes. A French submersible made seven dives in 1973.

Finally in 1974 three subs made 44 more dives into the heart of the ridge (**right**). Among their discoveries were fifteen-foot formations dubbed "haystacks" (**left**), which were formed when molten lava flowed from vents.

PAINTINGS BY DAVID MILLEDGE


West wall. Highest vertical fault scarp seen in the dive area, this 1,000-foot-high boundary was caused by violent uplift or by the dropping of the rift floor.
U.S. research submersible Alvin joined FAMOUS in 1974 for 17 dives.
French diving saucer Cyana completed 19 dives in 1974, mainly in the fracture zone north of this 2 1/2-mile-long section of the central rift.
Mount Venus and Mount Pluto. At the center of the rift valley, these volcanic peaks were built by eruptions less than 10,000 years ago.
Fissures. Such cracks run parallel to the axis of the rift; they increase in width with distance from the center.
French bathyscaphe Archimède made seven preliminary dives in 1973, and 13 more in the summer of 1974.
Mount Venus
Mount Pluto

Jagged sea fissure yawns three feet wide and 55 feet long in a photomosaic (**above**) taken by a camera towed by the U. S. surface research vessel *Knorr*. A rattail fish swims at far left; a compass suspended below the camera appears in the frame left of center. Later, the position of its needle will aid in piecing the photographs together.

Before their dives, geologists studied the features revealed in the black-and-white film, printed here in blue to match natural color. They believe lava flowing out of such fissures created the fantastic ocean-bottom forms they saw from the view ports of the U. S. research submersible *Alvin*.

Spigot of lava looms beyond *Alvin*'s mechanical arm (**below**), reaching for a rock sample. Such features took shape as molten lava at 2,200° F. surged up, only to be quickly solidified by cold seawater under the incredible pressure of two tons per square inch. Often, lava pushed forth again and again, a foot at a time, leaving growth rings on the tubes.

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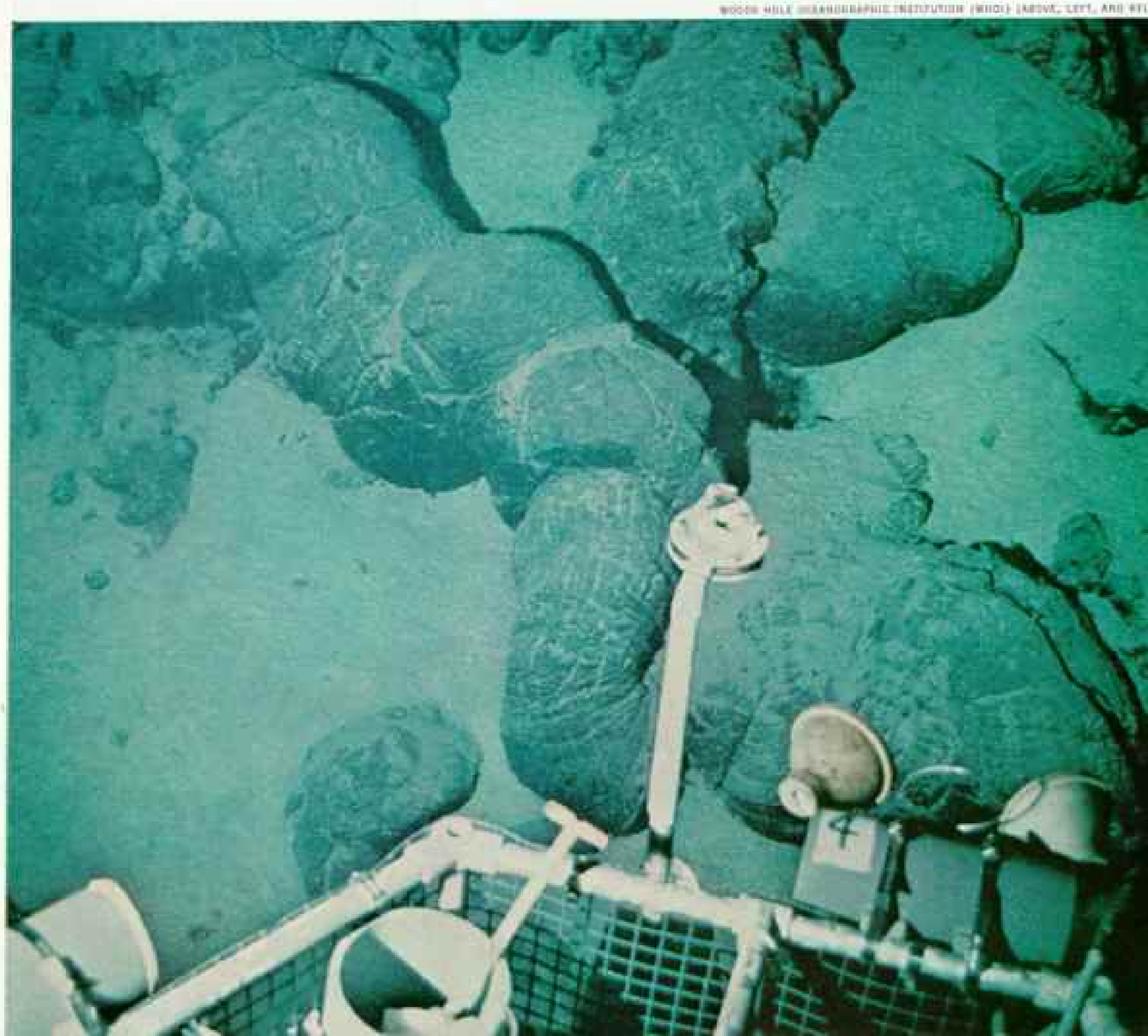
WOODS HOLE OCEANOGRAPHIC INSTITUTION (WHOI) (ABOVE, LEFT, AND RIGHT)



Like an elephant's trunk, a foot-wide lava tube noses down an incline two yards in front of *Alvin*'s collecting basket (**left**).

Scientists found the youngest and most distinct lava forms along the rift's axis. As they moved to the east or west, a chaotic landscape of shattered sculpture unfolded, evidence of the earth's movement away from the frontier of crustal genesis.

Pillow of lava pushed two feet above the surface of a tube (**right**). Later, gorgonian coral took hold. The snowstorm of sediment was kicked up by *Alvin*'s propeller. A scientist described working in such conditions: "It's like exploring the Grand Canyon at night in a blizzard with a flashlight."

WITH BY ROBERT D. BALLARD, WOODS HOLE OCEANOGRAPHIC INSTITUTION

Telltale interior of a shattered lava tube reveals its intricate history. After an initial flow created the hollow conduit, subsequent streams of lava moved through, leaving ledges or ridges much as rings in a bathtub show successive water levels.

Life persists at 9,000 feet

ADAPTABLE ANIMALS somehow can survive in the cold, lightless environs of the deepest oceans, scientists learned long ago. Still, they were surprised to find in the rift zone a variety of mollusks, corals, and fish such as this foot-long *Chaunax pictus* (**left**).

Unseen, a mysterious traveler, probably a worm or mollusk, burrowed through the sediment leaving a track of craters (**right**). The sediment, mainly the calcareous remains of plankton, drifts down from ocean levels above, adding less than half an inch every thousand years.

Slow-growing sponges and corals cling to an escarpment, eerie as the edge of doom (**above**). *Alvin* drove over its brink and circled back to study a greenstone cliff in Fracture Zone B.

Even a five-foot-wide chasm (**right**) is a suitable home for a tenacious flowerlike crinoid, an animal akin to a starfish. On *Alvin*'s bow a compass and instrument lever protrude like a figurehead before a water sampler rigged from two plumber's helpers. The sea here proved to be clearer than normal tap water.

ROBERT D. BALLARD, WHOI (TOP LEFT), AND WOODS HOLE OCEANOGRAPHIC INSTITUTION

(Continued from page 587) scientists of the two nations, but has involved those of Canada and Great Britain as well.

Project FAMOUS is part of the current worldwide Geodynamics Project, designed to study the mobility and evolution of the earth's outer shell. This mobility involves the movement of giant plates sliding and interacting on the surface of the earth.* Two of these plates are the American and the African.

Virtually all North America as well as the western Atlantic ride on the American plate; all Africa and most of the eastern Atlantic are part of the African plate. Europe, to the north, rides on another. The eastern and western plates meet at the Mid-Atlantic Ridge, running the full length of the Atlantic and passing through Iceland and the Azores.

Probing the Restless Sea Floor

The plates are separating, drifting apart by about an inch a year. The line of separation is very distinct. It is characterized by magnetically differing strips of volcanic rock, by high heat flow from the sea floor, by earthquakes, and, in the North Atlantic, by the rift valley that marks the separation.

Volcanic material from within the earth wells up in this rift and, by welding itself to the separating plates, creates sea floor.

It is believed that uplifted and modified sea floor makes up parts of today's continents. Thus any minerals emplaced in the rift valley may eventually make their way to land, to man's potential economic benefit.

There are other practical benefits of our study of this accreting plate margin. If we could understand the relationships of earthquakes that constantly occur in the rift valley to others on the far side of the plates, as in California, Central America, and western South America, we might be able to evolve better schemes to predict earthquakes. If we had better knowledge of how the Americas and Africa originally split from the primordial super-continent Pangaea, we might know how to locate petroleum and other mineral-rich areas off these continents.

Study of the rift may also give clues to the nature of deep-earth material and how it affects tectonic plate movement—one of the scientific mysteries of our time.

To determine how best to study the Mid-Atlantic Ridge, the U. S. National Academy of Sciences convened a meeting of international earth scientists at Princeton University in January 1972. That was followed by a detailed plan by American and French scientists for a series of studies that would culminate during the summer of 1974 in joint dives using manned research submersibles.

Such a project required new tools, including new pressure hulls for some of the world's deepest-diving submarines, new navigation systems, and new deep-towed instruments. It also required special training for submersible scientists and pilots.

Though we think we now understand the behavior of tectonic plates on a global scale, studying that behavior close up, on a human scale, would be a far different matter. Thus we designed our program to go from broad observations to closer and closer looks. The closeup studies could then be interpreted in terms of the larger picture.

We chose an area that would fully represent what happens at a spreading plate boundary, yet would minimize logistics problems for short-range research subs. It was a particular section of the Mid-Atlantic Rift, between 36° and 37° N., some 400 miles southwest of the port of Ponta Delgada in the Azores. The general shape of this part of the mid-Atlantic floor was already known from a quarter of a century of depth soundings, dredgings, and photographs taken by oceanographic ships.

Navy Advances Undersea Photography

In the first year of FAMOUS, an aircraft carrying a magnetic sensor flew over this region of the ocean. The sea floor was remapped by normal research-ship echo sounders. Then narrow-beam echo sounders on U. S. Navy and French hydrographic ships refined the bottom charts. Britain's R.R.S. *Discovery* brought a seven-ton side-scan sonar system dubbed "Gloria," and the Scripps Institution of Oceanography in California provided a special Deep Tow instrument package.

Up to now, usual ocean-floor photographs have covered only a few square yards. The U. S. Naval Research Laboratory sent out the U.S.N.S. *Mizar* with a new photography system called LIBEC (LIght BEhind Camera). High-intensity electronic flash lamps, suspended well above the bottom, made it possible to shoot sections of the floor as broad as 120 feet (pages 598-9).

*Science's fast-growing knowledge of the spreading sea floor and drifting continents was described in "This Changing Earth," by Samuel W. Matthews, in the January 1973 NATIONAL GEOGRAPHIC.

To differentiate rock layers below the sea floor, surface ships ran seismic refraction studies. Instruments lowered to the bottom as well as sonobuoys on the surface recorded the epicenters and strengths of small earthquakes constantly taking place in the floor.

From all these sources of new information —a total of 5,250 LIBEC pictures, for example—came detailed and extensive photomosaics and contour maps, the finest bathymetric charts ever made of a small section of the bottom in the deep ocean.

In the summer of 1973 scientists first saw this seascape directly. The French Navy's bathyscaphe *Archimède* made seven initial dives in the rift (one with American geologist Robert Ballard of Woods Hole aboard). The 200-ton submersible—capable of reaching the deepest point in any ocean—brought back rock samples and many more photographs.

Then, in June 1974, the FAMOUS fleet came in force to the Azores: *Archimède* and her mother ship *Marcel le Bihan;* another French submersible, the *"soucoupe plongeante"* (diving saucer) *Cyana* and her surface tender *Le Noroit;* the American *Alvin,* owned by the Office of Naval Research, her catamaran tender *Lulu,* and *(Continued on page 602)*

Scientists of the deep

"WE'RE AT A WATERSHED in the understanding of our planet," says author Dr. James R. Heirtzler, far right, the U.S. scientific leader of FAMOUS. "In the past 15 years the theory of plate tectonics has turned earth science upside down, one of the major upheavals in the history of man's knowledge."

The concurrent advances in technology—new depth sounders, cameras, and seismic, magnetic, and gravity surveys—have contributed proof that the solid earth beneath our feet is really made up of moving plates. FAMOUS pushed this revolution forward with the first full-scale use of manned submersibles for deep-sea research.

A senior scientist at Woods Hole Oceanographic Institution, Dr. Heirtzler pioneered in magnetic studies of the sea floor. Here he reviews film with one of five U.S. diver-geologists, Dr. Tjeerd H. van Andel of Oregon State University. The others: Drs. Robert D. Ballard and Wilfred B. Bryan of Woods Hole, Dr. James G. Moore of the U.S. Geological Survey, and Dr. George H. Keller of the National Oceanic and Atmospheric Administration, NOAA. *Alvin* pilots from Woods Hole were John D. Donnelly, Dudley Foster, Lawrence A. Shumaker, and Valentine Wilson.

Aboard the research vessel *KNORR,* scientific programs were conducted by Dr. Heinrich Holland of Harvard University, Dr. Paul Johnson of Dalhousie University in Nova Scotia, Dr. Tanya Atwater of the Massachusetts Institute of Technology, and Dr. Steven Johnson of Oregon State. The floating drill rig *Glomar Challenger* took core samples of sediments and rocks, under the guidance of Drs. William Melson of the Smithsonian Institution and Fabrizio Aumento of Dalhousie.

FAMOUS was funded in the United States by the National Science Foundation and NOAA, and supported by the Office of Naval Research, Advanced Research Projects Agency, and the Navy.

The French, operating under the government agency Centre National pour L'Exploitation des Océans, CNEXO, were directed by Drs. Claude Rifaud and Xavier Le Pichon. The diving scientists: Drs. Roger Hekinian, David Needham, and Jean Francheteau of CNEXO, Gilbert Bellaiche and Jean-Louis Cheminée of the Centre National de la Recherche Scientifique, and Pierre Choukroune of the Université de Montpellier. The French pilots were Lt. Cmdr. Gerard de Froberville, Lt. Philippe de Guillebon, and Lt. Gilbert Harismendy of the Navy, and Raymond Kientzy and Guy Sciarrone of CNEXO.

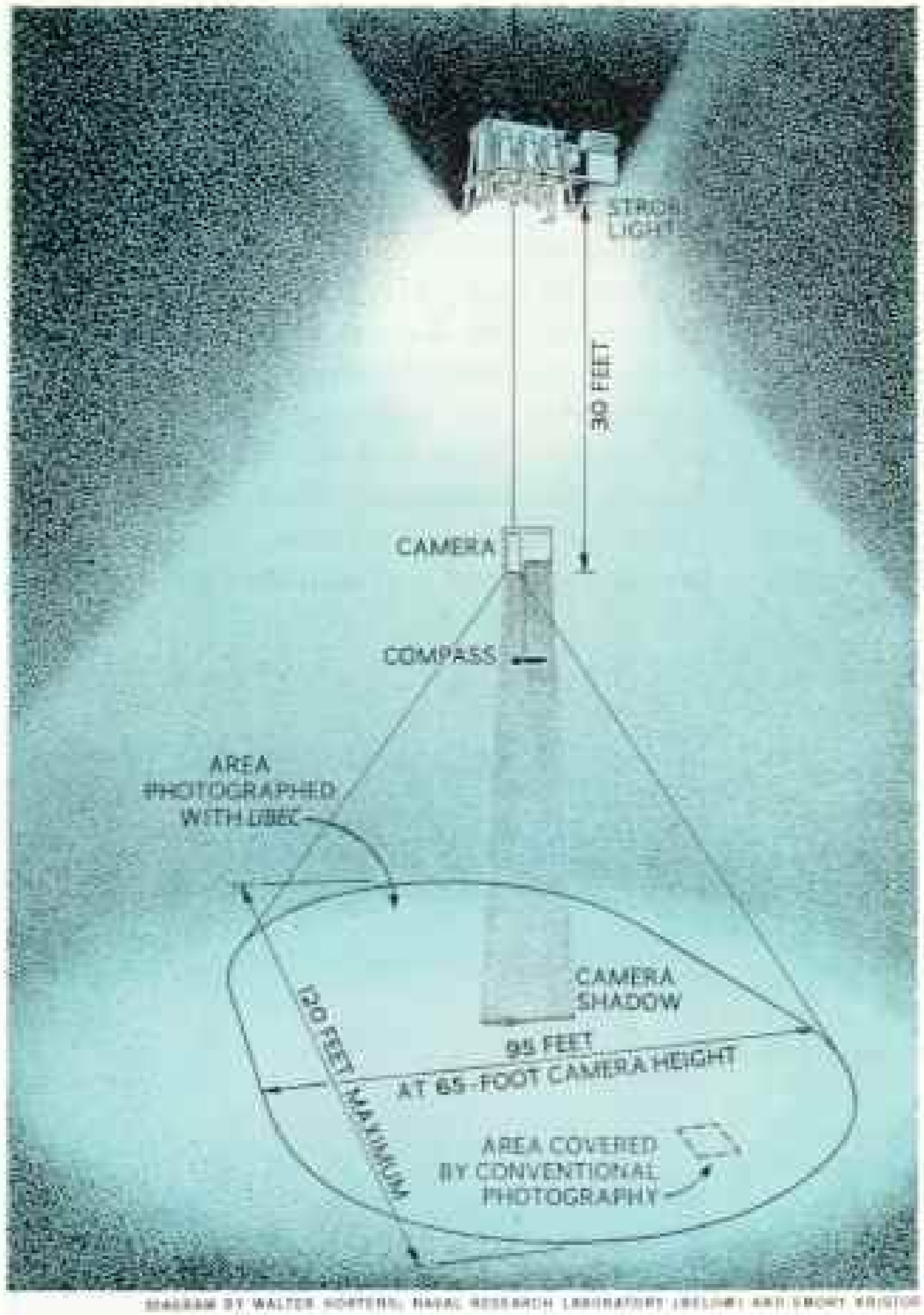
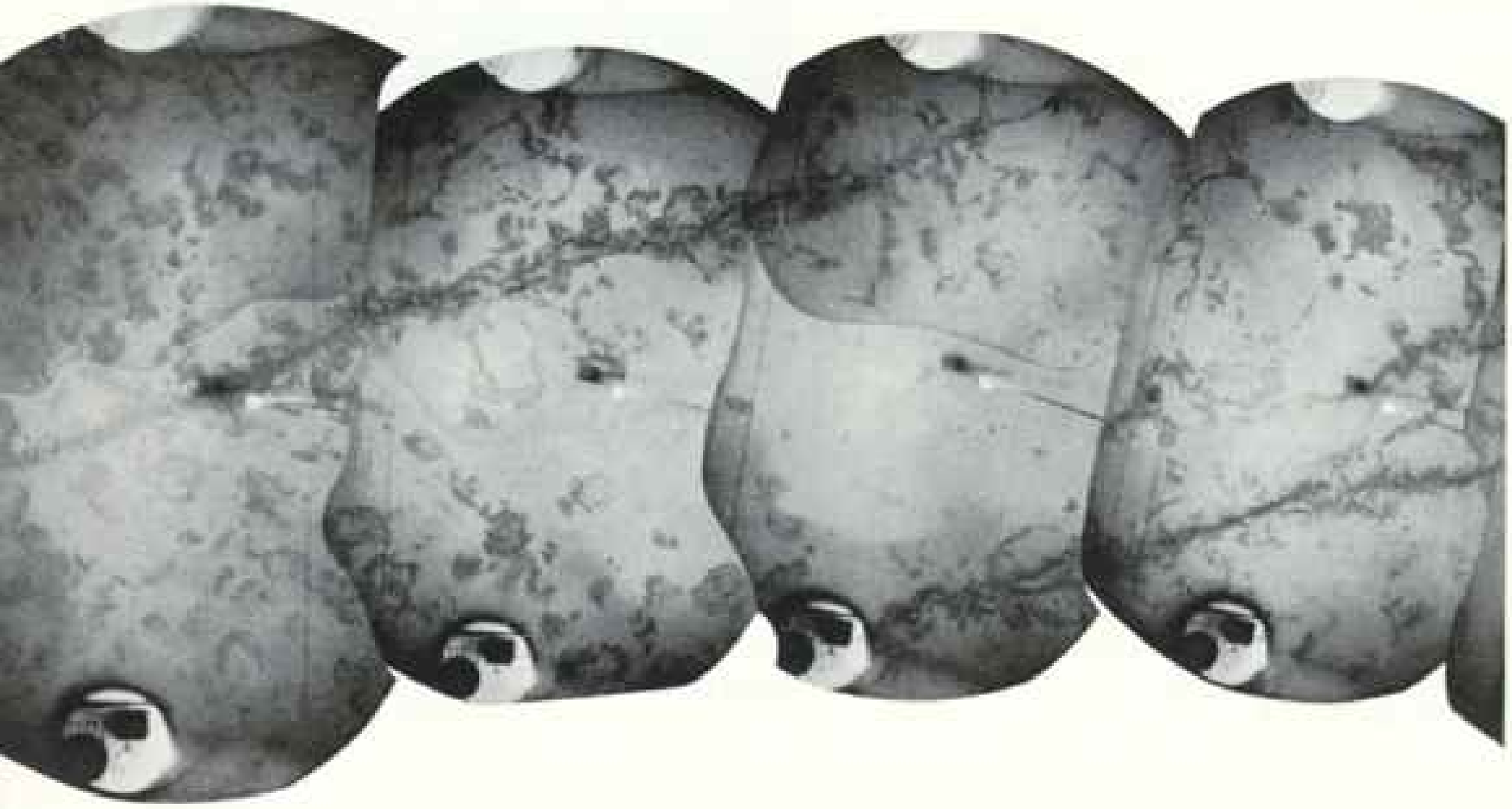


DIAGRAM BY WALTER HORTENS, NAVAL RESEARCH LABORATORY (BELOW) AND ERNST KRISTOF

Splashing light into the abyss, a towed photographic system called LIBEC gave scientists a predive look at rift features. Conventional camera systems, towed about ten feet above the floor, are mounted with lights that cause backscatter, reflection from particles suspended in the water. LIBEC, for LIght BEhind Camera, uses powerful strobes 30 feet above the camera (**left**). By diffusing light over a large area, it reduces backscatter and yields photographs of segments of sea floor as much as 120 feet across.

The Naval Research Laboratory perfected LIBEC for search work after the loss of the nuclear sub *Thresher* in 1963. For FAMOUS, its first scientific task, it was towed by the research vessel *Mizar* across the dive site for ten days. Fitted together, 5,000 prints span an entire gym floor at the laboratory in Washington, D. C. (**right**).

A small strip of the mosaic (**below**) shows parallel fissures 60 feet apart. Diving geologists found that such cracks were wider and more numerous the farther they were from the rift's centerline, a further proof of sea-floor spreading.



Mother ships of the French team tend their charges at Ponta Delgada in the Azores (**right**), base for all FAMOUS operations. Navy bathyscaphe *Archimède*, dwarfed by tender *Marcel le Bihan*, left, must be towed to dive sites, while the diving saucer *Cyana* rides on the stern of *Le Noroit*. The 200-ton *Archimède* (**lower left**) made preliminary dives in the mid-Atlantic in 1973.

Her view ports like frightened eyes, *Cyana* practices rescue maneuvers in the Mediterranean with her barely visible sister (**lower right**). Later, diving in Fracture Zone A, *Cyana* located manganese and iron deposits near open vents where, the French theorize, hot water circulates deep into the earth and brings up the metals in solution.

A drawing of the tormented rift valley (**left**) based on French echo soundings undergoes scrutiny by Drs. David Needham, left, and Vincent Renard at the Centre Océanologique de Bretagne in Brest.

WILLIAM A. DIMITRUSEN (TOP LEFT AND BELOW RIGHT), ROBERT D. HILLARD, WHO (LOWER LEFT) AND EMORY KRISTOF

Poring over scientific treasure, American diver-geologists Wilfred B. Bryan, left, and James G. Moore catalog rocks aboard *Alvin*'s mother ship, *Lulu*. *Alvin*'s arm retrieves samples so gently that rocks with delicate glassy coatings come up intact. The project's 3,000-pound haul included the full range of basalts, chief ingredient of oceanic crust.

the R.V. *Knorr* of Woods Hole Oceanographic Institution, which operates *Alvin*.

Twenty miles west of the diving site over the rift, the Deep Sea Drilling Project ship *Glomar Challenger* took station, eventually to drill a hole nearly 2,400 feet deep and take samples of the underlayers of the floor.

We were ready to study, to see and touch, one of the most tectonically active and important areas on earth.

Surface Ship Tends Each Sub

Our procedure for each of three diving periods was the same: With *Alvin* riding a cradle on her deck, *Lulu* was towed slowly by *Knorr* from the harbor at Ponta Delgada, on the island of São Miguel, to the dive site two days away to the southwest. *Archimède*, too big to be lifted out of the water, was likewise towed by *Marcel le Bihan;* the little highly maneuverable *Cyana* rode the afterdeck of *Le Noroit*.

The weather was kind to us for nearly two months of operations in 1974. *Alvin* made a total of 17 dives during the three periods; she spent a total of 81 hours on the sea bottom. The French, in both *Archimède* and *Cyana*, completed 27 dives, exploring the great transverse fracture zone to the north of us and diving in the rift valley itself north of *Alvin*'s area.

Gradually a detailed picture emerged of this canyon in the midst of that enormous mountain range on the floor of the Atlantic. Although detailed studies of some 100,000 photographs, other data records, and 3,000 pounds of rock samples will take months, if not years, to complete, we can already reach some initial conclusions.

The rift valley in the FAMOUS area is some 30 kilometers, or 20 statute miles, across from ridge top to ridge top, east and west. The depression drops at least 5,000 feet from the crest of the flanking ridges, forming a valley on the scale of the Grand Canyon.

The innermost floor of the valley is only one to three kilometers across—six-tenths to two miles. It has steep walls on both sides, higher than 1,000 feet in places on the west. Two prominent hills, clearly very young volcanic extrusions, stand in the center. The northern, about 1,300 feet high, we called Mount Venus; the southern, rising only 700 feet, Mount Pluto (paintings, pages 588-90).

Hideaway became a tomb for a crab in a rock sample dredged up by the research vessel *Knorr*. The temperature rise, not the pressure drop, killed it. Stains of iron oxide formed when iron in the basalt combined with oxygen in seawater. At the surface, some rocks popped and jumped as gas within exploded in the reduced pressure

Rocks brought up by *Alvin* from the slopes of Mount Venus were very young, many with glassy surfaces from quick cooling.

The farther out we went from the central axis of the rift, the more sea-worn and altered and manganese-coated the rocks became. Yet samples taken from the base of the inner walls were no older than 100,000 years—a mere blink in geological history.

Such dating verifies that the sea floor on both sides of the axis is moving apart by two to three centimeters (about one inch) a year, as magnetic studies predicted. The floor has spread about twice as fast to the east of the central axis, the African side, as to the west, the American side.

Along the floor of the rift, and in the huge fracture zones, microearthquakes occur continually in a narrow, distinct band of activity.

Fissures and faults are abundant, almost always paralleling the rift axis. Some cracks are short, only a hundred yards or so in extent. But faults may run on for miles. The cracks range from an inch to tens of yards wide. *Alvin* went into one of them, as Bob Ballard describes in the article that follows.

The width of cracks and vertical offset of faults seem to increase from the axis outward. In most cases the outward side is lifted above the inner. This uplifting, from processes unknown, may be the primary agent building the Mid-Atlantic Ridge.

In Fracture Zone A, to the north, the French found two small areas of sea floor heavily encrusted with manganese oxide. Our French colleagues feel they may have seen an instance of how mineral concentrations form beside cracks or vents in the ocean floor.

Project FAMOUS discovered that the young rock at the midline of the rift is more magnetic than normal, although we don't fully understand why. We do know that deep, strong forces are tearing that floor apart, constantly breaking and working it.

During this first use of manned submersibles for scientific investigation of the truly deep sea floor, we have gained a greater understanding of the forces that continually create, alter, and move the massive plates that make up the floor of the Atlantic and, indeed, the face of the planet upon which we ride.

For a first-person account of a journey down to the rift valley, turn the page.

Disappearing into an alien realm, *Alvin*, its white hull still reflecting sunlight at 150 feet, sinks toward the distant floor of the Mid-Atlantic Rift. Falling for a seemingly endless hour and a half, the 22-foot-long submersible, veteran of more than 500 dives, carried scientists on a journey to a dark and distant frontier.

PROJECT FAMOUS

II–Dive Into the Great Rift

By ROBERT D. BALLARD, Ph.D.
WOODS HOLE OCEANOGRAPHIC INSTITUTION

Photographs by EMORY KRISTOF
NATIONAL GEOGRAPHIC PHOTOGRAPHER

WITHIN A MINUTE *Alvin* has sunk 100 feet; the pitching and rolling we experienced on the surface has stopped. The sub is now falling peacefully toward the rift floor 9,000 feet below us.

Two swimmers were alongside as we flooded our tanks and started down. But at 50 feet they signaled good-bye and headed up. *Alvin* is now on her own, with no link to the surface except an acoustic telephone.

Three years of intensive training are over. Fellow geologist Jim Moore, *Alvin* pilot Jack Donnelly, and I have begun our first scientific dive into the Mid-Atlantic Rift valley.

The morning sun, which heated up the sphere to an uncomfortable 90° F. and lighted the interior through our three view ports, now is fading. It is as if the sun is quickly setting as *Alvin*'s interior gets darker and darker.

The temperature of the water outside drops, and the two-inch-thick titanium-alloy hull becomes cold; I rest my arms against it to stay comfortable. Beads of water form as the moisture in our breath condenses on the hull.

In less than 15 minutes we reach 1,200 feet, and now we are in total darkness. To conserve power, the outside lights are not on, and our only illumination comes from three small lights inside the sphere. As we continue to sink quietly in the blackness, the tense feeling I had at the start of the dive is replaced by a sense of relaxation and serenity.

We had gone aboard after *Alvin* was lowered into the water on *Lulu*'s huge elevator, and we quickly settled into position inside the 80-inch-diameter ball, the pilot in the middle looking out the forward view port, Jim to his right, I to his left.

"Oxygen on, blower running." Jack sealed the hatch, and Val Wilson, standing outside in *Alvin*'s sail, backed the sub out from the tender's two catamaran hulls with the help of line handlers. I felt like a fish looking up at the surface as *Lulu*'s three propellers began to turn and she slowly disappeared.

"*Lulu*," Jack radioed, "my hatch is closed, no leaks or grounds, my tracking pinger and underwater phone are on, no joy [echo] on the bottom sounder. Request permission to dive."

Dudley Foster, surface controller on *Lulu*'s bridge, double-checked his diving form. "Roger, *Alvin*. You are clear to dive. Present water depth is 8,700 feet. Good luck."

Ready for All Emergencies

As we sink, I slowly scan our instrument panels, rechecking in my mind all the points on our final predive check the night before. Should the pilot become incapacitated, the two scientists must know how to bring the submersible back to the surface.

In an emergency, for example, it is possible to drop *Alvin*'s three heavy battery tanks, mounted behind the sphere in bomb-bay-like frames. We can also drop the sub's large mechanical arm, should it get hooked in anything on the bottom.

Alvin's normal life-support system can sustain the three of us for about three days, and our emergency breathing system can operate for six hours. If any one of the subs, including *Archimède* or *Cyana*, gets in trouble, it can wait on the bottom for one of the other two to attach a recovery line. All three subs can talk to one another underwater, and home in with their tracking pingers.

Jack's final instruction during our predive check is always, "Should all else fail, here's how you jettison the entire after two-thirds of the sub. The sphere will rise rapidly by itself to the surface [diagram, page 609]. But please, try to get home some other way!"

As it turns out, none of these steps has to be taken during our two months of diving.

I look over at Jim, who is making his first deep scientific dive in a submersible. In my six years of work in *Alvin*, I've seen others on a first dive worry about claustrophobia. But no one has ever gotten this far and then wanted out. In contrast to scuba diving, I myself feel a sense of comfort in the sub. I'm glad I'm not cold, wet, or looking over my shoulder for sharks.

I stare out into the darkness, and my eyes slowly adjust. I begin to see small forms of life giving off light. Since we're falling so fast, I have only a few seconds as each sweeps past my port. Each animal seems to consist of a series of tiny lights strung together like pearls, six to eight inches long and with twenty to thirty individual lights. It looks much like a train or plane passing by night, with only a line of lighted windows visible.

Apparently when the creature is frightened, each bead suddenly brightens; the flashes begin at one end and travel down the string in a fraction of a second. As I watch this natural show of bioluminescence, I have my only feeling of falling rapidly toward the bottom.

I look up at our depth meter. It reads 6,000 feet. Suddenly the quiet in the sphere is broken by a loud voice.

"*Alvin*, this is *Lulu*. Your present position is X 55.6, Y 100.4. We suggest you drive a course of 180 degrees at 50 amps for 20 minutes, to close on your bottom target. Over."

"This is *Alvin*," Jack replies. "Understand."

He brings the sub around to a heading of 180° and starts to drive. Instead of falling straight, we now slope down, much as a dive bomber homes in on its target.

Computer Keeps Close Track

On this dive, as on all others, our constant concern is to know exactly where we are. To map and explore the floor of the rift properly requires a positioning accuracy within twenty feet, two miles below the open ocean.

Our navigation system for *Alvin* was developed by William M. "Skip" Marquet and other members of the Deep Submergence Engineering and Operations Section at Woods Hole; it constitutes one of the most sophisticated submersible tracking systems yet devised (page 610). The French, on their part, employed a similar setup.

First, five sonic transponders were dropped by *Knorr* to the sea bottom. Each rides on a 300-foot tether above an anchor, like a wartime mine. Each responds to and retransmits a sonic pulse when one is received.

Their positions are precisely fixed by echo ranging from *Knorr*, and pinpointed on our bathymetric maps. All positioning of *Alvin*

on the bottom, and *Lulu* above it on the surface, are in relation to those sonic "lighthouses" set amid the canyons of the Mid-Atlantic Ridge.

Alvin emits sound pulses every 30 seconds from its pinger, precisely timed to clocks aboard both the sub and *Lulu* to fractions of milliseconds. The pings from *Alvin* and echoes from the array of transponders on the bottom are received by *Lulu*, and their respective time delays fed into a computer in *Lulu*'s control van.

The result is a numerical printout of *Alvin*'s exact position in a navigation grid related to the bottom beacons. The people in the van can read the submersible's position within 20 feet. On a horizontal plot generated by the computer they can see *Alvin* stop, start, and turn within her own length.

Echoes Welcome *Alvin* to the Bottom

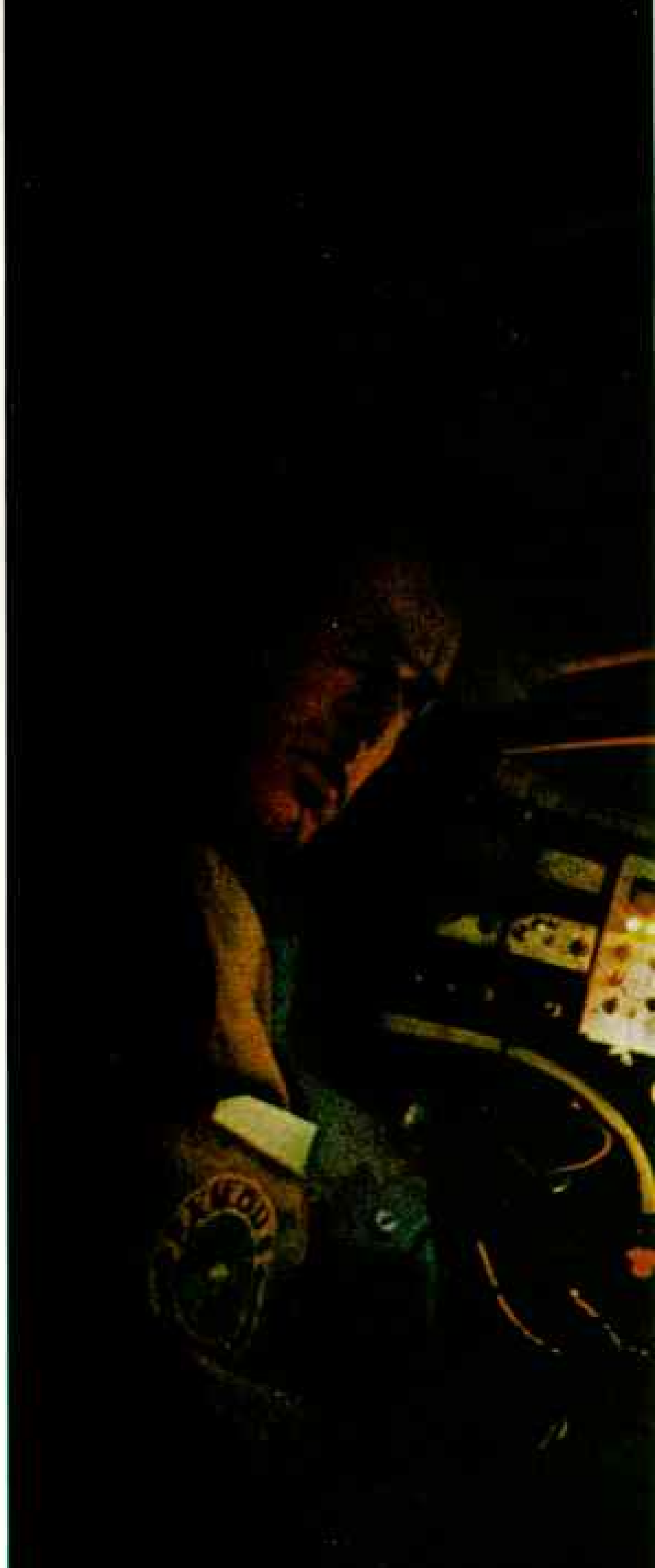
Jim Moore and I plot our present coordinates on a small but highly accurate topographic map of the rift floor. The fix puts us close to a depression between the volcanic hills we call Mount Venus and Mount Pluto (painting, pages 588-90).

Our scientific mission on this first dive is to explore that depression. Here, we believe, active rifting of the sea floor may be continuing, and could trigger the next phase of the volcanic eruptions.

Our depth now is 8,000 feet. We turn on our lights, cameras, data logger, and the sub's sonar system. The sphere fills with sounds, each having its own meaning.

In seconds the sound of the sonar changes from a continuous swishing noise to one interrupted by a high ping. The scope shows we are picking up the west wall of the valley at a range of about 500 yards.

We are now within 200 feet of the bottom. Jack drops two descent weights. The sudden release of 500 pounds stops *Alvin*'s rapid fall, and we start to rise slowly. Jack turns on the sub's variable ballast system and begins to



Inside *Alvin*'s cramped sphere, only 80 inches across, author Ballard, left, and Jim Moore take notes by the light of instrument panels after making observations through five-inch view ports. Pilot Valentine Wilson sits at his window, navigating by sight during a slow-motion eight-hour cruise across one mile of sea floor. ROBERT D. BALLARD, WHOI

pump seawater into six small titanium ballast tanks. After three minutes we attain neutral buoyancy, and *Alvin* hangs motionless 200 feet above the bottom.

"*Lulu*, we have neutral trim. Will now begin driving down." Since our props are noisy, this will be our last communication until we have landed.

Touchdown on a Lava Cliff

Jim and I are glued to our view ports. Through the noise of the props we can hear the sonar pinging off the west wall, closer and closer. At 100 feet our high-frequency altimeter picks up the bottom.

At 40 feet I report, "I have visual." Jack moves to my port and continues to drive down.

While we've been sinking, we've had no point of reference. This is our first chance to judge the current. Last summer when I dived in *Archimède* with the French, we had currents in excess of one knot. That could give *Alvin* a lot of trouble, particularly in rough rock terrain. *Archimède* bumped into rocks several times.

But at 15 feet Jack says, "Current is less than a quarter of a knot. It looks OK."

Jim quickly adds, "The bottom seems to be a lava flow, sloping steeply left to right."

Although the rugged slope is too steep to land on, Jack touches *Alvin* against it. We hang there like a mountain climber suspended on the face of a cliff.

"*Lulu*, we've landed. May we have a fix?"

The voice from the catamaran above is now that of Larry Shumaker, head of the *Alvin* operations group. "Roger . . . your position is X 54.4, Y 100.2. Over."

Jim plots and replies, "We're 50 yards from our target. Not bad!"

We decide to sample the lava while we're here. After 20 minutes of work, three samples that will weigh some 50 pounds in air have been dropped by our claw into a numbered section of the lazy-Susan tray mounted ahead of the sub.

"*Lulu*, we've completed Station One. We're going to drive at 180 degrees down the depression."

As we move down the lava flow, a lot of what we've seen in photographs by surface-towed cameras begins to make sense.

Instead of a mixture of apparently unrelated features, which surface pictures showed, we now see a systematic series of lava features related to the nature of the slope.

We soon can see, too, that these basic lava forms repeat themselves as we go on. Now hardened, all originally flowed out from deep in the earth as molten rock at some 1,200° C. (2,200° F.) into contact with seawater at 4° C. (39° F.) on the floor of the rift valley.

Rapid cooling of the outer surface of each flow built a series of tubes through which lava continued flowing. When it reached the end of a tube, it pushed out into the sea, forming a new section of the tube a foot or so at a time (pages 591-3).

Unlike the above-water flows we saw during a training field trip to Hawaii, these lavas did not travel great distances as molten rivers. But they are closer in appearance to the *pahoehoe* flows of Hawaii and Iceland than to the classic deep-sea pillow lavas pictured in textbooks.

On top of each flow we can see big feeder tubes that have collapsed. As *Alvin* crosses one, I can see six to eight feet inside. It has a series of ledges along its inner walls, recording the various levels at which lava flowed through it.

Though we find no open volcanic vents or craters, we see lava piles that we name "haystacks." Commonly 12 to 15 feet high and 20 to 30 feet across, they look like large termite hills, with lava having poured out the top and flowed radially in all directions (painting, page 588). We are to find these haystacks from Mount Pluto on the central axis of the rift out to the base of the west wall.

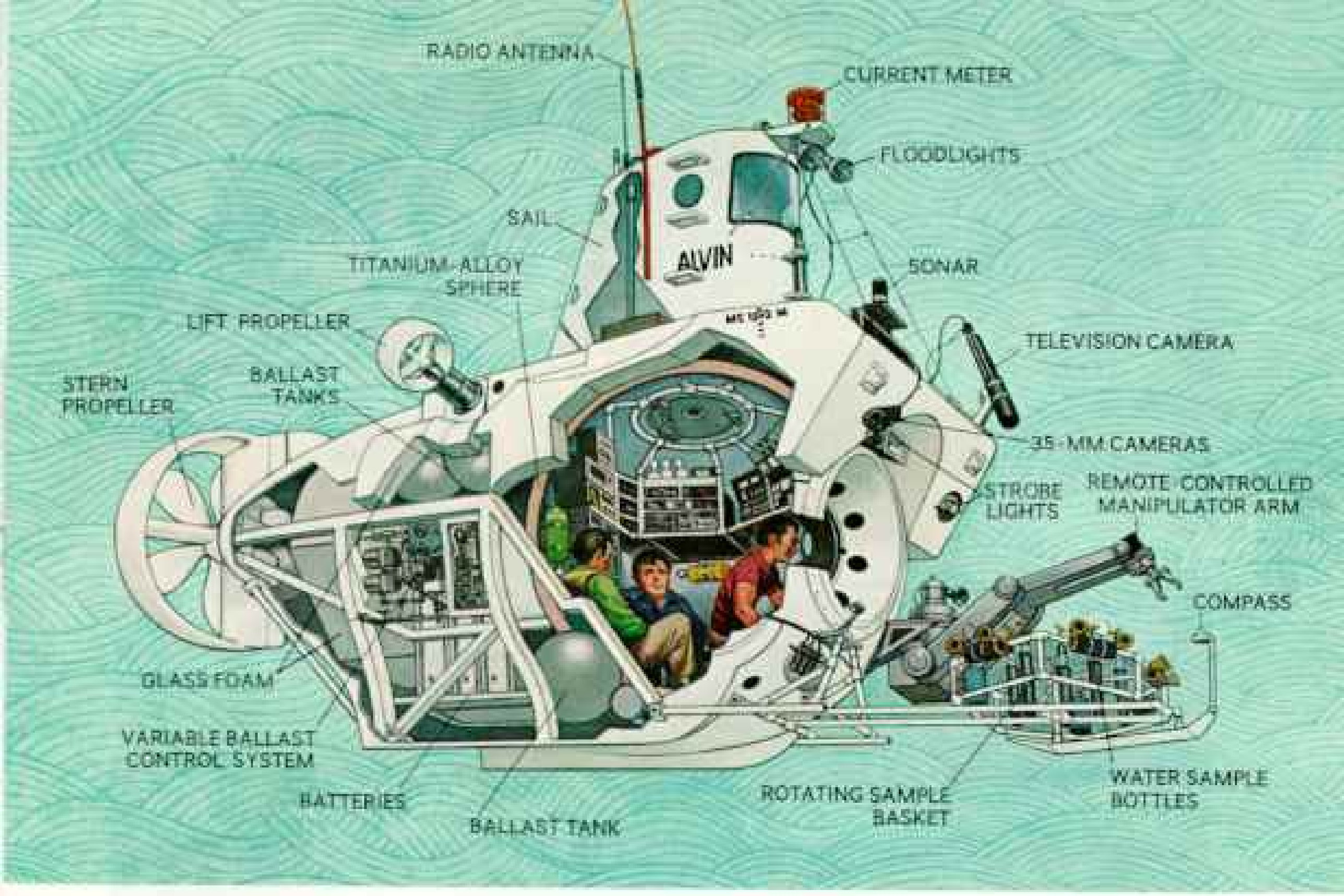
Talus, Toothpaste, and Trapdoors

Other lava features include bulblike structures showing no particular flow direction (page 593), and, at the steepest part of the flow front, sheetlike forms that indicate very rapid flow. We see massive piles of rock fragments, called talus, near the foot of each lava front. And, in addition, a variety of features have been sculptured by the now-hardened molten rock.

"Toothpaste" pillow looks as if a small tube or stream of lava had squeezed out of a crack, like toothpaste from a tube.

Another feature we call "trapdoor" pillow. It looks as if a door in the top of a pillow tube opened, permitting lava to flow out and lift the now-detached door.

Forty minutes after reaching the bottom, we come to the foot of the last west-facing lava flow. We're now at the very heart of the rift. We can see flows coming from both

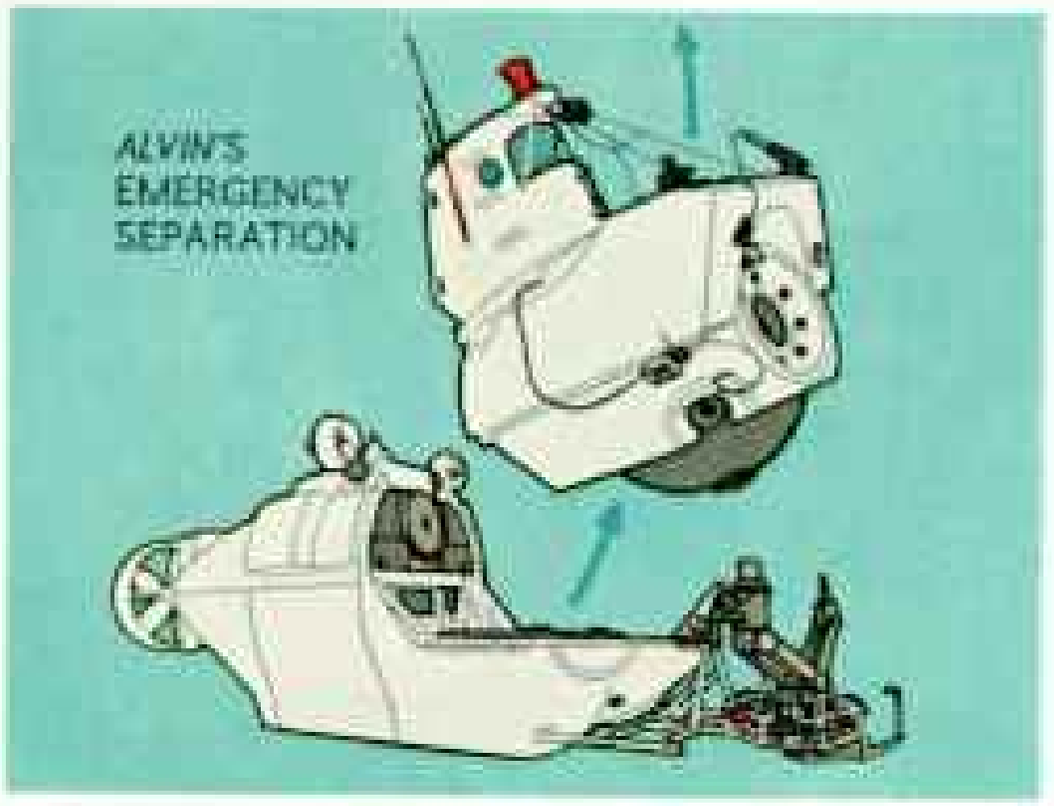


Safety comes first, not comfort, in the manned submersibles that took part in FAMOUS. Each houses its passengers in a sphere, the best shape for withstanding extreme water pressure.

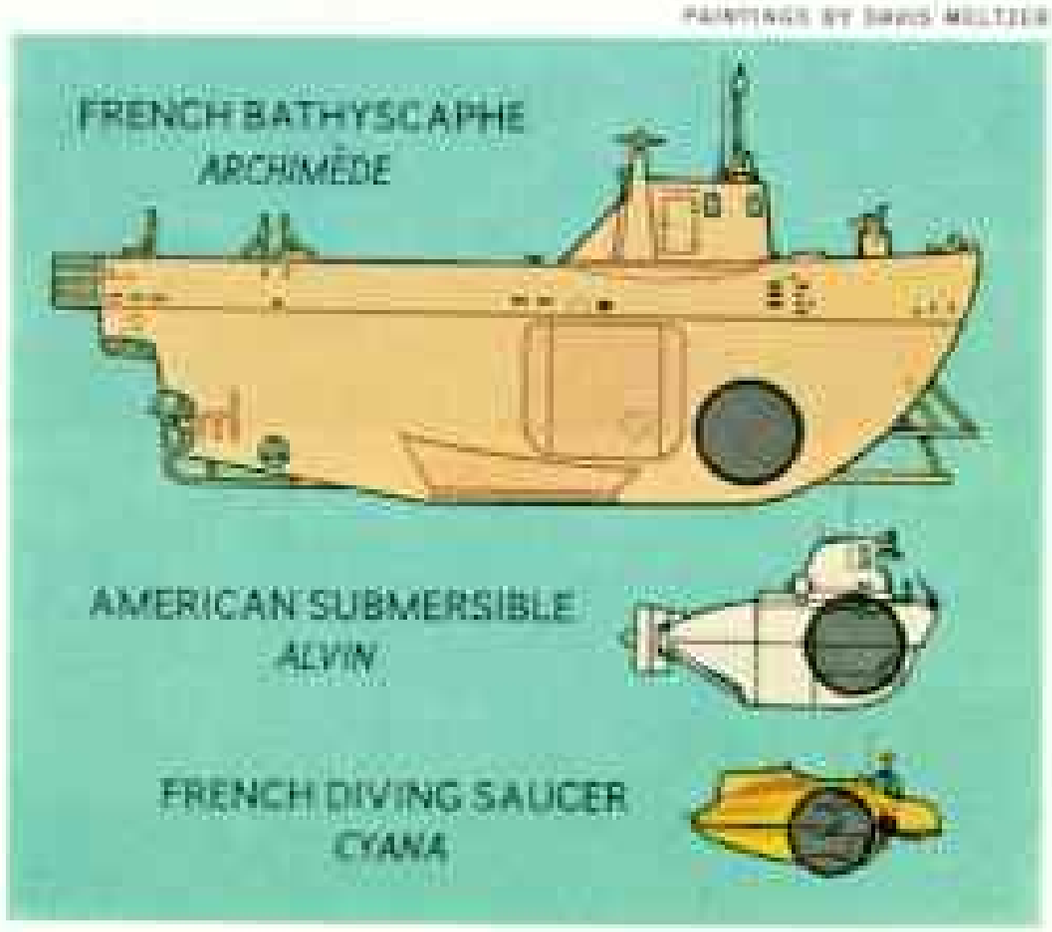
Alvin's new titanium-alloy sphere, only two inches thick, is identical to another that withstood pressure to 22,500 feet when tested by the Navy. Her self-contained variable ballast system (**above**) depends on pumping water in and out. Should *Alvin* become entangled, her passenger capsule and conning tower, or sail, can disengage and float to the surface (**right center**).

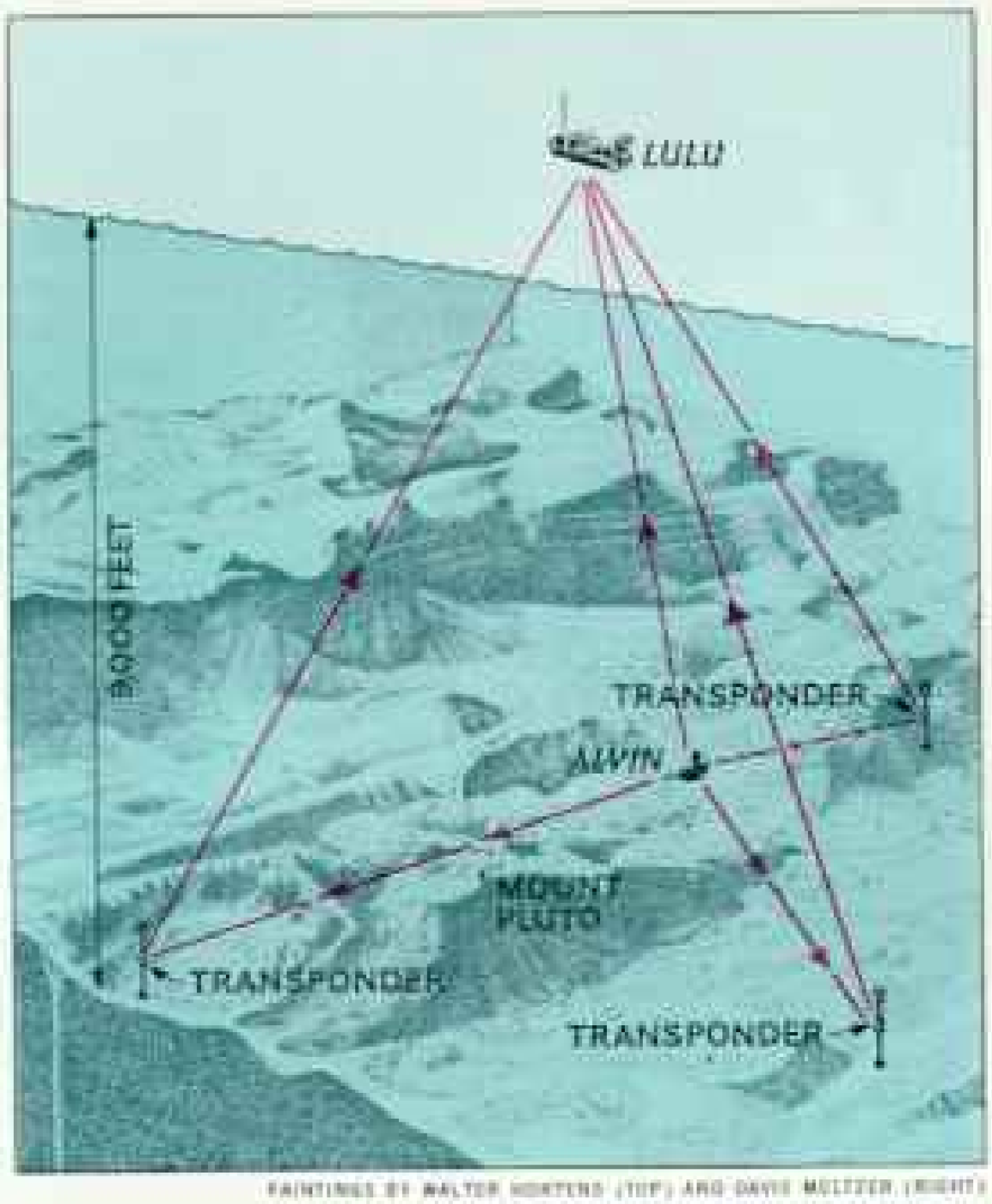
The French Navy's *Archimède* carries a personnel sphere with a six-inch-thick steel-alloy hull, capable of withstanding the ocean's greatest depths, more than 36,000 feet. To adjust her position, the sub sinks by releasing buoyant gasoline carried in the immense hull or rises by dropping some of her 19-ton load of steel shot.

Cyana, descendant of the world's first diving saucer, designed by Jacques-Yves Cousteau in 1959, can dive to 10,000 feet; it carries a 1.2-inch-thick steel sphere. In both small subs, glass foam, rather than gasoline, helps provide buoyancy.



PAINTINGS BY DAVID MEUTZER





PAINTINGS BY WALTER HORTENS (TOP) AND DAVID MEUTZER (RIGHT)

"**Alvin, this is *Lulu.*** Are you still at Station Four?" Aboard the mother ship, the author (**below**) was tracking the sub on the 526th dive of her career when a computer plot indicated no motion for more than an hour. "Better get under way," he suggested. "Mission time is running out."

The chilling answer: "We're trying."

The sub had angled down into a wide fissure, only to find when she began to rise that jagged outcrops stopped her from coming straight up. *Alvin* was temporarily caught (**painting, right**).

Lulu could monitor the submersible by a computerized tracking system, one of the most sophisticated yet devised (**left**). At the start of the summer's diving season, transponders that receive and send sonic pulses were dropped to the sea floor. As *Alvin* moved along the bottom, constantly signaling to two or three of these beacons, *Lulu*'s computer listened and plotted both the sub's exact location and her own.

With advice from topside, *Alvin* pilot

Jack Donnelly wiggled the craft by rotating the twin lift props, mounted behind the sail, and by pivoting and reversing the stern prop. After 90 minutes of patient jockeying, he worked the sub free and proceeded along the bottom for another 90 minutes of work. Later he quipped, "It was like trying to back a Cadillac out of a VW parking space."

east and west, forming a central depression.

At 12:13 we reach the deepest point in our dive: 9,110 feet. Pressure on the outside of our sphere is now more than two tons to the square inch.

No strain. *Alvin* is built to work safely as deep as 12,000 feet; an identical sphere has been tested to 22,500 feet without failing.

At 12:30 we stop to conduct our second work station. While Jack picks up rock, sediment, and water samples, I open our lunch. Traditionally, we lunch in *Alvin* on bologna sandwiches, cookies, and coffee. But today we have pepper-steak sandwiches. The smell of onions and peppers fills the sphere.

This contrasts with our more civilized French colleagues, who are lunching on cheese and Beaujolais a short distance away. Although we never meet underwater, for obvious safety reasons, we often hear them talking to their mother ship. Occasionally we talk to one another, as on the Fourth of July and Bastille Day, July 14.

Tracking Fissures in the Valley Floor

Lunch is over; we are under way south once again. *Alvin* cruises at a quarter of a knot about six feet above the bottom.

Jim and I record our observations on small tape recorders. Mounted outside are two cameras that take a stereo picture of the sea floor every ten seconds, providing nearly continuous photo coverage. Each of us also has a hand-held Nikon with a soft lens cushion that we can hold against our view port.

Our first encounter with a tectonic feature comes near the end of this first dive. As we cross the steep ridge that divides the central depression, we see a fault, or fracture, a few inches wide running southward down the axis of the rift valley.

The crack cuts across a lava flow, splitting individual rock features. We follow it for about a hundred yards before losing it in a pile of lava fragments.

All summer *Alvin*'s diving scientists are to be impressed by the way in which such faults and fractures seem to have overpowered purely volcanic features on the floor of the rift. Fresh, unbroken lava outpourings are seen only in a narrow strip along the central axis. Elsewhere, it is as if a massive wrenching, cracking, and grinding has worked and reshaped the rock floor.

Fissures like the one we have found at the very axis of the plate boundary are little more than hairline cracks. As we proceed either east or west of the central region, we cross others increasingly larger in size (pages 591-3 and 594-5). They range up to large fissures that have dilated or opened as much as twenty to thirty feet, with vertical fault scarps sometimes towering more than 1,000 feet.

As our summer of diving progressed, those vertical cliffs gave us excellent opportunities to see what type of rock lay beneath the surface of the younger lava flows. Like a roadside cut carved into a mountainside, the cliffs exposed the rock beneath.

Many of us believed that the fissures might be a good place to look for hot-springs activity and possible deposits of minerals. Some geologists theorize that seawater may travel or percolate down these deep cracks,

Splash-up: *Alvin* surfaces and heads for her floating garage, *Lulu*, which carries a 20-man crew. Standing in the sail, *Alvin*'s pilot drives her toward the submerged cradle

between *Lulu*'s twin hulls, giant floats that hold sleeping and working spaces. There, skin divers attach lines and the sub is lifted on a platform so technicians can prepare her for the next day. Driven by three external engines, the unusual catamaran from Woods Hole, Massachusetts, is registered as an outboard motorboat.

be heated by the hot magma somewhere deep below, then rise back to the surface carrying dissolved minerals. As the water recools, the minerals may be deposited in layers around open vents in the floor.

The French, diving in *Archimède* and *Cyana* in the fracture zone to the north of us, reported they had found such deposits. So our interest in the fissures grew even stronger.

Alvin Wiggles out of a Tight Spot

During a subsequent dive some days later, *Alvin* attempted to enter one of these fissures on the east side of the rift. I was serving as science controller in the van on *Lulu* for that dive. Jack Donnelly again was the pilot, with Bill Bryan and Jim Moore along.

After *Alvin* had not moved for more than an hour, a call down to the sub revealed what had happened. It had driven very slowly and gingerly on a slanting course down into a fissure appreciably wider than the boat. "Now we don't seem to be able to rise," reported Jack.

In the crowded van, all light conversation abruptly ceased. A quiet, calm sense of total concentration gripped us as we studied the navigational plot and talked to the three men far below.

The fissure apparently had narrowed until it was scarcely wider than the sub itself (page 611). The jagged walls of the crack would not permit the craft to come straight up, as it normally does when rising with its lift props. Nor could Jack move the sub forward or back with any degree of freedom.

"**It's OK!**" Pilot Donnelly signals as he debarks to *Lulu* after the harrowing 526th dive (pages 610-11). Behind *Alvin*'s divers stand the skills and esprit de corps of the sub's technical crew. Mechanic Russell Graham (**above**), here washing down the sub with fresh water, and crew chief George Broderson (**below**) have tended the craft since her launching in 1964. Jaunty red berets distinguish the nine men who served with *Alvin* on her most newsworthy assignment before FAMOUS. In 1966 they searched the Mediterranean off Spain for a hydrogen bomb dropped during an aerial collision and found it after many dives.

Val Wilson, chief pilot of the *Alvin* group from Woods Hole, talked the situation over directly with Donnelly. They began putting *Alvin* through a series of small-scale maneuvers, trying to work her free.

Our tension lasted for an hour and a half more, though it seemed like much more time to us—and to those on the bottom, they admitted later. But finally, well before any real emergency steps on *Alvin*'s escape checklist were taken, she inched and shimmied and worked her way out in reverse, like a car backing out of too tight a parking space.

"We're clear and under way again," Jack reported in a matter-of-fact manner. "We're proceeding to our next station."

It was the only mishap that occurred in *Alvin*'s six weeks of diving, and even then no lives were endangered. Considering the depths in which she worked, the nature of the terrain, and other unknowns we faced, that says a great deal for the professionalism of the program, the safety measures built into the operations of deep submersibles like *Alvin*, and her pilots' skill.

"All Clear, Come On Up"

After some five hours on the sea floor in our first dive, the three of us are beginning to tire. We know it will soon be getting dark on the surface, and Jack would like *Alvin* to be recovered in daylight.

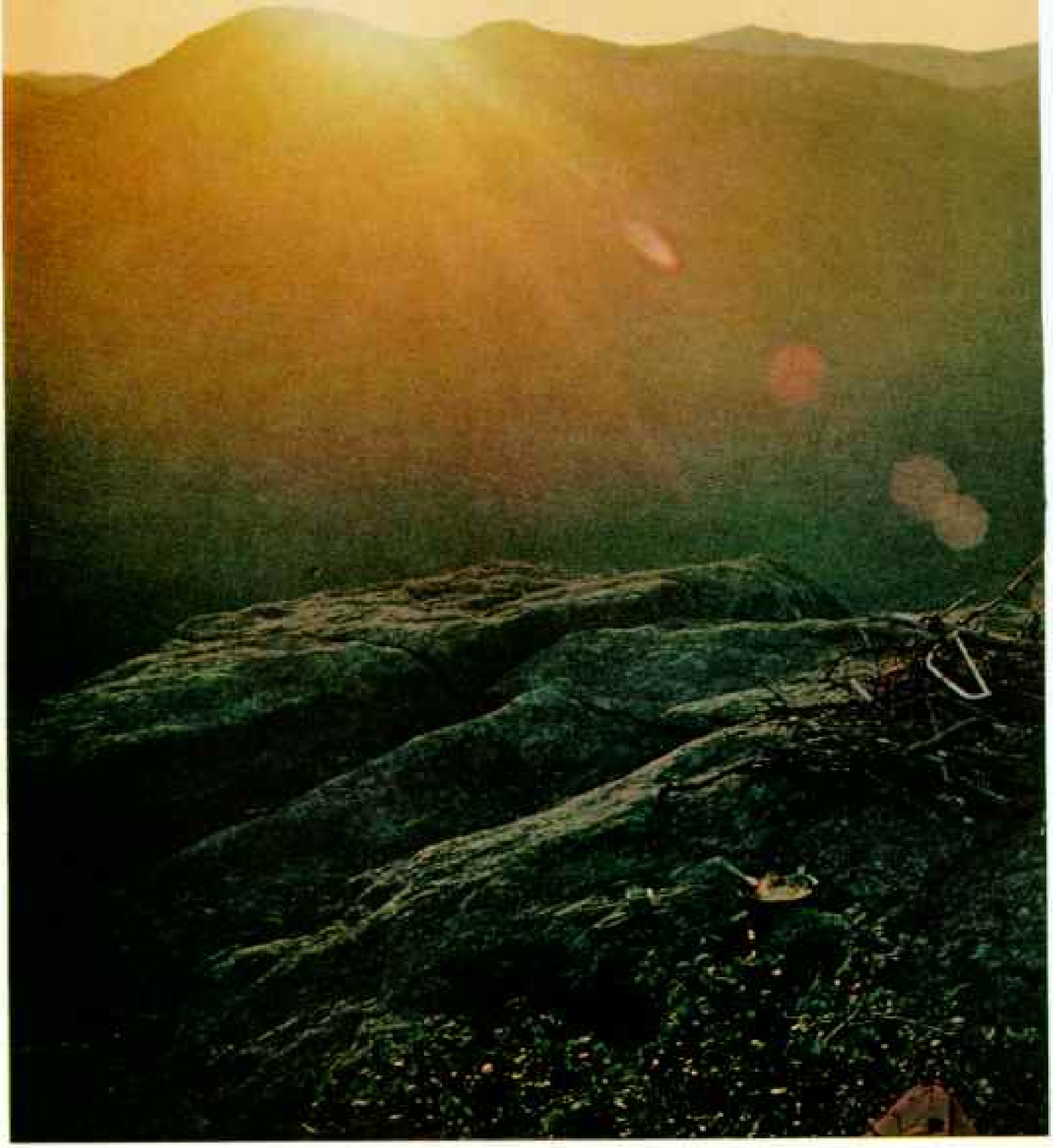
"*Lulu*, this is *Alvin*. We are running low on battery power. How does it look up there?"

Larry Shumaker quickly responds, "All clear. Come on up."

Jack now drops two more 250-pound weights, and we start upward as fast as we came down. With our instruments turned off, a great sense of accomplishment comes over me as we speed toward the surface.

In this first extended use of submersibles for scientific exploration of the deep-sea floor, the three little subs of Project FAMOUS have proved their ability to expand man's knowledge of the earth.

Our satisfaction will continue to grow in the weeks to come, as the three subs log a total of 44 dives in the rift valley and associated fracture zones. Over the months that follow, the data collected by both the surface and subsurface field programs of FAMOUS will be studied and compiled, providing geologists around the world with a new level of understanding of how the earth continually renews and re-creates itself. □



Populated mostly by mountains, New York's Adirondack Park embraces the largest wilderness tract in the eastern United States. Here the author romps with her dog, Pitzi, in the High Peaks region, whose panorama inspired an early guide to remark, "It makes a man feel what it is to have all creation under his feet."

My Backyard, the Adirondacks

By ANNE LABASTILLE, Ph.D.
Photographs by DAVID ALAN HARVEY

JUST A STEP beyond the door of my log cabin stretches my backyard—six million acres. As a resident and taxpayer of New York State, I own almost forty percent of it, and much of the private part is laced with public trails, canoe routes, beaches, boat-launching sites, and hunting and fishing areas.

My backyard is the largest state park in the United States, and undoubtedly the biggest tract of wilderness left east of the Mississippi. It's almost as vast as the combined acreage of Yellowstone, Grand Canyon, Yosemite, Olympic, Great Smoky Mountains, and Glacier National Parks!

The Adirondack Park is a country of cloud-splitting peaks, sunny beaver meadows, somber spruce forests, fragrant balsam flats, and trout-blessed streams clear and dark as bock beer. It is a land of awesome winter nights, when temperatures hover at 25 below zero and branches crack and ice rumbles.

In spring it is an exasperating area, enjoyed mainly by blackflies, peepers, and trout fishermen reeking of insect repellent. Come autumn, my favorite season, the Adirondacks rival in brazen beauty any other mountain group in North America.

This vast Adirondack region is a stronghold of some 125,000 self-reliant residents called "natives," still notably pioneerlike in attitude. They combine Vermont stubbornness

and reserve with an Appalachian hardiness and subtle skepticism of outsiders.

Sloan Wilson, novelist and resident of Ticonderoga, defines the essence of the Adirondack man as "his independence—he can wear what he likes, spit anywhere, and not go to work at 9 a.m."

No special cultural ties, no unique language or accent, no historical traditions unite the people of the towns and hamlets within the park. But they do share a fierce independence, a love of the woods, and a spirit of isolationism. Tell a native in Upper Jay that you live in Beaver River or Stark, and he'll say, "Where's that?"

Natives refer to that teeming, citified area beyond the mythical "blue line" surrounding the Adirondack Park as the "Outside." "It's for sure no one Outside gives a damn about us up here," a typical resident remarks. In almost twenty years in and out of the Adirondacks, I have not sensed much change in that general attitude. But now concern is definitely coming from the Outside.

The recent farsighted regional land-use plan of the Adirondack Park Agency seeks to protect the "forever wild" character of the state-owned acreage, and to regulate growth within the park. Signed into law by then-Governor Nelson A. Rockefeller on July 20, 1972 (public lands), and May 22, 1973 (private lands), it promises to conserve the quality of this exceptional mountain region for natives and outsiders alike.

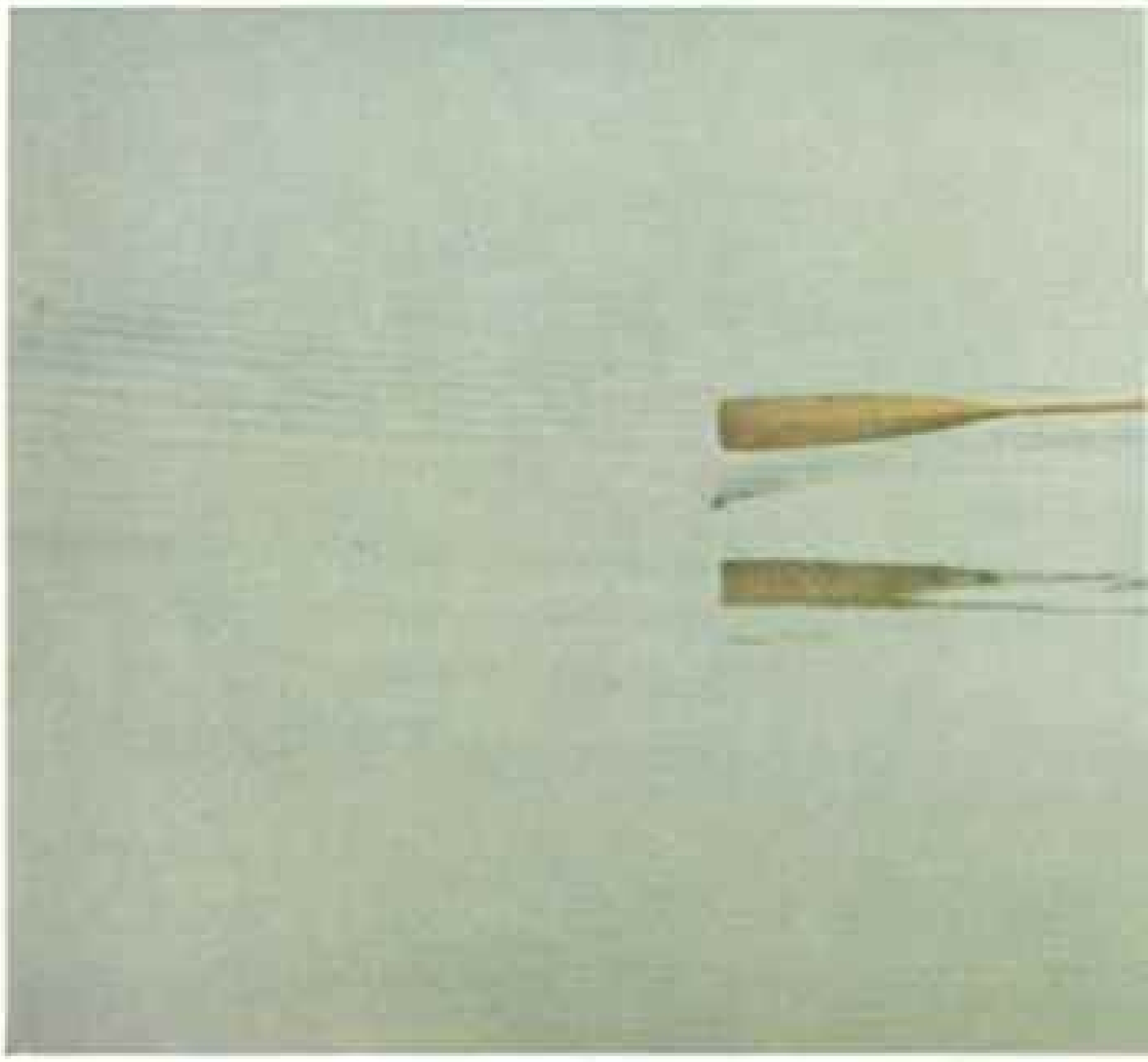
As can be expected in this bastion of rugged individualism, many people deplore such control. One said, "The natives would rather burn the woods to the ground than let the Adirondack Park Agency tell them what to do." Nevertheless, this new land-use plan ranks with those of Hawaii, Vermont, and Oregon as among the most advanced in the United States, and brings the first community cohesiveness in history to these mountains.

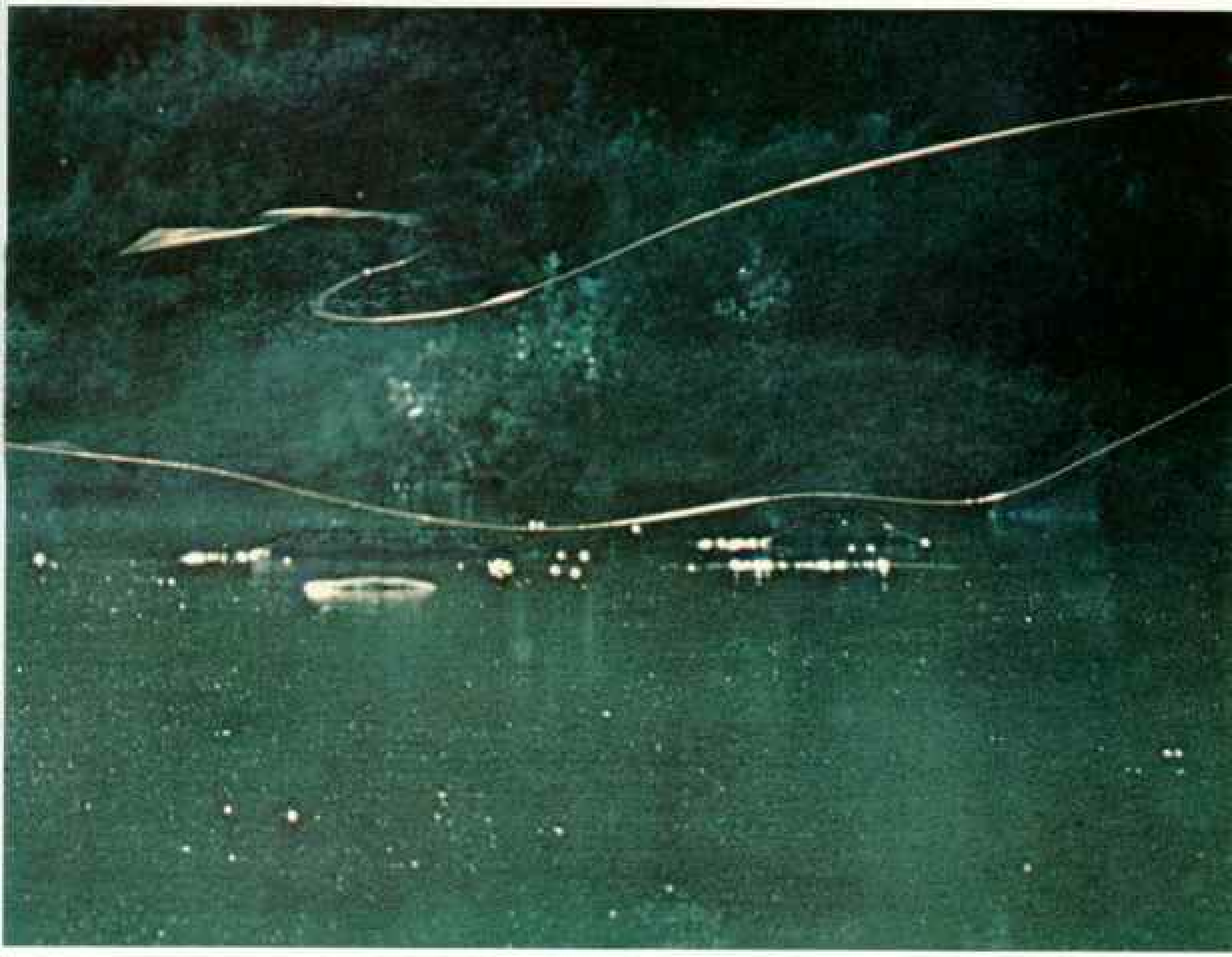
EDITOR'S NOTE: Ecologist, freelance writer, and lecturer, Dr. Anne LaBastille has been associated with the Adirondacks ever since she began undergraduate studies in conservation at Cornell University in upstate New York. Earning a Ph.D. in wildlife ecology, she embarked on a career to help save and protect endangered wildlife of the Americas. In 1974 she was awarded the World Wildlife Fund Gold Medal for her efforts to preserve the giant pied-billed grebe and Guatemala's quetzal (NATIONAL GEOGRAPHIC, January 1969).

PARK LIMIT

Malone
St. Regis
Potsdam
Salmon
Upper Chateaugay Lake
2,710+
3,830+
Dannemora
Saranac
Plattsburgh
Saranac
Valcour I.
Lake Champlain
Meacham Lake
+5,518
Hawkeye
+2,189
Stark
1,829+
Floodwood
Upper Saranac Lake
Saranac Lake
+4,872+
Upper Jay
Lake Placid
+3,623
Lake Placid
Keene
Averyville
Cranberry Lake
Cranberry Lake
2,670+
Tupper Lake
Tupper Lake
+4,100+
+4,268
HIGH PEAKS
+4,361+
Algonquin Peak
5,114
+4,627
St. Huberts
Lake Colden
Indian Falls
Mt. Marcy
5,344
Sabattis
+4,621+
+4,350
+4,857
+4,401
Long Lake
Sanford Lake
Tahawus
Disputed territory; 612-acre state-owned campsite occupied since May 1974 by Indians who contend the former Mohawk land was illegally sold to the U.S. Government in 1796.
Floodwood
Beaver River
Big Moose
Big Moose Lake
Blue Mountain Lake
Adirondack Museum
Blue Mountain Lake
3,386+
Moss Lake
Hudson
Indian R.
Indian Lake
Old Forge
Little Moose Lake
Moose River Primitive Recreation Area
3,903+
Indian Lake
North Creek
Ticonderoga
Schroon Lake
Cedar Lakes
West Canada Lakes
Mud Lake
+3,254
Vt.
N.Y.
Honnedaga Lake
+3,160
Speculator
Lake Pleasant
Lake George
Warrensburg
Pisco
Piseco Lake
Lake George
Fort William Henry
+2,650
Northville
Great Sacandaga Lake
Glens Falls
Hudson Falls
Corinth
Hudson
Forest Preserve
Private lands
Campground
Ski area
Saratoga Springs
PARK LIMIT

Big fish come in small waters, but only if you know where to look. Casting over the Ausable River, a trout fisherman seeks a prize (**above**). Despite rumors that the Adirondacks have long been "fished out," natives insist that record-size specimens still lurk in many of the several thousand streams and lakes. "The fish are just a little smarter round here," a backcountry guide explained. Since the 1850's, when "cityfolk" first descended upon the region in search of fish and game, Adirondack woodsmen have led the way in spruce-ribbed, pine-sided guide boats (**right**)—built to be portaged by the guide alone, yet strong enough to carry 800 pounds. Today two hundred licensed guides continue to lead parties to choice hunting and fishing grounds, perhaps the best-kept secrets of the Adirondacks.





My Backyard, the Adirondacks

AUTUMN AT MY CABIN is a season of splendors. At sunrise a lone great blue heron may lumber out of the creek and dissolve skyward into the mauves and grays of mist and hills. A flock of Canada geese may skim above my sleeping loft, wakening my German shepherd, Pitzi, and me with their boisterous conversations.

A family of sleek otters swims effortlessly past the dock, snuffling and snorting as I splash water on my sleepy eyes. One of them climbs agilely onto a granite rock, a trout clamped between its jaws. In the early morning hush I clearly hear the crunch of bones.

All day chickadees, nuthatches, and juncos peck at the feeder, while bold blue jays and chipmunks jet in for a tidbit, then dart back into the rustling woods.

At eventide pairs of ducks whistle into the cove to rest. Beavers push satin ripples across the lacquered black lake . . . only the beavers, and perhaps a silent canoe. After dark, barred owls hoot and eastern coyotes howl into the star-blazoned nights. And just before dawn, that mighty winter hunter, Orion, rises from his summer sleep to step out of the east and vault astride my cabin ridge.

Much as I love contemplating fall, it brings work and change. Pumps must be drained, storm windows have to go up, and the persistent search for cracks and drafts between the spruce logs is renewed. The stovepipe must be cleaned, the fire extinguishers checked. Living a mile and a half from the nearest dirt road means no fire truck could come to the rescue.

Yet fire is a most necessary comfort. Crackling and snapping in my Franklin stove, it warms the cabin and dispels gloom on rainy days. To nourish it, I cut cords of wood each fall. Few chores are as pleasurable as spending a tawny-gold afternoon with chain saw and ax, felling dead trees, blocking off 18-inch lengths, and splitting apart each section. It's wonderful work!

The clean bite of the ax into birch, the whine of the saw, the smell of wood chips, the fresh soreness of muscles, the pride of seeing one's woodpile straight and tall—these all remind me of why I choose to live in the Adirondacks. Each time I return from a consulting job or writing assignment, I find restoration and serenity in these mountains.

"Settlers went around this landmass," explains Richard W. Lawrence, Jr., kindly civic leader and chairman of the Adirondack Park Agency, "because the peaks were too rugged and the swamps too wet. The same thing happened with the Tetons and the Bitterroots."

Explorers, traders, and settlers took the easy, adjacent water routes—the St. Lawrence, Black, Mohawk, and Hudson, and Lake Champlain. Even today, mountain dwellers follow roads down the natural drainage patterns to surrounding lowland cities: Utica, Watertown, Ogdensburg, Massena, Plattsburg, Albany, Amsterdam.

OCTOBER IS THE MONTH to nail up "No Hunting or Trapping" posters around my land. I maintain my 22 acres as a wildlife sanctuary where every form of animal is welcome.

Each autumn I inspect two old beaver dams for any new engineering efforts, and note the growth of a few prized behemoth white pines. I drink from a mossy spring, then cut past a cove to look for a favorite pair of hooded mergansers, and tamp each corner boundary marker more firmly into the rich black duff.

Private lands legally protected by posting, I wait, like everyone else, for October 25, traditional opening day of hunting season. More than 150,000 persons come each fall in search of white-tailed deer and black bear—and spend an estimated eight million dollars. Diners and restaurants are ready with gallons of coffee and mounds of steaks, sausages, pancakes, and potatoes. Sport shops and service stations open early and close late. Motels blaze with neon along the roadsides.

State parklands suddenly blossom with crimson coats, red hats, and yellow slickers. Parking lots and boat-launch sites fill with four-wheel-drive vehicles, station wagons, campers, and trailers. Rifles crack through the woods. State Environmental Conservation officers prowl the roads. Jack Carroll, a leathery-necked veteran, explains, "We have to be as fast as foxes to outsmart game violators after illegal 'mountain lamb.'"

In an average year about 5,000 whitetail bucks are legally taken in the 12 Adirondack counties, and 300 to 700 black bears. Most natives feel this is far too many, but the state's senior wildlife biologist, Dr. C. W. Severinghaus, disagrees flatly.

"Hunting plays a vital role in keeping Adirondack deer herds from certain winter starvation, sickness, and agony," he says. "The hunters replace now-vanished natural

predators that once kept the deer in balance with the winter food supply. Just take a look at the browse line along most lakes. The cedar trees look like they were trimmed with giant clippers. Hungry deer did that."

Soon the big-game season opens farther south, where deer are more numerous and fatter. Like bird dogs on a fresh scent, the hunters move on. In the old days men came and stayed to hunt in the Adirondacks. This was the heyday of the Adirondack guide, immortalized in Winslow Homer's paintings. Old hat, baggy trousers, scarred leather boots, suspenders, Adirondack pack basket, and enormous strength characterized these men. Red Perkins of Old Forge bragged to me, "I once rowed and carried an 87-pound guide boat from Little Moose Lake to Honnedaga Lake—38 miles—in nine hours!"

"Why were you in such a hurry?" I asked.

"Well, by golly, I wanted to take my girl to a square dance that night!"

Good guides were legendary and in great demand. Vice-President Theodore Roosevelt was with guide Mike Cronin in the High Peaks country when news reached him of President McKinley's death in Buffalo, New York. Other guides, too, are still mentioned almost reverently: John Cheney, Mitchell Sabattis, Alvah Dunning, Mart Moody, Andy Carmen, Orson "Old Mountain" Phelps.

Today most of the old guides are gone. A new breed exists. More than 200 are registered by the Department of Environmental Conservation, only a few of them women, myself included. We guide because we find pleasure in sharing the Adirondacks with others, and there is also a certain pride in the badge and the license.

Once the fall hunters have gone, the Adirondacks settle back into quietude and November fogs and rains. The freeze-up begins. Lakes flirt with ice for a week or two. Bays skim over, then melt. Lakeshore grasses glaze, then drip. One evening around Thanksgiving the mercury plummets to ten degrees or even zero.

Seemingly amiable master of the forest ambles near the village of Big Moose. Increasing in numbers, black bears find campsites and garbage cans easy pickings.

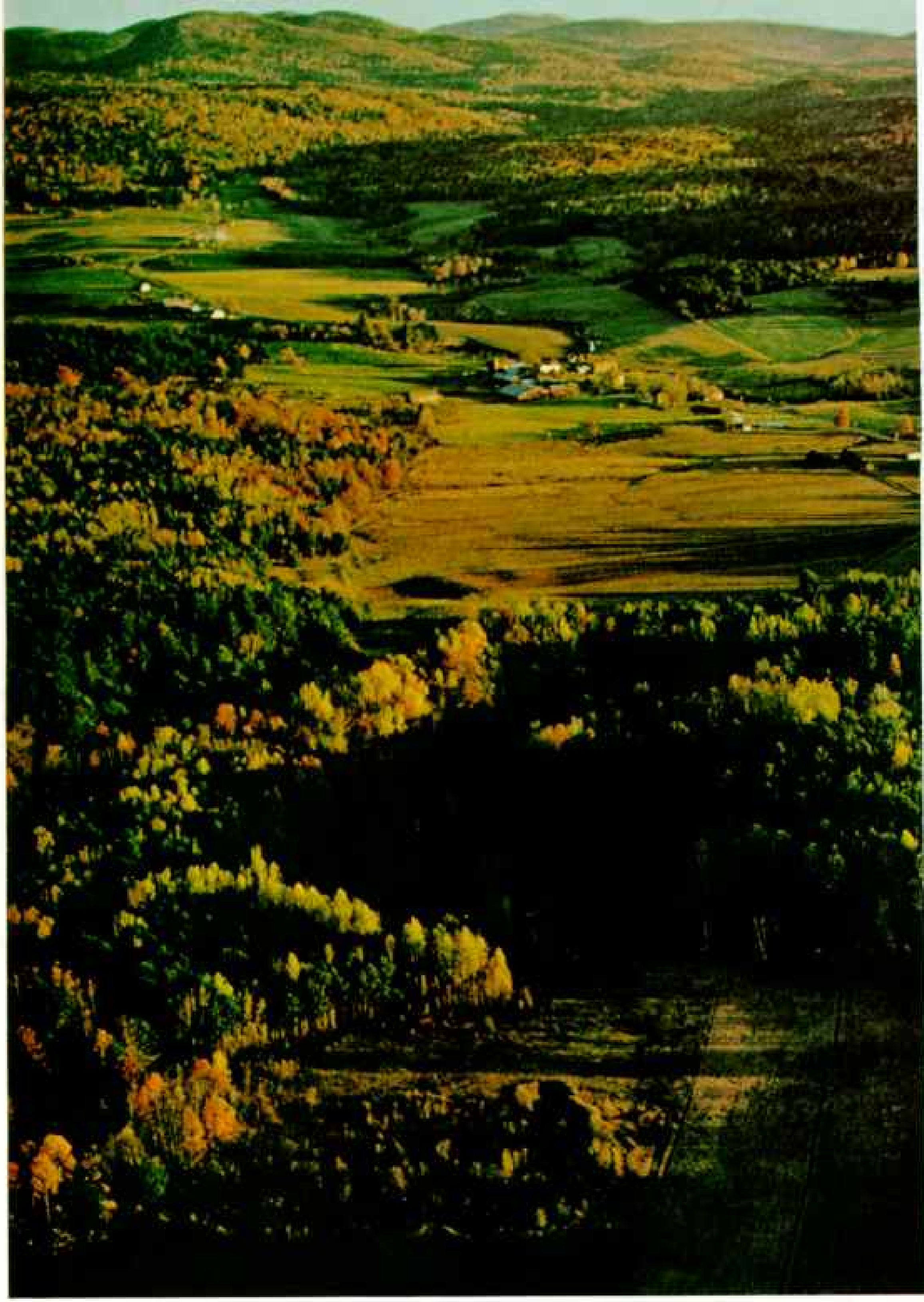
WINTER IS USHERED IN by a major snowstorm that seals lakes and woodlands for half a year. Snows accumulate up to 3 feet on the level; ice, 2½ feet on the lakes. Winter used to change the life-style of everyone in the Adirondacks. Natives literally burrowed into their homes like woodchucks. By spring, "cabin fever" reached epidemic proportions. Only trappers and lumberjacks, so they say, kept their sanity.

Today, with the first whine of a snowmobile, winter is suddenly freedom, and fun.

Snowmobiles have made a direct impact on winter life in the Adirondacks. As a mother of five told me: "I can remember six or eight years ago when I would gaze out across the lake from my kitchen window and see nothing but snowflakes go by. Temperatures might stay near zero for days. Now I use my snowmobile to have coffee with our neighbors, take the laundry out, play with the kids, or just go visiting."

On a good snowmobile weekend, every inn in the North Country will be jammed with vacationists. They bring their machines, trailers, snowmobile suits, boots, helmets, mitts, goggles, and arm patches. Organized caravans snarl down roads and trails: "Motor Mushers," "Polar Bears," "Driftbusters," "Winter Weasels," "Rump Bumpers."

Groups travel from lake to lake over the ice, stop for lunch, *(Continued on page 628)*



In summer's wake, an early frost brings autumn hues to dairy and vegetable farms of the western Lake Champlain valley. Offering a feast of geography, the lush land

BATTMAN JOHN

climbs westward to rich timber stands that cloak gentle mountains. Farther south the rolling hills merge into a region of rugged peaks dominated by Mount Marcy, at 5,344 feet New York State's loftiest summit. Millions of visitors every year taste the variety of the Adirondacks, many eager to trade city bustle for mountain solace.

Rain or shine, the woods are fine for the author, left, and two students sitting out a drizzle in the Adirondack backcountry. Dr. LaBastille led 14 college literature students on a "Wilderness Workshop." After reading the works of Thoreau and other nature writers, the group went on a ten-day hike, using the outdoors as a classroom. The students zip-lined across a high-banked ravine (**above right**), navigated by compass, and each spent 24 hours in solitude, thus achieving a new

awareness of the woods and themselves.

Love of the wilderness lures Jack Parsell (**right**) despite cast and crutches. He hobbles forth to gather litter at Indian Falls, part of a spring cleanup organized by volunteer groups.

build a bonfire, cook hot dogs, sing songs. More rugged types cover 75 miles in a day and camp in the snow.

The New York State Department of Environmental Conservation maintains more than a thousand miles of official snowmobile trails. And the town of Webb, which calls itself "Snowmobile Capital of the Northeast," cuts, packs, and grooms some 170 miles of woodland trails. Snowmobiling is big business in the Adirondacks. Devotees buy food, beverages, clothing, gas, and oil; they need lodging and repair service. Some have saved lives by reaching isolated or injured people in emergencies.

Nevertheless snowmobiles have many opponents. As one old-timer from Keene grumbles, "Those machines are just a bunch of converted chain saws!"

Some riders have awakened inhabitants at unearthly hours, revving engines outside bedroom windows. One homeowner responded to a 3 a.m. visit by applying his rifle butt to the leader of a snowmobile pack. "You come around this house at this hour again," he thundered, "and I'll use the other end!"

State law now limits the speed of snowmobile travel within 100 feet of any occupied dwelling during certain hours. But the machine's greatest threat remains the ease with which it can penetrate once-pristine and remote winter areas.

Bill Partridge, born at the picturesque hamlet of Beaver River—which has no roads connecting it to anything—gave this poignant epitaph: "When I was a boy, I could step outside in winter and *hear* the silence. Nothing anywhere, just once in a while ice rumbling or cracking. Not anymore. No, sir! Now it's *'wruuuum,wruuuum,wruuuuum!'*"

ADIRONDACK TRAPPERS today find snowmobiles indispensable. I spent a day with "Bun" Arndt of Indian Lake last March as he checked his beaver trapline. "I like to trap where I don't see other people," he grinned after we had traveled about twenty miles through wilderness country. By law he must check his traps every 48 hours. His hazards are biting winds, the peril of thin ice, and the danger of springing a heavy quick-kill trap on his hand.

Resting against his snowmobile in the lee of a balsam flat, Bun said genially, "Most of us don't have year-round jobs up here, so trapping helps us survive. Besides, beavers need some thinning out or we'd probably be smothered by 'em."

Nearly 4,000 trapping licenses are sold in the Adirondacks each year. Between half a million and a million dollars' worth of Adirondack furs are sold each year, including beaver, otter, fisher, weasel, raccoon, mink, muskrat, eastern coyote, and bobcat. Few areas in the East can sustain such harvests, which add precious dollars to the region's winter-weak economy.

Luckily the controversial sport of snowmobiling has not spoiled me, or Bun, or a great many other outdoors people for the more traditional pastime of snowshoeing.

I like nothing better on a clear, cold day than to strap on a pair of bear-paws and set out cross-country. Summer places are unrecognizable. Small spruce stands have become marshmallow mounds. Streams have vanished into musical iced-over rivulets. Drifts are sculptured with wedding-cake frillery. Lakes are wide white canvases upon which I create fanciful snowshoe patterns.

Sometimes I snowshoe at night, by the light of a full moon. In the intense cold my leather harnesses creak and the frames tap on the crust. Snowshoe hares slumber in shadowy caves beneath snow-laden spruces. Birches and beeches throw parallel shadows on the blue-white snow.

Despite all the beauties and diversions—snowmobiling, snowshoeing, skiing, bobsledding, ice skating, dogsled and iceboat racing, trapping, and impromptu partying—there is a pervasive quality to winter in these mountains. Loneliness.

I have known almost intolerable hours at the cabin, waiting for a blizzard to blow itself out. Roads are blocked. The mail stops. Phone and power lines are ripped down; fierce winds prevent social visits.

It is worse for those who are ill, aged, or widowed. I have one 80-year-old friend who stares down the country road for hours at the snow devils kicked up by the winds. He says glumly, "The older you get, the tougher winter up here gets."

Some of the merrier places to go in the mountains for human warmth, entertainment, and companionship are the local bars and taverns. Here we share the latest gossip, and lay bets on when a barrel placed on a certain lake will fall through the ice come spring. Some locals drop into the bars for a cup of coffee; others for "an Adirondack haircut"

(a drinking spree) and stay a couple of days, seeking solace from the loneliness.

Then one day the barrel *does* slip through the ice and a redwing blackbird shows up in the swamp. The faint honking of northward-bound geese drifts over the bud-bursting forest. And Orion, the winter hunter, slides weakly into the west.

March and April are capricious months. Sometimes, bikini-clad atop a well-blanketed toboggan, I have gotten a tan from the blaze of sun on crystal ice and snow. But the weather can also be as bleak and raw as in Siberia. Robert Louis Stevenson, during a spring stay at Saranac Lake in 1888, wrote, "The greyness of the heavens here is a circumstance eminently revolting to the soul."

SPRING OFFICIALLY BEGINS with the ice breakup, anywhere from mid-April to mid-May. Suddenly the sun is glinting on blue water. The ice is gone. One night the peepers start their chorus, swamp water having warmed to some catalytic temperature. White-throated sparrows trill at dawn and dusk. Red and white trilliums bloom in sun-dappled hardwood forests.

People go fishing at every available moment. Brook trout (8-, 10-, 12-inch beauties) are the most prized of native species, but lake trout (2- to 20-pounders), smallmouth bass, walleyes, great northern pike, and tasty bullheads are also much sought after. The state stocks thousands of Adirondack ponds, lakes, and streams each year.

In May, I join my longtime friend and fellow guide, Bob Burkhart, on jaunts to clandestine places where the big brookies lurk. Trout fisherman extraordinaire, Bob's philosophy is, "The best trout streams are those that haven't been fished much." His gnarled hands gently guide the loop of the line with its Grizzly King fly. Before lunch we have our limit, scarlet-spotted fish glistening against the fresh green ferns lining his creel.

From a worn pack basket, Bob produces two flattened peanut-butter sandwiches. We wash them down with icy spring water, a fine lunch. Supper will be even better.

Blackflies appear in late May and June. These tiny nuisances are a scourge, especially in swampy areas. The blackfly attacks like a miniature vampire. Few feel its bite immediately. Most natives seem to acquire a natural immunity and suffer only mild irritation. Others react violently, swelling and itching. We dress to minimize exposure, apply repellents, make smudges, stay indoors on hot cloudy days, or work outside at night when blackflies are inactive.

There are only two places I know where blackflies can't get you in the Adirondacks. One is on the windy summits of the highest peaks. The other is along any of the white-water rivers that roar through the valleys in spring. Most exciting of all are the rapids of the upper Hudson, whose headwaters are high up on Mount Marcy's slopes.

Last May I canoed the Hudson from Indian River to North Creek. Waves, eddies, and whirlpools surged and sucked around huge boulders. Two canoes in our party wrapped around rocks and had to be abandoned. In a few seconds the owners each lost about $500 worth of boat, paddles, and gear, and were lucky not to be injured. As bowman I fought hard to keep our own canoe from ending as a battered hulk on a sliver of beach. Through it all, I never felt a blackfly bite.

After running white-water rivers, I step with a sigh of contentment into an Adirondack guide boat to glide across a still lake. On calm water this distinctive type of rowboat is faster than a canoe.

The guide boat—"slender as a pike, buoyant as a cork"—is the most beautiful native craft of our mountains. The great boatbuilders are gone now, but the Adirondack Museum at Blue Mountain Lake maintains a collection of vintage specimens on display. And once, looking into the boathouse at the exclusive Ausable Club near St. Huberts, I counted 60 fine old guide boats on the racks! It was like seeing 60 Rembrandts hanging on a cabin wall.

AS SUMMER APPROACHES, I am reminded of a symphony shifting from allegro to andante. The high soprano peepers have been replaced by baritone bull frogs. The winter wren's frothing song is now supplanted by the deeper notes of woodpeckers and grackles. The pastels of young leaves turn to more somber greens. A visitor from downstate complains, "It's so green up here, with so little variation. It's like hearing a tenor saxophone all the time."

This summer blanket of greenery helps make the Adirondacks cool, clean, and restful. From the Fourth of July weekend to Labor Day, several million summer visitors throng the roads, *(Continued on page 634)*


GENERAL MERCHANDISE

Open for business—between blizzards—a general store at Long Lake (**left**) offers goods and good company. From her backpacking store in Keene, Mrs. Carolyn Schaefer (**above**) supplies hikers with everything from suspenders to snowshoes. At 65, having climbed all 46 of the region's highest peaks, she still relishes an excuse to close early and bundle off for a few hours of snowshoeing or, if weather permits, a night of snow-camping.

Mild winter nights come rarely, however, to the Adirondacks—once dubbed the "Siberia of North America." In deep winter the mountains shiver beneath waist-high drifts and temperatures as low as minus 50° F. Winter's solitude, welcomed after vacationing throngs retreat, has a way of fading into loneliness. One seasoned trapper confides, "Bein' alone I don't love—I don't even like it." Though conservationists protest their overuse for sport, snowmobiles in the past few years have made visiting easier.

For the author, living in a spruce-log cabin without electricity, plumbing, or central heat, winter brings extra chores. "I'm up early to rekindle the stove and bring in firewood. Then afternoons, I'm shoveling the roof and out on the lake chopping to reach drinking water (**right**)."

Alert to the season, white-tailed deer (**left**) and black bears, present all summer, seem suddenly to vanish when hunting begins. Autumn's last scarlet leaf has not yet floated to the ground when the first red-coated hunter appears. After the season's October 25 opening, 150,000 sportsmen converge on the park, and local businesses get a last flood of customers before the bleak months. Carefully regulated, hunting helps thin the deer population—too large for the winter food supply. Every day hunters march into the woods, until winter's onslaught drives all but the hardiest indoors, many without their one-buck limit.

No matter the weather, Bun Arndt inspects his beaver traps every 48 hours

during the midwinter season, as the state requires. Burdened by a 50-pound catch (**right**), its pelt worth thirty dollars, Bun heads home after a 30-mile cross-country journey by snowmobile and snowshoes. Beavers, wiped out by early trappers and lumbering, were reintroduced at the turn of the century. By 1940 they were so plentiful that trapping was again allowed. A felled tree near Blue Mountain Lake (**above**) marks the presence of the dam builders.

beaches, streams, lakesides, towns, campgrounds, and hotels.

With the completion in the late 1960's of Interstate 87, the Adirondack Northway between Albany and the Canadian border near Montreal, the mountains came within an easy drive for 50 million people. Inevitably, a stormy conflict between growth and development on the one hand and environmental and wilderness preservation on the other has been brewing.

The Adirondacks are accustomed to crisis. In the 1880's opportunists ravished the natural resources, mainly the forests. Unrestricted hunting, fishing, and trapping laid the wildlife low. Fires were devastating vast areas of the mountain woodlands. Adirondack streams and rivers were becoming "every year more slender and fitful."

The Adirondacks needed to be saved. Little by little public opinion turned toward conservation. In 1885 the state legislature created the Forest Preserve out of state-owned lands. Predictably, the feeling of many natives was, "Those wealthy outsiders are trying to lock up the land and limit the lumbering."

Then in 1895 the now-famous "forever wild" amendment was added to the state constitution in order to protect the timber and watersheds of the Forest Preserve. Eventually fish and wildlife laws were improved and strengthened. Hunting licenses became mandatory. Forest fire control grew stricter. The state established a commission to promote conservation.

As might have been expected, tourism and recreation flourished and became the chief industry. Now our growing population, with its affluence, leisure, and mobility, has pushed the Adirondacks into a second crisis.

The second-home craze has hit hard. Everyone wants a piece of the wilderness. Land prices have been rocketing. Lakefront property may sell for as high as $1,000 a foot. Developers have been buying large tracts of woodland for speculation, amusement or commercial centers, and housing subdivisions. One such scheme planned for a small city of 30,000 people!

As one land planner said, "It's like a snake swallowing its own tail." Second-home dwellers demand more roads, better maintenance, increased police, fire, and medical services, even new municipal buildings. Yet these same people are here only during the summer months; they leave lots and camps empty most of the year. The cost of local government goes up, and there's still a lot of unemployment in the winter.

It was these modern dilemmas that led to the newly adopted regional land-use plan of the Adirondack Park Agency—a plan aimed at countering the threat to the Forest Preserve and the park as a whole, yet designed to meet the needs of a growing recreation-oriented population. I saw for myself the need for such measures when I walked through the heart of the Adirondacks in 1973.

I traveled 113 miles on the Northville-Lake Placid Trail, which links lonely lakes and winds among trailless peaks. The path is a backpacker's delight and challenge.

PITZI AND I began the trip with food and gear weighing 55 pounds, 10 of those in the dog's saddlebags. Pitzi was dismayed at first by his doggie-pack, and I, as a lone woman, felt a certain apprehension. What if I met unpleasant company or broke a leg in the wilderness? But I soon forgot my fears; the trail offered too many diversions.

We passed through stands of magnificent timber, saw tranquil lakes reflecting thunderheads, hopscotched through swarms of tiny toads and scarlet salamanders, prowled around old lumberjack camps, and listened to loons calling. Wherever we found water, Pitzi and I drank deeply or jumped in for a swim. Such is the remarkable purity of our Adirondack lakes and streams.

Placed here and there along the trail, three-sided Adirondack log shelters offered protection from rain and wind. Most lean-tos have wooden floors, and pegs and shelves to keep packs and clothing out of reach of foraging porcupines. By state law, occupants are obliged to share the shelters with other backpackers upon request.

The lean-tos were replete with graffiti written in charcoal, lipstick, or pencil:

"Bugs! Bugs! Bugs! I am being eaten alive."

Or, "Jack had to go out to Saranac Lake for emergency surgery. 9 stitches." Then there was, "Gary was here. Joanne wasn't. Darn!"

Pitzi and I found more rest and privacy in my snug orange mountain tent pitched on a woodland flat or sandy beach. We would watch for a red fox to slip past, and listen to frogs plopping into the water.

After four days alone, we reached a state outpost headquarters at West Canada Lakes.

Earl Overacre, the park superintendent

there, and his wife, Thelma, first visited the lake as campers on their honeymoon. Twenty years later the state's conservation department asked Earl if he would like a job living "way back in." Two hours later he and Thelma were on their way to this wilderness.

"This is where we always wanted to be," Thelma said with a smile.

She served me ice-cold root beer and bacon-and-tomato sandwiches on fresh-baked bread. Thoughtful woodsman that he is, Earl carried my pack for a mile as I set out once more.

The footpath I followed was created by the Adirondack Mountain Club—ADK—in 1922. Hundreds hike the path every year.

During my first week on the trail, I met 28 people—mostly teenage boys or families—plus two troops of Boy Scouts. The Scouts passed us shouting and puffing like little beagles on the track of a coon.

At Mud Lake lean-to I met a friendly farmer with a handlebar moustache, and his four sons. They tumbled around their father like bear cubs. Their love for one another was touching. I learned that this was a very special vacation. The rest of the year the boys lived with their mother in a distant city.

At another shelter on Cedar Lakes I encountered a free-spirited couple carrying a guitar, Chinese philosophy books, crunchy granola, a road map, and no bathing suits. They were wandering a leisurely three miles a day. "Our home is where our packs are," drawled the pretty girl with long braids.

By the time my dog and I reached the dirt road at Moose River Primitive Recreation Area, our food was gone and we were tired. It was a good point to rest and restock our packs. Pitzi had lost eight pounds and I five.

RESUMING the Northville-Lake Placid Trail as autumn approached, I found days were cooler, bugs had disappeared, and scenery had become more rugged.

The saying is, "All trails lead to Mount Marcy," so, branching off my main route, that's where I went. New York's highest mountain (5,344 feet) is a major attraction, and the sad condition of its trails showed it. Roots gnarled as arthritic fingers lay exposed by thousands of pounding boots. Recent rains had made mudholes a foot deep; Pitzi was black to his belly.

Climbing Marcy was an endurance test—slipping, sliding, teetering, and grasping. I couldn't stop to enjoy the tundralike zone above 5,000 feet until we reached solid rock and alpine meadow.

I was transported several hundred miles northward. Alpine plants grew from crevices and patches of meadow: Lapland rosebay, alpine goldenrod, dwarf birches and willows. These reminders of the Ice Age, of a time when the glaciers retreated not more than 10,000 years ago, struggle for life in thin, impoverished soil through some of the worst winter weather in the nation.

The view atop Mount Marcy was spectacular, of course, but the sense of wilderness was marred by crowds. At Marcy Dam Ranger Station, I counted 700 hikers registered in the trail book between Friday and Sunday afternoon. Sixty cars were parked at the trail head. Clearly all trails did lead to Marcy.

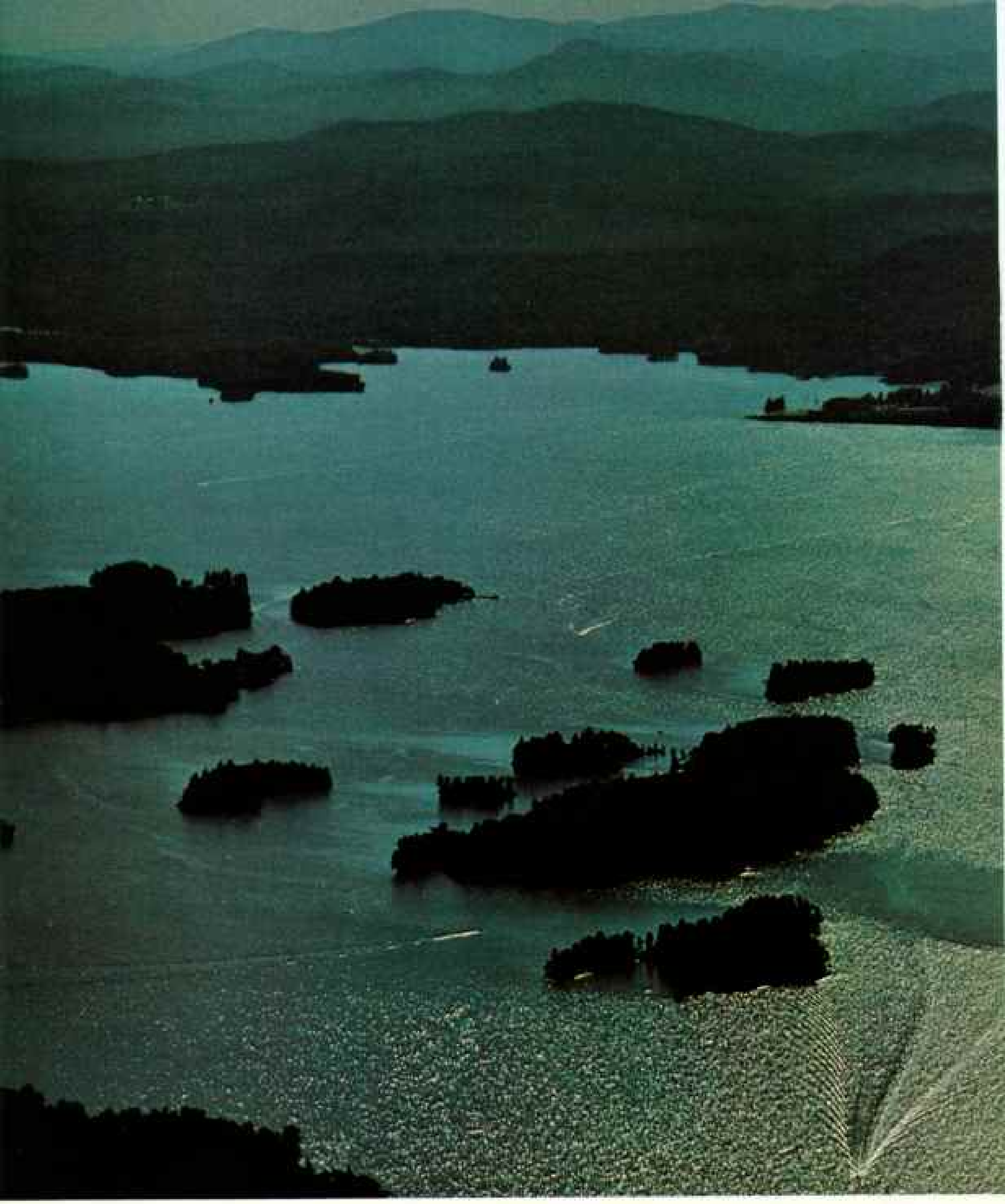
At the station I chatted with Park Superintendent Allan Jordan. Holding onto his St. Bernard while I restrained Pitzi, he told me that 40,000 people had used the Marcy Dam campsites and trail the previous year. "Word's gotten around that Marcy Dam and Lake Colden are where the action is. I took out five tons of garbage from here last Labor Day. Up at Lake Colden campsites, the trash had to be airlifted out by helicopter!"

Back on the trail, I fell in step with a gray-haired "Adirondack Forty-Sixer," dressed in hiking boots and flannel shirt. He was just down from Algonquin, the region's second highest peak. The Forty-Sixers are climbers who have ascended 46 of the Adirondacks' highest peaks, all but four of them loftier than 4,000 feet. The first person to climb them all did so in 1925; membership today is more than a thousand.

"Algonquin is like Marcy and the other fragile alpine summits," my companion told me. "Delicate soil and plants have been pounded down by hikers. Parts of the trail are deep ruts, where water has cut right down to bedrock."

We walked awhile, feeling the autumn sunshine on our shoulders. I recalled shelters on Marcy's slopes that were black hovels, their floors chopped out for firewood. Fireplaces had been kicked in and hearths used as trash heaps. Outhouse doors had been torn off their hinges for kindling.

"Our club probably had something to do with creating the stampede to the High Peaks," the Forty-Sixer said ruefully. "Of course the area is stunningly beautiful, but now people are coming just to 'bag a peak.'"



The park's portal: Lake George, only 4½ hours' drive from New York City, throbs with activity each summer as millions of concrete-weary people seek clear water and clean air. Droning powerboats crisscross the 32-mile-long lake, challenging sailors, canoeists, and foldboaters (**left**) who share the wind-rippled expanse.

Once a playground of the rich, whose enormous estates lined the shores, the lake today welcomes others who stay in motels or camp on its many islands. Despite the huge crowds of visitors, a strict water-protection program keeps Lake George's waters so clean that many homes draw drinking water directly from it.

TO SOLVE SUCH PROBLEMS, some conservationists in the 1960's advocated making the core of the Adirondack Park into a national park. This idea caused extreme partisan reactions, but it helped to focus attention on the Adirondacks. It led to a study commission.

Harold K. Hochschild, who has lived near Blue Mountain Lake for 70 years, served as the commission's chairman. He greeted me in riding boots and breeches at his estate, Eagle's Nest.

"We recommended creation of the Adirondack Park Agency," he explained. "As you know, the A.P.A.'s first action was to produce a master plan for the care and custody of state lands; then a land-use and development plan for private lands."

The state-lands plan designates a million acres (45 percent of the Forest Preserve) as wilderness, where permanent habitations and motorized vehicles will be forbidden, plus four less-restrictive categories. The private-land plan establishes six types of land-use areas, with firm density regulations.

The main purpose is to protect the parklike atmosphere and still consider the economic well-being of residents.

As can be imagined, the public reaction to this "second saving of the Adirondacks" is as varied as Adirondack topography. Some call it "a collision in the wilderness," and "the biggest land grab since the Bolshevik Revolution." To others "It's the greatest land-use plan in the Western Hemisphere." Lionel Atwill, capable young editor of *Adirondack Life* magazine, sums it up as "the first great unifying force outside of geography which these mountains have ever felt."

A local waitress worried as she poured my

"I go camping whenever I want to get away from people," says the author. At day's end on the Northville-Lake Placid Trail, she settles down for a light supper

coffee: "A few retired wealthy outsiders will get all the advantages. The park will end up as their natural history museum and playground." An outpost caretaker complained: "Those planning people want to remove everything from the woods—even floatplanes. We *need* wilderness stations, phone lines, and motorized vehicles for emergencies." A resident writer told me emphatically, "The inhabitants are being sacrificed for the park."

John Stock, superintendent for a large commercial forestry company and a member of the A.P.A., says that the plan allows the forest industry to retain a source of raw materials on land best suited for growing timber on a sustained-yield basis.

As opinions flourish and research continues, and cooperation grows between the A.P.A. and the towns, between locals and outsiders, many say, "We'll wait and see."

I PONDER THESE COMMENTS during my travels through the mountains. I listen again to coyotes howling from the hilltops of the Moose River Plains under moonlit clouds. I watch monarch butterflies wafted by the early-autumn wind like fragile orange paper planes. I cannot believe that people are being sacrificed to wildlife and wilderness in the Adirondacks.

I recall the words of a gaunt North Woodsman at the close of Joseph F. Grady's book, *The Adirondacks*, published in 1933: "Motorboats can't spoil mountains—and they can't spoil lakes. Neither can automobiles or railroads. It's how they're used and what they're used for that can do the spoiling. Do you know, it's fifty-five years since I first came here, and the woods are as beautiful today as they were then. God, it's a wonderful country!"

Yes, it was—is—and I hope will be. □

beside a crackling campfire. "Serenity and silence, night stars, and subtle-hued mountains—they're some of the best companions a person can know." 639

ERIC LABBATTLE

Rhodesia, a House Divided

By ALLAN C. FISHER, JR.
SENIOR ASSISTANT EDITOR

Photographs by
THOMAS NEBBIA

THERE IS A HILL in racially troubled Rhodesia that has become a shrine to black man and white alike. Ndebele tribesmen call it Malindidzimu, and its boulder-strewn brow commands a superb view of the Matopos, a chaos of huge granite blocks and precariously balanced rocks, of stark cliffs and outcrops of stone eroded into tortured, monstrous shapes.

Malindidzimu means the "Dwelling Place of Spirits." For generations it has been a veritable pantheon of bygone warriors and chiefs, ancestors of both the Ndebele and Shona and venerated by them. On this primordial eminence, the revered departed choose to reside in their spirit existence, and from it they control the affairs of their descendants.

Whites know the hill as the "View of the World," a name given it by Cecil John Rhodes. Indeed, Rhodes, the British-born empire builder, was buried there at his request. Near him lie other white pioneers, including 34 men of a military patrol wiped out by the Ndebele (also known as the Matabele) in a Custer-like last stand.

Both Ndebele and Shona fought the whites. But in 1896 the former agreed to peace terms with Rhodes, and six years later they turned out in a respectful throng for his burial. At their request no farewell volley was fired, lest it disturb the spirits.

Standing near the simple bronze tablet marking Rhodes's grave, I pondered the sad irony of that windswept hill.

After the burial Col. Frank Rhodes said to assembled chiefs, "Now I leave my brother's grave in your hands as a proof that I know the white men and the Matabele will be friends and brothers forever."

Today that place of brooding spirits lies within a national park. The fraternity of the grave is universal, and black man and white share, for time unending, their integrated hill. But their living heirs have yet to assure either peace or brotherhood in the lovely land of Rhodesia.

Recently that country's minority white government and militant black nationalists achieved the first step in the difficult task of resolving their long and bitter confrontation. Leaders of both sides accepted a cease-fire (since broken) in the guerrilla warfare that has flared for years along Rhodesia's northern border. They also agreed to a conference that, it is hoped, will forge a new constitution acceptable to both blacks and whites. Prime Minister Ian Smith then freed from prison scores of black nationalists.

Détente in Rhodesia—if indeed it can be achieved—may take months, even years. The divisions have been wide and deep.

The white government has been an unyielding holdout against the powerful tide of black nationalism flowing south across Africa. There are 5,800,000 Africans, or blacks, in Rhodesia and about 270,000 Europeans, or whites. Yet the minority race has firmly controlled the Senate and House of Assembly of

Two cultures at a crossroad: A chic European and two Africans carrying reed stools to a store cross First Street in Salisbury, high-rising capital of Rhodesia. In the rich heart of southern Africa, whites—outnumbered 20 to one—seek a meeting ground with blacks amid rising demand for majority rule.

Parliament, and all ministries and branches of government. This has resulted in a clamor of international protests and a racial animosity within Rhodesia that still smolders underground like a deadly, hidden mine fire.

LONG A SELF-GOVERNING COLONY of Great Britain, Rhodesia declared its independence in 1965. The act was branded illegal by the British, who wanted assurance of majority rule before granting independence. There have been attempts at settlement between the two governments, and a compromise was agreed to in 1971, only to shatter on the rock of African opposition.

The United Nations imposed sanctions prohibiting trade with Rhodesia, but many countries have continued a clandestine exchange of manufactures, raw materials, and food. However, for a decade the Montana-size land has been a pariah among nations, not recognized officially by any other country.

Moreover, the warfare in the northern region, though limited, has been extremely

Foxholes flank a tug-of-war, as a Rhodesian Army unit guards schoolchildren near St. Albert's Mission run by German Jesuits. Here, black guerrillas kidnapped 295 African pupils and staff in July 1973, an act perhaps designed to intimidate the moderate black community.

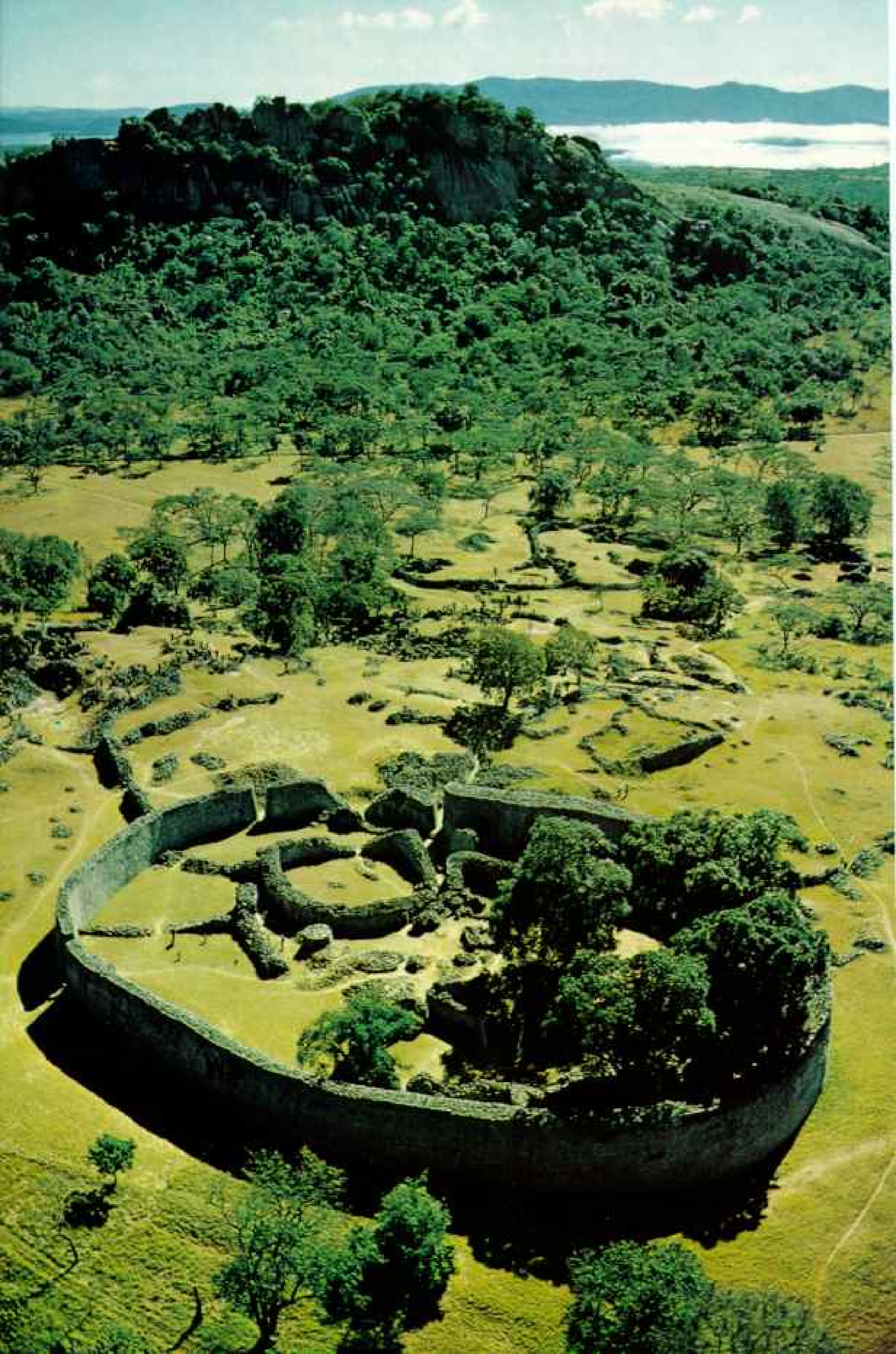
ruthless and brutal, as government security forces clashed with African guerrillas infiltrating the country from sanctuaries in Zambia, Mozambique, and Tanzania.

Recently I spent two months in Rhodesia, traveling freely wherever I wished. Many black leaders were then in detention, and I was not permitted to interview them. But otherwise I talked without hindrance to people of every color, every political belief.

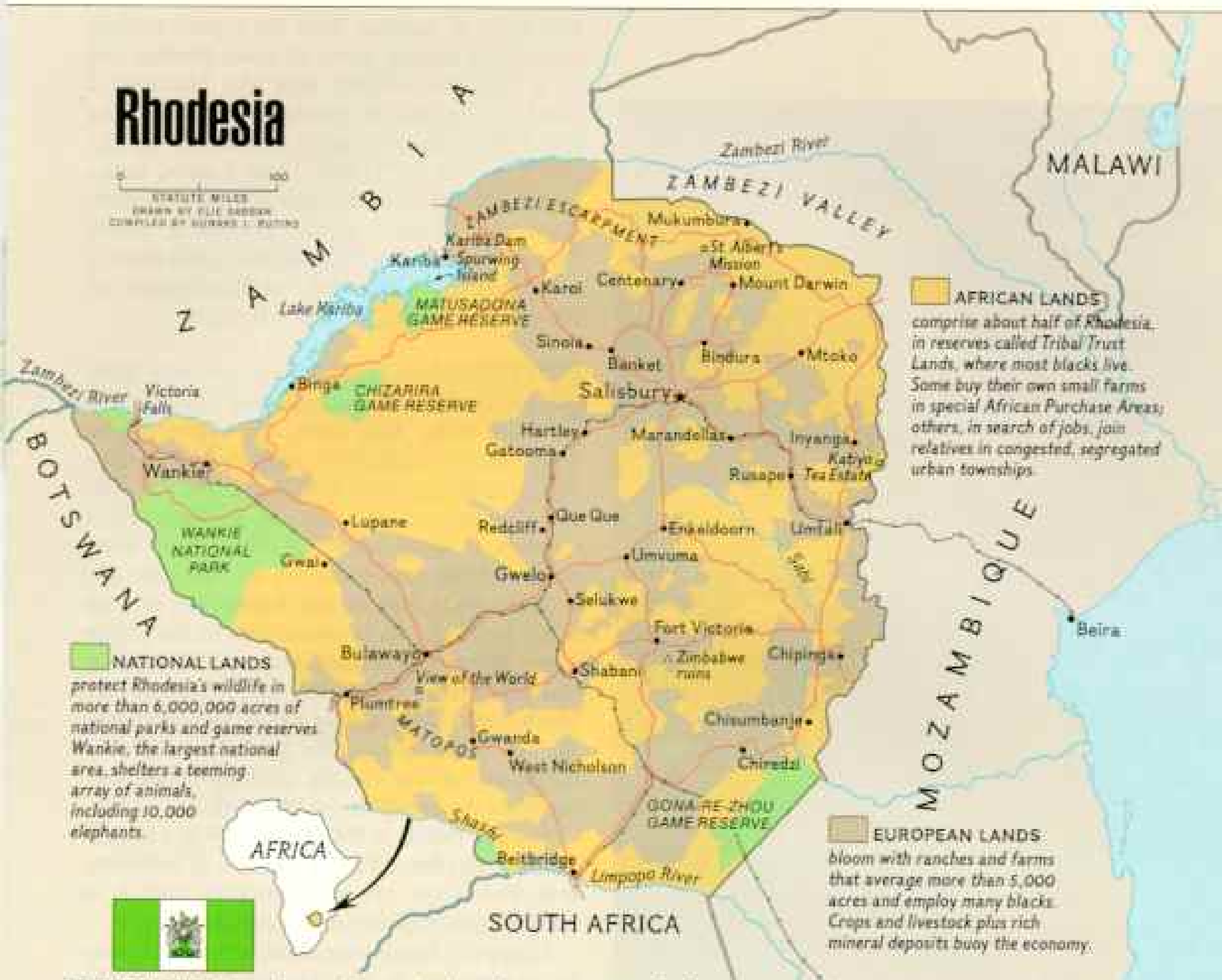
On the surface, nearly all Rhodesia seemed tranquil. Prosperous shoppers eddied in and out of stores stocked with merchandise from many nations. Shiny new cars crowded the streets of Salisbury and Bulawayo, two of the handsomest small cities in the world. Blacks and whites mingled casually in parks, shops, and big new hotels. Tourists still visited such superb attractions as Wankie National Park; that blue jewel, Lake Kariba; Victoria Falls; the scenic Eastern Highlands; the mysterious stone ruins known as Great Zimbabwe. And over it all the tropical sun shone benignly.

That is the Rhodesia of the casual visitor.

The hostages were taken toward a guerrilla base in Mozambique, but almost all were rescued or managed to slip away. In two years, the government says, rebel forces have killed 150 civilians—all but 20 of them Africans. In turn, at least 500 guerrillas have been slain.



Rhodesia



DIVORCED from the mother country, Rhodesia's whites have defied a hostile world after declaring unilateral independence ten years ago. Britain and the United Nations struck back with economic sanctions designed to force a greater voice for the nation's Africans. Tenaciously, the landlocked government has rationed fuel and grown more food to ride out the leaky blockade.

AREA: 150,332 square miles. **POPULATION:** 6,100,000. **LANGUAGE:** English, Shona, Ndebele. **RELIGION:** Christianity and widespread ancestor worship. **CITIES:** Salisbury (pop. 534,000), capital; Bulawayo (pop. 329,000). **CLIMATE:** Summer rains from November through April; cool through July; hot through October.

Like the phoenix, the legacy of the ruins of Great Zimbabwe rises to give an African name to Rhodesia. To blacks who long to govern, the nation is already known as Zimbabwe (meaning "venerated houses"). Here a key city of the Shona peoples grew and flourished from the 15th to the 19th century. Many white Rhodesians, however, believe the stone ruins endure from Arabic or Phoenician influence on an African culture of ancient times. A 17th-century missionary sowed the seeds of that theory, claiming such walls once housed the Biblical lode of Ophir—the fabled mines of King Solomon. Treasure hunters plundered the monuments for decades, compounding the mystery for archeologists.

"I felt a little tremor," David Livingstone admitted in 1855, as his canoe surged toward the thunder of the mile-wide falls he named for Britain's Queen Victoria. A plane (**above**) now carries tourists above the torrent of the Zambezi River, where the explorer saw "a dense white cloud with two rainbows." Pale moonlight recaptures one such rainbow in a haunting time exposure (**right**) that also records a star track.

But there is another land the tourist seldom sees. On a remote shore of Lake Kariba and in a forgotten village near the Matopos, I went among people seemingly untouched by the 20th century. Nearly two-thirds of the Africans live in Tribal Trust Lands, many under primitive conditions that few Americans can imagine (map, preceding page). Photographer Tom Nebbia and I also made a foray into the "sharp end," as Rhodesians call their bloodstained northern frontier.

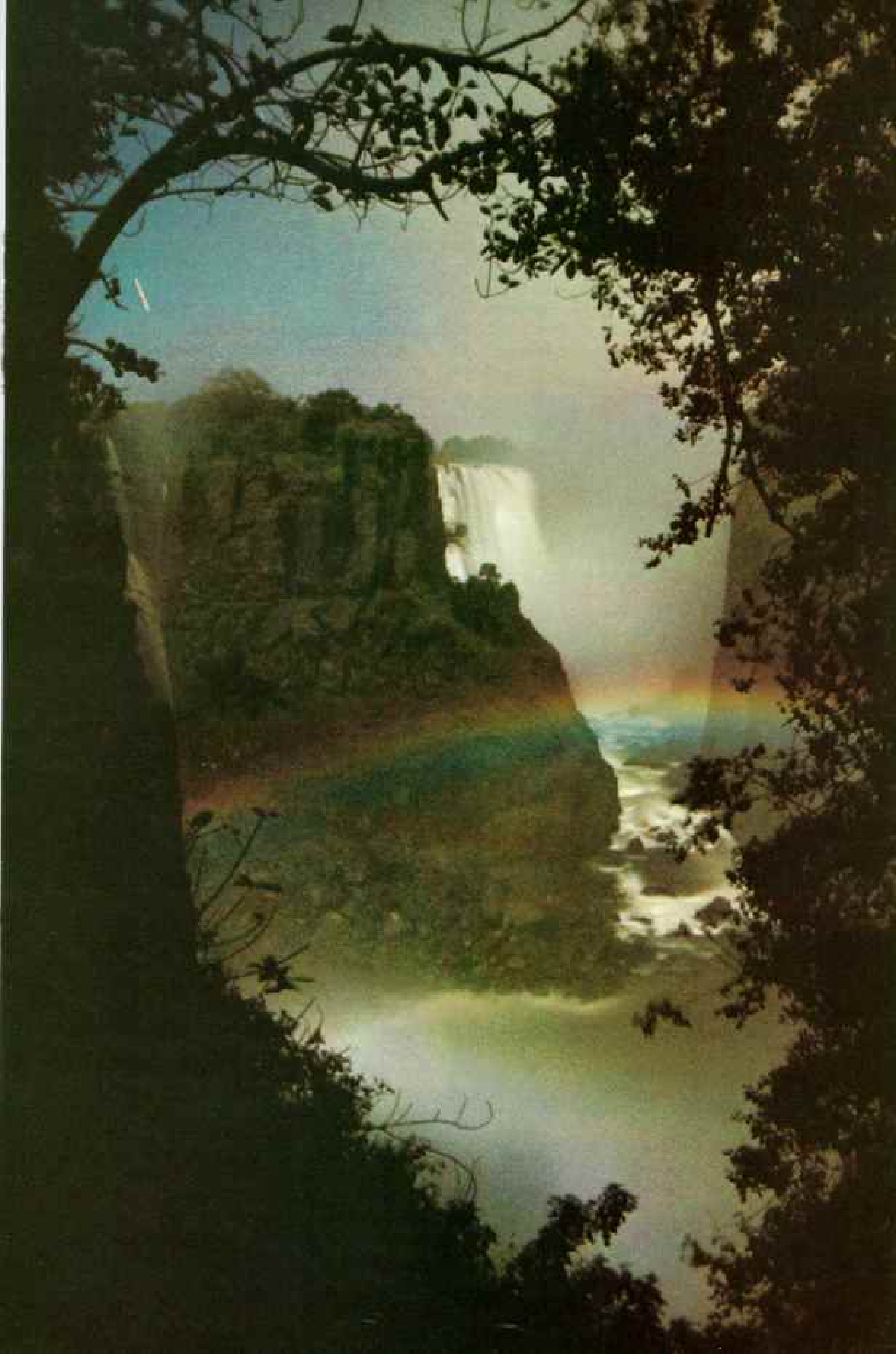
PHYSICALLY, then, there are two Rhodesias, the old and the new, and I love them both. Ken Mew, the white liberal who heads Salisbury's multiracial Ranche House College, once said to me, "It's a difficult country to get mad at because it's a country of paradoxes." I found that quite true, and the paradoxes are not well known:

More than half of the Rhodesian regular army is black. So is two-thirds of the police force. More than a third of the 1,500 students attending the University of Rhodesia are black—and they, unlike the whites, virtually all get scholarships. By law, 10 of the 23 members of the Senate and 16 of the 66-member Assembly must be black.

A park bench is for anyone. So is a seat in a bus or airplane. The best hotels in Salisbury and Bulawayo are desegregated, and it is commonplace to see nonwhites in them.

However, hotels, restaurants, and bars may be segregated or not at the option of the owners, and the government imposes on blacks a 7:30 p.m. curfew in some Salisbury bars. In practice, little is open to Africans outside the two principal cities. Schools are segregated, with separate facilities for white children, black, coloured (those of mixed blood), and Asian. There are also separate hospital facilities. Housing too is segregated. Indeed, tens of thousands of Africans live in government-built and government-owned "townships" outside the cities. Except for national land, Rhodesia is divided about equally between the large African and the small European populations, and the cities and towns have grown up in the white-owned half, where most of the jobs are.

Jobs—that's a word from which sparks fly in Rhodesia. Blacks complain that they are poorly paid and that many jobs are reserved for whites. Moreover, 50,000 young Africans come on the labor market each year, and the economy can't provide jobs for all of them.



As Ken Mew says of his paradoxical land, "Here are opposite ends of the human spectrum . . . a cross-cultured world. And oh, the agony!"

Agony to touch anyone's heart was in the voices of so many people, of all races:

Cecil Smith, a leader of the coloured community, said bitterly: "We arrived here nine months after the first whites. We are people who do not have any other homeland. The Asians and the Europeans do. But we have no ancestry anywhere else. We are Rhodesians.

"We hope for a settlement that will be to the benefit of all races, but we coloured have more reason to thank the blacks than the whites. At least our black mothers raised us."

Ronnie Sadomba, a Member of Parliament and a firm supporter of the powerful African National Council, the principal black organization, said: "It is up to the white man in this country to change his attitude if he wants African cooperation. The African wants discrimination uprooted."

Michael Ndubuva, an African social worker who told me his advancement was blocked because of his race, said, "We've suffered enough. Why must we settle for crumbs?"

But agony also tinged the voice of a government spokesman: "Look at the record of black nations to the north of us—tribal warfare and mass slaughter in some, dictators and juntas governing ruthlessly in many, one-party systems in others. We have counted 28 successful coups in those countries and 16 unsuccessful ones. Elspeth Huxley, a writer who lived in Africa for years, has been quoted as saying that you cannot translate 'Leader of the Opposition' into many African languages. The nearest you can come is 'Chief Enemy.'

"Must Rhodesia sink to that? It will if we cannot ensure a meaningful and influential European presence, lacking now in every country to the north.

"As for helping the Africans, we do all we can afford—often more. For example, we will spend R$19,000,000 [U.S. $33,654,000] this year on Tribal Trust Land development. And we will spend R$30,000,000 on African education. That latter amount is the third largest item in our national budget."

But of all the voices, the most agonized was that of a young white farmer: "I know I'm going to lose my land, my home, my country —everything. I'm one of those blokes who was born here. Where do I go? What do I do?"

"Living he was the land, and dead, his soul shall be her soul." Thus Rudyard Kipling eulogized Cecil John Rhodes, here towering in bronze in Bulawayo. In 1890 he sent out from South Africa the Pioneer Column, Rhodesia's first white settlers.

TO ME the confrontation seemed all the more poignant because of the beauty of the land. It linked the hearts of everyone in a shared love. Whenever the politics of Rhodesia weighed upon my mind and the sad voices burdened my spirit, I left the cities and became a wanderer amidst beauty.

In 1855 Dr. David Livingstone's African guides paddled him to an island in the Zambezi River, then led him to its edge. He gazed awestruck at one of the mightiest cataracts on earth. His guides knew it as Mosi oa Tunya, "smoke that thunders." We know it by the name Livingstone gave it, Victoria Falls.

It extends across the entire width of the Zambezi for a mile, and its waters plunge down vertical walls as high as 350 feet. Spray rises from it continually in writhing plumes and clouds in which rainbows glisten (pages 646-7). Zambia shares this wonder, but the best viewing has always been on the Rhodesian side of the river, where paths for strollers wind through a rain forest laved by the eternal spray.

Wankie National Park, to the south of the falls, is a wildlife sanctuary larger than Connecticut. Publicists call it "Tusker Territory" in honor of its 10,000 elephants. But most of the magnificent African animal species wander there in profusion.

Indeed, some become too profuse. For example, elephants; recent aerial photographs, when compared to those taken 24 years ago, show far fewer trees in Wankie. Many have been felled by elephants. Says Ohio-born John Herbert, a park biologist, "It's not that they are overbreeding, it's just that they are condensed." Human pressures drive the animals into refuges.

LONG AGO I succumbed to an inordinate fondness for wide waters. That's why I became so smitten with Lake Kariba, a man-made body of water 170 miles in length. High hills encircle the lake, and the giddy roads in and around the town of Kariba command superb views of sapphire waters.

A dam 420 feet high blocking a deep gorge of the Zambezi impounds 2,000 square miles of water—an area the size of Delaware. Generators on the Rhodesia side can produce 705,000 kilowatts, and the output is shared about equally by Zambia and Rhodesia. They built the huge installation while both were members of the now defunct Central African Federation, and through a joint corporation they still cooperate in running it.

Several big motels stand high above the lake near the town, but elsewhere much of the vast lake frontage remains unchanging bush, rich in game (pages 660-61).

Ever watch elephants swim? Or waterbuck? Or buffalo? With a little luck you can actually see this near Spurwing Island and the Matusadona Game Reserve. Jeff Stutchbury, a professional hunter, will ferry you from the town of Kariba to the island, where he has a comfortable tent camp, and he will take you on waterborne game-viewing trips or on foot safaris into the Matusadona.

We spent a magical day together, cruising near animals that seemed placidly unaware of our presence. Then, as the quick dusk of tropical Africa became imminent, Jeff nosed the boat quietly through the gray stumps of a drowned forest where birds perched in unbelievable variety: greater white heron, darter, reed cormorant, jacana, black crake, lilac-breasted roller, pied wagtail, bee-eater, crowned plover.

With so much of Rhodesia remote and underdeveloped, guerrillas can infiltrate it with relative ease. In recent years they have gained footholds only in the north, including newly

Straw-toppered school chums clown on the sidelines during a nationwide meet in Salisbury featuring cricket, rugby, and polo. Establishing international scholarships in his will, Rhodes stipulated "success in manly outdoor sports" for competing students.

Couched in modern comfort, Chief Mtonzima Gwebu displays full ceremonial regalia in his European-style house, built and furnished for him by the government—which also pays him a salary. The chief, whose name means "strong medicine," rules several hundred

Ndebele villagers. He relays the more serious problems of his people to the district commissioner. Rhodesia's electoral system, based on property and income, restricts those Africans who can vote; the constitution limits their representation in Parliament.

opened farm country atop the Zambezi Escarpment. Warfare, once intermittent, became a way of life there at the end of 1972. Since then, by government count, the guerrillas have killed 150 civilians, 20 of them white, and 50 members of the security forces. These forces, in turn, have killed 500 guerrillas and captured more than 200.

In an age virtually inured to violence, those numbers may not seem impressive. But it is a particularly dirty little war. The guerrillas have killed, raped, blown up, burned, tortured, and kidnapped noncombatants. That is fact. I have talked to survivors. I have examined police documents and have been sickened by pictures of victims.

In turn, Africans and white church leaders have charged government troops with atrocities, such as torturing noncombatants to obtain information about the guerrillas.

Most guerrilla victims were African villagers. Why should the guerrillas kill and maim people of their own race? The government says they have used terror to ensure obedience and aid—which is why the infiltrators are officially "terrorists" in Rhodesia. Africans say the "freedom fighters" have killed or punished only informers, though that hardly explains the kidnapping of 295 children and adults from a single mission school.

The government rounded up thousands of Africans in the battle area and moved them to "protected villages." This shields them—and it keeps them from helping guerrillas. The government can also imprison without trial anyone it says is a security risk; hundreds of Africans were detained, as was a former Rhodesian Prime Minister, Garfield Todd.

AMONG AFRICANS Rhodesia is known as Zimbabwe, a name taken from the stone ruins in the southern part of the country (page 644). Two banned political parties, Zimbabwe African National Union

Pawns in a grim game, mother and child (**above**) must live behind eight-foot fences in a "protected village" of Mukumbura. To seal off its 2,000 blacks from guerrillas, the government dismantled 13 smaller settlements and relocated them here. About 65,000 Africans dwell in such villages, which churchmen and others strongly criticize.

(ZANU) and Zimbabwe African People's Union (ZAPU), have led the guerrilla incursions from outside Rhodesia. They have received weapons and training from the Organization of African Unity, and Communist countries.

To avoid dirt roads that are often mined, Tom Nebbia and I flew into the "sharp end," where the security forces' Joint Operations Centre was fighting a scattered force of some 300 guerrillas armed not only with automatic weapons but also with rocket launchers and land mines.

Centenary is a raw-looking little farming center around which much of the violence has swirled, and there we attended a weekly briefing of white farmers by the military. Each incident, each attack, in the area—ten that week—was pinpointed and described. Then the wives practiced pistol shooting.

One of the embattled farmers, Archie Dalgleish, described an attack on his home. Eight people were in the house at the time.

"At 1 a.m. we were aroused by the barking of my dogs," Mr. Dalgleish said. "Then a rocket exploded in a bedroom where a man and his daughter were sleeping. Neither was killed, but she was injured very badly. We started getting automatic rifle fire, and I returned it. The terrorists threw grenades into the farm store and started burning down the compounds of my African workmen.

"They withdrew before the security forces arrived, but our men tracked them down. There were nine terrorists; we got every one."

That evening Tom and I and our pilot landed on the airstrip of tobacco farmer Ian Stacey and spent the night with him and his wife in their rambling, comfortable home—behind a high security fence (page 657).

Ian Stacey, who seemingly has no nerves, told us the next morning that a land mine had blown up a tractor on his property two weeks earlier; then he drove us over dirt roads to a Catholic school at St. Albert's

Dead or alive: Tribesmen willing to turn over guerrillas or knowledge of their whereabouts to authorities can claim huge bounties, as this notice proclaims (**above**). On the other hand, failure to do so can mean 20 years at hard labor.

The real fight against the rebels, however, falls mainly to the regular army—itself more than half black. For Africans facing high unemployment, a soldier's life is one of the most stable and best paying. "The army is my tribe," say members of the Rhodesian African Rifles, such as this machine gunner (**opposite**). Since 1967, hundreds of paramilitary police from South Africa have helped fight the guerrillas.

Mission. Here, a year earlier, guerrillas had kidnapped 295 children and staff members.

Armed soldiers guarded the school, and it seemed they were on the alert for something out of the ordinary (pages 642-3).

En route to the farm Stacey cut through the fields on a barely discernible track, finally stopping at the foot of a rocky hill.

"We originally intended to build our house there," he said, "but changed our minds. It is a lovely spot though, isn't it?"

His guests agreed, and for a few minutes we visualized the brushy little hill topped by a farmhouse. When we returned to the Stacey home, we found two helicopters flying about and troops sweeping a distant field. One pilot landed and spoke to Stacey, who shrugged off the explanation that guerrillas had been reported in the area. Not long afterward Tom and I left, flying low over the hill.

Later we learned two guerrillas had been killed and two captured near that pretty little prominence just two hours after we left. Apparently they had been hidden, not far from us, when we drove by. Perhaps they could have killed us, but didn't because firing would have betrayed their position.

MANY OF THE ANTIGUERRILLA forces are black, and I had wondered: Did these army volunteers mind fighting men of their own race? But a day on maneuvers with the elite Rhodesian African Rifles gave an emphatic answer to my question. "They are terrorists. We kill them wherever we find them and as fast as we find them," said one African soldier.

"If he comes after me man to man, that's one thing," a noncommissioned officer said. "But the terrorist goes into a village and says, 'Give me food,' and if the villagers have no food, he kills them. Is that freeing the country from the white man?"

"Do we mind killing Africans?" An Ndebele warrant officer repeated my question as if surprised I should ask it, then he smiled mirthlessly. "What do you think we have been doing for a thousand years?"

From the Stacey farm we flew to Mukumbura, a back-of-beyond place bordering Mozambique in the Zambezi Valley. Historically this has been an area for the tsetse fly, malaria, wild animals, and some of Rhodesia's more primitive tribesmen. Until recent years there were few roads and little evidence of the government. Guerrillas changed that.

Bulwark to Rhodesia's whites, symbol of domination to her blacks, Prime Minister Ian Smith (**right**) begins a new five-year term at his official residence, his wife at his side. At some future date, his policy states, Africans may be ready to exercise "responsible government."

Late last year, under pressure from white-ruled South Africa, Smith again entered negotiations with rival black leaders—who in turn were pressured by black-ruled African nations to unite and seek a settlement. Joshua Nkomo, greeting friends after church (**below**), formed the Zimbabwe African People's Union, now a part of the African National Council, chaired by Bishop Abel Muzorewa (**facing page, lower**). Nkomo was released from detention to join Bishop Muzorewa in the talks, which could lead to greater representation for blacks.

JAN TEGMAN

"I won't be driven off. I've worked too long and too hard," avows Ian Stacey, standing firm with his wife (**right**). Like many embattled farms atop the Zambezi Escarpment, theirs is linked by radiophone to a police station. On the other side of the fence, Allan Savory (**below**), recently defeated in a bid for reelection to Rhodesia's Parliament, fears that unless whites negotiate with blacks seeking more power, "They'll be lucky to pick up the crumbs from the conference table."

Their presence brought in troops and road builders and resulted in the construction at Mukumbura of three protected villages housing 6,000 Africans.

At the time of our visit only one village had been completed. Hundreds of round grass-thatched huts, the traditional home of the African, stood in row after row. I was surprised to find that these were the tribespeople's own homes, disassembled and trucked, with all their possessions, to Mukumbura. Among the houses, the government had built concrete structures with running water, toilets, and showers.

Thirteen small villages had been grouped together, each with its own area. Outside the completed village, women tilled large vegetable gardens. Grazing areas had been assigned livestock, though the move had forced the sale of many cattle. Clinics and community centers had been built. A wire fence surrounded the village, but people went in and out at will during the day.

JIM LATHAM, a young district commissioner, planned Mukumbura, and its people are his charges. "Their initial reaction was confusion, fear, consternation as to how long, and finally relief," said Latham. To my question, he said, "Yes, relief. They now know they are not in a prison, that they are in a secure haven."

Through an African interpreter I questioned a number of villagers, and only one condemned the move. I can't believe this a candid reaction, however. No one wants to be taken from his home and shut up with strangers. Ronnie Sadomba, who represents in Parliament the district in which Mukumbura lies, told me, "They feel offended and bitter."

Latham had journeyed to Mukumbura from his headquarters at Mount Darwin to seek the help of a spirit medium, an old man revered by perhaps a million Africans in northern Rhodesia and neighboring Mozambique. Their confrontation proved extraordinary. Jim Latham, an acknowledged expert in African affairs, said he could not recall a similar meeting in his lifetime. Indeed, it proved to be something out of the mists of an older Africa, changing but as yet unchanged.

Ancestor worship is still virtually universal in Rhodesia, as it is in many other countries. A tribe, a family, does not consist merely of its living members. The spirits of ancestors, including those recently dead, may possess human hosts. When in seizure these hosts, or mediums, go into trances and speak the words of the spirits. If not neglected or forgotten, the spirits will watch over and guard their descendants, who venerate these ancestors and consult them.

As Jim Latham put it, "Everyone lives in the shadow of his shade."

THE MORE IMPORTANT tribal spirits are great chiefs and storied warriors from centuries ago, and the mediums who speak for them wax powerful and influential. Such a man was Mawonda, the old medium who would meet with the district commissioner.

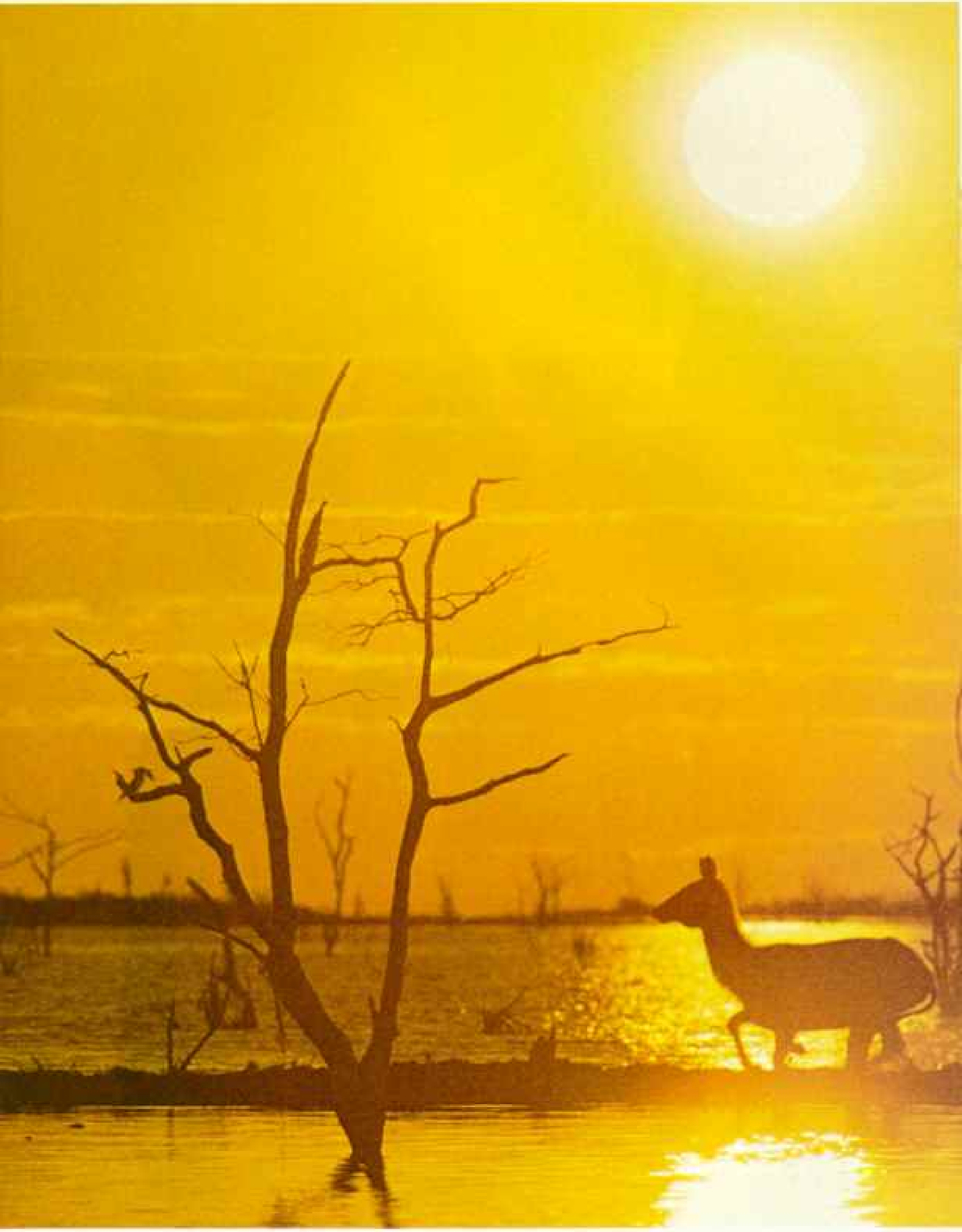
Mawonda spoke with the voice of Parengeta, son-in-law of Dzivaguru, great chief of an inland empire half a millennium earlier. In the Shona language Dzivaguru can be translated either as "big pool" or "medium of God," an indication of how important an ancestor he had become. Years ago he and his son, Karuva, had spoken through mediums, but these men had died and the unhurried deities had not yet selected new ones. Meanwhile, Parengeta was the principal spirit in a vast area.

I saw Mawonda the day before the big meeting. A tall, thin old man, he had the look of an ascetic. On his head he wore a band of black and white beads, and he clutched a robe of black cloth to his skinny frame. Long strands of beads, all black and white except for a single multicolored strand, swung from his neck (right).

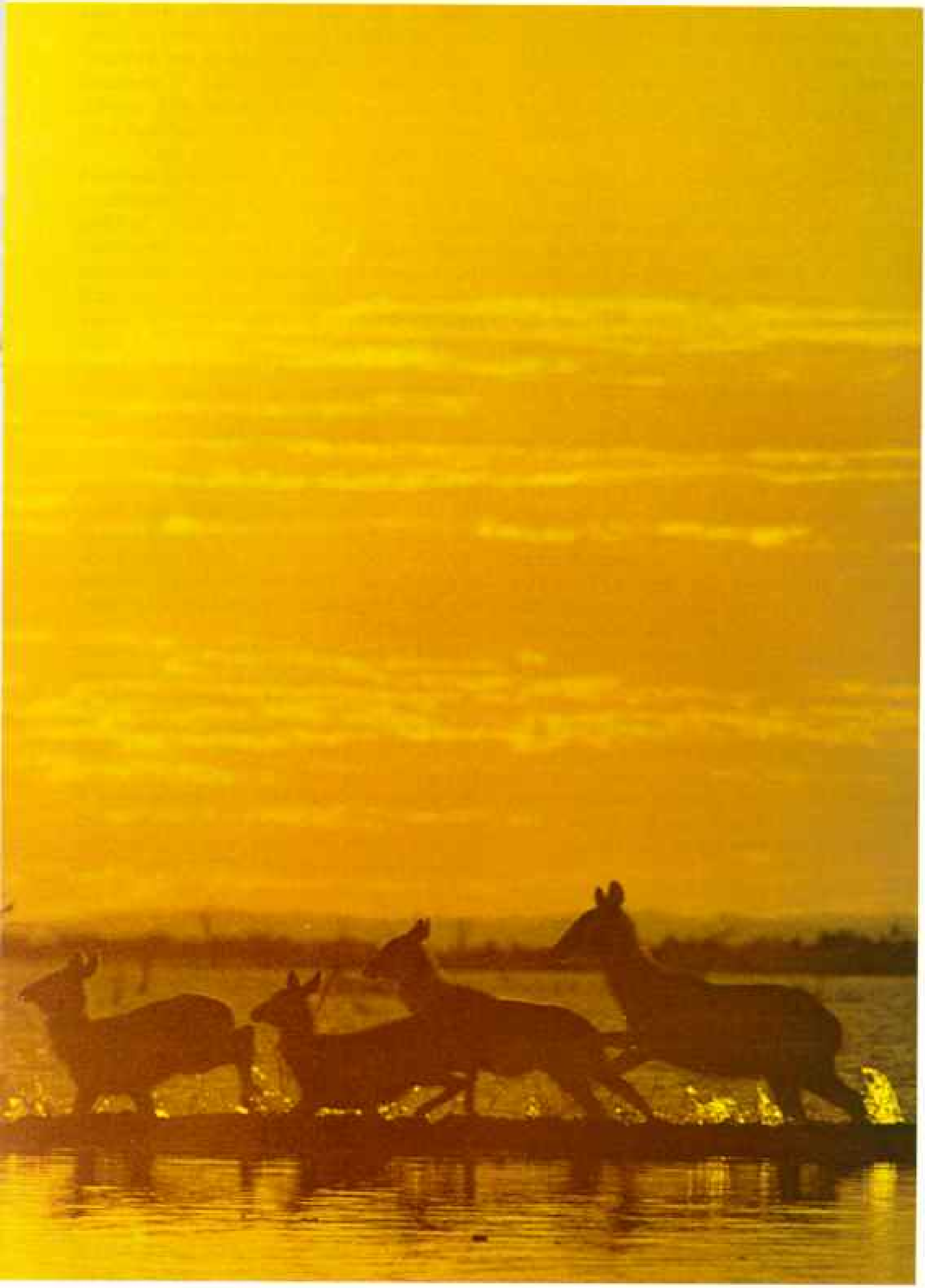
That night drums beat insistent rhythms long after darkness shrouded the village; shouts and singing carried far into the desolate bush, and figures danced tirelessly around fires. Jim speculated that Parengeta was speaking through Mawonda. The subject: tomorrow's meeting, to be held in a small tent pitched in the heart of the village.

The next morning at least 1,500 Africans

Wisdom of the ancients flows through Mawonda, a spirit medium revered by a million Africans; here, he performs a lion dance. When in a trance, he represents a powerful ancestor. One such forebear warned long ago, "I shall bring you people without knees [trouser-clad Europeans], and they will defeat you."



Waterbuck romp at dusk on a drowned islet in man-made Lake Kariba. To create the huge reservoir, engineers challenged Nyaminyami, god of the Zambezi River,



which they proposed to dam. Africans believe the spirit's wrath caused the great floods of 1957 and 1958, but concrete ultimately subdued the river's rampages.

surrounded the tent, and in it the old man sat as immobile and inscrutable as a Buddha. Jim had warned us not to wear any red clothing, for red is the color of blood, and taboo. We also removed our shoes and socks, for the ground would be made holy by the presence of Parengeta.

Mawonda said the people had grievances. Several villages, old antagonists, had been put together; they should be separated. One village should not have been included at all; it belonged in a different protected area. Road builders, and also soldiers constructing a cordon sanitaire along the border, had disturbed many homes of the spirits, although Jim had marked all of them on maps and had ordered them left undisturbed. Village headmen wanted permission to go back and protect the spirit dwelling places: a baobab tree, a hilltop, a hut.

Jim agreed to put all these things straight. The villages would be sorted out, the spirit homes would be restored wherever possible. Headmen could not live in the terrorist areas, but they could visit the shrines. Then Jim —because, as he later said, "I am responsible for the acts of my children, the road builders" —agreed that he should pay the tribesmen a fine of ten rolls of dark-blue cloth, ten of black cloth, and ten rolls of tobacco.

Perhaps only a young and imaginative man would have agreed to a fine. But it won immediate murmurs of appreciation. Then it was Jim's turn to get what he wanted—cooperation from Mawonda and his people in reporting and tracking down guerrillas.

TO SOME IT MAY SEEM incredible that ancestor worship should still flourish. Yet a prominent, well-educated African told me, "I doubt there are more than half a dozen Africans in all Rhodesia who do not believe in the spirits."

Indeed the government claims guerrillas obtained footholds in Tribal Trust Lands by forcing mediums to tell their people ancestral spirits favored the invaders.

As the name implies, TTL's are areas set aside by law for African use in the old tribal manner of communally-held land. Today there are 166 such areas, and no white man can own land or operate a business in them.

"That's for the protection of the African," a government spokesman said. "Europeans, with their greater education and wealth, would soon own most of the land and local businesses if they were not kept out."

African spokesmen acknowledge the truth of that statement, yet land apportionment remains a very sore point with them. In 1890, when Cecil Rhodes's Pioneer Column crossed the Limpopo and claimed mineral rights from Lobengula, the Ndebele king, there were only 500,000 Africans in what is now Rhodesia. Today there are 5,800,000, including some 3,490,000 in the Tribal Trust Lands. Overcrowding, overgrazing, and poor farming techniques have turned much of the tribal areas into virtual wasteland.

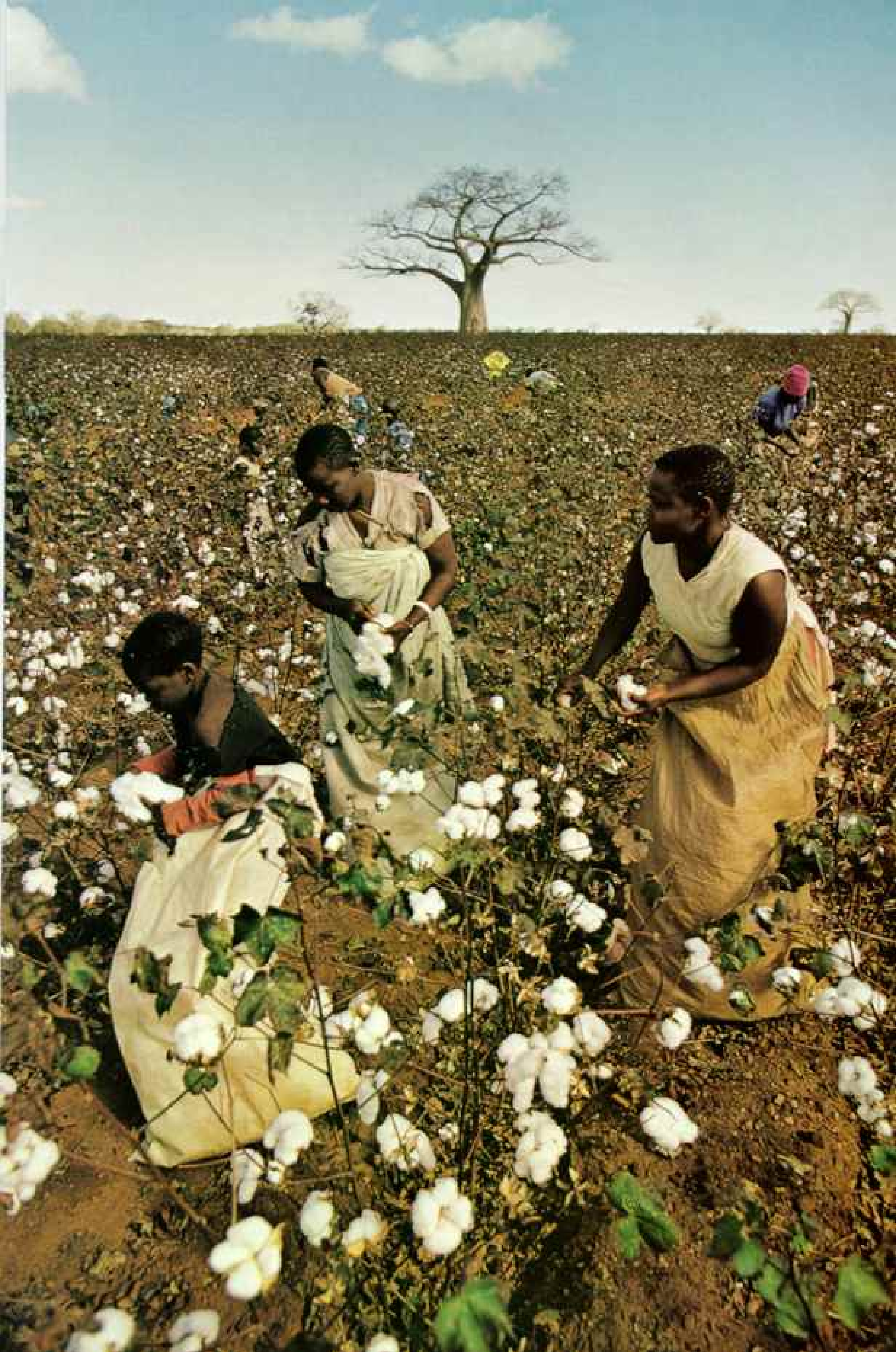
"NEXT DOOR to him in a European area the African sees thousands and thousands of acres that are not being farmed or put to productive use," a black social worker said to me. "Why doesn't the government buy these lands and put them back into Tribal Trust Lands?"

That is a typical complaint. Yet the answer is not simple. Many Africans do not practice crop rotation, watershed protection, and other land-management techniques. Moreover, the difference in productivity between the black and white areas is vast. Africans in the TTL's raise farm products with an annual value of R$16,200,000 (U. S. $28,771,200), but they consume most of their output. European farmers raise crops worth R$195,200,000 and sell nearly all of it.

"If the land were apportioned strictly in accordance with population, we could not even feed our present population, let alone make provision for the future," a government spokesman claimed.

The government has introduced into the trust areas many irrigation projects and marketing cooperatives. Its most ambitious project has been the Tribal Trust Land Development Corporation (TTLCOR), charged with establishing commercial, industrial, agricultural, or mining projects in all 166 tribal areas.

Snowballs of cotton swell the gathering bags of field hands near Chiredzi. Most of this premium-priced crop slips through the trade blockade, planters told the author, but the government remains silent on how much is exported—and to whom. On the horizon looms a baobab tree, sacred to Africans if they believe it shelters spirits.



IN A CHARTERED PLANE I flew across rugged mountains and plateaus to Rhodesia's eastern border, then hill-hopped to a landing strip near the junction of the Rwera and Pungwe Rivers. There, at Katiyo, TILCOR has covered 300 acres with tea plants and will soon increase that acreage to 750. Tea is a particularly beautiful crop. Emerald plants, closely spaced and as even in height as the pile of a carpet, covered all the nearby hills. At the foot of one hill I walked beneath acres of wattle screens shielding 2,100,000 cuttings that one day would mature into tea plants.

For centuries the overwhelming majority of Africans have been subsistence farmers on communally-held land allocated by the chief. But the Rhodesian Government is bringing several thousand African farmers into the cash economy by settling them in African Purchase Areas. These are farmlands acquired by the government for resale to blacks. Other lands are leased to them by TILCOR.

At Katiyo TILCOR is training and establishing the vanguard of some 60 Africans destined to be tea planters. Eventually each of these farmers will get 10 to 20 acres.

Edward Sanhanga, the project's clerk, will be getting land. "I've got the experience, and I'm sure I can do it myself," he said.

Chisumbanje, another TILCOR project I visited, lies in southeastern Rhodesia's lowveld, stark, dry bush country. But the soil is fertile, and irrigation transforms it almost beyond belief. We flew over 3,300 acres in cotton and wheat; a total of 30,000 acres soon will be under cultivation. Here TILCOR eventually will settle hundreds of families.

"I came here to take up land because I wanted money," said Taundi Mutekwa. "If I have money, I can build a good house, and I also want to buy a grinding mill. I will grind maize for my neighbors."

The previous year, on five acres planted in cotton, he had made R$868. Picking cotton for TILCOR had brought his income to R$1,200 (U. S. $2,130), a princely sum for an African farmer. As a reward for ability, he was permitted to farm 2½ additional acres.

At Chisumbanje TILCOR operates a modern agricultural school for 100 African men 18 to 25 years old; they come from all over Rhodesia for a one-year course. I found a class grouped around the model of an irrigation system. Another class studied a tractor engine's components, and still other students practiced with surveying instruments.

Sweet but sharp-edged harvest of sugarcane calls for rubber armguards on a worker (**above**) who bundles stalks in Rhodesia's southeastern lowveld. Canals lace lush fields of the crop (**facing page**), one reward for the 45-million-dollar investment by the Sabi-Limpopo Authority in five dams and a vast irrigation system for the semiarid region.

Creation teaches satisfaction in the Farayi Art Center, named for an African word meaning "to be happy." The young sculptor, Godfrey Chatambarera, exhibits a soapstone carving depicting a rural scene—the lowering of a beehive from a tree trunk.

Man from inner space: A worker takes a break in a chromium mine (**facing page**). Despite U.N. sanctions, some 50,000 tons of Rhodesian chromium have been imported annually in recent years into the U. S. as a strategic mineral.

"There is nothing stopping a man here," one of the African instructors said to me.

Black leaders label such government efforts too little and too late. They see steady deterioration in tribal area conditions. Cephas Msipa, employee of a large cotton firm (page 671), said: "For example, the government tells people, 'Let your council build the roads,' but these councils do not have the money. As a result, roads are in a shocking condition, yet in some areas people must walk three miles or more just to get water."

But Rhodesia, cut off from foreign aid and investment, does all it can afford, government spokesmen said repeatedly. TILCOR alone, they pointed out, spent R$10,000,000 (U. S. $17,760,000) on development projects in 1974. In Rhodesia that is a large sum.

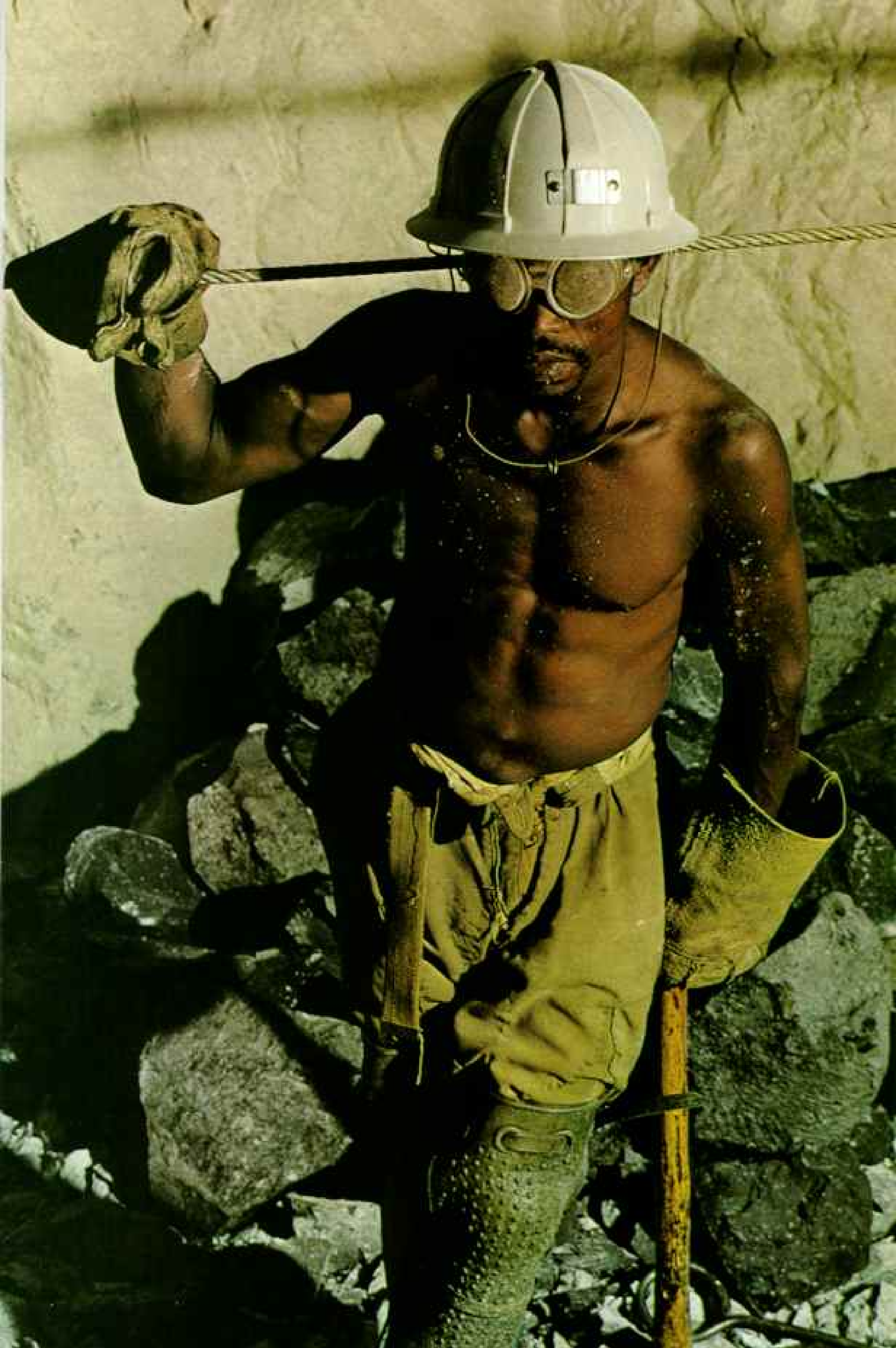
Manufacturing has outstripped agriculture as the mainstay of the economy, yet Rhodesia is becoming that modern rarity, a food-rich country. Much of the arid lowveld has been transformed by the Sabi-Limpopo Authority, which wrought quick miracles with irrigation.

I FLEW over one tract of 20,000 acres planted in wheat and cotton. We had been following the sluggish trickle of the Sabi River as it wound its sinuous dry-season way through desolate but wildly beautiful bush and occasional hills. We circled a huge phosphate plant that supplies most of Rhodesia's needs. Then, suddenly, we winged over an endless expanse of green where thousands of sprayers plumed water that glistened like showers of pearls. Moments later, with the new wheat behind us, we gazed down upon huge fields snowy with cotton.

At present the Sabi-Limpopo Authority has some 34,000 acres in production, and development continues. Bob Hack, who helped plan the project, said: "We have the potential and people here in the lowveld to do this ten times over. Moreover, much of this country can have the same kind of development."

Rhodesia also has a rich mineral potential. It holds 86 percent of the world's known reserves of high-quality chromium, plus copper, nickel, asbestos, gold, iron, and coal. Indeed, it mines some 50 different minerals.

But realization of the land's riches depends heavily on the labor of black workers, many dissatisfied with their share in an economy with a reported 6.5 percent annual growth rate. Africans comprise 99 percent of the work force in agriculture and mining. Yet in



1973, the most recent year for which figures are available, the average African in those industries earned only R$31 (U. S. $55) a month, compared to R$444 for the white.

Many Africans spoke of hunger and want among unemployed. Near Bulawayo, an African storekeeper said, "Every night I feed six people who can't get jobs. The sanctions hurt Africans more than Europeans."

He gestured toward some painfully thin children playing outside the store. "What do they know of politics? They come here every morning asking for stale bread."

For a moment he paused to get a grip on his emotions, then continued: "The son of my brother could not get a job. He looked for two years. To an African it is a disgrace if he cannot support his family. Finally he said, 'I cannot commit suicide. But I can die a warrior's death.' And he went north into Zambia to join the guerrillas. That was two years ago, and we have not heard from him."

DESPITE LOW PAY, some Africans with city jobs can live comfortably, but most have large families and must support relatives in the tribal areas. Each city has its municipally-built townships; Salisbury alone maintains ten. These are ghettos, an offense to the pride of any black, but I was impressed by the appearance of many. High-rise buildings for single people looked much like apartments anywhere but had small, crowded rooms; houses were all tiny, but mostly quite neat and clean. In Salisbury's oldest township, Harari, single people paid as little as R$3.50 a month for rent; families paid more.

Municipal authorities had provided swimming pools, stadiums, clinics, and day-care centers for children. Nowhere did I see anything approaching the wretchedness of slums that have shocked me in South America and some United States cities.

In a few areas Africans may buy their own municipally-built masonry homes, three rooms with bath. I saw one area near Salisbury where well-to-do Africans—a bus-line owner, a retired member of Parliament, a physician, a businessman—had built luxurious homes without government help.

All townships, however, are much too crowded. "For some years we have not kept up with the increasing number of Africans," said William Alves, the mayor of Salisbury. "We have a crying need for money, and the government is reluctant for municipalities to take European land for African housing. So we are trying to pour a quart of housing into a pint of land."

Dr. Eugene Gordon, Bulawayo's young, liberal mayor, conceded the need for African housing, but added: "Our biggest problem is the need for skilled and technical people. I feel strongly that the government has to start training Africans for more skilled jobs."

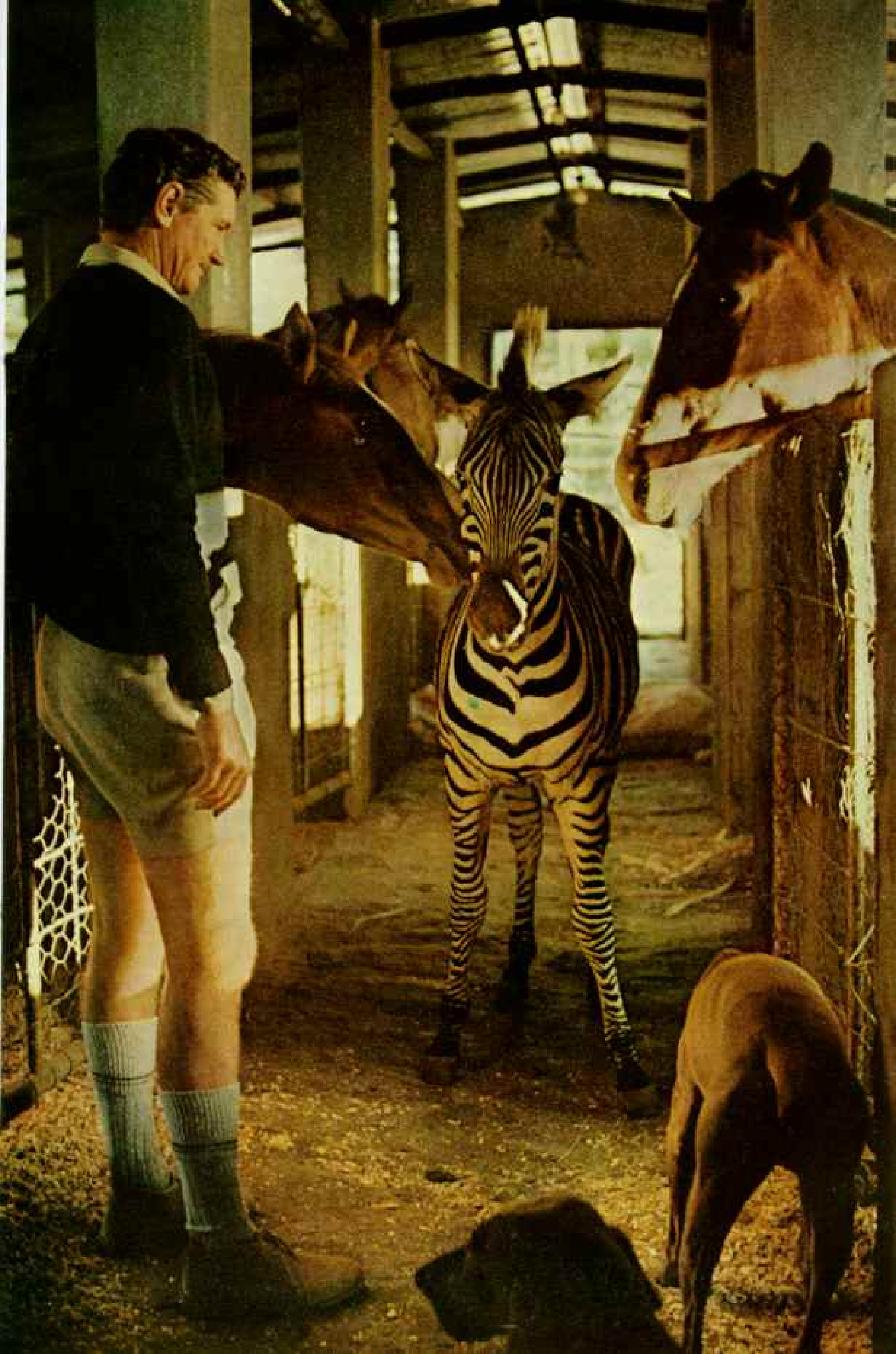
Rhodesia remains heavily dependent upon nongovernment schools, many run by religious groups, for the education of African children. Some 726,000 black youngsters receive such education, compared to only 83,000 in government schools. The government, however, gives financial aid to all schools and sets strict standards.

But the educational system too has many critics. An African university graduate voiced a frequent complaint: "From grade one to grade seven there are lots of schools in the Tribal Trust Lands, but there are not enough secondary schools. The children have to compete for entry into schools far from home."

CAN paradoxical Rhodesia solve its white-versus-black confrontation? The moves toward détente came after I left Rhodesia, but while there I found few optimists. Rhodesia used to have a common voters roll; then it established two, one for whites, one for blacks. Qualification of voters became complicated, and the constitution limited African representation in Parliament. This nettled blacks, whose demands have included an easier franchise and equal representation.

Bishop Abel T. Muzorewa (page 657) heads the United Methodist Church in Rhodesia, and also the African National Council (ANC), which represents most of the country's blacks. The bishop is a diminutive man and would appear boylike were it not for his clerical garb. But he spoke toughly about one of his principal demands, equal representation of

Horse of a different color gets a kiss from a cousin, but the zebra's swift kicks await the dogs, should they try to usurp this jealous pet's place in the life of Tom Warth. The Chiredzi farmer's menagerie also includes warthogs that gambol freely over his grounds and baby elephants that share sugarcane treats with the cattle.



blacks and whites in the House of Assembly.

"Our people will not accept anything less than parity. That's the minimum. Many want immediate majority rule," he explained.

At the time of our meeting, Bishop Muzorewa foresaw the possibility of civil war. "It seems we are talking into dead ears," he said.

"Our goal remains majority rule," said Dr. Gordon Chavunduka, a university lecturer. "How we get it is a matter for discussion. We want a number of changes, the main one being equal opportunity, but we won't interfere with property rights, and the future would be secure for all citizens."

YET in the past the government has seen little but doom for white hopes and white rights under majority rule. It has acknowledged the goodwill of moderates like Bishop Muzorewa and Dr. Chavunduka, but has doubted that they could control radicals within the ranks of the ANC.

I soon found that not all whites felt that way. Rhodesia's two daily newspapers both have criticized Prime Minister Smith and urged a settlement. Mayor Alves and Mayor Gordon have favored settlement. One of the strongest voices has belonged to Allan Savory, a former member of Parliament (page 657). He and Dr. Ahrn Palley were the only white members of recent Parliaments to speak out in support of African aspirations. They saw friends and colleagues turn their backs, but they still spoke on.

"We go back to a common voters roll or we have civil war, and if we have civil war, whites will lose," said Savory, a 39-year-old ecologist. "The trouble with our whites is they don't think black."

Sir Roy Welensky, the last prime minister of the Central African Federation, also saw the situation in a grim light. I had hoped the grand old man of Rhodesian politics would offer some hope. But Sir Roy turned his craggy old face from me when I mentioned hope, and suddenly all the days of his long years weighed upon him. He shook his head.

"I feel like an onlooker at a Greek tragedy —and there is nothing I can do about it."

Rhodesia's situation did not seem so grim when I talked to Prime Minister Ian Smith. He is a tall, spare man of grave countenance, and in conversation he sounds like a professor reading a dry treatise to students. But he also gives an impression of strength, poise, and inflexible will.

Leaning forward in his chair to give emphasis to his unemotional words, Mr. Smith said: "I see no reason for my optimism to wane. We've been through some difficult periods, particularly when we declared our independence. If people can overcome that sort of situation, the problems they face today seem small by comparison."

Seeking a solution to racial differences, Mr. Smith has negotiated with Bishop Muzorewa for some time. Once the prime minister thought he and the bishop had an agreement, but the ANC's central committee rejected it. But, said the prime minister, "We must continue; we must never give up trying."

And he added, "If I were prepared to sell out, I could get a settlement tomorrow. But this is our problem: to ensure that we get a settlement which does not sell out on our standards of civilization and doesn't undermine the position of the European and what he has built up in this country."

AFTER LEAVING RHODESIA, I became guardedly optimistic about its future. Allan Savory expected a black government in Mozambique to close Rhodesia's rail links with the vital ports of Beira and Lourenço Marques. He also predicted guerrilla raids all along the border with Mozambique. Both predictions may yet prove true, but neither had happened at our press time.

Indeed, Joaquim Chissano, prime minister of Mozambique's provisional government, has been moderate in statements about Rhodesia and South Africa, and both those countries have replied in kind. Prime Minister John Vorster of South Africa and several leaders of black African nations were instrumental in bringing the antagonists closer to the conference table.

May black hand clasp white in friendship and give Rhodesia peace to match the beauty of the land. □

Smiles belie the bitterness of Cephas Msipa and his wife; the former schoolteacher, now employed by a cotton firm, spent five years in detention for political activity deemed illegal. Late last year, about 100 other detainees were freed—part of an abortive cease-fire agreement—as Rhodesia's blacks and whites explored a word still new to southern Africa: détente.

NEW INSIGHTS INTO BABOON BEHAVIOR

Life With the

By SHIRLEY C. STRUM Photographs by TIMOTHY W. RANSOM, Ph.D.

"Pumphouse Gang"

I WAS WATCHING NAOMI, one of my favorite baboons, sitting with her friend Queenie. Entering notes about Naomi's behavior on my clipboard data sheet, I suddenly felt small hands touch my back, so softly that at first I could not identify the sensation. Surprised and puzzled, I slowly turned my head and saw that it was Robin, Naomi's two-year-old daughter, grooming the thin cotton of my shirt.

It was a gesture that thrilled me.

Early that still African evening I had come out on the brink of an imposing escarpment, one of the parallel cliffs that slash the plains of Kekopey Ranch in Kenya. A troop of baboons ambled ahead of me. They were still playing and grooming before choosing resting-places for the night on the ledges and in the niches of the cliff. Large trees—the natural dormitories for any monkey—are scarce in this part of the East African Rift country.

This was a peaceful time, relished by all. Both with each other and with me, the animals were more relaxed than in the active hours of the day. The baboons rarely moved away from me. After all, they had known me now for 16 months.

The day's last observation period was devoted to Naomi. Hers were the deepest of all those amber eyes that are characteristic of baboons. She was the largest of the females, blending a look of ungainliness with a certain self-assurance of gait.

Then came the feather touch of Robin's grooming, and I forgot everything else. With this first timid statement—baboons establish and cement bonds among themselves by

Gently cradling her baby, a baboon relaxes with a female companion. For 16 months the author studied a troop of olive baboons—dubbed the "Pumphouse Gang"—near Gilgil, Kenya. In a break with past research conclusions, she found that the stable core of such troops rests not with the powerful adult males, but with family groups of mothers and their offspring.

grooming—she was issuing a cautious greeting. It was as if she were saying, "You are special to me. Am I special to you?"

Little could Robin know what she meant to me, for I was not about to reveal my feelings for her. And if this declaration sounds hard-hearted, it states a position central to my study of the baboons. My object was to avoid intimacy, to be at the same time tolerated but unobtrusive. My aim was to let the baboons tell me about their primateness, not to force my humanness on them. It was an objective unattainable in the absolute sense, for there I was, quite openly, another living primate in their midst.

Robin's gesture of trust was a precious personal reward culminating a long association with a tightly knit group of monkeys known as the "Pumphouse Gang." Of course, it was not a gang at all, but one of nine troops of olive baboons (*Papio anubis*) totaling about 800 animals that ranged the grass and scrublands around Lake Elmenteita, famous for its flamingos and pelicans. An earlier observer had given this name to the baboon troop often seen around a pumping station that forced water up a cliff to an outlying residence and watering tanks of Kekopey, a 48,000-acre cattle ranch near Gilgil.

Experts Join Forces for Study

Kekopey's owners, Mr. and Mrs. Arthur Cole, had permitted me to use that unoccupied foreman's house, some distance from the main ranch buildings, as headquarters for my baboon study. In my fieldwork, I had an ally in Dr. Timothy Ransom, who had come to photograph the baboons. Tim had studied baboons himself at the Gombe Stream National Park in Tanzania.

I had come to Kenya on a National Science Foundation grant to do research for my doctoral thesis at the University of California at Berkeley. As I descended into the Rift on the road from Nairobi to Gilgil, the view took away my breath. The grasslands seemed to

Silhouetted at sunset, the troop forages for grass shoots on the savanna. Soon the baboons will return to their sleeping cliffs, where Brutus (**left**) strikes an aristocratic pose. The author gave names to many of the troop's 65 animals.

Among olive baboons *(Papio anubis)*, mothers spend much of their time with offspring. Like all female baboons, though, they also develop lasting bonds with non-family members of their sex. They stay in the troop for life, whereas males—who establish less permanent friendships with females—often transfer from troop to troop.

Bared-fang fury: 75 pounds of angry Strider lunges toward Ray (**following pages**). True fights resulting in injuries are rare; this seemingly vicious attack, actually just a form of ritualized aggression, ended when Ray retreated.

stretch endlessly north and south, flanked by shadow-dappled hills.

Kekopey shared this grandeur, with parallel cliffs running through vast brown pastures. The plains, which the cattle shared with impala, Thomson's gazelle, eland, and many other animals, had been cleared of their tangled natural cover. Although lush and green after rains, Kekopey usually presented a hot and dusty face to animals and humans alike.

Baboons are among the largest and most adaptable monkeys on the African Continent. They inhabit nearly all areas, from forests to semideserts, from Ethiopia to the Cape of Good Hope.

Eating grass, especially tender young shoots, the baboons of Kekopey compete with the cattle and other wildlife. But with their nimble hands they also gather any berry, seed, root, pod, or flower they can find. This diversity of diet favors the baboons. During bad times, when all other wildlife would be thin, the baboons could maintain themselves.

My hardest task was winning the trust of the baboons. They had learned to fear humans, who usually either chased them with dogs, threw rocks at them, or shot them for sport. These animals had grown accustomed to a van used by an earlier researcher, Dr. Robert Harding, but I felt I needed to be closer to them, which meant observing them on foot. It was only after several months, though, that they tolerated my presence.

Old Theory Put to the Test

A baboon group lives and moves as a unit. As I began my study, Pumphouse consisted of 61 individuals, from new infants, black in color, to large males weighing more than 75 pounds. The troop was composed of 7 adult males, 21 adult females, and 33 immature individuals. Distinguishable from one another after a time, these animals soon became as familiar to me as my dearest friends. But

Misplaced mothering ends in tragedy: While Zelda looks on, Naomi cuddles the dying infant Hal (**left**), whom she had "kidnapped" from Harriet a few days before. Hal perished of an illness within a week. Six weeks later Naomi herself (**below**, right) gave birth to Nanci, the object of Tina's curiosity. Though infants are always of interest to other baboons, few suffer Hal's fate.

knowing the individuals was merely the first step in making sense of what I was seeing and recording.

It took me many months to fit pieces to the puzzle of baboon social structure. According to one well-established theory, baboon society is a closed and rigidly organized system governed by adult males, few in number but all-dominant. Membership is stable except for births and deaths. Adult males are viewed as the core of the troop, affording protection, asserting discipline, and providing cohesion through their leadership. The role of females is merely reproductive.

This view was truly a breakthrough in its time, but from new information about primates, gathered worldwide, I had my doubts that even baboons could be so easily explained. I questioned that the adult males, a small percentage of the troop, could be responsible so totally for its social life.

When I went to work at Kekopey, I soon learned that troop membership was not static. During my stay, several males from other troops joined Pumphouse. Meanwhile a number of the resident males left to join neighboring troops.

The fortunes of Ray, one of the immigrant males, were closely intertwined with my own. Ray and I joined Pumphouse at the same time. We both sought acceptance and we both—at first—were viewed askance.

Caution Rules Stranger's Approach

I wondered how Ray would gain entry to the troop. Would this splendid baboon, at least 12 years old and in his sleek prime of life, walk into the troop and sit next to a female, demanding that she groom him? Would he find the top male and offer a challenge with bared canines, stares, ground slapping, and aggressive pant-grunting?

Surprising to me, Ray did none of these things. Instead he sat, as I was sitting, trying

to be as unobtrusive as possible. What Ray was watching from the fringes of the troop I could only guess. Now, much later, I have a better idea of what he learned, for I learned along with him.

Obviously, adult males crossed over from troop to troop. So it became apparent that smaller units, such as the family, assured overall stability to the troop. Among baboons, as among most monkeys and apes, paternity is neither known nor recognized. A family comprises an adult female and all her offspring, including large sons not fully mature.

Highest Loyalty Goes to the Family

I found baboon family ties to be very strong. Family members spend more time with each other than with other baboons. They walk and sit together, rest and groom together, and give each other assistance in times of conflict with animals outside the family. A young baboon's physical independence of its mother does not sever their relationship. As with chimpanzees—and humans—emotional bonds endure.

Peggy's family was the largest in Pumphouse. Her youngest offspring was an infant, Paul, followed in ascending age by the 2-year-old Blue, the nearly adult Thea, and handsome O'Henry. Though younger than O'Henry, Thea would be physically and sexually mature before her brother. While Thea at age 4 might have her first infant on the way, O'Henry would be 8 before being adult in appearance and behavior. In the wild they attain a maximum age of perhaps 20 years.

Peggy spent a great deal of time grooming Paul. Using her fingers to part his hair, she would remove insects and bits of grass, seed, dirt, and dead skin. The most comforting form of contact, grooming reinforces a mother's emotional bonds with her infant. It also serves to establish or maintain relationships with other baboons. Grooming stimulates rivalry already existing between siblings, and Blue would try to nuzzle his way between Peggy and Paul or give Peggy an invitation to groom him instead.

Peggy and Thea were now good companions as well as mother and daughter. Thea also doted on her youngest brother. O'Henry was the loner, spending less and less time—unlike Blue—with other juveniles. When he did socialize, it was with his own family.

In squabbles within the family, Peggy would invariably favor and support the youngest of her offspring involved. The others would choose the side that offered the best advantage, and in this juggling for power the squabble dragged on. But in the face of any challenge from without, the baboon family always presented a common front.

Friendship as applied to animals is an anthropomorphic concept, but I think it has meaning among baboons. Ties across family lines were often long lasting, and these "friends" liked simply to be together, sitting, resting, sleeping, grooming, and often moving near one another when the troop foraged.

I observed only two types of baboon friendships, those between females, and those between males and females—never between adult males. Just as family ties form the basic structure of the troop, so friendships, I discovered, provide the critical attachments between males and females, and between different family groups. Friendships between males and females seemed neither so intense nor so lasting as between females.

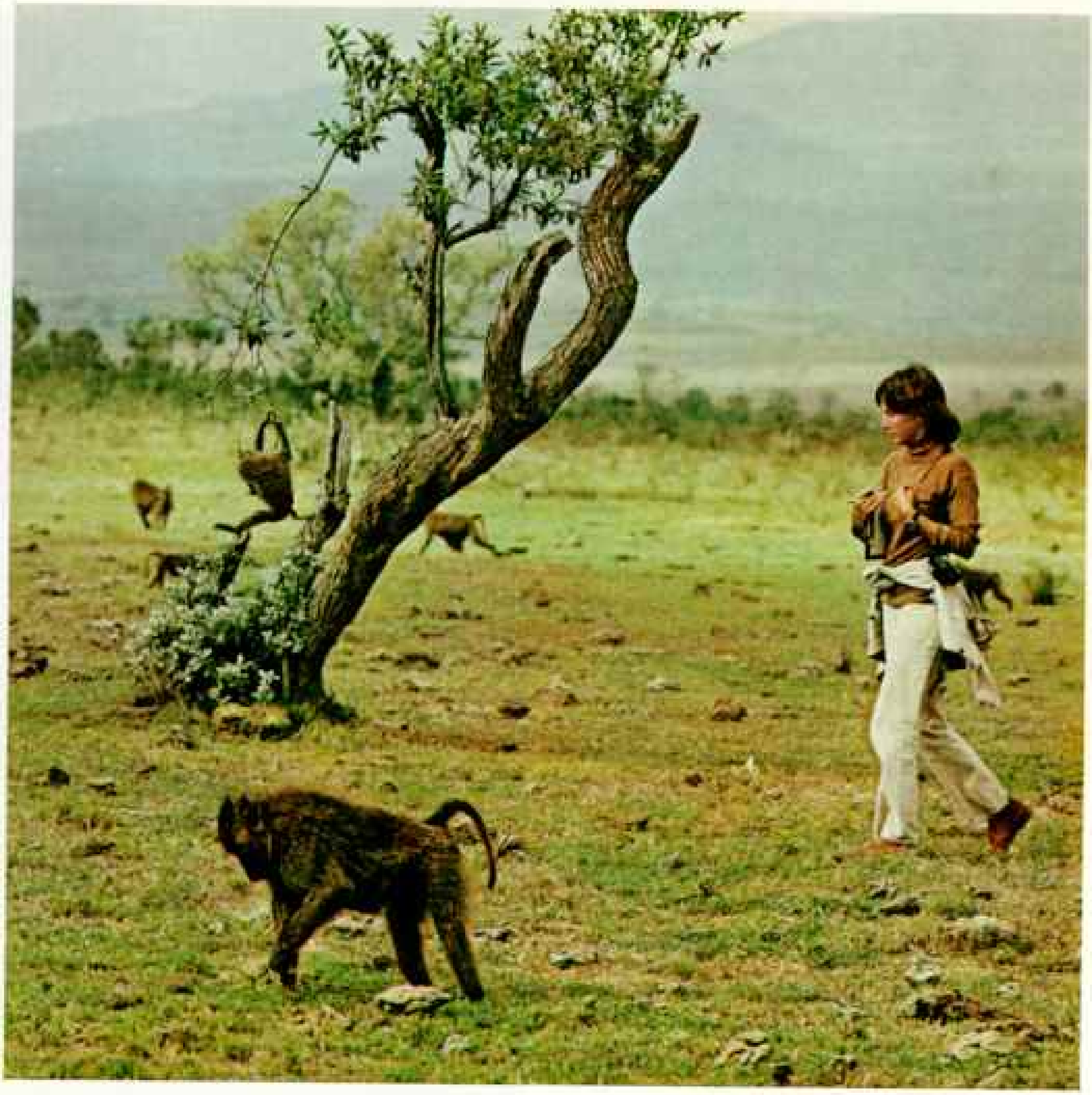
My understanding of the place of males in the troop began through observation of Ray's behavior as he sought the company of Naomi. Every one of the seven adult males had at least one female friend, and the cementing of that first friendship was a new male's key to group acceptance. Even if such alliances began when the female was sexually receptive, the close association continued throughout nonmating periods.

Female baboons are sexually attractive to males for only a very short period. Usually a female such as Naomi was either pregnant or nursing an infant, but in both these states she still had male friendships.

Sexuality Leads to Fray

Naomi's acceptance of Ray seemed to lessen his timidity, and he began to approach other females. But Ray's first serious encounters with adult males came when Naomi became sexually receptive again. At this time a female forms a temporary relationship with one male, or with several males in succession. The involved pair are said to be "in consort." Each consortship may last only a few minutes or continue for several days.

Ray acted like a consort male and followed Naomi doggedly, grooming her very frequently. Other males also were attracted to Naomi—not only her longtime friend, Radcliff, an exceedingly elegant male, but also Carl and Sumner, probably the oldest of the



"**Not a single boring moment in 16 months,**" declares the author (**above**). She determined not to interfere with the baboons' normal life as she ranged with them across their 15-square-mile home area. To record the baboons' behavior, she would observe each of them for 15 minutes at a time, taking approximately two days to monitor all the animals in the troop. Then she would begin the survey anew.

Whenever she came face-to-face with one of the animals, she kept her eyes downcast; to a baboon a direct gaze can signal a threat.

The 27-year-old anthropologist now teaches at the University of California at San Diego, but will return to Kenya this summer to continue her behavioral studies.

males. The veteran Pumphouse males could no longer ignore Ray, for he stayed close on Naomi's heels. Wherever she went, there too went Ray, Rad, Carl, and Sumner.

The males, with eyelids lowered, began yawning to display their canines—certain signs of tension. Rad began to slap the ground, pant-grunting a threat. Ray was caught in the middle, trying to stay close to Naomi and at the same time keep track of what the males behind him were up to.

To complicate matters, Big Sam, a younger male, joined the following. Most powerful looking of the Pumphouse males, he had a crooked smile, caused by an injury, that gave him—to me—a menacing appearance.

After a bit of feinting, a fight erupted—not between Rad and Ray but between Big Sam and Ray.

Both males were thoroughly frightened, but during the grappling only one male screamed. An adult male scream is a very serious statement of fear. Then, as suddenly as it began, the scrap ended. Neither Big Sam nor Ray had suffered hurt. Ray broke away and ran off, while Big Sam continued to gesture threateningly at his retreating figure.

The fight had carried off in one direction; the noncombatants had gone in another. Far off was Naomi—with a new consort.

Relationships Take a Turnaround

While the other males mated with Naomi, Ray stayed at a distance. I suspected that he might revert to his position of the early days, peripheral and friendless. But soon Ray made two moves to rejoin the troop. He sought out Kate, one of his other female friends. He also began a long spell of intimidating Big Sam, which ended a month later when Big Sam capitulated to Ray's harassment.

Big Sam and Ray exchanged positions. Big Sam now acted like a new and friendless male, while Ray added more females to his list of friends. Other adult males deferred to him, or at least avoided him. The change did not last; the situation was reversed not once but twice more during my stay.

The adult males kept shifting from troop to troop. Virgil moved in, briefly, from Eburu Cliffs troop. Then two other Eburu males, Strider and Brutus, joined Pumphouse. Changes continued when two of the troop's original males were killed and one subadult male, Taffy, left to join Crater troop.

Normally males would have little to do

Mutual curiosity society: Feline faces primates in an encounter at the author's

headquarters. Baboons who passed by the house were invariably intrigued by Balthazar, tiny relative of the big cats that occasionally prey on them.

with each other, spending the time quietly feeding or sitting with their favorite female friends. But the joining, departure, or death of a male, a serious fight, the sexual receptivity of a female—all these could drastically change a male's relationship to other males. In contrast, a female's relationships seemed stable and unchanging.

Baboons Refine Hunting Technique

Though baboons were known to be omnivorous, Dr. Harding, who studied Pumphouse before me, was the first researcher to observe meat eating as a rather commonplace event. My own study corroborated his findings—and also saw the baboons' little-known hunting skills develop dramatically.

Usually it was the scream of the captured animal that alerted me to a kill, but on a number of occasions I witnessed successful hunts. In most cases, but not always, the prey died during capture, most frequently of a broken neck. The animals that the baboons took were always smaller than themselves. Cape hares were a favorite. The young of small antelope such as steenbok, dik-dik, klipspringer, and Thomson's gazelle, together with an occasional bird, rounded out the list. In a few cases the baboons took infants of the larger reedbuck and impala.

Dr. Harding had found that the killers and consumers were almost exclusively adult

males. But in the course of my study, certain female baboons, juveniles, and even infants showed an interest in meat.

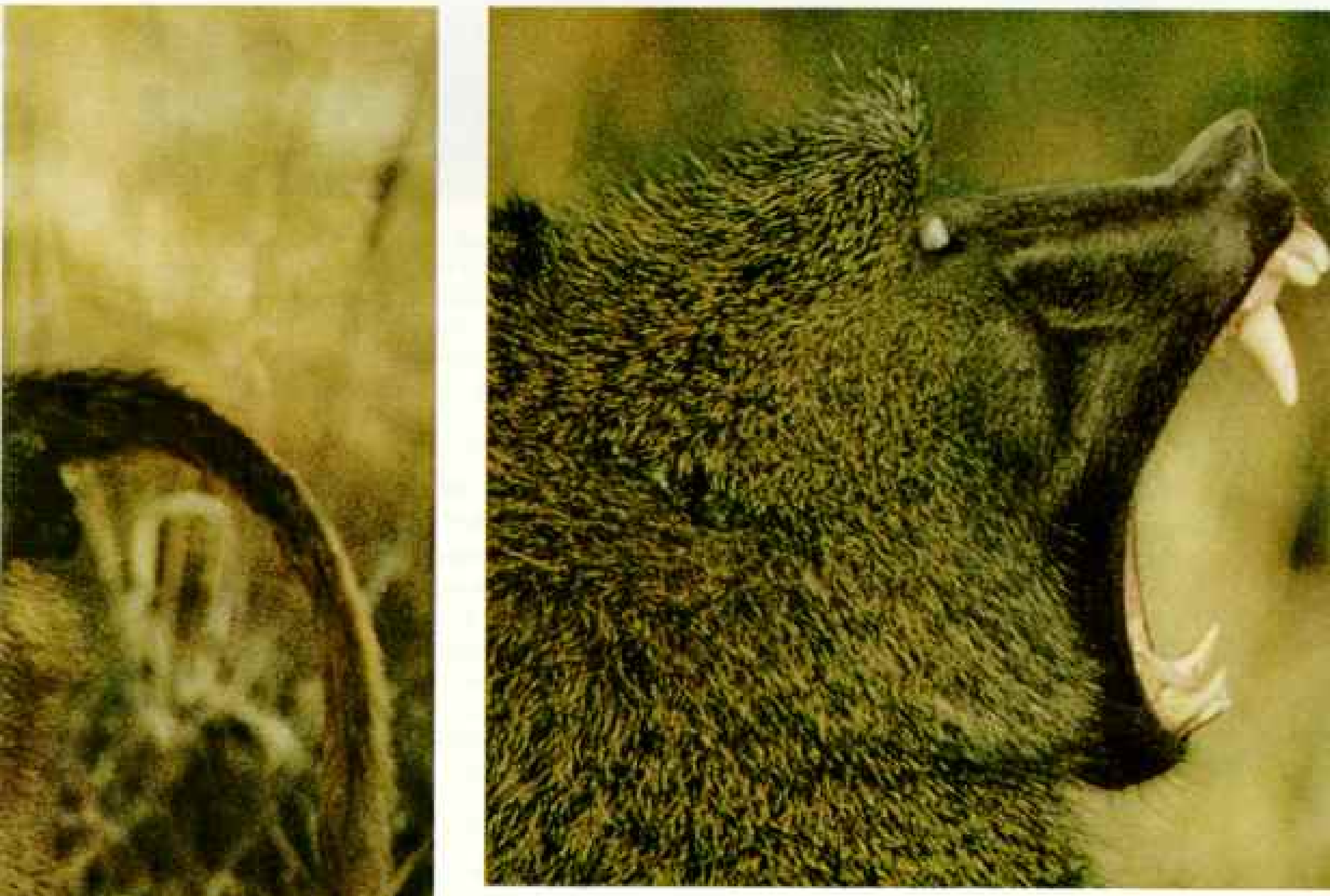
What began as a rare occurrence became a part of daily life by the finish of my study. Carl was the most persistent hunter, until he suffered a serious injury to his arm. Then Rad came into his own. When Rad took off after a herd of Thomson's gazelle, nearby males often attended him. At the victim's scream, the others would come running.

Out of this pattern evolved a truly exciting happening.

It began as usual. Rad closed in on a group of Tommies, as the gazelles are commonly called. Most were adult females with grown young, moving across an open grassy area. With my binoculars, I could see a mother with a small baby on the far side of the herd.

Rad scattered the rest of the animals, surprised the mother and infant, and almost succeeded in grabbing the baby. Having missed once, Rad was in earnest and ran after them full speed. Then, all at once, I noticed other males coming toward Rad!

Rad was at the end of his endurance, but just as he gave up Sumner took over, with Big Sam and Brutus also converging on the prey. The chase turned into a relay, one male running after the baby and another taking over when the first tired. Finally Big Sam chased the young antelope into Brutus's grasp.



Ivory daggers make formidable adversaries of adult males such as Radcliff (**above**), who here threatens an unseen foe with a display of two-inch-long canines and lowered white eyelids. Romping like two puppies, juveniles Sean and Dylan (**left**)—who have not yet developed the large canine teeth that signal male maturity—learn as they play. Such roughhousing, the author thinks, teaches control of aggression, perhaps explaining why so few serious injuries are inflicted upon one another by the powerful adult males. Their upper canines stay razor keen by grinding against lower teeth with every opening and closing of the mouth.

Strength, quickness, and cunning of the baboon Radcliff spell death for a young Thomson's gazelle (**above**). The successful hunter devours the viscera and other soft portions, then may share the rest with other males, females, juveniles, and even infants. In a grisly finale, Strider (**right**) gnaws the head. The author saw more predation by baboons than had ever before been reported, including several instances when males in relays ran down prey. Even more than meat, insects help fill out the primates' mainly vegetarian diet.

The baboons obviously learned from this experience. More and more frequently, I witnessed hunting in which one or more baboons chased a Tommy toward another hunter. The success rate climbed steeply.

The Pumphouse baboons killed more prey than baboons observed anywhere else. There is logic, but no proof, behind the apparent explanation: As ranching operations extended cattle pasture and introduced irrigation, the leopards, lions, and hyenas—antelopes' and baboons' natural predators—were being shot and trapped out. So more meat on the hoof was available to the baboons, and their own risk of being attacked had diminished.

A memorable event during a tense meat-eating session almost coincided in time with Robin's gentle touch of friendship. The two occurrences confirmed my final acceptance into Pumphouse.

Sumner had just killed a young Tommy. Strider loitered about nearby. The commotion drew in other males, including Ray and Big Sam, who were again—as periodically—at loggerheads. When Big Sam got the carcass, Ray intensified his threats.

Then it happened. With other males still present, I was startled to see Ray turn to look at me. There was no mistaking what he meant. He narrowed his eyes, pulled his ears back flat, and raised his eyebrows, the while hunching his shoulders. It was a familiar gesture of greeting: He was asking me to approach him.

Monkey Business Strikes Terror

I made no move toward him—this I had forbidden myself—but the event should have prepared me for what followed. Big Sam looked to Rad for support against Ray, but Rad consciously ignored the gambit. Seeing Big Sam thus deserted, Ray rushed him and chased him a short distance away.

Ray turned suddenly and came toward me. I can't describe the fear that seized me, seeing Ray with hair standing on end and so full of aggressive intent, rushing straight at me. I turned quickly to *(Continued on page 691)*

Easy rider, Frodo seems to grasp invisible handlebars (**left**) while perched on mom's back. As part of the weaning process, the 5-month-old infant will soon be grounded and for short periods purposefully ignored (**below**). Not much to his liking, this treatment can set off full-scale tantrums that slowly subside into moans and whimpers.

"Though it took all my willpower to keep from comforting him," says the author, "to have tried would have alarmed Frodo and upset the troop's natural behavior patterns."

avoid his glance, my heart beating hard. Ray pulled up short.

Ray, I thought, frustrated by Big Sam, was directing his aggression at me. Ray made a second and then a third rush at me, and I finally realized that he was not threatening me at all but instead was trying, in typical baboon fashion, to enlist my support against Big Sam! I had to decline, and signaled this to Ray by turning completely away.

Ray won that day without me, but I shall never forget the compliment he paid me.

In the end the Pumphouse baboons did accept me, but on their own terms. I had not sought intimacy with them. Not to respond to their overtures was often very hard, as when young Dylan, for example, mischievously untied my shoelaces and others, taking courage, rushed to imitate him.

Learning about baboons, I became convinced that many old notions about these monkeys needed revision. But my own study has only touched the surface. By continuing our observations of nonhuman primate behavior, we can hope to gain a better understanding of ourselves: what we share with other primates, and what is uniquely ours.

My last day with Pumphouse was, for the baboons, just like any other. But to me, as the animals made their way to the cliffs where they would sleep, everything seemed more beautiful than ever. The air was already cool, yet the rocks, heated by the sun, still gave off warmth. The sunset was like a testimonial to the lovely day just past.

Baboon Sounds a Haunting Farewell

Slowly, in twos and threes, the baboons climbed the cliff face to find comfortable places for the night. No stranger could have guessed that 65 of my animal subjects and friends rested there, had it not been for a baboon sound now and then. As I turned to go, a male—I don't know which one—cried "Wahoo!" Silence magnified the echo from the cliff. □

Special relationships that exist between adult males and their female friends extend to the females' infants. Yet, because baboons mate promiscuously, specific fathers are not identifiable among members of a troop, and play no role in baboon family life.

Here Ray, being groomed by Naomi, relaxes with her baby, Nanci. The distinctly darker color of infants in their first months seems to inhibit the natural aggressiveness of adult males—a phenomenon the elders exploit for their own protection. On several occasions, when powerful Big Sam made threatening approaches, Ray responded by scooping up Nanci. Big Sam's deep-seated regard for infants apparently outweighed his aggressive feelings, and the confrontation ended.

Blithely unconcerned with such nuances of behavior, little Cecilia (**right**) takes off in a nonchalant somersault.

PROVENCE, EMPIRE OF THE SUN

By WILLIAM DAVENPORT

Photographs by JAMES A. SUGAR

With all my soul I breathe the air
That comes to me from sweet Provence.
No other realm is quite so fair
As this between the Rhône and Vence
And from the sea to the Durance.
Joy shines here with such pure fire
This is the land of my heart's desire.

—PEIRE VIDAL, 12th-century Troubadour

OUR OWN LOVE AFFAIR with Provence began eight centuries after the writing of this paean of praise, which I have freely translated from the original Provençal.

Roselle and I had raised our children, Tony, 10, and Anne, 6, in the sunshine of Hawaii. Suddenly my newspaper transferred me to Paris, where we barely survived the ordeal of a gray Gothic winter. The minute school was out in June, we drove south with a million other Parisians in search of the Empire of the Sun. This was the Provençal poet Frédéric Mistral's name for the old Provincia Romana, first Gallic province of the Roman Empire, whence the name Provence.

Smaller now than in Roman times, Provence stretches from Italy to the Rhône River and from the Alps to the Mediterranean. En route to the coast, we drove down the Rhône Valley with the north wind—known as the *mistral*, "master wind" in Provençal—adding power to our ancient Mercedes.

At Vaison la Romaine we walked the gridiron streets of the old Roman town. (The Rhône Valley is said to have more Roman ruins than Rome itself.) At Avignon, walled city of 14th-century popes, the kids danced on the ruined bridge of St. Bénézet, and nearly fell into the Rhône.

Near Nîmes we paused at the Pont du Gard. On the top tier of this Roman aqueduct,

Ripe sun casts its vermilion eye on Réguste,

160 feet above the Gard River, Tony and Anne played a death-defying game of tag. Next day in the arena of Nimes, we had to restrain Tony, double-dared by his sister, from leaping into the bullring as a *spontanéo*.

"Let's get to the coast," pleaded Roselle.

We explored this legendary littoral from the bulrushes of the Camargue* to the lemon groves of Menton. The children took a dim view of Nice because its pebble beach was not like Waikiki. So we went back to Fréjus, where Augustus Caesar built the ships that defeated Antony and Cleopatra in 31 B.C., and found a proper beach of sand—but no hotel rooms. In desperation we rented a friend's 12th-century chateau. Tony locked his sister in the tower "in durance vile."

"We really need a place of our own," sighed Roselle. At St. Tropez we were offered a ruined sheepfold for $50,000. At that point we drove inland through the Maure Mountains and began to climb slowly into the foothills of the Alps of Upper Provence.

Far from the madding crowd's ignoble splash, we found sleepy villages of ocher stone and sun-bleached tile. In a luminous pine-scented solitude we lay on our backs staring at a sky as blue as Hawaii's. The reddish earth was mantled with green vines and silver olive trees, abiding gifts of the Greeks, who founded Marseille about 600 B.C.

At an altitude of 1,500 feet we came to Aups (the Provençal word for Alps), which some inhabitants say is the village Julius Caesar referred to when, according to Plutarch, he declared, "I would rather be first among these fellows than second in Rome."

Though there is no historic foundation for

*The author described this region, "France's Wild, Watery South," in the May 1973 NATIONAL GEOGRAPHIC.

one of many medieval villages that crown the hilltops of southern France.

this claim, great Caesar's ghost is much in evidence in the Auberge de la Tour, an inn built in 1303. The owner and chef, Albert Lions, commissioned an artist to paint murals depicting local history. One of them shows Julius Caesar offering friendship to the chief of the Oxubi tribe in Aups in 52 B.C.

"The chief was kneeling before Caesar in the first version," Albert Lions told us. "I couldn't accept that. I made the artist repaint it with the chief standing up. After all, he was from Provence."

Lions is not only independent; he's a first-rate cook (page 700). "Life without good food is unimaginable," he said as he regaled us with a pâté of thrush, a trout from his own pool served with a sauce of crayfish and champagne, and a dry white wine. We left the table agreeing with troubadour Vidal: Provence is the land of heart's desire.

FIVE MILES FARTHER WEST we found what we were looking for between the tiny villages of Moissac Bellevue and Régusse. Our dream house was an abandoned centuries-old *mas*, a farmhouse straight out of a Cézanne landscape. It stood on a knoll in a valley redolent of rosemary, wild lavender, and thyme. The name of the house was St. Martin, pronounced "sang martang" in the southern accent of the lady who showed it to us. It had stone walls a yard thick and fireplaces big enough to stand up in. Only part of its tile roof was missing. Its windows, long since divested of shutters and panes, looked out on vineyards, live oaks, and olive and almond trees.

"This is it," Roselle said.

Buying the house and ten acres of land was a complicated affair. There were 14 owners. Half the family was not on speaking terms with the other half, so we had to make two trips to the notary of Aups to get all 14 signatures on the deed of sale. It was hard to track down all the sellers. But when the notary spotted one—a shepherd herding his flock through the main street—Tony ran out of the office and captured him.

The most independent man we met in Provence was Fernand Archier, the leading mason of Aups, whom we hired to restore the house. After many a glass of *pastis*, the anisette liqueur that is the "national" drink of Provence, Archier agreed to do the basic work during our absence in the fall. We would return at Christmas to find whitewashed walls,

Heady ceremony begins with a formal toast (**facing page**) at the inauguration of a master of the Knights of Medusa, named for the mythical lady whose glance turned people to stone. France's oldest wine-tasting society, devoted to the joys of Provence's light but potent wines, was founded in 1690 in Provence's largest city, Marseille.

Robed in medieval style, two officers of the Order of Medusa (**below**) record names of new knights at Grand Master Baron de Rasque de Laval's Château Ste. Roseline.

plumbing installed, the animal stalls in the living room removed, and the gaping holes in the walls glazed and shuttered.

"Please clean up all the debris," Roselle said. "We don't want to risk a fire."

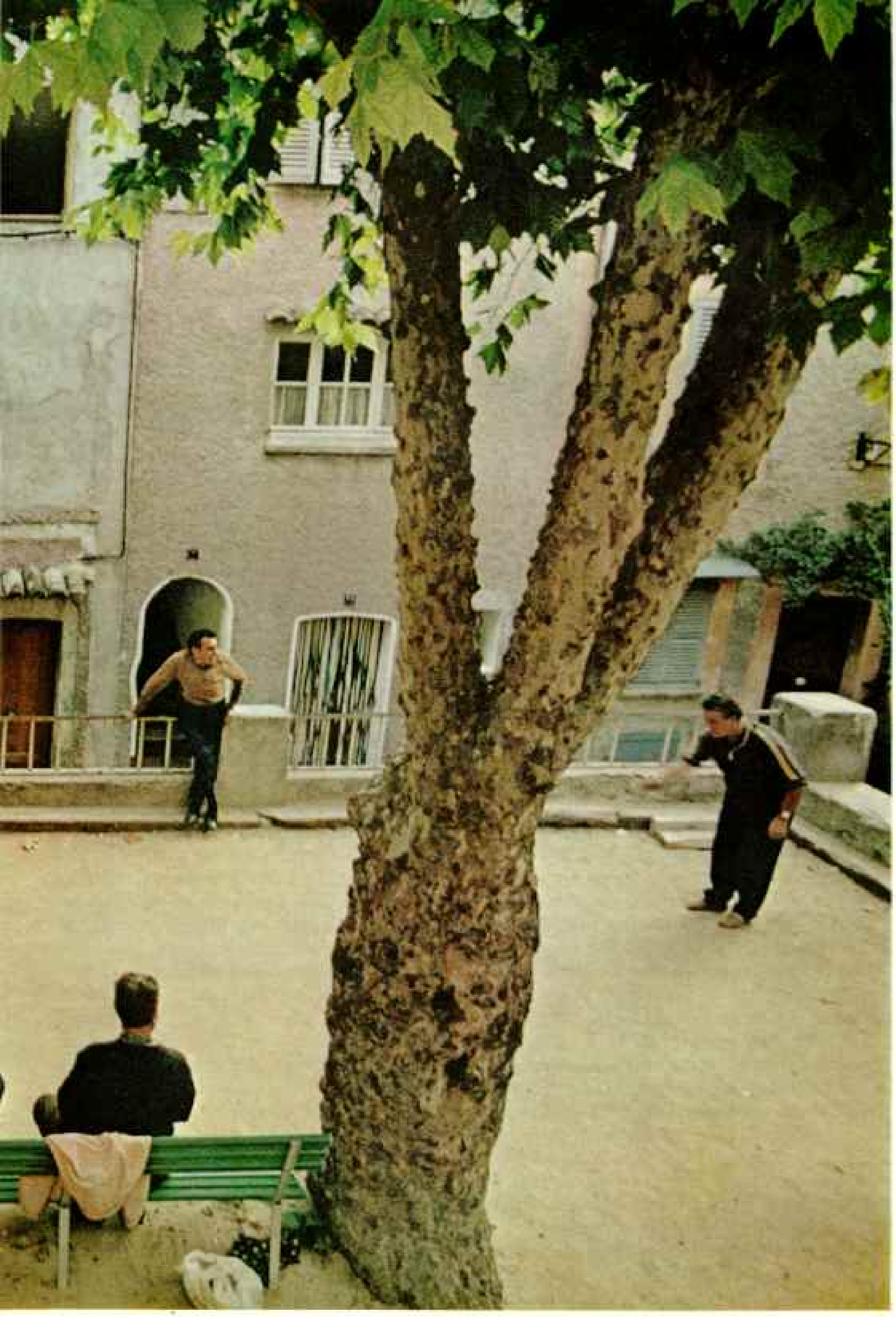
"Count on me," said Fernand Archier, and we confirmed our accord with many a handshake and more pastis.

Two weeks before our return from Paris to St. Martin, we wrote as agreed to give Archier time for the "finishing touches." At Christmas, we drove the 500 miles in a fever of anticipation.

"Holy cow," said Tony, as we finally turned into our private road, "the house is on fire!"

Black smoke billowed from the building, which was as full of holes as a Swiss cheese.

Easy street: Under peeling plane trees, players in the village square of Biot stage their afternoon game of *boules*, a variation of lawn bowling. Zealously independent, Provençal farmers work their



own crops in blistering heat and in the mistral, a cold, dry gale that sweeps from the north for days at a time. Just as dedicated to the pursuit of leisure, the Provençaux bowl for hours each day.

None of the promised doors and windows had been installed. In the middle of the living room, stoking a bonfire of rubble and hay, stood Fernand Archier.

"*Bonjour, bonjour,*" he said affably, shaking hands with each of us."

"Monsieur Archier," Roselle wailed, "I asked you to be especially careful of fire."

"Madame," he replied, "this house is made of stone. It is not afraid of fire."

"But no work has been done on the house," I complained.

"I demolished the animal stalls this morning," Archier replied, throwing another board on the fire. "We had heavy rains all fall. I didn't want to bring in the cement mixer—afraid of getting stuck in the mud. Then my foreman won the bowling championship of Aups, so he quit to devote himself to the game. The carpenter became a beekeeper.

"We try to please everybody," he concluded, "but it just can't be done. It's hard for foreigners to understand."

He used the Provençal word, *estranger*, for foreigner. In Provence this word is applied to anybody north of the Durance River. By any name I was ready to leave Provence forever. I drove the family to the Auberge de la Tour, where the warm welcome of Albert Lions and his wife cooled me off.

"You have to have a lot of patience," Albert said. "Down here the pace is slower than in Paris. You can't hurry things. It took us 25 years to restore this inn."

IT TOOK US only ten years to restore our house in Provence. During that decade we learned how different the easygoing Latin Provençaux are from the high-strung Franks of the north. We adapted ourselves, perforce, to a new rhythm of life.

Fernand Archier proved to be a good friend. He showed us the best places to swim and fish in the gorges of the nearby Verdon River, whose jade-green water is said to be the purest in France. Madame Archier invited us to dinner in her immaculate kitchen and gave us the recipe for *vin de marquis*, a delicious local aperitif made from the bitter oranges of Nice, white wine, and brandy. Roselle, who had studied Provençal in graduate school, was delighted that she could chat with Archier's 90-year-old mother-in-law in this old language that refuses to die.

When Archier had time and the inclination to work, he was a meticulous craftsman. Tony became his devoted apprentice, and remains an accomplished mason to this day.

Though Archier cheerfully accepted more work than he could handle, he steadfastly refused to employ more help. "I don't want to get too big," he said. "That's when your headaches start: taxes, social security, paperwork, government interference. We prefer to keep small and *artisanal;* craftsmanlike."

FOR US THIS REFRAIN turned out to be a kind of theme song of the Midi, as the French call the region of these easy-going southerners.

"I've had some big offers in Paris and New York," the famous photographer Lucien Clergue told us when we explored the classic theater and arena of his hometown, Arles, the "little Rome of the Gauls."

"I love every stone of this place," Clergue said. "I prefer to work here, in a small studio in a small town. I'm free to work at my own pace and do everything personally by hand."

"Personally by hand. That's the only way you can make good bread," echoed Fernand Viglietti, our local baker, as we watched him fire up his medieval stone oven one midnight. "I use 300 pounds of wood a day to produce 500 loaves. I knead my own dough, and I fashion my bread and buns by hand."

Viglietti's crusty baguettes and flaky croissants, hot from the oven each morning, may be the best in France.

"A lot of estrangers tell me that," said the baker. "They say I could make a fortune in Paris or New York. I'm better off here. A man needs space to live and breathe. I make a good living by making good bread. You have the touch or you don't. It's like being an artist."

A sense of artistry pervades another basic industry of the Midi: producing the baked tiles for the roofs and floors of Provençal houses. The process and the product have hardly changed since Roman times. Fernand Archier took us to another Roman town, Salernes, just south of Aups, to order what he called "authentic materials" from the tile factory of Jacques Polidori.

We saw the reddish-brown earth of Provence transformed into a thick soup, then dried to the consistency of a baker's dough and sliced into flat rectangles. A pretty dark-eyed girl, using a pattern and a taut guitar string, cut the rectangles into the traditional Provençal hexagons that are locally known as *tomettes*, the standard terra-cotta tile flooring

PROVENCE

"A beaker full of the warm South. . . ." Thus the poet Keats praised southern France's fertile land that rolls from Alpine peaks to Mediterranean shores. Monuments of civilizations past also shape the landscape of Vermont-size Provence. The Pont du Gard (**below**) reveals the engineering skills of the Roman Empire. The canal, 160 feet above the Gard River, carried water to Nîmes.

of Provence. Then this earth was cooked in an oven at 2,000° F. Though Polidori has more orders than he can fill, he too prefers to keep his business small.

"It's more human," he said. "We have only 18 employees. They are paid by the piece, and they take pride in the finished product. They average about 75 francs ($15) a day."

One of the tile workers told me that they receive an additional 75 francs a week to clean up their clothes and shoes: "We got that cleanup bonus by dealing directly with the boss. There's no union." He added proudly, "This isn't an industry; tile making is an art."

Art plays a role even in the bottling of the heady red, white, and rosé Provençal wines. They go into curvaceous bottles that recall the twisted columns of baroque architecture.

SEVENTEEN of the noblest vintages of Provence were served at lunch when Albert Lions took me to Ste. Roseline to be knighted as a chevalier of the Order of Medusa.

"I am especially happy to confer knighthood on an American," said Grand Master Baron de Rasque de Laval, hanging the bronze medallion of the Medusa around my neck and kissing me on both cheeks. "We saw our vineyards liberated by American soldiers in 1944. We don't forget that."

The Knights of Medusa were named in honor of the Gorgon whose glance turned men to stone. Seventeen wines can have a similar effect, but it is a slower and more joyous petrification.

"The Lord wanted us to be joyous," said

Master of delights, chef Albert Lions displays his "trout of the beautiful dawn" in his inn, Auberge de la Tour. Dating from 1303, it nestles in Aups, where legend says Julius Caesar stopped briefly during the Gallic wars. Master of mummery, a mime (**right**) plays "the

one of my table companions, a priest who was chaplain of the order. "He did not like sad people. He turned water into wine. That's why we bless the grapes and the sun and soil that He created."

Here was simple Provençal philosophy for a joyous afternoon. Before it was over I found myself swimming in the Mediterranean and looking for Greek amphorae off the island of Bendor with Claude Arzillier, a master of the knighthood, who directs the biggest scuba-diving school in France. Out of the cool depths and into the warm sun of August, I was invited to a nearby vineyard to relax and sample the wines of another master, Lucien Peyraud, at his Domaine Tempier at Le Plan du Castellet.

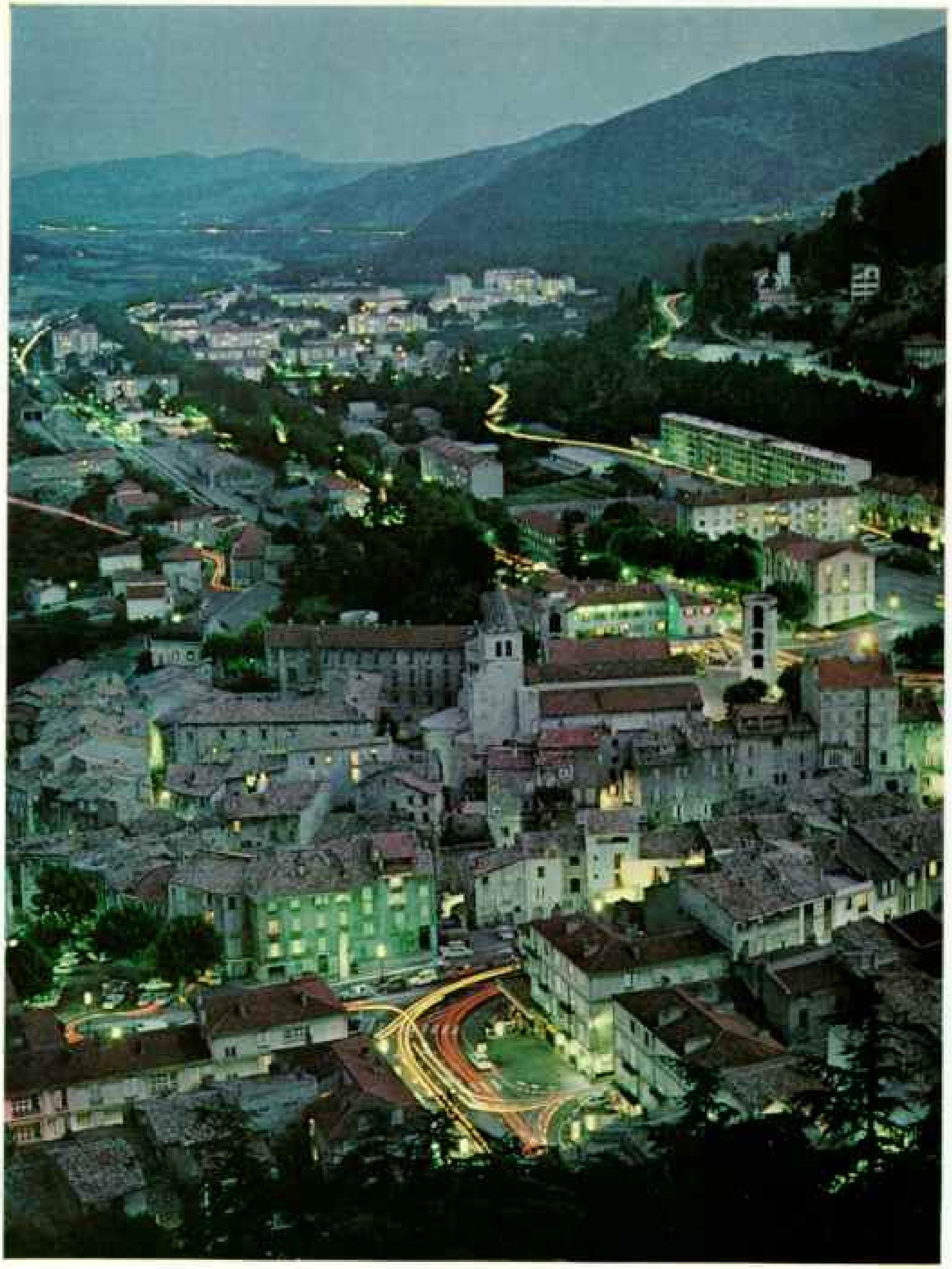
"It is easier to interpret Bach and Mozart than to interpret a wine," said Lucien as we sat under an umbrella pine at the edge of his vineyard. Still, he made a good try.

"Taste this 1973 red," he said. "You will find it *gouleyant*. That means it slides down the throat like velvet."

"Our two sons work here," Madame Peyraud said. "We have 11 grandchildren. It's a great comfort. You feel that you haven't lived in vain, that you won't really die. A big Marseille company offered to buy us out, but it's better to have your own little holding and labor in the vineyard yourself."

THIS ALMOST BIBLICAL statement seemed to sum up the philosophy of agriculture in Provence. In the tiny fortified village of Bargème, for example,

city dweller" outside the fortress-palace in Avignon, where the French popes established their courts during the 14th century. These popes ushered in an era of glory, nurturing the arts and transforming this Provençal town, "the Island of Chimes," into a cultural center.



Silk ribbon of the Durance River (**left**) winds gently through a rich fabric of land and chateaus toward the fifth-century village of Sisteron (**above**), a northern border town of Provence. Author Paul Arène described Sisteron, his birthplace in 1843, as "twenty narrow streets sheer as staircases, thickly carpeted with box and lavender . . . all jumbled together like the streets in an Arab village." Standing on a 16th-century fortress, photographer Sugar had but to swing his camera around to record both these views. Local legend tells that the fortress, secretly disarmed by Napoleon's supporters, surrendered in 1815 to the conqueror, just escaped from exile on the island of Elba. When he crossed the Durance safely here, he boasted, "I am already at Paris."

we found that all the inhabitants cultivate small fields of lavender in the shadow of the ruined castle of Pontevès.

"There isn't much work to it," a farmer told me as I admired his ordered fields, which glowed with bluish-purple clumps. "You just plant it and it grows."

The perfect Provençal product! I learned that he got six tons of flowers annually from his eight acres and that he made a net profit of $1,200 selling his crop to the perfumeries of Grasse.

A medieval jewel among fields of jasmine in the rolling hills above the Côte d'Azur, Grasse is the center of France's famous perfume industry. But even here we found resistance to mass production, expressed in the same phrase that mason Fernand Archier of Aups had used.

"We stay small and we want to remain artisanal," Paolo Giampietro told us as he guided us through the Fragonard perfumery. "We have only 55 employees."

Paolo led me past huge copper double boilers in which pork fat and beef fat were absorbing the essences of rose, jasmine, blue hyacinth, narcissus, and a dozen other flowers.

"Steam liberates the essence of the flowers from the fat," Paolo explained, "and we capture the perfume in alcohol. One ton of flowers yields about two pounds of essence. The fats are used for soap. Nothing is wasted in this business."

He escorted me to the research laboratory, where distilled essences were lined up in glass jars on shelves like books in a library. There I met a 28-year-old man in a white smock, Serge Kalougine (facing page). "Here is one of our key men, the 'nose,'" Paolo said. "A nose may not drink, smoke, or catch cold, but he is allowed to get married."

Married and a father, Serge makes a good living: $1,200 a month plus a percentage of the profits on the perfumes he creates.

"It takes from six months to two years to create a perfume," Serge told us, "and it can involve a blend of as many as 200 essences. A client tells me what he wants: 'fresh, daring, sensuous,' something like that. Then I go to work. I've created five successful perfumes, but I can't tell you their names."

"Other companies try to tempt our noses away," Paolo said. "That's why we give a percentage of the profits to the nose for his creations. One of the biggest American perfumers offered three times his salary to one of our noses. He went to New York, but he only lasted six months. It was too big, and they used too many synthetics. He languished for Provence. He was glad to come back to real flowers and our little firm."

Summer dawn haloes a girl picking jasmine near Grasse. From spring's orange blossoms to late autumn's sage to winter's violets, fragrant flowers bloom year round to supply 25 local perfumeries, a thriving industry introduced by 16th-century Italians.

ONE DECEMBER Roselle, Tony, Anne, and I were standing on a Roman bridge near the small town of Le Muy, admiring a 13th-century flour mill, when a man of about 65 years plunged fully dressed into the water of the Nartuby River to rescue a wild duck that was drowning in a whirlpool.

He emerged from the icy river dripping and shivering, but far more concerned about the injured duck than himself.

"She was winged by a hunter," he said. "I've removed the shot." He put the trembling bird in a cage on the riverbank. "She'll be all right. We must let nature take its course."

Letting nature take its course and restoring it to its pristine state turned out to be the obsession of this remarkable man, an inventor, industrialist, and conservationist whose name is Marcel Paulvé (page 709).

"Provence is the least polluted part of France," he said after he had changed to dry clothes. "Now we're having a big fight to keep it that way."

PAULVÉ TOOK US on a tour of the beautiful mill he had restored as his residence, then showed us the model factory he had built, where 40 employees manufacture signals, automatic switches, and other Paulvé-invented safety equipment for the French national railroads.

"I planted these poplars, cypresses, and pines to shade the factory and maintain the balance of nature," he said. "I'm proud to tell you that the effluents of our operations are purer than the water upstream from the plant. There's the proof." He pointed to a pool below the factory.

We watched sleek trout swimming in the clear water as Paulvé explained the system of drains, filters, and septic tanks that cooks and purifies the used water and turns the greasy by-products into fertilizer.

"I've offered this system to every township and factory on the river free of charge," he said. "But it's easier for them to pollute. Our antipollution laws in France aren't as effective as yours.

"Provence is one of the last earthly paradises," he reminded us. "It's a peculiar treasure. We've got to protect it."

Another "peculiar treasure" is Provence's cultural patrimony. Over the years we have made friends with Provençal poets, musicians, and teachers deeply concerned about preserving their traditions and the language of the troubadours.

The two major languages in medieval France were both derived from Latin and named after their respective ways of saying "yes." In the north people said *oïl;* in the south they said *oc.* The *langue d'oïl,* from which modern French evolved *(oïl* becoming *oui),* eventually triumphed over the *langue d'oc* as Paris extended its political and commercial domination across the land.

The more extreme Provençaux, members of the Occitania Movement, strive to revive Provençal as a spoken and literary language, as the poet Mistral helped to revive it in the last century, and they regard the north of France as a foreign imperialist power.

"It was an evil day for Provence when we got annexed to France," Daniel Daumas, the schoolteacher of Régusse, told us. Although this happened in 1487 as a result of dynastic

Perfume firm's "nose," Serge Kalougine, a native of Grasse, blends as many as 200 essences to create one fragrance for La Parfumerie Fragonard. He tests the combination daily, adjusting as needed during a process that may last two years.

marriages, Daniel regards it as a recent tragedy. "In the time of our own parents," he said, "there were signs in every schoolroom of Provence: 'Forbidden to Spit on the Floor and Speak Provençal.'

"We're changing that," he said forcefully. "I teach my pupils Provençal. I read them the folktales. I sing the songs too, in Provençal. And I've made recordings with my guitar. Now the children can speak Provençal to their grandparents. They're not ashamed of it anymore; they're proud of it."

AT ITS MOST EXTREME LEVEL the Occitania Movement would like Occitania (Land of Oc) to become a separate nation from France.

"We have a long history of dissidence and resistance to central authority," Daniel continued. "It dates from the 12th century, the golden age of the troubadours, when our big towns, like Marseille, Arles, Tarascon, Avignon, Draguignan, and Grasse, were self-governing, electing their own magistrates. We resisted all the French tyrants. Now we have local-action committees to resist the pressures of central power."

Members of the Occitania Movement especially resent the army, the centralized national power monopoly known as E.D.F. (Electricité de France), and the big tourist promoters who buy up the peasants' property in the Var—an administrative region—and erect vacation villas and apartments for estrangers, mostly Parisians.

"The situation is dramatic," Daniel said. "Four years ago when I came to Rëgusse there were 42 pupils in the school. Today I have only 18. A shepherd with five children just left because he can't rent grazing land anymore. The promoters have bought it up. To see what the army and E.D.F. are doing, go to the Plan de Canjuers and Les Salles."

The vast, desolate Canjuers Plain was often used as a movie set for French "Westerns." Now it swarms with soldiers on maneuvers. Here we saw the doomed village of Brovès, destined to end its days as an artillery target. A solitary old lady sat knitting in front of her house in this ghost town. "Some

Till death do us part: Vows are exchanged for the last time in Les Salles, a village soon to be drowned. The locally resented E.D.F.—Electricité de France—dammed the Verdon River to flood a flourishing valley in the name of industry and tourism. Workers level buildings (**above**), forcing the eviction of lifelong residents, who will be resettled nearby in a new village provided by the power company. The writing proclaims, "EDF equals Nazism; Thieves, Plunderers."

villagers were glad to sell and move away," she said, "but it's sad to leave the house you were born in."

"Enormously sad," echoed a villager of Les Salles (preceding page), a beautiful town that we saw being demolished before it is flooded by the Verdon River. The water was already lapping at the cobblestones as E.D.F. completed its new dam of Ste. Croix. This operation will turn one of the most flourishing valleys of Provence into an artificial lake, hailed by some as a boon to tourism and the economic renaissance of the Var, opposed by others, including Marcel Paulvé, as an ecological disaster.

E.D.F. says the reservoir will furnish water for power production and help to maintain the level of the Canal de Provence, which distributes water for agriculture, for industry, and for municipal requirements throughout a large area of Provence.

The chief victims are the farmers whose land will be inundated. "E.D.F. pays only $2,400 per hectare [2.47 acres] as compensation," one farmer told us. "The normal market price is $6,000. The hundreds of 'experts' deciding on compensation come from Paris, not Provence. It isn't just."

ON THE ROAD to Marseille, we passed many an Occitanian sign: "No to the Massacre of the Verdon," "Tourism Is the Death of the Var."

"Not so," Yves Ruffin, regional delegate of the French Government Tourist Office, said. "Tourism is the life of the Var." He ticked off statistics to support this thesis as we savored a bouillabaisse, the steaming saffron-flavored

fish stew of Marseille. Our restaurant, Les Santonniers, overlooked the Old Port of that vibrant city, oldest in France and biggest (population 900,000) in Provence.

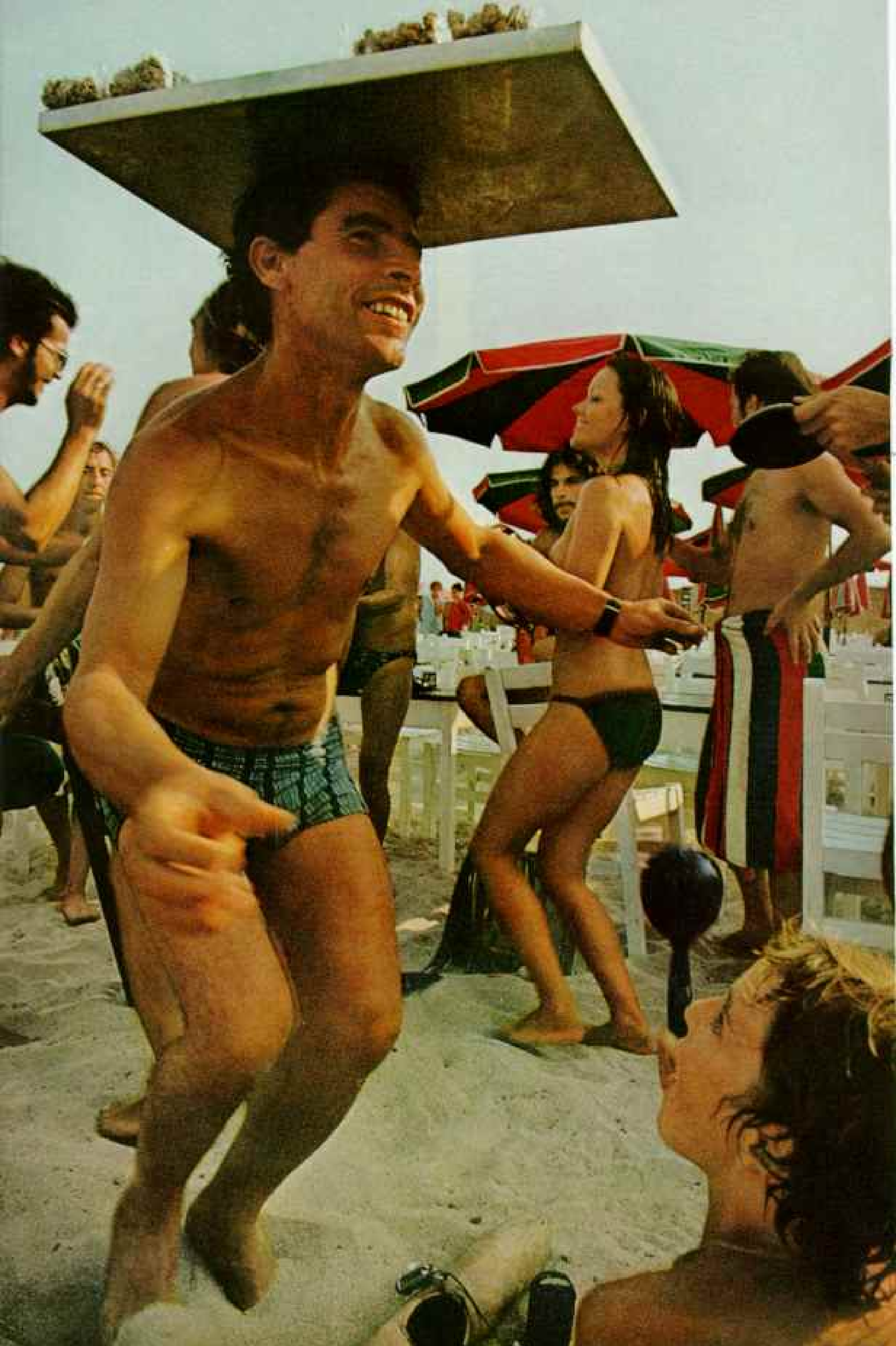
"Tourists spend five billion francs [one billion dollars U. S.] a year in Provence," Monsieur Ruffin said. He conceded that the Alpes Maritimes, with its great resorts like Nice and Cannes, gets the lion's share. "But the Var isn't so far behind: more than a billion francs in 1973, and the figure's going up.

"Provençal tourism provides employment for 175,000 people," Monsieur Ruffin went on, "and we have 1,100,000 beds for visitors.

"Mademoiselle Anne," he said to our daughter, who at this point was a disarmingly demure teenager, "I suppose you are an assiduous tourist like all Americans. What have you seen in Marseille?"

Cascading waters of the Nartuby River fall clean and clear behind Marcel Paulvé (**above**). Spearheading a drive to save Provence from ecological damage, the railroad-safety-equipment manufacturer produced an award-winning movie that prompted the creation of a regional environmental protection society. He stands with his dog, a Bouvier des Flandres, near the 13th-century stone flour mill he converted from a city dump into his home.

Odds on the wild side tempt kayakers (**left**) to challenge a slalom run just below the famous Fontaine de Vaucluse, which gushes from a subterranean river.



Vagabonds of summertime swing to Latin rhythms along Provence's Mediterranean shores. Balancing business with pleasure, a vendor of sugared almonds (**left**) times his beat to marimba music in St. Tropez. Brigitte Bardot rocketed the fishing village to fame by making a movie there, and today topless girls add their glamour. The population of Nice (**below**) triples each summer as this "Queen of the Riviera" hosts cosmopolitan sun lovers. The English built a flower-lined Promenade des Anglais in 1822, starting the resort's reign of pleasure. As with Cézanne and Van Gogh, the southern sun inspired Matisse, whose bright paintings idealized the life of Nice in joyful detail. Thousands invade the Côte d'Azur each year, but a few miles inland life continues undisturbed among olive groves and vineyards.

Her answer surprised him. He had no way of knowing she was preparing her senior high-school thesis on Marseille.

"Well," she said, "we saw your great oil refineries, soap factories, and shipyards, and we saw the Museum of the Roman Docks with those huge terra-cotta jars for storing grains, and we saw your 17th-century Charity Hospital that shows the influence of Roman architecture, and we saw Le Corbusier's model apartment house, the Radiant City, and we saw the old Greek ramparts and all those lovely Greek vases in the Château Borély, and we took a boat and visited the Château d'If where the Count of Monte Cristo is *said* to have been imprisoned, and. . . ."

"Did you see the Basilica of St. Victor?" Ruffin interposed determinedly.

"Well, no, I don't believe we've seen *that*."

"It's the oldest church in France, founded in the fifth century." He added in triumph: "If you haven't seen St. Victor's, you haven't seen Marseille."

The basilica looks like a small fortress, having been fortified in 1040 after it was destroyed by the Saracens. We expected it to be a sanctuary of silence and meditation. Instead we were greeted by klieg lights, TV cameras, and ear-splitting shrieks. In the chancel was a screen, across which red blips raced in jerky rhythm with the piercing waves of sound from an electronic device that creates musical tones.

A contemporary composer was seated in the nave with electrodes attached to his head. "I'm recording my brain waves," he shouted. "I wanted to do electronic music in the oldest church in France. I am trying to explore the extreme limits of noise. All sound is music, *n'est-ce-pas?*"

It was a moot point. I didn't feel like debating it in church.

Outpost of ancient Greece, Marseille drowses as dawn leaks gold between boat-laced docks in the Old Port (**above**). The Basilica of Notre Dame de la Garde crowns the horizon. Founded in the sixth century B.C. as a Greek colony, adaptable Marseille survived domination by Romans, Goths, Franks, and French, as well as invasion by Arabs. Today oil refining dominates the seaport's economy, and petroleum leads in exports.

Barkeep's best friend reaches for a treat in the quiet off-season at the resort of St. Tropez (**right**). Guy de Maupassant in 1888 called it a "gallant little city, full of salt and courage."

We made for the crypt and catacombs, where the remains of St. Lazarus and Mary Magdalene were alleged, even as late as 1965, to have been discovered.

A verger, who looked on the verge of a nervous breakdown, barred the entrance to the crypt. "Closed today!" he shouted above the reverberating noise.

"Monsieur Ruffin told us to see it!"

"But it's not Monsieur Ruffin who gives orders here! It's St. Victor! The crypt is closed because of this experimental music, which I frankly consider an affront to God!"

A fellow Philistine.

"Could I make a contribution for the upkeep of the church?" I suggested humbly.

St. Victor must have heard me above the din. We followed the verger into the crypt, losing ourselves in the silence of tombs dating from the morning of Christianity.

We returned to Les Santonniers to eat a black-currant sherbet and watch fishermen mending their nets on the stone quay. They worked with the unconscious ease of experts, looking up from the nets now and then to kibitz a group of their fellow fishermen who were playing *boules*.

"People say that the Marseillais aren't good workers," Monsieur Ruffin had said, "because they refuse to work overtime, even at time and a half. They *are* good workers, but they have a Provençal perspective on life. They want to enjoy their leisure. In other words, they are civilized."

THIS INSISTENCE on leisure and an individual approach to work *is* the legacy of a rich civilization. Now, after ten summers of Provence, we have become imbued not only with the sun of the south but also with something more deeply felt, a relaxed identity with this old and continuing culture.

It encompasses everything from magnificent Romanesque abbeys to modern painting. When Van Gogh abandoned Paris for Arles

and St. Rémy de Provence, he became, in his own words, "drunk with color." He stayed only two years, from 1888 until his tragic death in 1890, leaving an immortal legacy of swirling sunflowers, flamelike cypress trees, and the starry, starry nights of Provence, all seen through the eyes of a tormented genius.

In the Chapel of the Rosary at Vence, another genius, Henri Matisse, using white walls, black lines, and blue, green, and golden glass, distilled the joy that "shines here with such pure fire" into a nimbus of light that imposes a kind of religious silence.

We fell equally silent at Antibes in the Grimaldi Castle, on whose medieval walls the paintings of Picasso vibrate with the same elemental power as the sea outside.

OUR MOST MOVING PILGRIMAGE, however, was to Aix en Provence to visit the studio of Cézanne. The land between Aix and the sea was the laboratory of this native son, a classicist more concerned with space, form, and volume than with any expression of his own emotion. He saw the form and structure of this land more clearly

than anyone before him, and he painted this luminous vision with a probing passion that, quite unintentionally, revolutionized modern art. In Provence nature now imitates Cézanne.

On the beaches of St. Tropez last summer, nature was imitating nature as more and more of the younger generation divested themselves of what used to be known as bathing costumes (page 710). Despite these attractions there were too many people, too many yachts, too many cars. We were glad to regain the cool uplands of St. Martin, where I talked with a young mason of Moissac Bellevue, Leo Artaud, who was working with Tony to restore a ruin on our land. Artaud had been offered and declined a well-paid construction job on the coast.

"There's a difference between the coast and Upper Provence," he said. "Not just the scenery. It's a moral thing, something you feel. I'd rather raise my kids up here. Things are changing too fast on the coast.

"We have something worth preserving here: real blacksmiths, real houses, real bread, real peasants who work the earth. We want to hold onto it as long as we can." □

Bearing riches to the winepress, a farmer hauls hand-picked grapes by tractor (**left**), a rarity in Upper Provence, where traditions resist technology. Wine cooperatives in each town reward the villagers for their work at harvest time. Author William Davenport received 100 bottles of red wine for a week's labor in Aups.

Cherishing pastoral ways, a shepherd (**above**) holds a lamb in a meadow near the author's house, St. Martin, outside Régusse.

Mystery of the Ancient Nazca Lines

PICTURE STORY BY
LOREN McINTYRE

RULER STRAIGHT and tack sharp, a curious marking more than a mile long etches the desert in southern Peru. Wandering mule paths that cross it only emphasize the precision of its design.

Throughout hundreds of square miles of arid plateau, other markings abound, most of them concentrated between the towns of Nazca and Palpa. Known as the Nazca Lines, they form a geometrical mélange of quadrangles, triangles, and trapezoids; spirals and flowers; narrow lines that extend more than five miles; and a desert zoo of giant creatures—birds, reptiles, and whales, a monkey and a spider.

Because some of the figures resemble those decorating Nazca pottery, archeologists attribute the lines to the Nazcas, a coastal people whose culture rose, flourished, and declined between—roughly speaking—100 B.C. and A.D. 700.

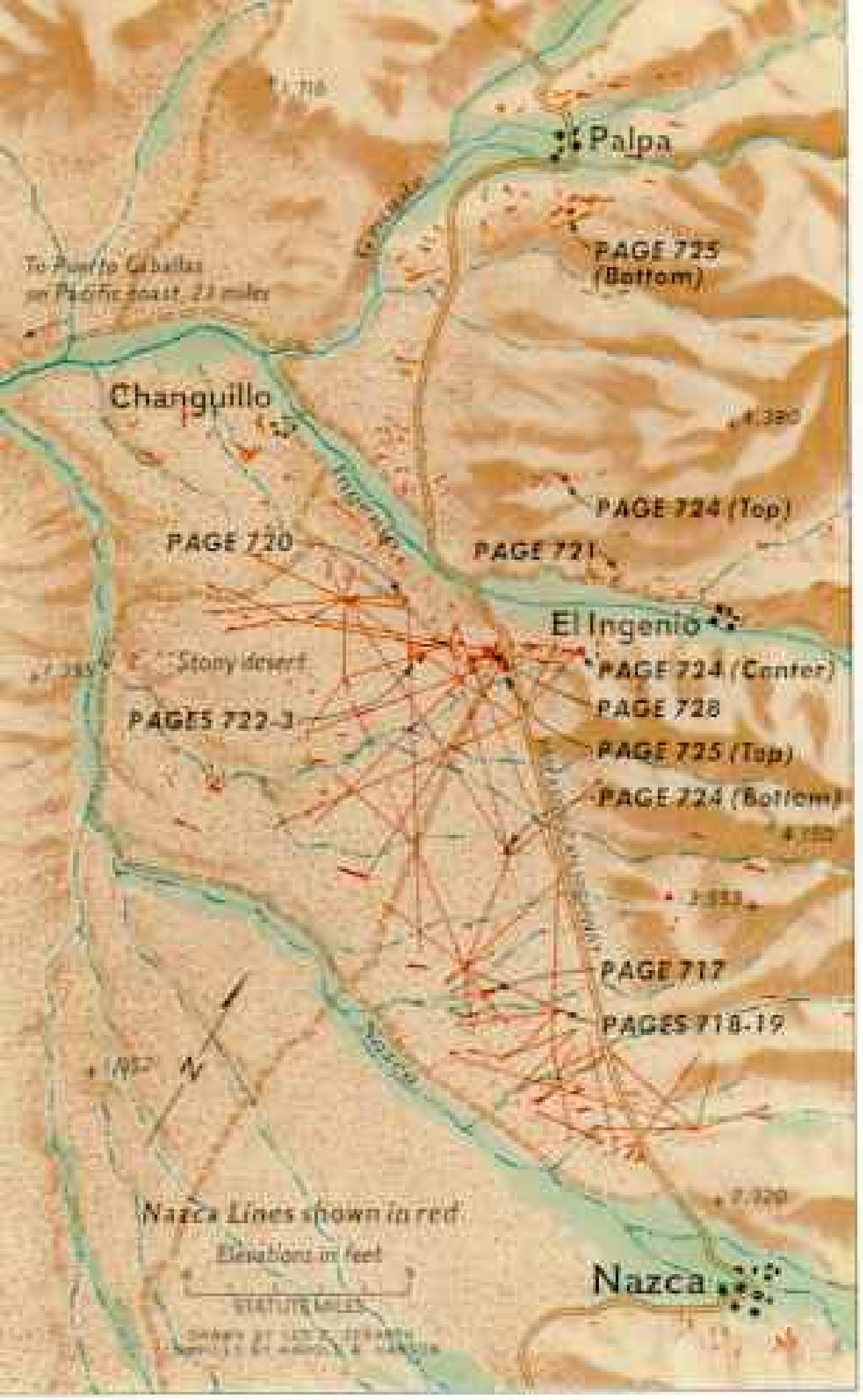
Making the marks must have been simple enough, though time-consuming. Clear away a few million rocks to expose the lighter ground beneath them, pile the rocks in rows, and you have designs that, in this nearly rainless region, can last thousands of years.

But why did the ancients construct them? Nobody really knows. There have been many guesses—that they were prehistoric roads, farms, or some form of signals or offerings to celestial beings.

Dr. Paul Kosok, the first scholar to study the markings after they were first recognized from the air in the late 1920's, speculated that they constituted a giant astronomical calendar, an almanac for farmers anxious to predict the return of water to valley streams.

A 1968 study, financed partly by the National Geographic Society, ascertained that some of the lines do indeed point to solstice positions of the sun and moon in ancient times, as well as to the rising and setting points on the horizon of some of the brighter stars. But, the study indicates, no more than could be expected by chance.

And so the mystery remains, including the most tantalizing question of all: Why did the Nazcas create immense designs that they themselves could never see, designs that can be seen only from the air?



FOR MORE THAN 25 YEARS Maria Reiche has photographed and charted *las lineas*, striving to complete a map of the hundreds of designs and figures that score a tableland some 30 miles long, threaded by the Pan American Highway (map, **upper left**). A National Geographic Society grant now aids her work.

At her desk in Lima (**left**), the German-born mathematician glances up from a chart, where azimuths of lines dart off in almost all the directions of the compass.

During fieldwork Miss Reiche sleeps on a camp cot behind her car on the rocky, grassless Peruvian "pampa," rising before first light for a breakfast of grapefruit and canned milk. Despite her 72 years, she then sets to work with a zeal as relentless as the noonday sun.

With the reel of tape in her left hand, she has just completed measuring one of the sides of a trapezoidal field (**right**). Seen from the air (**above**), it negotiates a hillock, then branches off octopuslike over the pampa.

Miss Reiche scorns the suggestion that such markings may have been airfields for outer-space visitors to earth in prehistoric times. "Once you remove the stones, the ground is quite soft," she says. "I'm afraid the spacemen would have gotten stuck."

AS IF DESIGNED AND DRAWN by a mad geometrician, markings great and small litter the pampa in configurations that defy explanation. They sometimes ignore topography as well.

Trapezoids congregate on a plateau that overlooks the Ingenio Valley (**above**). Others march up—or is it down?—the slopes of an old wash beside farmers' fields (**right**), accompanied by platoons of lines that appear to go nowhere. The looped pattern below them lacks the precision of many ancient lines and may be the remains of an irrigation system.

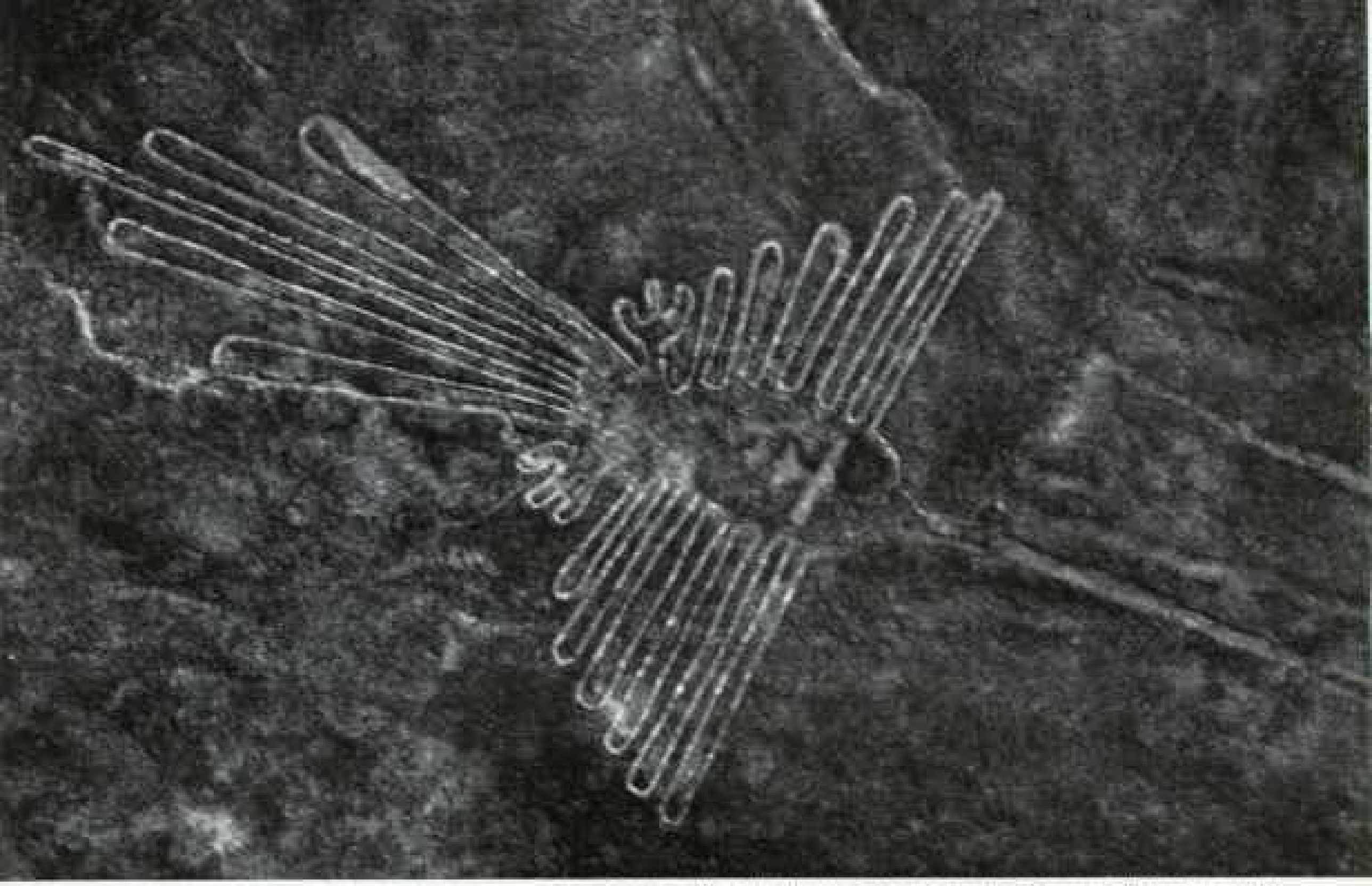
"Throughout the pampa," says Miss Reiche, "lines stretch for miles, crossing valleys and traversing hills, never swerving from their courses. Surveyors have been astonished by their straightness."

How did the Nazcas achieve such exactitude? Along some lines the remains of posts have been found at intervals approaching a mile. Perhaps sighting stations with men standing in line behind them? Perhaps.

BATES LITTLEHALES, NATIONAL GEOGRAPHIC PHOTOGRAPHER

LONGER than a football field and completely visible only from the air, a monkey (**left**) leans to grasp—nothing. Its left hand measures more than 40 feet across (**right**). Miss Reiche stands within the whorled furrows that comprise its tail (**above**).

The figure looks like any of several monkeys—woolly, spider, or capuchin—that live in tropical forests on the east slopes of the Andes, some 200 miles distant. But Nazca artists, who probably learned of these monkeys through trade contacts with forest peoples, weren't always accurate in anatomical detail. They gave their monkey four fingers on one hand, five on the other, and a prehensile tail that curves up instead of down.



SERVICIO AEROFOTOGRÁFICO NACIONAL (ABOVE AND BELOW); LOREN MCINTYRE (BOTTOM) AND GEORG GERSTER

ON THE PAMPA FLOOR birds fly, whales swim, and other creatures crawl and creep. Many of their forms closely resemble the figures on Nazca pots.

Ceramic representation of a killer whale (**below**), created near the end of the third century A.D., shares the sinuous form of a figure scribed in the desert (**right**). Stylized human heads, trophies of a Nazca head-hunting cult, band the side of the

potter's whale. Other pots render a head dangling below the whale's body, as the drawing does.

A few of the figures have been identified as pre-Nazca. Miss Reiche walks the outline of a wide-eyed hillside figure (**right**). Pottery and textile similarities link it with the Nazcas' immediate predecessors, people of the Paracas culture.

DESERT AVIARY contains 18 bird figures, including that of a hummingbird (**left**), an apparent duckling (**right**), and a sea bird almost 450 feet long (**below**), whose beak is only partly shown.

"We can't be sure what their meaning was, but we can be sure they had meaning," says art historian Alan Sawyer. "Most figures are composed of a single line that never crosses itself, perhaps the path of a ritual maze. If so, when the Nazcas walked the line, they could have felt they were absorbing the essence of whatever the drawing symbolized."

BIRD BY ROSA SERRITO

WARRIORS COLLECT TROPHY HEADS, LATE FIFTH CENTURY. ANANO MUSEUM, LIMA

PORTRAIT OF A WARRIOR-PRIEST, LATE FIFTH CENTURY. ANANO MUSEUM, LIMA

MASTERS OF MANY COLORS, the Nazcas brought polychrome pottery to a level of artistry unequaled in Peru and unsurpassed throughout the Americas. Their vessels tell of an overriding concern with fertility, which guaranteed food, which guaranteed life.

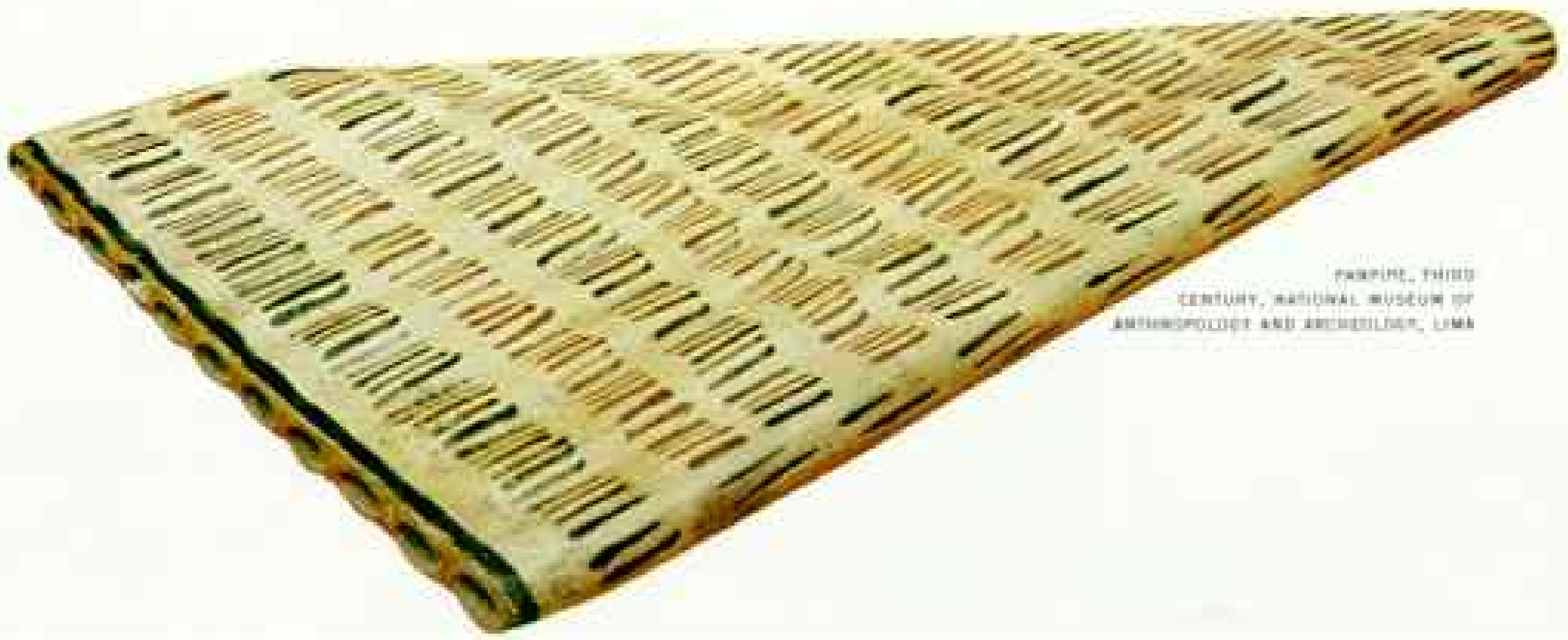
Thus they revered fertility, or life-force, in all forms of life, celebrating it in ceramics devoted to wild creatures and seeking it in the severed heads of their enemies. "For according to their way of thinking," says Dr. Sawyer, "a man's life-force, or soul, resided in his head."

Beneath the spouts of a step-fret bottle (**top left**), Nazca warriors in the guise of condors behead their victims. Below them a third warrior, clad in a cape symbolizing the tail of the killer whale, takes another head.

Both the condor and the whale were deities of a warrior cult dedicated to collecting trophy heads. Since the heads contained the life-force of the victims, they could be used in rituals to produce abundant crops, rituals perhaps presided over by a warrior-priest (**left**).

Marks decorating a panpipe (**below**) suggest to Dr. Sawyer the pepino, a kind of cucumber used as a food symbol. One life form consuming another, a tern eats a two-headed worm (**above right**).

A pot depicts male and female symbols of human fertility standing in what is probably a temple dedicated to the killer whale (**right**). On the pot's side, the red-mouthed whale itself appears in a highly stylized and symbolic form. Its anthropomorphic hands clutch trophy heads. Eyelike motifs on the creature's body may symbolize both the jack bean, the Nazcas' first domesticated crop, and the eye and mouth of a trophy head.



PANPIPE, THIRD CENTURY. NATIONAL MUSEUM OF ANTHROPOLOGY AND ARCHEOLOGY, LIMA

TERRA WITH TWO-HEADED WOOPA, THIRD CENTURY, AMANO MUSEUM, LIMA

TEMPLE OF THE KILLER WHALE, EARLY FIFTH CENTURY, NATIONAL MUSEUM OF ANTHROPOLOGY AND ARCHAEOLOGY, LIMA.

CRAFTED with uncommon care, the Nazca Lines remained much as their makers made them. For perhaps two thousand years a spider 150 feet long lay clearly in the sand, its outline almost undisturbed in a photograph taken in 1963 (**right**). Now it bears the scars of dune buggies, jeeps, and sightseers on foot (**below**). A similar fate threatens many of the markings.

For years Miss Reiche has crusaded to preserve the lines, an effort acknowledged last January when the Peruvian Government allotted one million sols (about $23,000) for the purpose.

"I would like to see a viewing tower erected near the Pan American Highway," she says, "so that visitors will not be tempted to walk on the lines. I used to direct people to the sites. Now I direct them away, before all the ruins are ruined." □

BATES LITTLEHALES, NATIONAL GEOGRAPHIC PHOTOGRAPHER, AND SERVICIO AEROFOTOGRAFICO NACIONAL (BELOW)

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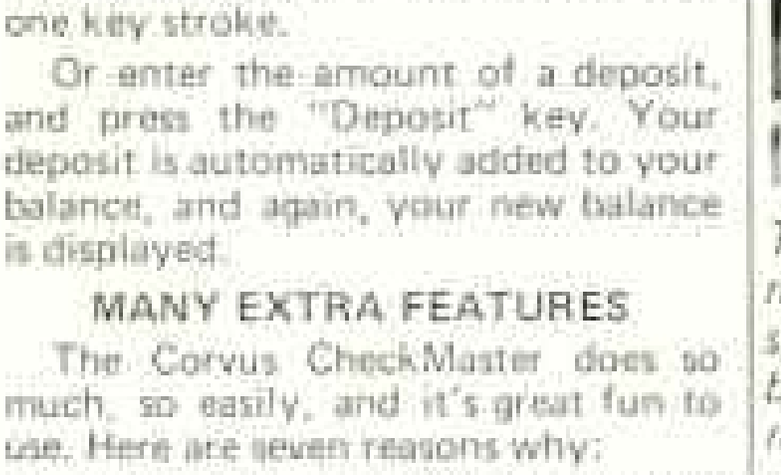

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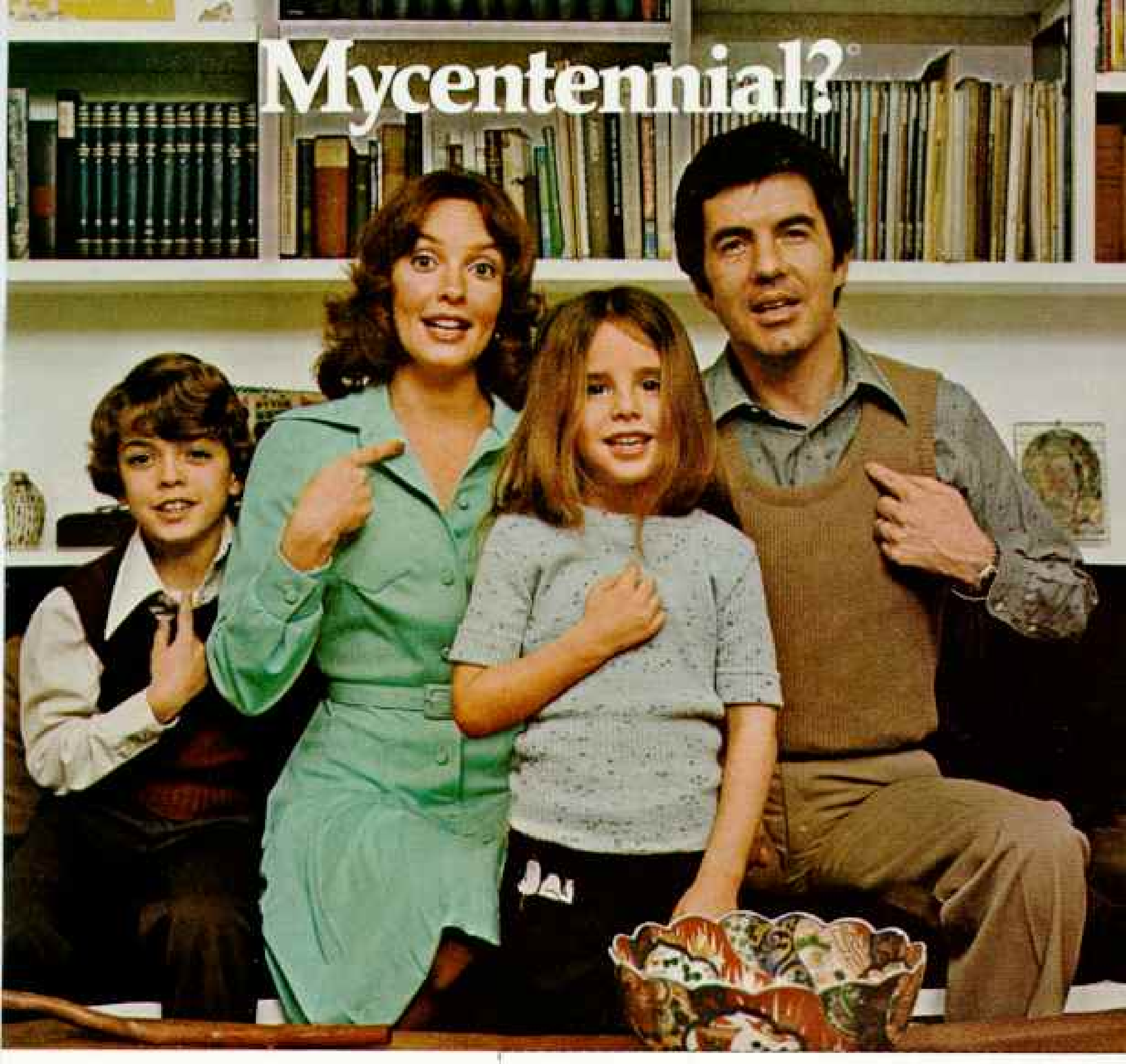

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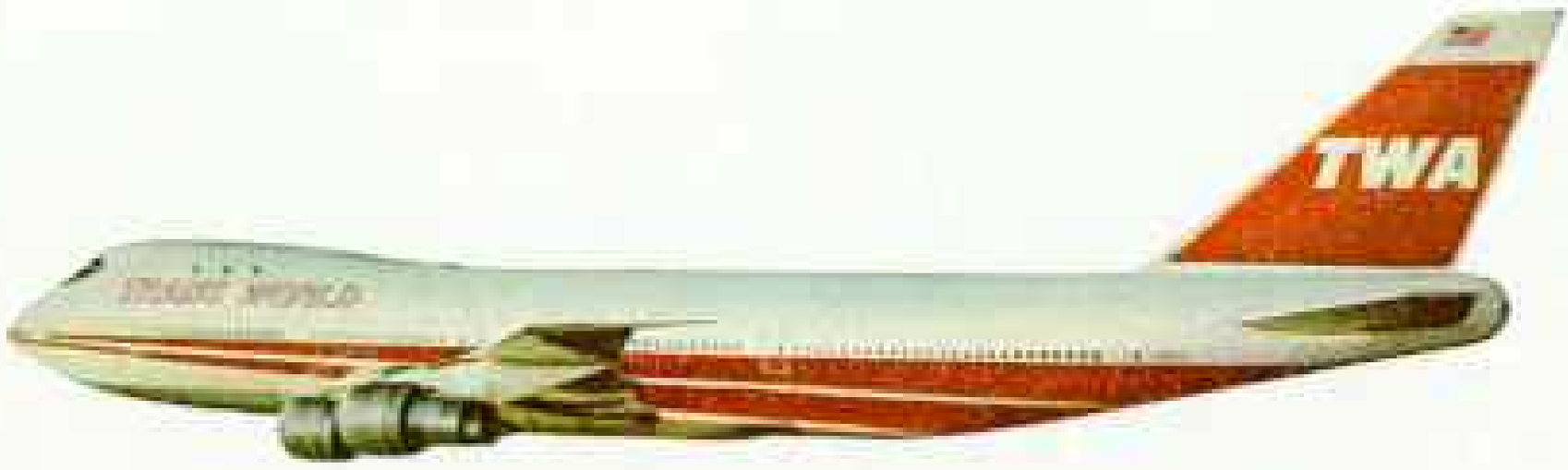

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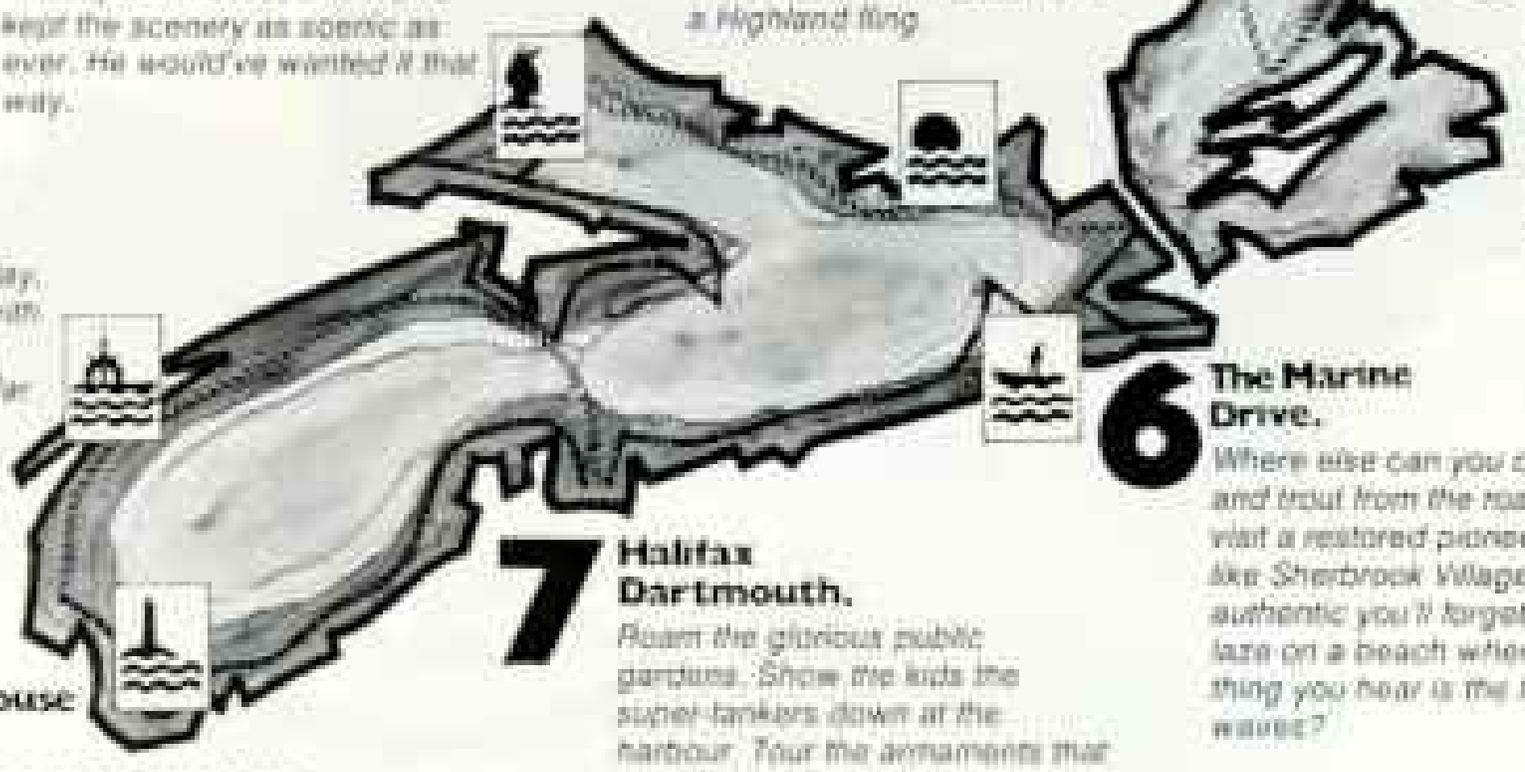

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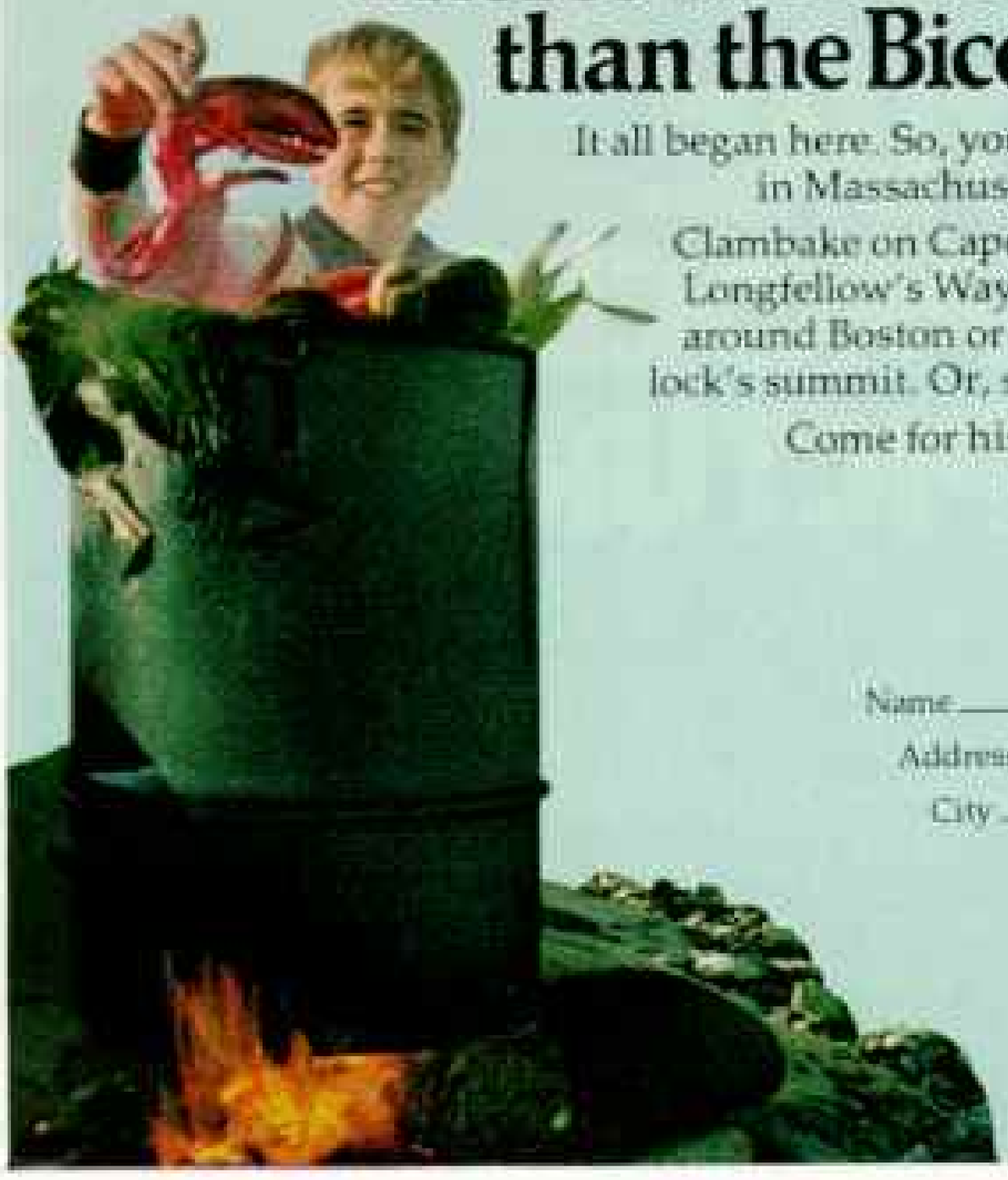

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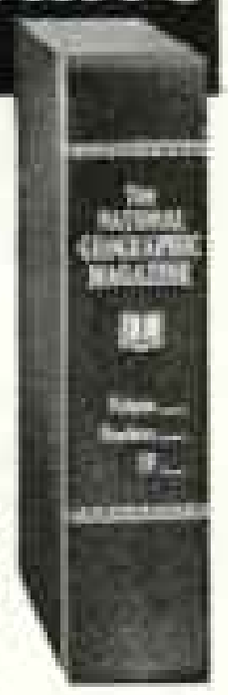

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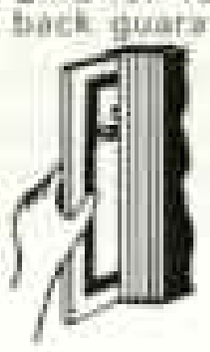

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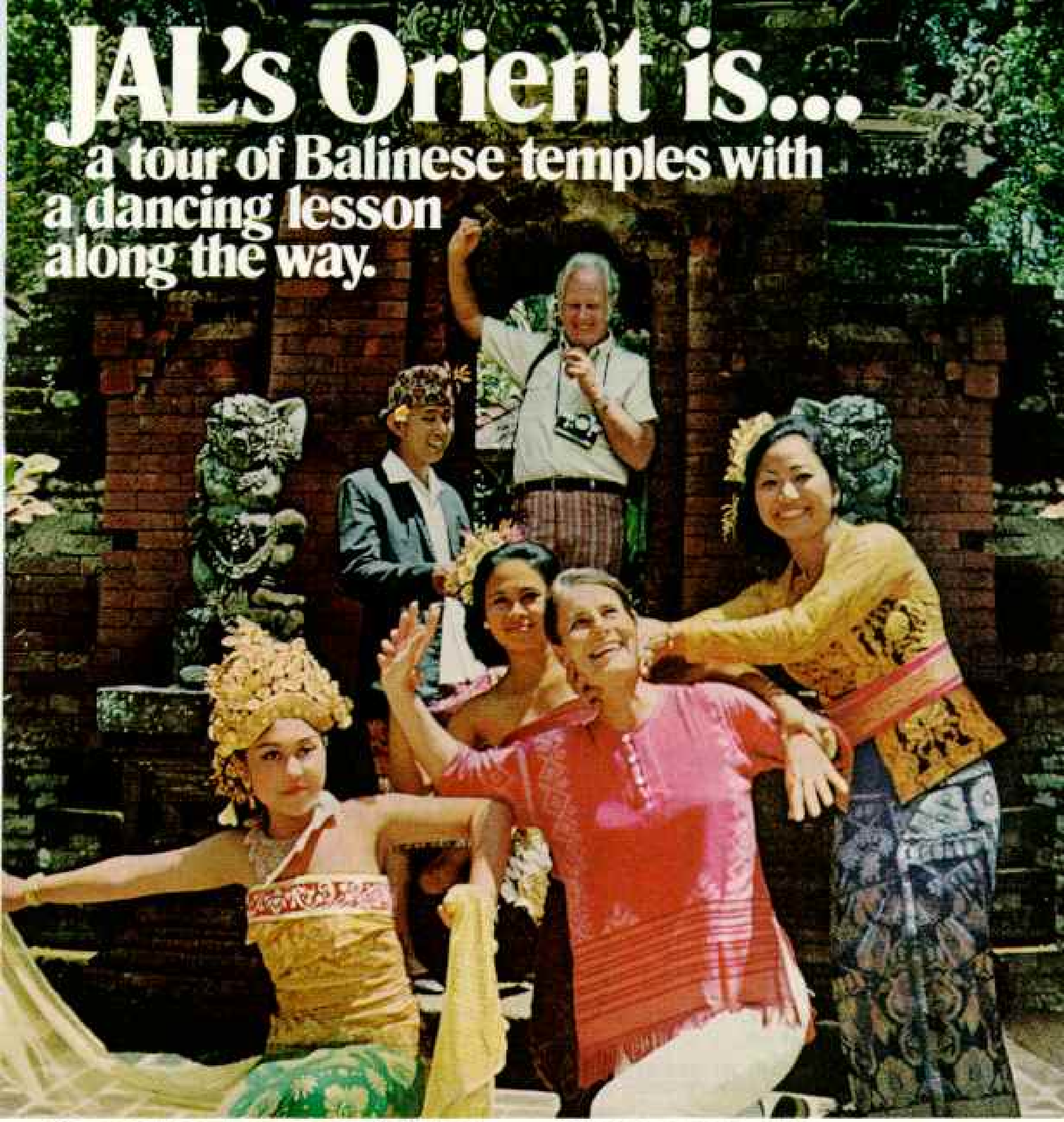

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