SPECIAL SUPPLEMENT: ARCHEOLOGICAL MAP OF MIDDLE AMERICA (page 520)

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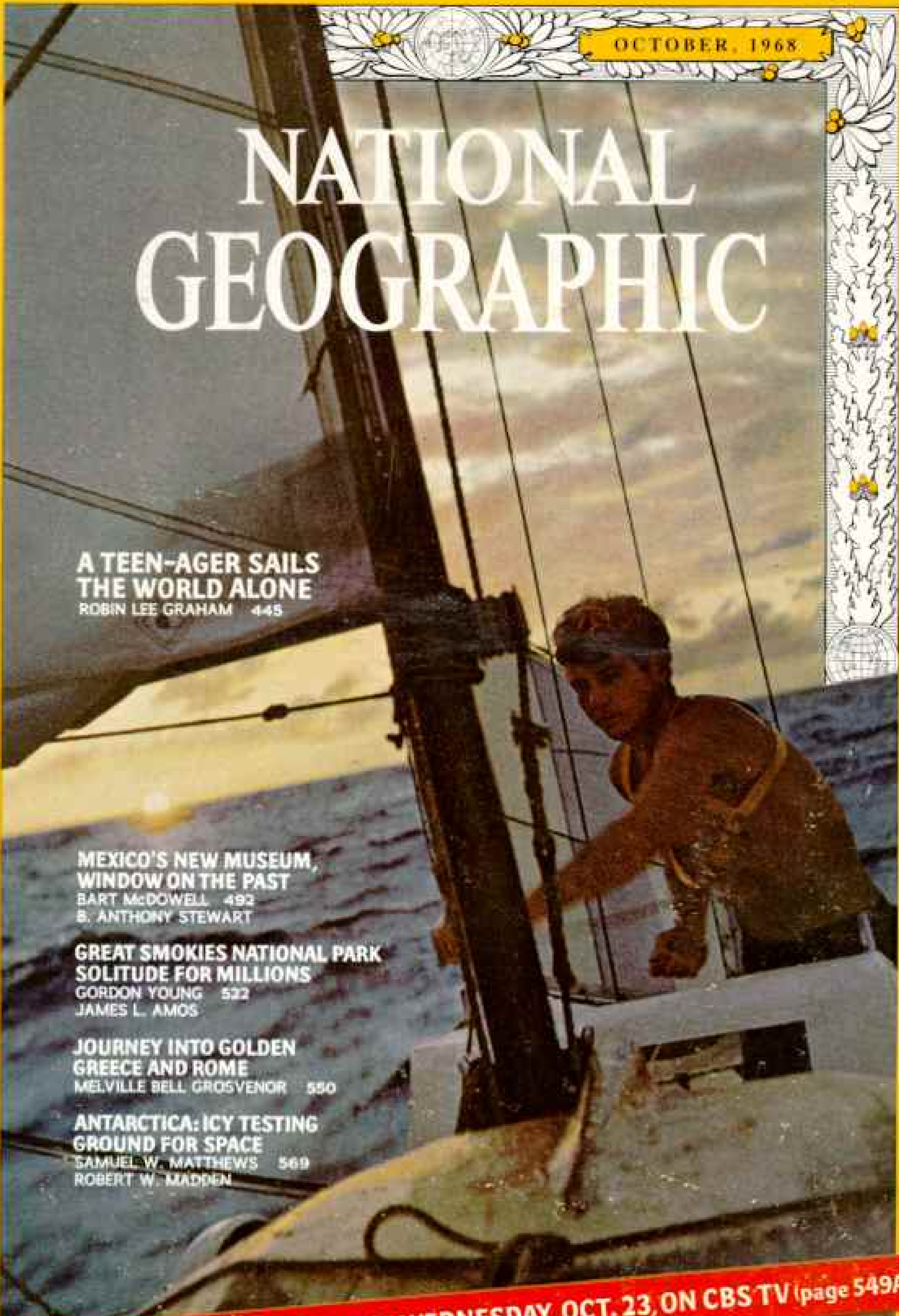

SEE "AMERICA'S WONDERLANDS" WEDNESDAY, OCT. 23, ON CBS TV (page 549A)

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A Teen-ager Sails the World Alone

Article and photographs by ROBIN LEE GRAHAM

WITH GENOA and mainsail rigged wing and wing, we sleigh-ride down into the deep trough of a trade-wind sea. Then *Dove* labors up the following crest, and down we plunge again, day after day, my boat and I.

I rely upon the usually predictable trade winds to carry me around the world. When they blow favorably, I feel exhilarated; when they don't, I wallow in my personal doldrums.

Into my recorder I tape just such a mood: *If this rate keeps up, I'm going to give up sailing. It's just miserable out here. I think this singlehanded sailing is for the birds. It's too lonely.*

Later I fuss: *Another thing I caught myself doing, that was really bugging me, is that I started answering myself.*

On a serene and empty sea, *Dove* ghosts beneath piled clouds off the Solomon Islands. EKTACHROME BY R. L. GRAHAM © N.G.S.

Honed and hardened by two years alone on the sea, Robin Lee Graham endures a nightmare brush with peril in the middle of the Indian Ocean.

Here anxiety haunts the face of the young sailor. His trial began in the dark of the previous night, when a storm roared down from the east. Reefing his sails to tiny handkerchiefs, he had lain down to uneasy sleep.

At 2 a.m. the sound of a crash jolted him awake. "Jumping up through the hatch, I saw black nothing where the mast and sails should have been." The mast had buckled and fallen overboard, trailing sails, lines, and boom.

In gale winds, he struggled frantically to haul the mast back on board. And in haste and excitement, he worked without his safety harness.

Suddenly the boat lurched. Somersaulting over the rail, Robin landed in the water. Quickly he pulled himself back aboard (painting, pages 484-5).

Robin set to work again. "With the mast down, *Dove* was out of control. The boat wallowed from gunwale to gunwale. It was 3:30 a.m. before I got my gear secure and went below to try to get some sleep.

"But I lay awake until the first rays of dawn, wondering what would happen next. Port Louis, Mauritius, was 2,300 miles off. I had never heard of a boat going that far under jury rig.

"Could I do it? I had no choice. I had to; turning back against the trade winds was impossible."

He stepped his boom as a mast and hoisted sail. In this self-portrait, snapped with a camera mounted aft and triggered by a string, he sails on under the makeshift rig.

Grins and gifts mark the beginning. At Los Angeles, California, a boyish Robin Lee Graham steps aboard *Dove* with an ice chest full of canned ham and chicken, cookies, nuts, candy. The next day, his 16th birthday only 4½ months past, he set sail for Hawaii in the light airs of July, 1965. His only companions—two female kittens, Joliette and Susette.

To be the youngest person to sail alone around the world was not Robin's goal at first. He loved to sail, respected the sea, and yearned for far landfalls over the western horizon in the South Seas. After a relatively easy sail of 2,230 nautical miles to Honolulu in 22½ days, it seemed to him natural, and entirely possible, to continue and circle the globe.

I'd ask a question, then I'd answer it. It's all right to talk to yourself, but when you start answering—that's bad.

During the two years that I have sailed singlehanded halfway around the world, I have weathered dismastings, hurricanes, a near collision with a freighter, and monotonous weeks slatting in the doldrums. But worst of all, I have tolerated the agony of loneliness. If only *Dove* could talk, we'd make a perfect team.

To Wander the World's Far Places

Why did I choose to sail around the world? Everyone asks me that the instant we meet. First of all, I want to see the world, and not on a tourist's itinerary with a passport stamped full of one-day visas. No, my passport must be imprinted with memories of landfalls where foreigners seldom set foot. Sailing my own boat to small, sparsely settled atolls or rarely visited snug harbors on the continents—that's what appeals to me. Not for just a day, but for months at a time, I planned to hole up among other peoples, eat their bread, and dance to their pipers.

And how did I get my parents' permission? That's the second question everyone asks. To answer that I must go back three years to the day I turned 16. That day I mustered the courage to confront my family with a dream:

"Mom and Dad," I announced in a firm voice that I hoped disguised a fear of certain rejection, "I'd like to have my own boat to cruise the South Pacific islands."

My father understood my wanderlust. As a boy he too had dreamed of a similar cruise, but World War II intervened. Now he would not deny me the opportunity that he had lost but never forgotten.

My practical mother, however, showed concern: What about school?

I would learn much more, I argued, seeing other lands and living with the people than by studying about them in books in a schoolroom in Hawaii.

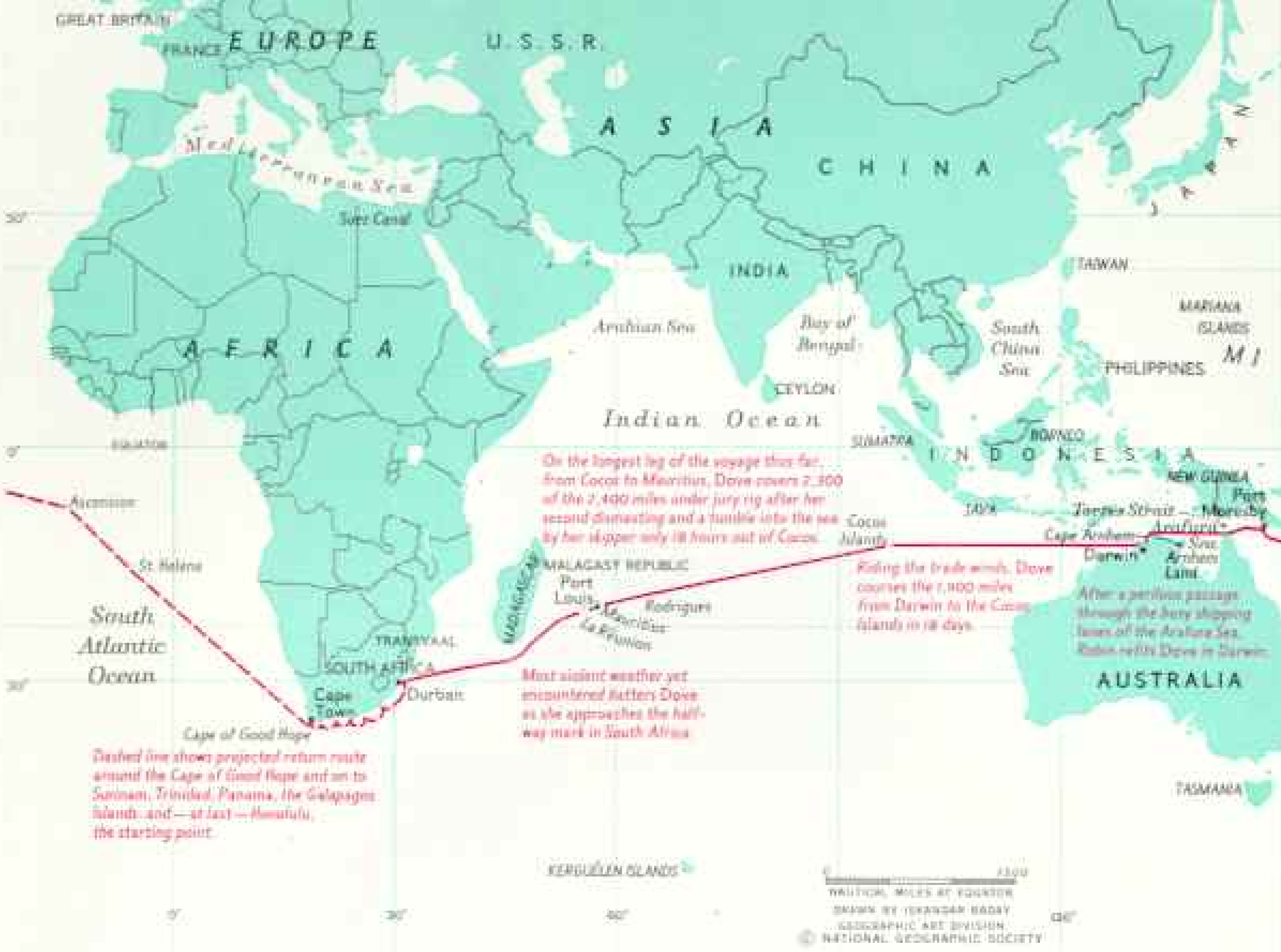
Before Mom could say no, I went on quickly. "Sailing is my life. I'm always happiest on the sea. And you know I can do it. After all, Dad taught me the ropes."

No one could dispute that! For 13 months in 1962 and 1963 the whole family—Mom, Dad, my older brother, and I—sailed our 36-foot ketch *Golden Hind* through the South Seas, calling at such exciting ports as Nuku Hiva, Papeete, Bora Bora, and Pago Pago.

On that voyage, when I was 13, Dad taught me to navigate by sun and stars with a sextant. From him I learned to anticipate the moods of wind and sea, to keep a shipshape boat, and to check and repair my gear constantly. But most of all, I gained a healthy respect for the sea.

To my utter joy, Mom did not say no!

When I won her approval, I had not yet decided to sail around the world, or to go alone. The more I planned, though, the farther west I wanted to sail, until finally it became just as practical to continue around the globe. Enthusiastically I charted my course. I'd sail the trades to Samoa and Fiji, slide down to Australia, cross the Indian Ocean, round South Africa, slant up the South Atlantic to the Caribbean, go through the Panama Canal, and ride home



to Honolulu on the Pacific's trade winds.

That was early in 1965. We started looking for a suitable boat. Soon, in California, Dad found *Dove*—a 24-foot fiberglass sloop—and was she a beaut! Just the right size, too. She carried an aluminum mast and boom, and although she was laid out below for day sailing, she did have reasonably strong hatches and portlights—strong enough, we decided, to withstand a steady pounding from heavy seas.

Two Kittens "Sign On" as Crew

All summer my energy, and Dad's too, went into outfitting *Dove*. Our spare time was consumed in poring over charts and books to learn the trade winds, ocean currents, and seasonal weather patterns that would determine my most favorable route.

For a shakedown cruise, I planned to sail from Los Angeles to Honolulu, where my family was then living. Looking about for crewmen my own age, I found many eager to join me, but none who could persuade their parents. I didn't want to go alone, so I took aboard a couple of kittens. With my guitar, we sailed the 2,230 nautical miles to Honolulu in 22½ days with ease. Once there, it seemed natural to continue my trip singlehanded.

Mother fretted, "But Robin, you're so young. Nobody your age has even skippered a boat around the world, much less sailed it alone."

I hadn't really thought about that aspect, but it didn't disturb me, or Dad. Against us both, she gave in.

Since I planned to end my circumnavigation in Hawaii, I consider that my true departure was Tuesday morning, September 14, 1965, when I shoved off at 11:00 a.m. from the dock at Honolulu's Ala Wai Harbor. Shouting final goodbyes to anxious family and waving well-wishers, I was on my way.

As the sea astern swallowed Oahu, I served supper to the ladies who had kept me company from the start—my kittens Joliette and Susette. They had been wound with leis, and Joliette wore hers for almost a day. The cats frolicked in the cozy cabin, heedless of the world of water around them.

The breezes at first were so light that they wouldn't move the self-trimming vane that controlled my steering with a small auxiliary rudder (opposite and page 456). Dad and I had designed and built this rig ourselves, and I was slightly disappointed that it did not operate perfectly right away. I was counting on it to be my constant helmsman.

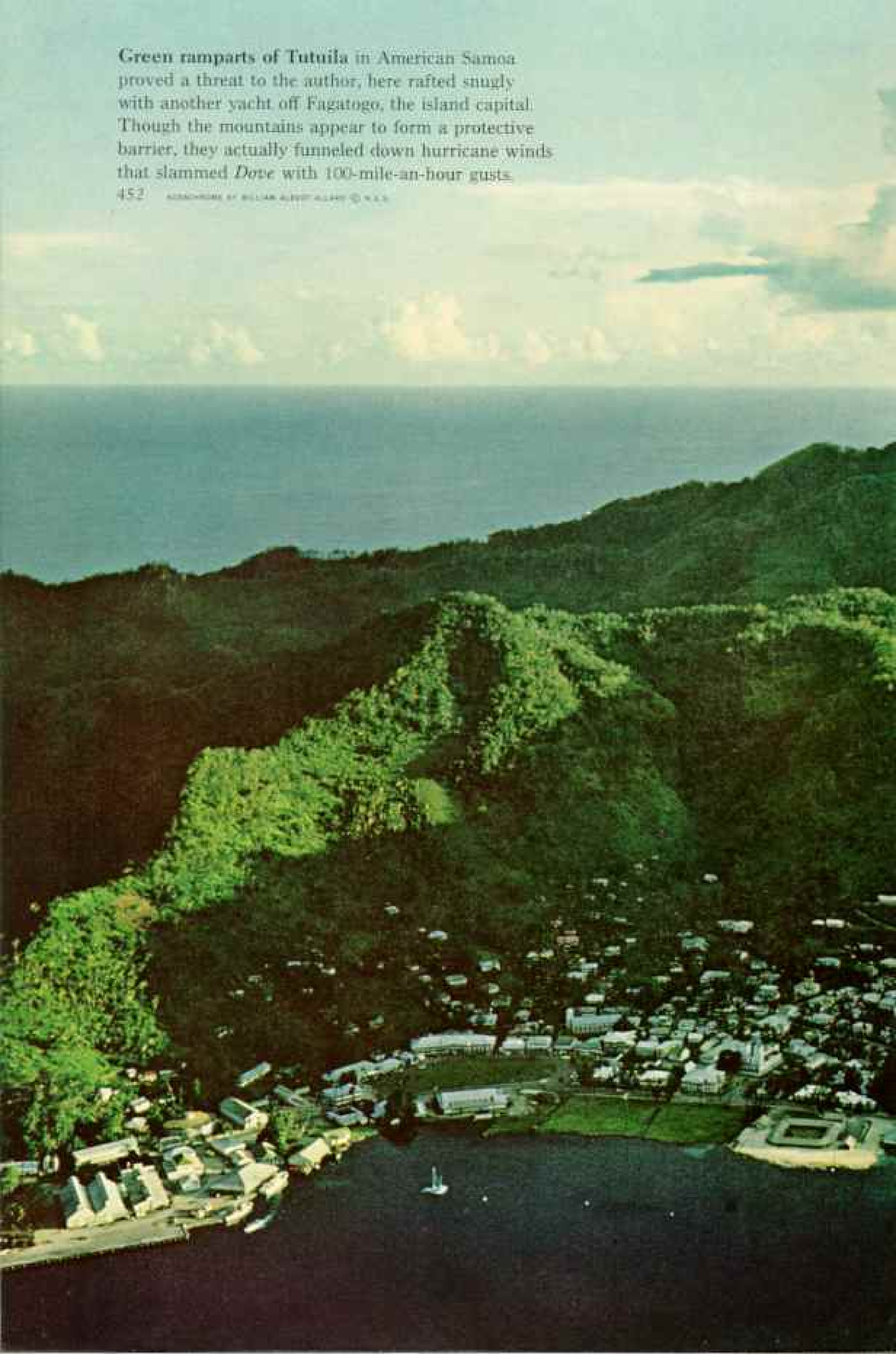

KODACHROME BY CHARLES ALLMON, NATIONAL GEOGRAPHIC STAFF © N.G.S.

A world to sail and only a 24-foot fiberglass sloop for the job. Robin's self-steering vane stands above the rudder; sails spread wing and wing to catch the wind. An outboard motor—rarely used—hangs idle at the stern.

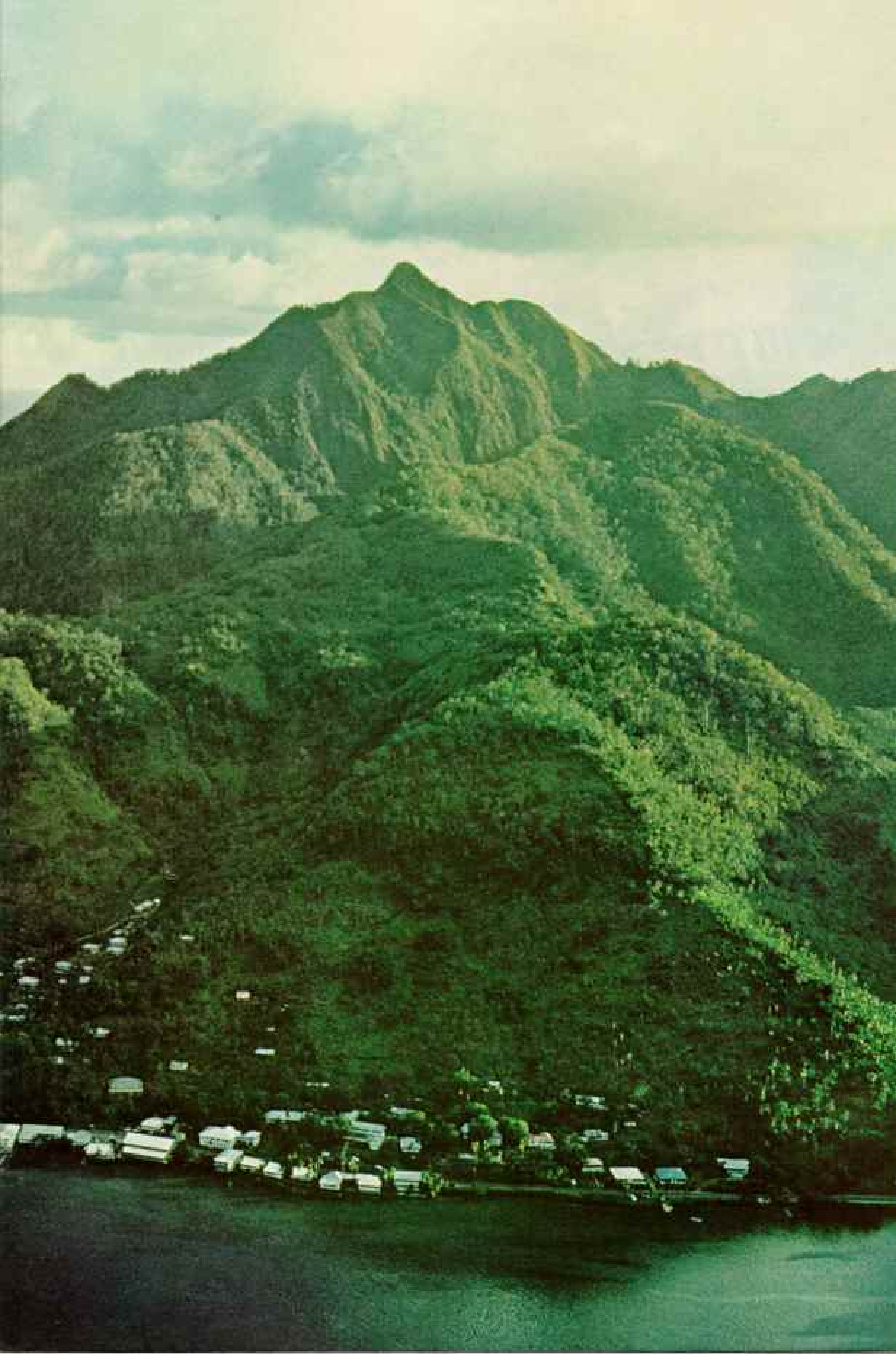
Robin was raised to sail. His father taught him to navigate by the stars and the sun. He yearned for the journey with a wanderlust that can come to any age, but is seldom fulfilled by one so young. Yet loneliness became his plague. He logged the symptoms:

"I'm going to give up sailing. . . . Oh, gee—this really makes me lonely . . . it's just no fun. But anyway, I've got the good old radio."

But sea and sky worked their spell, bringing priceless compensations. "It was really beautiful last night, red sunset—fantastic . . . the gods are awful kind to me."



Green ramparts of Tutuila in American Samoa proved a threat to the author, here rafted snugly with another yacht off Fagatogo, the island capital. Though the mountains appear to form a protective barrier, they actually funneled down hurricane winds that slammed *Dove* with 100-mile-an-hour gusts.



Besides this steering device, I had few mechanical aids. *Dove* was equipped with a small inboard engine as well as an outboard motor, but neither was much use against high winds or seas. I had no ship-to-shore radio, though I did have a small battery-powered transistor receiver, on which I could—near shore—hear news and weather. Eventually I also acquired a "Gibson Girl"—a World War II emergency transmitter, shaped like an hourglass, that broadcasts an SOS when you crank it. I had an ice chest, but, except in port, never any ice. I had fishing line, mainly for trolling, and a .22-caliber pistol.

Target: Fanning, 1,050 Sea Miles Away

As it turned out, one of the things I used and enjoyed most was my tape recorder. On it I dictated notes and records, messages to my family, moods and impressions. On lonely days it gave me the feeling—almost—that I had someone to talk to. Whenever I touched a big enough port, I mailed tapes home.

My first landfall, the low coral atoll of Fanning Island, lay 1,050 miles almost due south (map, page 451). But Fanning is only 12 square miles. Not much of a target!

The northeast trades pushed me along. For a week I was very sad and lonely—homesickness, I suppose. Always the initial few days at sea are depressing, until I gain my sea legs and adjust to the routine of life aboard *Dove*. Sailing alone deprives me of the luxury of sleeping uninterrupted for more than a few hours. Even in sleep, I sense shifts in wind or sea conditions, and any change in *Dove*'s motion invariably awakens me.

Although I never fancied myself as a pilgrim, I enjoyed sailing sea lanes blazed by great voyagers—Ferdinand Magellan, James Cook, William Bligh. But most I thought of New Englander Joshua Slocum, who, in 1895-98, was first to sail around the world alone.

At sea I would confront some dangers that, among these men, only Slocum had faced. Foremost, the lone voyager dreads being

KODACHROMES BY WILLIAM ALBERT ALLARD (BELOW) AND ROBIN LEE GRAHAM © N.G.S.

"Going full blast," Robin reported of the horses pounding down the track at Apia in Western Samoa. The races, first he had ever seen, drew a grandstand full of wagerers—but Robin risked none of his meager cash, only about $75 when he left Hawaii.

Hurricane-wrecked home still shelters two smiling youngsters at Tula on Tutuila. Visiting the village, half destroyed by the storm that *Dove* endured, Robin marveled at the spirit of the islanders.

"In any other place, people would be going around wearing grim faces, sad, feeling sorry for themselves," he said. "But these folks were happy." With a thatched *fale* easy to rebuild, everyone fell gaily to work.

Invited to the home of Mrs. Fa'ava Pritchard (right), Robin found himself dining before 30 interested neighbors. Leaving the village, he kisses his hostess goodbye.

washed overboard. At sea I always wear a lifeline. Normally one end is tethered to a ring on *Dove's* boom, the other fastened to a yellow nylon harness that I try never to take off, even in my bunk (left).

Like Slocum I lived with loneliness. A few days out of Honolulu I taped: *It gets very lonely out here at times. . . . I sure talk an awful lot. Of course, there is nobody else to talk to but this recorder.*

Small things, though, can highlight a day at sea. Next entry, same day: *There's a school of porpoises all around the ship. I can hear their squeaks. It's amazing how loud they talk. I guess I can hear it so well because my hull is so thin. I wonder if they are trying to talk to me? Maybe one porpoise hit the keel, because I heard a thumping and she was squeaking real loud. It was nerve-racking but exciting. It has been so long since I heard any voice—almost as though someone was answering me.*

After 14 days at sea I raised the palm trees of British-owned Fanning Island, a former cable station in the Line Islands. A boat appeared to escort me into the lagoon, and at the wharf I met the pilot, Philip Palmer. The only European on Fanning, he supervises 300

"I'm amazed at my navigation . . . how beautifully it's working out." Here, in his safety harness which he always tries to wear at sea, Robin calculates his position. Bobbing about on ocean swells, *Dove* provides a precarious platform for taking sextant sights (below). Yet aiming for tiny islands, sometimes thousands of miles away, he made perfect landfalls every time.

Wind vane, designed by Robin and his father, moves a small trim rudder which keeps *Dove* on course. This "automatic pilot" steers the boat most of the time, the vane's counterweight (red) always pointing into the wind. With *Dove* on course (Fig. 1), Robin locks the vane on its shaft. Gears then engage the trim-rudder shaft. When waves knock *Dove* off course (Fig. 2), the trim rudder moves in the opposite direction, turning *Dove* back to its proper course (Fig. 3).

workers, brought in from the Gilbert Islands to harvest copra for the Burns Philp Company, Ltd. Entire families agree to a contract for one to three years; then they are returned to their home islands.

Driving around at dusk in a Volkswagen, we frequently crunched beneath our wheels some of the large land crabs that crawl by the thousands over Fanning. I watched natives net fish in brackish ponds, the catch providing important protein for their diet. I hopped across ditches dug by United States forces in World War II to keep Japanese planes from landing there.

Returning after dark, we saw a gruesome scene in our headlights. Hordes of crabs were cannibalizing their less fortunate relatives we had earlier squashed. Mr. Palmer assured me that Fanning's crabs are edible, but my fondness for crab meat had vanished.

Mr. Palmer's housekeeper, Marybelle, was caring for a small boy. I gave him two T-shirts from my supply of 500 articles of good used clothing that I carried on *Dove* to present as gifts and to trade for necessities. Since my cash reserves were (to understate things) small, I hoped to make up for my shortness of cash by trading.

As I left, Mr. Palmer gave me fishing gear, food, and a model canoe. He also entrusted to me a sack of Her Majesty's mail to carry to Pago Pago (pronounced Pongo Pongo), on the island of Tutuila in American Samoa.

Shark Gulps a Metallic Meal

I left Fanning only 20 cents poorer than when I arrived. I hadn't spent that 20 cents, but lost it while gyrating to the drumbeats of an islanders' dance.

One dead-calm morning on my way to Samoa, a shark gobbled up my taffrail-log spinner, trailing 25 feet astern. Afterward, the beast swam along close behind. I dropped some canned tuna into the water. The shark gulped it down. I grabbed my .22 pistol and shot the creature in the head. He splashed, then sank slowly into the deep blue ocean.

While I dislike all sharks, this one really annoyed me. Without the log, which measures sea miles along my track, I would have to guess the distance made good each day.

Skipper shinnies aloft to change film in a camera mounted on the masthead. Running wing and wing before a fair breeze, Robin sets his mainsail to starboard; a whisker pole steadies the striped genoa jib to port.

KODACHROME BY CHARLES ALLMON © N.G.S.

The wind blows from every direction, I complained to my tape recorder. *I've never had it blow the way it's supposed to. The wind is really messed up—it's not supposed to do this—it's just not in the books.*

The following day, 15 days out of Fanning, my monotony vanished. On tape I exclaim: *I see it, I see it! It's right there, kind of a dome-shaped thing, but it's land! It's all rainy looking.* I had sighted Tutuila, chief island of American Samoa.

Finding a Distant Speck of Land

Right off, let me mention that the greatest thrill of open-ocean sailing is making a landfall. In theory, navigation is simple. First, with a sextant, I measure the altitude of the sun or stars above the horizon, mark the time precisely to the second, consult the nautical tables, then work out my position mathematically (page 456).

Yet in practice so many things could go wrong! A jarred sextant might give a false altitude, a faulty chronometer an incorrect time, or a slight arithmetical error could place me miles from my true position. Even a small error could be disastrous if I sailed past a tiny island into the vastness of an empty ocean. Many a mariner must have perished that way.

At noon on October 19, with Tutuila lying about 20 miles away, a sudden squall hit me. Within less than a heartbeat, my mast buckled and flopped overboard, carrying mainsail and genoa jib with it. The lower shrouds—the wire must have been fatigued—had parted.

After struggling more than two weeks to reach Pago Pago, I was so frustrated that I felt like crying. But I had too much to do.

Securing my safety line, I hauled the sopping sails aboard, pulled the mast on deck, and lashed it down. Then I erected the boom for a mast and set the mainsail as a jury rig. I

Friends in the Friendly Isles flank Robin on Tongatapu. Clad in black shirt, black skirt, and *ta'ovala*, a mat of plaited grass worn around the waist, the author attends the *kilikili* ceremony that marked the end of six months of mourning for Queen Sālote Tupou III. The monarch ruled Tonga for 47 years until her death in 1965.

During the solemn three-day rite, elders of the kingdom spread fine mats and tapa cloths near the tomb. Atop them, the men set black volcanic stones, gleaned from Tofua Island, 100 miles north, and anointed them with coconut oil. Finally, the shining stones were placed carefully on the grave. Behind Robin, bright ribbons and flowers entwine the fence surrounding the royal burial ground at Nuku'alofa, capital of Tonga.

Powered by waves, natural fountains leap through coral blowholes along the coast of Tongatapu.

hoisted a brilliant orange distress flag and even lit two flares, hoping to attract the attention of a plane that passed overhead, but apparently the pilot did not see them.

I wasn't very scared, but I did realize that if the wind shifted I could be in trouble. With this rig I could not sail to windward.

I had intended to round the east tip of Tutuila (map, page 451) and come into Pago Pago. But now I could see that the strong southeast breeze was going to blow me right past Tutuila. My engine wasn't powerful enough to counter the wind. So I set course downwind for Apia, on the island of Upolu in Western Samoa.*

Crippled *Dove* Makes a Safe Landfall

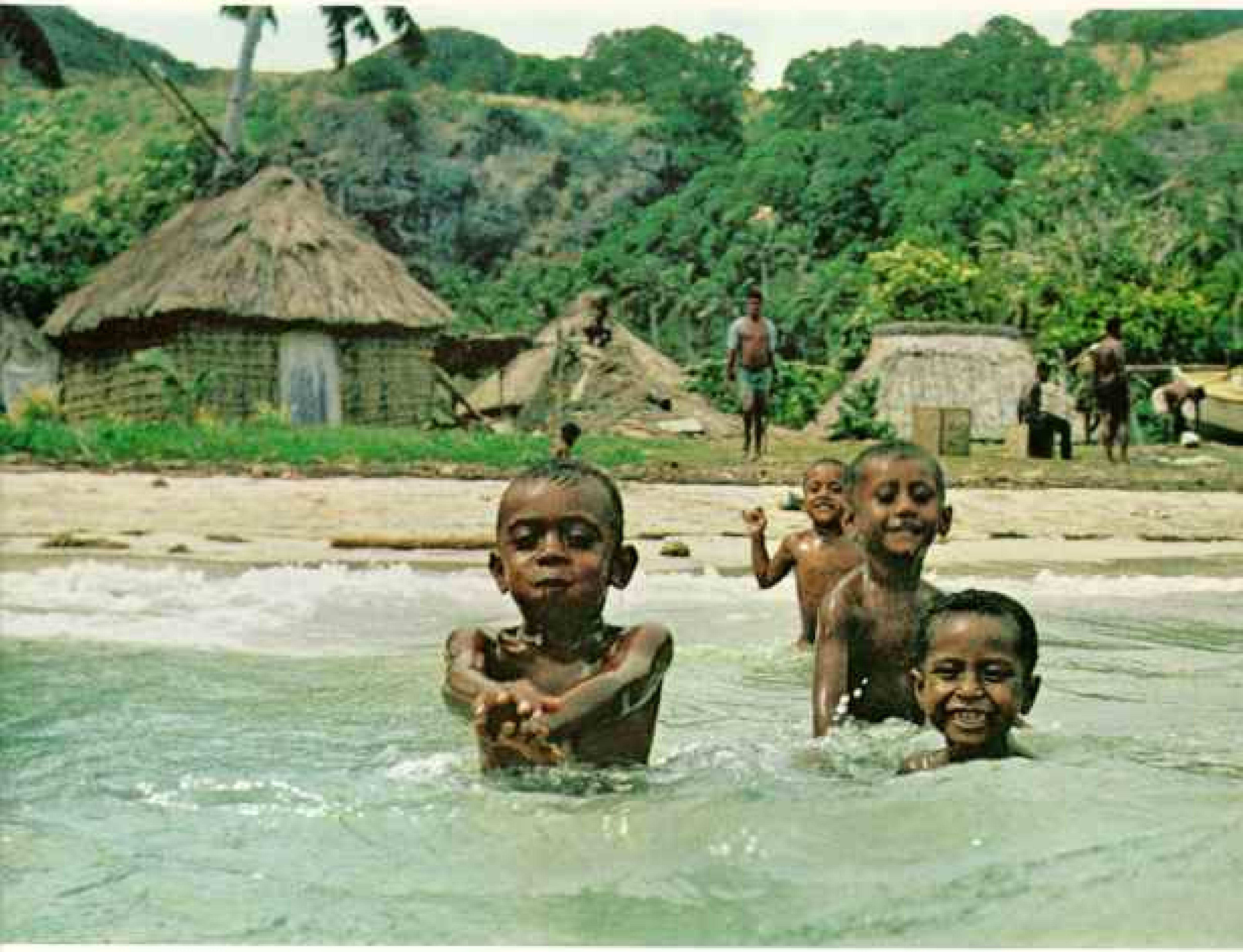
About 3:00 a.m. I spotted a light on Upolu. This afforded me little comfort, because the wind was driving me dangerously close to the rocks. All sailors fear a lee shore, and under my clumsy shortened sail I could never beat back to the open sea.

Fortunately a wind shift allowed me to skin past this nasty point of land. By daylight I was passing sandy beaches. Streams cascaded out of the hills. A church stood stark white amid green palm trees. Believe me, I welcomed the opportunity to duck into port.

The friendliness of people in Apia made me forget my woes. I met Aggie Grey, the part-Samoan proprietor of Aggie's Hotel.

"I know you," she said. "I read an article

*See "Western Samoa, the Pacific's Newest Nation," by Maurice Shadbolt, GEOGRAPHIC, October, 1962.



about Robin Lee Graham, 'schoolboy sailor.' "

For two weeks I didn't eat a meal on *Dove*. Aggie Grey, New Zealanders, Americans, and Samoans invited me to dinner every night. Alan Grey, Aggie's son, helped me try to fix the mast, but we got nowhere. Then he introduced me to Sam Heywood, principal of the local technical school. At the school Mr. Heywood welded the jagged ends of the broken mast, then jammed a hardwood core up the hollow mast to the weld. I rigged and stepped the spar, and *Dove* was seaworthy again.

Only one thing was omitted. There is a sailors' superstition that you must always place a coin as a good-luck piece under the mast when you step it. I overlooked this ritual, a failure I would later regret.

Life was lazy in Apia. Aggie, on the patio of her hotel, regularly staged Samoan dances for tourist visitors. The shimmering, shivering grass skirts—actually they're made from bark strips—kept me interested, but not so much as the feasts that followed.

To prepare such a feast, Aggie first built a fire of coconut shells and sticks in her *umu*, a rock-lined oven on the ground. Then more rocks were thrown on the blaze so that they, too, would heat up. Young pigs, fowl, fish, yams, and taro, basted with coconut milk and wrapped in banana leaves, were then placed in the umu. Covered with very hot rocks and more banana leaves, the food was allowed to bake for a couple of hours.

Spread out on a long buffet table, the hot delicacies were supplemented by coconut milk, melons, mangoes, bananas, and papayas. Piling my plate high, I missed very few dishes. To me, no food surpasses Samoan!

"Home Is the Sailor. . . ."

Western Samoa's main exports are copra, cacao, and bananas. Steep hills rise above the plantations, and on one of the summits lies the carefully tended tomb of Robert Louis Stevenson. Stevenson's fondness for the Samoans led him to live among them during his

Half-pint Fijians splash out to welcome *Dove*'s skipper. Sailing through the immense Fiji archipelago that flecks 100,000 square miles of the Pacific, Robin followed in the wake of Capt. William Bligh, set adrift in an open boat by the mutinous crew of the *Bounty*. But where Robin met openhanded hospitality, Bligh's oarsmen pulled for their lives in 1789 to outrun two war canoes of Fiji cannibals. "Being apprehensive of their intentions we rowed with some Anxiety," Bligh recorded in his log.

When Robin arrived, the village chief invited him to join the elders in a kava ceremony at Yalombi on the island of Waya (chart, next page).

twilight years, until his death in 1894. The climb was steep up Mount Vaea, but I found ample reward in reading the epitaph which R.L.S. wrote himself. Inscribed in Samoan on one side of the stone, in English on the other, the words have a haunting beauty:

HERE HE LIES WHERE HE LONGED TO BE
HOME IS THE SAILOR, HOME FROM THE SEA
AND THE HUNTER HOME FROM THE HILL

Christmas week in Western Samoa locks everything up tight. On December 23, the last day the post office was open, I received a box from home containing candy, cat food, and clothing. My Gibson Girl radio transmitter also arrived, as well as new shrouds, a plastic sextant, a watch, eight recording tapes, and a new taffrail-log spinner to replace the one eaten by the shark.

By the shank end of January, I was in Pago Pago. Fitful and uneasy weather had come to American Samoa. I decided to lie over until mid-April, when the hurricane season would be past—a wise decision, as it turned out.

Early on Saturday afternoon, January 29, a man rowed past *Dove* shouting, "You'd better batten down. A hurricane's heading our way." A visit to the Coast Guard station confirmed the threat. I took down my awning, unlashed my self-steering vane, and put out additional mooring lines.

By early evening the wind came gusty, then blew harder and harder. I taped what I saw and felt during the storm:

Barometer's dropping fast—down from 29.70 to 29.20 inches. Gusts over 70 are flinging salt spray through the air like snow. The boat's swinging wildly and rolling from gunwale to gunwale. Never been in a wind this strong before. Hold on! Here we go! That one dipped the gunwale under.

(Later) *It's 2:30 in the morning now. On the radio we heard that the airport has gusts up to 104 miles an hour. Jud Croft, a young American working in Pago, is with me. The boat—I can't believe it!—all of a sudden a* *gust will pick the boat up and tip it over. No sails, just bare poles. The sea pours in over the cockpit coaming.*

Oh, my—this is exciting. The ports have just gone under. Boy, my ears are popping. This is really swinging.

Dove came through unscathed, but ashore homes had taken a beating. Island chiefs and officials of the territorial government hurried about assessing the disaster.

With cameras slung over our shoulders, Jud and I rode buses and hitchhiked to the village of Tula at the eastern tip of Tutuila. Storm damage was terrific, and the islanders' houses and gardens had suffered greatly. Fallen banana plants and palms lay everywhere. Roofs had taken wing and crashed in splinters. About half the village of Tula had blown away.

Happily, Samoan houses are lightly built and inexpensive to replace. Stakes in a stone or coral floor support thatched roofs. Siding of woven coconut fronds pulls up or lets down like Venetian blinds.

We joined the communal cleaning-up. Then a gracious Polynesian lady, Mrs. Fa'ava Pritchard (page 455), insisted we have dinner and spend the night with her family in their European-style home—concrete-block walls with window holes but no windows, door frames but no doors.

When I told the Pritchards that the name of my boat was *Dove*, Fa'ava at once spoke up, saying, "We think you also are a flying dove, *lupe lele* in our language, and we will call you that." Thus I acquired my first island name.

KODACHROME (RIGHT) BY ROBIN LEE GRAHAM © N.G.S.

Robin's log maps Bligh Water, a dangerous and still only partly charted area named for the British captain of *Bounty*. Heading into Fiji's Yasawa Group on August 25, 1966, Robin reports: "I left Vomo, 0930. Had a very nice sail (east wind). Arrived Waia [Waya] Lailai, 1300 [1 p.m.]; 6,411 miles"—the distance he had sailed from California. At Durban, South Africa, end of this article, his log read 16,612 nautical miles.

Pounding war clubs and chanting battle cries, Fijian dancers in tapa skirts and leaf anklets perform on Kambara Island. Women beat tubular drums.

To radio music after dinner an old grandmother, face wrinkled like a raisin, began to dance the twist. "Come on, boy," she yelled at me. "*You* can dance!"

I did my best, but she out-twisted me.

When I sailed from Pago Pago on May 1, 1966, Joliette was my sole companion; fickle Susette had found herself a boy friend and jumped ship.

After so many months on the beach, I did not mind the gales and heavy seas riding down to Tonga. Then the weather moderated, and with the wind gone I strummed my guitar and sang the ballad "Henry Martyn" across the moonlit sea. I have to admit the song ends on a pretty gloomy note:

> For all the brave lives of the mariners lost,
> That are sunk in the watery main.

On the afternoon of May 4, I sighted islands of the Vava'u Group and sailed into Neiafu's harbor next morning. Scores of inter-island sailing vessels lay in port, enough masts and

Exploring back country of Viti Levu—Great Fiji—the author and the crew of another world-wandering yacht discover a sere land, eroded and brown in contrast to the lush green of the island's southeast slopes. Mrs. Louise Meyers and her son Charles ride bony mounts; another friend, Tom Thurston, follows on foot. The group passed through village after village where they were invited to join in kava ceremonies.

Small army enlists to fill Robin's water bottles on Naviti Island, in the Yasawa Group. With these bottles and *Dove*'s tanks, Robin could put to sea carrying 40 gallons of water.

Soaking clothes in a jungle pool, Robin does his laundry native-style.

KODACHROMES BY ROBIN LEE GRAHAM © N.G.S.

furled canvas to suggest the busy 18th-century days of sail.

An old man greeted me when I stepped ashore, insisting that I go with him to meet the chief, Mr. K. H. Kaho. Chief Kaho, a huge man in shorts and sport shirt, manages Vava'u's copra operation. He drove me by truck through the coconut plantations of this beautiful island. In Neiafu I bartered a few items of my used clothing for necklaces made of cowrie shells and of red and gray seeds so glossy they seemed enameled. I bargained also for native tapa cloth, with its geometric patterns in brown and black.

In mid-May I took *Dove* out of Neiafu for a few days of water-gypsying among the scores of islets and coral reefs of the southern part of the Vava'u Group. Calm weather had settled on the archipelago, and I often had to use the engine or the outboard motor.

EKTACHROME BY CHARLES ALLMON © N.G.S.

The easy way aboard ship—a lunch of bread and salami. Eating became a matter of necessity, rarely a pleasure. Off New Guinea, Robin logged: "Last night I fixed a real nice dinner of potatoes and cabbage and canned roast beef. That was a real feed. But it's no fun eating good food like that when you're by yourself. I could have had a sandwich and I'd have felt just the same."

Few people live on these islands. Villages are tiny—little more than fishermen's rests. I spent as much time looking downward as out and around. Glass-clear waters were windows on the world of clean white sands, multicolored fishes, scurrying crabs, and swaying coral fronds. I dived for little round shells with markings like cats' eyes. Steamed, the tender meat they contained was delicious.

Tongans Give Robin a Salty Name

At Nuku'alofa, in the Tongatapu Group, I met a local chief, Kalaniuvalu, who bestowed on me my second native name—*Kai Vai*, which means "eat water."

"In the old days," he told me, "certain men had the honor of sitting in the bows of our war canoes to protect the king from spray. Such a man had the title Kai Vai."

I stayed in Nuku'alofa until mid-June to witness a rare Tongan ceremony. This was the laying of the black stones, or *kilikili*, on the grave of the late Queen Sālote Tupou III, who ruled Tonga for 47 years. The ceremony took place on June 15, 1966, six months to the day after her death and a little more than a year before the new king would be crowned.*

To attend the ritual at the queen's grave in the palace grounds in Nuku'alofa, I donned a mourning costume of all-black shirt and lava-lava (page 459). Each person present wore a *ta'ovala*, a woven mat bound tightly around the waist.

A group of men positioned themselves beside the queen's grave, sitting on fine pandanus mats overlaid with superb tapa cloths. The mats and tapas were casualties of the occasion as the men poured coconut oil over thousands of smooth-worn black stones which lay piled on the cloth.

These symbolic volcanic stones had been gathered on the island of Tofua, 100 miles away. They were laid one by one, carefully and deliberately, on the queen's grave. Three days would pass before they all were placed to mark and protect the grave forever.

While sailing through the Vava'u Group in northern Tonga, I had hailed the round-the-world yacht *Kelea*, from Vancouver. Now at Nuku'alofa other circumnavigating boats

*See "South Seas' Tonga Hails a King," by Melville Bell Grosvenor, NATIONAL GEOGRAPHIC, March, 1968.

What do you do all day, alone on the ocean? Mostly navigate and check the rigging. But there are moments to spare to take pictures and clown a bit, using a piece of rope for a mustache (right). Anchored offshore, Robin constantly repairs his gear, like stitching up his companionway spray shield (below). A cat provides company of a sort, but it can't talk back. And Avanga was not always cheerful. "He just sits around," Robin noted, "or tries to attack me. But he's not seasick or anything—sometimes he even gets around and plays." Avanga replaced the two kittens that began the voyage with Robin. One jumped ship, and the other was killed by a truck.

KODACHROME (BELOW) BY CHARLES ALLMON; EKTACHROME (RIGHT) AND KODACHROME BY ROBIN LEE GRAHAM © N.G.S.

"I wonder if they are trying to talk to me?" Robin asked himself of the porpoises playing about his boat. "It's amazing how loud they talk. It has been so long since I heard any voice—almost as though someone was answering me."

showed up—*Corsair II* from South Africa, *Morea* from California, and *Falcon* from New Zealand. More and more I came to see myself as one in a company, the never-ending procession of ocean sailors who stitch the continents together with their vagrant tracks.

I crossed paths with *Corsair* and *Morea* again at Fulanga, a lonely atoll hung like a pendant from the long necklace of Fiji's Lau Group. In a lovely little cove of the Fulanga lagoon, I spotted the two yachts and dropped anchor next to them. Beyond white sands stood thatched houses of a simple village, where I traded ballpoint pens for kava bowls, nautilus shells, and fantastic masks.

We left Fulanga together, and at once smashed into some of the heaviest seas the Pacific had thrown at me. I decided to fall off into the lee of Kambara Island and await quieter weather. First I would alert the other boats.

Morea had pulled far ahead, and even *Corsair* was out of shouting range. I waved, gesturing to signal my intention. Stanley (Jeff) Jeffrey, *Corsair*'s skipper, waved back happily and pulled away. I knew he hadn't understood.

The upshot I learned later. *Corsair* reached Suva, and when two days passed without *Dove* arriving, Jeff asked Suva to broadcast an alert to look for me as a missing yacht. They thought I might have piled up on a reef.

Meanwhile, at the little village of Naikeleyaga on Kambara, I was attending a dance that made my blood beat. It was staged to raise funds for the local missionary church, but the hard rhythm, the staccato finger drumming, the swishing tapa skirts and leaf anklets of the male dancers, the battle cries and thumping war clubs created an effect that was savage (pages 462-3).

U. S. Consul to the Rescue

Sailing on to Suva, I raised Viti Levu, Fiji's chief island, at dusk on July 1. I entered the harbor in darkness. Viti Levu is mountainous, and here, as on the approach to many islands, the daytime range markers are often lost against the hills. Where ports have range lights, it's easier to come in at night. Suva showed two red lights that I could see miles away, and a big white flasher on a reef.

In port, the official greeting chilled me: "Before we can stamp your passport and permit you to stay in Fiji, we require a bond of $100 or your airline ticket home," announced the immigration officer.

My cash totaled $23.43. Of course I had no air ticket. The American Consul resolved my plight, guaranteeing that the U. S. Government would grubstake me if I became stranded.

While I worked on my boat, I was a goldfish in a bowl to tourists who drifted down to the pier. "You sailed that little teacup from California?" Unbelieving headshakes. "You're sailing alone? You must be crazy."

"Around the world? You'll never make it."

I found Suva, like Fiji as a whole, identified still with the spirit and traditions of old England. Cricket, tea, starched white clothing—the pride and proprieties of empire still linger among both the white islanders and the prosperous level of Fijian society.*

Globe-girdling Sailors Take to the Hills

In Korolevu, near Suva, I bumped into an American sailboat skipper, Mrs. Louise Meyers, whom I had known in Hawaii. We made up a party for a hiking and horseback traverse of Viti Levu. With two guides, we were seven. Of the three scrawny horses, one had to be pack animal. So some of us always were walking, a mode of progress I for one preferred, since our only saddles were folded sleeping bags—and were those mounts bony!

We wound amid dry, grassy mountains (pages 464-5). In a big house in one village, we watched a native dance. Four bare-chested men in skirts, draped with beads, sat cross-legged on the floor. To singing and the beating of sticks and drums, they twitched arms and heads and torsos in jerking motions, chanting a story about the devil going around the world with lots of layovers. I caught mention of Niagara Falls and New York City.

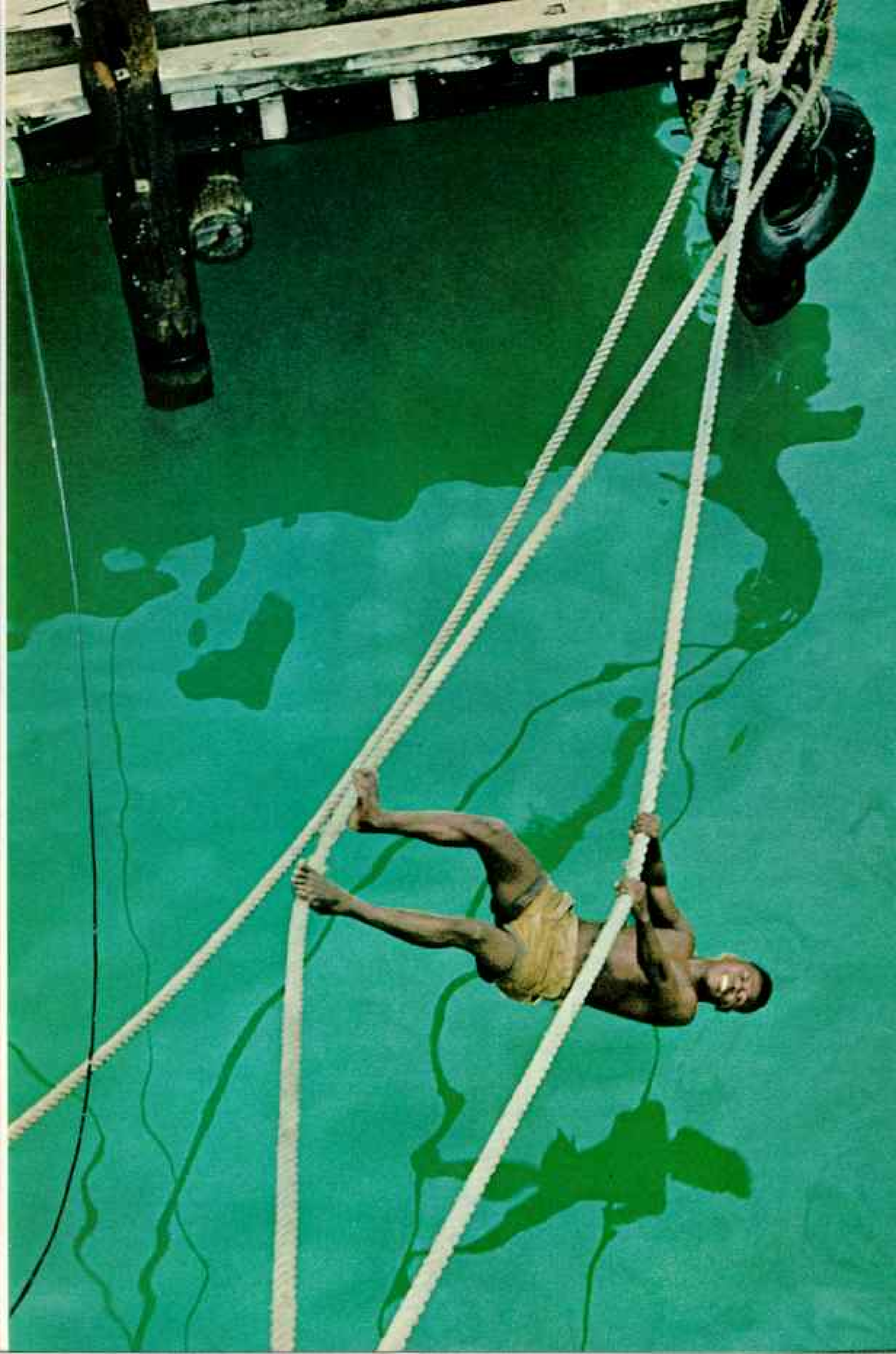
"Your GI's were here stringing wires in World War II," the chief told me afterwards. "Good fellows. We hadn't seen any other Yanks until you came."

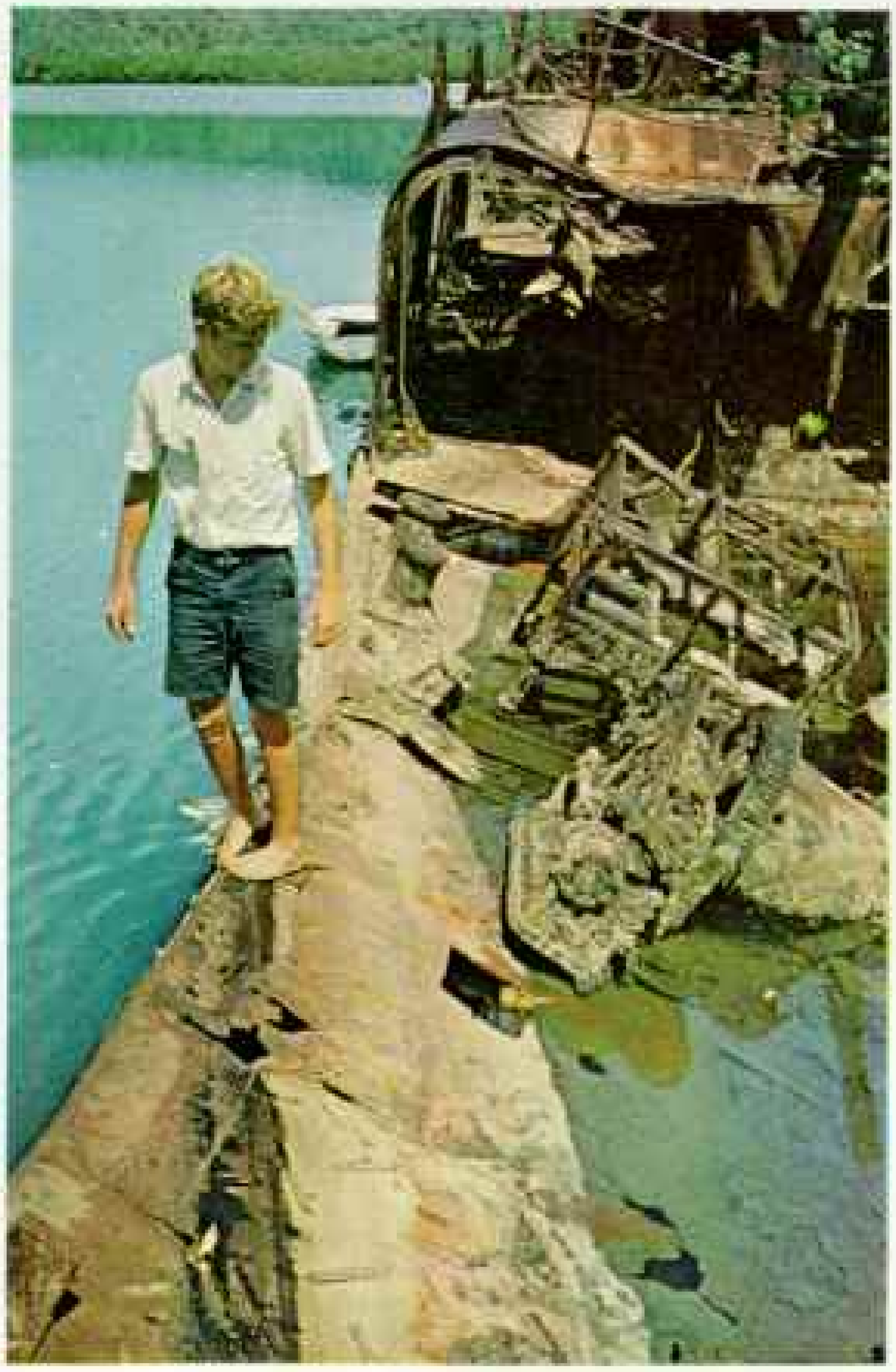
Northwest of Viti Levu, reef growth has built up around the mountainous volcanic islands. This is the Yasawa Group, idyllic but treacherous for sailing.

The Yasawas are a promised land for shell collectors. Diving off the beach at Waya Lailai, I found a treasure of shells—cowries, large

*See "The Islands Called Fiji," by Luis Marden, NATIONAL GEOGRAPHIC, October, 1958.

Tightrope walker, a young man of the Solomon Islands loses his balance while working his way toward *Dove* by way of the stern lines of another vessel moored nearby.





tritons, spider conchs, and pearl shells—souvenirs that enhanced my growing collection. Initially, to prepare the shells properly, I buried them in a bucket of sand on *Dove*'s stern. After a couple of days, when the breeze blew over the transom, the smell nearly drove me overboard.

Assuming that such beautiful creatures would provide delectable meals, I tried boiling spider conchs. Tough and chewy, the meat resembles a gum Mr. Wrigley would be proud to produce. If you're hungry and you really boil them well, though, they become *almost* edible.

In Suva's market I discovered that perfect spider-conch shells fetched two Fijian pounds. But when I tried selling them to Fijian traders, I found they wouldn't buy something they, too, can find for free.

Even pens and clothing failed me while trying to barter for flour, rice, soap, and razor blades. However, I did swap a shirt for a squawking hen, which some villagers and I chased for half an hour before catching her. I caged her aboard *Dove* to await an appropriate feast. Foolishly, I became so attached to Henrietta that I repeatedly postponed her execution.

For local transportation, I stepped a pole as a mast in my dinghy, then set a sail made of a bedsheet. It worked well downwind, but not into the wind, so I sometimes had to swim ahead of the dinghy, clutching the painter in my teeth. Invariably this attracted a number of handsome, pearly-

"To watch me be eaten," Robin explains this farewell delegation that assembled to see him swim out to his boat at Savo Island in the Solomons. "I later found that the people of Savo cast the bodies of their dead into the sea and sharks make off with them. It's very dangerous to swim around there." Light hair of the youngsters comes from lye daubed on to bleach it.

Debris of war provokes wonder and curiosity in a lad born after it was all over. Robin inspects the wreckage of a Japanese destroyer (above, left) beached on Florida Island in the Solomons.

With flippers and mask, Robin brings up giant clams from the sea floor off Florida Island. Robin first reached inside the creature's open shell to sever the muscle that snaps it shut.

KODACHROMES BY L. S. GRAHAM © NATIONAL GEOGRAPHIC SOCIETY

KODACHROME BY ROBIN LEE GRAHAM © NATIONAL GEOGRAPHIC SOCIETY toothed Fijians, who paddled out to talk with me about things in general. They offered me pink papayas and bananas, then traded me *bele*, a vegetable much like spinach, and tapioca for my fast-dwindling supply of inexpensive pens. Thus my sumptuous banquet, which finally featured "fried chicken Henrietta," included all the trimmings.

While shell-collecting with friends on the reef off another island, Nathula, I turned over a "rock" and, as the saying goes, it bit me. A stonefish, whose dorsal fin contains a painful poison, had stung my hand. Since stonefish stings have been known to kill people, we

dried roots with a metal pestle in a mortar cut into a huge log. Carrying the powder into a *bure*, or thatched hut, she poured it into a huge wooden bowl supported on legs. I joined the Fijian men sitting cross-legged, chanting, around the bowl on a thickly matted floor.

One man stirred the powdered root and water into a thick, muddy mixture. After straining off the fibers and dirt, he dipped up the liquid with a coconut bowl and poured it into a cup. He offered the first cup to me. Clapping my hands three times, I accepted the cup, drained it, said *"maca"* (it is dry), then returned it.

Devil man in a tree-trunk mask performs at a Savo Island feast given by Robin and his father, who had flown out for a visit. "The people showed their thanks by dancing for us. The children did the twist; women in costume followed in a traditional dance. Then, toward the end, this islander wearing an old GI fatigue uniform and a mask jumped out to scare everyone. But, instead, they all thought it was very funny."

In a dancing mood, Robin dons a palm-frond skirt and swings his hips in the twist.

KODACHROME BY L. S. GRAHAM © N.G.S.

applied a tourniquet to localize the venom. The excruciating pain lasted three hours. The wound healed in 10 days, but I wore a black spot on my hand for months.

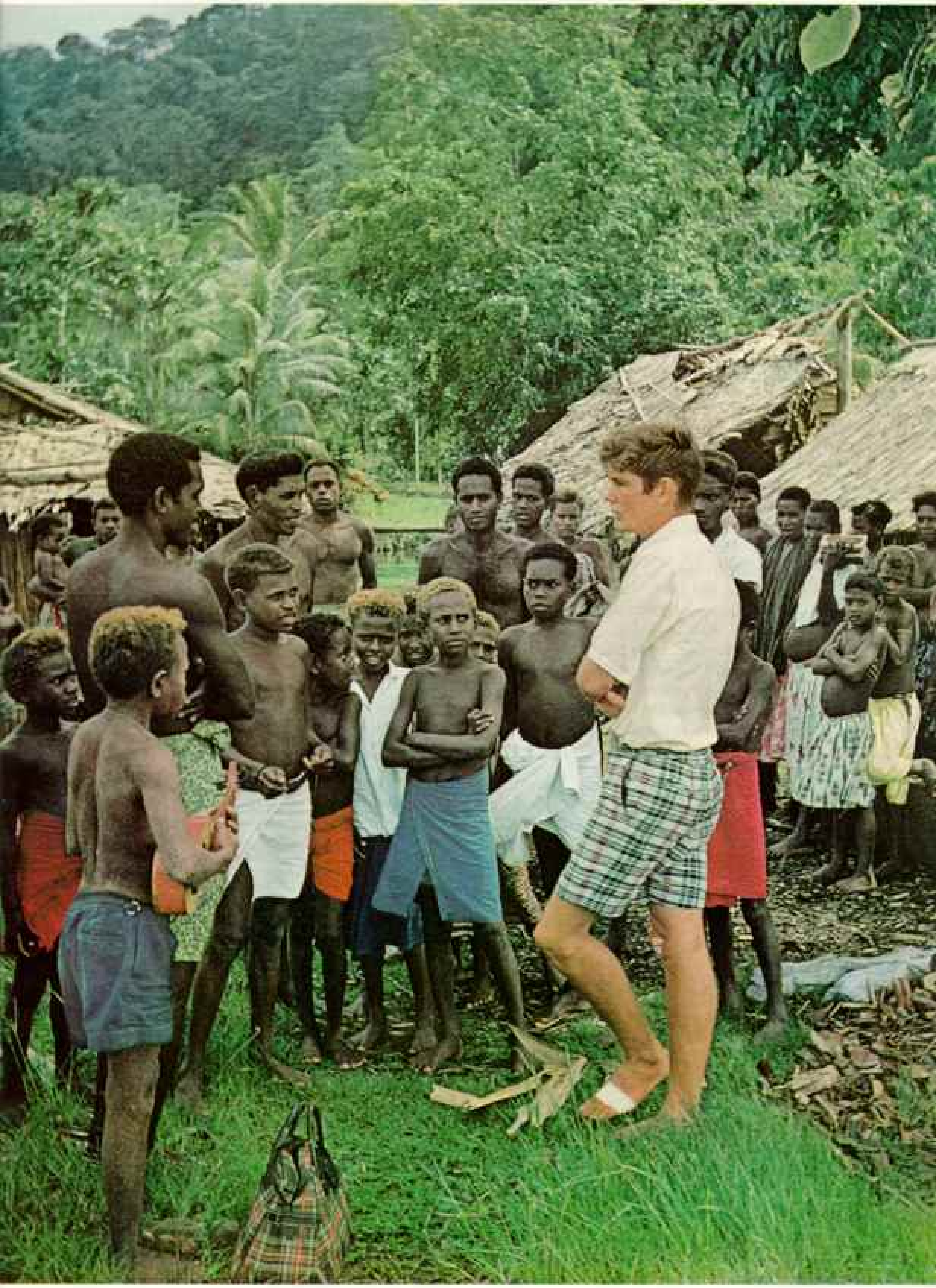
After days of shelling, I anchored *Dove* in an isolated lagoon and rowed ashore to visit with villagers. As custom decrees, I presented the chief with a bunch of kava roots, which I had brought from Tonga. Immediately, the chief invited me to join a ceremony which Fijians hold for honored guests.

Fijians call kava *yagona*, but the ritual of preparing it varies little throughout the South Pacific. First, a young woman pulverized

Around the circle the process was repeated.

Such ceremonies, focal point of Fijian social life, may last well into the night. Men gossip, solve the village problems, and enjoy themselves. While kava is a mildly stimulating beverage, I felt little effect—but I couldn't always say that of the Fijians.

One day while I was sailing in an almost reef-locked lagoon off Sawa-i-Lau in the Yasawa Group, the elastic shock cord holding my fishing line suddenly snapped to life. I pulled in the heavy monofilament line and hauled aboard a huge, flapping 40-pound tuna. Encouraged, I tossed line and lure



astern and trolled back and forth under sail. Total catch—two tuna, one barracuda. My problem: what to do with 120 pounds of fresh fish?

On shore I tried unsuccessfully to trade the fish for staples. In desperation I bargained poorly with a Fijian, offering him half the catch if he'd smoke them. He countered to include in his share the fish heads. Grudgingly, I agreed, though I could almost taste the fish-head soup I had planned to brew up.

When the Fijian returned with my share of smoked fish, it weighed less than 20 pounds. I never saw his share, but I knew he didn't gyp himself!

Beachcombing for Clam Chowder

A few days later I profited from the lesson: Prepare your own feast. While *Dove* was peacefully anchored off Nanuya Levu, a sharp knock on the hull awoke me. Bounding topside, I peered over the side and discovered my friend Dick Johnston, an American yachtsman who was also cruising the Pacific under sail. He had swum out from the beach to pass a few hours, but stayed aboard a week. Such is life in Fiji!

Still bemoaning my fishing fate, I bent Dick's ear about ethics among fishermen. "Forget it," replied Dick. "We'll do better than fish-head soup tonight."

He dragged me ashore, and we dug the sand for clams. Throughout the day we clawed our way up the beach until our large bucket overflowed. Aboard *Dove*, Dick boiled potatoes and onions, mixed in flour, milk, and spices, then added the clams to produce the finest clam chowder that ever graced Fiji's shores. No cost, no bartering, and best of all, no short half shares.

Stopping off at Lautoka, on the west coast of Viti Levu, I acquired a new traveling companion. I had been saddened in Suva when Joliette was run over by a

Legacy of good will created by Americans who served here in World War II marked Robin's meeting with Solomon Islanders. But among older people he found puzzlement over why the GI's left. "Why go America," one asked, "when you can stay in pretty Solomon Islands?" Here Robin visits with villagers on Florida. He stands on one foot; he cut the other on coral.

truck. So a new kitten, orange and a month old, was signed on. With rare foresight I named him Avanga, which is Tongan for "bewitched" (page 467). From the start it was a contest of wills. Avanga never moderated his initial judgment that in me he had bought a very bad bargain—as he demonstrated often with teeth and claws.

We left Fiji with a strong southeast wind on the quarter. *Dove* covered the 550 miles to Vila in the New Hebrides in four and a half days, a very fast passage.

My father flew out to join me in the New Hebrides. We had a joyful meeting; I had not seen him for more than a year. We planned to visit together for a few weeks.

Two Flags Fly in the New Hebrides

Vila, capital of the New Hebrides, seems more French than English, though these Melanesian islands are ruled as an Anglo-French condominium. French and British flags of equal size fly from public buildings. But the numerous small cafes create an unmistakable Gallic atmosphere.

Though I was reluctant to leave, I knew that another hurricane season was coming, so I headed north from Vila. My father shipped out, too, on an inter-island freighter, the motor vessel *Tulagi*. He would sail 700 miles to Honiara, on Guadalcanal in the Solomons, and be on hand to meet me there.

I pushed on through the New Hebrides, hurrying past the coast of Pentecost Island to Santa Maria in the Banks Islands, where I tape-recorded some thoughts about these tropic lands:

These are among the most beautiful islands I've ever seen. They're lush green, and you come up to them over a dark-blue sea, and when you get close, you see the jungle trees and plants, and up above the light blue of the sky with little white clouds.

Anchored at Honiara, I waited for two days before my father showed up; he had gone off on a brief trip to Malaita. He stayed in the Solomons until just before Christmas, the second of my voyage, and we had good times exploring the nearby islands of Savo, Tulagi, and Florida (preceding pages).

The Solomon Islanders, who became friends of the generous GI's in World War II, still are fond of Americans. We found them puzzled that the Yanks would fight and die for these lovely islands, then leave them.

We wandered over the World War II battlefields, saw grown-over trenches, and clambered over rusted tanks and ships. From schoolbooks, I had never really been able to appreciate the sacrifice my father's generation made here. But rotting leather boots, bits of human bone, and rusted, bullet-torn helmets were poignant evidence of the conflict. I could be proud, but it made me sad, too.

A few former GI's still maintain native friendships. One islander had recently received a gold watch from such an American, perhaps one who remembered the day this man had saved his life.

Savo Island is one of the homes of the strange incubator bird—the short-tailed, black-and-brown megapode, a chicken-like creature that gives its name to the local Megapode Airways. We found the birds nesting in cleared shoreside plots, where the island people "farm" for megapode eggs.

Early in the morning and before sunset we watched the megapodes perform their unique ritual of laying goose-size eggs and burying them by kicking earth over them with their enormous feet. Left undisturbed for about 40 days, the eggs hatch and the young birds dig out to the open air, able at once to fly.

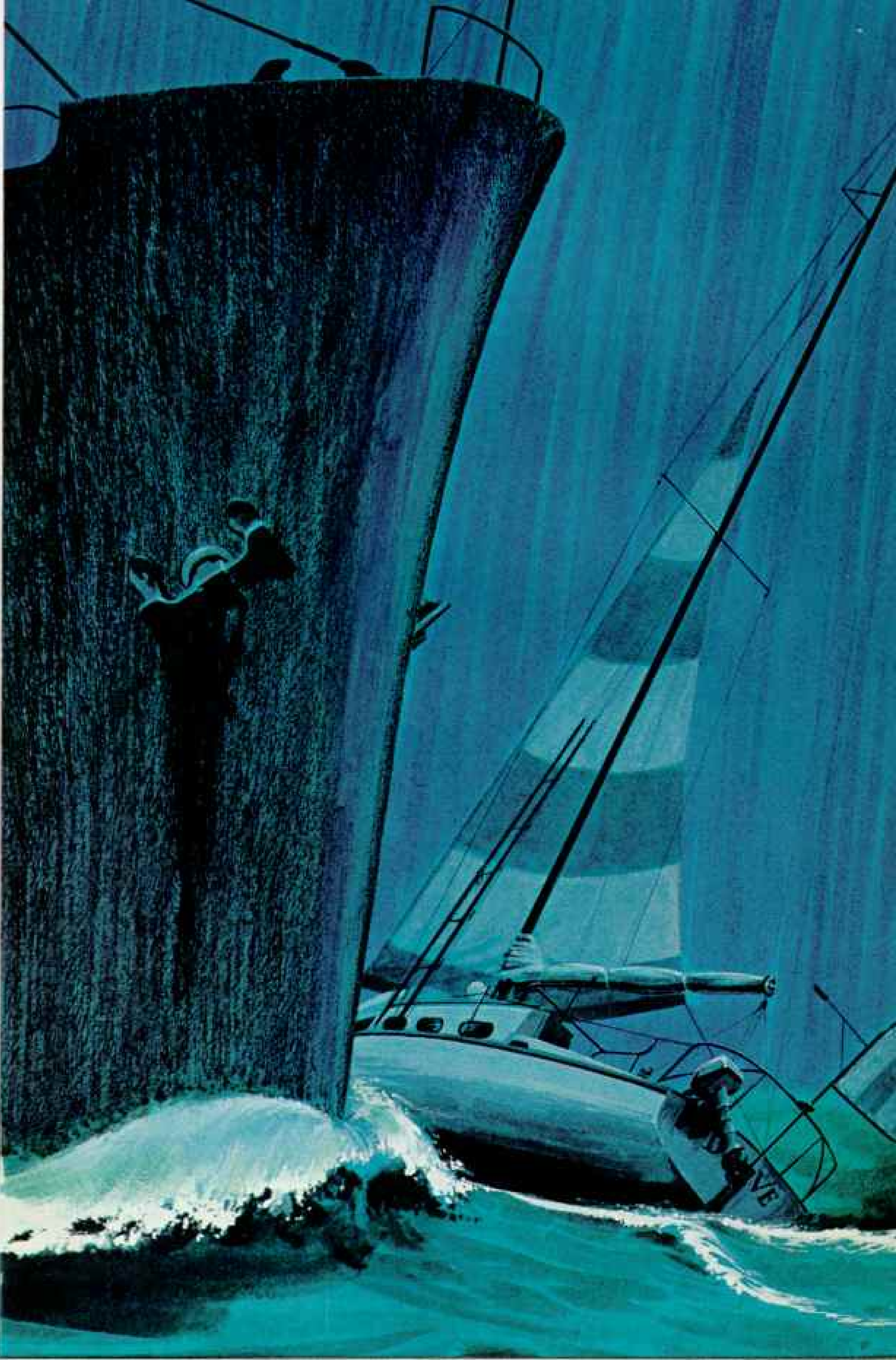
But man the harvester has interfered with nature's pattern, exploiting the megapodes as egg producers. We watched natives visit plots they had marked by stakes, locate the nests by the disturbed ground, and pick up the eggs. I was lucky to see one fledgling struggle to freedom from an egg that had gone undiscovered. A vigilant hawk at once swooped down and made off with it.

I was given two eggs, but lost them from my dinghy when it flipped in Savo surf.

At Honiara I took *Dove*'s inboard engine apart, greased and painted it, put it in working order—and then decided to sell it. This gave me more room aboard *Dove* and some extra money. The bills looked nice—the four Australian tens, two two's, and a one. Then,

In the dead of night, disaster brushes by. "All I saw was a great wall of water. But it turned out to be the huge black bow of a steamer," noted Robin after a near collision with a freighter en route to Darwin, Australia. The bow wave of the ship threw *Dove* out of harm's way, but left its skipper shaken. "All the room in the whole ocean, yet you can almost get run down. It was nerve-racking . . . after that, I don't think I can sleep at night near the shipping lanes."

PAINTING BY WILLIAM H. BOND, GEOGRAPHIC ART DIVISION © N.G.S.



for $40 cash, I rented my spare genoa jib to *Sirius*, a local boat going to New Guinea, with a guarantee of picking it up in Port Moresby, which I later did. I felt like quite a financier!

March 1st came. On the 5th I would be 18. As a nephew of Uncle Sam, I wrote to my draft board. I received their reply in Australia: I should check in with them when I got home. I wonder if they realized it wouldn't be next week!

In Honiara I cabled my family, filled my water bottles, bought fresh eggs, cleared customs, then shoved off for New Guinea. It was chancy, setting out during hurricane season. If someone had told me that 10 days later I would still have Guadalcanal in sight, I would have laughed in his face.

I was hardly beyond reach of voices when the breeze died. Day after day, as I tried to sail westward, the current carried me back toward the Solomons. I went on a binge and ate up my fresh eggs.

I took to reading, devouring Ian Fleming's *Moonraker*, Robin Moore's *The Green Berets*, Alan Villiers' *By Way of Cape Horn*, and a book about the Vikings called *The Long Ships*.

Walking the mast, Robin checks high rigging. Beached on mud flats near Darwin, Australia, *Dove*'s fouled hull was scraped clean and painted. "It was a race with the tide," Robin wrote, "for it rose an inch a minute."

Messy landing in prospect, Avanga decides to stay high and dry while Robin scrubs *Dove*'s transom. Empty water bottles dangle over his head. Two shaft extensions were necessary on his outboard motor so the propeller would reach the water.

During two months in Darwin, the voyager not only put his boat in shape but signed on with an electrical firm, rigging power lines. He also found time for sightseeing (following pages).

KODACHROMES BY CHARLES ALLMON © N.G.S.

My cat Avanga, too, went on a binge. He raced about the deck, snapped at me, ripped my clothes, jumped at nothing. But worst of all, he chewed and tore up my only tracing-paper copy (made from another yachtsman's chart) of the harbor at Darwin, Australia. For that I should have lashed him to the mast.

Eight Miles Bobbing Up and Down

Now and then a fresh breeze would tease me into thinking the days of aimless wandering were over. Then the breathless heat would return. *Dove* drifted in circles, sails flapping dejectedly. On my tape recorder I noted: *I've made 18 miles by log, but only 10 miles by chart. Since my log is mostly hanging straight down astern, I've probably gone eight miles up and down.*

I couldn't help thinking of the familiar lines from Samuel Taylor Coleridge's *The Rime of the Ancient Mariner:*

> Day after day, day after day,
> We stuck, nor breath nor motion;
> As idle as a painted ship
> Upon a painted ocean.

There was one blessing: *Dove* began to creak, and on the silent sea a creaky ship is companionable. Of course, it was not the fiberglass hull that was working, only the wooden bulkheads and shelves. Perhaps she was showing her age a bit. She might, I thought, be telling me it was time for an overhaul and refitting.

And it was hot, as my tapes attest: *This is one of the hottest days I think so far. I'm sitting here dripping, just constantly dripping. Sweat soaks my charts, my logbook. The salt* *drip runs down my forehead onto my nose. I blow it off, and it strikes the bulkhead and runs down to the deck. More of it runs down my neck and chest. What a miserable way to take a bath!*

Then—suddenly—the tail end of a hurricane slapped me. Northwest winds blew wild for three days. *Dove* took a bone in her teeth and ran for New Guinea.

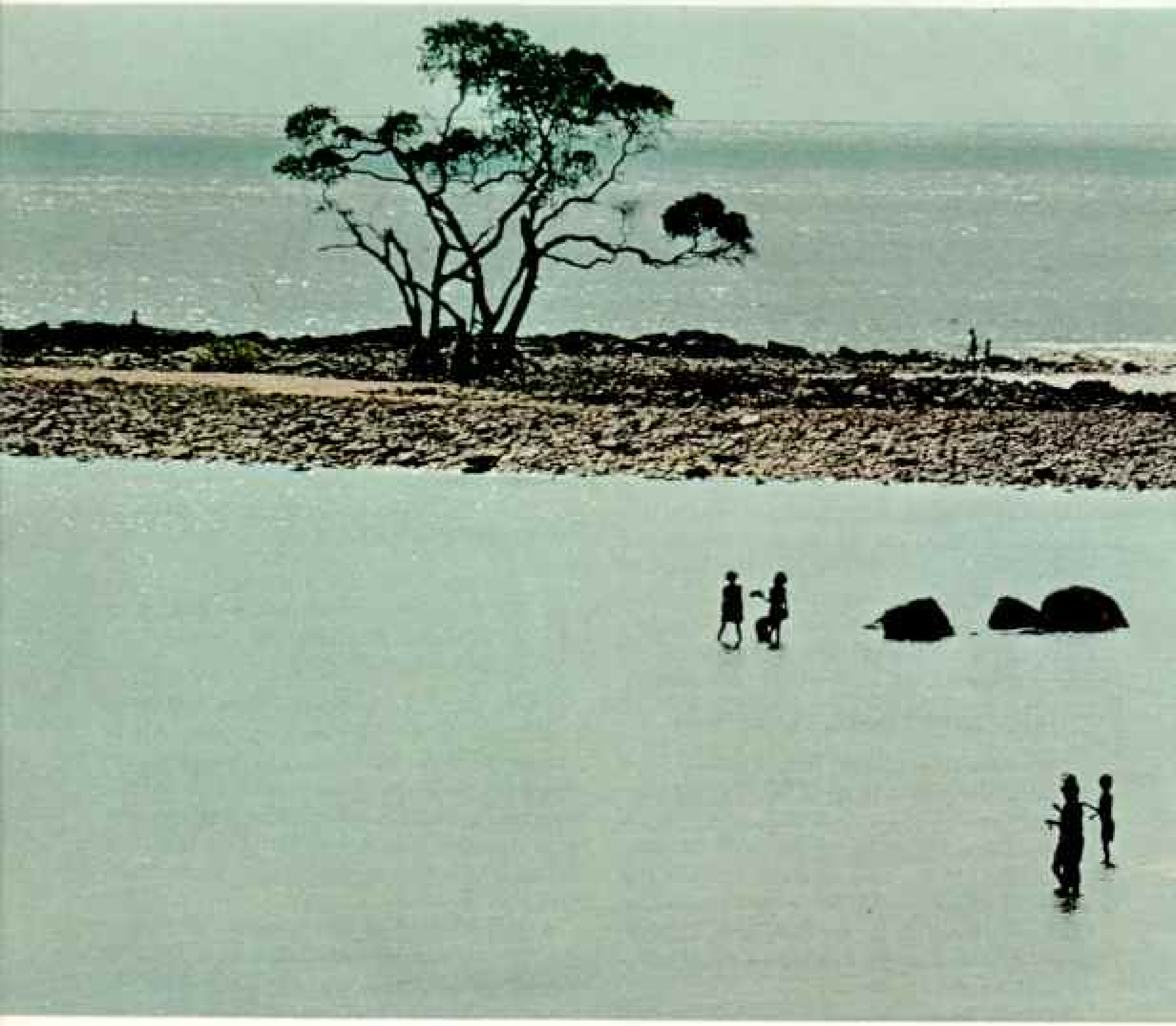
But soon I was again becalmed, only this time I had some excitement: *I woke up and heard this weird noise. Looking over the side, I saw a turtle. I grabbed one of its hind feet, but it just kicked a little bit and knocked my hand away—a pretty strong guy. Then it returned. I guess it must have been feeding. I grabbed it in the middle with both hands. I held it out of the water for about 30 seconds; then all of a sudden it just pulled out of my hands.* Too bad. I could have dined on turtle steak for days.

Calms alternated with the nor'westers until I finally drifted into Port Moresby, after the slowest passage I'd ever made—23½ days to cover 905 miles. I spent three weeks enjoying land legs and stitching my storm-torn, sun-rotted sails. Clews, headboards, seams, and tears I carefully patched.

Night Adventure Nearly Fatal

Port Moresby, too, is a patchwork in my memory—a big modern town with a few tall buildings set against rather bare and scrubby hills. Much of the city has moved to the new suburb of Boroko, on a flatter site five miles to the east. I enjoyed visiting the rubber plan-

Dawn of man lingers among the Stone Age people of Australia's Arnhem Land



tations outside town, where I watched the gatherers empty the latex-filled cups hanging under slashes in the bark of the trees.

On April 18 I set out for Darwin, Australia, loaded down with fresh provisions, but they did little to boost my morale. After a meal of roast beef, potatoes, and cabbage, I recorded: *It's no fun eating good food like that when you're by yourself. I could have had a sandwich and I'd have felt just the same.*

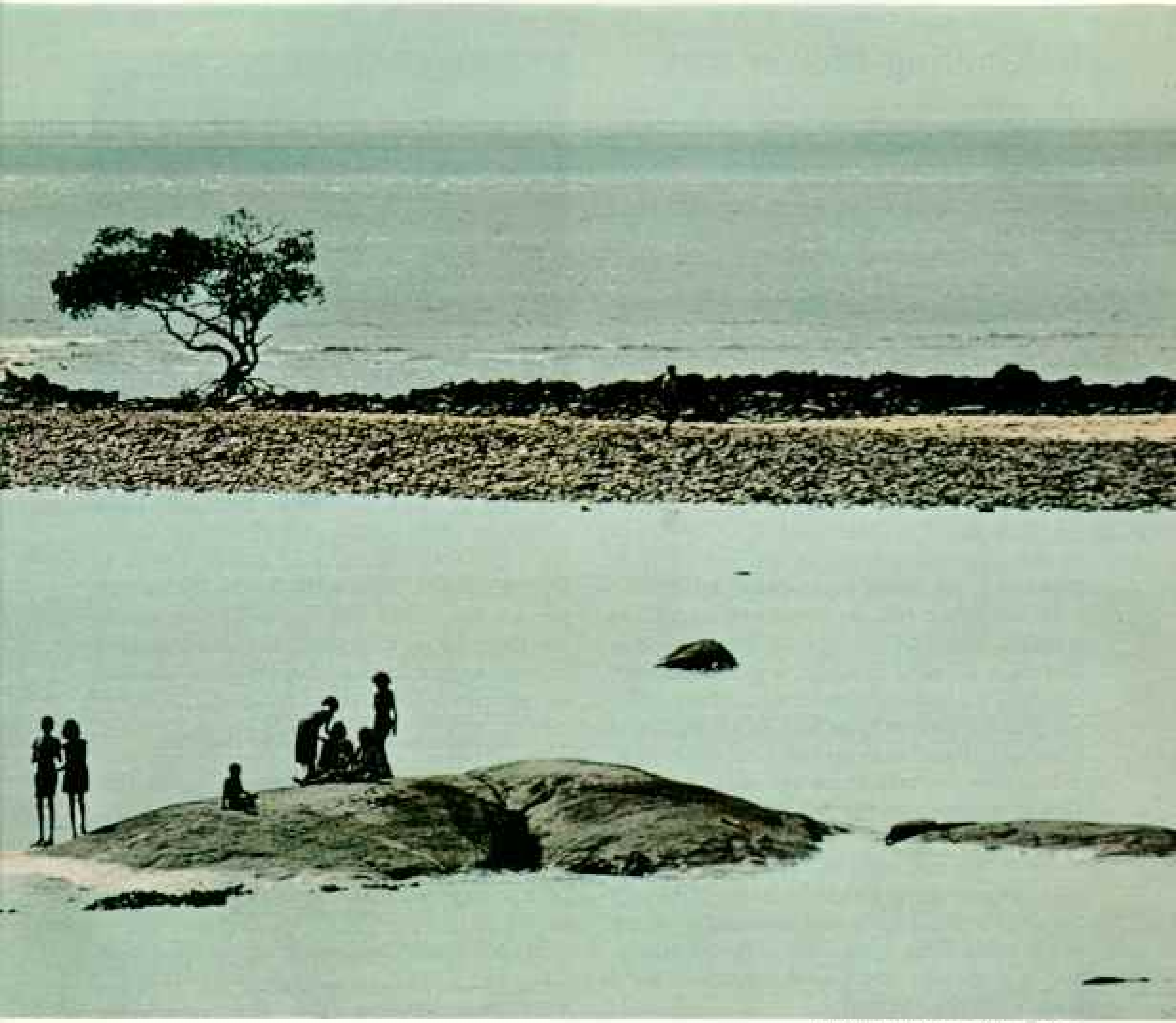
I headed now through the Torres Strait into the Arafura Sea (map, page 450). This is a major shipping route, and so many ships passed me in the night that I hardly dared doze. To get any rest at all, I had to rely in part on my self-steering wind-vane rudder.

Ironically, I was not asleep, but lying in my bunk listening to the radio, when I heard a monstrous swish—like a big breaker. A sudden wave shook the whole boat. Something on *Dove* scraped on something else.

I really dashed up on deck. I thought I'd had it. All I saw was a great wall of water. But it turned out to be the huge black bow of a steamer [page 477]. *The big sea was the bow wave that threw* Dove *out of the ship's path. My mast or the boat's side must have touched the ship.*

Dove rolled and bucked, and in a moment the long black hull slid by; then she was gone, her few lights dimming, no sign of men aboard, no shouts of apology or concern, no indication *Dove* had been seen. Silence. I stood stunned, just grateful that no booms were rigged outboard on that monster to rip off my mast.

Aboriginal Reserve. These children wade and fish in a tidal pool near Cape Arnhem.



Rekindling life on bark

TO KEEP HISTORY ALIVE, aborigines of Arnhem Land paint pictures. First an artist strips a eucalyptus tree of its bark (opposite). Cutting it into different sizes, he buries the bark in sand and builds a fire on top to dry out his "canvas." Plant juices provide the primer, and pulverized colored stones the paints; locks of women's hair become the brushes. Watching two artists at work (above), Robin sees a snake and kangaroo emerge (right). "Now it's mostly the old men who paint to write their history," he observed. "Many of the young do it just to sell their work to tourists."

At noon of May 4, I motored into the inner harbor of Darwin, capital of Australia's Northern Territory. I was relieved to be safely out of the shipping lanes. You can bet I looked forward to spending some weeks ashore.

Brawny as a frontier town but bright and modern, too, Darwin sits on a low plateau that falls in cliffs into the water. I buddied up with a South African cruising friend. We worked for a month, he as a foreman, I as a fitter's assistant, with an electrical contractor. While the job requirements were few, one almost disqualified me: Workers had to wear shoes. I had none.

By extraordinary good fortune I found a pair just my size in a rubbish heap. With copper wire I made laces and reported to work. We erected three towers for a power station and rigged guy wires and insulators for a transmission switchyard.

Two months in Darwin were just enough. Spruced up with new paint and gear, *Dove* sailed out of the harbor on July 6, 1967. Ahead lay 5,900 nautical miles of Indian Ocean to Durban, South Africa. While the Pacific had treated me gently, the Indian Ocean was to test me with its wild side.* If I had known of the storms and damage that lay ahead, I might never have left Australia's shores.

Stowaways—a Chorus of Crickets

Gales and rain sailors take in stride, but, coupled with loneliness, they wear you down. There's a limit to what you can take, getting knocked about in a cockleshell with only a tape recorder to converse with and a mad cat to yell at.

My navigation had proven accurate to date,

*See "Science Explores the Monsoon Sea," by Samuel W. Matthews, NATIONAL GEOGRAPHIC, October, 1967.

but still I was anxious, aiming at tiny island dots scattered in the emptiness of the Indian Ocean. To fetch my first two landfalls required precise, giant steps: 1,900 miles to Cocos, then 2,400 miles to Mauritius.

Consistent trade winds pushed me along at about 100 miles a day. To while away the monotony, I enjoyed my own orchestra—a family of crickets that had stowed away with me. One night some flying fish landed aboard, but the cat beat me to them. What a feast he had! Later windfalls I shared, for a meal of fresh fish offered a welcome change from my canned diet. When several squid jetted aboard *Dove*, I marinated them, then dried them for future snacks.

During these weeks at sea I constantly worked on projects: making leather sandals, tying patterned rope belts, drawing charts of island groups in my log, sewing sails, and repairing gear. Every day I took pictures. Sometimes I rigged a camera forward or aft, tied a string to it, then tripped the shutter from the other end of the boat.

Coconut Kingdom of Cocos Atoll

You can imagine my exhilaration the day Cocos rose from the ocean—right on the nose! I had sped those 1,900 miles in 18 days—darn good time for little *Dove*.

Cocos, a sizable atoll administered by Australia, is a kind of fief of the Clunies-Ross family. The first John Clunies-Ross, a sea captain born in the Shetland Islands, settled on the atoll in 1827. He colonized it with Malay workers and lived out his life there. The present John Clunies-Ross, his great-great-grandson, still harvests the island's coconuts for copra and directs the lives of today's 450-odd Cocos Islanders.

An idyllic community to this day, Cocos rarely experiences crime. Everyone is provided with food, clothing, shelter, education, and health care. When the Malay inhabitants marry, the couple is presented with a house and furniture.

Eighteen hours out of Cocos I was running under reefed mainsail and reefed genoa jib in rain and squally weather. I wasn't sleeping well. At 2 a.m. a weird rumble brought me scrambling topside.

There was nothing on deck—it was swept clean. As I taped: *The mast was knocked down into the sea. It didn't break, but bent over six feet off the deck, two feet below the old weld. Everything was in the water except the part of the mast which lay athwart the deck.*

I had been wearing my lifeline harness while sleeping. When I came on deck, I detached the harness, because it was rigged to the boom which was overboard.

I struggled, getting all cut up, to clear the lines and get the mast and rigging back aboard and lashed down. Suddenly the boat lurched, and for the first time in my life I fell overboard at sea—and without my lifeline.

Dismasted in stormy seas, Robin falls overboard during his Indian Ocean crossing (pages 446-8). For once unprotected by his safety harness, and fearing sharks, Robin quickly scrambled back aboard *Dove*.

Grabbing the rail, I climbed back aboard. The water had been nice and warm. But in the air, cold rainy wind made me miserable. I was in just my underwear.

In my bunk I lay down but couldn't sleep. At daybreak I started cleaning up the deck. After salvaging the rigging, sails, and the boom, I threw the twice-broken mast into the sea, cursing the day I had forgotten to step it atop a good-luck coin. I stepped the boom as a mast and hoisted the reefed mainsail on it, just as I had done before.

With wind and current behind me, I couldn't backtrack to Cocos. Ahead lay 2,300 miles of open water. If favorable winds did not blow strong and steady, the Lord knew where I might end up. As long as the wind was behind me, I knew I could make the long trip to Mauritius. But should the wind turn fickle, I would surely have my troubles.

Wretched weather continued, as 25-knot trade winds carved endless white curls atop the rough seas, but blessedly the wind remained astern. To increase my speed and to balance the boat better for my self-steering vane, I sewed a small square sail from a contoured bedsheet and set it on the forestay. Later the sheet ripped, so I set my old yellow awning, which I patched with a tea towel and an old shirt (next two pages).

PAINTING BY WILLIAM H. BOND, GEOGRAPHIC ART DIVISION © N.G.S.

EKTACHROME

Amazingly enough, *Dove* averaged 100 miles a day carrying this ridiculous sail combination, the same distance I had hoped to make good under normal conditions. But without doubt, this was the roughest passage of my life—until then. Two tape entries read: *A big wave broke over the side. I saw green water out the portlight for the second time at sea. My knees are still shaking. There's an awful lot of water in the cabin.*

Next day: *I was taking a noon sun sight when I heard a big bang. Another wave crashed aboard, soaking me and the sextant. This trip is getting to me. I felt like throwing the sextant right through the wind vane, but I thought I'd better not.*

After 19 days of such weather, as *Dove* approached the island of Rodrigues, on the track to Mauritius, I became concerned that I might run into it at night. Standing on the overturned dinghy, I strained in vain to see a black dot in the moonlight. . . . *and then this morning I looked and saw it, a long, solid piece of land, about 20 miles away.* Five days later I recorded: *Even under shortened sail, I've made Mauritius in 24 days from Cocos, right on time! What a sight to see the island lift up out of the ocean, green and round.*

At Port Louis a bevy of yachts arrived, some of them old friends—*Shireen* and *Mother of Pearl* from England, *Edward Bear* and *Bona Dea* from New Zealand, *Corsair II* from South Africa, and *Ohra* from Australia. Quite a convention of deep-water vagabonds!

(ABOVE) AND KODACHROMES BY ROBIN LEE GRAHAM © N.G.S.

"I need something to get my spirits back up," the harassed young sailor noted during his awesome voyage across the Indian Ocean under jury rig. Here in strong wind he carries a squaresail—his awning, patched with a tea towel and a shirt.

Miraculously, Robin sailed the 2,300 miles to Mauritius (upper right) in 23 days, meeting his original estimate of the time required under full rig. A new aluminum mast (right), sent by the NATIONAL GEOGRAPHIC, had to be air-shipped in two pieces. Robin readies an aluminum plug to join them.

A French atmosphere persists in sugar-rich Mauritius, from its 95 years under France before it was occupied in 1810 by Great Britain.* While I was there, the island was preparing for independence, which was formally proclaimed last March 12.

I didn't need French to learn that to build a new mast in Mauritius would trap me there for months. Special wood from Africa was needed, and by then the hurricane season would be upon me again. Here the NATIONAL GEOGRAPHIC came to my rescue by having a new, heavier aluminum mast built. Specially fabricated in two parts, it was air-freighted from California by Qantas Airways—all within two weeks.

Fifteen friends accepted my invitation to a mast-stepping party on *Dove*. Crewmen from the lying-over yachts helped me rig it. You can bet this time I remembered to place a coin—a Mauritius 50-cent piece—under the mast.

So many guests clambered aboard *Dove* that she looked water-logged. In fact, water flooded up into my self-bailing cockpit. I shoved everybody ashore while I plugged the scuppers! This minor inconvenience failed to dampen the party, and a local cook served us delicious fried rice and chicken. A friend borrowed my guitar, and we all sang folk songs.

It is only a 130-mile run to La Réunion, an overseas department of France. Prices on the island are so high that most yachtsmen can't afford to stay there very long.

Réunion is so very beautiful. Its volcanic mountains rise almost two miles high. Steep valleys, sharply winding alpine roads, and small farms dotted with sheep cover the island.

But the crops on Réunion that really put noses in the air are flowers and roots—geraniums, ylang-ylang, and vetiver—which furnish essential oils for making perfume.

I took leave of Réunion on October 4th in company, briefly, with *Bona Dea* and *Ohra*. For three days the decks stayed bone dry. But

*See "Mauritius, Island of the Dodo," by Quentin Keynes, NATIONAL GEOGRAPHIC, January, 1956.

it was the proverbial calm before the storm. Most of the run to Durban was a nightmare—the most violent passage I've ever weathered.

The worst came after passing Madagascar. Wallowing in mountainous seas, *Dove* several times almost turned turtle or pitchpoled—rolled over or somersaulted fore-and-aft—when caught under the breaking crests of swells. I was unsafe on deck and miserable below. I holed up in my bunk and read nine books in 17 days.

The weather deteriorated, as my tapes and log reveal: *October 11: Under a tiny reefed jib—maybe two square feet of sail—and towing a 150-foot, 3/4-inch line as a warp to help hold course. Seas are towering 30 to 40 feet. Constantly soaked by tops blown off the seas.*

October 13: I was reading up forward when a huge sea rocked Dove. *I thought she was*

Ships crowd the roadstead at Port Louis, Mauritius, here viewed from an abandoned fort that protected the harbor in the days of sail. The island traditionally served as a way station between the Cape of Good Hope and the Far East, but its importance diminished with the opening of the Suez Canal. Now, with the canal closed, traffic picks up again.

Halfway around the world and safe! After a turbulent crossing to Durban, South Africa, Robin smiles with relief.

KODACHROMES BY ROBIN LEE GRAHAM (ABOVE) AND ANDREW H. BROWN © N.G.S.

capsizing. Flying objects hit me. When she righted again, I found gear that was stowed aft had settled forward, that which had been forward, aft.

Something solid had even dented my barometer case mounted near the cabin roof. The sea broke in a portlight, and green water poured in below. Luckily, I was able to wedge the Plexiglas back into its frame. Otherwise, the seas might have swamped me. I don't think Dove *is very seaworthy. Last night I was really scared.*

My ice chest broke, the companionway doors were smashed, all my flour and other dry provisions were ruined, and my battery-powered tape recorder got soaked. After that it only worked when I turned it by hand.

My final log entry that night reads: *I prayed to God, and I prayed long and hard, to make the sea and wind calmer.*

By morning a nice northeast breeze blew 8 to 15 knots. The seas calmed.

Nearby, in the same storm, *Ohra,* about *Dove's* size, survived a horrible experience. The boat nosed under a sea, then pitchpoled. While upside

down, she twisted round 90 degrees and finally rolled over, right side up. Yachtsmen refer to this rare phenomenon as "corkscrewing." Although heavily flooded, *Ohra* was not dismasted and continued her voyage under sail.

I was not disappointed when the coast of Africa hove blessedly in sight! A dozen ships lay anchored off Durban, for the closing of the Suez Canal had diverted a continuous stream of heavy shipping traffic around South Africa. Once through the narrow entrance channel, I motored across the inner harbor to the wharf where the Royal Natal Yacht Club stands to welcome ocean wanderers.

It was a sunny spring day in Durban, and I had left all storm-weary troubles and loneliness somewhere far over the eastern horizon.

Ahead of me were several months in South Africa making *Dove* seaworthy again, and a month's trip by motorbike to the Transvaal, before continuing my singlehanded sail around the world. * * *

AS THIS ARTICLE *went to press, the teen-age sailor and his little* Dove *were setting out to cross the lonely South Atlantic to Surinam and the Caribbean. Robin planned to go through the Panama Canal, then on to his starting point, Honolulu—and to conclude in a later* GEOGRAPHIC *this vivid account of a remarkable voyage.*—EDITOR

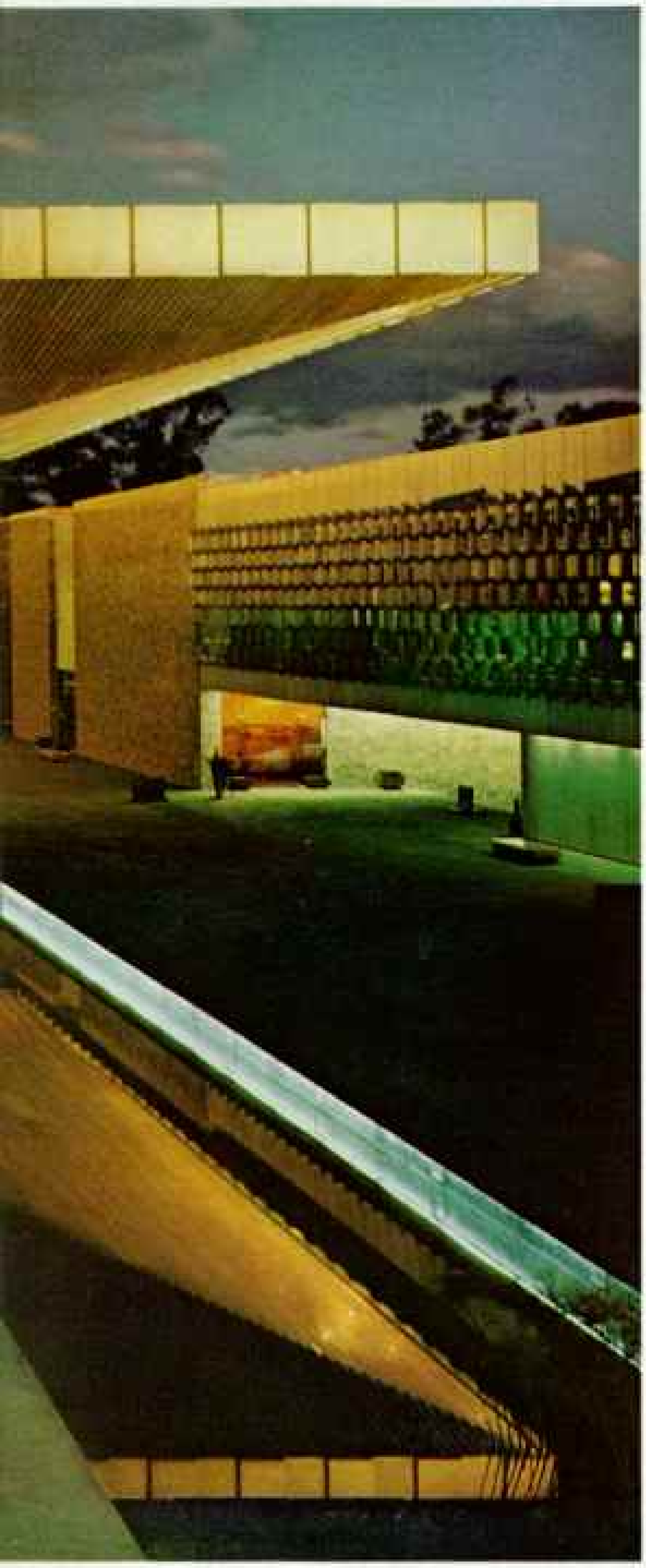
Silhouetted by golden twilight, Robin and *Dove* sail calm waters. Ahead lie days spangled with sun and shattered by storm and, with luck, the realization of a dream: to circle the earth alone.

KODACHROME BY CHARLES ALLMON, NATIONAL GEOGRAPHIC STAFF © N.G.S.

With the grandeur of an Aztec palace, the vast central patio of Mexico City's National Museum of Anthropology glows at sunset. Its aluminum umbrella shelters strollers passing between treasure-filled galleries.

Mexico's

Window on the Past



EKTACHROME BY B. ANTHONY STEWART AND JOHN E. FLETCHER © N.G.S.

By BART McDOWELL

Photographs by

B. ANTHONY STEWART

Both National Geographic Staff

SOON AFTER the Spanish conquest of Mexico in 1519, grieving Aztecs composed the "Songs of Huexotzingo," a poetic lament that asks this poignant question:

Will I leave only this:
Like the flowers that wither?
Will nothing last in my name—
Nothing of my fame here on earth?
At least flowers! At least songs!

Fittingly, those words are carved into a stone wall of Mexico's National Museum of Anthropology in Mexico City. The old Indian question is answered by the museum itself.

Since its inauguration in 1964, some four million people have passed through the glass doors of the museum. Here, in an 11-acre Olympus for the gods of pre-Hispanic Mexico, they have journeyed three miles through Middle America's past. Among all the world's museums, only half a dozen are larger.

None perhaps is more beautiful. The heart of the museum and the most memorable architectural feature is the great 600-foot-long central patio (left), protected by an aluminum umbrella half as big as a city block. Supporting this 2,000-ton shield is a single column 40 feet high: a decorative focus for the whole patio. A circular waterfall sheathes the column with a cylinder of water. Through the misty veil the visitor sees a relief design of gods and warriors—a view reflected in a central reed-garnished lagoon (page 506).

"We wanted a parklike atmosphere," explains the principal architect, Pedro Ramírez Vásquez. "People grow tired in museums. We wanted to vary their experience between indoors and out—and, after all, we are in Chapultepec Park."

The setting is apt. On this slope the wandering Aztecs first settled in the Valley of Mexico; they named it Chapultepec—Grasshopper

Hill—in their Nahuatl language. Later, when they moved their capital to an island in briny Lake Texcoco, they built aqueducts to bring in fresh spring water from Chapultepec. After the conquering Spaniards laid out present-day Mexico City over ruins of the Aztec capital, Chapultepec became a park, first for viceroys, now for the people.

A new era in Mexican archeology began in 1790, when workmen digging near the great Cathedral of Mexico pried from its very base a richly carved 12-foot stone disk, the Aztec Sun Stone (left). In 1865 a national museum was created near Mexico City's central plaza, and there the collection remained for a century, hopelessly outgrowing its quarters.

The new museum in Chapultepec gives an unmatched pre-Columbian collection a setting worthy of the old arts. From nomadic man's first reliably dated appearance in the Valley of Mexico 10,000 years ago, visitors can trace the fate of tribes and nations that have called Mexico their homeland. These early peoples left few written records, but the finds of archeologists give haunting clues to the richness of their cultures.

In the first two millenniums B.C., a period known as Preclassic, countless unnamed tribes of village farmers created objects in clay. On the Gulf Coast, a precocious people known as the Olmecs fashioned masterpieces in jade and stone. In the first millennium A.D., civilizations flowered and died: the city dwellers of Teotihuacán in the Valley of Mexico, the refined Maya of the Yucatán Peninsula, the warlike Toltecs of Hidalgo, the skillful Zapotecs and Mixtecs of Oaxaca; and, while the Renaissance was flourishing in Europe, the brilliant Aztecs reigned over southern Mexico.

The museum recaptures this past in its first-floor galleries. Spotlights dramatically penetrate the cavelike darkness. Unprotected exhibits invite a touch. Monoliths stand outdoors, washed by leafy patterns of sunshine and shade. On the second floor, recorded ethnic music eerily pervades displays of present-day Indian groups. All these theatrical devices conjure up a strong sensation of Mexico, past and present.

Today travelers are converging on Mexico City for the Olympic Games. Many visitors will use this great collection—sampled pictorially on the following pages—as an introduction to Mexican prehistory. Others will plan side trips to archeological sites, using the National Geographic Society supplement, **Archeological Map of Middle America**, distributed with this issue. Together, these companion features offer an enticing preamble to the vivid, varied study of old Mexico.

Pride of the Aztecs, the 20-ton Sun Stone (left) depicts the sun god and the four epochs of the creation and destruction of the universe in Aztec mythology. A guide explains other symbols that represent the 20 days of the Aztec month, source of the popular name Calendar Stone. Copy in the background shows original colors. The basalt disk dominates the Aztec hall, largest of 23 museum showrooms that bring Indian cultures vibrantly to life.

Silent before the centuries, a mother with her child marvels at the strands of their cultural heritage collected in the museum. Goal of 15,000 people a week, the galleries often evoke the comment, "See what our ancestors did!"

ACTUAL SIZE

KODACHROMES BY B. ANTHONY STEWART © N.G.S.

Lady and lap dog play in a 3,000-year-old clay figurine recovered from a grave in Tlatilco. Hair style and earplugs reflect ancient fashion. Early Indians loved dogs, but also raised them for food.

Abstract art decorates a clay pot of the fourth century B.C. It figured in religious rites of early Teotihuacán (pages 500-501).

1/2 ACTUAL SIZE

Mexico's childhood

THE FIRST MEXICAN VILLAGES took root beside primitive farms when nomadic hunters made a great discovery: If they planted maize and waited nearby, they could reap food. Thus, by 2000 B.C., man and corn had begun to domesticate each other. Simultaneously, a crop of arts and ideas ripened into a culture that scholars call Preclassic—not yet a true civilization, but certainly the seeds of one. The Preclassic hall traces progress of these early farmers throughout Mexico up to A.D. 300.

Sleepy clay armadillo with a spout on its back forms a bottle made 3,100 years ago at Tlatilco, now a suburb of Mexico City. The imaginative piece illustrates the creativity of Preclassic potters.

1/3 ACTUAL SIZE

ACTUAL SIZE

7/8 ACTUAL SIZE

Dancing girl from Tlatilco wears pantaloons whose puffs represent butterfly-cocoon rattles. Dried and filled with sand, they rustled with each step—a musical device that still delights Yaqui dancers of Sonora.

Heavy-hipped fetish blazes with a mirror of hematite. The ancients may have added the polished inlay to increase the magic powers of the clay fertility symbol. With paint still coloring her eyes, ear-plugs, and mouth, she is well preserved for her age—2,500 years.

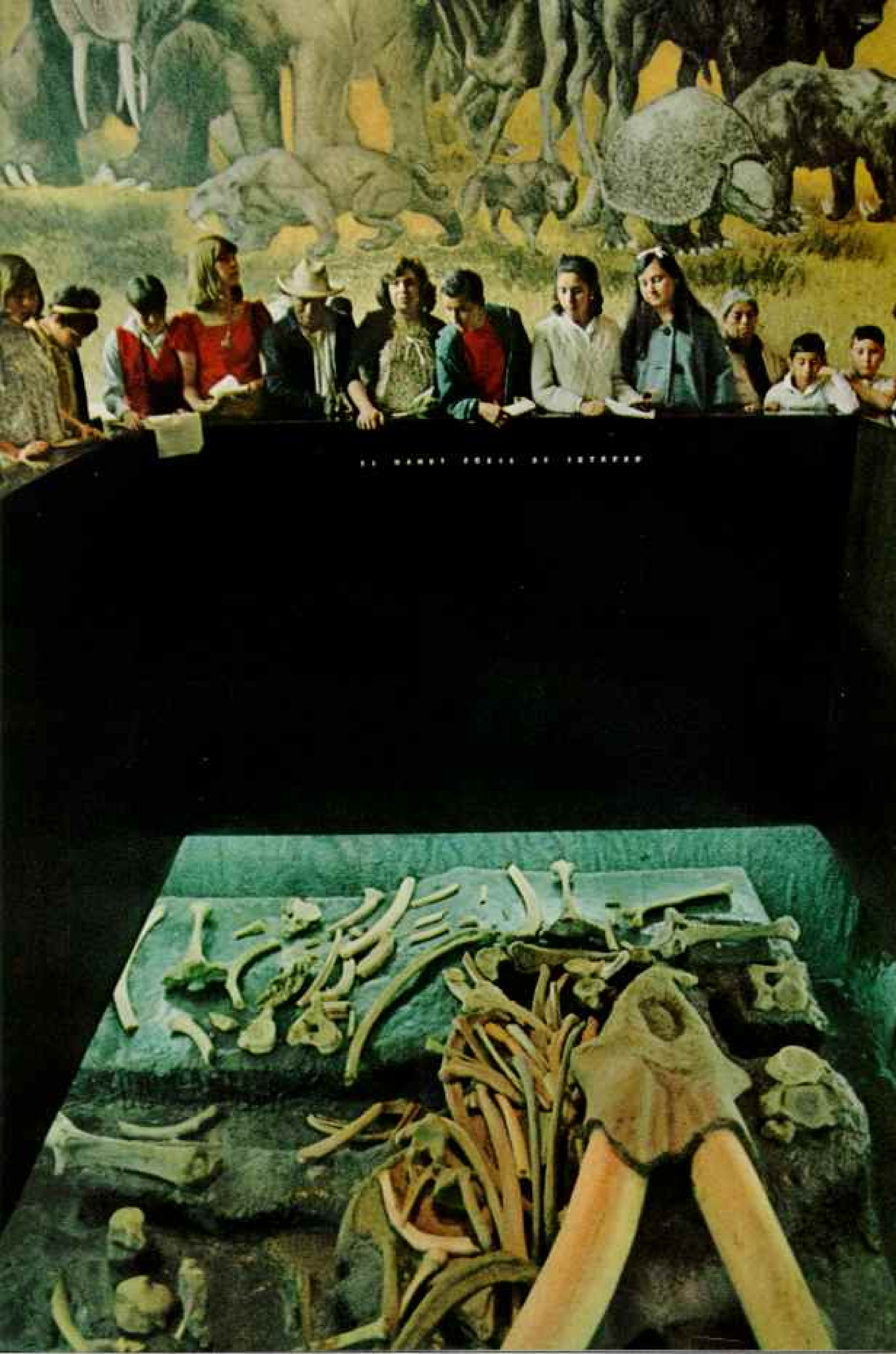
Director who digs, Professor Arturo Romano supervises the museum and also oversees excavations at Tlatilco, a site rich in relics nearly 3,000 years old. Skeleton 163 awaits the tape measure.

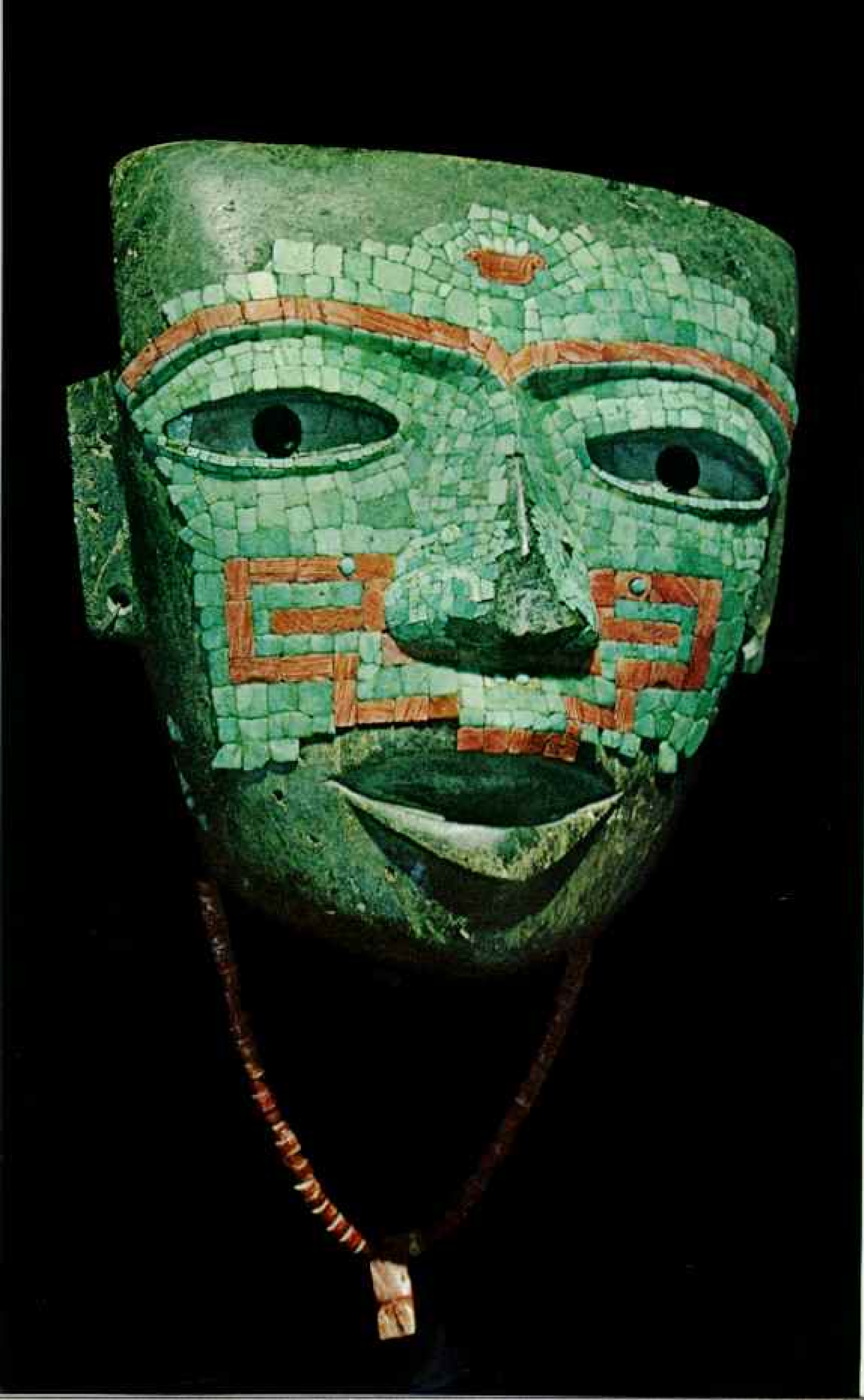
Agile acrobat balances on his stomach at a grave site in Tlatilco. The ancients perhaps counted on the ingenious clay figure to cheer the deceased. From such well-made pottery, archeologists deduce that Tlatilco had full-time potters, and thus a society divided into specialized trades.

Mammoth kill dates early man

IN THE DISTANT MISTS of Mexican time, hunters drove a great tusked mammoth until it mired in the marshes of Lake Texcoco. Butchering the carcass, they scraped flesh from the bones and extracted the brain. As they turned homeward laden with meat, they left a stone scraper, knife, and projectile point. Excavating these tools and the fossil bones in 1954, anthropologist Arturo Romano helped push back man's knowledge of himself in the Valley of Mexico to 8000 B.C., as established by carbon-14 dating. Before a mural of other Pleistocene fauna (right), the museum displays the remains just as they were unearthed at Santa Isabel Iztapan.

Now Director of the National Museum, Professor Romano continues to dig (above). Each Saturday he and his students take trowel and brush to the fragile remains of a Preclassic culture buried in the brickyards of Tlatilco. A four-acre site has yielded 400 skeletons and lavish offerings—clay masks and figurines, grinding stones and ornaments.





Men of many gods built the New World's first metropolis

FED BY FARMERS and ruled by priests, a tribe in the Valley of Mexico created an urban civilization that ushered in the Classic Period and influenced all Middle America. About the time of Christ, men of Teotihuacán moved mountains of adobe brick and stone to build pyramids that rival Egypt's; 28 miles from Mexico City they awe visitors today.

By the sixth century, as many as 100,000 Teotihuacanos, many living in patio apartments, devoted themselves to pleasing a pantheon of gods. Two hundred years later unknown invaders desolated the city. For centuries back-country folk, mistaking the area's mammoth bones (page 499) for those of ancient men, perpetuated a legend about a race of giants. Indeed, Teotihuacán means "city of the gods."

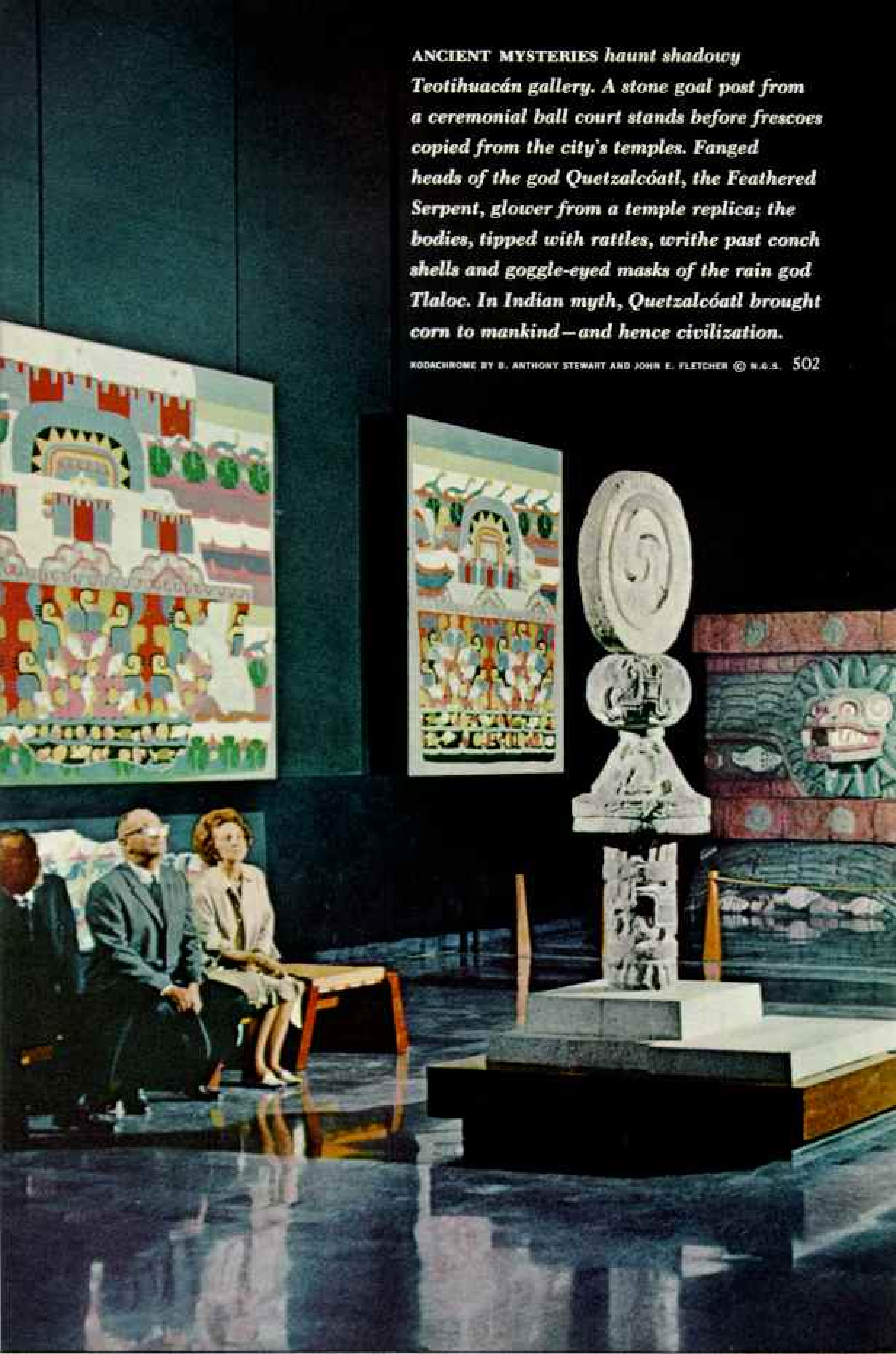
1/4 ACTUAL SIZE

EKTACHROME (ABOVE) AND KODACHROMES BY B. ANTHONY STEWART © N.G.S.

Still-glowing colors coat a shapely ceremonial vase made 15 centuries ago at Teotihuacán. Craftsmen stuccoed the fired vessel, then painted the design.

Gory god of spring, Xipe Totec wears a skin of a human sacrifice. In rites honoring the deity, priests presented him with the most valued gift, human lives, and also donned the skins themselves; the act symbolized earth acquiring its spring mantle of vegetation. In time Mexicans used molds to mass-produce the popular Xipe. This clay god from Teotihuacán sprouts a headdress patterned after a butterfly and holds a bowl and shield.

Mosaic mask may have fitted a wooden figure used in religious ceremonies. Chips of turquoise and red shell encrust a serpentine base; obsidian pupils peer from mother-of-pearl eyes. The life-size mask came from the Pacific Coast State of Guerrero, a hundred miles from Teotihuacán but once under its sway.



ANCIENT MYSTERIES *haunt shadowy Teotihuacán gallery. A stone goal post from a ceremonial ball court stands before frescoes copied from the city's temples. Fanged heads of the god Quetzalcóatl, the Feathered Serpent, glower from a temple replica; the bodies, tipped with rattles, writhe past conch shells and goggle-eyed masks of the rain god Tlaloc. In Indian myth, Quetzalcóatl brought corn to mankind—and hence civilization.*

KODACHROME BY B. ANTHONY STEWART AND JOHN E. FLETCHER © N.G.S.

1/12 ACTUAL SIZE

ACTUAL SIZE

Smiling trio (above) amused early coast dwellers. Potters of Tres Zapotes put wheels on toys like the dog, but otherwise the wheel was unknown in pre-Spanish America. Beaming boy wears a bell; four-legged turkey blows like a whistle.

Long-haired ballplayer (upper left) dresses with an attendant's aid; heavy padding suggests a rugged game. The Tepatlaxco relief dates from about A.D. 100.

Art in the open: An Olmec head shows a turned-down mouth, a feature still common to coastal peoples.

B. ANTHONY STEWART © N.G.S.

Gulf Coast art focuses on man

IN THE HOT COASTAL PLAINS of Veracruz and Tabasco, a little-known people concerned themselves with man as much as with deities. Early in the first millennium B.C., the Olmecs created a culture that influenced all later Mexican civilizations. They devised a calendar, a form of writing, earth pyramids, and an art style that spread throughout Middle America. At La Venta and other sacred sites they chiseled helmeted heads, like the 20-ton monolith (left), one of 11 uncovered by Dr. Matthew W. Stirling on National Geographic Society-Smithsonian Institution expeditions (page 521). A full-size replica of one head rests in the Society's Explorers Hall.

The Olmecs share the museum's Gulf Coast hall with later, distant Veracruz cousins. Some preserved their ball games on limestone (upper left); others molded smiling figures in clay (above).

Sports fan meets a champ. Basalt statue of a wrestler, unique in Olmec art for its realism, dates back 2,500 years. These people invented stone sculpture in Middle America.


CEM ANAHUAC TENOCHCA TLALPA
MEXICA

KODACHROMES BY B. ANTHONY STEWART © N.G.S.

Bold creator, the museum's architect Pedro Ramírez Vásquez blended trees and gardens into his design. The replica of a Maya wall behind him dramatically changes moods in the play of sun and rain.

Inspiration of the ancients guides a modern architect

PROUD AZTECS sang sentimentally of "the bulrushes . . . where we were born" and boasted, "The world belongs to the Aztecs." Today their bulrushes grow in the museum lagoon and their boast adorns a portal (left). This fusing of pre-Columbian folklore with function was the plan of architect Pedro Ramírez Vásquez. The lagoon offers an example: Visitors see the three Indian elements of wind—represented by a stylized conch shell—water, and earth. Just as Aztec priests used conch-shell horns to summon the faithful, a tape-recording in the bronze conch blares forth every half hour.

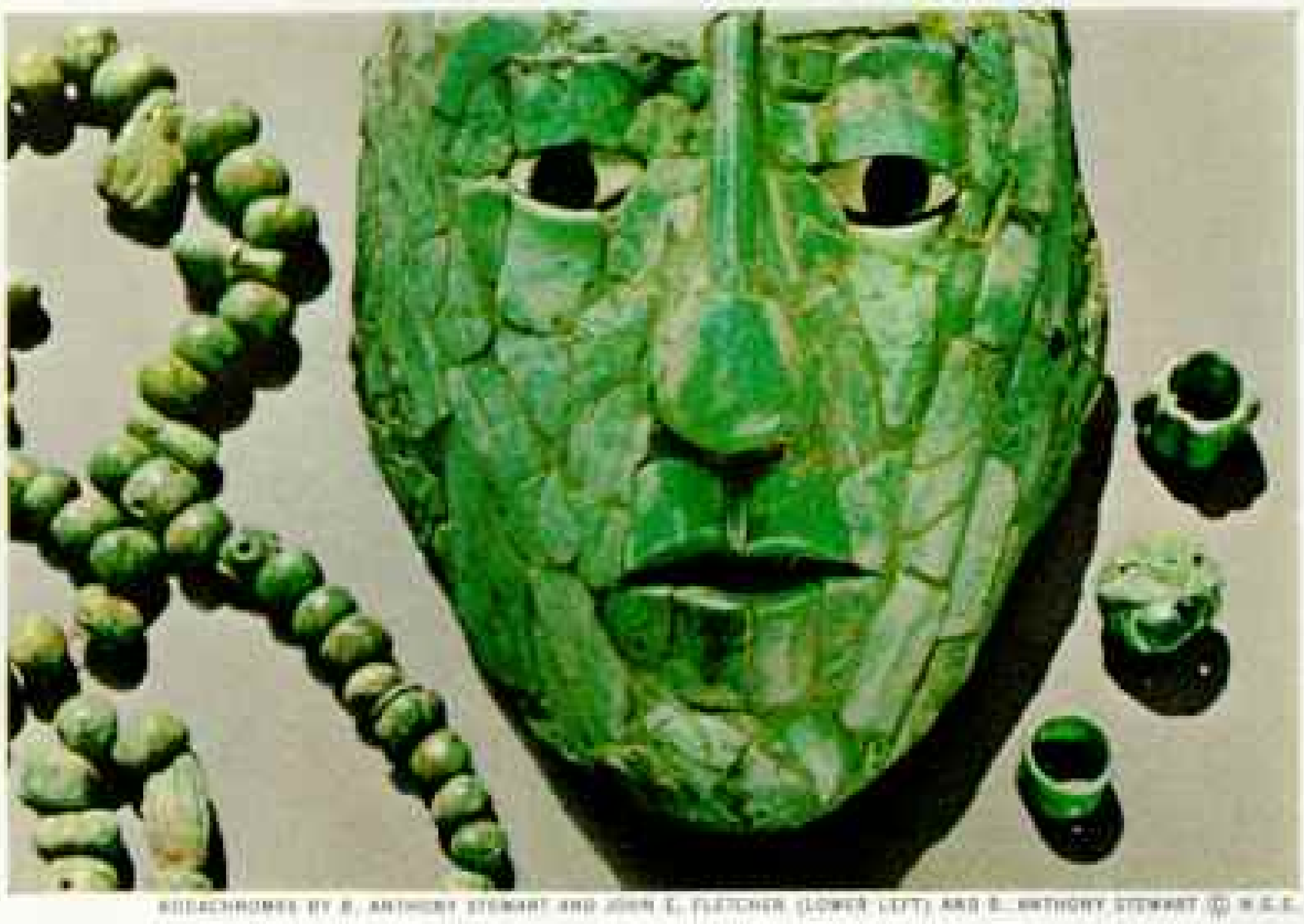
"Our ancient architects combined their buildings with open spaces," observes Señor Ramírez Vásquez. "They had plazas and patios long before the Spaniards came." The architect followed the tradition, but wedded metals and concrete with classic Mexican hardwoods and stone. Exterior walls of unpolished marble resemble natural outcroppings.

For all its hand-wrought craftsmanship, the museum was completed—from groundbreaking to opening—in 19 months. That record earned architect Ramírez Vásquez the challenge he has recently met as chairman of the Olympic Organizing Committee.

1/4 ACTUAL SIZE

Maya miniatures: Lifelike terra-cotta sculptures, unearthed on the Island of Jaina in Campeche, give a glimpse of seventh-century features and fashions. Two dignitaries parade in flamboyant headgear, necklaces, and earplugs. Arm outflung, a ballplayer in protective girdle crouches expectantly. A seated priest holds a bag of incense. Faces of all four figures illustrate the sharp features still found in present-day Mayas.

New World pharaoh wore a death mask, beads, and rings (right). Discovered in a pyramid at Palenque, the mask—200 jade fragments on a stucco base—may have been intended to protect the Maya corpse from evil spirits. A copy rests in a replica of the tomb's stone sarcophagus (below) in the Maya hall. The priest-king assumed the godlike mask at his funeral.



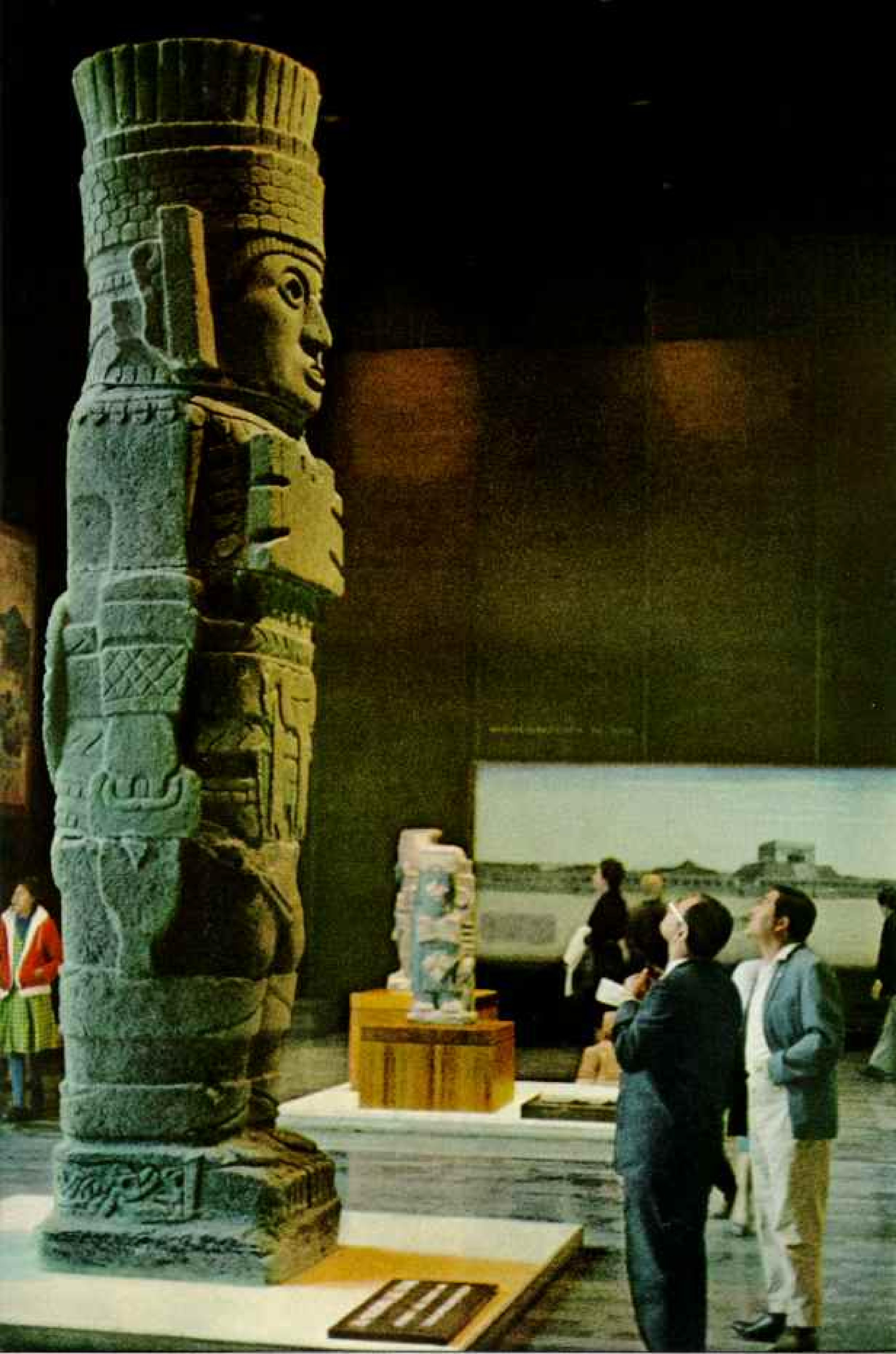
KODACHROMES BY B. ANTHONY STEWART AND JOHN E. FLETCHER (LOWER LEFT) AND B. ANTHONY STEWART © N.G.S.

Maya pyramid yields a priest-king's skeleton

CLEARING a secret rubble-clogged passage into a Maya pyramid at Palenque, archeologist Alberto Ruz Lhuillier reached a vaulted chamber that held a huge stone sarcophagus. As he pried open a five-ton lid, he beheld an eerie red cavity holding a skeleton. His was the first discovery of a New World pyramid used as a tomb.

Descending a stairway in the Maya hall, museum visitors relive the thrill of Dr. Ruz's 1952 discovery as they encounter a replica of the crypt (left), with other human bones in place of the original skeleton. Hieroglyphs date the sarcophagus at A.D. 700. Along the stuccoed wall marches a supernatural attendant, a lord of the underworld.

At the height of their power, from A.D. 300 to 900, the Maya brought southern Mexico under the sway of a civilization that boasted monumental architecture, an accurate calendar, and intricate hieroglyphs. With marvelous moderation, they maintained no standing army and left their cities unfortified. Though in time the Maya waned, a 16th-century chronicle recalled: "In the holy faith their lives were passed . . . the course of humanity was orderly."



Symbol of a warrior nation, a stone soldier in the Toltec gallery towers 15 feet high. The dart thrower in his right hand gave his army increased striking range. Just as Toltec warriors supported the 10th-century empire, the huge statue from Tula, with others like it, held up a temple roof atop a pyramid.

Lacking beasts of burden or the wheel, the Toltecs made their ponderous sculptures in four parts, then probably manhandled them to the top of the pyramid, as portrayed in the museum mural below.

Coyote-head helmet of a warrior—depicted in this mother-of-pearl sculpture—was designed to frighten his enemies.

Toltecs establish Mexico's first military empire

SWEEPING OUT OF THE NORTH in the eighth and ninth centuries, rude Toltec soldiers overran the Valley of Mexico and made their capital at Tula. There they built pyramids and crowned them with temples (below). Their young warrior-king took the name of his favorite god, Quetzalcóatl, and minted the Toltec golden age, as museum visitors see in a wealth of gems. The Toltecs became what their name proclaims: "master builders" or "civilized persons." Exacting tribute from subject villages, they erected elegant palaces, great markets, even public steam baths. Late in the 10th century rival priests banished Quetzalcóatl, who vowed to return. Less than two centuries later new invaders from the north broke the power of the Toltecs, ushering in a dark age that lasted until Aztec times.

EKTACHROME (OPPOSITE) BY THOMAS R. SMITH; KODACHROMES BY E. ANTHONY STEWART © N.G.S.

Tours through a treasure house inspire artists of today

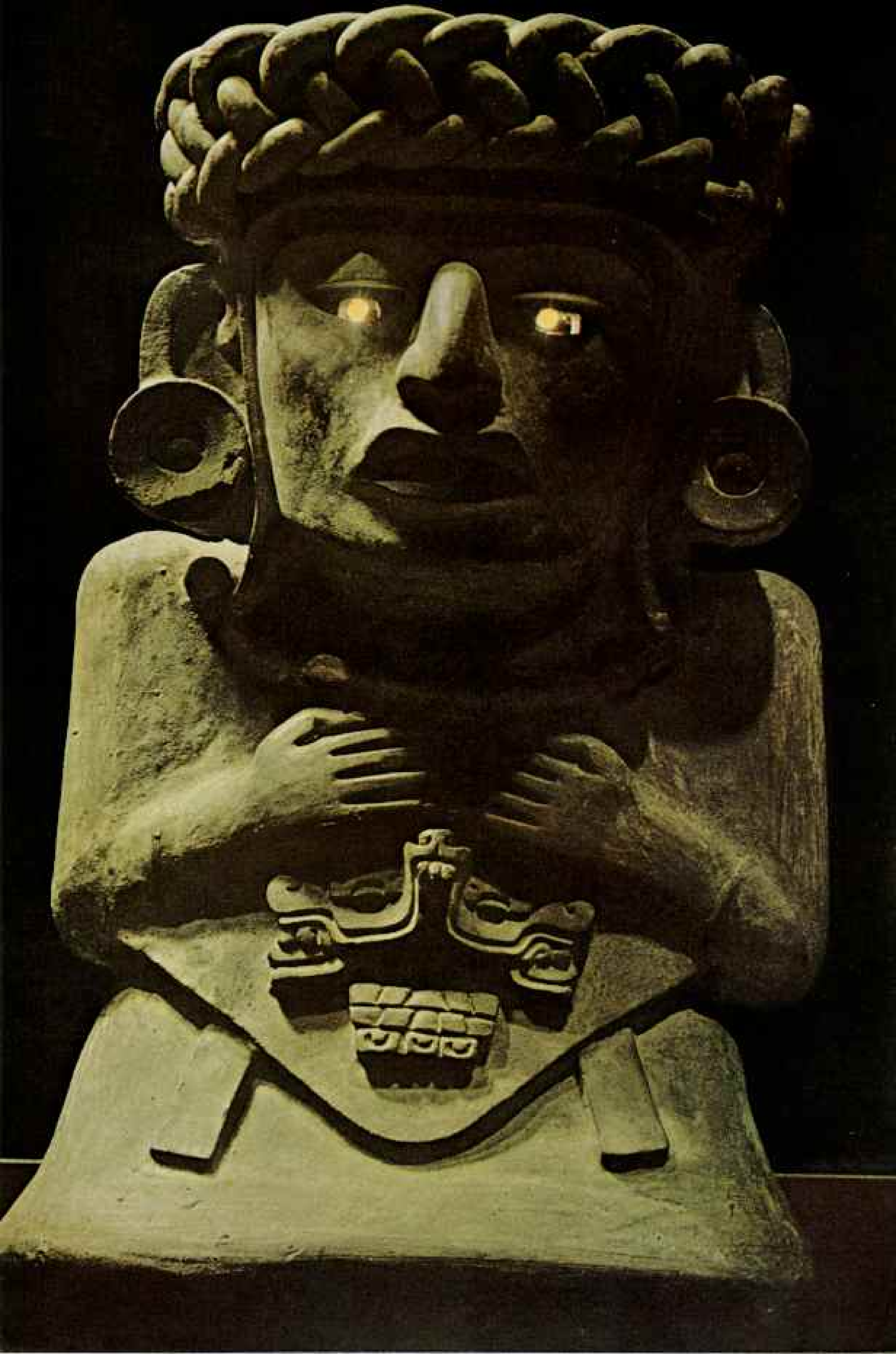
IN A BRIGHT MUSEUM WORKSHOP, intent youngsters (right) make clay models of gallery artifacts that fired their fancy. Through such imaginative programs, the museum staff brings Mexicans face to face with the crafts of their ancestors. Lectures, movies, special tours, and a library of a quarter of a million volumes daily draw 1,500 students, ranging from skipping children to grave candidates for graduate degrees. Fanning out from the museum, trailer-borne exhibits carry art and artifacts to factories and office buildings.

EKTACHROME BY DAVID F. CUPP © N.G.S.

Interview with *el negrito:* Students jot notes on a dance costume from the Puebla Sierra, inspired by Moors brought by the Spaniards. It enlivens second-floor ethnology exhibits of contemporary Indian cultures.

Snarling gods wage ceaseless war in a mural by modern Mexican artist Rufino Tamayo. Feathered Quetzalcóatl, deity of light, coils near the sun to strike Texcatlipoca the jaguar, evil spirit of the night.

EKTACHROME (BELOW) AND KODACHROME BY B. ANTHONY STEWART AND JOHN E. FLETCHER © N.G.S.



Dainty symbol of war, a gold brooch with turquoise inlay, arrows, and dangling bells attests to Mixtec skill.

Poised as if to drink, a hummingbird perches on the edge of a Mixtec cup from a tomb in Zaachila.

1/2 ACTUAL SIZE

KODACHROMES BY B. ANTHONY STEWART AND JOHN E. FLETCHER (OPPOSITE) AND B. ANTHONY STEWART © N.G.S.

1/2 ACTUAL SIZE

Tattooed specter, an urn probably represents the god Xipe Totec (page 501), honored in Oaxaca as patron of goldsmiths. Distinctive of Zapotec culture, such urns accompanied important burials at Monte Albán.

Zapotecs and Mixtecs prosper in Oaxaca

HER EYES BLAZING with a photographer's lights, a Zapotec deity (left) looks eerily out on the world. The serpent head and 13 squares on her apronlike skirt suggest she was goddess of a calendar day that the Zapotecs called 13 Serpent. The urn, half actual size, was discovered in a tomb.

Centered around Monte Albán in Oaxaca, the Zapotecs flourished from A.D. 600 to 900 and built elaborate burial vaults. In the 10th century, the Mixtecs dropped from their mountainous "land of clouds," occupied Oaxaca, and later used the burial chambers of the Zapotecs. They excelled as jewelers. Conquistadors described ornaments "which even the great goldsmiths in Spain were forced to admire." Museum archeologists continue to unearth treasures in the tombs of Oaxaca.

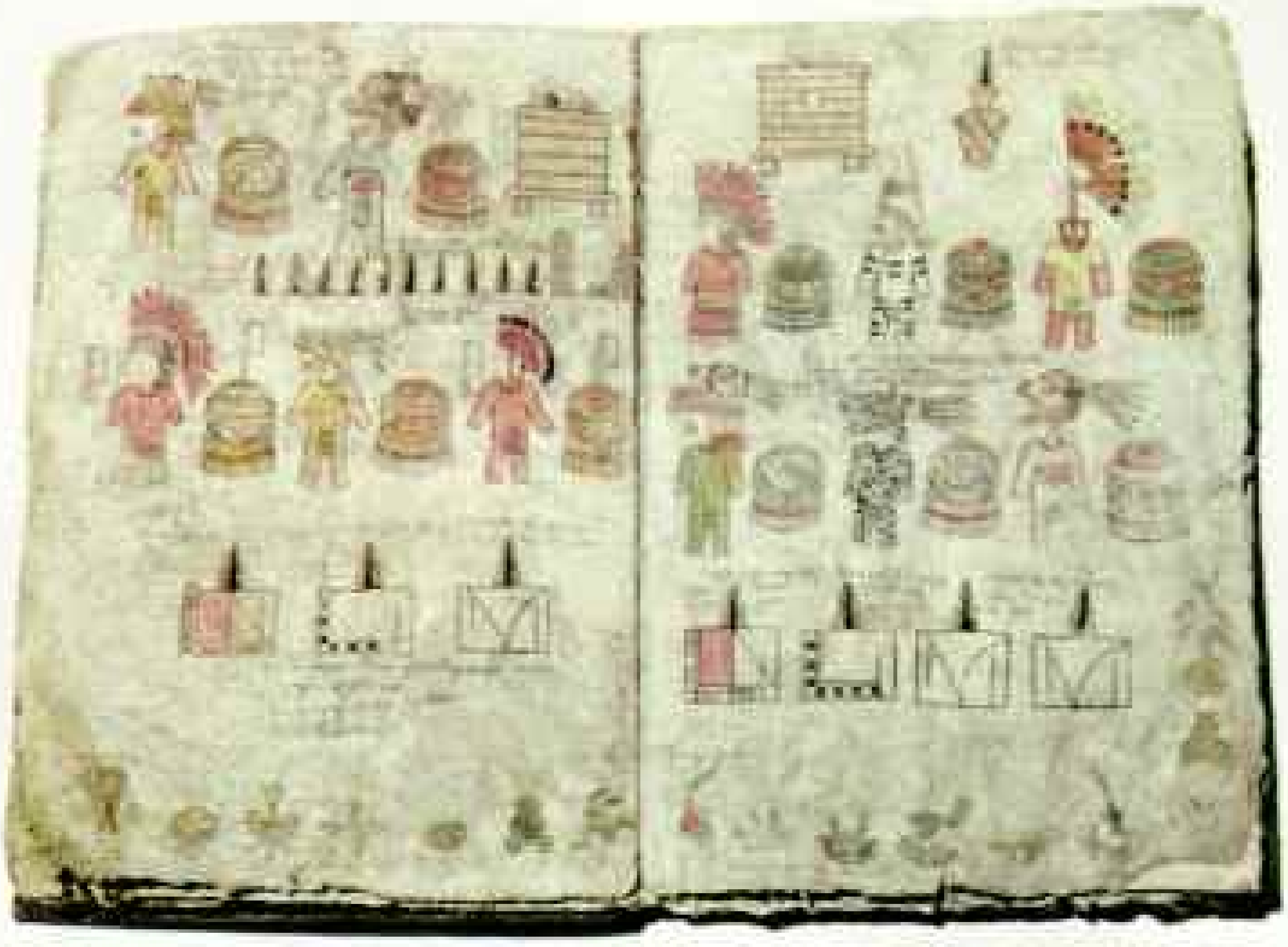
Aztecs: cruel cults and fine arts

VISITORS ENTERING THE AZTEC HALL to approach the great Sun Stone must pass the snarling mouth of a crouching stone jaguar (above). His back gapes with a yawning hole, for this is a sacrificial vessel that once brimmed full with human hearts.

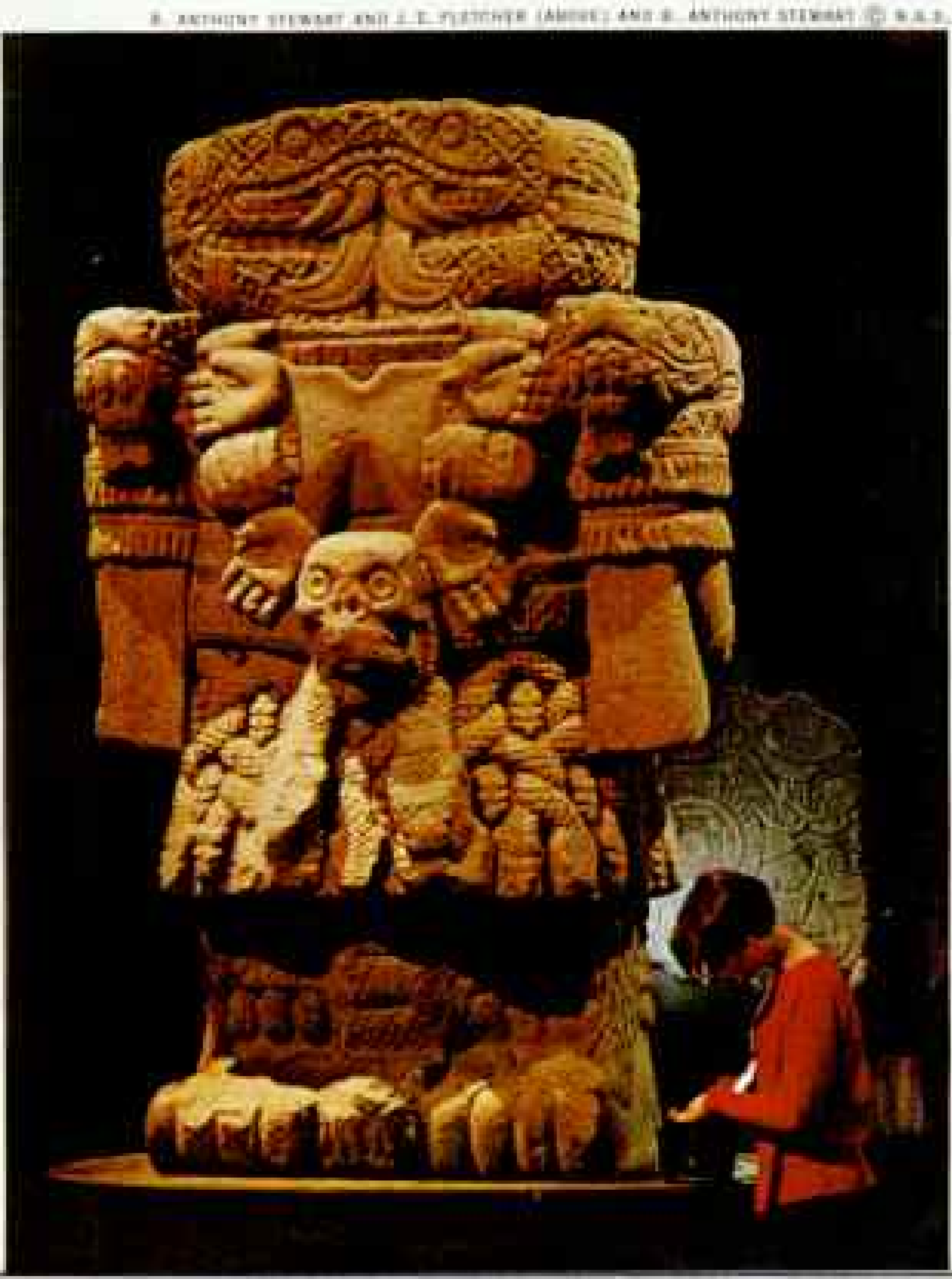
The Aztecs were as hard as their idols. Their fanatical priests taught that the sun would dim and die without a constant diet of hearts carved from human breasts by obsidian knives. From their capital Tenochtitlán, present-day Mexico City, Aztec soldiers raided neighboring nations for victims. Dedicating their greatest temple, they sacrificed perhaps as many as 20,000 human beings.

Yet the Aztecs, imbued with Toltec traditions, wrote an astonishing success story. As snake-eating barbarians, they made a bedraggled entry into the Valley of Mexico in the 13th century. In 200 years they conquered an empire that stretched from coast to coast and south into Guatemala; they spread a common language and a system of pictographic writing. When Cortés led his Spaniards into Mexico in 1519, he found the philosopher-king Montezuma II leading a stable government based on clan rule and tribute. Mistaking Cortés for the returning Toltec Quetzalcóatl (page 511), Montezuma submitted to the Spaniards. His empire crumbled; many pictographic volumes were destroyed as heathen. But the museum's wealth of artifacts bespeaks the grandeur of the Aztecs.

Like a mail-order catalogue, a rare manuscript listing tribute paid to the Aztec ruler Montezuma records the commerce of 1519. Goods include warrior suits, feathered shields, square bundles of clothing, and bins of grain. Flags and treelike symbols indicate items in lots of 20 and 400. Emblems at bottom signify towns that paid. The writing, added in Spanish, gives explanations.



B. ANTHONY STEWART AND J. E. FLETCHER (ABOVE) AND B. ANTHONY STEWART © N.G.S.

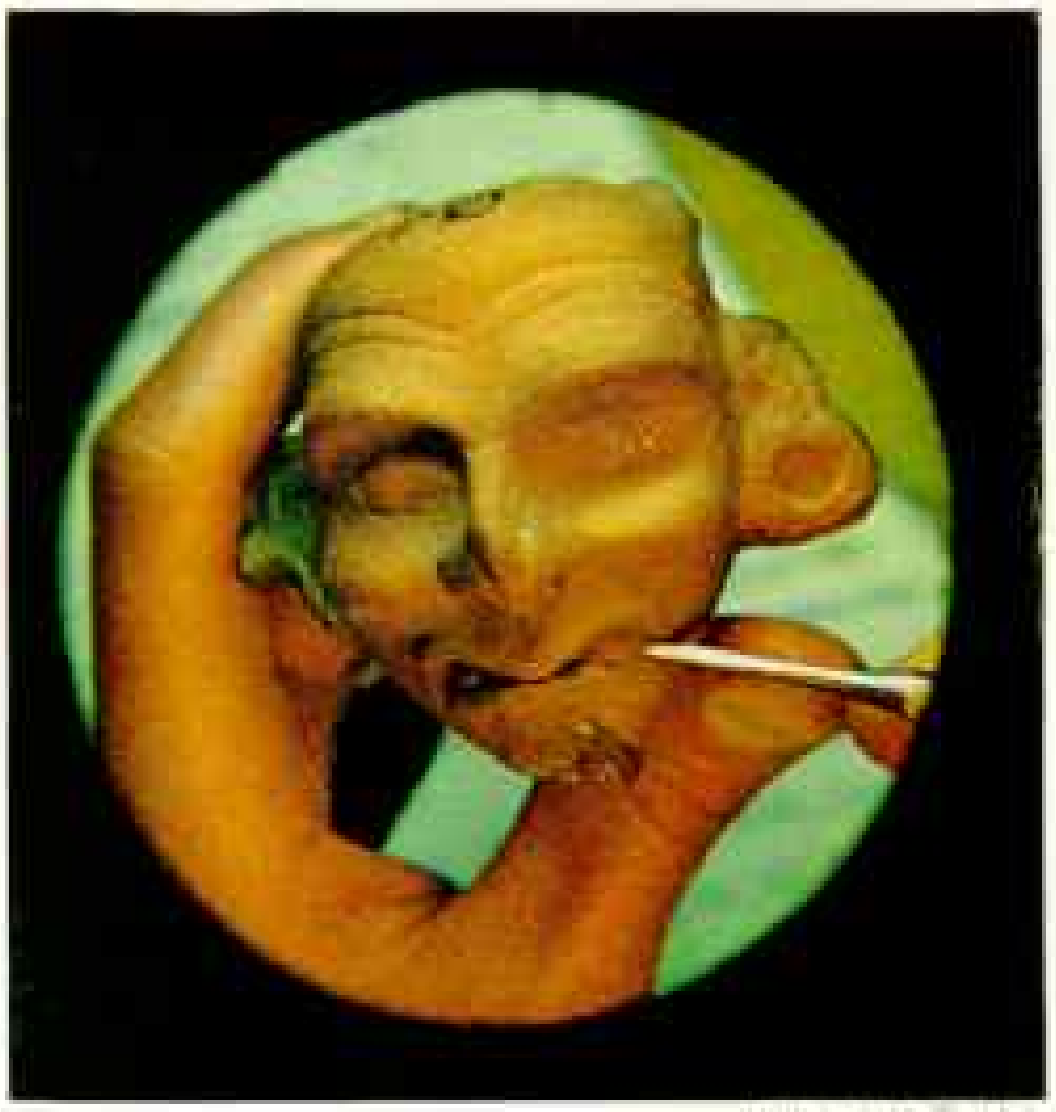


"**She of the serpent skirt,**" Aztecs called the grisly Coatlicue, mother of deities (left). Her decapitated body sprouts two serpents, symbols of blood. Her necklace links human hearts, hands, and skull. First unearthed in Mexico City in 1790, she was quickly reburied by a Spanish priest to discourage her worship.

Plump grasshopper carved from chalcedony came to light at Chapultepec, Grasshopper Hill.

1/6 ACTUAL SIZE

KODACHROME BY B. ANTHONY STEWART AND JOHN E. FLETCHER © N.G.S.



DAVID F. CUPP © N.G.S.

Puzzling portrait, this clay head was found during subway construction in Mexico City. The wrinkled brow suggests the elderly fire god Huehueteotl. Under a magnifying glass, it undergoes cleaning with an awl.

Proud City of the Aztecs

"WE SAW TEMPLES and oratories shaped like towers and bastions, all shining white, a wonderful thing to behold." Thus Bernal Díaz del Castillo described the Aztec capital, Tenochtitlán, as seen by Cortés in 1519. Guided in part by such accounts, museum artists created a model of its sacred precinct (left). Twin temples 100 feet high, once the scene of human sacrifices, dominate a paved plaza. A conical temple to Quetzalcóatl looks down on a columned ball court.

Giving a bird's-eye view, a huge mural shows the Venice-like city crowding an island in Lake Texcoco. Extinct volcanoes rise in the background. Causeways link the city with the mainland. The temples stand at the center of palaces, markets, and the homes of as many as 200,000 persons.

The conquerors leveled the religious center, and today Mexico City spreads over most of the former lake area. But engineers tunneling a new city subway repeatedly find Aztec artifacts that archeologists eagerly collect to feed an unrivaled museum collection.

New Map Brings Middle America's

NO WONDER that to Bernal Díaz del Castillo, battle-hardened conquistador and trusted lieutenant of Cortés, the sight of the capital of the Aztecs "was like the enchantments. . . . And some of our soldiers even asked whether the things that we saw were not a dream."

In Tenochtitlán—today's Mexico City—the conquerors of four and a half centuries ago were seeing the last of the great cultures developed over thousands of years in the rich soil and lush tropic climate of Middle America. Now this whole long series of civilizations unfolds in the unique supplement to this issue, the National Geographic Society's **Archeological Map of Middle America, Land of the Feathered Serpent.***

Like Mexico's National Museum of Anthropology, shown on pages 492-519, the map will add a new dimension of interest for the thousands flocking to Mexico City this month for the Olympic Games—and for the millions who will be traveling there vicariously by the armchair route.

More than 160 notes on the map provide 5,000 words of information on sites ranging from Tenochtitlán itself to the imposing pyramids and temples of the Maya in Yucatán and Guatemala, and on the cultures that produced them.

Notes on the main map in red highlight the various cultures; those in blue are arrowed to specific sites. Red symbols trace the overland expeditions of Hernan Cortés, who scourged the land with sword and lash in the name of gold and glory.

Large-scale insets show four of the most popular and rewarding sites to visit: Teotihuacán near Mexico City, Monte Albán in southern Mexico, Chichén Itzá in Yucatán, and Tikal in Guatemala.

Valley of Mexico, Then and Now

On the other side, a special map with notes gives a closeup of the Valley of Mexico, and an inset shows how geography has changed since that autumn morning in 1519 when Old World met New in a fateful confrontation on a causeway leading to the island city of Tenochtitlán in Lake Texcoco. The lake has shrunk to a small remnant outside the capital city's limits.

A "Yardstick of Time" keys Middle American cultures to an Old World time scale ranging from the era of Ramesses II in Egypt to the discovery of America and the coming of Cortés. Brief text sketches "Middle America Before Cortés," tracing the beginning of agriculture, the development of religion, the evolution of writing, of art, of astronomy, arithmetic, and the recording of time.

Major credit for this highly informative map goes to cartographer-archeologist George E. Stuart of the Society's staff, who conceived the map and compiled its wealth of information. He sought and received the expert counsel of such authorities as Dr. Ignacio Bernal of Mexico City (left) and Gordon R. Willey, Ph.D., Bowditch Professor of Mexican and Central American Archaeology and Ethnology at Harvard University.

Robert W. Northrop of the Society's cartographic staff produced the map's many meticulous drawings, including the cover painting, adapted from an Aztec manuscript, showing Quetzalcóatl, the Feathered Serpent, in one of his many guises. Neighboring cultures worshiped him under various names in the centuries before the Spanish came with a gentler deity and His symbol, the Cross.

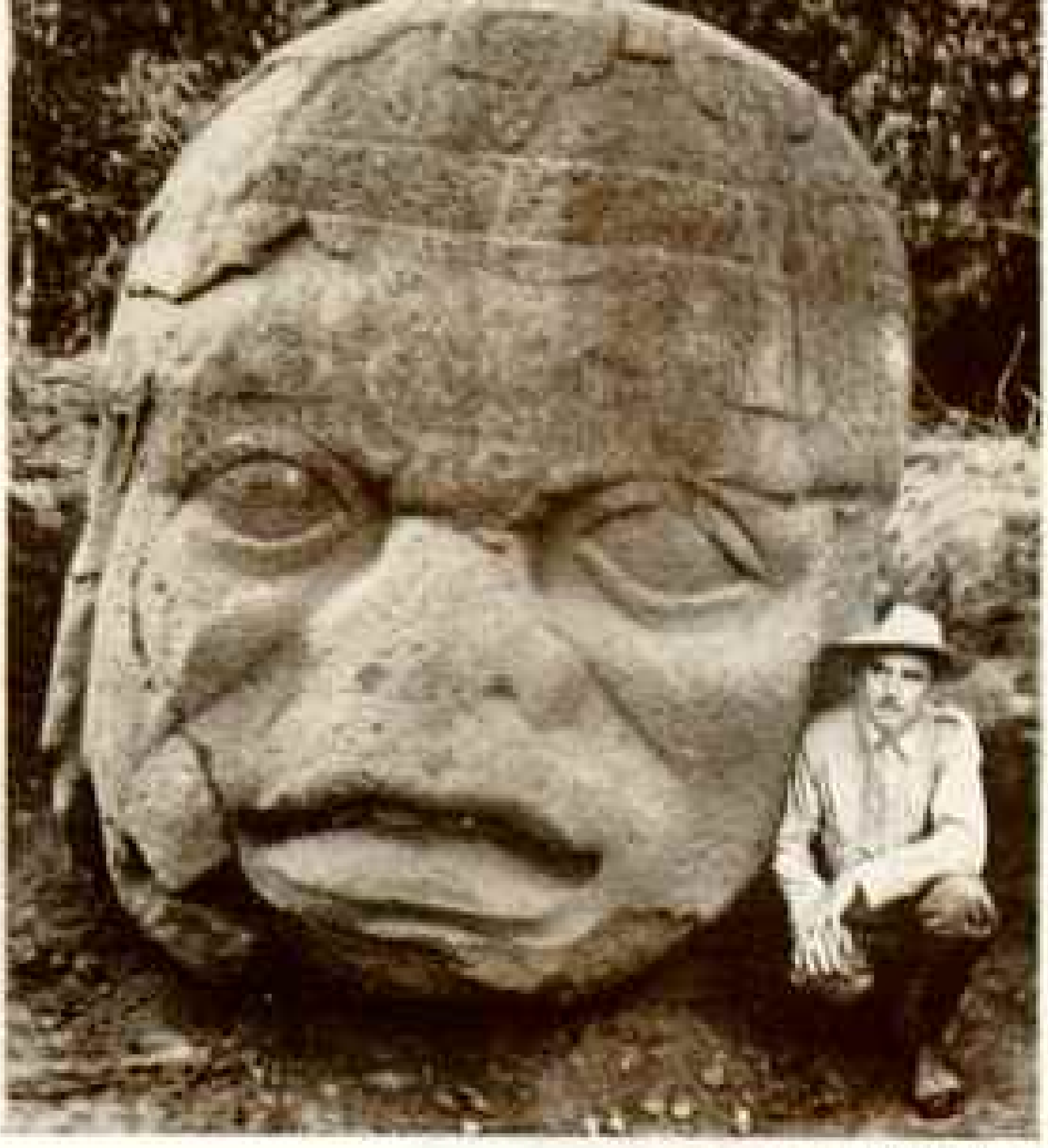
Map in the making: National Geographic Cartographer George E. Stuart (left) checks a preliminary print of the Society's Middle America map with Dr. Ignacio Bernal, director of Mexico's National Institute of Anthropology and History.

Mr. Stuart spent two years compiling the unique map, drawing on historical documents, the advice of scholars, and his own experience with the Geographic-sponsored expeditions to Dzibilchaltún, Yucatán (right).

*Additional copies of the **Archeological Map of Middle America, Land of the Feathered Serpent** may be obtained for 50¢ each, plus 10¢ postage, from National Geographic Society, Dept. 60, Washington, D. C. 20036.

Past to Vivid Life

KODACHROMES BY RICHARD H. STEWART (ABOVE) AND LUIS MARDEN © N.G.S.



RICHARD H. STEWART © N.G.S.

Splendors of the past reward National Geographic expeditions in Middle America. Since 1924 the Society has supported more than a score of explorations there.

At La Venta in 1940, a gigantic basalt head (above) from the 3,000-year-old Olmec culture dwarfs its discoverer, Dr. Matthew W. Stirling of the Smithsonian Institution, now a member of the Society's Committee for Research and Exploration. On a later expedition to Cerro de las Mesas, he unearthed 782 priceless jade carvings (left), distinguished by the figure of a priest holding a ceremonial knife.

Drowned treasure (lower left), a 1,000-year-old earthenware Maya jar, emerges from a *cenote,* or natural well, at Dzibilchaltún, Yucatán, the once-glorious city explored by Dr. E. Wyllys Andrews of Tulane University.

Cable and winch (below) hoist a section of temple column from another Maya cenote at nearby Chichén Itzá. Here divers recovered a huge assortment of pottery and other artifacts, as well as the skeletons of children presumably sacrificed in the cenote's depths.

EKTACHROME BY BATES LITTLEHALES © N.G.S.

Solitude for Millions

Great Smokies National Park

By GORDON YOUNG
National Geographic Staff

Photographs by
JAMES L. AMOS

THINK FOR A MOMENT. Which United States national park ranks first in number of visitors?

If you have just muttered "Yellowstone" or "Yosemite" or "Grand Canyon," look east to the vacationland that straddles the Tennessee-North Carolina border. Great Smoky Mountains National Park played host last year to six and a half million people—more than twice the number that visited any other national park in the country.

That means as many as 50,000 visitors on a summer day. Some of the people, of course, are just passing through, since a national highway bisects the park. But most of the visitors are seeking at least brief escape from their fellow men.

Can anyone find solitude in a park so intensively visited? The answer is yes. Last summer I strolled a Smokies trail for half a day and encountered not a soul.

But the story starts a few weeks earlier, when my family and I headed south from Virginia to discover for ourselves what attracts such multitudes to these mountains.

Driving down the Blue Ridge Parkway to Asheville, we approached the park from the south—through the Cherokee Indian Reservation. First stop: the town of Cherokee, just outside the boundary (map, page 531).

It helps to take a ten-year-old Indian buff along when you visit Cherokee. Watch his eyes and you'll understand why those Cherokee "chiefs" dancing in front of the souvenir shops wear elaborate Sioux war bonnets. Cherokee headdresses are not spectacular enough.

Early next morning we drove our camping truck north on the park's transmountain highway—U. S. Route 441—weaving our way between slopes covered with vegetation so dense it seemed almost overwhelming.

Indian beauty, 18-year-old Faren Sanders, played a leading role in *Unto These Hills,* long-running drama of the Cherokees, performed each summer at their reservation on the southeastern slopes of the Smokies.

Crumpled skyland, the Great Smokies wear winter robes burnished gold on the sunny side and electric blue on the other. The late-afternoon portrait, looking east, delineates the time- and weather-wrinkled profile of the venerable mountain range in the Appalachians. Great Smoky Mountains National Park, an 800-square-mile preserve in the heart of this wilderness, last year attracted 6,500,000 visitors.

"Stay in your autos; enjoy the bears at a distance," implore the rangers—obviously often in vain. One of an estimated 300 black bears roaming the park gives motorists a thrill. Rangers trap the boldest animals and exile them to remote preserves outside the park.

Pine, oak, hemlock, yellow poplar, tangled thickets of rhododendron and mountain laurel—how could nature possibly pack that much greenery onto these steep hills, we wondered. Those close-packed leaves exude water vapor and oils—and, according to scientists, this creates the "smoke" that gives the mountains their name (pages 544-5).

Wheeling into the entrance to Chimneys Campground, our truck was slowed to a crawl. A big black bear ambled down the road ahead of us, surrounded by tourists as he sauntered from garbage can to garbage can.

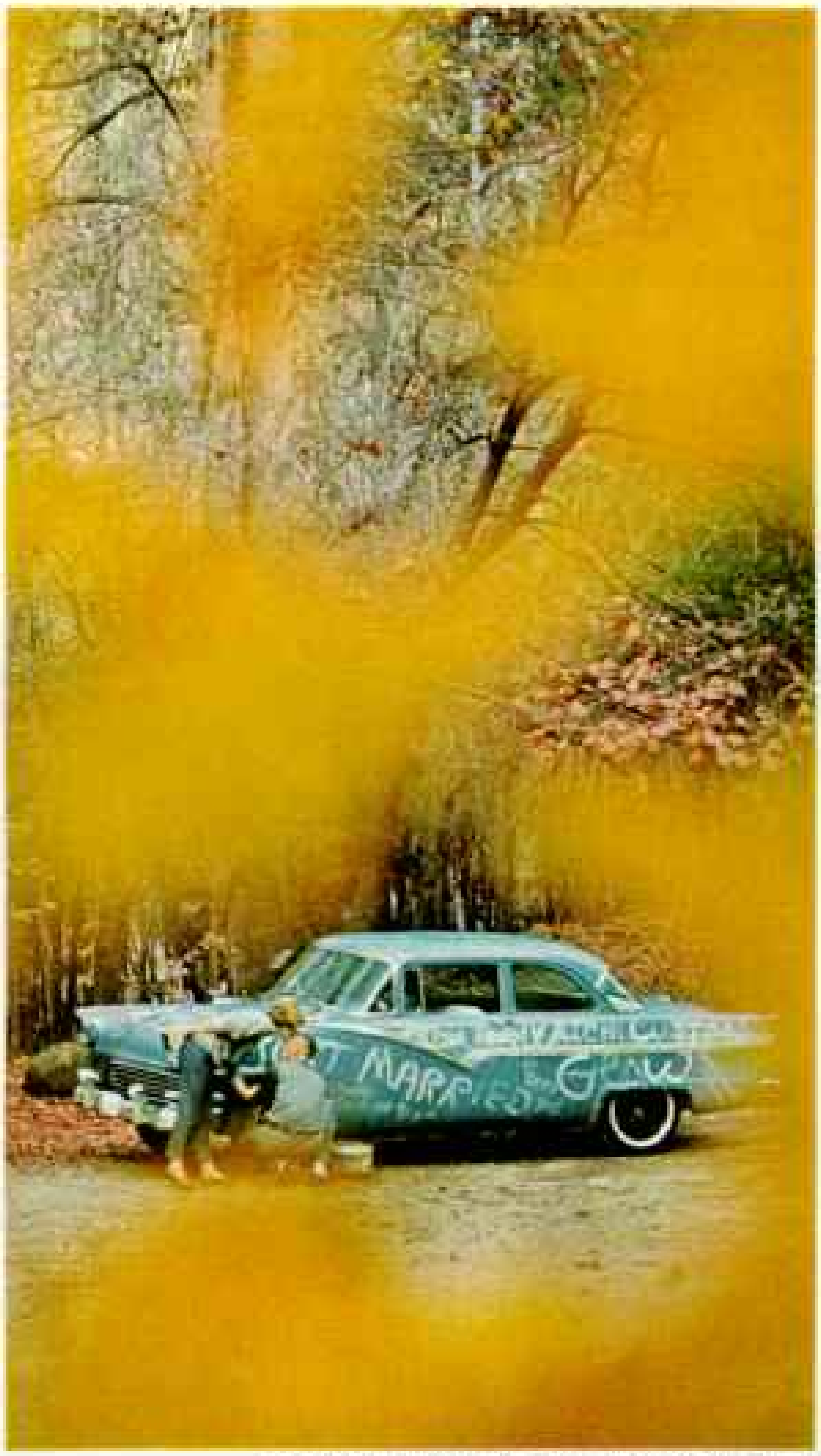
And thus we met "Yogi." For eight years he had been the campground's most popular garbage collector. We stared fascinated at the very small clearance between Yogi's sagging stomach and the ground. Obviously he had a good thing going.

Chimneys, one of the park's oldest campgrounds, lacked the electric lights of its newer neighbors. But there was a rushing creek to lure my barefoot son (pages 536-7), and Yogi to entertain us.

We had been well forewarned: To get a campsite, come early in the day, preferably in midweek. We did so and were rewarded with a pleasingly uncrowded feeling.

Millions Live Within a Day's Drive

Only a small fraction of the park's visitors come to use its 1,500 campsites. Most stay in motels outside the park and drive in on day trips. Viewing the horrendous traffic jams



EKTACHROMES BY JAMES L. AMOS (LEFT) AND BRUCE DALE © N.G.S.

The common black bear *(Euarctos americanus)* also enlivens the trails in such western parks as Yellowstone and Yosemite.

Even car washing can be romantic, when an old married couple of one day scrubs off wedding witticisms. The Smokies rival Niagara Falls as a haven for honeymooners.

that occur on Saturdays and Sundays on the transmountain road, one realizes that this park is a popular weekend goal. More than a fourth of the people in the United States live within a day's drive (inset map, page 531).

You can see some of the park's attractions without even leaving your car, on "drive-in" nature trails. One of those roads forms an 11-mile loop around Cades Cove, and as we traveled it, we drove through history (following pages). Around us were scenes that the pioneer settlers would have recognized—split-rail fences and sturdy log buildings. We browsed through a blacksmith shop, saw corn meal ground in a water-powered grist mill, and watched from a safe distance as honeybees swarmed around a hive known as a "bee gum."

Six years ago, Cades Cove and its people were the subject of a NATIONAL GEOGRAPHIC article.* Five families lived there then, farming the valley under Park Service leases to keep it from returning to woodland. Now, only two families—the Myers and the Caughrons—remain. All the other old-timers have died or moved away.

And the archaic flavor of the mountain dialect has been dimmed by contact with hordes of "furriners." Dimmed, but not extinguished. A bear is still a "b'ar" in Cades Cove.

The park's motor nature trails have their place in the scheme of things, but those who switch from horsepower to footpower will see

*See "The People of Cades Cove," by William O. Douglas, NATIONAL GEOGRAPHIC, July, 1962.

much more. Only 6 percent of the visitors use the hiking trails. Yet there are 650 miles of trails and less than 200 miles of paved roads.

I have walked half a mile down many trails in this teeming park and found soul-refreshing solitude. Naturalist-guided walks are available, too, for those who prefer company.

Consider the massive task faced by the park's staff. They must keep 800 square miles of mountain wilderness frozen in time, appearing much as it did before man began arriving in great numbers.

That goal can't be fully realized, of course. The chestnut trees are gone, wiped out by a

Velvet meadows set amidst henna-daubed hills, the rustic valley known as Cades Cove dozes under an Indian summer sun. In the graveyard of the Methodist church, tomb-

blight that struck 40 years ago. Only mouldering chestnut logs remain, and a few stumps that still send out futile new shoots each spring.

Ross Bender, the park's Chief Naturalist, told me about his "exotic" problems. "Like the wild boar," he said. "It's an exotic species —one not native to this area.

"A few were brought over from Europe's forests in 1912 to stock a game preserve nearby," he explained. "They escaped, eventually, and seem to thrive in these mountains."

"Are they dangerous?" I asked.

Ross shook his head. "That's not the problem; visitors rarely get a glimpse of one. But

stones call the last roll for pioneers who settled here in the early 1800's; only two families remain. An 11-mile road loops past restored cabins, barns, and a mill from frontier days.

EKTACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BRUCE DALE © N.G.S.

EKTACHROME (ABOVE) AND KODACHROME (LOWER RIGHT) BY JAMES L. AMOS © N.G.S.

Aerial train to the top takes skiers up Mount Harrison from Gatlinburg Ski Lodge. A second and longer lift nearby, the Eagle Top, affords expert downhillers a 4,800-foot run.

EKTACHROME BY BRUCE DALE © N.G.S.

Across the sun-shampooed fields of Cades Cove two riders hold their steeds to a gentle pace. Horses may be hired by the hour or the day from among 30-odd mounts at the stable operated by a descendant of an early Cades Cove settler.

"Now a right to your honey for a right and left grand. . . ." Heeding the caller, square dancers swirl at a jamboree in Fontana Village, North Carolina, just outside the park.

the boars encourage erosion by rooting up our grass balds—the mountain meadows. You'd have to see it to believe it. Sometimes it looks as if a machine plow has been working up there! So we live-trap as many boars as we can and ship them off to wildlife management areas in the adjoining states."

He grinned ruefully. "The trouble is, we just manage to trap enough of them to increase the food supply for the rest. Then the free sows have larger litters, and we're right back where we started."

Other animal life in the park includes fifty species of mammals, about half of them rodents. Some 200 species of birds are permanent or seasonal residents. There are more than 1,300 kinds of flowering shrubs and plants, 120 different trees, and nearly 30 varieties of orchids.

"Geologists class these mountains as among the oldest on earth," Ross told me. "They were already old when the Ice Age came, and glaciers crept down from the Arctic regions. The ice

KODACHROME BY JAMES L. AMOS © N.G.S.

"If you know the answer, raise your hand." Ranger Bob Stone quizzes a youthful campfire audience following his illustrated talk at Chimneys Campground. Nightly throughout the summer, Park Service naturalists and historians address vacationists assembled under the stars on subjects ranging from fishing to flowers, bears to mountain pioneers.

stopped north of here, and northern plants, trying to survive, shifted south to mingle with local species. Walk up Mount Le Conte, and you'll find trees on the upper slopes similar to those of southeastern Canada."

Mountain Lodge at Boulevard's End

I had heard of Mount Le Conte. Motorists see it only from a distance, for no road winds up its green slopes. Yet perched on the summit is a concessionaire-operated lodge that accommodates 50 guests. It is supplied by horse packtrain. Guests walk or occasionally make the climb on horseback.

Le Conte Lodge does a thriving business, I discovered when I telephoned for reservations. Yes, they could make room for me—if I didn't plan to stay into the weekend.

My wife and son, on their way to visit friends in nearby Knoxville, dropped me off at Newfound Gap next day. I left Route 441, with its chuffing, honking symbols of civilization, and started walking. For the next six hours I was alone with the mountain.

At least I saw no other hikers. But as I strolled along the eight-mile trail that wound between laurel thickets, juncos fluttered down to *tsk tsk* at me. A black-throated blue warbler flashed down through the trees, showing off his white vest, black bib, and blue coat.

For the first three miles I walked a section of the Appalachian Trail—it stretches 70 miles across the park.* Then I turned off on another trail, deceptively called The Boulevard.

Spruce and fir gradually appeared among the rhododendron and mountain laurel. Yes, Ross Bender's promise had come true. I'd climbed into "Canada."

At lunchtime I paused at a rill of clear, sweet water to wash down my sandwich. Then I spent half an hour lying on my back, watching white cumulus clouds sail by. As I

*See "Skyline Trail from Maine to Georgia," by Andrew H. Brown, NATIONAL GEOGRAPHIC, August, 1949.

arose, I found the mountain offering me dessert. Next to my resting place was a bush laden with blackberries.

Onward and upward, until finally the trail leveled off and the log buildings of Le Conte Lodge appeared ahead. I stopped for a moment to look back. Only a few hours ago my wife had worriedly muttered something about bears and rattlesnakes. Where were they now, I wondered. Even the blackberry bush had been thornless!

A cheerful welcome was waiting at the lodge, and it came from guests as well as from Herrick Brown, the owner. We 40 guests had varied backgrounds, and our ages ranged from seven to 60-plus. Yet nearly all of us had conquered the 6,593-foot mountain on foot, so we were a fraternity (page 537).

New friendships made the day fly. In the evening we all strolled out to watch a descending sun set the clouds aflame. Back to the lodge, then, to the warmth of roaring fireplaces—though it was midsummer in the valley below.

I'll return to Mount Le Conte some day, and my wife and boy will sit beside me to watch the sun go down.

Fun-fishing Limit: 16 Inches

Back at the Chimneys Campground, my son Michael greeted me with improbable fish stories about the big ones that got away. Well, there really are good-size trout left in those fisherman-lined streams. Park authorities keep them productive by using practical conservation methods.

Only children 12 or under may fish the best stretches of water near the campgrounds. Other sections of the streams are "Fishing-for-Fun" places, where anglers must free any trout measuring less than 16 inches in length. Now and then a lucky fisherman will land a 20-inch rainbow. Short-term fishing licenses are available from both Tennessee and North Carolina at modest cost.

We climbed a mountain a few

EKTACHROME © NATIONAL GEOGRAPHIC SOCIETY

Suppertime can't come too soon for three hungry hikers—author Young, his son Michael, and their cocker Shadrack. Steaks sizzle on the grill at Cataloochee Campground in the North Carolina section of the park. On summer weekends, as many as 5,000 campers claim tent and trailer space in the preserve.


Great Smoky Mountains
NATIONAL PARK
STATUTE MILES
© NATIONAL GEOGRAPHIC SOCIETY
Roads, principal, other
Horse and foot trail
Foot trail
Ranger station
Shelter
Campground (developed)
Campground (undeveloped)
Pioneer structure
Fire or observation tower
Horses for hire
Elevations in feet
Arrows on roads show traffic direction
IND.
OHIO
Cincinnati
Washington, D.C.
MD.
WEST
VIRGINIA
Charleston
Louisville
Frankfort
Lexington
KENTUCKY
Staunton
Charlottesville
Richmond
APPALACHIAN MOUNTAINS
Roanoke
VIRGINIA
Bristol
GREAT
SMOKY MOUNTAINS
NATIONAL
PARK
Knoxville
TENNESSEE
Winston-Salem
Greensboro
Raleigh
Mt. Mitchell
Asheville
NORTH CAROLINA
Chattanooga
Charlotte
Greenville
Spartanburg
SOUTH CAROLINA
Columbia
GEORGIA
Atlanta
Wilmington
Atlantic
Ocean
STATUTE MILES
Sevierville
Little Pigeon River
East Fork
Little Pigeon River
CHEROKEE
NATIONAL FOREST
Hartford
UNDER CONSTRUCTION
Pigeon Forge
Cosby
Pittman
Center
FOOTHILLS PARKWAY
TENNESSEE
NORTH CAROLINA
Mt. Sterling
Mt. Cammerer
Casby Knob
Greenbrier
Pinnacle
Mt. Guyot
Big Creek
PISGAH
NATIONAL
FOREST
Mt. Sterling
Gatlinburg
SKI LODGE
Mt. Harrison
ROARING FORK
MOTOR NATURE TRAIL
PARK HEADQUARTERS AND
SUGARLANDS VISITOR CENTER
Middle Prong
Waterville Lake
Hepco
Laurel Top
Big Cataloochee
Mountain
LITTLE CATALOOCHEE
CHURCH
ELKMONT
Mt. Le Conte
THE
LOOP
ALUM
CAVE
Charlies Bunion
APPALACHIAN TRAIL
Balsam Mountain
CATALOOCHEE
CHIMNEYS
Chimney Tops
Mt. Kephart
Blanket
Mountain
Newfound Gap
Spruce
Mountain
Cove Creek
Silers
Bald
Clingmans
Dome
MOUNTAINS
SMOKY
SMOKEMONT
OCONALUFTEE
JOB CORPS
HEINTOOGA
OVERLOOK
CATALOOCHEE RANCH
(SKI RESORT)
Andrews
Bald
CHEROKEE
INDIAN
RESERVATION
MINGUS MILL
OCONALUFTEE
VISITOR CENTER
Dellwood
High Rocks
Soco Gap
Waynesville
MOUNTAIN SIDE
THEATER
Cherokee
Soco Creek
BLUE RIDGE
PARKWAY
DEEP CREEK
Deep Creek
Noland Creek
Bryson City
CHEROKEE
INDIAN
RESERVATION
NANTAHALA
NATIONAL FOREST
National Forest
Boundary
National Forest
Boundary
Tuckasegee River
Lauada
Sylva

days later—the easy way. The three of us drove up Clingmans Dome to its high-perched parking lot, then walked up a half-mile trail to the top.

Now that is a trail that *should* be named The Boulevard, for it is paved to withstand the myriad feet that tread it. At the top of the mountain the trail continues skyward, circling up a spiral ramp to the top of an observation tower (pages 544-5).

A dozen people shared our view, and one of them was in a wheelchair. Suddenly the asphalted trail took on new meaning: how else could an invalid see this beauty?

Our platform, 6,697 feet above sea level, was perched on top of the park's tallest mountain. We seemed to be adrift on a stormy sea. Wherever I looked, mountains rose in great green billows—motionless waves given movement by the shadows of passing clouds.

I told Michael of the Appalachian revolution, the ancient upheaval of the earth's crust that formed these mountains. But my son preferred the explanation found in the old Cherokee legends.

"The Cherokee stories say that everybody used to live in the sky over the ocean," he told me. "Then a water beetle went down to the ocean bottom and brought some mud up to the surface, and made it grow into the earth. A big buzzard flew down to see if it was dry yet. He was tired by the time he got here, so he flew real low. When his wings flapped down, they made valleys, and when his wings flapped up, they made mountains."

"It Seems to Be a Good Book. . . ."

We returned to the reservation one evening to watch *Unto These Hills*. The outdoor drama, presented by the Cherokee Historical Association, builds up to an inglorious act in American history—The Removal.

Treaty after treaty had been broken, and, piece by piece, the Cherokees lost their once-vast domain. In 1838 Federal troops moved in to transport the Cherokees to land in what is now Oklahoma.

During The Removal 16,000 Indians made the harsh journey—some by river boat, and others overland along what became known as the Trail of Tears. By the end of the ordeal, 4,000 had died.

A small group of Cherokees escaped by hiding. They were the ancestors of today's Eastern Band of Cherokees, who live next to the park (map, page 531).

Driving back to camp, I remembered the words that history attributes to Drowning Bear, a Cherokee chief, regarding the Bible:

"It seems to be a good book. . . . Strange that the white people are not better, after having had it so long."

Open-window Camper Isn't Bear-proof

Next day we moved to Elkmont Campground in the northern part of the park. Our tenting neighbors all seemed to have bear stories to tell. As we sipped our evening coffee, we heard about a park ranger who, according to rumor, discovered a motorist trying to push a bear into the front seat of his car. He wanted to photograph it in there, next to his wife!

Gathered around a campfire, we heard other tales. One concerned a woman camper who had smeared cold cream on her face before retiring. She woke up, so the story went, to find a bear in her tent licking off the cream.

Interesting but imaginative stories, my wife and I assured each other as we walked to our campsite. Still, we stole nervous glances at bear-colored shadows that seemed to prowl just outside our lantern's circle of light.

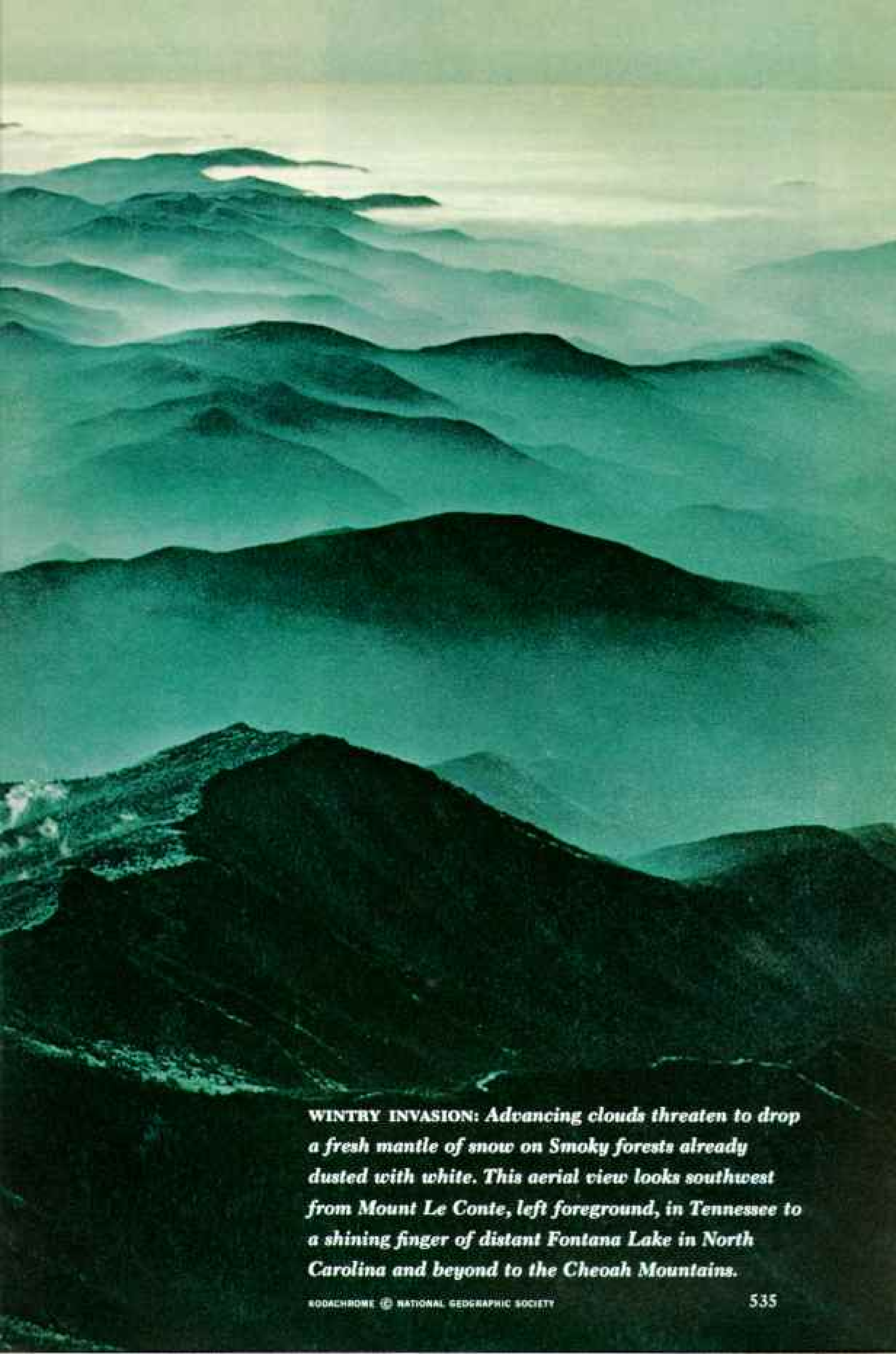
In the morning I visited park headquarters to find out about those bears. Dan Davis, Assistant Superintendent, greeted me with the calm, friendly smile that seems to be almost a part of the park ranger's uniform.

His grin widened when I asked about the Front-seat Incident and the Cold-cream Caper.

"No, I can't verify those stories," he said. "But almost anything can happen when tourists and black bears get together. People are used to seeing their wild animals kept in zoos. Some of our visitors evidently think that an unconfined bear must be a tame one. Well, these bears aren't pets!"

His smile faded. "Look at it from the bear's point of view. Suppose you're 300 pounds of hungry bear and a tourist offers you half his

Bittersweet strains of "The Wagoner's Lad," a ballad about a mountain girl's unrequited love, float on the soft September air. Jean and Bill Davis play dulcimers, using a Popsicle stick as a "noter." Last May the Gatlinburg couple, who make and sell the instruments, sponsored and directed the first annual Smoky Mountain Folk Festival. It attracted more than 5,000 folk-craft fanciers to the city's Civic Auditorium.



WINTRY INVASION: *Advancing clouds threaten to drop a fresh mantle of snow on Smoky forests already dusted with white. This aerial view looks southwest from Mount Le Conte, left foreground, in Tennessee to a shining finger of distant Fontana Lake in North Carolina and beyond to the Cheoah Mountains.*

Hand over hand, from one rocky niche to the next, climbers scale one of twin pinnacles known as Chimney Tops. Their reward for the strenuous two-mile hike from the highway: a superb view of the Sugarlands area.

Scores of foot trails garlanded with laurel and rhododendron wind through the park's forests, where every 1,000 feet of climb is the rough equivalent of traveling 300 miles north. Many trees and shrubs at the Smokies' highest altitudes resemble those of New England and southeastern Canada.

The famed Appalachian Trail zigzags through the park for 70 miles (map, pages 530-31).

picnic sandwich. You'd finish it and reach for the rest. If the tourist tried to swat you away, maybe you'd swat back."

Then Dan waved a cautioning finger. "Let's keep the problem in perspective, though. We expect more than six million visitors this year, and we have about 300 bears. We'll probably end the season with less than a dozen bear wounds, and most won't require hospitalization. Usually the bear damage is to equipment—such as iceboxes and tents."

Rather smugly I mentioned my bear-proof camping truck, but Dan undercut my complacency with a warning. "Just don't leave the camper with food on the table and the windows open. If a bear climbs in, you'll find a mess when you return."

During the rest of our chat I was trying to remember about those windows back in the camping truck.

Like many a city boy, I worry about poisonous snakes, so I asked Dan about the park's dangerous reptiles.

"We have timber rattlers and copperheads," he admitted freely. "Both species are anxious to get out of your way, though. They'll leave you alone. As a matter of fact, we don't have one fatal snakebite on record here."

Dan's eyes twinkled when we said goodbye. I think he knew

Mecca of hikers, Le Conte Lodge atop the 6,593-foot peak can be reached only by foot or horse trail. These lodgers enjoying a lighthearted breakfast hiked up the previous day.

Glowing fires chase the chill of the night at Chimneys Campground. Jabbering waters of the West Prong Little Pigeon River rush around and over boulders in a headlong flight down the mountainside.

Headache highway: Park-bound traffic clogs U. S. 441 as it funnels into Gatlinburg. A by-pass, opened last June, now eases congestion.

Serenity lane: A white-tailed deer leaps across the motor trail looping Cades Cove. Crows saunter beside the

that I was hurrying back to check my camper windows. They were open, by the way, but no bears had paid us a visit.

The park's few living hazards were in focus for me. If I continued to behave myself—and I solemnly vowed that I would—the bears and snakes would mind their manners too.

Next day, Dick Hardin, ranger at Elkmont, looked me up. "We're going after a trouble-making bear today," he announced. "Dan Davis wants to know if you'd like to go along."

An hour later I rode in a Park Service truck with Dick and seasonal ranger Ray Ledford. Behind us trailed a wheeled, tank-like cage.

Dick pulled off the road near a trash can. "The bear we're after usually turns up about three in the afternoon to check this can."

I watched Dick prepare his rifle. Despite its lethal look, it was a humane weapon, designed to fire an anesthetic dart.

While we waited, I asked what crime the bear had committed.

"Yesterday he ran four hikers out of an

EKTACHROME (ABOVE) AND KODACHROME BY JAMES L. AMOS © N.G.S.

road. The valley abounds in wildlife: Bears raid beehives, bobcats prowl meadows, and ground hogs—called "whistle-pigs"—tunnel fields.

Appalachian Trail shelter and tore up their equipment looking for food. He's been in that kind of trouble twice before; now we'll have to move him to a wildlife management area outside the park."

"We can't just haul him into the park's back country the way they do in Yellowstone," Ray Ledford added. "Our back country isn't that far back."

In spite of Dick's businesslike preparations, I sensed he had no great liking for this job that had to be done.

"Bears like this one aren't really bad," he said. "Just misguided."

The laurel bushes rustled 40 feet away from us. Suddenly there was our misguided one, heading for the trash can.

Dick moved off to the right to get a clear shot and fired. The bear wheeled, a bright-feathered dart decorating his flank, and lumbered back into the laurel. I followed Dick and Ray as they raced after him.

We found the drugged bear 50 feet up the slope. Working rapidly—for there was no sure way to tell how long his stupor would last—the rangers dragged him out of the thicket and onto the parking area beside the road. A goodly heave then, and soon our furry prisoner

KODACHROME BY DAN McCOY, BLACK STAR © N.G.S.

Blending of beauty: Buckeye butterfly *(Junonia coenia coenia)* sips nectar from a zinnia near park headquarters.

KODACHROME BY JAMES L. AMOS © N.G.S.

Flame azaleas, right, grow wild at elevations up to 5,800 feet. Other Smokies varieties range from palest yellow to red.

EKTACHROME (BELOW) BY BRUCE ROBERTS, RAPHO GUILLUMETTE © N.G.S.

KODACHROME BY JAMES L. AMOS © N.G.S.

Glory of the ridgetops, Catawba rhododendrons add their late-spring blush of pink to the burgeoning green of Andrews Bald, one of the park's lofty meadowlands.

Like miniature rays of sunshine, coneflowers brighten the lush forest floor of Clingmans Dome (page 545), where an average seven feet of rain falls annually. In the park more than 1,300 species of plants bloom through the seasons.

was in his portable prison, on his way into exile, never to return to Great Smoky Mountains National Park.

Most national parks have been carved out of Government land, but the situation in the Smokies was different. Lumber companies and private individuals owned the land.

The movement that eventually succeeded in establishing a park here began when Mr. and Mrs. Willis P. Davis of Knoxville, Tennessee, took a trip in 1923 through some of the western parks. "Why can't we have a national park in the Smokies?" Mrs. Davis asked her husband.

Answer Comes 17 Years Later

Mr. Davis began the crusade. Gradually, others took up the fight. One—Col. David C. Chapman of Knoxville—earned the unofficial title of "father of the park." And slowly the idea grew—in spite of political opposition, the protests of lumbermen, and public apathy.

Some 6,600 separate tracts in two states were involved, including tiny lots which had been given away as door prizes at a movie theater. Many titles and boundary lines were vague. Financing the purchase posed a seemingly insurmountable obstacle.

But even the money problem was solved. In 1928, John D. Rockefeller, Jr., pledged five million dollars to supplement funds from state and private sources. The Federal Government also contributed over the years.

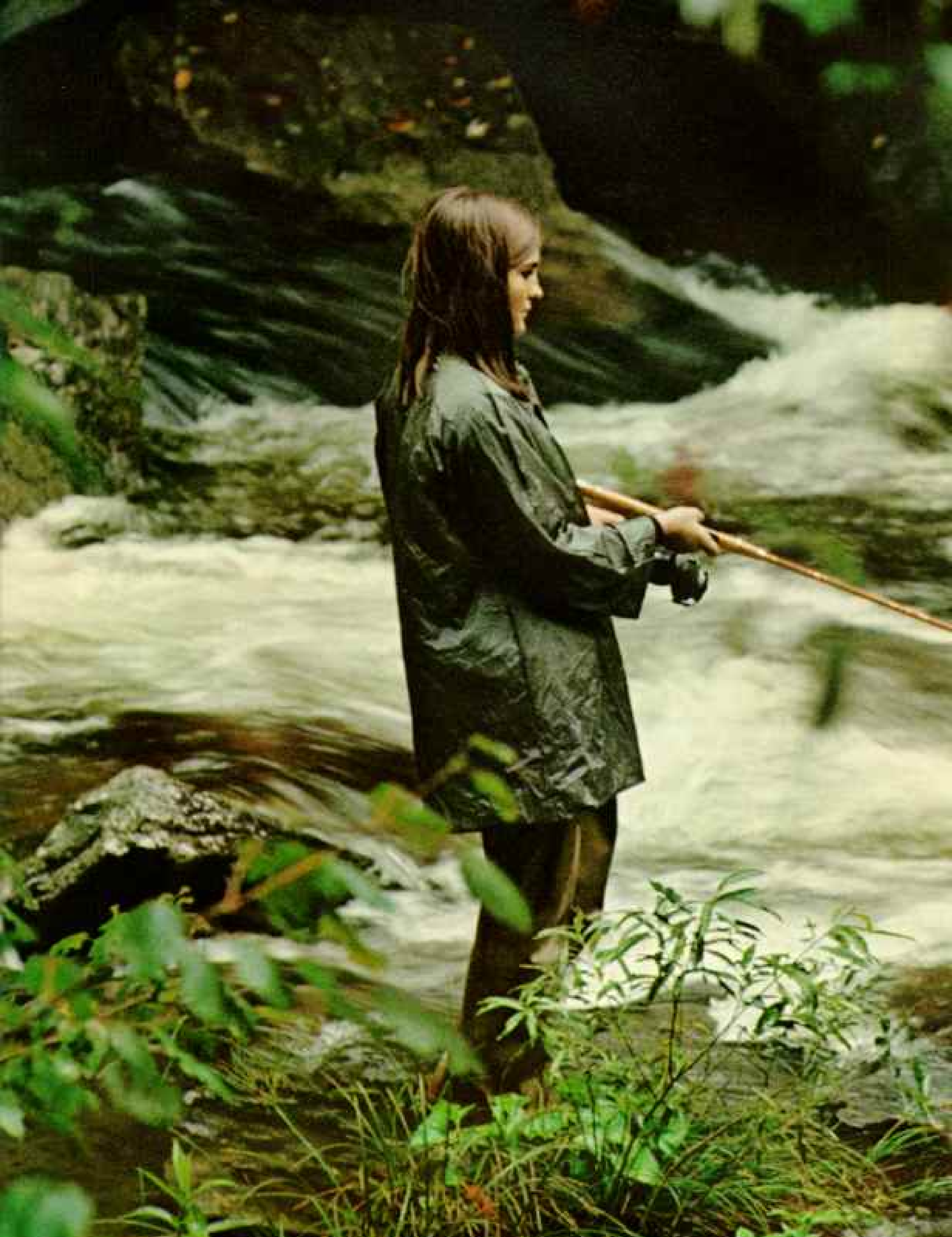
Mrs. Davis's 17-year-old dream finally came true on September 2, 1940, when President Franklin D. Roosevelt formally dedicated Great Smoky Mountains National Park.

On a sunny Saturday afternoon I had an eagle's-eye view of the park and realized then what an incredibly precious possession it is. From a plane, I looked down on a massive panorama of blue-green peaks—800 square miles of elbow room for people too long pent up in city apartments and office cubicles.

Below, on the transmountain road—U. S. 441—cars were creeping along, bumper to bumper. A few—oh, so few—pulled off the road to park where nature trails began.

We flew over Fontana Lake, which borders the southwestern edge of the park. At the western end of the cove-indented lake was the Tennessee Valley Authority's Fontana Dam (map, page 530). At the other end, connected to the lake by the Tuckasegee River, was Bryson City, North Carolina—and a problem that the Park Service has been trying to solve for more than a quarter of a century.

The lake that formed behind Fontana Dam



Frothing water, tumbling amid rocks and rills, lures a lovely angler to try her luck. Park visitor Marty Youngquist of Indianapolis, Indiana, lets her spinning line drift below the rapids of Straight Fork, where the trout laze in calm pools by the rocks.

With patience and skill she landed six 13- to 14-inch fish during the quiet afternoon. Both Tennessee and North Carolina offer short-term licenses to tourists who try for rainbow, brown, and eastern brook trout in the park's 600 miles of scenic streams.

inundated part of Swain County, in which Bryson City is located. Another portion of the county—44,000 acres—was deeded to the park. In return for both, the Government agreed to build a road north of the lake, giving Bryson City access to the newly created water recreation area near the dam.

That agreement, made in 1943, has yet to be fulfilled. The road would present a cutting and filling problem of immense magnitude. So the Park Service and Swain County have been searching ever since for an alternate way to satisfy the contract.

One solution, another transmountain road, was acceptable to the Swain County group. Some park officials, struggling with increasing traffic problems, favored it too, particularly since no part of the proposed road would run through virgin parkland.

But some conservation groups objected to more paved roads within the park. There is little enough wilderness left, they pointed out, especially on America's east coast. Protect what remains. Leave it inviolate. Those who yearn to savor its beauty should leave their cars and walk to find it.

Late last year, the Secretary of the Interior ruled that no new transmountain road would

be constructed—though efforts would continue to be made in search of a compromise.

Another flooded valley nestles on the park's northern side—a valley flooded with people: Gatlinburg, Tennessee.

When I first saw the town, I winced. Motels, restaurants, souvenir shops—everything was here, it seemed, except Cherokee Indians wearing Sioux war bonnets.

Cautiously I tried a restaurant. The food was delicious and surprisingly inexpensive for a tourist town. I prowled through a souvenir shop. Instead of the usual plastic bears and cheap ashtrays I found excellent wood carvings, hand-woven shawls, beeswax candles, and imaginative pottery.

Yes, Gatlinburg is a tourist town. But if a visitor pauses here on his way to the park, he'll find that it's a craft center. The old skills flourish, skills that once were practiced up in those mountains that became a national park.

I talked one day with Mrs. Marion Prince, director of the Pi Beta Phi Settlement School. In 1912, Pi Beta Phi, a national college sorority, sent a teacher to the Gatlinburg area. Today students from all over the country attend the settlement school, where the accent is on mountain crafts.

"We have taught many of the local people the art of hand looming," Mrs. Prince said. "Women *and* men. Right now, we have more than sixty weavers working in their homes. Our Pi Beta Phi chapters sell their products and we have our own shop here in town. So cottage industries still survive."

Popsicle Stick Makes Dulcimer Sing

Once I wandered off Gatlinburg's main street and ran across another fascinating cottage industry at the Davis Dulcimer Shop.

Appalachian dulcimers are certainly not made to standard (page 532). Some have three strings. Some have as many as eight. The shape of the instrument varies, too, from maker to maker—the Davis dulcimer resembles an elongated violin.

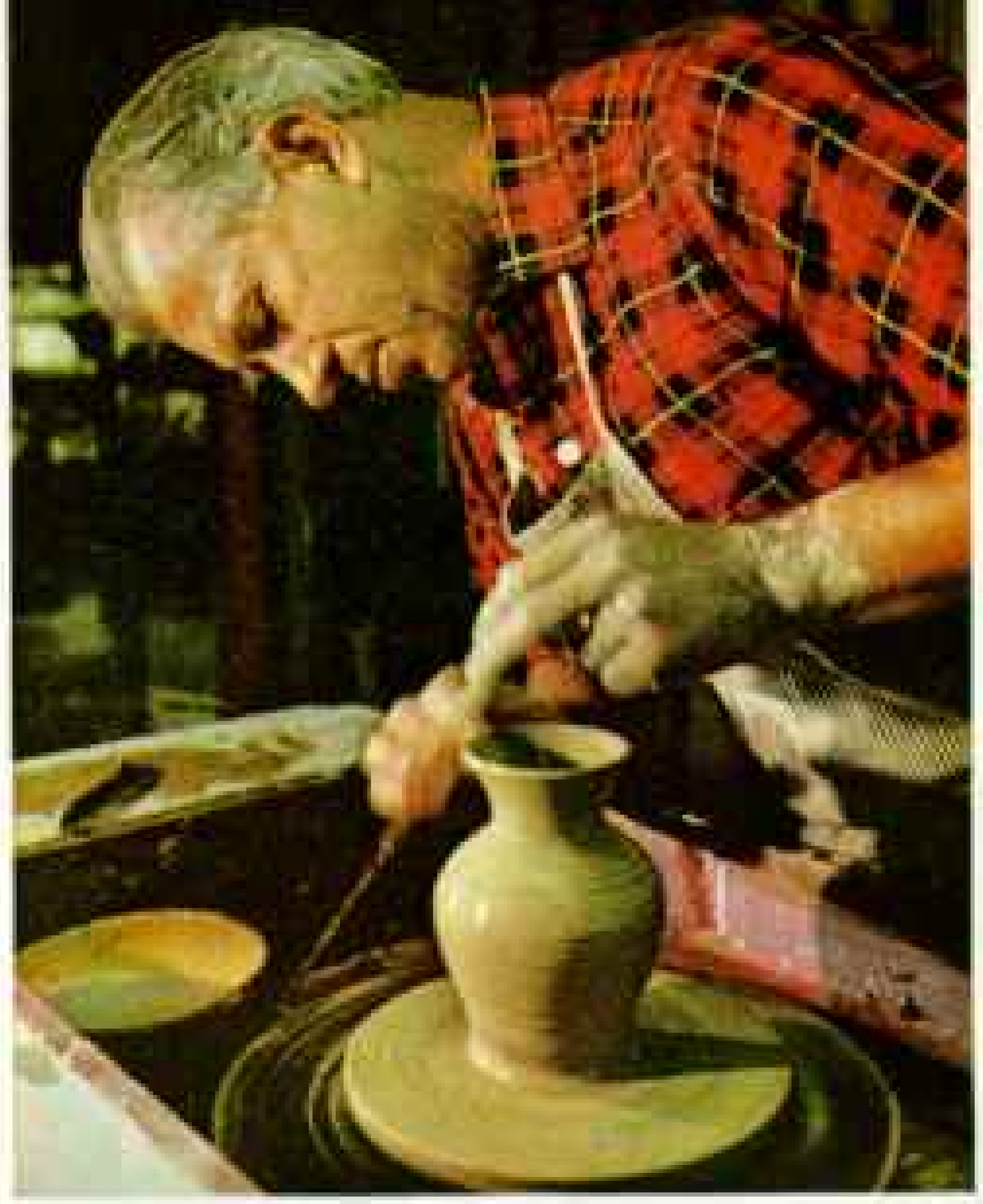
Half a century ago, many of the cabins in these mountains had a dulcimer on the mantel or hanging on the wall, and often it was a homemade one.

Bill Davis's dulcimers look anything but homemade, for he makes them with loving care and superlative craftsmanship. He and his wife Jean spend much of their time giving concerts at schools, playing at folk festivals, making phonograph recordings, and appearing on television programs.

Jean Davis sat on a low chair and laid a dulcimer across her lap. "Basically it's an easy instrument to play," she said. "About as

KODACHROME © N.G.S.

Spiraling to treetop level, a ramp leads visitors to the observation tower on Clingmans Dome. Named for Thomas Lanier Clingman of North Carolina, politician and Confederate general, the 6,642-foot peak is the park's highest. View from the lookout sweeps across wave after wave of densely wooded ranges. The mountains take their name from the smokelike mist that shrouds them—caused by tiny droplets of moisture and oils exuded by plant foliage.



Talented hands of Douglas J. Ferguson shape a vase on a wheel in his pottery plant at Pigeon Forge, north of Gatlinburg.

To make double-headed brooms—an original design—craftsman Lee M. Ogle grows his own broom corn.

"They challenge me," says Jim Gray of the Smokies. He painted seascapes before moving to the mountains with his wife Fran.

simple as picking out a tune with one finger on a piano." She strummed across the strings with a guitar pick, and, with her left hand, slid a small wooden stick back and forth across some of the strings. The haunting strains of "Barbara Allen" filled the room.

"That wooden thing you're holding," I asked when she'd finished playing. "Isn't it a Popsicle stick?"

Jean smiled. "It sure is. Oh, Bill could have made me a fancy 'noter,' but a Popsicle stick works fine."

Before I left the Davis Dulcimer Shop, I could play an almost recognizable version of "Go Tell Aunt Rhody." And today on my mantelpiece is one of Bill's beautifully crafted dulcimers. It is a precious possession, and it fills many of my evenings with music.

Modern Moonshiners Burn Butane

"Don't miss the Cataloochee area," Dan Davis had cautioned me. "And while you're there, look up Mark Hannah. He's the ranger in those parts."

And so we boarded our family camper and headed for the eastern end of the park.

After the corkscrew roads on the way up over the mountains, the rolling pastureland of Cataloochee seemed like Shangri-La. We took a 15-minute reconnaissance drive through the valley before making camp, and saw two deer, a wild turkey, a fox—but none of the park's 6½ million visitors.

As we made camp on the banks of Cataloochee Creek, Mark Hannah paid us a call.

Tall, bronzed, and soft-spoken, Mark looks like a mountain man. And he is. Virtually all his 61 years have been spent in these hills. Woe to the moonshiner or bear poacher who tries to operate in Mark Hannah's territory.

I asked about those furtive individualists who turn their corn crops into liquid form.

"We do have a little trouble with 'em now and again," he answered. "If they operate outside the park, they have state-law trouble. Sometimes one figures he'll take his chances with park lawmen—there aren't too many of us. They'll fire their stills with butane gas so fire watchers can't spot the smoke. But we get things taken care of before too long."

Mark and I roamed Cataloochee's slopes and valleys together, and never was a guide better equipped to answer questions. Mark's great-grandfather was one of the valley's first

white settlers, in the late 1830's. There have been Hannahs here ever since.

In Little Cataloochee valley, Mark led me over to a newly painted frame church. He pointed to one wall, where the wooden siding had been gouged recently. "Bears chewed those pieces off," he explained. "They like the taste of turpentine in new paint."

Stories came out that night as we lounged around our campfire. Mark talked about the Civil War—the 1861 war, he called it. "My great-uncle was in it. I remember him telling me about the time he made five hundred Yankee soldiers run."

"Five *hundred?*"

"Yes, sir," he said, eyes twinkling. "Uncle Logan was a dispatch rider. He was in the lead. The five hundred was chasing him."

Park Sets Expansion Limits

Soon Cataloochee will lose its splendid isolation. A new spur road will lead in from Interstate 40, and a campground is planned.

On our return from Cataloochee, I talked with Park Superintendent George W. Fry regarding the park's future.

"We have three main objectives in our planning," Mr. Fry said. "To preserve the wilderness aspects of the park, to preserve its historical traditions, and to define the limits beyond which there will be no more development within the park. When we reach those limits—well, that's it.

"We'll do what we can to handle the growing number of campers," he said. "We plan to add one new campground and develop existing ones, increasing the number of campsites from the present 1,500 to about 4,500. Dozens of new private campgrounds have been springing up on both the North Carolina and Tennessee sides of the park within the past few years, and that should help. More and more people will have to camp outside the park and drive in during the day."

Was camping restricted to the campgrounds?

Mr. Fry shook his head. "We allow wilderness camping in most areas of the park, provided the camper notifies a ranger of his proposed route and gets a campfire permit. That way, if he doesn't come out of the woods on schedule, we can locate him to see if he's in trouble. We get quite a few winter campers too—the park is open all year. Most of them

are skiers who camp here in heated trailers or camping trucks and spend their days on the ski slopes near Gatlinburg" (page 528).

Within the Great Smoky Mountains National Park are two Job Corps Civilian Conservation Centers. They operate under guidelines set down by the Office of Economic Opportunity in Washington, but Park Service personnel has the task of running them.

I visited the Oconaluftee Center to see how effectively the war on poverty could be waged in a national park.

"We have 186 students here," Director Jack Wheat told me. "It's a volunteer program, of course. There's no set length of stay; the boys can leave it at any time. Ages run from 16 to 21, and more than a third of our boys are nonreaders when they arrive. So quite a bit of the emphasis is on schoolwork."

Young Hands Improve the Park

The boys, I learned, spend 40 percent of their days in classrooms and in the vocational training shops. Another 40 percent of the time is devoted to park and community projects, like the ball park the corps had built recently in Bryson City. The remaining time goes into housekeeping chores.

That afternoon I drove to some of the park projects. One crew was building a picnic area: grading the roads, installing plumbing in the rest rooms, putting up picnic tables they'd made in their shop. Another group was renovating campsites at the park's Smokemont Campground. A third group, up at Laurel Top on the Appalachian Trail, was building a stone sleeping shelter for hikers.

I went away impressed. These obviously weren't make-work projects dreamed up to keep idle hands busy. The boys were paying their way by improving a national park, learning new skills in the process.

Suddenly it was September. School bells would be ringing soon. On Labor Day weekend a torrent of automobiles poured out of the park. We were among them, still telling each other bear stories, grumbling a bit about the crowds, reliving experiences.

I went back again that winter—back to an uncrowded park. The Cherokee "chiefs" had disappeared, and most of the souvenir shops were closed. Old friend Yogi no longer patrolled Chimneys Campground. I saw only one insomniac bear, gazing mournfully into an empty roadside trash can.

It was a different park—a much more open one, now that most of the leaves had gone. The mountains were still magnificent from the tower on Clingmans Dome, though they were white instead of green. There on Clingmans Dome I suddenly missed the crowds that had made me grumble before.

Why? Perhaps the reason is this: It had been a rare and wonderful feeling to leave the crowds and hike off into solitude—but pleasant, too, to re-enter the world of men. Many of us, I think, are too city-oriented to be more than part-time frontiersmen.

Once more I returned. This time in May, to visit friends who live just outside the park: Jim Gray—advertising executive turned mountain artist—his wife Fran, and their three children (page 547).

Bright new leaves filled the forest now. My mountains shimmered with color—flame azalea, mountain laurel, trillium, and wild orchids were in bloom.

The road carried a trickle of tourists, a trickle that would soon become a flood.

Changing Light Makes Mountains "Move"

One spring evening I sat with Jim on the veranda of his hillside home and watched a distant thunderstorm flicker its way across the mountains. As it moved, lush green slopes turned to shadowed blues and violets.

Jim gave an explosive sigh. "Before I came here, I'd always thought of a mountain as something that just sat there being a mountain. But look at that movement—those changing lights!"

The storm moved on then, and a heavenly theater curtain opened to reveal the Smokies in infinite detail. For a few precious minutes they would be free of their veil of mist.

Six-year-old Matthew Gray joined us for a moment. Then he rushed back into the house to spread the momentous tidings.

"Hey, everybody come look! Daddy's mountains are out!"

THE END

Where only the wind song and murmuring freshets ripple the stillness, a young leaf-gatherer strolls a nature trail bowered in gold. While fall may signal winter's long sleep for shaggy citizens of the Smokies, the season lures some of the largest crowds to the park. And even in winter, a night seldom passes without a few hardy hikers spreading their bedrolls in these hills. EKTACHROME BY BRUCE DALE © N.G.S.

ROBERT B. GOODMAN © N.G.S.

Kilauea Iki explodes in Hawaii Volcanoes National Park.

Diver meets brain coral at Buck Island Reef in the Virgins.

JAMES L. STANFIELD © N.G.S.

Behind the scenes in our national parks

BY THE MILLIONS we succumb to the lure of our national parks, seeking their riches and losing ourselves in the discovery. But we don't know how much we're missing.

We may throng Sequoia and marvel at its ancient colossi, or ponder the fury of earth's creation as Hawaii's Kilauea Iki erupts. Yet the treasure of our national sanctuaries remains largely untapped because few of us stray from the beaten paths.

Now, however, you may venture far afield, thrilling to little-known sights and sounds, when the National Geographic Society opens its 1968-69 television series on Wednesday evening, October 23, with "America's Wonderlands: The National Parks."

You'll fly across wintry Yellowstone's far places with men who herd wild elk by helicopter. Explore a new-found world of insects more than 250 feet up in a giant sequoia. Watch molten lava give birth to a beach. Visit Florida's Everglades and learn of its water problems and its wonders. Float weightlessly over a Virgin Islands coral reef.

This hour-long color documentary casts brilliant light on the past, present, and future of our incomparable national parks. It was produced by the National Geographic Society in association with Wolper Productions, Inc., and is narrated by Alexander Scourby. Sponsors are Encyclopaedia Britannica, Inc., and Hamilton Watch Company. See overleaf for CBS TV stations carrying the program.

OVERLEAF: GRAND CANYON AT SUNSET
WALTER MEAYERS EDWARDS © N.G.S.

OTIS IMBODEN (ABOVE) AND B. ANTHONY STEWART (LOWER LEFT) © N.G.S.

Airboat whisks a National Geographic television camera crew across Florida's Everglades.

Motorists thread a tunnel through a fallen titan in Sequoia, California's big-tree preserve.

JAMES L. STANFIELD © N.G.S.

Room to roam: Deer like this whitetail in Texas grace many of our national parks.

Journey Into Golden

By MELVILLE BELL GROSVENOR,

OUR CHART merely noted the spot as "ruins." But what magic ruins these were! For this dot on my map was Troy.

The very name conjured up the heroic deeds of Achilles and Hector, the legendary beauty of Helen that "launch'd a thousand ships," the golden treasure that emerged from the dust in one of archeology's greatest adventures.

The deck of the ketch *Yankee* heaved under my feet, to the surge of Homer's "sea deep-thundering," as we stood for Troy. Our sails swelled to the same winds that bore Agamemnon's fleet across the Aegean from Greece. From our deck we studied the sunny Turkish coastline where the Greek ships landed for the ten-year siege of Troy.

Suddenly 30 centuries of song and myth and history came alive. Jason and his fabled Argonauts passed here in quest of the Golden Fleece. Xerxes, King of Persia, flung a bridge of boats across the Hellespont and marched the hordes of Asia against the handfuls of Greece. Alexander the Great crossed here to invade Asia and conquer the greatest empire the world had yet known.

Greece and Rome

LL.D., Sc.D. Editor-in-Chief and Chairman of the Board, National Geographic Society

Twenty-two centuries later came a retired German merchant, Homer in hand, to fulfill a boyhood dream.

Our ketch anchored at the bustling port of Çanakkale, and as I sped in a car over a modern highway past farm and pasture, I mused on the fabulous life of that merchant, Heinrich Schliemann.

Time had hidden Troy. Some scholars dismissed King Priam's city as myth. But as a boy Schliemann exulted in his father's tales from Homer and never doubted Troy's existence—or that one day he would find it. His rags-to-riches story includes shipwreck, the California gold rush, and courtship by mail of a young Greek girl he had seen only in a photograph.

"If ever we were married," he wrote teen-age Sophia Engastromenos, "it would be so that we could excavate together and share our common love for Homer."

Following clues in the *Iliad*, he found the city under a mound named Hissarlik. And with his bride Sophia, he excavated it for all the world to see.

TROVA—TROY. The highway sign jolted me out of my daydream. Now we parked beside a souvenir shop named "Paris and Helen."

WATER GATE TO THE CLASSICAL WORLD, *the Dardanelles lies pincered between Europe and Asia. Haze veils distant Çanakkale in Asiatic Turkey. Across the strait—the ancient Hellespont—surged antiquity's death-dealing armies and life-giving ideas. A new book,* Greece and Rome: Builders of Our World, *re-creates ancient grandeurs and glories.*

KODACHROME BY JAMES L. STANFIELD © N.G.S.

KODACHROMES BY JAMES L. STANFIELD AND EDWIN STUART GROSVENOR

City with nine lives, Troy leapt into legend and history when its prince, Paris, stole the beauteous Queen Helen from Sparta. Homer sang in the *Iliad* of the vengeful Greeks' ensuing ten-year siege of Troy. Today its brooding ruins seem to shimmer with Homeric ghosts: wrathful Achilles, noble Hector, regal Priam, and the wooden horse that foaled Troy's destruction.

The Greeks had hewn the steed, crammed it with warriors, and feigned withdrawal. That night, after the Trojans hauled the horse inside city walls, Odysseus and his men slipped out (above right), opened the gates to their cohorts, and sacked the city.

The Troy of Homer already stood atop rubble of six earlier cities, and itself underpinned two later ones. All nine Troys hid under sediments of age until discovered by the inspired sleuthing of amateur archeologist Heinrich Schliemann in 1871.

Young Sara Grosvenor (left), also eager for discovery, probes walls that yielded the fabulous "Priam's Treasure."

OWER LEFT), PAINTING BY LOUIS S. GLANZMAN © N.G.S.

"Will we see the wooden horse?" my 12-year-old Sara asked. She had just studied about Greece in school, and her presence gave my wife and me a fresh perspective.

The "windy plains of Troy" failed to produce any sign of a Trojan horse. The best I could find was a small wooden horse from the curio kiosk. Yet Sara found far more.

"This south side of the city was not so steep," our guide Huseyin recited. "So the Trojans might have brought the big wooden horse in here, with Odysseus and the other Greek heroes inside. And on the west, Schliemann discovered 'Priam's Treasure.' "

The gold of Troy! Goblets, bracelets, necklaces, rings, gleaming diadems. "And it all came from that trench, beside the fig tree," Huseyin added.

Quickly riffling through our *Iliad*, we read aloud of the epic duel when Achilles chased Hector "along by the watching point and the windy fig tree always away from under the wall. . . ." Sara listened closely, then ran over to spread her hands along the selfsame wall (opposite). With her fingertips—here and elsewhere on our journey through this Mediterranean world—she met the builders of our civilization. And what treasures they bequeathed to us!

Here the Western World Began

Greek inventiveness transmuted the Phoenician *aleph* and *beth* into the *alpha* and *beta* that gave us our alphabet. Here arose concepts of law and government that rule our lives, thoughts that enrich our minds, beliefs that inspire our souls. Here began our literature, sports, medicine; the street plans of our cities, the architecture of our public buildings; the logic, geometry, engineering, and science that have transformed our world.

I made a pilgrimage to Delphi, where Apollo had settled at "the navel of the earth" to guide mortal men through his Oracle. I reflected on its maxims, "Know thyself" and "Nothing to excess," and gazed on Mount Parnassus, haunt of the Muses. It rises in majestic reminder that our poetry and song, drama and art were born in Greece.

Below Delphi spreads a silvery green sea of olives—more than a million trees sacred to Athena, extending to the Gulf of Corinth. They brought to mind the sacred olives of Athens' Academy, where the philosopher Plato posed questions for the ages to ponder.

Immortal Athens Speaks to Men

We climbed to the topmost row of the theater at Epidaurus, a perfect fan of stone spreading on a Peloponnesian mountainside, and could hear every whisper from the stage far below. What setting could be more fitting for *Oedipus, Orestes,* and other Greek dramas that probe the dark subconscious to illumine the human character? In the nearby sanctuary of Asclepius, healers diagnosed ailments from patients' dreams and worked cures through hypnosis.

Strolling the Acropolis by moonlight, we marveled at the perfect Parthenon (page 563), serene though scarred by time and man's wars. On another summer evening we attended the Sound and Light show and watched as spotlights transformed the Parthenon's columns into actors.

In southern France we studied the soaring arches of the Pont du Gard, a Roman aqueduct that once slaked the thirst of Nimes. And I realized that our concepts of what is beautiful and useful came from Greece and Rome.

In Bodrum, Turkey—where Crusader knights built a castle from stones of the original Mausoleum—we examined fascinating treasures from the sea that Dr. George F. Bass and his University of Pennsylvania Museum team have recovered from Bronze Age, Roman, and Byzantine shipwrecks. The Society has helped sponsor his work for six seasons. Here we saw earthenware plates and cups used by ancient sailors for their food and drink, the swords they fought with, axes, copper bullion, even stone anchors that took us back to Homeric times (page 557).

Suddenly we felt close to Odysseus and his homeward voyage from the smoking plain of Troy. What an odyssey that was! Ten years of adventure in a realm of nymphs and monsters ensued before the "much-enduring" wanderer made it home to Ithaca and his faithful Penelope.

Homer's *Odyssey* sprang to life as I read proofs of a "Voyage in Search of Fabled Lands," by the English sailor-historian Ernle Bradford. He tells of his years-long search for Mediterranean landfalls of Odysseus, whom the Romans called Ulysses. He traces him to the tropical isle of the Lotus-Eaters, the fog-draped cave of Cyclops, the mountain realm of the sorceress Circe, the wave-washed lair of the Sirens. Braving the whirlpool of Charybdis, Bradford sails to an island in "the navel of the sea" where the nymph Calypso kept Odysseus with her "in her hollow caverns."

To Bradford, who looks remarkably like the depictions of Odysseus, the landfalls seemed strangely familiar. The conviction grew that he was gazing at the world through someone else's eyes. When at last he reached Ithaca, an old shepherd, resembling Odysseus' faithful swineherd Eumaeus, scrutinized him.

"You are a stranger," the shepherd says, "but surely you know that this is the island of Odysseus?"

Bradford writes: "My own quest had brought me so close to Odysseus that I almost cried out: 'Don't you recognize me?' "

It is an absorbing story, filled with flavorful descriptions of lands and peoples. I know you will be as thrilled as I was when you read it in the Society's new book, *Greece and Rome: Builders of Our World.*

This is just one of the voyages of discovery that Book Service Chief Merle Severy and I have planned for you. We sought to weave the story of the ancient world around its towering figures—Odysseus, Pericles, Alexander, Hannibal, Caesar (pages 560-61).

You see Mediterranean lands through the eyes of Odysseus, Athens in the Golden Age of Pericles, and the vast Persian domain that Alexander won. You come to know Hannibal's Carthage and the Alps his elephants

Ephesus, "first and greatest metropolis of Asia." Inscriptions 18 centuries old proclaim the onetime grandeur of that white-marble city of temples and theaters, fountains, markets, and homes, set beside the Aegean in what is now Turkey. Archway of Hadrian's Temple, site of emperor worship in the second century A.D., echoes the city's splendor. Magnificent frieze within this temple porch parades elephants, warriors, kings, and gods. When St. Paul preached here, Ephesians rioted for fear he would dethrone their pagan goddess Diana.

crossed, Caesar's Rome and the empire that flowered in his shadow (pages 564-5).

We sent GEOGRAPHIC photographers and writers from the Pillars of Hercules to snow-crowned Olympus, abode of Homeric gods; to Syracuse, home of Archimedes, who gauged the awesome power of levers ("Give me a place to stand, and I will move the world"); to Alexandria, where Eratosthenes measured the circumference of that world to within 50 miles; and to Halicarnassus (today's Bodrum), home of Herodotus, "Father of History," whom I like to think of as the ideal GEOGRAPHIC staff man for his questing mind and vivid reporting.

Our teams trekked to fabled Samarkand and the Indus, entered homelike tombs, and on living-room walls of the dead witnessed colorful banquets in progress for 25 centuries. They studied fields of battle where history hung in the balance, recorded the beauty of temples open to the sky—and everywhere portrayed the timeless life of the land.

They brought back the most comprehensive coverage in color photographs and lively reporting ever made of the lands where the sun of our civilization rose. We complemented these with a trove of works by ancient artists —vase paintings (I especially like the scene of Odysseus lashed to the mast as sweet-singing Sirens seek to lure his ship to disaster), frescoes (one painted 2,400 years ago shows a couple jitterbugging), mosaics, terra cottas, bronzes, coins, jewelry, golden goblets, Schliemann's gleaming "Mask of Agamemnon" (opposite), and such famed sculpture as the Charioteer of Delphi and the Venus de Milo.

Scholars Floodlight the Past

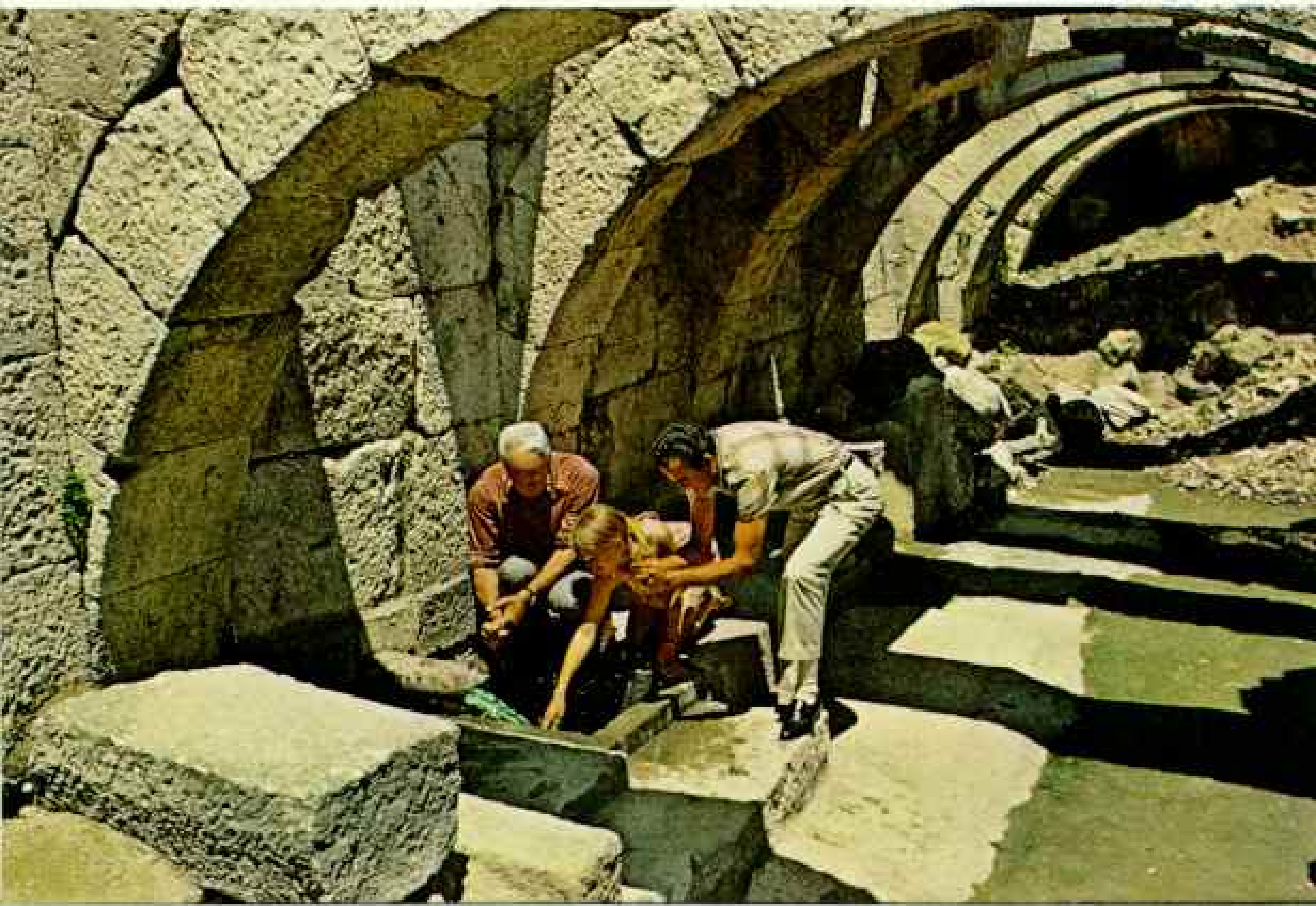
We turned to scholars whose explorations and researches have cast new light on the Mediterranean world. Dr. Paul MacKendrick, Professor of Classics at the University of Wisconsin, shared his great knowledge as consultant during the book's long months in preparation. Final proofs even followed him this summer to the American Academy in Rome, where he is a trustee.

"I have held in my hand an ostracon—an inscribed potsherd—bearing Pericles' name," Dr. MacKendrick writes in his essay evoking the days when democracy was fresh and gleaming as a newly minted coin.

Even Pericles was tested by the vote of those ostracons—the clay ballots cast by Athenians to decide whether too-powerful leaders should be ostracized. Fortunately, his enemies never quite succeeded in banishing him, and he went on to build a society that made his words prophetic: "Future ages will wonder at us, as the present age does now."

We step back into the Bronze Age to thread

KODACHROME BY JOSEPH J. SCHERSCHEL © N.G.S.



our way through the Minoan palace at Cnossus on Crete, the fabled Labyrinth, "walking past shadowy walls where life-size painted figures seemed to move.... Partitions muffled the sounds of life.... Drains running under the floors mingled their murmur with the chatter of green monkeys, the song of caged birds, the slithering of house snakes, the distant bellowing of the sacred bulls."

The author? Professor Emily Vermeule of Wellesley College. She recently made headlines with a 3,500-year-old Minoan city on the island of Thera, whose two- and three-story houses she is excavating with an expedition led by Professor Spyridon Marinatos, the eminent Greek archeologist.

Successive eruptions of Thera's volcano buried the city in ash; then, in a final cataclysmic collapse, it hurled tidal waves on nearby Crete. Some scholars believe this may have been the mysterious cause of the destruction of the Minoan civilization, giving rise to Plato's legend of lost Atlantis.

What memories came to me as I read Leonard Cottrell's chapter on Marathon, Salamis, and other scenes of Grecian glory! Famed for his BBC lectures and his books on archeology, Cottrell stands with Xerxes as the King of Kings' army passes in review: "Here were Persian warriors in leather jerkins and fish-scale armor, high-booted

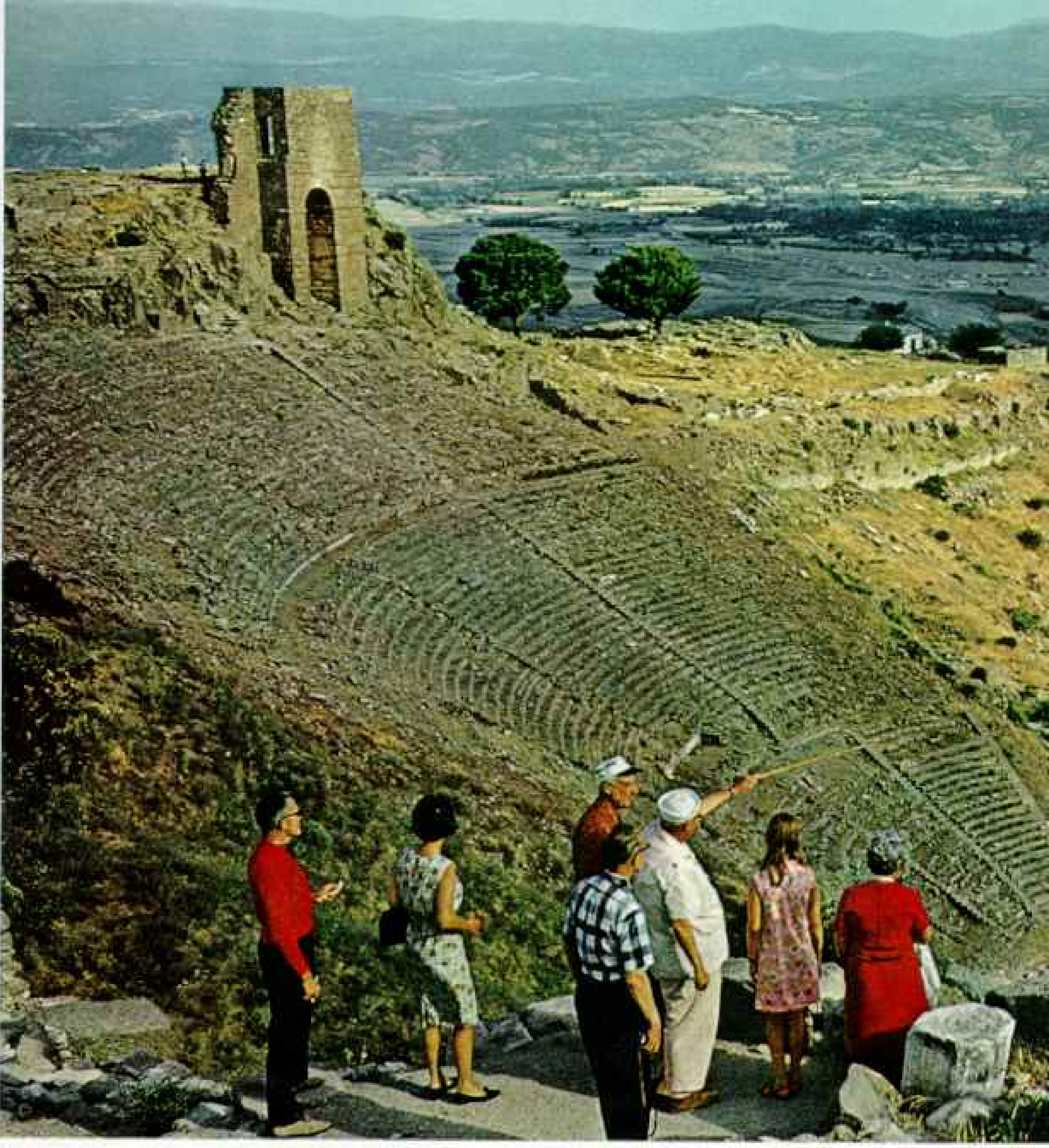
EKTACHROME BY ERICH LESSING, MAGNUM, COURTESY NATIONAL ARCHAEOLOGICAL MUSEUM, ATHENS © N.G.S.

Mask of mystery formed part of a hoard of gold and jewels unearthed by Schliemann at Mycenae in 1876. The German eagerly ascribed both death mask and treasure to the Greek King Agamemnon, Homeric conqueror of Troy. But research proved the find predates his guess by centuries.

Fount of refreshment—still serving its original purpose after 1,800 years—cleanses dusty hands and cools heat-parched lips of visitors to Smyrna's agora, or marketplace. The three-storied building, lined with bustling shops, boasted running water on every floor—an amenity envied by many Turkish villagers today, who must trudge far with heavy pitchers to get water. The luxury-loving Romans ruled Smyrna (modern İzmir) during that proud era when its stone-paved streets and noble edifices made it one of antiquity's most beautiful cities.

KODACHROME BY MELVILLE BELL GROSVENOR © N.G.S.

Did Odysseus lose these anchors during the storm that drove his fleet to the land of the Lotus-Eaters? Dredged from the Mediterranean, the relics pose tantalizing questions for the author's wife and daughter and Hakluk Elba, director of the museum in the Crusader castle at Bodrum, Turkey—ancient Halicarnassus. A partridge prompts smiles.



"Where Satan dwelleth," said the Bible (Revelation 2:13) of Pergamum, where Rome's priests martyred Christians. Yet Christianity took root and bloomed, making Pergamum the site of one of the original Seven Churches. The city's alliance with Rome won it riches to splurge on a marble acropolis, whose beauty rivaled Athens'. Citizens thronging this steep hillside theater,

Phrygians, Mysians bearing sharpened stakes, wooden-helmeted men of the Caucasus, Scythians in pointed caps, Iranians behind tall wicker shields, an Arabian camel corps, ass-drawn chariots from India—and Ethiopians in lionskins who brandished stone-headed clubs and spears tipped with gazelle horn.

"The exotic horde marched on toward Athens, ravaging the land. But this slave army, said Herodotus, marched under the lash. And ahead lay a pass called Thermopylae, defended by a band of freemen."

A thrilling double-page illustration—one of 54 specially commissioned paintings in this book—portrays Leonidas and the Spartans holding that pass (page 567).

The enigma of the Etruscans, who may have come to central Italy from the eastern

KODACHROME BY EDWIN STUART GROSVENOR © NATIONAL GEOGRAPHIC SOCIETY

built about 170 B.C. and capable of holding 15,000, reveled in plays by Aeschylus and Euripides. German archeologist Professor Erich Boehringer, who has excavated here for decades, points out highlights to Dr. Grosvenor and his party, including Guy A. Lee, U. S. Consul General at İzmir, in checked shirt. Turkey preserves Pergamum, near modern Bergama, as a national monument.

Aegean, has long intrigued me. We asked Professor Emeline Richardson, University of North Carolina archeologist, to unravel the mystery. She reminds us that though their language still eludes us—and our computers—we can peer through periscopes probing the Etruscans' hidden tombs, or unmask their buried cities with aerial cameras.

From painstaking study of the finds, we can reconstruct in our mind's eye an Etruscan city where horse-drawn carriages clatter along 50-foot-wide avenues paved with pebbles. "On raised sidewalks," Dr. Richardson writes, "cloaked men parade their bejeweled, fashion-conscious wives. At a crossing a woman daintily lifts her ankle-length skirt and on shoes with turned-up toes minces over the gutter slosh on a row of stepping-stones. Perhaps a lounging artist notes that shorter skirts are 'in' this year. He will immortalize the style in a tiny carved gem."

To a frontier town called Rome (which they ruled for a century) Etruscans brought the first glint of grandeur. Etruscan seers especially impressed the Romans, whose priests could ask the gods only yes-or-no questions. Etruscans could read all kinds of portents—for example, in the rumbles of thunder and flashes of lightning interpreted in their sacred Book of Thunderbolts.

"Thunderbolt" is the meaning of Barca, Hannibal's family name. It lives on in the name of Barcelona, Spanish city which Carthaginians founded.

Hannibal Crushes Roman Force

On a hazy afternoon last summer my family watched sailboats racing on Italy's Lake Trasimeno, shrunken from its former banks. We tramped its shores seeking the pass that funneled a Roman army into Hannibal's trap.

"By the battle-cry which arose on every side of them," the Roman historian Livy wrote, "the Romans knew they were surrounded. . . . In that enveloping mist . . . it was sounds, not sights, they turned to face—the groans of wounded men, the thud or ring of blows on body or shield . . . the cry of fear."

Under cover of fog from the blood-reddening lake 15,000 Romans died that day. More than 50,000 Romans perished in another day's slaughter at Cannae.

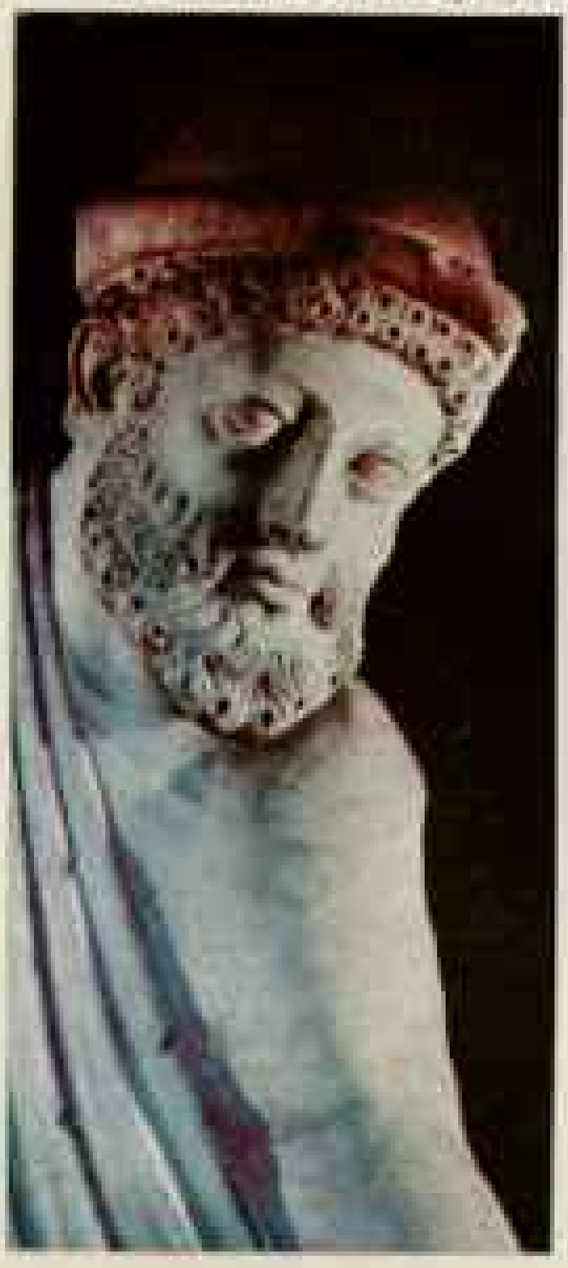
Who was this man who made Rome tremble, this man "for whom Africa was too small a continent"?

Sorbonne Professor Gilbert Charles-Picard, former Director of Antiquities in Tunisia and an excavator of Carthage, draws a vivid picture of Hannibal and his Carthaginian world. A trading empire, Phoenician in origin, Carthage collided with expanding Rome in the western Mediterranean, and the Punic Wars erupted. Punic is Latin for Phoenician.

From Carthage's namesake city in Spain, Cartagena, GEOGRAPHIC staff man Tom Allen follows Hannibal's footsteps through grim Alpine gorges. Taunts of the Roman poet Juvenal ring in his ears: "On, on, you madman . . . over your savage Alps. . . ."

Hannibal finds a great rock blocking his way. He orders his men to build a pyre around it. "Elephants shy, trumpeting their fear of fire," Mr. Allen describes the scene. "Logs crackle in the snow. Men pour their last rations of sour wine over the rock. Acrid mist veils them as they hack at the rock with

ERICH LESSING, MAGNUM, ISABELLA STEWART GARDNER MUSEUM, BOSTON



ODYSSEUS

ADAM WOOLFITT, BRITISH MUSEUM

PERICLES

Five colossi

MOUNTAIN-GIRDED cradle of Western man, the Mediterranean nurtured a brood of immortals who with sword and scepter inscribed some of history's noblest chapters.

Odysseus, the star-crossed wanderer, wove a tapestry of myth as he sailed the wine-dark sea on a tumultuous ten-year voyage from smoking Troy to his home isle of Ithaca.

MUSEO NAZIONALE, NAPLES, FROM SCALA

ALEXANDER

THOMAS R. ALLEN, COURTESY OF TEODORICO MORETTI COSTANZI

HANNIBAL

ADAM WOOLFITT, COUNCIL CHAMBER OF THE CITY OF ROME

CAESAR

who bestrode antiquity

Pericles, the incomparable statesman, fanned the barely glowing embers of Athenian democracy and ignited the Golden Age of Greek culture in the mid-fifth century B.C.

Alexander the Great laid low all foes from the Danube to the Nile and the distant Indus. Reveling in power, he took on the stature of a god—only to die at age 32 of an all-too-human fever.

Hannibal of Carthage boldly drove his vast army and trumpeting elephants southward over the icebound Alps, challenging Rome and nearly destroying the republic before his final defeat.

Julius Caesar stretched Rome's rule by military genius, then made himself master of Rome itself. The treachery of friends cut short his life and ambition on the Ides of March in the year 44 B.C.

picks. Suddenly, it cracks. Hannibal has shattered the final barrier on his bold passage through the Alps."

Back home in Maryland snows, Mr. Allen built a fire around a 70-pound chunk of dolomitic limestone similar to that in the Alps, poured vinegar over it, and saw it crack. But cold water, too, shattered the heated rock.

Conclusion: "Hannibal probably could have used snow melt and saved the wine to toast his triumph over the Alps."

Rome Forges a Sprawling Empire

For 16 years Hannibal ravaged Italy. Though he reached Rome's gates, he could not conquer the city of destiny. And once Carthage was destroyed and her ruins symbolically sown with salt, Rome began a march to empire that did not end until her eagle standard ruled from the snows of Britain to the sands of the Euphrates.

Rome has fascinated me since boyhood days, when in Sunday school I studied Bible stories of Jesus' crucifixion at the hands of Roman legionaries, of Paul's journeys across the Roman world, of Peter's martyrdom in the Eternal City. I thrilled to the great chariot race in *Ben Hur*. Its author, Gen. Lew Wallace of Civil War fame, was a family friend—U. S. minister at Constantinople (İstanbul) when my grandfather taught history

Time- and war-battered Acropolis, hilltop sanctuary of the gods, looks across the modern city of Athens to the stone peak of Lycabettus. To Pericles goes the credit for the many-columned Parthenon and other magnificent marble temples. Now crumbling, sun-bleached ruins, the structures once dazzled the eye with their brilliant painted-on colors.

Today's Athenians still drink deep at the sparkling cultural wellsprings of their ancestors. These actors (left) of the National Greek Theater perform Aristophanes' comedy *Plutus* in the Theater of Herodes Atticus, built in the second century A.D. at the foot of the Acropolis.

KODACHROME BY PHILIP A. HARRINGTON; EKTACHROME (OPPOSITE) BY MICHAEL KUH © N.G.S.

there at Robert College. My father spoke of General Wallace's visits to the house.

I had to see the sights myself. I can still hear the crunch of cinders giving way under every step as I slogged to the top of Vesuvius to look out over Pompeii, where history's clock stopped August 24, A.D. 79, when an eruption entombed the city in ash.

And Rome! The Tiber, still spanned by ancient bridges . . . the Via Sacra where emperors rode in triumphal processions . . . the Pantheon, its mighty dome still intact . . . the Colosseum. Standing in that vast oval of stone, I could almost hear the snarling of wild beasts, the roar of the bloodthirsty crowd.

So it was with pleasure that I read in our new book the essay, "The World of Caesar," by Pierre Grimal. This distinguished Professor of Latin Literature at the Sorbonne portrays the world's first "big city" bursting with a million people, stirred by new conquests, new money, new ideas. Speculators threw up "high-rise" tenements (which sometimes collapsed as swiftly). Housewives tossed garbage into the street. Grain from as far away as Egypt and the Crimea, its price kept low by decree, was unloaded along the Tiber's wharfs. To unsnarl traffic, Caesar banned heavy wagons during the day—thus ruining the nighttime sleep of thousands.

Imperial Rome was a city of squalor—and of grandeur, with marble palaces on the Palatine, great baths, and noble monuments. At its center stood the Forum. Here from every direction converged the roads of empire, roads that felt the tread of victorious legions.

We follow the footsteps of Caesar—to the Rhine, to the white cliffs of Dover, to desert wastes of Tunisia and Cleopatra's Egypt, to sere Andalusian plains, and to the remote region of ancient Pontus in Turkey, whence, after the battle of Zela, Caesar marched home to Rome bearing that tersest of communiqués: "I came, I saw, I conquered."

GEOGRAPHIC staff man John Putman used Caesar's own *Commentaries* as his guide. Oddly, Caesar nowhere mentions the Rubicon, which marked the boundary between his province of Gaul and Rome's territory. For Caesar, crossing the Rubicon was a crucial step. It meant plunging the republic into civil war. Mr. Putman found this river of decision a modest, summer-dry creek near Rimini.

Ancient Legacies Live Today

Did you know that one year in history had 445 days?

In 46 B.C., Julius Caesar found the old Roman year of 355 days so out of phase with the seasons that January fell in autumn. He decreed a 365-day year to conform with the solar year, adding an extra day in February every fourth year—basically our calendar today. But to begin the year 45 right, he had to add 90 days, thus bringing the previous year's total to 445. He also renamed Quintilis—originally the fifth month—July, after himself. His successor Augustus would convert Sextilis into August.

Did you know where we get the phrase "pyrrhic victory"? And what Roman emperor competed in the Olympic Games?

King Pyrrhus of Epirus in Greece, invading Italy in 279 B.C., defeated the Romans in a battle so costly to his army that henceforth no soldier would cheer a pyrrhic victory. And the Olympics? Emperor Nero won every event he entered at Olympia in A.D. 67; when he fell from his chariot, other racers prudently stopped until he remounted!

In this book you will discover that when you eat breakfast cereal you pay homage to a Roman deity, Ceres, goddess of grain. "Salary" comes from a Roman army word meaning "money to buy salt"—hence the expression "not worth his salt." Greek and Latin words live on in our age of television (from the Greek "far off" and the Latin for "see"). "Atomic" comes straight out of the fifth century B.C., when Greeks theorized that all matter consisted of tiny particles.

Drawings explain how the Parthenon's builders counteracted optical illusions; how Hannibal got his elephants across the Rhône; how Romans heated their great baths with remarkable central-heating systems; how they constructed roads and aqueducts. A special portfolio details the Roman art of war.

A guide to art styles, a handy chronological chart, and maps showing routes of exploration, trade, and conquest make this a

KODACHROME BY ALBERT MOLDVAY, PAINTING BY BIRNEY LETTICK © N.G.S.

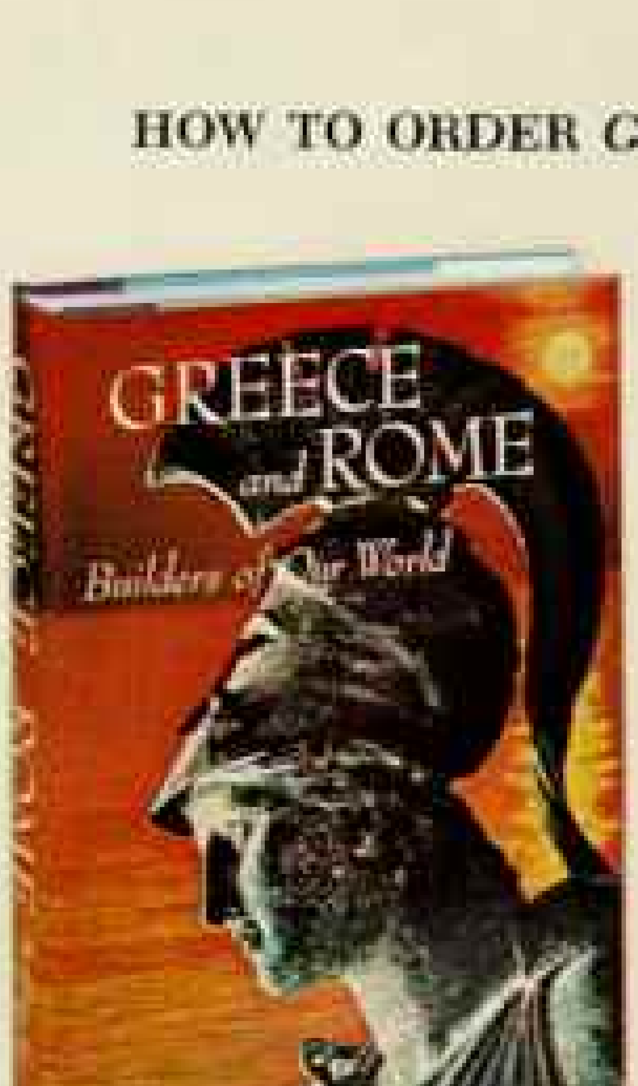
Mightiest Roman of them all, Julius Caesar still stands watch over the Eternal City of Rome 2,000 years after his death. Initials S.P.Q.R., which adorn a multitude of Roman relics, stand for *Senatus Populusque Romanus*—the Senate and the Roman People—both of whom Caesar served and ruled.

An oft-told episode of Caesar's youth foreshadowed his later audacity. Captured by pirates (right) and held hostage on the Aegean isle of Farmakonisi, he berates them for asking too low a ransom for his release. As the youth vows someday to capture and kill them, the pirates bellow with laughter. After being ransomed, Caesar kept his word. He outfitted an expedition, surprised the pirates in their lair, confiscated his ransom and other booty, then put them to death.

Transfixed in terra cotta, an Etruscan couple stare out from a sarcophagus lid. Predecessors of the Romans in Italy, the Etruscans faded when Rome burst forth. Only their tombs bespeak their glory.

As vast in scope as the ancient empires, the book *Greece and Rome: Builders of Our World* includes scenes from lands where Caesar marched—Switzerland, France, Spain, Britain.

HOW TO ORDER *GREECE AND ROME: BUILDERS OF OUR WORLD*



JOIN NOTED SCHOLARS in the quest for our golden heritage. Explore in rich detail two shining civilizations that affect our daily lives in fascinating ways. This new 448-page volume, indexed for permanent reference value, presents authoritative knowledge in a visually exciting way. You and your family will follow in the footsteps of Odysseus, Pericles, Alexander, Hannibal, and Caesar, and see their worlds through the magic of NATIONAL GEOGRAPHIC color photography and paintings.

Bound in gold-stamped linen and buckram, the book includes 130,000 words of text and 541 illustrations, 440 in full color; also 15 special page maps and a wall map showing **Classical Lands of the Mediterranean** on one side and **Mythical Realm of Gods and Heroes** on the other. Available at $11.95, only by direct order from the National Geographic Society, Department 61, Washington, D. C. 20036. Request later billing if desired.

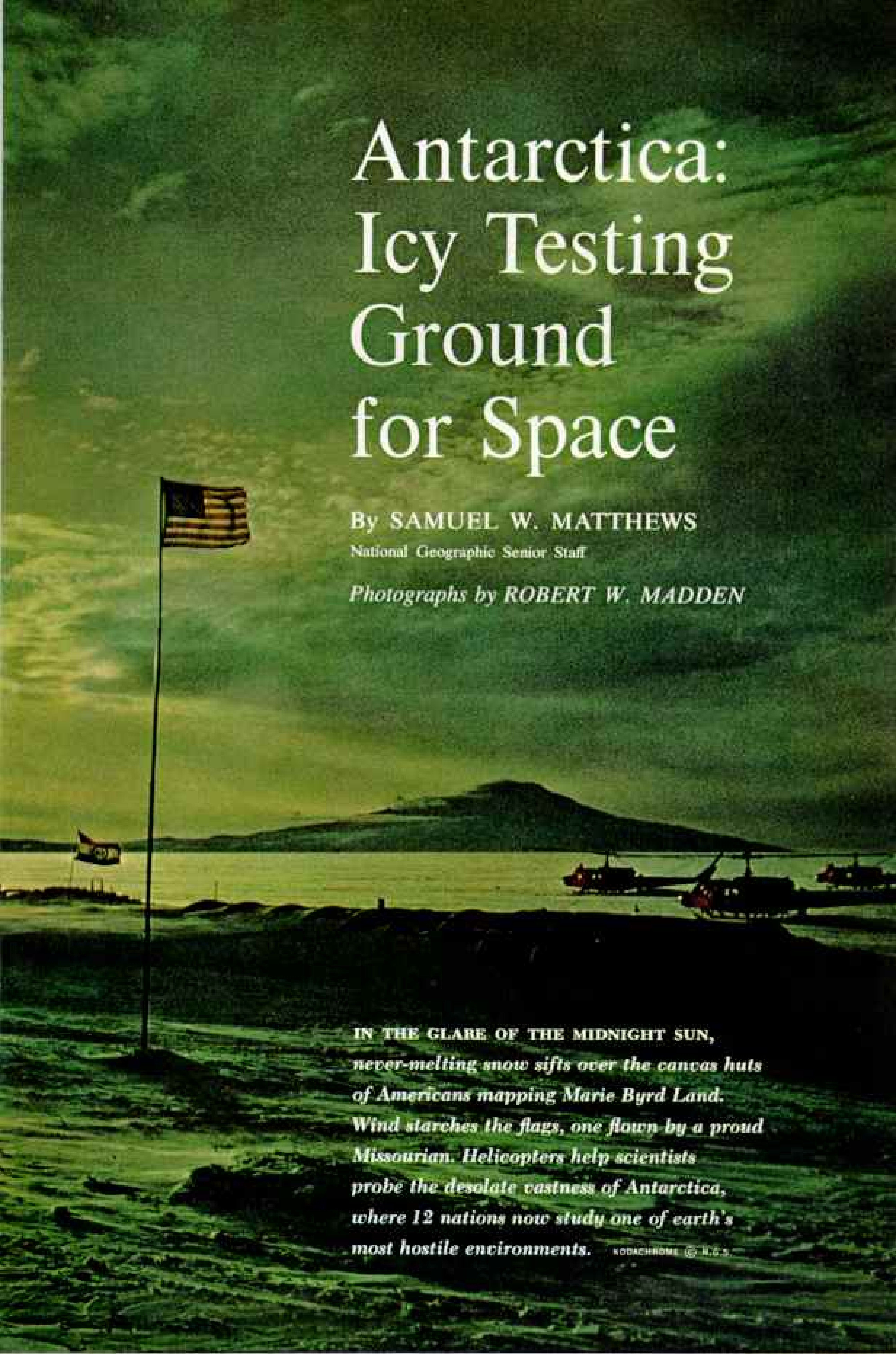
reference book especially valuable to the family with school-age children. A big Classical Lands map tucks in a pocket at the back; on its reverse is a delightful bonus—the famous legends of gods and heroes presented in a mythological landscape.

As I reviewed the zestful text, I was struck by the fact that in philosophy and science, in everyday customs and speech, we are all Greeks and Romans.

Our Founding Fathers took over the Greek and Roman inventions of democracy and republic. They proudly placed on the Great Seal of the United States the eagle of Zeus, holding his thunderbolts and the olive branch of peace, together with the Latin phrase: *E Pluribus Unum* (Out of Many, One). Our Senate and our system of checks and balances are as Roman as the dome of our Capitol, inspired by the Pantheon.

A companion volume published last year, *Everyday Life in Bible Times*, has proved to be one of the most popular books the Society has ever published (525,000 copies in print). I feel certain that member families will find equal pleasure and value in this beautifully illustrated new volume, *Greece and Rome: Builders of Our World*. THE END

Buying time with their lives, a small band of Greeks take their immortal stand against Xerxes' Persian armies at the narrow pass of Thermopylae in 480 B.C. Though slaughtered, the Greeks stalled the enemy and enabled fellow warriors to turn the tide of war.



Antarctica: Icy Testing Ground for Space

By SAMUEL W. MATTHEWS
National Geographic Senior Staff

Photographs by ROBERT W. MADDEN

IN THE GLARE OF THE MIDNIGHT SUN, *never-melting snow sifts over the canvas huts of Americans mapping Marie Byrd Land. Wind starches the flags, one flown by a proud Missourian. Helicopters help scientists probe the desolate vastness of Antarctica, where 12 nations now study one of earth's most hostile environments.*

"GREAT GOD! this is an awful place . . ." wrote British explorer Robert Falcon Scott at the South Pole on January 17, 1912. Seventeen years later Richard E. Byrd first looked down on the Pole from an airplane, and pitied "a person unfortunate enough to be living in the vicinity."

Scott and Byrd would stir in their graves to know the Antarctic of the late 1960's. Men now live and work not only at the Pole, as they have for a dozen years, but in nearly 40 other scientific outposts scattered around the edge of earth's remotest, loneliest, most inhospitable continent. Four stations—three U. S., one Russian—lie deep in the interior.

This October and November, as the polar sun climbs higher above the horizon to light the southern summer, planes will again touch down at Amundsen-Scott South Pole Station, at Byrd Station buried in its ice tunnels, and at tiny Plateau Station, half again as far inland from McMurdo Sound as the Pole.

Last January—midsummer in Antarctica—I visited all these bases, and others as well, in comfort and without great danger. I made three trips inland to the Pole, and it seemed scarcely more remarkable than catching a shuttle plane from Washington to New York.

Search for Knowledge Unlocks Antarctica

The white wilderness that wore out the lives of Scott and four companions only 56 years ago has yielded to the Air Age and to man's ceaseless quest for knowledge. That quest, in one of history's greatest international scientific efforts, continues in Antarctica.* It has changed a continent and opened the unknown. Its very success, the way men live and

*Over the past 75 years NATIONAL GEOGRAPHIC has recorded the opening of Antarctica in more than 70 articles and notes. Earliest accounts include "The Antarctic Continent," by Cyrus C. Babb, December, 1894, and "Plans for Reaching the South Pole," by Gilbert H. Grosvenor, August, 1899. For the complete list, consult the Society's revised two-volume Cumulative Index.

travel freely about those icy wastes today, points the way to other explorations tomorrow—to the moon, and all that lies beyond.

"Last January," a young Ph.D. at Byrd told me casually, "Dr. Wernher von Braun flew in to see our moon station. Here we are, out on the end of a limb, buried in the ice, living under the most hostile conditions. No need to wonder what a base on the moon might be like someday. We're it already."

During my own month on "the Ice," as all Antarctic hands call their world, I found:

• Biologists from the Jet Propulsion Laboratory in California studying microscopic forms of life that somehow survive the gripping cold, desert drought, and lack of sunlight half the year in mysteriously snow-free valleys. "We hope to learn how to detect life on Mars, if any exists there," they said.

• Physicists measuring upper-atmospheric disturbances and solar winds that could menace moon-bound astronauts.

• Psychophysiologists recording men's sleeping and dreaming behavior, to learn the effects of living under cramped and totally isolated conditions, as in a future space station.

• Scientists of a dozen nations working together, under international exchange programs, without regard to political differences. There is no cold war in earth's coldest land.

• Tourists, farther south than ever before.

Journey to a Frozen Far-off Continent

Going to Antarctica today, though it strikes one's family as taking a trip beyond the earth itself, is instead a matter of almost routine travel to a distant land.

I was invited by the Navy and the National Science Foundation to visit and report on Operation Deep Freeze '68 and USARP—the United States Antarctic Research Program, administered by the foundation. Thus, in scarcely six weeks, I flew 20,000 miles facing forward, in airliners to New Zealand and

KODACHROMES © N.G.S.

Wrestling the wind, geologists struggle to unload their swift, sturdy motor toboggans (left), today's polar dogsleds, at the end of a six-week field study of the Queen Alexandra Range in the Transantarctic Mountains.

C-130 Hercules planes on skis (above) now airlift scientists into and out of white wilderness once reached only by weeks of risky trekking. Other scientists make daily helicopter forays from base-station laboratories to field sites, like suburbanites commuting between home and office.

Camping in subzero temperatures even in midsummer, the geologists hunted ancient rocks and new clues to a tropical past: petrified trees, fossils, and coal formed when the Antarctic Continent may have been part of a single landmass closer to the warm Equator (pages 580-81).

Crunching through ice eight feet thick, the *Burton Island* splits a channel across McMurdo Sound so that summer's supply ships can reach the United States' chief Antarctic base during the three-month open-water season. The rest of the year quick-freezing seas can trap vessels in the ice like nuts in a chocolate bar. As the ship rammed ahead,

KODACHROME BY ROBERT W. MADDEN © NATIONAL GEOGRAPHIC SOCIETY

the ice bucked under photographer Madden's feet. Because of the telephoto lens, the rigging appears to snare the helicopter, hovering to make a motion-picture record.

home again; 5,000 miles backward, in the rear-facing seats of Navy transports between New Zealand and McMurdo Sound; and some 15,000 miles sideways, on the folding canvas benches of ski-equipped Lockheed C-130 cargo planes, the redoubtable Hercules, crisscrossing Antarctica.

Photographer Bob Madden, in six additional weeks, logged enough flights via Hercules and helicopters to take him twice around the world.

We fitted out in Christchurch, chief city of New Zealand's South Island and headquarters, from September to March, of the U. S. Naval Support Force, Antarctica. Our dunnage—from waffle-weave underwear and heavy Navy fatigues to white rubber "bunny boots" and flaming-red USARP parkas—made us vastly overdressed for summer when we waddled out to *Pegasus 7*, a C-121 Lockheed Super Constellation, for the ten-hour flight to the Ice.

Beyond the Point of Safe Return

One tends not to ponder, that long day, the nearly 2,500 miles of increasingly cold water below, the lone weather and rescue ship stationed midway, or the announcement, hours out, that you have passed the PSR—Point of Safe Return. Ignore it. What lies ahead gives one plenty to think about.

"Day after tomorrow, we're flying to Plateau, then to the Pole, then back to McMurdo. Come along, there's space on the Hercules."

Rear Adm. J. Lloyd Abbot, Jr., fifth commander of the Navy's Antarctic operations since 1955 (page 587), spoke from his working office shoehorned between 28 passenger seats and piles of strapped-down mail and cargo. With him rode Dr. Thomas O. Jones, National Science Foundation division director in charge of the Antarctic Research Program.

The Connie droned on, high above solid clouds. Evening came, but oddly no lessening in the brightness of the day. We were south of the Antarctic Circle. The sun would not set that night.

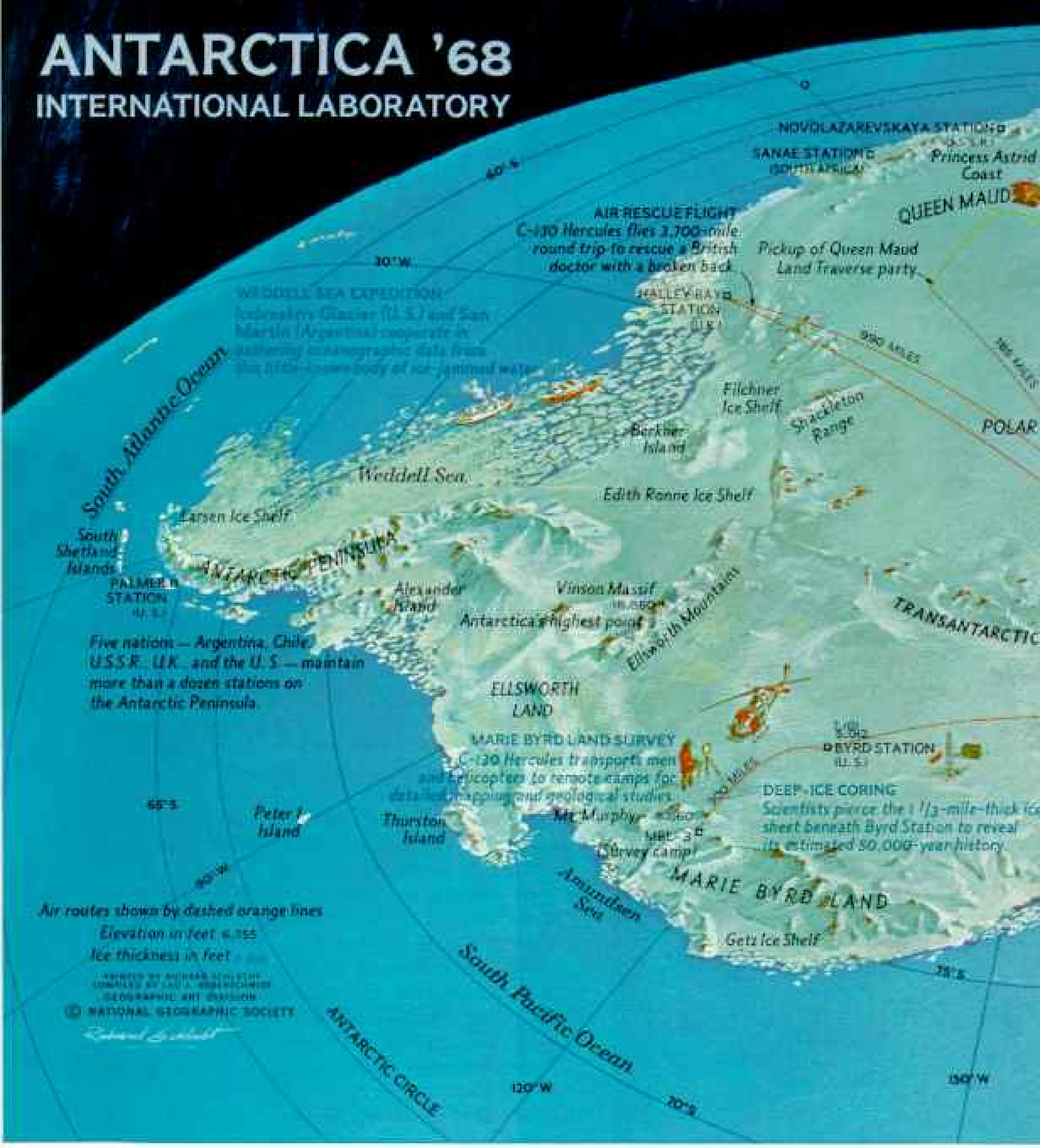
Then we let down through the overcast. A sharp turn, the rumble of wheels being lowered. Nothing but white through my porthole. A bump, and we were down.

I must have looked visibly relieved. "No sweat," said my seatmate with a grin. "Ground-controlled radar guided us in."

Williams Field, air crossroads of a continent, lies at the 150-foot-thick outer edge of the Ross Ice Shelf, which floats like a 500-mile-wide sliding roof atop the Ross Sea and McMurdo Sound (map, page 575). In summer Williams, with 200 men, ranks as the second largest "city" in Antarctica.

"We're standing here on only about eight feet of sea ice," Admiral Abbot said blithely as we clambered down the ladder from *Pegasus 7*. In a numbing wind, the mail was already being unloaded.

"A month from now, this runway won't hold the



Connie. After that," he went on, "we'll use another runway up on the ice shelf. We pave it with ground-up ice rolled hard as coral."

The heavy Hercules on their wide skis land all summer—and, if needed, in winter—on the softer snow-layered ice-shelf surface.*

Six miles away along "Mc-Willy Expressway" the largest of all Antarctic bases, McMurdo Station, clings to the steep volcanic shore of Ross Island. To a newcomer, no matter how much he has read about it, this frontier boom town of fuel tanks, power lines, and metal and wooden buildings astounds the eye.

It was 11 at night, yet full daylight. Men walked in woolen shirts or light jackets on black cinder streets. A thermometer read 25° above zero F. Here wind and 24-hour summer sun strip most of the snow from the dark slopes, and water runs in muddy streets.

Nuclear Power Station PM-3A—more familiarly, "Nooky Poo"—stands on a shelf of Observation Hill below a simple wooden cross in memory of Scott and his men, who

*Admiral Abbot described the first scheduled winter fly-in to McMurdo in "Flight Into Antarctic Darkness," NATIONAL GEOGRAPHIC, November, 1967.

died returning from the Pole in 1912. Today Nooky Poo generates electricity from atomic heat and distills fresh water from the sea for a settlement of 1,000 men in summer, and 200 huddling under fierce winter winds.*

Built for two or three years' use, McMurdo has been growing and improvising for 12. Now a badly needed "urban-renewal" program is under way. Amid other wonders rises a two-story steel living-and-working building, big enough to hold the entire winter populace.

Whenever I returned from an inland trip, the station came as a shock. It was too big, too busy, for any polar outpost. Round-the-clock shifts jammed the long mess hall. Diesel bulldozers and huge tractor-trailer trucks roared along graded roads. Cargo ships and icebreakers came and went from Winter Quarters Bay, beside the stark wooden hut Scott built there in 1902 (next page).

Around Hut Point, late one Sunday, sailed a tubby red-painted little ship named *Magga Dan*. She was the first tourist ship ever to

*The advent of nuclear power in Antarctica was described by Rear Adm. David M. Tyree in "New Era in the Loneliest Continent," GEOGRAPHIC, February, 1963.

reach McMurdo Sound. Hard by Scott's hut, she went aground.

She was Danish, a veteran of both Arctic and Antarctic service in ice-clogged waters; now, chartered by a New Zealand firm, she carried a New York travel agency's tour group. Eleven of her 21 passengers, each paying upward of $5,000 for a 26-day voyage, were women—one of them more than 70 years old.

While the U. S. Coast Guard icebreaker *Westwind* pulled her off undamaged, *Magga Dan's* passengers came ashore by small boat (below). They were dressed alike in red cold-weather gear. First to leave the boat, with shoulder-length blond hair streaming in Antarctic sun and wind, was Miss Betty Jane Boudreau of New York City—the first woman to see McMurdo, or to be seen there, except for two stewardesses on a Navy-chartered Pan American airliner that made a two-hour stopover in 1957.

Scientists and Navy men welcomed their guests, but never really got over being startled at the sight of women in masculine McMurdo. The visitors were serious, scientific-minded people, genuinely intrigued by the natural wonders they had come so far to see. During their three-day visit, they slept and ate aboard ship, but McMurdo welcomed them to its laboratories and plywood-paneled wardroom, and that all-male sanctum will never be the same again.

At the opposite end of Ross Island from McMurdo, an easy hop by today's helicopters but the "worst journey in the world" to members of Scott's winter party in 1911, lies Cape Crozier, one of

KODACHROMES © N.G.S.

Witness to courage, a wooden cross stands on Hut Point, where brave men challenged a frozen continent. Britain's explorer-scientist Robert Falcon Scott first quartered here in 1902. The cross honors one of his men, George Vince, who fell from a sea cliff during a storm. Scott's hut, at left, survives nearly as his men left it, after the final triumph and tragedy in 1912 when he and four companions died struggling back from the South Pole. Now, atop Observation Hill, far right, the carving on another cross salutes their determination "to strive, to seek, to find, and not to yield."

In contrast to those perilous times, U. S. scientists and military technicians live in relative comfort at McMurdo Station. The base even attracts a red-hulled cruise ship, *Magga Dan*.

First of their kind, 21 tourists from the *Magga Dan* visit the frozen world of explorers, scientists, penguins, and seals. An earlier tour—a proposed 50-day cruise from New Zealand to McMurdo Sound in 1911—fell through amid doubts that it might prove other than the predicted "grand picnic."

the world's most famous penguin nesting places. Here, for six years, a team of researchers under Johns Hopkins University physician and zoologist William J. L. Sladen has studied the antic 18-inch-high Adélies (pages 590-91) and stately four-foot-tall emperors. I hitched a copter ride to visit them.

"It's been a rough year," Dr. Sladen told me. "Two bad storms swept the cape. One in late winter decimated the emperor colony nearby. It killed or swept to sea perhaps 1,000 young birds. Not a single chick survived."

Again in November a great gale struck. "I saw countless Adélies hurled end over end," Dr. Sladen said. "Hundreds of adults were killed, and thousands of eggs were splattered everywhere. Our wind gauge took off after going well over 100 miles an hour."

Enough of the 300,000 Adélies at Cape Crozier rode out the storm, however, to assure their return this year. Right about now, they'll be swimming, waddling, and tobogganing on their bellies back across the pack ice, drawn by instinct and an incredible sense of direction to this same bare, stony point of land where they themselves were hatched.

To test their homing ability, Cape Crozier birds and others from the Soviet base at Mirnyy have been taken as far as the South Pole, on the high central plateau, then released and tracked. The flightless birds peered at the sun for a few moments, then set off without hesitation for the sea, each group in its own right direction. If clouds blanketed the sun, however, the birds became totally disoriented, wandering around in random directions.

Thus the trackers confirmed that penguins somehow navigate by the sun and, by some innate sense of time, can correct for the steady swing of the summer sun around the polar sky. Dr. Richard L. Penney of Rockefeller

In the bag, a Weddell seal lies quietly on the ice of McMurdo Sound as a biologist from New Zealand's Scott Base prepares to tag it for migration studies. Several hundred a year are thus marked. Seals, some weighing half a ton, regularly sunbathe here on the "Riviera of Antarctica."

Pedaling to nowhere, hospital corpsman Steve Church burns energy while breathing thin, icy outdoor air piped into the South Pole Station. Physiologist Albert Joern, taking blood from an artery, studies how the human body reacts to low oxygen and temperature levels, as in space.

University and the New York Zoological Society is continuing this study of the penguin's "biological compass" and "clock" by which, in some mysterious way, this flightless bird can tell direction.

Dry Valleys Hold Strange Life Forms

Scores of scientists each year unlock a few more secrets of the least-known continent. Geologists collect rocks in months-long journeys through unexplored mountains; glaciologists measure movement of the huge dome of ice that caps Antarctica; botanists cultivate mosses and lichens found on gaunt outcroppings. Each contributes some new bit of knowledge. Piecing together these bits, as in a vast jigsaw puzzle, is the reason for man's continuing presence in the Antarctic.

One day, in a clattering Navy chopper, I flew out across McMurdo Sound's frozen surface to one of the strangest regions in Antarctica. Behind the Scott Coast, under the towering Royal Society Range, lie valleys as ice-free and desertlike as the mesalands of the American Southwest (following pages).

"There, that's Wright Valley," pointed Bill Webb, leader of New Zealand's 60-man Scott Base, near McMurdo Station. We swept over the tongue of a hanging glacier into a dun-colored rocky depression, and put down beside a blue ice-free lake.

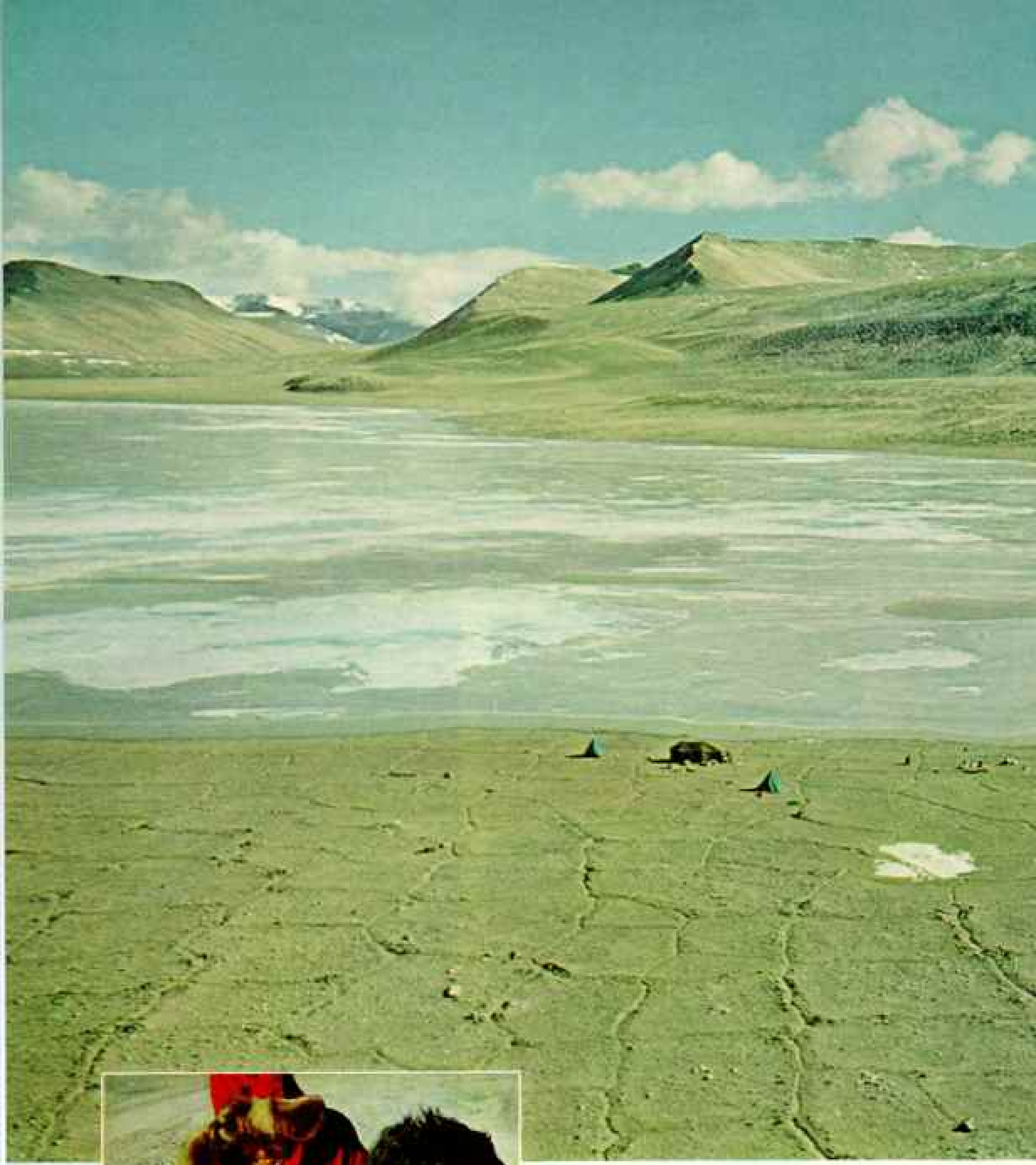
"Wright Valley, and several others like it, slope inland rather than to the sea," Bill said. He led us to the Onyx River, a stream that bubbled and chuckled seemingly uphill toward Lake Vanda at the head of the great trough. I knelt and drank the icy, crystal-clear water.

"No one yet knows the full answer," Bill replied when I asked the obvious question of the so-called dry valleys—why are they not buried in ice and snow? "The glaciers have

KODACHROMES BY NORMAN PEDDIE (ABOVE) AND ROBERT W. MADDEN © N.G.S.

Milestones of polar science, samples of ever-frozen snow fill these plastic containers. Scientists gathered the samples on a traverse of Queen Maud Land, the final trail-breaking exploration of the high Antarctic plateau. Traces of radioactive fallout and city smog in the snow prove air pollution has reached even to the bottom of the globe.

Hot soak combats the chill of swimming in the deep gloom under Antarctic ice. The scuba-diving biologists, dropping down to 130 feet, saw a sea teeming with plants and animals, unlike the nearly lifeless continent of ice and snow topside.



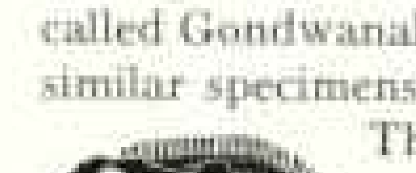
"Nearest thing to Mars on earth," scientists call Antarctica's dry valleys. Here they hope to learn what kinds of life might exist in the harsh world of the red planet. Stark Victoria Valley dwarfs explorers' tents by a frozen lake. Thawing and freezing cracks the ground into a giant flagstone pattern. Geologists think barricading mountains and dry winds keep such valleys free of mantling ice and snow.

Fossilized footprints 400 million years old crisscross a sandstone slab found by South African Professor T. W. Gevers, left, and Arthur Twomey of the University of Wisconsin. The tracks were left by a pair of ten-inch-long trilobites, relatives of today's crab.

EKTACHROME (BELOW) AND KODACHROMES BY ROBERT W. MADDEN © N.G.S.

DRAWING (LEFT) COURTESY JOHN WILEY & SONS

Relic of a lost land, a fossilized bit of jawbone of a four-foot-long amphibian gives evidence that Antarctica was once part of a supercontinent called Gondwanaland. Paleontologists have found similar specimens in Australia and South Africa. They argue that since the now-extinct labyrinthodont (left) did not swim in salt water, the ancient landmass itself must have split and gradually drifted apart. A cliff face near the head of the Beardmore Glacier, 325 miles from the South Pole, yielded the fossil; it was later identified in New York by Dr. Edwin H. Colbert of the American Museum of Natural History.



World's coldest job may be this daily climb to clear snow from weather instruments at Plateau Station. Here meteorologist George S. Rubin de la Borbolla works bareheaded on a summer day at only 35° below zero F. But midwinter cold has reached 123° below, and thinness of oxygen makes living at this most isolated U. S. base the same as at a mountaintop altitude of 14,000 feet.

retreated, but whether from subterranean heat, dry winds pouring off the central plateau, or a change in snowfall, we cannot be sure."

In these seemingly lifeless valleys, life forms somehow exist—bacteria, fungi, algae. "But not everywhere, and not all of them types we find elsewhere," said Dr. Roy E. Cameron, back in McMurdo's biology laboratory.

Dr. Cameron and his colleagues from the Jet Propulsion Laboratory of the California Institute of Technology were nurturing microorganisms in soil samples from the dry valleys. By studying what sorts of life can survive in these cold, windy deserts, dark for five months of the year, they seek guidelines to possible life on Mars—and how best to detect that life when the first unmanned spacecraft lands on the Martian surface.*

"We find isolated pockets of life," he said. "It may be in a depression high on a mountainside, where soil, moisture, and wind conditions are just right. In another place, which might appear more promising, the ground may be totally sterile. Fifty yards from where men have camped—and where we would expect to find bacteria we're familiar with—there may be absolutely nothing.

"We can walk along on black, barren volcanic rock and spot a bit of white quartz," Dr. Cameron remarked. "Pick it up, and there's algae underneath. The quartz lets enough light through, of just the right sort, to allow the algae to grow in the moisture under the rock. The same thing could occur on Mars."

Freight Train to a Field Camp

For 40 years, since Richard E. Byrd's first expedition to Antarctica in 1929, American explorers and scientists have probed another unusual and puzzling region of the white continent: Marie Byrd Land, between the Ross Sea and Ellsworth Land (map, page 574). Much of it is not land at all; mountains in places rear through its ice, but bedrock elsewhere lies far below sea level.

The Marie Byrd Land Survey, leapfrogging from spot to spot with helicopters, had reached a camp far out near the coast of West Antarctica when Bob Madden and I flew out from McMurdo. We were the only passengers in a Hercules jammed with drums of fuel for MBL Camp 3, and other supplies to be airdropped to glaciologists on Roosevelt Island.

The four-engine turboprop Hercules is a cavernous, snarling beast, and greatly beloved. Admiral Abbot says flatly, "It's the

*See "Mars: A New World to Explore," by Carl Sagan, National Geographic, December, 1967.

single most important piece of hardware on the Ice." Five hours and 1,245 miles later, we knew why.

Our Hercules slid over the prong of a saw-tooth mountain 100 miles inland from the Amundsen Sea, sloped down into a pool of shimmering whiteness, and turned sharp right toward a radar blip from a camp utterly invisible below. Finally, in a spume of flying snow, the plane touched its skis in an open-field landing, slewed once, and lurched to a stop.

Wind-blasting propellers never stopped. The floor of the tail section swung down and we piled out, as seven scientists heading home climbed aboard. Then, with ramp still down, the Herc gunned its engines to a roar.

Suddenly the plane shot ahead, and out the back flew row after row of fuel drums, landing upright in the snow. A resupply load had been "freight-trained" to MBL-3.

Surveyors Leapfrog From Peak to Peak

Three round-topped canvas Jamesway huts, half-buried in drifted snow, comprised the camp (pages 568-9). It still held four U. S. Geological Survey topographic engineers, there to establish ground-control points for aerial mapping; a geologist from St. Louis, Missouri, and another from Leningrad, Soviet exchange scientist Boris G. Lopatin; three Navy men, and a dozen members of a U. S. Army helicopter detachment.

Bob and I shortly became members of the survey team ourselves, hopping with the "topos" and copter crews from rocky peak to snow dome. We recorded the readings of radio-pulse instruments that measured 30-mile distances within inches. While fair weather held, we missed sleep without knowing or caring. Through days of brilliant sun and little wind, we fell victim to Antarctic enchantment.

In my notes I find: "Flew east along coast. Off to the left the open sea, a sky-blue edge to the ice sheet. Ahead three dark-chocolate peaks rear through the snow, with the towering backdrop of Mount Murphy just behind. It's like flying along the face of a frozen heaven. . . ."

And again: "Out across a huge snow field, rippled by sastrugi and streaked by crevasses. Earphones hum gently, a distant calling of a world yet unmade . . . ethereal . . . elusive."

Hard rock that spoke of Antarctica's dim past proved real enough, however. Geologist Thomas O. Early of Washington University in St. Louis, young, red-bearded, wielded his hammer tirelessly to collect ancient granites and younger volcanic outpourings. He marked the orientation of each specimen carefully, using spirit level and hand compass, before breaking it free.

"That's to map ancient lines of magnetism in the rock," he explained. "When the magma hardened, it locked in the alignment of molecules to the magnetic poles as they lay then.*

"If the poles were in entirely different places—or, as is now thought, the continents themselves have moved—such direction lines can show us when and how far.

"We don't have enough data yet to be sure," Tom Early went on. "But what I've seen makes me think there's been continental drift. That would explain the beds of coal and fossil plants and trees in Antarctica; it could once have been far to the north."

That same month, near the Beardmore Glacier, geologists from Ohio State University found still another clue: a fossil bit of jawbone in an ancient stream bed. Later it was identified by the American Museum of Natural History as the first vertebrate land animal bone ever found in Antarctica (page 581).

An extinct fresh-water amphibian that lived 200 million years ago in Australia and South Africa as well, the creature could scarcely have crossed thousands of miles of open sea. Its presence in Antarctica adds to other evidence of a onetime southern supercontinent, called Gondwanaland. This broke up, proponents of continental drift say, and its pieces—Antarctica, Australia, South America, Africa, even India—drifted to their present positions on the still-changing face of the earth.

Ice Jaws Squeeze Byrd Station

Rock takes millions of years to drift, but ice moves faster. Three hundred miles inland from Camp 3, in the middle of Marie Byrd Land, we found the largest interior station in Antarctica fighting a battle against flowing ice and crushing pressure.

"Byrd Station—new Byrd—won't last too many years longer unless we can stabilize it," Admiral Abbot had said. "It's like living in a big bowl of Jell-O."

Completed only six years ago to replace an earlier Byrd Station collapsing under snow accumulation, new Byrd used the most elaborate of polar construction methods. Heavily insulated prefabricated buildings went into huge trenches sliced into the mile-high snow field. Then arched steel ribs were placed side by side and covered with snow, completely burying the base. Only antennas and science towers show above the wind-scoured surface.

*See "Magnetic Clues Help Date the Past," by Kenneth F. Weaver, NATIONAL GEOGRAPHIC, May, 1967.

Yet creeping ice and heat escaping from the buildings have already deformed the tunnels. Their corrugated-arch roofs are buckling. A spike dangling from the roof on a long string, hanging against one end of the galley, was dropping an inch a month.

"What are we doing about it? We're digging a cold-air mine." Lt. (j.g.) J. Robert Clark, young civil engineer officer in charge, gave a wry grin. "We've carved a room off the main tunnel, and will install a big fan to keep cold air moving through the place to try to stop the sagging."

Column of Ice 1⅓ Miles Long

A roar in the main access tunnel marked the major project at Byrd Station in 1968. Here oil-smeared drillers were driving a 6½-inch hole straight down through the icecap to bedrock a mile and a third below. It would be the deepest hole ever sunk through ice, producing a continuous core sample 20 feet at a time, 4¾ inches in diameter.

Glaciologist Anthony J. Gow of the U. S. Army's Cold Regions Research and Engineering Laboratory at Hanover, New Hampshire, watched a long gleaming tube, lifted from 4,370 feet down, emerge from the tunnel floor and unsheathe its column of ice (page 592).

"There," Tony Gow pointed. "That dark band—possibly volcanic ash. It fell on the snow sometime about. . . ." He paused to consult a chart. "About 13,000 B.C."

In the upper core sections, layers like tree rings showed each year's snow accumulation, 10 to 20 inches at Byrd. Each layer would eventually be squeezed down into four to eight inches of solid ice. As far back as 400 years, the drillers could read dates directly. At deeper levels, the ice would be dated by measuring remnant radioactivity of carbon 14 in air trapped from Antarctica's prehistoric atmosphere.*

At 7,101 feet down—almost 2,000 feet below sea level—the drillers weeks later hit bedrock. From the Byrd ice core, scientists will learn more about variations in world climate thousands of years ago; how much the atmosphere has been contaminated by such things as the industrial revolution and leaded gasoline; and the rate of fall of micrometeorites, space dust from beyond the earth.

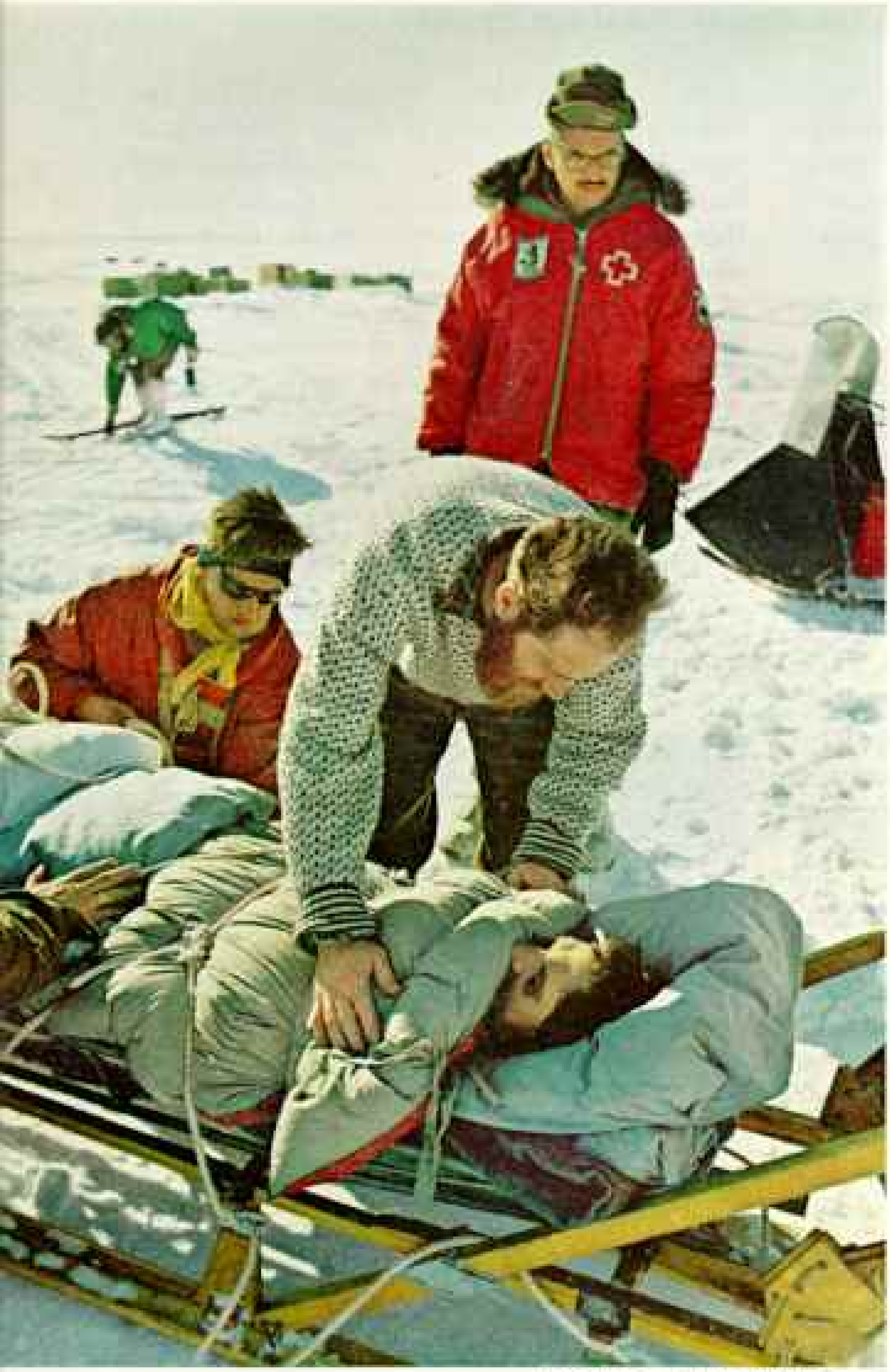
"The snow that falls on the center of Antarctica is not only the cleanest but the lightest anywhere." At the South Pole Station, which I visited next, Dr. Edgard E. Picciotto of the Free University of Brussels was explaining

*Carbon-14 dating methods were described in "How Old Is It?" by Lyman J. Briggs and Kenneth F. Weaver, NATIONAL GEOGRAPHIC, August, 1958.

KODACHROME (BELOW) BY NORMAN PEDDIE; EKTACHROME BY ROBERT W. MADDEN © N.G.S.

Fantasy in fractured ice, an old closed-over crevasse gleams before cave explorers' lanterns deep within a snow field near Scott Base. The photographer and his companions reached the gallery—part of a 2,000-foot-long cavern—after snaking on their backs headfirst through a 60-foot tunnel.

Huddling in a hole under blowing snow, a bundled-up member of the Queen Maud Land Traverse waits for companions to help dig out supplies buried during an airdrop.



KODACHROME BY ROBERT W. MADDEN © N.G.S.

Operation Brotherhood: Disaster on the ice, and a continent-wide, two-nation rescue effort. His back and upper jaw broken in a fall, Dr. John Brotherhood waited 30 hours for fellow Britons to reach him and sledge him back here to their base at Halley Bay. Then U. S. fliers crossed the Pole twice to rush him to a New Zealand hospital and eventual recovery.

why he ships wooden crates of snow halfway around the world to Belgium.

"Cleanest, because here we are farthest from civilization. Lightest in molecular terms, because at such low temperatures the snow has fewer of the heavier isotopes of oxygen and hydrogen than anywhere else."

Like the ice core at Byrd, Dr. Picciotto's polar snow will reveal much about fallout of material from space onto the earth.

Another scientist I met at Pole Station was a slim, goateed Russian physicist, Peter G. Astakhov. He had spent an entire year there, photographing auroras (pages 588-9) and recording other ionospheric disturbances.

Deep Freeze and USARP men worry that Pole Station, like new Byrd, is near collapse. Pole Station, built in the southern summer of 1956-57 and first manned under Dr. Paul A. Siple, has nearly reached the end of its days.*

Here groups of about 20 men—half of them Navy, half scientists—have lived and worked since 1957 "in a box," in Paul Siple's words. Their box began on the surface. Now it is buried under 18 feet of snow, shored up with metal arches and timbers. To reach the station, you walk down a long flight of wooden steps or a ramp to the under-ice tractor garage.

Inside, I watched men being wired for their night's sleep with a maze of electrodes on head, neck, and arms (page 588). Other volunteers pedaled furiously on a stationary bicycle while breathing 50°-below-zero air piped from outside (page 578). Physiologists would thus learn the effects on blood and body of exertion under low oxygen and temperature levels, as in a future space station.

"We didn't expect life here to be all roses," said one man. "There are compensations. We reach an extremely close relationship—a great comradeship, usually. Peter Astakhov has become one of the most popular men here."

The loneliest, highest base of all is Plateau Station, 1,400 miles inland from McMurdo and 11,900 feet above sea level. Here I met eight men who would be totally cut off from the world from early February until mid-November.

Temperature at Plateau fell on July 20, 1968, to 123.1° below zero F. (the record is minus 126.9°, reached at Russia's Vostok Station in 1960). Plateau's all-year average is minus 55°. At 65° below, aircraft no longer can be flown in safely; hydraulic seals would fail and fuel turn to jelly in the wing tanks.

*NATIONAL GEOGRAPHIC published Dr. Siple's vivid "We Are Living at the South Pole" in July, 1957, and "Man's First Winter at the South Pole" in April, 1958.

Altitude sickness is common for newcomers to Plateau; assigned personnel go first to the Pole, at 9,200 feet, to acclimatize.

Bob Madden was the first civilian photographer ever to visit Plateau. "After six days there," he admits, "I was bushed. The first few days were all right. Then I ran out of air."

Yet men work all winter at Plateau under these conditions. Scientific leader and meteorologist George S. Rubin de la Borbolla climbs a 100-foot tower once a day to clear instruments of wind-driven snow (page 582).

Nine Men in the Unknown

At Plateau, Bob Madden recorded the start of what may be the last major overland traverse in Antarctica by U. S. explorers. The 815-mile journey was made by nine men in three Sno-Cats, grinding across the flat snow desert of Queen Maud Land (map, pages 574-5). The travelers were led by Norman Peddie of the Coast and Geodetic Survey.

Bearded, sun-blackened, visibly fatigued, Peddie told me when I flew to meet them at the end of their trek: "Our biggest surprise came about 200 miles out from Plateau. On the horizon we spotted a dark speck. It took shape as a vehicle as we drew nearer.

"It was a Russian ice drill and sleeping cabin on a mammoth sled, abandoned the year before by a Soviet traverse party traveling to their Novolazarevskaya base on the Princess Astrid Coast. We don't know why they left it; maybe they ran low on gas."

EKTACHROME BY ROBERT W. MADDEN © N.G.S.

Russian hospitality: Soviet leader Boris Belyaev, right, spreads a welcome at pinup-decorated Vostok Station. U. S. Antarctic commander Rear Adm. J. Lloyd Abbot, Jr., and Jerry Huffman, senior National Science Foundation representative, flew in two American scientists for joint ionosphere studies. Likewise, Russians work each year at U. S. bases.

Another such journey by Americans is unlikely for two reasons: Not only was Queen Maud Land the last large expanse of the continent to be thus crossed, but a method of sounding ice thickness by radio waves from long-range aircraft promises to make such slow, hazardous traverses unnecessary.

The technique was flight-tested last December in a Navy Super Constellation by a team from the Scott Polar Research Institute in Cambridge, England. Signals beam downward from an antenna under the airplane's tail. Echoes return not only from the ice surface, but from the bedrock far below.

Like airborne radar through clouds or a ship's echo sounder through water, the radio ice sounder can reveal deep-buried mountains, valleys, canyons, and plains—giving a continuous profile as the plane races along.

"To me this is the most important scientific project in Antarctica," Admiral Abbot says emphatically, "not only this year but in any year since exploration began.

"Despite all the surface traverses, we still know less today of the real sub-ice Antarctic Continent than we know of the bottom of the Arctic Ocean. Without such a device, we would never really be able to chart what lies under all that ice."

What lies 25 to 250 miles straight above it, in the electrically charged layer of earth's atmosphere called the ionosphere, was the concern of many scientists on the Ice. One of them, Dr. Victor P. Hessler, has come all the way from the University of Alaska to work during the last four summer seasons at the Soviet Union's Vostok Station, high in the interior near the South Geomagnetic Pole.

There, for a joint U.S.-Russian research program, American Seabees in 1964 erected two tall antenna towers and installed a prefabricated building filled with apparatus for measuring ionospheric disturbances. Dr. Hessler and one or more young U.S. scientists return each summer to check the equipment and train the Russian operators.

Dr. Hessler, enthusiastic and youthful-spirited, flies straight to Vostok's 11,444-foot altitude without any acclimatization at the Pole. Dr. Hessler is 65 years old.

Each year he has been at Vostok, he told me, Russian cordiality and openness have

Sky fire at the end of the world, southern lights flare in the 24-hour darkness of the South Pole winter. Clouds of charged particles from the sun, slamming into earth's upper atmosphere over the polar regions, produce brilliant auroras and radio blackouts. Scientists photograph auroras to learn more about ionospheric storms; this picture was made in −90° F. temperature by a Soviet exchange physicist at the U. S. Amundsen-Scott South Pole Station.

Eavesdropping electrodes check Stan Massey's dreams, heartbeat, restlessness, or insomnia. The sleep study of men at South Pole Station may forecast astronauts' reactions to the tensions of prolonged spaceship travels.

grown. The Soviet scientists welcome him and other Americans with ever-increasing friendliness and enthusiasm (page 587).

Another tie of friendship between nations on the Ice was knotted more firmly by Deep Freeze '68. A doctor at Great Britain's Halley Bay base on the Weddell Sea, across the continent from McMurdo, fell from an ice cliff and broke his back. For 30 hours, still conscious, he directed his own first aid by a lone companion in a field tent until rescuers arrived.

To evacuate him, a U.S. Hercules flew 3,700 miles round trip over the Pole. It landed on a snow strip marked out with powdered cocoa, the first time a plane had touched at Halley Bay in nine years (page 586). Flown to McMurdo and on to Christchurch, Dr. John Brotherhood recovered to walk again.

Foster Parent Talks to Young Penguins

From McMurdo, late in January, I rode the *Westwind* north to Cape Hallett, where U. S. and New Zealand scientists work at a station in the midst of an Adélie penguin colony. Banging and crunching for 28 hours through loose ice chunks and floes, *Westwind* maintained an unperturbed 13 knots.

Off Moubray Bay the icebreaker slowed,

ANSCOCHROME BY PETER G. ASTAKHOV; KODACHROME (OPPOSITE) BY ROBERT W. MADDEN © N.G.S.

EKTACHROME (ABOVE) AND KODACHROME BY ROBERT W. MADDEN © N.G.S.

"Stop, thief!" A mother Adélie penguin flaps a protest as her egg is stolen by a skua, voracious bandit of the colony.

In formal dress for a family function, an Adélie sits on an egg in a rocky nest at Cape Hallett. Mates take turns hatching one or two chicks a season. On yearly migrations, penguins navigate by the sun with uncanny accuracy.

and her helicopter airlifted cargo into the base across open water and drifting ice. In the required black-rubber survival suit and bright-orange coveralls, feeling like an astronaut on my way to space, I flew in on one of the sorties.

David Thompson of the University of Wisconsin was delving into the mystery of how penguin parents and chicks can find and recognize one another amid a milling, cacophonic maelstrom of 100,000 Adélies.

"Come along," he said. "I have some chicks who think I'm their mother."

He took the wire lid from a wooden crate and lifted out four slate-gray, foot-high blobs of fuzz. Placing them on their webbed feet, he knelt beside them.

"Uh-uh-uh-uh-uh-uh-uh." Deep in his throat, Thompson gave a sound like a small boy pretending to fire a machine gun.

The chicks at once swiveled toward him. They craned their necks and emitted chirping trills in the penguin display of recognition.

"We don't know yet how parents and chicks distinguish particular calls," David said. "But we know that they do it somehow."

He had tested visual recognition, painting out the white eye rings of adult Adélies to learn if their mates were thus confused. They weren't.

Then he had recorded parents' calls and played them to chicks in a group. Invariably the youngsters responded to the sound of their own parents.

David walked away, and the four chicks followed. He moved to the left, and they turned. He reversed course,

and they veered with him. When he ran and outdistanced them, the chicks hesitated. Then they turned and retraced their course almost exactly, a zag for every zig, back to the familiar ground of their box.

"That's how they find their nest again if they wander away," David said. "But no one yet knows what guides them."

Such detailed and patient studies of the life of the Antarctic—from penguins and seals* to tiny red-legged mites and microscopic bacteria—have made biology one of the fastest growing fields of Antarctic research.

"But the big difference between Antarctica today and ten years ago," Dr. Jones of the National Science Foundation told me, "is how the work is done. A scientist no longer has to be also a survival expert, living unaided under the worst possible conditions.

"A man who comes down here today—say a microbiologist—can fly out from McMurdo by helicopter, work all day, then bring back his specimens for eight hours' more work in a laboratory that's fully the equivalent of his university lab at home."

What of tomorrow?

"Look at what we're doing already," answers Admiral Abbot. "Weather satellites in polar orbit now go overhead every hour and a half. They give us direct photographs of the entire continent. Think what that means to our pilots, to see cloud patterns and storms as they develop. The same pictures show ice and open water. Our ship captains know just where to head."

Polar-orbiting geophysical satellites, nicknamed POGO's, are already flashing data on magnetic disturbances and radiation in the upper atmosphere and space. Mapping satellites are not far off.

EKTACHROME © N.G.S.

Peering into the past, glaciologist Anthony Gow checks for dirt traces in ice perhaps 50,000 years old. The sample was drilled from the bottom of Antarctica's icecap, a mile and a third below Byrd Station.

Atomic-powered, automatic-recording stations, such as are already reading weather in the middle of the Ross Ice Shelf, may soon take the place of manned bases like Plateau Station, dangerously cut off for much of the year. Orbiting satellites could take data by radio from unmanned stations anywhere on the continent, for relay directly to scientists anywhere in the world.

Laboratory of Peaceful Exploration

Purely as a scientific laboratory, Antarctica has opened its doors in the past 12 years. New knowledge it has yielded is beyond price. It may be tomorrow's best testing ground for journeys beyond the earth—for vehicles to rove the moon, for example; for learning what man's arrival might do to Mars.

In the *way* that Antarctica is being explored—the Antarctic Treaty, signed now by 16 nations, reserves the entire icy continent for peaceful purposes—may lie the program's greatest benefit to man. Not only does it offer a model for other treaties, for exploring the oceans, the moon, and the planets; it also provides a pattern of cooperation, of greater understanding and friendship between men searching for common goals.

"I am hopeful," wrote Admiral Byrd, "that Antarctica in its symbolic robe of white will shine forth as a continent of peace, as nations working together there in the cause of science set an example of international cooperation."

His dream is coming true.

*See "Stalking Seals Under Antarctic Ice," by Carleton Ray, NATIONAL GEOGRAPHIC, January, 1966.

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COVER: Another sunrise finds American teen-ager Robin Lee Graham sailing ever westward to circumnavigate the earth alone in his 24-foot *Dove* (page 445).

KODACHROME BY ROBIN LEE GRAHAM © N.G.S.

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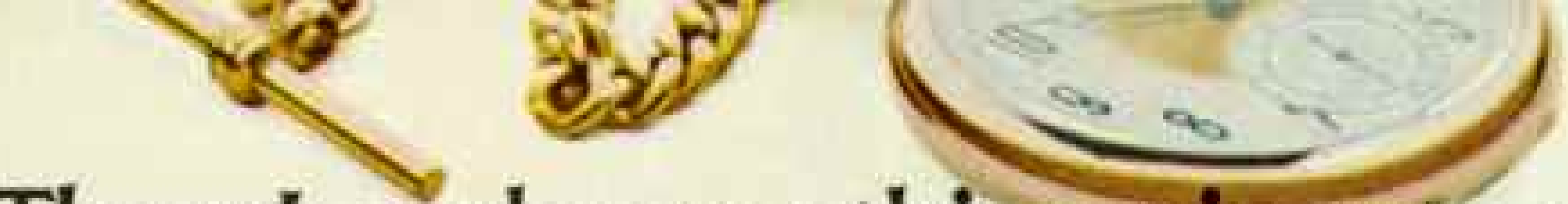

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Here the party's physician, Dr. Thomas Richert, surfaces with auger *(Terebra)* shells near Australian malacologist Dr. Barry Wilson. Senior Smithsonian zoologist and expedition director Dr. Harald Rehder, right, and Bishop Museum associate Mrs. Mariel King inspect a shell specimen aboard their floating laboratory, the *Pele*.

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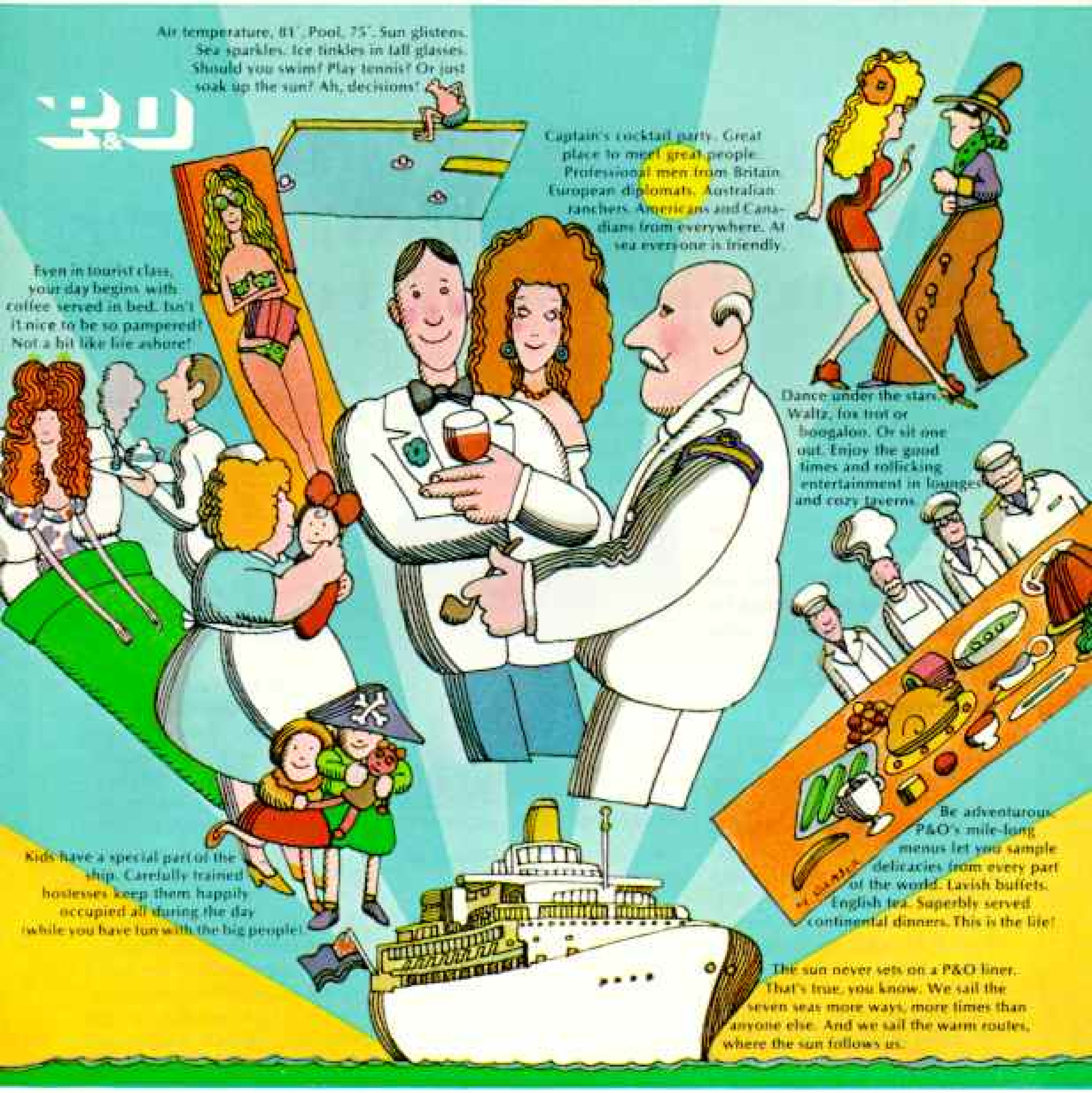

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10 **Merrill Lynch takes part, on average, in one out of every six trades on the Big Board**—a far greater volume of business than any other broker. Since every Merrill Lynch floorbroker handles orders in only about 80 stocks, he has a good feel for the market in those stocks. Also, when he concludes a trade, there's little chance anyone can guess whether he is representing one of a million private investors—or a billion-dollar corporation.

11 **Merrill Lynch can often save investors money on over-the-counter transactions.** When Merrill Lynch acts as your agent in buying or selling over-the-counter securities, we always check at least *three* other brokers to try to get you the best price. And we never charge more than the equivalent of a *minimum* N.Y.S.E. commission.

Merrill Lynch also "makes a market" in some 300 over-the-counter stocks—more than any other brokerage firm dealing with the public. You can get instant quotes on these securities —*at "inside" dealer prices.* And, usually, your Merrill Lynch man can *execute* your order for up to 100 shares *immediately.* Again, you pay only the equivalent of a minimum N.Y.S.E. commission.

Thanks to our network of electronic quote machines, our account executives are able, in general, to handle your business on these 300 stocks *faster* than the representatives of *any* other firm. If you are buying a stock on the upswing, this *speed* can save you money, too.

12 **Merrill Lynch operates openly "in a goldfish bowl" for all to see.** For example, although not required by law, Merrill Lynch publishes and distributes its own annual report—the first brokerage house in history to do so. If Merrill Lynch or its officers have an interest in the securities of any company, this fact is disclosed in all published research reports on the company.

13 **Merrill Lynch puts teeth in its policy: "The customer's interest must come first."** Whenever the firm makes a public offering of stock, no officer or employee is permitted to buy for himself until all customer orders have been filled. When the Research Department issues a new report on a stock, no officer or employee may buy or sell the stock for his own account for a period of 48 hours. Merrill Lynch discourages all trading in risky "penny stocks"—and *refuses* to open accounts for the purpose of buying or selling them.

14 **Merrill Lynch account executives are not paid a straight commission on sales.** Merrill Lynch pays its account executives a *salary,* plus adjusted compensation twice a year. The amount of additional compensation each man receives depends not only on the value of business he generates, but also on his success in giving as much personal attention and service as each customer needs. *Seventy-five* percent of the account executives who started with the firm are still with it.

15 **All new Merrill Lynch account men must pass a rigorous 7-month training program.** Out of every 100 men who have applied for the course in the past decade, an average of 90 have been *rejected.* Some of the tougher subjects studied: *Money Markets, Commodity Trading Procedures, Securities Analysis.* Graduates of the program must pass a New York Stock Exchange test to qualify as account executives. As a group, Merrill Lynch trainees consistently rank among the highest scorers of all men taking the test.

16 **Merrill Lynch has 170 offices, is a member of every major exchange.** On these stock and commodity exchanges, and in the over-the-counter market, Merrill Lynch executes more orders for its customers than any other broker or dealer. The firm is also a principal factor in the buying and selling of U.S. Government securities and municipal bonds.

17 **Merrill Lynch has the most ambitious public education program of any broker.** Through speeches and seminars, forums and films, brochures, booklets and broadcasts, Merrill Lynch offers information on investments and the stock market to investors of every level of sophistication. Sample literature available free: *How to Buy Stocks, How to Read a Financial Report, Investing for Tax-exempt Income.*

Write for our booklet "This is Merrill Lynch, Pierce, Fenner & Smith Inc.," with more details of our services, policies, and facilities. The address: P.O. Box 333, Wall St. Station, N.Y., N.Y. 10005.

Investigate—then invest.

MERRILL LYNCH,
PIERCE, FENNER & SMITH INC

Deadpan

Get a Konica Autoreflex T

You know how it is. She smiles and strikes a pose. You fiddle around with the camera making adjustments — turning a knob here and a ring there. She waits. Her smile begins to fade. Now we're ready. Hold it. But by that time, her smile is forced and her face is a wooden deadpan. Does this happen to you when you take pictures? It will never happen with a Konica Autoreflex T. Just aim, focus and shoot. No knobs or rings to turn. No aligning of a wobbling needle in the finder. The world's first and only SLR camera combining into one smooth-working unit the Through-The-Lens and Electronic Eye systems. Lets you take pictures without wasting time. See for yourself what this amazing all-automatic SLR camera is like. At your Konica dealer's or at all good camera stores.

KONICA COMPACT 8

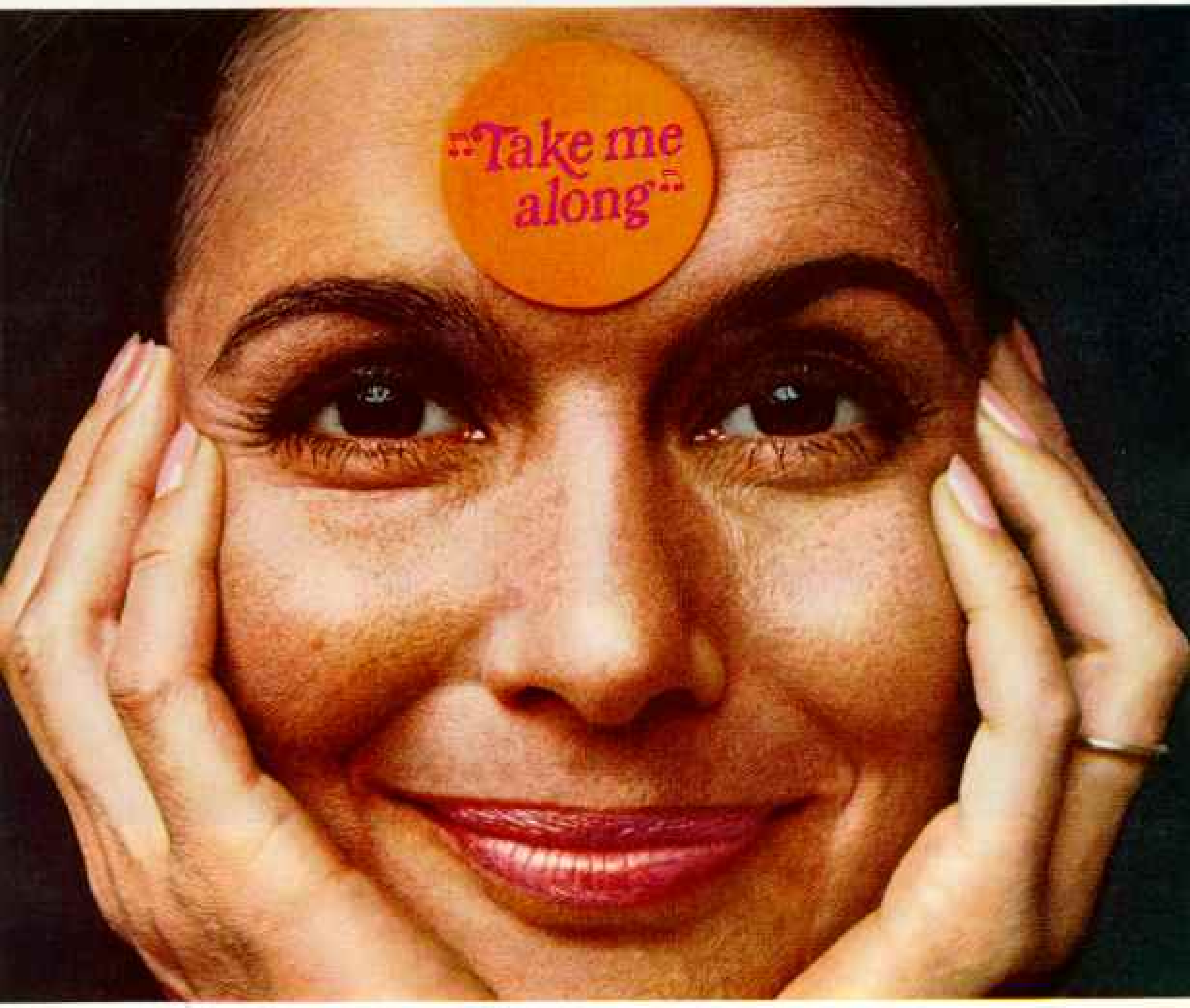
Novice cameramen and pros alike will delight in this handy little movie camera — the smallest and lightest in the world. Put it in your pocket and take it along anyplace. Slip in a film cartridge, aim and shoot. Bright f/1.6 lens. Sharpest color.

KONICA

KONISHIROKU PHOTO INDUSTRY CO., LTD.
No. 1, 3-chome, Muromachi, Nihonbashi, Chuo-ku, Tokyo, Japan

Want your husband to take you along on his next business trip?

Drop a subtle hint.



Sure, you can *say*, "Take Me Along."

You can even tell your husband about our special plan:

25% off your fare.

Side-by-side seating.

Special champagne cocktails. (We call them Short Flings.)

Reduced rates on hotel and rental car for the weekend, in most cities.

And he can charge everything on one of the many credit cards we honor.

A call to United or your Travel Agent wraps up the whole thing. But if your husband still balks – put up our free reminder stickers (we call 'em Put-Ons). They're waiting for you at all United Ticket Offices.

Stick them on anything—even yourself.

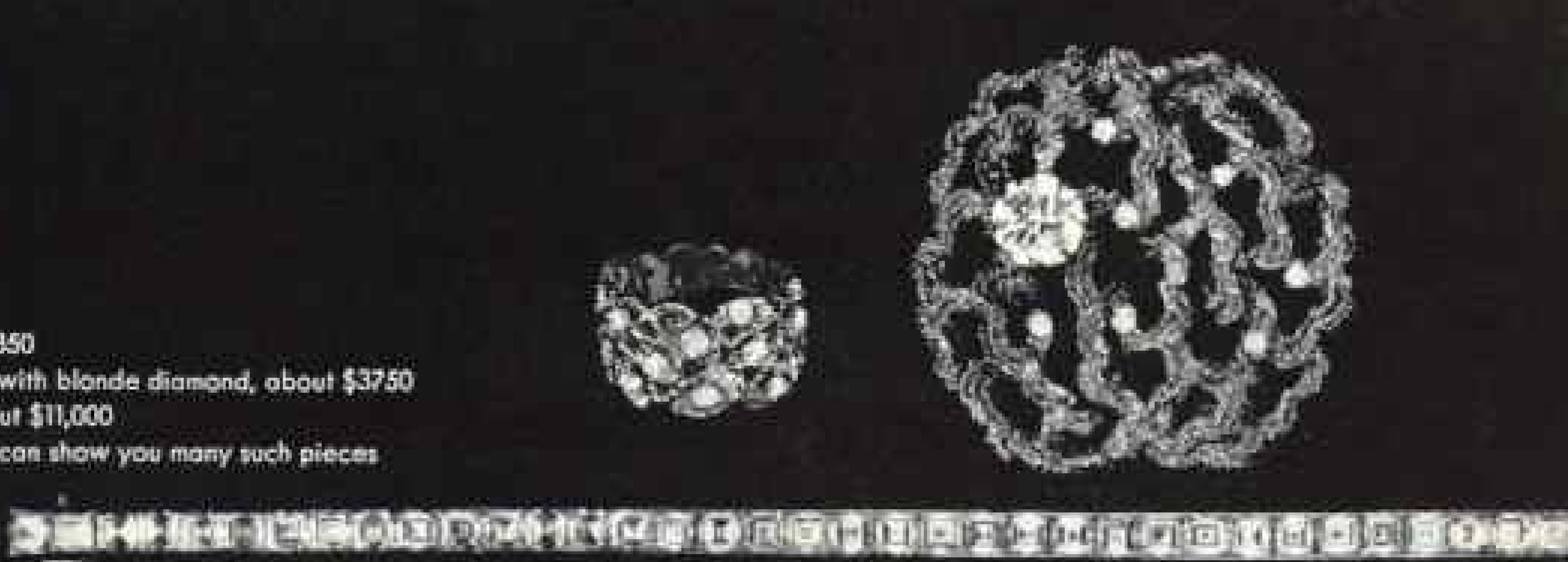
Now *that's* using your head!

fly the friendly skies of United.

"Doris, will you please take that thing off your forehead!"

Perhaps she knows you care more now than ever.
But how long since you've told her so
with love's own talisman, a gift of diamonds?

A diamond is forever.



Ring, about $350
Gold brooch with blonde diamond, about $3750
Bracelet, about $11,000
Your jeweler can show you many such pieces

You can buy a Polaroid Color Pack Camera for under $50.

But this isn't it.

This is the one that costs.

But it's also the one that will stand on its head for you.

It has a transistorized shutter that lets you make black-and-white pictures indoors *without flash*, and even make perfect time exposures up to 10 seconds, automatically.

If you add special Polaroid camera accessories, you can create beautiful portraits and close-ups.

It has a superb Zeiss Ikon single-window range- and viewfinder that automatically corrects for parallax and field size. Plus a sharp triplet lens. Two exposure ranges for color, two for black-and-white. An all-metal body with brushed chrome finish. And a flashgun.

This adds up to the finest automatic camera Polaroid has ever produced.

It also adds up to something under $160.

Top talent rarely comes cheap.

POLAROID®

Introducing the all new 1969 Imperial.

before you buy

There are only three luxury cars in America. We make one of them, the Imperial. And this year we've made it all new.

Now no one is likely to run out and buy a 1969 Imperial just because it's all new.

Actually there are many things you should know about the Imperial, or any luxury car, before you buy one.

One thing is size. They're all big. The '69 Imperial is the biggest but not for the sake of bigness.

It's big because it gives you a little more leg room, considerably more shoulder room, more hip room. More space under the hood for power equipment, room enough behind the back seat for a separate heater and defroster if you want it.

We don't expect anyone to buy an Imperial simply because it's the biggest car. But since added size is one of the reasons a luxury car costs more, you should know what size it is.

You should know that we've equipped '69 Imperial with the largest passenger-car engine Chrysler ever built. We think it may be the smoothest running engine in America.

You should know about disc brakes, since all luxury cars have them. They are standard equipment on Imperial. Of the three cars, Imperial's disc brakes are slightly larger. Though only very slightly.

You should know that the new Imperial rides on torsion bars instead of coil springs. Torsion bars are better on curves and highways. Unbeatable on long trips. The ride you get doesn't depend solely on suspension. Car weight, wheelbase, passenger load are other factors. You'll have to judge it.

All three luxury cars ride like luxury cars. And a twenty-page description of the differences between them won't mean as much as a twenty-minute drive.

We think the more you ride on torsion bars, the better you'll like them. But then, that's only what we think.

You should know that Imperial's unitized body is a single welded unit that's strong,

Le Baron 4-Door Hardtop

And several things you should know any luxury car.

quiet, and well-protected from corrosion by a seven step dip-and-spray treatment.

Not all luxury cars are unitized. And, while no car body, even a unitized one, is absolutely rattleproof forever, there's no better insurance against rattles. You should know that.

You really should know what the optional extras are. Luxury cars have lots of them. '69 Imperial has more than its share.

Reclining passenger seats. Built-in rear seat pillows. AM/FM radios, tape decks and a stereo system with 5 speakers instead of 4.

And headlights that you leave on when you park the car. They stay on for a minute or two to light your way to the door. Then they turn themselves off.

It isn't very likely that you'll run out and buy the new '69 Imperial just because the headlights see you to your door.

Or because Imperial's 5 stereo speakers produce a slightly better sound. Unless, of course, you're a fanatic about music.

Or unless you've been adding it all up, point-by-point. Because you should have been adding it up. These are the things you buy a luxury car for.

You can buy a good car with power options and all the basic parts the new Imperial has for half the Imperial price. But a luxury car isn't just basic transportation.

It's a little more of everything than you need. A little more room. A little more quiet. A little better ride and smoother engine and finer stereo.

These are the things that make luxury cars different from ordinary cars. And make the three luxury cars different from each other. And that's our point.

Before you spend $6000 or $7000 for a new '69 Imperial, or any other luxury car, you should know what you're spending $6000 or $7000 for. This year spend a little time with all three of them.

1969 IMPERIAL

CHRYSLER

The Panasonic TR-339R: Three portables you don't need three hands to carry.

Put your hand over the TV screen below. And you've got the picture. That slide-rule dial that looks like it belongs to a radio, belongs to two of them. Solid-State FM and AM radios.

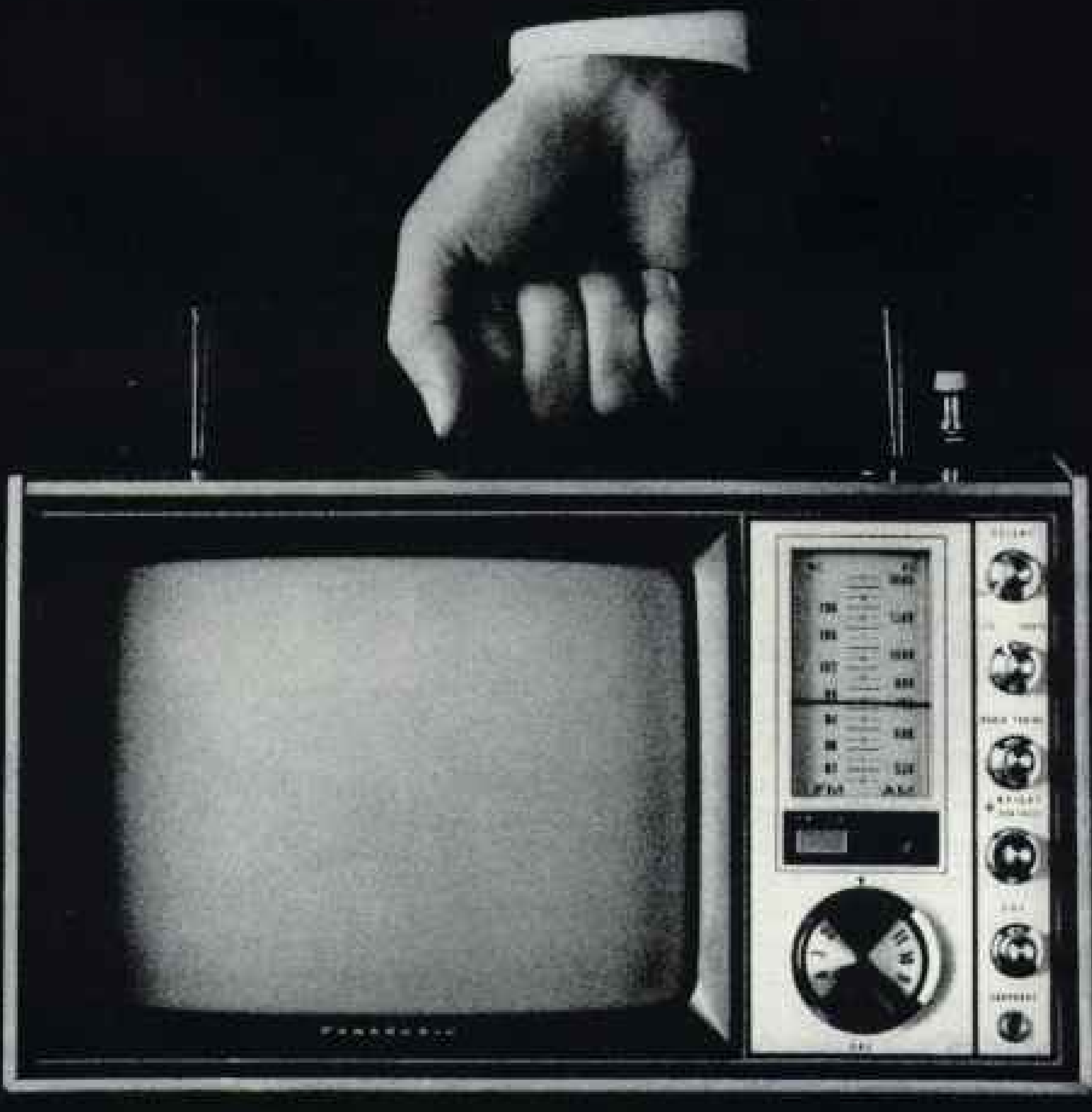
O.K. Hands up. You just uncovered 38 square inches of screen that'll cover you with every channel from 2 to 83. A dark-tinted screen that'll shade the picture from glare and reflection. And deliver a sharp, clear picture. With sound to match. Indoors or out.

Here are 3 portables you don't have to be a juggler or a weightlifter to carry. Because the whole works weighs only 12 pounds 2 ounces. Complete with 54 Solid-State devices, antennas for TV and both radios plus a special earphone for private listening.

Even when you operate it by optional battery you've still got a free hand. Because the battery (rechargeable) slides right onto the bottom of the set. So you just have one small package to carry.

Go ahead. Stop in at any dealer we allow to carry the Panasonic line. Ask for the Silverlake, Model TR-339R. Compare it with other portables. And see if our 3-in-1 Panasonic doesn't win.

Hands down.



PANASONIC.

200 Park Avenue New York 10017

For your nearest Panasonic dealer, call (800) 243-1890. In Conn., 325-4336. We pay for the call.

Cadillac Motor Car Division

Beautifully new, distinctively Cadillac. Cadillac craftsmen are accustomed to building the finest of motor cars, but even they have never built one like this before!

The 1969 Cadillac is an automotive masterpiece—completely new in styling, with major innovations in design, appointments and decor. Tasteful new fabrics adorn the spacious interiors, and Cadillac's conveniences are even more plentiful.

There is a new "control center" instrument panel and a unique Dual Comfort front seat, available on most models, permits separate driver and passenger seat adjustment.

A smoother, quieter 472 V-8 engine makes driving a Cadillac a sheer delight. Refinements include front disc brakes and an exclusive, new "closed" engine cooling system. An improved, Climate Control air conditioning system is available.

There are eleven different models, each a masterpiece from the master craftsmen of automobiles. See your Cadillac dealer and drive one soon.

GM
MARK OF EXCELLENCE

Enjoy the traditional hospitality of JAL on your way to the Orient . . . any day of the week from New York, Los Angeles, San Francisco or Honolulu.

The serenity of Japan begins the moment you board one of our Jet Couriers, when a kimono-clad hostess greets you with a classic bow. In the Japanese manner, she has been trained since childhood in the art of pleasing her guests. An *o-shibori* hot towel is offered to refresh you. Then, warmed *sake*, ritually served in its tiny cup.

Relax and enjoy all the special courtesies you'll find only on Japan Air Lines. It's the very nicest way to get to the Orient.

Whether you're traveling on business or for pleasure JAL offers an abundance of flights from both East and West Coasts, and you can enjoy a stopover in Hawaii at no extra fare. (Or, we can take you around the world in the same serene fashion.) Ask your travel agent about us. Why be a passenger with some other airline when you can be our guest?

JAPAN AIR LINES

the worldwide airline of Japan

Little devils make wonderful pictures.

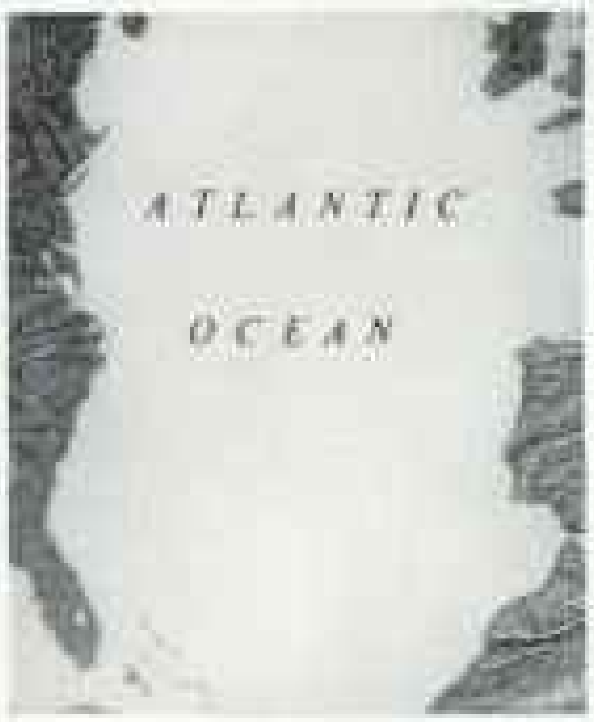
Little angels, too.

Those Halloween pictures that say "Boo!" are a joy to have. But pictures that whisper "Shhh" have a special charm of their own. And you can take them any day in the year. Just be sure, though, that it's Kodak film you're using. Because that's the film everything comes out best on. Any day.

Remember the Day...in Pictures

A clever little maneuver from TWA to save you a nice pile of dollars when you cross the River this fall.

The Old Way $440††



This is about what it would cost you for two weeks in, let's say, Paris and London if you go the old way—booking plane, hotels, everything individually. What you'd be paying for is your round-trip air fare, your hotel, your meals, your transfers and your sightseeing. The old way gives you the independence to see Europe the way you want to. The old way lets you pay for that independence, too.

††Includes 14/21 day round-trip economy excursion air fare from New York.

The TWA No-Tour Tour Way $352†

This is what you pay for the same two weeks in Paris and London if you go our way—on a TWA no-tour tour. Our secret is so simple it isn't even a secret. You fly at group tour rates, but when you get there you're free to do what you want. On your own. You get a room with bath in the same hotel as if you'd gone the old way, with breakfast, the same transfers and even a little sightseeing. You're not tied down to anything. It's all there if you want it. Our way gives you the same freedom to discover Europe as if you'd gone the old way. Our way also saves you $88, if you travel after Nov. 1. Slightly less before then.

Besides the London/Paris tour, there are 16 other no-tour tours. All simple. All money saving. All chargeable with TWA's Worldwide Jet Credit Card.

$355† for two weeks of wandering through Lisbon and Madrid.

$439† for two weeks of discovering Madrid and Torremolinos.

$442† for three weeks of freedom in Rome, Paris and London.

$588† for three weeks of roaming around Athens, Rome, Paris and London.

If you want all the particulars on our way to see Europe this fall, call Mr. Information (your travel agent). Or call us. Better yet, why don't you send for our free Bonus Adventures booklet. It's got pictures. Just write to TWA, Dept. 258, P.O. Box 25, Grand Central Station, New York, N.Y. 10017.

†Includes 14/21 day G.I.T. economy air fare from New York. Tour prices are slightly higher before November 1.

up up and away* TWA

*Service mark owned exclusively by Trans World Airlines, Inc.

Introducing The Zenette II Hearing Aid

So new that even a month ago you couldn't have bought it.

Even Zenith has never made a tiny, in-the-ear hearing aid to compare with this one. Although it's the smallest hearing aid Zenith has ever made, size alone is not what makes it so remarkable.

Because the Zenette II provides more usable amplification, it offers the extra degree of hearing help that can be the answer for more people who have suffered from a small, but exasperating hearing loss.

And, because of its advanced electronics in a new, more comfortable shape, it's the most dependable, reliable instrument of its kind ever made by Zenith.

Even if you have found before that an in-the-ear aid didn't give you all the help you needed, you owe it to yourself to visit your Zenith hearing aid dealer, listed in the Yellow Pages, and try the all new Zenette II.

You may hear some things you've never heard before.

Zenith Radio Corp., Dept. 4X, 6501 W. Grand Ave., Chicago, Ill. 60635

Please send me your booklet, "An Informative Guide for the Hard of Hearing," plus other free Zenith hearing aid literature.

Name__________ Address__________

City__________ State__________ Zip__________

The quality goes in before the name goes on. ZENITH HEARING AIDS

How do you like your Europe?

With a sea breeze? There's a fresh one off the Costa Brava every morning.

With snow-covered peaks? You'll be surrounded when you ski the Alps.

Want it accompanied by Mozart? Verdi? Go to the opera in six different metropolitan cities.

Or, see it across the footlights of a first-run London play.

This year Lufthansa can get you to most any kind of Europe you like. Pick it from the list below.

BROADWAY OF EUROPE—$320. Includes Jet air fare New York to Amsterdam, London, Paris and return. Tickets for exciting theatrical and musical events in each city, plus other unique offerings—70 services in all. 13 nights accommodation in rooms with bath, and delicious breakfasts throughout.

EUROPACAR HOLIDAY TOURS from $320. Includes round-trip Jet New York/Amsterdam. Avis Opel Kadett. Up to 3000 free kilometers. 20 nights accommodation in quaint Brilon, Germany.

EUROPACAR IBERIAN TOURS from $338. Jet round-trip New York/Barcelona. 20 nights accommodation in lovely Barcelona. Avis Rent-A-Car with up to 2000 free kilometers.

EUROPACAR SKI TOURS from $338. Prices include round-trip Jet New York/Zurich or Munich, Avis winterized car, up to 3000 kilometers free, accommodation for 20 nights in Bad Ragaz, Switzerland, or Zell am See or Landeck in Tyrol, Austria. Or pick the 2 week special—as little as $343 includes 7 nights in Zell am See or Landeck in Tyrol, and 6 nights in either Berchtesgaden in Bavaria, Kitzbuehel or Innsbruck in Tyrol, or Bad Ragaz in Switzerland, breakfasts and all transportation.

SKI THE ALPS from $338. Includes round-trip Jet New York/Zurich or Munich. A great choice of Alpine resorts most preferred by Americans, 14 nights with continental breakfasts and all ground transportation.

OPERA EUROPE from $599. Includes air fares New York to Munich, Milan, Vienna, Prague, Berlin and return. Accommodation for 13 nights. Continental breakfasts. Tickets to 9 opera performances. 7 departures scheduled throughout 1968/69.

For more information on your kind of Europe, see your travel agent, send the coupon, or call us. Lufthansa.

Prices based on 14-21 day, 15 passenger GIT Economy Fare from New York. Land arrangements based on each of 2 people traveling together.

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Gentlemen:

Please send me information on the following tour(s).

- ☐ 13-night BROADWAY OF EUROPE Tour—$320.
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- ☐ 20-night EUROPACAR Iberian Tours—$338.
- ☐ 20-night EUROPACAR Ski Tours—$338.
- ☐ 14-night SKI THE ALPS Tours—$338.
- ☐ 13-night OPERA EUROPE Tour—$599.

Name__________

Address__________

City__________

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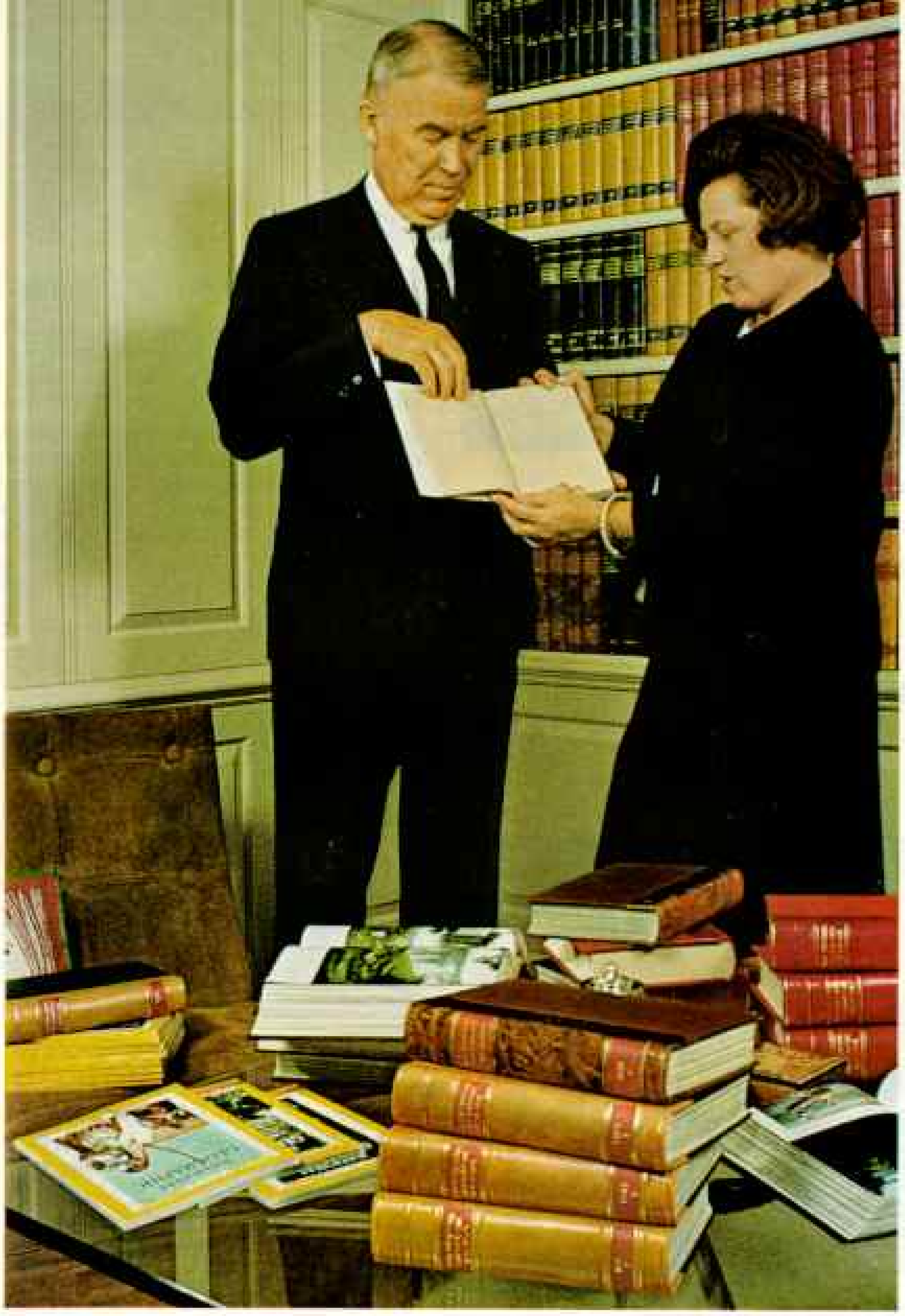
My Travel Agent is__________

Lufthansa

Lufthansa—the airline that keeps your air fare dollars here while you enjoy a fabulous vacation in Europe.

737
BOEING 737



"I AM NOT A SCIENTIFIC MAN..."

Mr. and Mrs. Henry Gardiner of Washington, D.C., inspect these first words of the first issue (1888) of the National Geographic Magazine in their custom-bound collection. It might take some time, industry, and money to assemble so beautiful and complete a collection yourself. Nevertheless, should you be less ambitious, you or your friends can still start receiving the benefits of National Geographic membership. On the page which the Gardiners hold, Mr. Hubbard, the Society's first President continued prophetically, ". . . our Society will not be confined to professional geographers, but will include that large number who, like myself, desire to promote special researches by others, and to diffuse the knowledge so gained, among men, so that we may all know more of the world in which we live."

To carry on the tradition of our first President's words, see the membership form on the third page of a magazine compiled eighty years later—this one.

This is our groovy, colossal, spectacular, extraordinary, fantastic, amazing $300 London Super Show Tour.

If we weren't British, we might boast.

ROUND-TRIP JET FARE
is included. On our VC10, the world's most advanced commercial jet or Rolls-Royce 707. Both give you the roomiest, most comfortable Economy Class seating in the air.

14 BRITISH DAYS
to explore London and its countryside... Stratford, Stonehenge, Oxford et al.

13 ENGLISH BREAKFASTS,
right out of Dickens,...kippers, sausages, porridge, marmalade...the works.

TICKETS TO 8 LONDON SHOWS,
orchestra or dress circle seats guaranteed. And one night, a visit backstage.

HOTEL FOR 13 NIGHTS
is your pleasant pied-à-terre in London.

GUEST MEMBERSHIP IN A CASINO,
one of London's elegant gaming clubs. A chic divertissement for late evenings.

5 DINNERS FOR $15,
on a unique plan that lets you dine well, and very inexpensively, at some of our leading London restaurants.

A CAR FOR 3 DAYS,
our way of inviting you into our countryside to catch your breath. And to discover what tranquility really means. (You pay a modest mileage charge.)

A POLAROID CAMERA
is provided to help you remember your holiday. Provided you buy a small supply of film in London.

10% PERSONAL SHOPPING DISCOUNT,
coupled with the currency devaluation makes London's famed shops even more attractive bargains.

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I'm interested in getting a lot for my $300.*
Please send me your London Super Show Tour brochure.

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Address ____________________

City __________ State __________ Zip __________

My Travel Agent is ____________________

BOAC
TAKES GOOD CARE OF YOU

*Based on 14/21-day Economy group inclusive tour fare from New York. Applies to groups of 15 or more. (You do not have to form the group.) Double occupancy in hotels. Bookings must be made at least thirty days prior to departure.

The Continental Mark III.

The most authoritatively styled, decisively individual motorcar of this generation.
From the Lincoln-Mercury Division of Ford Motor Company.