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THE NATIONAL GEOGRAPHIC MAGAZINE

Exploring Davy Jones's Locker with *Calypso*

Captain Cousteau and His Mates Test the New Edgerton Deep-sea Camera and Photograph the Silent World Under the Indian Ocean and Red Sea

By CAPT. JACQUES-YVES COUSTEAU

Leader, National Geographic Society-*Calypso* Expeditions

With Illustrations by Luis Marden, National Geographic Staff

ON a bright Mediterranean day last summer, some Greek fishermen got the surprise of their lives.

With our ocean research ship *Calypso* we were testing the fabulous new camera designed by Dr. Harold E. Edgerton to take the world's first photographs at the bottom of the greatest deeps of the sea.

Our good friend Dr. Edgerton had boarded *Calypso* at Marseille with his redesigned camera, a 3-mile length of nylon line, and a grin that said, "This time I think I've really got it!"

Withstands 8½ Tons per Square Inch

For more than three years the National Geographic Society has been giving technical and financial support to the noted Massachusetts Institute of Technology engineer and inventor in his efforts to carry photography to the depths of Davy Jones's locker.

Now Dr. Edgerton had reported to The Society's President that the camera had withstood tests of 17,000 pounds to the square inch—more than the pressure of water at the bottom of the greatest known ocean depth, the Challenger Depth off Guam, where soundings show 35,640 feet, or nearly seven miles.

Skeptically we examined the nylon line, a braided rope less than a quarter of an inch thick. Did our friend really think it was strong enough to lower and raise his 100-pound camera in such tremendous depths?

The problem of an adequate cable has always been almost as much of a poser as the development of a pressure-proof abyssal camera. Most researchers have worked with wire cables, but lowering and raising miles of wire require heavy and powerful winches. More important, wire is heavy and tends to break of its own weight.

We knew that Dr. Edgerton had been working on a revolutionary weightless cable —weightless in water because it would have the same specific gravity as the sea—but we regarded with doubt this puny-looking cord.

"I think it will work," Harold declared. "It has a breaking point of 1,500 pounds and—this is important—an elasticity of about 20 percent. Let's try it out in the deepest spot we can find in the Mediterranean."

Anchored in Nearly 3 Miles of Water

Off Cape Matapás, Greece, we give it a try. We tie a chunk of pig iron on the end, and Capt. François Saüt lowers it from a *Calypso* launch with 14,000 feet of water under the keel. When the pig hits bottom and the launch dances gently at anchor in this great depth, all hands have a real thrill of surprise —and Dr. Edgerton's grin grows wider.

Furthermore, the launch remains firmly an-

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Giant Turtle and Electric Hare Run an Underwater Race at 3 Knots

The battery-powered tug, designed by Cousteau, took *Calypso*'s men on undersea explorations (page 156). On occasion it carried five in a train. This day Falco was holding Dumas's ankles when they surprised a green turtle feeding. Falco changed "horses" in midstream. Thus encumbered, his mount lost the race.

chored for 48 hours. All right, we think; so far so good. We'll use it as a fixed radar target to give us an accurate reference of position while we make echo soundings and a few underwater pictures around here.

Calypso is working about two miles away when a Greek fishing trawler spots the empty launch and makes for it, obviously thinking that it is a derelict. We cannot go to the launch because we have an Edgerton camera down.

Through the glasses we see the crew of the trawler attempt to heave the launch aboard —and discover the astonishing fact that the boat is at anchor in this fantastic depth. We start firing colored Very lights and the trawler hastily departs without the prize. I wish I could have eavesdropped in the fishermen's tavern that night when they tried to make their pals believe they found an empty boat anchored in 14,000 feet.

To our delighted amazement, the nylon withstands every test. We try using it for towing specimen dredges across the sea floor 10,000 feet down—a much sterner test than the launch experiment. Suddenly the dredge

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strikes an obstruction. Maurice Léandri feels the tension of the line at once and yells to Saôut. He stops *Calypso*. Then everybody simply stares at each other in wonderment. The elasticity of the nylon is actually pulling the 360-ton ship backward! We ride securely at anchor in 10,000 feet on a snagged dredge and two miles of thread.

An unelastic wire cable would doubtless have snapped under the strain of snagging when under way. Our nylon had merely stretched. All we had to do was to back off the obstruction and haul up the dredge. Nylon dredging has now become a regular routine of our expeditions. We think these experiments off Matapás have profound interest for seamen, particularly oceanographers.

On this cruise we lowered Dr. Edgerton's abyssal camera to 14,000 feet and made the deepest photographs yet obtained in the Mediterranean. In the black abyss between 2½ and 3 miles below us, the camera revealed few living things, mainly shrimps and one small fish. At 13,320 feet it took a nice clear picture. What of? An old tin can! Man's debris certainly gets around.

To Dr. Edgerton, to me, and to the National Geographic Society's officers and Research Committee, the success of the abyssal camera and the nylon line conjures up a picture: A ship—we trust it will be *Calypso*—rides anchored by much larger nylon cables over the deepest place in the sea while another of those miraculous weightless lines lets down the camera to reveal to man the uttermost depths.

A Turning Point in Ocean Research

We of *Calypso* have lived the pioneering days of free diving; now the whole world dives. We have contributed to the development of diving photography; now thousands take cameras underwater. In six years in the French Navy Undersea Research Group and four years of *Calypso* Oceanographic Expeditions we have developed Aqualung diving as a marine research tool; now free-diving teams are valuable branches of the leading oceanographic centers.*

Geologists are swimming down to the conquest of the continental shelf, the submerged rim of the land masses. They press on toward the dropoff line, roughly 600 feet down, where the shelf falls off to the deep. But compressed-air diving is limited to about 300 feet.

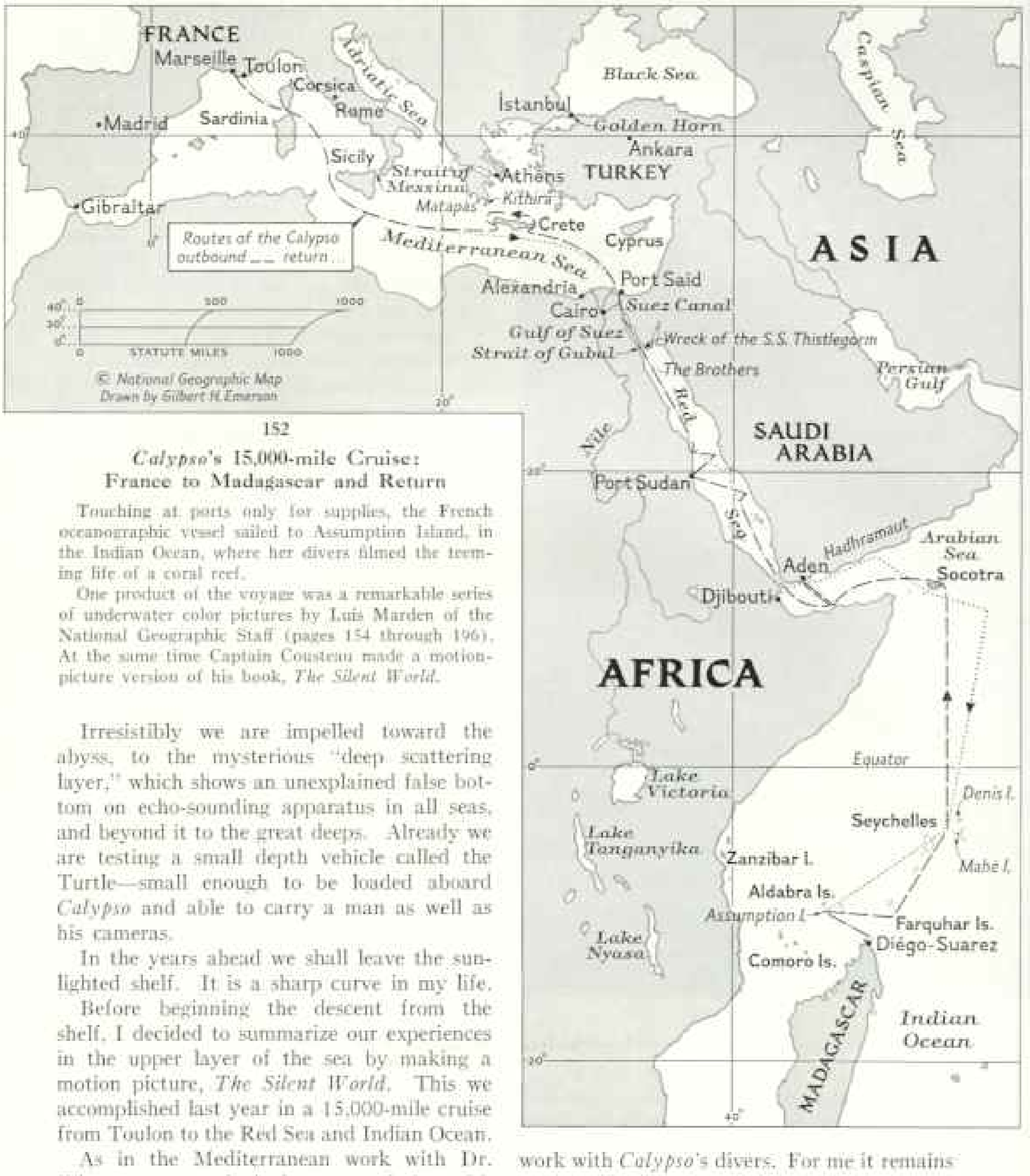
For several years our curiosity has been driving us beyond free diving, to the dark beneath the dropoff line. The *Calypso* team has been scouting ahead with powerful echo sounding and dredging, and with the Edgerton electronic flash cameras, which have made 25,000 photographs in the depths.†

We have worked with the French Navy's dirigible of the deep, the Bathyscaphe *FNRS-3*, which has carried men to 13,287 feet, below the average depth of the oceans.‡

* See in the National Geographic Magazine, "Fish Men Discover a 2,200-year-old Greek Ship," January, 1954; and "Fish Men Explore a New World Undersea," October, 1952, both by Capt. Jacques-Yves Cousteau.

† See "Photographing the Sea's Dark Underworld," by Harold E. Edgerton, in the National Geographic Magazine, April, 1953.

‡ See in the National Geographic Magazine, "To the Depths of the Sea by Bathyscaphe," by Capt. Jacques-Yves Cousteau; and "Two and a Half Miles Down," by Lt. Comdr. Georges S. Houot, both July, 1954.



Calypso's 15,000-mile Cruise: France to Madagascar and Return

Touching at ports only for supplies, the French oceanographic vessel sailed to Assumption Island, in the Indian Ocean, where her divers filmed the teeming life of a coral reef.

One product of the voyage was a remarkable series of underwater color pictures by Luis Marden of the National Geographic Staff (pages 154 through 196). At the same time Captain Cousteau made a motion-picture version of his book, *The Silent World*.

Irresistibly we are impelled toward the abyss, to the mysterious "deep scattering layer," which shows an unexplained false bottom on echo-sounding apparatus in all seas, and beyond it to the great deeps. Already we are testing a small depth vehicle called the Turtle—small enough to be loaded aboard *Calypso* and able to carry a man as well as his cameras.

In the years ahead we shall leave the sun-lighted shelf. It is a sharp curve in my life.

Before beginning the descent from the shelf, I decided to summarize our experiences in the upper layer of the sea by making a motion picture, *The Silent World*. This we accomplished last year in a 15,000-mile cruise from Toulon to the Red Sea and Indian Ocean.

As in the Mediterranean work with Dr. Edgerton, we again had our association with the National Geographic Society to thank for the privilege of working with a man who shares our consuming interest in the world beneath the surface of the sea—Luis Marden, veteran photographer of the National Geographic Magazine and a world traveler as a member of its Foreign Editorial Staff.

In his article, "Camera under the Sea," which begins on page 162 of this issue, and with his remarkable color shots, Mr. Marden gives a graphic picture of his underwater work with *Calypso*'s divers. For me it remains only to sketch a few highlights of the voyage by way of introducing his fascinating account.

On a winter night in the Toulon Arsenal, among the dark warships, the small white *Calypso* is loading under floodlights for her long cruise. We sail at midnight, and the peace of the open sea soon replaces the hectic hustle of preparation.

We carry 18 large packing cases of Marden's impedimenta, including 600 flash bulbs. Our divers wonder how a man can fire that many bulbs in only four months. They soon

discover how. Hardly have we left the Suez Canal before Marden begins diving with stout Emile Robert as bearer.

Robert goes down carrying Marden's second camera and a large string bag of flash bulbs, which floats above him like the envelope of an 18th-century balloon. It is not long before Marden is crying for more bulbs and we radio for a fresh supply.

The bulbs, when under pressure, develop leaks in the metal bases. Water seeps inside, short-circuits the lead-in wires, and makes firing uncertain.

Marden is chagrined, but the *Calypso* team comes to his rescue. At night we see a strange scene in the mess. Cook Fernand Hanen heats water; Marcel Colomb, the second cook, melts wax in the water; my wife, Simone, cleans the bulb bases; engineer René Robino drills two tiny holes in the base of each bulb; and at the end of the production line stands the ship's young surgeon, Dr. Denis Martin-Laval, in his white tunic. With the delicacy of a brain surgeon he injects liquid wax into the holes to insulate the wires.

Luis's expenditure of bulbs taxes the production rate: it is a race between manufacturer and consumer. We treat 2,500 bulbs before the voyage is over.

In the refit before we left Marseille we built a new underwater observation chamber at *Calypso's* forefoot. Now two men lie in the chamber eight feet under water and watch through five ports. They have cameras and a phone to the bridge. We run along the Hadhramaut coast, looking for the fantastic army of high-jumping porpoises we saw there in 1954. Very few porpoises are seen.

Noises of Porpoises and Whales

We turn south for the Seychelles, in the Indian Ocean, running at full cruising speed in daylight and dawdling at night. There are animal watches round the clock on the high observation bridge and men in the underwater chamber, looking for big mammals. Then we strike porpoises, as many as a hundred leaping giants in a single movie frame. The watchers under the bow see them flickering a few feet ahead, whistling among each other like chirping birds or squeaking mice. The new chamber turns out to be a fine acoustic amplifier.

Heading into the Indian Ocean, we overtake a herd of about 15 killer whales, led by a 30-foot bull. It is the first time we have met true killer whales. As we draw up to the herd, the bull leaves the formation and swims to the ship. We follow him and he leads us away from the others. Suspecting that he is deliberately luring us away, we turn back to the herd. He runs up speed and easily beats us to them. Then he repeats the maneuver, tricking us away from his family.

One calm afternoon Simone yells down from the observation bridge, *"Cachalots!"* She sights the raked, foggy spouts of sperm whales, almost at the same place near the Equator

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This Slender Nylon Thread Anchored a 360-ton Ship in 2 Miles of Water

Calypso carried 3 miles of this braided line to lower the deep-sea camera of Dr. Harold E. Edgerton (right). Once the snagged line pulled *Calypso* backward (page 151), Captain Cousteau (center) smiles at the successful test off the Greek coast.

Harold E. Edgerton

Streamlined Pelagic Snappers Streak By the Undersea Camera and Head for the Open Sea

This photograph and those on succeeding pages were made with hand-held cameras in the Indian Ocean and Red Sea. The Aqualung fed air to National Geographic photographer Marden as he swam at depths down to 200 feet.

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Sudden Lightning from the Photoflash Reveals Living Colors of the Submarine World

These **Snappers** (*Caesio*) swim 30 feet below the surface. At greater depths, down to the limit of light, water absorbs the sun's red and yellow rays, and everything appears blue green. Artificial light restores natural colors.

where we came upon them the year before.*

As *Calypso* overtakes the pod, watchers in the underwater chamber see a cosmic spectacle, the great animals swimming just ahead of the bow with the slightest of lazy motions. They hear the tiny soprano chirps of leviathan and look out like Ned Land and Prof. Aronnax gazing from Jules Verne's *Nautilus*.

Submarine Paradise off Assumption

From Mahé in the Seychelles we sail in the brunt of the southeast trades for the Aldabra Islands. It is heavy going, and we are glad to stop at the tiny gourd-shaped island of Assumption, which affords perfect shelter.

The water is warm, there are few sharks, and the clarity of the sea is almost incredible. Right under our keel, sloping from 20 feet to 200 feet, is the most gorgeous coral bank any of us has ever seen, an amazing ensemble of coral varieties and myriad tropical fish. Here were taken most of Marden's color photographs and much of our movie footage.

We have two underwater scooters, bullet-shaped electric tugs which haul one or two divers without fatigue on long searches. Their safe speed limit is 3 knots, about 3½ miles an hour. This is not exactly supersonic, but hanging on to a 3-knot *Calypso* scooter gives one a dizzying sense of speed in an element 800 times as dense and heavy as air.

The sensation is like driving a jeep in fog with the windshield down at 70 miles an hour. The water resistance claws at your mask, and the reefscape comes at you like a view from a Mack Sennett runaway auto.

Once diver Albert Falco is on a scooter ride with Frédéric Dumas near an Indian Ocean reef. They overtake a big sea turtle. Falco lets go of Dumas's ankles and transfers to the back of the turtle, like a cowboy bulldogging a steer (page 150).

With the electric scooters, we make long, rapturous explorations of the reef at Assumption, two of us driving abreast and admiring the abundant world. The yellow nose of the scooter sweeps past the reef wall, and from every crevice fish eyes stare. Fish whip around and show their tails, and then inquisitiveness rules and they turn to look again. In the open water there is a ballet of fear and curiosity, as the veils of brilliant fish hesitate, dart off and drift back, unable to decide what to do about us.

From the surf comes a 400-pound female sea turtle. She settles on the sandy beach and excavates a circular hole 18 inches deep with all four flippers. The hole is widened and the turtle rests in it. Using her rear flippers as spoons, she scoops out a well about eight inches wide and two feet deep under her tail. She drops her eggs into the well until about 150 are laid. The process takes two hours.

As she strains, big gummy tears flow from her eyes and hang like pendants. It is tempting to think of it as birth pain, but probably the tears are the result of long exposure of her eyes to air, the reverse of what happens to the human eye in salt water. The turtle fills the well with sand and continues to paw the level sand with little caressing motions. Then she waddles heavily back to the water, exhausted, halting after each five steps.

Barracuda Eats Stowaways

At Assumption we discover a bunch of stowaways: the divers find dozens of remoras adhering to the bottom of *Calypso*. These parasites have transferred to us from the whales and sharks we have studied. We notice a large barracuda prowling around the ship and also find fewer remoras stuck to the ship each morning. It seems we have brought the barracuda a nice help-yourself fish market.

One day I return from a dive with Falco and sight the barracuda. We see a silvery flash, a lightning jump, and the barracuda has cut a remora in half and is eating the pieces. All my time under the sea I have looked for the drama of one fish catching another and have never seen it until this day. The barracuda eats all the suckers one by one, until there are no more stowaways.

* See "*Calypso* Explores for Underwater Oil," by Captain Cousteau, National Geographic Magazine, August, 1955.

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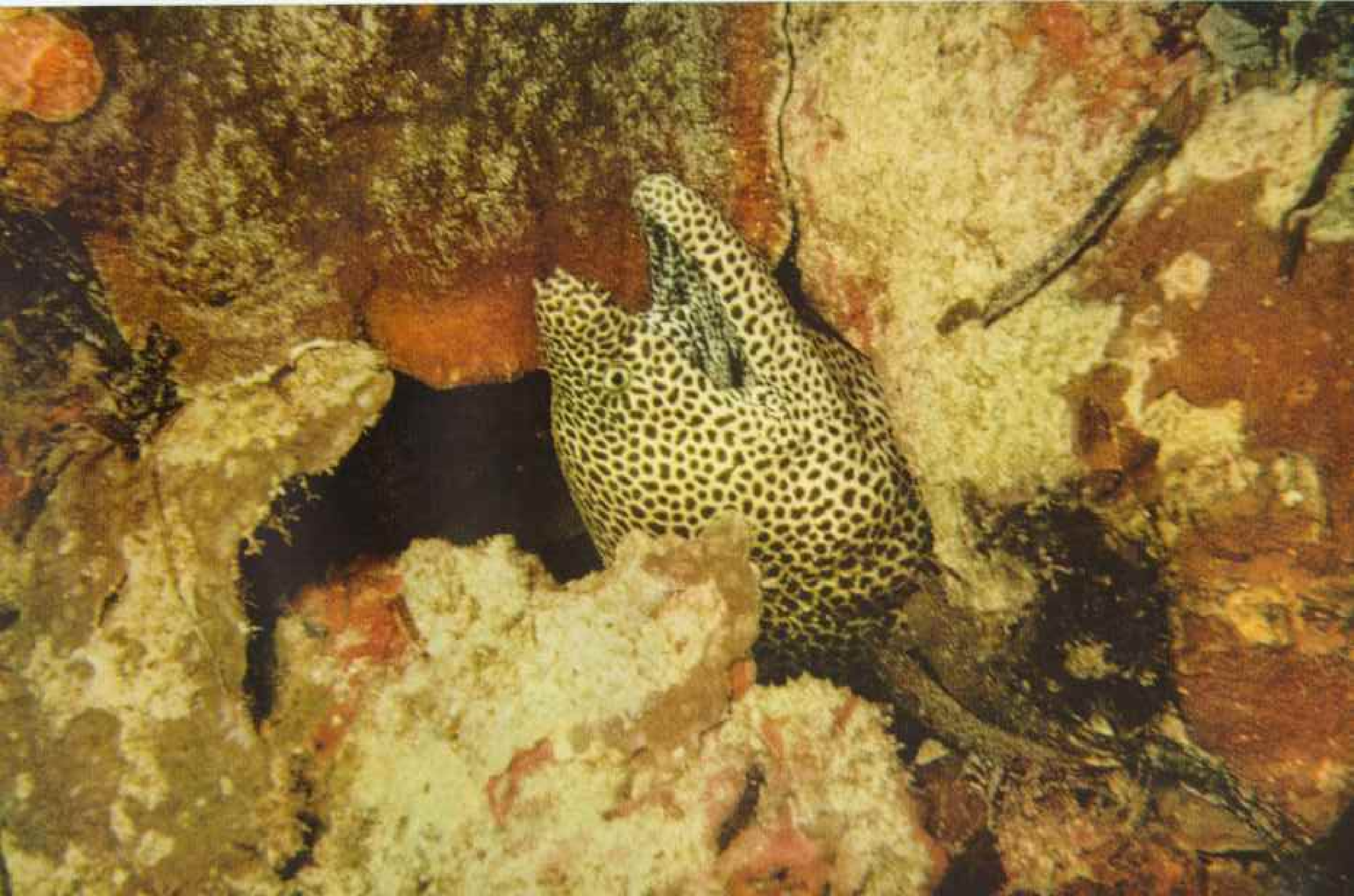
"And Welcomes Little Fishes In, with Gently Smiling Jaws" →

Like the crocodile in *Alice's Adventures in Wonderland*, moray eels eat nearly everything they can seize; they feed mostly at night.

Many divers fear the moray more than the shark. Respecting its needle-sharp teeth, they avoid putting hands in crevices. The wound is painful and often becomes infected from mucus on the teeth.

Ancient Roman epicures, who prized morays, sometimes kept them in tanks.

This four-foot **Moray** (*Gymnothorax tessellata*) thrusts its head out of a coral cave 144 feet down on the bed of the Indian Ocean. To breathe, it opens its mouth rhythmically, gasping as if in agony. Leopard spots cover even the inside of its mouth.



We discover a wonderful mystery on the deep sandy floor: many small cones of sand which occasionally erupt like tiny volcanoes. Plainly there is an animal inside which squirts water and sand. Marden resolves to photograph the eruptions. He dives with cinematographer Pierre Goupil, and they lie in wait beside a volcano. All around them the cones erupt, but their animal will not perform.

The pair dive for several days without luck. I dive to see what is keeping them. Marden shrugs with disgust. I give him a gesture of confidence and point my finger like a pistol at a peak. Instantly it erupts. I go to another mound and point. It, too, squirts. So does a third mound. Marden is so surprised he gets no pictures.

On deck he follows me around, begging me to tell him the trick. I tease him for several days. "It's a secret." The secret is that I just had the fantastic luck to point at three mounds that were ready to squirt. Marden has to lie on his belly for hours before he photographs an eruption (page 186).

So eager are we to round out the filming that we stay at Assumption after our fresh water and food stores are exhausted. We cannot wash and we suffer salt inflammation of the skin. We eat sea turtle at every meal. We sail for Aden and roll heavily in beam winds.

Dumas invents a device to keep from getting thrown out of bed. Under his thin mattress he has inflatable air tubes on either side. If *Calypso* begins to roll at night, he simply reaches for the inflation tube, blows up the side supports, and makes a nice valley to nestle in.

At The Brothers, islands in the Red Sea, the water is teeming with the nervous type of sharks. After sunset I find Marden in Aqualung and fins, preparing to go down and photograph them at night. I restrain him. Enormous sharks circle the ship, snapping at anything we throw overboard. Sometimes Marden's zeal for fish gives me the choice of losing his friendship or saving his life.

After we returned to France, *Calypso* made summer cruises with scientists to the eastern Mediterranean and into the Turkish area of the Black Sea. Our hydrologists completed over a hundred sea stations.

Off Kithera, Greece, in latitude 35° 53′ N., longitude 22° 19′ E., we discovered a new deep of 15,431 feet.

While we were at sea, our Office of Undersea Research in Marseille had completed

several small, compact underwater television cameras in collaboration with the British Thomson-Houston Company, Ltd., of Rugby, England. When we returned, *Calypso* staged demonstrations for 200 guests who watched six television screens on the ship.

We picked the worst conditions of visibility, the foul, oily waters of Marseille's commercial port. Yet the guests clearly saw harbor divers constructing jetties and inserting new bituminous mortar in underwater masonry. With microphones we spoke to them on the harbor floor.

As a result, the Marseille harbor authority has taken up television as a tool of everyday underwater engineering.

One reason why the *Calypso* team remains fascinated with a life entailing nine months at sea every year, with only the briefest calls in port (and then sometimes merely to work aboard in calm water), is this endless variety of experiments. There is change all the time, something new every day, virgin landscapes of the undersea to be visited. It gives an impression of disorder and disconnection, but the experiments are coming to a point now. This year we leave the shelf and try to enter the deep.

Free Divers Meet a Man Tethered to His Ship

←*Calypso*, modern diving vessel, speaks a Greek sponge-diving ship off the island of Crete. The Greeks, a nation of divers, have plucked sponges from the Mediterranean's floor since pagan times.

↓Two Frenchmen, whose Aqualungs leave them free to roam as they will, extend greetings to a sponge diver, who is bound to the mother ship by twin umbilical cords: lifeline and air hose.

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♠ Suspicious Predator Lurks Under Coral

The **Grouper** (*Plectropomus maculatus*) waits with sharp teeth ready. White sand kicked up by divers' swimming fins dusts its back. A little blue **Wrasse** (*Labroides dimidiatus*) at top center waits to pick parasites off the big fellow. Night-vision eyes of the **Squirrelfish** (*Myripristis*) register distrust of the photographer. Depth: 25 feet in the Indian Ocean.

Bizarre Dress ➔ Spells Danger

Balistoides niger, a rare **Triggerfish,** rests on a shelf 90 feet down in the Indian Ocean. It belongs to a family whose flesh may be very toxic when eaten. Victims of a severe attack die of respiratory paralysis. So far, no one has found an antidote.

← Flying in a Dream: a Diver's Sensation

Page 160: The self-contained diver is nearly as weightless as a man in a space rocket. Up and down are the same to him. In murky water he may have to watch his bubbles to know which way is up. Edmond Séchan here glides down the face of a Red Sea reef. Alcyonarians, a plantlike animal, clothe the rock.

Camera Under the Sea

By Luis Marden

Foreign Editorial Staff, National Geographic Magazine

With Illustrations from Photographs by the Author

I LIKE fish. It is well that I do, because during four months in the Red Sea and Indian Ocean I literally rubbed fins with them as I swam in the depths of their blue-lit improbable world.

Eight years ago in Paris I had heard of Capt. Jacques-Yves Cousteau and his little group of submarine pioneers, but it was not until much later that I met the fearless captain in the United States. In my copy of his book, *The Silent World*, he wrote: "With the conviction that we shall have the occasion to work together some day."

Last spring this prophecy came true: I sailed from Toulon with the captain and his crew aboard *Calypso*, the diving-research vessel that has become legend to undersea explorers all over the world. I was the expedition's underwater still photographer, specializing in color. This carried on a long-time interest of the National Geographic Society, for, as far back as 1927, the National Geographic Magazine had published the world's first undersea color photographs.

We found an ideal place for color photography at a small dot in the monsoon-whipped immensity of the Indian Ocean—Assumption Island, 240 miles from the northern tip of Madagascar (map, page 152). Only a handful of humans were living on the low islet, and above water the white sand and scrub did not look inviting. But *Calypso* moved slowly in toward shore and anchored over the mottled yellow-brown shadows of a vast coral reef.

Seamen rigged the diving ladder, and Frédéric Dumas and Albert Falco descended to look around. In a few minutes they popped to the surface like seals and, removing their mouthpieces, cried out "*Extraordinaire!*"

It was indeed extraordinary. Compared with *Calypso*'s veterans, I am a novice, but all my diving has been on coral reefs. Yet never have I seen so magnificent a sight.

When I dropped backward off the diving ladder, I sank for a few feet, then doubled up and rolled over, to drive straight downward with strokes of my rubber-finned feet.

Thirty feet below me a low jungle of corals

Like a Balloon Vendor at a Fair, Pierre Goupil Swims with Flash Bulbs

Lead weights on net bag counteract lamps' buoyancy. Used bulbs go back into bag to preserve equilibrium.

glowed with soft yellows, pinks, blues, and purples. Stunted trees, umbrellas, convoluted domes, and crooked fingers unrolled and gradually faded into the blue of distance.

The luminous transparency of the warm water bathed me in light. Fish, corals, even my own body, were outlined with a soft lunar effulgence; I seemed to hang suspended in the heart of an enormous liquid sapphire.

The reef pullulated with fish. Small fish of green, yellow, red, blue, and black flashed by or hung motionless in solid, tree-shaped schools. Bigger fish swam with the deliberation of aldermen among the crowds of nervous small fellows.

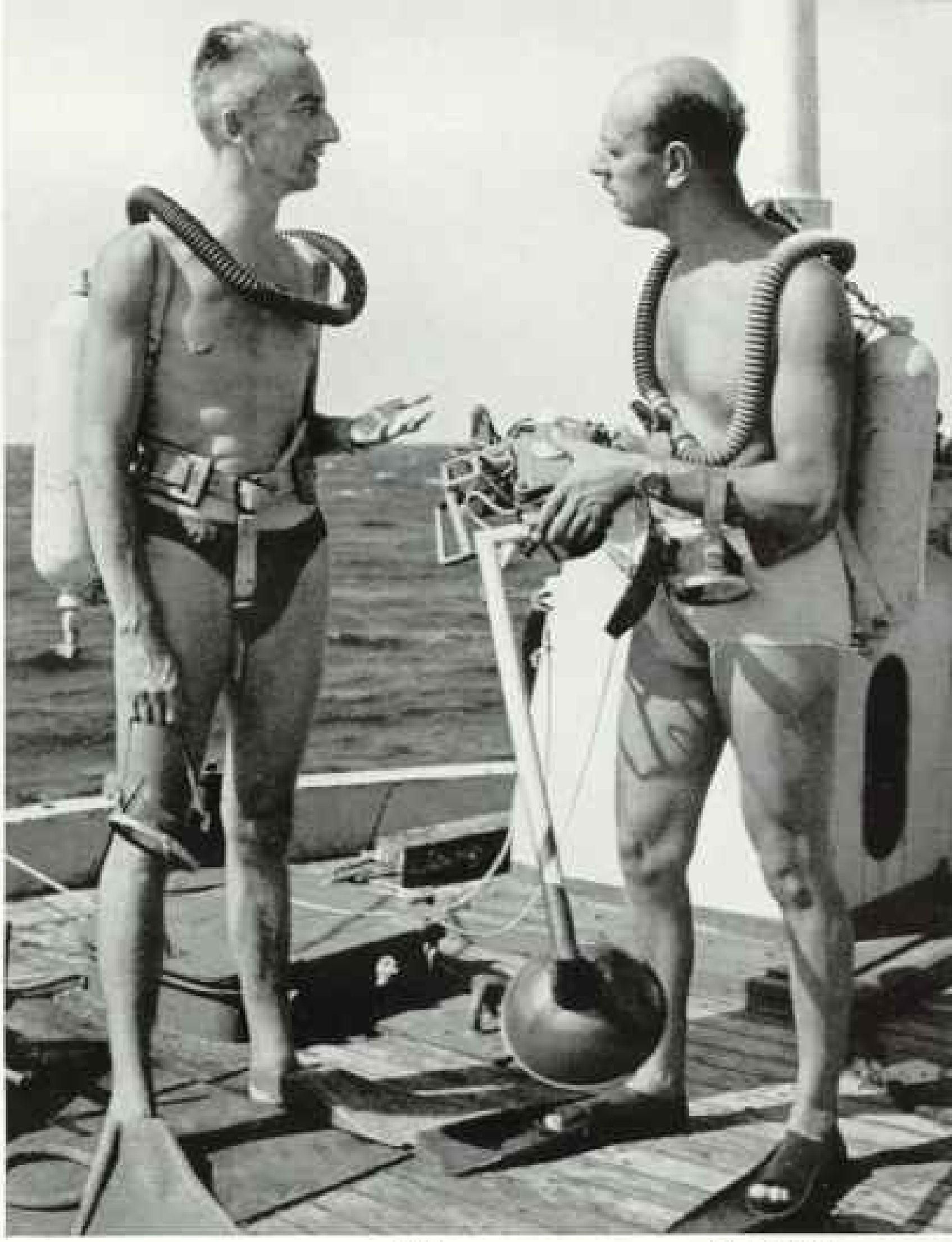
As I flipped downward, solid walls of fish parted and streamed round me like air smoothly diverted round an airfoil, then closed again when I had passed. Near the bottom little fish came up and peered inquisitively into my mask.

I straightened and came to rest with a gentle bump on a big coral boulder. Standing on my rubber-shod feet among the living polyps that covered the dome with a coat of gently waving fingers, I seemed to rest on a curving carpet of deep translucent pile, yet an inch below the polyps' deceptive softness, razor-sharp coral lay ready to draw blood at a touch.

On a level with my eyes a colony of sea anemones waved their lethal fingers, disclosing as they rippled gracefully in the strong tidal current occasional flashes of deep magenta from their fleshy bodies.

Two small orange fish glowed like hot coals among the beckoning fingers. They lived there, secure in the knowledge that, in some strange fashion, the anemone recognized them as friends and carefully curled its stinging tentacles away. In return the little fish share their captures with the sedentary animal (page 173).

I made a photograph of the anemones, and



163 Pierre Gaspi

Captain Cousteau Briefs Author Marden Before a Plunge

Both men wear 3-cylinder Aqualungs, which permit them to remain under water about one hour. Marden holds the twin-flash underwater Leica.

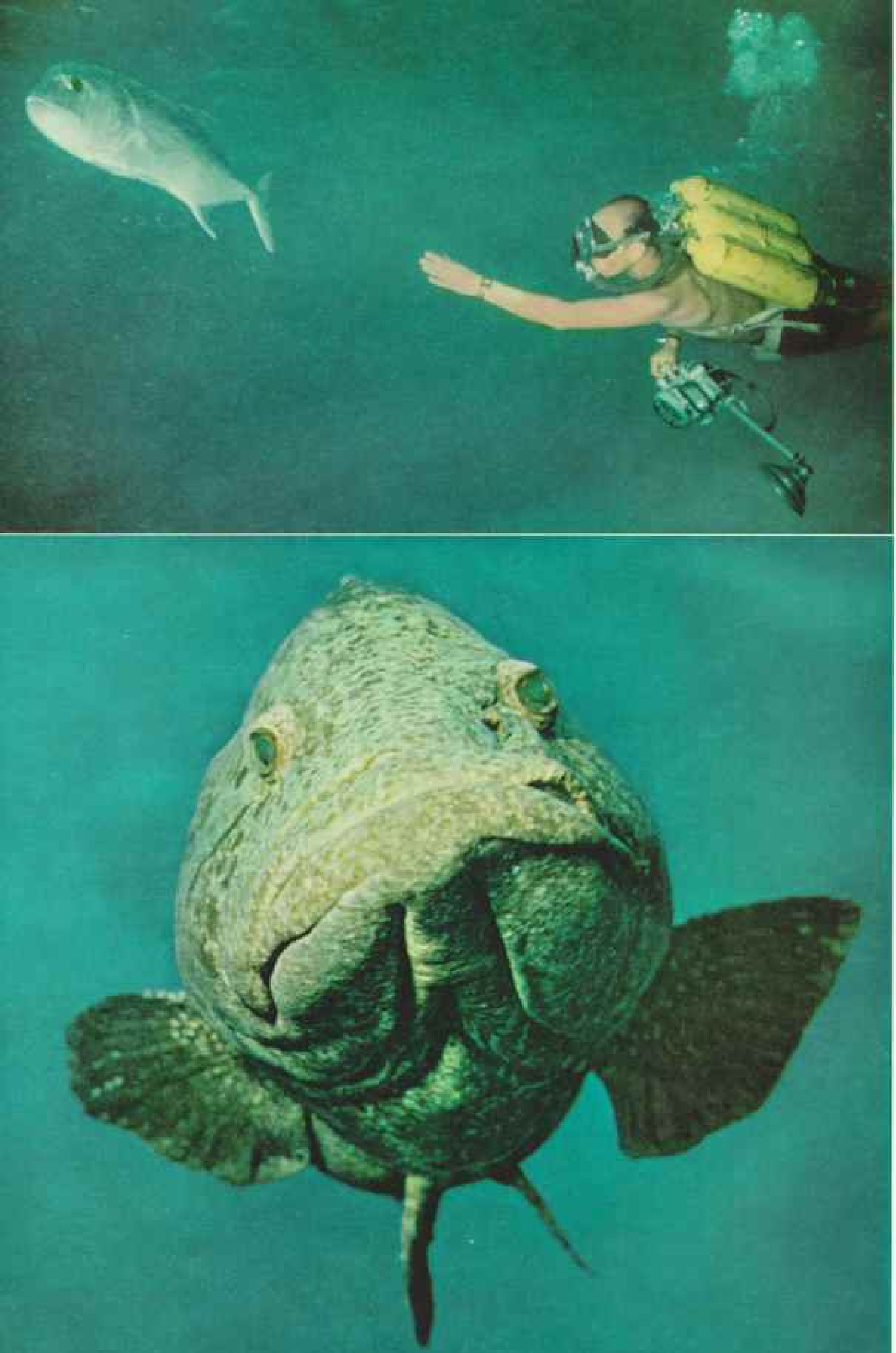
bent over my camera to change bulbs. Diving masks permit the diver to see straight ahead but not far on either side, and when I looked up I nearly jumped out of my Aqualung.

Friendly Monster Startles Cameraman

Not one foot from my eyes, a nightmare face stared at me. From a blotched and mottled head, bigger than my own, with thick, turned-down disapproving lips, two popping eyes gazed insolently at me (next page).

My leap backward off the boulder was cushioned by the thick medium of water, and I floated down to the sand floor slowly, while the 60-pound grouper beat its thick tail and followed me.

I have already said that I like fish. I now became convinced that fish like me. Everywhere that Marden went, that fish was sure to go. The grouper swam slowly after me,



← Fish Man Vainly Chases a Fish

Page 164: This big **Jack** (*Caranx*) startled photographer Luis Marden by shooting out of the Indian Ocean's blue depths and snapping at the flash reflector. The metal's gleam probably attracted the fish.

Mr. Marden wears a diver's waterproof watch and depth gauges on his wrists; he carries a submarine camera.

Kodachrome by Pierre Gouzé

studying everything with its swiveling popeyes, and even nuzzling the gleaming flashbulb reflector. I am convinced that the reflector attracted fish as does a fishing spoon, by sending moons of light glancing through the water.

Cousteau calls the big groupers the intellectuals of the sea. Certainly they have more curiosity than any other fish I have known. You can almost hear the ponderous workings of their minds as they swim toward you, stop, then turn one broad flank to look you over with an eye that swivels drolly in its socket.

Intellectuals they may be, but they also have something of the air of the country bumpkin who stands in uncomprehending fascination before some complicated mechanism.

From that day onward the big grouper always accompanied us on our undersea tours. Though it did not have very big teeth and seemed friendly, it was rather disconcerting to see the fish appear unexpectedly from behind. I had the uncomfortable feeling that it was always just out of sight, in the mask's blind spot. I could now understand the bit of stable lore about never approaching a horse suddenly from behind. I did not like it, either.

Someone named the grouper Ulysses (page 166). When a diver startled him by making a sudden movement, the big fish would take off in a spurt, making audible thumps—*boomp, boomp, boomp*—as he beat the water with his tail. Gradually he grew tamer, until at last I could stroke his side gently. Whenever I did this, Ulysses would roll over with pleasure, like a dog.

← Inquisitive Ulysses Loves the Camera

Reef fishes of the Indian Ocean's Assumption Island dwell in a submarine Garden of Eden. Never having seen a man, they had almost no fear of the sea's most dangerous prowler, the diver. This 60-pound **Grouper** (*Epinephelus*) followed Marden everywhere (pages 166, 168).

Ulysses grew to be a nuisance. It was hard even to make a picture of him. I would set the lens for three feet, then press my mask against the viewing port to focus. The big blunt head would swim into the field and then, before I could trip the shutter, bump softly against the porthole of the camera.

My diving companions would knock themselves out laughing at my attempts to back away to keep the grouper in focus. They said he was *cabot*—a lens louse, who mugged the camera and had to be kept out of range.

On Assumption's reefs the fish lived in an underwater age of innocence. Never having seen a man, they had almost no fear of us.

At first they stayed just out of reach. After a few days, when they saw that we did them no harm, most of the fish around our anchorage accepted us.

Captured Trunkfish Squeaks

Only once was I actually able to catch a fish with my bare hand. When a slow-moving trunkfish, whose Brazil-nut-shaped body is encased in bony armor like a turtle's, took refuge in a coral crevice, I picked it up gently.

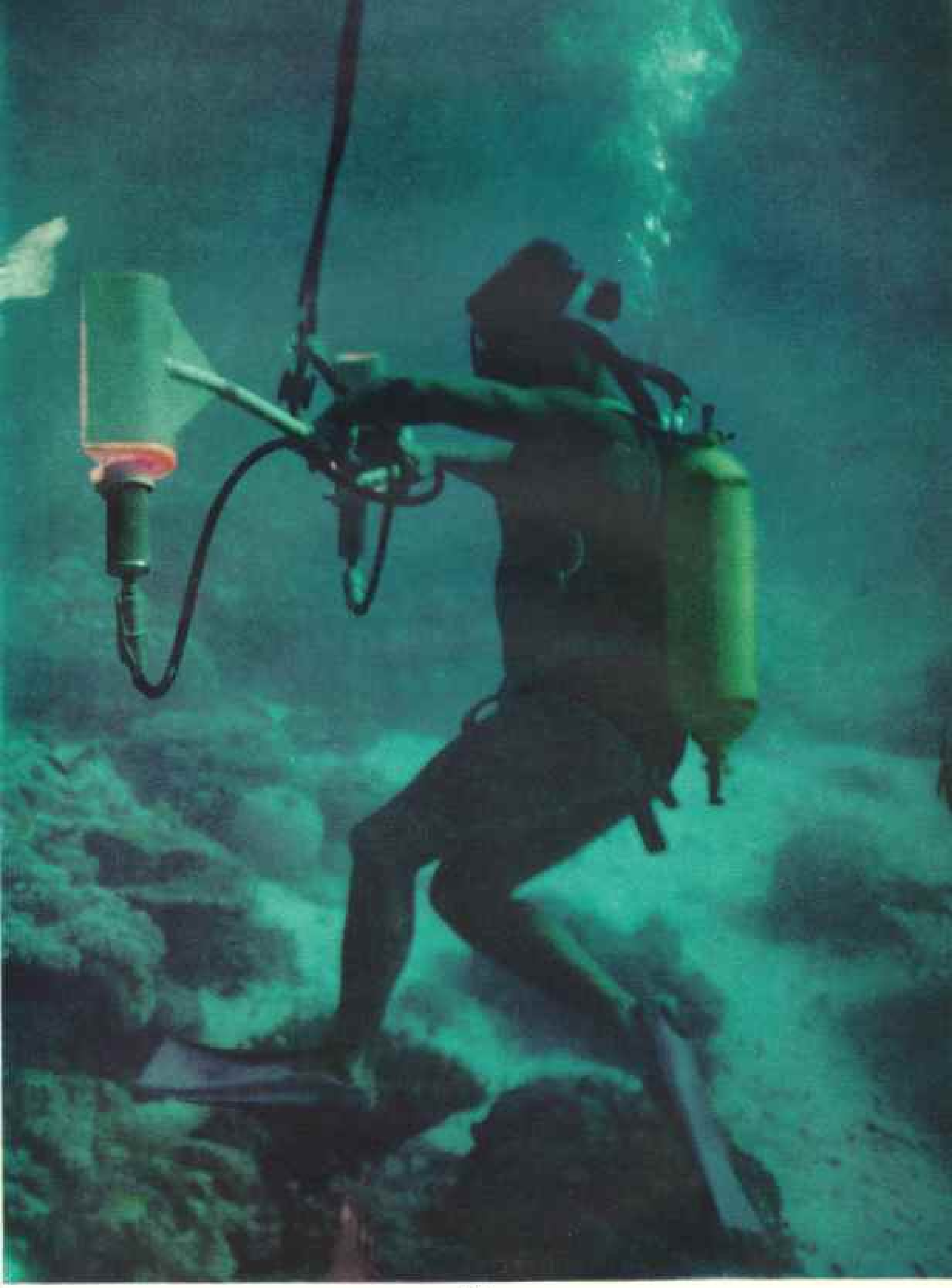
I have heard few fish utter any sound under water, so I was startled when my little trunkfish began to squeak. He creaked like an old gate until I opened my fingers and let him sail off, erratically sculling with fins and tail like a small surrealist galley worked by disorganized oars.

Calypso's cook was the only one to whom Cousteau had issued a fishing permit. Even he was required to use a very small hook, lest he catch one of our movie stars. When I was swimming under the ship one day, I saw the cook's thin nylon line coming down out of the blue. I gave it a tremendous yank, having first carefully got out of the way of the upward jerk I expected. Nothing happened. When I came on deck, Hanen turned a pale-blue Alsatian eye on me and said, "I have caught my share of divers. I'm looking for fish."

Most of the fish we saw under *Calypso* were reef fish, bottom dwellers that usually stayed pretty much in the same place. But amidships of the anchored vessel the reef dropped off into 150 feet of water, and frequently schools of pelagic fishes would streak in from the open sea. These were the hunters—bold, swift fish, streamlined as torpedoes, with the thin lunate tail of the high-speed swimmer. Staring-eyed jacks, flat and com-

Ulysses the Grouper Performs for the Camera in a Sea-bed Movie Studio

The big fish swam daily with *Calypso*'s cameramen in the Indian Ocean. Tame and inquisitive, it became such a nuisance that the divers lowered a cage to the bottom and shut it up while filming.



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Thrusting Out a Greedy Lip, the Gluttonous Fish Hopefully Demands Food

Jean Delmas (center) warily feels the grouper, which eats with a vacuum-cleaner effect that can suck in an arm to the elbow. Albert Falco holds the lamps. Frédéric Dumas (left) carries a shark billy on his shoulder.

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Ulysses the Potbellied Grouper Lives Well in His Sea-bed Jail

Hampered by this too-friendly fish, *Calypso*'s photographers enticed him into the divers' anti-shark cage for a two-day stay. Here at 35 feet in the Indian Ocean, Captain Cousteau films the pampered prisoner, whose stomach is distended from having dined on a four-foot barracuda (pages 164, 165, 166).

pact and glistening like molten silver, would circle us as we swam over the corals.

Once a big jack of 30 pounds or more flashed from behind me, hit my flash reflector with a loud clang, and arched back over my shoulder in a streak of light. I nearly spat out my mouthpiece, because I had only glimpsed it and feared it might be a shark or barracuda. I turned and circled to try to tweak its tail, but it was no use. It was in its element, and I was out of mine, and I never touched it (page 164, upper).

Dumas Swims Like a Fish

I have seen one man who can hold his own with most fishes. That is Frédéric Dumas, the master diver who has worked with Cousteau since his earliest experiments. Never have I seen anyone swim more gracefully or with less effort underwater. Once I watched him jackknife and slip vertically downward over the edge of the reefs, with no apparent movement of his flippers. When we got on deck, I asked him how he could swim with so little movement.

"Oh," he said, "I don't know—I feel the water flowing along my body, sense the change of pressure and direction, and flex my body accordingly."

Dumas must be at least 60 percent fish, because this is the way a fish swims. Some years ago, in a classic paper, Dr. Charles M. Breder, Jr., showed that fishes swim almost entirely by pushing alternately against the water on each side as they flex their bodies, and that their tails have much less to do with it than is popularly supposed.

Dr. Breder classified all fish locomotion into three broad categories, according to the amount of undulation: eel-like, for the extremely sinuous swimmers; snapperlike, the broadest category for the classic "fish" shape; and trunkfishlike, for the rigid-bodied as exemplified by the little fish I had caught in my hand who, having his body closed in a bony box, must row his way through life.

Whenever I swam over the sudden dropoff of the reef, I looked down into a subtly changing blue that shaded from turquoise just below me to an intense cobalt as the depth increased.

Even the clearest sea water holds myriad minute particles in suspension, and the scattered light reflected from these makes the water itself appear to be luminous. It is this light haze that marks the limits of visibility in very clear sea water; objects at a distance

(Continued on page 177)

Like Gold Coins Turning and Flashing, Butterflyfish Dart Through Coral Thickets

These **Butterflyfish** (*Chaetodon lunula*) flit like insects on the wing. Their generic name, meaning "hair tooth," describes mouth bristles that scrape food from corals. Sponges form scarlet patches on the Indian Ocean reef.

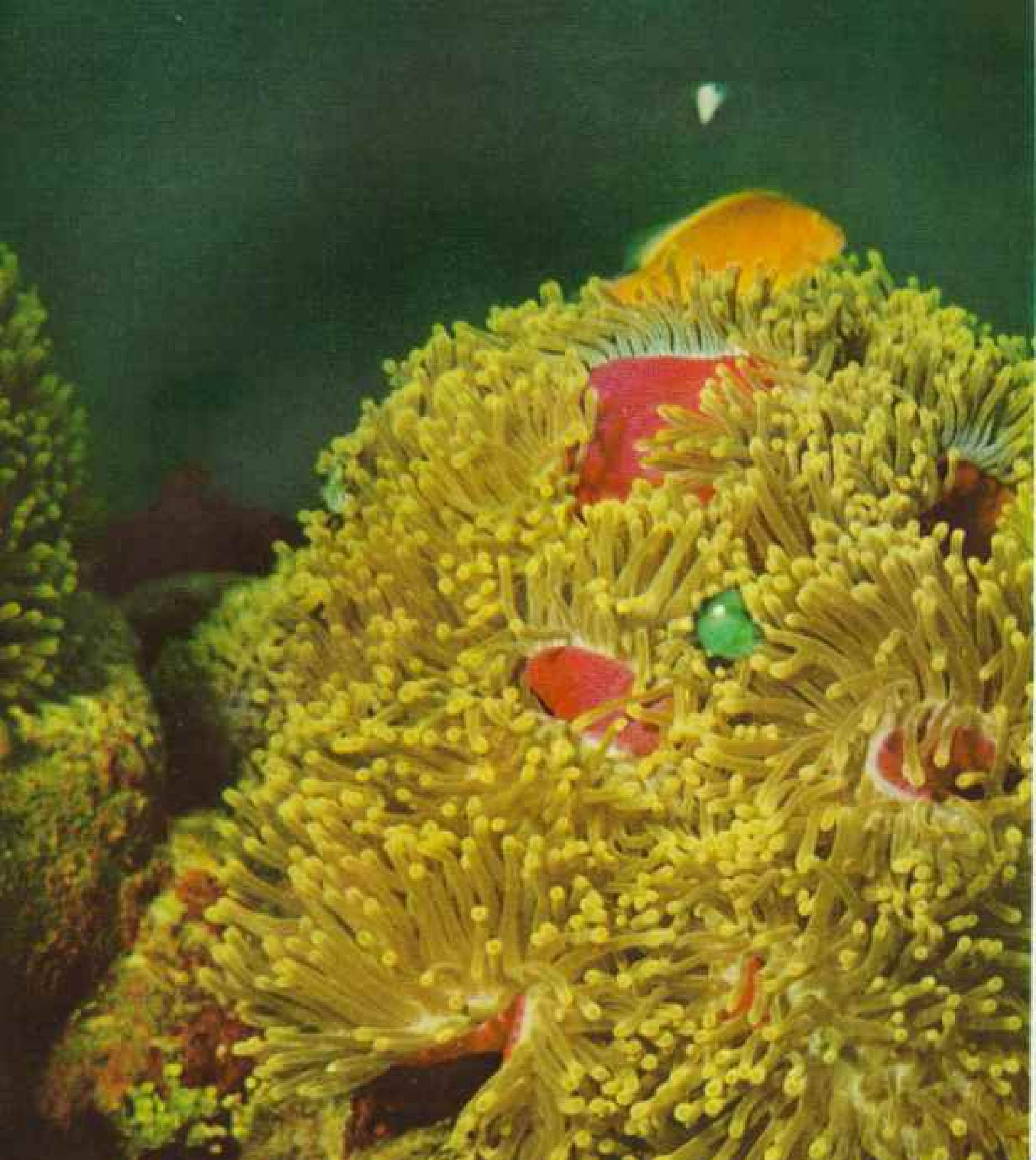
Aqua-Men Cross the Equator by Swimming Under It

Calypsonians who had never passed the Line were made to do so below the surface, as befits divers. *Calypso*'s speeding launch traced the zero parallel on the Indian Ocean with a yellow-green trail of dye. After their submarine crossing, the initiates submitted to lathering, shaving, and other standard indignities.

↓ Man Takes Fire to a Somber Sea

Page 171: *Calypso*'s divers sometimes used pyrotechnic torches to illuminate the blue depths for color photography. Such fireworks can burn under water because they carry their own oxygen within combustible compounds. In deep water the brilliant flares reveal true reds, oranges, and yellows if held close to the subject. They burn for 45 seconds.

Here Captain Cousteau aims his movie camera at divers swimming vertically down the face of a Red Sea reef. Four men at left have reached 60 feet. White smoke from their torches mingles with air bubbles.



The Sea Anemone: Death and Refuge in the Indian Ocean

Several flowerlike anemones here form a colony on a spur of coral. They cling to their support by means of a sticky foot. So tight is their hold that one rarely can dislodge them without tearing.

These sedentary animals are capable of slow movement. In sliding along, some anemones co-ordinate their parts so poorly that they "forget" pieces of their own bodies and leave them behind. These fragments grow into complete individuals. Sometimes the animals reproduce by deliberately pulling themselves apart, though they normally propagate sexually.

Translucent tentacles surround the mouth cavity. Unsuspecting small fish that swim within reach are held fast by sticky hypodermic filaments, stung to death, then drawn into the inner sac and digested.

Curiously, the orange **Anemonefish** (*Amphiprion akallopisos*) lives happily within the protective forest of tentacles (upper center). This fish, timid when beyond the shelter of the death trap, makes sorties to capture food, storing its victims within the anemone's body. Later the partners share the feast.

Apparently the tenant is not immune to the sting of its landlord. But in some strange way the anemone recognizes its friend and carefully curls its deadly threads away.

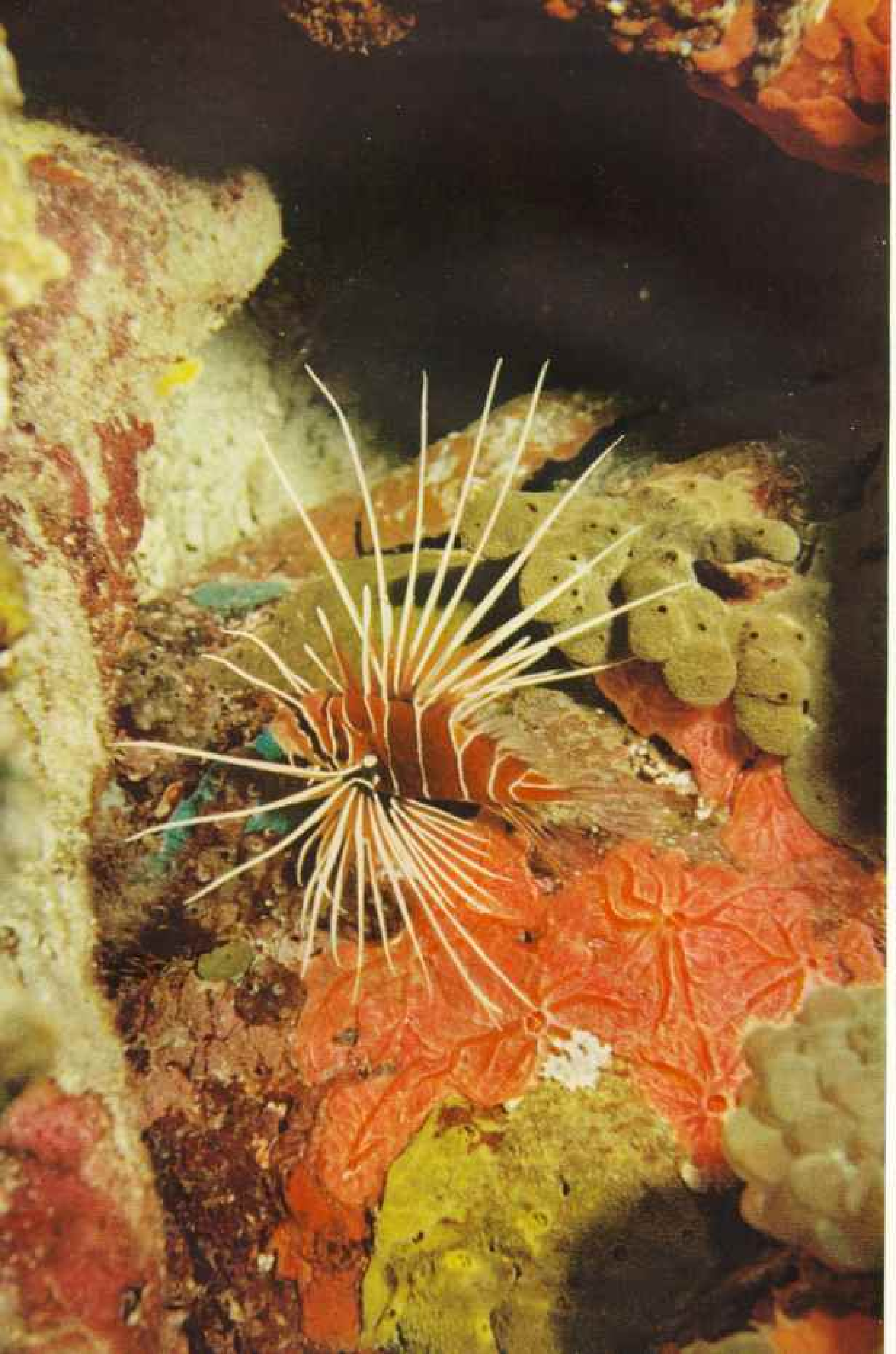
Just as wind ripples a field of grain, a current here "blows" the tentacles aside and reveals the bright magenta bodies (pages 174 and 175).

As Daylight Wanes, Anemones Draw In Tentacles and Lock Up Their Fleshy Houses

Sea anemones live in all the oceans, from shallows down to the deepest trenches. Some species reach two feet in width. This group lay in 30 feet of water, just under *Calypso*'s stern off Assumption Island. The author observed that as afternoon wore on the anemones pulled tentacles progressively farther into their gullets. Their color varied with individuals, possibly also with the time of day.

← Page 174, upper: Tentacles begin to recede, and body columns become visible. A pair of orange-colored anemonefish still find shelter in their lethal den. Lower: Two anemones, having puckered their drawstring muscles, assume the shape of fat tomatoes.

Above: At day's end the colony is shut tight, and the two small fish are locked out on the doorstep. Black **Damselfish** (*Dascyllus trimaculatus*), marked with white spots, hover round, but do not approach the tentacles too closely (top center).



do not so much disappear into cloudiness as dim and vanish in a bright-blue glow of light.

Sea water is a mysterious substance. Cousteau says, "People are apt to think of clear tropical sea water as being like the chemist's distilled water, a liquid cleanliness, an absence of matter. Nothing could be more wrong. It is a living soup, a broth made up of millions of microscopic particles of living animal and vegetable matter, and, as living organisms will, it changes from time to time."

Some mornings we noticed that, despite the absence of wind or unusual currents, the water would be much cloudier than usual. On such days the sea water in a small plastic basin we kept on deck for two baby sea turtles to swim in would also grow cloudy, showing that the minute beings that inhabited it seemed to share the mysterious rhythm of their brothers in the sea below.

Landscape of Another World

I first became seriously interested in diving during the last war. I happened to be in the West Indies, and had my first good look at a coral reef. Like everyone else who has had this experience, I was enchanted.

It is hard to convey to a person who has never seen it the wonder and strangeness of the teeming life of a tropical reef, and it was then I began to think of photographing that other-worldly landscape.

The problem of taking pictures underwater has engaged the interest of many men for a long time. So far as I know, the first one to do anything definite about it was a Frenchman, Louis Boutan, who in 1893 made the first undersea exposures. He employed a bulky glass-plate camera enclosed in a water-tight case so big and heavy that he had to use a wine barrel as a float. In 1900 Boutan published a book, *La Photographie Sous-marine*, the world's first on the subject.

A few pioneers followed Boutan, but for the most part commercial divers were too busy with prosaic hacking and cutting below water to think very much of photographing what they could not, in many instances, even see. Most of them worked in muddy harbor waters, groping in nearly absolute blackness.

Few photographers, on the other hand, put on a diving dress, with its heavy helmet, rubberized suit, lifeline, and air hose. For years a division of purposes and of training hindered submarine photography: the divers were not photographers, and the photographers were not divers.

Not until the invention of light, self-contained breathing apparatus did undersea photography begin to flower. The Cousteau-Gagnan compressed-air apparatus [on this continent christened the Aqualung] was placed on the market in 1946, and camera enthusiasts began to go down into the sea. They have done so in increasing numbers ever since.

There are three questions that people most often ask a diver: "Aren't you afraid of sharks?", "How do you stand the pressure?", and, "What do you see down there?"

Water Acts as Huge Light Filter

It was to answer that last question that we took our cameras to the clear waters of the Indian Ocean. We wanted to show what the diver sees, and, in many cases, even more than he sees, for the undersea world of the depths beyond a few feet below the surface looks entirely blue and green to him.

As a diver descends, the thickening layer of sea water filters the sunlight penetrating the ocean. Acting as an enormously thick blue-green light filter, the water absorbs progressively the red, orange, and yellow rays, until at great depths all the warm tones have disappeared and even flowing blood, as Cousteau has graphically described, emerges as cold green smoke.

At depths up to 30 feet or so, I could still see traces of red and orange, although the colors appeared degraded to a deep maroon or brown. Yet if I had made a color picture by natural light at this depth, the exposure would have recorded only blue. The explanation is that the eye adapts to the prevailing blue color underwater and after a while sees

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◆ **Beautiful but Deadly Is the Lionfish Deep in Its Red Sea Lair**

Bristling spines of the **Lionfish** (*Pterois radiata*) inject a potent venom into any living thing that touches them. The human victim experiences excruciating pain, and the affected arm or leg swells to twice its normal size. Pain continues for hours or even days. If the sufferer has been wounded by several spines, thus receiving a large dose of poison, he may die an agonizing death. No antidote is known.

This specimen lurks on a coral shelf 130 feet down. An anemone at lower right resembles a bunch of grapes. Scarlet and olive sponges cling to the coral ledge. They feed by taking water in through the pores and ejecting it from the large excurrent openings, visible as round holes. This cycle filters out edible micro-organisms.

♠ The Silent Gun of a Sunken Ship Looms in a Cobalt Dusk

Diver Falco swims over the stern of a British freighter blown apart by Axis aircraft in 1941. *Thistlegorm* lies in 103 feet of Red Sea water. Marine growths encrust the hulk.

♦ A high-domed **Wrasse** (*Coris aygula*) passes a bollard on the foredeck. Separate fin rays serrate his tail.

Like Birds in an Aviary, Damsels Flutter ➔ Round the Loop Antenna

Page 179: Big fish had their favorite stations on deck and left them only to search for food. Here a gray **Porgy** (*Plectorynchus picta*) hangs at center. Above it a spotted **Surgeonfish** (*Acanthurus guttatus*) nibbles coral. The radio direction finder stands atop the wheelhouse.

it as gray, so that the reds and yellows still show some trace of their original color.

Color film, of course, does not possess the human power of color adaptation, and a filter must be used to absorb the blue and green so the warm tones may come through. This is naturally possible only where there are still red rays to impress on the film. At great depths, when all visible red has been filtered out by the thick layer of blue-green water, no color filter, no matter how strong, will show colors that are not there. At such times one must resort to artificial illumination to restore the whole spectrum.

The world's first undersea color pictures, made by the National Geographic Society's Charles Martin and Dr. W. H. Longley, were taken on Lumière Autochrome plates, a color process so slow that an exposure of *one second* at f/8 was required in bright sunlight. This was for photography on land. For undersea work the two pioneers used magnesium flash powder, in the incredible amount of one pound per exposure. That was more light than has ever been used, before or since, for submarine photography.

Photographs Made History

The resulting exposures, a technical *tour de force*, were a landmark in the history of photography, for in those days instantaneous action photographs in color, even of ordinary subjects on land, were almost unheard of.*

The color photographs in the accompanying series were selected from 1,200 exposures made during *Calypso*'s four-month cruise. I took them with two cameras: a Rolleimarin, the standard Rolleiflex enclosed in a watertight housing; and an ultrawide-angle Leica in an Aquaphot case, modified and adapted by *Calypso* technicians.

My Leica looked through a correcting lens instead of a flat glass window. This ingenious optical system corrects the underwater refraction effect and restores the angle of view of the lens in air.

Refraction of light rays in the thicker medium of water makes everything at a given distance look bigger and nearer than in air, in the ratio of 3 to 4. So, wide-angle lenses used underwater give approximately the same field of view as that of normal objectives in air. The submarine photographer thus tries to use the shortest possible focal length, and, in addition, a correction lens.

I used flash-bulb auxiliary lighting with both cameras: one lamp on the Rolleimarin, and two on the Leica. Both were powered by battery-capacitor units mounted inside the watertight cases.

The problem of color rendering is the most troublesome in submarine color photography, as the absorption effect of sea water does not manifest itself suddenly, at a given depth. Instead it increases by subtle shadings, with the depth below the surface and with the distance of the subject from the camera, so that any one solution, either of special light filters or of tinted flash bulbs, will not do for all subjects and all depths.

Whenever possible, I used shutter speeds of 1/100 second to stop most motion. Apertures varied from f/3.5 to 5.6 and 8, with an occasional closeup calling for f/11 or 16.

The great thing in underwater work is to keep the natural effect of daylight coming down from the surface wherever possible. If the flash is so strong that it overrides the natural light, then the background appears black and all feeling of "wateriness" is lost.

Rolleiflex exposures were made on daylight Ektachrome and the Leica photographs on daylight Kodachrome.

One day I swam to the edge of the reef and beat my way down into the slowly dimming water. Butterflyfish darted among the thick growths on the precipitous limestone face, and black triggerfish, staring vacantly out of round eyes as placid as those of a ruminating cow, flapped round me.

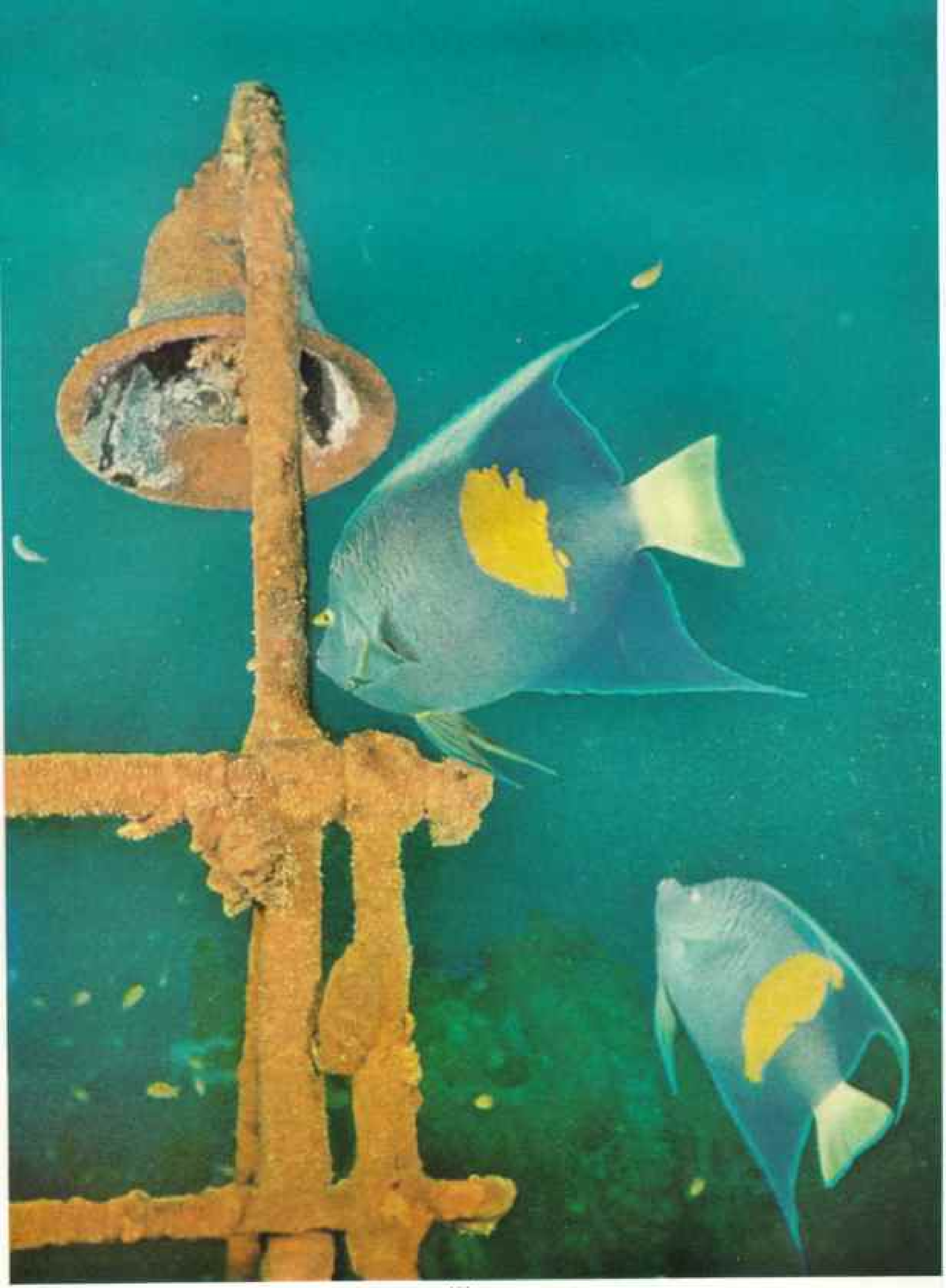
Poison Fish Can Kill Men

On a ledge at 90 feet lay the most bizarrely marked fish I have ever seen. From its egg-shaped body a little tail fanned out, and two diaphanous frilled fins rippled like the pleated hem of a nylon undergarment. A diagonal streak of yellow ran under its eye, and coin-sized livid white spots covered its belly (page 161).

The rare triggerfish rolled its black eyes at me and allowed me to take two pictures before it slid off the ledge and rowed away, flapping nylon fins from side to side. Perhaps the flamboyant markings are a warning, for this fish can kill a man. To eat its flesh causes severe illness and even death.

Dr. Bruce W. Halstead, who has made a special study of ichthyotoxism, or fish poison-

* See "First Autochromes from the Ocean Bottom," 8 illustrations in color, National Geographic Magazine, January, 1927.



Thistlegorm's Bell "Doth Suffer a Sea Change into Something Rich and Strange"

Angelfish (*Pomacanthus maculosus*) scrape bryozoan or coral that sheathes the wreck. Aerial bombing detonated mines, torpedoes, and ammunition in the freighter's cargo. Nine of the crew lost their lives.

ing, has described the grotesque symptoms resulting from eating poisonous fish. First, your tongue and lips begin to tingle, then the tingling spreads to the hands and feet. You grow numb; your arm or leg swells to twice its normal size, and you suffer agonizing pains.

Then come nausea, vomiting, abdominal pain, and convulsions. Your joints ache, you have fever and chills, you sweat; your skin erupts, you itch, you may become paralyzed or go temporarily blind. Some sufferers complain that all their teeth are loose, though they are as firm as ever.

Most curious of all this fantastic catalogue is a reversal of the sensations of heat and cold. Hot objects feel cold to you, and a cold shower will make you think you are being boiled alive. One victim who had recovered from the most drastic symptoms was observed to blow on a dish of ice cream in order to cool it.

Dr. Halstead calls fish *poisonous*, when they induce toxic symptoms when eaten, and *venomous* when they produce their noxious effects by means of stinging spines, stings, or teeth.

One of the chief villains in the gallery of venomous fish is the beautiful but deadly lionfish (page 170). Usually the red-and-white banded body of this fantastic fish is no bigger than a human hand, but the exaggeratedly elongated dorsal and pectoral fin rays make it look double that size.

Do not touch this deceptively alluring fellow! If you do, his grooved spines will shoot a strong poison, for which no antidote is known, into your system.

Like the porcupine, these prickly fellows know they are safe from aggression, and are in no hurry to get out of the way. Erecting their bristling lances, they turn their backs on the diver and try to ignore him, like a little child closing its eyes and hoping the bogeyman will go away.

Divers Pressurized Like Plane Cabins

People often ask divers, "How do you stand the pressure?" The answer is simple: You don't feel it, because the body is pressurized from breathing air at a pressure slightly greater than that of the water.

The Aqualung, like all good mechanisms, is basically a simple device. It consists of a cylinder of high-pressure air fitted with a valve, a so-called demand regulator, that re-

Marine Growths Clothe a Motorcycle Deep in a Sunken Ship's Hold

World War II cargo stands in an open-bodied truck. Encrusting sea life shuns the rubber tires.

Ship's Lanterns Lie in the Gloom of 100-foot Depths

Edmond Séchan examines spare lights from *Thistlegorm*'s lamp room. He swims above a treelike alcyonarian.

leases air to the diver only when he is inhaling, and shuts it off during the exhalation. Sea water pressing on a diaphragm in the regulator automatically controls the pressure at which air is delivered to the diver. The deeper the diver goes, the higher the pressure of the air fed to him, counteracting the growing pressure of the depths.

Calypso's divers made at least three dives per day, and on many occasions we made five. At such times, however pleasant it had been below, the draining fatigue of continued deep diving had a telling effect, particularly at the moment when emerging from the buoying water onto the diving ladder. Then the triple steel cylinders on our backs and the lead-weight belts would seem to weigh a ton.

Once on clambering up the ladder I saw the long birdlike figure of Cousteau standing, spread-legged and arms akimbo, sucking on his broken-stemmed pipe, watching the returning file of divers with brooding eyes.

As I shrugged off the heavy cylinders and sank to the hot deck planking, gratefully stretching out in the sun, I remarked to Cousteau, "Underwater photography is the bunk. If God had wanted man to dive, He'd have given him gills."

Dumas, who lay supine on the hatch cover, answered without opening his eyes, "*Il y a longtemps que j'en suis convaincu*—I've been convinced of that for a long time."

As always, there is a price to pay. Continued breathing of high-pressure air forces nitrogen into the bloodstream. At moderate depths, nitrogen is harmless. The trouble begins when the diver ascends too rapidly from deep water. Then nitrogen tries to escape from the blood as fast as possible, and if the ascent is too rapid, the gas fizzes and bubbles, as in an uncorked bottle of soda water.

Bubbles moving along the blood vessels seem to lodge around the joints and cause the bends, the feared diver's disease. Most frequent symptoms of the bends are itching, sharp pains, perhaps paralysis; death may follow. The remedy is immediate repressurization in a special chamber which forces the gas back in solution in the blood, then slow

↑ Grouper Grazes on Coral Growths

Occurring in all warm seas, groupers range in size from this foot-long specimen to 700-pounders. Large ones play leading roles in the sea's unceasing drama of eat or be eaten.

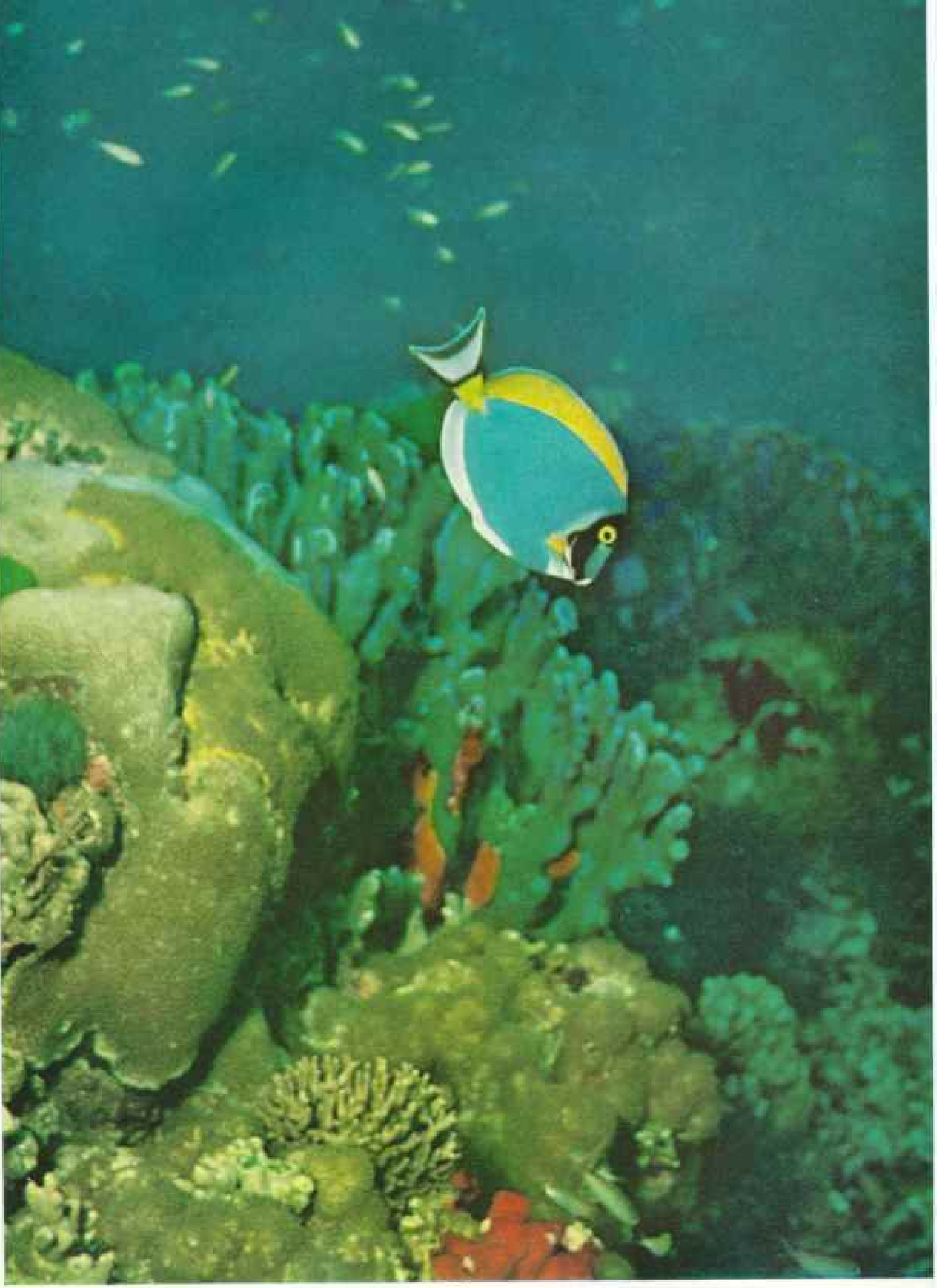
This *Cephalopholis*, sometimes called **Rock Cod,** eats organisms living among corals 30 feet down in the Indian Ocean.

← Hunted Fish Flees Through Coral Jungle

A lover of the shallows, this **Surgeonfish** usually evaded the camera by slipping between intertwined corals.

The species *Naso lituratus* has two fixed tail spines, which are blunter and therefore less dangerous than the single barb of its relative on the opposite page.

Brilliant color marks these weapons, perhaps as a warning to other fish.



Round-eyed Surgeonfish Carries a Scalpel for Operations on Its Enemies

Acanthurus leucosternon wears a razor-edged lancet sheathed in a slot at the base of its tail. When in danger, it erects the spine, which is outlined in yellow. Sideswiping, the **Surgeonfish** inflicts deep gashes.

decompression to enable the gas to pass off harmlessly, without bubble formation.

The preventive is to come up slowly from deep dives. Tables have been calculated to show the length of time one may remain safely at different depths without stopping for decompression. For example, 10 minutes is the maximum amount of time you may remain at a depth of 150 feet. If these optimum times are exceeded, then you have to decompress by stopping for several minutes at predetermined stages on the way up. Navies have computed tables for such stage decompression, but for self-contained diving, as with an Aqualung, simplified tables have been worked out.

Where Life Begins to Thin

Our segment of Assumption reef came to an end 150 feet down on a floor of white sand, but beyond the 100-foot level life had already begun to thin out. To grow best, reef corals need plenty of light and oxygen, and so they like shallow water, preferably with violent wave movement to oxygenate the water.

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An Animal-made Volcano Erupts 50 Feet Deep in the Indian Ocean

While cruising over a submarine slope off Assumption Island, the author observed symmetrical hillocks of sand 6 to 12 inches high. Sporadically, as a buried tenant spurted a column of water, the cone spewed a geyser of sand. What was it—fish, worm, crustacean, or bivalve? Mr. Marden never learned (page 158).

Jacques-Yves Cousteau (opposite)

Passing Surgeonfish Show No Interest in Camera Crew or Sand Volcanoes

Waiting for an eruption (opposite), Marden lies flat. His tendency to rise is checked by Goupil's hand.

Most coral reefs are found in the western parts of the oceans. One reason is that trade winds of the tropics tend to blow surface water from the western shores of continents. To replace this surface loss, cold water wells up from below. As reef corals cannot flourish in water of less than 70° F., reefs tend to form on or off the eastern continental rims. Another reason is that the warm equatorial currents move westward, concentrating coral larvae there.

One day we filmed a scene for *The Silent World* at 144 feet. Nine divers took part, including actors, lamp carriers, and cameramen. At a signal from director Cousteau we jackknifed and swam down as rapidly as possible, through the squeeze of increasing pressure, into the dark blue of deep water.

Near the base of the reef cliff rose a spire of coral to a height of 10 feet. On this column I saw specimens of nearly every kind of invertebrate marine life of warm seas: scarlet and yellow sponges, small fibrillate yellow sea fans, platelike pearl oysters, and, crowning the pinnacle, a magnificent plumed bush of black coral.

Amid this miniature jungle of animal growth flitted darting blue wrasses, nervous round damselfish of black and yellow, and a majestic pair of butterflyfish which peered into each mask in turn.

We took up our stations around the coral head for the scene: the light carriers suspended in water halfway up the coral head, and I kneeling on the sandy bottom, gently controlling my sinking into position by exhaling so as not to raise a cloud of sand.

The cloud of animal life looked uniformly blue to us, and then Cousteau signaled and the floodlights switched on.

Zebra Stripes and Droll Shape Mark an Artist's Favorite

Zanclus cornutus, the **Moorish Idol,** looks more stylized than real. It is so flat and thin that when it turns edge on it becomes almost invisible. The smooth body feels like pin-seal leather. *Calypso* divers named it radio fish because of its antennalike dorsal fin. Depth: 35 feet.

↓ Clownfish Dwell in a Death Trap

Grapelike clusters are the lethal tentacles of a sea anemone (page 173). Fish that inadvertently touch the spheres are stung to death and drawn into the animal's stomach.

In a classic example of symbiosis, the **Clownfish** (*Amphiprion xanthurus*) is permitted to live unharmed among the anemones. In return, it shares captured fish with its partner.

Sixty feet down in the Red Sea, the anemone looked bright red to the diver, yet it appears dull brown in this flash photograph.

Blue fish on left is *Labroides dimidiatus*, a **Wrasse.** Red patches are sponges.

What a transformation! Hot oranges, reds, and mustard yellows glowed in the fan-shaped cones of light from the dazzling incandescent lamps. Fish in somber blue and black darted into the white cone of light, instantly appeared in vivid orange and yellow bands, then swam out of the light to snap quickly back into the world of blue.

The ciné cameras started with a high whirring whine as Dumas slowly glided into the circle of light, chipping with his hammer at the coral spire and putting the samples into his net bag.

I had raised my twin-bulb flash camera, when suddenly there was a dull concussion and a heavy blow knocked me on my back. The implosion of 20 flash bulbs had bowled me over and momentarily stunned me.

Something must have brushed against the net bag of bulbs that floated upright like a bunch of toy balloons on a line tied to my shoulder. The glass lamps, already strained by the pressure of five atmospheres pressing against the vacuum inside the globes, had simultaneously collapsed. Bits of glinting metal foil settled like silver rain about me as I struggled to my knees.

All round me the ghostly laughter of my eight good companions sounded hollow as a dream sequence recorded in an echo chamber.

"My friends!" I muttered through teeth clenched round my rubber mouthpiece; then I grinned up at my comrades, who were literally rolling over with laughter. That is the advantage of submarine mirth; you can do rolls, spins, and slow outside loops while enjoying yourself. You must take only one precaution: do your laughing with clenched teeth, or you may spit out the mouthpiece that feeds you air.

Flash Bulbs Dangerous Under Sea

Undersea photographers should handle flash bulbs very carefully, especially after they have been fired. Twice, as I was unscrewing lamps, the bulb imploded, cutting my hand badly. One instance occurred at a depth of 100 feet, and the violence of the implosion drove the glass through my heavy leather glove with the impetus of a shot from a gun.

Rising from a deep dive is like something in a dream. With hardly a beat of our fins, we rose in a cluster. Relieved of the weight of the air we had used up, we were slightly lighter than the water we displaced, and mounted gently, head first, toward the surface.

As we rose, we were bathed in a tingling froth of the myriad silver bubbles of our exhaled air. It was like taking a bubble bath in champagne.

Because of the lessening pressure, we felt lightheaded as we neared the blue ceiling of the surface. The limpid blue the diver sees when he looks toward the surface through 100 feet of clear water I have seen in only one other place—in the 13th-century stained-glass windows of Chartres.

Indigo Dusk at 217 Feet

The deepest I have ever dived was 217 feet, off Assumption Island. Albert Falco, a superb diver, accompanied Louis Malle, submarine cinematographer and director, and me. The rule in deep diving is to go down as fast as possible and to ascend slowly. Our ears were in condition, so after swimming just under *Calypso*'s hull to the bow, which hung over deep water, we tilted downward and flutter-kicked our way into the indigo.

We descended vertically down the face of the reef, passing at different levels many of our fish friends, who were out on their balconies taking the current.

At 217 feet we paused in a deep-blue dusk. Looking upward toward the luminosity of the surface, I could see far overhead the silhouette of *Calypso*'s hull, swinging on its curving anchor chain.

I had wanted to dive deep to test the effect on myself of nitrogen narcosis, the so-called drunkenness of the depths. Cousteau had told me that the effects vary with individuals and even change in the same persons from day to day. The symptoms vary in kind, too. Some persons become exhilarated, some depressed or sleepy. I wanted to see how this strange affliction would affect me, but I felt nothing.

After our ascent I asked Falco if he had noticed anything unusual. "Well, you did seem to move your hands and feet faster, rather nervously," he said. But I had felt nothing.

I did not take this to mean that I was immune—far from it. We had remained at that depth only a few minutes, and it may be that on another day the insidious drunkenness would strike me without warning at shallower depths. I still do not know.

No one fully understands the mechanism of this strange aberration. Physiologists think it may be due to the effect of high-pressure nitrogen on the nervous tissues, but

An Army of Sergeants in Ragged Formation Maneuvers Above White-tipped Fire Coral

Demoiselle (*Abudefduf sexfasciatus*) of the Indian Ocean is related to the Sergeant Major of the American Tropics. Clumps of stinging corals grow on the bottom at 50 feet. Their touch raises burning, itching weals on humans.

Butterflyfish's Staring False Eye May Confuse Foes

It is hard to tell whether this lone *Chaetodon bennetti*, a **Butterflyfish,** is going or coming. The actual eye at right is much smaller than the startling black ocellus near the tail.

Blue-striped **Snappers** (*Lutianus kasmira*) belong to a family of food fishes widespread in tropical seas.

In the Indian Ocean, *Calypso's* divers saw vertical formations of snappers packed as closely as leaves on a tree. When a man approached, the solid mass elongated and changed shape, frequently assuming the mushroom outline of an atomic cloud. As the diver swam into the wall of fish, a hole opened before him, and after he passed it slowly healed.

Fish everywhere swim with a grace unknown in air because water's dense medium smooths out jerky movements.

Slender Snouts Probe Stone Flowers

Long-nosed **Butterflyfish** (*Chaetodon xanthocephalus*) wear a pensive look as they search for bits of food in sand and coral at 50 feet.

Coral's living polyps usually emerge only at night, when the colony's limestone skeleton bursts into flower like dry sticks that have miraculously blossomed.

Stinging jellyfish, fire coral, and razor-sharp coral present real hazards to the diver in warm seas, but sharks and barracudas, as a rule, are only storybook dangers.

Several hundred fish of a dozen species can be seen in a single dive on an Indian Ocean reef.

no one is sure. At depths beyond 150 feet, narcosis may strike anyone, but inexperienced divers would do well not to go below 60 feet.

The question people ask a diver most frequently of all is "Aren't you afraid of sharks?" My own answer is "Yes," but with qualifications.

Through much diving, I have grown to be almost contemptuous of the barracuda, but more respectful of the shark. Some years ago my feelings were exactly the opposite, having been fostered by the stories current in Florida of the fearlessness of the barracuda and the cowardice of the shark.

"You can always scare off a shark by splashing, but a commotion in the water only attracts a barracuda," ran the story.

Well, I can only say that most sharks I have known seem not to have read the book. True, the barracuda is one of the most curious fish in the sea, one of the few that will swim toward a diver on sight, rather than away from him. But then so does the shark.

If you move toward the barracuda, he keeps his distance. And if you spear him, his one thought is to flee. The shark—well, I don't know about the shark. If you hurt a shark, he *may* flee, or he may react as Voltaire's animal did. Voltaire said, "That animal is very wicked; when one attacks him, he defends himself."

Author's Spear Guns for Sale

For some 15 years gogglefishing has been a hobby of mine, and I possess an arsenal of guns, with spears propelled by rubber bands, by springs, and by compressed gas. But as I become closer to fish, as I move and live with them under the seas, I find it increasingly distasteful to kill them.

In virgin waters fish trust me, they permit me to swim with them and share their world for a time, they look at me out of round eyes from which the uneasiness and distrust gradually fades, and finally they pay me the ultimate compliment of disregarding me. My guns are for sale.

Despite all the tales of barracuda and sharks, I agree with Cousteau who, when asked what is the most dangerous creature in the sea, replies "Man."

Edmond Séchan, one of France's leading cameramen and chief cinematographer on board, had offered to stand the crew champagne the first time he saw a shark underwater.

Fish in Coral Trees Perch Like Birds →

Page 193: Timorous **Hawkfish** (*Paracirrhites*) rests pectoral fins on coral branches. Sometimes, by leaning also on its tail, it supports itself on three points like a small airplane.

Red Sea's staghorn corals look pale blue to the diver's eye, but become pinkish brown to the camera's revealing flash.

We dived one day 100 feet down on a murky bottom covered with fantastic spires and pinnacles of coral that receded and vanished into the gloom like some nightmare forest. Few small fish perched in these stone trees, and here the teeming life of the reef seemed still. I wondered why until I saw the gray obscene shapes of five big sharks threading the limy holes of coral.

I held up five fingers to Séchan, who was slightly behind me. He nodded vigorously. At the camera's first flash, the sharks turned tail and sped back into the murk.

At dinner that evening Séchan appeared and silently set five bottles of champagne in a row down the middle of the table.

Was It a Fluorescent Anemone?

After a month's work on the reefs of the Indian Ocean, *Calypso* sailed north to the Red Sea.

In one of my first dives on a Red Sea reef I discovered a clump of anemones 60 feet down, with spherical tentacles like a cluster of grapes. Over them hung a pair of clownfish (page 188). For some reason, it did not strike me as unusual that these spheres should look bright red, and I gave it no thought until I saw that the animal appeared dull brown in my developed color photographs. Why did they look red and photograph brown? Normally I should not have been able to see a bright-red color at a depth of 60 feet.

I think this may be a case of fluorescence, where some pigment in the tentacles, excited

(Continued on page 197)

Big and Little Fish Are Partners →

Nature is full of strange alliances. Tickbirds perch on rhinos to pick off insects. Crocodiles lie with yawning jaws so that agile small birds may clean their teeth. So it is in the sea.

Here a finger-size blue **Wrasse** (*Labroides dimidiatus*) swims close to the pectoral fin of a **Sea Bass** (*Variola louti*) to pick small crustaceans and other parasites from the bigger fish's body. When the bass slices up a meal, its small friend filches scraps.

In some waters and seasons, this *Variola* may be poisonous when eaten.

Undersea Angels and Butterflies Wear Striped Coats

↑Spiny Butterflyfish (*Pygoplites diacanthus*) flickers like a prismatic spectrum among Indian Ocean coral heads. This hand-size specimen swims at 100 feet.

Patches of sponge and algae cling to the ledge below.

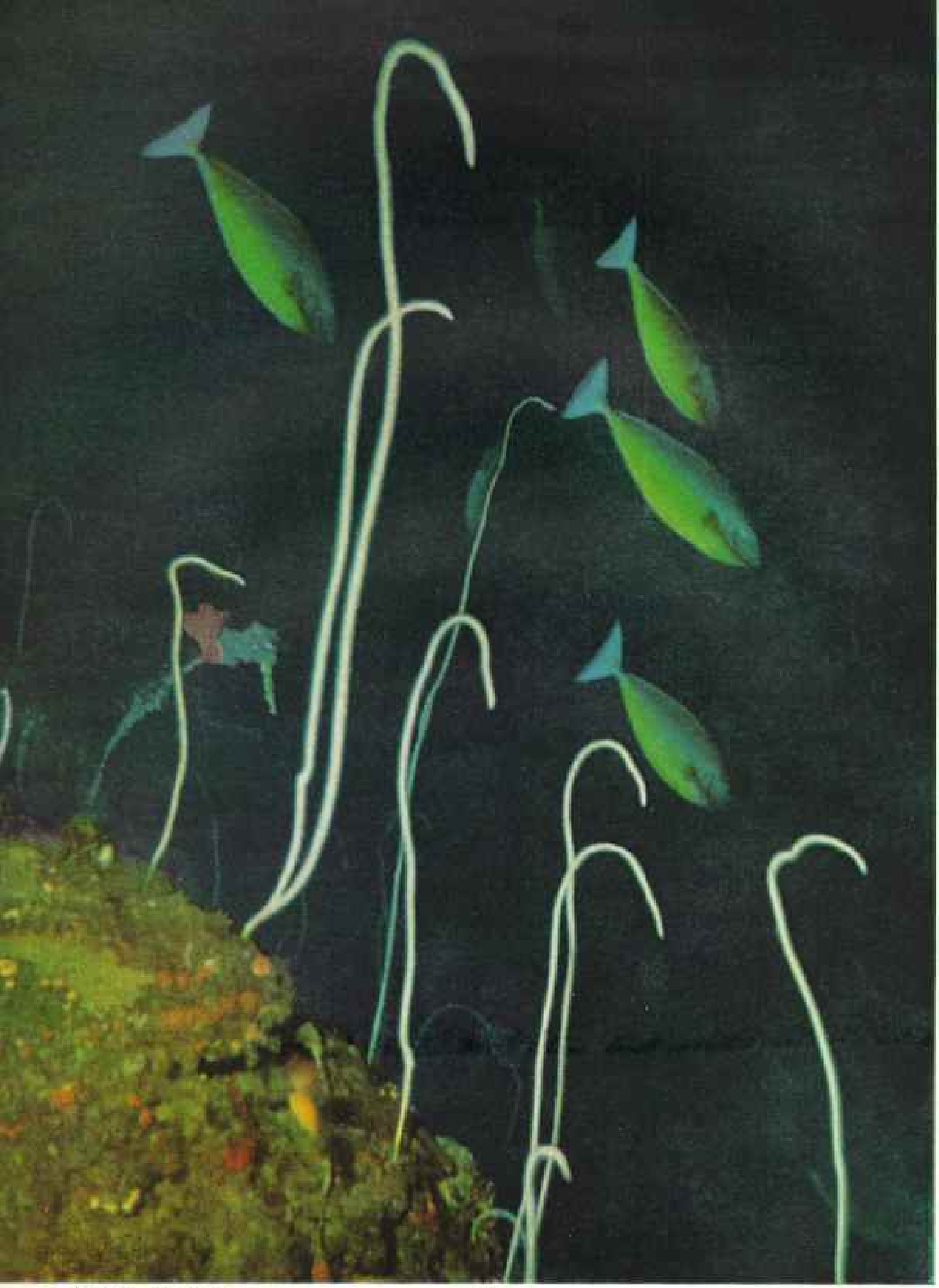
←Emperor Angelfish (*Pomacanthus imperator*) wears sharp spines on its gill covers. Its upturned baby mouth, which always seems to be saying *o-o-oh*, carries teeth like a toothbrush's bristles.

A wrasse swims beyond the angelfish.

Flowing Lines and Sickle Tail Mark a Fast Swimmer

Open-sea fish like this **Jack** (*Caranx melampygus*) frequently dashed in over Indian Ocean reefs where *Calypso*'s divers were filming. They followed the divers around and sometimes snapped at air bubbles. Depth is 20 feet.

⬇ Divers called these striped fellows tiger fish. Actually they are a kind of **Porgy** (*Gaterin*), with this genus's characteristic blubbery lips. A **Squirrelfish** (*Myripristis*) at lower right shares the porgies' uneasiness. The suspicious cyclopean eye peering over its tail belongs to another squirrelfish. Depth: 35 feet.



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"Through Caverns Measureless to Man, Down to a Sunless Sea"

Leather-skinned **Surgeonfish** (*Naso vomer*) plunge into the twilight of 200-foot depths off a Red Sea reef. Curving white walking sticks are sea whips, a low-order animal related to the sea fans.

by the blue-green light, fluoresced bright red, as do some advertising paints and pigments. The photoflash, being predominantly red, would not excite a fluorescent substance, and the animal's normal coloration would appear in the photograph.

Sunken ships furnish shelter and food to hosts of fish. The creatures live in the angles and nooks of the wreck, and they feed on the corals and other marine growths that sheathe the hulk. At the upper end of the Red Sea in the Strait of Gubal, the narrow neck that leads into the Gulf of Suez, lies a ship sunk by enemy action in World War II. The wreck is noted on the charts, but to pinpoint the hulk, which lay in more than 100 feet of water, was another matter.

Cousteau did it with a precision and elegance that excited my admiration. First, he sent out one of the ship's launches, which carried a mast topped by a metal sphere, to a point at one end of the Shu'ab 'Ali reef. From this known point, pricked off on the chart, he laid off a wedge-shaped segment of sea. While we kept a constant check on this fixed reference by radar signals that bounced off the metal sphere, *Calypso* made methodical sweeps back and forth. The echo depth sounder traced the bottom's profile on graph paper, and every bump was marked for investigation.

Wreck Spotted 103 Feet Down

At one spot we got a consistently high hump with a ragged outline. Dumas and Falco went over the side to investigate. In 10 minutes their heads broke water, and they held up their thumbs in triumph. Back on deck, they said, "It's a big one, a freighter of eight to ten thousand tons, 103 feet down."

When at last I slipped into the water, I felt like a small boy who is about to be shown Captain Nemo's submarine world. I was not disappointed. As soon as I had my face underwater, I could see the shadowy skeletal outline of the steel mast and the straight lines of its wire stays disappearing into the blue. We were diving to the stern, so I swam aft, doubled up, and went down.

For a few strokes I saw nothing but blue water, then dimly the tremendous elliptical outline of a ship's stern materialized. Down I swam, thrusting my head into the tightening grip of depth until I came to the deck.

The round stern lay tilted skyward, and as I swam down I passed the railings that were festooned with the submarine growth of many years. Clouds of fish swarmed over the dim hull, passed in and out of the black gaping portholes, and streamed along the blue twilight of the 'tween decks (page 179).

On the open rear deck a four-inch gun pointed to the sky. Shells that had rolled into the scuppers were cemented so hard with the coral growth of more than a decade that I broke my knife blade trying to pry one loose. Soft corals, sponges, and the flat discs of pearl oysters clung to the steel plates (page 178).

Wreckage Piled High on Sea Floor

I flipped over the side and thrust down to the sandy floor. Here under the counter the gloom thickened and the curving blades of the enormous single propeller loomed overhead, dwarfing Falco, who peered at me over the propeller shaft.

I swam forward, and the curving line of the ship's hull suddenly came to an end in a jungle of twisted metal and broken cases piled in a 40-foot-high jumble on the sea floor.

Despite a strong current, the water was far from clear, and the crazy angles of steel loomed menacingly out of the gloom. I dived to the mangled remains of the keel, and in one icy shock felt the atavistic fear of the dark and the unknown.

Down in the blackness under the curving hull plates, something had moved, something so enormous that it seemed too big to be even a shark. I clung to a packing case and mastered my fear.

As my eyes adjusted to the darkness, I saw the thing move again, and then a gigantic fish, more than eight feet long and nearly five feet high, covered with great mailed scales, slid slowly out of the smashed hold. It had a towering bump on its forehead, and big canine teeth projected from its jaws.

Giant Wrasse Is Camera Shy

Never had I seen so big a fish underwater, and the fact that I at last recognized it as a giant wrasse did not allay my feeling of awe.

This great wrasse, *Cheilinus undulatus*, belongs to the family of brightly colored little fellows that swim among the corals. Why the genus should take this sudden leap in size, from finger-long specimens to eight-foot monsters, mystifies me.

These giant fish, because of their size called "truckfish" by crewmen, were exceedingly wary. I never succeeded in getting one into

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A Bristling Sea Cucumber Delivers Two Live Fish

One or more glassy fierasfers usually make their home within the holothurian, the sea cucumber, a delicacy of Chinese cuisine. Here diver Emile Robert holds, rear end downward, a two-foot cucumber brought up from 75 feet in the Indian Ocean.

➔When he squeezes, two eel-like fish slither out on deck.

camera range. Many times during our dives to the wreck we saw their silhouettes skulking in the jumble of steel. I was never lucky enough to sight the monster wrasse Dumas and Falco saw, which was at least 15 feet long.

We found the ship intact from the bridge forward. The huge windlass on the foredeck had become a submarine garden, with the sharp outlines of the gear teeth softened by a coating of fronds, spikes, and filaments that might have belonged to some Martian flora. From the windlass the anchor chain ran down through the starboard hawsepipe, and when I peered over the bows I saw the chain receding into invisibility along the bottom. Later our divers found the anchor fathoms away on the sandy sea bed.

Two railway tank cars were lashed down on the well deck. Their metal cylinders were flattened by water pressure, yet our men swam unconcernedly over them, in a graphic demonstration of the way the Aqua-lung functions by pressurizing the body inside to withstand the crushing pressure outside.

Between the lashed-down tankers yawned the open mouth of the main hold. Slowly beating my way down into the blackness, I saw, when my eyes adjusted to the semidarkness, motor trucks stowed tightly against each other.

Sea Growth Encrusts Metal

Each truck held several motorcycles. Coral, sponges, and oysters encrusted the metal of the motorcycles, but the black rubber tires were nearly spotless (page 182). Between the trucks stood the metal ribs of aircraft wings.

Slanting upward again, I floated up the face of the bridge, turned round the ends of the bridge wings, and entered the wheelhouse. I moved carefully, with a minimum of motion, so as not to stir up

the fourteen-year accumulation of fine silt.

Inside I found the compass shattered to bits. Sextants, binoculars, and the chronometer, all broken up by the explosion, lay among the foot-deep debris. Electric wires hung in festoons. What tremendous explosion could have so shaken this big ship and broken her in two?

The doors leading into the captain's house beneath the chartroom were closed, but when we put our flippered feet on them and pushed they fell slowly inward. Childhood's lingering instincts—and a diver's experience—peopled the yawning black tunnel with monsters, but we pulled ourselves slowly in, switching on our electric torches.

Bottles clung to the ceiling. Earthenware dishes marked with the flag of the steamship line lay scattered on the deck. The air that bubbled from our exhausts floated upward and deposited on the ceiling a growing pool of quicksilver that mirrored our winking lights.

Ship's Identity Discovered

With a bubbling sigh of relief, I emerged into open water, glad to be out of that black hole into the light of day. As we swam down the front of the wheelhouse again, Dumas pointed to the makers' name plate riveted to the bulkhead. He scrubbed the silt and spotty growths from it, and we read: "Joseph L. Thompson & Sons, Limited, North Sands Shipbuilding Yard, No. 599, Manor Quay Works, 1940, Sunderland."

We now knew she was an English vessel, but for days did not know her name, because we did not scrape the ship's bell clean until we had finished filming the foredeck. The big bronze bell hung from a standard on the foredeck, just abaft the windlass (page 181). On it grew one perfect pearl oyster. Finally, the order was given to scrape the bell, and the ship's name emerged—*Thistlegorm*.

That same night I wrote a letter to the makers asking for information about the ship and posted it a week later in Port Said. On my return to Washington, I found a letter from the builders, who had kindly got in touch with the former Third Engineer of the *Thistlegorm*, Mr. H. A. Bansall, who described the ship's end.

The 9,000-ton vessel had been loaded for her fourth and last voyage with trucks, motorcycles, locomotives with tenders, two tank cars, and shells, bombs, mines, torpedoes, and small-arms ammunition.

The builders wrote: "Because of the intense and destructive activity of the enemy in the Mediterranean, *Thistlegorm*, which was bound for Alexandria, was routed via the Cape of Good Hope. Eventually, after being on passage about two months, she arrived at Aden towards the end of September. Moving off from Aden about September 24, she joined about 20 other ships waiting at anchor in the Strait of Gubal because of the congestion at Alexandria, caused by a tanker having been mined and sunk near the Mediterranean end of the Suez Canal.

"On the tenth day, which was October 6, 1941, our feeling of safety and security was completely dispelled, for during an enemy air attack a plane dropped two bombs on *Thistlegorm*'s afterdeck, which housed the two locomotives and below whose hatches there were stowed shells, bombs, and ammunition.

"Two violent explosions followed, and almost immediately flames enveloped the after part of the ship, while the air was filled with the bright flames of tracer bullets as they flew in all directions from No. 4 hold.

"There was no possibility of those at the after end of the ship reaching the lifeboats, and they simply had to jump for it. Then one of the crew performed an outstanding deed of valour, which not only saved a life but which was recognised by the award of the George Medal and Lloyd's Medal for Bravery at Sea.

Sailor Carries Mate Through Flames

"When Angus McLeay, a quiet, unassuming A. B. from Stornoway in the Hebrides, was thrown out of his bunk by the explosion, he made his way to the deck to find sheets of flame forcing men to jump overboard. Noticing an injured gunner on the deck, McLeay flung him over his shoulder and dashed barefoot through the flames. Miraculously evading the bursting bullets, he succeeded in carrying the wounded man to a lifeboat.

"Although avoiding injury from bombs and bullets, McLeay suffered badly from burned feet, for the deck was then red-hot and strewn with debris. He was also burned about the body.

"Some 10 minutes afterward, which was actually only about 20 minutes from the time of the air attack, an explosion aboard the *Thistlegorm* was followed by a second violent blast, which rent the air and which was later thought to be the blowing off of the stern.

"Mr. Bansall thinks that the heat of the

No. 4 hold had become so intense that it detonated some of the mines or torpedoes.

"The effect of this explosion was devastating, and debris was flung everywhere, even striking some of the near-by ships. Survivors saw a great piece of debris tear an 18-inch hole in a steel plate on the ship which had rescued them.

"Later, when the rescued were grouped aboard the antiaircraft cruiser, it was found that out of 49 crew members, nine (five of them gunners) had been killed.

"Three days later a shot-down German airman, who said he had been operating from Crete, claimed to have been responsible for the bombing of the ship."

Thus the story of the *Thistlegorm*.

The last day we remained over the wreck I descended for a parting look around. Pierre Goupil went with me, but his air tanks were nearly empty, and he soon started for the surface. Alone, I swam slowly along the ghostly length of the wreck.

It was late afternoon, and the sinking sun sent little light below. Pale beams of silver light, wavering like the spectral curtains of the aurora, shimmered among the black tracery of the mast and booms. The sagging wire rope of the rigging hung like coiling snakes against the faintly luminous surface, and, as I swam under the starboard bow, the glowing blue eye of the hawsepipe stared down at me.

I shivered. The water was cold, but I was colder. I looked aft to the tangle of misshapen metal, where the monstrous mailed fish lurked, then turned to look down at the long segmented anchor chain vanishing into blue-black night. I shivered again, and, tilting upward, followed the silver and blue mushrooms of my expanding air bubbles to the surface and the sun.

Like Pigeons in a Park, Black Surgeonfishes Swarm Round a Bag of Food

Diver Etienne Puig kneels 60 feet down on the Indian Ocean's floor and distributes a largess of chopped fish. Two small snappers, less bold than the surgeons, hover behind his head.

Virgin Islands: Tropical Playland, U.S.A.

Gleaming Beaches, Duty-free Bargains, and a Hint of Old Denmark Lure Vacationers to These Climate-blessed Caribbean Isles

By John Scofield

National Geographic Magazine Staff

With Illustrations by Charles Allmon, National Geographic Staff

BEFORE I went to the American Virgin Islands, a visiting St. Thomian characterized these easternmost bits of United States territory in one concise sentence.

"You'll never meet three sisters with less in common," he told me. And different indeed are these three Virgins.

The island of St. Thomas, to which a plane brought me from near-by Puerto Rico, is urbane and up to date. Most of its 13,813 inhabitants cluster in bustling, commerce-wise Charlotte Amalie.

Next door, separated by a channel that shades from leaden gray to the palest of aquamarines, lies nine-mile-long St. John, smallest and least developed of the Virgins, and the proposed site of Uncle Sam's 29th national park.

Forty miles away, quiet St. Croix cultivates sugar cane and dreams of the past (map, page 207).*

Islands Discovered in 1493

Columbus first sighted the islands on his second trip to the New World. The largest he called Holy Cross—in Spanish, Santa Cruz. The others he named Santa Ursula y las Once Mil Virgines, in honor of St. Ursula and the 11,000 Virgins.

"For more than 200 years," an island acquaintance reminded me, "the islands were known as the Danish West Indies and were Scandinavia's only possessions in the Americas. In 1868 William H. Seward, Lincoln's Secretary of State, tried to buy St. Thomas and St. John. Congress pigeonholed the bill. In 1902 another treaty was negotiated, but the Danish Parliament blocked the sale.

"Finally World War I forced the issue; the United States feared that Germany had her eyes on the Virgins. This time both Americans and Danes agreed. On March 31, 1917, the Danish West Indies became a nonselfgoverning United States territory.

"They were expensive pieces of real estate," my friend added. "The $25,000,000 price tag works out to almost $300 an acre. Alaska, you know, cost less than two cents an acre."

As we walked toward Charlotte Amalie's old Danish fort, a row of rusting cannon caught my eye. "They always remind me of Virgin Islands cockroaches," my companion volunteered.

He laughed at my puzzled expression.

"I'd classify this one as folklore, not fact. The story is that in Danish times the caretaker of a fort on one of the islands was asked to account for some missing cannon. Copenhagen was an ocean away, and the caretaker didn't take the order too seriously. 'Eaten by cockroaches,' he reported testily. Back came another letter. Please, it directed, send us samples of your cockroaches.

"The harried caretaker put an end to the affair by asking how they proposed he should send these iron-chewing insects across the Atlantic without their destroying the ships?"

Today the three islands are administered by the Department of the Interior; the governor and government secretary are appointed by the President of the United States. Virgin Islanders elect their own legislature of 11 members for the three islands, but they do not vote in presidential elections or send representatives to Congress.

Motorists Drive on Left-hand Side

As I started across busy Dronningens Gade a sleek European car bore down on me. Just in time I remembered and hopped back onto the curb; left-hand driving is the custom here.

From its pedestal in the park, a bust of Denmark's Christian IX gazed seaward through blossom-heavy bougainvillea. A gray donkey jogged an island Frenchman toward the market; behind him strode an erect Negress, balancing on her head a tray heaped with golden papayas.

* See, in the National Geographic Magazine: "*Carib* Cruises the West Indies," by Carleton Mitchell, January, 1948; and "The American Virgins," by DuBose Heyward and Daisy Reck, September, 1940.

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↑ **Escapists from Northern Snows Bask on a Virgin Islands Beach**

The United States, fearing German occupation of the Danish West Indies in World War I, paid $25,000,000 for these easternmost of its territorial outposts. Since those days residents of the three islands—St. Thomas, St. Croix, and tiny St. John—have found winter-weary visitors a better source of income than sugar, their former mainstay.

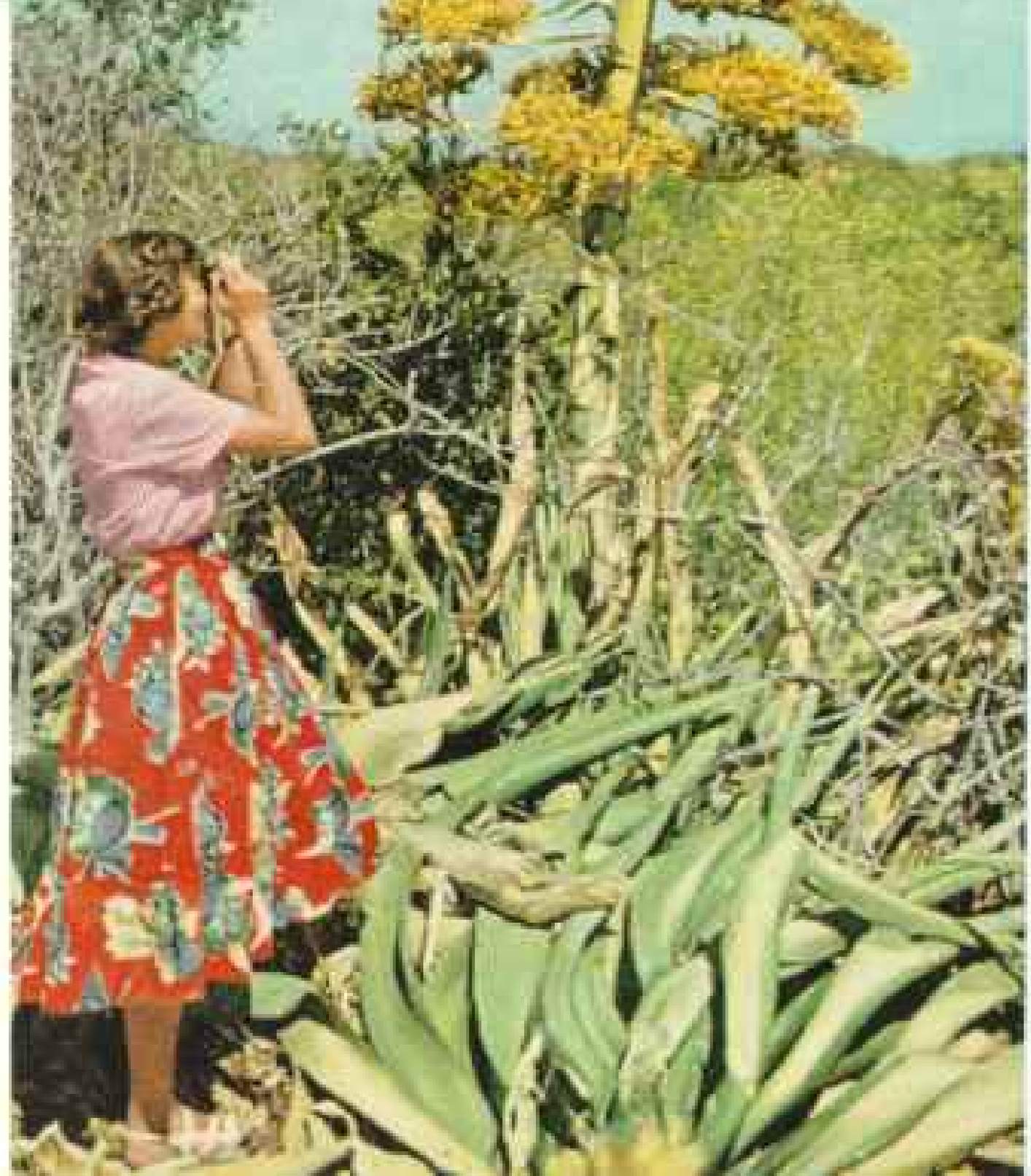
Glistening sand and clear skies give Great Bay, at the eastern tip of St. Thomas, a characteristic aquamarine tint. Guests of a hotel in Charlotte Amalie, the islands' capital, loll on striped beach mats.

← **Skiff Appears Suspended Over Air-clear Caribbean Water**

Page 202: Crystalline seas wash the islands. Sightseers in glass-bottomed boats can often peer 75 feet down to where tropical fish browse on coral-foliaged landscapes. With sail furled, these visitors row near Water Island, in St. Thomas Harbor.

↓ **Century Plant Blooms Once in a Lifetime**

Fleshy-leaved *Agave americana* owes its popular name to a belief that it flowers once following a century of growth. Actually the spiky yellow cluster sometimes appears after only five years. Death invariably follows the blossoming. This plant grows near Great Bay (left).



A few blocks away, sports fans cheered a cricket match. At the West India dock visiting Americans stepped ashore from a gleaming cruise ship; beyond it in the harbor native sloops from half a dozen exotic islands came and went.

It was hard to realize, amid these unfamiliar scenes, that I was still on United States territory, and not in some foreign land.

Most Virgin Islanders, including the last four governors and the majority of other officeholders, are Negroes. Happily, the races get along with an easy tolerance for each other's foibles.

"Our islands are small," a businessman told me, "and we all have to live together. We get to know each other as neighbors, and that prevents misunderstandings."

St. Thomas Depends on Visitors

Island English is a baffling speech born of many influences. A first cousin of the singsong "calypso talk" of the British West Indies, it preserves words and phrases left by Danish colonials and the men who came to manage their plantations.

"Don't be surprised," an acquaintance told me, "if an islander accosts you with 'What're you doing, at all, at all?' Without realizing it, he's mimicking the Irish overseers brought here years ago by the Danes."

The only people who have preserved their identity in this welter of passing tongues are the Chachas, who came to St. Thomas a century ago from French-speaking St. Barthélemy (pages 218 and 231).

Now some 1,500 strong, they alone among St. Thomians succeed in wresting a living from the sea and scant soil. Everyone else depends on an annual invasion by free-spending "continentals."

During the 1954-55 season, 17,000 passengers debarked from cruise ships for one-day buying sprees and glimpses of Charlotte Amalie's sun-spangled harbor. Add to this two or three planeloads a day, plus 30,000 sailors week-ending ashore, and you have the formula that makes this tropical playland tick.

On shop counters along narrow Dronningens Gade—Queen's Street, in English—I saw the eye-catching array that, as much as anything else, draws winter-weary visitors to this Caribbean vacation land. Here, logically enough, are Danish silver in profusion, and Haitian mahogany; Cuban alligator purses, Guatemalan leather, and odd rubber figures made in Jamaica.

Not so logical for an out-of-the-way West Indian island are rings and brooches from faraway Thailand; Austrian porcelains and Swiss watches; French antiques and wood carvings from Bali; butterfly-wing jewelry from Brazil and carved ivories from Delhi. I was offered Italian swim fins, German underwater cameras, and Dutch pottery; Irish linens, French glass, and liqueurs from a dozen distant lands.

What makes this stunning display of merchandise more attractive here than it would be, say, on New York's Madison Avenue, is a blunt matter of dollars and cents. When the United States acquired the islands in 1917, President Woodrow Wilson specified that the inhabitants should never "be placed in a less favorable position . . . than they now enjoy." The Danes levied almost no duties on imports. U. S. customs officials had to follow suit. As a happy sequel to the story, most tourists may now take home, duty free, a whopping $500 worth of foreign merchandise—enough, at Virgin Islands prices, to satisfy almost anyone.

Chief competitor as a tourist attraction with the islands' bargain counters and Old World flavor is their admirable climate. Temperatures hover close to the 70's, and the trade winds blow dependably. One audacious St. Thomas hotel, the plush Virgin Isle, backs Caribbean weather to the limit. Between December 15 and April 30 guests are given paid-up insurance policies; if the thermometer drops below a mean of 70° F., Lloyd's of London pays for the room!

"Pirate" relics abound in Charlotte Amalie, though historians can authenticate few of them. Blackbeard Castle, whose fire-gutted hulk crowns Government Hill, appears to have been built in 1674 by Carl Baggaert, a Dane.

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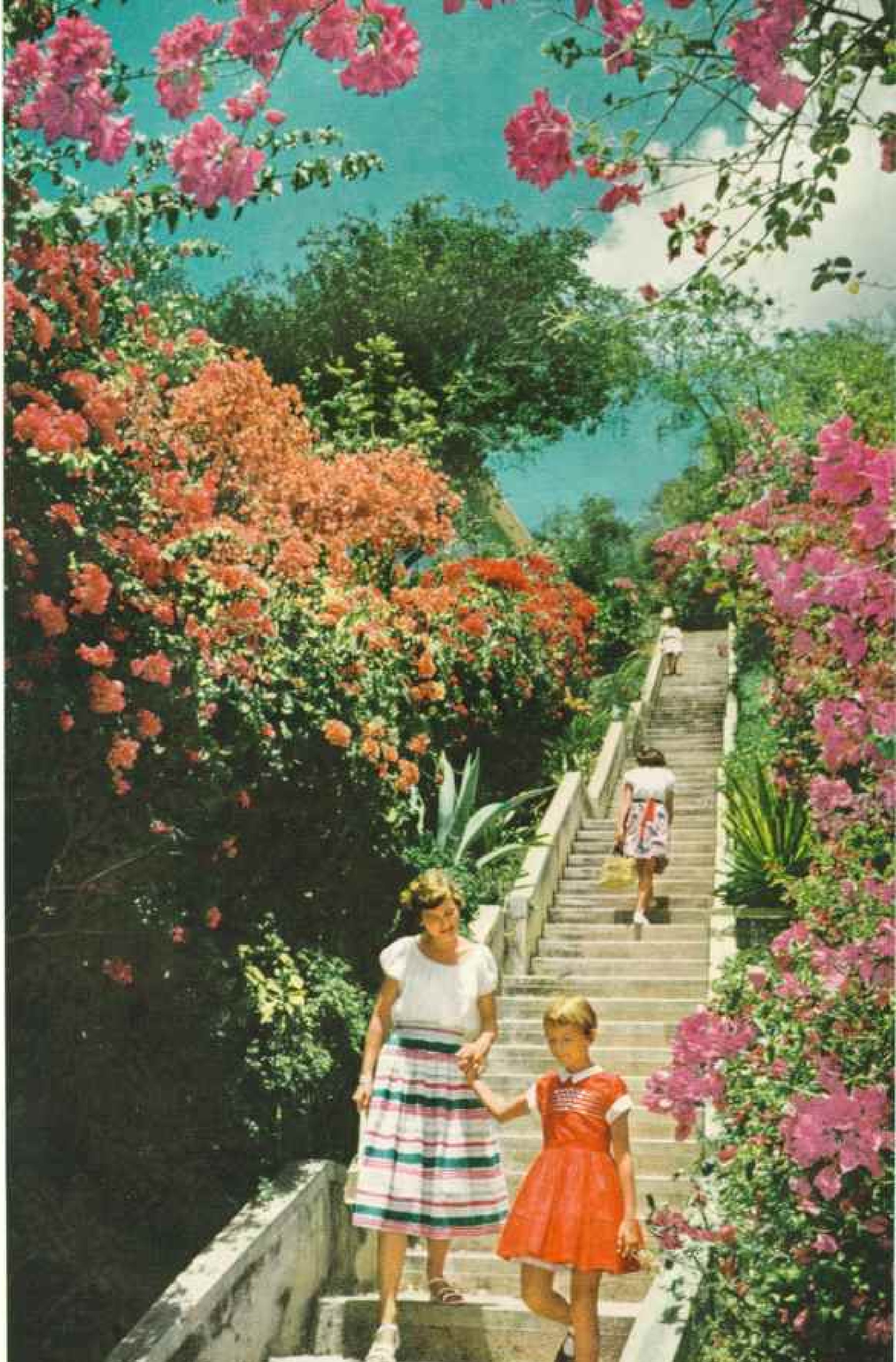
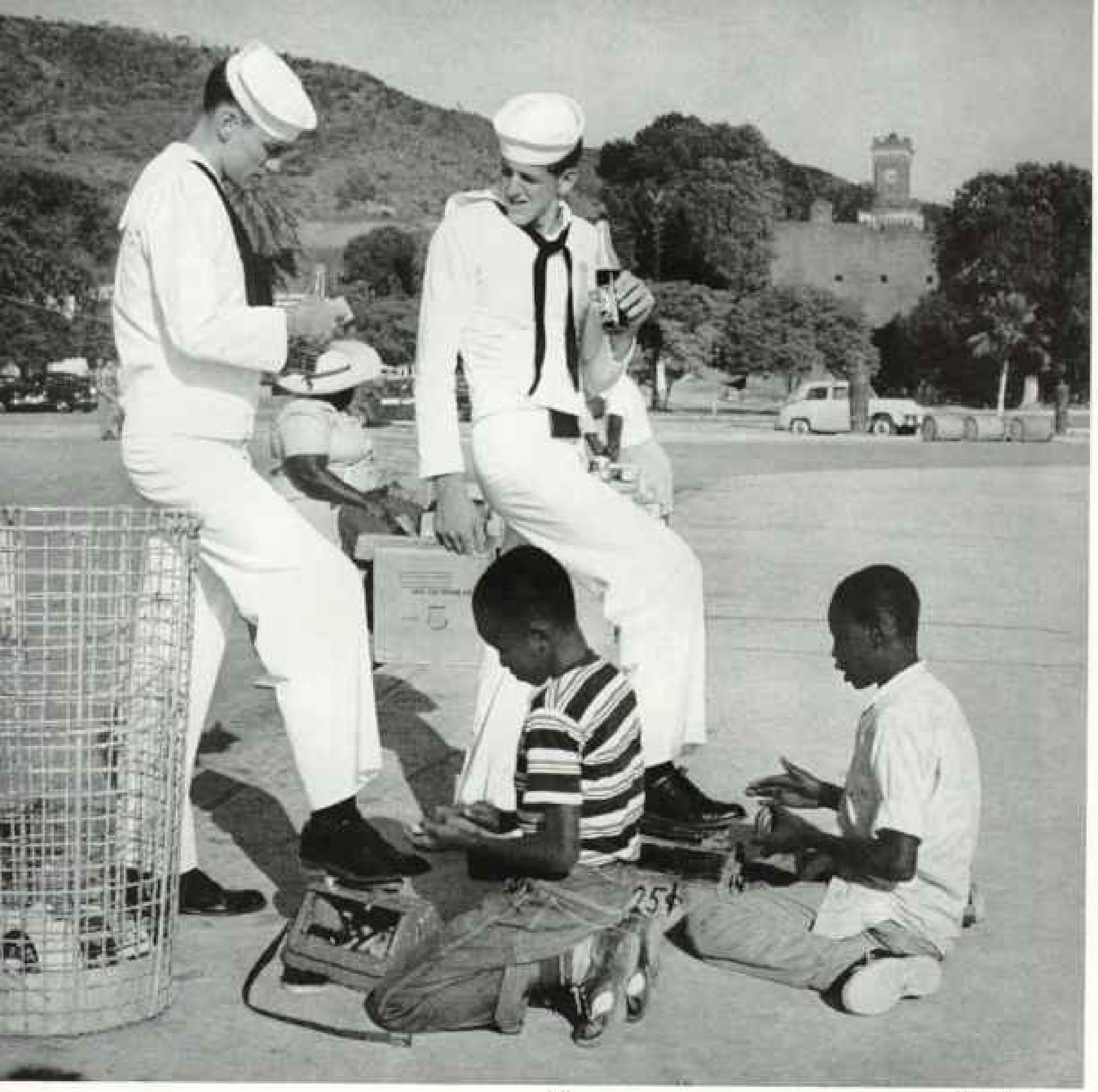
Blossoms Cascade in Frothy Waves → Down Charlotte Amalie's Floral Way

The only town on mountainous St. Thomas takes its name from the consort of Denmark's King Christian V. Three hills, known to old-time mariners as Foretop, Maintop, and Mizzentop, account for the stone steps that lead from one level of the city to another.

For years two women have devotedly cultivated these narrow plots beside their hillside homes. Bougainvillea blooms in a year-round riot of billowing red and pink.





Sailors of the U. S. Navy's Atlantic Fleet Welcome Shore Leave in Charlotte Amalie

Shoeshines prepare these visitors for a tour of old Fort Christian (background).

Chances are that Edward Teach, alias Blackbeard, never set foot in the crumbling ruin. Bluebeard Castle, on an adjoining hill, has even less claim to pirate fame; built by the Danes, it is now part of a hotel (page 226).

Authentic enough, though, is the fact that pirates were once welcomed to this island outrider of the Spanish Main, and that Danish governor Adolf Esmit, himself a retired freebooter, did nothing to discourage their evil traffic. Historians vouch, too, for the tale of a buccaneer who looted ships, towns, and churches on the authority of a "permit" issued by a governor of St. Thomas. Eventually, chagrined islanders discovered that the mysterious document granted its plundering owner permission to do nothing more than hunt wild pigs and goats on the island of Hispaniola!

Today, sun-seekers turn for sport to these same waters that pirates once sailed. "The Virgins," an ebullient if somewhat prejudiced skin diving enthusiast told me, "are undistinguished bits of land entirely surrounded by some of the world's most beautiful water."

To see for myself, I looked up the man whose name has become practically synonymous with water sports around St. Thomas. I expected to find him coldly raking in the profits from a fleet of boats while other

U. S. and Britain Share the Virgin Islands

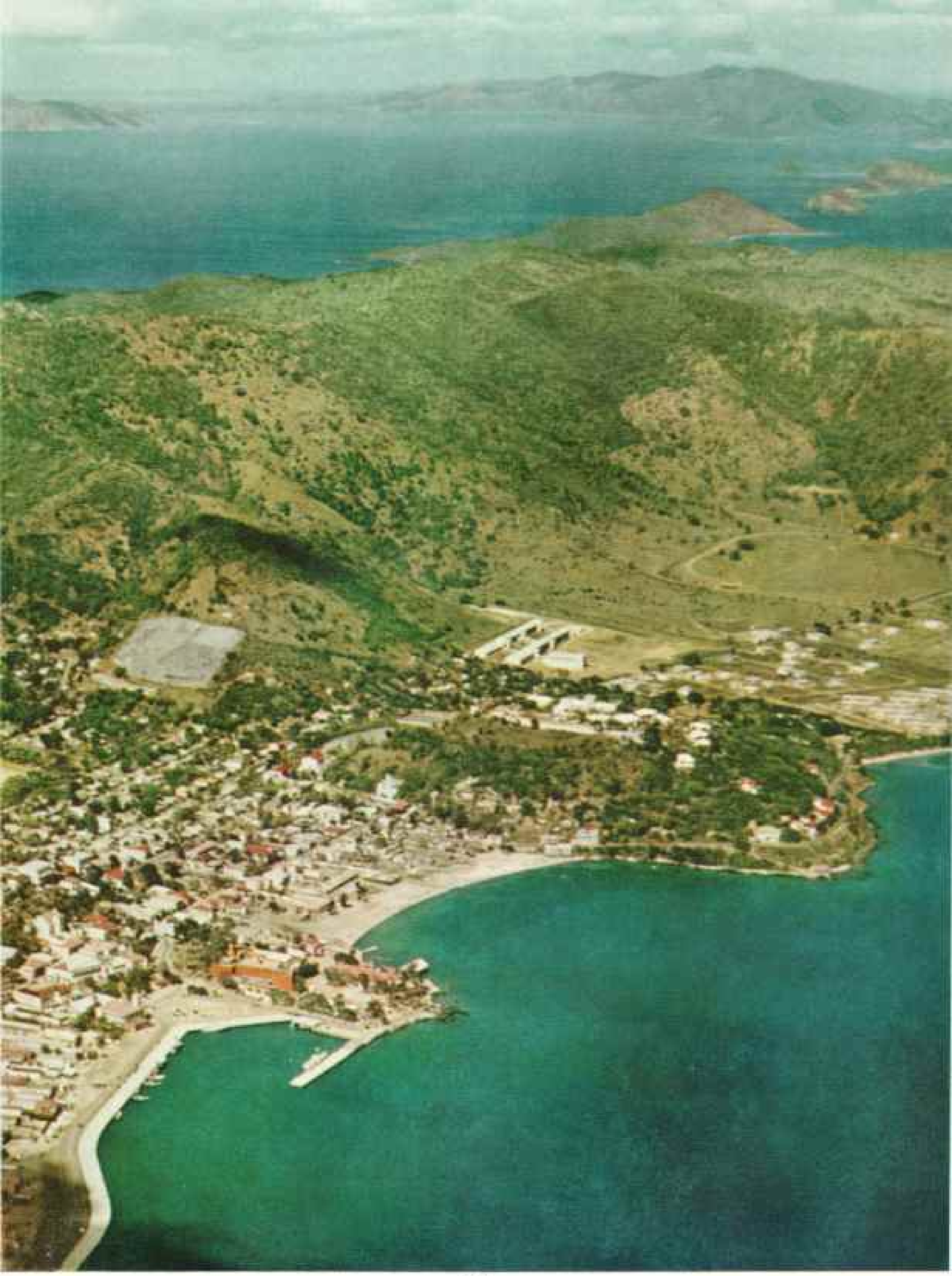
St. Thomas, St. John, and the British Virgins (center panel) belong to the same group. St. Croix (right) sits by itself, 40 miles south in the Caribbean.

The Antilles provided stepping-stones for waves of Carib Indians, who swept from South American jungles all the way to Cuba before Columbus reached the New World. The discoverer called these fierce savages *Canibales*, from which came the word "cannibal" (page 211).

© National Geographic Map
Drawn by Irvin E. Alleman

Red-roofed Charlotte Amalie Naps Contentedly Beside the Warm Caribbean

More than half the Virgin Islands' estimated 22,000 people live along the territorial capital's sharply tilted streets and blossom-bowered ways. Rain, collected on concrete-floored catchment areas, provides a reserve water supply. Fort Christian, built by the Danes in 1671, stands on the narrow point beyond the breakwater (page 212).



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Neighboring Tropical Islets Lie Hazy and Jumbled Across the Horizon

St. Thomas's sparsely settled north shore faces the Atlantic. Beyond lie uninhabited Little Tobago and Tobago Islands (left) and Jost Van Dyke; wooded Tortola thrusts into the picture at right. All four are in the British Virgin Islands. Columbus sighted them in 1493, on his second voyage.

people had the fun of running them. Instead, I found ex-Navy Comdr. Harry Elliott Harman III barefoot, stripped to the waist, and oily to the elbows as he repaired an outboard motor. He seemed to be enjoying himself. Around him in utter disorder were oars and fish spears, boats and more motors, bleached heads of coral, old life preservers, and grotesquely eroded bits of driftwood.

Released from Navy public relations duty after the war, Georgia-born Harry Harman and his bride had cruised into St. Thomas in one of the most outrageous craft the staid old harbor had ever seen. *Love Junk* was squat, ugly, and fire-engine red—but as roomy as most big-city apartments. The boat had started life, Jeanne Harman told me, as a $45,000 oil-cleaning and recovery barge. Harry bought it from the Navy, surplus, for $500—and promptly sold its tanks and pumps for just that amount. Net profit: one diesel-powered houseboat, rent free!

Barracuda Lurk in Sunken Ship

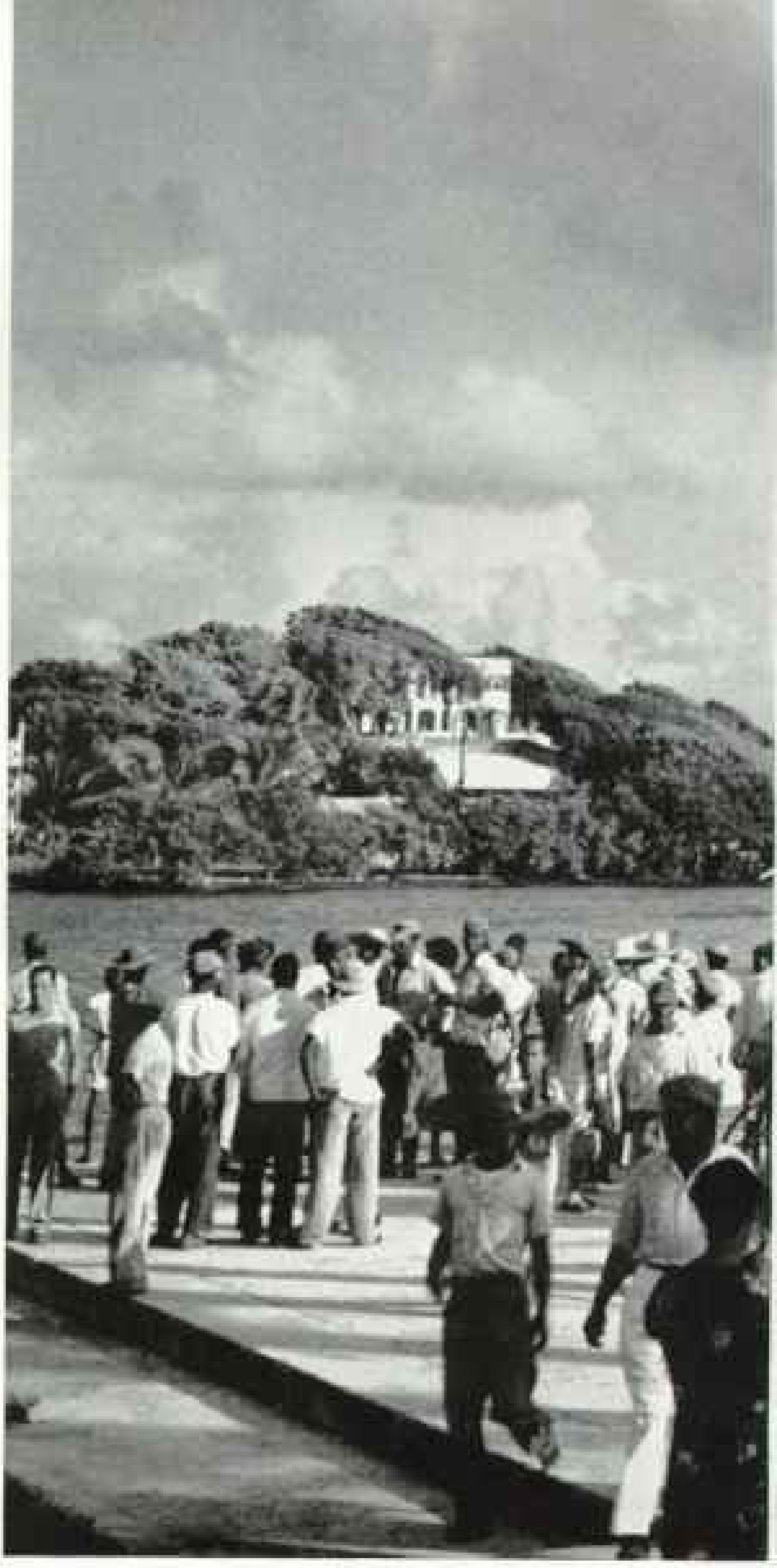
Harry and Jeanne tethered *Love Junk* to a palm tree, acquired the beginnings of a fleet, and went to work. Eventually a third member joined the Harmans' budding colony of escapists. Skin diver Randolph Boyd spent the war with the Merchant Marine; sea fever had won him over, too.

Thereafter, I spent day after day happily exploring the watery world that Harry Harman and Randy Boyd have taken as their own and that lures so many visitors to the Caribbean.

One moonlit night, with cast nets and kerosene flares improvised from Coke bottles, we splashed through the shallows opposite Water Island stalking spiny crayfish. The succulent crustaceans, dressed and frozen, become the "rock lobsters" of stateside supermarkets.

On a cloudless afternoon I tried diving with an Aqualung; 30 feet below me, sunlit coral heads and rainbow parrotfish stood out as distinctly as if nothing but air separated us. Momentary panic seized me. Like most beginners, I feared that this all-but-invisible water might not support me as safely as the murky soup I knew at home. But eventually I grew accustomed to relaxed sightseeing in the Caribbean's crystal water.

I sailed in Harry Harman's scarlet-sailed sloop *Calypso* on a Sunday morning as a rising sun gilded the awakening harbor; above us towered the masts and pennants of an anchored destroyer of the U. S. Atlantic Fleet. Later that day, through the viewing



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port of a glass-bottomed boat, I peered down at the graveyard of an iron sailing ship that foundered half a century ago. Now coral and sea fans are her only cargo; glistening barracuda have her decks to themselves.

Tawny-haired Monica Flaherty is another who came to St. Thomas for a visit and stayed to lose her heart. This talented daughter of famed movie-maker Robert Flaherty has taken island archeology as her province. In the Indian room of a new museum she showed me stone axes, graceful cooking pots reconstructed from shattered fragments, and delicately carved images that the aborigines called "zemis." All were recovered from village sites along the island's north shore.

"I've done all my own digging," she said, laughing. "Look at my hands!"

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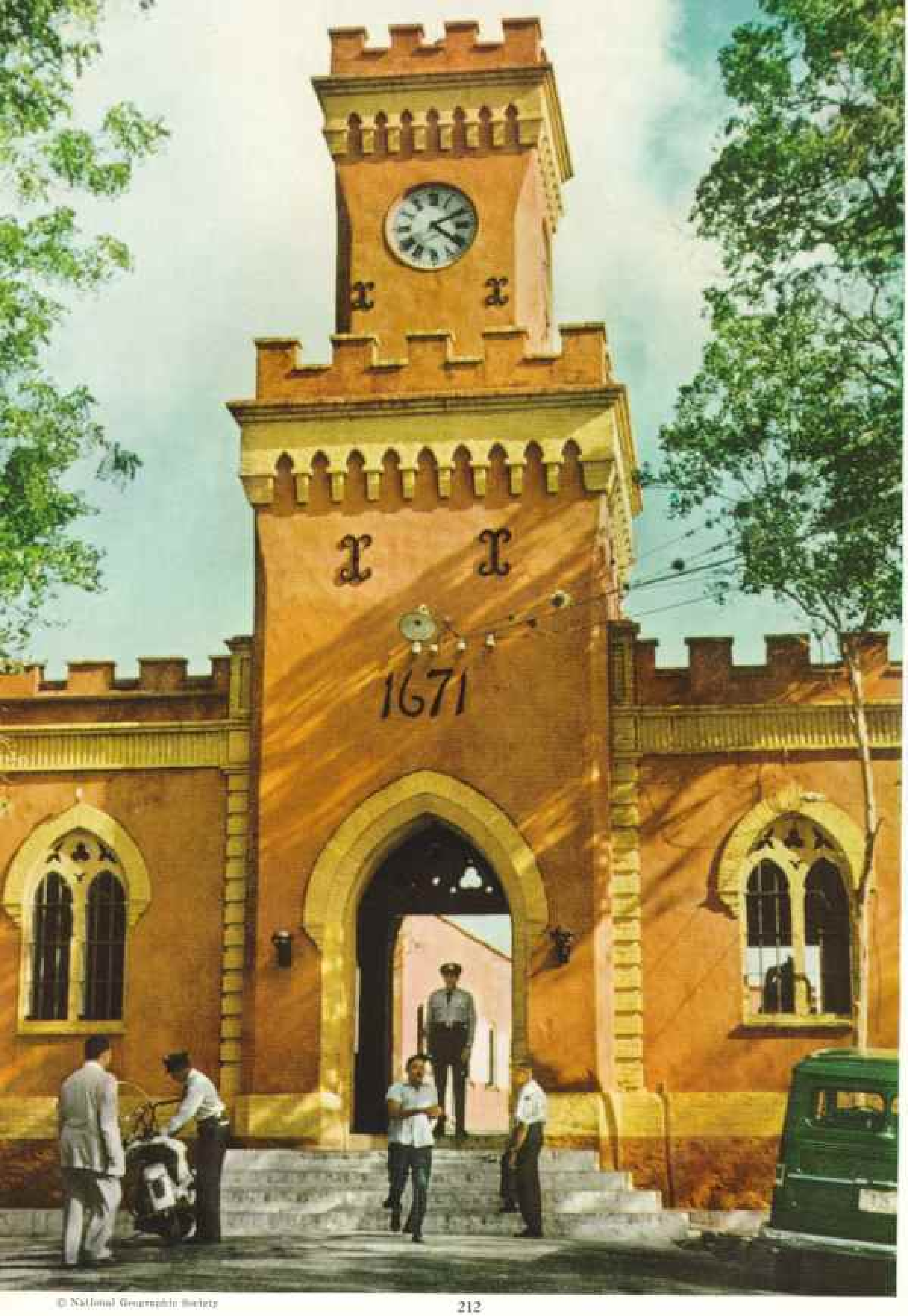
Taut Sails Pull a Trading Sloop to Sea from Christiansted's Crowded Quay

The first Virgin Islanders, Monica told me, were probably Ciboneys—a shadowy people remarkable chiefly for the great quantities of shells that mark their village sites. Peaceful Arawaks, whose reconstructed gods and goods I had seen in the museum, joined the Ciboneys, only to give way in their turn to warlike Caribs. These cannibal invaders swarmed north along the island steppingstones of the Antilles, killing the men of the tribes they encountered and enslaving the women.

But not even these truculent savages could hold out against the white man. In 1555 the Emperor Charles V of Spain, an old account declares, ordered the Indians exterminated as enemies of the faith. It was an idle threat; the last Virgin Islands native had probably long before been packed off to labor and die in the gold mines of Hispaniola.

Now it was time to sample another island. A gleaming Caribair plane bore me across a leaden sea, where Navy warships steamed in maneuvers, and dropped me amid the green fields of 23-mile-long St. Croix. From the airstrip, hemmed in by ripening cane, a taxi whisked me over the island to drowsy Christiansted, the colonial capital (page 228).

Charlotte Amalie has grown up to the hurry and bustle of the 20th century, but venerable Christiansted clings fondly to the past. The ghosts of days gone by linger over streets still bearing proud Danish names



Afternoon Sunlight Spangles the Face of Old Fort Christian, Now a Police Station

on painted signboards: Kongens Gade, King's Street; Dronningens Tvaer Gade, Queen's Cross Street; Kirkegade, Church Street; and Kompagnigade, Company Street. The last, a local historian told me, is a reminder of the Danish West India and Guinea Company's two decades of rule over the island.

The influence of Denmark pops up in unexpected places. On lovely Protestant Cay, in Christiansted's aquamarine harbor, Hotel-on-the-Cay surprises its guests with breakfast eggs from Denmark. In town, Government House still flaunts the ornate ciphers of Danish kings. Across the street a sign proclaims the Alexander Hamilton hardware store, though historians express grave doubts as to the actual site of Danish merchant Nicholas Cruger's countinghouse, where the first Secretary of the United States Treasury clerked as a boy.

When I looked in at Rasmussen's grocery on Kirkegade, the owner showed me shelves loaded with imported foods.

"A lot of island folk were growing up while St. Croix was ruled from Copenhagen," he explained. "They still expect a proper grocer to stock Danish hams and sausages."

I expressed surprise that little Christiansted can support a supermarket as lavish as most of those on the mainland.

"It really doesn't," the proprietor confided. "We're a bit too large, but St. Croix is growing; we'll just wait for the island to catch up with us."

Families Dine in Crying Room

Rasmussen's chrome-trimmed showcases and well-stocked shelves are discreetly hidden behind the cool shelter of centuries-old arcaded sidewalks. Thanks to the efforts of a group of residents organized as the Landmarks League, the best of the town's gracious old buildings have been set aside in a National Historic Site.

Lone outpost of obvious modernity is the new Alexander Theater. Residents with an eye for the town's Williamsburglike appeal decry the movie palace's neon-lighted front, which stands in startling contrast to the weathered brick and mahogany-shaded streets around it. But Crucian mothers appreciate its plush, glass-enclosed crying room, complete with cribs and a sound system of its own, where fretful infants may howl to their hearts' content.

"You should see it on Saturday," the manager told me. "Mothers bring supper for their whole families and stay in there all evening."

Back on the street, I watched a steady flow of islanders riding to market behind dusty donkeys; spotted coach dogs, perhaps descendants of animals brought to the island by Danish aristocrats, trotted beneath the axles of creaking carts. In the market I saw heaped piles of limes, squash, plantains, dried ginger, and sweet potatoes, and such unfamiliar specialties as pigeon peas, kalaloo greens, and herbs and mabi bark for "beer." Under the gaze of an ebony matriarch, live leeches swam in a gallon jar.

Cannon Guard Colonial Buildings

At Christiansted street corners, cannon stand buried to the trunnions; long ago abandoned as weapons, the rusting relics kept horse-drawn vehicles from scarring buildings as they navigated the town's abrupt turns. Other cannon, planted upright on the concrete quay, tether restless sloops from neighboring British islands. Above them I watched a man-o'-war bird wheel and dive.

So benign are year-round temperatures that few Christiansted windows wear glass. Through a classroom's open windows I heard third-graders chanting with their teacher: "Eight times eight is 64; nine times eight is 72 . . ." Inside, chalked in red, yellow, pink, and white, was a history lesson to remind me that this distant isle is yet a part of the United States: "The cotton gin," it read, "was invented by Eli Whitney. Alexander Graham Bell invented the telephone. George Washington was called The Father of His Country."

Across the sunlit street a Crucian seaman hailed a friend: "Macca, come y'ere, mahn." Among themselves, St. Croix natives answer to nicknames that newcomers find completely baffling. Even longtime residents are sometimes hard put to explain why a man is called Help Out, or Kohlrabi, or Macca, which is a kind of fish.

St. Croix museum director Cyril Marshall supplied a partial answer. "There's a man here who had a ship's stove blow up in his face. He jumped overboard to save himself. Ever since, he's been called Burn-burn."

"How about Speed?" Marshall's assistant chimed in. "That man's so slow he takes 15 minutes to get from here to the door."

Across the island, I wandered through the cool warren of a fort that has guarded sleepy

← Rainbow Hues Clothe a Carnival Merrymaker

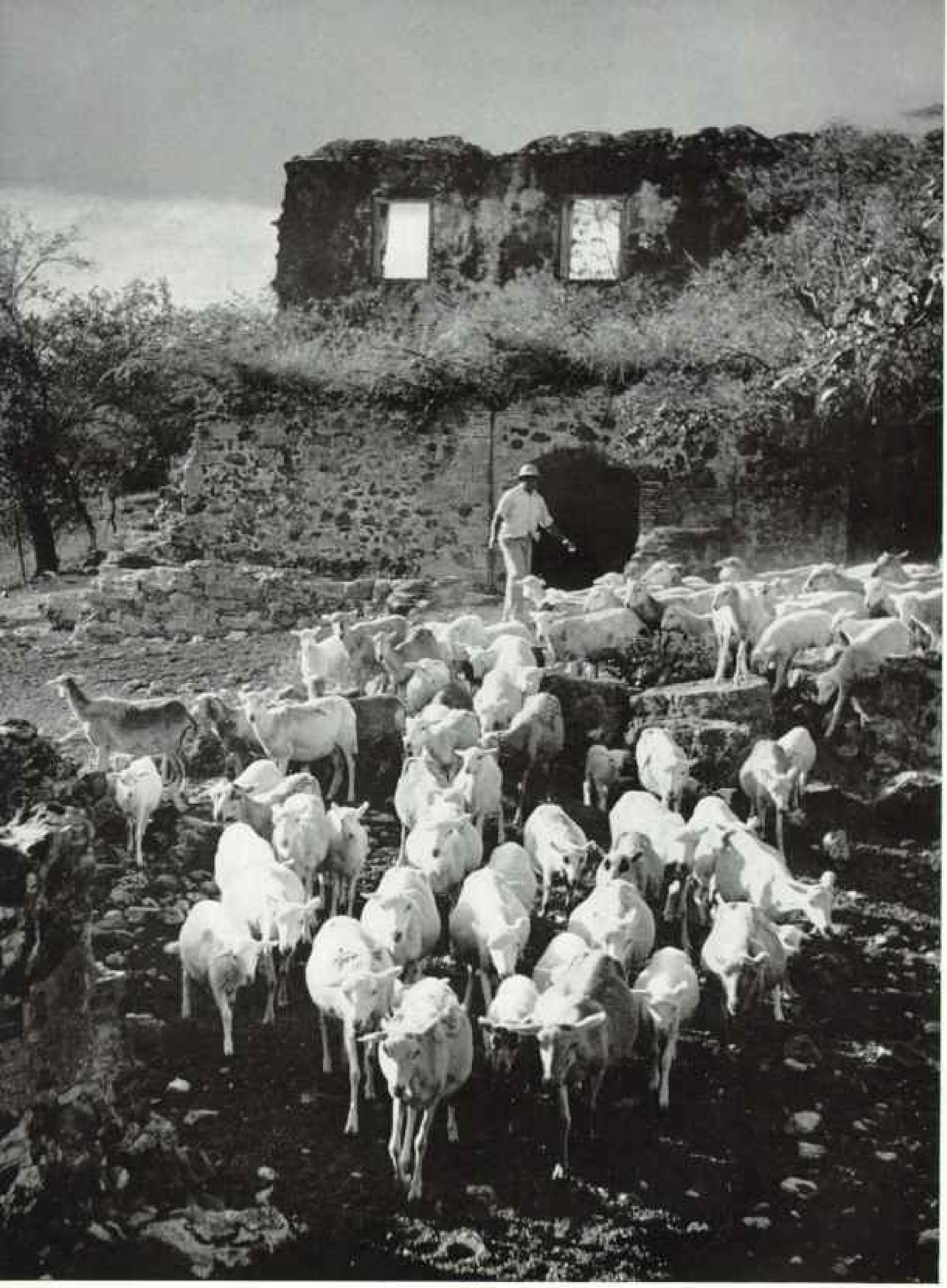
St. Thomians discontinued their spring revel about 1912. Celebrations for holidays and boat arrivals took its place. Four years ago the islanders started the carnival again. Now during the last days of April, when most of winter's paying guests have gone back to the mainland and business can be forgotten, Charlotte Amalie gives itself over to the roistering of a noisy, brightly garbed, fun-seeking swirl of humanity.

This costumed and painted reveler, who shows off before a reviewing stand erected on the baseball diamond, led the group of prize winners below.

Second-story Antics → Thrill St. Thomas Crowds

Page 215: Striding for hours about the streets and parks of Charlotte Amalie, the "Mockoo Jumby" balances expertly on stilts striped like barber poles. Traditionally he dresses in women's clothing for the carnival's starring role. Island historians believe his dance, called *bamboula*, stems from an original brought from Africa by slaves.

↓ Members of the group that won first prize parade in filmy saris on their way to the carnival's reviewing stand.



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Goats Browse Contentedly Where Sugar Barons Once Held Sway

St. Croix is studded with the ruined great houses and towering windmills of plantation days. These crumbling walls near the island's north shore once graced wealthy Greencay Estate.

Frederiksted's shallow harbor since 1760. In the entrance corridor a plaque caught my eye.

"From the ramparts of this fort," it read, "on July 3, 1848, Gov. Gen. Peter Carl Frederik von Scholten issued his famous proclamation which began:

'All unfree in the Danish West Indies are from today FREE.'"

The governor's sudden action signaled the end of human servitude in the kitchens and cane fields of St. Croix; 15 years were to pass before Abraham Lincoln issued his Emancipation Proclamation declaring slavery illegal in the United States.

Front Steps Hid Pirate Treasure

As I had on St. Thomas, I asked time after time on St. Croix if any relics of pirates were still in existence. Only Jamaican freebooter John Martel, I learned, is known to have brought his ships to St. Croix, and no trace of his visit remains. But the place has its share of legends. For what it was worth, attractive Rachel Armstrong, who presides, appropriately enough, at the Buccaneer Hotel, told me this story one evening as we watched the last rays of sunlight gild the hills behind Christiansted Harbor.

"This one is supposed to have happened on Tortola," she began, "in the British Virgins. An Englishman had a chance to rent his house; it would bring him a few dollars, so he agreed and moved in with friends.

"The evening after his tenants arrived he saw lights moving about in the distance. He went to investigate, but was met at the gate and told politely but firmly to leave. Next evening he noticed the lights again, but shrugged it off and stayed away. In the morning a native woke him; his tenants had left with not so much as a goodbye.

"Our friend found the front steps of his house torn away; where they had been was a hole still bearing the imprint of a great pot. Half concealed in the grass beside it lay one gold doubloon."

Undiplomatically, I asked Mrs. Armstrong if she thought the story was true.

"It could have happened, I suppose," she said, and laughed—"but I'll admit that no one offered to show me the doubloon!"

History, before the Danes came, left only the lightest of imprints on St. Croix. In 1493, on his second voyage, the 17 vessels of Columbus's fleet cruised for a day along the island's north coast; some historians record an encounter with fierce Carib Indians. Little more is heard of St. Croix until 1587, when Sir Walter Raleigh's colonists paused there on their way to Virginia.

In 1625 came an explosive mixture: French, English, and Dutch colonists. Friction between Dutch and English flared into open conflict. The Dutch, joined by the French, fled. In 1650 Spain claimed St. Croix but promptly lost it to the French.

Within three years France sold various West Indian properties, among them St. Croix, to the Knights of Malta for 120,000 silver livres. Twelve years later the French West India Company bought up the Maltese holdings at a profit to the Knights of 380,000 livres. Finally, long-term ownership came in 1733, when France again sold St. Croix, this time to the Danish West India and Guinea Company. Once more a profit accompanied the transfer; 750,000 livres went into French pockets.

For the next two centuries St. Croix, to the world of business, meant sugar. Driving back and forth between Frederiksted and Christiansted, I saw the crumbling ruins of one stone mill tower after another—mute reminders of the fact that St. Croix, under Danish rule, became one of the wealthiest islands in the West Indies. In 1796, 115 of these windmills, plus 144 animal-powered mills, were busy grinding the cane produced on several hundred plantations; in a record year, 46 million pounds of sugar and countless gallons of rum crossed St. Croix's docks.

Depression Fells an Island Industry

By 1935, less than a tenth as much sugar made up the annual crop; instead of feeding several hundred mills, all of it went for processing to one huge central. Moreover, two facts were by then painfully evident: Cane appeared to be the only practical crop for the island, and every pound of St. Croix sugar cost more to produce than it could be sold for.

Here was a typical paradox of the depression-ridden '30's. No investor in his right mind would back a sure loser, yet the United States Government could hardly push 12,000 Crucians onto relief rolls by letting their only means of livelihood disappear.

Out of this came the Virgin Islands Corporation. In addition to milling and marketing all the sugar produced on St. Croix, the corporation supplies power, lends money, sponsors research in cooperation with the

← Fairy Tale Enthralls First-Graders in Charlotte Amalie

The majority of islanders, including most of the territory's high-ranking officials, are Negroes. Public and private schools traditionally admit children of all races. These 6-year-olds attend a school conducted by the Episcopal Church on St. Thomas.

↓ Basket Weavers Wear High-crowned Straws

A handful of French-speaking immigrants from neighboring St. Barthélemy settled on St. Thomas about a century ago. Today some 1,500 of these shy islanders cling together in hilly Chacha Village, on the outskirts of Charlotte Amalie. Bilingual, and Catholic to a man, most of them farm or fish for a living (page 231).

These village matrons make baskets of brightly dyed straw for sale to visitors. Their hat style was brought from St. Barthélemy; both men and women wear it.

agricultural experiment station, and seeks ways of increasing the islands' scant supply of water. Losses still hover close to half a million dollars annually.

In his office at Golden Grove, within sight of Vicorp's towering sugar mill, I talked to the corporation's aggressive new president, Dr. Kenneth A. Bartlett.

"We're trying to make a business out of this," he told me, "instead of a relief operation. It's going to take time—three years or longer—but eventually the St. Croix cane industry can be put on a profitable basis. Then we can give it back to the islanders.

"The answer," he went on, "one answer, at least, is new machinery and improved techniques that will lower costs."

Old Machines Grind Cane

Later, in the noisy hubbub of Vicorp's Bethlehem mill, I understood what Dr. Bartlett had meant when he talked about new equipment. "Built in 1906," production manager M. O. Proverbs shouted above the din, as he pointed to a row of old-fashioned steam-driven crushers.

From a conveyor belt Proverbs dipped a handful of coarse, faintly brown crystals. "Taste it," he suggested. Only in texture did it differ from the sugar I had used in my coffee that morning.

"'Raw' sugar is misleading," he told me. "That's about 98 percent sucrose. Our grandparents probably never tasted sugar that pure!"

Next to costs, labor is Vicorp's major headache. "I could take you through the fields right now," Proverbs said, "and you wouldn't find a dozen young Crucians out there cutting cane. They'd rather enlist in the Army or get a job in the States."

During harvest season, he told me, the Corporation imports as many as 400 laborers from near-by British islands. The rest of the force of some 1,200 come in large part from Puerto Rican families living on St. Croix.

Admittedly, sugar is about 75 percent of the story of St. Croix. But I wanted to find out what else was going on. One morning I tried to phone Dr. Richard M. Bond, busy head of the islands' agricultural experiment station; before I was through, I ran head-on into the Crucian telephone system.

"Whom are you trying to reach?" the friendly operator asked, ignoring the number I had given her. "Dr. Bond," I said.

"Oh, he's in St. Thomas today."

"When will he be back?" I asked, to go along with what seemed to be a joke.

"This afternoon," she answered.

"Thanks," I said, skeptically. "I'll call him then."

This was my first lesson in an institution familiar to every mature Crucian. Why use telephone numbers, they inquire blandly, when you can ask for your party by name and find him whether he's in the office, lunching at home, or in town getting a haircut?

When I caught up with Dr. Bond at the U. S. Department of Agriculture's experiment station, he greeted me in tennis shoes, rolled-up sleeves, and khakis. Atop his cluttered desk lizards and snails in bottles competed for space with correspondence and reports.

"The wildlife is for the University of California," he explained. "When I have the time I gather natural-history material for its museum."

Despite the evidence in the bottles, Dr. Bond's enthusiasm for his job allows little time to spare. His activities as the hard-working head of an experimental and extension program for all three islands reach into every corner of the territory and touch every stratum of its population.

Neighbors Laughed at Hornless Cattle

"Is there any chance," I began, "of helping St. Croix get some of its eggs out of one basket and into another?"

"That's our whole program, in brief," Dr. Bond agreed. "What we hope to do is introduce supplementary crops, so that fluctuations in the sugar market won't be felt so sharply by the landowner. The profit from two or three cows, for instance, would help a farm family smooth out its income from month to month. Beans are another possibility; a hundred acres will produce enough to supply the island for a year. Castor beans grow well here. There is a good market in Puerto Rico for goat meat, and the animals thrive on land that's worthless for crops."

I asked Dr. Bond about cattle; the island's sleek chestnut-coated animals were unlike any I had seen before.

"They were developed right here on St. Croix," he told me. "Among other advantages, they are one of the tamest, gentlest breeds on earth. One day you're going to see St. Croix cattle all over the West Indies.

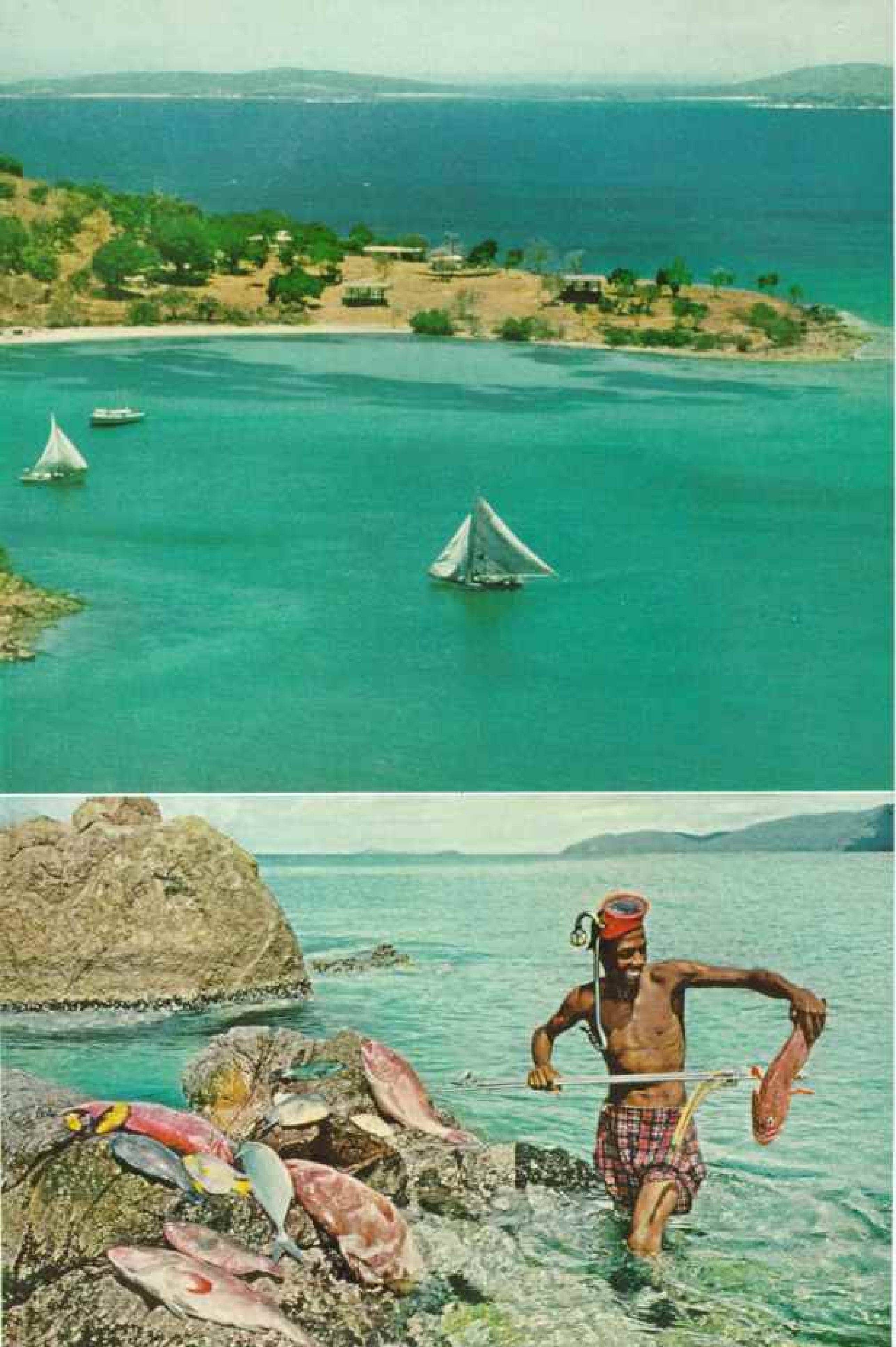
"In 1914, a decade before the King Ranch

↑ Solitude and Quiet Enrich Idyllic St. John

The nine-mile-long island may become the site of Uncle Sam's 29th national park. A tract of some 5,000 acres has been offered to the United States by philanthropist Laurance S. Rockefeller. Lacking paved roads, movie theaters, signboards, and supermarkets, the island's 749 people live a simple, peaceful life in an atmosphere of year-round summer. Here native sloops coast into the harbor of Cruz Bay.

←Red and yellow watercolors brighten petroglyphs chipped by Indians beside a St. John forest pool. The symbols presumably were old when Columbus discovered the islands.

→Page 221: Spearfisherman lands a rainbow catch at Water Island in St. Thomas Harbor.



in Texas started to develop its Santa Gertrudis breed, plantation owner Bromley Nelthropp decided he wanted a heat-resistant strain that would combine extreme gentleness with good milk and beef production.

"It was a big order; people laughed at him when he crossed our local Senegals, which had come from west Africa in the 18th century, with Captain Kidd, a $2,000 Red Poll bull he had bought from the British experiment station in Trinidad. Captain Kidd sired only hornless calves, so the British were happy to get rid of him.

"Nelthropp's neighbors laughed louder than ever when he ruthlessly butchered any of his crosses that showed traces of horn. The market then was for work oxen for export to Puerto Rico, and the type of yoke used there had to be lashed to the horns. But he wanted a breed that would be absolutely safe.

"Nelthropp had the last laugh," Bond concluded. "Tractors killed the demand for draft oxen; milk and meat suddenly became important."

As far as Nelthropp was concerned, development of his St. Croix breed was a labor of love. To some of his island neighbors he gave animals; others, I heard, won them from him at the card table. Not long before Nelthropp's death, Ward M. Canaday, Willys-Overland president and number-one landowner of St. Croix, bought most of the Nelthropp herd for his estate at Annaly. These were the animals I had seen.

Rats Outwit Rikki-tikki-tavi

I asked Dr. Bond about the mongoose problem. Time after time I had watched these reddish-brown, weasel-like animals, apparently unafraid of humans, as they disappeared leisurely into roadside brush piles. The little killers, familiar as the Rikki-tikki-tavi of Kipling's *Jungle Book*, were brought from India to rid the islands of rats. In Jamaica, I had heard, the animals killed off the snakes and then started in on frogs, birds, lizards, and domestic poultry. The rats took to the trees and are still doing fine!

"Getting rid of the mongoose here is not desperately important," Bond told me, "although it would be desirable. Sportsmen dislike them because they curb our population of quail and other ground-nesting birds. And naturalists regret the extermination of an interesting, harmless snake and the near extermination of a little lizard that is found nowhere else in the world. And, of course, mongooses are fond of baby chicks.

"Aside from that, the only serious danger is that the mongoose might act as a reservoir for rabies if it were ever brought to the islands. So far, the disease is unknown here."

The Indian mongoose is not the only animal that has been introduced to the Virgins. White-tailed deer, brought from the United States in the early 1800's, occasionally raid the flower gardens of St. Croix. On St. Thomas, deer from the Aransas National Wildlife Refuge in Texas have been released to take the place of an older strain that has all but died out, and bright-feathered parakeets from distant Curaçao have also taken up residence on the island.

Airborne Seeds Scattered from Planes

When I ran out of questions, Dr. Bond took me on a tour of the station. In an outbuilding he showed me wooden trays where winged, airborne seeds like those of a maple lay drying. Above our heads, sacks of the same seeds hung from rafters.

"Mahogany," he explained. "The 4-H Club children in our rural schools gather them. So far, they've brought us more than half a ton, and seed is still coming in."

The seeds, Dr. Bond told me, would be used by Vicorp for reforestation on all three islands; some of them would be dropped over suitable areas from planes.

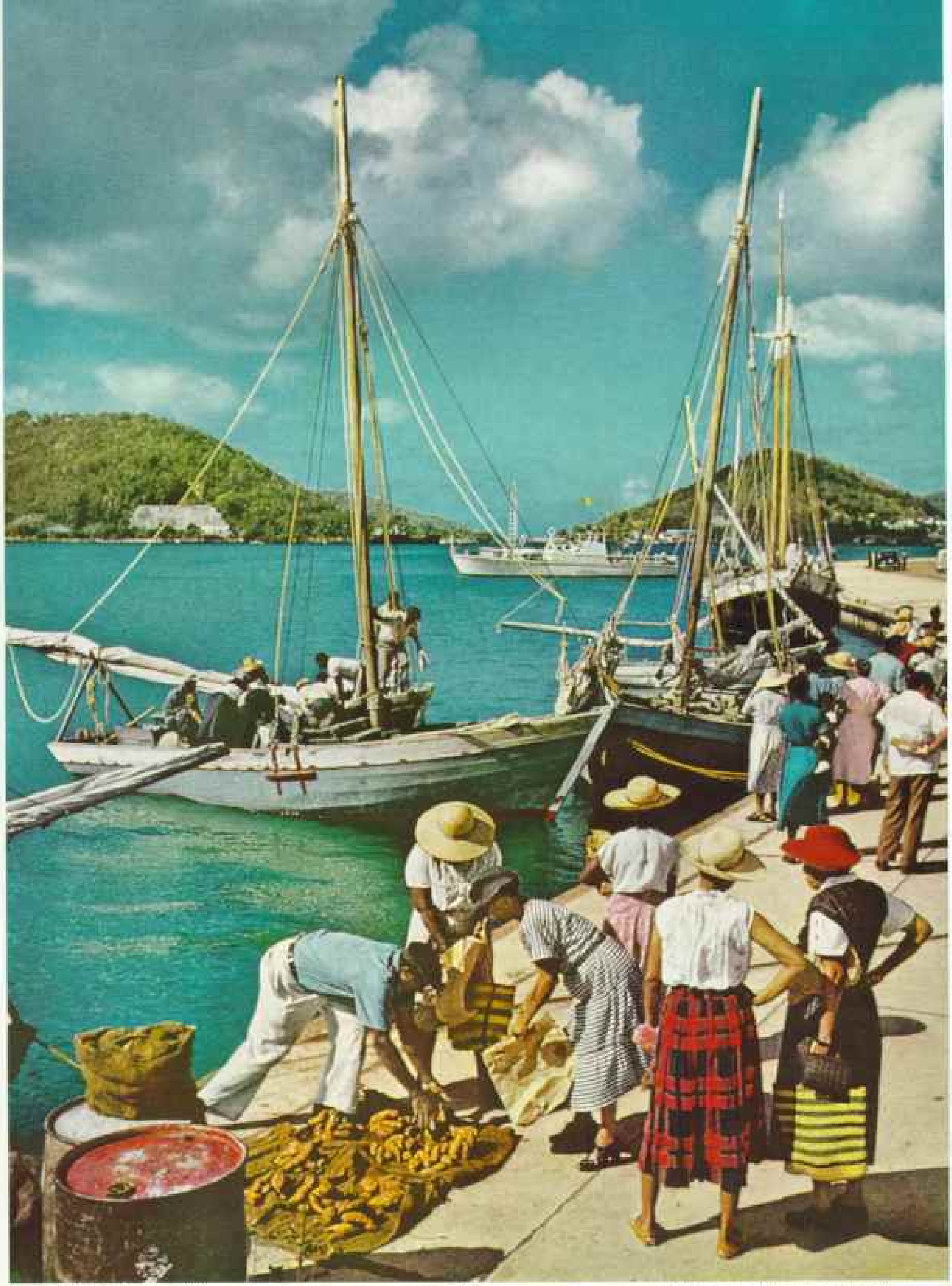
"It's a long-range project, though," he said, and laughed. "It takes 75 or 80 years to grow marketable timber."

Back in Christiansted that evening, I went to see real estate man George Van Riper. Friends of my family were looking for an island to which they might retire on a modest annuity. Would I, they asked, look around?

St. Croix and the neighboring islands, I found, are not budget paradises.

"People used to come down and buy good land for $100 an acre," Van Riper told me. "Today they'd pay closer to $1,000."

I asked about the cost of living. "St. Croix, I expect, is going to remain a place for the fairly well to do," he began. "True, there's no heating problem and no trouble about clothing." He gestured toward his own open-throated shirt and summer-weight slacks. "But even so, a family of two will need $50 to $100 a week to get along comfortably, not counting the cost of house and land"—he thought for a moment—"and



John Scofield, National Geographic Staff

Produce of the Caribbean Flows into Charlotte Amalie's Seaside Market

Island folk buy their simple needs—charcoal, fruit, fresh fish, and vegetables—from native sloops that ply the sea between St. Thomas and neighboring Dutch, French, and British islands. The black-hulled two-master came from Haiti. Merchant in foreground sells sweet potatoes and starchy tania root.

not counting servants and trips back to the States when our island's simple diversions begin to pall. And income taxes, you know, are the same here as in the States."

Few of the continentals who have settled on St. Croix, I noticed, are content merely to bask in the sun. A retired advertising executive indulges his love for fine craftsmanship in a woodworking shop, where he and a handful of island-born employees turn native mahogany into superb reproductions of West Indian antiques. A red-headed ex-dancer, once understudy for screen comic Danny Kaye, makes jewelry. And a Pittsburgh businessman, who sold a successful precision-spring manufacturing plant in order to move with his family to this land of year-round summer, offers accommodations to a handful of paying guests on his restored plantation.

Standard Oil Company engineer Russell P. Ewing, who retired in 1951, raises orchids. In lush garden areas surrounding a house that looks down on Christiansted's picture-postcard harbor, he showed me purple cattleyas the size of a dinner plate and white insectlike blossoms scarcely an eighth of an inch across. "You can see why I call these mosquito orchids," he said.

New Law Boosts Territorial Income

Back in St. Thomas for a day I dropped in on the government secretary, who ranks next to Gov. Walter A. Gordon among island executives. Before his appointment in 1954, Charles K. Launch had served as White House protocol officer under Presidents Hoover, Roosevelt, Truman, and Eisenhower.

In his airy office in Charlotte Amalie's porticoed Government House, Launch handed me a forbidding-looking booklet: *Public Law 517—83d Congress.*

"Thanks to this," he said, "the islanders are going to have a lot more to work with than they ever had before. It's a revised Organic Act—a new constitution, in effect."

Congress, he explained, has agreed to match the territorial government's revenues, penny for penny, out of taxes levied on Virgin Islands products coming into the States. The new arrangement will add some $3,000,000 a year to territorial income.

"So many things were impossible under the old fiscal setup," Launch went on. "The islands' educational system, for instance, needs improvement. In the past there was only about $98 a year for each child; now there should be about $225.

225

Carving Trunk Bay Woos Bathers and Boatmen

Most island beaches lie empty and inviting the year round. By St. John standards, this glistening sand strip is crowded.

Fritz Henle

"An increased public health appropriation will help make the Virgins not just the healthiest places in the West Indies, but among the healthiest in the world.

"St. Thomas, particularly, must have a complete water survey. It's almost totally dependent upon rain, you know. Last summer was typical; Navy tankers saved our skins by bringing us about 7,500,000 gallons of water from Puerto Rico.

"Most important," he concluded, "is self-respect. The Virgins are small islands with few resources; they can never be as much of an asset to their country as Hawaii or Puerto Rico. But they can stand on their own feet."

Claunch's face relaxed into a smile as he changed the subject. "Have you seen the other islands?" I told him I had visited St. Croix and would now go on to St. John. I had deliberately saved it until last.

"Good," he said. "You'll find it completely different. And we hope there'll be a park there soon."

Before I left Washington, D. C., I had heard of the plans for this newest of Uncle Sam's recreation areas; bills are pending in Congress to set aside up to 9,500 acres as a national park. Centering around a tract of 5,000 acres offered by philanthropist Laurance S. Rockefeller, the park would eventually embrace about two-thirds of an island that has kept itself surprisingly free from civilization's inroads. Rockefeller's hope is to keep it that way.

"When you get to St. John," Claunch directed, "give my regards to George Simmons."

Island administrator Simmons's rambling old house at Cruz Bay was once a Danish fort (page 220). Now it doubles as residence and jail; outbuildings house the administrator's office, courthouse, post office, police post, and, until the completion recently of a spanking new four-bed hospital, a clinic to boot. While the administrator's assistant sorted mail that had come in by boat from St. Thomas, I asked him how the people of St. John, all 749 of them, would feel about sharing their island with the rest of the United States?

"Most everybody likes the idea," he told me. "Park development would bring increased employment and a better standard of living, and yet our hills would not be defaced with billboards and hot-dog stands."

Before I left St. John's tiny, somnolent capital I stopped to chat for a moment with the burly sergeant who bosses the island's four-man police force. "No, mahn!" he told me vehemently. "There's no crime here. Folks is too honest!" There hadn't been a murder, he said wistfully, since 1939. Then the sergeant flashed a wide grin as my guide turned his jeep toward Coral Bay and the island's forest-tangled center.

Life Is Simple on Wilderness Isle

For the next few days I found myself about as far from the complexities of 20th-century living as is possible under the United States flag. This never-never land has no telephones and no semblance of a newspaper; no movie theaters, and practically no stores. Only jeeps can cope with its hair-raising roads, and the island boasts but a handful of the rugged little vehicles. There is no landing field and for the majority of homes, no electricity.

What St. John has, though, is enough to warm the heart of the sternest city dweller. Its gemlike beaches lie inviting and empty (page 225). Trails thread forests that are a plant-lover's paradise. On every side sapphire waters beckon. And, mainly, there is solitude. Walk half a mile at most from any of the island's settlements and you can spend a week without seeing another human. As Laurance Rockefeller remarked to me later, while we looked down from his 56th-floor New York office into Manhattan's teeming canyons: "St. John is a place where people can go to face themselves."

For the whole of my stay on the island, genial Linda and Ridge Folk were my hosts. With typical St. John hospitality these ex-Floridians turned remote Estate Lameshur over to me as if it were my own. Blond Linda greeted me with a choice of local or "store-bought" food; when I elected St. John cookery, she regaled me with conch chowder, spiny lobsters, broiled papayas, kingfish, and baked tania root that tasted like a cross between potato and yam.

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←Old Glory Waves Atop a "Pirate" Castle

A local tale has it that a buccaneer named Bluebeard concealed the skeletons of six wives in this blue-shuttered tower overlooking Charlotte Amalie harbor. Actually, the structure was begun in 1666 by Danish governor Erik Smidt. Called Frederiks Fort, it guarded the city until 1735. Now part of a hotel, the top floors of the venerable tower will soon boast guest rooms with round beds.

Old World Atmosphere Pervades Colonial Christiansted

The Arawak Indians of St. Croix called their homeland Ay Ay. Before the United States flag was raised in 1917, the island knew the authority of French, Dutch, English, and Spanish colonists. The Knights of Malta owned it briefly; and Denmark ruled for almost two centuries. In 1927 the Crucians, along with their neighbors on St. John and St. Thomas, became U. S. citizens.

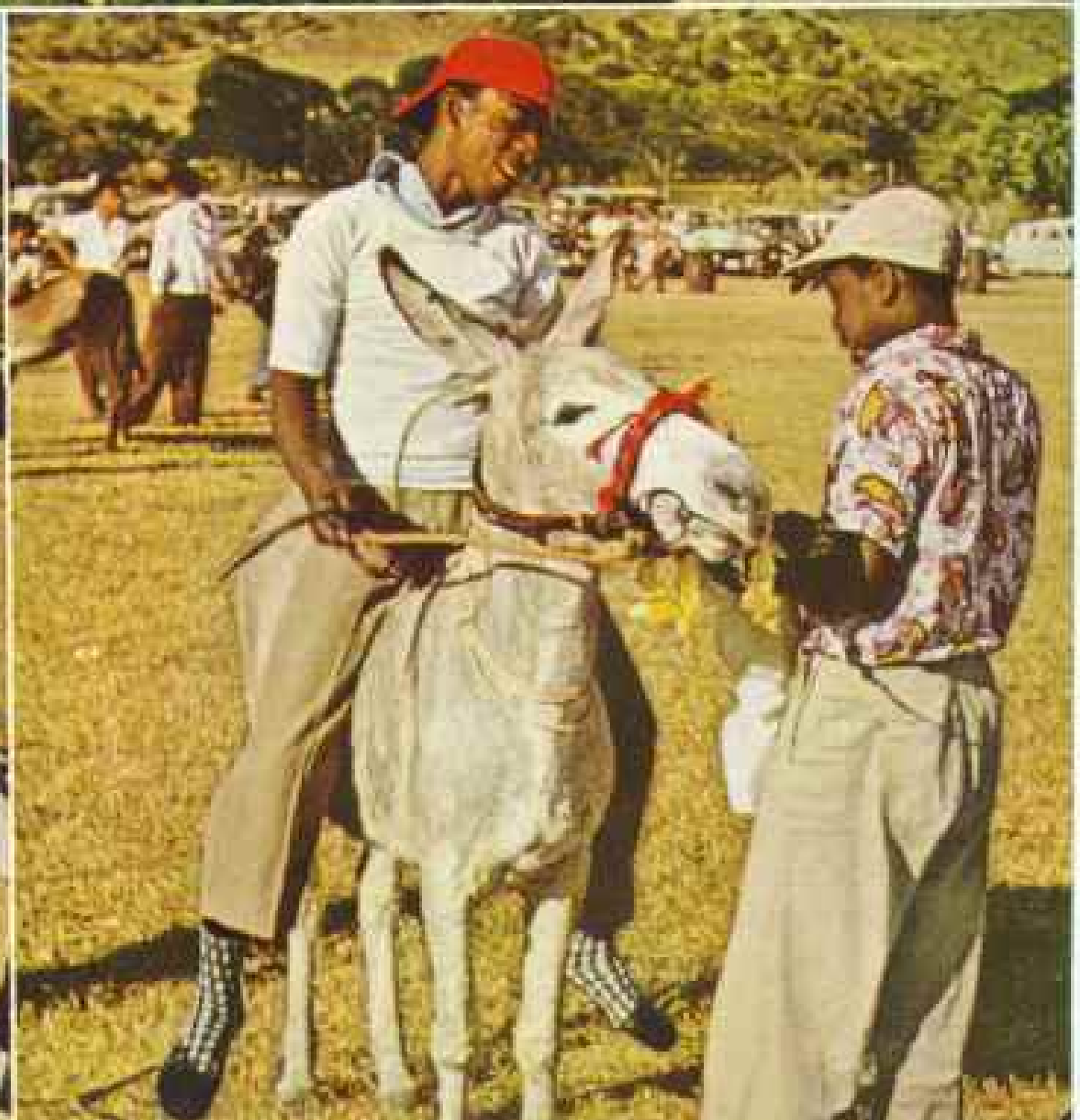
The heart of Christiansted, the islands' drowsy 18th-century capital, has been designated a National Historic Site. Like Williamsburg's, its streets and buildings will continue to reflect the quiet dignity and calm of bygone days.

Flags at right fly over the customhouse and post office. Palms at left screen a fort completed by the Danes in 1740. Building in center houses library and museum.

"Jonkeys" Race for Charity

The St. Croix Jonkey Club has as its avowed purpose the preservation of a time-honored mode of transport: the donkey cart. Annually the club stages events in which the animals are wheedled, bribed, or pushed by their teen-age drivers around an island racecourse. As a by-product of the annual outing, some $10,000 has been collected for charity.

Page 229, lower: Stockinged jockey appears to outweigh his pint-size mount. ↓ A donkey reluctantly approaches the finish line.



With Ridge Folk I watched an island fisherman lift his pots in choppy Europa Bay. A flopping, shimmering rainbow spilled into his skiff—vivid parrotfish, which the islanders call "goot-too," and scarlet squirrelfish; boxfish and lancet-armed "blue doctors," or surgeonfish; harlequin Nassau groupers and an old-wife, the brilliant queen triggerfish, which the natives believe is occasionally poisonous. Characteristically, the fisherman gave it back unhurt to the sea.

The indefatigable Folks saw to it that I missed no square mile of their island home. As we strained skyward from sea-level Lameshur in a jeep that panted for water, Ridge pointed out a continually varying tropical flora. "Wild tobacco," he noted calmly as we stalled on a heart-stopping near-vertical hairpin. I could see the spear-shaped leaves clustered at the base of a kapok tree.

Scaling a precipitous goat track, we neared little Bordeaux, highest settlement on the island. Within a mile Ridge identified dozens of useful plants: the rich-leaved bay, from which bay rum is made; plums, cashews, soursops, mammee, and breadfruit, and the "apples" of the tropics—star apple, custard apple, and sugar and bell apples. Hat palms drew lacy patterns against the sun. Vines from which island fishermen weave lines and traps swayed from the trees.

Manchineel Lingers in St. John Bush

At Reef Bay, on St. John's lonely south shore, we paused by the ruins of an old sugar mill to gather oranges and limes gone wild; laden coconut palms towered above our heads.

Here I saw my first manchineel, the dreaded "death apple" of the West Indies. Columbus's crew had recklessly tasted this strange fruit "and upon only touching them with their tongues, their countenances became inflamed, and such great heat and pain came over them that they seemed to be mad. . . ."

Wherever men have settled in the West Indies, they have tried to stamp out the manchineel. Even on St. John it grows only in the remotest corners. As we passed one of the trees, which looked like a contorted, almost leafless apple, I threw a sharp rock that split the fragile bark. Milky, caustic sap pulsed from the wound as if a heart were beating within the trunk.

At Laurance Rockefeller's Caneel Bay Plantation, on the island's western end, bulldozers and construction crews were already at work developing the facilities that are sure to be needed when word of St. John's attractions gets around. From Mary Point I climbed through thick brush to the ruins of Annaberg; viewing the gutted great house and its crumbling mill tower made it easier for me to realize that St. John, in its sugar-raising days, supported more than three times its population today. At Annaberg and Reef Bay, branding irons lay rusting forgotten in the ruins; cattle, too, represented wealth on St. John a century ago.

Even this tiny isle has its pirate tales. As we jounced over Centerline Road on my last evening, Ridge pointed to a hole dimly visible beneath the roots of a roadside tree: "There's a story here that a stranger came to the island and then disappeared suddenly. The natives say he took $35,000 in gold out of there."

Park Idea Originated in 1939

Back on the mainland again, I flew to New York to see the man whose personal generosity is responsible for the proposed Virgin Islands National Park. From the moment we met it was evident that a warm and genuine enthusiasm is back of his interest in this distant bit of real estate.

"I grew up with a family tradition of conservation," Laurance Rockefeller told me. "My father, you know, assisted in the creation of Grand Teton National Park.* St. John offers another perfect opportunity."

This modest grandson of John D. Rockefeller gives credit for the park idea to someone else. "The possibility of setting a part of St. John aside for future generations first came up in 1939," he said. "With World War II the plan was shelved. Then a couple of years ago one of my island neighbors, Frank Stick, of Kitty Hawk, North Carolina, sent me a copy of the original proposal and suggested that the idea be revived. We had never met, but I agreed that we should get together and discuss the possibility. To my complete surprise, Stick rounded up signed options on about half the land we needed."

Apologizing because it had to be couched in bald terms of dollars and cents, I asked Mr. Rockefeller what the extent of his gift to the people of the United States would be, provided, of course, that Congress accepts his

* See "Wildlife Adventuring in Jackson Hole," by Frank and John Craighead, National Geographic Magazine, January, 1956.

Vegetables for Charlotte Amalie Tables Grow on a Terraced Hillside

French-speaking farmers till most of these plots at Estate Dorothea. Beyond lie Inner and Outer Brass Islands.

Thanks to a Philanthropist's Foresight, These Ruins May Spring to Life Again

Laurance S. Rockefeller (second from right) has offered the United States some 5,000 acres on sparsely settled St. John. Bills to establish the 29th U. S. national park on the island are pending in Congress. Here, busy with blueprints of the Caneel Bay development plan, are George Starling, who until recently led a Baptist congregation on the island; Julius Sprauve, St. John representative to the Virgin Islands Legislature; and conservationist Frank Stick, who revived plans for the park (page 230). Henry Beebe (right) superintends construction of the project. Walls of Caneel's sugar mill rise in background. If Mr. Rockefeller's plans come true, park visitors may one day see the venerable structure restored to operation.

offer. "There's no secret about that," he reassured me. "We've spent about $1,000,000 on land, and expect to spend as much more to finish the job. And $2,000,000 has already been spent developing hotel facilities, with considerable future development to be done.

"We hope to get the land above Caneel Bay back into production, so that visitors can see sugar cane and tropical fruits actually growing. Eventually we'd like to restore the entire plantation area."

This, I knew, would be in addition to improvements scheduled by the National Park Service. In Washington, NPS director Conrad Wirth had outlined to me the Service's plans provided St. John joins the ranks of national parks: a ranger staff, and roads and trails so that visitors can see the island in comfort, plus a museum and trailside exhibits.

As I turned to leave, Mr. Rockefeller expressed his pleasure that there would be an account of the Virgin Islands in the NATIONAL GEOGRAPHIC MAGAZINE. "It's time Americans heard more about these islands of theirs.

"That reminds me of a story. I don't know that it's true, but it's pertinent. A plea was being made in the House of Lords; funds, it seems, were desperately needed for Britain's Virgin Islands. The speaker was building an eloquent case when a rural member interrupted to ask where, exactly, were these little outposts of empire.

"The speaker admitted that he wasn't sure. 'But I'm certain,' he volunteered, after a thoughtful pause, 'that the Virgins lie an appropriate distance from the Isle of Man!'"

The Making of a New Australia

Postwar Immigrants Invigorate the Land, Build Up Industries, and Add Spice to Life in the Growing Cities

By Howell Walker

Foreign Editorial Staff, National Geographic Magazine

With Illustrations from Photographs by the Author

ALONG the waterfront, dawn hung like damp gray flannel; clouds glowered darkly and the air felt heavy. Another wet day for Melbourne, I thought.

But for 1,500 passengers of the *Fairsea*, this particular morning held an exciting freshness, a personal promise. Approaching Australia as emigrants from Europe, they looked toward a new land, new homes, and a new way of life (next page).

They would, in fact, become "New Australians"—the name for postwar immigrants. Since World War II a million of them have arrived, boosting the island continent's population above 9,000,000. And Australia, about nine-tenths the size of the United States, wants and plans for millions more.

Populate or Perish

"This Commonwealth is a juicy plum," Premier Thomas Playford of South Australia told me, emphasizing the abundance of foods and raw materials in the country. "Only way to protect it," he said, "is to have enough people to hold it."

As it is, however, immigration is not rapid enough to keep up with the industrial development taking place. Annual immigration amounts to about 125,000. Some persons, including Premier Playford, feel the figure should be increased to 250,000 or higher in a gradually expanding program.

See what immigration has done for the United States;* think of what it can do for a young nation like Australia.

To meet a shipload of immigrants, I waited at Port Melbourne for the *Fairsea* to come in. On the pier I mingled with former Europeans here to welcome friends and relatives. German, Greek, and Italian voices rose excitedly around me as the immigrant vessel drew nearer. The day brightened.

Tugs pulled, pushed, churned, and grunted until the liner lazily docked. Commands, megaphoned from ship to shore, were drowned in a noisy sea of greetings. Men, women, and children packed the decks, jammed the railings; heads popped from portholes. To someone aboard, a youth beside me hurled a chocolate bar. Flowers, too, flew through the air.

Fathers struggled under bundles, boxes, and bags. Mothers hugged babies; wide-eyed boys and girls stayed close to parents. Filing down the gangplanks, they passed through customs and climbed into a waiting train. I took a seat in a compartment with seven Germans.

When 650 immigrants filled the cars, we began the 6-hour journey to Bonegilla Reception Centre in northern Victoria (map, page 241). Another train with as many immigrants followed later. The rest of the shipload remained in Melbourne or continued by sea to Sydney.

We of the same compartment introduced ourselves. There were Mr. and Mrs. Willi Pfeiffer and 6-year-old daughter Karin from Augsburg (page 236); Walter Milenz and his wife Hilde, with 5-year-old son Jürgen, from Mannheim; and a young man, Ludwig Kratzmeier, also from Mannheim.

Willi used to work in a factory making diesel engines. Walter assembled tractors. Ludwig was a barber.

Ach, So—Australia!

What would they do in Australia? They wondered about it, gazing through the windows upon their new world. At Bonegilla, employment experts would interview them and direct them to jobs they best fitted. Their work would take them to cities, farms, small towns, or widely scattered rural projects.

Everything they could see from the train interested the Germans. They commented on the prevalent bungalow-type house, automobiles driving on the "wrong" side of the road, endless wire fences, vast expanses of buff-colored grass, a lonely homestead.

* See "Immigrants Still Flock to Liberty's Land," by Albert W. Atwood, National Geographic Magazine, November, 1955.


PANAMA

Karin clapped her hands with delight at the sight of a foal. Locomotives puffing on sidings fascinated Jürgen. Ludwig had apparently never before seen a steel windmill, so essential in this drought-conscious land.

"Coca-Cola *überall*," said Mrs. Milenz, recognizing the familiar soft-drink sign.

Although Walter Milenz had worked in a German factory, he had set his heart on farming in Australia. He asked about cattle, learned that the country grazes 15,500,000 head, and wanted to know the names of different breeds. When we stopped beside railway cars packed with sheep, he studied them intently.

"Merinos?" he guessed.

I guessed so. Most of the fleece produced in Australia comes from Merinos. Last March the country's sheep population reached 131,000,000—an all-time high. The annual wool clip brings $900,000,000 or more.

"Maybe in four or five years I can have my own farm," Walter said, as if to himself.

His face lit up with a smile at the thought of it. And quite unconsciously, I think, he slipped an arm around Hilde.

Willi Pfeiffer spoke of his chances of getting a job in an airplane factory. Jet propulsion, not pasture improvement, excited him; he hitched his future to engines with wings. On a piece of paper I wrote, "Try Commonwealth Aircraft Corporation, Melbourne, Victoria," and handed it to him.

Irmgard, Willi's wife, leafed through an Australian magazine, glancing at pictures and trying to read captions. Karin began to doze; she had been up since 5 that morning.

We reached Bonegilla late in the afternoon. Under big gum trees buses waited to take us to the reception center. There was something incongruous about German *Lederhosen* (leather breeches) and eucalyptus trees in the same picture. But I knew I'd become used to it, for lederhosen and eucalypts last a long time.

After the second train from Melbourne arrived, a total of 1,300 Europeans entered the reception center that day. An official broke the figure down as follows: 700 Germans, 300 Greeks, 150 Austrians, and 150 persons from Russian-occupied lands.

A town in itself, Bonegilla Reception Centre contains 23 blocks of housing units. Each can accommodate between 300 and 400 persons and has a central kitchen and two mess halls (page 237). Also, there are churches, schools, kindergartens, hospital, bank, fire and police stations, theater, the usual shops and offices, and recreational facilities.

Bonegilla Funnels Men to Jobs

To give me an idea of the community, administrative officer Pat Smith, himself a postwar emigrant from England, drove me around the area. During World War II it had been an Australian Army camp. The numerous corrugated-iron buildings are not beautiful, but they are practical.

The purpose of the reception center is to allocate immigrants to suitable occupations as soon as possible. So everything at Bonegilla, purely a staging base, hinges on its employment office staffed with Australian interviewers and European interpreters.

I watched men from different parts of Europe explain their capabilities and tell of previous employment. Earnestly and anxiously, I feel sure, each sought a place in Australia to live peaceably by honest work. I wondered where on this vast continent these New Australians would end up.

"About a third of the migrants go into city industries, a third into farming, and a third into unskilled jobs in rural areas—hydroelectric power projects, for example," said a supervisor of the employment office.

Australia needs people, millions of them. As nothing else could, World War II brought this fact home to the sparsely populated, faintly industrial, and highly vulnerable continent in the strife-bound Pacific.

A population of only about 7,000,000 was distributed along desirable bits of the country's 12,000-mile coastline, on isolated sheep and cattle stations (ranches) in the lonely

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Page 234

← ***Fairsea* Arrives at Melbourne with 1,500 New Australians**

A million persons, most of them from Great Britain, continental Europe, and North America, have arrived in Australia since World War II. Thanks to immigration, the Commonwealth's population has increased beyond the 9,000,000 mark.

Each year the Australian Government pays the transportation charges of thousands; others arrive on their own. Some individuals have sponsors, who pay all expenses and guarantee jobs and housing.

This welcoming party consists largely of former Europeans, now called New Australians. They await friends and relatives from Germany, Greece, and Italy. Greater Melbourne, Australia's second city and capital of Victoria, has a population exceeding 1,520,000. Largest is Sydney (page 256).

Immigrants Learn a New Tongue and New Tastes

♠Mr. and Mrs. Willi Pfeiffer and daughter Karin, who recently called Augsburg, Germany, their home, study a German-English phrase book aboard the train carrying them from Melbourne to Bonegilla Reception Centre in northern Victoria (opposite). They arrived on the *Fairsea* (page 234).

➔Sister M. Mulqueeny (left) and her German assistant watch over children at the Bonegilla nursery. Murals were painted by an immigrant Czech.

Page 237, lower: Czech chefs serve the noon meal to Germans in a wartime army mess hall at Bonegilla. Dishes hold mutton, potatoes, peas, and stewed fruit. Tea and milk are the drinks.

➔Newcomers learn English at cost-free evening classes, by correspondence courses, or on radio programs. This Australian volunteer teaches in Cooma, New South Wales. His students came from Bulgaria, Poland, Italy, and Germany.


SCHOOL

interior, or crowded into the half-dozen State capitals.

War revealed to what a dangerous degree Australia relied on imports for tools to work with or materials to fight with; manufacturing industries had for a long time taken a secondary role in this agricultural land where prosperity depended on the price of wool.

Overnight, the so-called Far East had become Australia's Near North; so it remains today. Indonesia is closer to Darwin than this north-coast town is to the Commonwealth capital at Canberra. But the White Australia policy of immigration excludes hundreds of millions of land-hungry Asian neighbors.

New Blood for Australia

Once Australians prided themselves on their almost pure British stock; only two percent were foreign born. Soon after the war, however, Australia began to welcome immigrants in a way unthinkable a generation earlier. Slightly more than half have come from Europe, with a sprinkling from the United States; the balance came from Great Britain.

So far, the Commonwealth Government has arranged and paid for the transportation of 54 percent of the immigrants, including some 200,000 displaced persons; the rest arrived on their own initiative.

The important thing is to get suitable people, particularly laborers, into the country, and let industries absorb them as they will and can. As to professional types—doctors, lawyers, bankers, and the like—the situation is rather one of frustration. For Australia's immigration scheme caters to overalls, not to white collars, a point made quite clear to all intending migrants.

Upon application, British immigrants may become Australian citizens after five years in the country. Non-British may be naturalized after the same period (page 249). There is no compulsion, but most newcomers take advantage of this opportunity to enjoy all the privileges of their adopted homeland.

What is immigration doing for the nation? To find out, I traveled all over Australia; I moved in directions as diverse as those taken by migrants passing through Bonegilla into their new lives and occupations.

For an official impression of the New Australians' impact, I visited Canberra, the Washington, D. C., of the Commonwealth.

"Industry could not have expanded as it has without immigration," said the Honorable Arthur A. Calwell, M.P., who did more than any other person to start the flow of immigrants to Australia after World War II.

And Mr. Calwell's successor, the Right Honorable Harold Holt, has carried on the good work as Minister for Immigration since the end of 1949. The program has continued as successfully as it began (page 240).

Mr. Holt pointed out that Australia, drawing on her own population resources, would have added only 126,000 to the postwar work force. Actually, thanks to immigration, the manpower figure has increased by 532,000.

At the present pace Australia should have 10,000,000 people before 1960. During 1949 and 1950 the rate of immigration was higher in proportion to the country's population than anything the United States attained even in the busiest days of Ellis Island.

Inevitably, but subtly, the newcomers bring something more than the will to win bread and live by that alone. Their music, ballet, theater, and art (including culinary) have already enriched Australia's cultural life.

The migrants' more adventurous attitude toward eating has influenced Australia's restaurants and delicatessen shops (opposite). Migrants have made it possible to dine in Continental style at Continental hours (and not only between 6 and 7 p. m., the time when Australia takes its evening meal, called "tea").

Migrant-managed food stores carry European cheeses, fish tinned in Scandinavia, caviar, sausages, sauces, pickles, and spices. The traditional mutton-and-spuds fare will continue, but not without competition.

Free Lessons in English

Transplanted Europeans have brought with them their love of the soil, and they lose no time in growing a variety of vegetables in the genial climate. Here and there one sees a leafy grape arbor shading some southern European's yard or covering the piazza he has added to an English-type bungalow.

The Aussies, who seldom had heard anything but the English tongue, no longer turn to stare at someone speaking a foreign language on the street. After all, nowadays one of every nine persons in the Commonwealth is a New Australian.

In time, of course, New Australians of all nationalities will use the same language. To this end, the Commonwealth encourages them to learn English free of cost at evening classes, through correspondence courses, or

↑ **A Hungarian Pours Coffee in Tea-drinking Australia**

Mrs. Steven Zsolt serves her husband (center) and friends in Adelaide, South Australia. Starting as a truck driver in 1950, Mr. Zsolt now owns a fleet of trucks, a service station, a lodge for drivers, and this lunchroom.

→ The gold button weighs 481 ounces and sells for $15,750. It was produced by Lake View and Star Limited at Kalgoorlie, Western Australia. Four companies work Kalgoorlie's fabulous Golden Mile, and each year they recover some sixteen million dollars' worth. Men of no fewer than 11 nationalities labor in the mines.

↓ Molten gold flows from a tilting, or semirotary, furnace.

on radio programs (page 236). Their children automatically enter the local schools. Already some speak with an Australian accent.

Australia's alps rise near the southeast coast. Here, on the continent's roof, the Commonwealth's Snowy Mountains Hydro-Electric Authority in New South Wales is engineering to produce electricity for a big part of a power-hungry country and to irrigate thirsty land. The scheme is to conduct rivers, born of snow on the highest eastern slopes, through power stations, then divert them westward to inland farm regions thousands of feet below. Thus the valuable water will no longer flow uselessly into the sea.

Reshaping the Continent's Roof

But, as I saw for myself, it's not so simple as that. The undertaking will involve construction of seven major dams, 80-odd miles of large-diameter tunnel, 17 power stations, and more than 400 miles of mountainside race lines to lead streams to reservoirs and tunnels. It all calls for manpower; so migrants are funneled into the job.

With a man from the head office in Cooma I drove and trudged over the rugged Snowy Mountains to watch the work in progress. It took three days to get a cursory glimpse of the operations, which employ some 5,000 men, half of them New Australians.

Until engineers began poking around, few persons except sportsmen ventured into the upper Snowy Mountains. Anglers still fish the fast streams, and skiers come in winter. Livestock graze on the lower slopes. A few old villages drowse in the valleys.

For six months of the year the Snowy Mountains can be lonely, freezing, forbidding wilderness. Timber grows thickly up to an altitude of 5,000 feet; then rocks and snow and wind take over.

Imagine the initial complications of crowding men of all nationalities into isolated construction camps under the rigorous living and weather conditions of the Snowy Mountains. War scars don't disappear overnight. The welding of human races, like any enormous engineering project, takes time.

I found this welding process at work all

Australia's Millionth Postwar Immigrant Arrives in Melbourne from England

Harold Holt, Minister for Immigration, and Mrs. Holt (right) welcome Mrs. Dennis Porritt and her husband.

Don Edwards

over Australia. Sweating through a steel mill at Port Kembla, New South Wales, I saw New Australians beside the Aussies at coke ovens, blast furnaces, open hearths, and rolling mills; together they labored to turn out annually about 1,030,000 tons of pig iron and 1,167,000 tons of steel ingots.

In the open-hearth division, Hungarian Louis Molnar and I shouted through a conversation. He started here in 1950 as a day laborer and has risen to foreman.

Molnar is built like a heavyweight wrestler, but he can use his head as well as his strong back. Before the war he attended technical universities in Budapest, Berlin, and Warsaw; he speaks seven languages.

"I am more happy here in Australia than at home because I now am a free man," he yelled into my ear as sweat ran down grimy channels in his happy face.

Louis Molnar is one of 2,728 New Australians of 28 different nationalities at the mill, which employs 8,500 men.

Since the war, Australia's steel production has nearly doubled; it now exceeds 2,000,000 ingot tons a year.

Merry Christmas in 11 Languages

In Sydney, capital of New South Wales and the nation's largest city,* I rode in taxis so often driven by New Australians that I called at the head office of one local cab company and asked the manager how many migrant drivers he employed.

"Enough to say 'Merry Christmas' in 11 different languages," he replied. "In the last year we've had about 100; but they come and go, you know. An Englishman left to take his law degree; a Dutch fellow got a commission in the Air Force; a Pole went into business for himself . . ."

Growing Sydney spills over into suburbs which only the sea can limit. Around its magnificent harbor, private homes and apartment buildings overlook some 150 miles of foreshore. And ferries, busy as water bugs, are continually shunting, juggling, and shifting the population from here to there and back again (page 256).

King's Cross, the Greenwich Village of Sydney, is popular with migrants. They live here, work here, meet here. They sell fruit and flowers from street barrows, establish excellent restaurants, bake delicious long loaves of bread, linger over small cups of coffee, and make me very homesick for Europe.

Immigrant Builds His Own Home

Mr. and Mrs. Konrad Pijols, formerly of Latvia, worked and saved enough money in Australia to buy a piece of land on the northern outskirts of Sydney.

In spare time and with his own hands, Konrad, a house painter, is building a brick dwelling that will be their permanent home.

* See "Sydney Faces the War Front Down Under," by Howell Walker, NATIONAL GEOGRAPHIC MAGAZINE, March, 1943.

Developing Australia Offers Living Room for Millions

About nine-tenths the size of the United States, the inland continent has only an eighteenth as many people. Half of the Australians live in cities and towns of the southeastern corner (inset).

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A House on Concrete Stilts Escapes Termites

White "ants" are a pest in Batchelor, Northern Territory, especially during the six-month-long wet season, when timbers absorb the moisture required by the cellulose-eating insects. On rainy days this family hangs the washing below the house on lines between the pillars.

Batchelor, a new residential community, sprang up in the wake of a uranium strike in near-by Rum Jungle. There, 60 paved miles south of Darwin, the mineral was discovered 6½ years ago by a man hunting kangaroos. Today the din of drilling shatters Rum Jungle's quiet.

Some 420 men on the job include Italians, Poles, Czechs, Germans, Latvians, Hungarians, Greeks, Irishmen, Dutchmen, Frenchmen, Britons, and Americans.

← Christmas Down Under Comes in Summer

Sun-tanned children romp around their tree on Christmas Day south of the Equator, where seasons are reversed. The scene is Bondi Beach, near Sydney (page 258).

And in her spare time Mrs. Pijols takes care of the neat vegetable garden and embroiders well enough to win prizes at Sydney shows.

They invited me into their temporary home, a makeshift but pleasant little place of two small rooms. We sat in the bed-living room into which were squeezed a three-quarter bed, table for two, clothes-hanging space behind curtains, one chair, two stools, and an upright piano. Mrs. Pijols set the table with sandwiches, cakes, and coffee.

Konrad gave his wife, Olga, the piano for Christmas. Friends wondered why he didn't give her something far more practical.

"But," said Olga, who was a professional singer in Latvia, "it is the most practical thing Konrad could have given me."

To help family finances, Olga has taken on various jobs that have nothing to do with music, her real love. Someday she hopes to resume her singing career.

When Olga served as cleaning woman in a migrant hostel, the manager asked her how she felt about the work.

"I told him I felt as though I was acting on a stage, and I put the broom on my shoulder and marched away like a puppet," Olga said, her eyes twinkling at the memory. "One must keep a sense of humor."

"Little Italy" in a Big Sugar Mill

Most of Sydney's New Australians work in the city's ever-increasing number of factories. The Colonial Sugar Refining Company's bagging department, for example, employs so many Italians it is known as "Little Italy."

Acute in cities, the housing problem lessens in rural areas. Sheep and cattle stations gladly provide accommodation for New Australian hands. At the New South Wales property of Mr. Geoffrey Ashton I found 11 well-settled immigrants: three Yugoslavs, a Scottish family of four, also an English family of four (page 245).

Bill Munro, a middle-aged man, is the Ashtons' head gardener. Like most Scots not long out of their country, he couldn't be mistaken for anything else when he speaks. But Bill already has an Australian look about him. A broad-brimmed hat shades his tanned, leathery face. There are wrinkles around his humorous eyes, which squint at the glare like any outback Aussie's. Australian-made clothes hang loosely on his wiry frame.

Actually, the three Yugoslavs have the most typically Australian jobs on the station: they work the sheep and cattle. All three share the bachelor house and do their own cooking. They raise vegetables in a garden tilled in their spare time, and they buy meat and other necessities at the station store.

One day I watched them move a mob of sheep to fresh pasture. They rode horses and depended upon dogs to keep the flock together. When all went smoothly, Ilic now and then addressed the dogs in English (page 244). If things began to get out of hand, he gave rapid commands in Serbo-Croatian and got results. Everyone knows that Australian sheep dogs are unusually smart, but I never before knew how easily they could pick up a foreign language.

Country Life More Comfortable

The Yugoslavs knew hardly a word of English when they came here early in 1950; there was much sign language between them and the Australians. But Jeff Roberts, the station overseer, teaches them, special radio programs for immigrants help them, and now they have reached the point where they can even make some sense out of the newspapers.

In Australia, sheep and cattle stations vary in area from a few hundred acres to thousands of square miles. Formerly, outback life had few, if any, urban amenities; it still involves rough, hard work with long hours at a time in the saddle. But today improved roads, automobiles, and mechanized farming, airplanes, radios, refrigerators, and electricity have removed the pioneering aspect and much of the loneliness. Country life, in short, is becoming more comfortable.

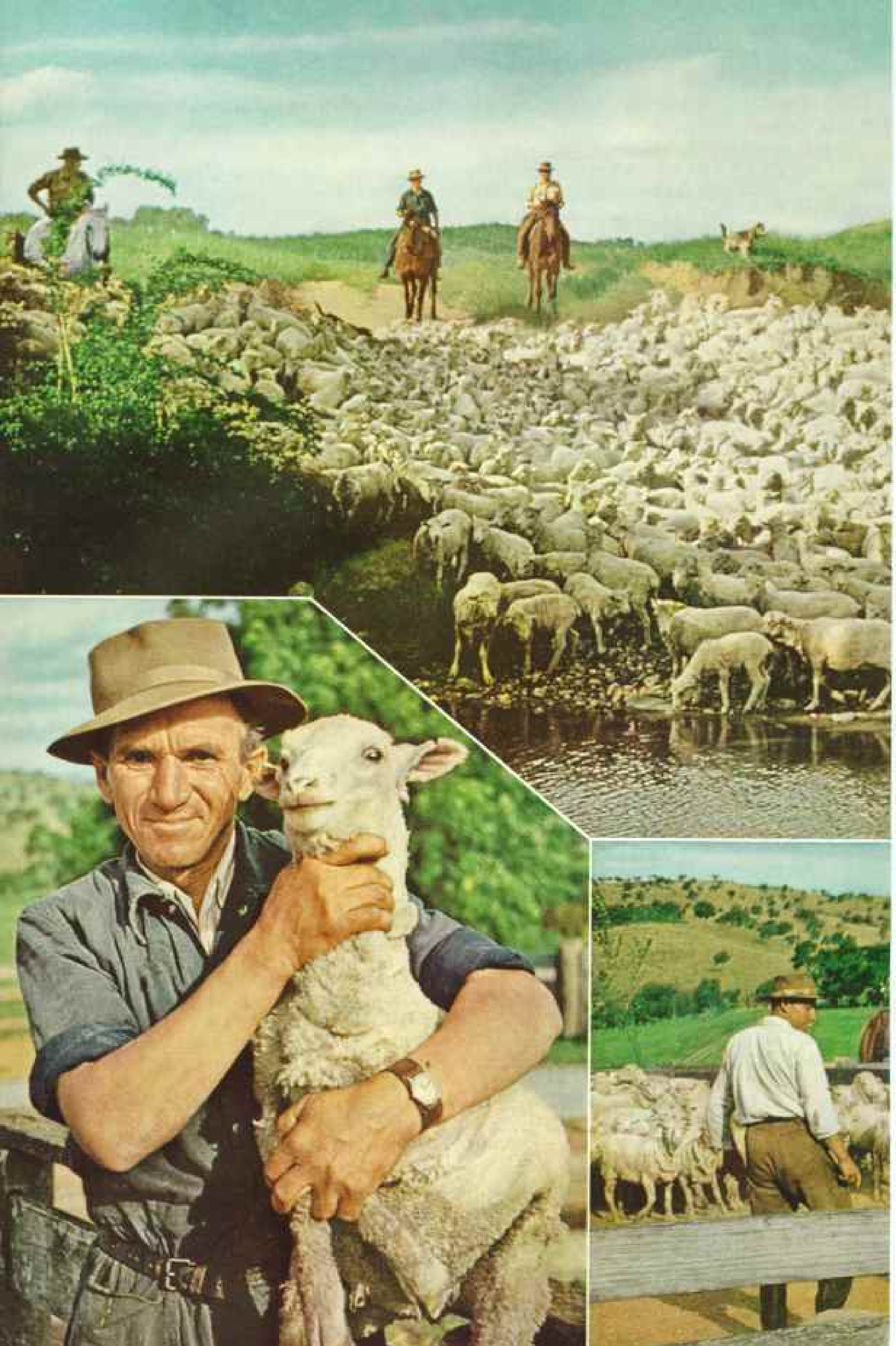
Brick Business Starts in the Hole

Near Brisbane, capital of Queensland, I visited brickworks started in 1951 by three Poles. The staff had increased to nine Poles and one Australian. All were laborers, all shareholders in the plant, which makes 100,000 bricks a month in good weather. Clay comes from their 28½-acre property, which determined the site of the kilns.

"How did you make the first bricks to build a kiln?" I asked one of the Poles.

"In a hole in the ground with fire," he said.

Before the war Brisbane impressed me as an easygoing town, lazing in a subtropical atmosphere. Today it is a city of more than half a million persons with things to do. The outskirts flare farther out. Factories rise and go to work, new suburbs creep up the once



Yugoslavs Count Sheep and Their Blessings in New South Wales

Australia leads the world in wool production. Mutton and wool have fixed the pattern of life and language in rural areas. The clip from the nation's 131,000,000 sheep sells for some $900,000,000 a year.

Three Yugoslavs take care of livestock on the Geoffrey Ashton sheep and cattle station at Markdale.

Here, assisted by several smart sheep dogs, horsemen drive the flock across the stream to greener pastures. When all goes smoothly, the riders call to the dogs in English. If the sheep get out of hand, commands fly in Serbo-Croatian.

Page 244, lower: Svetislav Ilic, like the other two Slavs, went to work on the Ashton station in 1950, a month after arriving in Australia.

↓ Sheep Break and Run; Two Jump for Joy

Mr. Ilic (right) and Branislaw Radisavljevic tally ewes and lambs in the sorting pens.

thickly wooded western hills, and a large modern university building nears completion.

I flew to Cairns in northern Queensland to see migrants harvesting some of Australia's 8,800,000-ton sugar-cane crop, four-fifths of which grows near the tropical coast of this State. The fertile strip extends 1,300 miles north and south between the highlands and the Pacific; along here the monsoon meets the mountains and keeps the fields green. The lush countryside reminds me of the Hawaiian Islands (page 254).

When the White Australia policy came in, dark-skinned labor went out; so Australians and Italians began to work the cane early in this century. Today, Italians own a high percentage of the cane farms, and hundreds of immigrants are settling in the sugar belt.

Sugar Cane Keeps Thousands Busy

As I moved from farm to farm in the Cairns area, I found Greeks, Maltese, Estonians, Danes, Germans, Poles, and English among the New Australians. Some had never before handled a cane knife. One man held up a hand for me to count 12 blisters.

Field hands work on an incentive basis; the more cane they cut, the higher their pay. An average cutter harvests about 6¾ tons a day. But there are ambitious migrants like Giuseppi Damiani, who has weighed in nearly 18 tons in a single day to earn roughly $30 —big money in Australia.

Apart from its annual value of better than $100,000,000 to this State, Queensland's sugar industry populated a vulnerable corner of Australia as no other industry has. It supports at least 200,000 persons in a tropical region that might otherwise lie wide open to invasion. And nowhere else in the world does one tropical industry depend to such an extent upon white labor.

Cairns is a city of small homes, a few big hotels, palm trees, bougainvillea, bicycles, and umbrellas. The main street ends at the docks where ocean-going vessels berth. Flying boats and landplanes save hours of train travel between here and Brisbane, 1,000 miles south.

"Much migrant labor on this job?" I asked a building engineer at the railway station under construction.

"Like the League of Nations," he said.

Cairns calls itself Australia's northernmost city, but more northerly Darwin * is fast reaching city status. Just before the war Darwin had a population of fewer than 3,000; today its more than 8,000 include 1,000 New Australians.

Recent discoveries of uranium have given the Northern Territory a sharp shot in the arm. Rum Jungle, 60 paved miles south of Darwin, reverberates to the rumble of heavy equipment, drilling machinery, mass construction, a noisy symphony of 420 men at work in the country's richest uranium fields. Approximately a third of the labor force consists of postwar immigrants.

Six miles from the uranium fields the township of Batchelor has sprung up to accommodate uranium workers and their families (page 242). If necessary, the community can expand. There's plenty of room in the Northern Territory, with an area nearly twice that of Texas but with a population of only some 17,000.

At the post office I received a letter bearing the romantic and once remote address, "Rum Jungle, N.T." Now Batchelor, close to a railway, highway, and airfield, offers all the usual facilities of a prosperous small town. At the school, children learn the three R's by day while New Australians attend English classes by night.

"Rum Jungle," said a resident of the Northern Territory, "gives Darwin a stability, a reason to exist, an assurance it never had before. For the first time in its history the town can count upon a big, sound industry. People come here to settle, not just to take a casual job for a year or so, then go home. Here is their home."

Australia Makes Own Autos and Planes

Wherever I went in Australia I found this process of human absorption and industrial expansion. Into Melbourne, capital of Victoria, more than 120,000 immigrants have streamed, increasing the population of the Commonwealth's second largest city to more than 1,520,000 (page 250).

"Can't think of a factory in Melbourne that doesn't engage New Australians," said an employment official.

Melbourne, with stately bank buildings, fine shops, exclusive clubs, and trees along many of the streets, is deceptively industrial.

On the city's outskirts I visited a tremendous plant which manufactures the Holden, only automobile wholly built in Australia. A New Australian from the personnel office

* See "Life in Dauntless Darwin," by Howell Walker, National Geographic Magazine, July, 1942.

Scarf and Wooden Shoes Say This Family Came from the Netherlands

Jack de Vries (left) took his wife, daughter, and two sons to Australia in 1953. They settled in Victoria on the farm of novelist Nevil Shute, himself an emigrant from England.

Mr. De Vries, who takes care of 100-odd swine, says he is making more money than he ever did in the old country. He bought the wooden *klompen* by mail in answer to an advertisement in a Sydney newspaper. Jim (center), his 17-year-old son, is a plumber's apprentice. A younger son goes to school.

Gerda (right) does the housekeeping. Her scarf was sent as a gift from her grandmother in the homeland.

Yugoslav Artist Works in Tasmania

Some 20,000 New Australians have settled in Tasmania, Australia's island State. Of these, about 7,000 live in or around Hobart, the capital. Here Mrs. Gelica Milovanovic makes a color-separation drawing at the plant of Silk & Textile Printers Ltd., near Hobart.

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City Hall's Clock Tower Marks Time in the Heart of Brisbane

Office workers at lunch hour customarily gather at King George Square to enjoy fresh air. These Queenslanders watch an event on the municipal building's steps (opposite).

guided me through the works. In the engine-testing department I saw a Greek foreman watching an Italian make a final check on a machine. The company has factories also in Brisbane, Sydney, Adelaide, and Perth. In other areas additional Holden plants are taking shape. Altogether, the firm employs 14,500 workers, and New Australians make up a generous third.

Commonwealth Aircraft Corporation spreads its massive wings over a Melbourne industrial district. Hundreds of immigrants add to the manpower of this factory built around production of Australian-made Sabrejets of U. S. ancestry, and Winjeel training planes entirely designed and made in Australia.

Victoria's second city and port, Geelong, has been described recently as Australia's most industrialized per capita. The prewar census of some 40,000 has jumped to nearly 80,000 people; one in every eight is a New Australian.

When a friend drove me into the factory-fringed city, he said, "Old 'Sleepy Hollow' is waking up."

He had gone to school in Geelong some years ago; then it was a quiet, slow-going community of broad, empty streets, living chiefly by wool. Today a wide range of industries mushrooming around the earlier woolen mills attracts migrants. Another drawing card is available real estate close to the city. An immigrant can buy a block of land cheaply, readily put up a temporary dwelling, save money, and eventually build a permanent home.

New Australians are so pleased with their lot that they write to friends in other parts, and migrants keep coming to Geelong to work at the Ford Motor factory, International Harvester, Shell Oil, woolen mills, and in other industries.

Driving east to Yallourn, Victoria, I saw a man-made crater one mile square. It is an

When the Ceremony Ends, These New Australians Will Be Citizens

Immigrants in good standing qualify for naturalization after a residence of five years. Here Brisbane's Lord Mayor in his robes of office accepts pledges of allegiance to Queen Elizabeth II and the Commonwealth.

Australian Department of Immigration

opencut brown-coal mine, revealing the kinds of trees and other vegetation that grew in prehistoric times. In it I found leaves eons old, tinged a yellowish brown.

Graphically the mine shows how the fallen Miocene forests of some 20,000,000 years ago, under the weight of earthy overburden, were pressed into coal, brown in this instance.

I watched dredges bite a seam 200 feet thick, producing 22,400 tons of coal a day.

"At the present rate of mining," said a Yallourn official, "that seam will last 600 years. We have another seam in the area; it will last more than four times as long."

The project supplies fuel to power stations generating electricity for the State of Victoria. It means steady work for 5,400 persons at Yallourn, where almost 2,000 New Australians make a comfortable living.

Program up to June, 1998

"The adult immigrants working here are adapting quite well to their new life," the mine official said. "But it's to the next generation, free of language difficulties, that we are really looking. You see, our present program takes us up to June, 1998."

So, if Emil Kobiela, formerly of Poland and now at the opencut, stays here long enough,

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Coming! The First Olympic Games Ever Held in the Southern Hemisphere

Next November the XVIth Olympiad will begin in Melbourne, Victoria, with the arrival of the traditional torch from Greece, birthplace of the games. Aircraft will fly the flame to northern Australia. Runners, including New Australians, will relay it across the continent into the Melbourne stadium (above).

When this 110,000-seat oval is complete, it will be the largest for any Olympiad so far.

← Italian-born Surace Santo works on an addition to the stands.

his 8-year-old son won't have far to go to work. And something, maybe his smile, tells me Emil will stay.

Pleasantly placed midway between sea and mountains, Adelaide, South Australia, is deliberately laid out with streets at right angles. Parks, gardens, and a river within this capital city break what might otherwise be monotonous regularity. And a broad green belt of recreation grounds on all sides separates the city proper from the suburbs.

One Saturday afternoon in Adelaide I watched "Budapest," an all-Hungarian soccer team, fight to an exciting tie with the Aussies. The majority of spectators were European, mostly Hungarian. Ability on either side drew cheers; but, like any Australian, the Hungarians jeered bunglers with "C'mon, you mugs, play soccer!"

Because of its rich gold fields, Western Australia is called "the Golden West." Near Kalgoorlie, four companies along a stretch

named the Golden Mile contribute about half its wealth. And the State mines about three-fourths of all Australia's gold (page 239).

As could be expected, New Australians have come to Kalgoorlie. Some work at the mines, others elsewhere in the area.

On the city's main street I entered a small-goods shop and met Jovan Dimitrijevich, a Yugoslav. Signaling to a pretty young woman to take care of customers, he sat down with me. A small boy rode a tricycle in and out of the building.

Before Jovan saved enough money to buy this shop, he worked two years for the Trans-Australian Railway as a fettler, or maintenance man.

"I had an accident on the job," Jovan said, "and had to go to hospital. But I couldn't speak English to answer questions. So the doctor got a young Yugoslav woman to interpret, and now"—he nodded toward his wife behind the counter—"there she is."

When I rose to go, I mentioned the name of a Dutch baker I wanted to see.

"Do you know where to find him?" Jovan asked.

"Well, sort of," I said vaguely.

"Then I will take you to him," he said. "Come with me."

He led the way from the shop and opened the door of a new automobile.

"Please," he motioned for me to get in. "This car may explain better than my words how I am getting along in Australia; it is mine. I bought it with my savings."

Perth Perks Up

After the arid, flat emptiness of south-central Australia, Perth seems a delicate pleasure. Its few tall buildings are surrounded by green playing fields and parks full of blossoms and flowering trees. At the foot of the city's front lawn sweeps the Swan River in a graceful bend that makes a quiet bay.

New Australians like this capital city of Western Australia, too; 36,000 have settled here, raising the population to some 350,000. In fact, along with the State's oil prospects, they are changing Perth from a tranquil town by a sleepy river into an active city.

I watched a New Australian conduct Perth's symphony orchestra, talked with foreign students at the university, enjoyed a French film and Ukrainian opera on the screen, dined at Italian, French, Czechoslovakian restaurants, and reminisced about Heidelberg with a German taxi driver. Even when it came to a laundry Mrs. Apollonia Reis from Yugoslavia washed my shirts.

To me the spirit of New Australians is one of the remarkable features of this mass movement of people from the Old World to a new one. Faced with a housing shortage, many immigrants build their own homes. Some take jobs Australians scorn; others do better; all are glad to have the opportunities a free country affords. Australia seems to give them great faith in the future.

Life Begins at 42

The attitude of 48-year-old Geza Igloi, a Hungarian who brought his family to Australia in 1950, is not unusual; it's that of most immigrants, young and not so young, willing to start from scratch.

"It is much harder to transplant an old tree than a young one," Igloi said, "but possible."

He told me how he struggled 25 years to build up his import-export business in Hungary, then lost everything when the Germans and Russians fought through the country. Today he's foreman in the crockery division of a Perth department store.

One Saturday Geza Igloi asked me to come to his home and meet his family. The neatly built brick house of one story contains three bedrooms, living room, kitchen, pantry, bathroom, and laundry. Igloi and his son had done all the construction over a period of two years when not at their regular jobs. Mrs. Igloi and the daughter helped as they could.

When Igloi had shown me around, we went into the living room for tea and Hungarian cake baked by his wife. The daughter sat at the new piano to play a *czardas*, their national dance, and the son joined in with his accordion.

"I have applied for naturalization because I feel I owe so much to Australia," Igloi said during a lull in the music. "I saw this land at the bottom of the globe, but here I am on top of the world. We have come 12,000 miles after 25 years to get a new house and a new life.

"Now we never look backward." He waved away the past with a gesture of finality. "In Australia we look only forward."

For additional articles on Australia, see, in the National Geographic Magazine: "The Making of an Anzac," by Howell Walker, April, 1942; "Beyond Australia's Cities," December, 1936, and "Capital Cities of Australia," December, 1935, both by W. Robert Moore.

Romanian Dressmaker in Her Australian Shop Fits a Luxembourg Model

Born in Romania and trained in Paris, Zita Wanievschi moved to Sydney in 1949 short of funds and a knowledge of English. "Australians were kind to me," she says. "Friends advanced money to start me in business."

Sugar Cane Grows High in Queensland

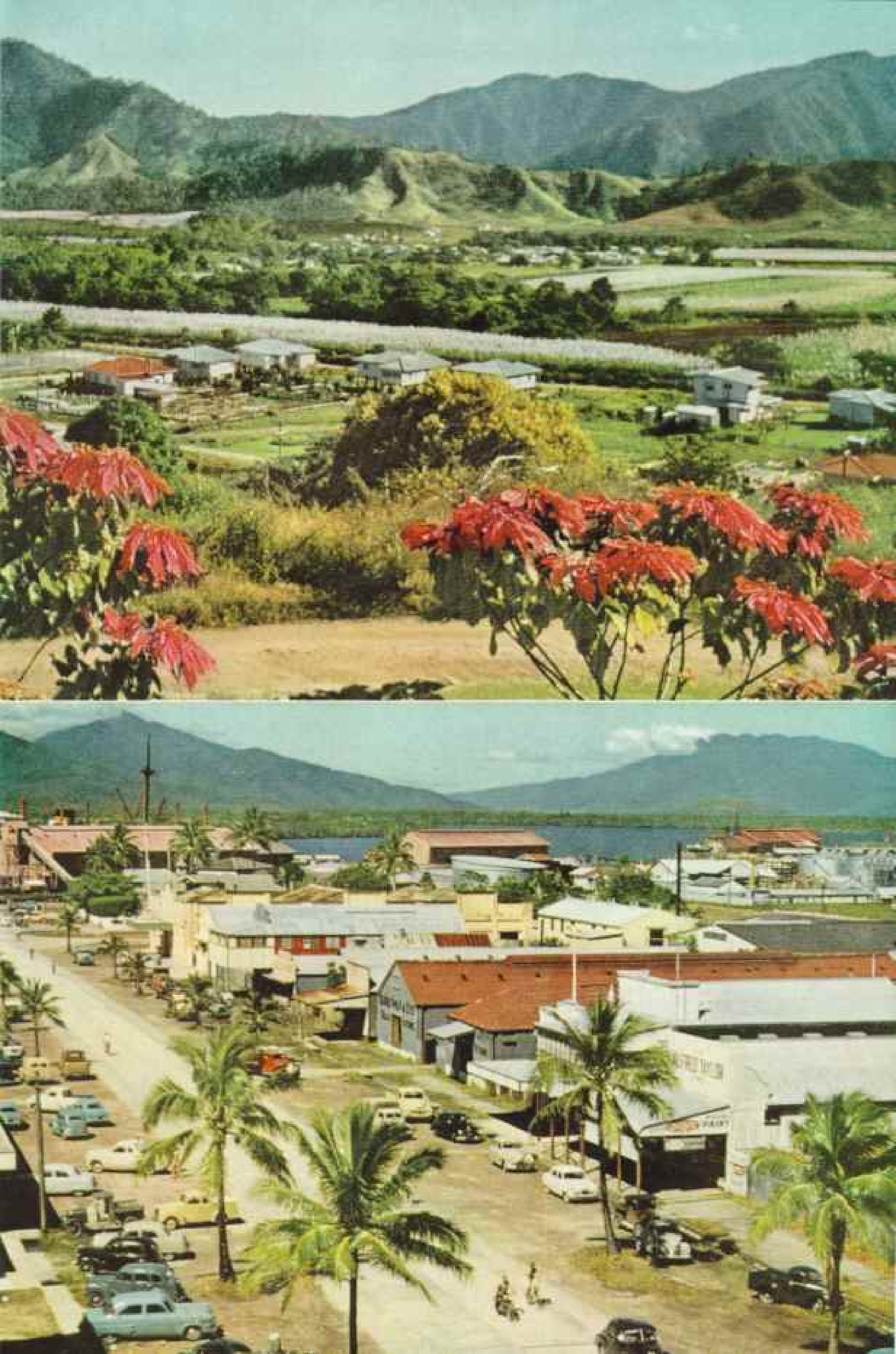
A fertile strip 20 miles wide and 1,300 miles long produces all of Australia's average annual 1,400,000 tons of cane sugar. This narrow land is squeezed between sea and mountains. Where yearly rainfall is less than 45 inches, cane growers irrigate their crops.

More than 200,000 Queenslanders depend on the sugar industry. Italians took field jobs in the early 1900's. Many of them today own farms and hire newly arrived Greeks, Maltese, Estonians, Danes, Germans, Poles, or other Italians.

Above: Viewed across crimson poinsettias, cane fields at Cairns lie below the Atherton Tableland.

←An Italian Australian cuts cane near Cairns.

→Page 255: Palm-lined Lake Street leads toward wharves in Cairns, the home of more than 21,000 people.



Australia's Chief Port and Largest City, Sydney Grows Bigger with Immigration

Since World War II more than 100,000 New Australians have settled in the capital city of New South Wales. The author caught this view from a pylon on the huge bridge that spans the harbor.

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Ferryboats Dock at Circular Quay. The Gently Curving Cove Has Been Squared Off

Here in 1788 British pioneers established Australia's first permanent white settlement. Today more than 1,863,000 persons live in the Sydney area. Thousands daily pour in and out of these buildings. Many arrive by ferry.

Sun, Surf, and Sand Make Bondi Beach a Sydney Playground

Magnificent strands fringe much of the continent's 12,000-mile coast. In the northwest of Australia Eighty Mile Beach presents an uninterrupted stretch. "I have never seen a more inviting shore," says the author. "There was nothing to defile it; the sand appeared clean enough to eat."

Sydney offers at least 20 good beaches. Among them, Bondi lies only a few miles from the heart of the city. These Christmas Eve sun bathers look toward apartment buildings thrusting into the Pacific.

Lives are closely guarded here, as they are at Australia's other seaside resorts. Organized volunteers stand ready to help any bather in distress. Teams of six are rigorously trained and severely tested.

For work close in, a lifeguard swims with a rope paid out by his teammates, who then reel in victim and rescuer. To save those far offshore, surfboat crews row through the breakers.

Bathers and Canoeists Shiver in July

June and July are the country's coldest months; yet hardy surfers make midwinter excursions to the seaside. Temperatures sometimes drop to the 50's at this beach near Perth, Western Australia.

Australians ride ocean waves on boards, skis, or canoes like these. Some use rubber mattresses; others prefer no support.

Surf canoeists paddle out where the breakers rise. Choosing a promising roller, they catch it on the boat's stern, paddle vigorously, and ride the foaming crest to shore.

Sharks present an infrequent hazard. Few bathers have been attacked in recent years. Many beaches, however, maintain a shark lookout. When a telltale fin appears, warning bells ring and surfers dash to safety. Some places screen the bathing area with nets.

Ektachrome by Ray Fisher, Miami Herald

Saved from a Siamese Cat, One of Florida's Gay New Immigrants Breaks into Song

Spotted-breasted Orioles from Central America have unaccountably appeared in Miami and are nesting there. Granting "citizenship papers," the United States Fish and Wildlife Service has placed the bird under Federal protection. This adult, one of a colony of about 100, sat for its color photograph after being rescued and nursed back to health in a cat-proof Miami garage. One leg is banded. Spots on sides of breast give the mature bird its name.

An Exotic New Oriole Settles in Florida

By Charles M. Brookfield and Oliver Griswold

BIRD LIFE in the United States is richer now by the addition of a new oriole, a tropical species of striking brilliance and melodious whistling song.

Mysteriously arrived in Florida from the tropical lowlands of southern Mexico and Central America, the Spotted-breasted Oriole has taken up residence in Miami and vicinity.

Dominant colors of the newcomer are flame-orange and black. Patches of white appear in the wings. On the orange breast, at either side of a black gorget, or bib, is the sprinkling of dark spots that gives the bird its name (opposite page). Male and female look alike.

Original Home 1,000 Miles Away

Just how the Spotted-breasted Oriole came to take up residence and multiply in the area —1,000 airline miles from its proper home— is a question still unanswered. On this point the noted Smithsonian Institution ornithologist, Dr. Alexander Wetmore, observes:

"Some have supposed that this oriole may have been carried to Florida by tropical storms, since birds are sometimes borne far from their usual range in this way, and in a few instances a species has become established in entirely new territory. The cattle egret, for example, may have come to the New World in some such manner.*

"In the case of the Spotted-breasted Oriole, however, it is probable that man has been responsible, since it is known that numbers of this species have been brought to Florida as cage birds. Some may have escaped by chance, or some may have been liberated. In either event, it is certain that the birds have found southern Florida a favorable home, and from all appearances the species is there to stay."

First reports of unusual orange-and-black birds were received at the National Audubon Society office in Miami in August, 1949. Some observers thought they might be escaped troupials, somewhat similar orioles frequently imported from the tropics as pets.†

Co-author Oliver Griswold and I saw the new bird for the first time in September of that year, at the northwest Miami home of Mr. and Mrs. Leslie A. Maltby, in a lush hammock area near the Miami River.

Through Miami newspapers we told of the appearance of the puzzling beauty and asked Miamians to be on the lookout. The conservation-conscious press cooperated heartily.

Thrilled at seeing such a striking immigrant that could not be found in United States bird guides, Miami's myriad bird watchers poured in reports of new observations in various areas. From these it soon became apparent that the new orioles were permanent residents, not just a few individuals dying off in a strange and unfavorable habitat.

At first we thought the mystery bird might be Lichtenstein's Oriole (*Icterus gularis*), which has been reported occasionally from southern Texas. However, when Miss Marguerite Michaud discovered the first Florida nest of the species, it proved to be a cup-shaped structure, wholly different from the sacklike nest of Lichtenstein's Oriole (pages 262 and 263).

Accident Victim Identified

Then Miss Michaud found the most important evidence—the remains of an oriole killed by some accident. Our Miami Audubon Office promptly sent these to the U. S. Fish and Wildlife Service at Washington, D. C., where they were placed in the hands of Mr. Allen J. Duvall, Research Biologist, Branch of Wildlife Research. He consulted Dr. Wetmore and his associates at the U. S. National Museum, Smithsonian Institution, and reported that the remains appeared to be those of the Spotted-breasted Oriole of the Central American tropics.

At our request, the new Floridian was given United States citizenship, so to speak, by being placed on the list of birds protected by the Migratory Bird Treaty Act, and now it

* See "A New Bird Immigrant Arrives," by Roger Tory Peterson, National Geographic Magazine, August, 1954.

† See "Exotic Birds in Manhattan's Bowery," by Paul A. Zahl, National Geographic Magazine, January, 1953.

The Authors

Mr. Brookfield is Florida representative of the National Audubon Society and in that capacity directs wildlife tours of Everglades National Park and Florida Bay. His article, "Cannon on Florida Reefs Solve Mystery of Sunken Ship," appeared in the National Geographic Magazine for December, 1941. Mr. Griswold is program coordinator for the University of Miami's radio-television-film department and producer of the university's educational television series, "Science Snapshots."

Oriole Parent Rears Its Chick in a Cup of Palm Fibers

Florida's immigrants thus far have built less elaborate nests than they do in their home jungles. "Their shallow nests," says ornithologist Alexander Wetmore (page 264), "do not compare with the well-made pendent pouches, 18 inches long, that the species weaves in its native haunts."

This family lives in a dying avocado tree. Falling leaves exposed the nest and made this close-up possible.

Marguerite Mitchell

is on the official check list of the American Ornithologists' Union.

Now the oriole's race has been definitely established by Dr. Wetmore on the basis of four accident victims sent him by Prof. Oscar T. Owre, Curator of the Museum of the Department of Zoology at the University of Miami (page 264).

Two subspecies, or geographic races, of this oriole may be recognized, according to Dr. Wetmore, in different parts of the native home in Central America. He reports:

"Careful examination and comparison with specimens in the national collections from their native jungles show that the Florida birds are the larger, brighter colored form, the technical name of which is *Icterus pectoralis pectoralis* (Wagler). The handsome strangers now found in Miami, therefore, stem back to stock that came originally from somewhere between the southern Mexican States of Oaxaca and Chiapas, and Nicaragua."

Accident and good fortune again aided science in obtaining the first close-up motion pictures and still photographs of the bird.

A rapid succession of phone calls early in April, 1955, followed by agile action on the part of two University of Miami zoology students, resulted in the capture of a mature oriole alive.

The near-tragic, but lucky, sequence began with a call from Mrs. Paul Ware, of Coconut Grove, Miami, to the local Audubon office. Her Siamese cat, she reported, had just brought a still-struggling oriole into her house. Knowing the trick of slightly squeezing the cat's throat to release its prey, Mrs. Ware did so and was relieved to see the bird fly to the highest beam in the cathedral ceiling of her living room.

Net Wielders Capture Bird

When this information was relayed to Professor Owre at the university, he dispatched two of his students, Stewart Warter and Warren Burgess, with nets and a cage.

Here was a problem not covered by the college curriculum: how to catch a wounded and wary bird at large in a room containing valuable and fragile furnishings, including a crystal chandelier. The young net wielders solved it, however, after some lively action, and took the bird to Mr. Griswold for convalescent care. Promptly it proved its spunk—and ingrati-

tude—by clamping its beak on one of his fingers.

Fortunately, Mrs. Ware had previously observed this bird and other Spotted-breasted Orioles feeding on the sweet fruits of her loquat tree. Safe in a cage in the Griswolds' cat-proof garage, the injured bird devoured the plum-size fruits at the rate of 15 or more a day. The fruit course was supplemented by two dozen meal worms daily.

When the wounds healed, the bird was banded on the leg by field ornithologist Louis A. Stimson, with U. S. Fish and Wildlife Service Number 50-115308, so that perhaps its future travels might be traced. Then it was photographed and released. With vigorous flight it wheeled swiftly into the topmost branches of a live oak.

In a few minutes a pair of bickering cardinals carried their noisiness too close, and the disdainful oriole flew off with a flash of flaming orange, to disappear in the thick foliage of a near-by mango tree.

Now that the new citizens are legally protected, the Tropical Audubon Society, the Dade County branch of the National Audubon Society, has undertaken an educational campaign. This will be directed toward commercial bird importers, pet-shop dealers, Federal and local government officials, and also the commercial catchers of birds in Central America, so that all concerned will know of this oriole's protection and the ban on its further commercial importation.

Despite the likelihood of considerable loss from automobile traffic, cats, dogs, and heedless youngsters with air guns and slingshots, the orioles definitely are multiplying. Reports of them come frequently and from points steadily more distant from the original area, mainly in the heavily populated residential sections of Greater Miami.

Range Widens Steadily

The new orioles now have been seen in North Miami, eight miles northeast of the first discovered nesting site, and in South Allapattah Gardens, 18 miles southwest. Their known range at this writing, therefore, extends for 26 miles. It will be interesting

Orin Pugh

One Oriole Couple Set Up House on a Miami Front Porch

Mr. and Mrs. George W. Oldham show author Charles Brookfield (center) a nest built in their aralia bush. One chick hatched; two eggs failed. After the youngster departed, nest and eggs were presented to the University of Miami's Zoology Museum.

National Geographic Photographer B. Anthony Stewart

Florida's New Oriole and Central America's Show Identical Spots

Dr. Alexander Wetmore (right) holds an accident-killed Miami bird and compares it with mid-American specimens at the National Museum, Smithsonian Institution, Washington, D. C. Allen J. Duvall (left), of the U. S. Fish and Wildlife Service, consulted Dr. Wetmore for the proper identification.

to observe their further spread with the passage of years in their new-found home.

These orioles can be readily identified by means of the striking color close-up on page 260. Young individuals lack the breast spots, which do not appear until the birds have reached maturity. The orange-yellow crown distinguishes young and old from the Baltimore and Orchard Orioles.

In glorious displays of flame-orange and black, the birds stand out briefly against the luxuriant green of south Florida's subtropical foliage. Then, after melting from sight momentarily, they reappear, working their way rapidly among the branches as they probe for food. Typically, they soon burst from the treetop with strong, blithe, clear whistles, flashing against the sky on their way to another feeding place.

"Incomparably beautiful" is the description of the song of the Spotted-breasted Oriole by Alexander F. Skutch in his book, *Life Histories of Central American Birds*. He calls it "a series of the clearest, most mellifluous whistles possible, blended into a continuous liquid stream of melody."

Indeed, the exotic newcomer is a boon to the ear as well as to the eye.

Pescadores, Wind-swept Outposts of Formosa

United States Ships and Planes Help Protect These Fishermen's Isles, Traditional Way Stop of Invaders in Formosa Strait

By Horace Bristol, Sr.

With Illustrations from Photographs by the Author

LIKE a flock of drab ducklings adrift in a big windy pond, the low, flat Pescadores Islands cluster in Formosa Strait two-thirds of the way from the Communist-held Chinese mainland to Nationalist Formosa.

Tension between the two Chinas has brought these barren bits of land into the world's spotlight as possible steppingstones to invasion of the big rich island called Formosa by the West and Taiwan by the Chinese. The Pescadores are closely guarded by Nationalist forces and patrolled by ships and planes of the United States, bent on preserving peace in Formosa Strait.*

Fishermen's Islands (Ilhas dos Pescadores), 16th-century Portuguese seamen labeled them, for fishing is the chief occupation. The Chinese name for them, Penghu, may be translated loosely as "A Surging Lake." It alludes to the reach of water bracketed by the three largest islands (map, page 268).

The group has 64 islands, most of them little more than tiny basaltic land lumps or rocky reefs flecking the sea. Not quite 50 square miles in land area, they are scantily watered and so wind-swept that gardens must be protected by high coral walls.

Planes Booked Weeks Ahead

Eager to see what life is like today in the Pescadores, I asked about plane passage at the Civil Air Transport office in Formosa's capital, Taipei.

"We have a daily flight," petite Sally Chen told me. "But it is always booked up solid by the military for weeks in advance."

I showed her my impressively stamped and sealed permission to visit the islands and take photographs there.

She smiled and agreed that I should have the first two available seats, one for myself and the other for my interpreter-guide, Maj. Hsu Piao, of the Government Spokesman's office. Then, as if in consolation for this prospect, she added, "There's absolutely nothing to do on the islands, anyway!"

A few mornings later, we—Major Hsu and I, with overseas correspondent Richard Kallsen and TV cameraman Wade Bingham, both of Columbia Broadcasting System—boarded a DC-3 for the flight to Makung, capital town of the Pescadores.

Crowded aboard also were trussed-up chickens, baskets of fruit, piles of newspapers, and mail, together with sundry other passengers. These included nursing babies in arms, wives and children of military men on the island, black-robed Chinese grandmothers hobbling on bound feet, and military officials returning from conferences in Formosa.

Trouble at the Airport

When we landed on Makung's unpaved airfield, I understood what Sally Chen had meant. The place seemed empty except for a line of people impatiently waiting to board the plane for the return trip to Formosa.

Two jeeps and an open weapons carrier appeared on the plain, trailing a plume of light-gray dust. Unfortunately the cars were not for us.

Our faithful major, however, did not fail us. His seat companion had been a colonel in charge of the political section of the army garrison. Since the vehicles were for the colonel and two other officers, they generously offered us one of the jeeps and the use of the truck for our baggage.

We thankfully accepted and elected to ride in the back of the truck with our cameras.

Thus we started out, Major Hsu in the lead jeep, which bore the flag of the island command. The colonel followed in the second jeep, and our vehicle brought up the rear.

At the entrance to the airfield we ran into difficulties. Coming abreast the sentry, Major Hsu's driver stopped dutifully, although the command flag would have permitted his passing. The colonel, however, drove on, and the sentry took after him, shouting and waving his automatic pistol.

The colonel's aide, who was riding with us,

* See "Patrolling Troubled Formosa Strait," National Geographic Magazine, April, 1955.

A Fortress Town, Makung Guards the Pescadores

No invader—Chinese, Spanish, Dutch, French, or Japanese—has ever achieved success in Formosa without first occupying the Pescadores. The 64 tiny islands lie 30 miles west of Formosa, 85 miles off the Chinese mainland.

Makung, major town and chief port in the island cluster, shelters ships of the Chinese Nationalist Navy. Naval command headquarters spread across the peninsula at extreme left. Tip of land at right leads to the naval base. Block-long barracks stand out in center.

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U. S. Warship Moors ➔ in Penghu Harbor

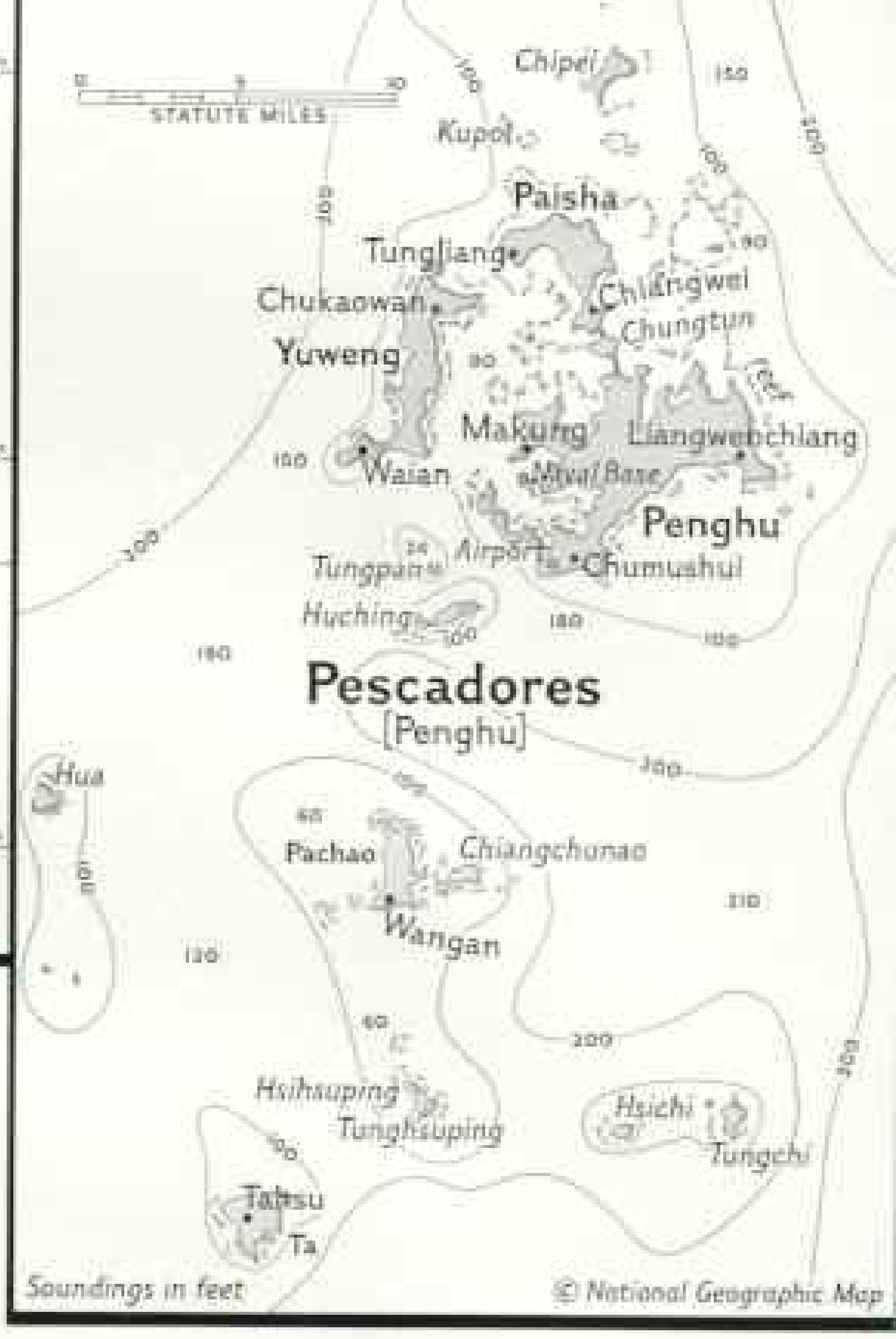
Page 267: Sea and air units of the 7th Fleet, U. S. Air Force planes, and Chinese Nationalist forces work together in the defense of Formosa and the Pescadores.

USS *Salisbury Sound* anchors between Yuweng and Penghu Islands. This seaplane tender services and refuels squadrons flying out of bases in Okinawa and the Philippines.

Ashore on Yuweng, an islander and his wife load shells and pebbles to be spread over muddy roads.

Gauntlets and face mask protect the woman against sun and wind (page 276). Her volcano-shaped hat provides additional shade.

➔Gleaming eyes in the bow of this light sampan suggest a dragon's (page 284). Bamboo battens support the cloth sail. The crew fishes off the Pescadores.



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The Pescadores: 64 Volcanic Islands Cover Less than 50 Square Miles

Penghu, Yuweng, and Paisha enclose an excellent harbor where ships of the U. S. 7th Fleet frequently moor. A causeway connecting Penghu, Chungtun, and Paisha is often submerged by high water. Makung, on Penghu, is the capital and largest town.

shouted not to fire; whereupon the sentry whirled around, came back to our truck, and scolded us violently.

Major Hsu stepped from his jeep and tried to explain the situation. The sentry told him, in effect, to shut up. Emphasizing his words with his pistol, he ordered the colonel's aide to get out of the truck. More brave than wise, the aide refused to budge.

The sentry called another guard, who immediately slipped a cartridge into the chamber of his rifle and poked his bayonet at the stubborn noncom's ribs. We correspondents ducked behind a convenient stone wall.

When no explosion or groans followed, we peered around the wall to discover that the major's soft voice had prevailed. We remounted our truck and headed toward Makung, a 30-minute ride away.

"There may be nothing doing in the Pescadores," one of us said, "but if this introduction is a sample, there won't be a dull moment!"

We knew that Makung was without hotels or other commercial accommodations. Consequently, we were both impressed and pleased when our weapons carrier halted before an imposing structure.

"This is Generalissimo Chiang Kai-shek's house when he visits the island," Major Hsu explained. "Formerly it was a resthouse used by visiting military when the Japanese had a naval base here."

We were shown to paper-partitioned rooms through wide corridors floored with sweet-smelling Japanese cypress. The view from the glass doors at the rear of the building was magnificent, commanding a coral beach and curving expanse of blue water.

Sunny, Windless Days Rare

"I wouldn't mind spending some time here," Wade Bingham commented.

"Wait until the wind begins to blow," Major Hsu cautioned. "My driver told me this is the first good day this month."

He pointed to a few straggling trees beside the building. "We're lucky today. Most of

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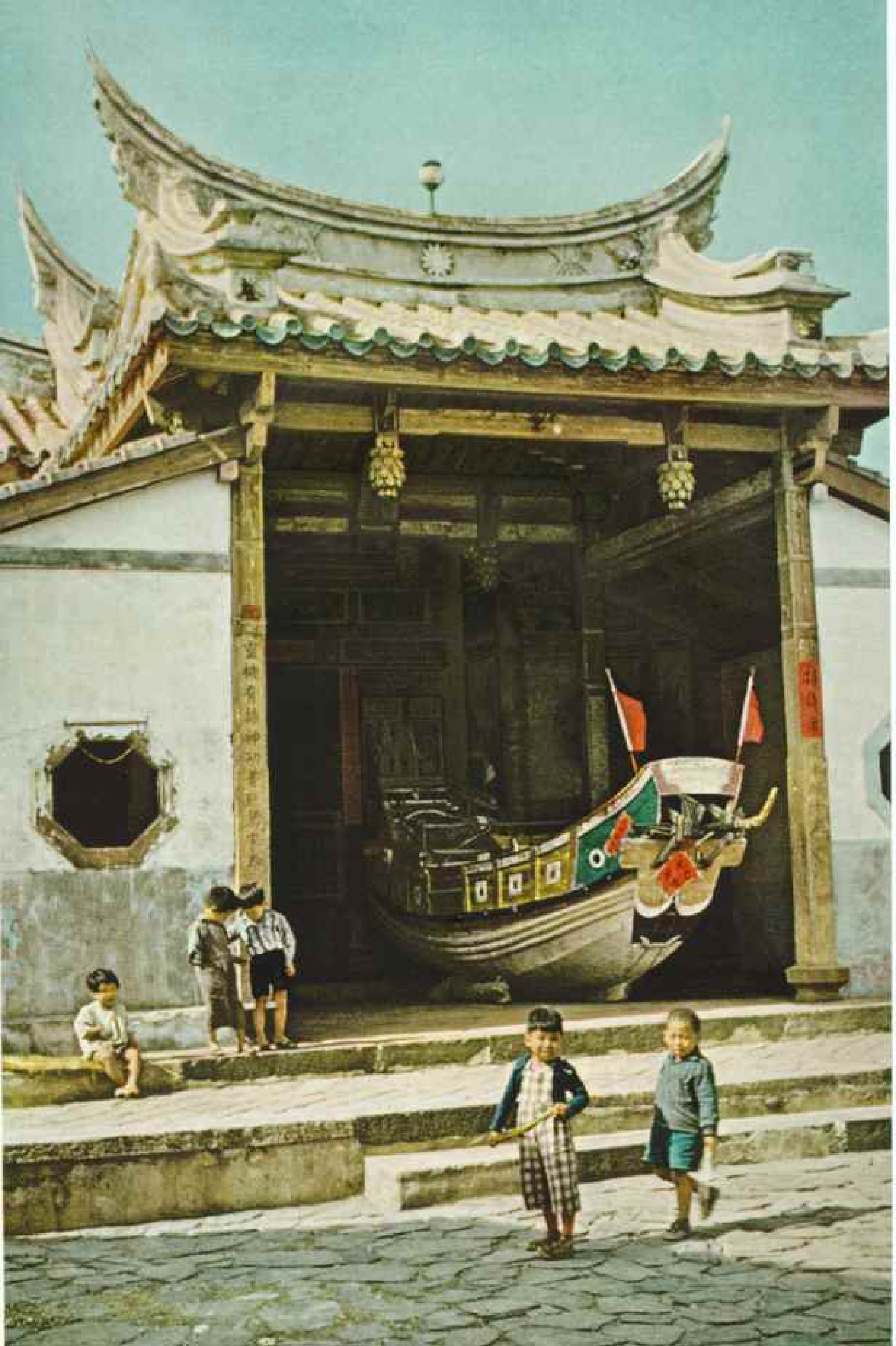
A Seashore Temple Houses a Ceremonial Boat →

Abundant fish in these waters inspired Portuguese explorers to name the islands Pescadores, meaning "Fishermen."

Fishing still supports most of the estimated 83,000 inhabitants. Once a year the men of each village carry a symbolic boat through the streets. Priests bless the vessel for the sake of the entire fleet. A firecracker barrage climaxes the ritual. Nationalist China's emblem, a 12-pointed sun, graces the roof of this temple. Flags flutter atop the boat's prow.



270

Paisha Islanders Offer Food to the Gods in a Temple's Tree-roofed Courtyard

After a priest dedicates the rice, pork, and fish to the use of the gods, thrifty housewives take the food home again. Musician wearing golden paper crown (center) plays at the ceremony. A trellised banyan tree, largest in the Pescadores, shades nearly 800 square yards, yet stands only 16 feet.

the time these trees have to be protected by heavy straw matting."

At the moment we paid little attention to the trees. Later, touring the island, we began to appreciate his comment. Trees grow only in the protection of buildings or natural barriers. Gales trim exposed tops as smoothly as if the trees had been clipped by shears.

Since the weather was perfect for color photography, I was eager to get started.

"First we must clear with the Army Command, then the Political Office," Major Hsu insisted. "And the general will expect you to lunch with him."

I visualized our sun vanishing while we sat drinking tea in the general's office.

"Mr. Kallsen is a writer and radio commentator," I suggested in what seemed excellent compromise. "You and he can lunch with the general and make the proper apologies for us. Bingham and I can go directly to the Political Office and secure an interpreter-censor to take us around."

The political officer assigned us a plump, pleasant lieutenant colonel. And again we heard the now-familiar comment.

"I don't see why you have come to Penghu to take photographs," the colonel said. "There is absolutely nothing here."

Nothing in such a strategic outpost! We tried to convey to the colonel that, bleak and wind-bitten though the islands are, people live here. There are, in fact, some 83,000 dwelling on the 21 inhabited islands, a concentration far greater proportionally than on Formosa. These people fish the sea and patiently grow sweet potatoes, cabbages, and peanuts in the lee of high coral walls.

The colonel shrugged. "My instructions are that you can photograph anything you like, except for military installations. But still I think there is nothing here."

We rode through Makung, a town of some 8,000 persons, stopping whenever we saw a subject for our lenses. Homes and shops in town are solidly built of concrete, brick, and coral blocks.

Temple a "Military Installation"

At the outskirts we drew up in front of a Confucian temple undergoing gaudy repainting. Within its courtyard soldiers were playing a crude form of volleyball (page 273). As we approached the gate to photograph them, the officer murmured apologetically, "No military installations, you know; that is an order."

Later we received permission to picture such scenes of no military importance.

In the open countryside our first impression was that the womenfolk do most of the daily chores and field work. Bright-skirted girls were cultivating the gardens and carrying water to irrigate thirsty crops. Nearly all had their faces hidden by towels or scarves.

↓U. S. Navy Gives an Ice Cream Party

Officers and enlisted men from the seaplane tender USS *Pine Island* dish out sundaes at an improvised soda fountain. School children line up for the treat.

U. S. Navy Official

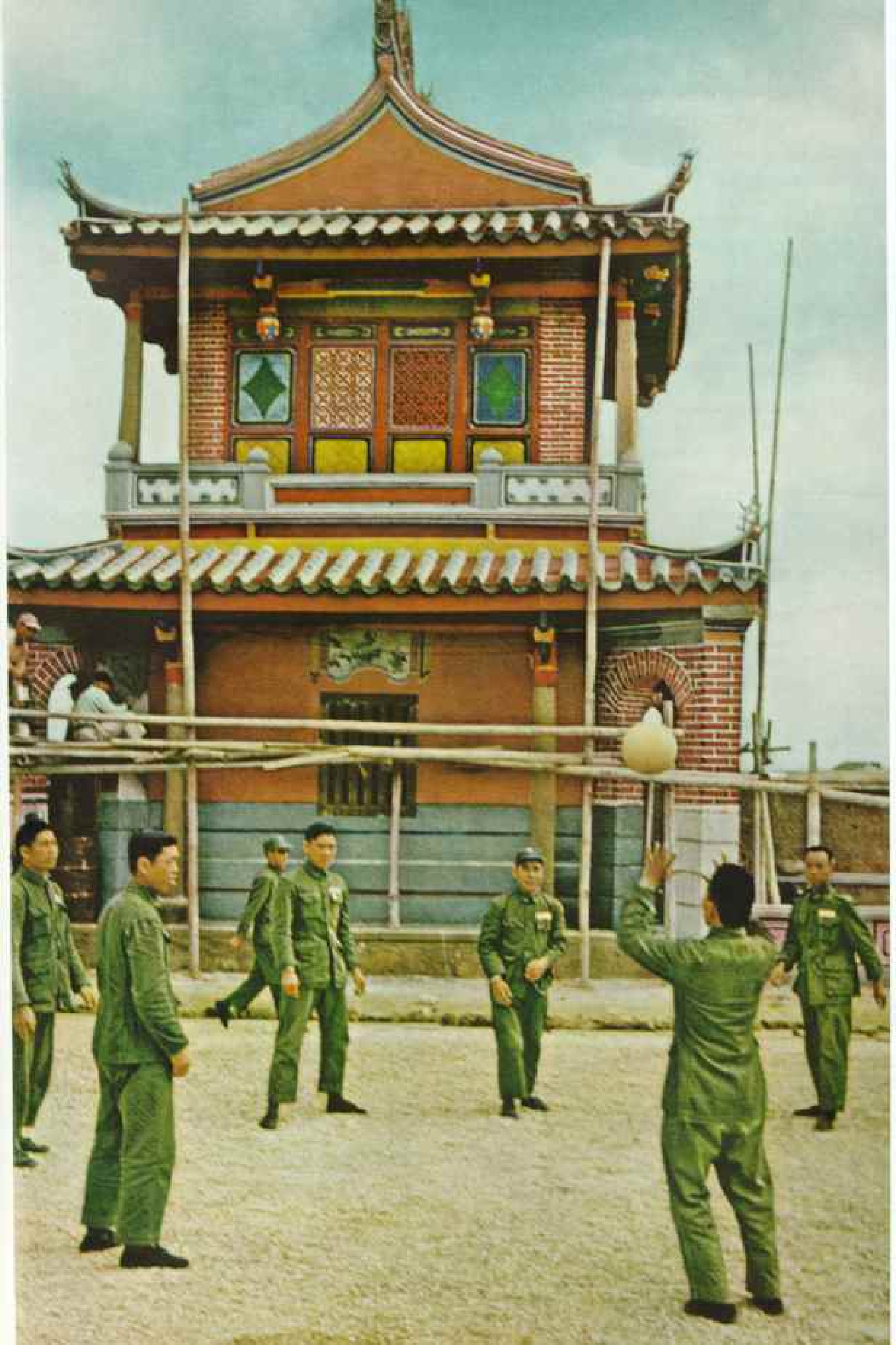
↓ Gossip and Water Alike Gush at a Village Well

Hundreds of shallow wells supply water for home use and irrigation in the riverless Pescadores. This farm boy, who balances a heavy shoulder yoke, is charged with watering the crops. Coral windbreak shelters a vegetable plot from destructive winds.

↑ Women Probe Rocky Shores for Edible Seaweed

Dried in paper-thin sheets and wrapped around rice, the weed is esteemed as a delicacy.

→Page 273: Recreation is limited. Volleyball, even without a net, helps Nationalist soldiers pass leisure hours. Painters refurbish the Confucian temple.



Most of them also wore glovelike sleeves from wrist to elbow, and some wrapped their legs in spiral puttees.

Inquiring, we found that this dress derives, not from modesty, but from need for protection against wind, dirt, and sun (page 276). Partly, too, it reflects vanity; light complexions, we learned, are greatly prized.

Social events where young people can display their carefully protected complexions, however, are few indeed. Such occasions consist mainly of religious festivals and similar celebrations. Only in Makung is there a movie house.

Along every road we were forcibly struck by the humble existence of the people. Everybody must work for a meager living; there is little class distinction.

The infertile land and serious lack of water preclude anything but the barest subsistence form of agriculture. Each individual seed and plant must be protected from the searing salt-laden winds.

Although some cattle are used as beasts of burden, most cultivation is done by man and woman power—not excepting the children, who work alongside their parents. There are schools in the villages, but work comes first. The only tools available on most tiny holdings are primitive hoes and sickles.

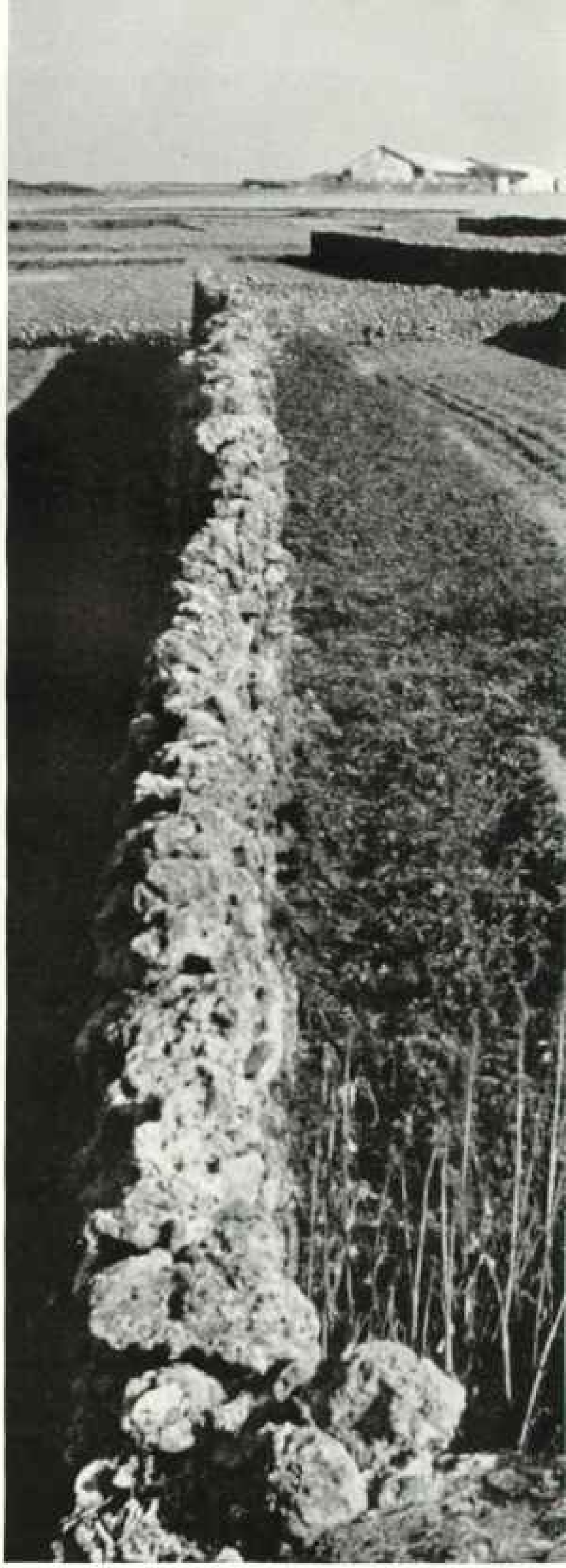
Smiles Undimmed by Hardships

Despite the rigors of island living, the people have ready smiles. Young folk laugh and joke as they work together, especially at harvest and planting time. Much of the work is communal, or at least is done by several members of the same family.

Until the advent of commercial aviation, the islands were almost completely isolated from both the mainland and Formosa itself. Under prewar Japanese rule, when the Pescadores served as a naval base, neither immigration nor emigration was encouraged.

Outside Makung few houses have electricity, so there is little temptation to stay up past sunset, even without the military curfew which was in effect when we were there. Social life is usually confined to the limits of each little village, though good roads connect them with the capital.

Most village homes, we found, huddle together around a central square, with pigpens, cow stalls, and chicken cages an integral part of the house compound. Chickens and ducks run at will through doorways, picking up stray bits of food dropped by the children, who always seem to be eating.



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From the main island of Penghu we crossed to Paisha over a causeway that ties with the intermediate small island of Chungtun.

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Rock Walls Crisscrossing Penghu Fields Shield Crops from Wind-borne Salt Spray

Gales blow in off the sea more than 200 days a year. Only a few crops, such as the hardy sweet potato, can grow in the open. Some coral walls rise as high as 10 feet. Here a farm wife hauls irrigation water.

At the end of the road on Paisha we came to a large fishing village. Clinging to the side of the bare hills, its rich pinks and earthy ochers contrasting with the blue of the bay, it might almost have been transplanted from the Mediterranean. Several boatbuilders were hand-hewing new craft.

Crowds of cheering youngsters followed us everywhere. To them, we "foreign devils" were like visitors from outer space.

A lone sentry paced the beach. As I focused on him, the colonel spoke reproachfully. "No military installations. Remember?"

I remembered.

On the hillside stood a beautiful old temple, painted a warm pink and roofed with aging blue-green tiles. At one side were several gnarled trees, their trunks wrapped in woven wicker sleeves to protect them from both wind and children. A few girls played in the foreground. As I raised my camera, I suddenly realized that a group of soldiers was visible in the distance. "No military installations," I remembered; so I sent the colonel down to ask them to move.

GI's Help Install Warning System

Dinner our first night was simple, unaffected army chow, Chinese style. During the meal we asked if there were any Americans on the island. We were told the MAAG (Military Assistance Advisory Group) had a hostel next door, with a small group of officers and enlisted men.

Later, talking to the officers, we learned that most of the group were radar or communications specialists and instructors, who were helping to set up air-raid detection and warning systems on the island.

Next morning, in still-brilliant weather, we hurried to the docks to watch the fishing fleet return. Small boats, painted in bright reds, yellows, and blues, with staring eyes on their prows to guide their passage through the dangers of the deep, glided into the harbor under square sails (page 266).

Bigger diesel-driven craft, built for deep-sea fishing, lined up at the cold-storage plant to take on ice for trips that might last days.

At the plant, fish merchants weighed baskets of silver-scaled catches. Fishermen watched narrowly and shouted a few words of guttural Fukienese whenever they questioned the weight or the price. A few men sat cross-legged on the hatches mending nets.

As the sun crept higher, more and more boats set sail. By 9 o'clock the harbor was deserted. Only a ferry from one of the other islands chugged into the quay to discharge its load of assorted livestock, babies, grandmothers, and harried parents, burdened by boxes, bags, and paper-wrapped packages. A uniformed customs officer examined every parcel with meticulous care.

Water and Winds Warp Island Life

Although Keelung (Chilung), at the northern tip of Formosa only 165 miles away, is one of the wettest cities on earth, these islands rarely get enough water. In dry periods every drop must be drawn by backbreaking labor from the hand-dug wells or brackish pits, then carried by bucket to the gardens.

Fortunately, the Government is drilling wells and building an irrigation system with the hope of providing enough water to permit year-round agriculture. As it is now, there is generally only one harvest a year.

Even though the people have the promise of water, they still will have the winds. Strong gales blow with a steady, determined ferocity, warping the crops, trees, and lives of even the hardiest inhabitants. And on occasions come howling typhoons.

"Why do you live here under such difficult conditions?" we asked the Pescadoreans.

"Because our people before us lived here," was their simple answer.

If the Communist leaders on the China mainland attempt an invasion of Formosa, as they threaten, the Pescadores undoubtedly will figure in their strategy. Always in times past, these tiny islands have served as a convenient steppingstone to that larger goal.

The Chinese first occupied the Pescadores at the end of the 6th century of our era. The islands were known as a formal part of the Chinese Empire after 1300. The Dutch briefly held them in the early 1600's.

Koxinga conquered the Pescadores, and in

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← **Sun and Wind, Not Modesty, Dictate Hoods for Farm Women**

Unlike that of near-by Formosa, the soil of the Pescadores is infertile. Peanuts, sweet potatoes, and a few garden vegetables grow in the basalt sands. Most crops are planted between March and June when the northeast wind is weak, the rainy season imminent, and a typhoon unlikely.

Lower: For most islanders the oxcart provides the sole means of transportation. Few bicycles and fewer automobiles quicken the tempo of island life.

Fishing Boats Load Ice in Makung Harbor

More than half the islanders are full-time fishermen; thousands more derive at least part of their income from fishing. Surplus fish is traded to Formosa for rice.

Lacking resources, the Pescadores must depend on the world for lumber, coal, oil, and most manufactures. A few small factories produce ice, peanut oil, bricks, and dried fish.

American aid helped these fishermen restore ice-storage facilities and repair boats and equipment.

Marksmen Practice Near Makung

Troops use a range close to a cemetery stretching along the coast. Though the Pescadores total only about 50 square miles of land, graveyards cover almost 10 percent. Housing occupies less than half as much space.

Winds Clipped This Gnarled Old Banyan

Northeast gales buffet the islands in winter; monsoons sweep them in summer. A few stunted trees grow only in sheltered spots. This ancient specimen, its trunk encased in crumbling cement, stands in the courtyard of a Makung temple. ↓ Baseball cap shields a boy's eyes from the sun. Grandmother prefers Oriental dress.

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Nothing at This Roadside Fruit Stand Is Home-grown

Pescadores people import virtually all fruit from Formosa. Bananas, oranges, and sugar cane command high prices.

the 1660's he took Formosa and used the islands as a base for his revolution against the Manchus. He is still a hero to Formosans as well as to Chinese and Japanese. Koxinga, also known as Cheng Chen Kung, had a Chinese father and Japanese mother.*

The broad harbor beside Makung is big enough to hold any invasion fleet of junks and landing craft. The land affords ample room for several jet airfields.

Breakfast: "Eight Delights"

This point was emphasized by the island commander the day we left. He had invited us to breakfast, during which he interlarded military briefing with the special treat his cook had prepared. This was a rich dish of rice mixed with bits of dried persimmon, lotus seeds, nuts, raisins, red bean paste, and dried *lung-yen* (dragon's eye), a pulpy fruit related to the litchi nut. The whole was saturated with a heavy sweet sauce. "Dish of eight delights," our host called it, and explained that it was usually reserved for weddings, festivals, and other special occasions.

"Don't underestimate the importance of this island group in the plans of the Communists," he told us. "No matter what promises they make, when they are ready they will attack here first. It is the logical and ideal place for them to build up an invasion fleet, which otherwise cannot make the crossing of the strait in one night under cover of darkness.

"I know you correspondents," he added when we were saying farewell, "and I know there is nothing here to bring you back—except a war. That, none of us wants; but if it comes, we will be ready."

* See "Formosa—Hot Spot of the East," by Frederick G. Vosburgh, NATIONAL GEOGRAPHIC MAGAZINE, February, 1950.

An Elder Reflects Wisdom and Serenity

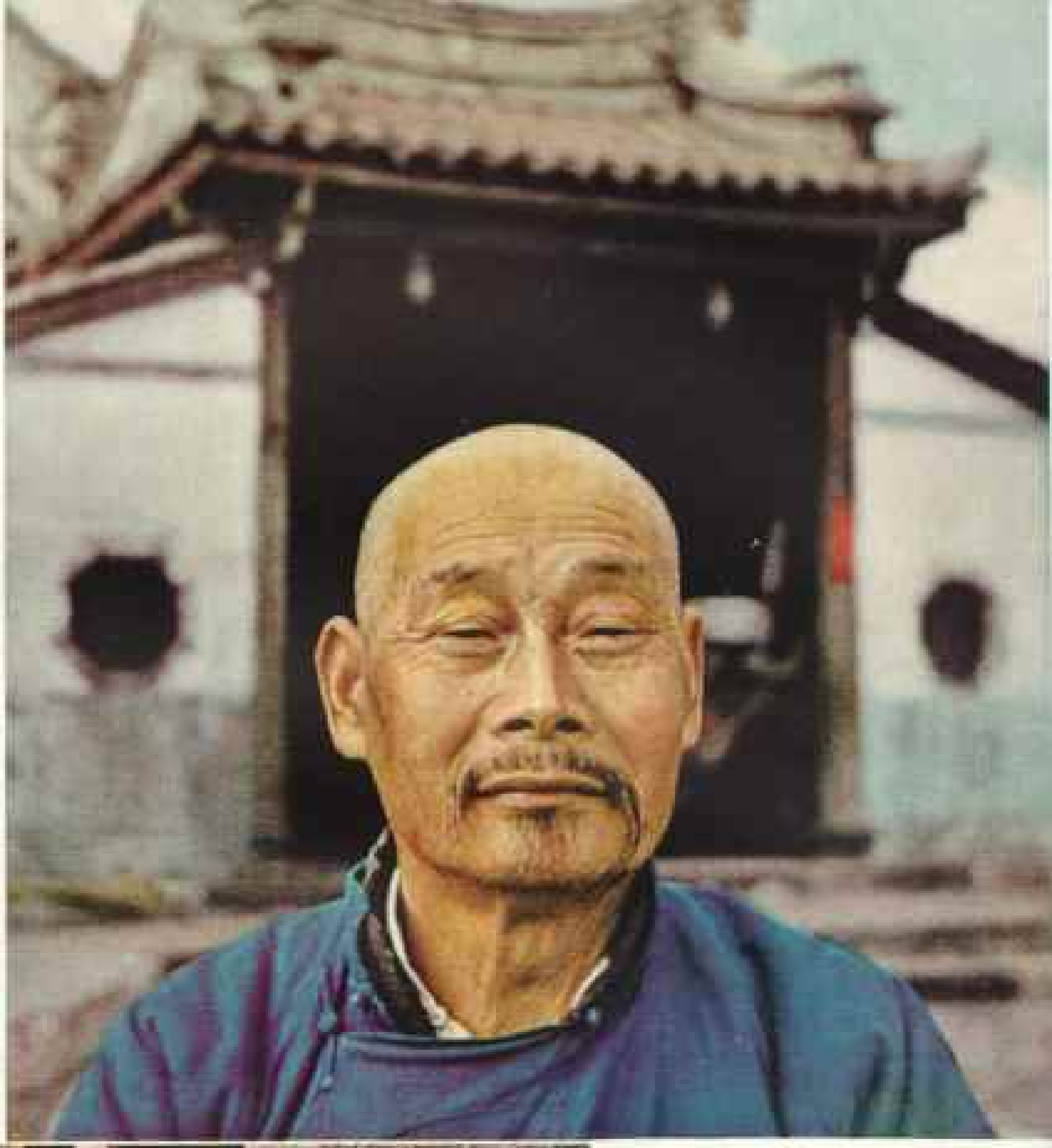
Obeying the custom of old China, Pescadores families worship ancestors and revere the aged.

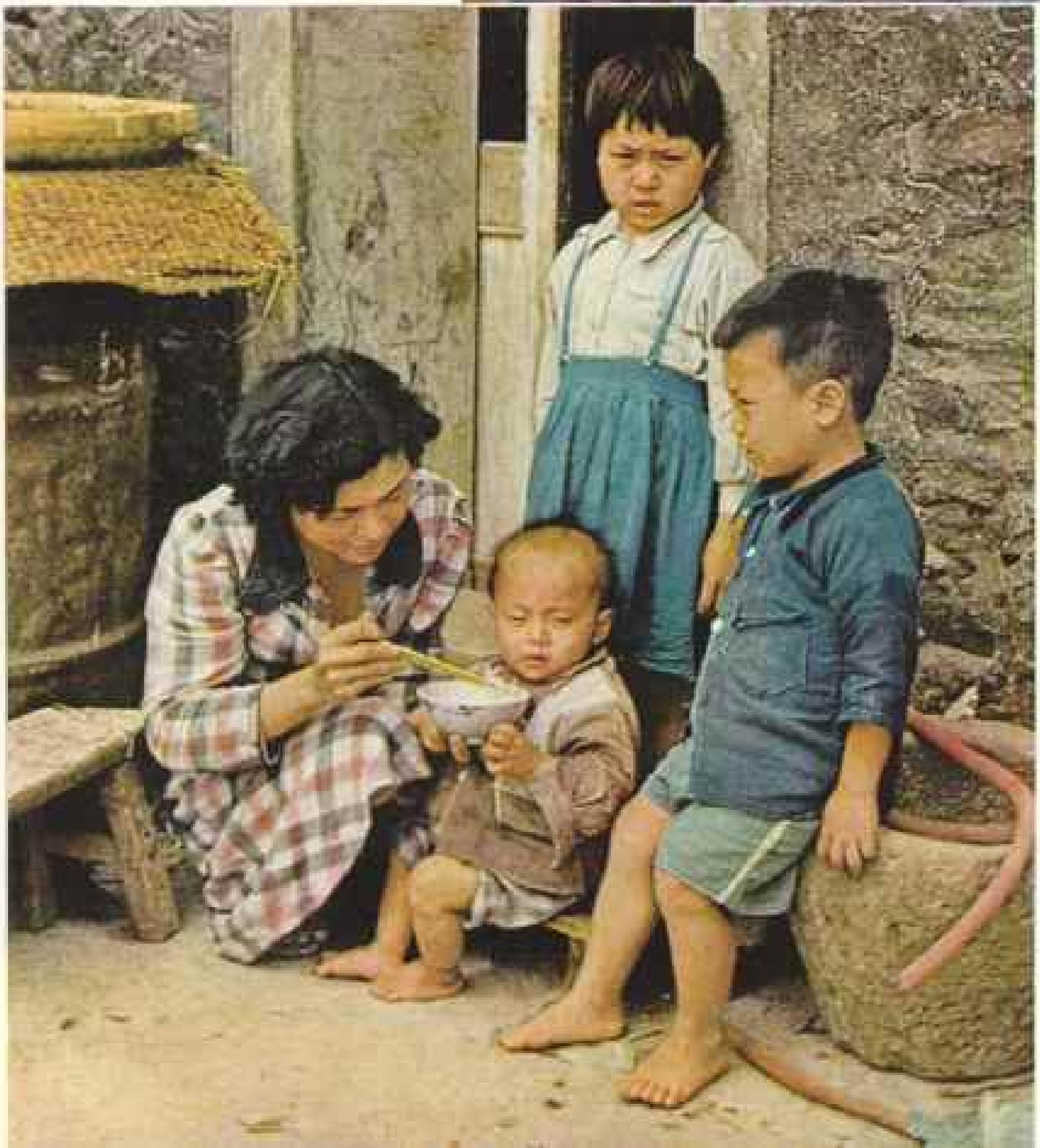
In the villages the word of the elders is respected. Residents look to them for counsel and guidance.

Although a few large and ancient temples enjoy public contribution, there is little organized religious activity. Many householders and some entire communities worship spirits associated with fertility or with physical safety.

The island's large and numerous graveyards testify to harsh conditions on the barren land. Cholera, now suppressed, claimed a heavy toll in the past.

Most of this man's life was spent under Japanese rule. Japan gained possession of the Pescadores in 1895 following war against China. For half a century the Japanese isolated the islands while strengthening the defenses. Foreign visitors were barred; emigration was discouraged.





← Food Bores Baby; He'd Rather Stare

Chinese youngsters learn early to eat rice. They progress from gruel, eaten with a spoon, to flaky boiled rice, eaten with chopsticks.

Women far outnumber men in the Pescadores. Many young men leave home to seek an easier living outside the islands. Notwithstanding, the birth rate has risen in recent decades. New medical facilities and improved sanitation have lowered the death rate.

With land at a premium, farms are small. One agricultural expert has deemed the Pescadores capable of supporting 6,900 people at most, yet about a dozen times that many gain a living from sea or land.

Left Hand Fingers Keys, the Right Strums the Strings of a Lutelike Instrument

Seafarers Fit Out a New Boat

In Formosa Strait just west of the Pescadores, a warm current sweeping from the south meets a cold current moving from the East China Sea. These waters harbor more than 300 varieties of fish.

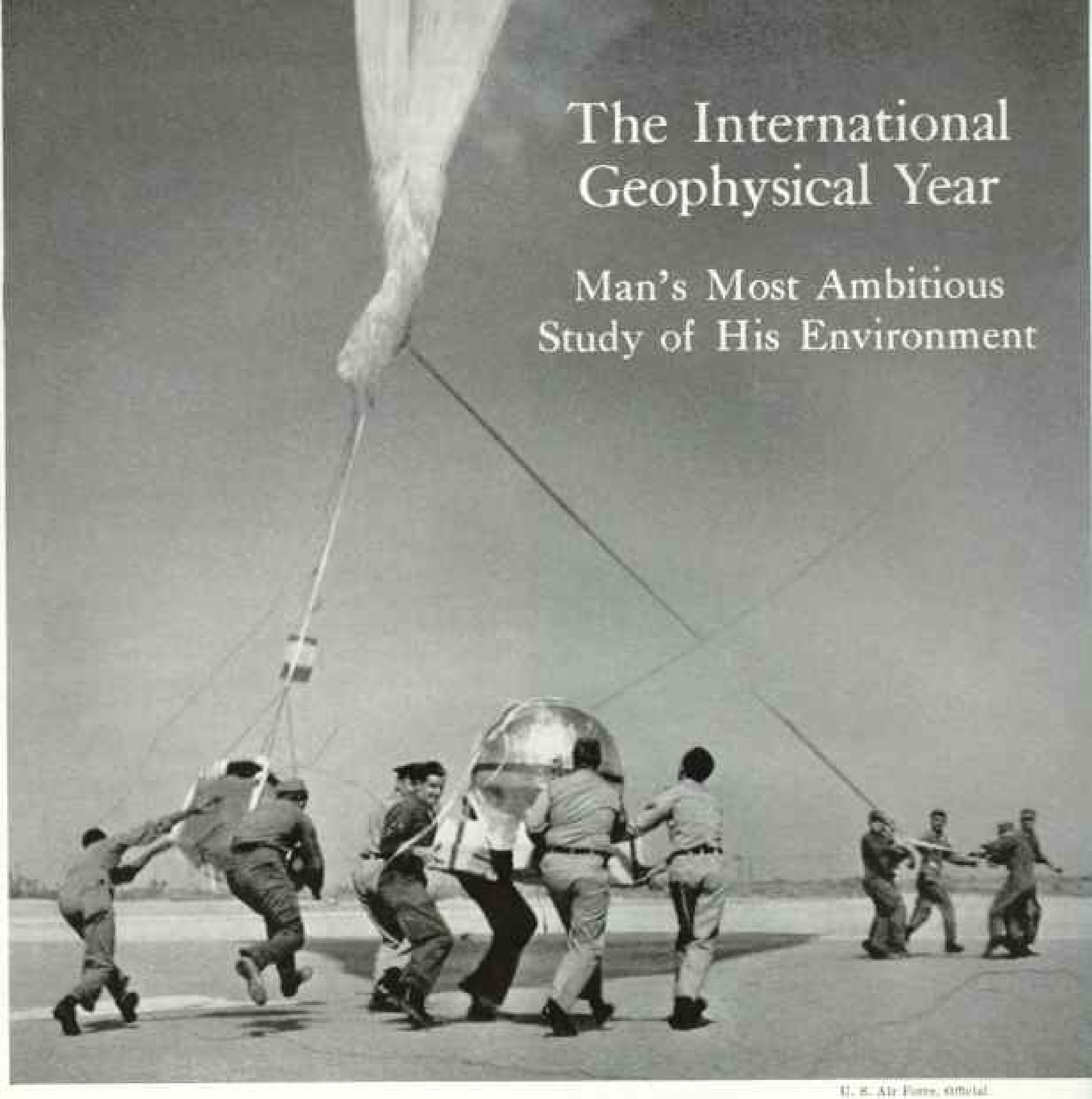
The average annual catch totals about 15,000 tons. It includes red snapper, sardine, shark, and bonito. A species of spiny lobster, among the world's largest, is caught in the Pescadores area.

← "Eyes of the Dragon Are Glistening"

So reads the paper streamer—a good-luck insigne—on the vessel's bow. Crewmen hope it will ward off leaks in their newly launched boat. Symbolic eye enables the craft to "see" its way through shallow reefs and other dangers.

The International Geophysical Year

Man's Most Ambitious Study of His Environment



U. S. Air Force Official

By Hugh L. Dryden, Ph.D., Sc.D., D.Eng., LL.D. 285

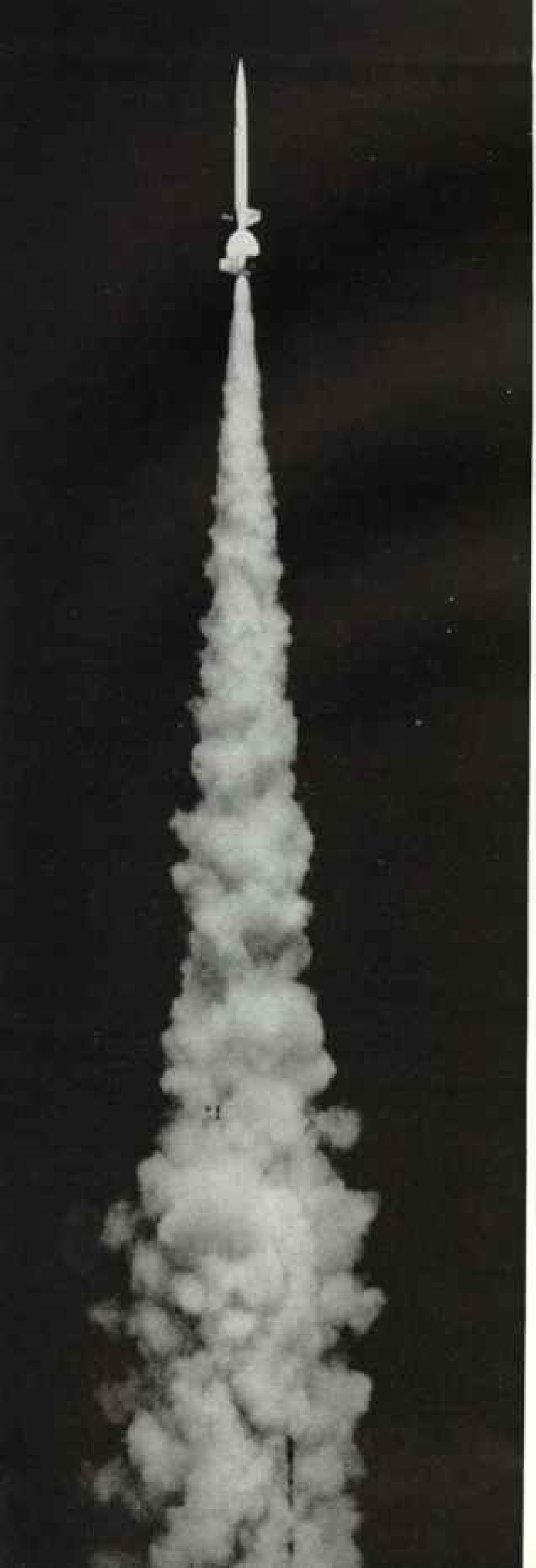
Director, National Advisory Committee for Aeronautics; Home Secretary, National Academy of Sciences; Trustee, National Geographic Society

ALL over the world men of science are mobilizing for the most intensive survey of man's physical environment ever attempted, the International Geophysical Year.

During this great "symphony of science," extending from July, 1957, through December, 1958, some 5,000 scientists representing more than 40 countries will make a concerted, globe-girdling study of the so-called "earth sciences." Thus into 18 months will be telescoped the equivalent of many normal years of research into the nature of our world and its atmosphere, and the mysteries of its alliance with the sun and of its place in space.

"Tired of war and dissension, men of all nations have turned to mother earth for a common effort on which all find it easy to agree," said Dr. L. V. Berkner, Wisconsin-born President of the International Council of Scientific Unions and Vice President of its Special Committee for the International Geophysical Year.

During the IGY, scientists will measure and probe our whirling planet, seek knowledge of its core and crust, and study the



chemistry and physics of its atmosphere and oceans.

Men will record the rhythm of the strange tides that surge through its water and air and will capture samples of the atmosphere at many levels. They will study the puzzling "electric rain" of invisible radiation that bombards our atmosphere from space and the apparently random fluctuations in the earth's magnetic field.

Observers will scrutinize every major land and sea mass. They will sample conditions from ocean deeps to altitudes of hundreds of miles, above 99.99 percent of the earth's atmosphere.

Answers to Many Questions Sought

Now, a year and a half before the start of the ambitious program, geophysicists everywhere are preparing plans and instruments. Expeditions of the United States, British Commonwealth countries, France, and the Soviet Union sailed late last year for Antarctica to set up bases for vigorous exploration of the earth's least-known continent (map, page 288).

For most of the million years or so of man's time on earth, he remained almost ignorant of the true nature of the planet he rode through space. Only during the last few centuries has he gained any clear understanding of the roughened ball of rock on which more than two billion of his kind travel through space around the life-giving sun.

This century's fast-increasing knowledge of the earth undoubtedly will be greatly accelerated by the International Geophysical Year.

Answers may be forthcoming to such baffling questions as these:

Can the paths of hurricanes be more accurately forecast? Is the climate of the whole earth warming up? How soon, at the present

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Man Flings Aloft a Fiery Lance to Explore the Fringes of Space

Rocket exploration of the upper atmosphere is one of 12 task areas marked for intensive study in the International Geophysical Year (the IGY) between July, 1957, and December, 1958.

This Aerobee rocket starts its climb from Holloman Air Development Center, New Mexico. A leg of the launching tower shows through the smoke.

An improved model, the Aerobee-Hi, will be used for IGY tests. After 2½ seconds the six-foot booster rocket will drop off. Speed will reach 4,800 miles an hour in 44 seconds. The instrument carrier will attain maximum altitude, 175 miles, in 4½ minutes.

Page 285: At Holloman a balloon takes off with cosmic ray instruments and test animals.

New Mexico College of Agriculture and Mechanic Arts

rate of Arctic thawing, may ships on schedule traverse the Northwest Passage? Is there danger that melting icecaps eventually may flood populated coastal lowlands?

Where do cosmic rays originate? How do they tie in with the aurora? Can earthquakes be predicted? Is the earth losing atmosphere into space? Can dry spells be forecast in time to forewarn farmers?

The International Geophysical Year, as the third in a series of International Years, continues a tradition started by the First International Polar Year of 1882-83. That year saw bases set up in the Arctic which contributed much to our knowledge of the northern lights and of Far North magnetism and weather (page 295).

The Second International Polar Year, half a century later, in 1932-33, brought new knowledge of radio communication and opened the way for many electronic advances, such as radar.

World-wide Cooperation

Headlong progress in the earth sciences made desirable another "year" after only a quarter of a century, instead of the intended 50-year lapse. Learned societies around the world, therefore, working through their International Council of Scientific Unions, set in motion plans for the 1957-58 IGY.

President Eisenhower has heralded the undertaking as "a striking example of the opportunities which exist for cooperative action among the peoples of the world." Enthusiasts have dubbed the IGY the "Geophysics-for-Peace" program. The U.S.S.R. and at least four other Iron Curtain countries will participate.

The IGY will focus a major effort on the polar regions, especially Antarctica, and on the equatorial belt. Stations will be grouped,

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Rockoon, a Balloon-borne Rocket, Rises 13½ Miles Before Taking Off

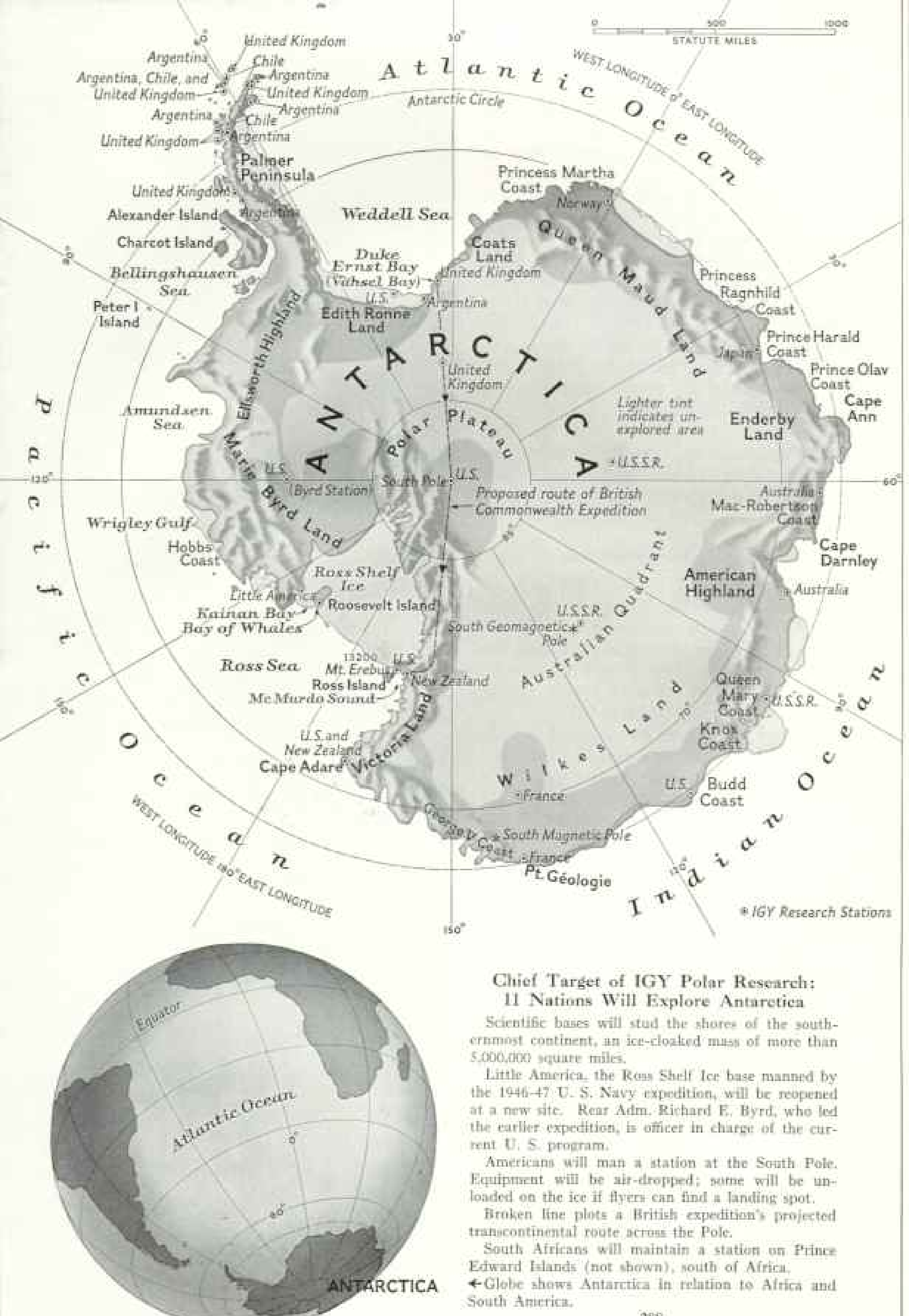
During the IGY several nations will conduct rocket shoots for research in the stratosphere. Hundreds of missiles, including dozens of Aerobee-Hi's, will be launched by the United States.

Ninety feet in diameter, this plastic balloon drifted aloft from the icebreaker *Staten Island* near the North Magnetic Pole in 1953.

The flight was one experiment in the Skyhook program, by which the United States Navy measures cosmic radiation and other phenomena of the upper atmosphere in high latitudes.

Fired automatically, the rocket cut loose from the balloon and attained a 60-mile altitude, a record for its type. Its instruments radioed back data.

U. S. Navy, Official



Chief Target of IGY Polar Research: 11 Nations Will Explore Antarctica

Scientific bases will stud the shores of the southernmost continent, an ice-cloaked mass of more than 5,000,000 square miles.

Little America, the Ross Shelf Ice base manned by the 1946-47 U. S. Navy expedition, will be reopened at a new site. Rear Adm. Richard E. Byrd, who led the earlier expedition, is officer in charge of the current U. S. program.

Americans will man a station at the South Pole. Equipment will be air-dropped; some will be unloaded on the ice if flyers can find a landing spot.

Broken line plots a British expedition's projected transcontinental route across the Pole.

South Africans will maintain a station on Prince Edward Islands (not shown), south of Africa.

←Globe shows Antarctica in relation to Africa and South America.

too, for detailed investigations along five meridians of longitude—10° E., 110° E., 140° E., and 70°-80° W. (map, page 294). These pole-to-pole lines roughly link regions sufficiently developed to afford ready-made observation sites.

Each country will plan and execute its own program, under guidance of the coordinating international committee, the Comité Spécial de l'Année Géophysique Internationale (or CSAGI). The National Academy of Sciences has responsibility for realizing the United States program, using Federal funds obtained through the National Science Foundation.

A U. S. National Committee has been established under the chairmanship of Dr. Joseph Kaplan. Dr. Lyman J. Briggs, Chairman of the Research Committee of the National Geographic Society, represents The Society in the IGY program.

With men and materials, ships, trucks, and planes from each of its three services, the Department of Defense will support United States scientific teams, especially in remote and relatively inaccessible regions.

Man-made Satellites Planned

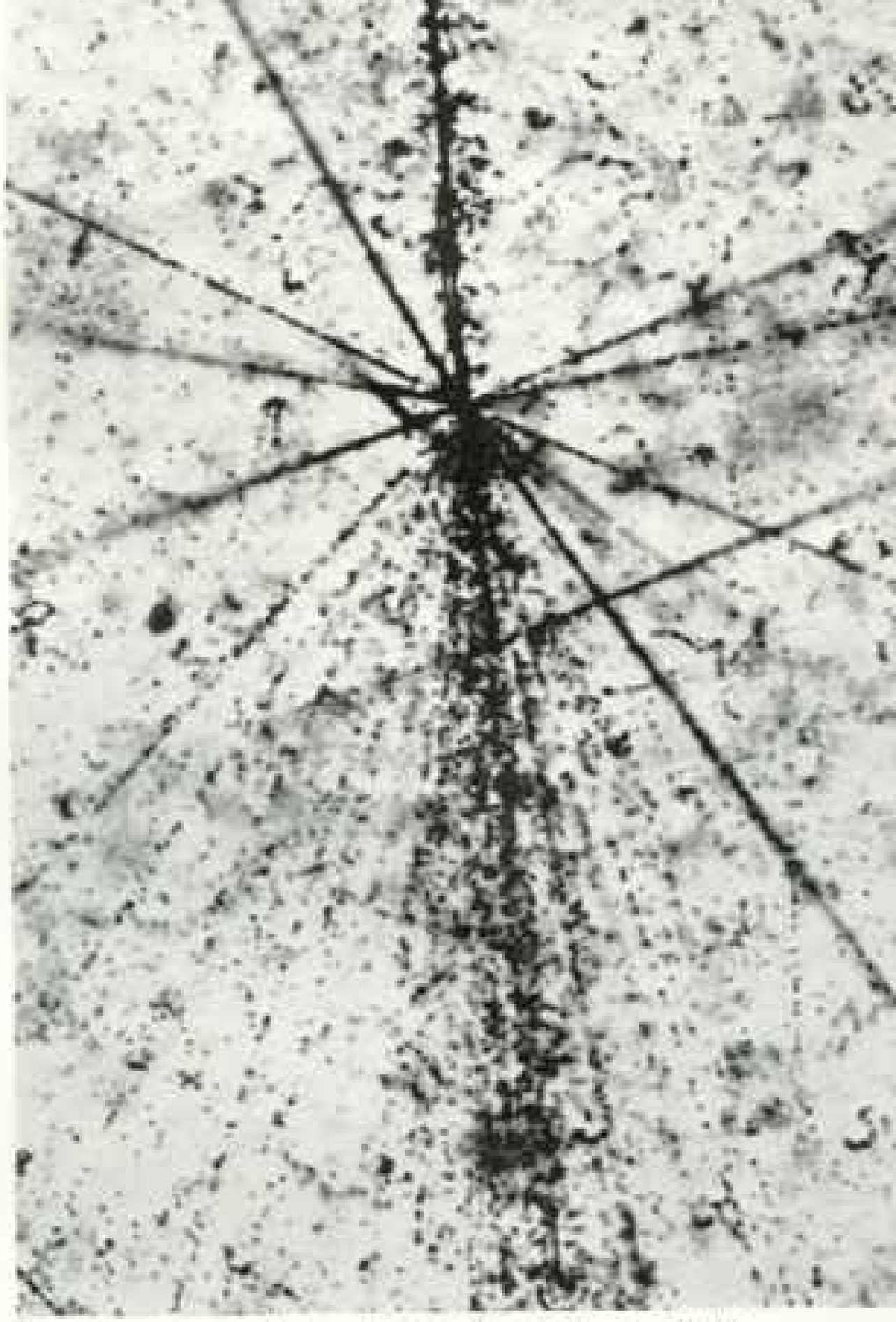
An announcement issued from the White House on July 29, 1955, released important news: The United States planned, as part of its participation in the IGY, to launch into space during 1957 or 1958 history's first artificial earth-circling satellite. The man-made moon will be a lofty lookout for the International Geophysical Year.

Every effort will be made to equip one or more of the new heavenly bodies with compact recording and transmitting instruments that will telemeter to earth vital information about the character and frequency of radiation in space, including cosmic, gamma, solar ultraviolet, and X-rays. Observations of the gravity-tethered device will reveal the density of matter in space as well as add to our knowledge of the size and shape of the earth.

The artificial satellite, or "long-playing rocket," as Dr. Kaplan has called it, will girdle the earth entirely for scientific purposes. All nations will have full access to data emanating from the satellite and gathered in observing it from the earth.

Less spectacular than the satellite projects, but likely to produce results of equal value, are IGY plans for the use of sounding rockets.

A year-long "rocket shoot" will pull new plums of knowledge out of the heavens at heights from 60 to 200 miles above the earth. The United States, Great Britain, Australia,



289 Herman Yagoda, National Institutes of Health

Cosmic Ray Shatters an Atom

A heavy ray from outer space left this pattern on the silver bromide and gelatin of a balloon-borne photographic plate at 100,000 feet. The ray entered at the top. Striking the emulsion, it exploded an atom into protons and alpha particles (thick tracks to right and left) and into a beam of mesons (downward shower of dots). Such heavy-nuclei rays normally smash no closer to earth than 70,000 feet, where they break up into less energetic particles.

Japan, and possibly other countries will fling aloft the flaming missiles, packed with instruments. The United States alone plans to launch hundreds of rockets (pages 286 and 287).

American plans include the launching of several dozen 1,250-pound, 20-foot Aerobee-Hi rockets, most of them at Fort Churchill, Manitoba, on the west coast of Hudson Bay. Others will blast off from New Mexico. Fort Churchill, on the fringe of the northern zone of auroral intensity, is a choice site for the study of auroral particles in the upper ionosphere.

The United States also intends to launch two-stage rockets—combinations of the Nike booster and the Deacon rocket—and several hundred smaller rockets, some from land sites at Thule, Greenland, and in central Alaska and some from off the coasts of southern Cali-

fornia and Virginia. Others will be launched from ships at sea in numerous locations: between Canada and Greenland, in the Florida-Bahamas area, and en route between the Equator and Arctic and Antarctic destinations.

Rockoons, rockets released from balloons at the top of ascent, will play a part in the program (page 287). While the Aerobee-Hi climbs to an altitude of about 175 miles, the Rockoon tops off at 60. Plane-borne rockets, called Rockairs, may also participate.

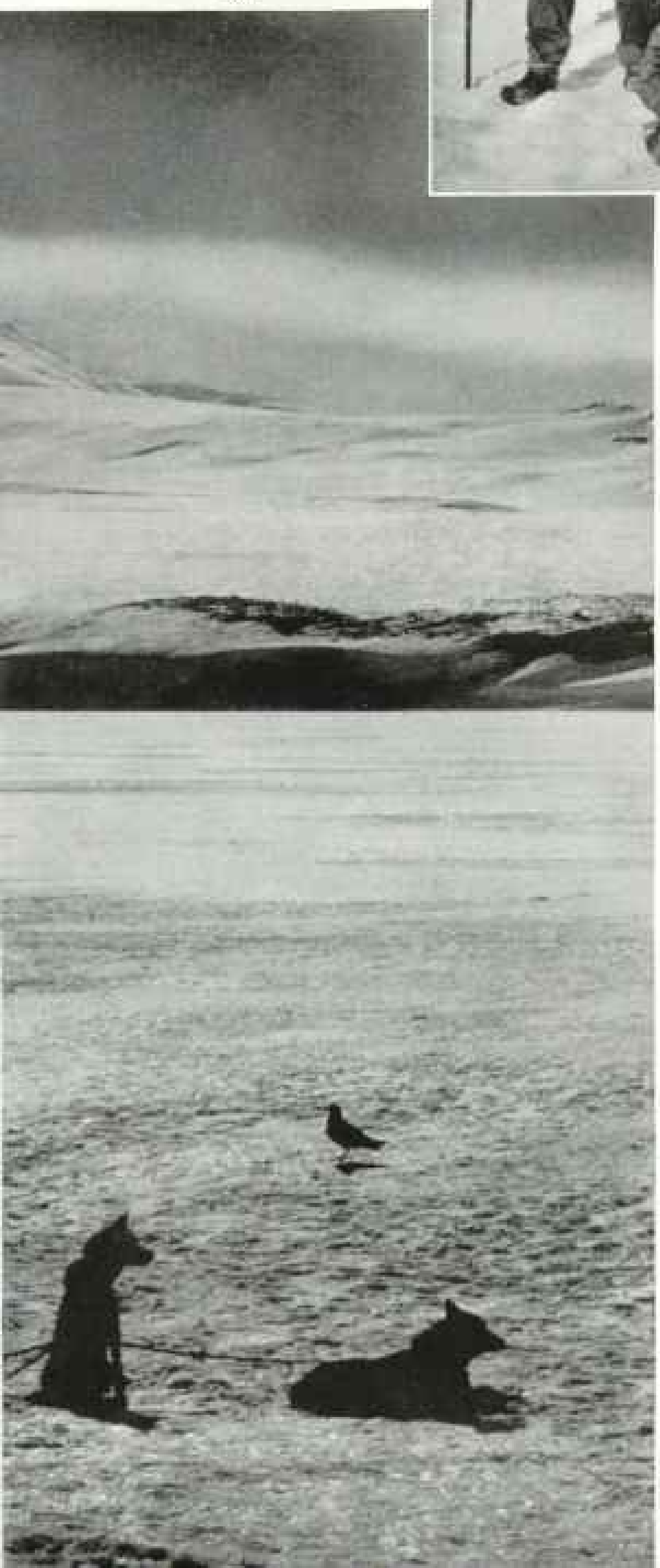
Rocket-borne cameras and electronic instruments will provide "eye-witness" reports of conditions on the threshold of space.

By reaching the outer limits of atmospheric interference, rockets and artificial satellites promise man his clearest view yet of the wonders—and mysteries—of the sun and radiation in space.*

* See "Our Universe Unfolds New Wonders," by Albert G. Wilson, National Geographic Magazine, February, 1952.

Scott at South Pole: → Triumph and Defeat

Capt. Robert F. Scott (standing, center) and his companions reached the Pole January 18, 1912. They found a tent of the Roald Amundsen party, which attained the Pole December 14, 1911. All in the British party died on the return trek. Standing: Capt. L. E. G. Oates, Scott, and Edgar Evans. Seated: Lt. H. R. Bowers, Dr. E. A. Wilson.



© Herbert G. Ponting

←Mount Erebus Smokes in a Land of Ice

Erebus, a 13,200-foot volcano on Ross Island, was discovered by Sir James C. Ross in 1841 and named for one of his ships; Britons climbed it in 1908.

The U. S. Navy is building an air base on Victoria Land, just across McMurdo Sound from Erebus, to support scientific stations in Antarctica during the International Geophysical Year (map, page 288).

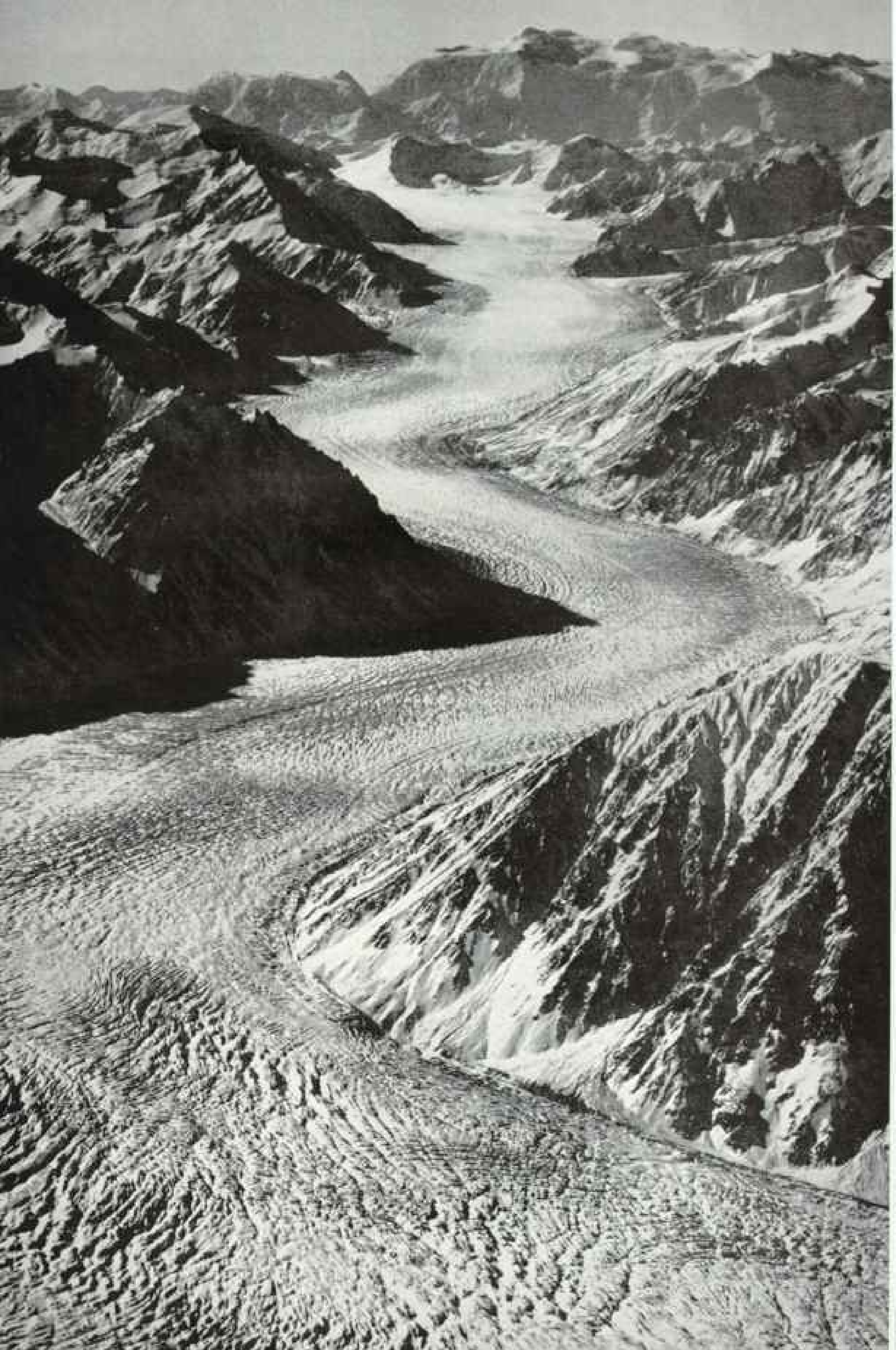
Men and dogs in this view participated in Scott's expedition. His cameraman made the picture.

The surface of the earth, spottily afflicted by earthquakes, floods, volcanic activity, and avalanches, is of course the foundation of man's physical environment, which the IGY is dedicated to explore.

Yet men live, work, and play at the bottom of an ocean of air. Radio communication and radio aids to navigation are affected by variable conditions in this atmospheric sea. The air may be thought of as a filter, too, protecting man by absorbing rays from outer space that would prove deadly if his body received their total charge.

The IGY will emphasize upper-air exploration in an effort to increase our limited knowledge of the top half of our atmosphere.

One unsolved puzzle, for example, concerns a tremendous, invisible tug of war that goes on endlessly, high in the sky. The average temperature difference between the hot tropics and the cold poles, resulting from unequal heating by the sun, represents a daily energy transport across the 40° latitude belt equal to the explosion of four and a half million atom bombs. Eddies and whirls of atmosphere, in the form of "highs" and "lows," some covering areas as large as the United States, transfer this huge amount of power northward.



Bradford Washburn

Pan American Airways

A Writhing River of Ice Drains a Canadian-Alaskan Snow Field

Page 292: Glaciers, which cover about a tenth of the earth's land surface, will get special study during the International Geophysical Year. About one percent of the world's water is locked up in ice. This reservoir vitally concerns man, because it influences climate and sea level.

Wrinkled by crevasses, Donjek Glacier leads the eye to 19,850-foot Mount Logan, highest peak in North America after Mount McKinley. This area was a blank until the National Geographic Society's Yukon Expedition explored it in 1935.

Rippling Curtain of the Aurora Silhouettes Alaskan Spruces

Called northern lights, the aurora borealis has a counterpart in the Southern Hemisphere, the aurora australis. The phenomenon distorts reception of radio waves, including the broadcast frequencies.

In this view, the parallel arrangement of the fine rays shows how the earth's magnetic field affects the aurora. Stars appear as elongated dots, a result of the earth's rotation during a time exposure.

The National Geographic Society has supported aurora research conducted by Dr. Carl W. Gartlein of Cornell University since 1938.

Yet no one fully comprehends the whys and wherefores of this colossal activity.

To explore this phenomenon, as well as to further other upper-air studies, four main chains of weather stations will coordinate IGY observations along the five chosen lines of longitude between the north and south polar regions. Sounding balloons, released simultaneously from these stations, will soar to 100,000 feet. Their findings, metered earthward by radio, will help tell the story of the upper atmosphere.

More will be learned of the powerful jet streams that boost aircraft speeds by 100 miles an hour or more. Weather studies from thousands of observation points will assist IGY analysts in correlating the interaction of air masses thousands of miles apart.

The maps of all continents will be far better tied together by precise new latitude

and longitude determinations in an important area of IGY environment appraisal. Even with modern optical and electronic equipment, the charted distances between key geographical points on certain continents may be as much as several hundred feet in error.

By direct photography of the moon, making this natural satellite of the earth a triangulation point, mappers are confident of reducing the probable error in measured distances between continents to a fraction of the present error.

Pinning down place locations will assure more accurate time measurement, as well as more precise knowledge of the speed at which the earth spins in space and of irregularities in its rotation.

Society Aids Cosmic Ray Study

Since 1946 research grants by the National Geographic Society have supported cosmic ray studies. A major objective of the IGY effort will be to swell our knowledge of these little-understood impulses, spawned, it seems, both in the sun and in interstellar space.*

Mightier far than any form of energy man has yet been able to release, cosmic rays spray the earth constantly, with occasional power bursts greater by multiples of millions than those generated by the biggest atomic accelerators. Cosmic rays may hold, locked in the secret of their nature and origin, clues to new sources of power as revolutionary as thermonuclear fusion.

Ultraviolet radiation from the sun, by ejecting electrons from the molecules of the gases constituting air, creates the so-called ionosphere, the atmospheric layer from 50 to more than 200 miles above the earth.

Ebb and flow in ionization, which directly affect radio reception, are thought to reflect abnormal activity on the sun. By means of electronic recorders, IGY observers at hundreds of stations will trace the pattern of such fluctuations in earth's "electrical weather."

The beautiful and elusive aurora throws across the sky an electrical mirror that grossly distorts reception of electric waves (page 293). Studies of the aurora, as well as of cosmic rays, have long been supported by the National Geographic Society.†

International Geophysical Year studies in oceanography will broaden knowledge of the deep currents in the sea, as a requisite for long-range weather forecasting. Submarine geophysical studies will be made in the eastern and western Atlantic basins and in the central and eastern South Pacific.‡

Sea level recorders at 30 island stations will measure the puzzling day-to-day and season-to-season fluctuations in sea level and their relationship to other phenomena in the ocean and the atmosphere.

The oceans and seas cover about 71 percent of the earth's surface. A better understanding of the constantly moving circulation of the sea is vitally needed, since it affects the climate and weather of the land as well.

Just as a river's current speeds up here and there in rapids, so will the normal IGY

IGY Research Focuses Along Five Meridians

Chosen lines of longitude—70°-80° W. and 10°, 110°, and 140° E.—cross major land masses with numerous observation sites. North Americans will work along the 80th meridian; South Americans along the 70th. Other geophysical surveys are scheduled for the equatorial belt and polar areas.

The 1957-58 International Geophysical Year continues the cooperative studies for which the Polar Years of 1882-83 and 1932-33 set precedents.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Trailing Cosmic Rays in Canada's North," by Martin A. Pomerantz, Leader, National Geographic Society–Bartol Research Foundation Cosmic Ray Expeditions, January, 1953; and "New Frontier in the Sky," by F. Barrows Colton, September, 1946.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Unlocking Secrets of the Northern Lights," by Carl W. Gartlein, November, 1947; and "Mystery of Auroras: National Geographic Society and Cornell University Study Spectacular Displays in the Heavens," May, 1930.

‡ See, in the NATIONAL GEOGRAPHIC MAGAZINE, "New Discoveries on the Mid-Atlantic Ridge," November, 1949; and "Exploring the Mid-Atlantic Ridge," September, 1948, both by Maurice Ewing.

↟ *Proteus* Calls to Mind a Tragedy of the First Polar Year

In the summer of 1881 three-masted *Proteus* deposited U. S. Army Lt. Adolphus W. Greely and 24 men at Fort Conger, Ellesmere Island. There they carried out scientific observations for two years.

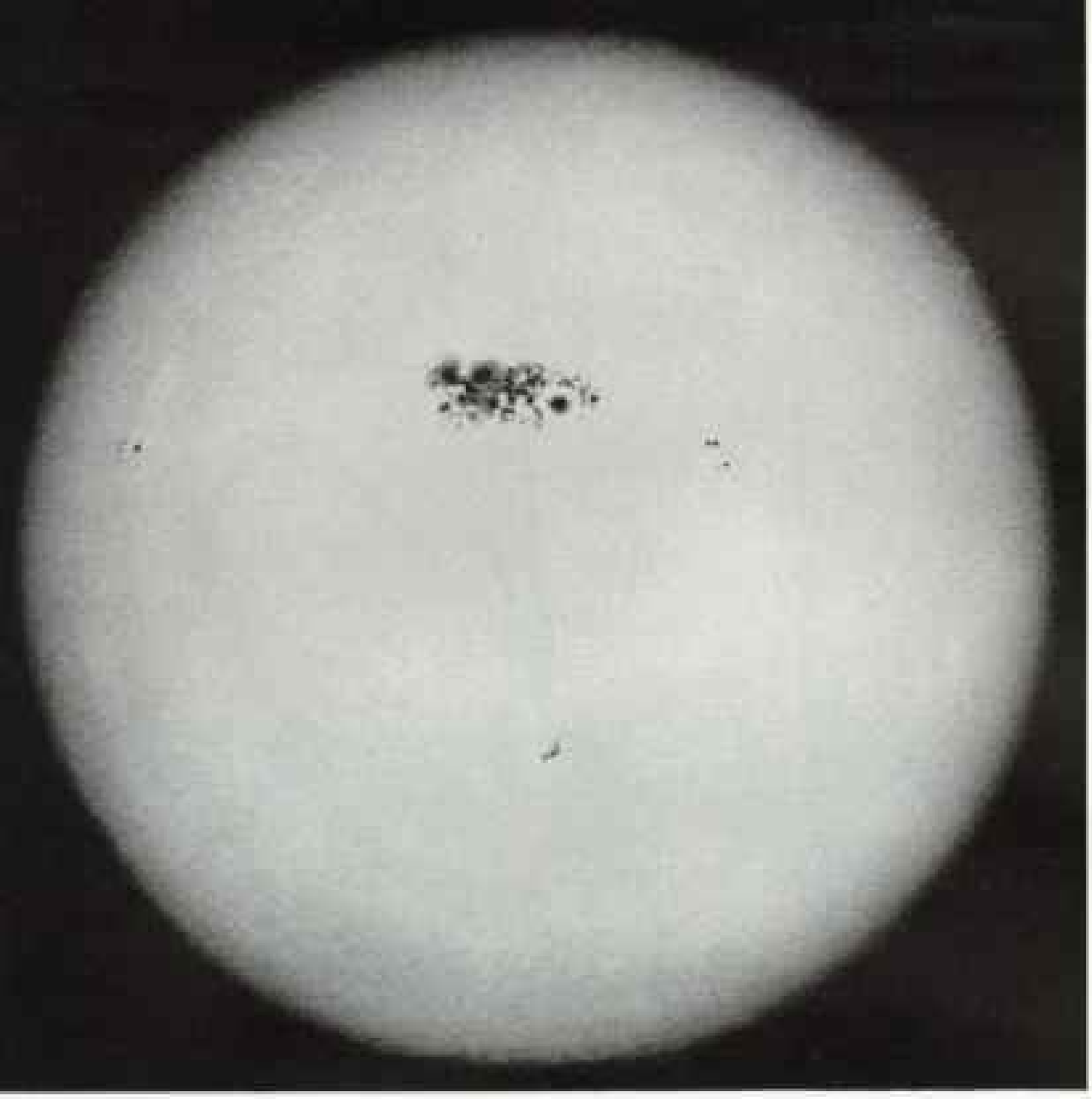
When promised relief ships failed to arrive in 1882 and 1883, the 25 retreated in open boats to Cape Sabine, Ellesmere, expecting to meet *Proteus* at the edge of the ice. Instead they found in a rock cairn a letter saying the ship had been caught in the ice and sunk.

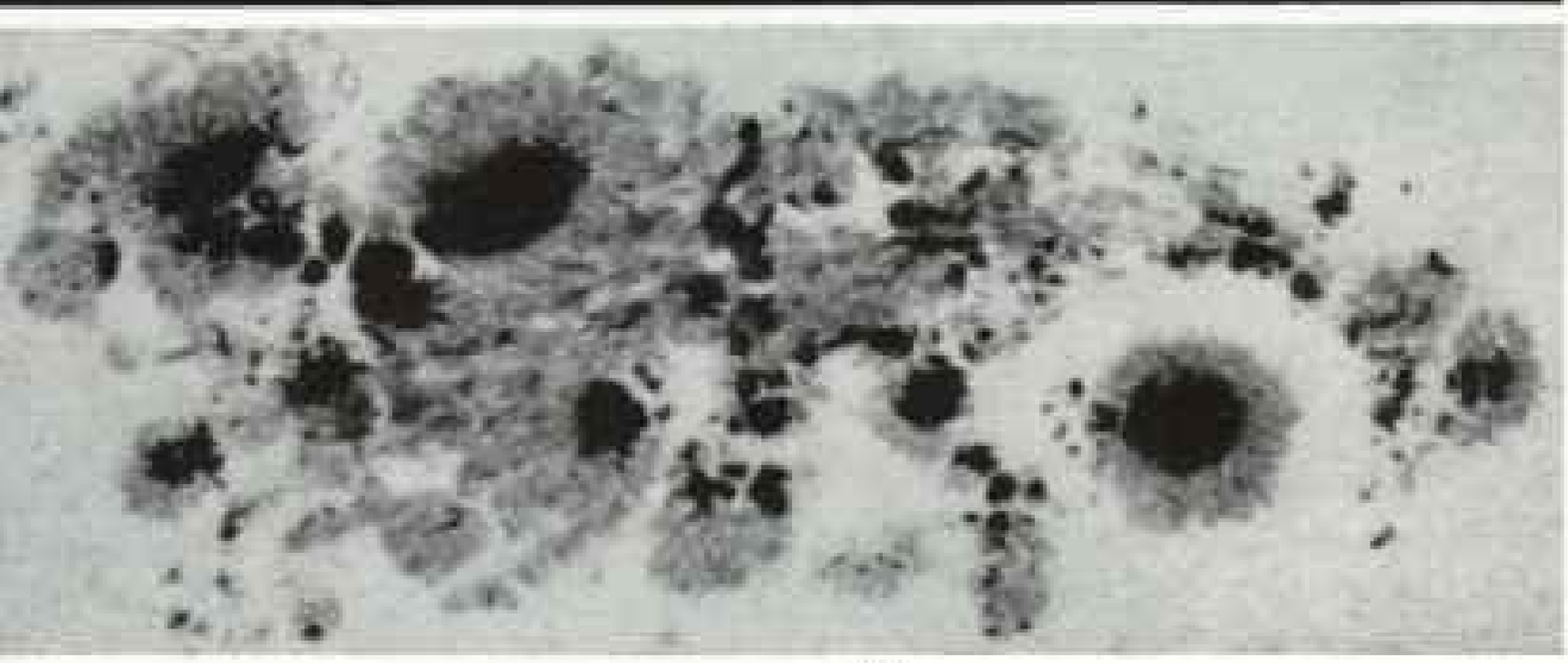
Still optimistic, the men erected rock walls, overturned a boat for a roof, and tried to live for eight months on two months' rations. One by one they starved. Seven were rescued in 1884; six survived, among them Lieutenant Greely, who later rose to the rank of major general.

Despite its tragic end, the expedition made notable observations on meteorology, the aurora, magnetism, and geography. Its findings contributed to the First International Polar Year (1882-83).

Proteus, a Newfoundland sealing bark built in Scotland, here lies off fog-shrouded Disko Island, Greenland, in July, 1881.

➔One of those who died on Cape Sabine was Sgt. Winfield S. Jewell, shown reading his weather instruments at Fort Conger. Library of Congress





One of These Sunspots Is Big Enough to Engulf the Earth

Actually hot and bright, sunspots appear dark only in contrast to their blinding surroundings. They show the solar atmosphere writhing in violent turmoil. Astronomers watch them closely because they sometimes cause auroral outbursts and radio disturbances in the earth's atmosphere.

Solar rotation carries the spots around the sun in about 27 days. They reach their peak in 11-year cycles. Activity was severe on July 26, 1946, date of this photograph.

IGY observers will watch sunspots closely in 1957-58, hoping to discover their cause.

Outbreaks pictured here extend a distance of some 155,000 miles, about one-fifth the sun's diameter.

Enlargement shows the dark cores, which astronomers call umbrae.

Mt. Wilson Observatory

programs be interspersed with periods of maximum effort. Intensified observations are much to be desired during days when atmospheric conditions are especially favorable, and at other times when unusual manifestations occur on the sun.

Each month will include three or four days, called Regular World Days, picked for their coincidence with special phases of the moon. Quarterly 10-day periods, entitled World Meteorological Intervals, also have been marked off. Weathermen all over the world will spur themselves to redoubled efforts at these times.

In addition, warnings from communication centers in the United States, Alaska, Japan, Australia, and the U.S.S.R. will alert all stations to Special World Intervals. These periods, of perhaps a few days' duration, will be singled out when forecasters expect unusual solar, magnetic, auroral, or ionospheric activity. Special World Intervals also will be announced at times of solar eclipses and unusual meteor showers.

During each of the special periods the frequency of observations of all phenomena will be drastically stepped up, on the principle that the more scientific lines are out, the more likely will be notable catches of unusual and useful data. Analysis centers will call on electronic computers to digest the mass of information resulting from readings that, during intense magnetic storms, may follow one another as closely as every 15 to 30 seconds.

Stirring action will be the lot of explorers, engineers, and arctic experts who push to completion IGY researches in high latitudes.

From Canadian, Danish, and United States bases and weather outposts in the Far North, trained task groups will head out by ship, dog sled, tractor train, and aircraft to fill in some of the big blanks in our knowledge of the Greenland Icecap and of polar Canada.* The

* See "Wringing Secrets from Greenland's Icecap," by Paul-Emile Victor, National Geographic Magazine, January, 1956.

U.S.S.R., the Scandinavian countries, and France plan further Arctic programs.

The most spectacular polar projects, however, are those of the all-out, many-nation attack on the Antarctic Continent, with its 16,000 miles of little-known coastline.

Eleven governments—Argentina, Australia, Chile, France, Great Britain, Japan, New Zealand, Norway, Union of South Africa, the U.S.S.R., and the United States—have plans for bases on Antarctica or its offshore islands.

These listening posts will place a scientific stethoscope against the cold heart of a continental mass comprising 5,050,000 square miles and averaging 6,000 feet above sea level, most of it thickly cloaked in ice.

The 30 or so bases will pretty evenly stud the periphery of Antarctica. France, Great Britain, the U.S.S.R., the United States, and possibly others plan also to build stations at widely separated points inland. The United States will establish its remotest outpost at or near the South Pole.

The U.S.S.R. projects one interior base near the so-called "pole of inaccessibility," the central area of the Europe-size region in Antarctica's African quadrant which has never been explored. The Soviets may establish another camp at the geomagnetic pole, about 800 miles from the geographical pole (map, page 288).

British Plan Cross-continent Trek

Several nations expect to traverse the cold interior of Antarctica; the South Pole is an intended way-stop of three or four of these parties. The Trans-Antarctic British Commonwealth Expedition will undertake a trek by snow vehicle from Duke Ernst (Vahsel) Bay on the Weddell Sea by way of the South Pole to a New Zealand base at McMurdo Sound. The New Zealand team, led by Sir Edmund Hillary, Everest conqueror, will establish a chain of depots toward the Pole to support the British on the final leg of their traverse. This party, and others, will plumb the depth of the Antarctic ice sheet by echoes from explosive charges.

The United States already has launched the lead-off venture on perhaps the most extensive Antarctic program of any country.

Briefly, the United States plans six Antarctic observatories—one at McMurdo Sound, another at Little America near Kainan Bay, and two inland stations, the first at latitude 80° S. and longitude 120° W. in Marie Byrd Land (Byrd Station), and the second at the

297 Edison Pettit, Yerkes Observatory

A Solar Prominence Rakes Space

This glowing filament shot out from the sun 280,000 miles; the observed record is 1,000,000 miles. Speed is as great as 450 miles a second. Motion pictures reveal these clouds of gas sweeping out from the sun and cascading back in graceful arches; fragments appear to float out into space. Electromagnetic forces are generally believed the cause. Bright area at the base of the prominence is the chromosphere, an incandescent layer of gas six to ten thousand miles thick. As if eclipsed by the moon, the sun's disk is blacked out by a device fitted over the telescope.

geographical South Pole. In addition, coastal sites on opposite sides of Antarctica will be manned on the Weddell Sea—possibly at Duke Ernst Bay—and on the Knox Coast. U. S. ships also will carry equipment to the New Zealand station at Cape Adare.

The nations which launched expeditions late last year sought preliminary bases in different parts of Antarctica. Russian ships were believed bound for the Knox Coast, while the British headed for Duke Ernst Bay and the French for Point Géologie near the South Magnetic Pole.

The United States Operation Deepfreeze, with Rear Adm. Richard E. Byrd in charge, aimed at construction of bases on McMurdo Sound and at Little America.

Next October the third phase of Operation Deepfreeze will begin, with reinforcement of the small wintering-over parties and with massive replenishment of construction materials, furnishings, food, and instruments. It will carry the IGY scientists to their stations.

In the southern summer of 1956-57 flights to the South Pole will determine whether landings there are possible. If so, men will be airlifted in to build and staff Pole Station. Big cargo aircraft will parachute and free-drop most of the equipment and supplies. Fifteen scientists and maintenance experts will man the South Pole observatory throughout the years 1957 and 1958.

Byrd Plans Return to Pole

Admiral Byrd, a Trustee of the National Geographic Society, whose articles in the NATIONAL GEOGRAPHIC MAGAZINE about his four previous Antarctic expeditions stand out as notable landmarks in polar literature, plans, of course, to visit Pole Station. On November 29, 1929, and again on February 16, 1947, Admiral Byrd led the first flights over the South Pole.*

The network of stations in Antarctica will make surface weather observations every three hours, and upper-air observations to 100,000 feet twice daily by balloons with radio transmitters to send back reports on temperature, pressure, moisture, and wind. From a weather central at Little America frequent forecasts will be issued for parties traveling by air and on the surface over the ice-covered continent.

Standard magnetic observatories will be established at four of the American bases. Gravity measurements will be made on over-snow journeys and airplane surveys. Balloons and rocket flights for cosmic ray measurements will further amaze the penguins and add to the incongruity of modern science at work in an ice-age setting.

Glaciologists will drill holes through Ross Shelf Ice and through inland ice to a depth of 1,000 feet or more, to obtain ice cores and measure temperature gradations.

Fifty institutions are collaborating in the U. S. share of the IGY program. More than 100 scientists have taken an active part in planning the U. S. program and a far greater number will be engaged in carrying it out.

The governments and institutions that supply the financial support for the IGY program expect and will receive very practical dividends in return for their contributions. They will enjoy improved weather forecasts and radio communication. They will benefit from greater knowledge of the upper air and near-by space environments in which airplanes, guided missiles, satellites, and, eventually, space ships will travel.

And beyond these immediate advantages lies the potential of far greater, and even unsuspected, discoveries of who-can-guess-what value to man.

Fruits of Cooperative Effort

The compelling motivation of the individual scientist is the desire to know and understand the nature of the phenomena he observes and their relations one with the other. In the great laboratory of the earth itself, man's control of his environment still is feeble. He observes only the experiments which proceed before his eyes. By himself, the view of the scientist is limited, although his mind seeks to comprehend the whole.

Cooperative effort is the answer, for it provides a simultaneous view of events and of their development in time. From cooperative effort come the raw data from which ingenious human minds will sort out order and law.

The International Geophysical Year assuredly will make a significant contribution to man's unceasing search for clearer understanding of his environment and to the fuller appreciation of its practical and spiritual values by all peoples.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Our Navy Explores Antarctica," October, 1947; "Exploring the Ice Age in Antarctica," October, 1935; and "Conquest of Antarctica by Air," August, 1930, all by Rear Adm. Richard Evelyn Byrd, USN, Ret.

NATIONAL GEOGRAPHIC SOCIETY

SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON 6, D. C.

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded sixty-eight years ago, the National Geographic Society publishes the National Geographic Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus. By dating the ruins of vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for 300 years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest dated work of man in the Americas. This stone is engraved, in Mayan characters, November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything else dated in America and reveals a great center of early American culture, previously unknown.

On November 11, 1935, the stratosphere flight of the world's largest balloon, *Explorer II*, sponsored by The Society and the U. S. Army Air Corps, reached a world-record altitude of 72,395 feet. Capts. Albert W. Stevens and Orvil A. Anderson took aloft a ton of scientific instruments and obtained results of extraordinary value.

A notable undertaking in astronomy was launched in 1949 by The Society and Palomar Observatory of the California Institute of Technology. This project photographed vast areas of space, making available to observatories all over the world, at less than cost, the most extensive sky atlas yet achieved.

In 1948 The Society sent seven expeditions to study the sun's eclipse on a 5,320-mile arc from Burma to the Aleutians.

A Greek cargo ship sunk in the Mediterranean 2,300 years ago was found in 1952 and is being excavated by the National Geographic Society–Calypso Marine Archeological Expedition led by Capt. J.-Y. Cousteau of the French Navy.

The National Geographic Society and the Royal Ontario Museum in 1951 explored and measured newly found Chubb meteor crater, 11,500 feet in diameter, in northern Quebec.

The Society and individual members contributed $100,000 to help preserve for the American people the finest of California's sequoias, the Giant Forest in Sequoia National Park.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration in 1938.

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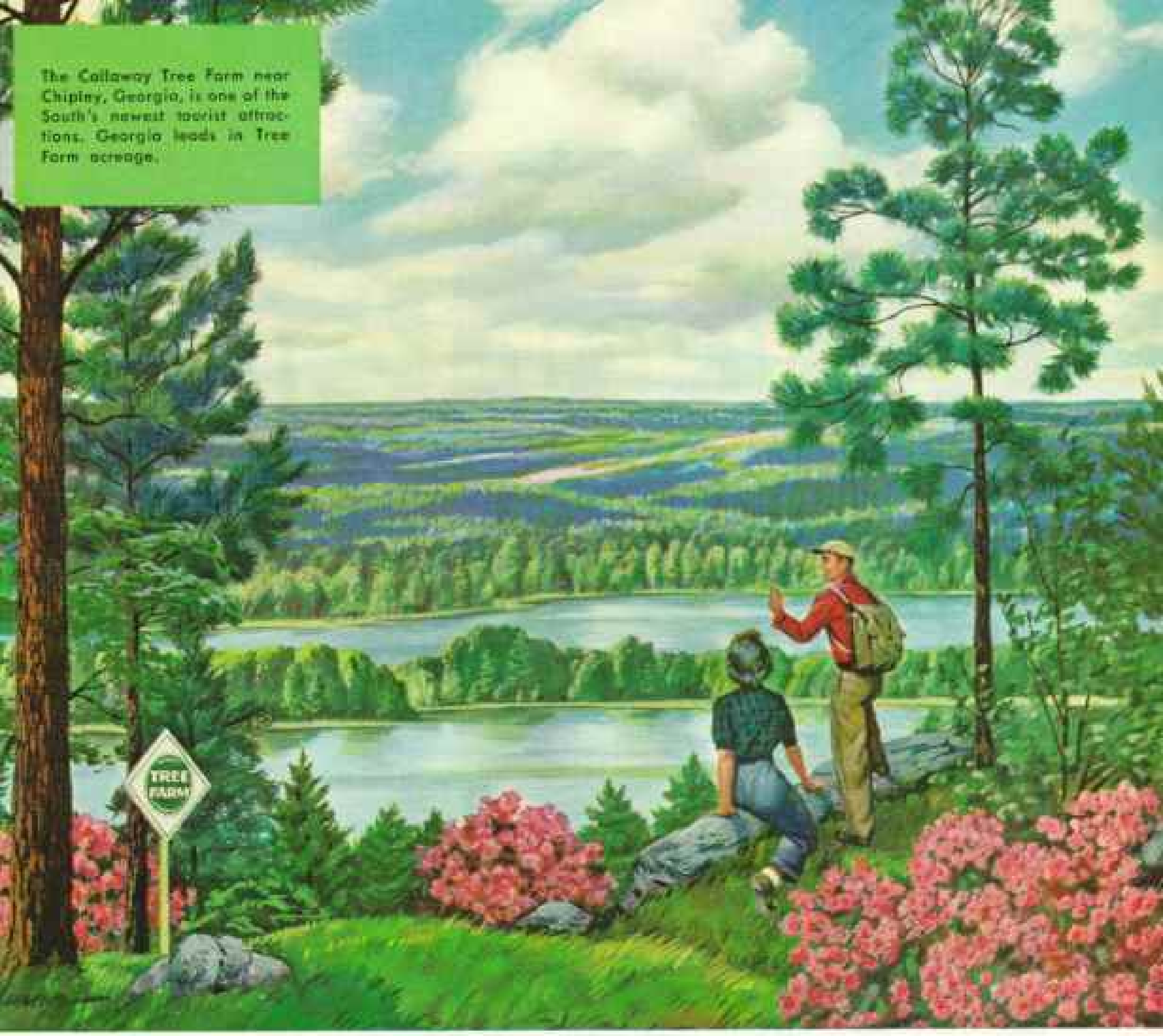

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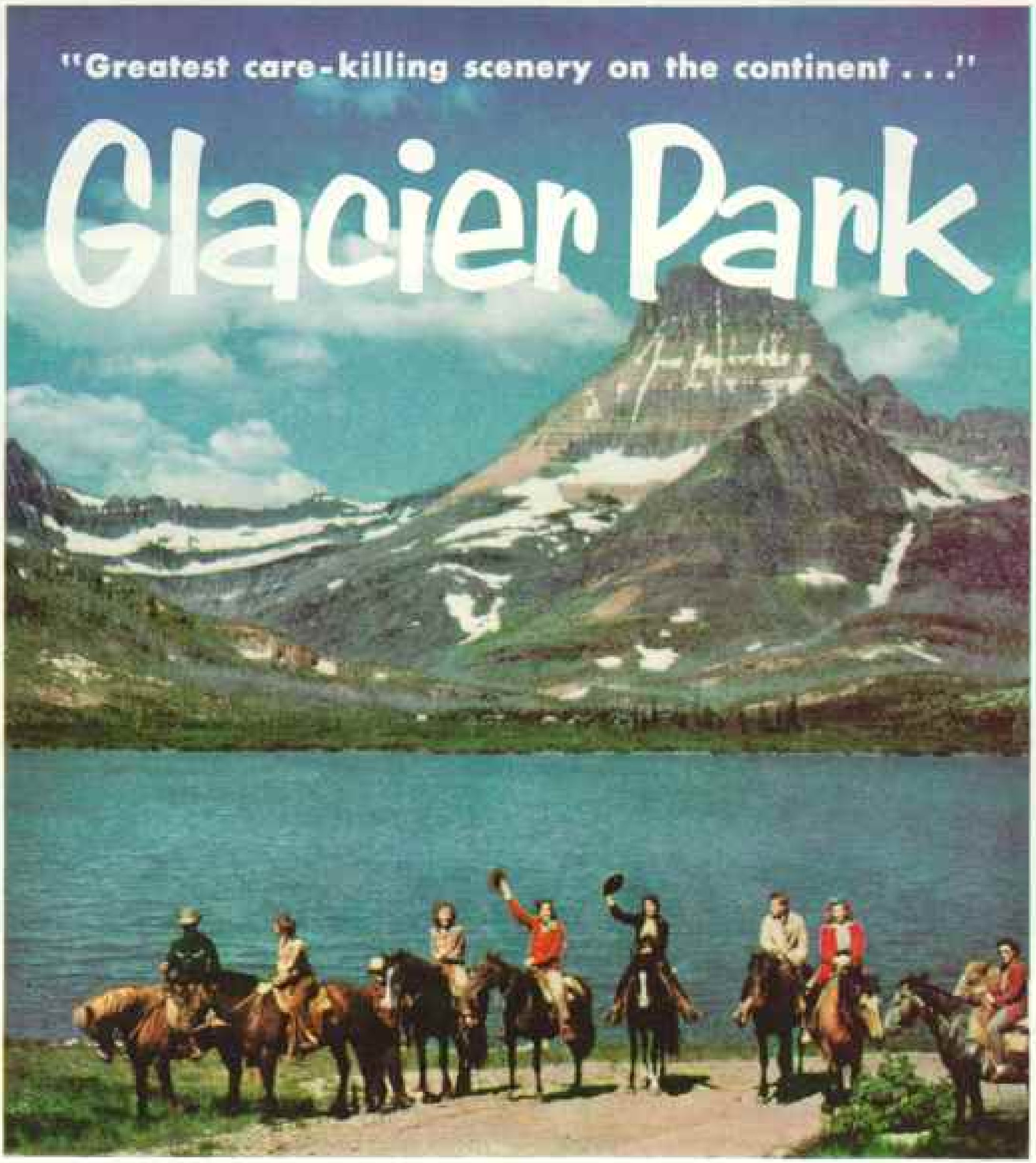

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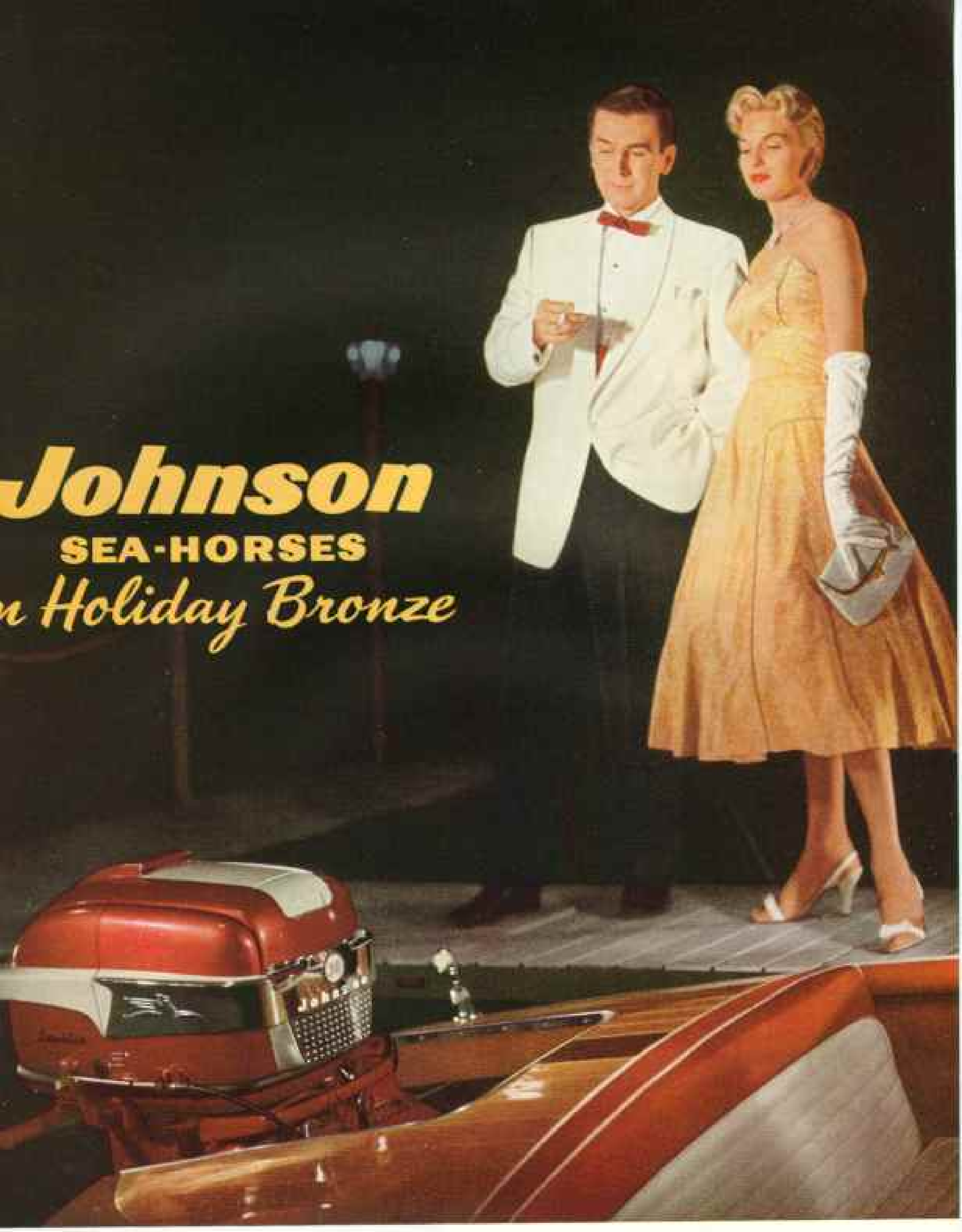

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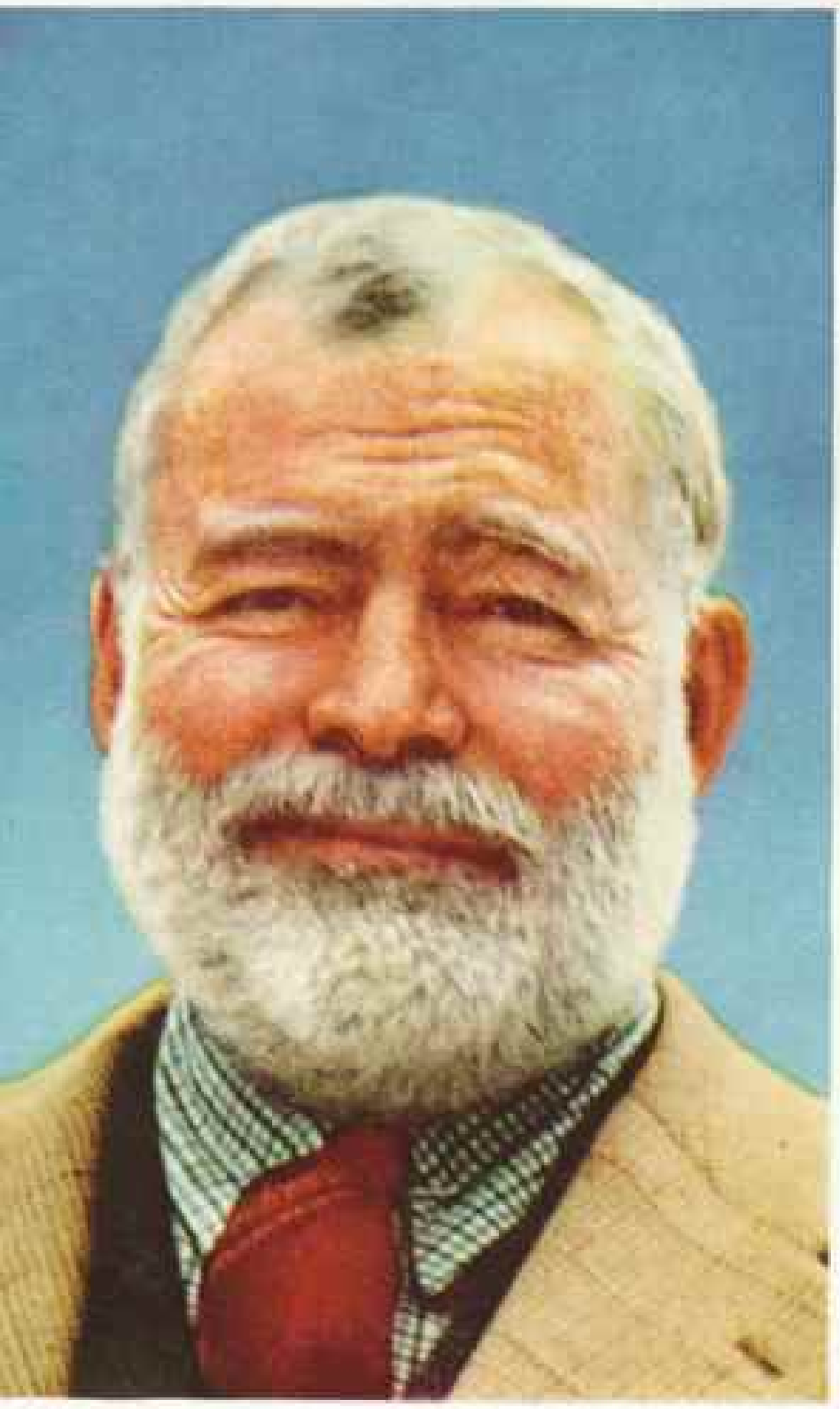

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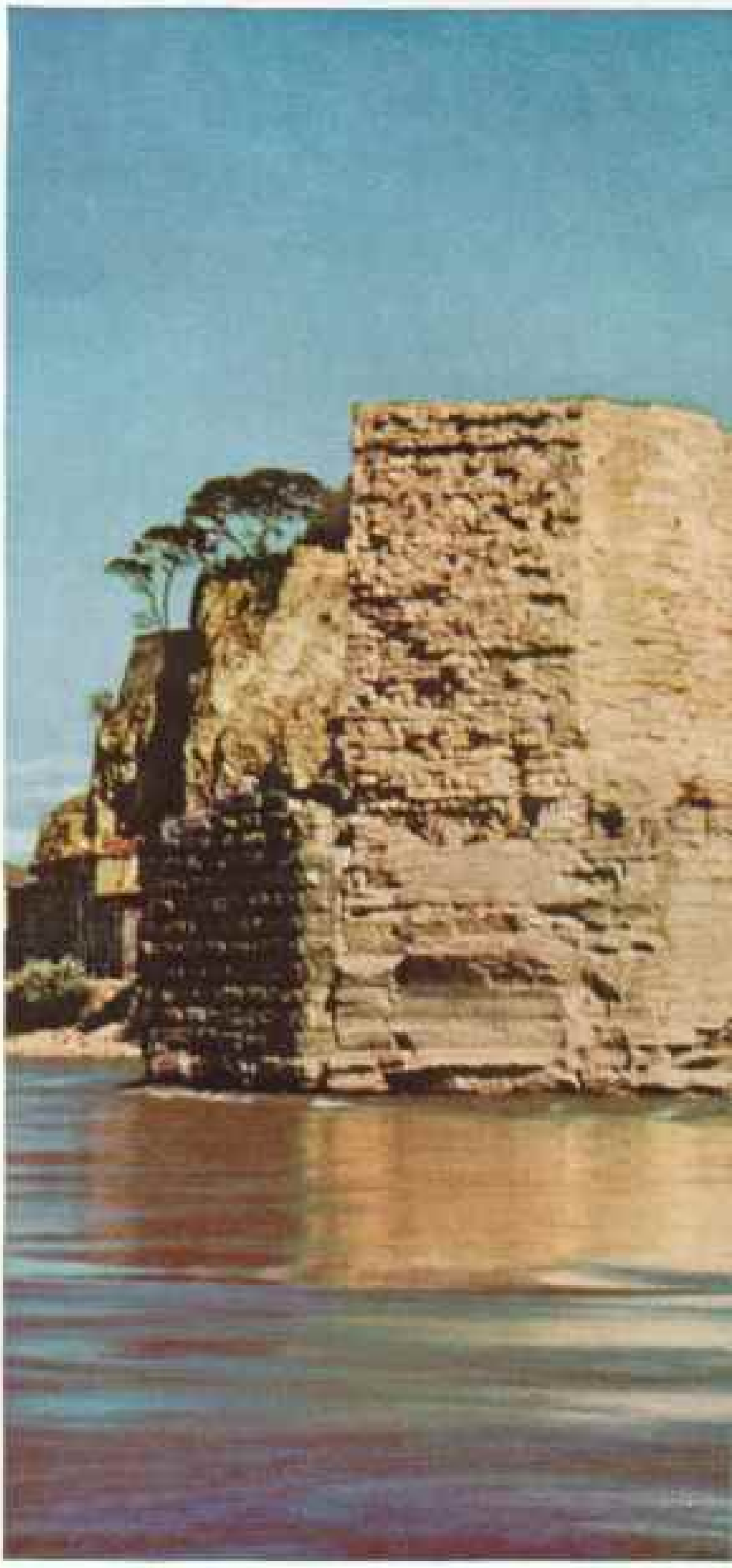

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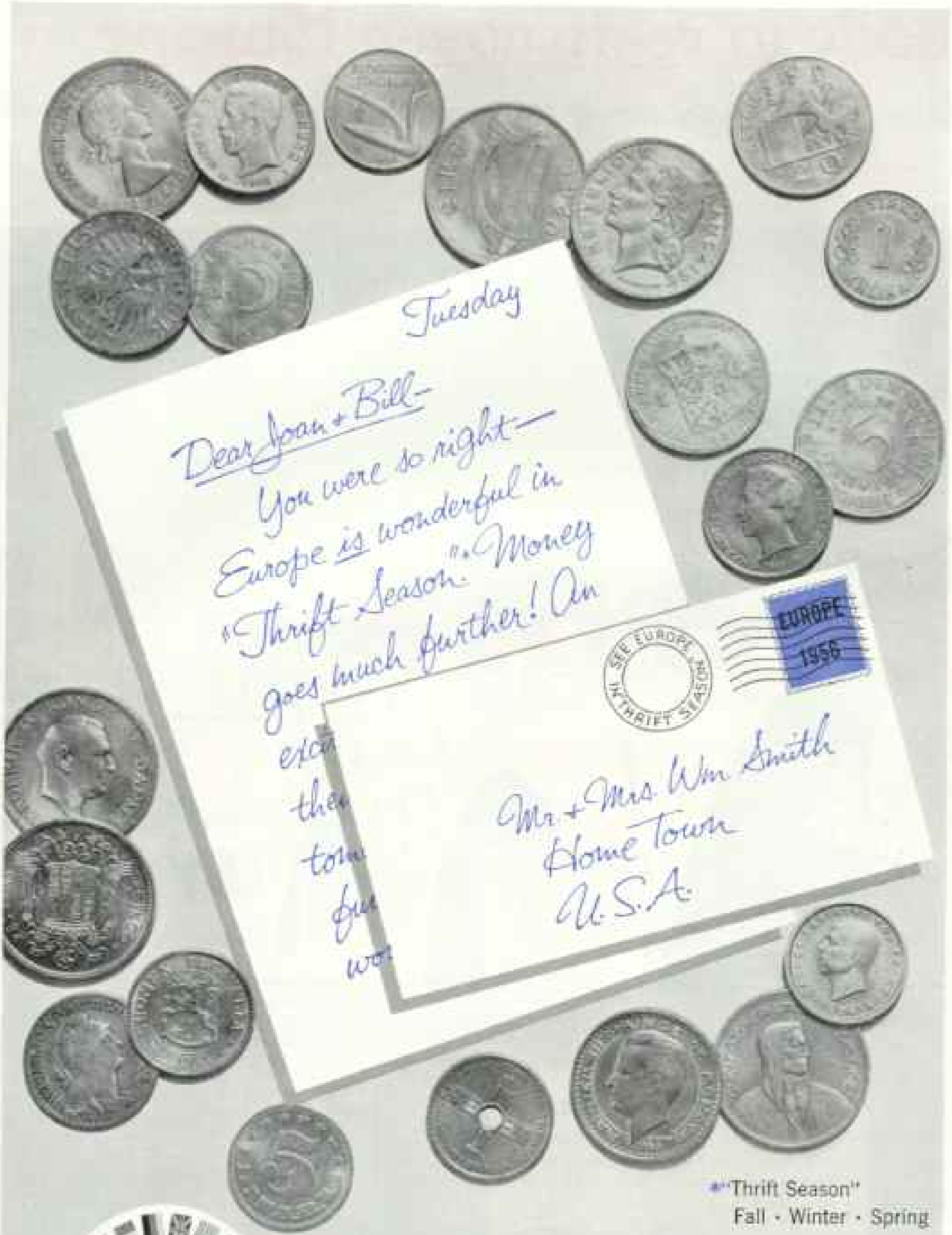

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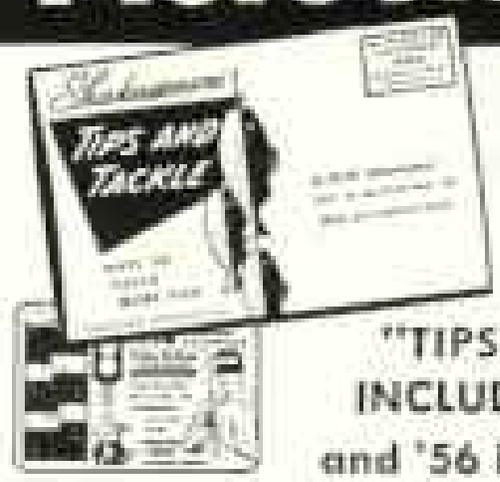

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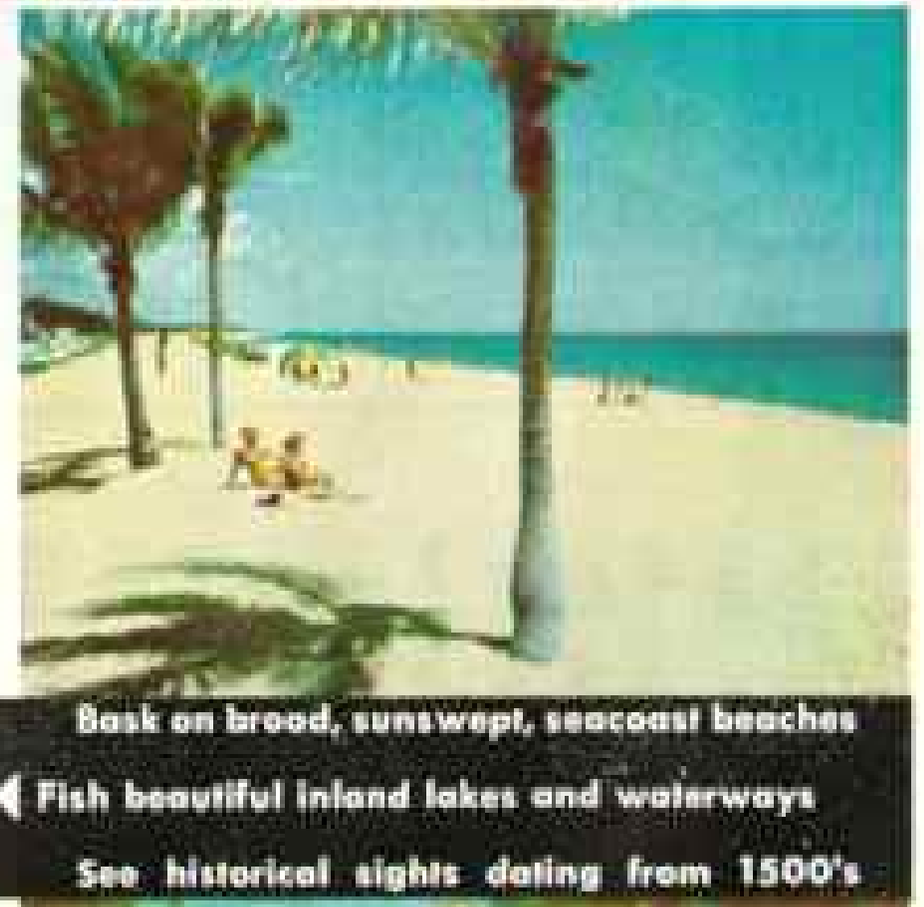

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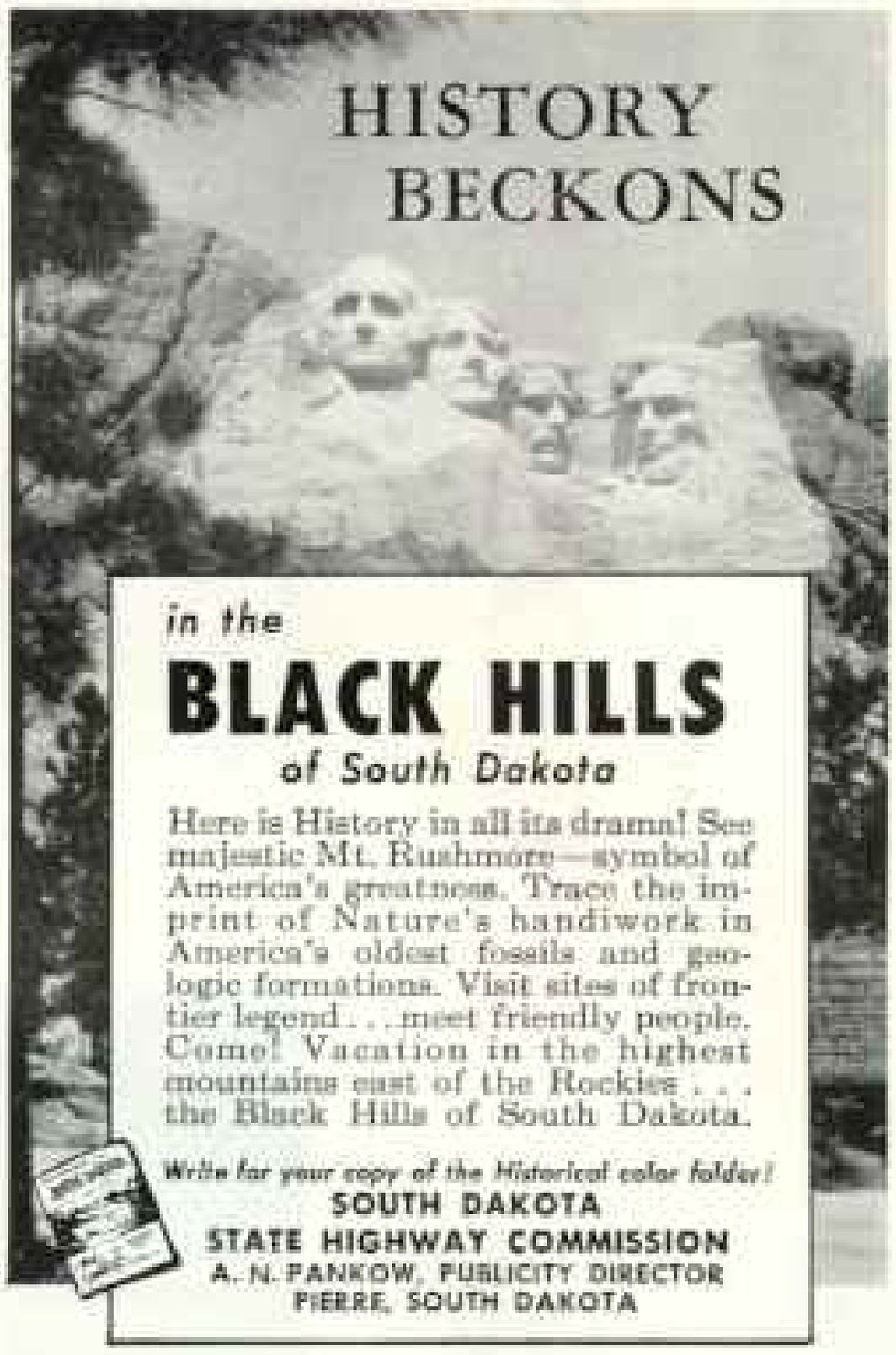

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Some Sober Facts Behind the Search for Oil

by former Ambassador to Great Britain,

LEWIS W. DOUGLAS

In recent times some people have expressed the view that the oil industry has been enjoying a favorable tax position by reason of the provision for depletion. Yet, drilling for oil has always been one of the riskiest businesses in the world and is becoming more hazardous. Here are a few sober facts that face the man who drills for oil today:

He must invest around $123,000—on the average—in every exploration well he drills; yet only 1 out of every 9 of these "wildcat" wells ever produces oil.

And only 1 out of 44 wells finds an oil field big enough to supply America for just 4 hours. The odds against finding a 50,000,000 barrel field—enough to supply the U. S. for about a week—are incredible—966 to 1.

But this is not all. To a great extent the obvious shallow sands where oil might be found easily have already been tested. Consequently today's wells must be drilled to much greater depth at much greater cost to reach productive oil sands. Drilling and exploration costs are about 400% higher than 25 years ago and the odds of finding even marginal production are far more adverse.

And unlike a factory which can produce at a constant rate for many years, an oil well dies a little each day. Finally it stops producing altogether—in other words, it becomes "depleted."

As early as 1918 Congress recognized that, with America increasingly dependent on oil, it had to create an incentive so that men would take the unusually hazardous financial risks involved in the search for oil.

Therefore, Congress wrote a depletion provision into the tax law — permitting oil producers to exclude 27½% of the gross income from their oil or gas property in arriving at a taxable income basis for tax purposes. This deduction, however, cannot exceed 50% of the property's net income. And, of course, it applies only to oil and gas production. Other activities of the industry, such as refining, are not subject to depletion.

Coal and metal mining—in fact, all "natural resource" industries—have similar tax provisions. Actually, the depletion provision is designed to make up for the inevitable exhaustion of the natural resources man has discovered. And it encourages the costly search for new deposits — needed to replace those that are exhausted. Yet, the provision for depletion is often misunderstood and unfairly indicted.

Experience demonstrates that the national interest has been properly guarded and well served by provisions for depletion. With the depletion provision in effect, America has become the world's largest producer and user of petroleum. Yet we pay less for most oil products than most other nations. And, despite record usage, we keep finding more oil than America uses. In a world of wings and wheels, this could well provide the balance of power. Certainly it is the necessary support for an economy that runs largely on petroleum products.

We can be thankful for the incentives that have encouraged men to brave the heavy risks of loss and to continue the increasingly difficult search for new oil fields which alone can replace the old fields being used to power our country.

Lewis W. Douglas has won distinction in virtually every phase of American life. Prior to serving as Ambassador to Great Britain, he was a Congressman, Director of the U.S. Budget, and a college president. Mr. Douglas is now Chairman of The Mutual Life Insurance Company of New York.

This is one of a series of reports by outstanding Americans who were invited to examine the job being done by the U.S. oil industry. This page is presented for your information by The American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.

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It's yours for just $1, and the big 128-page 1956 edition includes practically every passenger-carrying service starting from or going to New York, Canada, New Orleans, the Pacific Coast, Mexico, South America, England, France, the Mediterranean, Africa, the Antilles, Australia, the South Seas, Japan, Hawaii, etc. There's a whole section called How to See the World at Low Cost, with maps and pages of photos and maps.

A big $1 worth, especially as it can open the way to more travel than you ever thought possible. For your copy, simply tear out ad, print name and address, and mail with $1 bill to **HARIAN PUBLICATIONS, 152 PARKWAY, GREENLAWN (LONG ISLAND), NEW YORK.**

First if you order above book before March 31, 1956: Lands in the Sun, a guide to where to stop a while—even retire—in Mexico, the West Indies, and other lands to the south where the dollar buys so much more. For your free copy, your order must be postmarked no later than March 31, 1956.

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"Not long ago," says Mrs. C. H. Holtermann, "I received a telephone call from San Marino, Cal. It was my son and daughter-in-law and my five grandchildren.

"The youngest, a baby girl, laughed and I could hear her as distinctly as if she were at my side.

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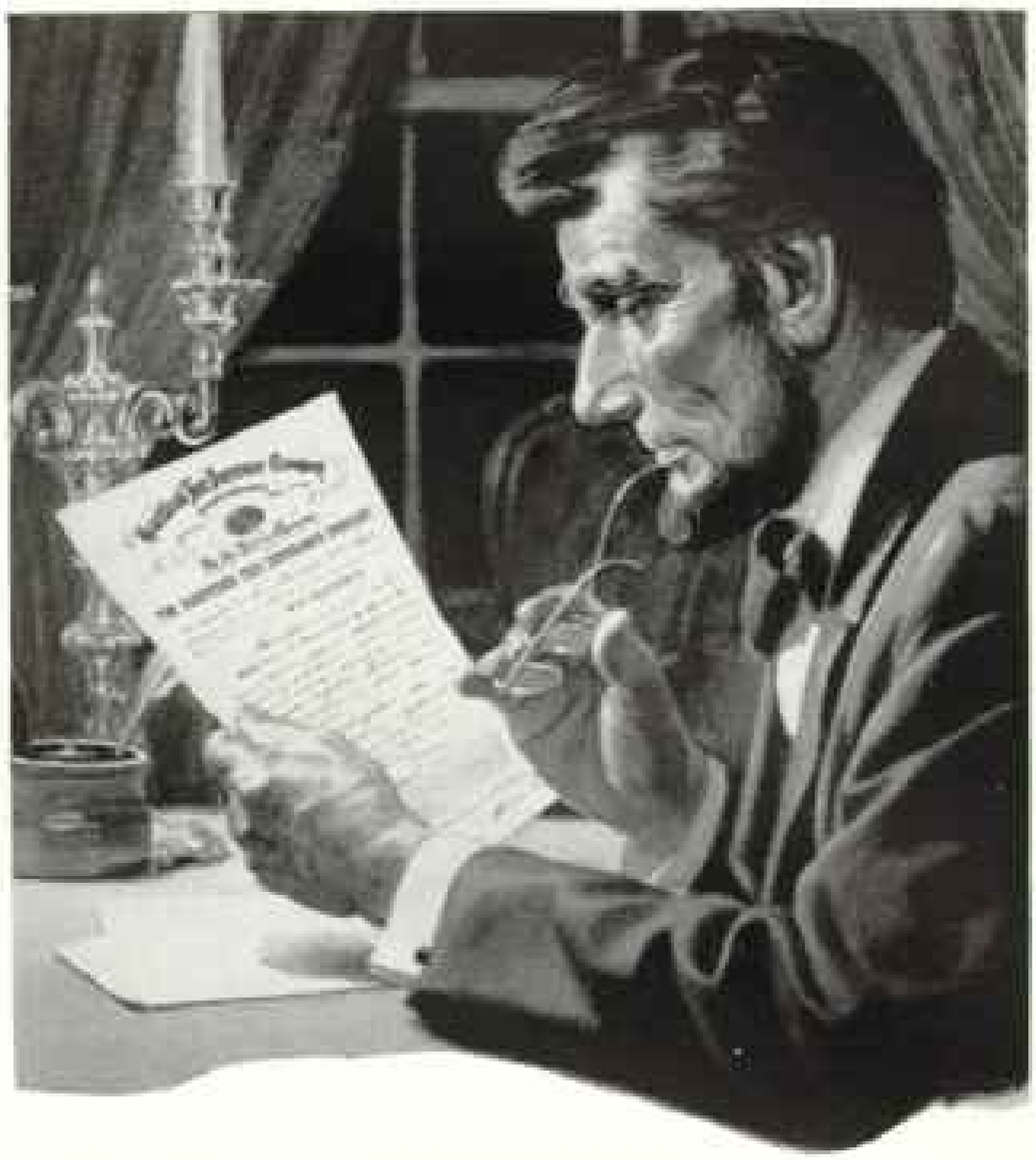

For the only home he ever owned

. . . *Lincoln chose this Hartford policy*

It is the first week of February, 1861. Abraham Lincoln is winding up his affairs in Springfield, Illinois. Next Monday morning he begins the trip to Washington, where he is to be inaugurated as sixteenth President of the United States.

Mr. Lincoln has just said goodbye to a visitor. The man was James L. Hill, local agent of the Hartford Fire Insurance Company, who has left with Mr. Lincoln the insurance policy which protects the only home he has ever owned.

At Mr. Lincoln's request, Jim Hill had made a thorough inspection of the property only a few days before. He noted the construction of the buildings . . . measured their dimensions and the distances between them. Then he drew up a policy for the President-elect—and delivered it.

We are proud that Abraham Lincoln chose to insure his home with the Hartford. And we treasure the original policy to this day. Mr. Lincoln's son, Robert Todd Lincoln, presented it to Hartford Agent Jim Hill as a memento several years after the President's death.

Copies of this historic document are available upon request. Write the Hartford Fire Insurance Company, Hartford 15, Conn., and ask for "The Lincoln Policy."

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It looks high priced—but it's the new Chevrolet "Two-Ten" 4-Door Sedan.

For sooner and safer arrivals!

It's so nimble and quick on the road...

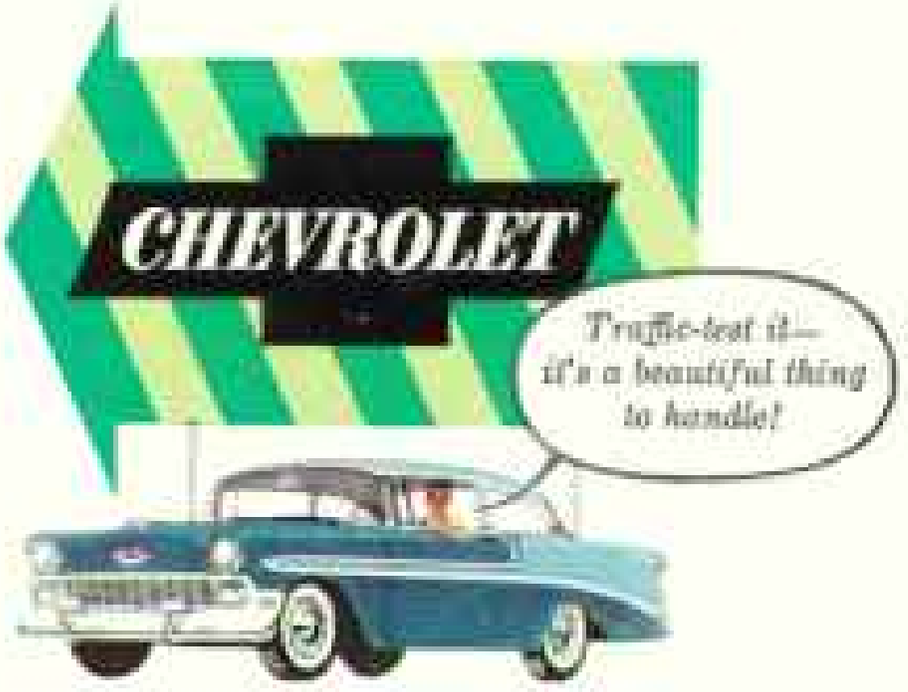
Of course, you don't have to have an urgent errand and a motorcycle escort to make use of Chevrolet's quick and nimble ways. Wherever you go, the going's sweeter and safer in a Chevy.

Power's part of the reason. Chevrolet's horsepower ranges up to 205. And these numbers add up to *action*—second-saving acceleration for safer passing . . . rapid-fire reflexes that help you avoid trouble before it happens!

True, lots of cars are high powered today, but the difference is in the way Chevrolet *handles* its power. It's rock-steady on the road . . . clings to curves like part of the pavement. That's *stability*—and it helps make Chevrolet one of the few great road cars!

Highway-test one, soon. Your Chevrolet dealer will be happy to arrange it. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

THE HOT ONE'S EVEN HOTTER



OPEN TO VISITORS is Oregon's striking State Capitol in Salem. Structure is of white marble, topped with golden statue of The Pioneer. Azaleas bloom in foreground.

YOU WILL WANT TO STOP often at roadside turnouts to marvel at Oregon's natural grandeur. Snow-crowned, 11,245-foot Mt. Hood (below) forms a spectacular background for colorful pear orchard in the Hood River Valley.

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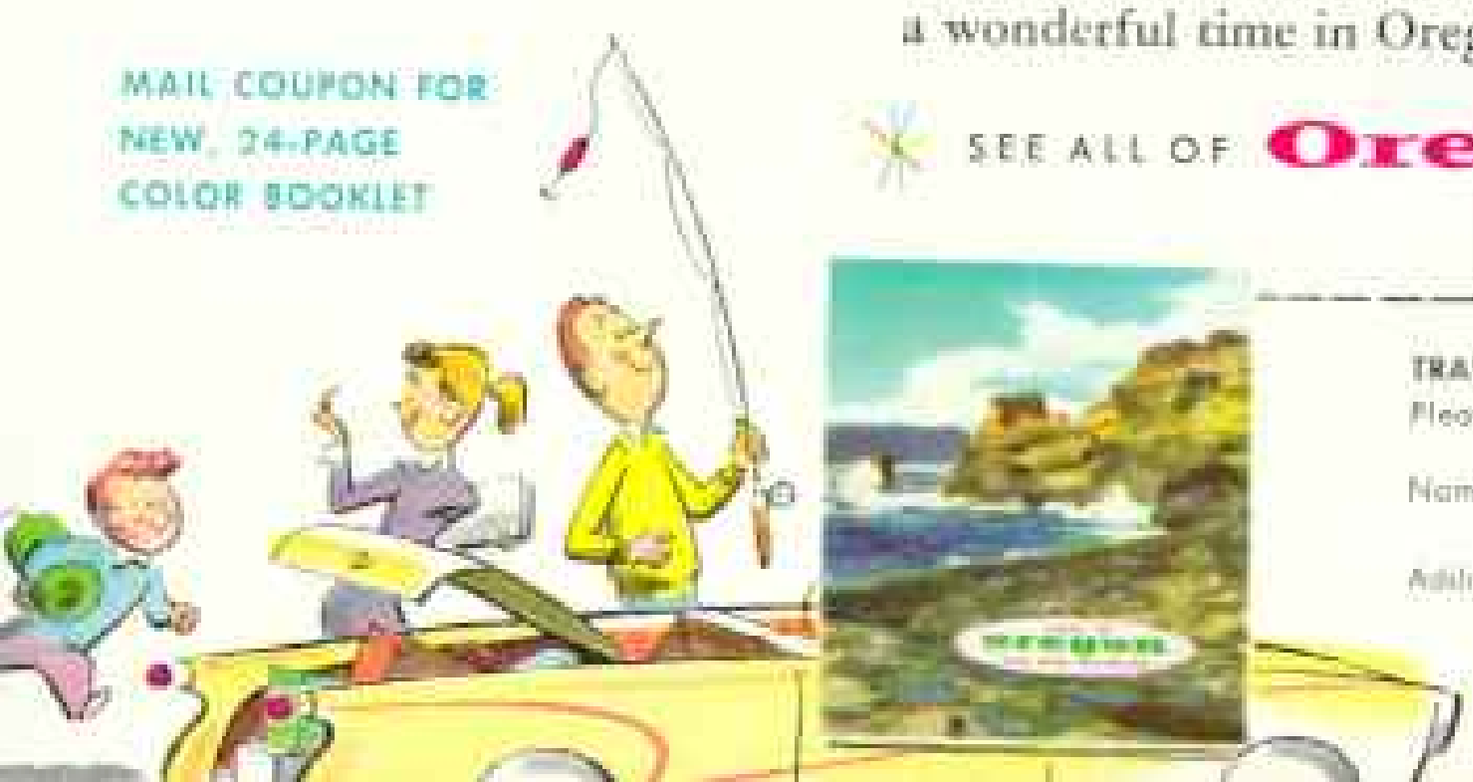

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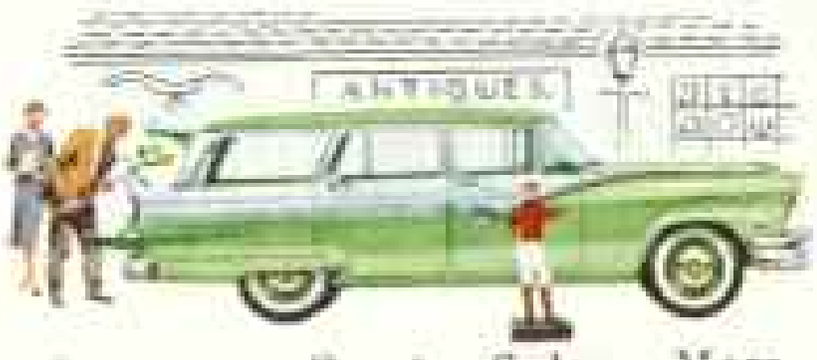
Why Ford tops the "tote-'em" Poll!

Thunderbird styling . . . Thunderbird "GO"... and Lifeguard safety are just a few of the reasons why more people buy Ford station wagons than the next two makes combined!

Yes! There are more reasons than ever why Fords are favorites among the station wagon set! These stunning do-it-alls with Thunderbird-inspired styling are head-turners wherever you go. And whether you choose a 2-door, 4-door, six- or eight-passenger wagon, Ford's Stowaway seat lets you convert it from luxury liner to cargo carrier in a split jiffy.

And this year, you can have the Thunderbird's "GO", too, *at no extra cost* for the new Thunderbird Y-8 engine is the *standard* eight in all Ford station wagon models.

To top it all off, Fords are the only wagons with Lifeguard Design... a new family of safety features which help protect you and yours from the major causes of injuries in the event of accidents. Come in soon! Choose *the* Ford station wagon to fit *your* living scheme.

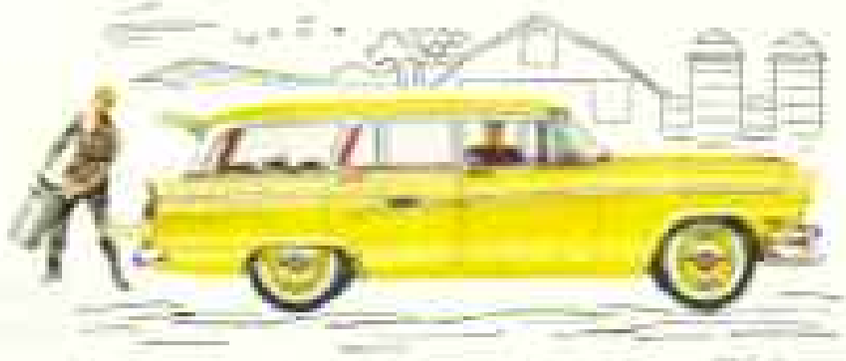


8-passenger Country Sedan — More stylish than ever, this 4-door gives easy access to both front and rear seats.

Ranch Wagon—This good-looking all-around favorite for work or play has two big doors, easily holds 6 big people.

Custom Ranch Wagon—It's a 2-door, 6-passenger fashion plate. Easy-to-clean interior can really take it.

Country Squire—Mahogany-finished steel panels give woodlike beauty to this 4-door, 8-passenger dreamboat.



6-passenger Country Sedan — This beauty has 4-door convenience and, like all '56 Fords, has Lifeguard Design.

They sell more because they're worth more!

'56 FORD

STATION WAGONS

Can you help **your heart** "tick" longer, too?

Sometimes a clock that has kept perfect time over the years will get temporarily out of order. With skilled attention, however, it can go on ticking again for years to come. The same is true of your heart.

A number of things can happen to your heart. Among the more serious of these is the form of heart disease due to hardening of the coronary arteries. Heart disease caused by coronary-artery trouble is becoming increasingly recognized. In fact, many of the conditions vaguely called "heart trouble," or "heart attack," are caused by partial or complete blocking of the blood flow at some point in the coronary arteries. The common form of such occlusions is known as coronary thrombosis.

The outlook for those who have had coronary thrombosis is good and is steadily improving. Studies show that four out of five recover from first attacks of this severe form of coronary heart disease.

Today, the great majority of those who successfully withstand their first attack can, if the heart has repaired itself through rest and skilled medical care, safely resume activities with little or moderate restriction.

In fact, many such people have not only been able to resume full-time work involving great responsibility, but have continued at work for many years. Indeed, being at work was actually "good medicine."

Thousands of other people with various heart impairments are also living happily and filling useful places in life. We cannot be complacent, however, about heart disease, for it continues to be the leading cause of death in our country. So, if you are approaching middle age, now is the time to do these things to help protect your heart:

1. Keep your weight down. If you *are* overweight, follow your doctor's suggestions to bring it down.

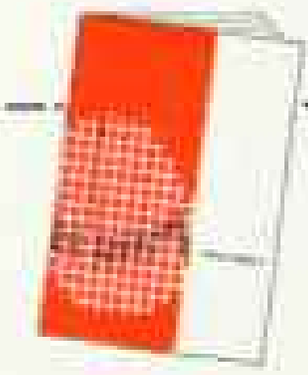
2. Exercise regularly, but moderately. Stop *before* you get overtired.

3. Have periodic health examinations. Never wait for heart symptoms to jolt you into seeing your doctor.

4. Follow your doctor's advice about healthful living habits, particularly as regards diet and rest.

Remember, the normal heart is strong, with a great reserve of power and a wonderful capacity for comeback. Even an impaired heart can carry on and, with sensible care, usually be expected to do its job to a ripe old age.

If you want to know more about this subject, write for a free copy of Metropolitan's booklet, *Your Heart*.



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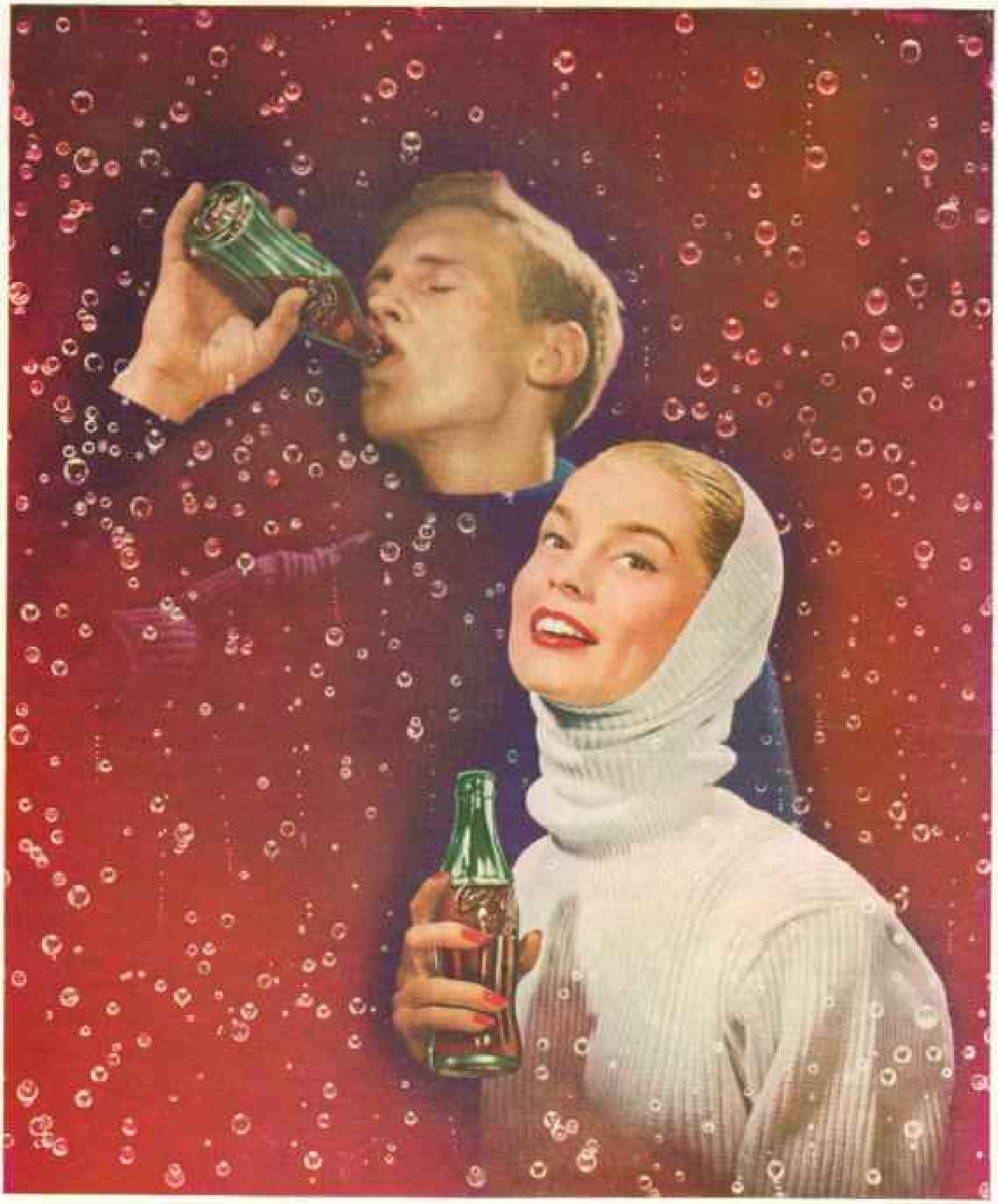

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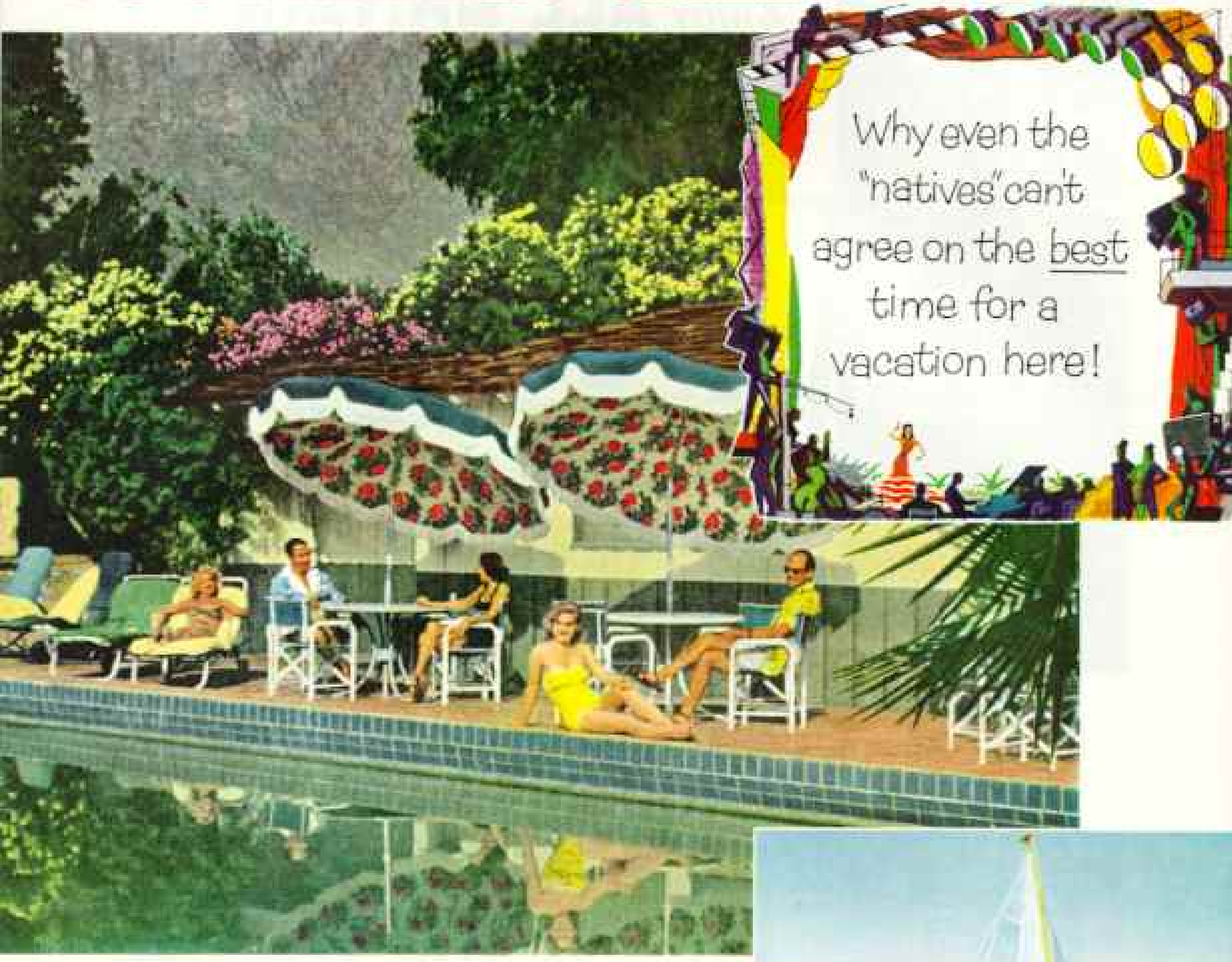

Typical midwinter scene, near Los Angeles. Because of our dry subtropic climate, opinions vary about the "best" time for a Southern California vacation. This Mediterranean-like climate (found no place else in the U.S.) means *year-round* sunny skies, outdoor sports and flowers. If the oleanders aren't blooming, the camellias, roses or hibiscus *are*. You'll see oranges growing any day of the 365; our lawns and palms are forever green. And imagine a land where you sun-tan in January, yet sleep under blankets in July! What time of year *is* best here? Take your choice: winter, spring, summer, fall. We never close!

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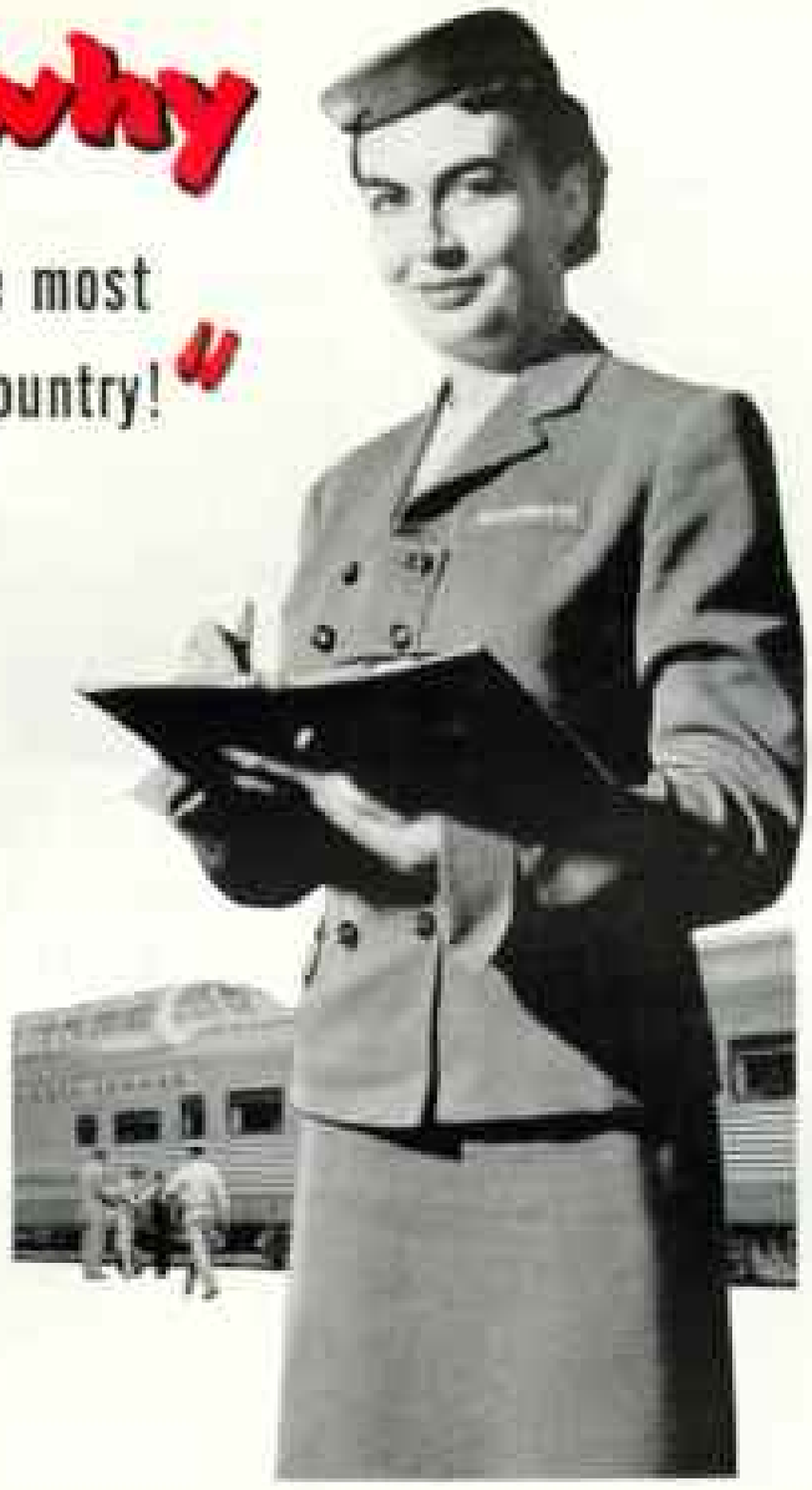

"Why do I know? Because I'm a Zephyrette (the name's Nellie O'Grady) and I've made over a hundred round-trips aboard this Vista-Dome streamliner. As the California Zephyr's official 'hostess', I naturally have a chance to chat with just about every passenger on every trip. And believe me, they do talk about this wonderful train!"

"Like my dinner? I like every meal on the Zephyr! Thank goodness my wife isn't here to count the calories when the Steward comes around with one of those wonderful menus!"

"Any good shots? If not, it's my own fault! What could be more scenic than the Rockies and Feather River Canyon! No wonder this train was picked to star in 'Cinerama Holiday'!"

"Having fun? You bet we are! This is the first time the whole family has made the trip. Got lots of room in this Bedroom Suite, and we're saving money by using Family Fares."

"Enjoying myself? It's the most fun I've ever had on a trip to the Coast! There's so much to do and see... all those Vista-Domes, Lounge Cars, and so on. And you meet such nice people!"

"Comfortable? Young lady, I'm always comfortable when I travel in these Vista-Dome Chair Coaches. Fact is, I'd like to have this reclining chair in my living room at home!"

"Signal green? Sure it is! Up here in the Vista-Dome I can see way ahead just like the engineer does. And right after we left Moffat Tunnel I saw a whole herd of deer right down near the track!"

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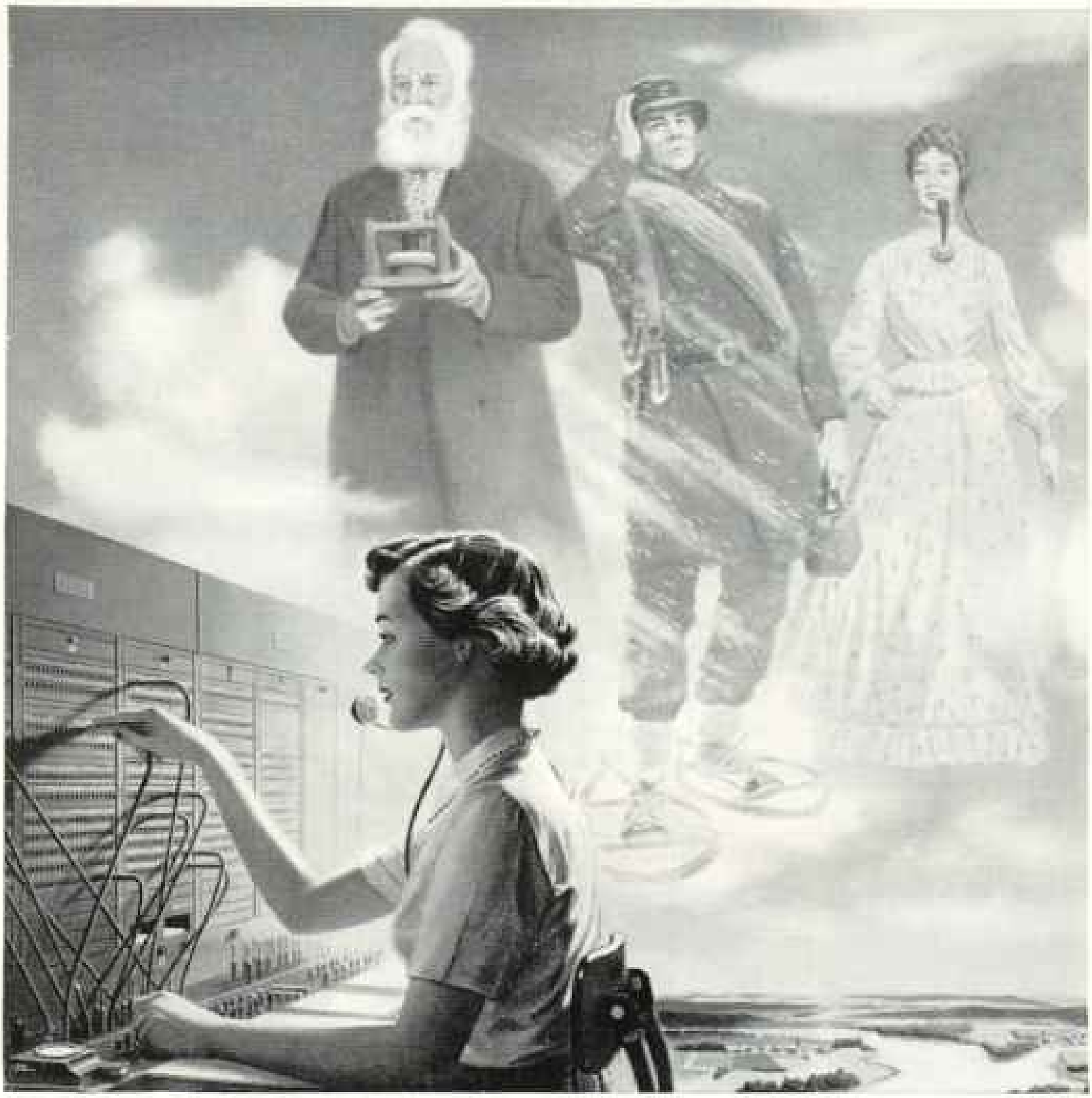
2-56



The Spirit of Service That Keeps on Growing

There is a heritage of service that is passed on from one generation of telephone people to another.

It had its beginning far back in 1875 when Alexander Graham Bell gave the world its first telephone. It has grown as the business has grown.

Many times each day and night this spirit of service is expressed in some friendly, helpful act for someone in need. The courtesy, loyalty and teamwork that telephone people put in their daily jobs are a part of it. Out of it have come the courage and inspiration that have surmounted fire and storm.

We, the telephone people of today, are vested with the duty of carrying on this trust.

We will make mistakes, for it is human to err. But in the long run, how we do our individual job and how we bear our individual responsibility, will determine how we fulfill our trust.

For our business is above all a business of people . . . of men and women who live and work and serve in countless communities throughout the land.

BELL TELEPHONE SYSTEM

Intense Cold...Fierce Heat...Terrific Pressure

—forces of nature used by UCC scientists to work for you

HEAT SO FIERCE it makes steel boil . . . cold so intense it turns the very air to liquid . . . pressure so great it has the force of 600 hurricanes . . . space so "empty" that nothing could live in it.

THESE FORCES OF NATURE are used by industry in making so many of the things we take for granted today. The electric arc furnace—6,000 degrees hot—is the birthplace of alloying metals that go into stainless steel and other fine steels. Oxygen, so vital to medicine and industry, is extracted from air made liquid when cooled to more than 300 degrees below zero.

ETHYLENE GAS SQUEEZED under pressure of 15 tons per square inch changes into polyethylene. This remarkable plastic is used to make such familiar things as unbreakable nursing bottles, squeeze-spray containers, and transparent wrappings. Exposing natural gas to terrific pressures and the "nothingness" of vacuum have been key steps in making hundreds of new chemicals during the last 20 years.

THESE ARE BUT A FEW examples of how industrial scientists such as those of Union Carbide have discovered how to use the forces of nature to create the new processes and products necessary to America's progress.

FREE: *Learn how* ALLOYS, CARBONS, GASES, CHEMICALS, *and* PLASTICS *improve many things that you use. Ask for "Products and Processes" booklet.*

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UCC's Trade-marked Products include

ELECTROMET Alloys and Metals NATIONAL Carbons ACHESON Electrodes SYNTHETIC ORGANIC CHEMICALS HAYNES STELLITE Alloys PREST-O-LITE Acetylene Dynel Textile Fibers PRESTONE Anti-Freeze UNION CARBIDE LINDE Silicones EVEREADY Flashlights and Batteries PYROFAX Gas BAKELITE, VINYLITE, and KRENE Plastics LINDE Oxygen