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APRIL, 1962

# NATIONAL GEOGRAPHIC

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# Society

16th & M Streets N.W.

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◀ COVER: Brisk trade wind on her quarter, *Bounty* nears Tahiti, end of the voyage (page 436).



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**NEXT MONTH**

# Report on New Guinea's changing ways

Observe two busy master craftsmen at work in the Trobriand Islands, off New Guinea: The canoe maker swings his stone mallet; Assistant Editor John Scofield of the GEOGRAPHIC loads his Leica. The May issue will feature his brilliantly illustrated report on today's New Guinea, where Stone Age peoples have been caught in a power struggle between Dutch and Indonesians.

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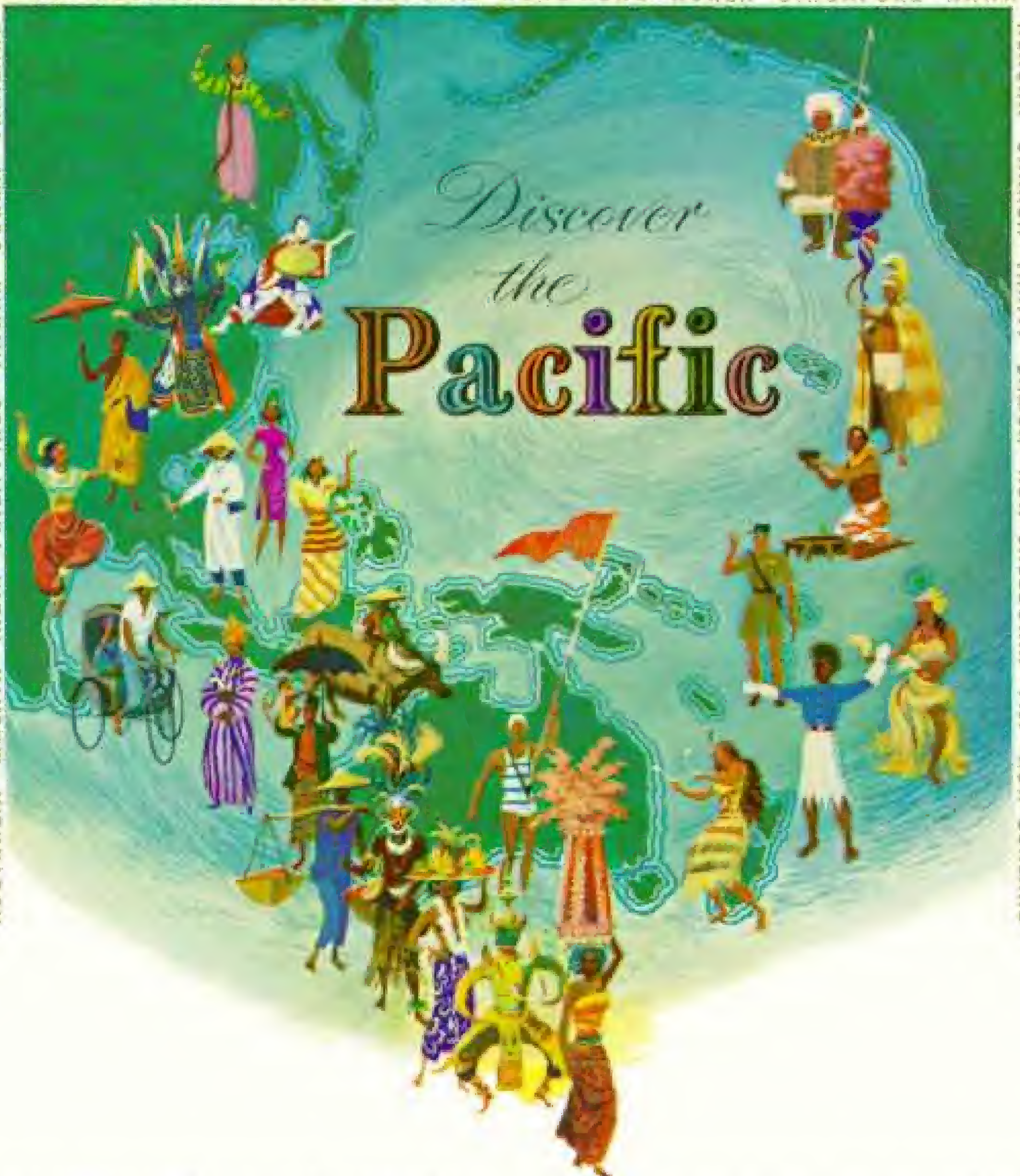
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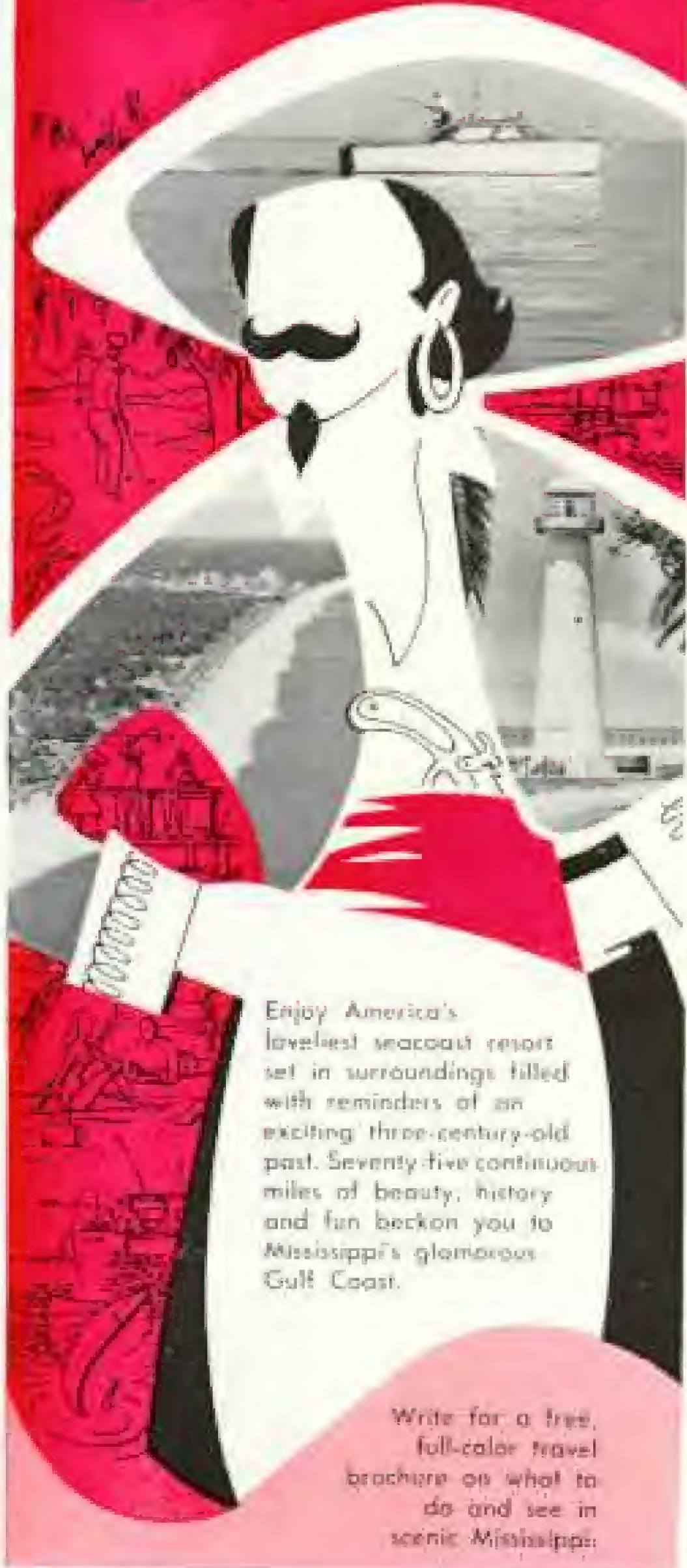
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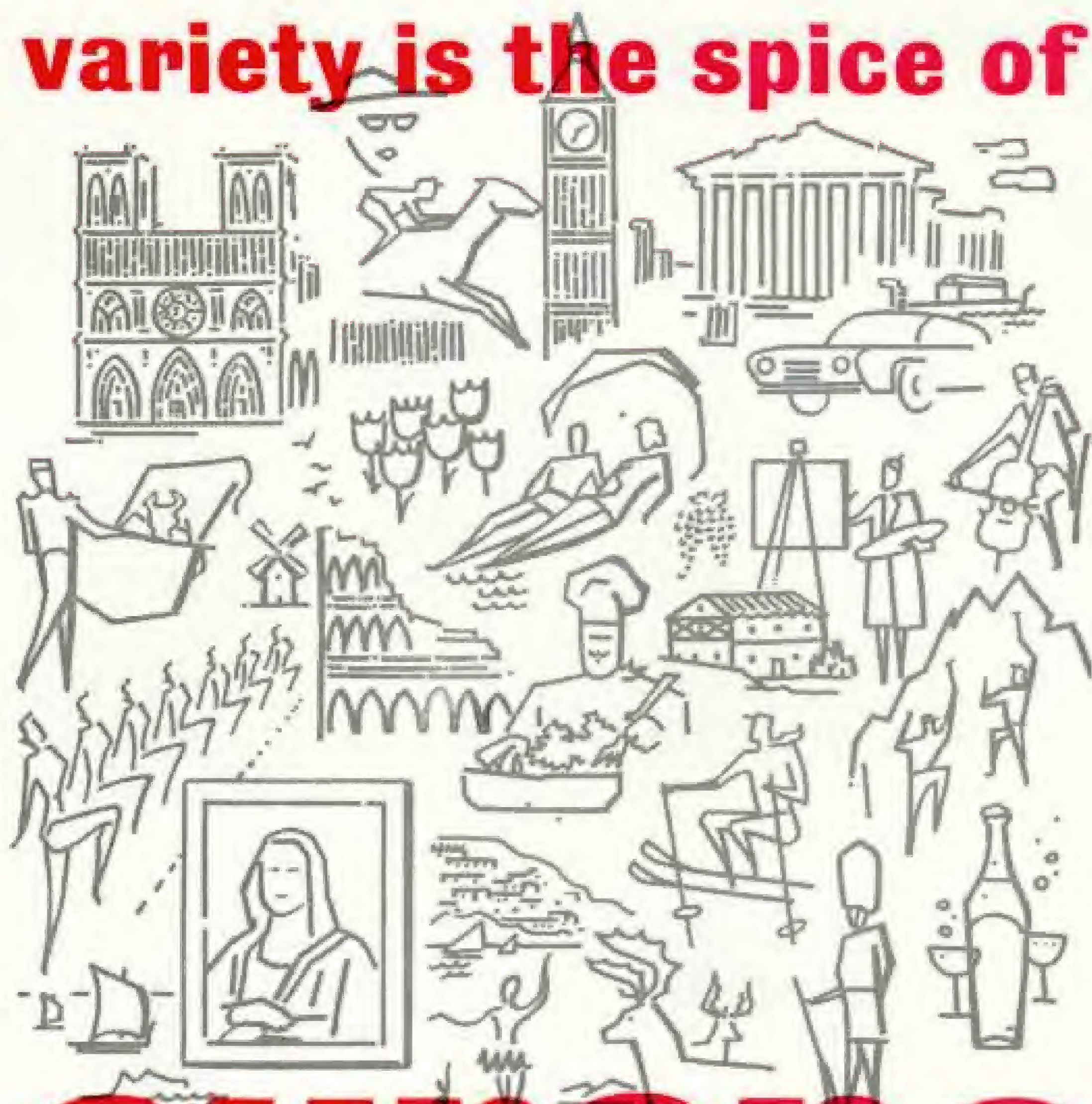
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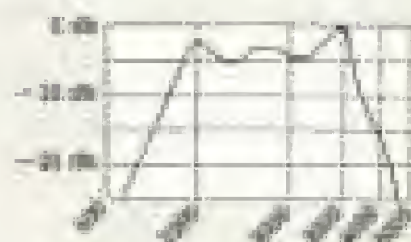
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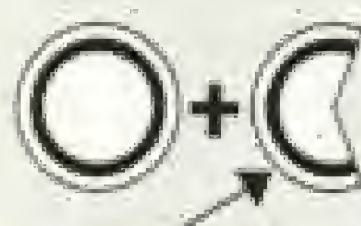
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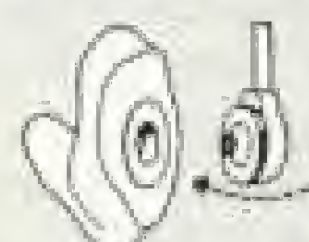
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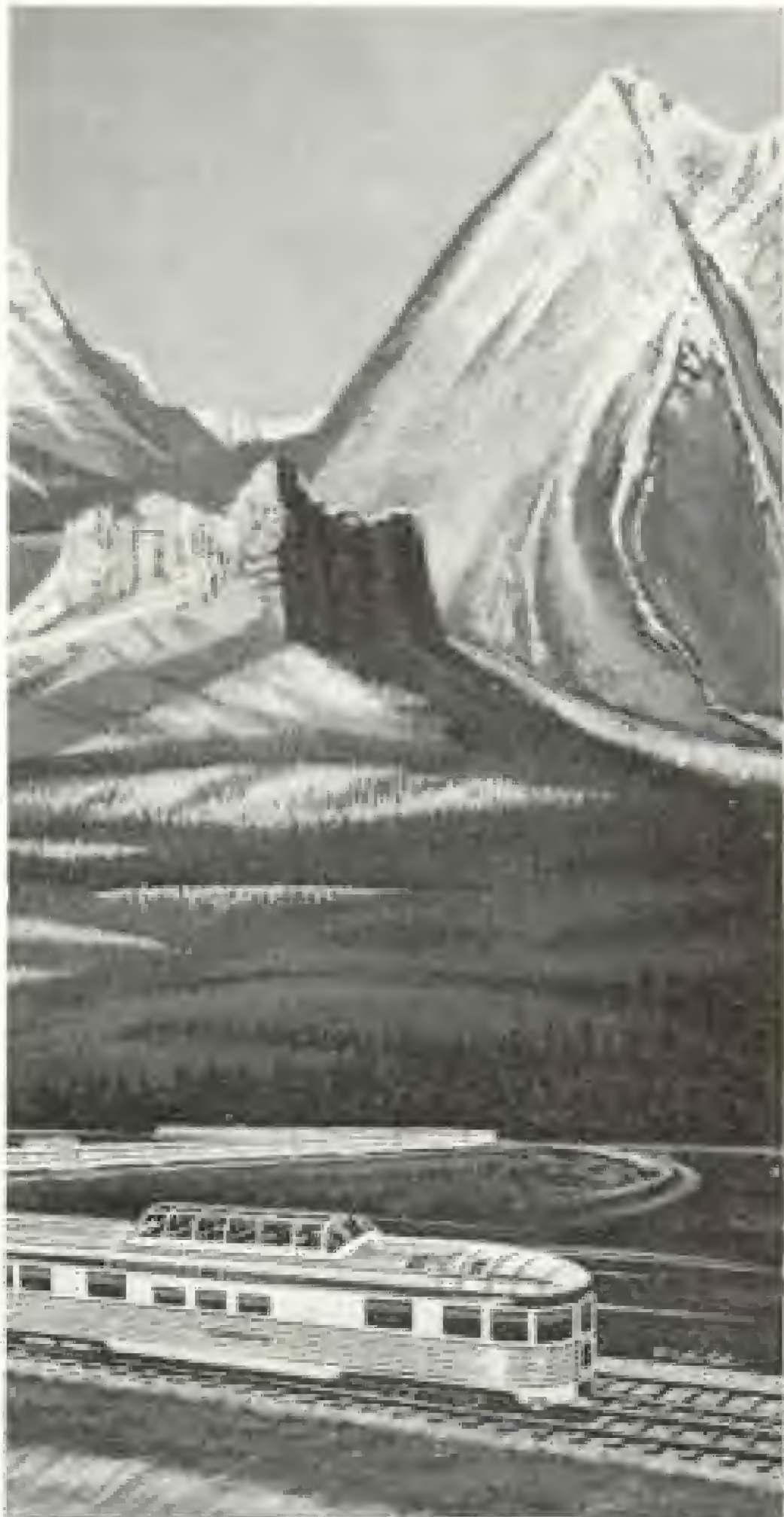
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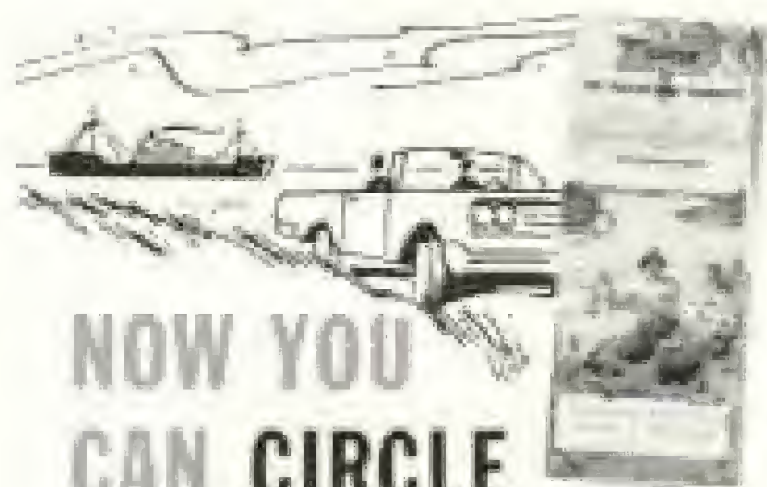
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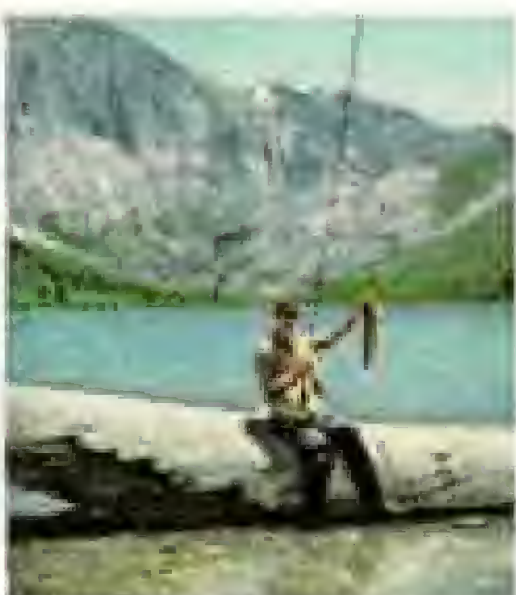
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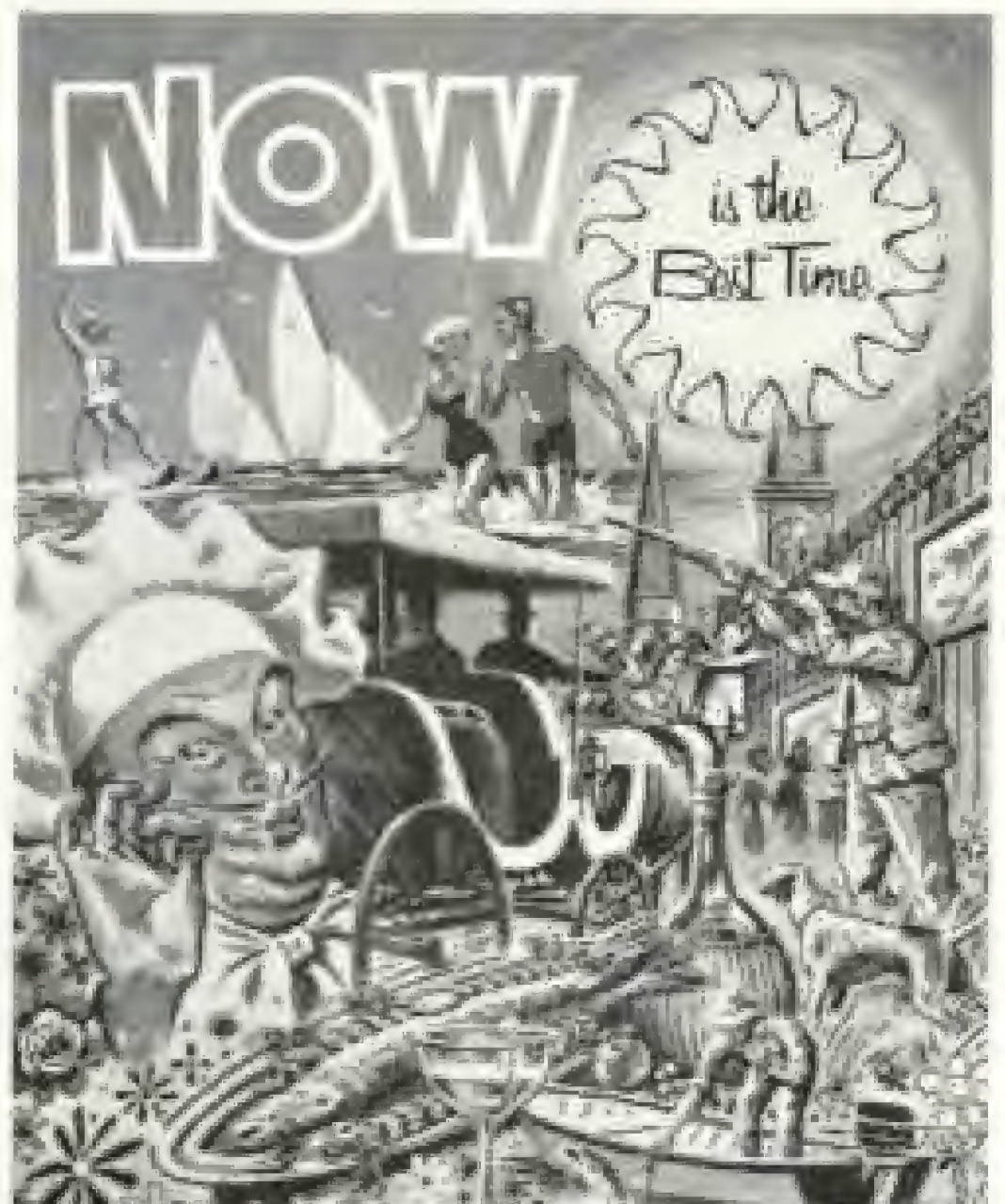
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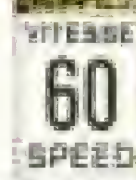
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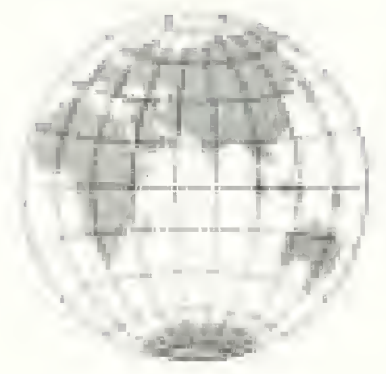
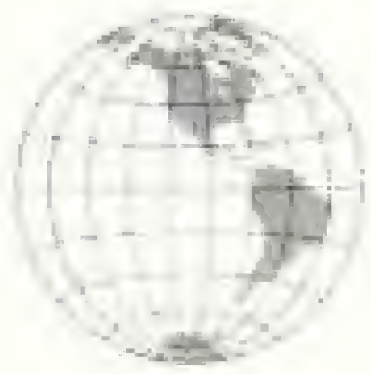
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VOL. 121, No. 4 APRIL, 1962

Modern-day *Bounty*, a replica of the square-rigger Captain Bligh knew, relives history in the South Seas

# Huzza for Otaheite!

Article and photographs by LUIS MARDEN

National Geographic Senior Staff

WHEN I WENT to Pitcairn Island several years ago to look for the remains of the mutiny ship *Bounty*, I used to dream of what it must have been like to sail in the Golden Age of Discovery. Like everyone else, I had sailed in my imagination with Cook and Bligh and Bougainville, but I had never set foot on the deck of a square-rigged ship.

Last year I voyaged to Tahiti as the early navigators did, in a full-rigged 18th-century ship, a copy of the *Bounty*. She was built in Nova Scotia with the help of original plans, to be used by Metro-Goldwyn-Mayer in a new filming of Nordhoff and Hall's book *Mutiny on the Bounty*.

Nearly everyone knows that classic sea story: How in 1787 King George the Third sent William Bligh in the small ship *Bounty* to Otaheite (Tahiti) in the South Seas to load breadfruit plants for transport to the British colonies in the West In-

dies; how after a stay of more than five months at "the finest island in the world" part of the crew, under the leadership of Fletcher Christian, the mate, mutinied shortly after the start of the return voyage; how they cast Bligh and 18 others adrift in an open boat, and how the mutineers returned to Tahiti expecting a life of ease.

Later, some of them fled to spend the rest of their days on lonely Pitcairn Island. Those on Tahiti were captured by a frigate of the Royal Navy, but the mutineers on Pitcairn were never brought to justice.

I had gone to Lunenburg in Nova Scotia to see the new *Bounty* under construction. There I met James Havens, M-G-M director and nautical expert who designed the vessel. He told me that he would take no one but the working crew with him when the ship sailed for Tahiti. I had lived so long with the *Bounty* story that I could not conceive of not being aboard



REPRODUCED BY JAMES HAVENS (M.G.M.)

The author uses a sextant to take the sun's altitude. He sailed to Tahiti as third mate of the new *Bounty*, a copy of the famed mutiny ship. Diving off Pitcairn Island in 1957, Geographic staff man Marden found the bones of the original *Bounty*.



*"Fair Weather and a pleasant Trade,  
Under all Sails"*: from Bligh's log

The new *Bounty* foats along off Tahiti with head-sails, square sails, and spanker set; a lone sailor makes up gaskets on her fore-topsall yard. She reached the island after sailing 20 days across the



South Pacific from Panama (map, page 401). Capt. William Bligh of the original *Bounty* left England on Christmas Eve, 1787, intending to round Cape Horn, although he beat for a month against heavy

seas, he could not make a westing. Reversing course, he bore away for the Cape of Good Hope and an eastward passage to Tahiti. His voyage took nearly 11 months in all.

## An 18th-century ship slides into Lunenburg Harbor

THE NEW *BOUNTY* was launched in the summer of 1960 at the Nova Scotia fishing port. She was built by Smith and Rhuland, the yard which forty years ago launched the celebrated *Blue-nose*, the fishing schooner that defeated *Gertude L. Thebaud*, the United States contender, in the International Fishermen's Races. Lunenburg maintained an intense rivalry with Gloucester, Massachusetts, in the building and sailing of fast fishing schooners.

Beneath the curving bilge of *Bounty's* hull, a shipwright drives wooden treenails (seamen call them "trunnels") through planking, frames, and ceiling—the planking inside the ribs. Galvanized bolts hold the ribs together. Hull fastenings in His Majesty's Armed Vessel *Bounty* of 1787 were copper and bronze.

To hold diesel engines, generators, and other equipment, the 118-foot *Bounty* was built about 30 feet longer than the original. She carries dummy guns (page 444). Her predecessor, an armed merchant vessel, mounted four 4-pounders and ten swivel guns.

BY THE PHOTOGRAPHERS OF LIFE MAGAZINE © 1960



when she sailed, and so it came about that I made the voyage as third mate of the *Bounty*.

On November 7, I joined the ship in Panama, where she lay after a 13-day passage from Lunenburg. *Bounty* was berthed in Cristóbal, at the Atlantic end of the Canal. I had seen her on the stocks in Nova Scotia as a full-bellied hull that curved up into the dimness of the building shed; now as she lay at her pier the ship looked like a copperplate out of *Cook's Voyages*.

Her spars and rigging stood out in black tracery against the evening sky, and her dark-blue hull, its potbelly hidden now below the

waterline, curved gracefully from the stern cabin to the sharply steeved bowsprit. The windows of her great stern cabin glowed yellow, and at her bow the "pretty figurehead of a woman in a riding habit" lifted her skirts daintily with one hand and stared aloofly ahead as she gently rose and fell on the quiet sea (page 446).

### Crew Small by Bligh's Standards

The Canadian crew swarmed all over the ship, setting up the rigging, loading stores, and repairing the sea damage to the blue and yellow paintwork. We would be 26 on board,





U. S. Navy

an adequate number for the new *Bounty*, but somewhat shorthanded by the standards of Bligh's day.

In Bligh's time there were men allocated to each of the three masts, so that the setting, and particularly the taking in, of sail could be done simultaneously. In case of a sudden squall, the ship might be in danger if canvas were not taken in with dispatch. One reason Bligh's ship needed them and ours did not was that we had two powerful auxiliary diesel engines for entering and leaving harbor, for calms and for emergencies.

In my baggage was one crate that I car-

ried aboard the *Bounty* with great care. It contained a flourishing young breadfruit tree. Two years before, I had been in Jamaica, where I was shown two breadfruit trees, still living, of the original ones that Captain Bligh planted in 1793 after his second and successful attempt to transplant the breadfruit to the West Indies.

#### The Tree That Sailed Back Home

I had sent rootstock of these trees to the United States Department of Agriculture in Washington, where three had sprouted but only one had survived. This one I was taking



EDWARD M. JOHNSON/GETTY IMAGES

### *Bounty* Takes the Easy Way to the Pacific—the Panama Canal

Dwarfed by the passenger-freighter astern and the huge lock chamber, the sailing vessel sinks a 33-foot step toward the level of the Pacific as swirling waters drain from Pedro Miguel Locks. Sails are furled. Triangular red signals (some out of sight) indicate how many pairs of electric mules—locomotives—are used to shepherd a ship through the lock. *Bounty* required two teams. Some mules pull while others astern serve as brakes.

back with me now to the land of its origin, after an absence of 167 years. *Bounty* would carry breadfruit again.

Also at Panama I hammered into the hull a bronze sheathing nail from the original *Bounty* that I had brought up from the bottom off Pitcairn Island, so that the old ship contributed at least a small portion to her namesake.\*

Our captain, Ellsworth Coggins, like nearly all his crew, was a Bluenose from Nova Scotia (page 444). Most of our seamen were young lads who had signed on because they wanted to sail in a square-rigger or because they had always wanted to see the South Seas. Nearly all the crew had been in sail before, although only one, William (George) Snow, the boatswain from Newfoundland, had served in square-riggers. In his seventies, George was one of the most active and able men aloft.

With the pilot on board, *Bounty* started through the Panama Canal under power, "running on the machine" as the Gloucestermen used to put it—with disgust.

In one of the locks, as the water swirled slowly in and raised the ship to the level of the next water step, a worker hailed us.

"Where's the mate?" he wanted to know.

Ross McKay, our first officer, waved.

"Hey, Fletcher Christian!" shouted the man on the lock gate, "the British Government has been looking for you for two hundred years!"

At the Pacific entrance to the Panama Canal, we passed ships of all nations, coming in or heading out to sea: rusty freighters, wallowing tankers nearly awash, sleek Scandinavians glistening in fresh paint.

At six o'clock the last buoy dropped astern and we headed into the Pacific, rolling a little as we drove into a windless sea.

I stood at the knightheads and stared at the horizon and thought, "Well, at last it's 'Huzza

Broad arrows mark *Bounty's* track from Nova Scotia to Tahiti. Dotted line traces part of Bligh's voyage of 1787-89. He was sent out from England to take breadfruit from Tahiti to the West Indies. Line at lower right shows where he turned back from Cape Horn.

for Otahelie!" The mutineers had shouted these words as they cast Bligh adrift and came about for the good life.

Suddenly, into my dream of kinship with Bligh and his men, a guilty thought intruded. True, we were in a ship such as theirs, but we were fitted with diesel engines and refrigeration and electronic navigational gear, gliding effortlessly into the Pacific through a great canal that did not even exist in the day of the original *Bounty*.

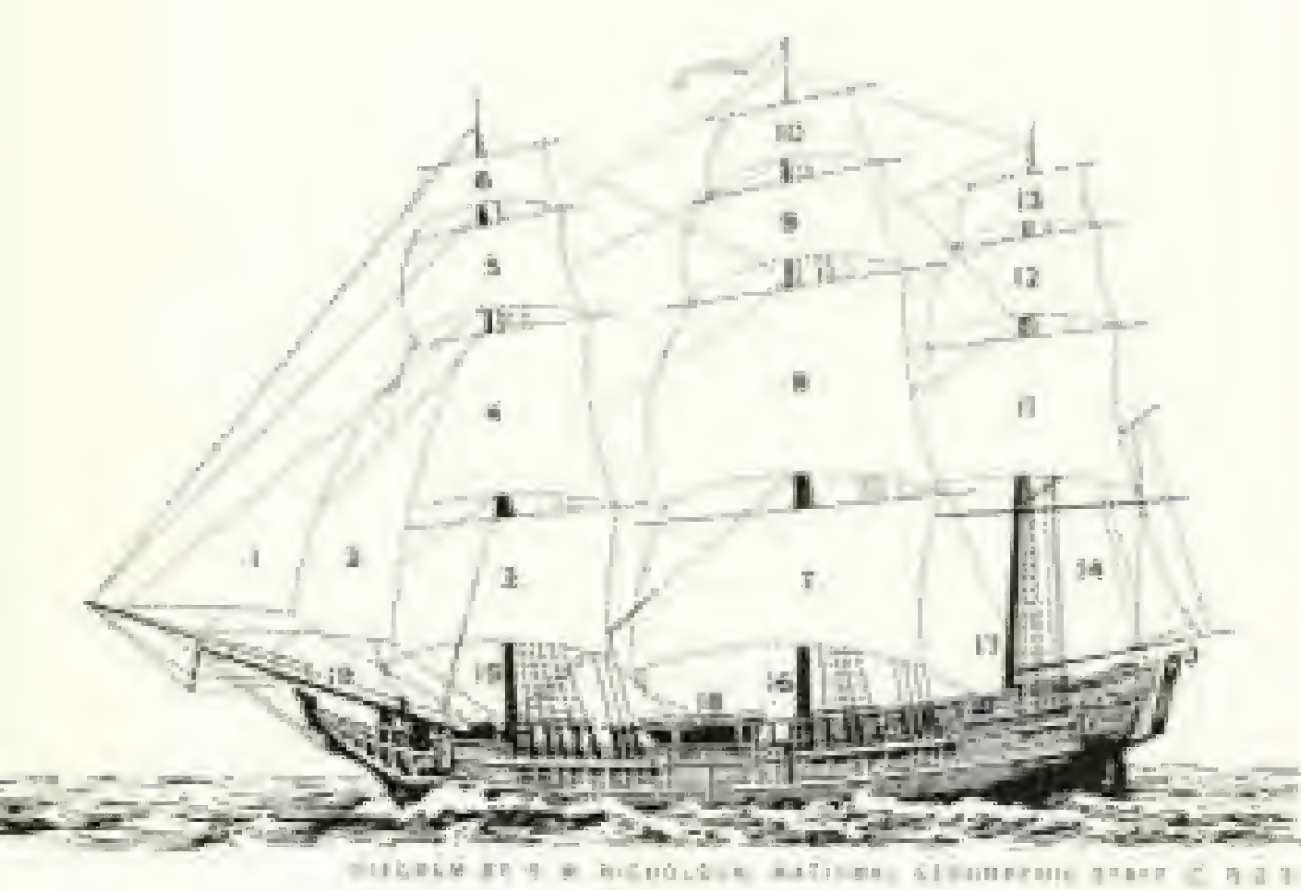
### Driven Back by Cape Horn Gales

Bligh, in his crowded ship with salt-pork meals and ever-present threat of scurvy, underwent savage hardships to reach this same ocean. He had to sail to Cape Horn at the southern tip of South America, and once there, met such howling gales that for 30 days *Bounty* could make no westing against them. She barely held her own in the icy seas.

In the end Bligh gave up. He turned and sailed in the opposite direction, halfway around the world, to reach the Pacific we entered so easily; he logged 19,759 miles more than we did. He would have rated little sympathy from other captains of his day, most of whom had to do the same thing at one time or another, but he had mine. I went below, lay down on my foam-rubber mattress, turned on the electric lights, and read his log.

\*See "I Found the Bones of the *Bounty*," by Luis Marden, NATIONAL GEOGRAPHIC, December, 1957.





DICKER ET S. W. RICHOLDS, NATIONAL GEOGRAPHIC STAFF C. 1923

## *Bounty's* sail plan

1—Jib 2—Fore-topmast staysail 3—Foresail  
4—Fore-topsail 5—Fore-topgallant 6—Fore-royal 7—Mainsail 8—Main-topsail 9—Main-topgallant 10—Main-royal 11—Mizzen topsail 12—Mizzen-topgallant 13—Mizzen-royal 14—Spanker 15—Foremast 16—Mainmast 17—Mizzenmast 18—Launch 19—Bowsprit.

Standing on footropes, eight seamen furl the main-topsail. Sailor's tradition says the man aloft must use "one hand for the ship, one for himself." In practice, the sailor works with both hands, hanging on as best he can. Rope ends hanging below the sail are reef points, which are used to shorten sail by making fast part of the canvas to the yard in rough weather. When the sail is snugly furled, it is stopped with gaskets, as on the upper yards. Masthead pendant flies from the main truck.

*Bounty* used diesel engines for auxiliary power. She averaged 236 nautical miles a day; *Bligh*, 108.

On April 1, 1788, he wrote: "It blew a Storm of Wind and the Snow fell so heavy that it was scarce possible to haul the sails up and furl them from the Weight and Stiffness."

"At 6 in the Morning," he recorded next day, "the Storm exceeded anything I had met with and a Sea higher than I had ever seen before . . . from the frequent shifting of the Wind broke very high and by running in contrary directions became highly dangerous."

Two weeks later, amid another storm, he wrote: ". . . I cannot expect my Men and Officers to bear it much longer . . . from the Violent motion of the ship the Cook fell and . . . broke one of his Ribs, and One Man Dislocated his shoulder."

Now hear *Bligh*, the "monster":

"I now Ordered my Cabbin to be appropriated at Nights to the Use of those poor fellows who had Wet Births, by which means it . . . rendered those happy who had not dry beds to sleep in."

Finally *Bligh* had to write: "It is a Dear



Point to give up . . . but it is impossible to act against the severity of this tempestuous Weather." He determined to bear away for the Cape of Good Hope.

"I ordered the Helm to be put a Weather to the universal joy of all hands. . . ."

On the morning of our new *Bounty's* first day in the Pacific, a harbinger appeared, a yellow-green warbler that fluttered down out of the murk and settled on the tender green leaves of the breadfruit tree, secured in a tub under the boats. When the sky brightened, we were invaded by land birds: three swallows, a thrush, and a big osprey, or fishhawk.

One swallow perched on the taffrail and peered inquisitively at the patent log, as if trying to calculate how far we were from land. Another lighted briefly on the head of a man working the pumps. The osprey landed on the highest horizontal perch, the port main-royal yardarm (pages 446-7).

Late in the afternoon a magnificent rainbow arched across our stern. As the stars ap-



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peared, Venus and Jupiter hung off the port bow—Venus brilliant and white, and Jupiter smaller and by contrast slightly yellowish, just above and to the left. Toward midnight the sky cleared, the watch took off their clammy oilskins, and *Bounty* rode a slight swell under a sky of brilliant stars.

#### Continent Seeker Finds Tahiti

I had the midwatch, from 8 to midnight. As I paced the deck, my thoughts turned to the old-time sailors who had plowed these same waters in similar sailing ships.

When Bligh sailed for the South Seas, he followed in the wakes of brilliant navigators sent out by George III, the geographer-king.

Many scholars of his day believed in the existence of a Southern Continent, a great land mass in the South Pacific. They argued that such a continent must exist to counterbalance the earth against the weight of Europe, Asia, and North America.

One of King George's captains discovered

Tahiti, which became the ultimate dream-island of escapists everywhere.

It was in the year 1766 that Captain Samuel Wallis of the Royal Navy received secret instructions which said in part:

“... whereas there is reason to believe that Land or Islands of Great extent, hitherto unvisited by any European Power may be found in the Southern Hemisphere between Cape Horn and New Zealand, in Latitudes convenient for Navigation, and in Climates adapted to the produce of Commodities useful in Commerce. . . We have, in consequence thereof, caused the Ship you command [the *Dolphin* frigate]. . . to be fitted. . . in all respects proper for such an Undertaking. . .”

Although he thought he had sighted it, Wallis never found the chimerical Southern Continent. Instead, he brought back Tahiti.

James Cook, in my view the greatest geographical explorer the world has ever known, was about to set out for the South Sea to observe from the Southern Hemisphere the



*"I have determined the Longitude":* Bligh's Jug. Capt. Ellsworth Coggins, master of *Bounty*, plots his position. Behind him, the depth indicator; at left, the loop of the radio direction finder. Plath sextant stands on the chart table.

*"The breadfruit was very good. . . King George would like it,"* wrote Bligh. This young plant grew from rootstock obtained in Jamaica by the author from a tree surviving from Bligh's imports of 1793. Standing beside a 4-pounder gun, the tree returns to its ancestral land aboard the new *Bounty*.

444



transit of Venus across the sun's disk, when Wallis returned with word of the new island. Cook, whose secret instructions also directed him to search for the Southern Continent, sailed to Tahiti and made his observations on the spit of land at the entrance to Matavai Bay, which he named Point Venus. That same bright planet shone over our heads, too.

Bligh had accompanied Cook on his third voyage to the South Seas, 11 years before taking command of the *Bounty*.

#### Yankee Sailor Discovers Paradise

Next on the scene after these Englishmen left Tahiti were French and Spanish navigators. Much later came the American whalers. Few today realize that the men of Nantucket, New Bedford, and New London were among the great Western pathfinders of the Pacific.\*

Scouring the far seas for the whales grown scarce off their own coasts, the Yankee sailormen discovered island after island and brought back such tales of life in the South Seas that every youth in New England would have given an arm to go there. Herman Melville signed on as a crewman in 1840 with the New Bedford whaler *Acushnet*. When

they reached the Marquesas he jumped ship.

And no wonder. "In this secluded abode of happiness," he wrote of Taipi Valley on Nuku Hiva, "there were no cross old women, no cruel step-dames, no withered spinsters, no love-sick maidens, no sour old bachelors, no inattentive husbands, no melancholy young men, no blubbering youngsters, no squalling brats. All was mirth, fun, and high good humour. Blue devils, hypochondria, and doleful dumps went and hid themselves among the nooks and crannies of the rocks."

Paul Gauguin painted and died in the Marquesas and is buried on Hiva Oa. I have stood at his grave and looked down on the emerald bay beneath his lonely hill.

And I have made my pilgrimage, too, to Taipi. I rode into Melville's "Vale of Typee" on a small horse, and it is a quiet and ghostly place now, for the whalemens brought not only a sensitive writer, but diseases that nearly wiped out the happy people. As the new *Bounty* bore me once more to the South Seas, I thought often of Melville's book *Typee*, that forever established those islands as a paradise.

\* See "American Pathfinders in the Pacific," by William H. Nicholas, NATIONAL GEOGRAPHIC, May, 1916.

With this chronometer and celestial observations, Captain Bligh made remarkably accurate determinations of longitude. Larcum Kendall of London made the instrument in 1771. Despite its watch-like appearance, the timepiece is five inches in diameter, with outer and inner cases of solid silver. Taken to Pitcairn Island by the mutineers, the chronometer was later given to an American sea captain. Eventually it found its way back to London, where it is now on display in the Royal United Service Museum.

Pencil portrait of Bligh was drawn from life by George Dance in 1794, five years after the mutiny. By then Bligh had successfully transplanted the breadfruit to the West Indies after a second voyage to the South Pacific.



NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. FOSTER; NATIONAL PORTRAIT GALLERY, LONDON, ENGLAND



Swallow flutters on the rigging. Warblers, several hawks, and a thrush invaded the ship.



Osprey settled on a yardarm when the *Bounty* was one day out of Panama and clung to the







spar for four days. Finally weakening, the hawk fell into the sea and rose no more.



Three days out the wind picked up. It blew from nearly ahead, so we could not use the square sails efficiently. We set the fore-and-aft sails: main-topmast and mizzen-topmast staysails, fore-topmast staysail and spanker. When we brought the sheets home, the wet sails bellied out into beautiful curves and began to draw, taking the strain off the engines, which we ran to make up for time lost in Panama for repairs to our ventilating system.

We should have preferred to shut off the droning engines, but the entire motion-picture company was already on location in Tahiti, and each additional day's delay meant a substantial drain of money, and so Sparks's headphones crackled with urgent messages and *Bounty* made the best time she could.

Our course was SW and the wind from the south. Once past the meridian of the Galapagos, we hoped to run into the southeast trades that blow fair for Tahiti, day after day. Then we could set the square sails, the real workhorses.

#### Superstition About Birds Recalled

Our osprey was still with us, but obviously sick. He sat on the port main-royal yardarm, hunched into the wind, with drooping head and closed eyes. Two days after the appearance of the first one, another hawk, smaller and darker, appeared out of nowhere and landed on the fore-topgallant brace.

Early sailors on voyages of discovery attached great importance to birds. If sea birds were numerous, they sometimes could relieve their monotonous diet of salt meat and hard-tack by catching one.

When Bligh was off Tierra del Fuego on April 14, 1788, he wrote: "By Hooks and Line floating my People jigged (as they called it) two Albatrosses. . . . I have encouraged their eating those Birds, and by cramming them with Ground Corn like Turkeys they are as fat and not inferior to fine Geese. . . ."

#### "the Ships Head is the figure of a Woman . . . well carved": Bligh

Tahitians who inspected the old *Bounty* admired its figurehead, the only representation of an Englishwoman they had ever seen.

"I directed it to be painted in colours," Bligh wrote, ". . . and they kept gazing at it for hours."

*Bounty* furrows the cobalt waters of the mid-Pacific. Able seaman James Johnson, off watch, relaxes on the port headrail.



"All Sails set." Crewmen make up the mainsail gaskets as *Bounty* scuds at 10 knots



A Bluenose from Nova Scotia, like most of his shipmates: Victor Magarvey, A. B.

Captain's son, messboy Ellsworth Coggin, Jr., is making his first sea voyage.



REPRODUCED BY LUIS WAZZEM © N. S. S.



A straight wake always marked able seaman Lewis Jennex's trick at the wheel.

*"My men are all active good fellows"*

— Captain Bligh

in the southeast trades

A good man aloft and alow, A. B. Hugh Boyd stands watch beside *Bounty's* bell





*"the country had the most Beautiful  
appearance its possible to Imagine"*

— George Robertson in *Dolphin's Journal*

With clewed-up sails, *Bounty* lies to under the improbable mountains of Moorea, a small island separated from Tahiti by a channel  $7\frac{1}{2}$  miles wide.



Moorea, top of an extinct volcano, rises abruptly from the floor of the Pacific. Plugs of fiery lava shaped its fantastic pinnacles of basalt.

Plainly he did not share the superstition so graphically recounted by Coleridge's "Ancient Mariner" after he killed the albatross:

*And I had done a hellish thing,  
And it would work 'em woe:  
For all over'd I had kill'd the bird  
That made the breeze to blow.*

And when seafarers spied a land bird, their hopes soared. On his first voyage in 1492, Columbus's hopes rose falsely while he was still three weeks at sea; he sighted boobies, far-ranging sea birds, and mistakenly thought they were land birds from the Indies he had set out to find.

On a long voyage under sail, especially in the trade winds, there is not much to do, unless a storm comes, or some unusual happening breaks the routine. The passage-making sailing ship does not try to beat to windward, but sets the best course she can for those seas where her captain knows he will find fair winds for his destination.

In our *Bounty*, except for the man at the wheel and the lookout forward, the watchkeepers did odd jobs: tautening the standing rigging, emptying the boats of water (a launch and a cutter, they stood in chocks amidships), varnishing the deck furniture.

#### Night Sea Has Its Own Milky Way

The night watch was the quiet time. The stars shone through the cloud scud with a blurred halo round their magnified images. The sea, sheared in two by the cutwater, made a rushing sound under our forefoot, gleamed along *Bounty's* dark sides, and burst in a disintegrating Milky Way of green stars as phosphorescent sea creatures glowed ephemerally in the troubled water of our passage.

Sometimes during the night watch I would lie out in the bowsprit net looking at the stars. Just under my stretched feet the "pretty lady in a riding habit" looked distant and unconcerned. The moonlight gleamed on her painted profile, and she seemed to lift her skirts higher and clutch her crop more tightly as she rode the white horses of the sea.

Our osprey died in the lonely morning watch, between four and eight o'clock. Jim Havens saw it happen.

"It was just before dawn," said Jim. "He flapped off the yard, tried desperately to gain altitude, then gave up and fell into the sea. He went plop and that was it."

During fine weather we had all spare hands busy teasing out rope junk to make baggy-wrinkle. This is chafing gear to wrap around



APRIL 1954 NATIONAL GEOGRAPHIC PHOTO

Baggywrinkle, a garland of frayed rope, keeps rigging from chafing sails. Richard Newcomb applies the wrapping

the standing rigging where the sails may rub against it. You make it by cutting old rope into six-inch lengths, separating the strands, and then twisting them into a doubled length of marline (above).

One day one of the messboys who had been furiously twisting suddenly stopped work. I asked him why, and he said: "I just found out what it's really for!"

His messmates had told him that he was helping to make "grass" skirts that could be traded for almost anything in Tahiti.

Most of the crew, knowing I had been in Tahiti before, asked me at one time or another, "What are the girls like there?" The girls of Tahiti have been celebrated for their good looks and their kindness to sea-weary sailormen since Capt. Samuel Wallis first put

the island on the map in 1767.

George Robertson, master of Wallis's ship, wrote in his journal: "... when our boats returned to the ship all the sailors swore they never saw handsomer made women in their lives... this piece of news made all our men madly fond of the shore, even the sick which had been on the Doctors list... said a Young Girl would make an Excelent Nurse, and they were Certain of recovering faster under a Young Girls care nor all the Doctor would do for them..."

At noon I used to shoot the sun under the critical eye of First Mate McKay, a black-mustached young man of quick positive movements, who lived navigation. The object was to measure the height of the sun above the horizon. To do it, you squint through the sextant's telescope, and by moving a mirror, bring the image of the sun down to the horizon. The sun's disk swooped wildly when *Bounty* rolled and pitched.

Down in the chartroom I would compute the position, using the nautical almanac and tables the astronomers have compiled to speed calculation and to aid mathematically semi-literates like myself.

I kept trying to come out exactly on the first mate's fix. One Sunday my position worked out just one mile north of the mate's. Consolingly he said: "Well, we could have seen each other, anyway."

#### Bligh a Skilled Navigator

Finding the longitude was the great problem in Bligh's day. You see the difficulty in old maps, on which north-south distances are accurately drawn but east-west ones are wildly distorted. Because the earth spins west-to-east, to get longitude from the sun you had to know the exact time of day — and accurate chronometers were then rare.

Bligh was a brilliant navigator. As a mark of favor, one of the best timekeepers of his day was entrusted to Bligh by the Admiralty.

With it and his sextants he established Point Venus's longitude within four miles of the true position.

#### Bearded Neptune Holds Ceremonies

On November 20 we crossed the Equator at longitude 102° 50.0' W. Neptune (Mr. McKay) came aboard over the port bow, with a tow beard streaming in the wind and a salt mackerel impaled on his trident.

He sat on a throne on the midships hatch, while 15 neophytes were lathered with a slimy mixture concocted by the cook and surgeon, and then shaved with a big cardboard razor. Finally they were made to crawl through a tube-shaped canvas wind-sail while being helped along by the iron-hard jet of a high-pressure salt-water hose.

Bligh, who has been unjustly portrayed by history and the films as an unfeeling ty-

rant, made this entry when he crossed the Equator on February 9, 1788:

"This Afternoon those who had never crossed the Line before underwent the usual Ceremony except ducking, which I never would allow for of all the Customs it is the most brutal and inhuman." He probably referred to the custom of passing a bight of line under a man's arms and tossing him over the side.

Questions of humanity aside, men and sail were the motive power of a ship in those times, and Bligh, who was before anything else a seaman, would not be likely to mistreat the men who would work his ship and enable him to perform the King's business.

Yet there is no doubt that those were sterner times. One night as I sat on the port cathead talking with one of my watchmates, soft-spoken Captain Coggins came forward. "All

Music whiles away the off-watch hours for seamen. Bligh kept "a fiddle playing every night" and set his crew to dancing to keep them in "health and good humour."

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right, boys," he said, "let's take in the mizzen t'ga'n's'l." As he turned away, he caught sight of the mug of coffee one of the seamen was putting down on the deck. "Oh, I'm sorry," he said, "finish your coffee first." Other times, other customs.

#### Air-conditioning a Necessity

And other conveniences – air-conditioning. We had it throughout, but let me add that it was not entirely a luxury. Diesels build up a great deal of heat, especially in tropical waters.

Our *Bounty* was 118 feet on deck, about 30 feet longer than the original. Bligh's ship

could not have held all our machinery and electrical equipment.

With sails alone we footed along at  $9\frac{1}{2}$  knots. With all square sails drawing and the diesels nudging, we once did better than 13 knots over a cobalt sea flecked with dazzling whitecaps.

Bligh averaged  $4\frac{1}{2}$  knots for the whole voyage of nearly eleven months from England to Tahiti – not at all a bad record, when one remembers his thirty days' beating about off Cape Horn and the frequent calms found in the horse latitudes.

Because we were too few in the night watches to deal with a sudden squall with-





ENGRAVING FROM *Captain Cook's First Voyage*

### H.M.S. *Dolphin*, Fearing Attack, Fires On Tahitian Canoes in Matavai Bay

In 1767 menacing Polynesians who had never known gunshot ventured too close to the British discoverers of Tahiti. "We . . . fired some round and Grape shot amongst them," Master George Robertson wrote in his journal, and "soon put them to the flight." Other Tahitians gathered on One Tree Hill (right), and "thought they were safe. Until we throw'd a round shot closs by them which rose the Earth that they could not help looking at the hole it made After that, . . . they neaver Attempted to Molest us any more . . ."

Rusting round shot came to light on One Tree Hill during the author's visit. Could it be the shot fired by the *Dolphin's* cannon?



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### Hundreds of Tahitian Canoes Enact *Bounty's* Arrival in 1788 for the Movies

"in the Morning . . ." Bligh wrote, "I worked into the Bay" and saw "Vast Numbers of Natives." The scene on the following pages brings his welcome to life 172 years later.

out rousing the watch below, we clewed up t'ga'n's'ls and set them again in the morning. Old *Bounty* carried 46 men. Shorthanded or not, our procedure would have made Bligh's lip curl. On February 22, 1788, he recorded:

"Saw a Sail in the ESE her lower Yards to be seen from the Deck. She had no Top Gt Masts up, which with her reefing Tops'ls at Sun Down which I saw her do, I concluded she was not an English Man."

#### Yarn Features Ghostly Helmsman

So now we bowled along with the trade winds. The new moon had become a thin crescent with her horns turned upward, and

*Bounty* sailed straight down her faint yellow track of light on the sea.

We stood along the rail and talked of sea superstitions. The surgeon said:

"Of course, as a man of science, I have no superstitions, but never mention in my hearing aboard ship a certain four-footed animal that grunts and makes bacon."

I asked Jim Havens if he had any superstitions. "No, I haven't," he replied, "but I did see that silver coins were placed under all three masts before they were stepped, and tossing a coin overside to buy a capful of wind seems to work sometimes."

"I'm not at all superstitious," said the cap-





tain, "but I was in a ship once where they told a story about the man at the wheel being killed because the skipper carried too much sail too long. Not long after, the helmsman was approached by a seaman who said, 'I've come to relieve you.' The man went below and found all his shipmates there. 'Who's at the wheel?' he says. They rushed on deck and found no one at the wheel. After that, every night on the stroke of midnight, the dead sailor came to take the wheel."

One afternoon the pleasant routine of trade-wind sailing was broken. For what happened, I turn to the journal I kept on shipboard:

21st November.

Course SW  $1/2$  S, wind SSE, force 3. Slight sea. Fine and clear. Noon position:  $00^{\circ} 40.0'$  S. Lat.,  $104^{\circ} 24.0'$  W. Long.

Just before half-past six I was sitting in Jim Havens's cabin with Captain and Jim when an alarm bell went off and we heard the cry "Fire in the engine room!" We dashed into the passage, which was rapidly filling with smoke. I was ordered on deck by First, where I found most of crew in life-jackets mustering forward and taking covers off boats. Smoke pouring out of after ventilators. Jim Havens, the Mate and engineers in engine room trying to extinguish fire with  $CO_2$  system.

At 6:37 SOS sent by Sparks

Second Engineer was on watch when a fuel line parted and sprayed fuel over him and hot engine block. Blindly he reached for electrical switches when a sheet of flame flashed at him and forced him on deck. Within twenty minutes the  $CO_2$  system got fire under control, but not before engineers had come on deck, retching, and Jim Havens had badly burned his left forearm.

At 6:53 main power came back on in wireless room and Sparks signalled "QTA [cancel] SOS fire under control. . ."

### Tahiti Appears as Venus Sets

A wooden ship like this has little chance in a fire, and if flames reach the sails—poof!

When the great cabin filled with smoke I automatically dashed down and brought the breadfruit on deck. Jim Havens later made a good story of my "saving" the breadfruit, saying I had seized it in my arms and clambered into the boat on deck crying "Launch me! Launch me!"

The plant drooped so much with its smoke

treatment and lack of sunlight that for a while I had little hope for its survival.

On the night of December 2 a full moon shone through a mackerel sky like clotted cream. It rose on our starboard quarter, and soon its blue-white radiance seemed to overpower Saturn, which hung faintly yellow in the west. The brilliant disk burned a hole through the cloud layer, and round it in concentric circles glimmered a nimbus, pale moon-bow ghost of the daytime spectrum.

It was so bright I could read Bligh's log. The ship rolled and creaked, and the lines rubbing through the fairleads in the tops cracked in a repetitive staccato like pistol-fire.

The last entry in my sea journal reads:

3rd December 1960

Noon position:  $15^{\circ} 43.5'$  S. Lat.,  $149^{\circ} 44.0'$  W. Long. Altered course to S. by E.

Breadfruit must sense its nearness to its native land. It looks much better and I think it will survive.

Just before 9 p.m. I climbed to foretop, Venus and Jupiter off starboard beam. I watched Venus and her companion sink into the scud. Half a point off the port bow another planet glowed low on the horizon, waxing and waning in intensity strangely. Suddenly the planet winked out, then reappeared 5 seconds later, curiously yellow and steady.

All at once I came to my senses. I was looking at another Venus, the lighthouse at the entrance to Matavai Bay.

Tahiti!

And so a *Bounty* came once more to the green island of dreams. None of the crew jumped ship, although one did take home a black-haired Tahitian bride.

I signed off the ship's articles and stayed ashore, where gratefully I sank once more into the warm, sweet-scented life of the islands. With my friends I dived for brightly colored fish on the reefs, climbed mountain trails to fish brawling rivers, and ate succulent baked pig and roast breadfruit.

Oro, god of the Polynesians, willing, Tahiti will never come to the world. But one day during my stay, a swelling roar drowned the thunder of the reef. The first jet rumbled overhead, and the world had come to Tahiti.

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Mr. Marden will write of his visit to Tahiti in a forthcoming NATIONAL GEOGRAPHIC.

*"We had farewell to Otaheite, where . . . we were treated with . . . kindness"*

*Bounty's* captain remained 23 weeks at "the finest island in the world." With a cargo of breadfruit plants, Bligh set sail in April, 1789, intending to thread Torres Strait on his way to the West Indies and England. Three weeks later mutiny broke out.



# The Pacific Ocean Re-



SEEKING a rumored southern continent, great navigators of the past sailed the Pacific. Men like Magellan, Cook, Bougainville, and Bligh risked their lives in quest of mysteries beyond this endless horizon. They charted islands and atolls, studied reefs and currents, measured latitude and longitude. And though the new continent remained a myth until discovery of Antarctica far to the south, there meanwhile emerged a portrait of this mightiest of oceans.

Today scientists, oceanographers, and geologists still explore, still probe and measure. The information they gather, painstakingly compiled, produces a new map—a sheet such as Cook might have dreamed of. This latest Atlas Map supplement, *Pacific Ocean*, distributed to members with this issue, is the

most detailed and up-to-date portrait of the ocean's land features and its floor that the Society has ever published.\*

The new map—a study in vastness—charts a third of the earth's surface, an ocean so huge that all the continents could fit easily in its 63,800,000 square miles.

## New View of an Old Realm

It is a portrait of change. Where Magellan's gallant squadron on its circumnavigation of the globe took more than a year to traverse the Pacific, modern jets whisk passengers almost overnight from the United States to Sydney, Manila, or Hong Kong. Islands once synonymous with remote paradise—Tahiti, Samoa, Tonga—now lie only hours by air from mainland cities.

# explored



## Lightning Splits the Sky Above Sydney, World Port and Australia's Largest City

Sparkling in the summer twilight, Sydney shows off the blend of sea and hills that makes it one of the Pacific's most beautiful harbors. Resident sailors and swimmers take full advantage of their front-yard playground. Harbor Bridge, a 1,650-foot single-arch span, links the city's northern and southern shores. Brightly lit Luna Park (left) entertains merry-makers with thrill rides and games.

Winsome wallaby delights young citizens of Sydney. A marsupial, the small-scale kangaroo belongs to the same animal order as the wombat and the American opossum.



Yet for all man's conquest, the Pacific still lies vast and mysterious: Even today, travelers vanish forever in its immensities.

Keeping pace with the growing interest in the Pacific islands, the new map on its reverse side presents 48 large-scale insets of important islands and island groups, with New Zealand on a scale of 65 miles to the inch and New Guinea at 150 miles to the inch. The main map portrays the Pacific at 575 miles to the inch.

The map will come to life as you read three timely articles on Pacific regions in this issue: "New Zealand, Gift of the Sea," by Maurice Shadbolt; "Twenty Fathoms Down for Mother-of-Pearl," a portrait of the Tuamotu Archipelago, by Winston Williams; and "Huzza for Otaheite!"—the chronicle of a

modern *Bounty*, by Luis Marden of the National Geographic Senior Staff.

Timely, too, is the close-up map of New Guinea, a Stone Age land caught in a modern power struggle, whose story appears in next month's NATIONAL GEOGRAPHIC. The inset of Western Samoa portrays an island nation that achieved independence from New Zealand only last January.

Surface lands on the new map would appear familiar to a Cook or a Bligh; what lies

\*Pacific Ocean, thirtieth in the series of uniform-sized maps issued as magazine supplements in the past four years, becomes Plate 61 in the Society's Atlas Series. To bind their maps, a quarter-million members have ordered the convenient Atlas Folio, at \$4.25. Single maps of the series, at 50 cents each, or a packet of the 28 maps issued in 1958-61 at \$11.00, may be ordered from the National Geographic Society, Dept. 3, Washington 6, D. C. A combination of the 28 maps and folio is \$15.25.



Shell hunters raise a wheel of *Porites* coral and uncover a tiger cowrie beneath the tangled growth. They seek treasures of the sea in the Great Barrier Reef, which rims northeastern Australia with the mightiest coral mass on earth. Lips of a *Tridacna* clam appear snakelike in the foreground.

Hawaiian beauty laces her hair with poinciana blossoms in the fashion of Polynesia.



beneath would astonish them. Since the Society's last map of the Pacific, published in 1952, a new age of submarine discovery has reshaped man's concept of his earth. The new map reflects these dramatic discoveries, charting the Pacific Ocean's floor even more precisely than the navigators of old plotted their newly found islands.

Where previous charts have merely shown prevailing currents and a few of the deepest soundings, the new Atlas Map presents the Pacific floor in contour, with shadings of blue indicating seamounts and plateaus, trenches and basins. More than a thousand soundings dot the new map, including the world's deepest—6,033 fathoms, nearly seven miles—south of Guam in the Mariana Trench. In January, 1960, the United States Navy's man-carrying bathyscaph descended into the trench and touched bottom only 398 feet short of that deepest point.\*

Conversely, the world's tallest peak, Mauna Kea in the Hawaiian Islands, stretches 33,476 feet from its submarine foot to its volcanic crater, exceeding by 4,448 feet Everest's reach—though not its height above sea level.

The entire Pacific, as seen on the new map, represents a great basin, many of its islands

\*For a fascinating account of *Trieste's* achievement, see "Man's Deepest Dive," by Jacques Piccard, in the August, 1960, NATIONAL GEOGRAPHIC.

A speck in the vast Pacific, Sand Island in the Midway group lies 5,200 miles west of San Francisco, 3,600 miles east of Shanghai. The





the coral-capped peaks of volcanic mountains a hundred million years in the building. Some of these ranges—the Hawaiian and Aleutian chains—stretch more than 1,000 miles.

Other vast seamount ranges never break the surface. One such group, stretching south from Alaska toward Hawaii, was discovered only last year by the United States Coast and Geodetic Survey vessel *Pioneer*. Still others are the Emperor Chain in the north Pacific and the vast Marcus-Necker Chain of Hawaii.

The great Easter Island Cordillera dwarfs all these in length, stretching 8,000 miles from the South Pacific to Central America and beyond into the Caribbean. Scientists believe that further study of this immense bulge in the earth's crust may provide clues to the origin of all volcanic ranges beneath the oceans.

The map contains a footnote to exploration of another vast frontier—that of space. The detailed chart of Kwajalein Atoll in the western Pacific locates the Pacific Missile Range Facility, testing site for U. S. rockets. Another inset gives a close-up of Christmas Island, British-administered nuclear-weapons test site, 1,200 miles south of Hawaii.

With the new Pacific map in hand, readers may journey back into history, tracing the routes of the early navigators, or explore one of man's newest and most fascinating frontiers—the world beneath the seas.



PHOTOGRAPHS BY JOHN BOSTWICK, NATIONAL GEOGRAPHIC STAFF (2) (P. 2)


Nose bone worn by a tribesman of New Guinea's Eastern Highlands resembles a ball-point pen. Shells in parrot-plumed headdress show wealth.

Midways, two islets of coral ringed by foam-crested reef, witnessed one of history's pivotal battles in June, 1942, when United States Navy planes routed a Japanese armada, sinking four aircraft carriers. Huge colonies of sea birds breed within the coral circle, typical of Pacific atolls.

PHOTOGRAPHS BY ROBERT E. GOODMAN (BELOW), PAUL S. SARG (TOP LEFT), AND THOMAS WOODS, NATIONAL GEOGRAPHIC STAFF (P. 2)







# New Zealand: Gift of the Sea

By MAURICE SHADBOLT

*Photographs by BRIAN BRAKE, Magnum*

**T**HE FACT WAS, I told this tourist, I'd never really finished seeing New Zealand.

"Never finished seeing it?" he cried. "And you lived here twenty-five years?"

"That's right," I said. "Which is most of my life."

He looked dismayed. He was an American and was trying to see the country in ten days; we had met in Rotorua, in the center of New Zealand's thermal district.

"Now," I added, "I'm trying to see it again. I suppose that's one reason I came back from England. But there's still too much to see."

And that's the plain truth. There *is* too much to

Mountain in a meadow, Egmont wears a wreath of green forest and a crown of snow. Its volcanic cone dominates the butter-and-cheese pasturelands of Taranaki Province, North Island. In New Zealand such scenic wonders lie within eyereach and weekend enjoyment of any citizen.

## New Zealanders celebrate

**S**AILING a vast ocean, Maoris arrived in New Zealand many centuries ago. European colonization followed Captain Cook, who claimed the islands for Britain in 1769. *Pakeha*, as the Maoris called the white men, wanted land held by the tribes, and trouble began.

In February, 1840, Queen Victoria's representative, William Hobson, invited Maori chiefs to Waitangi and proposed a treaty under which Maoris would yield sovereignty to the Queen, while she would protect their land rights. Many chiefs spoke against the

*Governor General speaks  
as the Crown's representative*



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## the birth of their nation

treaty, but one of their greatest rose to its support, saying to Hobson, "Remain, be to us a father, a judge, a peacemaker." As the chiefs signed the treaty, Hobson grasped each by the hand, saying in Maori, "We are one people."

Ceremonies each year at Waitangi commemorate the occasion.

Maori in flax skirt and kiwi-feather cloak repeats a speech made at the treaty signing. Gov. Gen. Viscount Cobham urges unity. Sailors hoist the Union Jack, and ships in Bay of Islands thunder a salute.

*Maoris speak through  
one of their leaders*

see in New Zealand. There are wonders enough for a continent; nowhere else could you find two small islands so varied. New Zealanders like to boast that their country has "something of everything"—of Switzerland, of Norway, of England, of America, and, above all, a large slice of Polynesia.\*

### Glaciers Feed Trout Streams

Volcanoes soar above cold tussock deserts, and warm white beaches sweep lazily into the haze of midsummer. Graceful mountains lift from glossy green pasture, and constellations of glowworms light a cave with uncanny beauty (pages 480-81).

We have glaciers in New Zealand that sprawl down into thick bush; from swift, ice-fed streams, huge trout leap. We have dense, creepered forests rich in game, and plains that spread so far that, walking them, you imagine yourself in the middle of a continent. And much of it under a light as bright and burning as that of the Mediterranean. Where to begin?

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**The Author:** Maurice Shadbolt, whose ancestors settled in New Zealand more than a century ago, calls himself a "pale-skinned Polynesian"—his way of voicing affinity with the people and places of the South Pacific. He quit Europe for a return to his native country so that his first child, Sean Francis, could be born in the land of his heritage. From the soil his forebears won from the hush, Mr. Shadbolt drew authentic flavor for a book of stories, *The New Zealanders*. His articles have been published in many countries.



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This, you might guess, is a story of rediscovery. It begins properly a few yards from the river Thames, in London's Chelsea. It was there, with my wife, that I decided to return to New Zealand.

We were expecting our first child. We're a nomad pair, my wife and I, and we'd been traveling the world for the past three years. After a spell in Spain, we'd settled in London so that I could complete and publish my first book of stories—about New Zealand and New Zealanders.

Now the book was published, the critics had liked it, and we were, for the moment, free. And perhaps a little homesick.

We both belong to the South Pacific—very much so. My wife was born in New Guinea, brought up in Sydney, and married in New Zealand.

\*See "New Zealand, Pocket Wonder World," by Howell Walker, NATIONAL GEOGRAPHIC, April, 1952.



Future secretaries, Maori and pakeha students practice typing in a class at Kaitiaki College, a high school in North Auckland district. Eager for modern skills, Maoris comprise half the enrollment. In another class, brown and white pupils together study the history and legends of New Zealand's Polynesian settlers.

Champion shearer Godfrey Bowen demonstrates his technique to apprentice fleecers on North Island. Using electric clippers, Bowen painlessly rolls off a sheep's wool in less than a minute. He recently set a world record that bettered his own mark by shearing 463 sheep in nine hours. Bowen's methods have revolutionized shearing in New Zealand, which has nearly 49 million sheep.

Diemen lifted sunlit from the afternoon sea. This is New Zealand's northernmost tip (see the Atlas Map, Pacific Ocean, published with this issue).

In the rich late sun, the sandhills of the cape rose a breath-taking gold. And I thought of another New Year's Day, 318 years before, when the Dutch explorer Abel Tasman, in his flagship *Heemskerck*, gazed on this sandy coast. He named the cape for Maria van Diemen, wife of the Governor General of the Dutch East Indies, and the Three Kings Islands, on the twelfth day after Christmas, for the Three Wise Men.

#### Legend Leads to Discovery

Tasman and his crews were the first Europeans known to have seen New Zealand. They had come by way of Tasmania, seeking a legendary great southern continent, and on December 13, 1642, toward noon, they sighted "a large land, uplifted high." They were off the western coast of the South Island of New Zealand, and what they actually saw was the great white rampart of the Southern Alps rising above dense green rain forest.

Tasman named the place Staten Landt, but later it became Nieuw Zeeland after the watery province of the United Netherlands.

Neither Tasman nor any member of his expedition ever set foot on the long-sought soil. When he tried to land, in the north of the South Island, he lost four men in a clash with natives and, saddened, sailed away.

It was to be more than another hundred years before a European glimpsed that barbarian coast again. Tasman had not discovered that New Zealand was merely two large

My own ancestors came out to a raw land last century, in whaling ships and crowded immigrant boats; they panned for gold beneath southern peaks, and dug kauri gum from the tough soil of the warm north. They pushed roads and railways miraculously through mountains and hacked lonely farms from the bush. They slept with rifles by their beds during the Maori wars; they claimed a new land with their sweat and, more than once, with their blood.

My wife, like any woman, wanted the last word. "He," she said (for she was certain we were to have a son), "can be born in New Zealand, if we go back now. Even if we don't decide to live there again, at least he can be born a New Zealander."

As I said, she had the last word. We sailed a month later.

It was New Year's Day when we saw a sight that must have greeted many of the old voyagers, European and Polynesian. The Three Kings Islands and Cape Maria van

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New Zealanders belonging to the National Geographic Society exemplify the loyalty and support of overseas members. In 1961 New Zealand membership renewals reached an unprecedented 99 percent. — The Editor.





islands flung lonely, as by some giant hand, into the South Pacific. He died believing that he had sighted a continent.

The fact is that, to find a continent, Tasman came millions of years too late. The islands of New Zealand are remnants of a great continent that geologists call Gondwanaland, which vanished in a time unimaginably remote.

More poetically, the Maoris say that New Zealand is the result of a fishing trip. The folk hero Maui went angling with his elder brothers and landed a fish which must be an all-time record. This is the North Island of New Zealand, called by the Maori *Te Ika a Maui*—the fish of Maui.

The story of New Zealand is an is-



Auckland's spectacular sprawl testifies to its residents' love of individual house and garden. Red-lead paint protects corrugated-iron roofs.



land story; isolation, and thousands of miles of open sea, govern New Zealand's life and history and, even in the present day, much of the character of its people. It is nearly 1,200 miles to Australia, 5,000 miles to Asia, and 6,000 miles to the Americas.

So long separate from other land, New Zealand is sometimes regarded as forming a distinct botanical region: Three-quarters of its flora is unique. Moreover, the land must have become isolated before the appearance of mammals on the earth's surface. Until the Polynesian voyagers brought the rat and the dog, bats were the only land mammals.

In New Zealand birds came to occupy many of the positions held elsewhere by mammals. Species of flightless birds developed. There was the great moa, hunted to extinction by the Maori and surely one of the most fabulous birds of all time—it grew as



Pony-tailed beauty picks flowers in her yard. Few Aucklanders choose apartments.



PHOTOGRAPHS BY ERIC BRANT FOR NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT S. COCKING (LEFT) & H.A.S.

Called "city of the seas," Auckland gives its heart to a commerce that pumps meat, wool, and dairy products into ships bound for world markets. Albert Park (right) appears like a green gem stone set in a ring of concrete. Spire of the Auckland University College rises beyond the park. Notched cone of Rangitoto guards the harbor, which Maoris named Waitemata, or sparkling waters.



RECREATION CENTER AND ITS DEVELOPMENT BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT D. COOPER. © R. D. C.

high as an African elephant and grazed on grassland. There was the *Notornis*, or takahē, long thought extinct until the startling discovery of a colony a few years ago in unexplored fiordland of the South Island, and the world-famous kiwi, which forages in the bush (page 483).\*

Ancient forms of life have also survived in

\*For an account of the kiwi and the takahē, see, in the NATIONAL GEOGRAPHIC: "The Kiwi, New Zealand's Wonder Bird," by Ron J. Anderson, September, 1955; and "Finding an 'Extinct' New Zealand Bird," by R. V. Francis Smith, March, 1952.

these islands. The country's only notable reptile, the lizardlike tuatara with its vestigial third eye, is the world's most archaic; it belongs to the time when dinosaurs roamed the earth (page 485).

This, then, was the strange green land, a treasure locked in vast ocean, lost in time, unseen by human eye, untouched by human foot until after the time of Christ. The name that the early Maoris gave the country was *Tiritiri o te Moana*.

Which means "the gift of the sea."

### Motorized and on Foot, Shoppers Clog Queen Street in Auckland

Principal business center of a city with growing pains, Queen Street during the work week looks like Saturday on Main Street, America. But home-loving Aucklanders desert downtown by night, and most of their shops close on weekends.

To protect customers from torrential rains, stores extend marquees above the sidewalk. Like their British cousins, New Zealanders drive on the left-hand side of the street (opposite).

Quick lunch at a coffee shop interrupts a tour of Queen Street's fashion shops.

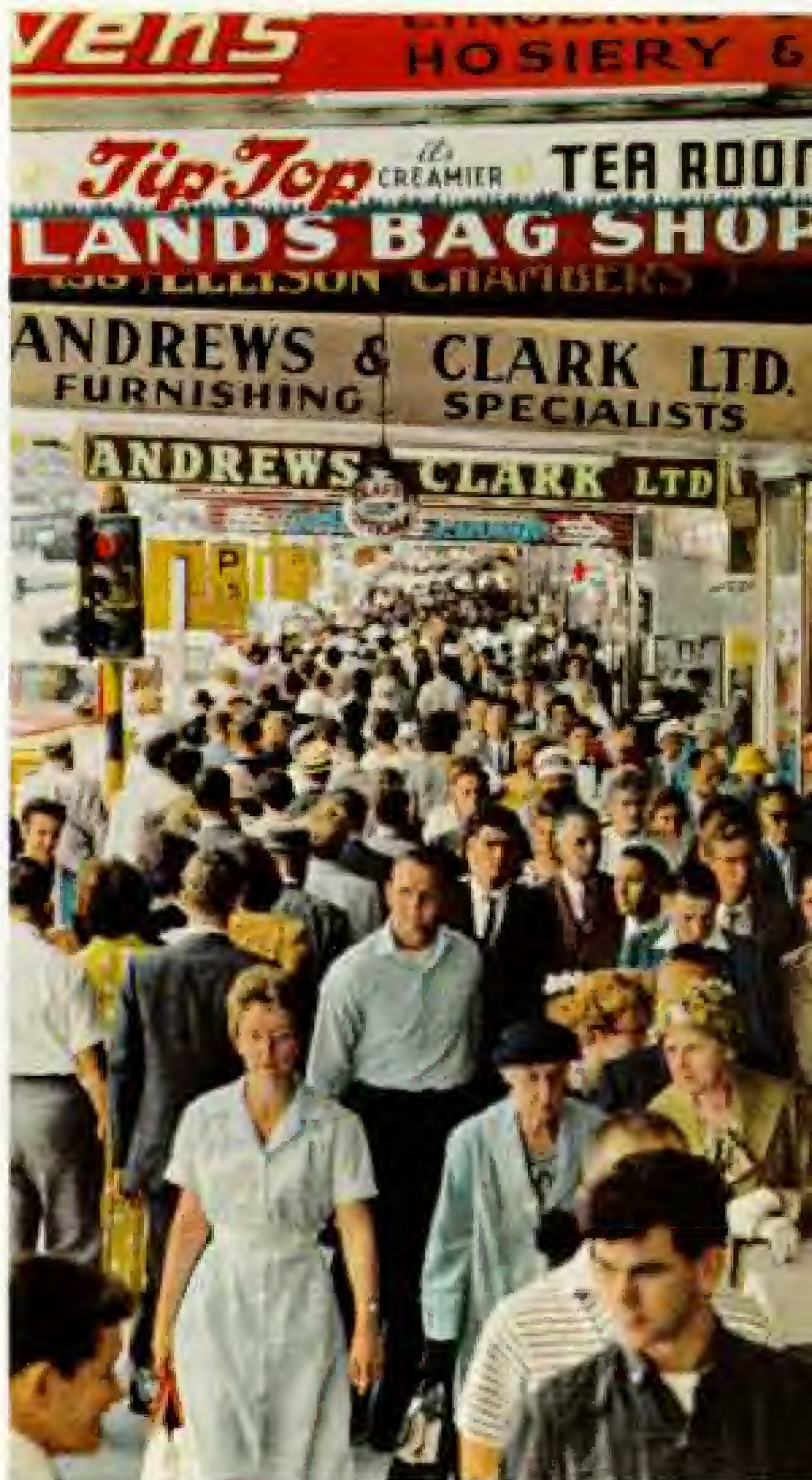


Tasman turned his back on the gift. It was accepted at last by a European when Capt. James Cook made landfall in 1769. Within three-quarters of a century—after dispute and hesitation—New Zealand was to be a British colony; within 140 years, a dominion

#### No Counterpart in All the World

What is New Zealand like today?

That was the question I set out to answer with an old friend, Brian Brake, who was also, with his camera, rediscovering New



Zealand for the members of the National Geographic Society.

At the end of 7,000 miles of travel, if we could agree on an answer, it might be this: New Zealand is like no other country. It is, and will always be, very much itself. And New Zealanders are beginning to realize it. They look less and less to England, or any other country, for their future; they are searching for it in themselves and their own potentials, in the uniqueness of the country, and in their own individuality.

Brake and I made a good team. He's a South Islander, I'm a North Islander. He's as much of a stranger to the warm northern beaches as I am to the cold southern mountains. New Zealand, 1,000 miles long, is almost like two separate countries. In the south one is often conscious of the pack ice of Ant-



#### Jets of Steam Roar From Bores of a Geothermal Power Project Near Taupo

Atop a maze of volcanic faults, New Zealand's thermal region erupts with wonders: geysers and boiling pools, blow holes and bubbling mud pots. Here in Wairakei Valley engineers have drilled deep into the earth to tap its heat for power. Pipes attached to each bore funnel steam to generating turbines in a plant nearby.

arctica across a cold sea; in the north one senses the not-too-distant tropics.

It was a good time to begin to search for New Zealand and the New Zealander. In the north, Maori and *pakeha*—the Maori name for European—were celebrating the 120th anniversary of the Treaty of Waitangi.

In this agreement of 1840, Maori chiefs ceded sovereignty to the British Crown in return for a guarantee of their tribal lands. The progressive document, for the first time in the history of British colonization, approached the native inhabitants of a country as equals. And in spite of later armed conflict, the spirit behind the treaty was never entirely lost.

Maori and pakeha live side by side today as friends and equals. They have shared battlefields in two world wars, and share sports fields in peace. The Maori race has produced fine military leaders, scholars, and politicians.

Statistics tell a remarkable story. Near the end of the last century the Maori were every-

where assumed to be perishing. The population had dwindled from about 250,000 to 45,000. With health services and state assistance in agriculture and housing, the Maori population is now a fast-growing 167,000. Many more New Zealanders have some Maori blood, for intermarriage is common.

So on the wide lawns before the old treaty house at Waitangi, by the blue-and-green sweep of the Bay of Islands, representatives of two and a half million New Zealanders celebrated racial harmony and New Zealand's colonial beginnings. There were *haka* (war dances), speeches, and feasts. Treaty Day is a big event in the Maori calendar (pages 466-7).

#### Deep-sea Anglers Compete in Russell

Later Brake and I crossed the bay to where New Zealand's first capital was located, near the tiny township of Russell. Russell grew on the remains of Kororareka, notorious as one of the roaring towns of the South Pacific



PHOTO COURTESY OF NATIONAL GEOGRAPHIC PHOTOGRAPHY © BOBBI A. COOPER II, USA

Scalding steam escapes from a pipe connection. Hard hat and rubber coat and gloves protect the workman.



### Earth's Inferno Spews Angry Clouds That Men Harness for Electricity

Molten rock heats underground water, sending steam to the surface through man-made vents. Capturing natural energy, the Wairakei project initially will generate some 69 million watts of electricity, enough to meet much of North Island's needs.





### Natural Caldron at Rotorua Cooks Food Maori Style

Demonstrating the method, 15-year-old Turangi Rikihana holds a cord attached to a kit containing mussels, potatoes, and pork. If the food remains in the water too long, it acquires a sulphur flavor.

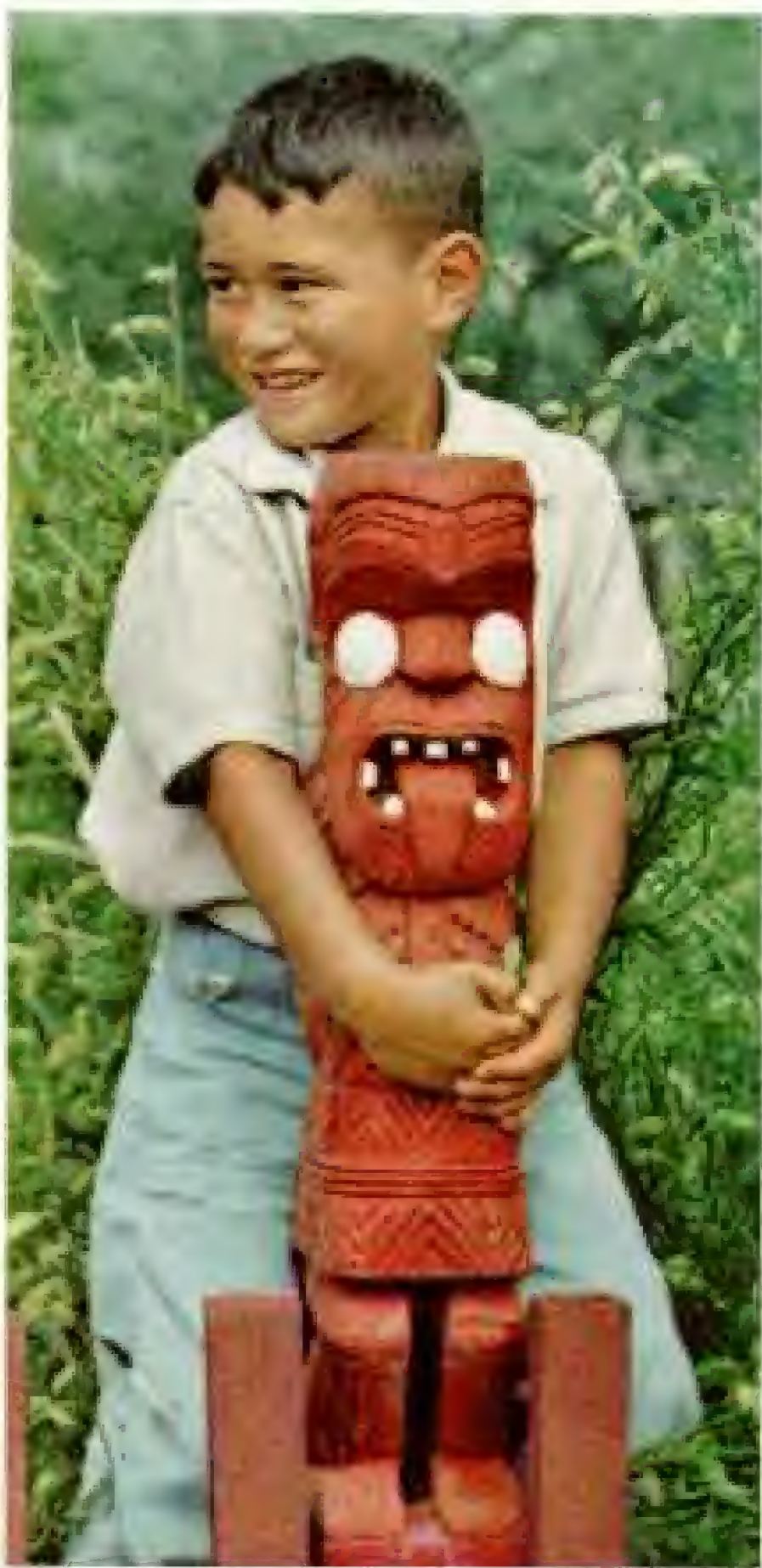
Seemingly bottomless, the Parekohuru Basin supplies most of the hot water needed at Whakarewarewa, a model village where Maoris preserve their ancestors' ways.

Extended tongue of a carved wooden figure shows defiance, a gesture Maori warriors made to frighten foes. This figure and others adorning a fence around Whakarewarewa represent tribal heroes and gods and remind Maoris of ancient struggles between good and evil.

Nature provides hot water for bathing and washing at Rotorua. A run down a sluice from the Parekohuru Basin robs the water of enough heat to make it bearable.

ILLUSTRATION BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT D. GARDNER © N. G. S.





© NATIONAL GEOGRAPHIC SOCIETY

in the early 19th century. Grogshops abounded; beachcombers—deserters and escaped convicts from Australia, many of them—lived with the Maoris in a glorious state of freedom.

"The very refuse of society," Charles Darwin said in disgust, during the world-shaking voyage of the *Beagle* in 1835.

Russell is different these days. This tiny cluster of colonial homes is the gateway to one of the finest deep-sea fishing grounds in the world. Zane Grey, American author and sportsman, helped make Russell famous.

"Of course," said a fisherman, "Grey's records have been bettered now. But at the time, his catches rocked the angling world. Otherwise this place wouldn't be what it is today—the site of New Zealand's Big-Game Fishing Championships."

Bustle filled the township as it played host to fishermen from Australia, South Africa, New Zealand, California, and Hawaii. A South Australian team won, followed by the Tuna Club of Avalon, California.

One evening I walked up from the sea to find the oldest church in New Zealand, in the graveyard were whalers from Nantucket buried beside seamen from Plymouth.

History and sport—the two meet strangely and pleasantly in Russell.

Auckland was once a frontier capital, too, and Aucklanders still insist that theirs is New Zealand's most important city. Certainly in urban area it's the largest and commercially it's the busiest; a third of the country's trade passes over its wharves. It had grown incredibly since I had last seen it.

Brake and I viewed Auckland's vast sprawl from the air (pages 470-71), then wandered its car-crowded streets, sampled its coffee-bar jazz bands and new exotic restaurants, its growing night life; we saw its restless population and a growing influx of Polynesia—Maoris, Cook Islanders, Samoans.

We passed new housing settlements with sprouting television aerials and crossed Auckland's new bridge, gracefully spanning the Waitemata Harbor, that brings the northern suburbs closer and gives Auckland something more in common with its sister Pacific cities of Sydney and San Francisco.

Auckland is not only growing but spreading out—"eating up 2,000 acres of good farmland a year," a busy architect told me.

The reason is that New Zealanders, perhaps because of some pioneer instinct for space and freedom, seem to dislike flats and the crowded life of modern cities; they insist on their own privacy, their own homes on green quarter-acres. The result: Auckland's enormous, sprawling suburbs stretching like tentacles into the plains and hills.

"It can't go on," added the architect. "New Zealanders sooner or later will have to learn to live in flats, make their cities grow taller instead of wider. Look at it—there's not quite half a million people here in Auckland, and yet we're already approaching in area some of the world's major cities."

#### Sea and Isthmus Shape Auckland

Unlike New Zealand's other large cities, Auckland was not the result of planned settlement. Dominated by a Grecian museum, a Gothic-spired university, and a grammar school in California mission style, the city has grown haphazardly around the lovely Waitemata Harbor, an intricate inlet of the Hauraki Gulf. Its buildings are strewn along a slender volcanic isthmus. Extinct cones thrust themselves up from the suburbs like sentinels.

"We're people of the Pacific," Aucklanders will tell you. "People of the sea." Many have two homes—one in the city, one for weekends beside the ocean. Thousands have yachts or



Saga of love unfolds in song and sign language of a Maori concert at Ngaruawahia in Auckland Province, North Island. Singer wears headband and bodice of woven hemp; imitation tattoo marks her chin.

Canoes hurdle a pole in an obstacle race on the Waikato River. Boats copy those in which the Maoris navigated New Zealand's rivers.

Fury of battle finds an echo in a foot-pounding, fist-socking *haka* at the Ngaruawahia festival. Women, including a few pakeha students, join in the simulated war fever.



launches, and the harbor is thick with sail in the summer.

The Hauraki Gulf, a yachting paradise, is sprinkled with attractive islands and beaches and has as its most prominent landmark the scrub-clad island volcano of Rangitoto, dormant for the past 300 years.

"We're growing busier, more brash up here every year," a city journalist took time off

from his typewriter to tell us. "Money changes hands here faster than anywhere else. Other New Zealanders are starting to look at us as people apart, sometimes they rather resent us.

"There's always something new happening up here," he added. "Take this story I'm writing. A new motor-assembly plant—Fiat, of Italy. Or the one I did last week—a new air-





PHOTOGRAPHS BY BOBBI BRACE © NATIONAL GEOGRAPHIC SOCIETY

plane, designed and built by New Zealanders.”

New Zealand is something of an oddity — an agricultural country whose people are mostly townsfolk. So, on a Saturday, we followed a trek out of the city to an agricultural show at Kumeu, about 25 miles north of Auckland.

We drove past the hilly northern suburbs  
*(Continued on page 484)*

### Myriad Stars in the Night Are Glowworm Taillights in Waitomo Cave

Unique to New Zealand, larvae of a gnat (*Arachnocampa luminosa*) dangle flypaper lines beneath lighted lures and reel in glitter-loving flies and midges. Sightseers glide noiselessly through the grotto because the slightest sound extinguishes the wary insects' lanterns (turn clockwise to view).







Keas earn man's enmity as sheep killers



Blue-winged kingfisher brakes for a landing

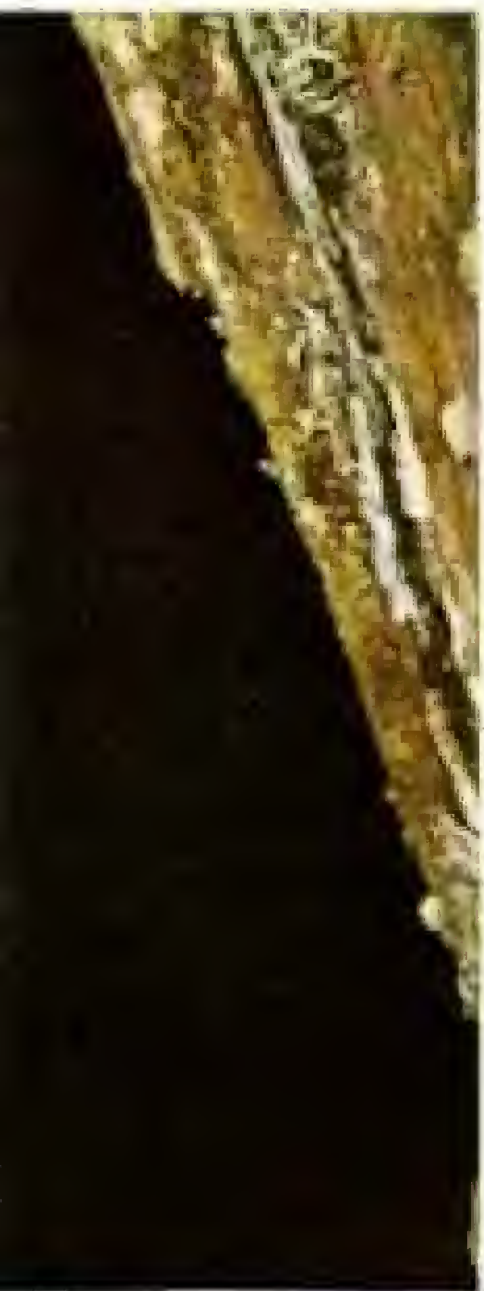


Tiny rifleman stalks insects in the forest

Yellow-eyed penguin nests among rocks along the sea

Remnant of a continent that sank into the sea millions of years ago, New Zealand dwelt in isolation for eons. With Australia, the nearest land mass, more than a thousand miles away, the islands saw few plant and animal immigrants before the coming of man. Some native birds evolved into distinctive forms, without close relatives anywhere else in the world.





### Kea and Kiwi: Villain and Hero Among Rare Birds

A large parrot, the kea (far left) once fed on plants and insects. About a century ago the bird began to develop a taste for meat. Although flocks often devour dead sheep, some killer birds enter a mob to tear the flesh from a living animal. To cut down on depredations, the government pays bounties to kea hunters.

Harmless, worm-grubbing kiwi (lower right) is so popular that New Zealand soldiers call themselves Kiwis. A forest-dwelling night hunter, the kiwi has developed keen hearing and smell to compensate for near-blindness and inability to fly. The chicken-sized hen lays a one-pound egg.



Kakapo, a ground-prowling parrot, feeds at night

### Yellowhead returns to its hole-in-a-tree home



PHOTOGRAPH BY R. P. BOWEN, U.S.S.R.



Male pukeko incubates eggs in a swamp nest

### Flightless kiwi sniffs food with a long beak



PHOTOGRAPH BY R. P. BOWEN, U.S.S.R.

of the city which, with a climate akin to that of the Adriatic, have become a center for grape-growing and orcharding. Here Yugoslavs and Lebanese, with memories of older lands, have nursed the vine from virgin soil and built a prospering wine-making industry.

"It may be that this country has the best climate for light, dry wines in the world," a young and enthusiastic Yugoslav told me.

We left the vineyards for green countryside, spotted with farmhouses, gardens, and pine shelters.

"The English race should not come to New Zealand to renew the town life which they left behind them," wrote the English historian James A. Froude after a visit in 1885. "They will never grow into a new nation thus. They will grow into a nation . . . when they own their own acres, raise their own crops, breed their own sheep and cattle. . . ."

There were raisers of sheep and cattle in plenty at the Kumeu show. You couldn't mistake them.

There's something distinctive about the New Zealand farmer—his tough and leathery face, the aggressive stance which proclaims him inheritor of the land he and his fathers won with ax and fire from the bush. He is the rock on which New Zealand's prosperity has been built.

Farmers argued the merits of the livestock judging, the sheep-dog trials, the agricultural displays. Farmwives displayed their cooking and handiwork, children their farm pets and schoolwork.

#### Champion Shears 463 Sheep in a Day

To see an agricultural display of a different sort, we went to a shearing shed north of Kumeu, overlooking Kaipara Harbor. It was a fine day; out on the sunny harbor were boats fishing for the young sharks which abound in Kaipara and are valued for their livers. But sheep and shearers, rather than sharks, were our concern.

Outside New Zealand the best-known New Zealanders today are probably Sir Edmund Hillary, conqueror of Everest, and the country's recent Olympic champions; inside New Zealand another stands beside them: Godfrey Bowen, world-champion shearer. His feats have been astonishing his countrymen for ten years.

Beside the bright waters of Kaipara, Bowen was instructing seven prospective young shearers. Dazzled by his performance, the

boys watched fleeces peel off the sheep so quickly that the dazed animals hardly had time to notice their painless loss (page 469).

Once an office worker, Bowen made his name a few years ago by shearing 456 sheep in a day, a world's record. Recently he bettered his own mark, shearing 463 in a day. His precision techniques have revolutionized shearing in New Zealand.

"Why the high-speed techniques?" I asked.

"This country's got nearly 49 million sheep," he said. "They all have to be shorn sometime in a year. And there's only a few thousand to shear them. Work it out yourself."

"What we've done," said Bill Martin, a soft-spoken Kaipara farmer responsible for organization of the training school, "is start these schools for shearers to beat the shortage. It's working pretty well."

#### Farming Begins With an Ax

I asked about Bill's farm—and found pioneering still hadn't finished in New Zealand.

"I've worked pretty hard since I came back from the war," he said quietly. "I started off with 2,000 acres of bush. Now I've got 2,000 acres of farm. It was a long business, getting it all from the bush, but the land's looking pretty well now."

We were joined by a Yugoslav farmer, Tom Alach, on whose property the shearing shed stood. I asked Tom his story.

"I came out to New Zealand in 1911," he said. "I worked around the country as a laborer—cropping, felling timber, building fences. It was a hard life, but this is a good country for a young man."

Eventually he was able to buy his present property at one pound (\$1.80) an acre. Some of it was cleared, some still in kauri forest. With plough and ax, he finished the job. Now, on his rich 1,400 acres, he runs 2,500 sheep and 150 cattle.

South we traveled, through Auckland and into the fertile Waikato country, where dairy farmers boast that their land is the richest in the world. Certainly it can be a lush sight—green fenced pasture with fat cows grazing. Here pioneering is long finished.

At Ngaruawahia, where the Waipa and Waikato rivers join, the Maori tribes 100 years ago proclaimed themselves a nation and crowned themselves a king. Tragically, this event, along with land disputes, was to lead to war between the European settlers and the powerful Waikato tribes. But the



REPRODUCTION BY A. V. EIDBOCH AND PHOTOGRAPHY BY S. J. H. BOON © NATIONAL GEOGRAPHIC SOCIETY

### City of Gannets Colonizes the Bare Shelves of Cape Kidnappers

Nearly three thousand pairs live on this North Island sanctuary, named Kidnappers by Capt. James Cook when Maoris attempted to abduct a Tahitian boy from his ship. Nesting birds on the distant rock suggest pins in a pincushion.

idea of a Maori king still survives.

Continuing the tradition is King Koroki; he lives in an intricately carved residence at Ngaruawahia where, in 1954, he received Queen Elizabeth II.

At the junction of the rivers once traveled by swift war canoes, thousands of Maoris and Europeans were gathering for a big annual event—Ngaruawahia's regatta.

It was a photographer's paradise: I soon lost Brake in the colorful, cheerful crowd. I relaxed on a grassy bank above the river, with a tall, friendly, distinguished-looking old Maori. His father had fought against the British redcoats—perhaps against one of my great-grandfathers.

Now together, white and brown, we watched the Maori canoe races and canoe leaps beside the European scullers and speedboats (pages 478-9).

"Once there was difference between

Living fossil, the dragonlike tuatara survives from ancient reptiles that claimed the dinosaur as ancestor. A scale-covered lump on its head endures as the remnant of the once-important pineal, or third, eye. Feeding mainly on insects, the saurian ranges outlying islands. Hunters and their dogs have exterminated them on the mainland.





PHOTOGRAPH COURTESY OF BRUCE BERRY AND HIS PICTORAMA

Costumed cast of the New Zealand Ballet primp before multiple mirrors, preparing for an *Alice in Wonderland* performance for children at the Wellington Concert Chamber



us, and quarrel," the Maori elder said. "Now there is difference still, but no quarrel. The Maori must retain his difference to retain his identity. I will share with you almost everything, my friend—but not everything I will tell you one, two, and three—and maybe even four. But five I will keep for myself. You understand?"

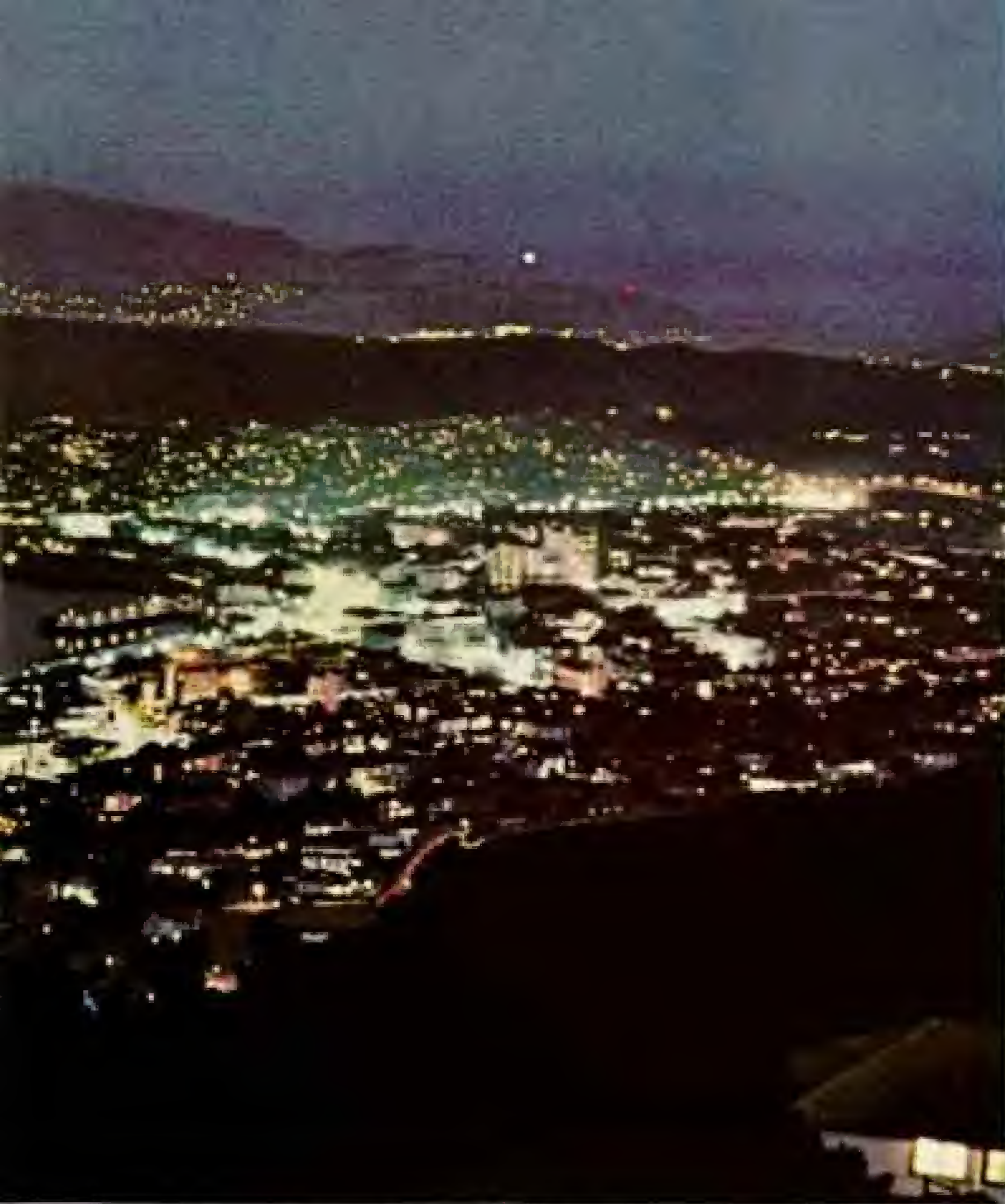
I thought I did. We talked on, of the legends of the Maori, a history that changed subtly to poetry on the lips of the old storytellers.

According to the most popular tradition, the Polynesian voyager Kupe discovered New Zealand about A.D. 925. Then he returned to the Society Islands and gave his people sailing instructions, by sun and stars, for reaching it. In 1350 a great fleet of canoes is supposed to have sailed from the Society Islands to New Zealand.

Present evidence indicates that New Zealand was in fact uninhabited before the fourth century A.D. The earliest radio-carbon date found thus far is about A.D. 1000, suggesting the existence then of a settled life already a few centuries old.

Yet some modern scholars dispute the old





### Tiara of Glittering Lights Rims Wellington's Harbor

Capital of New Zealand, Wellington aptly chose as its motto "*Suprema a situ*." And supremely situated it is, with homes perched like eagles' nests on an amphitheater of hills, and business offices rising from dredged land at the water's edge.

Built on the southern tip of North Island, Wellington lies near the geographical center of the nation (see back of Atlas Map).

**Candlelight** and French cooking delight diners at Le Normandie, a Wellington restaurant stocked with cream and cheese, tender beef, and sole, flounder, and crayfish. Eating houses specializing in foreign menus enhance the city's cosmopolitan air.

Here a waiter ladles brandy over home-grown peaches to convert a flaming dessert.

NATIONAL GEOGRAPHIC PHOTOGRAPHER SOCIETY © BOYDAN © N.G.S.

legends. They maintain that there never was intentional migration; that it is unlikely there was a great fleet of canoes; that settlement of New Zealand was more or less accident.

I talked about it with my friend.

"We can still trace back our *whakapapa*—our genealogy—to the voyagers of the great fleet," he said proudly. "To the *Tainui*, *Aotea*, *Takitimu*, and all the other canoes of the fleet."

What then, I asked, was I to believe?

"There are some things we shall never know," he answered. "Our truth—of Kupe and the great voyages—is the truth of poetry. Poetry is always the greater truth."

And perhaps he is right.

### Where Geysers Leap and Mud Boils

Through the center of North and South Islands run geological cracks, part of the Pacific fault system. Along the fault in North Island rises a great volcanic plateau. From it, in places, the old fires that shaped our planet still smoke out of the earth. Here, as in America's Yellowstone Park, are leaping geysers and boiling mud.

Most concentrated display of thermal ac-



tivity is about Rotorua. In neighboring Maori villages women still cook and wash in water that boils through the earth's crust (page 476). Thermal springs heat many Rotorua homes.

Yet this sometimes sinister district has known tragedies. In 1886 the mountain of Tarawera exploded, burying an entire village and its inhabitants beneath a blanket of ash and cinders. In 1931 an earthquake destroyed the city of Napier on the east coast and killed 255 people.

And on Christmas Eve, 1953, the slumbering volcano of Ruapehu abruptly let loose its crater lake; it swept away a railway bridge and a train, killing 154 people.

#### Nature's Fires Turn Generators

Now man has begun to harness the restless energy of this plateau.

As Brake and I drove south toward Lake Taupo, our car was brought abruptly to a stop by gusts of steam swirling across the highway. When it cleared, we could see on our right, up a long valley, lines of great jets of superhot steam pouring out of pipes driven deep into the ground. And on our left we saw the plant that the New Zealand Government has built to generate electricity from the erupting earth.

Years of patient experiment now have paid off, and the steam turns giant humming dynamos. The old fire of the earth has become the bright new fire of man—lighting and warming his houses, cooking his food, turning the wheels of his factories.

On a still and clear day, the roaring jets of steam leap high in the air, visible above the forests of the plateau for miles around, a symbol of change and progress (pages 474-5).

We saw other signs of leaping progress on the plateau too—about the great exotic pine plantations of Kaingaroa, one of the biggest man-made forests in the world.

Pine, like much other exotic vegetation, grows much faster in New Zealand than in its native Northern Hemisphere. Seedlings planted since the beginning of the century make up rich forests of timber. Now the harvest is being gathered, newsprint is one of the many forest products being exported in increasing quantities each year.

Where Brake and I had last seen tiny villages, we now found thriving towns that will soon be cities. In these busy new communities on the plateau we saw people of many nationalities—Netherlanders, Germans, Hungarians, Finns, as well as Maoris.

Many nationalities, too, find their way to



Lake Taupo, that great stretch of water that lies almost dead center in the North Island. This is a home of New Zealand's famous rainbow trout. All year round, fishermen line the river entrances of the lake; we saw many with strings of glistening fish.

It was a clear, bright day and, beyond the lake, three volcanoes rose—Ruapehu, Ngauruhoe, and Tongariro, which figure in Maori legend. Ngauruhoe and Ruapehu have erupted in recent years.

The area around them has been set aside as a national park of 161,500 acres. The slopes of Ruapehu are popular for skiing; this is the North Island's winter playground.

West of Taupo is the King country. It earned its name when followers of the Maori king retreated into its bush fastnesses after



PHOTOGRAPH BY ROBERT D. WOODHEAD © N.S.P.

Seat of government, the sprawling Parliament building stands not far from Wellington's Lambton Harbor. Here 80 elected members of New Zealand's one-house legislative body — including four Maoris — shape the laws; the Governor General, appointed by Queen Elizabeth II, signs for her.

Uniformed students troop by to classes. Girls' hatbands bear school colors.

In executive session, Prime Minister Keith J. Holyoake (seated at left) confers with members of his Cabinet. He heads the National Party, which defeated the Laborites in 1960.





the Maori wars. It was there my grandfather went when, toward the end of the last century, it was first opened up to the white man. With his ax, he won bush farms from the banks of the Wanganui River.

After the ax and fire of the pioneers came erosion, flood, and abandoned farms. Now the airplane is bringing fresh life to the hills of the King country, as it is to other depleted districts of New Zealand.

At the last war's end the Royal New Zealand Air Force perfected the technique of dropping fertilizer from the air. Now thousands of tons are spread this way every year (page 496). It means a big boost for agricultural production. And New Zealand, with its tiny two and a half million population, al-

ready exports more than 270 million pounds' (\$756,000,000) worth of produce a year.

I spent my childhood on the fringe of the King country, near the Waitomo Caves, which burrow deep into the earth and glitter with an unworldly beauty. Here thousands of tourists come every year to see glowworms light the strange skies of the underworld like stars on a summer night (page 480).

#### Butter Flows From Taranaki

We journeyed down the west coast of the North Island to New Plymouth, center of Taranaki Province and one of the country's oldest, quietest, and pleasantest provincial cities. It is the sea gate, too, for one of the nation's richest dairying provinces; butter



Teen-age skippers launch P-class boats for a regatta near Wellington. All alike, the boats permit sailors to pit skills rather than craft.

Tip-over race in prospect, a youngster adjusts the outhaul of his sail. Three maneuvered turnovers, as required by rules, teach apprentices how to right capsized craft and show that upsets pose no hazard for the experienced.



PHOTOGRAPHS BY BRIAN BRAKE © NATIONAL GEOGRAPHIC SOCIETY

and cheese pour off the plains of Taranaki.

Here we discovered enthusiastic citizens busy about their annual festival. In a huge natural bowl, across a lake, New Plymouth staged its annual Passion Play, which already rivals those of Europe; and New Zealand's national orchestra performed.

Symbol of Taranaki is 8,260-foot Mount Egmont, which rises gracefully from pasture lowlands and has been compared with Japan's Fuji (page 464).

Taranaki has New Zealand's only producing oil wells, and recent major finds of more oil and natural gas point to a booming future. The gas yield may reach 100,000,000 cubic feet daily — 40 times Auckland's present needs. Taranaki beaches run dark with iron-

rich sand, another potential source of wealth.

Taranaki's new wealth, like that of the rest of New Zealand, is reflected in Wellington, the country's capital, where new buildings are pushing up the city's skyline (page 486).

Wellington is blocked in by hills and cannot sprawl in usual New Zealand style. Houses climb into strange places up the hill-sides as Wellington's population grows.

Wellington has a reputation for wind. It sits, along with its neighboring communities of Upper and Lower Hutt, on the southernmost harbor of the North Island beside Cook Strait, notorious for unpredictable gales. Brake and I had spent years in the city, so when a sharp breeze came gusting down its narrow streets, we felt at home again.

In a flat high above the harbor and Wellington's swarming night lights, I talked with old civil-servant friends about New Zealand's problems and future.

Geographically the farthest reach of overcrowded Asia, New Zealand continues to support a small population; its two and a half million average only 23.3 people to the square mile. Yet, unlike Australia, New Zealand has not embarked on a massive immigration policy to fill its empty spaces.

"There's been only a trickle of immigrants since the war," a friend pointed out, "mostly from England and the Netherlands."

"Yet it's been said," another observed, "that this country could support 20,000,000 people. But at our present rate, we'll have only about 5,000,000 at the end of this century."

"We can and should support more population," said a third. "I'd like to see selected Asian immigration—from India perhaps, and Indonesia. After all, we're part of Asia. And more southern Europeans—Yugoslavs, Italians, Greeks—to add color and variety to our life."

But these far-sighted views are still exceptional. I talked with other New Zealanders who are content to leave things as they are. Maybe it's characteristic of the ruggedly independent New Zealander to demand that the world leave him alone.

These are problems argued behind the stately masonry of Wellington's Parliament building, a proclamation in stone of pioneer ambition (page 489).

The atmosphere of an old colonial capital still clings tranquilly to the large wooden homes and spired churches that line the city's back streets. It was here that writer Katherine Mansfield set her best-known story, *The Garden Party*. A memorial to her stands near where she once lived in Fitzherbert Terrace.

Wellington had made great leaps culturally in the years Bruke and I had been away. Ballet and opera companies flourish. We spent an evening at a promenade concert given by the National Orchestra; another at a play performed by the New Zealand players; a third at New Zealand's first national ballet's *Children of the Mist*, with a story based on Maori legend. We heard folk songs of the pioneers sung in a coffee bar, and New Zealand poets reciting to eager young audiences.

#### Over Cook Strait to South Island

We flew out from Wellington's new airport in the morning, over the foam-flecked waters of Cook Strait, and gently descended to the sun-washed seaport city of Nelson on South Island. Named after the hero of Trafalgar, Nelson claims the sunniest climate in New Zealand. The province in which it stands—also called Nelson—is gay with blossoming orchards in spring, rich with fruit in summer.

Within a couple of hours we were sampling apples from an orchard near the town of



White and waxy, clusters of Mount Cook lilies dot the slopes in summer like patches of leftover snow. A giant buttercup, *Ranunculus lyallii* thrives on the Southern Alps at altitudes up to four thousand feet. A single bloom may consist of up to 60 petals.

#### Perpetual Snow Mantles Mount Cook, New Zealand's Mightiest Alp

Telephotography distorts distance but magnifies detail of the 12,349-foot peak that Maoris call *Aorangi*, the cloud piercer. Glen-tanner sheep station appears to sit under the mountain. Actually it lies some 30 miles distant in a basin named for Jock Mackenzie, a rustler who hid stolen livestock there.



### Tasman Glacier's Icy Arms Embrace Mount Cook

Eighteen-mile-long Tasman drops in slow motion through the valley at right. Planes land skiers on the glacier for breathtaking downhill runs. Other sportsmen, like the four ant-size climbers atop Cook's summit, challenge the heights with ice axes and crampons.

The Southern Alps harbor 17 peaks more than ten thousand feet high; some appear beyond Mount Cook. There, on perilous cliffs and wind-swept ledges, Sir Edmund Hillary trained for his conquests of Mount Everest and Antarctica.

Motueka. The orchard was owned by Tom Driver, a friend of Brake's. The apple pickers—mostly girls on a working holiday from Australia and England—were busy gathering the harvest (page 496). In his sorting shed, Tom stamped cases of apples for export to France, Norway, Germany, England, and Venezuela.

### Bargain Land Yields Gold

Beyond Nelson's fruitful plains and valleys rise steep blue mountains. It was through the mountains, along narrow winding roads, that we made our way south to the province of Westland, first part of the country glimpsed by the explorer Tasman. It is a region of lakes, rain forests, glaciers, and iron-bearing sands. The crests of the Southern Alps form its border with Canterbury Province.

The ancient Maori scorned the district except as a source of jade, or greenstone, for war clubs, tools, and ornaments; its inhabitants were mainly the remnants of defeated tribes. In 1860 the white man purchased it for a mere 300 gold sovereigns, a sum soon to be repaid thousands-fold. For a hundred years ago Westland was the setting for one of the largest gold rushes in the South Pacific. In the peak year of 1866, production of gold exceeded 550,000 ounces.

Now its boom towns have been swallowed

up by the bush. Small coastal communities remain, of course; main occupations these days are coal mining, timber milling, and farming.

Where the Southern Alps begin grow the great glaciers—the Franz Josef and the Fox. I had never seen this part of New Zealand







PHOTOGRAPH BY ERIC SHAW © NATIONAL GEOGRAPHIC SOCIETY

before. The road down to Franz Josef is lined with dense rain forest. There are timber mills, lonely farms, and lakes reflecting the snow mountains.

Then you come to the glacier itself, one of the most astonishing sights I have ever seen: a great tumbling river of ice falling

from glistening mountains down to green jungle. There were dull explosions in the valley as chunks of ice split and fell and swirled down the stream from the melting end of the glacier.

Farther south still, along an indented bulge of coast, is the famous fiord district of New



PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY

**Bombing with superphosphate and lime revitalizes grazing lands.** In recent years air-minded New Zealanders have doubled grass yield. Sheepmen use planes to destroy grass-eating rabbits and deer. This pilot dusts the countryside near Wellington.

Zealand. Once only whalers and sealers knew the indescribable beauty of these arms of the sea, their lofty sides hung with gleaming cataracts. Now armies of vacationists find sport and relaxation amid bush, sea, and mountain. The large government hotel at Milford Sound attracts thousands of tourists every year (page 504).

We drove, the next day, across the Southern Alps into the province of Canterbury. A narrow road dropped us into the mountain township of Arthur's Pass, where Brake had spent his childhood. Austrians and Swiss have settled here, instructing skiers and selling mountaineering equipment.

Beyond Arthur's Pass we stopped at the sheep station of Grasmere, named after the poet Wordsworth's home in the English Lake District. Here tall and gentle author-farmer David McLeod, who came out from Scotland as a youth, showed us some of his 35,000 acres and demonstrated new mechanical methods of dusting sheep to kill parasites.

McLeod is author of a series of tales about the lonely life of the high country, collected under the title of *The Tall Tussock*. As we sat to dinner in his 100-year-

**Apple pickers sort Jonathans near Nelson.** Many overseas visitors help to pay for their New Zealand holiday by harvesting fruit, hops, and tobacco.





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Crazy quilt of fertile fields blankets the Canterbury Plains near Christchurch, the Dominion's largest expanse of flatland rolls in a parquet pattern toward the sea. Surf-sprayed isthmus dams Lake Ellesmere at upper left from the blue Pacific.



REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER HERBERT D. GROOMER © N.G.S.

Buses scuttle past Christchurch Cathedral. Because earthquakes occur frequently, wood—not masonry—tips the 210-foot-high spire. Soldiers' War Memorial faces the square. English emigrants founded the city in 1850 and started the cathedral in 1864.

old homestead, he told us his feelings about the land.

"Life up here in the mountains has a very special quality," he said. "You get all sorts retreating from civilization to work up here. Sometimes criminals, men on the run. It's a lonely life, a hard life, but the rewards are of a particular kind. The peace of mind one can find in the mountains is like no other." He paused; the silver on the table gleamed in the candlelight. "If I had my life over again, I don't think I'd choose differently."

Outside again, the mountains rose darkly in the frosty air as we continued on our way to Christchurch, the city of the plains.

The founding fathers of Christchurch, 110 years ago, set out to build a copy of the cities they had left behind. Today, with 215,000, Christchurch still retains something of this English character. The streets are grouped in orderly fashion around a Gothic cathedral (opposite). The river Avon winds beneath stone bridges and past smooth lawns and weeping willows.

The city is now the base for the United States Deep Freeze expeditions (page 501). Every summer planes fly from Christchurch south to the frozen continent of Antarctica.

#### Into a High and Lonely Land

Seen from the air, as Brake and I saw it, Christchurch hugs the coast at the foot of the Canterbury Plains; and the plains, in harvest time, spread out like a many-colored map to the Southern Alps.

But it was the high tussockland Brake and I sought as we traveled on across the plains (page 497), and up into the sprawling river valleys of the Southern Alps.

Our destination was Mount Possession, one of the largest sheep stations in New Zealand—it rambles over 108,000 acres of river flat and mountain.

And about it rise the great peaks of Erewhon.

It was here, on the neighboring sheep station of Mesopotamia, that the English writer Samuel Butler a century ago began his famous novel. He used as setting for his lost, imaginary world of Erewhon the soaring Southern Alps. "Never," he wrote, "shall I forget the utter loneliness of the prospect . . . the vastness of mountain and plain, of river and sky."

It was late afternoon when we reached the homestead; there were



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Striped necktie and matching boater identify a student of Christ's College, New Zealand's oldest secondary school. In customs, curriculum, and campus, the boys' academy at Christchurch resembles an English public school. This senior wears coat unbuttoned—a privilege only monitors enjoy.

Saturday sportsmen warm up for a cricket match on one of 39 fields of Hagley Park in Christchurch. Batsman with leg guards defends his wicket from a hurtling ball.



rich autumn colors in the old English trees planted around it. Sam Chaffey, manager of the station, came out to extend a welcome.

"I think I can promise you a good muster," he told us. "The weather's holding well. Perhaps a bit of snow, but that shouldn't worry you."

Mount Possession, like many of these big high-country stations, is no longer owned by an individual, but by a company. One or two stations are government-owned; in fact, Sam told us of a visit he had just made to the government station of Molesworth, New Zealand's largest—half a million acres.

Rabbits, unwisely introduced by early settlers, and overgrazing by sheep have left much of the country a semidesert. Now the government is controlling the rabbits and introducing cattle to bring the land back into production—too enormous a job for any individual farmer.

Rabbits cause desolation by stripping tussock to the roots. Sam Chaffey, on Mount Possession, is a pioneer of the new and most effective method of warfare on the rabbit in New Zealand—*aerial poisoning*.

"It was during the last war," he said. "I suddenly had the idea of dropping poisoned meal from an airplane. Everyone told me I was mad. I'd poison the rivers, they said, and poison the sheep—perhaps poison people too. But I went ahead. After all the sheep had been brought down to the station, I scattered the stuff from the side of an airplane. A couple of days later I found dead rabbits along the line of poison we dropped. I knew it had worked.

"Then someone had the idea of dropping poisoned carrots. Now every year, after the sheep have been mustered, the planes go into the mountains, scattering poisoned carrots. And that's the story of how we beat the rabbit in the high country. Some stations have been able to almost double the number of sheep they carry."

#### Musterers Scale Peaks for Strays

Twenty-five thousand sheep graze Mount Possession's mountainous acres (page 503). And we were to see most of them in the next few days, as we made camp with the musterers on their lonely tracks through river valleys.

The muster is carried through with all the planning and precision of a military operation. Area by area, the back country is ransacked for sheep. No matter how high, how

far they wander—sometimes way up toward the snow line, on rocky ridges or shingle slides without a trace of vegetation—they are retrieved by dogs and men and driven to the station. There they are dipped and mated, and held for the winter on warmer levels.

The musterers are men of a special breed. They pride themselves on their fitness for one of the toughest jobs in the world.

Limberly they scale half a dozen peaks, searching out sheep, all in a day's work. They may climb 3,000 feet up precipitous rock to bring down a mere three or four sheep. Soaked by rain, chilled by wind, they still crack jokes at the end of the day. They are awake again at four in the frosty morning, and out on the mountaintops before sunrise.

#### Brave Feat Goes Unmentioned

One day, in particular, stays fixed sharply in my memory.

It was toward the end of the muster; everyone was tired and looking forward to the station. I was walking the lower end of a valley with a tall and taciturn musterer named Ian, who had a thick growth of beard. On each side of us, musterers were working the "tops." We were to make sure no sheep were left in the valley, and we spent most of the long day without sight of one.

We lost touch with the other musterers; their whistles and cries, together with the faint barking of their dogs, receded into the great silences of the mountains.

Ian stopped, and looked up a steep mountainside. "See them?" he said.

I looked. I could see only a mountain. Tussock merging into vast slides of shingle; rocky spurs beneath a ragged peak lightly sprinkled with snow; sheer bluffs and a lonely sparkling waterfall.

"See what?" I said.

"Look again," he said.

"Sorry," I conceded after a while. "I can't see a thing."

"Half a dozen sheep up there. Above the right-hand shingle slide."

Baffled, I stared. I still couldn't see them.

With his dogs barking at his heels he went off to fetch the strays. It occurred to me that he could easily have forgotten about the sheep up there, and no one would have been any the wiser.

But that isn't in the high-country tradition. And so away he went, up a couple of thousand feet of mountain or more. We were late

### Antarctic Hero Scott Stands in Stone at Christchurch

England's Robert Falcon Scott and four companions reached the South Pole only five weeks after its discovery in December, 1911, by Norway's Roald Amundsen. Fighting blizzards and  $-40^{\circ}$  F. cold, Scott and his men perished on the way out.

Scott's statue, executed by his wife, stands beside the tree-lined Avon River.



Antarctica calling! From Christchurch, personnel of the United States Navy's Operation Deep Freeze confer daily with their colleagues in Antarctica. Radio permits communication with picket ships, aircraft, and stations.

Staging base for all Navy men going to and from the polar continent, Christchurch bustles with activity each January—midsummer in the frozen wastes where the bases are situated.

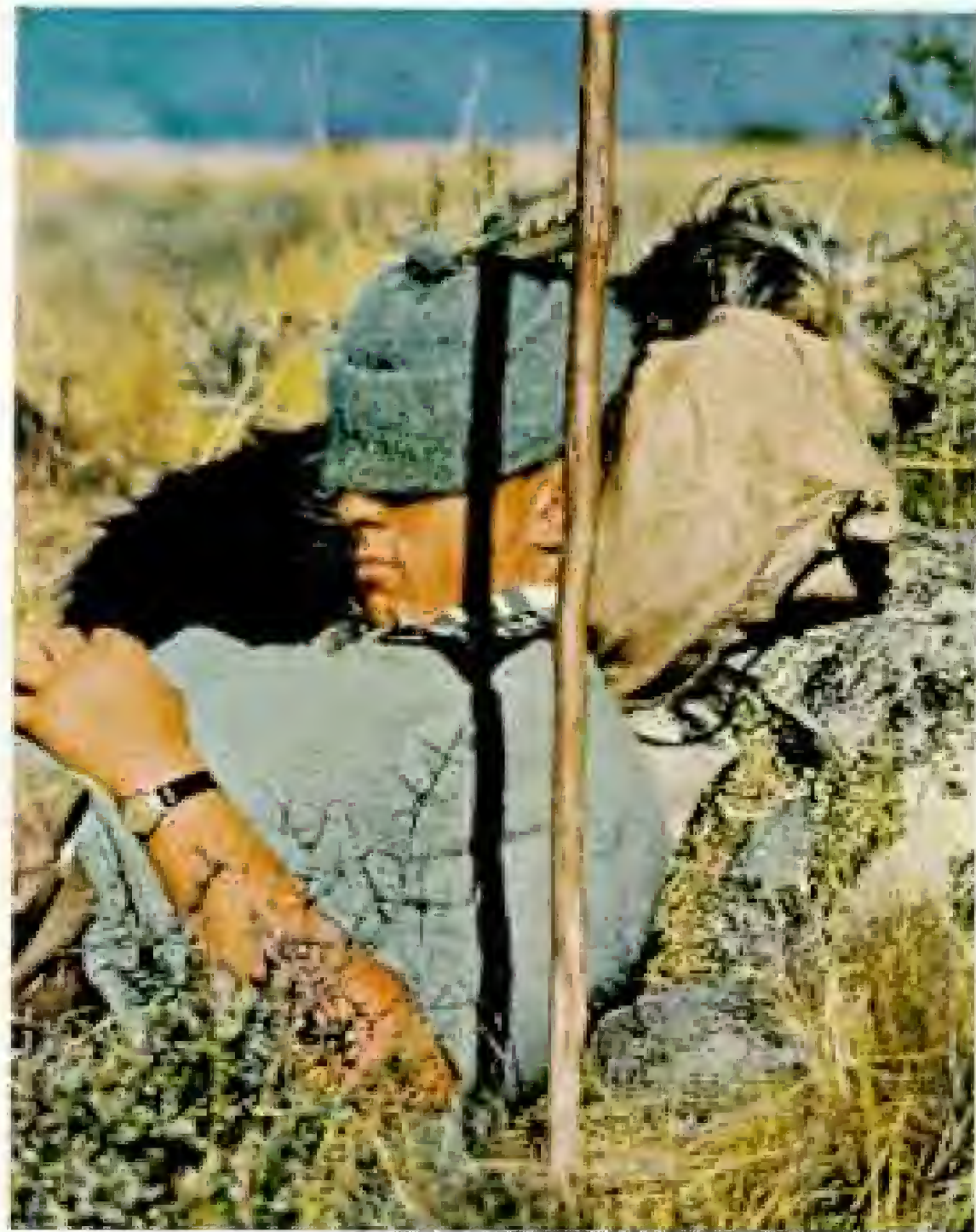
Speaking into the microphone, Comdr. H. K. Butcher asks McMurdo Sound, 2,000 miles distant, about conditions on the ice. Lt. Louis Bruyneel, who has just been flown back to Christchurch, wears the beard he grew in Antarctica. Other officers wait their turn to talk.

PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHY SERVICE • ILLUSTRATION AND MAP BY MICHAEL J. WOOD



Woolly mob of merinos files along a slope of Mount Possession to winter on warmer runs below. Having ranged free all summer, they head for the fall muster. Herdsmen take pride in their ability to spot stragglers on high ridges and shingle slides.

Weary sheepmaster and dog take 40 winks after the week-long muster. A kea feather ornaments the youth's cap. Staff helps him vault streams and scale crags.



getting back to the hut that night, but there were half a dozen new sheep added to the mob. Ian didn't even think his effort worthy of mention.

Day by day small mobs of sheep, stringing out along the skyline, were brought down from distant places. The dogs became as weary and footsore as the men. Then, with the muster almost over, we were driving 18,000 sheep down to the station.

This is the last, most delicate of jobs. The big mob must be moved along slowly — one fright, and a couple of hundred might smother themselves in their own panic.

Sam Chaffey was waiting for us at the homestead, a grin on his face. "Good muster?" he asked. "Have a bath and a shave, and I'll send you both out on another one."

We pleaded to be excused, very definitely, as we limped toward him.

Next day Sam, for light entertainment,

showed us how he could move a mob of 2,000 sheep around with a single dog.

Standing on a hill, half a mile from the sheep, he sent the dog careering away. Whistling instructions, he had the dog spinning the sheep in a circle, then swinging in an oblong, then packed in a square. The patterns were almost perfect. It wouldn't have surprised us if Sam and his dog had persuaded the sheep to walk upright on their back legs.

"Only one thing I've never learned to do with my dog," Sam confessed.

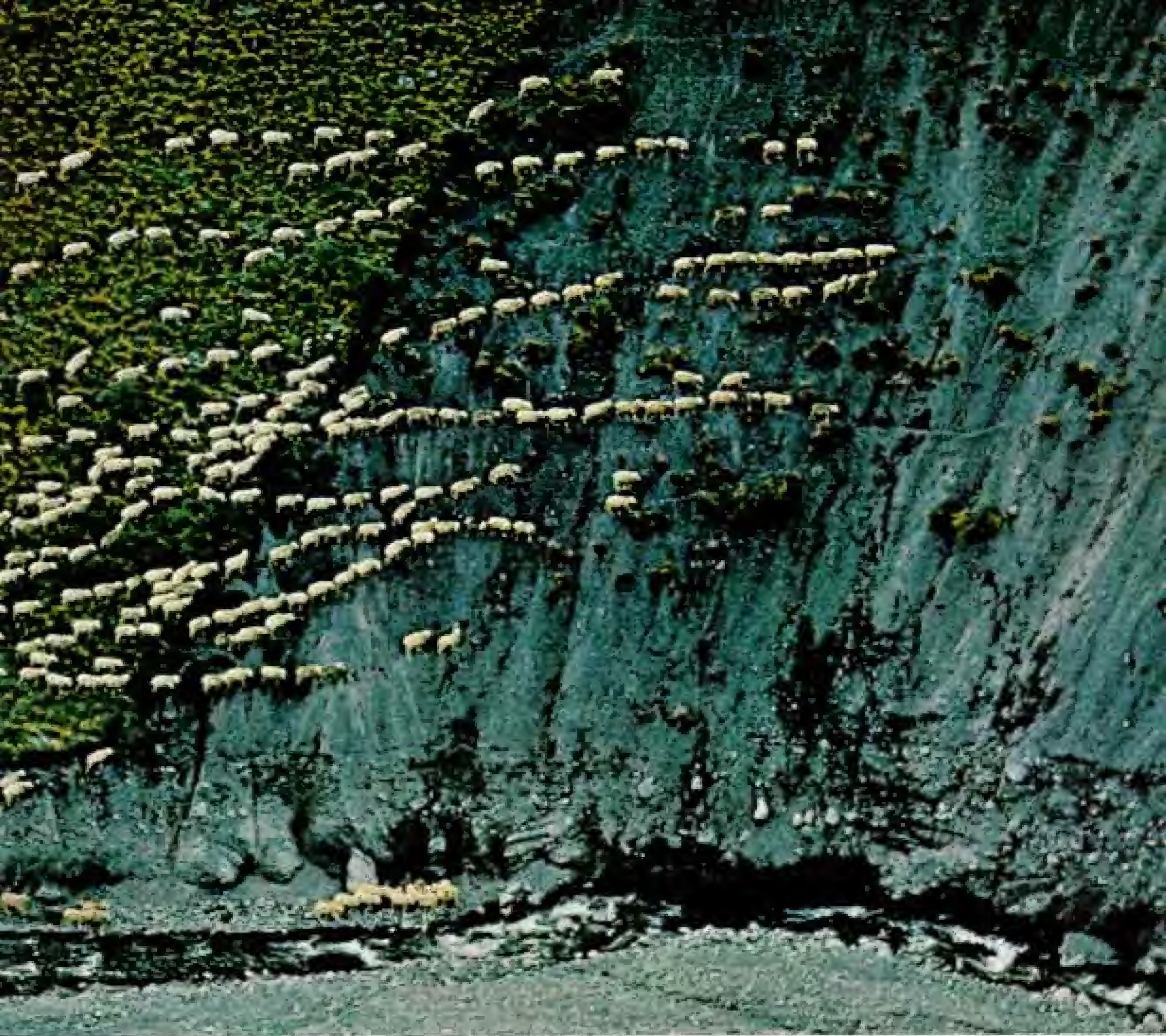
"What's that?"

"How to make it drive a tractor," he said. "Think of the labor it would save."

We drove south again, skirting the Mackenzie country, named after a Scottish sheep rustler who grazed his stolen sheep over its vast mountain-locked acres when it was still unknown to other Europeans.

Lately it has become the location for en-





PHOTOGRAPH BY BRIAN PEARCE © NATIONAL GEOGRAPHIC SOCIETY

deavor of a new kind. New Zealand's industrialist-inventor Bill Hamilton, who has his home and workshop here, devised and built a jet boat to swoop over the shallows and counter the currents of swift South Island rivers. It has opened up to explorers and sportsmen otherwise inaccessible mountain river valleys. Recently his jet propulsion unit, which has gone into international production, won fame on rivers of the United States (pages 552-65).

#### Mount Cook Trained Everest Climbers

In the distance we glimpsed, now and again, Mount Cook, whose 12,349 feet make it the greatest peak in the Southern Alps. It was the training ground for New Zealand's skilled mountaineers and for Hillary's eventual conquest of Everest (page 493).

Then we crossed the 45th parallel and drove between the strange arid hills of Central Otago. A hundred years ago this area

meant one thing only: gold. Now it means one of the loveliest lake districts in the world. Autumn blazes with poplar and sycamore, maple and willow—brought in by the early settlers. Placid lakes catch up the gaudy dance of color; soaring peaks cast their reflections upon the still water.

Center of this district is Queenstown, built along the shore of Lake Wakatipu (the long lake) and beneath The Remarkables, a range of mountains that rises 7,000 feet from the water's edge (page 506). The Maori knew Queenstown as *Tū Tapu-nui*—"the sacred place"; here they came to find greenstone for tools, weapons, and jewelry; later the white man was to find it equally rich in gold.

Queenstown is well situated. To the west lie the fiords. North, Mount Cook and the Alps. South lie lakes, bush, and prospering farms of the district called Southland, with its appendage, Stewart Island, the nation's



Cotton clouds tuft mile-high cliffs above majestic Milford Sound. Here the most magnificent of New Zealand's dozen-odd fiords joins the Tasman Sea. Cruiser *Royalist*, flagship of the nation's navy, slices the channel carved by a vanished glacier.

Like molten metal, Sutherland Falls, one of the world's highest, spills from Lake Quill and explodes in rainbows almost two thousand feet below: an aerial view.





third island, famous for oysters and scenery. Southland one day may have one of the biggest aluminum industries below the Equator. A smelter with 250,000-ton capacity is planned at Bluff, near Invercargill, with completion in 1967. It will refine Australian bauxite and ship it to the world.

A few miles from Queenstown, past Lake Hayes and the ski grounds of Coronet Peak, we came to Arrowtown, a peaceful survival of Otago's gold-fevered past. History settles as gently as afternoon sunlight upon its old gold miners' cottages set beneath huge English trees. Here Brake and I took breath after 6,000 miles of travel and prepared ourselves for the last long lap of our journey.

First we traveled out of Central Otago, along rocky gorges and past tumbling rivers, through sheepland and orchards, down to the

city of Dunedin. Dunedin is the ancient name of Scotland's Edinburgh, and it was given this name by Scottish pioneers. A statue of the Scottish poet Robert Burns—his nephew Thomas settled here—has pride of place in the city's center (page 508).

We were heading north. Back the way we came, and then as far as we could go.

Look at your map of New Zealand; at the thin peninsula that rises like a pointing finger from the most northerly part of the country. This was where we were headed. Why?

There was the old Maori I met at the Nga-ruawahia regatta. "So you are trying to tell the story of New Zealand," he had said. "Well, you will never tell the story properly unless you tell of Te Rerengawairua, the leaping-off place of the spirit of the Maori after death.

"Go to Cape Reinga. Look out upon the



KUDRINSKIY © NATIONAL GEOGRAPHIC SOCIETY

### Golden Poplars Blaze Above Queenstown

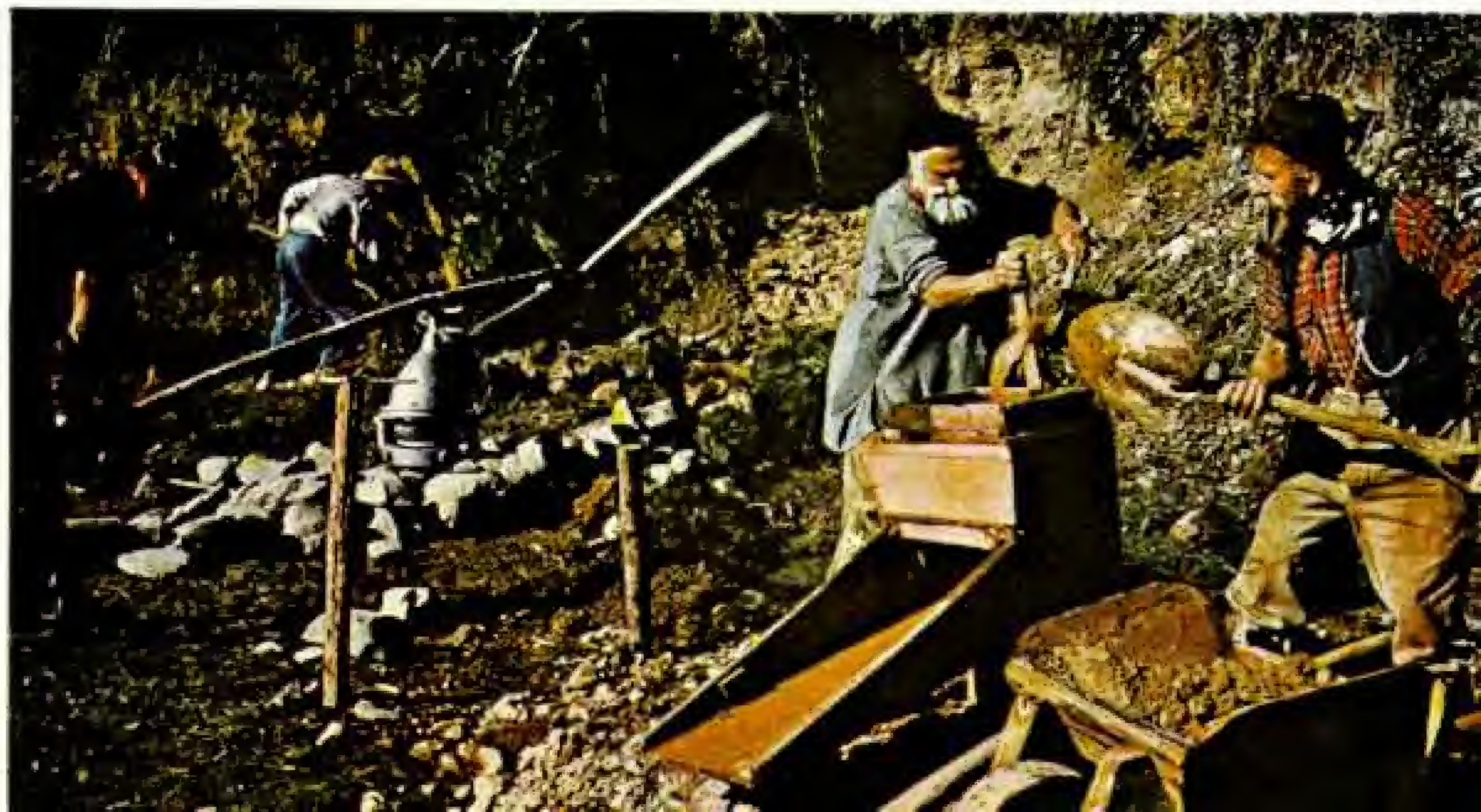
A century ago gold prospectors opened Central Otago to settlement. Their descendants found fortunes in farming.

Today the Queenstown region attracts sports enthusiasts from all parts of New Zealand. Some sail landlocked Lake Wakatipu, which rises and falls three inches every five minutes, defying explanation. Others storm ramparts of The Remarkables (beyond).

The excursion steamer *Farnslaw*, trailing smoke, sails for Kingston.

"Old-timers" in cotton whiskers use sluice and shovel to bring back gold-rush days at the Ross Centennial celebration in Westland Province. Pioneers panned coastal sands and riverbeds; later they probed deep deposits with drill and dredge. Within half a century pay dirt played out, and grassland became the bonanza.

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Boys and bard share the pedestal at Dunedin's annual festival. This statue of the Scots' beloved Robert Burns stands before St. Paul's Anglican Cathedral in the center of the city. The Rev. Thomas Burns, nephew of the poet, helped to found Dunedin.



Bagpipes skirl as kilted clansmen lead

sea and the sky, and the lonely tree from which the spirits leap to the underworld in the track of the setting sun. Stand a while on the hill of Haumu, where the spirit must pause before it sets out for its old lost homeland of Hawaiki."

We arrived at Ahipara, a small coastal Maori village of New Zealand's far north, and spent the night with a friend of mine, Barry Mitcalfe, an enthusiastic collector of Maori legends and translator of Maori poetry.

Next morning, well before sunrise, we climbed a hill above the village to see the

first light flood over Ninety Mile Beach, most spectacular of New Zealand's sweeping shores. It runs almost the entire length of that last peninsula of New Zealand. Once it was a road for marauding Maori war parties; now it is better known as the home of the toheroa, the rare New Zealand shellfish whose soup is sought by gourmets the world over.

Here, according to legend, is the last broad track of the Maori spirit as it makes its way out of the country for the underworld journey to Hawaiki. The sand swept away into the distance as the sun rose, and seemed to tilt



BY ESTABLISHED BY DAVID BRADY © NATIONAL GEOGRAPHIC SOCIETY

a procession of floral floats up crowded Princes Street during Festival Week in Dunedin

away over the world's edge. There were sudden flares of gold fire on curving waves, and the world was day. It was a scene from the ancient past, from the time when men still lived in wonder upon the earth.

Then, seeking the future New Zealander, we went to Kaitiaki, the college where Barry is a teacher.

The Maori population is largest in the north, an area which welcomed the first Polynesians and the first European settlements. And Kaitiaki College, otherwise typical of most New Zealand schools, is one of only four

that have a 50-50 Maori and European roll.

"An experiment in race relations? No!" Tom Hawthorn, Kaitiaki's principal said in reply to a question. "As you suggest, this is more than just another school; we are all too deeply committed to be described as an experiment. This college represents race relations at work—and working well."

It certainly seemed so that day, as we wandered the college and watched some of its 600 pupils in classroom and workshop. It also seemed right that one of our last glimpses of people, on our tour, should be the young

of two races joined in so friendly a fashion, their faces, which Brake recorded, tell the story of tomorrow's New Zealand (page 468). For more than a third of the country's population is under 20 years of age. One child in every seven or eight is Maori, and perhaps one child in five has some Maori blood.

We drove swiftly to reach Cape Reinga before dark. The last winding stretch of road, the last steep climb, and then the Tasman Sea spread dazzlingly before us.

#### Last Lighthouse Guards Rocky Cape

To our left, in the west, was the long golden finger of Cape Maria van Diemen, to our right, in the distance, the blue shadow of North Cape. And immediately before us, beneath the last lighthouse in New Zealand, the long rocky point of Cape Reinga, leaping-place of the spirits, thrust itself dramatically into the sea. Far out on the point we could see the lonely pohutukawa tree, growing inexplicably on solid rock, from which the spirits slide into the water (opposite).

It was sunset, the right time to see Cape

Reinga. In life the Polynesians voyaged into the sunrise; in death they follow the blazing track of the setting sun.

Then I realized I had come full circle. I was back again where I had begun the search for my own country.

And what had I found?

Everything I had seen returned to me with vivid, uncanny force. Scene after scene — city and country, mountain and plain, beach and forest, river and valley. And people, a swarm of faces — from the tough musterers of the south to the shy Maori children of the north.

I had found a country becoming aware of itself. A country stirring, like some long-sleeping beauty, waking to the pride and splendors of new nationhood. A country of sturdy bodies nourished by the sun of the South Pacific.

But there was still one more New Zealander I had to meet — literally the last man in New Zealand. The New Zealander who would ask the necessary question.

While Brake took photographs, the lighthousekeeper came down to talk to me. "The name's Bill Kemp," he said. "Like a meal? I can easily fix you beds for the night." His eyes had a friendly sharpness, his skin was brown and roughened by sun and storm.

I thanked him for the hospitality. He still eyed me curiously. Something about me must have been puzzling him.

"You're a New Zealander?" he asked at last.

"Yes," I answered. "We both are, as a matter of fact. My friend travels professionally. And I've just come back here."

He grinned. Then he asked the question, "And you're home to stay?"

Well, there it was. The gift of the sea was mine if I chose to accept it. Was I home to stay?

"Well, yes," I said finally. "I guess I am."

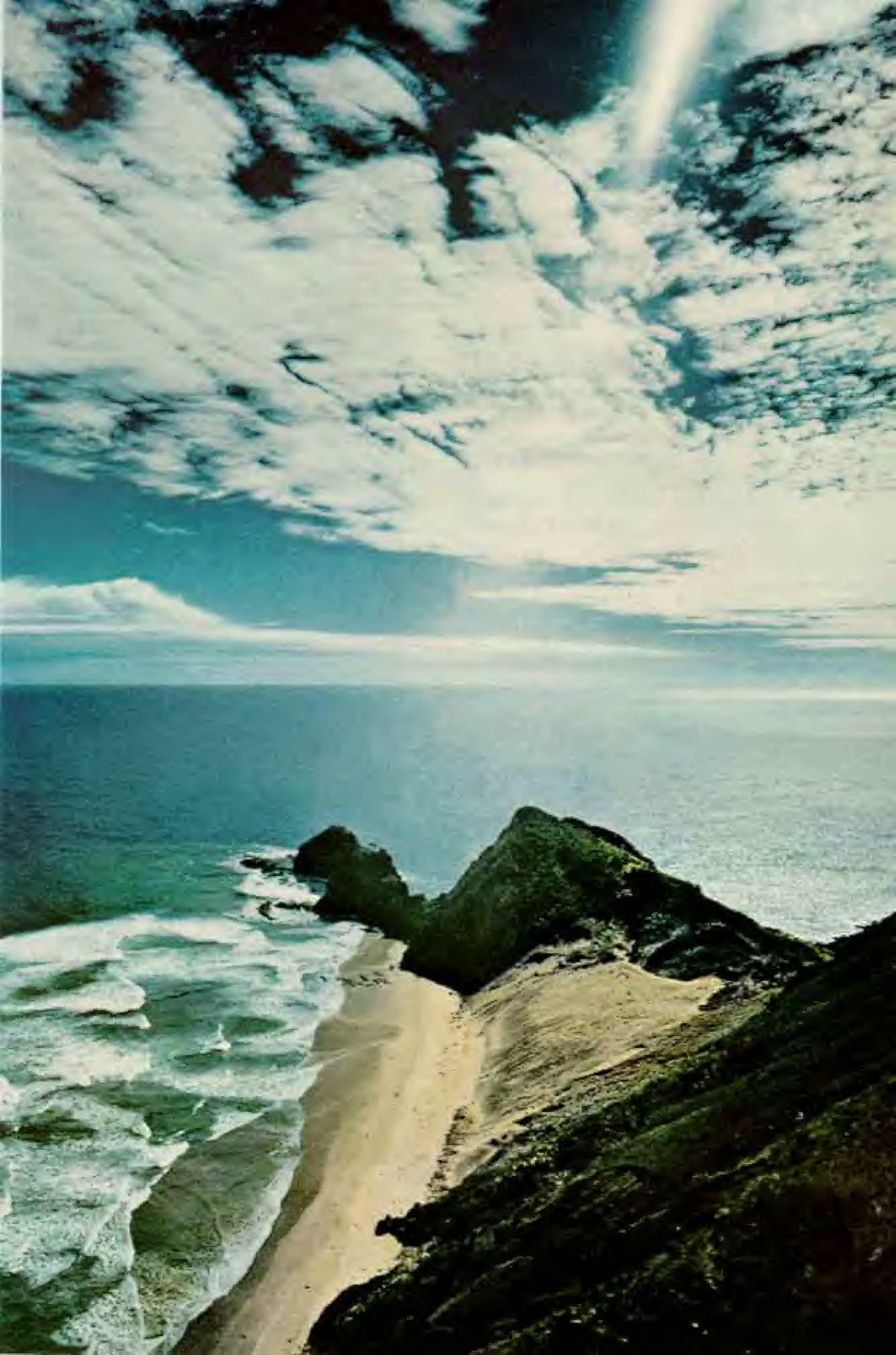
Maori matriarch wears chin tattoo in a tradition that is now vanishing.

#### Sea Gate to Eternity! Maoris Regard Cape Reinga as the End of the World

Like other elders among her people, the old woman at left believes the rocky promontory points the northern tip of New Zealand toward Hawaiki, legendary home of the Maoris, to which their spirits return. Souls of the dead glide down a root of the lonely pohutukawa tree to the sea and ride rays of the setting sun into everlasting life.







# Twenty Fathoms Down for Mother-of-Pearl

By WINSTON WILLIAMS.

*Illustrations by National Geographic  
photographer BATES LITTLEHALES*

THE SHADOWLESS BLUE of the lagoon floor surrounded us. Among somber masses of coral, we hung suspended at 130 feet, as far down as a 12-story building is high.

Then a flash bulb went off. In a fraction of a second, brilliant colors exploded everywhere—reds, pinks, yellows, and bottle blues, reflected from the shimmering coral. As we watched, our Polynesian friend Hitii swam to a big mound of coral and wrenched a pearl shell free.

He moved deftly, swooping down on the shell and twisting it off before the muscular oyster inside could tighten its hold on the coral head. He seized several more, placing each shell carefully in a woven basket.

## Into the Depths 40 Times a Day

With our Aqua-Lungs, NATIONAL GEOGRAPHIC photographer Bates Littlehales and I could stay underwater for the better part of an hour. But Hitii worked in a hurry. Like nearly all the pearl-shell divers in the Tuamotus, he used no breathing device. Thus he could submerge only as long as he could hold his breath, from 90 seconds to about two minutes at most.

Now Hitii gave a tug on a rope—a signal to a companion in an outrigger canoe above—then rose to the surface like a cork. His helper hauled up the basket. It contained five

large shells, valuable for their inner layers of mother-of-pearl, the material from which the best buttons are made.

After 40 or more such dives in a day, Hitii with luck might bring back 150 to 200 shells, for he is one of the most skillful divers in the islands.

This underwater spectacle, a daily routine in the lives of pearl-shell divers of the South Pacific, had drawn me to the Tuamotus for the second time. *Marie Céline*, my trim 45-





PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY

foot schooner out of Nantucket, had stopped for supplies in Papeete, Tahiti, the capital of French Polynesia, and Bates had joined me there. Then, with six of us aboard, we headed for Takarua in the French-ruled Tuamotu Archipelago, 300 miles to the northeast (see the latest National Geographic Atlas Map, **The Pacific Ocean**, distributed to members with this issue).

In the Tuamotus, I knew, pearl-shell diving had been drastically regulated because of

### **Intense Pressure at 120 Feet Distorts the Face of a Polynesian Shell Diver**

Tuamotu islanders in French Polynesia harvest the floor of the Pacific. During the March-to-June shelling season, daring divers pluck mother-of-pearl oysters from coral heads. Though they wear no underwater breathing apparatus, they can submerge nearly two minutes. On an exceptionally good day, this goggled diver may bring up as many as 200 shells, which will be sold to make buttons, earrings, and knife handles.

the development of underwater breathing apparatus.

Even before World War II, men with diving suits and helmets—the “hard-hat” divers—scooped shells from the lagoons in such quantities that markets were glutted and the oyster beds were threatened with extinction. Later development of lightweight underwater

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**The Author:** Winston Williams, 26, learned deep-water sailing aboard Irving Johnson's brigantine *Yankee*. He circled the world on her 1956-58 voyage (see NATIONAL GEOGRAPHIC, May and December, 1959). Fascinated by Polynesian culture, he has since studied its songs and rhythms as he sailed to remote Pacific isles.

breathing devices increased the depredations.

Except where pearl shells lie too deep, divers today are not permitted to use underwater breathing devices, not only for the sake of conservation but for their own safety as well. Aqua-Lung users who dive deep and stay long cannot just pop to the surface. If they do, they risk ruptured lungs or the painful condition known as the bends.

These dangers rarely strike the diver who holds his breath. He comes up with the same amount of air he took down, not an excessive amount pumped into his lungs to equalize the heavy pressures of the depths, and thus he is not likely to rupture his lungs. And he cannot



stay down long enough for extra nitrogen to build up in his body. It is this gas in excess amounts, forming bubbles in the bloodstream and tissues, that can cause the bends unless a slow and carefully timed ascent follows extensive periods in deep waters.

Hence, authorities of French Polynesia maintain strict control over the taking of pearl shells with the aid of underwater breathing apparatus. They allow only residents to dive for the shells.

The divers must confine their hunt to a few islands — different ones each year — to give the shellfish a chance to grow.

This year divers were converging on Taka-

WOODRUM/REUTERS © NATIONAL GEOGRAPHIC SOCIETY



"Land ahead!" Perched on the foremast spreader, a lookout sights a Tuamotu atoll. Across sun-flecked waters, the tops of palms loom into view, then broad spits of sand and the iridescent breakers of long swells. Low-lying islands fringed with jagged barrier reefs, the Tuamotus merit the nickname bestowed by seamen: Dangerous Archipelago.

Isle of perpetual summer, Takarua wears the languid charm of the South Seas. Blue waters lap a beach of broken coral; trade winds rustle coconut palms.

The atoll's one village, dominated by a Mormon church, slumbers in the midday sun. A carnival air shatters its serenity in the shelling season, when hundreds of neighbors invade Takarua from nearby islands.

ron from several of the 77 other islands in the Tuamotu group, that enchanting string of atolls whose name the natives translate as "cloud of islands."

An old South Seas hand in Papeete had once described the Tuamotus to me.

"They stretch roughly 1,100 miles, and some people say they are all alike," he said. "Just the same, there's an intangible something about them that seems to make each island different from the others."

#### Isles of Trade Winds and Typhoons

He was right. But at first sight it hardly looked that way, and in describing Takarua I am, at least in a physical sense, also describing Takapoto, Fakahina, Fakarava, Hikueru, Pukarua, Manihi, and Niau— islands with names as exotic as the trade winds that ruffle the tops of their coconut palms.

They rise no more than 30 feet out of the sea, and their coral reefs encircle lagoons of varied shapes and sizes— some measuring 60 miles across, some barely six. Most of the islands have passes through the coral reefs into

the lagoons, but not many channels are deep enough for large boats. Schooners sometimes anchor off the reef, sending supplies ashore in surf boats.

Irregular-shaped Takarua is made up of 16 islands, or *motus*, separated from one another by a few hundred yards of submerged coral. The reef encircles a 17-mile-long lagoon. Many a captain has misjudged his position here and sailed his vessel to its doom on the jagged coral.

When typhoons sweep through the islands, great waves roll over the low atolls. One of the worst storms of record hit in 1906; thousands of people perished in the Society Islands alone. Islanders climbed trees to escape 40- to 50-foot seas, but 120-mile winds tore many from their perches.

This storm blew a British four-masted ship of 2,090 tons, the *County of Roxburgh*, onto Takarua's lee shore. Ten of her crew drowned. Her hull still rusts on the reef, and flowers grow beneath it; gaping holes amidships let beams of sunlight through in the early afternoon.

As we approached the island, still unseen below the horizon, I began to think of my previous stay there. Life on Takarua, as I remembered it, was serene and slow moving. A year earlier, I had arrived alone aboard a trading schooner, with my duffel bag, a ten-dollar guitar, and a few songs learned in Tahiti. A husky Takaruan named Ramana had spoken to me at the dock.

"We have little here," he said. "The water comes from what rains we are lucky enough to have. Sometimes we run out of flour before the schooner arrives and must eat coconut and fish. Our beds are hard and the mosquitoes are many. We have no *popaa* entertainment [entertainment for foreigners]. Why do you come here?"

"I am interested in your people," I said. "I would like to live among them."

Raven-tressed girl in bathing trunks hauls water in a paint can from a Takarua well. Some of the roofs catch rain for drinking.



Coral-sand strip serves Takarua both as street and playground; the island has no automobiles. Villagers often sweep the road with palm fronds. No housing code inhibits home builders, who use wood, masonry, galvanized iron, or thatch. Tricolors anticipate a visit by French Polynesia's governor.





**Big man, small boat:** Takaroan diver and his wife, who serves as canoe tender, head out into the lagoon for a day's shelling. Husky Ramana was the author's host on the island.

"His size belies his agility," Mr. Williams says. "Under water, he moves with amazing speed and grace. His weight keeps him warm and his buoyancy lifts him up to the surface quickly."

Men seldom dive when ailing, because their bodies provide their livelihood.

#### **Hitching a Ride to the Shelling Grounds, Outriggers Dance in the Wake of a Power Boat**

Takaroa atoll encircles a 12-mile-long lagoon, a sheltered basin in which pearl-shell oysters thrive.

In good weather the shelling fleet puts out from the village each morning, trailing motor boats like freight cars behind a locomotive. Well out in the lagoon, the canoes drop off and diving begins.

Lacking hardwood trees to hollow out, islanders build canoes of plank. Outriggers, which prevent capsizing, skim the water eight feet from the gunwales.

"Where will you stay?" Ramana asked.

"I don't know. I have no friends here."

Ramana smiled. "You have me and my family," he said. "Come, I will lead you to my house."

During my first visit I found the Takaroans remarkably carefree and lighthearted. Every morning Ramana would spend several hours diving and spearing fish with a long homemade gun — carved wood from Tahiti, a steel point from France, and a strip of elastic from the Chinese store. When he came back with a string of brightly colored fish, his wife cleaned them and cooked them on hot bricks. Or she would dip them in lime juice and let them bake in the sun.





Each night under a cloud of stars, the boys of Takaroa gathered near the Mormon Church. They carried their French guitars or ukuleles from Rangiroa Island — carved from a single piece of hardwood, with goatskin or sharkskin stretched over the hollowed-out sound box.

The songs told in brisk tempo of gods fighting each other; of the arrival of the first white man, and how hairy he was; of the charm of a woman on Pukarua Island. The words of some songs changed often, representing the latest gossip. The slower rhythms, I remembered, belonged to songs of farewell. "*Aue e ra tau here*" was such a tune, with a rhythm like the waves. "Alas, the sail of my beloved. . ."

My reverie ended as Takaroa came in sight once more. There is a good passage into the lagoon, and soon we were easing alongside the wharf.

A welter of brown faces and wavy hair surged toward the *Marie Céline*. Someone shouted, "*Aue! E tau-poo api na Vhiivini!*" ("Alas! Winnie has a new hat!")

The crowd burst into laughter, and I spotted my old friend Ramana. We secured our lines and distributed the bananas and papayas and the mail we had brought.

The village on Takaroa Island was still dominated by the bell tower of the red-roofed Mormon Church (page 514). A coral-sand street stretched some 300 yards from the wharf to the church; a branch led past the Chinese store to the opposite end of the village. Some houses were a patchwork of corrugated iron. Others, of stone or wood, gleamed in whitewash. But most walls were woven palm leaf, proclaiming newness or age by their color, from succulent green to cigar brown.

I noticed an innovation at once. Two girls cavorted inside yellow and blue Hula Hoops.

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PHOTOGRAPHS BY NATIONAL GEOGRAPHIC SOCIETY

Diver with prized lind, a shell dressed with antler coral, rises toward the surface. He rejects the basket lift lest it crush the delicate branches.

Disturbed sediment speckles the lagoon's depths. With bare hand, a diver wrenches loose a lime-encrusted shell. He wears face mask but no Aqua-Lung.

Net basket brims with bearded oysters a few feet above the floor of the lagoon. With a tug on the rope, the diver signals the boat tender to haul up the container. Hunters make one to a dozen dives at a spot, depending on the number of shells large enough to harvest.





Otherwise Takaroa seemed the same calm and familiar place.

Children drank coconut milk. Women wrapped in boldly flowered cotton played cards on palm mats along the shore. A graceful girl, her hair in a bun and her blue jeans rolled up over her ankles, walked dreamily along the pier, pushing a tin can with her bare foot.

Men in shorts of denim, khaki, or linen went off to dive for fish in the passage. Some wore hats of woven palm fronds with bands of cowrie shells. Others sported a flower over one ear.

#### Pearl-shell Season Spells Festival

Takaroa produces two things. First, copra—the dried kernel of the coconut, a valuable source of vegetable oil for making margarine and soap. The other important product, of course, is pearl shell. Real pearls are too rare to bring much income. But the hard, glossy mother-of-pearl, the shell of the pearl oyster, is comparatively plentiful and commercially desirable for making knife handles, earrings, trinkets, and especially buttons (page 523).

To the islanders, the pearl-shell season marks not only a time for making money but also a period of festival, during which people from remote and lonely atolls come together for a good time.

Under my eyes the serenity of Takaroa gave way to a carnival atmosphere. The population swelled from 300 to 600, including—by way of a reminder of French authority—a gendarme. He was an ingenious man. Takaroa has no jail. When a diver got out of hand, the gendarme simply handcuffed him for a while to a coconut tree.

A whole new village attached itself to Takaroa, for all the inhabitants of the neighboring island of Takume had packed up their huts, stowed them on the foredeck of a copra schooner, and sailed over for the diving. Within four days after unloading

**Grimacing diver, cheeks compressed and lips peeled back, endures 54 pounds of pressure a square inch at 120 feet—nearly four times as much as at the surface. Small metal-rimmed goggles contain little air to compress against the eyes under the weight of the deep water.**

Shell gatherers risk a dreaded occupational disease known as *taruanga*, which damages the brain and enfeebles the mind.



BY SAATCHI/BRUCE & NATIONAL GEOGRAPHIC SOCIETY



**Skillful shucker** severs the muscle of a pearl oyster, flips out the flesh, and tosses the split shell into the canoe. Islanders eat the oysters but do not regard them as delicacies. Only rarely do the mollusks yield a gem pearl.

**Head above water**, a diver repeatedly inhales and exhales to store as much oxygen as possible in his lungs. His weighted line drops him to the bottom like a fast elevator on its steel cable.

their lumber, nails, and corrugated iron, the Takumeans had put up 20 huts, three large Chinese stores appeared as well.

I visited my old Takaroan friend Hitii in his fine home of pure island style—corrugated-iron roof, palm-frond sides, immaculately swept sand floor. As we sat in the living room with its three couches, two tables, and a sewing machine, a pig trotted past us toward the kitchen. Hitii urged it gently on with his foot.

"Hitii," I asked, "why don't you play your guitar anymore?" Since my return I had missed the nightly music session on the stone wall. There was still music at night, the favorite being a furiously fast version of "You Are

### Cleaned and Polished, Pearl Shell Gleams With Lustrous Beauty

Iridescent oyster shells from the lagoons of French Polynesia show black lips. Those of the Indian Ocean are yellow-edged; Australia's are pure white. Stripped of its horny lip, the Polynesian shell still shows traces of black on the face.

Demand for pearl shell fluctuates with fashion. The 1920's proved bonanza years, but the industry dwindled a decade later for lack of customers. Souvenir-conscious combat troops sparked a new market during World War II. Although synthetics have hurt their business, divers still find buyers for all they can collect.

My Sunshine," strummed to Tahitian lyrics. But there was not much of the music I remembered.

"*Fiu!*" said Hitii. "The guitar is boring. Why should I play it when there is the cinema, the pool tables, ice cream, and new people to talk to?"

#### Theater Doubles as Launderette

Why indeed? Chinese storekeepers had brought two pool tables from Tahiti. These stood in open sheds and were always busy. With the new stores came ice cream and refrigerators. Gasoline generators chugged away constantly. There was not one movie house but two, their sound tracks turned on full blast and the projectors breaking down a dozen times each night. By day, women went to the movie houses to hang up laundry where it would be safe from rain.

Most of the films had been made before World War II. I saw a boxing match filmed in 1942 and Buster Keaton, by virtue of dubbed-in sound, apparently speaking Parisian French.

But we had come to see pearl-shell diving, not movies, and at last the arrangements were made. Early one morning the boats assembled at the wharf. Bates and I took our places in Hitii's outrigger. In the old days, the divers would have sailed or paddled, but nowadays one out of every four boats carries an outboard motor. Boats without engines were towed by those few with motors or by the



ESCHACHNER'S BY ROBERT C. JAMES (FRONT)  
AND DAVID LYELL (BACK) © W. H. S.

30-foot Catholic mission boat from Raroia (page 519). As we headed out into the lagoon, the little mission boat struggled to windward with 30 outriggers bouncing behind her.

I learned that inspectors appointed by the French authorities patrolled the lagoon, enforcing the rules: No diving on Sundays; on other days, diving only in one part of the lagoon at a time.

At the diving area the outriggers separated and struck out on their own. Hitii chose a spot and dropped anchor. His helper lowered a weighted woven basket on a line straight to the bottom—an underwater freight elevator for the shells.

Then he coiled a half-inch rope in the bottom of the outrigger. The rope had a heavy lead sinker at one end, ready to pull Hitii down to the bottom feet first, quickly and without effort on his part.

Before his first plunge Hitii prayed a long time. He wound up with "*Tē mao—aita oe*



#### Gifts in Hand, Women Visitors From Takume Island Go Ashore at Takaroua

Only half a dozen of the 78 Tuamotu islands possess enough oysters to make diving profitable. Thus the shelling season on Takaroua attracts hordes of neighboring islanders. Entire families arrive on trading schooners and set up housekeeping in a temporary village at dockside. These divers' wives take coral antlers to friends.

*Inere mai. Manuuaon Tetua.* Shark — do not come to me. Thank you, God."

Then, in the water, Hitii took a series of long slow breaths, giving off whistles and falsetto notes that made me shiver even in the broiling sun. This was no aria or war cry. He was merely "hyperventilating" — inhaling and exhaling as deeply as he could, to charge his system with oxygen. Finally, letting out part of a last breath, he scissored two toes around the lead line and disappeared, the sinker pulling him down like an elevator.

#### Hitii's Basket Comes Up Empty

We waited. A minute and a half passed — an eternity to us on the surface. Finally there came a tug at the lead line. Then up popped Hitii, while his helper pulled up the basket. It was empty, and the helper stared at it unbelieving. Hitii extended his empty arms, and said, "*Aita parau* — no shell."

Then his eyebrows arched slyly and he reached down between his legs. He brought up four pearl oysters, each about eight inches

across. "*Manuia roa*," he cried, "good luck here," and his glistening face was one big grin. He rested briefly, then was gone again.

Later, Bates and I, with our Aqua-Lungs strapped on, swam down to observe Hitii on the job 130 feet below the surface. We learned that 140 feet is about maximum for divers. A few can stay down two minutes or even more, but they are considered foolish by the wiser men.

Hitii's equipment consisted of two items, a thick cotton glove on his harvesting hand to guard against the shell's sharp edges, and a pair of close-fitting goggles from Tahiti, in a shape reminiscent of Ben Franklin's spectacles (pages 513 and 520-21).

Down here, the pressure of the water's weight reached almost four atmospheres — close to 60 pounds per square inch, four times as much as at the surface. No wonder Hitii's features were weirdly distorted and his lips peeled back into a mirthless grin.

At noon, everything stopped for lunch. Hitii motioned to a boat nearby, and it pulled

alongside. The crews lashed the two boats together and laid a long board across them for a table. A can of apricot preserves appeared, followed by some bananas and dry biscuits.

With his knife Hitii scraped the rough edge and coral crust from a shell, cut it open, and scooped out the meat for me. I found it tougher than the oysters of New England, but succulent and tasty. I asked why he hadn't even looked for a pearl.

Hitii explained that few pearls were found, and these usually rough and irregular, not the kind wanted for matched strands.

After an hour's nap, diving began again, and when we headed home in the midafternoon, I was full of admiration for Hitii and all the Tuamotu divers. To hunt for shell at depths of 80 to 130 feet, to stay down during each dive for nearly two minutes, and to do this for hours a day from March to June—this was a hard way to earn money, by anyone's standards.

#### Moray Eels Have Fearsome Bite

And what of danger? Radio Tahiti reported that a man had barely survived a shark's attack in the lagoon of Takume Island. When we swam from the wharf, we always sighted whitetip sharks in great numbers on patrol near Takaroa's pass. Often they snatched a fish from a diver's spear. We even saw children swimming above the sharks during school recess.

Later, watching divers in the lagoon, we occasionally saw sharks of another species, big white ones, gliding like torpedoes. To our questions the divers all replied: "No worry." But I noticed, just the same, that they quickly climbed into their outriggers and waited until the shark was gone.

Another danger is the moray eel, which lurks in holes and crevices in the coral. Should an unwary diver come too near, the eel will clamp his jaws around the man's wrist, and the needlesharp teeth will inflict a dangerous wound.

I made up my mind to try a dive the island way, and told Bates my plan. We arranged that I be dropped off on one of the outriggers

and picked up again after Bates and the rest of the crew had finished their picture-taking for the day. As we approached a flotilla of outriggers, I spotted my old friend Ramana. His wife was his helper (page 518).

"Hello, Ramana," I said. "Deep here?"

"*Aita hohomu. Piti ahuru bras,*" he said. "Not deep, maybe 20 bras." A bras measures the length of a man's extended arms.

I dived overboard and swam to Ramana's canoe.

"*Hopu koe!*" he asked. "Do you want to dive?"

PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY



Chinese merchant at Takaroa weighs shells in his shop. As middleman in the shelling operation, he buys direct from divers and sells to dealers in Tahiti.



"Maeva"—Welcome, chief—a Takaroan girl greets the visiting governor of French Polynesia. She wreathes him with a *lei*, Tuamotu's lei.

Guitarist in leaf crown strums island melodies to a small but attentive audience.



Talented comedienne, a rubber-faced clown with outstretched arms, breaks up a dance rehearsal at Takaroa. Dressed in boldly patterned *pareus*, members of the chorus prepare to perform for the governor. "Carefree and

"Yes," I said, and grasped the line between my toes a few feet above the lead sinker. Ramana smiled down at me, and his wife giggled. I took a series of deep breaths, let go of the gunwale, and felt the downward tug of the lead.

It was a strange sensation. My eyes told me that I was floating motionless in a blue haze. But the increasing pressure on my ears told me that I was rapidly descending. I glanced up and saw the outrigger, dimly silhouetted by the sun, looking small and far away. Then it was gone.

The bottom rushed up at me—a smoky desert dotted with shapeless patches of coral. Then these cloudy objects assumed definite





EXERCISES AND AN ENTERTAINING JUMP—LEFT BY NATIONAL GEOGRAPHIC PHOTOGRAPHER DAVID LITTLELAND © N.G.A.

completely natural, islanders love to laugh and make others laugh," says the author

*Tipanic blossom behind an ear, a girl lends her beauty to the governor's reception.*

shapes. Small fish hovered over me like helicopters. I was no longer moving downward.

I glanced at the depth gauge on my wrist. Ninety feet! There was not a sound. I thought I saw a huge shark with pilot fish around it gliding toward me through the gloom. It was an illusion. But the pressure pushed at my face and dug into my cheeks. I felt my lungs were about to burst. I tugged at the line. Quickly I was pulled to the surface and gulped the sweet air.

"Where are the shells?" Ramana asked.

"I couldn't find any," I said.

"Never mind," he said with a smile. "We are happy to see you back."

Tuamotuans begin diving for pearl shell in





their teens, and some keep it up past fifty. I met a man of 59 who was still at it. He picked as much shell as the younger divers, plunging to 100 feet as many as fifty times a day.

I asked him how he did it.

"*Aita peapea*," he said, "It is nothing. I sleep well at night, and my wife feeds me nicely. I have big lungs and a strong body. It is my work. Why should I not be able to do it?"

"Don't you ever get sick?"

"Sometimes I have ear trouble and headaches. But they only last a day. I take care of myself. There is no worry."

#### Contracts Rule Pearl-shell Trade

The Chinese merchant is indispensable in the business of pearl-shell diving. Before the season starts, he signs a number of divers, usually six or more, to a contract called a *paranfa'au*—meaning "firm words," or "firm paper." This document states that the diver can sell his shell only to the contracting merchant and that it must measure at least five inches across to be acceptable. The merchant, on the other hand, pledges to insure the diver, to advise him how to dive safely and avoid damaging his health, and to pay his travel and housing expenses.

At the beginning of the season the merchant gives the diver an advance of 15,000 Colonial French Pacific francs, or about \$170. The pearl-shell diver's money quickly disappears. He usually starts the season in debt from the previous year. He must rent his outrigger and possibly a motor for the shelling period, and pay for gasoline and supplies. What is left he spends with a light hand.

"Now I have much fun, many clothes, the movies, and canned meat from the Chinese store," a diver said to me. "Tomorrow? *Aue!* Back to fish and flour and working copra."

One moonlit night the schooner *Vaitere* arrived, an old island vessel that had been trading in the atolls for many years. I first saw her running lights and then her tired lines as she drew near the entrance to the pass. Villagers jammed the wharf, awaiting their principal link with the outside world.

The *Vaitere* stayed 24 hours. When her flour and rice, canned goods, cigarettes, and building materials had been delivered ashore,

the crew wrestled sacks of pearl shell into the hold. Pile after pile disappeared down the hatch, until the vessel settled to her Plimsoll mark. The handling of the sacks tended to be rough, but the tough shells, heavily encrusted with lime, could stand it.

In the evening the *Vaitere* sailed with the ebb tide. The divers saw her off, shouting, "*Haere mai viti'iti*. Come back quickly." In Tahiti, their shell would be stored until a buyer made an acceptable offer. Then it would be shipped to some faraway place—to West Germany, the largest pearl-shell market in the world, or perhaps to New York, Paris, or Rome.

There, experts would examine the latest shipment. Most of them would never have seen a lagoon. But they would know that the shells of Mangareva bore worms in the 1930's, that Hikueru has shell of the best quality, and that Apataki's is smaller than Takapoto's.

The black-lipped shell of the Tuamotus brings about \$1.20 per pound in New York. Recently it brought as much as \$1.70, but the rise of synthetics has hurt the shell business. Yet while plastic buttons become more and more acceptable, old timers around Papeete think there will always be a market for their lustrous mother-of-pearl.

#### Happy Tumult Only a Memory

When we sailed away from Takaroa, the season had passed its peak. Hiti'i told us how it would end.

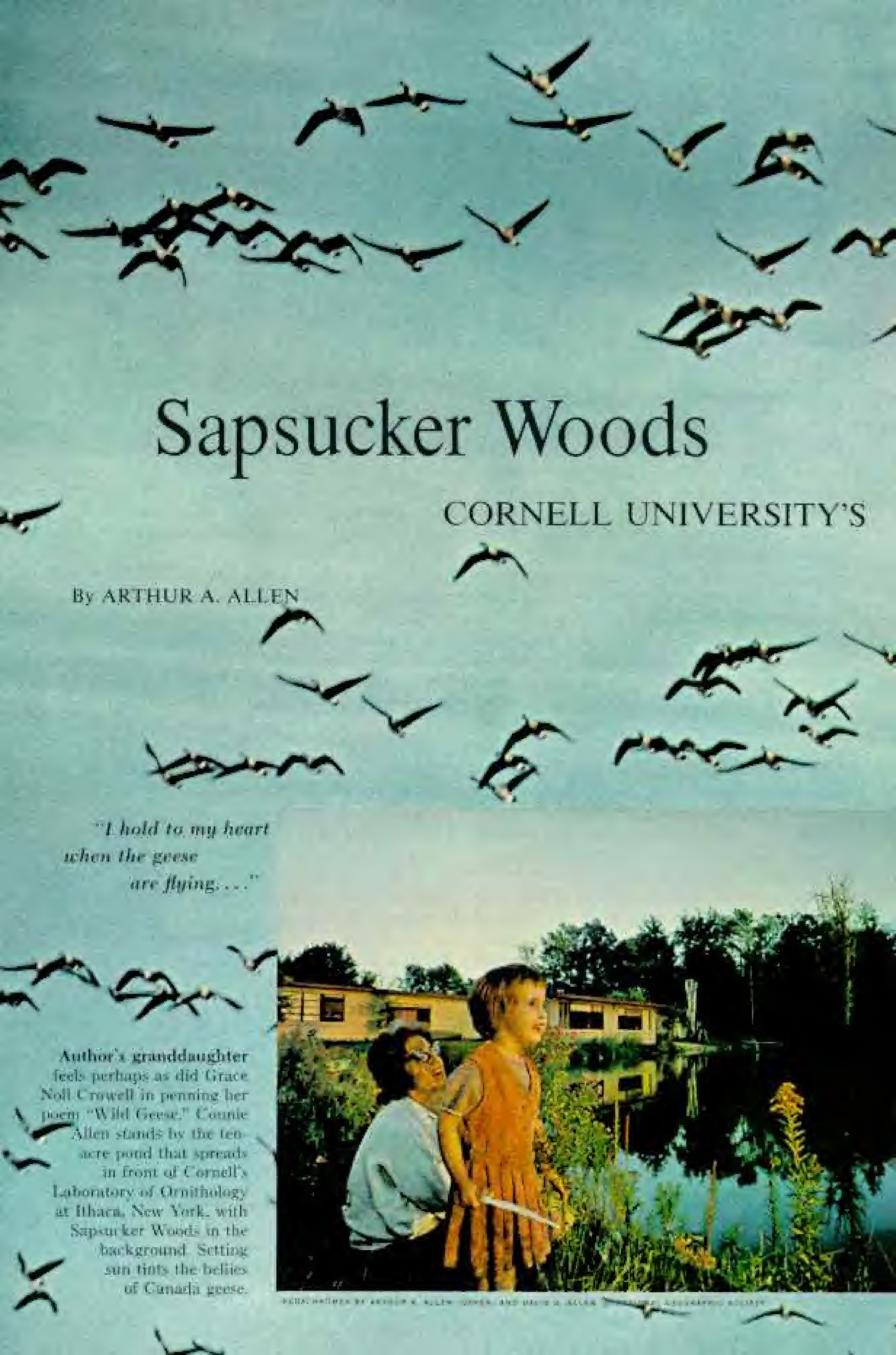
The coming and going of the divers is like the arrival and departure of a circus. Suddenly it descends upon a town and fills it with unaccustomed noise and excitement. Then, overnight, it is gone.

The divers dismantle their houses, pile the lumber aboard the schooners, and sail off. The visiting merchants take away everything they brought: the refrigerators, the gasoline generators, and all but one of the Chinese stores. The movie houses are torn down, too, and loaded board by board.

The circus—the gay and wonderful festival—has moved on. Then there is only the wind in the coconut palms and the mournful thunder of the Pacific swells ending their long journey on the reef.

#### On a Ribbon of Gold, Marie Céline Cruises Under Full Canvas

Embarking from California, the author sailed four thousand miles in his 45-foot schooner to study and photograph the pearl-shell divers of the Tuamotus.



# Sapsucker Woods


CORNELL UNIVERSITY'S

By ARTHUR A. ALLEN

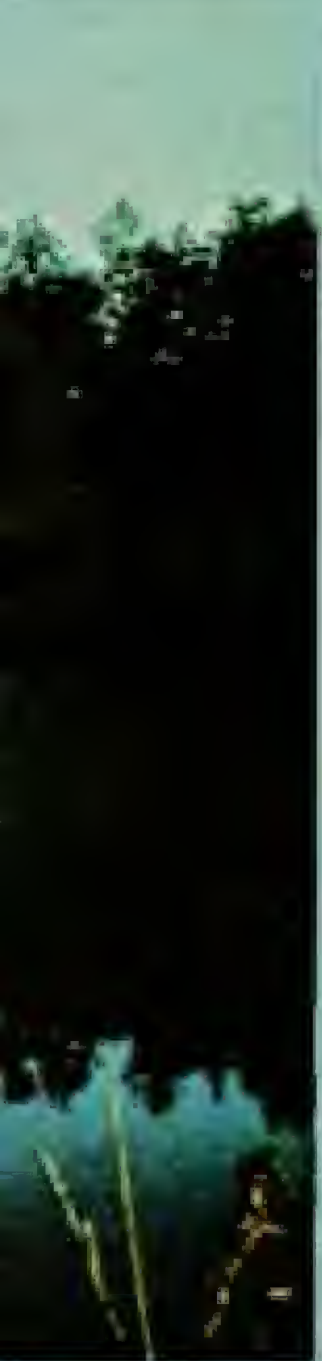
*"I hold to my heart  
when the geese  
are flying..."*

Author's granddaughter  
feels perhaps as did Grace  
Noll Crowell in penning her  
poem "Wild Geese." Connie  
Allen stands by the ten-  
acre pond that spreads  
in front of Cornell's  
Laboratory of Ornithology  
at Ithaca, New York, with  
Sapsucker Woods in the  
background. Setting  
sun tints the bellies  
of Canada geese.





## EXCITING NEW BIRD SANCTUARY



**O**NE CANNOT OVERESTIMATE the far-reaching results of an article in the *NATIONAL GEOGRAPHIC*. Certainly I could never have guessed that my account of "Duck Hunting With a Color Camera," in the October, 1951, issue, would lead to the creation of a new bird sanctuary—and thereby change my whole manner of living. Still less likely would have seemed the establishment of the first research laboratory in the Nation for the study of bird behavior. But the ways of fortune are roundabout. Six months after publication of my duck story, I received a letter from a total stranger. The article, he said, had appealed to him so strongly that he went hunting with a color camera himself. He had tried his luck with a woodpecker. It took him two weeks to get the photograph, and when it came back from processing, he couldn't find the woodpecker in the picture.

This led to a pleasant correspondence and an invitation to the Allens to spend an Easter vacation in Arizona with the Lyman K. Stuarts and show them how to take bird photographs. Mr. Stuart, an industrialist of Newark, New York, was such an apt pupil that when he entered a photo-essay contest two years later, in competition with 1,232 contestants from 50 countries, he won first prize.



The author, at his office desk, aims his camera at a green heron at the edge of the pond. His "Early American" feeder reproduces a rail-and-pine-stump fence. Squirrel-proof feeder on a pipe welcomes chickadees. Venetian blinds screen a visitor in the public observatory.

Dr. Allen, for half a century a teacher at Cornell, became the world's first professor of ornithology. He is now honorary director of the laboratory that he founded. To NATIONAL GEOGRAPHIC he has contributed 17 articles and a book, *Stalking Birds With Color Camera*, that has sold nearly 100,000 copies.

Crow-sized green heron spots a goldfish in the pond; catches a toehold, bends over the log, and spears the fish; turns it in open bill, gobbles it head first, swallows it down to the tail; and gulps with satisfaction.



One thing leads to another. Lyman Stuart, a member of the Cornell University class of 1921, asked me whether I had some favorite project at the university in which he could help. I told him about a cool woodland some three miles from the Cornell campus. In 1909 the great bird artist Louis Agassiz Fuertes and I had named this unspoiled wilderness Sapsucker Woods, after the yellow-bellied sapsucker nesting there (page 548). We had dreamed of preserving it as a bird sanctuary; but by now many of the great oaks and hemlocks had been felled for timber. Highway and housing developments were coming closer.

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EDITH STUART BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT E. GOODMAN (LEFT) AND ARTHUR E. BELL (© 1984)

"Cornell shall have it," Lyman said, and with his aunt, Mrs. Edith Stuart, he bought 110 acres. Generous neighbors contributed 29 more. Around the tract, Lyman built a three-mile chain-link fence. Then, with help from the State Conservation Department, we constructed a 1,500-foot dike to flood a field and five acres of woodland. The result was a ten-acre pond, ideal for wood ducks, herons, and brown creepers.

"What's the next project?" Lyman asked.

"I dream of a low ranch-type building with broad windows overlooking the pond," I replied, "with laboratories, a sound-recording

room, a photographic workroom, and an aviary, for research in bird behavior."

Now we have exactly that. The Arcadia Foundation, a philanthropic organization founded by Lyman and four of his associates, donated the money for our Laboratory of Ornithology, the finest in the country.

#### Do Grebes "Fly" Underwater?

Here we have already solved numerous riddles of bird life. For example: When grebes or loons or mergansers dive, do they use their wings underwater? Can they swallow their catch without surfacing?

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Snow goose on the feeding log spills cracked corn to a muskrat half submerged in the pond.

To get the answers, we built a large glass-fronted tank. Now we have watched the horned grebe swallowing minnows underwater. He chases them without moving his wings at all, relying on the lobes on his toes (page 541). Redhead ducks, on the other hand, unlimber their wings underwater when they need a little more speed than they can get from their large webbed feet.

As for me, for nine hours a day I sit in a combination office and bird blind. From my window I have seen 153 different kinds of birds—everything from loons to sparrows; including songbirds, birds of prey, game birds, shore birds, wading birds, and waterfowl. It may well be that through this window more different kinds of birds have been seen than through any other.

The pond, beginning barely twenty-five feet from my chair, is studded with ducks of many species and with blue, snow, and Canada geese. Herons spear fish from an old log anchored offshore (previous pages). The ducks and geese like to rest there and eat cracked corn—all within easy camera range.

Close under one window, between the pond and me, stands our "Early American" feeder for land birds. This is a reproduction





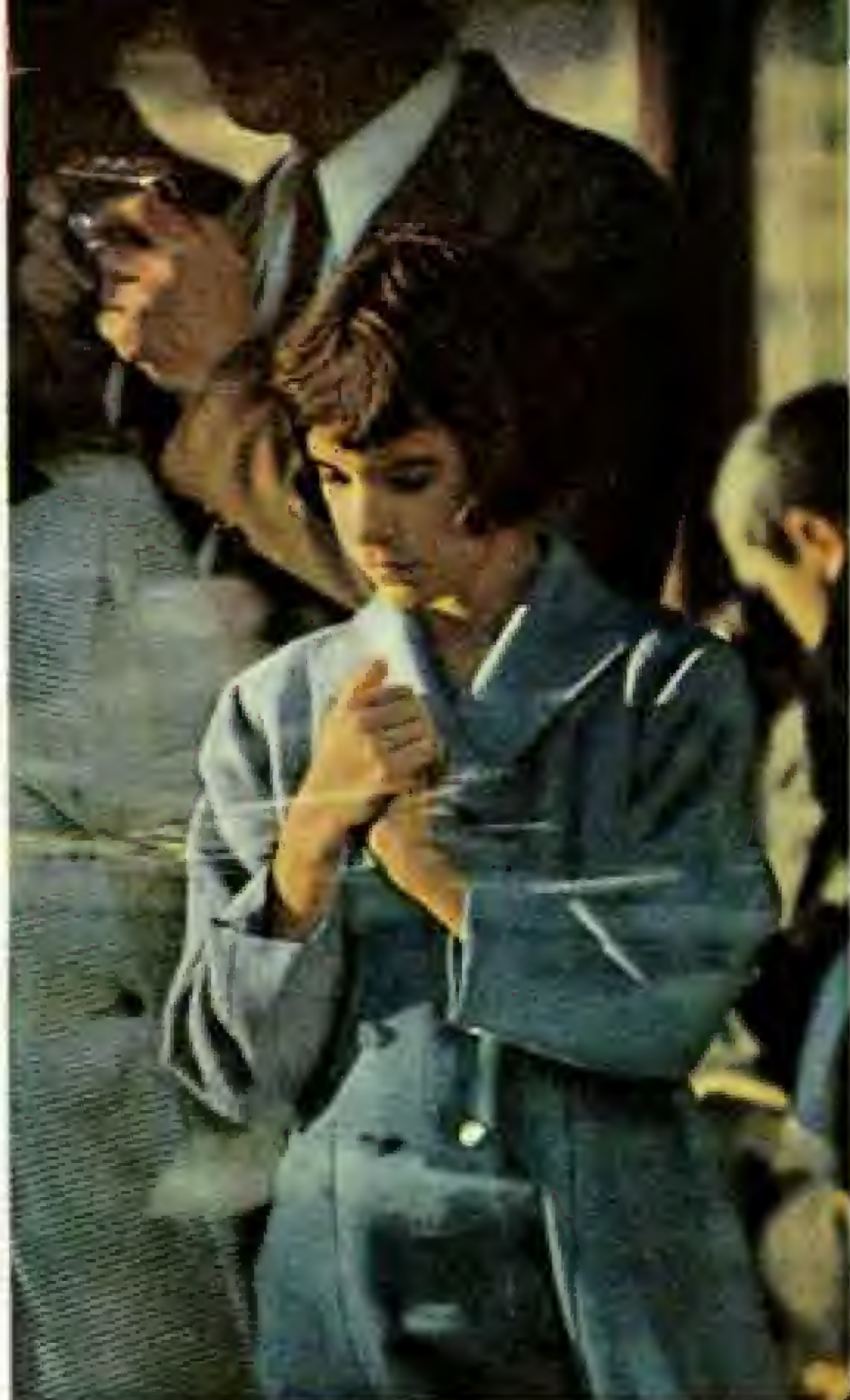
of one of the zigzag rail-and-pine-stump fences once so typical of the New York landscape, and so attractive to birds seeking shelter and weed seeds. Here the resident nuthatches, chickadees, and woodpeckers mingle with visiting tree sparrows, juncos, and evening grosbeaks.

My chair swivels between the desk and the camera table at the window, and I frankly confess that I often spend more time facing the window than facing the desk.

### Speakers Bring Bird Songs Indoors

Our most unusual room is the observatory, where three plate-glass windows, each ten feet long, present an intimate view of ever-changing beauty. Two microphones under the eaves bring indoors all the songs and calls of the birds by day and the calls of the frogs and toads by night, as if no glass intervened. Seated near the window, with binoculars at hand and undisturbed wildlife all about, one has a sense of remoteness from the rush of civilization.

At certain times of the year, especially when the wild geese drop in to feed close to the window, we lower the Venetian blinds and tilt them a little. Then observers can still



HE TAKES CARE OF NATURAL SCIENTIFIC PHOTOGRAPHER ROBERT E. DOORER © R.E.D.

Visitors in the observatory watch and photograph the spectacle on the pond. Microphones and speakers pipe the bird calls inside.

Mallards practice togetherness, making it difficult for the bigger Canada geese to reach the feeding log; later the geese pecked the ducks aside. A habble of feeding calls attracts still more waterfowl.

Four-day-old Canada goslings follow the leader—papa—on a tour of the pond. Mama lagged so far behind she did not make the picture. 535



FOUR-DAY-OLD CANADA GOSLINGS FOLLOWING PAPA ON A TOUR OF THE POND. MAMA LAGGED SO FAR BEHIND SHE DID NOT MAKE THE PICTURE. © R.E.D.



Yellow warbler guards his brood in an arrowwood bush near the pond. Though a feeding has just ended, the nestling's open mouth shows it is still hungry.

During the mating season, male warblers sing almost constantly. Later, as they help feed the young, they seldom give voice to song.



PHOTOGRAPHS BY ROBERTA K. THOMAS (LEFT) AND NATIONAL WILSON

see the waterfowl clearly, and movements in the room do not frighten the birds.

A few of the waterfowl are pinioned—that is, we remove from one wing the bone with the longest flight feathers. After that the bird is unable to fly. Such birds serve as decoys to show the newcomers where the food is.

During the migratory seasons some pintails, teals, and baldpates may stay an hour or a day. Mergansers, finding plenty of minnows because we stock the pond well, may stay a week. Some black ducks and mallards, and occasionally wood ducks, stay all year round. The cracked corn never runs out, and in winter an electric agitator keeps a hole open in the ice so the birds can drink.

Once, when the wintering flocks reached nearly 500 black ducks and mallards and the temperature dropped to 40° below zero, this hole was hardly larger than a drinking fountain. Our refuge manager, my son David G. Allen, had to enlarge it often.

Each year we look forward to the middle

of June. The pond is rejuvenated then by many families of goslings and ducklings, after having been deserted for weeks while the females were incubating. The little flotillas are most conspicuous during early mornings and evenings (preceding page). However, a new wood duck family is likely to show up almost any time of day. As we count the little powder puffs, we are not always certain to which mother they belong.

#### Trails Lead Visitors Through Woods

Despite predators and disease, some families survive remarkably well. Last year a female wood duck brought 16 youngsters to the feeding area when they were only a few days old. We watched all 16 grow from their downy nestling plumage, through juvenile feathers, into brilliant winter attire.

Like the changing seasons and the changing foliage, the panorama of bird life is never monotonous, and the great windows onto Sapsucker Woods announce all the exciting changes to those of us who have had the good fortune to spend our days behind them.



Recording bird songs, Dr. Allen holds a 30-inch parabolic reflector that has the effect of bringing a songster thirty times closer. Wired microphone, which feeds sound into the tape recorder on the ground, receives 900 times more energy than it would without the reflector. David Allen (with earphones) monitors a call and tells his father where to aim.

Bird-song records at lower left help support the laboratory. Fifteen long-playing discs are available. Some buyers use them to attract birds to windows. "Don't wait until spring for the birds to sing," says the author; "get a record now."

Dr. Peter Paul Kellogg, the assistant director of the laboratory in charge of sound recording, explains to Lewis Pearsall, an assistant, the use of an oscilloscope in studying recordings of bird songs.

ANTHONY/REX USA; (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)





At dusk the laboratory bustles on lecture nights. Dr. Allen reads a list of the Cayuga Lake Basin's 300 birds; a "Yes!" greets any the audience has seen during the week.



Two bags full. Chipmunk fills his cheek-pouches with sunflower seeds intended for birds and stores them in his burrow. Marsh marigolds say the time is spring.

Bird feeder explodes in a flurry of feathers as a bobwhite bounces five sparrows, two colliding in flight. Speedlight flashing at 1/20,000 of a second freezes the action.

Old hat to some, but a treasure of cracked corn to redpolls, winter visitors from the Far North. Normally they search for seeds in weed patches. Males have rosy breasts.



But not only from the laboratory can bird observation be enjoyed. Four miles of trails transect Sapsucker Woods, and 84 different kinds of birds have been found nesting here. Migrants in spring and fall bring the total observed to more than 200 species, all in a quarter of a square mile.

Some of the trails are much too wet for ordinary footwear. We have built plank catwalks over the water, so that visitors can penetrate dryshod into areas Tennyson might have described as the "haunts of coot and hern" (page 550). Where the pond has flooded woods, some trees have died—fine for visitors who want to see a pileated woodpecker, or a brown creeper that sometimes nests within twenty feet of the catwalks.

In building the trails, we tipped over a few large trees with a bulldozer. Their upturned

roots offer Canada warblers and northern water thrushes the kind of nesting places they prefer. Two pairs of red-shouldered hawks and a pair of barred owls nest in the woods. Our pair of horned owls is less welcome, especially when we find ruffed grouse feathers beneath their tree-stub feeding places.

#### Grouse Drumbeat Welcomes Spring

Nearly every spring a familiar thunder rolls through the woods. That's the drumming grouse, standing on his favorite log and beating the air with his wings. Some years the drumming log is silent. A tragedy has occurred during the winter, and the log will be silent until another grouse moves in (page 549). We usually blame the horned owls, but we prefer to let nature take its course, so we do not kill predators unless absolutely necessary.

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ILLUSTRATION BY ARTHUR A. ELLER © NATIONAL GEOGRAPHIC SOCIETY





IN ESTABLISHED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER RICHARD S. GOODMAN © N.G.S.

**Operation parakeet.** Dr. William C. Dilger anesthetizes a lovebird, determines its sex, and applies an identifying band in a painless operation. Within half an hour the bird will be up and flying. Some young male and female lovebirds look so much alike that surgery is necessary for sex determination before behavioral studies can begin.

**Peach-faced lovebirds** cut paper into strips to line their nests. This species tucks and carries the strips under rump feathers, others transport only in their bills. When the species are crossbred, the hybrids inherit the urge to tuck but not the ability to hold. Inevitable frustrations result.



When a Cooper's hawk refuses to take suggestions and hangs around the aviary, frightening the birds, we have to remove him. But ordinarily the hawks and owls, the crows and jays, the grackles and starlings, the raccoons and opossums, the minks and weasels live on together, for better or for worse, and we watch and record what happens.

#### Visitors Flock to Observatory

The windows and the walks of Sapsucker Woods are here for all to enjoy; since the dedication of the laboratory in 1957 more than 30,000 visitors, from every State and 70 foreign countries, have signed our guestbook. So overwhelming is the view that a hush falls over even the noisiest children.

Behind the scenes, however, other projects require privacy. This is because the laboratory is primarily a research institution, a place for the undisturbed asking of questions.

We are curious about what birds do, but what interests us even more is why they do it, and how their patterns of behavior have evolved. This is the orientation of our research program, headed by a brilliant former student of mine, Dr. William C. Dilger. As research director, he supervises 18 graduate students, postdoctoral fellows, and research associates.

"We do this work because we like it," he says, "but underlying it all, like a conscience, is an awareness that a lot of things wrong in the world are due to ignorance of behavior. To understand complex human behavior, we should first investigate the simpler behavior of animals—how they cope with hunger, sex urges, anger, frustration, and fear."

For such studies, birds make excellent subjects, often preferable to mammals. Though we may feel we understand mammals better, they respond strongly to sounds we cannot hear and to smells we cannot notice. Birds see more as we see and hear more as we hear. As we observe birds, we get a better idea of exactly what they are reacting to than we can with mammals.

Dr. Dilger himself has shown how frustrations arise in the bird world, as readily as in the human species, when

a bird inherits the drive to do something but not the ability to do it.

To prove the point, Dr. Dilger crossbred different species of African lovebirds. Females of all these species cut narrow strips of bark or leaves for nest building. In captivity, they will cut strips from wrapping paper instead (opposite, below).

But the females vary in their manner of flying the strips to the nest site. Some carry with their bills, while others tuck one end of each strip under feathers of the body and fly home with perhaps a dozen strips trailing like streamers. Aware of these differences, Dr. Dilger wondered: What happens when "nontuckers" are mated to "tuckers"?

The hybrids inherit the urge to tuck but not the ability to hold. They may cut and tuck for twenty minutes without understanding that their feathers cannot hold the strips. Finally they carry off a single strip in the bill, but when they return, they try to tuck again and again without success. Over a period of years, however, they gradually learn to carry the strips in their bills and virtually abandon the tucking.

#### Young Birds Reared in Soundless World

Jim Hartzorne, one of our graduate students, applied his ingenuity to the songs of birds. He concerned himself with the basic call notes, such as distress calls and begging cries, and especially with the song characteristic of a species, called the primary, or true, song, which the male sings to attract females and to challenge other males near his territory. Are the call notes and true song inher-



PHOTOGRAPH BY DAVID B. ALLER, U.S.S.A.

**Horned grebe, or hell-diver, reveals its underwater table manners.** Glass tank shows how the bird catches and swallows its prey.

**Minnows scatter as the grebe, in winter plumage, swoops in.** Photograph demonstrates that the hell-diver does not use wings underwater, but kicks with the broad lobes of its toes.

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PHOTOGRAPHS BY NATIONAL GEOGRAPHIC



PHOTOGRAPHS BY JAMES W. HARTSHORNE © N.G.P.

ited, he wondered, or must they be learned?

To find out, Jim designed the Hartshorne Sound-Isolation Chamber (above), so that he could raise pairs of bluebirds from the egg up without ever letting them hear sounds from the outside world — not even the calls or song of their own parents!

The experiment made Jim a nursemaid to his motherless charges. For days he watched a birdhouse nest through a one-way window to see what bluebird parents dish up. He saw them bring a variety of insects, from flies to praying mantises — fare that he could not easily provide in quantity. So he perfected

his own formula: cottage cheese plus fruit, vitamins, and antibiotics, mixed with earthworms and chick starter in an electric blender and fed with a tiny syringe.

Jim kept some of the birds completely isolated for six months. Then, through a speaker in their chamber, he played recordings of the songs of the robin, the Baltimore oriole, and the wood thrush. The young bluebirds showed little interest.

Next he played the bluebird song — but in reverse. Even though the young birds had never before heard such a sound, they perked up a little. Finally he played the bluebird





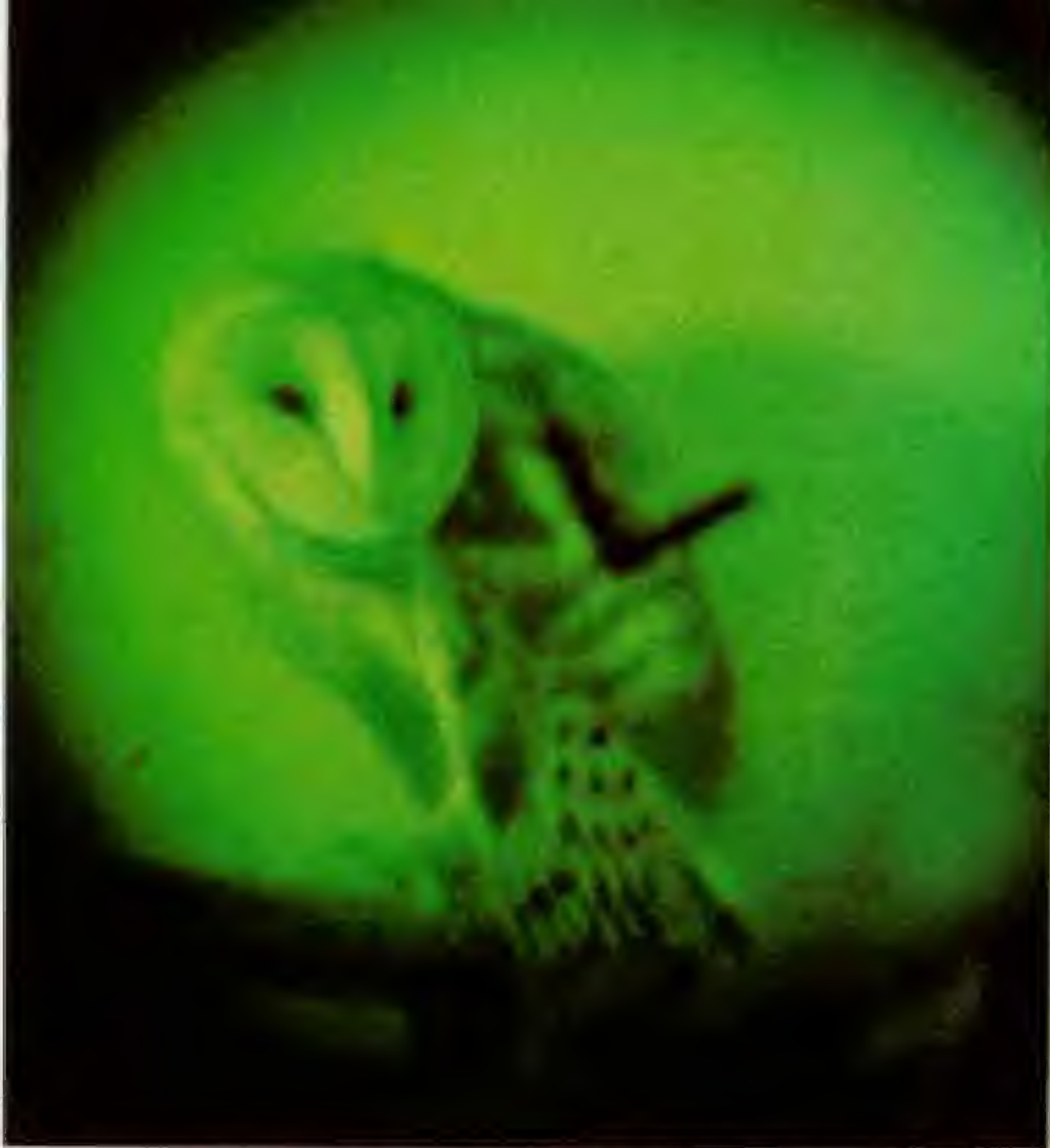
PHOTOGRAPHER ROBERT D. WHITMAN © R. S. S.

Hand-raised bluebirds live in a sound-isolation chamber where they never hear the notes of other songbirds. James M. Hartshorne, with microphone at lips, records their behavior patterns. Do birds inherit their songs, he wondered, or learn from their parents? Isolation that began before hatching gave the answer. When the birds were six months old, the bluebird song was piped in, and the youngsters suddenly recognized it and began to sing.

Glass window in a bluebird house lets the camera see what the wild parents are feeding. In the opening picture (upper left), the father removes from the nest an imitation berry; shortly before, both parents fed true berries to their young. Following pictures show them feeding a half-grown tree frog and a caterpillar; a praying mantis; a grasshopper; an earthworm; and finally a centipede, whose poison claws failed to harm the babies.

Syringe feeds a scientific formula to a baby bluebird. Mr. Hartshorne tries to develop a diet for other bluebirds that he will later raise in the isolation chamber at left.





Bathed in infrared light, which appears green through an electronic view finder, a barn owl listens for the sound of a mouse he will catch in total darkness. Unlike bats, which emit high-frequency sound pulses that rebound from the target (NATIONAL GEOGRAPHIC, April, 1961), the barn owl in the light-proof laboratory relies solely on sounds made by his prey.

To film the owl's strike, researcher Roger Payne sets up camera and tripod in a dark flight shed. War-surplus sniper scope, which makes infrared rays produce a green image, guides him in aiming a movie camera loaded with infrared film. Dr. Payne uses strobelights that fire a 70-watt-second flash every 24th of a second. Filters absorb all visible rays.

HE BATHED IN INFRARED LIGHT BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT B. BRIDGES © R. B. B.



Owl detects the rustle of a mouse and homes in, flying blind. Infrared light does not disturb him. Arrow indicates mouse.

Solving a problem of parallax created by the fact that the feet are so far from the ears, the bird computes the mouse's position, brings claws up under the ears, and swiftly pounces. In the last split second, talons snap forward to take the place of the ears in the strike path. Just before impact, the owl extends his eight claws in a pattern six inches long and three inches wide to cover the target area.

Left foot grabs the mouse; right foot absorbs the jolt of landing. In darkness, the owl rarely misses on flights up to 24 feet.

Body slumps in carry-through. Eyes, shut at impact, reopen.





ROBERT B. GOODMAN

song the right way. The man-raised birds appeared thunderstruck. They crouched, cocked their heads, sat motionless for thirty or forty seconds, and then burst into a crude version of the song. Five minutes later they sang it in recognizable form.

Bluebirds isolated for 15 months, on the other hand, never learned the song of their species. They merely warbled at random. Yet all the birds produced the call notes of alarm or distress without any coaching.

In this way Jim determined that most of the simple call notes of the species are inherited, but that the more complicated song must be learned. After a certain period, however, instruction no longer does any good.

Another graduate student, Barbara Brockway, used the Hartshorne chamber to investigate the relative importance of sight and sound to budgerigars. She put pairs into the glass-fronted chambers where they could see other pairs but could not hear them. They refused to breed until they could hear the chattering of others of their kind.

The laboratory is the home of the Cornell Library of Natural Sounds, an extensive collection of recordings, primarily of birds. Duplicates on tape are mailed on request to investigators all over the world.

The early impetus for this work came from the late Albert Brand who, at 39, sold his seat on the New York Stock Exchange to devote the rest of his life to something he found more

interesting—namely, bird study at Cornell. He noted that the verbal descriptions of bird song are more fanciful than adequate. Bird guidebooks say that the black-throated green warbler gives “a lisping, dreamy *zoo-zee-zoo-zoo-zee*,” or that the Traill’s flycatcher has “an explosive *weeps-a-pi-deea*.”

#### Ambushing Birds With a Recorder

Brand decided that there ought to be some way of recording the songs and spent a small fortune on the project. Using the system he developed, we did exciting work, notably recording the ivory-billed woodpecker, the rarest North American bird. We found a pair nesting in Louisiana, 43 feet off the ground in a dead swamp maple. Today there may be only one or two pairs left.\*

Later we also recorded the *kerloo! ker-lee-oo!* of the second rarest bird, the whooping crane, in Texas; and the brassy bugle of the fourth rarest, the trumpeter swan, in Montana. We had no luck with the California condor, which ranks third in rarity. After struggling to a nest and much watching and waiting, we saw condors but heard no sound.

In the early days our recording equipment weighed half a ton and required a special truck. Today better recordings are secured with tape recorders weighing less than twenty pounds. Albert Brand’s name, however, should be honored with those of naturalist-author Frank M. Chapman and photographer George Shiras, 3d, who popularized use of the binocular and camera in bird study.

Often it is impossible to see the bird we are trying to tape. We record him as best we can, and play his notes back immediately, over a small loudspeaker. The bird will usually suspect a rival and show up at once to defend his territory. In fact, he may try to get right into the speaker. Then we not only see him, but we obtain a much better recording.

Thanks to this technique and up-to-date equipment, dedicated people without professional training are making substantial contributions to ornithology. We have appointed several of them research associates. An example is Myles North, who lives in Kenya and whose numerous recordings include the black-throated honey-guide and the white-bellied go-away bird.

Definitive analysis of bird notes thus collected in many parts of the world is now possible through the audiospectrograph. I will

\*In “Hunting With a Microphone the Voices of Vanishing Birds,” NATIONAL GEOGRAPHIC, June, 1937, the author described capturing the ivory-bill’s sounds.



let Dr. Peter Paul Kellogg—Professor of Ornithology and Biological Acoustics, and an assistant director of the laboratory—explain how it works.

"Most bird songs are less than two seconds long," he says. "In the audiospectrograph, the same song is played scores of times, while various filters permit only selected frequencies to come through.

"On each playing, a stylus makes a graph of the sound on a paper-covered drum. The finished picture, called the audiospectrogram, represents a diagram of the entire bird song. All the overtones are shown. All the notes are unscrambled.

"We have found birds that sing two notes at the same time, and some may sing three."

#### Bird Songs Help Support Laboratory

There are about 8,600 bird species in the world, and we have recordings of 1,250 of them. Many are available to the public on long-playing records. *Songbirds of America* is especially popular, and also *Bird Songs in Your Garden*.\*

Some people use the records to attract birds closer to their windows—for birds that set up territories in gardens are quick to respond to imagined rivals.

Unlike most departments of the university, the Laboratory of Ornithology is self-supporting, and if it were not for gifts from friends

\**Songbirds of America*, at \$4.95, and *Bird Songs in Your Garden*, at \$5.95, may be ordered directly from the Laboratory of Ornithology, 55 Sapsucker Woods Road, Ithaca, New York. A list of all 15 records, costing from \$2.50 to \$10.95, will be sent on request.

Buttercup's yellow glows against the throat of a bobolink nesting in June. In August she will gather with others of her kind and take wing for Argentina.

Devoted father, a kingfisher flies a mile from the pond with a minnow in his bill for one of seven youngsters. This hole-in-the-ground nest, dug out of a vertical sandbank, offers security against minks and weasels.

and the phonograph record royalties, we might have difficulty in maintaining our building and our research staff.

Let's look in once more on Bill Dilger and his African lovebirds. Since we cannot tell their sex simply by looking at them, he may be operating on some young birds to make sure (page 540). Then he will band and log them. For convenience, they also are given names—Ted and Lois, or Robert and Laurie.

Bill's routine is to watch what goes on in the cages, day by day. He dictates what he sees into a tape recorder, so that he won't have to take his eyes off the birds. When Lois cuts a strip of paper for her nest, does she cut to the right or left? How long are her strips? And so on, in great detail, for weeks and months.

Machines tabulate the massive records. Then we can ask fruitful questions. For instance: When a lovebird drops a strip, does she pick it up again? Or does she cut another strip? The tabulations show that birds that carry strips in the bill will pick up a dropped strip. Others, that tuck strips into their rump feathers, usually cut a new one.

Thus we discover that the species that carries strips in the bill, being less wasteful, represents a more advanced behavior type. Birds may be classified as belonging to a simple species or to one more complex in behavior, as reflected in the females' choice of nesting material:

Stage I. Short pieces, that can be carried stuck into feathers all over her body but can be made only into a simple pad. Stage II. Long strips, carried in the rump feathers, that



Gaping mouths cry for an injection. Mother ruby-throated hummingbird, who lacks the male's bright plumage, sometimes feeds nestlings on the fly, sewing nectar with needlelike bill. For camouflage, she glues lichens to her cottony nest in a sumac.

REPRODUCED BY DR. JOHN J. ALLEN



Yellow-bellied sapsucker, fond of sap, gave its name to the Cornell sanctuary.



Dr. Allen takes a last look before retiring into his photographic blind near the laboratory. His lens peeps from "gravedigger's cloth," a canvas covered with artificial grass. Using the blind, he obtained many of these illustrations. Ducks took several days to accept the enclosure, then paid



Young cardinals daily eat their weight in food



PHOTOGRAPH BY ROBERT S. GODDARD III, U.S.A.

if no attention, but the slightest movement of the photographer sent them skyward with a whir of wings and splash of water.

To impress a female or intimidate a rival, the ruffed grouse spreads tail and neck ruff and parades up and down a log, shaking his head so that iridescent feathers flash in a blur of light. He drums, not by thumping the log, as many have supposed, but by fanning the air with his wings. A rush and a prolonged hiss end the display.



PHOTOGRAPH BY BRUCE W. ALLEN

Red-shouldered hawk feeds his young in a top-floor apartment



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can be woven into a round, cuplike nest. Stage III. The bird builds a roof and therefore needs stronger materials, namely twigs, which can be carried only in the bill.

Now, after a little detective work, we say that the lovebird species of Madagascar (Stage II) are more primitive than those of Angola (Stage II), and that the most advanced species live south of Lake Victoria (Stage III). We can even predict some female lovebird behavior of the future: Stage IV probably will carry not one but several twigs in her bill.

#### Parrot's "Aggression" Mostly Bluff

Once a week Bill and the research staff meet in the observatory and discuss experiments and new findings in related sciences. They talk of "survival value," "fear thresholds," "redirected aggression." It is fascinating, and not nearly so forbidding as it sounds.

Imagine parrot A stalking fiercely toward parrot B. That's aggression. Parrot B doesn't give ground, and bird A becomes frightened.

He has reached his fear threshold. Bird A flies off to a high perch and pecks fiercely at the perch. That's redirected aggression.

Other birds, such as pigeons, fight frequently but are not equipped to harm each other much. The parrots, however, carry extremely powerful bills. The behavior described above—bluffing rather than fighting—keeps them from tearing each other to pieces. Therefore this behavior pattern has survival value.

On Monday nights the observatory is usually crowded with bird lovers from all walks of life: professors, students, doctors, lawyers, and businessmen, many from neighboring towns.

They hear lectures, perhaps from our new director, Dr. Olin Sewall Pettingill, Jr., on his study of penguins in the Falkland Islands,\* or from our executive secretary, Dr. Sally Foresman Hoyt, on talking birds. Recently

\*Dr. Pettingill's account of his experiences, "People and Penguins of the Faraway Falklands," appeared in the March, 1955, NATIONAL GEOGRAPHIC.





We ran a unique film about the bald eagle, produced by Bayard Read of our Advisory Council under the auspices of the Cornell laboratory and distributed by the National Audubon Society.

At the start of the program, I customarily call "the roll of the birds"—reading the list of all 300 species that have ever been seen in the Cayuga Lake Basin and checking off those reported. Thus we take an informal census of the birds seen each week throughout the year. The information provides interesting material for our Saturday morning radio talks, as well as a permanent file of the birds occurring in central New York State.

#### Sanctuary Combines Beauty and Science

As I write, a downy woodpecker insists on driving the bugs out of the microphone at the corner of the building. The sound is like an air hammer. Now it stops, and I turn to see the rosy clouds deepen to lavender. The trees are starkly silhouetted.



Father brings home the bacon—a throatful of ants dug out of a tree. Eighteen-inch-long pileated woodpecker meets hungry offspring at his doorstep beside a trail. He hollowed his nest hole two feet deep.

Bird walk on a catwalk. Cornell faculty wives, members of the Campus Club, ramble through the swamps of Sapsucker Woods, led by Doctor Sally Hoyt (left) of the laboratory staff. Boardwalks save their shoes on wet trails. Eighty-four bird species have been found nesting in the sanctuary.

A flock of mallards sets its wings to land on the freshly frozen pond. Some slide five feet, some twenty. I never tire of watching ducks—so graceful in the water and in the air, so clumsy on the land they weren't made for, so cheerfully flatfooted on the ice. I shall watch them until it is quite dark.

This is the story of Sapsucker Woods and the Laboratory of Ornithology at Cornell University, a rare combination of science and art, of research and popular education—where the professional and the layman work side by side to produce a place of charm and relaxation, as well as of study and discovery.

It is our hope that similar projects will spring up the country over to attest the value of natural areas where the beauty, the grace, and the freedom of wild birds relax the mind and enrich the spirit.

ARTIST: R. ALLEN © NATIONAL GEOGRAPHIC SOCIETY



# Shooting Rapids in Reverse!

*JET BOATS CLIMB*

*THE COLORADO'S TORRENT*

*THROUGH*

*THE GRAND CANYON*

*Article and photographs  
by WILLIAM BELKNAP, JR.*

**M**AJ. JOHN WESLEY POWELL, who lost his arm in the Battle of Shiloh, ran the Grand Canyon downstream in 1809. Many have followed in his wake, including tourists on inflatable rafts.

No one, however, either rowed, towed, or drove a boat "against the grain" of the Colorado River's great gorge until we accomplished the feat in the summer of 1960.

Assembling our fleet on Lake Mead, we started climbing at the Grand Wash Cliffs (map, page 557). Between Grand Wash and Lees Ferry, the river level rises two thousand feet. In our path lay a score of major rapids, of which the toughest was Lava Falls, known to rivermen as Vulcan.

Our nine-man expedition made the run in nine adventure-packed days. One man suffered a broken leg on a shakedown cruise. Near the end we lost one of our four boats.

Veteran Canyon voyager Otis (Dock) Marsion, who led us, says we never would have made it but for the river-driving genius of New Zealander Jon Hamilton and a new marine jet-propulsion unit made in Indiana.

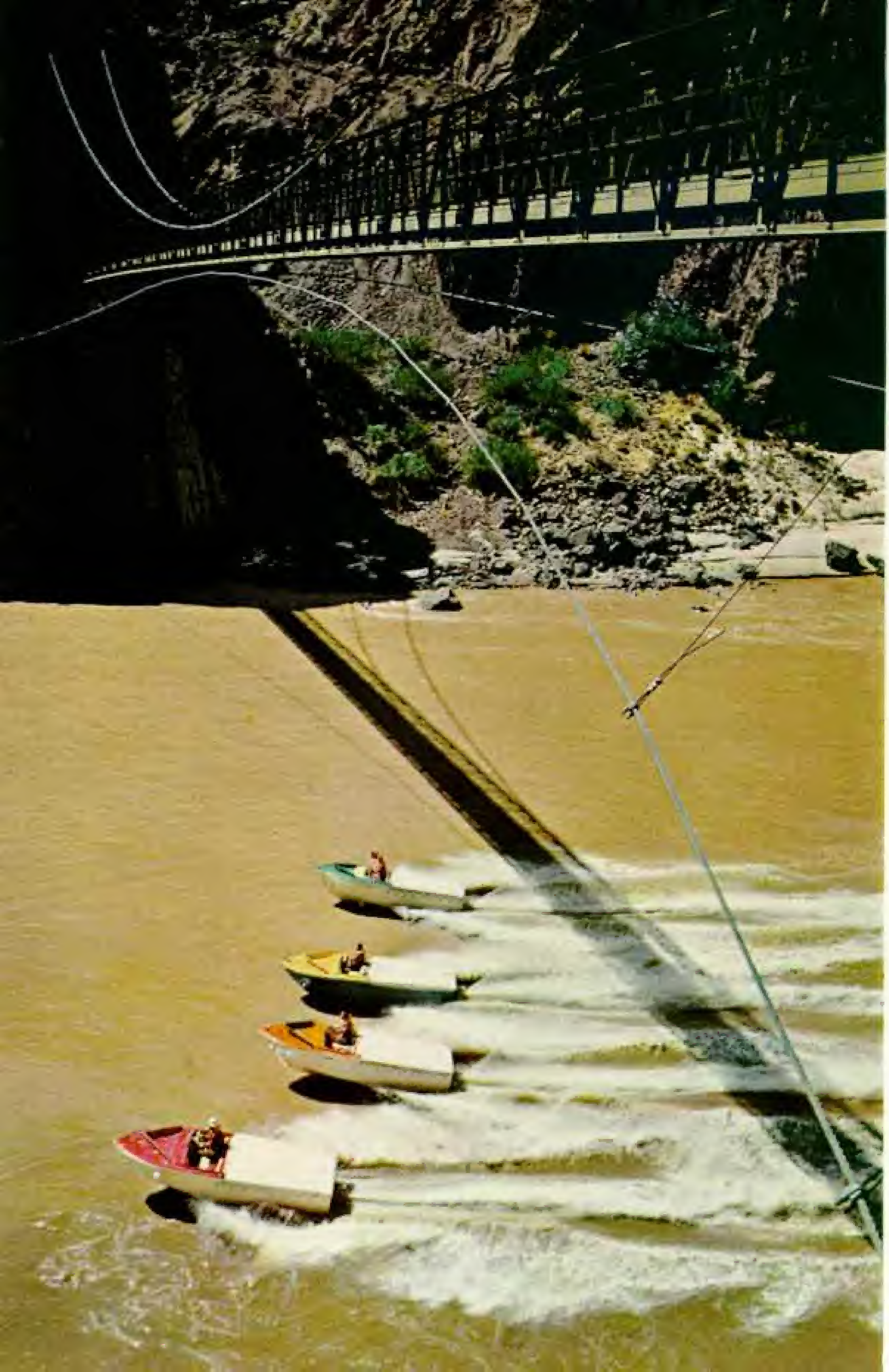
Mr. Hamilton's father, William, developed

*(Continued on page 565)*





*Inches from foaming disaster, Jon Hamilton steers a plunging jet boat up Vulcan Rapids, Grand Canyon's wickedest water. Here the current's maelstrom runs 20 miles an hour.*





Violent crashes against submerged rocks holed at least one tough fiberglass hull a day. Here driver Richard Young patches a boat battered in Granite Rapids, otherwise known as Monument Creek Rapids. The expedition suffered only one serious casualty: William Austin broke a leg and lost control when his boat plunged over a 10-foot wave. An Air Force helicopter lifted him out of the canyon.

#### Jet Boats Race Abreast Under Kaibab Suspension Bridge

Stripped of windshields, the four 18-foot stock models carry canvas over cockpits and splash boards on fore-decks to ward off water. *Wee Yellow* (third from camera) did not finish the run to Lees Ferry; she sank in Grapevine Rapids. *Kizel* (orange deck) was the first to top Vulcan.

Thousands of vacationists, descending Bright Angel Trail on muleback, have crossed the swaying span to Phantom Ranch on the north bank.



BY TONY SHORE - PHOTO AND PHOTOGRAPH BY N.E.A.

Business end of a Turbocraft exposes a success secret: The propelling jet discharges water into the air, permitting extremely shallow draft. Pump can throw as much water as four fire department pumper trucks. Small gates deflect the jet for steering.





Grand Canyon of the Colorado slices 300 miles across northwest Arizona and bares some of the world's oldest visible rocks. Fifteen to 20 major rapids and hundreds of lesser ones challenge rivermen. Jet boats voyaged 350 miles from Lake Mead to Lees Ferry.

Toroweap Overlook, in Grand Canyon National Monument, looks down 2,802 feet into the Colorado. Expedition wives on rim patrol chose vantage points like Toroweap to look for trouble and flash mirror signals to their husbands, who answered with sandwriting on the beaches (page 561).

Mooney Falls tumbles into a turquoise pool near Havasupai Indian Reservation, which lies half a mile below the canyon rim. The peaceful Havasupai long ago withdrew into this rock-walled retreat.

Havasupai children swim at three years.





History-making run begins. Mr. Hamilton throws *Kiwi* full throttle into the maelstrom of Vulcan. The skilled New Zealand riverman spots and dodges hidden rocks; he must react in split seconds when the current flings him at jagged canyon walls.

### *Kiwi* Lunges for a Hole in a Wall of Waves

"Photographs can only hint at the violence of the struggle between man and river," says author Belknap. "One moment the boat teeters on a wave top. Another instant, and nothing shows above the crests but the driver's head. Always the river roars and thunders, drowning every human sound."

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HEADLORDS (BELOW) AND HIS EXPEDITION BY WILLIAM BOLGER, JR. © NATIONAL GEOGRAPHIC SOCIETY



Moment of victory. *Kiari* blasts onto smooth water at the head of Vulcan. Mr. Hamilton, the most experienced of the rivermen, drove every boat over this rapid. A second after the camera clicked, *Kiari* stalled and almost drifted back into danger. Black basalt in the background hardened when lava spewed from Vulcan's Throne, a now-extinct volcano.

Planning a run with the next boat, Mr. Hamilton describes with gestures how *Kiari* rolled and leaped. Photographer James Bechtel (center) lost all his film when *Wee Yellie* sank. George Morrison (right) represents Indiana Gear Works, builder of the jet power units and sponsor of the expedition.

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### River Runners Stop for a Swim in the Little Colorado's Blue

In this quiet lagoon the muddy main torrent meets the clear stream of its tributary. Swimmers started one of No. 21's twin engines and gamboled in its jet stream. On this early trip they drove downstream to cache fuel for the main assault.

Two scow-hulled boats on the beach, together with two 18-footers, made the down-rapids run because they could haul more supplies.

Centuries of rain, frost, and sand-laden winds sculptured the nameless rock castle on the skyline.

The river's hard knocks dictate dinner dress. Edward L'Anson's medical cummerbund holds cracked ribs in place. Dock Marston's bra soothes strained shoulder muscles.

Foot-written "OK" in the sand tells rim watchers that all is well. Jon Hamilton darkens the "O" with water. *Wee Red*, which survived both downriver and return voyages, gets a bottom patch.

Here, far below Tarowrap Overlook, the Colorado runs quiet, "too thick to drink, too thin to plow."



PHOTOGRAPHS BY STEPHEN DEGENBERG FOR LIFE



Camera Beside  
the Vortex Catches  
*Wee Red's* Close Call

From a flat rock in the torrent, the author saw Guy Mannering, a New Zealander, barely cheat Vulcan's slavering fangs. Racing for an open slot, *Wee Red* struck a boulder in a boiling dome of water. The rock shows in the left foreground.

"Above Vulcan's roar," Mr. Belknap reports, "I heard the crash of hull against stone."

Slewing around until solid water cascaded over the driver's lap, the boat lurched broadside to the current and nearly capsized (below).

*Wee Red* recovers and makes the beach opposite, lower. Men lever her back into the stream. On the next try, Mr. Hamilton drove her over the top.

In Vulcan's grip, Mr. Mannering almost tumbles out. Like the other drivers, he wears a life jacket but dares not use a seat belt.





PHOTOGRAPHER © NATIONAL GEOGRAPHIC SOCIETY







BY KENNETH R. COLEMAN © NATIONAL GEOGRAPHIC SOCIETY

Drivers' last campfire crackles on the beach at Nankowcap Creek mouth. The author's son Buzz and Mr. EAnson letter a sign to commemorate the expedition. Three surviving boats nuzzle the shingle. *Wee Red* wears her scars of battle, a mass of patches.

Like a wall of water from a broken dam, Horn Creek Rapids drops 10 feet in 350. Jon Hamilton flings *Dock* at the cataract's lip, a knife edge of schist beneath the rushing water. He found only one navigable channel, boat-wide and dangerously swift.

the jet to climb New Zealand's shallow mountain torrents (page 503). Indiana Gear Works of Indianapolis, a division of the Buehler Corporation, manufactures the jets for hulls called Turbocraft—the boats we used.

A jet boat such as ours has no propeller or rudder to cause drag or scrape against rocks—key features in its talent for climbing rapids. If you could look inside the propulsion unit, what you would see, basically, is three propellers in a tube. The unit is housed entirely within the smooth-bottomed hull.

Our 18-footers, with jets powered by conventional 185-horsepower gasoline engines, made 35 knots and turned in their own length at almost that speed.

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Matching the adventure of the first ascent of the Colorado River, told in these pages, was the account of the first United States Geological Survey Expedition to descend the same turbulent waters in 1923. The story, by Lewis R. Freeman, appeared in the May, 1924, NATIONAL GEOGRAPHIC.

Turbocraft throw water, not flame. They suck the water through an opening in the hull, and their engines drive pumps that spew it out in a furious stream behind (page 555).

Jet propulsion was proved possible on the Potomac in the 1780's when James Rumsey demonstrated a steam-powered jet craft, the result of a project in which he had been encouraged by George Washington. The years since then have seen many variations of jets, including Mr. Hamilton's powerful model that took us up the Colorado.

During our voyage, the National Park Service watched over us. So did our wives, driving rim trails day and night, and looking down with binoculars for distress signals.

We needed no one's warning to take care. Lonely graves in the canyon and the wreckage of boats offered enough danger signs.

After our adventure *Dock* Marston "retired" from the river. My wife Fran said, "Never again!" But I bet we all came back.



BY PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT E. ALBON.



# The Nation Honors Admiral Richard E. Byrd

**A**DMIRAL BYRD was one of those restless, striving souls without whom mankind would still be living in caves and gnawing at bones. He respected – but he was not content with – the achievements of the past.”

So said the Vice President of the United States in accepting for the Nation a monument to Rear Admiral Richard E. Byrd presented by the National Geographic Society.

Dr. Melville Bell Grosvenor, President and Editor of the Society, presided at the dedication of the statue on the new “Avenue of Heroes,” between Arlington National Cemetery and the Potomac, on November 13, 1961.

Soon after Admiral Byrd’s passing in 1957, the Congress of the United States authorized the Society to commission a statue. The Secretary of the Interior and the National Park Service selected the site, beside Memorial Avenue leading to the main entrance of the Nation’s most hallowed national cemetery. One day, it is planned, statues of other heroic Americans will flank the way from Arlington Memorial Bridge to the cemetery gate.

The Society commissioned sculptor Felix de Weldon, who also did the U. S. Marine Corps Iwo Jima Memorial nearby, to execute an 8-foot bronze. On the day of dedication, family, friends, and shipmates gathered for brief ceremonies.

## Pioneer of the Frozen Wastes

“As the years go by,” said Vice President Lyndon Johnson, “all of us acquire a perspective on life which shatters some of our early dreams and some of our early illusions. But even though maturity may bring lessened enthusiasm and even cynicism, it never destroys our proper respect and reverence for those who break new trails.

“There is, deeply embedded in the souls of every man and woman, a desire for growth



**Honoring a hero,** Vice President Lyndon B. Johnson dedicates the Richard Evelyn Byrd Memorial near Arlington Cemetery last November 13. Melville Bell Grosvenor shares the platform as President of the National Geographic Society, which commissioned the statue. Navy color guard (left) passes the 8-foot bronze. Flags of the Nation and of the Society honor the man who bore them afar.



PHOTOGRAPH BY GEORGE WHELFY © N.A.S.

Scanner of far places, Byrd pitted his will against the polar elements. Sculptor Felix de Weldon created the statue.

and a yearning to reach out to far horizons. Somehow, we instinctively sense that we must grow or perish.

"Most of us find ourselves imprisoned in the workaday cares of everyday life, and early dreams of adventure fade with the passing of time. But once in a while there comes a rare individual who pioneers the wastelands and sets the feet of his fellow human beings on new lands."

#### Antarctic a Schoolroom for Survival

Recalling Admiral Byrd's personal philosophy, Mr. Johnson said: "I will always treasure his words when he explained why he was returning to Antarctica for his fifth and last mission.

"'Well, I like it there,' he said, in response to a question. 'I like the endless reaches of the wind-rippled snow, the stark peaks, the awesome glaciers. I like the clatter of the tractor trains, the whir of helicopters, and the shouts of men wrestling with vehicles and gear. Yes, and the howling of huskies; they are still needed for rescue work.

"'I like the symbols of life's triumphs in a lifeless land: the squawking gulls, the comical penguins, seals wheezing at their blowholes; the arching backs of whales.

"'Most of all, I guess, I like the challenge of it, for Antarctica still plays for keeps. And

I believe, as the scientists do, that the things we can learn there will have a profound effect upon the lives of us all.'

"These were the words of a man who lived life to the hilt; who enjoyed the conflict of men against nature; who had discovered the eternal truth that happiness comes only from striving in a worthwhile cause. These were the words of a man whose passing would be mourned, but whose life would serve as a perpetual inspiration for men who respect and honor their manhood.

"Even before Admiral Byrd 'discovered' Antarctica, the Byrds of Virginia had been serving this land we love. It is very, very doubtful whether any other family has produced more statesmen from the beginning of our history to the present day.

"From the original William Byrd, who arrived on these shores in 1671, up to my close and cherished friend who is here on the platform with me today [Senator Harry F. Byrd], the Byrd family have displayed an independence and integrity of mind that have always made them outstanding in every generation.

"I know the grief that fell upon Senator Byrd when his brother died. But I know also the thought that brought solace and healing comfort to him and to all the Byrd family: It was that the man who had conquered the air space over the Atlantic, who had mastered the North Pole and the South Pole, could never really die. And so it is a great honor and a high privilege to come here to dedicate this beautiful memorial.

"To you, Dr. Grosvenor, and to the National Geographic Society, Americans all owe a deep debt of gratitude. I take great pride in dedicating this memorial today to one of the great Americans of our time."

John B. Connally, Jr., then Secretary of the Navy, told the dedication-day audience of incidents in Admiral Byrd's early naval career.

"Richard E. Byrd entered the United States Naval Academy in 1908," the Secretary recalled. "As a member of the football squad, young Byrd broke his right foot. He fractured the same foot and ankle again in a fall while performing a difficult stunt he had devised for the flying rings (which he later ruefully described as his 'first aerial adventure'). Because of the injury, Midshipman Byrd missed his semiannual examinations. For five months he struggled with his lessons and lame leg. All except one bone in his ankle healed — and it clicked as he walked.

"In spite of excruciating pain, Byrd kept exercising his bad leg, and it gradually im-



REPRODUCED BY ARNOLD JAROSL OF THE NATIONAL GEOGRAPHIC SOCIETY

Byrd the scholar, in his Boston office, tips a globe to put Little America atop the world. His last published words in *NATIONAL GEOGRAPHIC* expressed hope that his articles would "help light the way for the seekers and finders from all countries who accept the siren challenge of Arctic and Antarctic." He died March 11, 1957.



proved. He caught up with his class. Characteristically, years later Admiral Byrd wrote, "This terrific struggle I had made to graduate taught me a great lesson — that it is by struggle that we progress."

#### Young Officer Fights Retirement

Twice in Byrd's early naval service, the Secretary said, the future explorer's career seemed to be ending almost before it began.

"Byrd's game leg was not strong enough to stand long watches on a battleship," Mr. Connally explained. "After long hours of deck duty, his whole body was wracked with pain that began in the mangled ankle. Finally, he was retired for physical disability in 1916.

"A few months later Byrd was recalled to

active duty. He worked day and night for months to organize the Navy's Commission on Training Camps. Hard work and worry that he would not see combat caused him to lose 25 pounds and approach a breakdown.

"He was called before a medical board and told that he would have to take leave. Byrd begged the board for a chance to build himself up so that he could go to flight training school. The doctors agreed. The prospect of learning to fly served as a tonic, and Byrd was pronounced in perfect health when examined two months later.

"The young officer reported in August, 1917, to the Naval Aeronautic Station in Pensacola, Florida, for aviation instruction. Just eight months later, Byrd became Naval Avia-

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tor No. 608. He conceived the idea of flying the Navy's new NC-1 flying boat across the Atlantic, with a stop in the Azores, to deliver it for service in Europe. Armistice Day arrived before the idea could be put into practice, but it was typical of the imaginative planning that animated Admiral Byrd throughout his life.

"He once wrote, 'From the moment I became a full-fledged Navy pilot, my ambition was to make a career out of aviation. Not merely in the sense of routine flying, but rather in the pioneering sense.' Few men have so well fulfilled an ambition. The young officer's career as polar explorer began when he was given command of the Naval Aviation Unit that accompanied the 1925 Arctic Ex-

Old comrades hear John B. Connally, Jr., then Secretary of the Navy, praise Byrd's "determination and sheer grit." The Secretary's bandage covers a cut made by an accidental rifle blow during an inspection a few days earlier.



For the Byrd family, Senator Harry Flood Byrd, the Admiral's brother, expresses thanks to the Society for the memorial. A former Virginia governor, the Senator has held his present post since 1933, continuing a tradition of public service that began when his family first came to Virginia in the 1600's.



Family and friends gather on Arlington's Memorial Avenue for the dedication. Front row includes Mrs. Byrd; son Lt. Comdr. Richard E. Byrd, Jr. (USNR); six grandchildren; daughter Mrs. Robert G. Breyer; and (leaning forward) brother Thomas B. Byrd.



**Sled and Plane, the Old and New  
in Polar Travel, Help Map the Icy Unknown**

Though Byrd used snow tractors on all his expeditions, he never led an Antarctic party that did not also include dogs. On the first expedition in 1928-30, groups sledged 400 miles inland, mapped the Queen Maud Range on a 175-mile front, and cached supplies for planes. Eskimo dogs above struggle across pressure ice on the Bay of Whales.

Wings folded, engines muffled, the three-motored *Floyd Bennett* eases down a ramp, headed for winter hibernation in a snow hangar. The following summer, on November 29, 1929, the plane carried Byrd and three companions over the South Pole.



Byrd briefs a sledge driver setting out to establish food depots in Antarctica. No man ever perished on an expedition Byrd led in person, so careful was his planning. All his surveys produced masses of scientific data.



With three engines, 100,000 lbs. and 15,000 sq. ft. wingspan, the plane was the largest ever built.



—NATIONAL GEOGRAPHIC SOCIETY

pedition of Donald B. MacMillan, sponsored by the National Geographic Society.

"During his distinguished career, Admiral Byrd led five expeditions to Antarctica. His conquest of the South Pole by air and the discovery of Marie Byrd Land climaxed his 1928-1930 venture.

"More than 450,000 square miles of land and surrounding waters were explored and mapped via ship and plane by the 1933-1935 party. The 1939-1941 journey delineated the hitherto shadowy Pacific coastline of the great continent.

"World War II halted work in the Antarctic, and Admiral Byrd returned to active duty in the Office of the Chief of Naval Operations. It was at this time, as a young naval ensign, that I had the great privilege of meeting Admiral Byrd on several occasions. I stood in awe then, as I now stand in awe of his magnificent accomplishments for his country.

#### Ten New Mountain Ranges Found

"From 1942 to 1945 he led important missions to the Pacific, including surveys of remote islands for airfields. Within a year after the war ended, Admiral Byrd—as might be expected—was back in the Antarctic in force. The Navy's Operation Highjump in 1946 and 1947 was the biggest exploring expedition ever organized. Highjump flyers covered an area more than half as large as the

United States and recorded ten new mountain ranges.

"Admiral Byrd was Officer in Charge of our Nation's vast Antarctic program for the International Geophysical Year. In his new role, Admiral Byrd paid his last visit to Antarctica during Operation Deep Freeze I of 1955 and 1956. In farewell, he flew over the South Pole for the third time.

#### Destroyer Carries Admiral's Name

"The Navy demonstrated its high regard for Admiral Byrd's achievements with a host of awards and citations. These included the Navy Cross, the Distinguished Flying Cross, and the Distinguished Service Medal with a Gold Star.

"Not long before his passing, Admiral Byrd received his final award, the Medal of Freedom, in recognition of his outstanding accomplishments as Officer in Charge, U.S. Antarctic Programs, and his humanitarian contributions to the world."

Secretary Connally closed his remarks with an official announcement.

"In beloved recognition of Admiral Byrd's great contributions to the Navy, to aviation, to exploration, and to science, the guided missile destroyer U.S.S. *Richard E. Byrd* will be launched in February. I am confident that this splendid ship will honor the memory of this outstanding naval officer as she makes her way along the sea lanes of the world....

and express to people of all nations the pride the United States holds for one of its most distinguished citizens."

On behalf of the Byrd family, Senator Harry Flood Byrd, the Admiral's brother, expressed "a feeling of both honor and humility that we of the family are privileged to be here for the presentation of the Richard E. Byrd Memorial by the National Geographic Society.

#### Proud of Colors He Served

"I think it may be said that my brother Dick had four great dedications in life: He was dedicated to the family whom he loved. He was dedicated to his country, which he cherished. He was dedicated to the Navy, which he served. And he was dedicated to the National Geographic Society, which he esteemed.

"In this ceremony, representatives of all four have participated, and for the family I wish to express our profound gratitude.

"To you, Dr. Grosvenor, may I repeat what my brother Dick has said before. Addressing the members of the National Geographic Society, he said, 'Other than the flag of my country, I know of no greater privilege than to

carry the emblem of the National Geographic Society.'

"I know how deeply grateful he was for the Society's assistance and interest in his projects, and I know the pride with which he served on your Board of Trustees.

"In the past you bestowed upon him your highest awards: both the Hubbard Medal and your Special Medal of Honor. And you now dedicate the greatest honor of all, this Richard E. Byrd Memorial. It is difficult for one of his family to find words to describe our feelings at this time.

"We know well the great mission of the National Geographic Society and its fine record for constructive achievement. From its beginning under the great Gardiner Greene Hubbard and Alexander Graham Bell, the Society has done a wonderful work unequalled in human history in its promotion of geographic research and dissemination of information in a manner that can be understood by all. In more recent years, the Society has become the greatest scientific and educational organization in the world, with nearly three million members [see page 570].

#### World Viewed With Fresh Wonder

"Certainly, no other private institution has done so much to support bold hands when they have sought to draw the veil from the mysteries of the world.

"And over the years, the National Geographic Society has developed the art and the means for describing what the world has to offer in a manner that has opened the eyes of all to the dazzling spectacles of science and sound speculation.

"It has stimulated intellectual energy and excitement in the search for the exact knowledge of the sciences. And in addition, it has contributed immensely to the creation of an insatiable curiosity as to the source and direction of great developments and their universal significance.

"We are pleased, immensely pleased, that the setting of the ceremony is on the soil within the geographical borders of Virginia and that the significance of the memorial has been recognized by resolution adopted by both Houses of the Congress of the United States.

"We feel that the occasion and the memorial are symbolic of the will and the courage to open even vaster horizons for the benefit of all mankind. We know that this is the objective of the National Geographic Society. We

From his pioneering flights over the Arctic regions to his final trip to Antarctica, the trail-blazing accomplishments of Admiral Byrd have been chronicled by NATIONAL GEOGRAPHIC. The Admiral himself penned these exciting stories.

"Flying Over the Arctic," November, 1925.

"First Flight to the North Pole," September, 1926.

"Our Transatlantic Flight," September, 1927.

"Conquest of Antarctica by Air," August, 1930.

"Exploring the Ice Age in Antarctica," October, 1935.

"Our Navy Explores Antarctica," October, 1947.

"All-out Assault on Antarctica," August, 1956.

He completed "To the Men at South Pole Station," his last article, shortly before his death in March, 1957, and NATIONAL GEOGRAPHIC published it in July of that year. The same issue contained a tribute to the explorer, "Admiral of the Ends of the Earth," by Melville Bell Grosvenor.



Alone in a hut beneath the Antarctic ice, Byrd spent four bitter winter months in 1934. He had moved to the advance station to make weather observations, but fumes from a defective stove soon made him ill. Realizing his comrades would risk their lives to save him if they knew his peril, he sometimes crawled on hands and knees to make regular radio reports. Finally alerted by his faltering signals, three men broke through the polar night and rescued him.

**Fruitful partnership:** A National Geographic dinner in 1935 celebrates Byrd's return from his second Antarctic expedition. Byrd did his first polar flying in 1925 as leader of the Navy-sponsored MacMillan Expedition to Greenland. He received the Society's backing for his first two Antarctic journeys. The Government sponsored his last three trips.

Gilbert H. Grosvenor, then the Society's President, and Senator Byrd congratulate the lawmaker's brother



BYRD ANTARCTIC EXPEDITION





INTERNATIONAL NEWS

Hubbard Gold Medal, the Society's award, goes to Byrd for his North Pole flight in 1926. President Coolidge, speaking before 6,000 Washington members, praised the flyer's courage, vision, and persistence.

F.D.R. meets Byrd at the Washington, D.C., Navy Yard on the explorer's return in 1935 from his second Antarctic expedition. The President departs from ceremony to extend a warm, personal greeting.



THE WASHINGTON POST



INTERNATIONAL NEWS

"First to the . . . South Pole by Air," says the inscription on a Special Medal of Honor presented to Byrd by President Hoover on behalf of the Society. Gilbert Grosvenor, Navy Capt. Charles R. Train, and Col. Campbell B. Hodges witness the 1930 ceremony.

Paper blizzard greets Byrd in New York on July 18, 1927. Broadway hails him and his crew as the first to fly a multi-engine plane nonstop from the U.S. to mainland Europe.

know this is the national objective of our country; and certainly it is the hope of our family. To all who have contributed to this event, please be assured that you have our deepest gratitude."

On behalf of the National Geographic Society, Dr. Grosvenor thanked the distinguished visitors and paid special tribute to Mrs. Byrd as "the gracious lady whom many of us consider almost as much a discoverer as the Admiral himself—because she was his inspiration."

A special introduction was accorded "the world-famous sculptor who conceived this beautiful memorial, Mr. Felix de Weldon,"

and to Conrad Wirth, Director of the National Park Service and a Life Trustee of the Society, who had played an important role in making the site available.

"It is especially appropriate," said Dr. Grosvenor, "that this memorial to Mr. Antarctica should stand as the first monument on a great avenue that will eventually be lined with heroes of exploration and science and the military—all great heroes."

"With the passing of Admiral Byrd in March, 1957, the world lost one of the greatest of all explorers. No man contributed more to our knowledge of the Arctic and Antarctic than he. The first man to fly over both Poles,



WINSLOW HOWARD

he will live in history as the Admiral of the Ends of the Earth. With the passing of Admiral Byrd, the National Geographic Society lost a beloved friend, a Life Trustee, and an ally in the cause of discovery. But his courageous spirit lives on in our hearts.

"I remember well the day in 1925 when Lieutenant Commander Dick visited the Society's headquarters for the first time. He had come to see my father, Dr. Gilbert Grosvenor, then President of the Society, to ask his backing for a new kind of exploration: The first use of the airplane in the Arctic.

"I had the honor of welcoming the young naval officer to the Geographic, and immedi-

ately I liked the cut of his jib. He was straight as a jack staff, handsome, and forthright. He had an enthusiasm and warmth that we of the National Geographic found instantly to our liking. We were greatly attracted by his bold plan to take planes into polar wastes—in those days a fantastic idea.

"The expedition proved beyond doubt the feasibility of aerial exploration in the frozen north and the frozen south. It began an association between Richard E. Byrd and the National Geographic Society that lasted the rest of his life. For three decades the Society sponsored and supported Admiral Byrd in the explorations and daring adventures of his



NATIONAL GEOGRAPHIC SOCIETY, WASHINGTON, D. C.

His signature of courage written wide upon the bright globe, a bronze Richard Evelyn Byrd lifts his eyes to the horizon he unceasingly pursued in life. White Carrara marble of the pedestal symbolizes polar ice and snow; inscriptions on two faces cite Byrd's conquests of the two Poles by air, his pioneer flight across the Atlantic, and five Antarctic expeditions. The Society's steadfast friend for years, the Admiral became a Life Trustee in 1953.



ILLUSTRATION BY GEORGE WOLFF

astonishing career. Admiral Byrd carried the Society's flag on his historic flights over both Poles.

"The Admiral showed his friendship in many ways. He named mountains in the Antarctic for both Dr. Gilbert Grosvenor and the late Dr. John Oliver LaGorce. Admiral Byrd contributed a long series of notable articles to NATIONAL GEOGRAPHIC; they are among the most popular we have ever published [see page 574].

"With his winning personality and unique exploits, Admiral Byrd was destined to become one of the brightest stars of the American lecture program. Audiences all over the United States thrilled to his talks and his superb films. On all those trips across the continent, Mrs. Byrd followed him. I remember so well when he came to Washington to lecture the first time for the Society; she was always with him, looking out for him—a wonderful thing.

"An avalanche of honors was heaped upon Admiral Byrd in his lifetime. He could easily have basked in his early glories. To an ordinary man, successful flights over both Poles might easily have been enough for a lifetime. But the Admiral was not a man to deny the call of adventure or service to his country. No sooner had he returned from one expedition than he was prepared to go on another. This statue shows the determination in his face.

"The memorial, ladies and gentlemen, is a symbol of our affection and esteem for our beloved Admiral of the Ends of the Earth—Richard Evelyn Byrd."



PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER DEAN LINDLEY © 1968

Member of note at the Geographic: Omaha teacher Golda Prewett meets Dr. Thomas W. McKnew (left), Executive Vice President, and Melvin M. Payne, Vice President and Associate Secretary. Dr. McKnew has since become Vice Chairman of Trustees. Mr. Payne, Executive Vice President of the Society.

## Our Society Welcomes Its 3,000,000th Member

By MELVILLE BELL GROSVENOR, LL.D., D.Sc., President and Editor

**T**HE MEMBERSHIP FIGURES which come to my desk told an astonishing and gratifying story: Each December day was bringing a flood of new members to the National Geographic Society. On a single Tuesday, 11,527 applications were accepted.

"This is unprecedented," said my associate, Dr. Thomas W. McKnew. "If it keeps up, we'll have three million on December 8—three months ahead of forecasts. Christmas gift memberships are breaking all records."

What sort of person, I wondered, would the three-millionth member be? He might come from Asia or Europe; nearly half a million members live outside the United States. He might rule a kingdom, study microbiology, or drive a taxi; the Society has members in all those occupations, and a thousand others.

"Keep a close watch on December 8," I said. In the central mail room, operators adjusted the controls of a Remington Rand electronic counting-sorter, which scans applica-



tions at 800 per minute. When the count narrowed, the machine was stopped and hand sorting began: 2,999,997 (a meteorologist in Hong Kong) . . . 2,999,998 (a lawyer) . . . 2,999,999 (the wife of a famous professional boxer) . . . then 3,000,000!

The nominating letter came from Mrs. Carl Bisanz, of Omaha, Nebraska. "Dear Sir," it said, "We are hoping we are not too late for this little plan. Our daughter's class, sixth grade of Western Hills School, has decided to give their teacher a Christmas gift membership in the National Geographic Society. . . . The class wishes the magazine to be sent to Mrs. Golda Prewett. . . ."

Too late? No, I thought. The timing is perfect, and this calls for a celebration.

By telephone, Dr. McKnew invited Mrs. Prewett and her family to come to the Society's Washington headquarters for an appropriate welcome by the Board of Trustees. A staff photographer hurried to Omaha for pictures of the 43 generous sixth-graders. We wanted to know everything about the Prewetts.

The family's two older children were unable to come. But Mr. C. H. Prewett, Professor of Engineering at the Municipal University of Omaha, and teen-agers Roger and Linda Ann joined our queen for a jet flight to Washington.

**They pooled pennies.** Sixth-graders at Omaha's Western Hills School gave teacher Prewett her membership for Christmas. The Society flew her to Washington, D.C., to receive it. Mother of blond Carol Bisanz (in green dress) nominated Mrs. Prewett.

**With their children, Roger and Linda, Prof. and Mrs. C. H. Prewett tour Capitol Hill.**

**Prewetts inspect one of 55,000 volumes in the Society's library.** Librarian Esther Ann Manion leads through a rare edition of centuries-old Portuguese charts. National Geographic encourages the public to consult its reference works.



This was the family's first trip to the Nation's Capital. The Prewetts visited the White House, Supreme Court, Mount Vernon, the Capitol, the Smithsonian Institution.

At the Society's headquarters, I welcomed our guests. "How did your pupils find out about your interest in the Society?" I asked.

"Well, it started last fall with a class project," Mrs. Prewett explained. "We were studying our neighbors, Canada and Mexico. We used *GEOGRAPHICS* for research. I asked the children to bring their copies from home."

The story was typical of our members. One person shares his enthusiasm with another—and our Society grows. The pattern was set in 1888 when 33 men founded the nonprofit National Geographic Society to promote science and education. Membership, said these pioneers, should be "broad and liberal."

The Society did not broaden overnight. The second President, inventor Alexander Graham Bell, later said, "I can well remember . . . how the idea was laughed at that we should ever reach a membership of 10,000. Why, it was ridiculous. Geography, the driest subject of all in our schools!"

Dr. Bell shared his vision with a young editor: "Why not popularize the science of geography and take it into the homes of the people? Why not transform the Society's magazine . . . into a vehicle for carrying the living, breathing, human-interest truth about this great world of ours? Would not that be the greatest agency of all for the diffusion of geographic knowledge?"

The young editor was my father, Dr. Gilbert Grosvenor. When he began his career with the magazine, he carried a month's issue on his back to the post office. When he retired 55 years later on May 5, 1954, the Society had 2,041,019 members.

#### Society Continues to Grow

Experts predicted that the rolls would level off at that figure. They reckoned without the enthusiasm of our members and their officers.

Among those enthusiasts was Thomas W. McKnew, who joined our staff in 1932. A fifth-generation Washingtonian, he brought a distinguished list of achievements: He had constructed such important works as the United States Internal Revenue Building and the Folger Shakespeare Library in Washington, D. C., and the State Office Building of West Virginia at Charleston. Dr. McKnew also brought a sense of dedication and a questioning mind. One of his first responsibilities with the Society was serving as project officer for the National Geographic Society—U. S. Army

Air Corps Stratosphere Expeditions of 1934-35; the flights established a world altitude record of 72,395 feet for manned balloons and laid a foundation for the exploration of space.

As Secretary and Executive Vice President, Dr. McKnew brilliantly managed the design of our new high-speed color presses and the gigantic task of moving the magazine's printing operation from Washington to R. R. Donnelley & Sons Company in Chicago.

It was Dr. McKnew who led the negotiations for the Society's sale of the Champion-International Company to the Oxford Paper Company—then worked with Oxford for the development of revolutionary improvements in paper quality for the magazine's use. Recently, he has helped guide plans for our new National Geographic Headquarters Building; now in construction, it promises to be an architectural triumph in function and form.

Recognizing his achievements, the Society's Trustees recently elected Dr. McKnew Vice Chairman of the Board, as successor to the late Dr. John Oliver La Gorce. Elected Secretary and Executive Vice President was Melvin M. Payne, long-time Associate Secretary, a key administrator in the Society's affairs and in our undertakings in research and exploration. Mr. Thomas M. Beers was elected Vice President.

#### Sixth-graders Share a Milestone

Dr. McKnew and Mr. Payne joined me in showing the Prewett family through our headquarters. In Explorers Hall we pointed out the world map that traces the web of more than 150 expeditions and scientific projects made possible by the dues each member pays. In the cartographic department, our guests watched map makers draft and edit master copies for the 21,000,000 maps distributed by your Society each year.

On behalf of the Trustees, I was happy to award to Mrs. Prewett a life membership in the Society, a complete set of National Geographic books, and a framed color photograph of her Omaha sixth-graders. "Such a sweet group of children," she said proudly. "You couldn't have given me anything nicer."

Then Mrs. Prewett told me of overhearing her pupils as they talked about all the exciting plans—especially the prospect of seeing their own class picture in the *NATIONAL GEOGRAPHIC*. "Just think," said one little girl, "all of this for just fifteen cents apiece."

The child had a point for all of us: By sharing among three million members the costs of exploration, map making, research, and publication, we indeed make possible "all of this."





## Science helps build a new India

Oxen working the fields . . . the eternal river Ganges . . . jeweled elephants on parade. Today these symbols of ancient India exist side by side with a new sight—modern industry. India has developed bold new plans to build its economy and bring the promise of a bright future to its more than 400,000,000 people. ▶ But India needs the technical knowledge of the western world. For example, working with Indian engineers and technicians, Union Carbide recently made available its vast scientific resources to help build a major chemicals and plastics plant near Bombay. ▶ Throughout the free world, Union Carbide has been actively engaged in building plants for the manufacture of chemicals, plastics, carbons, gases, and metals. The people of Union Carbide welcome the opportunity to use their knowledge and skills in partnership with the citizens of so many great countries.

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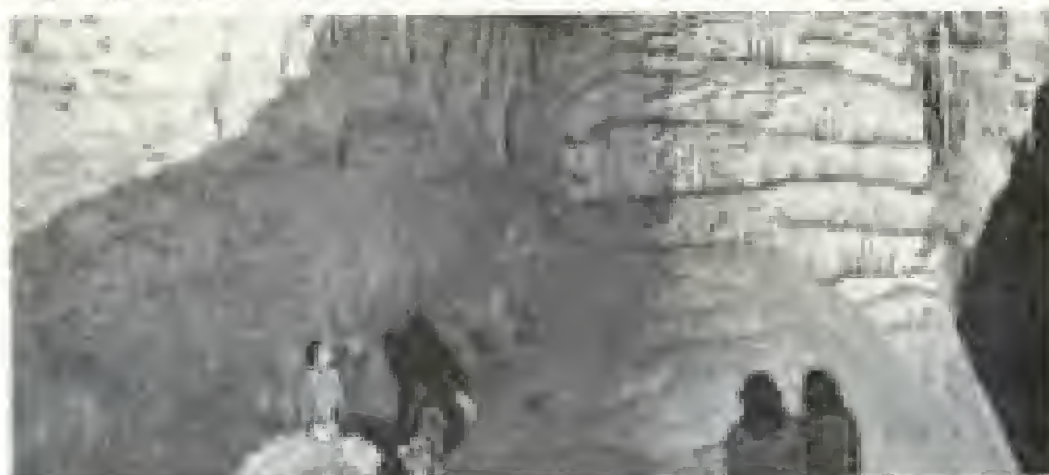
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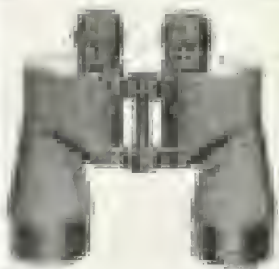


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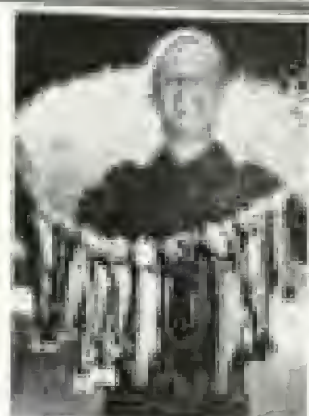
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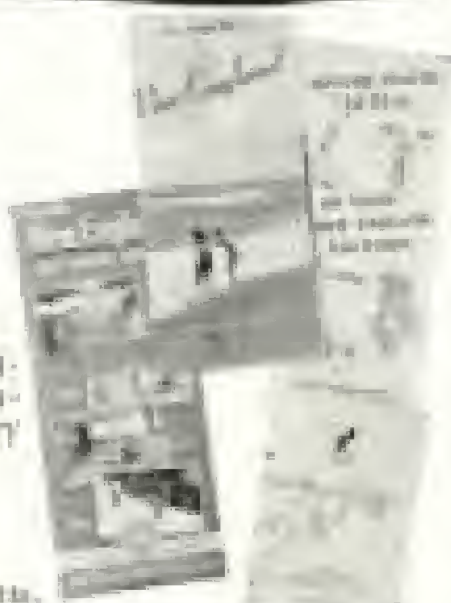
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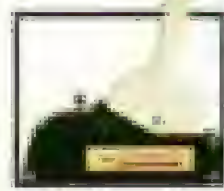
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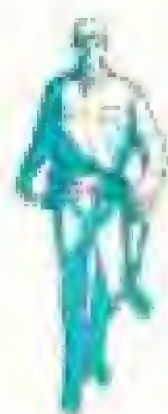
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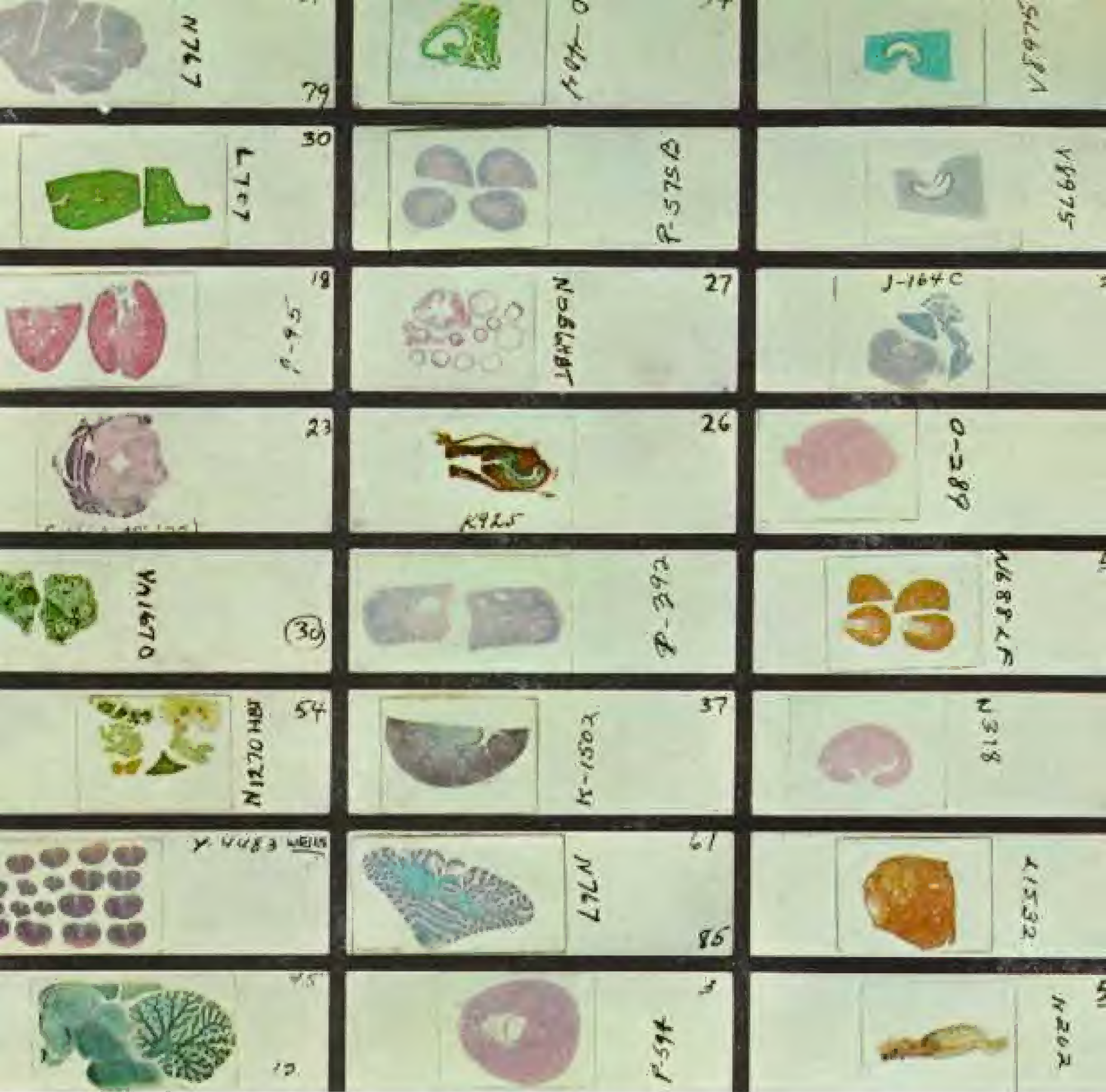
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