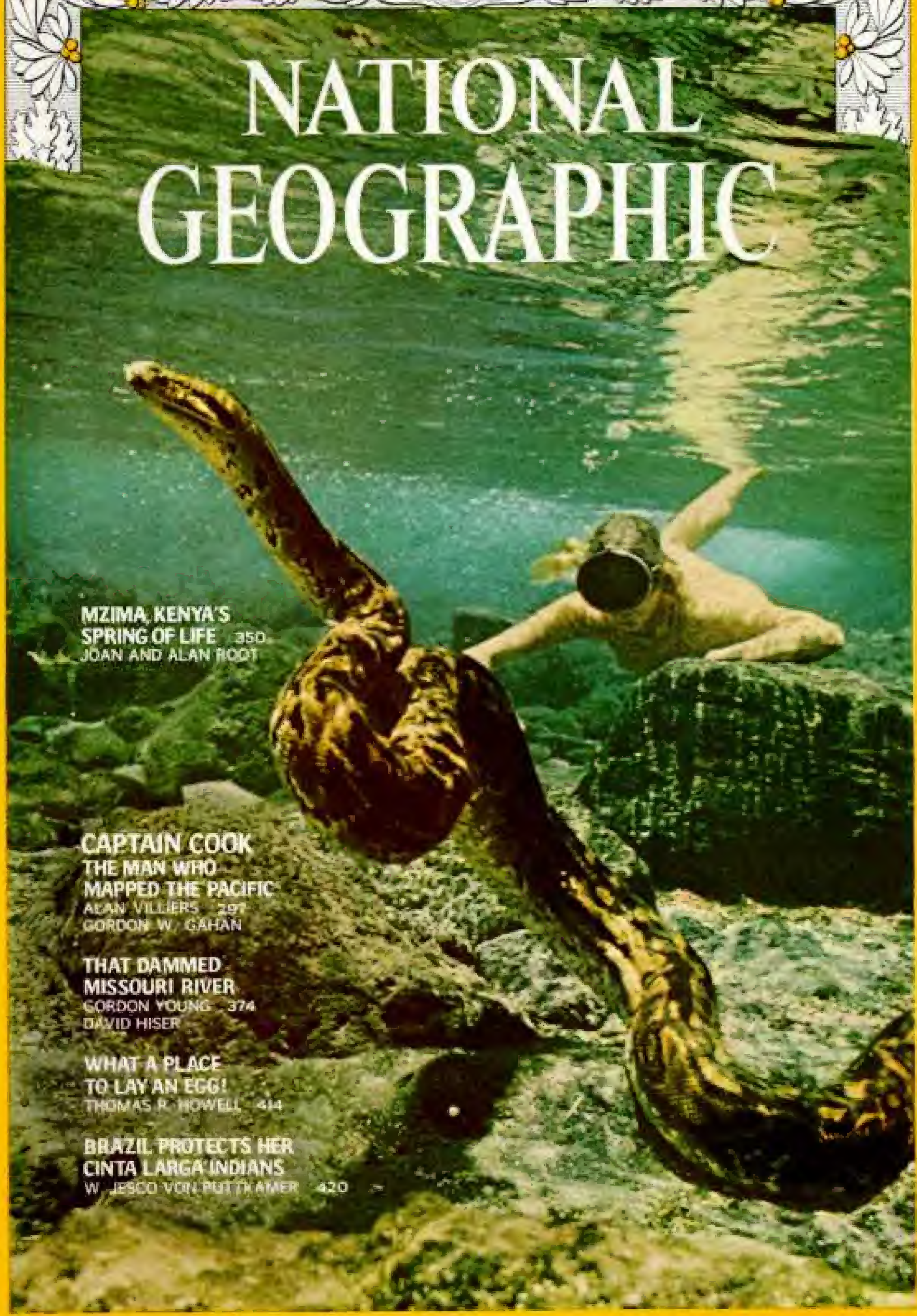
VOL. 140, NO. 3 SEPTEMBER 1971

NATIONAL GEOGRAPHIC



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

From Lennox air conditioning and heating: the four freedoms

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LENNOX

Vic Tennison, a contractor from Yucca Valley, California owns this 1966 Toyota Corona.

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"Oh, sure, I've put it in the shop a couple of times," he says. "For instance, I needed new brake shoes at around 100,000 miles. And I think we put in new rings at 139,000 and another rear end in at 175,000."

Tennison does claim a secret youth formula.

"You buy a good car. You take good care of it. It takes good care of you."

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As Tennison puts it, "I've driven a lot of economy cars and there's nothing like a Toyota."

What do you expect him to say?

TOYOTA

We're quality-oriented.

You'd think a car that went 234,000 miles in 4½ years would be ready to call it quits.

Captain Villiers writes about Captain Cook

AND WHAT a perfect choice! In his 28th GEOGRAPHIC article, Alan Villiers (above, holding Cook's chronometer in Britain's National Maritime Museum) reminds us that he, too, circled the globe under square sail. He did it in his own *Joseph Conrad*, taking the little frigate as close to Cook's track, he tells us, as he dared. Today Villiers lives in Oxford, England, busy getting down on paper the knowledge gained during a unique career afloat. Even his voice, as he talks of his days aboard the Cape Horn grain ships or as captain of awkward *Mayflower II*, carries the unmistakable growl and lift of the sea.

Cannon jettisoned by Cook (page 323) was raised two centuries later. King George III's monogram appears in reverse on coral peeled from the venerable weapon (right). You can introduce a friend to such special worlds of discovery by using the form below.

See the art that turned on Picasso.

See the influence of African art in the portraits of Picasso's cubist phase.

See its colors and broad strokes in the work of Ferdinand Leger.

See the impact of it in those strange, marvelous long faces of Modigliani.

Take a look around South Africa.

Not far from Pretoria you can stop at the N'debele village, where masterly women artists create abstract, geometric murals on the walls of their houses.

While you're in Kimberley, visit the Bantu Museum. Here you can actually pick up fantastic masks, sculpture, pottery, and examine them at close range, feel their shape and weight.

You'll want to bring home examples of African art and artifacts. And you can. In the shops and the Indian Market you'll find masks. Pottery. Weaving. Stone sculpture. Wood sculpture. You can even take home a warrior's shield as tall as a man.

Prices are incredibly low. Walk off with a Zulu axe for $2. Or an African mask for 1/10th of what it would cost in the U.S.

Interestingly enough, these low prices apply not just to art, but to everything.

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South Africa is almost unique in its striking contrasts. With its modern cities—like Johannesburg, Durban, Cape Town—you'll discover *both* primitive life *and* present-day luxury.

Fastest, easiest way to get there is with South African Airways. A Boeing 707 Stratojet will wing you down from New York via the most direct route.

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VIRGINIA

Mariners' Museum, Newport News

When are the schools going to

All children may have been created equal in the eyes of God. But once they get into a classroom, it's another story.

As any teacher can tell you, students don't learn the same things at the same speed.

Albert Einstein breezed through math courses. Yet he was no Einstein at history. Some of our greatest writers had trouble passing spelling tests. And you don't have to be a detective to know what kind of marks your doctor brought home from penmanship class.

There's a tremendous need for individual instruction, say our educators. And thanks to some modern new learning aids, schools are beginning to get help in this area.

One such aid is the Chester Electronic Educational Information System from GTE Information Systems, Inc. It sounds complicated. But it's really one of the simplest, most natural ways to help teach kids today.

For information write: Chester Electronics, Chester, Conn. 06412. Or, GTE, 730 Third Ave., New York 10017.

stop treating our kids as equals?

Each student sits in front of a closed-circuit TV set with a pair of earphones. What he sees and hears is a lesson. Not everybody's lesson—his lesson.

If a point is a little hazy, he can dial a number on the system's telephone dial and see it again. If everything's clear, he can dial another number and go on to the next lesson.

Meanwhile (and this is an important meanwhile), the teacher is free to work with each student on a one-to-one basis.

So far, more than half a million students in more than 400 schools are using our new system. Which means it's a success.

But then, how could the idea miss? Doesn't every mother and father think their kid belongs in a class by himself?

GTE

GENERAL TELEPHONE & ELECTRONICS

The Jones family just survived a 50 mph crash. So that you can too, in a couple of years.

If they can survive, so can you.

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Right now, the Joneses are involved in crash tests in the search for a passive restraint system. A device inside your car that will work automatically to save you if you crash.

A new federal standard calls for such a system to be available on the 1974 cars.

Even with passive restraints, we'll still need seat belts for full protection.

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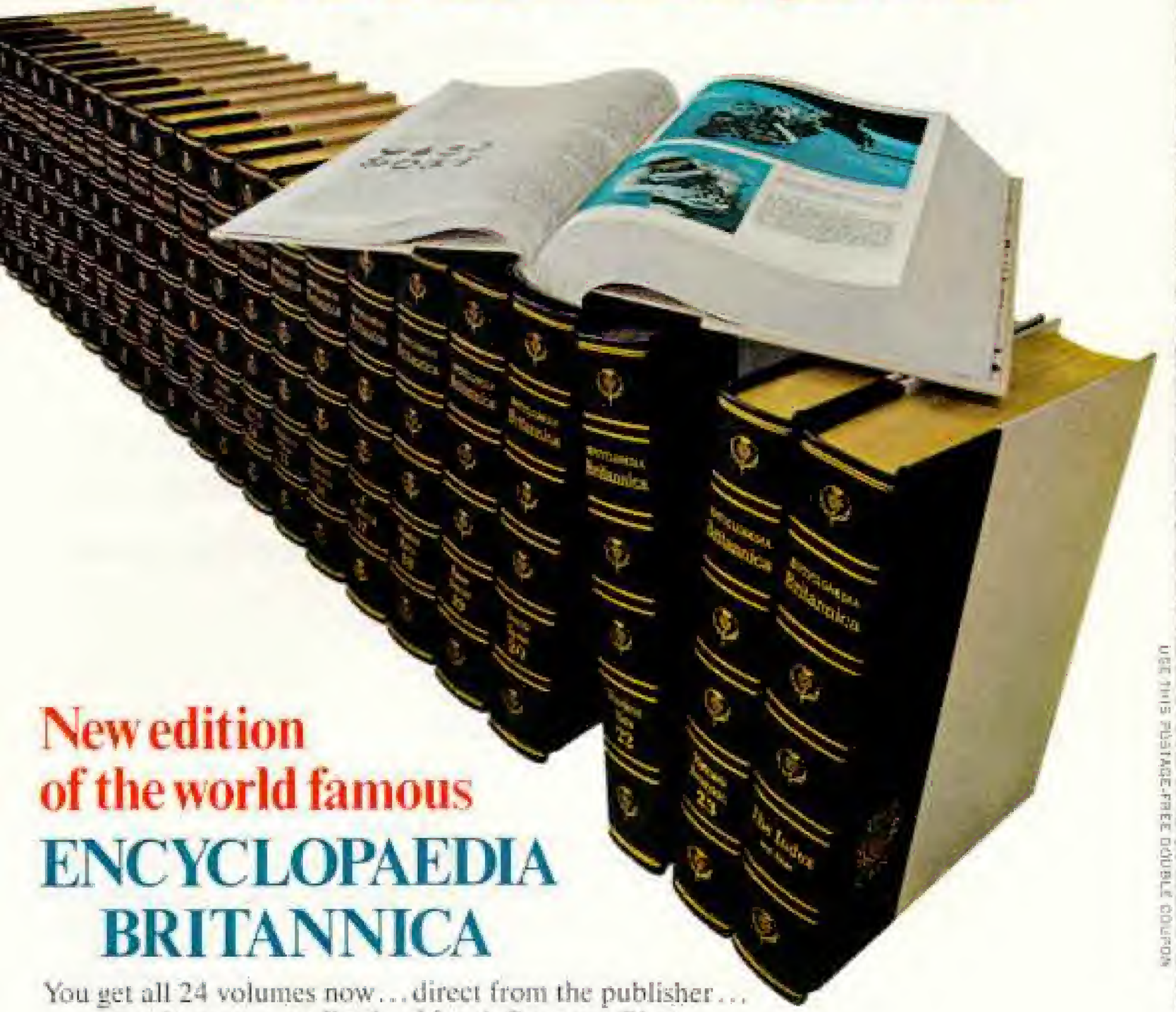

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"Down with stereotyped hotels!"

Local delicacies grace the menus of each Esso hotel. Some are mysteries. We also have menus for children.

Esso Motor Hotels Inc. started business in 1963. It is one of Jersey's fastest-growing European affiliates.

The company now operates fifty hotels in nine different European countries. Last year, they provided bed and board for over a million guests. With twenty-six new hotels on the drawing boards, they expect to triple this figure by 1975. Some business.

We hope this advertisement will give you an idea of what caused this success in eight short years. Esso's frontal attack on modern hotel monotony is probably at the heart of it.

Esso hotels are not the familiar shoe-box stereotypes. They are full-fledged hotels specifically designed to offer shelter, recreation and blessed variety to the motorist.

Of course, every Esso hotel has its own service station. So your car can be washed and checked out while you rest. But there the similarities end.

Interiors are designed to express the local life-style. In Sweden, you can simmer in a sauna. In Germany, you can chug-a-lug the local brews in a traditional rathskeller. In England, you can gorge yourself on roast beef and Yorkshire pudding in a sixteenth century manor house.

And so it goes in six other countries—Norway, Denmark, Belgium, Austria, Holland and Italy. Chefs are chosen for their genius at making local dishes as well as for their skill at running a good international kitchen. All managers speak several languages. And the wine lists are a delight.

We think the best testimonial to the food and ambiance comes from the locals themselves. About 70 per cent of the guests at any one hotel come from the country in which it sits. Can we say more?

For information and reservations, write to the U.S. Representative of Esso Motor Hotels, Robert F. Warner Inc., 630 Fifth Avenue, New York, N.Y. 10020—or telephone (212) 586-4500.

Here is the English manor house within the grounds of an Esso hotel at Maidenhead, England. Within a few hundred yards, you can walk four centuries.

says Esso in Europe.

The Esso hotel in Hannover, Germany, is in a game park. The deer are friendly. The wild boar are not.

Our hotel on Sweden's Lake Vattern has a marriage chapel, just in case you fall hopelessly in love.

Your welcome comes in several languages. One is universal. Service. Esso employees smile because they like people. And they like their jobs.

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Standard Oil Company (New Jersey)

ESSO

A CLOSER LOOK AT YOUR WORLD

Every month NATIONAL GEOGRAPHIC brings you unique, stimulating close-ups of the world we live in. You probe the secrets of nature . . . feel the excitement of discovery . . . relive history . . . meet a fascinating variety of people. Share the adventure and knowledge of NATIONAL GEOGRAPHIC with your friends by nominating them for membership. Or, if you prefer, present gift memberships. Use the form on the third page of this magazine.

The 747 is a lot of nice little things.

1 Enjoy a new feeling of freedom under 8-foot ceilings. You can stand up and stretch in a way never before experienced on a jetliner.

2 Your choice of wide-screen, full-color movies with full-dimensional stereophonic sound. Controls at your fingertips also let you select from a variety of music and other programs.

3 Conveniently located overhead luggage compartments to put your carry-on things up and out from underfoot. Gives you more room to stretch your legs.

4 Full-course meals from ultra-modern galleys and service centers conveniently located between each passenger section.

5 Relax in extra-wide, extra-comfortable seats. Two, three, or four-abreast seating arrangements to meet your needs whether you're alone or with a whole family.

6 Easy access to any cabin section. Wide double aisles the length of the plane, plus numerous cross aisles, add to the feeling of spaciousness.

There are other nice things to know about the 747, too.

For example, the superjet flies to 58 major vacation and business centers around the world. Since going into service, the 747 has carried 12 million passengers and flown 150 million miles.

Try a 747 soon. And see how everything adds up to a fun way to fly.

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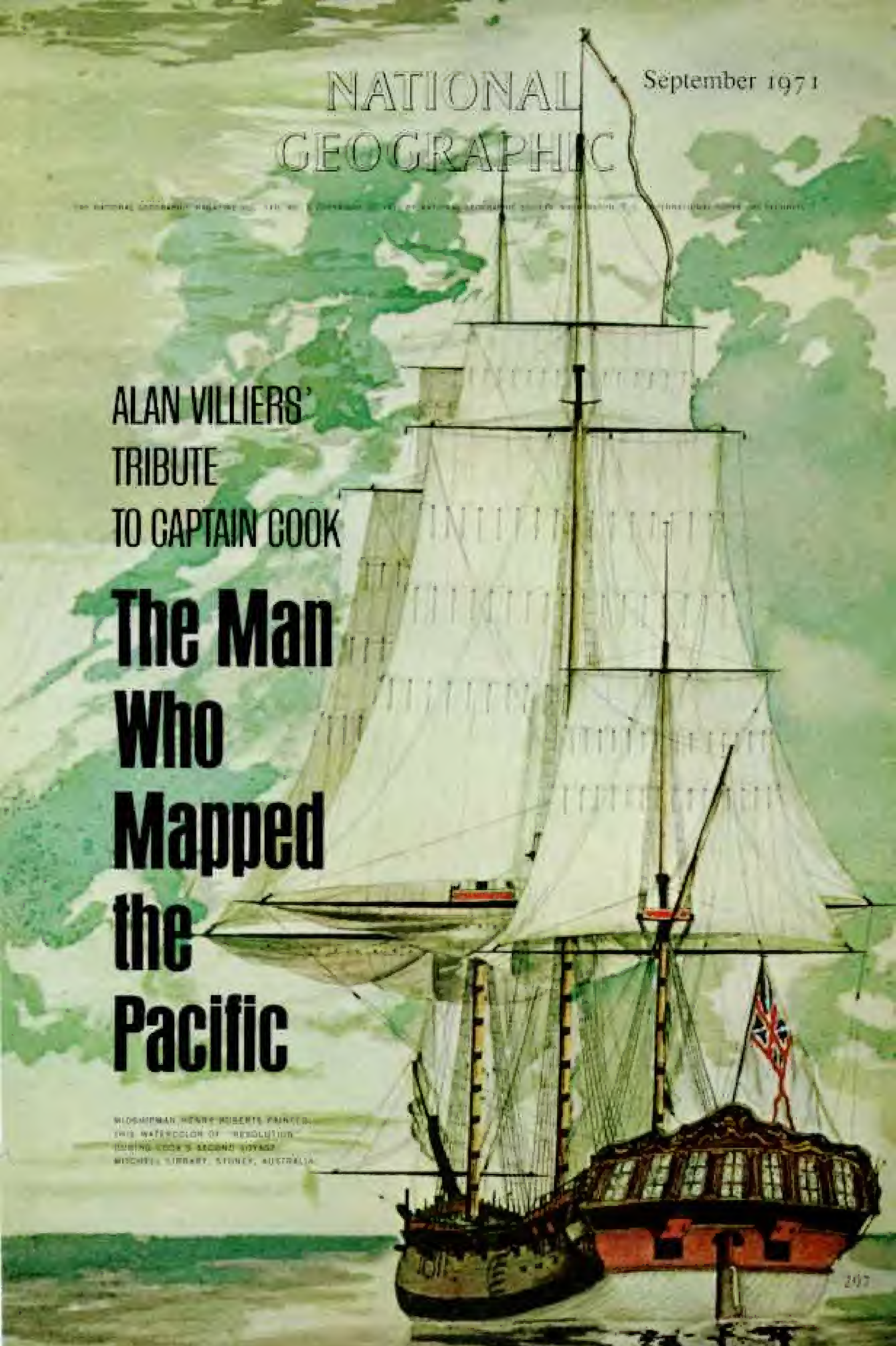
NATIONAL GEOGRAPHIC

September 1971

ALAN VILLIERS' TRIBUTE TO CAPTAIN COOK

The Man Who Mapped the Pacific



MIDSHIPMAN HENRY ROBERTS PAINTED THIS WATERCOLOR OF *RESOLUTION* DURING COOK'S SECOND VOYAGE
MITCHELL LIBRARY, SYDNEY, AUSTRALIA

The VOYAGES and Historic Discoveries of Capt. JAS. COOK

A TRUE and ACCURATE ACCOUNT Undertaken and Performed by CAPT. ALAN VILLIERS

Photographs by GORDON W. GAHAN

I WAS BORN IN AUSTRALIA. I speak English because Captain Cook sailed there 200 years ago. There was a picture of him in our schoolroom in Melbourne showing him landing at Botany Bay in New South Wales—a tall, fine-looking man in old-style British naval uniform.

He was restraining a couple of his men from firing on a group of Australian aborigines, understandably upset at the invasion of their territory. In the background lay his ship, the famous *Endeavour*. With his pleasant, open countenance, he looked such a quiet, kindly man to be a great figure of history. No guns belched from his ship, no cutlasses shone in the Australian sunshine, no captured natives lay in bonds at his feet.

"The most moderate, humane, gentle circumnavigator who ever went upon discoveries"... "the ablest and most renowned Navigator this or any country hath produced"—some of his contemporaries knew the true value of James Cook.

In three great world-circling voyages between 1768 and 1779, this farmhand's son took possession of Australia's east coast for Britain, circumnavigated Antarctica, discovered the Hawaiian Islands, and charted the dangerous west coast of North America for 3,000 miles, from what is now Oregon to beyond Bering

Sailing son of a Yorkshire farmhand, *James Cook learned his trade in coal ships that plied the North Sea. Starting a new career at 27—then an unusually advanced age—he joined the Navy, and served 13 years before earning a commission. In ten years as an officer he learned more about the Pacific than had all the explorers before him.*

OIL PAINTING BY JOHN WEBBER, 1779. COOK WORE THIS PORTRAIT IN HIS MOST RECENT SITTING OUT ON HIS ILL-FATED THIRD VOYAGE. HE NEVER SAW HIS HOME. NATIONAL ART GALLERY, WELLINGTON, NEW ZEALAND

Strait. Through it all, he showed a thorough concern for his men, crowned by his extraordinary victory over scurvy, which until his time was accepted as a necessary evil in ships and destroyer number one of seamen.

Cook's luster is greater today than ever. Queen Elizabeth II traveled to Australia and New Zealand in 1970 to commemorate his opening of those lands to British settlement, and to inaugurate the great bicentenary celebrations which, over the next ten years, will continue in other places that Cook discovered or explored.

At his birth in 1728 James Cook had poor prospects of receiving high tributes from either his contemporaries or posterity. Son of a Scots farmhand settled in a remote village in Yorkshire, he was apprenticed to a grocer and dry-goods merchant at 16. His schooling had begun at 8, ended at 12. He did not begin his sea career until he was 18, in a period when it was customary to go to sea at 11 or 12. He joined the navy late, too, volunteering as an able seaman at the age of 27. He was 40 before he received his first commission as an officer, and he served as a commissioned officer for only ten years. Yet in those ten years he charted more of the Pacific than had been recorded by more than twenty predecessors—Spanish, Portuguese, Dutch, French, English—over the previous 250 years.

THE IMAGE that shone from that picture in my Melbourne schoolroom—of the great humane sailor—stayed in my mind. It was a mind made up even at the age of 9. When I grew up I would go to sea, in ships like Cook's *Endeavour*. I read all I could about him. I would be a sailing-ship captain too.

It took me a long time to realize that dream, but in the end I did. I returned to Australia one day in a ship like Cook's, a full-rigged ship named *Joseph Conrad*, which I commanded and sailed in as much of his track as I dared.

Sometimes in those days I felt very close to Captain Cook—especially once when I got on a reef in the Coral Sea, as he had done on his first voyage. Drifting on a windless day, I was carried off course by currents. My ship touched on the coral, trembled, and stopped. I had to move quickly; the rise and fall of the ground swell would pound the *Conrad*'s bottom on the coral till it holed her.

I was lucky. I got the *Conrad* off that reef fast, by the grace of God, the brawn of my young seamen, and the calm weather. I didn't have to dump ballast, or water, or stores, as Cook had to do (even six of his cannon went over the side). We got a big anchor away and hove her off to it.

The rasping sound of the coral biting at my ship's keel brought home to me vividly the alarm Cook must have felt when his ship hit the Great Barrier Reef in that same Coral Sea in June 1770. The little bark *Endeavour*, a former collier only 106 feet long, had been sent on a twofold mission: To make astronomical observations from Tahiti that would help determine the distance between the earth and the sun; and to search for a conjectural continent, the Unknown Southern Land, with which imaginative map makers loved to fill the blank space that extended across the bottom of the globe.

No one had any real idea at that time what proportion of the Pacific might be land and what water. Cook's predecessors, from Magellan onward, had left the chart of the vast ocean much as they had found it. A squiggle that represented Dutchman Abel Tasman's observations of western New Zealand, Spanish and Dutch outlines of New Guinea and the north, west, and south coasts of the "desert" called New Holland (now Australia), a blob for southern Tasmania—these were almost all that was known of what lay beyond Balboa's wide South Sea.

Until indomitable Captain Cook came.

He had shown great courage to be there among the reefs at all. No man could sail through the shoal-studded maze of the Coral Sea and the Great Barrier Reef and get away with it day and night for weeks on end. The greatest reef system in the world—1,250 miles long by 10 to 90 across, 80,000 square miles of it off Australia's Queensland coast (map, page 323)—it waited with ship-ripping fangs just below the surface. Sailing through such waters, still uncharted, was as great a hazard as a seaman could face anywhere.

"A Reef such as is here spoke of is scarcely known in Europe," Cook wrote in his journal; "it is a wall of Coral Rock rising all most perpendicular out of the unfathomable Ocean . . . the large waves of the vast Ocean meeting with so sudden a resistance make a most terrible surf breaking mountains high especially as in our case when the general trade wind blowes directly upon it."

But Cook was lucky, too, even when he ran aground. His flat-bottomed bark paid off, for she stood up square, even on her pierced hull. She didn't fall over when the tide left her. If she'd done that, she'd have been finished.

When the tide came again and lifted her off, half the crew pumped for their lives while the other half rowed like mad in her boats, towing her. Cook bandaged her —"fothered" is the old term—with a sail bound right around the most damaged area. Then she slowly sailed on to a convenient beach at the mouth of the river now named Endeavour, on the coast of Queensland (below).

When she dried out, he saw that it wasn't the sail bandage that had saved her,

Maimed by the coral teeth *of the Great Barrier Reef, Cook's ship* Endeavour *in 1770 limped to shore on Australia's Queensland coast; repairs delayed the voyage for two months. On this first as well as on his second voyage, Cook relentlessly sought that continent of conjecture, the Unknown Southern Land.*

though it had helped. A coral head had broken off right in the worst hole and jammed there like a cork. It took weeks to patch her up.

Cook summed up the incident in a cool understatement: "Was it not for the pleasure which naturly results to a Man from being the first discoverer . . . this service would be insuportable . . . but it is time I should have done with this Subject wch at best is but disagreeable & which I was lead into on reflecting on our late Danger."

As for those six cannon that he dumped, they stayed right on the reef for almost 200 years. Then, in 1969, they were discovered by an expedition from the Academy of Natural Sciences of Philadelphia, led by Dr. Virgil Kauffman and equipped with underwater metal detectors. Up they came at last, mightily overgrown with coral but still in good condition (page 323).

One summer evening last year, in Britain's National Maritime Museum at Greenwich by the Thames, I watched Prime Minister Edward Heath unveil one of those cannon. I sat among the great of Britain and of many other countries, noble lords and ministers, admirals and ambassadors, listening to the tributes and the applause, and I reflected that so distinguished an assemblage had never met to honor Cook while he was alive. I wondered whether the wraith of James Cook, somewhere out there, might have smiled.

COOK, OF A FAMILY with neither influence nor wealth, began the hard way, in North Sea coasters. These little barks, about as big as modern harbor tugboats, carried coal to London. In the days of sail, coasting was much more dangerous than making long open-sea voyages, for it was land that most threatened the ships. Tides set them upon it, adverse winds blew them upon it, storms drove them upon it. All could be fatal.

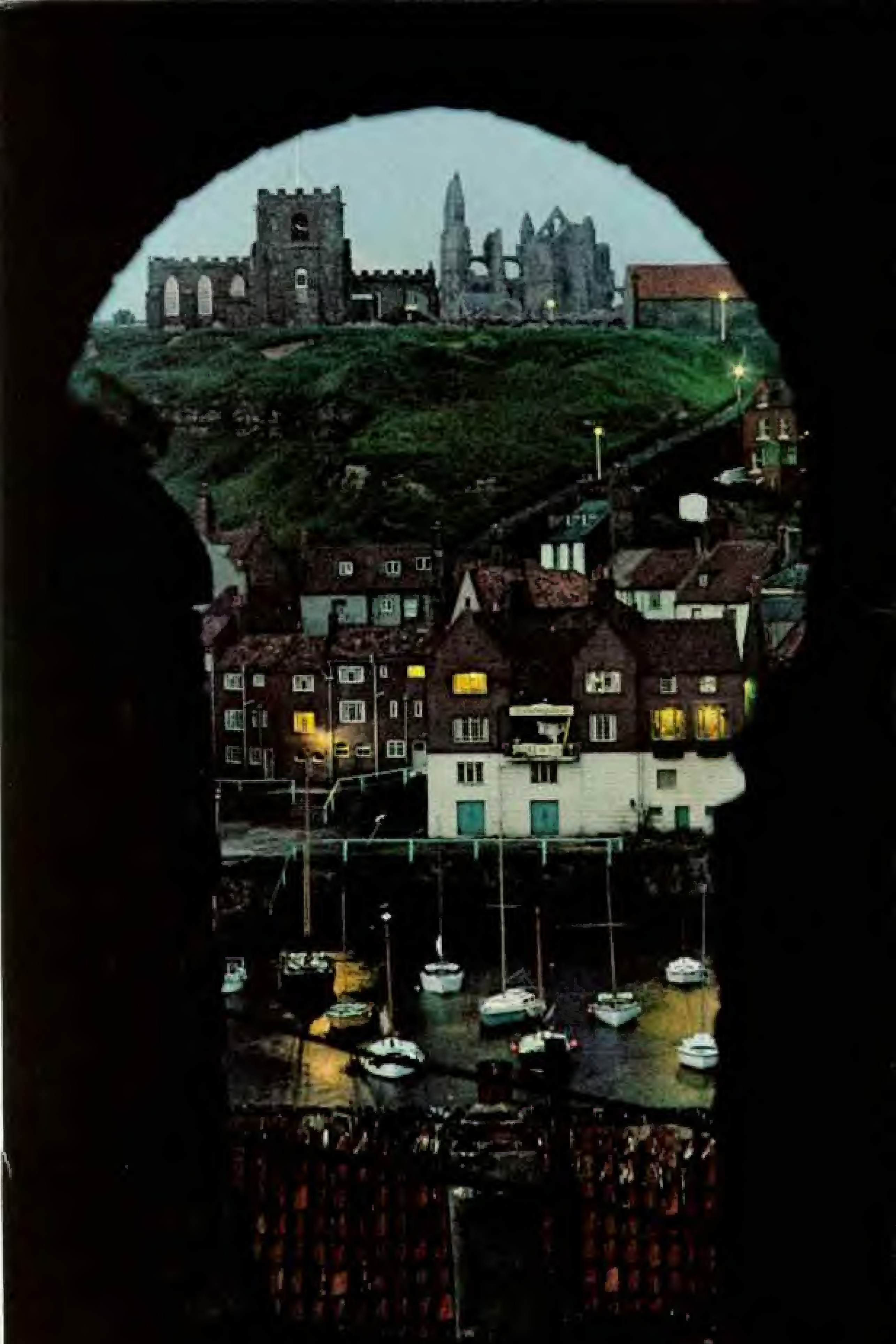
In those North Sea ships a sailor had to know his business, and Cook could scarcely have had better training. After three years as an apprentice and three more as able seaman, he was promoted to mate. By the time he was 27, in 1755, he was selected for command. He turned this down and volunteered into the navy as a plain able seaman; why he did so, he never explained.

Even today, a seagoing mate of a merchant ship might be considered almost crazy to make such a choice. In Cook's day, merchant seamen were press-ganged into navy ships as needed—waylaid in seaports, slugged, drugged, or dragged aboard. Most seamen avoided the king's service if they could.

Very rapidly—for the navy—Cook climbed to the rank of master, a warrant officer, not commissioned, who had charge of sailing the ship but not of fighting her; that responsibility belonged to the commissioned officers. At 29 he was named master of *Pembroke*, a 64-gun ship, for the North American station.

In Canada he distinguished himself by charting the turbulent St. Lawrence River as far as Quebec. This made possible the successful amphibious operation, under Gen. James Wolfe, that dislodged the French from dominant power in Canada. Then, for five years, he made charts of Newfoundland, charts so good that they were still in use a century later. Even in *(Continued on page 325)*

Bleak ruins of an abbey *loom above the harbor at Whitby in Yorkshire, where Cook began his love affair with the sea. Here, at age 18, he apprenticed himself to a coal shipper, but left the merchant trade nine years later. He married Elizabeth Batts in 1762, when he was 34, but spent more than half his married years far at sea. While he was away, death claimed three of their six children.*



First voyage: 1768–1771

Cook, in Endeavour, *charts the South Pacific*

BOUND FOR THE SOUTH SEAS, the *Endeavour* and a complement of 94 seamen and scientists left Plymouth, England, on August 25, 1768.

At Tahiti on June 3, 1769, Cook observed the transit of Venus across the disk of the sun. Thereafter he charted and claimed Tahiti's neighbors; he named them the Society Islands because "they lay contiguous to one a nother."

Then he launched his quest for the Unknown Southern Land. On October 8, 1769, he reached New Zealand, which scholars thought might be its northern tip. Six months later Cook completed the circumnavigation of New Zealand's two main islands, establishing for all time their true nature.

In the middle of 1770 Cook meticulously mapped 2,000 miles of Australia's hitherto unvisited east coast, claiming it for Britain and naming it New South Wales. He nearly lost his ship on the Great Barrier Reef.

Endeavour reached home July 12, 1771, without a single death from scurvy—a historic feat. Dysentery and malaria contracted in Batavia en route home, though, killed a third of the voyagers.

Cook's discoveries won him prominence, promotion, and the opportunity to sail again.

OPPOSITE PAGE FOLDS OUT

Second voyage: 1772-1775
Around Antarctica in Resolution *and* Adventure

COOK'S NEW COMMAND, *Resolution* and *Adventure*, departed from England July 13, 1772—just a year after the first voyage ended. Their mission: Press the search for the Unknown Land.

From Cape Town the explorers sailed toward the bottom of the world, and on January 17, 1773, they became the first men in history to cross the Antarctic Circle.

When progress was blocked by ice fields, Cook retreated north. He spent much of 1773 ranging the Pacific from New Zealand to Tahiti.

Separated from *Resolution* in a storm, *Adventure* briefly continued her quest, then sailed for home. *Resolution* headed back to the Antarctic. In January 1774, with impenetrable ice ahead, Cook reached his southernmost point at 71° 10′ S. If a continent did lie farther south, he reasoned, it must be fit only for penguins.

On his long voyage Cook charted and named the New Hebrides, New Caledonia, and South Georgia.

He arrived in England on July 30, 1775—a year after *Adventure* had returned. Only four of *Resolution's* company had died on the three-year, 70,000-mile journey—again, none from scurvy.

Third voyage: 1776-1780
To the North Pacific in Resolution *and* Discovery

LEISURE REJECTED, Cook volunteered to head a third expedition to the Pacific, this time to look along the North American coast for the long-sought northern passage from the Atlantic. On July 12, 1776, he sailed in *Resolution* again; her new consort, *Discovery*, soon followed.

In December of 1777, after numerous stops at South Pacific islands, they entered the North Pacific, where Cook discovered Christmas Island. On January 18, 1778, the explorers became the first Europeans to see and visit the Sandwich Islands—Hawaii.

From March 7 through August 18, 1778, they charted the North American coast from Oregon northward through Bering Strait. Eleven days after reaching 70° 44′ N. —their northernmost point—the ice prevented further probing; the ships returned to Hawaii for the winter.

There, on February 14, 1779, an encounter with natives cost Cook and four marines their lives (page 348).

Their commander gone, the ships sailed north again, but again the Northwest Passage eluded them. On October 4, 1780, after four years and three months, they returned to England from one of the longest voyages of discovery in history.

HIS MAJESTY'S BARK

Endeavour

1 BOWSPRIT AND JIBBOOM
2 KNIGHTHEAD
3 FOREMAST
4 CATHEAD
5 ANCHOR
6 FO'C'SLE
7 FIFE RAIL
8 BELFRY
9 WINDLASS
10 GALLOWS
11 MAIN DECK
12 MAIN HATCH
13 PUMP
14 MAINMAST
15 CAPSTAN
16 QUARTERDECK
17 WHEEL
18 MIZZENMAST
19 VENTILATOR
20 TILLER
21 SWIVEL GUN
22 GREAT CABIN
23 MR. BANKS'S CABIN
24 ASTRONOMER'S CABIN
25 LOBBY
26 CAPTAIN COOK'S CABIN
27 DRAFTSMAN'S CABIN
28 ARTIST'S CABIN
29 PANTRY
30 CARPENTER'S CABIN
31 CARPENTER'S STOREROOM
32 GALLEY
33 SAIL ROOM
34 BOSUN'S CABIN
35 BOSUN'S STOREROOM
36 CARRIAGE GUNS
37 MAGAZINE AND LIGHTROOM
38 SHIP'S SUPPLIES
39 BALLAST
40 STEWARD'S ROOM
41 GUNNER'S CABIN
42 SURGEON'S CABIN
43 1ST LIEUTENANT'S CABIN
44 2ND LIEUTENANT'S CABIN
45 SAILING MASTER'S CABIN
46 RUDDER

"**A BETTER SHIP** for such a Service I would never wish for," commented Cook of his *Endeavour*, a craft only 106 feet long and 29 feet wide. A converted collier, she incorporated all the features Cook demanded in his oceangoing vessels. The round bluff bow and wide deep waist provided uncommon spaciousness; the small size and broad bottom permitted easy beaching for repairs and stability if the ship were to ground. Below the waterline *Endeavour* had an extra skin of thin planking fitted to the hull with thousands of closely spaced flatheaded nails—a precaution against wood-boring shipworms. Outfitted for peaceful exploration, the crowded bark also carried ten carriage guns and 12 swivel guns for defense.

Devoted to the scientific aspects of the voyage, Cook volunteered the Great Cabin for use by the expedition naturalists—even though the room

was one of the few places in the ship where Cook, more than six feet tall, could stand erect. Here he confers with a scientist on the main deck above the cabin.

Endeavour ended her career on a Rhode Island reef in 1795, but her accomplishments still inspire men. Apollo 15 astronauts gave her name to their command spacecraft. They saw their lunar voyage, with its emphasis on scientific discovery, as a modern parallel of Cook's trailblazing first expedition.

By a primitive but reliable means, an underwater swimmer at Tahiti measures clearance between his boat's keel and the ship-killing coral. A Polynesian priest, Tupaia, used the same method two centuries ago to guide *Endeavour* through these reef-strewn waters. Voluntarily piloting the craft through the Society Islands, Tupaia, aboard ship with Cook, directed islanders in accompanying canoes to plunge into the sea and check the depth wherever he suspected danger.

Elsewhere in such circumstances, crewmen forged ahead in small boats to plumb the depths with lead-weighted lines. In 1770 when Cook blundered into "the very jaws of distruction"—the Great Barrier Reef—his ship depended on a sounding boat for more than 1,000 miles.

PEARL OF POLYNESIA, *craggy Bora Bora rises within a barrier of coral and lashing surf that thwarted Cook's only attempt to harbor here. Shattering the little island's isolation, an airstrip on the islet at lower right now regularly attracts visitors from neighboring Tahiti.*

Whisper-soft firelight enhances the beauty of a Tahitian dancer being anointed with coconut oil. During Cook's visits here, even a sliver of metal would win for a sailor the company of an island girl. Such bartering forced Cook to post guards on the ships to keep seamen from prying nails out of the planking.

All in a lather, a Tahitian youth surges to shore on a board. Here Cook first observed canoe surfing. It was the "almost amphibious" Hawaiians, though, who first demonstrated the surfboard, which, one of Cook's lieutenants wrote, "sends them in with a most astonishing Velocity . . ."

Grimacing like a gargoyle, this greasepainted Maori dancer (**left**) entertains tourists at a New Zealand hotel. In Cook's time, a tattooed predecessor (**right**) would have used the same expression to frighten away visitors. The fearsome Maori war dance, wrote a surgeon's mate on Cook's ship, "is admirably calculated to strike Terror into their enemies, consisting in violent Gestures & contortions of their Faces & Bodies, hanging out their Tongues, staring as if theyr Eyes were ready to start out of their Heads. . . ."

FROM A DETAIL OF "ENDEAVOUR" WATER WORKS PAINTING,
ALEXANDER TURNBULL LIBRARY, WELLINGTON

Regal blend of two cultures, Lady Miria Woodbine Pomare is the daughter of a Maori and an Englishman. According to family legend, an ancestor of this widow of a knighted Maori saw *Endeavour* in 1769 when the ship first approached New Zealand off Young Nick's Head. Lady Pomare, now in her 90's, traces her family tree to Tahiti, whence forebears of the Maori are thought to have immigrated to New Zealand in canoes more than 600 years ago.

Arrayed here in a traditional cloak ornamented with parrot, pheasant, and pigeon feathers, and holding a kiwi-feather bag, Lady Pomare sits beneath her own portrait in a Maori meeting hall at Wellington, on the North Island.

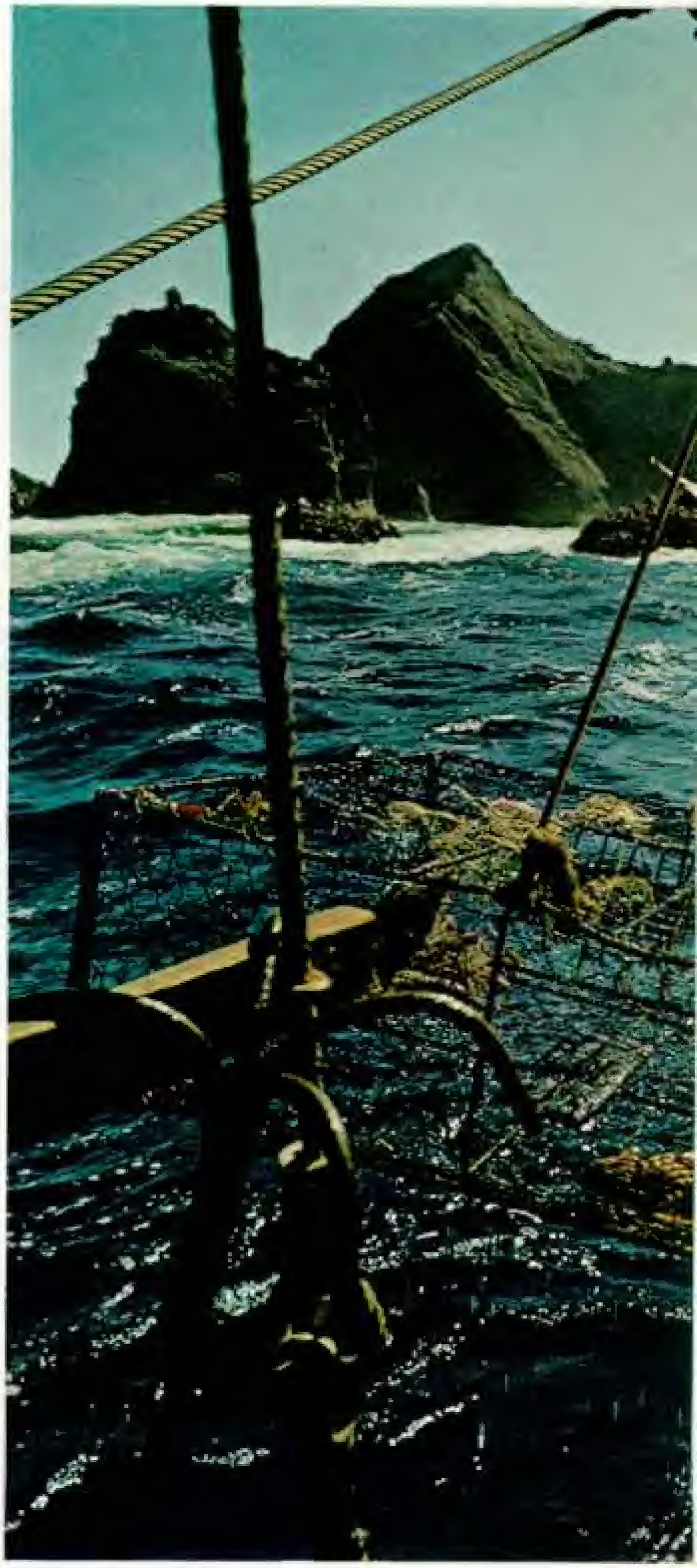
PHOTOGRAPHS (1971) BY ADELTON M. EDWIN AND
BOUDEWIJN BY JAMES A. SUGAR © N.G.S.

Teeming cupboard for Cook's spent seamen, New Zealand's Dusky Sound still offers a wealth of fish and game for the lonely few who venture into its remote reaches. This fisherman hauls up a crayfish pot (**right**).

During 1773, after traveling 11,000 miles in 17 weeks without a glimpse of land, *Resolution*'s crew rested for a month and a half in this fjordland region at the southwest tip of the South Island.

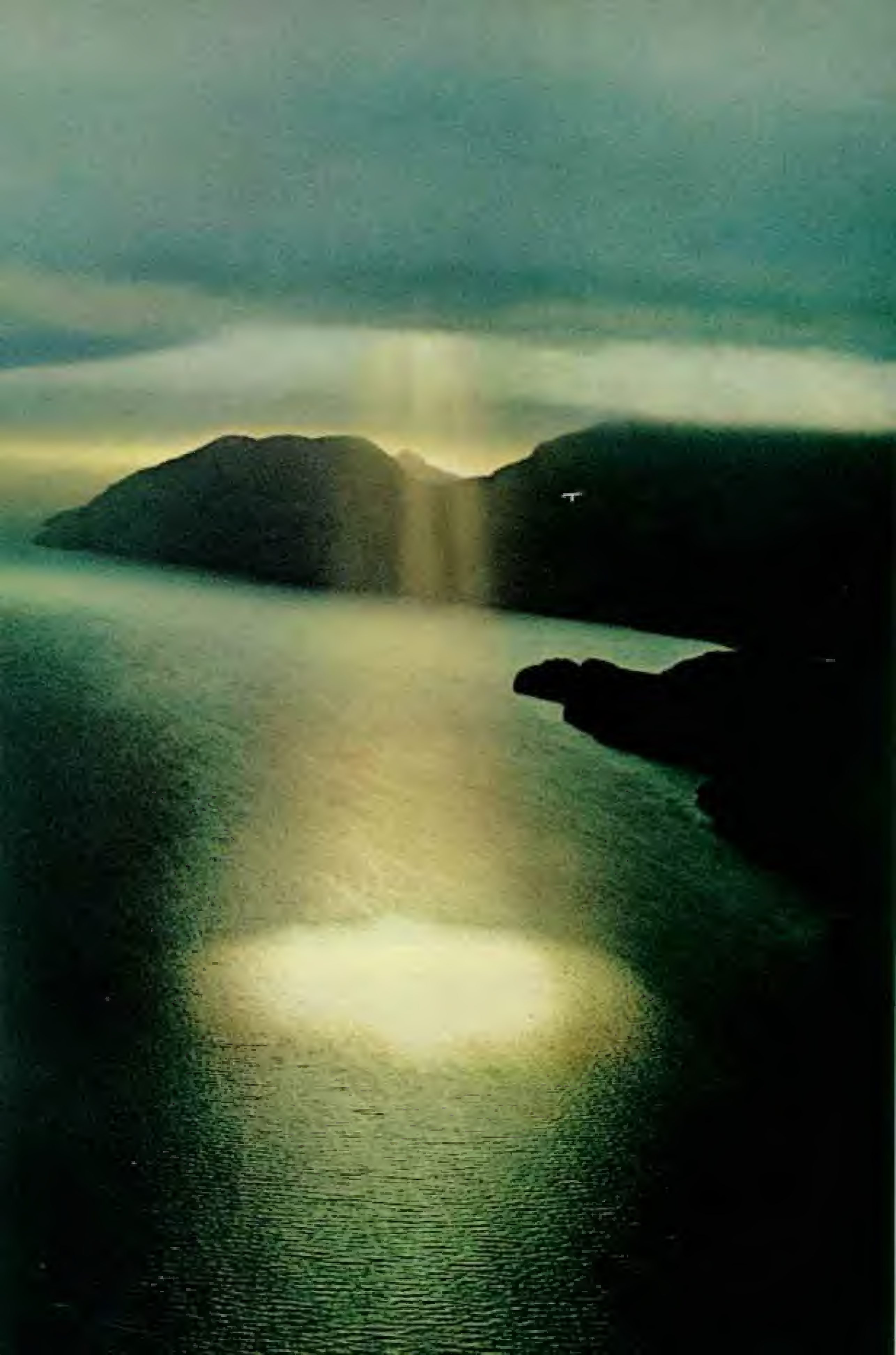
Here the ship's landscape painter sketched a Maori family (**below**) that Cook had met and rubbed noses with in their traditional manner of greeting.

FROM AN ETCHING BASED ON A PAINTING BY WILLIAM HODGES, MITCHELL LIBRARY, SYDNEY, AUSTRALIA (RIGHT) © N.G.S.



"THIS BAY I HAVE NAMED DUSKEY . . ."
Cook wrote in his journal when he first came here in 1770, in the murky blue-dark of day's end. It must have appeared to him much as it does in this photograph, with a single shaft of sunlight breaking leaden clouds.

KODACHROME © N.G.S.



Mincing and bobbing like great flightless birds, clay-streaked Djinang tribesmen of Australia imitate emus in an ancestral dance (**right**). The story of a hunt unfolds on a beach of the Arafura Sea (**below**), near the home of the performers. A hunter, camouflaged by a leafy branch, creeps within yards of his emu prey, portrayed by a fellow dancer. The startled bird breaks and runs. Too late! The spear, catapulted from the hunter's throwing stick, finds its mark. The emu stumbles, then slumps to the ground, mortally wounded.

When the drama ends, the "victim" releases the spear from beneath his arm, where he had caught it, and rises unhurt to perform again.

Cook in 1770 found the aborigines a shy but fearless people who often greeted his efforts at friendship with a hail of spears, which they could hurl 40 to 50 yards with deadly accuracy.

Despite such encounters, the gentle navigator admired and respected the primitive tribesmen. His ship's journal records his feelings about them: "in reality they are far more happier than we Europeans . . . they live in a Tranquility which is not disturb'd by the Inequality of Condition; the Earth and sea of their own accord furnishes them with all the things necessary for life. . . ."

Devilfish express: A snorkeler hitches a ride from a 14-foot manta ray, escorted by striped remoras, while diving over the Great Barrier Reef. The treacherous maze stretches 1,250 miles along Australia's northeast coast. Lying a hundred miles offshore at its southern extremity, the reef angles to within about ten miles of the mainland as it

Its booming voice forever stilled, this coral-encrusted cannon (**below**) made up part of the 50 tons of weight heaved overboard when Cook's ship grounded on the Great Barrier Reef (**above**). The hammer and crowbar belong to members of a Philadelphia Academy of Natural Sciences expedition that raised this and five other guns in 1969.

ANNOTATIONS BY BEN CROPP AND EXPLORATIONS (RIGHT) BY [illegible] © N.G.S.

extends northward. Funneled into the jaws of the 80,000-square-mile hazard, northbound *Endeavour* in 1770 soon became impaled on razor-sharp coral.

(Continued from page 302) recent years, when I was in those waters with Portuguese dory fishermen in the schooner *Argus*, I noted that authorities for some of the charts we used included "James Cook, Master and Surveyor."*

And as the *Argus* navigated those treacherous waters, I marveled too at the grim hazards he had coped with. The Labrador Current sweeps along assorted floes, pack ice, and icebergs. Fog, sunken rocks, freezing gales compound the perils.

In spite of all this, James Cook found time to be a meticulous scientist too. When an eclipse of the sun was observable from these waters in 1766, he made thorough observations. Though he couldn't spell and was no writer, he sent a well-received paper on his day's work to the great Royal Society in London—an unheard-of achievement for a noncommissioned naval officer.

Just about that time, the savants of the Royal Society, with the Lords of the Admiralty, were planning the *Endeavour* voyage, which James Cook was to make so triumphantly his own. Why did they give him the command? He was still a warrant officer, a master only. He had never even crossed the Equator. He had never had command of any expedition. It looks simply as if the Lords of the Admiralty for once exercised a considerable degree of intuitive genius in selecting Cook. At any rate, at the age of 40, he was commissioned lieutenant—bottom of the officer ladder then—and put in command of *Endeavour*.

NAVY SHIPS OF THOSE DAYS were manned on a scale to allow for heavy casualties to scurvy and to cannon, and the little *Endeavour* did not provide much in the way of adequate quarters for the 94 officers, scientists, seamen, and marines who crowded aboard her (cutaway painting, pages 307-309). Among these was an enterprising young botanist named Joseph Banks—later Sir Joseph, president of the Royal Society for 40 years—who went along as chief scientist. Banks was a very rich young man, a great landowner. He came aboard with four personal servants and two big dogs, one a greyhound, but the accommodating Lieutenant Cook took that in stride too.

It was a good thing for science that Banks was aboard. His presence greatly widened the scientific scope of Cook's voyage, and inaugurated the custom of carrying exceptional landsmen on naval expeditions. Had Banks not set the precedent, Charles Darwin might never have sailed aboard the *Beagle* 60 years later.†

After crossing the Atlantic, the little *Endeavour* sailed down the east coast of South America. She was an object of scorn and disbelief at Rio de Janeiro, where the Portuguese viceroy refused to believe she was a king's ship at all, and kept Cook aboard like a prisoner. But riding the rough wind, stubborn on her stumbling way, *Endeavour* rounded the Horn and made for Tahiti.

What that little bark must have endured I did not have to imagine when, in 1936, I made the Cape Horn passage from Tahiti in the *Joseph Conrad*. The wind roared in the rigging, and the few sails still set picked the ship up and flung her along. Sea after snarling sea thundered at her, often throwing wild eruptions of spray and spume right over her.

*See "I Sailed With Portugal's Captains Courageous," GEOGRAPHIC, May 1952.
†Captain Villiers wrote "In the Wake of Darwin's *Beagle*," for the October 1969 GEOGRAPHIC.

Bypassed by Cook in 1770, *Port Jackson now sprawls at the heart of Sydney, Australia—a metropolis of 2,750,000 persons. Its 152 miles of shoreline form one of the world's finest harbors. Cook saw but did not enter this inlet as he sailed from Botany Bay, at top right; he named it for a judge advocate of the British fleet.*

RESEARCH BY JOYCE A. TOWER AND N.G.S.

I faced this in the *Conrad*, and worried. But Cook's hazard was worse. *Endeavour* was built of wood; it leaked. My *Conrad* was of iron, my rig was modernized with supporting shrouds of wire, lower masts of iron, topsail sheets of chain. *Endeavour*'s rigging was of hemp. But her captain was Cook. She survived.

I did what I knew he would do, had he been sailing the *Conrad*. He would heave to, get the canvas off her, let her lie shoulder to the sea, helm lashed down, the ship yielding to the rise and fall of the huge waves, driving to leeward—safe, like an old albatross asleep. Thus I hove to on that Cape Horn passage, before running on again. I was 37 days on the way, and thanked God, and the shade of Captain Cook watching at my shoulder.

Cook sailed on to Tahiti, nearly 5,000 miles northwestward. That island had already been visited by an English and a French explorer, and *Endeavour*'s crew had been yarning for months about its fleshly attractions: A present of a small nail would win a sailor a girl, and a spike would finance a harem for a month. The Tahitians, who knew nothing of metal, would trade almost anything to possess this marvelous material. The previous British ship, *Dolphin*, in which Samuel Wallis had discovered Tahiti, had almost sunk because in one month the crew had surreptitiously extracted so many vital spikes and bolts from her interior that her structural integrity was threatened.

FOR THREE MONTHS *Endeavour* was to be in Tahiti, and Cook took immediate precautions. He placed the ship's hardware under guard and decreed: "No Sort of Iron, or any thing that is made of Iron, or any sort of Cloth or other usefull or necessary articles are to be given in exchange for any thing but provisions." Though Cook was well loved by his crew, this regulation seems to have been badly breached. Two seamen who absconded to the hills with fully paid-for native wives were seized and put in irons.

When I visited Tahiti recently, Matavai Bay, where Cook anchored, was empty of ships. On nearby Point Venus a museum and monument, since completed, were being erected in memory of Cook and his predecessors there, Wallis and Louis de Bougainville. Tahiti, shaped like a mountain-packed figure eight, is still the beautiful island Cook knew, though modernity has banished the grass-skirted maidens to hotel dance floors. Cook and Banks made a circumnavigation of the whole of it by boat and on foot. It took them six days. To drive around the main part of the island took me only a pleasant morning.

The captain and the scientists often stopped at wayside temples called *marae*. At one of these, on his third voyage in 1777, Cook saw a human sacrifice (opposite).

I attended a reenactment of an ancient ceremony, the enthronement of a high chief, at the old Marae Arahurahu at Paea, which has been reconstructed. The dark basalt and ancient coral of the open temple stood in a valley of wild beauty. Tahitians speaking in their own language, dressed in rich cloaks and high ornate helmets, droned ancient incantations. Heralds escorted the new chief, and a sinuous and shapely vahine danced before him.

The Tahitians I watched made their parts meaningful. It all seemed real to them. There was a long bundle secured on a carrying pole in a corner. This was the "human sacrifice"—but there was nothing human about it. It was just a lash-up of old tapa, not the real thing that so horrified Captain Cook.

After the Tahitian visit, *Endeavour* left the zone of favorable southeast trade winds, thus abandoning the safe beaten track back to Europe around the north of New Guinea. Cook struck south and west into the unknown.

FROM AN EXHIBITED SKETCH BY PROFESSIONAL ARTIST JOHN WEBBER, AUTHOR HIMSELF

Guests at a human sacrifice *on Tahiti, Cook and his party gamely watch priests murmur ritual phrases over the victim, a man chosen at random from the island's lowest social class and ambushed and clubbed to death earlier. After the liturgy, an eye from the corpse—symbolic of the whole body—was plucked out and offered to the islanders' god; then the body was buried in the shallow grave nearby. The skull would eventually be unearthed and added to the 49 that Cook counted on the platform beyond the animal-sacrifice scaffold. The trellislike devices rising among the skulls represent honored ancestors.*

Down there was no vast Unknown Southern Land extending far up into the Pacific, but the two long, lovely fertile main islands of New Zealand and, beyond them across the Tasman Sea, the east coast of the great land that was to become the Commonwealth of Australia.

Cook first charted 2,400 miles of New Zealand's coasts. The Maoris were sure the Britishers were supernatural beings because they rowed ashore facing aft, and so must be able to see through the backs of their heads. Besides, they could remove their skins (their coats) and some (who wore wigs) their scalps as well.

Fifty years later, a Maori chief remembered: "There was one supreme man in that ship. We knew he was the lord of the whole by his perfect gentlemanly and noble demeanour. He seldom spoke, but some of the 'goblins' spoke much. He came to us and patted our cheeks. My companion said: 'This is the leader, which is proved by his kindness to us; he is also very fond of children. A noble man cannot be lost in a crowd.'" The Maoris appreciated Cook.

After New Zealand, according to his orders, he could have turned back eastward to reach the Atlantic—and England—by way of Cape Horn. The winds were favorable, the distance to the Horn some 4,700 miles. But James Cook did not do things the easy way. That great blank upon the map, the thousands of miles of the eastern face of "New Holland"—the future Australia—challenged him.

He headed his little ship west again. Instead of five months, it took more than 15 to reach home by way of the Tasman Sea, the east coast of Australia, the Coral

Sea, the Great Barrier Reef, the Torres Strait, across the Indian Ocean and around the Cape of Good Hope—the first part of this a monumental passage that no European had ever made (map, page 304). On his very first Pacific voyage, this Columbus of the South Seas had given men a new view of their world.

ONE SUNNY DAY I sat on a beach south of Wollongong on the coast of New South Wales and thought about all this: How the farmhand's son had come upon the fertile east coast of my country after so many others had passed it by, maybe because they'd heard of that Coral Sea and its maze of reefs.

The southeast wind blew pleasantly across the blue water, as empty as the day Cook came to Australia. He sailed 2,000 miles of its unknown coast. The only humans he met were aborigines, poor Stone Age fellows. At Botany Bay, he raised the flag for King George. The aborigines kept out of the way, except to go fishing in their primitive canoes—"the worst I think I ever saw," said Cook.

Today, for 150 miles north of the beach on which I sat, stretches the incipient megalopolis where a fourth of all Australians now live—more than three million of them, two and three-quarter million in Sydney alone (page 324). Where a few primitives had once fished and thrown boomerangs, eking out a meager living, now the eastern shore of a lively, pulsating continent carries far more people than lived in the whole South Pacific when James Cook first sailed there.*

To add a mite to the honor due him, I made a pilgrimage to Botany Bay, to the new museum maintained by the trustees of Captain Cook's Landing Place. Acting on behalf of the Newport Historical Society in Rhode Island, I presented an old piece of English oak to the museum. Misshapen and bashed, it didn't look like much. But it had been part of the sternpost of the famous *Endeavour*.

She did not reach fame until long after she had fallen to pieces, after grounding on Rhode Island's Brenton Reef in August 1795. She was then a French whaler named *La Liberté*. But in my country she will, of course, always be the *Endeavour*.

When Cook sailed *Endeavour* home to England, Mr. J. Banks was acclaimed, for he was known among society; Lieutenant Cook was not. Mr. Banks had indeed made great contributions to science and returned with fabulous collections. But Lieutenant Cook's astonishing scientific feat in bringing the ship's company home without a single death from scurvy was not at first fully appreciated.

We know today that scurvy is caused by a deficiency of vitamin C. On long ocean voyages fresh vegetables and fruit—rich in vitamin C—were unavailable. Before Cook's pioneering efforts to prevent it, the disease decimated ships' crews. It was an ugly, frequently fatal affliction, running through debility, depression, loss of teeth, and hemorrhages, to death.

In 1747 James Lind, a Scots naval physician, showed that lemon juice could cure the disease. The *Endeavour* had a small supply of it aboard, to be used only as a cure, not a preventive, for there was never enough of it.

In his search for more readily available preventives, Cook tried "portable soups"—thick brown meat broth issued by the Admiralty in concentrated slabs so well preserved that there are specimens of them from the *Endeavour* at the British National Maritime Museum to this day. Stuff which Cook—no genius at spelling—called "Sour Krout" he took aboard by the barrelful in quantities sufficient to allow every seaman two pounds a week for at least a year, and this went into the soups too (page 338).

At first his sea dogs spat it out, claiming it spoiled the soup. Cook, who knew

*Captain Villiers described his native land in a two-part article in the September 1963 GEOGRAPHIC.

seamen, simply stopped their kraut for a week, said nothing, and increased the amounts served in the officers' mess, with quiet instructions that all there should eat the stuff with obvious gusto, even if feigned. This "favoritism" toward officers being duly reported to the seamen by the officers' servants, the idea grew that perhaps the infernal kraut had something after all, and soon the mariners were shouting for it. Hunger and envy are great persuaders. Cook must have smiled.

When *Endeavour* reached bleak Tierra del Fuego, Cook sent the men in quest of "scurvy grass" and "sellery," and these appalling—but effective—greens went into the soup too. In kindlier climes, Cook bought or gathered onions, fruits, all sorts of fresh vegetables.

His critics claimed that the new places Cook had charted—New Zealand, inhabited by warring cannibals; Australia, its northeastern shore guarded by coral, the abode of primitives who produced nothing—did not sound like the stuff of instant empire far off at the end of the world. What of the Unknown Southern Land? There was still room in the southern ocean for a great continent, particularly in the Pacific between New Zealand and South America, where no ships had yet searched.

So Cook, promoted to the rank of commander (not to captain, as he should have been) was sent off to look again. This time he was given two little ships, both of them former Whitby colliers, because the chances of losing a single ship were

PARKINSON SOWERBY/NATURAL HISTORY MUSEUM, LONDON (LEFT); ARTIST'S PAINTING BY J. E. HOECH

Winging to Europe *on a sketch pad, the red-tailed tropic bird of the Society Islands makes up part of the collection of wildlife drawings compiled by* Endeavour *artist Sydney Parkinson, who died en route home from the first voyage.*

Capturing the magic *of faraway places on the second voyage fell to naturalist Johann Reinhold Forster and his draftsman son George. Men of science accompanied each of Cook's expeditions and expanded both his and the world's knowledge. The first voyage included a future president of Britain's famed Royal Society, the wealthy young botanist Joseph Banks, who paid all the expenses of the scientists aboard* Endeavour.

considerable. For Cook's orders were to circumnavigate the Antarctic region and to probe down there to find a new continent or dispel the idea forever.

One day in July 1772 Commander Cook sailed again from Plymouth, Devon, in His Majesty's sloop *Resolution* (page 297), about 120 feet long, accompanied by the smaller sloop *Adventure*, Tobias Furneaux commanding.

Mr. Banks, unfortunately, was not in either, for he had wanted virtual command of the whole expedition and so large a retinue (including scientists, artists, servants, and two musicians) that the *Resolution* had to have an overbuilt upper deck to accommodate them. With this she was so crank she could not sail. Off came deck, retinue, and Banks—which was a pity.

The idea of two ships being better than one did not work well. In the fogbound sub-Antarctic wastes, *Resolution* and *Adventure* became separated, met at a rendezvous in New Zealand, and were separated again. *Adventure* returned to England a year before *Resolution*. It was July 1775 before Cook was back, after a voyage of three years and 18 days.

He had done all he set out to do, and a great deal more. He circumnavigated Antarctica, and *Resolution* became the first ship to cross the Antarctic Circle—three times in all. Cook reached as far south as 71° 10', in the southern Pacific; while still with the *Adventure*, he had come within 100 miles of Antarctica in the Indian Ocean, but never glimpsed land. He sailed around the whole area, disproving the myth of a huge, inhabited southern land. If there was such a continent, it was locked behind ice (map, page 305).

Without heat other than an improvised stove or two, *Resolution* could sail the Antarctic only in the short summer seasons, and perilously then. So Cook had to make his southern voyage in three sections, sailing away each time as fall came. Otherwise he would have been frozen in down there forever.

For more than 12,000 miles he accepted the hazard of ice in the form of floes, bergs, and pack, as well as fog, storms, and calms (page 340). He looked after his people, issuing clothes of wool and baize. The intense cold was hard on everyone, and the ship never properly warm. Cook himself was so ill with intestinal trouble that he nearly died.

WHEN I SAILED IN COOK'S TRACKS in the ship *Joseph Conrad*, I kept clear of the Antarctic as too dangerous. I judged it prudent never to approach the Antarctic Circle closer than necessary, and the closest I came was south of the Diego Ramirez Islands, by Cape Horn. It was a stormy, savage road; I had troubles enough.

The only voyage I ever made into the real Antarctic was in 1923-4 aboard a 13,000-ton whale factory ship. She was the *Sir James Clark Ross* of Sandefjord, Norway, Capt. Carl Anton Larsen commanding, bound for the Ross Sea. The *Ross* had plenty of power, steam-heated quarters, and five stalwart steel whale chasers in company. At the time Captain Larsen was the most experienced Antarctic seaman in the world.

We bashed and pounded through an infinite field of pack ice for a week, and were often stopped altogether. Then we climbed *(Continued on page 339)*

Christianity's servants *followed European explorers to the far corners of the oceanic world, as evidenced by this baptism on Rarotonga in the Cook Islands. The religion here dates from 1823, when the Reverend John Williams of the London Missionary Society arrived in search of converts.*

Undisturbed by chattering artists, an infant drowses on a tapa-cloth memorial to Tonga's Queen Sālote, who died in 1965. After the women finish inking the designs, the 12-by-75-foot sheet will be displayed only on such special occasions as state marriages and funerals. To make the material, islanders peel the bark from paper mulberry trees, soak the separated inner layer, then pound it long and vigorously with grooved mallets. The strips thus produced are glued in numbered sequence into one piece.

At the coronation of King Taufa'ahau Tupou IV, son of Queen Sālote and ruler of the last Polynesian monarchy, one of the island villages blanketed its main street with tapa for a mile. Cordiality of the Tongans led Cook to name the archipelago the Friendly Isles.

"They hang swing-swang to the branches of the tops of high trees & sleep all day, they have a head and nose like a dog."
Thus Cook's astronomer William Bayly described the cat-size fruit bats of Tongatapu in the Tonga Islands. A royal edict designed to preserve the species protects the "flying foxes" from the vengeance of mango farmers whose crops they raid by night.

Ephemeral footprint of a sprinting youth in the black volcanic sand on Tanna recalls the warlike New Hebrideans who fled from a beach at the sound of a gun on Cook's ship

Glowing fountains of Yasur Volcano, a legendary meeting place for the spirits of Tanna's dead, "... made a terrible noise throwing up prodigious columns of Smoak and fire at every

ACCIDENTAL TORNADO AND LIGHTNING ABOVE AND OPPOSING PAGES: © N G S

eruption . . ." wrote Cook. Islanders believed the evil spirit Iaramus spilled scorching matter from the volcano's mouth as he clumsily played with fire and blistering stones inside the vent.

Drawn like moths to the coconut-leaf torches of New Hebrides fishermen (following pages), flying fish soar from the water and often plop into the outrigger canoes.

(Continued from page 330) overboard and sawed and axed and dynamited to keep the big ship free in the ice, lest she be crumpled like a tin can.

I thought of Cook and Furneaux battling such conditions in their minute wind-driven ships; of a young midshipman in the *Resolution* named Vancouver who, just before the ship was swung about to head north again, clambered near frozen to the jibboom end. He stood out there and shouted delightedly, "I am the farthest south man in the world!" As indeed he then was, and probably remained (by the length of the ship's bowsprit) for the next 49 years, until Englishman James Weddell sailed deep into the Antarctic sea that bears his name today. Later, George Vancouver would become an explorer on his own, leaving his name to a city and an island on Canada's Pacific coast.

On one of his swings to the north, during the Antarctic winter, Cook was back briefly in Tahiti. He saw there a fleet of more than 300 war canoes, splendid double-hulled craft, gay with streamers, full of warriors in coconut-fiber breastplates and helmets. One canoe was 108 feet long—nearly the length of Cook's *Resolution*.

The sight of such a fleet stirred the captain to reflect on his relationship with the Polynesians of Tahiti. "Three things made them our fast friends," he wrote, "Their own good-Natured and benevolent disposition, gentle treatment on our part, and the dread of our fire Arms. . . . They are very sencible of the superiority they have over us in numbers and no one knows what an enraged multitude might do."

While Cook had charge of the visiting Europeans, there never was an "enraged multitude"—not until his last day alive. He was, however, sometimes sorely tried by the Polynesians. Pilfering was carried on with such an air of childlike innocence —it seemed to be an amusement—and restitution made so cheerfully on discovery that it was impossible for Cook to be angry for long. It was hopeless to get them to mend their ways. Giving a purloiner a dozen of the best made no difference, for they accepted the flogging as just, and went away to try another day (taking the cat-o'-nine-tails with them if possible, or anything else handy).

WHEN *Resolution* came home in late July of 1775, James Cook was at last publicly honored. He sent to the Royal Society a report of the means by which he brought back his crews without a single loss to scurvy on two of the longest voyages ever made. Now the society voted him their Copley Gold Medal, Britain's highest honor for intellectual achievement—an extraordinary distinction for the farmhand's son, graduate of no school, holder of no degree.

In recognition of his feats as indefatigable seaman-discoverer, Cook was promoted to captain at last, and given an appointment to the board of Greenwich Hospital that assured him time to work on his observations, journals, and papers, and to renew his acquaintance with Mrs. Cook and their children.

Poor Mrs. Cook! She had not seen much of her husband. He had been at sea for at least six of the preceding seven years, or preparing ships to go again. Life could not have been easy for quiet, self-effacing Elizabeth Cook. Each time her husband

Tyrannical only about diet, *Cook cajoled, punished, bluffed, and tricked his seamen into eating scurvy-fighting fare. Before his monumental voyages, the disease had decimated crews of oceangoing vessels. England's scientific community paid Cook high tribute for proving that scurvy could be avoided by regular consumption of such foods as these, assembled aboard Admiral Nelson's 18th-century flagship* Victory *at Portsmouth, England. They included steaming "portable soup," made from slabs of dried meat broth and laced with wild greens, and kerchief-wrapped "scurvy grass," "Sour Krout," and other dishes rich in vitamin C.*

Fresh water comes in chunks, *the men of the* Resolution *learned during Cook's second voyage. In this sketch by William Hodges, seamen hack away at ice fallen from an Antarctic berg; the ship's naturalists in another boat try to down seabirds. The brine-soaked drifting ice supplemented a cleaner variety that formed on the sails; Cook melted both kinds to replenish the ship's water supply.*

had come back from the ends of the earth to the modest home at Mile End not far from Greenwich, he looked for the little faces of the children he had left when he had sailed. Never were they all there. High infant mortality plagued the land as scurvy did the sea, and three of Cook's six children had died. Two more were not to reach 18. But Mrs. Cook was to outlive her husband by many decades; when she died in 1835, at 93, the age of the steamship had already arrived.

Now, in 1776, she was to be parted from her husband for the last time. *Resolution* was being commissioned once more. Who else could command her?

This was to be the most difficult sea assignment James Cook had ever faced. What about that old problem, a sailing route between Britain and the East Indies via a northern passage? A route wholly in the Northern Hemisphere, even if practicable only in the summers, would shorten voyages, add greatly to trade. Since all seekers had failed, looking from the Atlantic end, let Cook, explorer of the Pacific, find the way, not from the Atlantic but from the Pacific.

Considering that it was then the best part of 300 years since Columbus's first voyage, astonishingly little was known of the North Pacific. Americans had no real idea of the precise size of their great continent. Its northwest coast was less known to them than the west coast of Africa, where their slave traders sailed. Few explorers had ventured far into North Pacific waters.

In Cook's third-voyage orders the Admiralty commanded him to make a running survey of the coast from Oregon northward, probing above 65 degrees for a river or inlet leading toward Hudson Bay or Baffin Bay. If no such passage showed, he was to try to sail back to the Atlantic entirely around the north of Canada, or the other way, around Siberia toward Europe. And more and more: Find sub-Antarctic harbors, revisit New Zealand, and take home the Society

Islander, Omai, whom Furneaux had brought to England on the second voyage.

It should have been obvious that Cook had already done enough, and that he needed a year or two ashore to recover from that "bilious colick" he had suffered in the Antarctic, which was later judged to have included acute infection of the gall bladder. But Cook was no man for quiet backwaters. The light of discovery was in his eyes again. He would be off as soon as the old *Resolution* and her new consort, the *Discovery*, were declared seaworthy.

Unfortunately, the vessels got a hurry-up refit—brief, skimped, shoddy. The American Revolution was in full swing. Lord Sandwich, First Lord of the Admiralty, gave the ships the best outfit and stores he could, and—despite the war—the best men. Cook's officers included William Bligh as master (the same Bligh who would later captain the mutinous *Bounty*), George Vancouver, and an American-born lieutenant, John Gore. Charles Clerke commanded the *Discovery*.

Armed with a safe-conduct from the new United States Minister to France, Ben Franklin, who would let no war impede the progress of science, Cook sailed from England on July 12, 1776. He headed for the Pacific via the Cape of Good Hope, struck far south in the Indian Ocean to survey the Prince Edward and Kerguélen Islands for favorable anchorages, then made for Tasmania (map, page 306). There he noted that the aboriginals—who were all to be gone a century later—had no canoes. Taking this as evidence that they must have come overland, he concluded (wrongly) that Tasmania was joined to Australia.

He revisited New Zealand and greeted the Maoris there warmly, though he knew that these same Maoris had killed and eaten a boat crew from Captain Furneaux's *Adventure* during the second voyage—a couple of midshipmen and eight sailors. To the surprise of the Maoris, Cook made it clear that he had not returned for vengeance. The English seamen, he knew, had shot first. Cook was always humane, always aware that he was the interloper, that these Pacific peoples would have been better off left alone. Not many of the white men who followed him into the Pacific would be so enlightened.

Sailing northeast, he revisited the Cook Islands, then put in again at the Tonga group, which he had named the Friendly Islands during the second voyage.

Today, as I verified on a visit to Tonga's capital, Nuku'alofa, the islanders' friendliness survives increasing Westernization. The new King of Tonga (successor to the beloved Queen Sālote) has put up a large modern hotel on the waterfront. Motorcycle taxis buzz about.* But the Friendly Islanders smile warmly at their Western visitors, and they do not forget their old friend James Cook: A map in flowers on a main street indicates his first landing place a few miles away.

COOK WAS NOT ALWAYS HIS FORMER SELF on this last voyage. His strained digestive system, the constant worry over leaky, badly refitted ships combined to torture his iron will and inclined him to outbursts of shouting, cursing, and sometimes ill-judged actions.

When he reached Tahiti, he found that another affliction had become unbearable. He had developed crippling rheumatism, intensified by wet quarters below leaky decks. "We'll fix that," said a friendly chief.

So 12 large, muscular women, four of them the chief's relatives, were paddled out ceremoniously in a great canoe, descended to Cook's cabin, and spread a mattress and blankets on the deck. "Lie!" said the women.

*See, in the March 1968 National Geographic, "South Seas' Tonga Hails a King," by Melville Bell Grosvenor, and "The Friendly Isles of Tonga," by Luis Marden.

Cook lay down. The 12 giantesses immediately fell upon him, pummeling and squeezing unmercifully with their plump, lively hands, until his joints cracked and all his flesh felt like misused blubber. After 15 minutes of this, the released victim got up. To his astonishment he felt immediate relief.

"More?" asked the ladies, smiling.

Indeed, agreed the captain. Three more treatments, he recorded, ended his pain.

Leaving Tahiti, Cook made another of his great discoveries, the Hawaiian Islands, which he named the Sandwich Islands in honor of his noble friend at the Admiralty. Cook later chose them as a North Pacific base for his Arctic probes.

These were arduous, navigationally hazardous, and, from the point of view of discovery, quite futile. There was no way through Canada to the Atlantic, nor round Alaska either. Cook groped far up the most promising estuary, now called Cook Inlet, to where the city of Anchorage now stands. From there he sent Mr. Bligh and some crewmen on inland in small boats. The farther they went, the fresher the water—there was no road through.

Next he fought his way along the Alaska Peninsula and Aleutian Islands, and up toward Point Barrow to his farthest north of nearly 71°. Beyond was the hopeless ice jam of the Arctic Ocean. There was no slightest sign of a useful sailing passage around either Siberia or North America.

In the strain of it all, Cook began to take chances, which was unlike him. Once, near Dutch Harbor in the Aleutians, thick mist clamped down while he sailed. But the wind was moderate, so the ships ran on, *Resolution* ahead, the smaller *Discovery* close astern, following a mark that the leading ship towed.

Suddenly the leadsman found the bottom, rapidly shoaling! Seabirds shrieked. The wind had an odd swishing sound, as if among cliffs. To the seamen's alert ears there came the unmistakable sound of sea breaking on rocks. Still they could see nothing; it was time to stop until the fog cleared.

"Down helm! Clew up everything!" roared Cook. The ship spun into the wind. Sails flapped. Well-used cordage sang through blocks.

"Let go anchor!" Down splashed the heavy bower.

The ship shook like a reined-in steed, almost as if she were frightened. A few hours later the fog cleared slightly. Cook looked back the way they had come and saw two huge rock pinnacles, with lesser rocks between. All unknowing, he had sailed not just between the crags, but by the only clear passage.

He took off his hat and wig, mopped his brow. "I would not have tried that on a clear day," he said.

ON A RECENT FLIGHT from Amsterdam to Anchorage, I fell to wondering what Cook would have thought of such a journey. It took me a long afternoon; flying distance direct across the Arctic Circle was logged as 4,475 miles; the big jet's average speed against head winds was nearly 500 miles an hour. The eleven hours' time difference was greater than the flying time, so, according to the clocks, I reached Anchorage at an earlier hour than I had left Amsterdam.

At Dutch Harbor the king-crab industry was in full power.

"I take my hat off to Captain Cook, pioneering up here in those flimsy cockleshells," said Capt. Niels P. Thomsen of Aleutian King Crab, Inc. "There was a sailor!" Alaska veteran Captain Thomsen knows what he is talking about. He was once mate of the wooden four-master *C. S. Holmes* operating to the Bering Sea in 1924-28, and master of the Aleutian mail boat from 1954 to 1964.

At Anchorage I stayed at the luxurious Captain Cook Hotel and had something

of a vacation, yarning with enthusiasts of the Cook Inlet Historical Society. Paintings and relics of the great captain dominated the lobby; his world-girdling routes were printed on the place mats. So it goes all around the Pacific world

After months amid the ice and fog and rocks, Cook returned to Hawaii and warped the ships close in offshore at Kealakekua Bay. The Polynesians there received the English well. Cook they called Lono, after a benevolent god of that name. There was a tradition that Lono, a deified chief who had departed ages earlier, had promised to return on a "floating island" with trees, laden with gifts.

Cook could not know this; researchers unearthed this myth years after his time. But his ships were near enough to floating islands and their masts and yards to trees. He brought gifts. He and his veteran officers spoke some Polynesian, learned at Tahiti and Tonga, and knew something of Polynesian ways. So the islanders, led by their chiefs and priests, took Cook for the long-awaited Lono (next page).

Nevertheless, it appeared that these strange men in their floating islands took a lot of feeding. After several weeks, this became a strain: stocks in the local gardens, larders, sweet-potato patches, and pigsties were run down. The islanders were greatly relieved when their guests hove up their anchors and sailed.

Then storms struck and damaged *Resolution*'s foremast. It was split at the head, beyond possibility of shipboard repair. Cook must seek port again. He knew of no good anchorage other than Kealakekua. Aware that the ships had overstayed their welcome there, he was reluctant to return. But it had to be.

At anchor again, "Lono's" floating islanders found a different attitude. The

Cinder-hot rocks *plunked into water provide steam for cooking spitted fish in this Indian dwelling at Nootka Sound, British Columbia. Dried fish fringe the rafters.* Resolution *artist John Webber traded his metal jacket buttons for permission to draw the large carved statues, representations of ancestors.*

brown-skinned citizens were soon threatening to throw stones. Petty thieving became major when a boat from the *Discovery* was stolen and not returned.

As was his custom, Cook landed to take a senior chief hostage against the boat's return—or rather he tried to. Perhaps because the Hawaiians knew the boat had already been ripped to pieces for its metal fastenings, there was noisy opposition that rapidly grew to a fracas.

Cook made for the beach to re-embark. Stones flew fast and viciously.

The boat began to pull off. Muskets banged. Small shot bounced off the Hawaiians' body mats, but at least one warrior fell dead. This was no Lono!

Cook turned seaward at the water's edge and raised his hand to command a cease-fire (page 348). As he turned, a warrior clubbed him. He sank to his knees in the water. Others stabbed with knives, and stabbed again.

I MADE A PILGRIMAGE not long ago to Kealakekua Bay. There in the shadow of the volcano Mauna Loa, a monument and a nearby plaque, underwater at high tide (pages 348-9), commemorate Cook at the scene of his assassination. As the liner *Kungsholm* came abreast of the spot, Capt. Per-Eric Sjölin and I dropped a wreath in the sea.

Today the memory of the great man who died there in his fiftieth year, on February 14, 1779, is green in millions of hearts. His memorials are modern, populous Australia and New Zealand, and islands and island groups of the Pacific, almost beyond reckoning, that he discovered or rediscovered.

The farmhand's son from England indeed changed the Pacific world. □

Steak-size slabs *of whale flipper whet appetites at Point Hope, Alaska, some 125 miles above the Arctic Circle on the Chukchi Sea* (right). *Cook's crew dined on walrus meat—dubbed "marine beef"—when they sailed these waters in 1778. Not all the men shared Cook's high opinion of it. Wrote one seaman: "... the flesh disgustfull as it was we eat thro extreme hunger...."*

Lono, god of peace and light, *towers in robe-draped effigy above Captain Cook, whom the Hawaiians welcomed as the deity himself. The explorer's demeanor, his ships' appearance, and the timing of his visits in 1778 and 1779 coincided with island prophecies. Cook never understood why the Hawaiians called him Lono and prostrated themselves at his feet, but he accepted it rather than risk offense.*

DETAIL FROM A SKETCH BY JOHN WEBBER, HONOLULU ACADEMY OF ARTS; KODACHROME © N.G.S.

LUNGING FROM FLOE TO FLOE
on the Chukchi Sea, an Eskimo hunter of Point Hope heads home with food for his family. After each leap he stops to drag the dead seal across an icy channel.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Cook first trod Hawaiian soil in January 1778 at the village of Waimea, by a gentle river of the same name (left). After bartering with the Kauai islanders, he wrote: "No people could trade with more honisty than these people, never once attempting to cheat us."

Ironically, the theft of a boat on the island of Hawaii during Cook's 1779 visit lit the fuse of violence that brought about the great seafarer's death (below).

EXPEDITION ARTIST JOHN WEBBER, MITCHELL LIBRARY, SYDNEY

In a moment of rage, islanders slay the man they revere as a god even as he orders his marines to lower their muskets (**opposite**). In Kealakekua Bay a simple plaque, submerged at high tide (**above**), marks the beach where the peerless voyager fell—linked in death, as he had been in life, with the eternally mysterious Pacific. □

Mzima, Kenya's Spring of Life

PICTURE STORY BY
JOAN and ALAN ROOT

WE CAME to this desert-rimmed Eden to photograph hippos. The fountain-clear pools of Mzima Springs in Kenya's arid Tsavo National Park offer a perfect outdoor studio. But as we film the huge "river horses," a broader scene unfolds, launching one of our most absorbing studies as naturalist-photographers. Within this verdant oasis pulses a universe in miniature. Creatures large and small form an intricate web of life in which each depends on others for survival. Equipped with underwater masks and cameras, Joan and I explore above and below the surface of the pools, as do the turtle and the water-diving darter, or snakebird (**right**). Accepted, usually, as harmless visitors, we watch a thriving animal community sustain itself as it did before man first glimpsed it.

GHOSTLY BEHEMOTH, a hippopotamus prowls an underwater tunnel formed by overhanging vegetation. I approach this 3,000-pound male cautiously, for the nine-inch tusks that stud his cavernous mouth (page 365) can fatally gore a man. Unperturbed, the hippo moves off slowly amid his retinue of *Labeo* fish, which feed on algae covering his hide. Ponderous on land, he treads the pool bottom in a graceful slow-motion ballet, seemingly able to control the buoyancy of his huge body.

Mzima's threescore hippos dominate the springs' ecology. Emerging at night to engorge as much as 150 pounds of grass each, they return at morning and enrich the pools with dung that supports smaller creatures in the life chain. The huge vegetarians also dominate Mzima's social order. We saw hippo cows drive off a 14-foot-long crocodile menacing their calves.

On land, young hippos occasionally fall prey to lions. But the creatures' worst enemy is man, who has slaughtered thousands for meat or sport or to protect crops. Underwater at Mzima the hippos tolerate us. Perhaps they do not recognize the ungainly swimmers as the erect land creatures they usually try to avoid.

FED BY UNDERGROUND streams, a lush garden brightens the parched Tsavo landscape in southern Kenya (map, left). Mzima Springs draws hundreds of animals that roam East Africa's largest national park—some 8,000 square miles of scrubland.

Two bull elephants fill their trunks to slake a thirst equal to their huge bulk (right). They pay little heed to a human intruder—perhaps unable to visualize the submerged part of the body—and allow me to approach within 20 feet. While earth's largest land mammals drink with relaxed confidence, zebras and impalas come with nervous hesitation (below), ever wary of predators. All have grown accustomed to a steady trickle of visitors, who observe them from a deck at the edge of the pool at left. But man's appearance outside the viewing area sets off a rumbling tattoo of hoofs.

Seepage from the distant Chyulu Range waters this narrow haven. Rising 4,000 feet above the plain, the volcanic mounds catch more rain than the bush country at their feet. Instead of running off the slopes, the water seeps through porous ash until it reaches bedrock, then it flows underground some 35 miles to Mzima. Gushing forth at 50 million gallons a day, it fills a chain of pools about two miles long but seldom more than six feet deep. Then it disappears again into the ground. In that brief appearance, the water transforms a small, parched stretch of land into a bustling green oasis.

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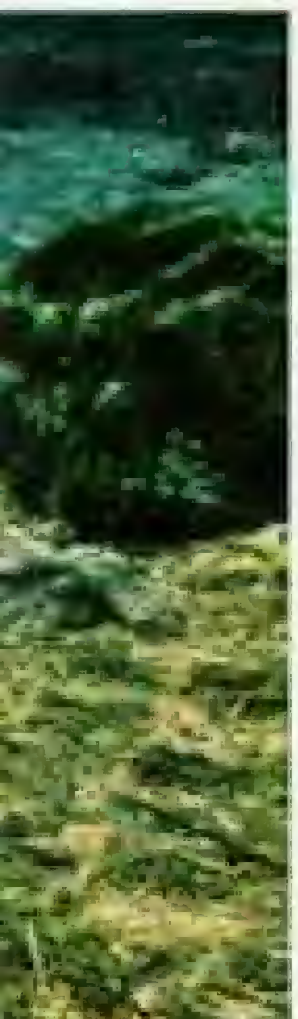

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Mzima's countless small occupants are at first overshadowed by their large spectacular neighbors. But during our months of observation we see how the energy of life flows between the varied creatures of the springs.

All owe a debt to the hippos, whose dung supports a wealth of aquatic life unmatched in springs that lack them. The waste of earth's second largest quadruped covers the pool floor with a rich carpet—a nursery for insect larvae and crustaceans. In motion the hippo stirs up food for schools of hungry fish. Even in death he leaves a ponderous bequest. Wounded in a battle with another male or wracked by age or disease, he slips to the bottom a final time, offering a two-ton feast that ends in a litter of bones (1).

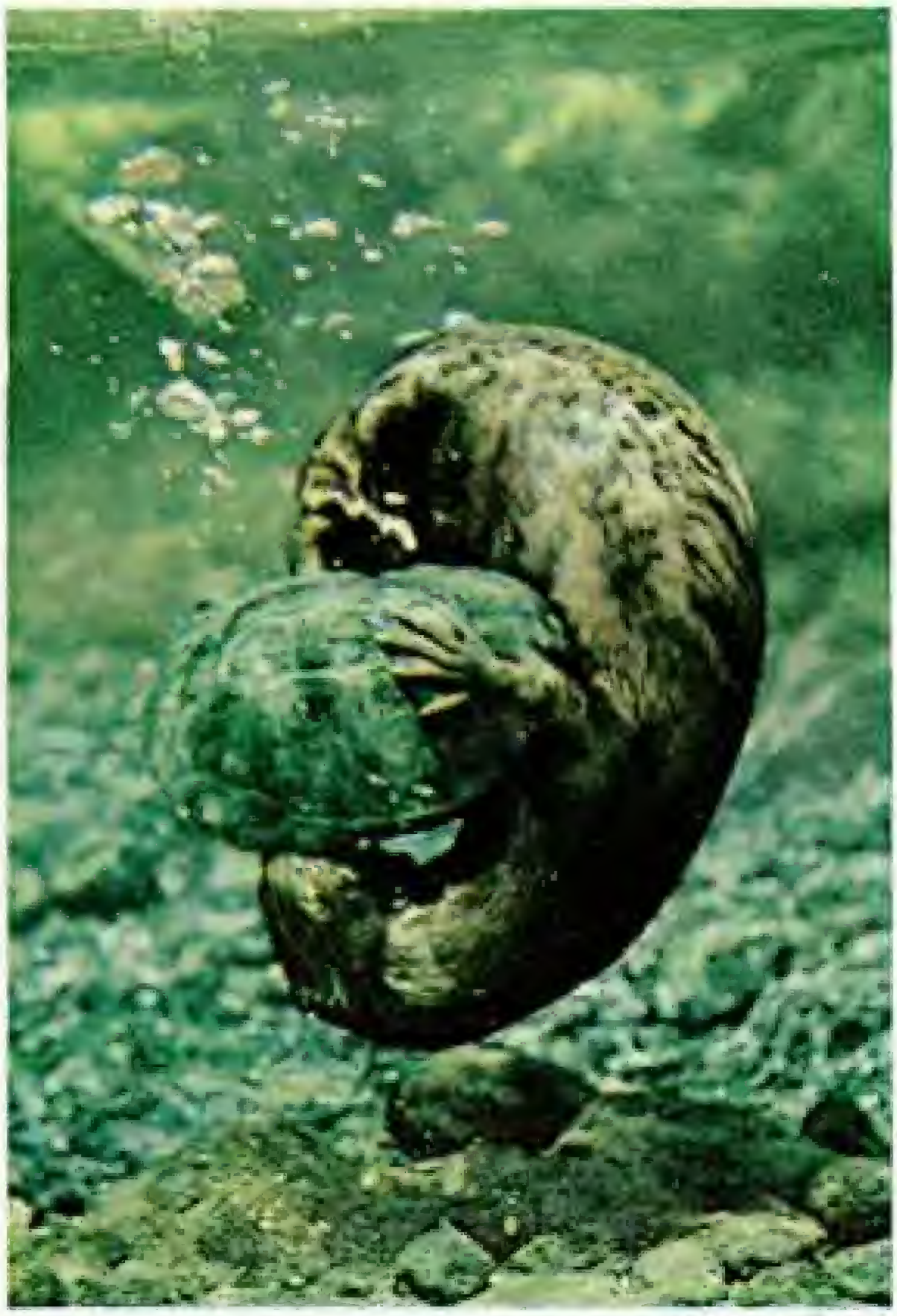
From the hippos' smallest beneficiaries extends a continuous food chain. The insects feed Mzima's orchestra of frogs, which may in turn become meals for a green snake (2), a dark scrawl against the bright sky as we view it from below. A freshwater shrimp searches the dung-covered floor for bits of food (3); my approach sends him scuttling into the shadows. With varnished gloss, a damselfly poises (4) before diving on a smaller insect.

Water-loving monitor (5) relishes crocodile eggs, but may fall victim to the angry mother. The big lizard, a close relative of Indonesia's famed Komodo dragon, may reach a length of six feet.

Exploring this underwater world, we marvel at the adaptations displayed by pursued and pursuer. Mottled scales camouflage an eight-inch goby feeding on the sun-dappled floor (6). The snakebird (7), a fast and agile swimmer, impales fish on its spearlike beak, then surfaces to swallow them whole.

BUSINESSLIKE FISHERMAN, a cormorant (right) seizes a scaly victim. Specially adapted eyes aid this skillful underwater hunter; unlike most vertebrates, it can vary the shape of both lens and cornea to compensate for refraction.

The bird's broad webbed feet, clumsy as snowshoes on land, drive it through the water in fish-catching bursts of speed. A throat-bulging gulp will dispose of its catch.



ETHOLOGUE © W.B.P.

WITH KITTENISH ABANDON, a spotted-necked otter grips a meal (**left**) after a darting, looping chase. A nimble humpback on land, this large cousin of the weasel moves underwater with fluid grace, propelled by webbed feet and an undulating body.

Stodgy resident of the springs, a turtle becomes a target for a playful otter's mischief (**above**). The victim retreats to safety within its shell and patiently endures the game, while our cameras click.

The otter often attracts uninvited guests that share its food. Swooping kites and fish eagles sometimes pluck half-eaten meals from otters, or drive them from their catch. Small fish and eels tear shreds from abandoned carcasses. Even the harassed turtle gulps neglected scraps, as if in payment for the otter's abuse.

Lolling underwater to escape daytime heat, hippos cluster near a fallen water-pear tree. Calves stay near their protective mothers, often climbing atop their broad backs to bask in the sun.

Dozing submerged, Mzima's hippos raise their massive heads every 40 seconds or so for air, blowing twin plumes of spray as they exhale. Carrying a land trail into their water habitat, they ribbon the pools with underwater trails (**right**).

Even on these trails, we must watch our step. My African assistant, Richard Gichuhi, bearing camera supplies and belted with lead weights, trips over an eel (**below**). Fortunately, the creature swims away without inflicting its painful bite.

BARREL-BODIED SUBMARINE, a two-ton bull hippo glides along the bottom of the pool. White scars tell of duels with other males and battles with cows protecting their young. Our most exhilarating experiences come as these huge slate-colored shapes loge by us in eerie silence.

Our only hippo attack came from a cow whose calf had been killed by a rampaging bull. Upset by her loss, she had sought solitude away from

the herd. As I approached, she tucked in her chin in defiance, then suddenly surfaced. Out of breath, I too was forced up, seeing me topside, she charged. Her bow wave knocked me backward. I flailed at the frothing water with my camera, and the hippo fled.

As a bulbous male naps, I scratch the nearly hairless hide on his broad backside (right) to mimic the algae-scraping *Labeo* (left).

Cautious bathers, we keep close watch for crocs and hippos as we take our nightly dip. Joan rinses by the light of a gas lantern (**left**), while I search the darkness for visitors attracted by her splashing. Fortunately for us, crocodile eyes flash a red warning in lamplight.

Grunting and snorting impatiently, hippos often ring this handy bathing spot, located on their path to grazing lands. En route to night pastures, one sniffs my perch soon after we leave (**below, left**). Farther along the trail, another protests our flash-camera ambush with a display of formidable tusks (**below**). The lower fighting canines stay knife sharp from constant wear against upper teeth. They serve little purpose in grazing, when hippos pluck grass with lips nearly two feet wide.

Although hunger may drive them miles inland, the hippos spend half their lives in water, which offers safety and support for the animals' huge bulk. With few natural enemies, they may live nearly half a century—portly giants supporting thousands of small neighbors.

TURNING THE TABLES on a crocodile, I approach from deep water as the 11-foot reptile swings to investigate. Seconds later it came toward me. Gently I submerged, and we warily eyed each other. Too cautious to attack a creature it had never before seen underwater, the croc slowly moved off.

Crocs normally lurk in the shallows, waiting for fish, turtles, or any but the largest mammals that come to drink. Stalking underwater, they seize a land victim by its

muzzle or leg and pull it beneath the surface.

Like the antelope and other grazers that flock to this water hole, we face greatest danger when entering the pools. As I stood knee deep one day preparing for a dive, my resemblance to a drinking animal lured a hungry nine-footer. "Croc coming!" yelled a lookout just as I dived. It streaked from beneath an overhanging bank, but stopped short when confronted by a goggled swimmer instead of an upright meal. For an instant we hung motionless, face-to-face. When I advanced, it retreated.

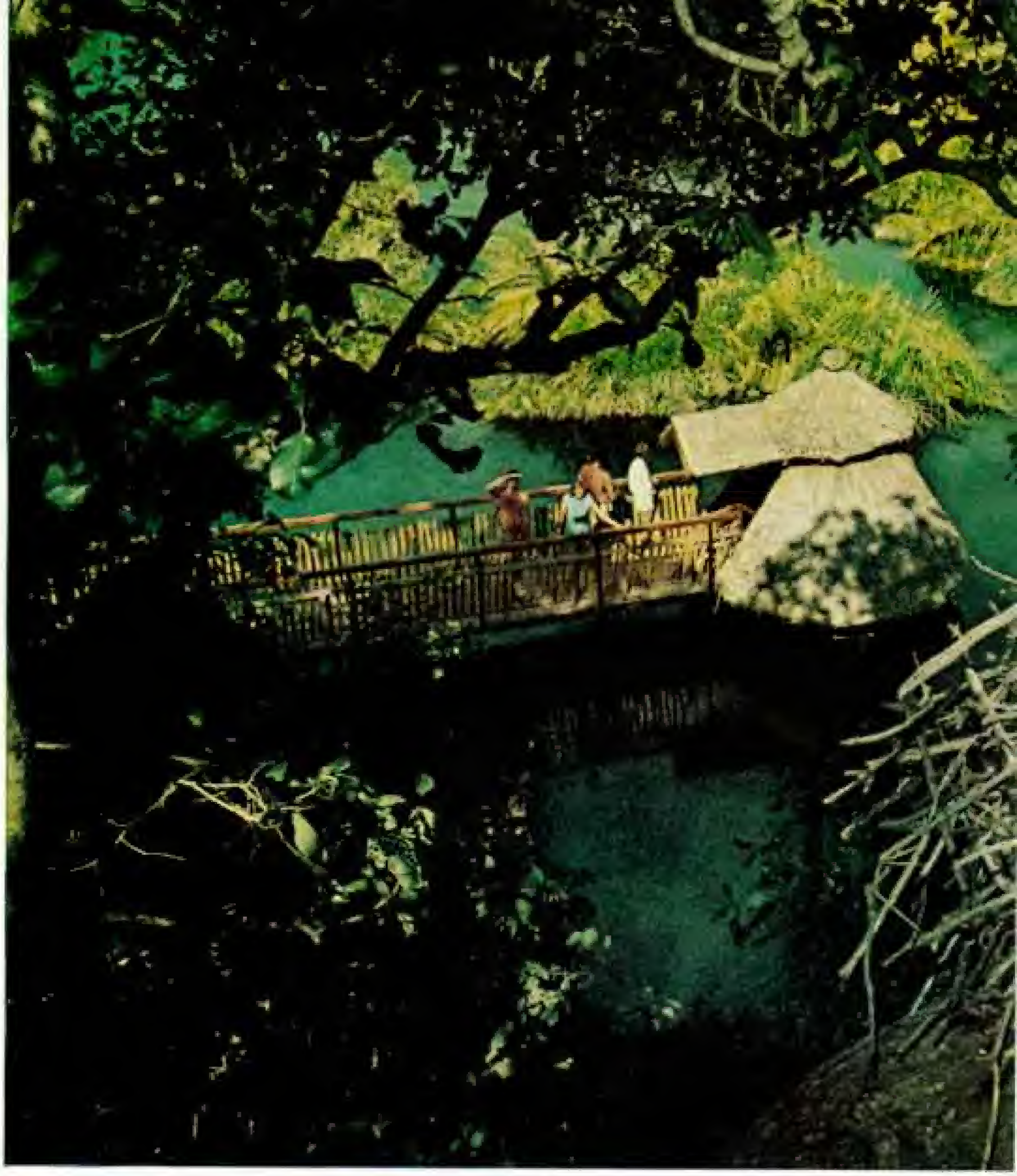
Such dangers of the deep have taught zebra and eland (**below**) to drink from shallow tributary springs, but a waterbuck, eye cocked cautiously, ventures to within ten feet of a sunbathing enemy (**bottom right**). Crocodiles help maintain the quality of animal life at the springs. Efficient eliminators of the weak, they capture many sick and wounded beasts.

UNDERWATER WITNESSES to a crocodile's meal, we photograph its remarkable eating technique. Since most crocs drag kills into murky backwaters, making camera work impossible, we fasten the carcass of an impala—killed earlier by a lion—under a log in a clear spot. At once a croc comes to feed (**above**), despite reports that the reptiles must wait for decomposition to soften the meat. It rips off chunks by violently rotating its whole body (**left**), as another joins the feast. Ignored in the mayhem, fish that may later feed the croc here fatten on scraps from its meal.

TORPEDO ON THE PROWL, a rock python seeks surface prey as Joan follows. Fourteen feet long and thick as a man's thigh, the huge constrictor moves sluggishly except when striking and throwing coils around its prey.

Joan can attest to the force of its lunge. As she stood waist deep in a pool one day, a python's broad head erupted from the water and struck her hand. The serpent quickly retreated, but its teeth tore a nasty gash. The attack, like that of the crocodile (page 367), appeared to be a case of mistaken identity, quickly corrected.

Among the largest and most primitive of snakes, the python prefers land, but readily enters the pools to ambush water birds and small mammals. It can remain submerged for half an hour or lie for hours near the bank, nostrils barely protruding from the water as it awaits a victim. Seizing prey with needlelike teeth, it wraps the animal in a suffocating embrace, then swallows it whole. Like most residents of the springs, however, the hunter may quickly become the hunted; For all its awesome size, the python is fair game for Mzima's largest crocodiles.



Showcase of nature, Mzima's unceasing biological mill grinds on with a rhythmic perfection, protected from human molestation by strict park rules. Within view of the observation deck, a yellow-billed kite tends its nest (**above**). From the catwalk, visitors can see the swaying head of the snakebird or the loglike crocodile, or hear a hippo's unforgettable bellow.

Inside the thatched hut at the end of the ramp, steps descend to a glass-paneled tank (**left**), where fish and visitors trade stares. Other aquatic sights may reward a patient gallery:

A streamlined cormorant suddenly scattering the finny crowd . . . hippos, huge masters of the springs, passing in stately review . . . a sinuous shadow moving across the bottom, cast by a prowling snake.

Despite man's presence, the watery sanctuary retains the wild freshness and exquisite beauty of a superbly balanced community. □

That Dammed Missouri River

By GORDON YOUNG
NATIONAL GEOGRAPHIC STAFF

Photographs by
DAVID HISER

OLD MISERY, she was called by those who knew her best—for the Missouri was never one of your run-of-the-mill streams.

Early fur trappers and explorers cursed her tricky currents and seething rapids as they fought their way into the new western lands of the Louisiana Purchase. Later, steamboat pilots hurled their own colorful epithets at this river that could change channels overnight and create sandbars where none had been an hour before.

When the land was settled, Old Misery still kept the curses coming. Too often she'd leave her bed and wander off to find a new one, all littered with crops and houses and railroad tracks. Then, with a woman's caprice, she might wander back again to her old bed—and litter *it* with crops and houses and railroad tracks.

And, oh, how she flooded! Farmers and townsmen alike lived with the fear that the rampaging river would rise over the

Gentled by man, the once-rebellious Missouri placidly shoulders barges near the eastern Missouri city of St. Charles. Just downstream, the river joins the Mississippi, ending a 2,500-mile odyssey from the Rockies—longest course of any stream in North America. On the upper reaches a gantlet of dams harnesses flood tides that once made spring a time of dread and destruction.

levees to devastate crops and smash cities. The water level at Sioux City, Iowa, varied more than 27 feet—and more than 40 feet downstream at Kansas City!

She was a stupendous river. Born in the western mountains, she churned and swirled her way 2,500 miles southeastward to the Mississippi, draining half a million square miles (map, page 379). Each year she dumped 175 million tons of silt into the Mississippi.

But then, beginning in the 1930's, men set about to tame her in a massive engineering project that will take another half century to complete. Already, seven federal dams convert her boisterous energy into electric power, and their lakes, together with reservoirs backed up on tributary streams, can store more than three times the Missouri's annual flow.

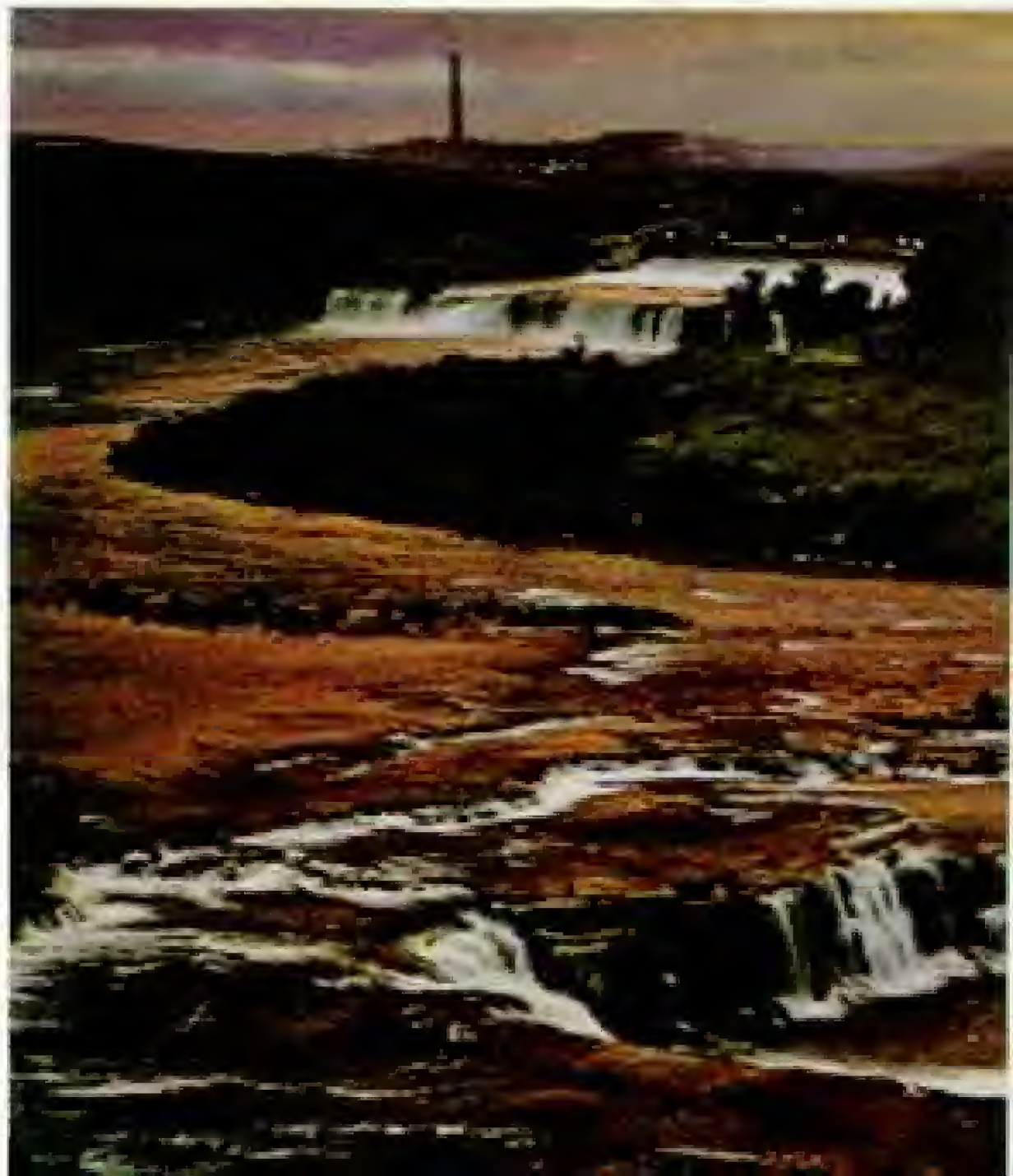
River Still Holds to Wandering Ways

Now that she has been harnessed—more or less—river-town conversations turn nostalgically to her wayward years. Citizens of St. Joseph, Missouri, for example, recall a morning in 1952 when they awoke to find that the wandering river had cut a new channel. Since then their city airport, though still legally Missouri domain, has been on the Kansas side of the stream.

What writer could resist getting to know a lady with such an interesting past? With Michael, my 12-year-old son, I flew to Butte, Montana, and drove to the Missouri's headwaters, near the town of Three Forks. There, three rivers—the Gallatin, Madison, and Jefferson—blend their waters in a broad valley, and thus the Missouri is born. Clear and blue, the new river winds north through lush cattle-dotted valleys.

My son and I followed by car at first—but tucked into the back of our automobile were two canvas bags filled with aluminum tubes, fabric, and wooden frames. The pieces fitted together ingeniously to form a 17½-foot kayak.

We carried maps of these upper stretches, and they proved detailed and accurate, though published in 1893. Our guidebooks



Armchair anglers wet their lines for trout near Great Falls, Montana. The upper Missouri's series of reservoirs favor lake fish over river dwellers.

Liquid energy races down rocky steps toward Great Falls as the river tumbles from mountains to plains. Five small power dams on the falls will make each cascading droplet labor repeatedly to spin hydroelectric turbines.

were even better and older—the journals of Lewis and Clark, who first explored these farthest reaches of the Louisiana Purchase.*

The journals confirmed the view we encountered at Gates of the Mountains, just north of Helena. There the Montana Power Company's Holter Dam backs a ribbon of blue water through the spectacular rocky cleft named and described by Meriwether Lewis: "the river appears to have forced it's way through this immence body of solid rock for the distance of 5¾ Miles . . . these clifts rise from the waters edge on either side perpendicularly to the hight of 1200 feet . . . the tow[er]ing and projecting rocks in many places seem ready to tumble on us."

That evening, in Great Falls, Montana, after much studying of plans and examining of pieces, we assembled our kayak on the sidewalk in front of our motel room. We carried it inside and leaned it against our bedroom wall, with the bow nosing into the bathroom.

I'll never forget the look on the motel owner's face when he saw us emerge next morning, carrying a boat longer than the room!

Kayak Paddles Ply River of Solitude

Even more memorable was the week that followed. Michael and I paddled and camped our way down a magnificent stretch of wilderness waterway for 120 miles.

Launching our craft near Virgelle—a tiny settlement 70 river miles downstream from Great Falls—we filled every cranny with camping gear, freeze-dried food, and water jugs. Then our double-bladed paddles began to swing in rhythmical arcs, paced by Michael's enthusiastic rendition of an old voyageurs' song and sea chantey:

Away, away, I'm bound away
Across the wide Missouri.

We pitched our tent that night at the mouth of Eagle Creek, where the Lewis and Clark expedition had pitched theirs on the evening of May 31, 1805. They had been bound upstream, and we were going down—thus the entry in their journal for that date told us what we'd see tomorrow.

"The hills and river Clifts which we passed today," Meriwether Lewis had written, "exhibit a most romantic appearance . . . seens of visionary inchantment . . ."

He didn't spell well, but he had not exaggerated. Next day we paddled past mile after mile of castles and minarets and all manner of magical shapes carved by nature from the white sandstone (page 384).

Sometimes our river was walled by those sculptured cliffs. Sometimes the Montana rangeland rolled down to a cottonwood-studded shore—and Michael amused himself by mooing in solemn conversation with white-faced cattle. Twice we exchanged stares with deer that peered curiously at us from the bank not 50 feet away.

Old Misery All Width to a Ferry Operator

We saw only one person during the trip, the operator of a cable-guided ferry that crosses the Missouri near the mouth of the Judith River. We paddled over to learn from a veteran riverman what hazards lay ahead.

Hazards? Just shuttling across the river was hazard enough for him. He'd never been five miles downstream in his life!

By all the laws of logic, the Missouri's fast current should have carried us downstream while we dipped a leisurely paddle, now and then, to keep our bow pointing downriver.

But time after time we'd ride the roiling water and relax—only to find ourselves in an opposing eddy. Mysteriously, the downstream current had disappeared, to surface again along the opposite bank. We'd chase it, then—back and forth, back and forth.

But when it came time to camp, the downstream pull was always with us. While we paddled furiously for shore, the current would sweep us past our intended landing. We'd sigh and choose another site, and try again.

*See the National Geographic book, *In the Footsteps of Lewis and Clark*, by Gerald S. Snyder, and Ralph Gray's June 1953 Geographic article.

Missouri country

RAINS AND MELTED SNOWS of approximately a sixth of the continuous United States flow oceanward through the Missouri and her tributaries. Projects to bring the vast and often rampaging river system under control, begun in the 1930's, will take another 50 years to complete.

A six-foot strip of thick gumbo mud usually lay between the river's edge and our grassy campsite. We'd nose into the mud, slog ashore, and gather rocks to pave a path back to our boat so we could unload our gear.

Through this stretch of Montana, the river progresses eastward in a series of giant loops, like a sidewinder rattlesnake. The Missouri carried us west and east and north and south, and somehow we were always paddling against the wind—another of Old Misery's perverse tricks.

Tablets Banish Germs, But Not Silt

"Dad, you didn't bring enough drinking water," Michael announced on the fourth day.

He was right; I hadn't realized how much liquid it takes to prepare freeze-dried foods. We were reduced to drinking the Missouri, after lacing the water with purifying tablets.

Drinking it? Eating would be a better word. I recalled a tale I'd heard about an old farmer who ran Missouri River water through a pipe and sawed it into disks when it came out—for grindstones.

Finally, after six days of uninterrupted wilderness, we nosed our boat into the mud-bank at Montana's James Kipp State Park and went ashore. Old Misery had shown us a few of her infuriating habits—but who could deny that she had helped make the trip an interesting one?

We'll treasure that voyage, Michael and I —and we'll always be closer for having shared it.

In central Montana, 400 miles from its source, the river becomes a chain of reservoirs backed up behind giant dams. We folded our boat and headed downriver by car toward one of those reservoirs. Enough of paddling! We'd made plans to switch to a sleek 33-foot powerboat for our next voyage.

Two of the nicest people I've ever met, Tomy and Joyce Clausen, were waiting for us in Williston, North Dakota, near the upstream end of Lake Sakakawea, named for the Shoshoni Indian woman who helped

Fast-hoofing the mails between St. Joseph, Missouri, and California, the privately operated Pony Express galloped across the West for a spectacular 19-month period in 1860 and 1861. Posters like this one drummed up customers. After completion of the transcontinental telegraph in October 1861, the Pony Express went out of business—$200,000 in the red but with its name indelibly inscribed in American history.

Echoing only with memories, a ghostly hotel and social hall gather evening shadows at Elkhorn, Montana, one of many boom-and-bust towns that sprouted in Montana and the Black Hills during gold and silver rushes of the latter 19th century. Missouri River steamboats brought hordes of miners and speculators to these remote Indian lands.

"**Breaking**" **beef,** a cutter at an Omaha meat-packing plant power-saws a forequarter into sections. Fine cuts from Missouri River packing centers—Kansas City, Omaha, Sioux City—sizzle on restaurant platters across the Nation.

Ablutions for a Hereford bluebood: 4-H youngster Bonnie Tadej primps her handfed steer before exhibiting him at the Chouteau County Fair in Fort Benton, Montana. Her entry won a blue ribbon for fatness, and she was awarded a coveted blue rosette for showmanship. Irrigation from new dams enables many ranchers on semiarid lands to grow high-yield alfalfa for their cattle.

guide Lewis and Clark. The Clausens own *Turmoil Two*, a modern Chris-Craft that would be our home for the next week.

Home was never like this. As Tomy eased the cruiser out of its slip and headed for open water, I prowled around, marveling. Even the open cockpit had stereo speakers.

Traffic Hazards Include Drowned Trees

We were thundering along at 20 knots. I peered over the rail in time to see a huge log flash by on the starboard side. It was almost as long as the boat.

Tomy swiveled around in the helmsman's seat and grinned. "Great cruising country, if you watch where you're going," he said. "Lots of debris out here to dodge."

Lake Sakakawea, backed up behind Garrison Dam, used to be a wooded valley. The drowned trees sometimes tear loose from the muddy bottom and bob to the surface.

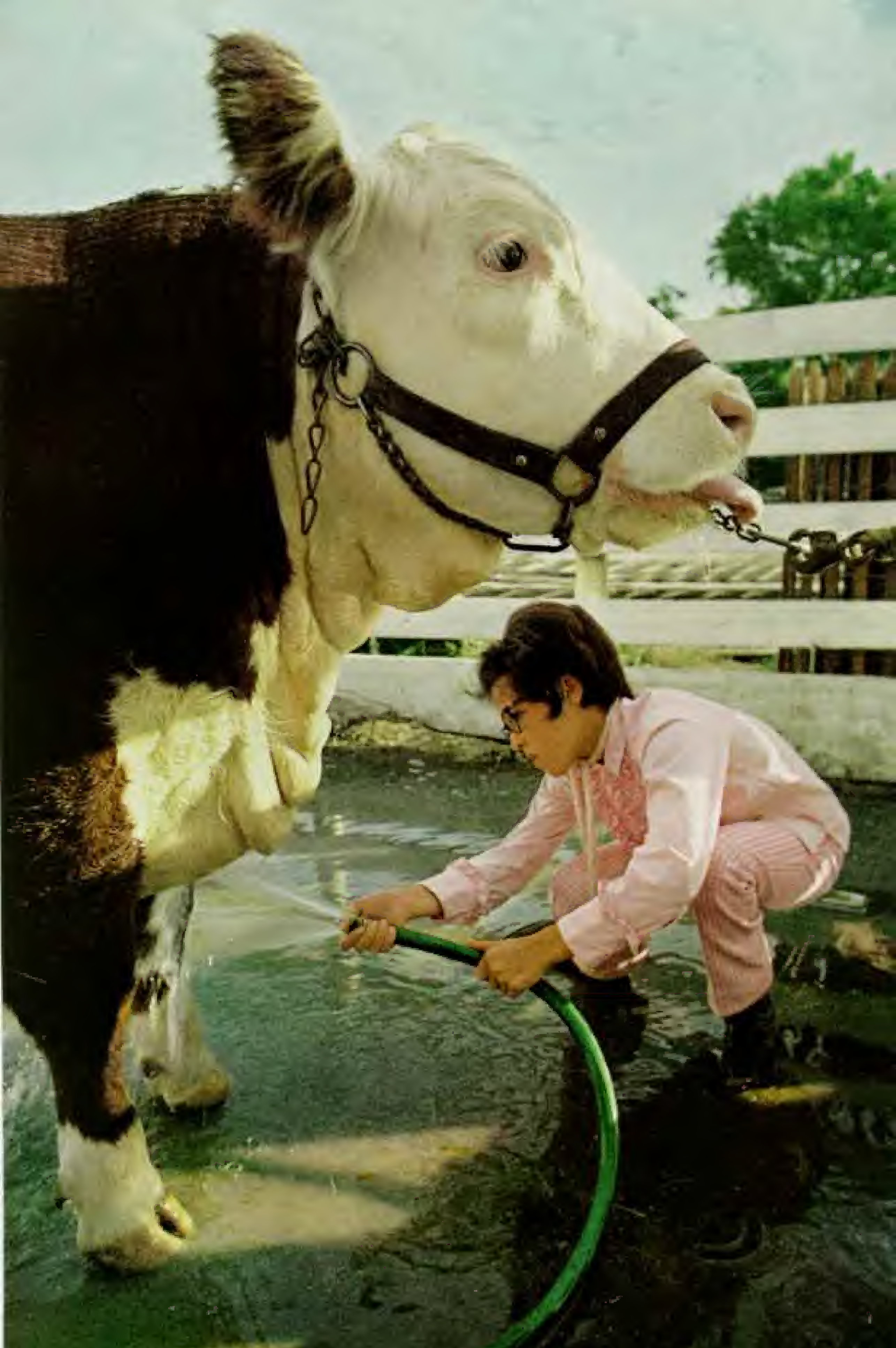
"What happens if you hit one?" I asked, not really wanting to hear the answer.

Tomy shrugged. "Something gives, and it usually isn't the tree. We hit one with our first boat. The log came right through the hull into the forward cabin, then dislodged itself. Joyce stuffed sweaters into the hole while I steered for shore at full throttle. We made it to the bank before the rising water in the bilge flooded the engine out."

For much of its 178-mile length, Lake Sakakawea winds through the Fort Berthold Indian Reservation. Mandans, Arikaras, and Hidatsas have lived here for more than a century. We stopped for supplies at New Town, the area's youngest settlement.

New Town was established in 1952, a year before the lake began to fill behind Garrison Dam, drowning three villages. Houses and inhabitants were moved to New Town.

The lake covered almost a third of the reservation. Each Indian who lost land was reimbursed in cash by the Government, and moving expenses were paid. Still, it was a sad time for many, said John Stone, Sr., a rancher and member of the joint tribal council.



"There's a lot of heartache when people have to move from places where their families have farmed, and hunted deer, and run cattle for generations," Mr. Stone told me. "The dam might be a good thing for the general public—but relatively few of us can make a living from the land now."

To take up the slack, the tribe operates Four Bears Park and a museum, and is building a 40-unit motel and marina. The area is turning out to be a tourist attraction.

"Some day," Mr. Stone mused, "the dam may make up for all the hardships it's cost us. It's going to take a lot of time and a lot of development to make that happen, though."

Part of Indian history, too, has been drowned by the Missouri River's giant reservoirs. Many hundreds of important archeological sites were flooded.

In 1946 the Smithsonian Institution, the National Park Service, and several state organizations launched a crash program to explore as many as possible of the ancient village sites that would be lost. Some dated from more than 7,000 years ago. Indians through the centuries had placed their settlements near the life-giving Missouri.

The archeological work was frustrating as well as rewarding. So much lay waiting to be

Nature the sculptress whittled Montana's castellated White Cliffs. Visitors to the sandstone wonderland stand in a "window" overlooking the Missouri 65 miles below Fort Benton. Far below, a pontoon riverboat drifts on the current.

Man the river tamer has corseted the Missouri with seven major dams. Scores of others curb the waters of tributary streams. This infrared high-altitude photograph makes a mottled blue carpet of Gavins Point Dam, Lewis and Clark Lake, and checkerboard farms in Nebraska and South Dakota. Reservoirs created by the dams can hold more than three times the river system's yearly flow.

Toiling on into twilight, a Montana grain farmer levels a truckload of barley. The Great Plains of the Missouri and Arkansas Basins, once misnamed the "Great American Desert," now burgeon as a powerhouse of agriculture.

Buffer against blowing dust and snow, a shelterbelt of trees protects this North Dakota farmstead the year round. In winter such windbreaks save significantly on fuel costs.

unearthed, and there was so little time. Meticulous archeologists winced as bulldozers rumbled in to hurry the digging. Much was discovered. Much was irretrievably lost.

My son headed home, and I went on to Pierre, South Dakota. There—accompanied by Carl Falk of the National Park Service's Midwest Archeological Center and Stephen Sigstad, South Dakota State Archeologist—I flew over the reservoir that stretches between Bismarck, North Dakota, and the Oahe Dam at Pierre, South Dakota.

"Occasional surface finds along the Missouri trench suggest that some groups were in the area well before the time of Christ," Carl told me. "We've found a few stone tools from this early period, but the evidence is scanty. Pottery doesn't appear until just before the Christian Era. The first permanent structures—earth lodges—appear about the ninth or tenth centuries A.D."

Sioux Warriors Won Respect of Foes

My archeologist companions pointed out some of the sites still visible on the banks of the reservoir below us. In places I could see faint circular marks on the ground; other marks formed rectangles.

"Those depressions are the remains of earth lodges," Carl explained.

As our Cessna banked for the homeward flight to Pierre, Steve Sigstad summarized later Indian history for me. "In the early 1700's," he said, "Dakotas—the Sioux—moved over from Minnesota and came into contact with the Arikaras and other tribes that had acquired horses from the Spaniards. The Sioux in turn got horses, and guns from French and English traders, and they took up a nomadic, bison-hunting life.

"They were first-class warriors," Steve continued. "They harassed the village Indians and held down organized resistance by keeping the Mandan and Arikara tribes apart. Yes, the Sioux were fine guerrilla fighters, as our federal troops later discovered when they tried to put them on the reservation."

The troops, of course, finally won. But I couldn't forget the words on a bumper sticker (they eventually became the title of a best-selling book) that I'd seen on an Indian's car a few days before in New Town: *Custer Died For Your Sins.*

As our plane approached the Pierre Airport, I could see the sweeping curve of Oahe Dam in the distance. Next day I visited this barrier that has helped tame the Missouri.

With Vester Merideth, superintendent of the dam's power plant, I roamed through a huge room filled with the humming of giant generators.

"This is one of the biggest earth dams in the world," Mr. Merideth told me.

Days of Massive Flooding Now Past

Seven main-stem dams, six built by the U.S. Army Corps of Engineers and one by the Bureau of Reclamation, work together to control the river. The first, Fort Peck Dam, was finished in 1945. Before the next one was completed, Old Misery lashed out again, in the flood of 1952.

But Fort Peck Dam and a few smaller dams on Missouri tributaries cut about a foot off the 1952 flood crest. That one foot made a difference: at vulnerable Omaha and Council Bluffs, the levees held. Today, all seven main-stem dams are "on the line," and the days of disastrous flooding on the Missouri should be over.

How has the dammed Missouri affected farming along the riverbank? I asked Carl Kuehn, who grows corn eight feet tall and raises livestock on his 3,360-acre riverside ranch below Garrison Dam.

"Floods used to be quite a problem," he said. "Lowlands would go under when water backed up behind ice jams in the spring. Sometimes the ice would break with a sound like dynamiting. But now the turbines churn the water and keep the river from freezing for about twenty miles downstream.

"I can remember when the water was always muddy. Now, at least the first few

Too busy to be cold, Sioux boys play a heated game of basketball on Standing Rock Reservation in North Dakota. Their house overlooks Oahe Dam's vast reservoir, which floods former bottomlands that were the tribe's ancestral home. Though compensated, many Sioux regret the loss of their valley. Like other tribes similarly affected, however, they are developing recreational facilities near the man-made lake.

Building their own future, men of Standing Rock learn as they earn while assembling prefabricated houses on the reservation. Their skills will help provide hundreds of government-financed housing units being built by the Indians themselves.

With the help of good friends now and then, Janie Hawk Eagle of Standing Rock Reservation found enough of life's essentials for her simple wants until her recent death at the age of 79. Here a fellow Sioux, community health representative Ambrose Running Hawk, asks about her well-being. For the proud old woman, his visit became a reprieve from loneliness and routine. she was

tography © N.G.S.

healing laundry when he arrived. Eluding his official queries, she launched into animated discussion of people and events long gone but vividly alive in her memory.

miles below the dam, it's pretty and blue."

Because of the location of his ranch, Mr. Kuehn was irrigating his fields long before the dams went in.

"But they've been a big help to places away from the river," he told me. "Having water sure makes a difference in this country, where rain can be a pretty uncertain thing."

Montana Knew the Chug of Steamboats

A century ago, steamboats could fight their way up the Missouri all the way to Fort Benton in northern Montana (map, page 379). But no longer—none of the Missouri dams have locks. Only the stretch from Sioux City, Iowa, to St. Louis, Missouri, carries barge traffic now (pages 374-5).

The stark towers of grain elevators made it easy to locate Sioux City's big barge terminal, completed only seven years ago. Half a million tons of cargo, mostly grain and fertilizer, moved through that terminal last year. The facility will see even busier days; tonnage is expected to double in a decade.

The officers of the Sioux City and New Orleans Barge Lines, Inc., had agreed to let me ride a towboat downstream to Omaha, Nebraska—but towboats, like tramp steamers, seldom operate on a set schedule. While I waited for my ship to come in, I roamed Sioux City's quiet streets and noisy stockyards. Evenings, I climbed the hill in Floyd Park, overlooking the river, to watch a setting sun daub nature's own cosmetics on Old Misery's countenance.

Sergeant Floyd, the only fatality on the Lewis and Clark expedition, is buried on the hill. He died of a "Biliose Chorlick," Clark noted. More likely it was a ruptured appendix.

Finally the *Omaha* arrived. The black-and-white towboat—boxy, blunt-prowed, 128 feet long—nudged her port side delicately against a barge tied up at the terminal. On the towboat, someone beckoned. Clutching my suitcases, I leaped down onto the barge that separated us.

Caution. Do not leap down onto the deck

Poignant relics: Skeletons of a tricycle and baby buggy mark children's graves on Fort Berthold Reservation in North Dakota. The cemetery lies near an Indian settlement since displaced by waters of Lake Sakakawea. In many places the reservoirs have drowned ancient burial and village sites, some dating from at least 2,000 years ago; archeologists worked feverishly excavating precious artifacts before flooding began.

of an unknown barge while wearing a clean suit and leather-soled shoes. The deck might be coated with slick gray fertilizer!

Regaining my feet, I slipped and skated across the barge. Two dungareed and life-jacketed crewmen hauled me aboard the *Omaha*. It was not one of my prouder moments. I slunk across the recently scrubbed deck leaving a trail of gray-fertilizer footprints.

Admittedly, my knowledge of commercial tugs was limited to dimly remembered scenes from an early *Tugboat Annie* movie. Up in the pilothouse, I suspected, would be a snarling skipper—resembling either Marie Dressler or Wallace Beery—ready to chew me out for my lubberly ways and dirty feet.

But Capt. Jerry Adams gave me a friendly greeting, in the soft accent of Kentucky. "Glad you made it," he said. "I'll ask someone to take your luggage down to the guest room." He handed me a steaming mug of coffee.

Stopping Distance: Half a Mile

The setting sun had turned the Missouri pink by the time we headed downriver. Two huge barges, lashed end to end, protruded from the *Omaha*'s blunt bow. (River towboats don't tow, they push.)

Each barge was 195 feet long and 35 feet wide—and laden with 800 tons of cargo. According to Captain Adams, this was a light tow. But each barge held enough fertilizer to fill 25 boxcars.

Except for occasional periods in dry dock, the towboats are always on the move. The *Omaha* carried two complete crews that alternated on duty at six-hour intervals. Captain Adams, skipper of the after watch, had finished his six-hour shift; he introduced me to Capt. Paul Middleton and went below.

Aided by swift current, we churned downriver at ten miles an hour. There was no depth indicator on the towboat's instrument panel, I noticed. Captain Middleton shrugged. "A depth sounder wouldn't help much," he said. "By the time the bow of that lead barge started to go aground, it would be too late. It would

take close to half a mile to stop even this light load."

He told me that the channel in this stretch of the river is about eight feet deep, and that the lead barge drew seven and a half. We had about six inches of water to spare—as long as we avoided Old Misery's shoals.

During most of the night I lounged on a sofa up in the pilothouse, while my comfortable guest cabin went to waste. It was time well spent—drinking uncountable cups of coffee and chatting with the crew on duty.

I asked Captain Middleton which of the many rivers he'd worked in his 17 years of duty had been the most difficult.

"This one," he said. "The Army Engineers run sounding boats to keep track of the depth, and the Coast Guard marks the channel with buoys, but this river has a sand bottom. Bars build up fast, and they move around."

The river was an almost continuous series of bends, twisting its way toward Omaha. I asked why some of those bends weren't eliminated with shortcut canals.

The captain shook his head. "We have all the current we can handle now. Straighten this river, and it would flow even faster."

Ever probing, the searchlight beams swept the darkness ahead of the lead barge (page 413). When a diamond-shaped marker on the bank flashed white, the captain moved one of his big steering levers, and our tow began its ponderous swing around yet another bend.

Once the quiet atmosphere in the pilothouse tensed up. Captain Middleton sent two crewmen down to the towboat's bow, and each carried a sledgehammer over his shoulder.

"On the way upriver yesterday, we dragged bottom at this bend," he told me. "Those men are ready to hit the release shackles if the lead barge runs aground. We'd want to cut loose quickly, before the current swung the towboat into the bank."

"How would you get a loaded barge off a sandbar?" I asked.

"We'd separate the two barges and moor the free one to the bank," he said. "Then we'd maneuver our stern against the one that's aground—remember, we draw less water than the barge does. We'd use the prop wash of our engines to wash the sandbar out from under the barge."

Fortunately, the sledgehammers weren't needed. We swung around the bend without trouble, and lifted our coffee cups once more.

"Yes, this is a tricky river," Captain Middleton said. "But not as tricky as it used to be before the Army Engineers stabilized the channel. A few years ago, we'd go aground three or four times on the average trip. It doesn't happen often, now."

The Engineers have built stone-filled piers that angle downstream from the shores—to focus the river's flow in the channel. A constant current there flushes the bottom; thus the river dredges itself.

Captain Tries Some Light Humor

The sky was beginning to gray when Captain Middleton pointed off to starboard toward a tiny village. It boasted one streetlight, controlled by a photoelectric cell that would turn it off at daybreak.

The captain chuckled. "It's almost morning. Time for that light to go out." He swung one of the towboat's searchlights around and worked its beam slowly up the pole, groping for the light-sensitive photoelectric cell.

He found it. A murmur of applause filled the pilothouse when the streetlight suddenly went dark.

After 30 days of six-hours-on and six-hours-off, the two crews would go ashore for a month, and another pair of crews would take over the boat. I asked Captain Middleton how he spent his leisure ashore.

"Just hanging around the house, mostly," he said. "No, I don't go fishing. I stay away from this old river when I'm not working."

My departure from the *Omaha*—suitably, in Omaha, Nebraska—was hurried but uneventful. The captain moored his barges along the wall at Omaha's freight terminal, and I scrambled ashore with my luggage. A brief

comradely wave from Captain Middleton, and the towboat was underway again. Four barges were waiting for him downriver at Nebraska City.

Towboating is no picnic today. But a century ago the river was a skipper's nightmare. Old Misery wrecked more than 250 steamboats between 1819 and 1897.

One of the casualties was the stern-wheeler *Bertrand*, sunk in 1865 on its way from St. Louis to Fort Benton, in Montana Territory. The 162-foot steamer ripped open her bottom near DeSoto, a village long since vanished, 20 miles north of Omaha in Nebraska Territory. She went down within ten minutes.

Tales of Sunken Treasure Spur Searchers

For a century the river hid the sunken steamer, building a thick blanket of silt and sand over the hulk. The *Bertrand* became a legend—a ship whose cargo was reported to include gold and 18 tons of mercury.

In February 1968, treasure hunters finally located the hulk, buried 30 feet deep in a dried-up river channel on the DeSoto National Wildlife Refuge. Excavation revealed that any gold it might have carried and most of the mercury were gone—probably removed soon after the ship sank. But the remainder of the *Bertrand's* cargo—more than 140 tons of it—was still there. It now rests in a National Park Service laboratory on the refuge, awaiting preservation.

Since the photograph on pages 396-7 was made, the *Bertrand's* grave has been allowed to fill with water to protect the timbers from uncontrolled drying. If money and methods can be found, the only surviving example of a mountain steamboat hull may be saved.

But tourists and historians can at least examine a selection of the ship's cargo on display in the laboratory building. The artifacts are astonishingly well preserved, for once. Old Misery had cooperated with the human race. She filled the sunken steamer's hold with hard-packed blue clay that sealed out

(Continued on page 399)

Pluming around a bend, a skier slices waters of a flooded oxbow of the Missouri, north of Omaha. Dams upstream have created a set of "Great Lakes" in miniature that lure droves of summer vacationists.

Squadrons of waterfowl—ducks and geese—rest on a small lake in Pierre, South Dakota, before resuming their autumnal flight south. Spring will see their return up the Missouri's valley, a favorite flyway.

Stuck-in-the-mud steamboat, the *Bertrand* tore a gaping hole in her bottom and sank into the Missouri's maw in 1865. More than a century later excavators removed 30 feet of sand and clay to uncover the 163-foot hulk (**right**), landlocked in a former river channel within DeSoto National Wildlife Refuge. Inside her hold, salvors found more than two million items—a pre-Sears Roebuck array of frontier needs and luxuries, ranging from brandied peaches (**above**) to homesteaders' plows and hobnail boots. Perhaps most intriguing of all, they exhumed 780 gallons of Dr. J. Hostetter's Celebrated Stomach Bitters (a potent 32 percent alcohol).

Following the hounds, the North Hills Hunt turns out for a Sunday morning chase near Omaha. They found no quarry on lands where game once teemed. Wrote Capt. William Clark when

the Lewis and Clark expedition struggled upriver in 1804: "Saw a verry large wolf on the Sand bar this morning walking near a gange of Turkeys. . . . Deer to be Seen in every direction. . . ."

oxygen and prevented deterioration. The salvors found it difficult to remove the clay, but when it was gone, they had unearthed something resembling a time capsule—a cross section of the myriad supplies traveling to a frontier fort in the mid-1800's.

Some people up there in Fort Benton a century ago were living very well! I saw fur hats and bottles of French champagne; canned oysters and peaches (page 396), bolts of silk —and case after case of Dr. J. Hostetter's Celebrated Stomach Bitters.

Stomach bitters? Ronald Switzer, director of the conservation laboratory, grinned at my reaction. "We have about 780 gallons of bitters here," he said. "It still has a rather potent alcoholic content. More than 30 percent. But nobody samples it. The maker also put in strychnine and belladonna!"

Why, I wondered, would 780 gallons of stomach bitters be shipped to the western wilderness? Was the labeling simply a way to avoid paying liquor taxes? Or maybe it was a ruse to sidestep the law against selling alcohol to Indians.

Cargo for Gourmets and Pioneers

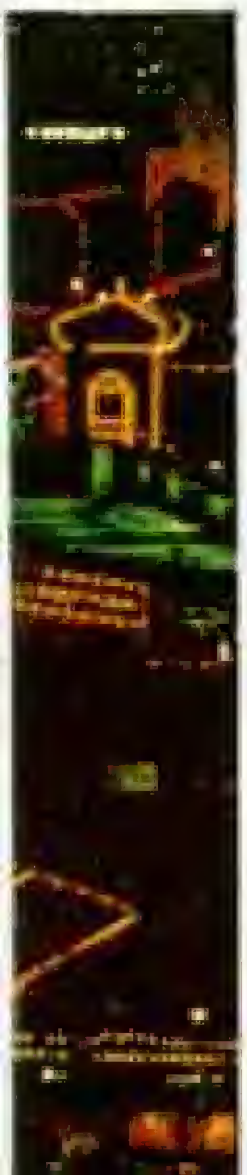
In any event, the laboratory director is faced with an embarrassment of riches. "We have more than two million items here," Mr. Switzer told me. "Most are still stored in plastic bags to keep them from drying out until we can get around to preserving them. The job will take about three years. Perishable items, such as food, get top priority now." He pointed to some ancient jars of peaches.

"Have you tasted those?" I asked.

He shook his head. "Not on your life! We don't even handle those without gloves, because of the danger of botulism."

Not all the *Bertrand*'s cargo was gourmet fare. There were hobnail boots, sod-cutting plows, candles to light a trapper's hut. Looking around that laboratory storeroom, I began to realize how rugged life could be in the western wilderness a century ago.

(Continued on page 406)



City at the elbow: Where the great river veers sharply east, near the heart of the contiguous 48 states, the skyscrapers of Kansas City, Missouri, crown the bluffs. Largest metropolis on the Missouri, with more than a million people, the vast urban area spills across the state line into Kansas City, Kansas, which is bisected by the Kansas River, foreground. Funneling trade from the Missouri Basin and beyond, "K. C." relishes its role as a commercial and historic portal to the West.

At Christmastime, multicolored lights trace the Spanish towers and tile roofs of Country Club Plaza (**left**), a style-setting shopping center built in the 1920's.

Photographed through colored celluloid (**right**), an artist at Hallmark Cards creates an astrological design for a greeting card.

Pure as mountain snow, headwaters of the Missouri (**left**) gurgle down Taylor Fork, 10,000 feet high in Montana's Madison Range, where a wrangler takes a drink.

Befouled by noisome waste from industry and farm, the Kansas River (**right**) bears a bloated animal carcass as it nears its junction with the Missouri at Kansas City. Lack of state and local coordination has hampered efforts to clean up the stream.

Sniff-tester at Kansas City's waterworks (**below**) smells beakers of Missouri River water for objectionable odors. Red tint prevents its appearance from affecting the sampler's judgment. Chemical tests can check potability, but none detect scent as well as a human nose. In foreground stands a sample of raw river water.

Carpet of corn seems to unroll from the lawn of Missouri's capitol at Jefferson City. Actually, the river flows between farm and capitol in this telephoto view. Capitals of four states —Missouri, Montana, and the two Dakotas—flank the Missouri.

River-town revival: Comic vocalists at the Jane Froman Music Center in Arrow Rock, Missouri, appear in a revue recalling the town's heyday during the steamboat era. Named for the famed singer of the 1940's and '50's, the center has raised funds to help train promising young musicians.

River in art: Missourian Thomas Hart Benton, famous for half a century as a painter of mid-Americana, displays his 1957 canvas, "Lewis and Clark at Eagle Creek." It depicts the Missouri near the White Cliffs.

And I pondered the incredible task of moving cargoes like this 2,000 miles up the treacherous Missouri.

The frequent snags, with luck, could be dodged. Shoal water might be overcome by literally rolling the steamer across the river bottom on her paddle-wheel blades. Even sandbars could be conquered by an ingenious technique called "grasshoppering"—using poles and cranes on each side of the boat to lift the hull and send it lunging forward a few feet at a time.

Sometimes a steamer would set out for an upriver port, only to find that the river had cut a new channel, leaving the "port" a mile inland. Oh, you roving river!

"A steamer that cannot, on occasion, climb a steep clay bank, go across a cornfield and corner a river that is trying to get away, has little excuse for trying to navigate the Missouri." So wrote a man who knew the river well, George Fitch, back in 1907.

Part of Iowa Moves to Nebraska

To Congress, it seemed eminently logical to use major rivers as borders between states and territories. But when the Missouri became part of Iowa's boundary, it created problems that exist to this day.

In 1877 the river finished chewing a new channel that left a sizable chunk of Iowa over on Nebraska's bank. It's still there, surrounded on its other three sides by the city of Omaha, Nebraska.

Though the Missouri was instrumental in the founding of both Omaha and Council Bluffs, she played a typically cantankerous role. For these two cities were born not because the river was a water highway, but because it formed a water barrier—a barrier that the wagon trains had to hurdle.

The Mormons, heading toward their Promised Land from Nauvoo, Illinois, faced the barrier in 1846 where Council Bluffs, Iowa, is now located. For six years they stayed—planting crops to be used by the Mormon groups that were following—while the California gold rush sent forty-niners moving on toward the goldfields.

One small ferry was already operating across the river when the Mormons arrived. They built another, and by 1854 (the Mormons had moved on by then) there were several, one of them steam powered.

The Nebraska Territory was opened to settlement in 1854. One of the Mormon settlements had become Council Bluffs, Iowa, and businessmen from that town crossed to the Nebraska side and laid out the streets of Omaha. Another gold rush—the Colorado strike of 1859—sent thousands of miners flocking onto the boats.

Why did tiny Omaha surpass Council Bluffs in growth? Because the Union Pacific Railroad started in Omaha. Other railroads moved in to connect with it. The Army moved its supply center there, to supply the forts farther west. By 1875, Omaha was on its way to big-city status.

The United States has been at war with

Still kicking up her heels, the ornery Missouri takes her toll even today along lower reaches remote from upstream dams. Farmlands near the river's confluence with the Osage in central Missouri (**above**) brim with destructive floodwaters after 6¾ inches of rain doused the area in a two-day period in October 1960.

Sometimes the rain-swollen river turns back inflowing waters of tributaries and creates local inundations. One such flood in May 1970 hit Hermann, Missouri, where youths (**left**) play in a park awash with two feet of water.

Yet these are but puddles compared to the deluges that once ripped across the lower Missouri's floodplain. In 1943 the river swept away property valued at 65 million dollars, prompting an alarmed Congress to pass the Flood Control Act of 1944 and launch an era of dam building that has seen the Mighty Mo caged to serve man's needs.

Cornucopia of corncob pipes flows from the Missouri Meerschaum factory in Washington, Missouri; company president Carl Otto beams over a binful of 59-cent models. Each year the firm makes 10 million pipes in some 70 models, using cobs from a specially bred white corn.

this river ever since Congress passed the Flood Control Act of 1944. Wars are fought by armies; this one has been spearheaded by the U. S. Army Corps of Engineers.

At the Engineers' Missouri River Division headquarters in Omaha, I discovered that Old Misery is a worthy adversary.

Brig. Gen. John Morris, division engineer, pointed out some of the problems involved. "The river basin has a tremendous elevation range, from 14,000 feet up in the western mountains down to 400 feet at the mouth. And the precipitation pattern along the river varies a great deal, too."

Vigil on Dam Flow Spans the Seasons

General Morris outlined some of the complexities of flood control—which is only one of the uses to which the Missouri dams must be put. "We start lowering the reservoir levels in the fall," he said. "We keep at it during the winter, but there's a limit to how much water we can release after the river has iced up—too great a volume of water can raise the ice sheet as much as nine feet above normal river level, and that would be pretty hard on towns along the bank.

"Our reservoirs start filling when the spring floods come. In summer we must be careful how much water we release from the reservoirs, because the river is subject to sudden storms. If we release too much water, we might aggravate storm floods farther down. In fall, we start the cycle again."

Congress decreed that the Missouri was not only to be conquered, she was to be put to work.

Already the river irrigates many thousands of acres of corn and alfalfa in Montana and the Dakotas. Soon irrigation ditches will fan out from the Garrison and Oahe reservoirs to water a million additional acres. The seven government-owned main-stem dams—together with many of the 80 tributary dams—annually generate more than nine billion kilowatt-hours of electricity.

And eight months of the year the lower

Missouri carries barge traffic—almost three million tons of it last year. Although the swift current now minimizes wintertime freezing of the channel, the water level drops too low for navigation between December and April.

Before the dams went in, however, this stretch of the river stayed frozen all winter. Charles Martin, past president of the Nebraska Historical Society, told me that before the first railroad bridge at Omaha was built in 1872, even locomotives had been taken across the river by laying temporary tracks on the thick sheet of ice!

What happens to the fish when you tame a river? Dudley Rehder, a biologist with the Corps of Engineers, answered my question.

"The dams have changed the aquatic environment," he told me. "The upper and middle Missouri is essentially a chain of lakes now. From a sportsman's point of view, it's a change for the better. Game fish, such as northern pike and walleye, have increased. And white bass and coho salmon have been introduced. The fishing is really fantastic, among the best in the Nation."

I heard more talk about the *Bertrand's* cargo while chatting with Seymour Smith, one of Nebraska's most genial and most durable citizens. Recently retired after practicing law in Omaha for 45 years, Mr. Smith has memories of the river that go back into the late 1800's.

"I was born in 1893," he told me, "about a mile from where the *Bertrand* sank. As a matter of fact, I'm quite sure that some of the ship's cargo—including some of Dr. Hostetter's Celebrated Stomach Bitters—was on its way to my grandfather's store in De Soto."

Mr. Smith hastened to defend his grandfather's good name. "Granddad always told me that he sold the stomach bitters for medicinal purposes, and not for 'frolic.' If anyone bought a bottle and drank it on the spot—without reading the directions on the label—Granddad wouldn't sell him any more."

Mr. Smith's farm bordered the river, and he knew Old Misery well.

"Floods? We had them almost every spring. The DeSoto bend area is bottomland, so most of the farm went under."

He chuckled. "One of our neighbors, Bill Miller, had a wife who was always after him to install a pump in the kitchen; she was tired of having to go out to the backyard pump for water. Well, Bill woke up one morning and found the river coming in under the back door. He hollered up to his wife, 'Rosie, you finally got running water in the kitchen!'"

Even when the river was not flooding, it caused trouble. Mr. Smith told me of another neighbor whose farm dwindled from 300 acres down to 100 when Old Misery suddenly decided to gnaw the riverbank away.

"We used to say that the Missouri had a first mortgage on all the farms along the way," Mr. Smith said. "And there have been plenty of times when the river foreclosed on the mortgages."

Strand of Wire Stopped the Pony Express

Below Omaha, Old Misery tamely becomes the wide Missouri. It's a "six-barge river" there, with a channel wide enough and bends gentle enough to let towboatmen lash them three deep and two abreast.

Nebraska City, which once challenged Omaha for supremacy in the Nebraska Territory, stretches its barge-lined seawall along the river. And farther down, where the river separates Missouri and Kansas, lies St. Joseph, Missouri.

The Pony Express started in "St. Joe" in April 1860. From the stables at 914 Penn—now a museum—the route stretched almost 2,000 miles to California. Delivery time of a letter? Just ten days (page 380).

Neither snow, nor rain, nor heat, nor gloom of night—nor hostile Indians—could stop the Pony Express. The thing that finished it, after only 19 months, was the completion of a cross-country telegraph system.

Thirty miles farther downstream, on the river's western bank, lies Leavenworth, Kansas—a town of tree-lined streets, quiet homes,

Meeting of mighty rivals: The Missouri receives her biggest "tributary," the upper Mississippi, right, a few miles north of St. Louis. At their confluence on the border of

Missouri and Illinois, the Missouri River has traveled more than twice as far as her companion stream, but averages about 17 percent less in volume. A brisk westerly breeze flattens a plume of factory smoke near Alton on the Mississippi's Illinois shore, where late-spring floods have invaded tree-studded lowlands.

and a famous prison. Tourists: Turn your back on those cold prison walls and find Fort Leavenworth, a military post since 1827. In the post museum your youngsters will marvel at Custer's sleigh, a Conestoga wagon, and a carriage that Lincoln used.

By the time the river has twisted past Leavenworth and reached Kansas City, she has lost her sinful ways. Seemingly so—though towboatmen tell me that the shifting channel still proves troublesome. But stare at her dull countenance from a Kansas City dock and you know she's been civilized—because her face is dirty.

From John M. Rademacher, Regional Coordinator of the new Environmental Protection Agency's Kansas City office, I learned that the dirt is more than surface deep.

"Above Sioux City," he told me, "the major pollution problem is agricultural runoff—silt, fertilizers, and pesticides. From there on downstream, we have problems with inadequate sewage-treatment plants, feedlot runoff, and industrial wastes. The amount of organic contamination below Kansas City is *fifteen* times greater than it is above Sioux City!" (page 403).

Is there any hope? Mr. Rademacher expressed guarded optimism. "Federal standards state that the cities must upgrade sewage-treatment plants by 1975," he said. "Most of the meat-packers—they used to be quite a problem—are moving out to smaller cities now, near where the cattle are fed, and their new plants include pollution-control systems. Things should get better along the Missouri."

"Barnyard Briars" Catch On

At Kansas City the river turns east, and winds its way past a succession of peaceful Missouri towns. One of my favorites is Washington, Missouri—whence come virtually all of the world's corncob pipes.

Just a few years ago, most sophisticated pipe smokers would curl a lip at the very thought of those "barnyard briars." Things have changed; Washington's three corncob factories are working hard to keep the pipeline filled.

I chatted with Carl Otto (page 408), president of the Missouri Meerschaum Company—whose yearly sales amount to about ten million corncob pipes.

"Some are sold to decorate the hillbilly hats that tourists buy," he said. "Others are just giveaway gimmicks. But pipe smokers have accepted the corncob in a big way."

He rummaged around his cluttered desk and riffled through a sheaf of papers. "Here are our current foreign orders—Denmark, England, Switzerland, Canada, Norway, Sweden, France, and Australia."

Not just any old corncob will do, Carl told me. His company asked the University of Missouri to develop a special seed. It grows large cobs with lots of grain and low stalks that the wind won't topple.

What happens to the corn after the cob has been shelled? "Some of it ends up in South America for tortillas," he said.

Rambunctious River Keeps Past Alive

Still brushing flecks of corncob from my jacket, I hurried downstream to witness a marriage. Old Misery becomes one with Old Man River—the Mississippi—just north of St. Louis (preceding pages). Like a dutiful wife, she assumes her husband's name. The Missouri is no more.

I was sorry to lose her. Our acquaintance had been close enough to reveal glimpses of her magnificently cantankerous personality. All our dams and turbines and revetments have not tamed her completely.

In a way I'm glad they haven't. There is too much blandness in this world today. As long as Old Misery can still give a gurgle of discontent—while she changes a channel or grounds a towboat—she celebrates our past.

Remember that this land was settled by strong-willed individualists. They cursed and sweated and fought this river—and gave her grudging admiration. And as long as her spirit survives, so, too, will theirs. □

Missouri nocturne: A towboat's twin searchlights probe the darkness aiding the lower river in quest of the channel buoys that mark safe waters. The anchored markers and bankside signs help keep barge traffic moving day and night without a slowdown.

Ever-shifting sandbars and snags require a constant vigil from river pilots—and sometimes earn their eloquent fury. As in her boisterous youth, when she carried trappers, miners, and settlers westward in search of their particular dreams, the Missouri continues to demonstrate a fickleness that makes boatmen hypersensitive to her changing moods. Dams and continual dredging restrain—but have not eliminated—her flooding and her wanderlust.

What a Place to Lay an Egg!

By THOMAS R. HOWELL, Ph.D.
PROFESSOR OF ZOOLOGY, UNIVERSITY OF CALIFORNIA, LOS ANGELES

LOUD SQUAWKS outside my bedroom window awoke me from a deep slumber. Though it was only 2 a.m., a pair of fairy terns were pacing the window ledge, obviously seeking a place where they could raise a youngster. For a bird that builds no nest, such a choice is critical. A few days later the ten-inch-long female laid a single speckled egg on the edge of the gravelly sill.

Thus began a 14-week study of the fairy tern—so named because of its ethereal beauty. Taking sabbatical leave from my university post, I had gone to the Midway Islands. These two bits of land in the northern Pacific are especially favored nesting grounds of the fairy tern, which ranges widely over the tropical and semitropical oceans of the world.

My National Geographic Society-sponsored research taught me much about *Gygis alba*, also known as the white, or love, tern. The parents, for example, participate equally in the care of their offspring. While courting (**below**) and raising young, the birds groom each other's faces—the one being preened assuming ecstatic postures, much as cats do when their chins are stroked. Such behavior, I think, helps establish a bond between parent birds.

When laying her one egg, the female may choose a place that is nothing short of incredible—a stump, a roof edge, a woodpile, or, very often, a fork in a swaying tree (**right**).

Poised atop a precariously balanced egg, a parent takes a turn at incubating. For some 34 days male and female share the task. On such hazardous sites, an adult's wing-flapping approach and casual settling on the egg is a nerve-racking sight. Surprisingly, I never saw a tern dislodge an egg, although I found many broken ones, especially after storms.

While one bird broods, the mate flies off to fish. Feeding terns hit the water quickly to catch small surface fish or to snatch up others leaping to flee from predators below.

Ball of damp fluff, a newly hatched chick dries beneath a protective parent. Already

AFTER repeated efforts, the chick on my window ledge still finds this mouthful too big to swallow. I cut the fish in half and fed it to the little one, while the offended parent scolded loudly.

A chick may eat almost half its weight in a day. To keep up with this appetite, the parents shuttle between ocean and offspring, bringing home at one time as many as 15 small fish and squid neatly lined up crosswise in their bills. How the birds continue to fish while holding their catch remains a mystery.

the infant can grasp the limb with oversize feet and even hang upside down. 417

HOVERING AT EYE LEVEL, a fairy tern inspects a visitor while clucking softly (**above**). Sunlight transforms the fluttering wings to a translucent aureole. Apparently unafraid, an incubating bird even allows my son to touch it (**below**).

DINNER ALMOST OVER, a half-grown tern rests sleepy-eyed (**opposite**), the tail of a flying fish still protruding from its bill. Stains of squid ink mark the parent's throat and wing.

Homelife can be hazardous for a young tern. Often an attending parent does not wait to be relieved by its mate before departing to fish, and the chick may be left alone for hours. Should a rainstorm occur, the youngster can become soaked and so chilled that it loses its grip and tumbles to the ground. The adult bird cannot cope with this calamity. Returning with a beak full of food, it will sit on the perch looking disconsolate while its offspring, lying in plain view, perishes of hunger and exposure.

I sometimes replaced lost chicks with others from a stock of foundlings I acquired. Invariably, the parents adopted the orphan, even if it was younger or older than the original, and the chick readily accepted the foster parents.

Such tolerance deceives. Among themselves, fairy terns are raucous, quarrelsome, aggressively hostile, even thieving. Midair fights are not uncommon, with both birds locking bills and grappling as they fall to the ground. Sometimes neighbors set upon an adult returning to its young and rob it of its catch of fish. Adults even steal food from other birds' chicks after the parents depart.

But, considering the fairy tern's rare beauty and unusual choice of nesting sites, I found it easy to forgive its fractious side. □

Brazil Protects Her Cinta Largas

ARTICLE AND PHOTOGRAPHS BY

W. JESCO VON PUTTKAMER

In one of civilization's final encounters with the living Stone Age, a group of brave men reach back into time to touch hands with the shadowy "people of the wide belts." The record of that extraordinary meeting reveals proud and still almost unknown Indians—portrayed exactly as they are.

—THE EDITOR

WARILY, two young men walked toward each other in a clearing in the green heart of Brazil.

One was a friend of mine. The other, in all likelihood, no *civilizado* had ever seen except perhaps as a fleeting shadow in the great tropical forest of Rondônia Territory. He was a Stone Age Indian, a wild warrior whose people for 400 years had escaped the encroachment of civilization.

The two young men came to within arm's reach of each other and stopped. And my friend's heart gave a great bound, for behind the nearly naked Indian, out of the seemingly empty forest, appeared more than fifty warriors, each with a longbow in which a six-foot arrow lay notched.

"Silently the Indians flexed their bows," said my friend. "My hands shook as with the chill of malaria. I shut my eyes.

"Then I heard a new noise, a rustling. I looked in astonishment at the man before me. With hands trembling as much as my own, he was offering me a headdress of palm fronds.

"In that moment I knew him to be a human being as frightened as myself. I felt also he had love in his heart, as I had in mine.

"I took his gift. I gave him my machete. We turned about and walked each to his own side of the clearing.

"Before my own weeping drowned all other sounds, I heard the clicking of the arrows being withdrawn from the bows."

In this manner one of earth's last Stone Age peoples took their first fearful steps into a bewildering new world of men who know how to fly to the moon. One of the longest, hardest, most dangerous jobs ever undertaken by my native Brazil's National Foundation for the Indian seemed headed for success.

Few Mysteries Solved in a Year of Contact

But the task is by no means completed. A year after that first friendly contact, the foundation people working among these tense, wild tribesmen still lived in daily peril of their lives. At any time, a civilizado might inadvertently do some small thing that would be misconstrued by the primitive mind and trigger a massacre. It has happened before.

The Indians have not allowed a foundation worker into any of the 22 villages so far spotted from the air. Of an area population we estimate at between 3,000 and 5,000, only a few women have been seen, and no infants—a bad sign, for it means distrust.

When I temporarily left the pacification team last year after many months as semiofficial photographer and diarist, we had not even learned the name of the Indian group we had met, nor their relationships with the Indians of other villages. Did the people of all the 22 communities belong to the same tribe or, as seems more likely, to several tribes? As yet we do not know. For the time being we are calling all these Indians "Cinta Largas," from the Portuguese words for the broad belts often worn by men and boys of the region.

The language of our new friends was not known to us, nor to the pacified Gaviões and Arara Indians we had brought along in

the hope they could interpret for us. I recorded considerable conversation on tape; linguists later identified several words as being of Tupian stock—a language group common to many Brazilian aborigines.

In 1914 Theodore Roosevelt and Col. Cândido Mariano da Silva Rondon, who inspired Brazil to protect her Indians, explored the river now named for the United States President (map, page 426). They saw no Indians. But later, when fortune seekers penetrated Rondônia in quest of wild rubber, jaguar pelts, and diamonds, they were driven back by warriors wearing wide belts.

For years the Cinta Largas were left in peace. Then, in the 1960's, the highway being built from Brasília to Cruzeiro do Sul came close to their hunting grounds. With the road came more fortune seekers, this time in hundreds. The newcomers were of all kinds, from gunslingers a jump ahead of the police to adventurers of substance seeking tin, rubber, or land for speculation.

FUNAI Must Balance the Interests of Many

Hostilities with the Indians resumed at once. There were ugly incidents. And though we Brazilians know of no nation that has ever passed through a similar stage of development without committing such sins, my country is ashamed of some of the things then done by its nominally civilized citizens.

Indians were shot on sight. I know several Cinta Largas with bullet scars, and one who survived a machete slash that almost split his face. A Cinta Larga village was dynamited from the air. Poisoned foods were left temptingly on trails.

The Indians also did cruel things. They killed the young wife of a settler on the Riozinho River. They murdered a rubber tapper with 13 arrows and gruesomely mutilated the corpse. And once a Cinta Larga proudly showed me his prize trophy, a set of false teeth.

Eventually the government acted. It ordered the National Foundation for the Indian—FUNAI, we call it, from its Portuguese name—into action. FUNAI is the agency with which the government replaced its original Indian Protection Service in 1967; over the years the old service had grown cumbersome and tangled in red tape.

FUNAI's mission is a dual one. First, it pacifies hostile Indians so that Brazil, an underdeveloped nation, may extract the riches of its vast wilderness area as efficiently and painlessly as possible. Second, it protects the Indians it pacifies against the harmful aspects of our civilization with which they cannot cope.

As an example, it prosecutes trespassers on lands set aside for Indian use. It guards its charges against exploitation. It seeks to keep the diseases of civilization

Friendship rebuffed: Stone Age Indians of western Brazil mutilated a plastic doll left for them as a gift, and then impaled the head on a tree. This angry rejection marked an early attempt to contact the Cinta Largas, after nine months of fruitless effort.

During their months-long "flirtation," members of a Brazilian Government expedition sought to gain the confidence of the Cinta Largas by leaving gifts of tools and trinkets in the forest. Playing a wordless game of trust, José Moreno (**below**) ties peace offerings to a hunting shelter frequented by the Indians. Cinta Largas retrieved them unobserved, leaving in exchange their own plumed headdresses, seeds, even arrows. Hinting at preferred presents (**bottom**), they left a stone ax and clever imitations of scissors, needle, and knife. After almost a year of such exchanges, an Indian steps cautiously into view (**right**). He carries a six-foot bow and bamboo-tipped arrows. Armlets and a necklace of wild nuts adorn his nearly nude body. The facial tattoo may signify rank.

away until the Indians can be immunized; otherwise, measles or smallpox might sweep the region, taking a fearsome toll.

But there is one thing that not even the selfless, dedicated people of FUNAI can prevent. That is the erosion of a simple culture by a strong, complex one.

The process begins the moment a wild man exchanges his stone knife for a steel one, or wears a civilizado's discarded shirt. It ends, at best, in assimilation by civilization, or survival on a reservation that is an island in an alien cultural sea. At worst, it terminates in despair and ultimate extinction.

But in no event can the Stone Age Indian ever be the same again, and that is why each FUNAI *sertanista*, or Indian expert, carries in his heart *saudade*, a nostalgic sadness. For he must live with the knowledge that whether he brings stark tragedy or better lives to the people of the forest, he will unavoidably diminish a simple, fragile beauty the world can never see again.

Still, FUNAI has a job to do. Francisco Meireles, leader of the Cinta Largas expedition, was earnestly trying to do his when I first met him at the Seventh of September advance pacification camp.

"Chico" Meireles is one of the most famous and experienced sertanistas on the FUNAI roster. Others are the brothers Villas Boas, Orlando and Claudio, with whom I served on the Xingu River during the pacification of the Tchikao tribe a few years ago.*

*See the Villas Boas' "Saving Brazil's Stone Age Tribes From Extinction" in the September 1968 GEOGRAPHIC. The late Harald Schultz also wrote movingly of Brazil's Indians in the January 1966, May 1964, and January 1962 GEOGRAPHICS.

"I have had about thirty people camped here for six months," Chico complained as I slid off the mule that had carried me in from the highway. "Has any one of us seen a single Cinta Larga? No, they are ghosts. They take the machetes, scissors, pots, pans, and such things as we set out for them, but they permit us not even a glimpse of themselves.

"It is most frustrating, for we are using all the techniques we have found successful in the past. We do not push; we leave all initiative to them. We come to them with love."

Eventually the Cinta Largas gave us reasons to hope. They left headdresses for us, made with the brilliant plumage of forest birds—objects so elaborate and so beautiful that they must have been of great value to their makers.

We received manioc, peanuts, and corn, staple items of Indian diet. We were elated, for such gifts seemed to imply that we were expected to remain and plant crops. One day there appeared a bow, taller than a man, and a good supply of arrows with razor-sharp, fire-hardened bamboo tips. Surely these were tokens of trust.

We still saw no one, though the Indians became increasingly careless about making noise. Once, while I helped lay out presents at the exchange place, I heard someone cough.

"You smoke too much," I said jokingly to a man behind me. Then I saw that he was staring in fear at a bush fifty feet from us.

For the next ten minutes, while we finished our work, I watched that bush. But I saw nothing, not even the movement of a leaf. We laid the last gift down and started back to camp. Suddenly a series of sounds came from

Bridging the ages, an Indian warily accepts sewing needles from Apoena Meireles' outstretched hand. Apoena's father, veteran Indian expert and expedition leader Francisco Meireles, offers more gifts. Three youths watch as their companion takes a hesitant step toward civilization. For modesty, the Indians keep their scrotums pulled up and secured with palm-leaf ribbons. On their backs they carry sticks which they rub together to make fire.

Delicate balance of friendship: A Cinta Larga reaches for the machete of Francisco Meireles, who will not resist for fear of destroying the fragile relationship.

Heart of South America opens to civilization as Brazil moves to develop its natural resources. In Rondônia and Mato Grosso, 3,000 to 5,000 Cinta Larga Indians, of whom little is known beyond the fact of their existence, live in scattered villages. As prospectors and developers enter the area, Brazilian Indian experts attempt to contact the Cinta Largas, hoping to protect them from armed clashes, from diseases to which they have no natural immunity, and from the sudden shock of a bewildering technology.

In a rare moment of cooperation, an Indian and an expedition member work side by side. As the camp's tense visitors relaxed, they began imitating their new friends. Before trying his hand at tamping the airstrip, this warrior handed bow and arrows to a *civilizado*—the ultimate sign of trust.

Fleeing a metal monster, a Cinta Larga runs from a supply plane at the camp airstrip. The engine's sputtering warm-up aroused his curiosity, but the roaring takeoff sent him fleeing in terror. Since then, three Indian boys have made the 230-mile flight to Pôrto Velho, capital of Rondônia Territory.

the bush: the cry of a monkey, bird trills—and a very human giggle.

Encouraged, we tried noises of our own. Nearing the place of exchange each morning, we sang; we shouted, we banged the boles of the trees with machetes. The best sort of primitive philosophy, this: The man who comes noisily comes in peace.

We turned my tape recorder to full volume, and the forest rang with the singing and flute music of the Indian tribes I had known along the Xingu River. Our interpreters shouted into the forest in several aboriginal languages.

"Do not fear us." "We will not harm you." "Come to us."

No response. But the exchange of gifts continued, and from it we learned something about the Cinta Largas' tastes. For example, they appeared to have a genuine antipathy toward the lids of aluminum pots. They bent them into uselessness and threw them away.

In the beginning they shattered the mirrors we had left, though eventually they would learn to value them (page 433).

In one of the mule convoys that supplied the camp from the roadside settlement of Riozinho, we found a carton of little plastic dolls. We left them for our friends. Next day we found them ripped apart, the heads stuck on tree limbs (page 421), the bodies, skewered by arrows, lying beside the trail.

Would-be Bathers Must First Oust Fish

As time passed, the lack of amenities in our daily lives began to get on our nerves. Most sertanistas love the life of the wilderness, but they cannot forget the attractions of a cold beer and a hot bath.

The tub at our camp is a pool in a forest stream. Trusting the water will not be too muddy to wash with, one sets forth for the pool in heavy boots, for many poisonous snakes, including rattlers of respectable size, live near the stream. At poolside one first skims off dead fish, victims of Cinta Larga fish poisoning upstream. Next one throws in a few stones and stirs the bottom with a stick.

This last maneuver is designed to frighten away stingrays and electric eels. The former can inflict severe, even crippling, wounds if stepped or sat upon. The eels, running to six feet in length, can deliver a shock sufficient to knock a man unconscious. The ray usually flees downstream, but the eel, a curious fellow, comes back to see what is going on. When his snakelike head pokes out of the water, it is best to frighten him off with another stone.

There are other forest animals that are not the most congenial of neighbors. Like the Amazon Indians, I consider the big spotted jaguars we frequently hear (but rarely see) a menace, at least to women and children. And there are women and children in our camp. Chico feels that their presence assures the Cinta Largas of our peaceful intentions.

Even Jaguars Yield to Foraging Pigs

Everyone fears the peccaries, the wild pigs that abound in the forest. The pigs come in two sizes, large and small, and they go about in sizable bands, gnashing their teeth and smelling to high heaven. When we see the larger species—the white-lipped peccary—headed our way, we look to our guns and our line of retreat; even the jaguars give them the right-of-way.

But most forest creatures are inoffensive. The shy tapir; the capybara, largest of rodents; monkeys of many kinds; deer in assorted sizes; turtles; gaudy birds, such as the brilliant red macaws and the turkey-size *mutums*, or curassows. Of necessity we hunt and eat them. Otherwise we could not survive here, for our lines of supply from civilization are often disrupted.

In the rainy season, mud, fallen trees, and swollen rivers prevent mule caravans carrying our supplies from making the 56-mile trip from Riozinho to our camp. The trail to camp is an old one cut years ago by rubber tappers, before they were driven out by the Indians.

The mule caravans run another risk. Occasionally the Cinta Largas stampede a packtrain. The mules find their way home, but often without their cargoes.

To keep our minds occupied, we work very hard. We begin to cut an airstrip and a plantation out of the virgin forest, Indian fashion, with machete and fire. We dig a well.

We must frequently take apart and clean our mechanical devices—the little gasoline-powered generator, the radio transmitter, my

Prelude to abduction? After a playful scuffle, an Indian clutching camp booty suddenly yanks an expedition youngster toward the forest. Fear mounts in the boy's face. "When camp members put a stop to the maneuver, the warrior laughed as if it was all a joke—but we weren't sure," says the author.

cameras. In this humidity everything quickly turns rusty and moldy.

We shoot at targets. We swat the *borrachudos*, the biting flies. In the evenings we have tape-recorder concerts, and sometimes I play my accordion.

We have our share of silly quarrels. But also we nurse each other through our attacks of malaria. This illness is a serious thing here, and one of our men has died of it.

Stirring Moment Caps Long Campaign

One day Chico Meireles was away from camp. His son Apoena—named for a chief of the Chavante tribe, which Chico pacified—was in command. Just 20 years old, Apoena was already a fine sertanista, lacking only the experience of his father to make him his equal in the forest.

Big stars mark the day in my diary:

"At last the Cinta Largas have made overtures! Returning to camp from the place of exchange, our people heard shouting behind them. They looked back.

"There in the clearing four warriors stood in plain view, waving and calling in a language no one understood.

"Apoena was summoned. By the time he arrived, only one Indian remained in sight. When Apoena tried to approach, he too ran into the forest. The jungle fell silent."

Five days later the Cinta Largas called again from the forest. It was then that Apoena and the magnificent young warrior leader we now know as Noára (opposite) reached trembling hands to each other across the millenniums of history.

Faithful to the policy of leaving the initiative to the Indians, Apoena returned to camp to await the Cinta Largas' next move. It came the following morning. While two score armed warriors watched from the far side of the stream, four boys about 15 years old crossed our log bridge and trotted into camp.

Wondering why the Indians sent boys instead of adults, we nevertheless met them with smiles, holding out new axes and machetes. These the youngsters snatched avidly and took across the stream, after which they returned and held their hands out for more.

For an hour we gave out presents and were given things in return—ornaments and arrows. As our supplies dwindled, we tried to break off the trading by ignoring the outstretched hands. At this the four boys simply ran through camp and picked up whatever took their fancy.

One entered the cookshack, took every pot and skillet he could carry, and set off for the forest at a run, pursued by the enraged cook.

"Let him have them!" shouted Apoena. "Do you want us all massacred?"

Indeed, on the other side of the stream, the watching warriors were fitting arrows to their bows. Had our cook laid a hand on that boy, I am sure we would have paid for it with our lives. For though we carry arms, we will never violate the commandment handed down by FUNAI's spiritual founder, Colonel Rondon: "Die if necessary, but never kill."

Machete Opens a Puzzling Container

Encouraged by the success of the kitchen raid, the four boys now all but took the camp to pieces in their search for treasure. They dug in what they thought likely hiding places, they searched the sleeping huts, poked into every drawer and cupboard.

One lad was puzzled about how to open a suitcase, but not for long. He slashed into it with a machete. He fingered the clothes, money, and papers within in wonder, but took only a knife, after first discarding its sheath.

Among the camp dogs was a silly, friendly one. The boys carried it away. It escaped and came home that night, but was taken again next day. This went on for two weeks, until the dog tired of the game and stayed with the Indians of its own accord. Another, an old mongrel, bit the lads, and they left it alone.

At first our visitors were extremely tense and nervous. Any sudden moves on our part, any attempts to get close to them, put them to flight. But as the days passed and we let

With a king's composure, proud Chief Noára pays a call at the expedition's camp. Bark belts, one slung over his shoulder, may serve as armor; warring Cinta Largas use arrows tipped with fire-hardened bamboo. But disease, not war, could spell the Indians' doom. The expedition hopes to immunize them soon against such illnesses as measles and smallpox, to which these forest dwellers have no resistance.

"**Magic**" **from another world** draws Indians to the camp. The author's writing worried them. When he jotted down their words and repeated them, the Indians ripped his notes in alarm. Lured to a ball-point pen, one drew lines, a circle, and a squiggly pattern (**far left**). An ink marker makes an instant success with a youngster, who decorates his body while clutching a plastic bottle (**middle, left**).

Matches, first regarded as sorcery, intrigue Takanine, here lighting dozens at a time (**left**).

A mirror frightens, then fascinates Cinta Largas (**above**), who have also appropriated a cap and a vacuum bottle.

Struggling with a wheelbarrow (**left**), an Indian fails to realize the purpose of the wheel as he pushes the legs into the ground. The Indians often took things whose use they did not understand, but they usually discarded them later in the vicinity of the camp.

them do as they pleased, they grew bolder. I held the tape-recorder microphone toward one. His face contorted. Then he shouted angrily at me and swung his machete at the machine.

All the boys made what I took to be threatening gestures when I aimed my whirring movie camera at them, although they exhibited only minor annoyance at my still photography, and did not even flinch at my flashbulbs.

"What juvenile delinquents!" I said to Apoena after one boy had snatched the sunshade from my camera and made off with it. "I am beginning to believe these Cinta Largas must be the most arrogant of all the Indians in Brazil."

"Ah, no, Jesco," said the young sertanista. "We are seeing a rare and wonderful thing. We are not dealing here with the pitiful remnants of a beaten tribe, but with vigorous youngsters from a healthy, proud people who have always been masters of their own destiny.

"We are in a delicate position. We must move carefully, lest we frighten these people into killing us, or, just as bad, humiliate them and crush their spirits. You see," he added, "these Cinta Largas think *they* have pacified *us!*"

Civilizados Willingly Accept Menial Tasks

As time went on, it began to appear as though their purpose in "taming" us had been to make servants of us. The boys allowed us to accompany them on hunting trips, but expected us to carry the game they killed. Of course we did so. When we came to streams deep enough to harbor stingrays and electric eels, the Indians silently climbed upon our backs, and we carried them across the water.

We were also asked—commanded might be a better word—to join Cinta Larga fishing parties. Like most Brazilian Indians, they usually fished with the sap of a vine called timbo. This vine, pounded on a streamside rock, produces a milky juice which runs into the water and stupefies the fish.

Beating timbo is hard work, so this job was given to us. In addition, I was always chosen to gather the vines. This made good sense. Timbo climbs into trees and must be pulled down—an easier task for my heavy self than for the smaller Cinta Largas.

Once I collected and beat timbo until I literally collapsed with exhaustion. As I lay on my back and panted, I wondered if they would try to force me back to work. But they merely glanced at me and took over my work. They asked nothing more of me that day and even gave me something to eat, which they rarely did. The snack consisted of crushed Brazil nuts and roasted insect larvae.

Although adult Cinta Largas had by now accepted our presence, and even come into our camp, for days at a time we had only boys as visitors. Was this by design, we wondered? Were these little hellions sent to test the limits of our tolerance?

Whatever they wanted, they took. If anything annoyed them, they broke it. They climbed at will into our hammocks. They refused our food, but sat on our tables while we ate, their feet everywhere but in

(Continued on page 440)

When words are strangers, faces say it all. Smiling visitors gather around Apoena Meireles after presenting him with a small capuchin monkey; another pet clings to an Indian's arm. Man at left was shorn with scissors, a gift of the expedition; sharp slivers of bamboo are the usual barber tools.

Displaying a skill born of constant practice, 10-year-old Pazlababéta takes

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aim with his longbow. His arrow split a matchbox target twenty yards away.

Wilderness waltz: Asinging, prancing Cinta Larga, wearing an ornamental nose plug (above), joins 12-year-old Raimundo Fortunato in an impromptu dance. Children of expedition *caboclos*—people of mixed European and Indian blood—helped break the ice in early contacts with the Cinta Largas. Families of expedition members move into camps in Indian territory to avoid the appearance of hostility.

Armadillo for dinner: Indians roast the armored beast on a grill of sticks at the camp's edge (opposite). One young tribesman greets an expedition member with the open affection that marked the Cinta Largas' final acceptance of their new friends.

Warrior and baby-sitter (below), young Takanine fashions a headband for a little civilizado, the brother of Raimundo. By age 12, Cinta Larga boys take on the role of adults—hunting and helping to protect villages. Shifting for themselves, groups of two or three wander for days through the vast forest, where jaguars and wild pigs are an ever-present danger.

our plates. They made off with a small pet monkey and a rooster. For a long time afterward, we heard the bird crow each morning in the nearby forest.

They even tried to kidnap the handsome young wife of one of our workers, but the girl, a *caboela*, or mixed European-Indian, put them to astonished flight with a shrill verbal torrent. Progress on the airstrip we were building near the camp was interrupted when the Indians took all the tools, even while work was under way.

Discipline Comes in a Bug-spray Can

When the boys brought bows to camp and aimed arrows at us if we denied them anything, we knew the time had come to risk asserting ourselves.

I am a little ashamed of the way I "tamed" Takanine, an exceptionally bright youth. Still, he was prying at my tape recorder with an arrow and would not stop. (Primitive Indians, in my experience, often believe mechanical devices to be living creatures.)

I shouted at Takanine and reached for his arrow. He reached for his bow. I seized a can of insect repellent and sprayed it at a lighted candle. The inflammable repellent ignited with a flash. Takanine departed for the forest at speed. When he returned, he was highly respectful, and remained so for days.

With this and other tricks, we gradually brought the lads under a semblance of control. To our relief, the adults made no objections to our tactics, and even backed us up a time or two.

The days lengthened into weeks, the weeks into months. We learned many things about these Indians. Their senses of smell, hearing, and sight, for example, were extraordinary.

The jungle people could spot a bird or small monkey high in the forest canopy when we could see nothing. One day, as we waited on the finished airstrip for a plane, they pointed excitedly at the sky minutes before we could hear anything. Sure enough, the plane eventually appeared.

On another occasion a Cinta Larga sniffed a trailside bush and told Macurap, our expedition's chief hunter, that a tapir had just passed by. It was a young female, he indicated. Macurap set forth with his rifle. An hour later he was back carrying a small tapir on his shoulders—a female.

In time the Indians lost their initial fear of such things as our flashlights, firearms, and generator. They sampled our food eventually, but disliked most of it.

They told us each others' names; a man would never say his own, so far as we could discover. They learned ours, though they seemed not to like "Jesco." They called me something that sounded like "Borbula."

One red-letter day a large group of Indians all painted and dressed as if for a ceremony came to see us, and with them were three women, the very first we had seen (opposite). They wore necklaces of dyed nutshells and almost nothing else. Though demure, they were unabashed and headed directly for our kitchen. The cook was delighted and showed them around. But his smile faded when the ladies departed with all the pots and pans they could carry.

Time and the Golden Rule Help

Despite the presence of the women, we knew our task with the Cinta Largas was far from finished. We felt that they only tolerated rather than liked us. And they were suspicious: Every visiting adult group contained a few men who kept bows and arrows at the ready and watched our every move.

But with each passing day they relaxed a tiny bit more and treated us with more kindness and consideration. The golden rule was working for us: They imitated our manners toward them.

Unfortunately, their new boldness reached beyond Seventh of September Camp. In Riozinho they openly raided settlers' vegetable gardens. They visited a diamond camp and asked for Apoena and Borbula. When they began appearing on the new highway, road crews and truck drivers fled in terror.

"Now we must complete our job, for this is the time of greatest danger in any pacification," said Chico Meireles. "A terrified truck driver, a drunken diamond prospector, an angry settler could easily touch off a war in which many lives would be lost.

"But the Cinta Largas stand in far more

Stylishly clad in painted "clothing," a feminine contingent arrives. Expedition members felt the women's presence marked a new level of confidence. Impressed by their poise, the author named them the "Three Graces." The camp cook was less than pleased when the visitors made off with many of his kitchen utensils. PETER BEARD © N.G.S.

Bright with beads and feathers, a group of Cinta Largas visits the camp. Word of

expedition gifts may have drawn Chief Dikimoi, second Indian from left, to claim a share.

Cloaked in forest, veiled by smoke, the secrets of a Cinta Larga village remain hidden. Ten minutes away by air, team members await the invitation that will allow them to enter one of 22 such compounds they have sighted.

danger than we. Through their new contacts with civilizados, they can catch our diseases and die like flies.

"It is the time now to enter the villages and cement the peace forever. And only there can we inoculate and vaccinate, and undertake the studies that must be made to assure these people a place in the future."

We have not yet entered a village, however, although we have tried in every possible way to gain an invitation. Twice we believed ourselves invited, but each time discovered we were not welcome.

Once Takanine and some other boys, using sign language and the small vocabulary we now had in common, clearly asked us to come home with them. Nearing the village, we were suddenly surrounded by warriors who shouted angrily at the boys and warned us to go no farther. The night before this futile hike, we had heard a large jaguar coughing near the camp. I think Takanine and his friends feared the beast and wanted our company through the forest next day!

On another occasion we understood Noára to have invited us. He offered no guides, and we set out on our own. After a few miles we found the trail unmistakably closed with nylon fishing line I had given the Indians.

I write these words from my home in Goiânia, near Brasília. My jungle gear is all packed and waiting on my front porch. When I hear that a visit to a Cinta Larga village has been arranged, I shall go at once.

With luck, I shall record the first entry into the village in words and photographs. Meanwhile, I have news both good and bad from Seventh of September Camp.

The good word is that the Cinta Largas are showing unmistakable friendship for the FUNAI people. Apoena, who is a pilot, probably brought this about by taking three very brave youths on a flight to Pôrto Velho, capital of the territory. There a unit of the Brazilian Army was kind enough to parade in honor of these emissaries from the forest.

"The young men conducted themselves with a dignity that won the respect of all who saw them," writes Apoena. "I wish I could have watched as later they recounted their experiences to their people!"

As for the bad news, we have heard that influenza has swept through Cinta Larga country. How bad it was we do not know.

We have medical teams standing by, but we can do nothing until we are invited. Nothing, that is, except pray that we will not be too late, that the intrusion of civilization has not already doomed another primitive people to extinction. □

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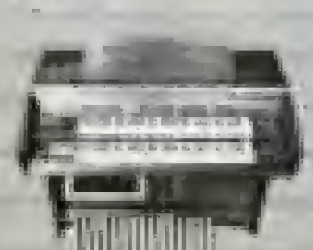

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Combine ingredients. Makes 1 cup.

PARMESAN CHEESE DRESSING

2/3 cup HELLMANN'S Real Mayonnaise
1/3 cup grated Parmesan cheese
1/3 cup milk
1 teaspoon white wine vinegar
1/4 teaspoon Worcestershire sauce

Mix ingredients. Serve on greens. Makes 1 cup

CREAMY ROQUEFORT DRESSING

3/4 cup HELLMANN'S Real Mayonnaise
1/4 cup crumbled Roquefort cheese
1/4 cup milk
1 teaspoon Worcestershire sauce
1/8 teaspoon salt
1/8 teaspoon garlic powder
1/8 teaspoon white pepper

Combine ingredients. Serve on tossed salad greens. Makes about 1 cup

Note: Make dressings ahead, then chill. Warm to room temperature before using. Thin further if desired.

MAYONNAISE ESPAGNOLE

1 cup HELLMANN'S Real Mayonnaise
1/4 cup finely chopped cooked ham
1/2 teaspoon prepared mustard
Dash red pepper or cayenne
Dash garlic powder
1/3 cup milk
1 tablespoon Mazola corn oil

Combine ingredients. Serve on greens. Makes 1 1/3 cups.

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FOR BETTER-THAN-BOTTLED SALAD DRESSINGS... BRING OUT THE HELLMANN'S AND BRING OUT THE BEST.