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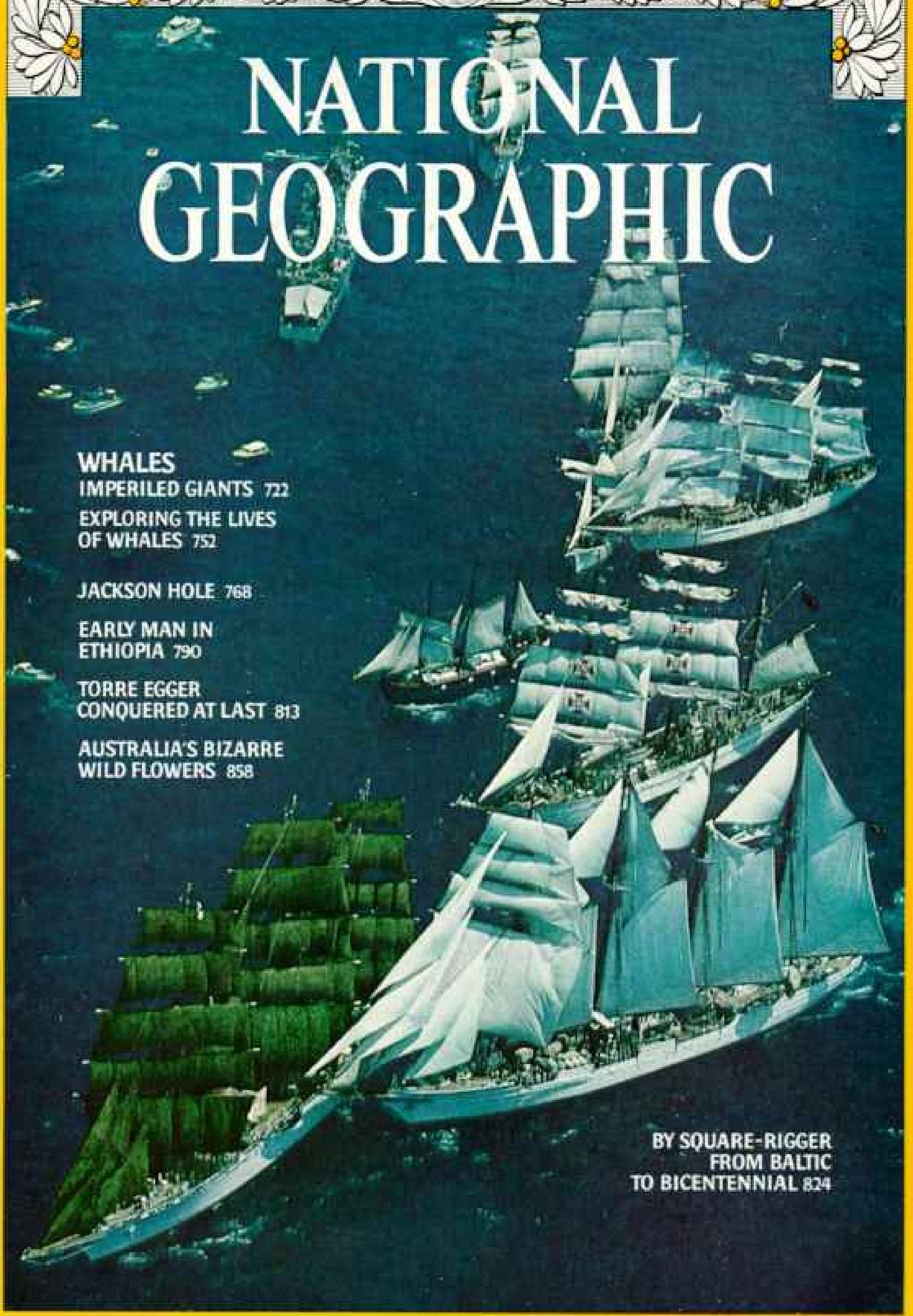

NATIONAL GEOGRAPHIC

THE NATIONAL GEOGRAPHIC MAGAZINE VOL. 150, NO. 6

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A GREAT GEYSER spewed close aboard; a fluke the size of a dory broke the surface, then disappeared. I still recall vividly that day thirty years ago when Irving Johnson's brigantine *Yankee* chanced upon whales in mid-Atlantic. I knew, and tried to understand, why men of another time had hunted such creatures, for their bounty of oil and bone. But awed by the sheer beauty, grace, and incredible power of these animals swimming free in their own realm, I could not—nor can I now—condone such action. Must they be killed today? For what marginal purpose?

In recent years those questions have ignited an international controversy and effort to end the commercial hunt, conducted chiefly by the Soviet Union and Japan, which last year slaughtered 34,000 whales and this year will take 28,000 minkes, sperms, seis, fins, and Bryde's.

The popular outcry against commercial whaling has focused on the annual meetings of the International Whaling Commission, which sets voluntary quotas on what whales to hunt and in what numbers. A spate of new books, antiwhaling organizations, boycotts, and bumper stickers culminated in a recent unsuccessful drive to have whaling nations agree to a ten-year moratorium on all killing, while scientists seek more knowledge of the cetaceans.

For, in truth, we know little about these colossal creatures, and our ignorance only fuels the controversy. Thus one expert can cite the quotas adopted by the IWC in recent years, and the growing list of protected species, and believe that no whale species today is in real peril of extinction. Another can greet that declaration with skepticism. And while one man can regard confrontations at sea between whalers and protestors as meaningless drama, another can view such efforts as heroic last-ditch attempts to stop the slaughter.

On one thing, all seem agreed. The natural legions of whales have been dealt a devastating blow in the past century, under impact of the explosive harpoon and the fast catcher boat. The blue whale, like the American buffalo, nearly became extinct. No one can tell if those that remain can restore their numbers.

In the articles that lead this issue, and on the double-sided map-painting that supplements it, we have tried to present the facts as they are known. Yet I feel that no one reading them can escape the conclusion that the whale has become a symbol for a way of thinking about our planet and its creatures, and in that, at least, there is hope of a better day for both whales and men.

Gilbert M. Grosvenor

WHALES OF THE WORLD

COVER: *Collisions mar the start of the tall-ships race from Bermuda to Newport as a fleet under sail gathers to honor the U.S. Bicentennial. Photograph by Gilbert M. Grosvenor.*

THE IMPERILED GIANTS

By WILLIAM GRAVES ASSISTANT EDITOR

THROUGH the twilight sea they come, gliding with infinite grace, a vast and gentle presence in the waters. Ten feet below the surface I watch as the immense shapes—six full-grown humpback

HUMPBACK MOTHER AND CALF: WILLIAM R. CURTSINGER

whales—turn and swim directly toward me. They are awesome, each weighing 40 tons and measuring 45 feet in length, yet somehow I feel no fear. As they glide closer, I glance at my partner,

Jim Hudnall, and recall his advice before the dive. "It's unusual to see humpbacks underwater," he said, "but we might just be lucky. If we catch sight of some, stay put and let them make the moves; they've learned to be wary of people."

Apparently we pass inspection, for the humpbacks never hesitate. Coasting straight toward us with enormous flippers outstretched, they veer off at the last second and sweep past almost at arm's length, the great eyes seemingly benevolent but curious.

A pair of massive tail flukes skims so close to my face mask that I can make out individual grooves on the barnacles clinging to their surface. Another whale eyes Jim intently as it glides past, then pauses for a moment and actually backs up for a second look.

With only snorkels in place of scuba tanks Jim and I are soon forced to surface, but there is no time for conversation. A quick breath and we are down again, to find a reception committee waiting.

As I arch from the surface, I discover a humpback poised and motionless twenty feet beneath me. The instant I start down, the massive flukes lift smoothly upward and a surge of rising water pops me like a cork to the surface. Twice more I burrow down and twice more receive the elevator treatment. Just as I despair of ever getting back underwater, I feel a faint downward suction and realize that I am being helped on my way.

Nothing, I reflect as I slip below the surface, will ever persuade me that whales have no sense of humor.

DURING THE NEXT HALF HOUR Jim and I are treated to displays of underwater acrobatics, feats of bubble blowing, occasional lobtailing—the slapping of flukes against the surface of the water—and what seems to be sheer exuberance of life.

Only once does the mood change, when Jim spies something peculiar on the side of a passing whale and starts to swim after it for a closer look. Instantly the great flukes lift in unmistakable warning. "That's close enough!" and the crisis passes.

As abruptly as they had appeared, the humpbacks seem to tire of human company and glide off into the violet depths. Surfacing, Jim and I recover his outboard skiff and head back to Maui, one of the islands of Hawaii.

Since that memorable day I have spent countless others among whales, yet none with a greater sense of joy and wonder. To Jim, a specialist in marine mammals, the humpbacks are familiar friends. Each winter when they gather off the coast of Maui to calve and to mate for the following year, Jim spends weeks studying and recording their behavior. Only through such patient accumulation of knowledge can science begin to answer an age-old question: Where, and how, do the great whales live?

WHERE AND HOW THEY DIE has become equally important, for many conservationists, armed with historical estimates and modern harvest tallies, believe that the great whales are perilously threatened. Since 1966 the blue whale and humpback have been completely protected from hunting, joining the right, the gray, and the bowhead. The fin is protected in the entire Southern Hemisphere and the North Pacific; only a few hundred are taken in the North Atlantic. Smaller, noncommercial whales such as the narwhal and the pilot are hunted largely for subsistence. (See the special map and painting, **Whales of the World,** distributed as a supplement to this issue.)

But each year thousands of four other species of whales—sei, Bryde's, sperm, and minke—are killed by commercial whalers (table, page 755). No one knows how long it takes to replace the losses. And although international agreement places limits by geographical area on the total number of whales to be taken each year—currently 27,939—the agreement is voluntary. Moreover, it applies only to the signatory countries, leaving half a dozen others to hunt whales indiscriminately.

Of the whaling industry itself, my friend David Hill says, "It's like leaving a rabbit to guard the lettuce patch." David directs an organization in New York City known as the Rare Animal Relief Effort, devoted to protecting the world's endangered species.

"The whaling industry," he continues, "claims that whales are a valuable economic resource and that whalers have a vital interest in preserving them. But historically, the industry has slaughtered whales wherever it found them and stopped only when the profits did.

"Nobody knows how much punishment

COURTESY BANCROFT LIBRARY, UNIVERSITY OF CALIFORNIA AT BERKELEY

Frolicking in an Arctic playground, gray whales break through an icebound lagoon as whaleboats close stealthily behind them. "Ere long it may be questioned whether this mammal will not be numbered among the extinct species," wrote San Francisco whaler Charles M. Scammon, who published this scene in an 1874 book. But thanks to an expanding ban on killing grays that began in 1937, they have recovered remarkably. Their number is now estimated at 11,000 animals, a level believed close to the original stock.

the whales can take. It's largely guesswork, and God help us if we're wrong. One of the tragic wildlife losses was the disappearance of the great auk in the mid-19th century. Let's hope that never happens to the whale."

TIME WAS WHEN WHALES held a loftier place in men's minds, as beloved companions of the gods. Their cousins, the dolphins—fellow members of the order Cetacea—figure in a 4,000-year-old mural in the great Minoan palace at Knossos in Crete and later adorned the walls of temples in Greece and Rome.

Early Norsemen were among the first to hunt whales and perhaps to eat them. Stone harpoon heads found with segments of whale bones in northern Norway date back more than 4,000 years.

Other early hunters of whales included the polar Eskimos, and later the Basques, who developed the first organized whale fishery by the 12th century A.D. in the Bay of Biscay, and who managed through overfishing virtually to eliminate an entire stock of great whales—those known as the Biscayan right whales. It was to become a familiar pattern among whalers.

The technique of coastal whaling spread to the New World, where in the early 1700's it underwent a major change. American whalemen gradually extended their range from coastal waters to the open sea. Later they transferred their tryworks—furnaces and iron caldrons in which blubber was reduced to oil—from the shore to the ships themselves.

The development transformed the New England fishery from a local enterprise into a worldwide industry, with catastrophic consequences for the great whales. The American fleet became pelagic, scouring the oceans in search of whales and returning from three- and four-year voyages loaded down with oil and bone for lamps and lubricants, umbrellas and corset stays, reaping fortunes for the owners and masters.

"It was too good to last," Capt. Donald Poole remarked to me one day on Martha's Vineyard, an *(Continued on page 730)*

APPARITION FROM THE DEEP
embodies all the spine-tingling wonder of the leviathans. This gray whale with maw agape cuts a swath through a kelp bed. Did it unavoidably snag the seaweed, or is it toying with it? Scientists differ, but agree that the creature doesn't eat the plentiful giant algae. But stranger stuff than kelp has been found in the stomachs of sperm whales—rubber boots, plastic toys, rocks, coconuts, and fishing nets for squid. HOWARD HALL

Aftermath of the hunt: Villagers of Barrow, Alaska, wielding long flensing tools, slice blubber from a bowhead whale they have just landed. Discarding much of the carcass,

NATIONAL GEOGRAPHIC PHOTOGRAPHER ERORY KRISTOF

they save the skin and its thin layer of attached fat called *muktuk*—considered a delicacy by Eskimos. The United States allows only aboriginal Americans to hunt whales.

(Continued from page 725)

Hands and hearts of Eskimos in Alaska sing praise to the whales. Peter Mayac, an artist, carved a hunt on a sperm whale tooth—an example of scrimshaw (**below**). Carl Hanks wove a basket embellished with ivory (**bottom**) from strands of baleen that some whales use to filter food from the water. Teaching Eskimo children the lore of the whale, Tamar Griggs (**facing page,** center) shows them how to make paper models. Sometimes the youngsters lie on the floor and "play whales."

NATIONAL GEOGRAPHIC PHOTOGRAPHERS STEVE RAYMER (FACING PAGE) AND JOE BAILEY

island adjacent to Nantucket. A descendant of New England whalers, Captain Poole has devoted most of his life to research on the American fishery in partnership with his wife, historian Dorothy Poole.

"The peak whaling years were between 1820 and 1860," Captain Poole explained, "and during that time Americans dominated the industry. Out of 900 whaling vessels operating worldwide in 1846, more than 700 were American. The U. S. fishery alone employed more than 70,000 men." He paused.

"Probably more rubbish has been written about that period than about any other in our history. It was colorful, all right, but there was precious little romance in it—and even less money for the lowly foremast hand. Profits went to the shipowners and officers.

"In the 1850's there were two brothers from here named Reed, who shipped out of New Bedford. After four years, one brother came home with $2 as his share of the profits. The other brother did better. He ended up with $41—$3 in profits and the other $38 from washing the captain's clothes.

"As for the master of a whaling ship," Captain Poole added, "he was a law unto himself, and the farther from home the stricter the law. In the American fishery, home waters were known as 'this side of land,' and the Pacific Ocean was 'the other side of land.' The old captains had a saying: 'This side of land, I have my owners and God Almighty; the other side of land I *am* God Almighty.'"

EVEN TODAY a measure of the wealth and power of the whaling captains endures in the elegant homes many of them built for themselves in the major ports of the fishery—Nantucket, Fairhaven, New London, Sag Harbor, and the acknowledged capital of them all, New Bedford. In his classic portrait of the American whaling industry, *Moby Dick,* Herman Melville declared that "nowhere in all America will you find more patrician-like houses; parks and gardens more opulent, than in New Bedford.

"Whence came they?" Melville asked, then supplied his own sardonic answer: "One and all, they were harpooned and dragged up hither from the bottom of the sea."

Melville foresaw what few others did: that overfishing would eventually destroy the

whaling industry. "The moot point is," he wrote in *Moby Dick*, "whether Leviathan can long endure so wide a chase, and so remorseless a havoc; whether he must not at last be exterminated from the waters. . . ."

He very nearly was. Yet the steady decline of whales during the 19th century drastically reduced profits, and the American Civil War wreaked havoc on the Yankee whaling fleet. The discovery of petroleum in 1859 foreshadowed a cheap substitute for whale oil. The American fishery finally collapsed, never to revive, and other whaling nations began to retire their fleets. The oceans at last seemed safe for the great whales. In fact, the real carnage was yet to come.

In the late 1860's a Norwegian whaler named Svend Foyn developed a remarkable gun. At a range of fifty yards the gun could fire an explosive-tipped harpoon into a whale, riddling it with shrapnel and making it fast to the harpoon line by means of heavy steel barbs.

During an early test-firing a loop of the line became tangled around Foyn's foot, and he was jerked overboard into icy seas by the stricken whale. He attributed his rescue to the tender mercy of God, and later celebrated Christmas Eve by patenting the gun.

With the new gun and with the development of steam-powered ships, whalers were at last able to catch the swiftest of whales, those known as the rorquals, which previously had eluded them. In the late 1800's the industry turned to the last great refuge of the whales—Antarctica.

"IT WAS INEVITABLE," Tom Garrett, wildlife director for Friends of the Earth, explained wryly, "because the whalers had killed off practically everything else within reach." Tom, an expert on the history of international whaling and a widely respected environmentalist, continued:

"Nineteenth-century whaling was pretty ruthless, but it was nothing compared to what happened in Antarctica. As in the Northern Hemisphere, the whales tend to gather in a few large areas. Each summer they migrate to their natural feeding grounds—vast concentrations of shrimplike crustaceans known as krill, which form the staple diet of the baleen whales.

"With their fleets of catcher boats and big factory ships, the whalers timed their voyages to the feeding grounds to coincide with the arrival of the whales. The whales came by the hundreds of thousands, and they died in almost the same numbers. Within half a century the whalers systematically massacred the great whales. They'd have gotten them all if the world hadn't finally waked up. Even so, it was a mighty close thing."

Perilously close for the species known as the blue whale, which was considered the most valuable of all. The largest creature known to have inhabited earth, the blue reaches lengths of nearly 100 feet and weights of 200 tons—the equivalent of 33 African elephants.

World opinion gradually mobilized on the side of the whales, and whaling nations, beginning with the first international treaty in 1931, started to limit their operations.

NO ONE KNOWS whether such measures are too little, too late. In absence of conclusive proof, reliable estimates of whale populations are almost impossible to come by. Conservationists once estimated the number of surviving blue whales at 600—a virtual guarantee of extinction. A more likely figure is 13,000. Most scientists agree that before the days of whaling the blue numbered more than 200,000 worldwide.

Dr. Victor B. Scheffer, the distinguished marine mammalogist whose fascinating portrait of whales begins on page 752, believes that over the centuries whaling has reduced the world's total stock from 2,400,000 animals to 1,200,000, a drop of 50 percent. Yet even these careful estimates are attacked by some conservationists as wildly optimistic.

Ironically, those who continue to reduce the world's stock of great whales contribute most to our knowledge of what is left. In the case of remote areas such as the Antarctic, scientists rely heavily on annual catch and sighting reports of whalers to arrive at estimates of surviving stocks.

The nation most deeply committed today to the preservation of whales once led the world in their slaughter—the United States. Christine Stevens, a pioneer conservationist and champion of whales, sees it as a gradual process of enlightenment.

"We were poor when we were whalers," she says, "and, about whales, very ignorant and narrow-minded. Ignorant though we still

are, we know enough in 1976 to admire whales and to fight for them against their persecutors."

Certainly by the 1960's the United States had come to recognize its own position in regard to these greatest of mammals.

"The milestone was the Marine Mammal Protection Act of 1972," said Dr. James Mead of the Smithsonian Institution. "Among other things, the act makes it a crime for United States citizens to disturb or harass marine mammals anywhere in the world, regardless of local laws. The act also prohibits commercial harvesting of any species of these creatures without the approval of a special scientific committee."

Other laws regarding marine mammals are equally strict. Today the United States forbids the importation of whale products into the country and bans such products from interstate commerce.

On the international front the United States has urged a ten-year global moratorium on whaling, to permit an accurate census of all species and to give depleted stocks a chance. The suggestion, however, is opposed by a number of countries, among them Japan and the Soviet Union, the two major whaling nations, which account for 85 percent of the world catch. I asked Dr. Mead his opinion.

"Frankly," he said, "I don't think a moratorium is necessary, at least from a management standpoint. The annual whaling quotas are gradually being reduced by international agreement, and our own U. S. representatives concede that no species of great whale is endangered by current whaling.

"Mind you," Dr. Mead added, "I think the damage has already been done, in the wholesale slaughter that took place during the first half of this century. Compared with that, the present quotas are reasonable.

"It's heresy as far as some people are concerned, but whales are an incredibly efficient food resource. Consider an animal that starts from three or four tons at birth and—without anyone feeding it—puts on 30,000 to 40,000 pounds of meat in the space of two years. It's good meat, too, as those who have eaten it will tell you. Whales put beef cattle to shame, and we may need them one day to feed an increasingly hungry world.

"But there's another side to the moratorium that people overlook," Dr. Mead continued. "If you think of whaling as analogous to clear-cutting in forestry—and that's what it was during the first half of the 20th century—then you have to consider the problem of regrowth. We know that the blue whale was close to extinction, and that other species such as the fin and sei suffered less. There are many more fin and sei whales today than blues. If you don't manage the recovery of all three types—that is, if you declare a blanket moratorium on whaling—you might find that the more numerous fins and seis will eventually crowd the blues right out of existence through competition for available food and space.

"There's nothing simple about the world of whales," Dr. Mead concluded, "and we've only begun to explore it." He shook his head. "One day we may just know a little something about whales."

LUKE KOONOOK knows a great deal about them, though he'd be hard put to explain it to science. Luke knows, for example, that if you set out to hunt *Agvik*, the great bowhead whale of Arctic waters, you must never speak ill of him beforehand. Furthermore, you must bid him welcome when he arrives during spring breakup, shouldering his way northward through the great ice-mantled seas, the sound of his mighty breath carrying for miles.

Without such courtesies, Luke knows, Agvik will not allow you to catch him, and no matter how great your skill, you will go empty-handed. That is hard on your village and harder still on your boat crew, for to them it is not just a matter of food but of pride.

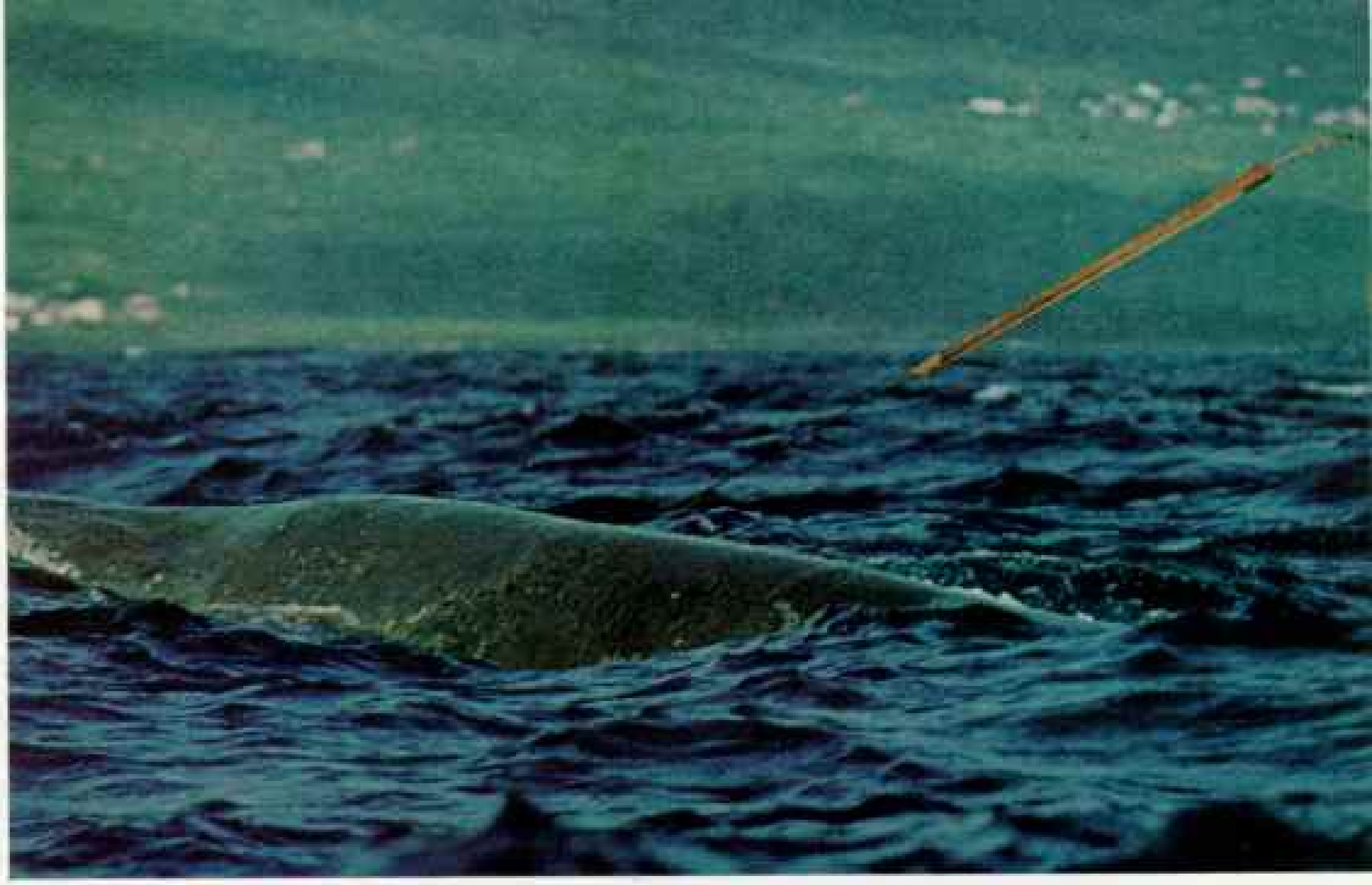
I met Luke through a young archeologist and anthropologist, Dr. John Bockstoce, whose work at the whaling museum in New Bedford is supported by the National Geographic Society. Each spring for the past ten years John has traveled to the tiny village of Point Hope, on Alaska's remote Chukchi Sea coast, to visit his Eskimo friends during the hunt for the bowhead.

Alaska's Eskimos are exempt from the Marine Mammal Protection Act and may hunt such traditional game as the whale, the walrus, and the seal without obtaining a government permit.

I joined John in Nome, and we flew to Point Hope by small chartered plane, arriving to find the village still blanketed with

ALL BY DON KINCAID

Beneath a blistering sun, 30 false killer whales lie beached on Loggerhead Key in Florida's Dry Tortugas, overheating rapidly while out of their environment. For reasons unknown, they cast themselves ashore. Some biologists have speculated that ear parasites can destroy a whale's ability to use sonar signals to echo-locate his surroundings. But cetologist Bill Watkins notes: "Maybe lots of whales have ear parasites. We haven't looked at any—except for the stranded animals." Volunteers (**left**) were able to turn most of them back to sea. Meanwhile, they measured the animals and took blood samples (**right**).



The hard way: Traditional New England-style whaling—with the hand-thrown

snow and all but deserted. Most of the 400 villagers had abandoned their frame houses ashore and moved to tents pitched a mile or more to seaward amid the pack ice. The tents were spaced at intervals of several hundred yards beside a newly formed lead of open water, through which the bowheads had to pass on their way to summer feeding grounds in the Arctic Ocean.

At their tent beside the lead I met Luke and his wife, Angeline, both attractive and in their 40's, and the Koonooks' three teenage sons, Henry, Simon, and Luke, Jr. Together with three other villagers, the sons form a six-man whaling crew under the command of their father as *umealiq*, or captain.

At the water's edge, poised and ready for launching on a slipway chiseled out of the ice, a 21-foot umiak, or traditional sealskin boat, resembled a Grand Banks dory in design, with flaring gunwales and a distinctive high bow and stern.

Tucked alongside the thwarts of the boat were seven large wooden paddles, and in the bow lay two slender steel harpoons attached to long handles made of saplings.

"You won't find anything like them outside a museum collection," John said. He indicated one of the harpoons, whose shaft bore a short gun barrel of brass, a foot and a half long and an inch and a half in diameter.

"That's the darting lance," he explained. "It carries a twin charge of powder—one to drive a small bomb deep into the whale, where the second charge explodes. It's what the old New Bedford whalers used. You can't throw it far; you have to strike with it, which means you must get really close to the whale."

Although Luke and his people are exempt from the law, John and I are not. I asked how we were expected to act during the hunt.

"You may watch," Luke answered, "and even accompany us in the boat, but you must be careful not to help, or it will mean trouble for all of us."

THROUGHOUT THE AFTERNOON and evening we sat beside the lead as daylight slowly softened into the luminous dusk of an Arctic spring night. Several times we heard whales blowing among the ice floes beyond the far side of the lead, their massive sighs clearly audible over long distances. Now and then herds of belugas, the small white whales of the Arctic, bobbed and snorted past us in the twilight.

Toward morning a pair of bowheads suddenly surfaced in the lead, their long dark

L. LOUIS MAZZATENTA, NATIONAL GEOGRAPHIC STAFF

harpoon and lance—spells death for a sperm whale in the Azores.

shapes moving in low silhouette against the gleaming ice of the opposite shore. Without a sound half a dozen boats instantly took to the water, like crocodiles slithering from the bank of a stream.

They were gone for two hours, paddling far up the lead until at last the bowheads sounded and vanished beneath the ice. Over the next two days similar chases occurred and I began to wonder if the season would be successful.

On the third afternoon Simon Koonook had gone into the village on a short errand when a bowhead was sighted half a mile down the lead. Luke nodded at the empty seat in the boat and told me, "Take it if you like." I scrambled aboard, and within seconds we were out on the broad surface of the lead.

The bowhead seemed to be breaching—leaping partly out of water in a way some scientists interpret as communication. What the whale communicated to Luke was agony.

It had been harpooned moments before by another boat with only one lance aboard, and it had been severely wounded. Now that boat could only stand helplessly by as the whale thrashed its life away in the open lead.

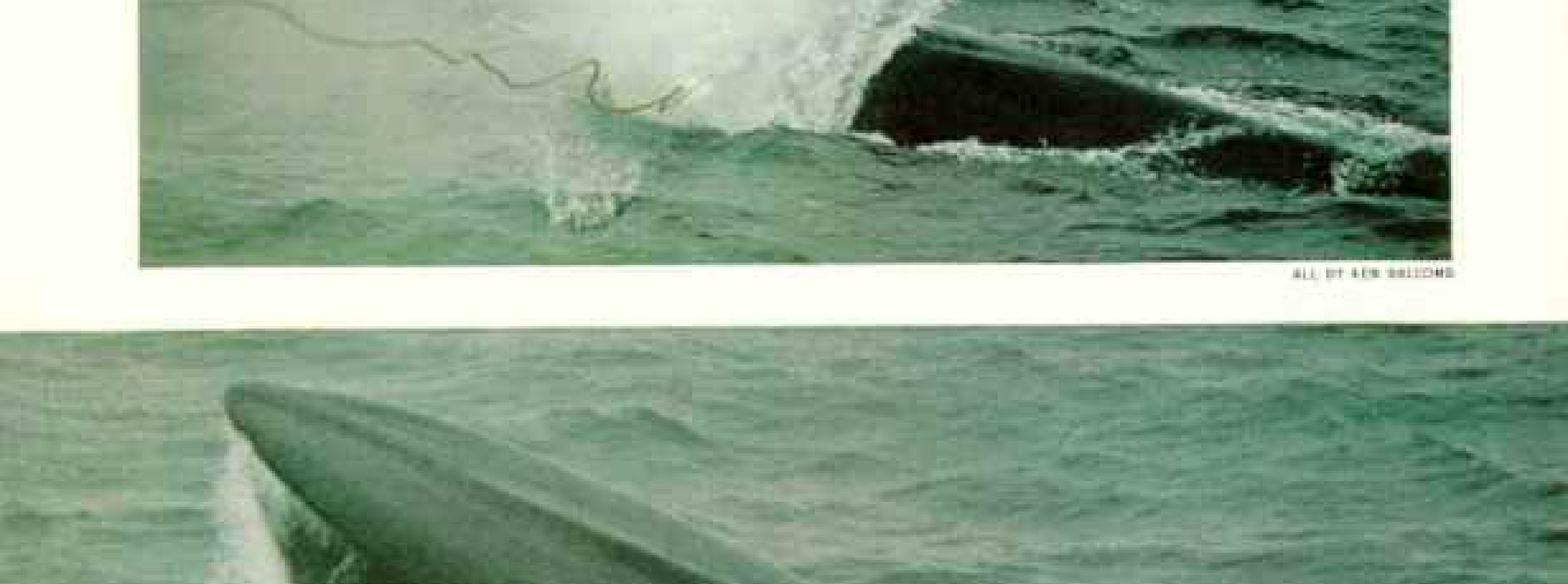
Luke would not have it. Despite the obvious risks, he decided to try for a kill rather than let the whale suffer and perhaps be lost beneath the ice. Standing in the bow with the darting lance ready, Luke waved his crew in twice on the whale and both times ordered it back out to avoid the fearful lashing of the great flukes. Even a glancing blow could demolish the boat, and in that icy water a man soon becomes paralyzed and dies.

The crew moved forward a third time. During a split-second pause in the whale's frenzy, Luke thrust the darting lance deep behind one of the flippers. A pair of muffled explosions followed and the whale rolled once, then lay still. It was a long time before anyone broke the silence.

A few hours later, when the whale had been cut up and distributed among the villagers, I watched the solemn ceremony as its spirit was returned to the sea. By then only the massive skull remained, standing taller than a man by the water's edge. With a brief prayer in Eskimo that the whale would return one day with his brothers to supply the village, the skull was launched into the dark waters.

AMONG THE MILLIONS of conservationists devoted to the cause of whales, I know only one who commands a private navy. Flying south from Alaska, I

ALL BY KEN BALCOMB



stopped in Vancouver, British Columbia, to visit Bob Hunter and his famed minesweeper. I found him planning a three-month voyage across the North Pacific in hopes of intercepting the Japanese and Soviet whaling fleets.

Five years ago Bob and a group of friends founded an international conservation movement called Greenpeace (pages 742-3).

"We'd seen what reason and goodwill can do for the environment," Bob told me when I called at his office near Vancouver's waterfront. "The answer is a big fat zero, and time is running out, not just on whales but on a lot of other things in this world. As someone once said, 'Push will get you anywhere except through doors marked "Pull."' We decided on direct action."

Direct action in 1975 took the form of a converted 80-foot halibut seiner and a confrontation with the Soviet whaling fleet off the coast of California.

"We shook the Russians up," Bob recalled with satisfaction. "They got so mad they tried to ram one of our little Zodiac inflatable boats, and when they couldn't do that, they fired a harpoon four feet directly over it. We hope we cost them a number of whales."

In the end, however, the seiner proved too slow—top speed was nine knots—and the Soviets simply walked away from her.

"That's when we decided on the minesweeper," Bob said with a wave toward the slip where she was moored. "She's 150 feet long, she's got an honorable discharge from the Canadian Navy, and her owner leased her to us for the summer whaling season. She can do better than 20 knots, which is top speed for both the Japanese and Soviet fleets. Nobody's walking away from us next time."

The next meeting, in the Pacific north of Hawaii, proved less violent. Unable to outrun the minesweeper, the Russians temporarily halted killing operations and even allowed the Greenpeace crew to distribute leaflets calling for a permanent end to whaling.

While Bob and his fellow crew members scour the seas in search of their opponents, scientists explore other areas on behalf of whales. The ban on marine-mammal products in the United States in 1970 threatened to deprive American industry of a vital substance—sperm oil.

"We're not talking about oil for lamps," Dr. Noel Vietmeyer told me with a smile. A specialist in experimental products at the National Academy of Sciences in Washington, D. C., Noel is deeply interested in rare materials and their possible substitutes.

"Sperm oil is a fascinating substance," he said. "The 19th-century whalers didn't realize what they literally had on their hands. Sperm oil—and spermaceti, its related solid wax—comes only from the sperm whale, mainly its head, and can do amazing things. Add the oil to lubricants for everything from automatic transmissions to machine tools, and it will perform superbly, forming a bond when applied to metal. It won't break down like other oils. There's only one thing wrong with it: It's illegal."

HAPPILY, SCIENTISTS have discovered substitutes. "An extremely promising one is called jojoba oil," Noel said, "and it comes from beans that grow wild in arid regions of California, Arizona, and Mexico. Not only is it a substitute for sperm oil, in some cases it's actually superior.

"For years sperm oil has been used as what we call an antifoam in the manufacture of penicillin and other antibiotics—it simply bursts the bubbles. A friend of mine, Dr. Pathak at Wyeth Laboratories in Pennsylvania, recently experimented with jojoba oil in the creation of penicillin and found not only that it suppressed the foam just fine, but, spectacularly and unexpectedly, that it also actually increased production of the drug by 10 to 25 percent!

"So far," Noel continued, "we're limited to the supply of jojoba oil from wild plants, and that's literally only a drop in the bucket compared to what we need. But plantations have been started in California and Arizona, and

The easy way: Swift and unerring, modern whalers dispatch a fin whale off Newfoundland. A harpoon hurtles toward the whale (**top**), slams into it (**middle**), and holds it fast (**bottom**). Then an explosive-tipped harpoon fired into the chest will supply the mortal blow. Towed ashore, the carcass will be turned into ingredients for such products as fine lubricants, cosmetics, and margarine.

Mysterious gash marks the flank of a false killer whale. Too small to interest harpooners, the seven-foot animal may wear scars from nails, sharks, or propellers. Unlike most dolphins, the false killer is suspected of feeding on large prey, such as birds and other dolphin species.

in another five years inexpensive jojoba oil should be coming on the market."

I could see the advantage to American industry but not to the sperm whale. With or without jojoba beans, sperm oil is banned from the United States.

"Yes," agreed Noel, "but not from other countries, like Britain, Japan, and the Soviet Union. They still use great quantities of sperm oil, just as we once did. If we can produce enough jojoba oil to bring down the price and make it competitive on the world market, we might help to put an end to the sperm whale industry.

"Unlike most whales, you see, sperm whales are unpalatable. They've been killed largely for their oil, at the rate of about 20,000 animals every year. That's a lot of lives in exchange for a crop of beans."

NOT TO SAY a bargain. Soon after my talk with Noel I watched a sperm whale fishery in operation off the southwest coast of Australia. While declining to allow me aboard a catcher boat, the company offered me a seat in the spotter plane that escorts the catchers and alerts them by radio to whales in their vicinity. From a thousand feet overhead I watched while modern technology removed every conceivable advantage on the part of the whale.

Following the continental slope in search of its favorite food, squid, a whale would be located first by the spotter plane and then by visual contact from the catcher boat. At the latter's approach the whale generally dived, only to be picked up by the boat's sonar and tracked until it was forced to surface for air.

From that point the whale's chances were narrowed almost to zero. If it managed to dive again, it returned to the surface so short of breath that another immediate dive was out of the question. With the advantage of greater speed the catcher boat simply wore the frenzied victim down and at point-blank range put an end to the chase. On that particular day 11 whales lost the contest, one or two only after the second harpoon.

"It's not a pretty business," the pilot agreed during our flight home. "I've yet to meet a harpooner who enjoys the work or who would pick up a gun ashore. To them, killing is an ugly but necessary job; I never knew one to do it for sport."

Neither would Kimio Watanabe, assuming he got the chance. Nineteen straight seasons in the Antarctic and North Pacific give a man little time ashore.

I met Mr. Watanabe in the Japanese port of Taura, to the southwest of Tokyo, where I had gone to inspect one of the country's whaling fleets. Among more than a dozen nations that continue to hunt whales, only Japan and the Soviet Union still operate large pelagic fleets in Antarctic and North Pacific waters. In hopes of visiting one or the other fleet between seasons, I had applied to both countries.

The Soviet response was an unequivocal *nyet*, but the Japanese permitted me to visit the fleet at Taura before it weighed anchor for summer operations in the North Pacific.

CHARLES R. KNIGHT, JR.

Kimio Watanabe is a veteran *hoshu*, or harpooner, with more than half his 52 years devoted to whaling. A soft-spoken man, he welcomed me aboard the giant factory ship *Kyokuyo Maru 3* and guided me through what amounts to a modern packing plant.

We began with the cavernous slipway at the stern, where harpooned whales are delivered by the catcher boats and then winched up to the flensing deck amidships. There the whales are cut up and the various parts distributed: meat to the freezing lockers; blubber and internal fat to the huge steam cookers; bone to the power saws and later to the cookers for extraction of the oil. A 60-ton whale can be completely dispatched in less than an hour.

It all seemed splendidly efficient, and I was reminded of Peter Matthiessen's chilling summary of a South African whaling station in his book *Blue Meridian:* "Nothing is wasted but the whale itself."

Mr. Watanabe was aware of American opposition to commercial whaling and of the spreading U. S. boycott of Japanese goods until that country retires its whaling fleets.

"Japan's situation is unique," Mr. Watanabe explained. "We are the only country that consumes sizable quantities of whale meat—it is even part of our school-lunch program for children. We have no large domestic supply of protein such as your American beef cattle, for we simply cannot spare the land to raise them. We depend for protein on what we harvest from the sea, and for centuries that has included whales."

In Mr. Watanabe's case it has included personal sacrifice. Now and then during our conversation he bent close to catch an unfamiliar word or phrase. At length he caught my glance and smiled apologetically.

"It is the sound of the harpoon gun," he explained. "Slowly over the years the gun has taken away my hearing, as it has taken life from the whales. But every job has its price, and I do not regret it."

FOR OTHERS in Japan the price of whaling has neared its limit. To Akito Kawamura it is a simple matter of priorities. I met him in the tiny port of Ayukawa on northern *(Continued on page 745)*

BEN MORGAN (ABOVE AND COVER RIGHT) AND MATT HERRON OF GREENPEACE, BLACK STAR

Modern Davids and Goliaths: Nerve and speed help members of Greenpeace, a conservation group, to defend whales from huge Soviet catcher ships. In rubber boats, they zoom between whales and whalers. Last year a harpoon whistled close over their heads. This year they photographed a dead sperm whale (**above**), towed by a factory ship that later winched the carcass up a ramp (**left**) to be processed.

To track the Soviets, the group sailed a converted Canadian minesweeper (**right**). Recently the Soviets and Japanese—who together account for 85 percent of all whale kills—have allowed observers aboard their vessels and have rarely exceeded International Whaling Commission quotas.

Unicorn of the sea, a rare, beautiful, and elusive narwhal glides through frigid waters off Baffin Island (**right**). An even rarer sight, and a unique photograph: a narwhal calf nursing (**below, right**). The legendary unicorn, a horselike animal with a horn growing from its head, was possibly inspired by this strange whale. The tusk (**below**), six to eight feet long and usually limited to males, is actually an overgrown tooth. What purpose do these ivory "rapiers" serve? To rout rival males? Perhaps they are simply beautiful, to lure lovely lady narwhals, muses cetologist Watkins.

(Continued from page 741) Honshu Island, where the Japanese have a whale fishery.

As an outstanding young cetologist, or authority on whales, Dr. Kawamura relies on the whaling industry not only for specimens but for financial support. Nonetheless he foresees an end to large-scale hunting.

"Not because whales are in danger of extinction," he told me. "Under present hunting quotas no species is really threatened. It is simply a matter of not killing wild animals unless one is obliged to do so—either to survive or to preserve something even more precious than the animal itself.

"In that sense I think that both your Alaskan Eskimo and the Japanese coastal whaler are justified. The people of Ayukawa, for example, depend heavily on whales for their livelihood. In my opinion, neither they nor the Eskimos seriously affect the world's stocks of whales.

"One cannot say the same of pelagic whaling," Dr. Kawamura added. "Although it contributes to our food supply, in time we could learn to do without it. Not tomorrow, as you Americans insist, or for a period of ten years. But slowly—and forever."

I remarked that such a development might cost Dr. Kawamura his job, and he nodded cheerfully. "I would be out of work, wouldn't I? But I believe we should replace pelagic whaling with pelagic research, and perhaps operate an international scientific fleet to gather knowledge for all mankind. I would gladly join such a project.

"In the past," he concluded, "whales have too often divided us. I believe that anything so wondrous should bring us together."

WHALES, in fact, bring men together every year, though not always in a spirit of cooperation. At the International Whaling Commission meeting in London each summer, representatives of more than a dozen nations bargain endlessly over the lives of whales. The commission is charged with setting annual whaling quotas, yet it has no *(Continued on page 749)*

Spouting simultaneously, killer whales cruise north of Puget Sound (**above**), an area in which Ken Balcomb and Camille Goebel are making a behavioral study. The species seems gentle in captivity, but in open water it voraciously attacks other dolphins, seals, and sometimes a great whale.

The show is free for startled boaters in Puget Sound as a killer whale hurtles clear of the water (**right**). Some biologists believe breaching is a form of communication; others think it may be just play.

KEN BACCOME (ABOVE) AND WILLIAM H. CURTINDALE

Caught by a fluke, a humpback unwillingly poses for a head-on portrait (**above**) while its tail is entangled in a cod net off Newfoundland (**right**). Biologist Peter Beamish later attached a marker to its dorsal fin and cut the net away. When swimming free in the sea, humpbacks are among the most playful of whales, often using their long, curving flippers to smack the water in apparent delight. Their haunting "song" provided the background for Judy Collins's recording of the whaling ballad "Farewell to Tarwathie."

(Continued from page 745) real power to enforce them. In recent years, scientists and conservationists have had increasing influence on the 16-member body.

Coupled with its lack of power, the commission is split almost evenly between whaling and nonwhaling members. For a week last June I watched as the United States Commissioner, Robert M. White, argued tirelessly with the Japanese and Soviet delegations to force a reduction in quotas.

The results were encouraging—a net reduction of 6,000 whales, to a new annual limit of 27,939. The fact remained that it was unenforceable.

"Never mind," declared Craig Van Note, a U.S. congressional assistant and an observer at the meeting. "There are other ways of making the quota stick. Under federal law the U.S. can prohibit seafood imports from any country that hinders international fishery conservation programs, and the American market is too big to lose.

"In a few months," Craig added, "when the United States extends jurisdiction over its coastal fisheries to the 200-mile limit, it will have strict control over some of the world's richest grounds. I think that the Japanese and Russians are beginning to get the message."

A more gentle but equally moving message circulates today among millions of Americans who share a concern for the great whales. Whether on a T-shirt, bumper sticker, or decal, the message reads the same—Save the Whales. Judy Collins has even put it to music.

"It's really a joint effort," the gifted young singer told me when I asked about her recording of the 19th-century whaling ballad "Farewell to Tarwathie." "I sing the melody, but the whales provide the chorus—they're on loan from my friends the Roger Paynes."

Dr. Roger Payne, an outstanding cetologist, and his wife, Katy, recorded patterns of sound made by humpback whales underwater and reproduced them under the title "Songs of the Humpback Whale." * With the sounds as background Judy Collins has made a hit of the haunting ballad.

"It's a celebration of whales, not whalers," Judy explained. "The humpbacks have truly incredible voices and very distinct personalities. There's one soloist in the group that I fell in love with. He, or she, makes you just want to be a whale."

NOWHERE is the wish more widespread than in California, where the gray whale has become a symbol of hope. Wholesale slaughter during the 19th and early 20th centuries made heavy inroads on the species. Given belated protection in the

*See "Swimming With Patagonia's Right Whales," NATIONAL GEOGRAPHIC, October 1972 and "At Home With Right Whales," March 1976, both by Roger Payne.

PAINTING BY WILLIAM R. CURTSINGER

In love with leviathans, a group of conservationists in Mendocino, California, led by Byrd Baker (**right**), fights to stop the killing of whales off the coast by Japanese and Soviet ships. As a symbol of the whales' peril, Byrd carves one out of a huge log (**above**). Their cause has sprouted jacket patches (**top left**), whale belt buckles (**left**), and other ornaments. In contrast, one of the first recorded pieces of scrimshaw, done in 1828 aboard the whaler *Susan*, bears this inscription: "Death to the living, long life to the killers, Success to sailors wives & greasy luck to whalers."

ALL BY WICKER FELDER

1930's, the whales slowly recovered and today number roughly 11,000, a level thought to be close to the original stock.

A few whalers insist that grays might now be harvested in limited numbers, and Californians have guaranteed to harpoon the first man who tries. Every winter the gray whales migrate as much as 5,000 miles down the Pacific coast, from their feeding grounds in Arctic waters to calving and mating sanctuaries among the lagoons of Baja California. Like thousands of other Californians with a hopeless addiction to whales, John Olguin always turns out to watch them pass.

THE WHALES had long since made the return run north when I called on John at the Cabrillo Marine Museum on the coast near Los Angeles. There he has developed a marine educational program for children that has become a model for other museums. Though not a trained scientist himself, John at 56 has inspired several outstanding cetologists who are graduates of his program.

We talked for a time about the magic appeal of whales and the growing awareness of their unique role in the delicate balance of the ocean systems.

"They stand for something in a way no other creature does," John said. "Nothing quite matches a whale for sheer grandeur and excitement, and probably nothing ever will as long as they're around." He waved toward a group of children on the beach who were sifting sand for an assortment of small treasures.

"Sometimes I think how close they came to never seeing a live whale. But thank heaven they did, and they think whales are just the greatest. You can't fool them with any nonsense about minimum quotas and maximum sustainable yield, because they know you're talking about killing whales, and they don't buy it. Who knows? Perhaps within their lifetime we will be able to communicate with whales."

My mind went back to a day many months before, to the swim with Jim Hudnall and the humpbacks off Maui. I smiled at the recollection of the whale that had teased me for a while, keeping me on the surface and then finally helping me under with a flick of its giant tail. It occurred to me that in a sense whales have been talking to us for centuries.

It's time we paid attention. □

EXPLORING THE LIVES OF WHALES

By VICTOR B. SCHEFFER, Ph.D., CHAIRMAN, U. S. MARINE MAMMAL COMMISSION, 1973-76

HOWARD HALL

HOW UNBELIEVABLE is that creature we call the whale—that air-breathing relative of the human species, yet shaped so like a fish! Moving through a dim, dark, cool, watery world, it is ancient and timeless, part of the heritage shared with man and yet remote, awful, prowling the ocean floor under the influence of powers and senses we are only beginning to grasp. We know that the whale has been a remarkable success in its forbidding environment, that it has met the challenges of *its* world, and we are encouraged to meet the challenges of our own.

My interest in the cetaceans—the whales, porpoises, and

Lord of the oceans, a barnacled gray whale trails a mouthful of kelp through California waters. Whales still elude man's full understanding. Threats to their numbers, however, propel the drive for added knowledge.

Lesson one is breathing. A mother blue whale nudges her newborn infant to the surface for life-sustaining air, in this artist's portrayal. Other early lessons include how to breathe in gales and avoid killer whales.

dolphins—began in 1932 when I sailed to Alaska as a deckhand on the *Catalyst*, the University of Washington's first oceanographic research vessel. Steaming through the Inside Passage, our ship often passed baleen whales swimming in pursuit of plankton and herring. Later, as a U. S. Government zoologist on expeditions to seas of western North America, Siberia, and Antarctica, I saw the leaping bodies of humpback whales hanging briefly in the air; I marveled at orderly ranks of pilot whales swimming abreast; I watched as killer whales bloodied a gray whale, attacking like a wolf pack.

When my service on the federal Marine Mammal Commission ended last May, I had been involved for more than forty years with the beasts of the sea. During that period the numbers of whales shrank alarmingly. Not till the dawning of the age of environmental awareness in the late 1960's did the public begin to see clearly the consequences of abusive whaling. It had fragmented the populations of seven great whales—the blue, fin, gray, humpback, sei, right, and bowhead.

TODAY, worldwide acceptance of that dismal fact is arousing new interest in cetacean research. Suddenly the whale has become a supreme symbol in a new campaign to preserve nature. This is partly because the whale is the largest creature our planet has known, not excepting dinosaurs, partly because the mystery of its life recalls the deep and unexplored regions of human life, and partly because its wasted ranks reveal what harm men can do to a living heritage. (See the special supplement, **Whales of the World**, distributed with this issue.)

The fin is down to an estimated 22 percent of its virgin, or unexploited, population size, the humpback to 7 percent, and the blue to an alarming 6 percent. Can these ravaged species successfully compete with other whales that have not been so depleted?

Continuous research on whales began in the 1920's, *(Continued on page 759)*

WHALE POPULATIONS

STATISTICS on whales are among the most difficult of all wildlife data to assemble, and most of what is known is the result of commercial hunting. Biologist Victor Scheffer's compilations **(right)**, listed in order of reduction in population, have been challenged by some conservationists as too optimistic. But most cetologists agree that current hunting quotas do not pose an extinction threat to any great-whale species.

Because figures are so nebulous, percentages have not been computed for the right, bowhead, and Bryde's. The 1976–77 quotas for sperm whales do not include 685 of either sex that may be taken in the North Atlantic.

PAINTING BY LARRY FOSTER

Species	Numbers Before Commercial Whaling	Estimated Numbers Today	Percentage Remaining Today	International Whaling Comm. Catch Quotas 1975-76	International Whaling Comm. Catch Quotas 1976-77
Blue*	210,000	13,000	6	0	0
Humpback*	100,000	7,000	7	0	0
Right*	50,000?	4,000?	?	0	0
Bowhead*	10,000?	2,000?	?	0	0
Fin	450,000	100,000	22	585	344
Sei	200,000	75,000	38	2,230	1,995
Bryde's	100,000?	40,000?	?	1,363	1,000
Sperm, male	530,000	230,000	43	11,070	8,214
Sperm, female	570,000	390,000	68	7,970	3,777
Gray*	15,000	11,000	73	0	0
Minke	360,000	300,000	83	9,360	11,924

*Fully protected species

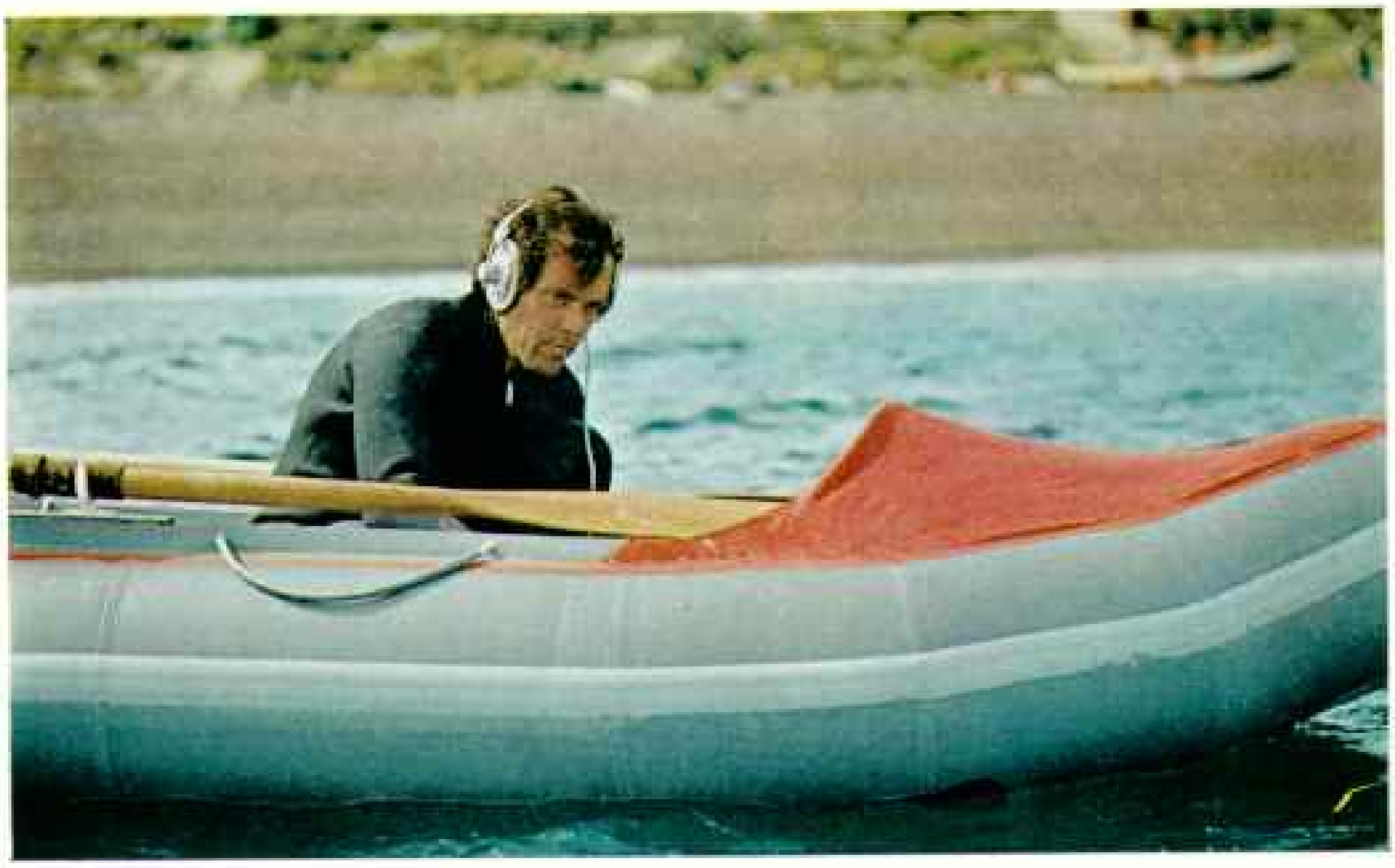
Detained in the name of science, two killer whales (**left**) in the San Juan Islands acquire radio tags on their fins as researchers seek clues to their wanderings. Working under Dr. Al Erickson of the University of Washington, aides made casts of the fins (**below**), from which they fashioned harnesses for the transmitters. The three-pound units are secured with zinc fastenings that will fall off in a year. During handling, the whales were daubed with salve to prevent cracking skin and given antibiotics (**bottom**). Releasing the whales, Dr. Erickson tracked their 75-mile-a-day meanderings for nine days before losing their signals.

ALL BY DOUG B. WILSON

WILLIAM A. WATKINS, WOODS HOLE OCEANOGRAPHIC INSTITUTION (ABOVE); WILLIAM R. CURTSINGER

Fierce in appearance, peaceful in intent, a northern right whale (**above**) feeds by streaming openmouthed through a plankton field in Cape Cod Bay. In place of teeth, its jaws hold a giant sieve of baleen, whose fringed plates trap thousands of minute crustaceans. The right's bonnet, as 19th-century whalers named it, consists of a mound of rough, thickened skin called a callosity.

Off the coast of Patagonia, scientist Roger Payne (**below**) eavesdrops on the eerie moans and whistles of southern right whales during their winter breeding season.



(Continued from page 754) when the first huge pelagic factory ships steamed into Antarctic waters. Scientists on board the ships began to study whales in death as a means of reconstructing whales in life. They are still at it, especially in Japan, the Soviet Union, Australia, and Norway. The United States, no longer a whaling nation, carries on only small-scale research into commercial-whale populations.

The zoologists who study within the whaling industry analyze kills by size, age, sex, season, and hunting area. They have found that in a declining population the catch (per unit of whaling effort) also declines, as does the average age of the animals killed (the older whales become fewer).

On the other hand, life becomes rosier for those that survive. They gain more food and living space. As a result, the average whale calf tends to arrive at puberty sooner than its forebears did. After fifty years of being intensively hunted, the southern fin reaches sexual maturity at age 6 rather than at 11. And adults, too, find life easier. Some species that normally breed every third year may, when times are good, breed every second year.

ONE SHORTCOMING of doing research through whaling records is that the records deal with ghost populations—animals that have been slaughtered rather than those that survive. Even when the records cause great concern, economics and politics delay remedial action. In 1960 the International Whaling Commission worried about the declining blue whale population and appointed a committee to analyze kill records. Not until 1966 was the commission able to achieve a total ban against killing blues. Meanwhile, whale hunters had taken nearly 5,000 of the great mammals.

Another weakness of whalers' statistics is that they fail to reveal the effects of killing on such social creatures as whales, which may travel in family groups. Presumably, killing the head of a family is more disruptive to the reproductive rate than is removing a subordinate member.

I talked with Michael A. Bigg, an expert on killer whales with the Arctic Biological Station of Canada. "We believe that the average family, or pod, of 10 to 15 killer whales remains intact for several years," Mike said. "We have deduced this from a study of more than 7,000 photographs of killer whales in the wild, in which individuals with distinctive marks show up again and again."

Thus, statistical studies that guide fish management will often not be adequate for cetaceans. Whales are not fish; they are creatures endowed with social instincts, family bonds, and capacities that seem at times very close to human feelings.

They share with humans a great urge to travel. The migrations of most great whales of commerce involve voyages of astounding length. They usually feed in cold food-rich waters during summer. The baleen whales, swimming near the surface, devour macroplankton, especially tiny shrimplike organisms called krill; the toothed sperm whale feeds heavily on squid, often diving to the dark depths where lurks the 400-pound giant squid, *Architeuthis*. In winter most whales migrate to warm waters to breed.

THE ROUND TRIP of a gray whale between Mexico and Alaska may cover 10,000 miles. If the migrant gray is pregnant, she may lose 8 tons of body weight (from 24 tons down to 16), partly from giving birth to a one-and-a-half-ton baby, though mainly from not feeding. This slimming regimen does the mother no harm. Part of the whale's success results from its great body size and its thick layer of blubber. About half of a blue whale's blubber could maintain it for four to six months.

Whales, like other marine mammals, must be large to conserve body heat in the chilly sea. I once tried to find a record of the largest whale measured. It seems that, about 1931, when hundreds of thousands of whales were still roaming the southern circumpolar waters, the body of a huge female blue was brought into the whaling station at Prince Olav Harbor, South Georgia, not far from Antarctica. She measured almost 97 feet long, and her weight was calculated at 196 tons.

The late N. A. Mackintosh, Britain's distinguished student of whales, supposed that a blue whale, the largest animal known in the history of the world, might reach a length of 100 feet, which could mean a weight of 200 tons. The late E. J. Slijper of Amsterdam University estimated that a blue whale calf grows about eight and a half pounds *an hour* during

its six- to seven-month nursing period, the mother whale providing her offspring with some 130 gallons of fat-rich milk a day in 40 feedings.

At Durban, in South Africa, Peter B. Best has been investigating other aspects of whale sex life. From studying the ovaries, mammary glands, and fetuses of specimens brought into the whaling station and others found dead on African beaches, he has hypothetically reconstructed the sex life of a southern minke whale. In winter she gives birth in warm northern waters and mates again a month or two later. In spring she moves southward with her suckling calf toward colder waters, weans the calf at age 4 months, then pushes on alone. In summer she feeds heavily at the edge of Antarctic ice, nourishing herself and the new fetus in her womb. In fall she turns northward again toward calving waters. Here she gives birth, having carried the fetus for 10 or 11 months.

HOW LONG is that newborn whale likely to live—if it survives man's predation? Christina Lockyer of England, among others, uses an ingenious way to gauge the life span of baleen whales. She counts the layers in the waxy earplugs of the ear canal. (The ear openings of whales are only tiny skin dimples about the diameter of a pencil lead.) Seen under a hand lens, each earplug layer has a dark streak and a light streak, together making up one year's deposit. The layers resemble the rings of springwood and summerwood in a tree. Some years ago, in the earplug of a big fin whale 80 layers were counted. Discounting the hazard of whale hunters, the largest whales probably live as long as men.

The age composition of any whale population is an essential statistic for the biologist who must estimate the population size to predict the annual allowable kill, or harvest. But because whales roam over vast regions and are largely hidden from man's view, this is not as easy a job as the rancher's stock analysis of calves, yearlings, bulls, and cows, to decide how many animals should be shipped to market. Setting whale harvest figures involves a good many educated guesses.

We are also still guessing about the earliest ancestors of whales, unrevealed as yet in the fossil record. They probably left continental shores 60 million years ago. The oldest actual fossil remains of whales lie in beds of North America and Africa and are dated—by the isotope decay in rocks—to 40 million years ago. Experts deduce that about 20 million years would have been required for these "dawn whales" to evolve from land ancestors.

SINCE THERE IS A LIMIT to what we can learn about whales from fossils and kills, much modern research is being done on live whales. One fascinating live study was conducted by the U. S. Navy's Undersea Center on Oahu, Hawaii. Researchers told me the incredible tale of Morgan, the friendly pilot whale who had been trained to dive to the ocean floor, as deep as 1,654 feet. Once there, he would locate a "lost" torpedo. He would then attach a lifting tool to it and swim to the surface for a food reward, all within 15 minutes.

In a movie filmed by the center, I watched Morgan perform as if he truly enjoyed his assignment. From a fenced ocean pen on shore he would swim freely behind a Navy boat to a deepwater site seven miles at sea. Later he would follow the boat back to his pen. At no time did he try to defect.

One of the principals at the center, veterinarian Sam H. Ridgway, known for his work in cetacean physiology, told me, "Through whale studies may come answers to human medical problems—not only diving diseases, but others." Because whales are "far out"—extremely specialized—their reactions, especially those related to breathing, are more pronounced than those of nondiving animals. Studying whales may throw light on such human problems as sudden-infant-death syndrome (crib death) and shock.

"What about the bends?" I asked. "How do whales avoid it?" (That cramping affliction, which a human diver suffers when he rises too quickly from a deep dive, can be fatal. It results from nitrogen bubbling from solution in his blood.)

"The whale has only the air it inhaled before diving," Sam replied, "while a human diver is continuously breathing nitrogen in air from a tank. And the whale's body is adapted to pressure. When it dives deep, its lungs and windpipe partially collapse. The contained air rushes into nonabsorptive passages in the head. The whale then draws on oxygen stored in its red blood cells and

muscle cells. The heartbeat slows to about one-third its usual rate. Body temperature and metabolic rate drop. Blood leaves the skin, tail, and flippers to enrich the supply to the heart and brain. As the whale rises, the air stored in its head reenters the lungs and is then forcefully exhaled at the surface of the sea."

The mammalian deep-diving record is held by a sperm whale. Its tragic remains were found twisted in a submarine cable off South America at a depth of 3,720 feet. Tracking of sperm whales with sound detectors indicates that they may dive to twice that depth.

Almost as astounding as the whales' diving prowess is their ability to produce weird sounds. The sounds may rise to levels 12 times as shrill as any human ear can hear, or to 256,000 cycles per second as compared to the human upper limit of about 20,000.

Zoologists translate tape-recorded whale noises into spectrograms, lines on paper that depict sound, which are useful in comparing whale "dialects." If the tapes themselves are played slowly—say at one-eighth speed—a shrill whistle becomes a fire-siren wail.

Navy zoologists William C. Cummings and Paul O. Thompson once listened to the underwater voice of a blue whale off the coast of South America and measured its volume. They were astonished. It was, they said, the most powerful sustained sound from any living source and, because of its pitch, could surely be detected for hundreds of miles. They rated it at 188 decibels, comparable to "the same overall noise level as that of a U. S. Navy cruiser traveling at normal speed."

JUST AS ZOOLOGISTS have developed devices to eavesdrop on whale conversations, so are they always on the lookout for new methods of instrumenting whales—of fastening markers or recording devices to bodies that are smooth, flexible, and powerful. They have tried nylon girdles, which are prevented from slipping by a loop around the animal's back fin (an instrument is then fastened to the girdle). They have fed instruments, hidden in food, that radiobroadcast body temperature as they move through the gut. They are developing a tiny electronic device that can be surgically implanted under the skin of a captive whale slated for later release in the open sea.

The English cetologist Sidney G. Brown recently reported on the progress of an international whale-marking scheme. Since 1932 some 25,000 whales have been marked to track their migrations. At each marking a numbered metal tube is fired from a 12-gauge shotgun into the back of the whale. Later, if a marked animal happens to be killed, the mark is recovered at the whaling factory.

If whales are to be exploited—as they seem destined to be—this tracking of the great animals on their oceanic pathways is a key to their conservation. Whales must be managed, and a prerequisite will be to chart the boundaries of their separate populations.

In Seattle I watched a team of researchers fasten a radio transmitter to a 20-foot female killer whale, captured a month earlier in Puget Sound (pages 756-7). The team secured the transmitter to the back fin with four bolts having zinc nuts that would corrode in seawater and eventually fall away, freeing the whale of her three-pound burden.

She and an 18-foot male companion, also radio-tagged, were released, and a tracking boat, the *Propeller*, followed their signals as they meandered generally northward some 75 miles a day. After nine days the *Propeller* lost them because of radio interference.

Few full-grown large whales have yet been radio-tagged. William E. Evans, of the Naval Undersea Center, once tagged a young gray. She was Gigi, captured in Scammon Lagoon, Baja California, tamed in a San Diego oceanarium, and released in the open Pacific in 1972, soon after her first birthday. For eight weeks she broadcast her position, as well as the depth and timing of her dives (maximum depth 558 feet; maximum downtime 16 minutes, 32 seconds). Then her radio fell silent, presumably because she broke off the antenna while swimming through kelp.

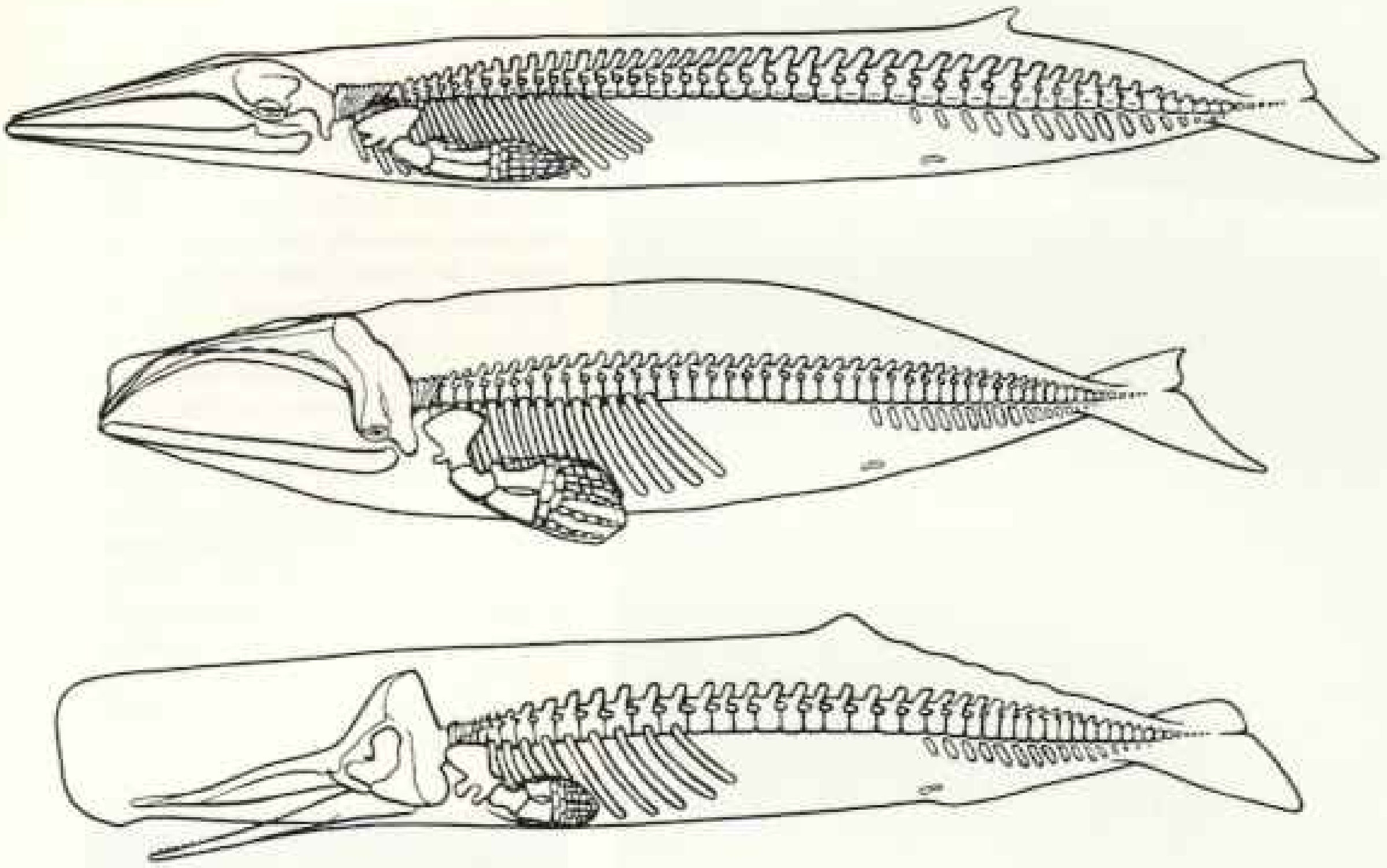
Most whales shy from human contact, but there have been exceptions, notably in San Ignacio Lagoon on the west coast of Baja California. In February 1976 a skiff carrying six whale-watching tourists entered the lagoon. As they drifted, a young whale, 28 to 35 feet long, slowly approached. Finally she bobbed up beside them.

Now I let Joseph G. and Dodie Vandeventer, from Sun City, Arizona, tell the story:

"She stayed near us, repeatedly rubbing her body gently under our skiff and surfacing . . .

Out into the cold poke the flukes of a bottlenose dolphin being born at Miami Seaquarium. Unlike most mammals, dolphins—generally the smallest members of the whale order—emerge tail-first. After this 75-minute birth, the mother whirled around to snap the umbilical cord and pushed the baby to the surface for air. Earlier she had stolen and nursed the calf seen nuzzling her side. Most dolphin pregnancies last about 12 months. Fin, flukes, and flippers form early, as on a tiny eight-week-old pilot whale fetus (**below**). Though scientists have presumed that cetaceans are born tailfirst—to delay breathing until free of the womb—the only two great-whale births ever witnessed were headfirst deliveries.

J. M. LaTOURRETTE, MIAMI SEAQUARIUM, (LEFT); CAMILLE R. DORÉ



Skeleton facts reveal the specialities of different whales. The fin, top, is a cruiser, its streamlined body capable of sprinting at 20 knots. The right whale, middle, is a tugboat, steered deftly by its broad flippers. The sperm, bottom, is a submarine, diving deeper than half a mile. It has been known to ram ships with its broad head, an action vividly described in Herman Melville's novel *Moby Dick*.

For about 45 minutes this kept up, during which time all our party patted and rubbed her head and chin. . . . She was most curious and very friendly and interested. . . ."

Other friendly whales in San Ignacio Lagoon have captivated visitors: a few immature grays, including a couple playing at courtship, and even cows with calves.

THOUGH WHALES move through sunlit, cleansing waters, they nonetheless suffer from many of the ailments with which man is distressingly familiar: pneumonia and tuberculosis, tumors and stomach ulcers, and many kinds of parasitic worms.

They may even turn psychotic in captivity; John C. Lilly, an American scientist, believes the bottlenose dolphin may commit suicide. He bases his belief on personal experiences, one of them especially tragic. He had decided to end his years of dolphin research in order to free his test animals, which he had come to regard as friends, when five of them inexplicably sank to the bottoms of their pools, quit breathing, and died. Alarmed, Dr. Lilly quickly released the other three. Though the deaths appeared deliberate, that would imply premeditation—an attribute of human beings but not (so far as is known) of dolphins, whales, or other living things.

The study of whale health and environment has been greatly stimulated by the federal Marine Mammal Protection Act of 1972. This significant law made clear that "the health and stability of the marine ecosystem" must be preserved. One basic whale requirement being investigated is food.

Canadian zoologist David E. Sergeant estimates that the daily food demand of a baleen whale is 2 to 4 percent of its body weight. Thus, a 200-ton blue whale may consume four to eight tons of krill a day.

My friend Akito Kawamura, of Japan's Whales Research Institute, once measured the plankton-straining surface of a 47-foot sei whale's baleen, the series of horny plates that serve in place of teeth. The plates hang from the upper jaw and are finely fringed on

KEN BALCOMB, ABOVE; DRAWN BY JERRY YOSTER

Familiar shape of the reassembled bones of a sperm whale flipper suggests the structure of a human hand. Scientists believe that whales descended from land mammals that lived some 60 million years ago.

the tongue side. Akito found the baleen surface to be 39 square feet. Thus, every time a sei whale contracts its throat and mouth, squishing out seawater and retaining a helping of plankton, it is, in effect, casting a net nearly as big as a king-size bed.

Akito fits the public image of a typical zoologist—a man with a full beard and a lively, intelligent face, pierced by a pipe that he often lays down among the bloody innards of a specimen. I traveled with him to the shore-whaling stations of Onagawa and Ayukawa, northeast of Tokyo.

About eight o'clock one evening he and I were standing on the whaling platform at Onagawa. (The station's catcher boats sometimes discharge their cargoes at night.) Akito measured and collected samples of baleen plates—blackish, tipped with white, up to a foot long—from a 41-foot Bryde's whale. (Still, by whale standards, that was not impressive; in a 60-foot bowhead the plates may reach 14 feet or more.)

The rest of the Bryde's carcass vanished almost explosively under the knives and the power saws of yellow-helmeted workmen while Akito told me about his research.

"I started my career studying plankton on an American floating ice station in the Arctic," he said. "From plankton simply as flora and fauna I jumped to plankton as whale food, and then to the baleen, which strains the food. Differences in their baleen help me to separate the Bryde's populations of northern and southern Japan. They evidently don't interbreed, except maybe where their ranges overlap off central Japan. Differences in the plankton food found in their stomachs tell me something about the patchiness of plankton swarms in the sea. I could not easily measure patchiness when I had to depend on small samples taken with cloth nets. It is better now to let the whales do the sampling for me."

Patchiness interests marine scientists trying to determine the potential value of krill as food for mankind. It has been estimated that the total production of just one species in Antarctic waters is several hundred million tons. Theoretically, such a biomass could produce more food than all the world's commercial fisheries, which are now yielding about 70 million tons each year.

The summer night deepened. Under floodlights, a workman collected whale testes and earplugs for future study by zoologists. I was intrigued by the combination of brutal machine power and delicate finger power used in collecting the earplugs. First, the whale's head was torn apart by steam winches, to the sound of popping cartilage and tendons. A man with a flensing knife bared the inner ears. Then, with tweezers, he lifted out each plug, shaped roughly like a golf tee, and plopped it into a vial of preservative.

WHALES CANNOT RIVAL MAN in destructiveness toward another species, but they do share some of our better qualities. They sometimes display care-giving behavior, a trait that resembles human kindness or altruism.

Recently, off Vancouver Island, British Columbia, a ferry captain saw a vivid demonstration of care-giving. He heard a crunch from the stern and, supposing he had struck a partly submerged log, he turned about. To his dismay, a young killer whale, one of a family of four, was wallowing in the sea.

"The cow and the bull," he said, "cradled the injured calf between them to prevent it from turning upside down. Occasionally the bull would lose its position and the calf would roll over on its side. When this occurred, the slashes caused by our propeller were quite visible."

Fifteen days later, in the same waters, a woman saw "two whales supporting a third one, preventing it from turning over."

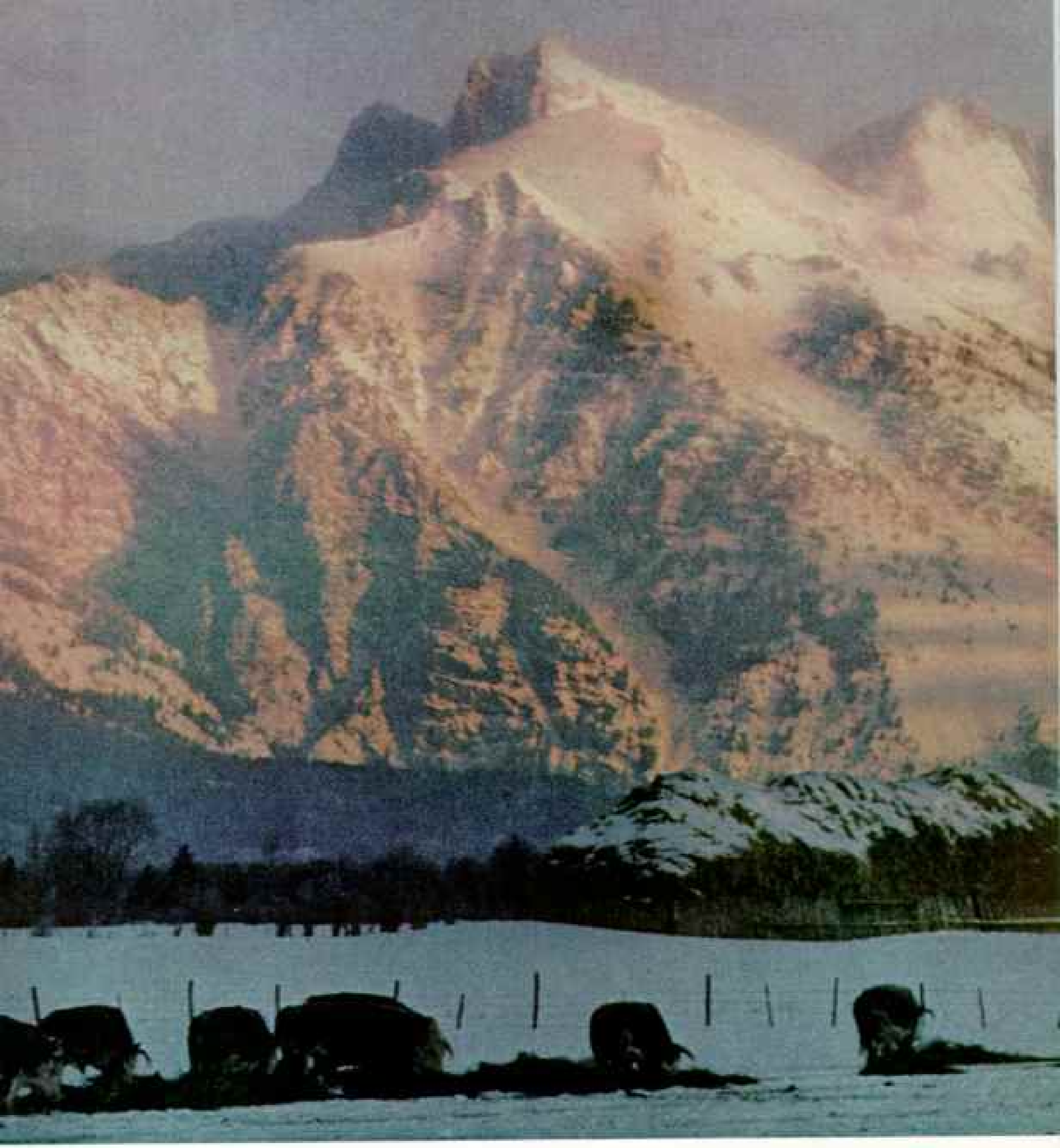
IS SUCH A DISPLAY of "human kindness" also a manifestation of manlike intelligence? We humans like to believe that at least a few lower animals are intelligent, for in so believing, we permit ourselves to feel less alone. But we apply to animals tests of intelligence that cannot possibly measure their real qualifications for survival—their real "smartness."

We do know, however, that the brain of the sperm whale (up to 20 pounds) is the largest on our planet. The ratio of brain weight to body weight in the bottlenose dolphin is slightly greater than in man (2.0 versus 1.9 percent)—first assuming that the animal's heavy jacket of blubber has been removed. Also, the ratio of advanced, neocortical, or new brain, tissue to whole brain weight in the common dolphin is greater than in man (97.8 versus 95.9 percent).

Like humans, some whales live in families, play in the moonlight, talk to one another, and care for one another in time of trouble. We humans can feel a bond there. But is it not enough simply to respect whales as whales? Instead of wondering whether they can reason, or worry, or think ahead as we humans can, perhaps we should be content to admire them for their unique minds and bodies—for their vital architecture that allows them to exist in a forbidding world of water in which our own naked selves could not long survive. □

Whales, whales, everywhere. At Somerset Island in Canada's Northwest Territories, more than 1,000 belugas—small white whales—mass in clear, shallow waters at calving time. Photographed on special film from an aircraft at 1,000 feet, this Arctic herd is one of the largest groups of cetaceans ever pictured.

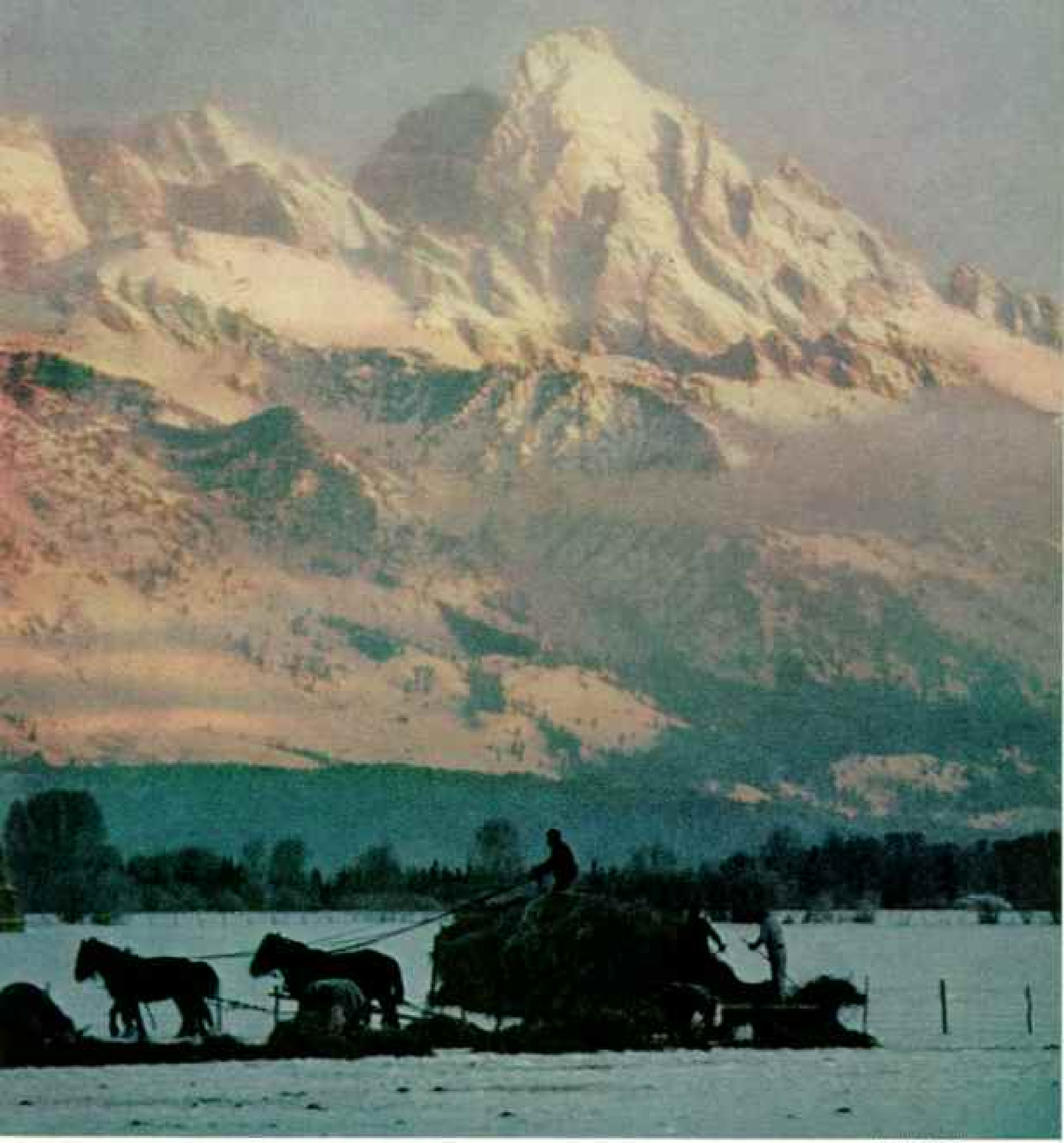
J. DOUGLAS WILLIAMS, QUEBEC BIOLOGICAL RESEARCH SERVICE



Wyoming's Tetons abide in the sky, a mighty leap above Jackson Hole. As developers

Jackson Hole: Good-bye to the Old Days?

By FRANÇOIS LEYDET Photographs by JONATHAN WRIGHT



JACQUES SARTHOU

and more tourists discover the historic valley, a way of life hangs in the balance.

"ANY MORE OF ANYTHING here will be too much!"

Mardy Murie spoke softly, as is her wont, with a mischievous twinkle in her brown eyes. But as we sat talking by the fireplace in her cozy log house, I could feel the sincerity and the strength of this small woman, widow of famed biologist Olaus Murie and herself a leading conservationist in Jackson Hole, Wyoming (page 786).

"Any more of anything. . . ." I knew exactly what Mardy meant: any more people, any more houses, any more roads, any more cars, any more airplanes, snowmobiles, power lines, sewage, mobile homes, and other appurtenances of man. She was not, of course, complaining of a surfeit of natural splendor in this incredibly beautiful, mountain-girt valley. And yet I wondered. Perhaps Jackson Hole, almost fifty miles long and six to eight miles

Known only to Indians until 1807, when trapper John Colter reportedly ventured into it, Jackson Hole stretches 48 miles from the big lake's northern tip to the flatlands south of today's Jackson. Other mountain men followed, but the "hole" (trappers' lingo for a flat mountain-encircled valley) returned to solitude when beaver hats went out of fashion. In the 1880's homesteaders, ranchers, and outlaws became its first settlers. Jackson Lake expanded by nearly a third—to 25,500 acres—upon completion of a dam on the Snake River in 1916. To spare the valley overdevelopment, John D. Rockefeller, Jr., in 1927 began buying acreage that he later donated to the Government. Some 33,500 of those acres, costing more than a million dollars, are now part of Grand Teton National Park.

wide, is just too gorgeous for its own good!

Jackson Hole. The very name of the place evokes images of the magnificent and the wild, and it is such images that most often haunt me when I recall my visits:

The sound, one cold night near the foot of Signal Mountain, of bull elk bugling all around me—high, pure, long-drawn-out notes like the final strains of taps blown on silver trumpets. The marvelous mixed aroma of horse, saddle leather, and sun-dried grass on a ride to the top of West Gros Ventre Butte. The evocative silence at Cunningham Cabin, a sod-roofed house of hand-hewn logs where J. Pierce Cunningham homesteaded in the late 1880's and where, in April 1893, two young alleged horse thieves were shot to death.

The reflection of Teewinot Mountain in the waters of Jenny Lake. Two bald eagles on a gravel bar in the Snake River at Oxbow Bend. A pair of moose browsing in the coppery Willow Flats. The lonely dirt road overlooking the Snake River between Timbered Island and the Potholes, and a herd of 13 antelope bounding through sagebrush.

And always, and above all, the Tetons. There are few places in Jackson Hole (the town of Jackson is one of them) where you are not constantly, almost hypnotically, aware of their silent presence. With no intervening foothills to blunt their dramatic surge, they are, to me, the most breathtaking mountain range in the country. And yet, despite the elevation (Grand Teton soars to 13,770 feet, and my map shows ten named peaks that tower to about 12,000 feet), it is not a big range—only 40 miles long and 10 to 15 miles wide. It is merely unique. The modest range realizes in one grand, jagged scarp the ideal of mountain as Jackson Hole once realized the ideal of open wilderness.

Valley's Reputation Draws Hordes

For nearly a century and a half after its discovery in 1807, geographical isolation and the long, cold winters combined to preserve much of Jackson Hole's wilderness character. But the 20th century has begun to catch up with it. Nearly three million tourists visited Grand Teton National Park last year—85 percent of them in the summer season. Downhill and cross-country skiing lures thousands in the winter.

The majestic landscape and its romantic

associations are a magnet to many who would settle in the valley, or at least claim it for a second home. The pressure to subdivide the scarce private land has led to a new plan that may help end the battle between those who, like Mardy Murie, would preserve Jackson Hole as much as possible and those who stand to gain by its development.

"I hate to see Jackson get so big, but I don't see how we can stop it," old-time resident W. C. "Slim" Lawrence said to me. "All we can do is keep it as West as we can for as long as we can." Sierra Club northern plains representative Laney Hicks added, "The big question is this: Is Jackson Hole going to be just another commercial resort or is it going to keep some of the genuine local color?"

Young State Senator John Turner, a trained ecologist and author of a book on the bald eagle, was keenly aware of the problems but at the same time hopeful of the future. "Wyoming is feeling the effects of energy development," he told me. "It's doubled the population of some communities, brought in a rough crowd, caused an increase in mental-health problems, divorce, alcoholism, and crime. But this county, Teton, is one of the most environmentally conscious in the state."

And indeed I found this concern for the environment shared, at least to some degree, by most Jackson Hole residents with whom I talked. In fact, 70 percent of the respondents to a public-opinion survey favored strong land-use controls and very limited growth.

A Park Service plan that would "build an umbrella over the area" by purchase of some land and protection, through easements, of other private land in a scenic preserve has gained widespread support. This represents quite a revolution in a state where until very recently "planning" was a dirty word!

"It may still be an unholy mess," Frank Galey told me. "Condominiums all over the place, big hotels—we can't stop them forever." Frank owns the White Grass Ranch, one of the older and better dude ranches of Jackson Hole. We were drifting down the Snake River in a small raft, Frank trolling for trout, I plying the oars and scanning the streamside willows—russet and gold in their autumn colors—for the dark bulk of a moose.

Luck was not with either of us; the trout were not rising, and the moose, if any, must have been hiding in the stands of spruce and cottonwood beyond the willows. I did not really care. The day was warm and golden and the silence was absolute; we had the river to ourselves except for a few Canada geese that took off as we approached.

"The way it is today," Frank said, "so quiet and peaceful, it's difficult to picture the scene here in the summer months when 82,000 people run the few miles of river through the park!"

By midafternoon we had reached the cable-operated Menors Ferry, built in 1892 and now restored. It had been the principal means of crossing the river for 35 years. Soon after, I pulled in to the landing at Moose, the park headquarters community with its large visitors center and cluster of employee housing once dubbed "Levittown West."

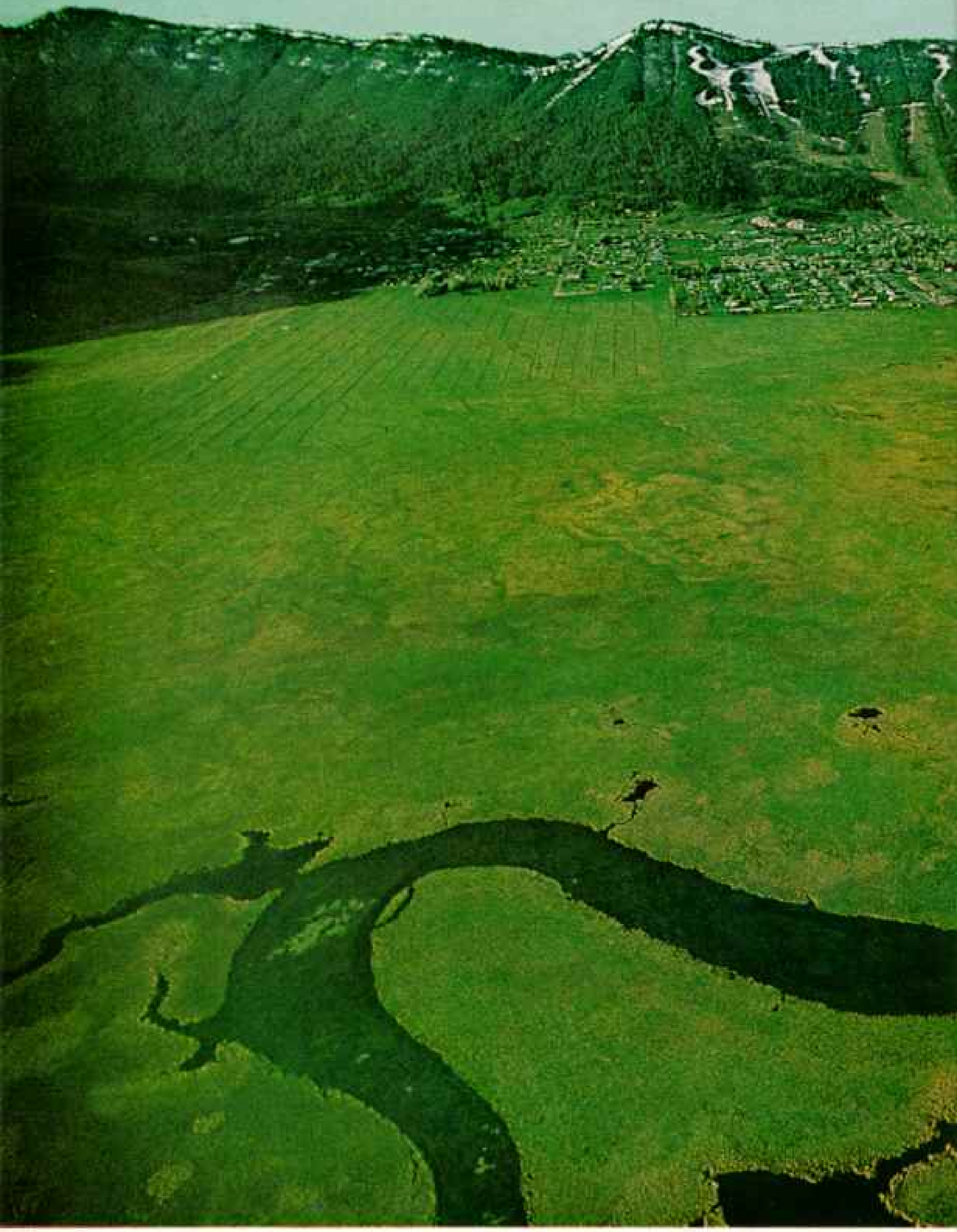
Urban Clutter Competes With Nature

Visually, the drive back to Jackson epitomized the dilemma of the valley. I soon saw my first moose of the trip, a big-antlered bull that trotted across the highway, cleared a fence with the effortless grace of a steeplechaser, and continued on toward Blacktail Butte to the east. But as I neared town, a tawdry mishmash of billboards and ticky-tacky buildings defaced the flank of East Gros Ventre Butte. (A few years earlier, a number of billboards had been mysteriously chopped down by unknown assailants.)

On the opposite side of the road a lone coyote sat atop a rock on the edge of the National Elk Refuge; in Flat Creek two long-necked trumpeter swans cruised slowly about.

The road became Cache Street, and the sleazier aspects of urbanism burst into view: gas station after fast-food carryout after motel after root-beer parlor, a cacophony of signs trying to outshout one another for the tourist's attention. I drove past the board-walked town square, with its neon-lit bars and archways of elk antlers, and turned right onto Broadway. More neon, more gas stations, more billboards—and finally to my motel on the southern edge of town.

Again and again during my visits to Jackson, I found myself involuntarily contrasting it with the lovely mountain villages of Vermont and New Hampshire, or the tidy Alpine towns of Switzerland. Without exception Jackson Holers have a fierce and understandable love of their beautiful valley, but



Wide-open spaces of the National Elk Refuge, slashed by meandering Flat Creek, dominate the valley's southern end. The town of Jackson, population 4,300, snuggles beneath Snow King Mountain. Though only 3 percent of Teton County's land is privately

WILLIAM ALBERT ALLARD

owned—the rest being protected as refuge, park, or forest—many residents worry about development. One planned low-density project, Rising Sage, a 360-acre minicommunity atop East Gros Ventre Butte, right, would allow only thirty homes.

few of them are smug about the problems caused by its popularity.

Architect Vince Lee is acting director of Friends of Jackson Hole and Wyoming representative of the Nature Conservancy. "In the nine years since I moved here," he told me, "I've watched the gradual suburbanization of the whole area. It's sad to see how fast the life-style has changed. Jackson Hole is becoming a little less unique, a little more like everyplace else.

"Now you have to lock your car and your house. And all of a sudden there are lots of new residents in Wyoming—people who've come to the state for the hunting and fishing, who make their money in Casper and Rock Springs, but who are now in a position to have vacation homes here in Jackson Hole."

Bill Ashley, chairman of the Board of County Commissioners and a strong advocate of planning, was guardedly optimistic. "There's no way we can shut off growth," he said, "but we are going to try to control its quality. The biggest problem in Jackson is the lack of low-cost housing. There is none, so trailers are the only alternative. And there are no standards for trailer developments. Right now we have 394 mobile homes scattered all over town in a shotgun pattern."

"Certain types of development Teton County shouldn't have," declared Jackson City Administrator Duane Wroe. "There has been a lack of attention to sewage, solid waste, transportation, and coordination in planning. But county government is awakening. I thought for years that growth was good. Now I'm convinced it can be a bummer."

Even Mayor Lester May, never known as a great lover of planning, conceded that "we should discourage people from locating here. It's ridiculous how many second and third homes are being built. Many of those who build can't afford them!"

Certainly, the first white men to enter Jackson Hole did not look upon it as a place to settle: Nearly eight decades elapsed between John Colter's purported crossing of the valley in the winter of 1807-08 and the arrival of the first permanent settlers. But then Colter and his ilk—Jedediah Smith, William Sublette, Jim Bridger, Kit Carson are among the best known—were not the settling type. They were hunters, trappers, mountain men, an extraordinarily hardy breed who mined the streams for beaver pelts and then cleared out. They left little trace of their presence save a few rusty traps, legends, and place-names.

Name Honors Trapping Buddy

It was a party of French-Canadian trappers who named three of the peaks Les Trois Tétons, The Three Teats; it was supposedly Sublette who named the valley Jackson's Hole for his partner David E. Jackson.

Good guys win again in the daily shootout staged in summer by Jackson Hole's Chamber of Commerce. "Hellfire, it's just a phony thing," says Jackson's Mayor Lester May. But some three million visitors to the area annually quell thoughts of discontinuing the 15-minute showdown.

The trapping era ended in the 1840's. The 1860's and '70's brought Government exploration and systematic study of the area. In the 1870's, too, following the establishment of Yellowstone National Park immediately to the north, word of Jackson Hole's splendid hunting and fishing began to spread. Rich sportsmen from the East discovered its resources, as did nobility from Europe.

The first homesteaders arrived in the 1880's, and soon became concerned for the elk in Jackson Hole. They ran off the "tuskers," hunters who shot bull elk for nothing more than the teeth that were prized by members of the Benevolent and Protective Order of Elks.

This concern for the elk, thousands of which died of starvation and disease each winter—"There was a time when a person could walk for five miles on the bodies of dead elk," historian Elizabeth Hayden told me—resulted in the establishment of the first small National Elk Refuge in 1912. It has since been expanded to 23,972 acres.

But many Jackson Holers—and out-of-state visitors—were interested in preserving more than just the elk. One such outsider was John D. Rockefeller, Jr., who visited the valley in 1926. He was so impressed by its beauty and so appalled by the growing stigmata of commercialism that in the following year he incorporated the Snake River Land Company and began to buy up land.

In 1929 Congress established Grand Teton National Park on national-forest land, an embryonic park that originally included only the eastern drainage of the Tetons and the little lakes at their feet. But Rockefeller holdings continued to grow, and so did the fury of

a faction of Jackson Holers who resented outsiders—whether Government or private—controlling the destiny of their valley.

Tempers really boiled over in March 1943, when President Franklin D. Roosevelt, spurred by Rockefeller's decision to sell his land, quietly decreed a Jackson Hole National Monument embracing 221,000 acres east of the Snake, including 33,562 acres deeded by Rockefeller. But for all the raging in Jackson and in Congress, Roosevelt's decision stuck. In 1950 Congress incorporated the monument into an expanded Grand Teton National Park of some 310,000 acres.

Opinions Change With Conditions

Mrs. Robert Bertschy, who with her three sons runs the well-known Triangle X guest ranch, reminisced: "The way the park was first set up, I fought it tooth and nail. But now, with what I've seen them do in Jackson and Teton Village, I say, 'Thank God for Grand Teton National Park!' "

The Rockefeller family retains a strong

"**Neat way to spend the summer!**" Life in a rustic cabin—no heat, no electricity, no phone—gave Pennsylvania student Diane Arnold (**left**) a new view of life. "Out here, if the sink breaks down, you don't call a plumber, you fix it yourself." She paid rent by recycling old lumber (**below**) and earned money for tuition by waiting on tables.

Most outsiders leave Jackson Hole "after getting the West out of their system." But some stay. A doctoral candidate works as a school janitor. County commissioner Bill Ashley, a geologist, runs a sporting-goods business. "This valley's full of people doing things they weren't trained for," says Ashley. "But then, we're not a keeping-up-with-the-Joneses community."

interest in the future of the valley. Laurance S. Rockefeller, who recently recalled his father's "long and sometimes bitter struggle" to enlarge the park because of the "unwise and unsightly development in progress even then," today is president of Jackson Hole Preserve, Incorporated.

Through grants to planning and conservation groups, JHP is trying to find ways to meet the need, in the younger Rockefeller's words, "to accommodate the millions of Americans who want to see, experience, and learn from their great natural heritage without having these delicate areas eroded."

The best way to get your bearings in a country as varied and spacious as Jackson Hole is to view it by air. Virginia Huidekoper, newspaperwoman, veteran pilot, and member of the board of the Teton Science School, took me up in a little Cessna on a clear autumn afternoon. . . . Up, and up, and up, and up . . . and there we were, over the Grand Teton, nearly 14,000 feet above sea level, 7,000 feet above Jackson Hole. The whole valley spread

Shimmering clouds garland the Tetons during a summer storm. As recently as 15,000 years ago, massive glaciers carved the mountains' ragged peaks—"like sharks' teeth against the sky," as historian Merrill J. Mattes wrote. A dozen small glaciers hidden in basins continue the sculpting. One, 3,500 feet long, advances thirty feet a year.

out below us, from Jackson Lake at its northern end to the golden meadows of South Park, with the tree-lined meanders of the Snake River bisecting its sagebrush flats.

A great clockwise circle brought some contrasts into sharp focus. West of Jackson Lake, a forest fire smoldered, allowed to run its course by the Park Service as an agent of natural succession. On the opposite shore of only half-natural Jackson Lake (its level was

ART AND DES BARTLETT

raised 39 feet by a U.S. Bureau of Reclamation dam) spread the geometric design of the paved campground, trailer village, and tent-cabin loops at Colter Bay (page 787)—a type of in-park development that the new park master plan is designed to keep from proliferating.

We spanned the virgin forests of the Teton Wilderness Area—and farther south, but still in Bridger-Teton National Forest, wide swaths clear-cut from the slopes and ridges, with logging slash bulldozed into contoured windrows. Then we crossed the great natural scar of the Gros Ventre Slide of 1925, when fifty million cubic yards of mud and rock slid from the flank of Sheep Mountain and dammed up the Gros Ventre River. Two years later the top of the dam collapsed, and the little town of Kelly was washed away.

With the Gros Ventre Range behind us,

Ginny brought the plane low over South Park. Herds of fat Hereford and Angus cattle dotted its broad pastures; great haystacks, their bases girt by elk-proof fences, cast lengthening shadows across the grass. In shape and in color they looked exactly like newly baked loaves of bread.

"See that row of houses?" Ginny asked, banking the plane. "Well, we want to avoid turning *all* of South Park into a mass of houses and condominiums!"

Then, heading northward, we saw the big pseudo-Swiss-chalet inns and neighboring condominiums of Teton Village, smack against the foot of Rendezvous Mountain's ski slopes, and the scattering of houses and condominiums near the golf course. Ginny lined up the plane with the runway of Jackson Hole Airport—only commercial airport ever incorporated into a U. S. national park.

Wonderland Shaped by Moving Ice

Much of Jackson Hole's topography is the result of glaciation. At least three times in the past quarter of a million years glaciers flowed over the land, relentlessly scraping and gouging, and depositing colossal amounts of soil, rock, and gravel. When I visited Jackson Hole in the winter, it seemed to me to be in the grip of a new ice age. A thick blanket of snow mantled the whole valley and frosted the craggy face of the towering Tetons. And what snow! Light, fluffy, powdery, and the purest sparkling white. Most of the park was snowed in; the road to Jenny Lake was plowed only to Cottonwood Creek.

I drove out there one brilliant cold morning and stood staring at the mountains, their icy crests etched sharply against a deep-blue sky. The scene was absolutely still; nothing moved across the land; not a sound broke the massive silence, not even the chirr of a squirrel or croak of a raven. Then the spell was shattered as two snowmobilers roared past, throwing up plumes of snow as they sped across an untracked flat.

That afternoon I went to the National Elk Refuge just outside Jackson, where some 7,500 elk winter every year under the protection of the U. S. Fish and Wildlife Service (above). When deep or crusted snow prevents the elk from grazing, refuge personnel feed them alfalfa pellets.

I climbed aboard a heavy sled drawn by two massive Belgian horses. Teamster Bob Johnson shook the reins, and we took off in the direction of the elk. These were not massed in one contiguous herd, but rather were scattered, in groups of a few hundred, over the wide, flat ground of the refuge. We headed straight for one such group. Only when we were less than a hundred yards away did the cows move to the side, some walking, some trotting. Lordly bulls, with their extravagant

HERB KNORR, II (ABOVE) AND JON AND TOM BARTLETT

racks of antlers, hardly moved at all. Some lay calmly in the snow, chewing their cuds, as we passed only yards away.

"What would happen if I stepped off the sled?" I asked Bob.

"Oh, then there'd be a stampede. As long as you're aboard, they don't seem to know you're human. But as soon as you walk, you become a hunter—and they've learned over the years to run from hunters."

Predators and Prey Keep Watchful Truce

Real hunters were about: In the course of the afternoon I counted 14 coyotes trotting across the refuge. The elk paid them no heed —the coyotes rarely bother them, but do clean up the remains of any elk that dies. In an average winter about one percent of the elk die; 75 elk are a lot of coyote food, and indeed these coyotes were the largest, healthiest-looking specimens I had ever seen.

I watched one hunting mice. For minutes on end he would stand absolutely still, ears pricked forward, head cocked to the side, peering intently at a snow-covered mound. Then all of a sudden he would spring straight up, come down with all four paws together, and bury his furry face in the snow. Three times, when he straightened up, I could see that his speed and patience had paid off.

When I returned to the elk refuge in the spring, the annual Boy Scout antler pick-up

Jackson Hole: Good-bye to the Old Days?

Acres of elk clear a path for the feed truck at the National Elk Refuge, winter home of some 7,500 animals. In summer they migrate to Yellowstone National Park. To counter overpopulation, about 175 permits, each good for one elk, are issued annually to lottery-picked hunters. Outside the refuges, regular hunting seasons prevail. Coyotes on the 23,972-acre preserve rarely harm healthy elk but thrive on carcasses (**below**).

Winter ritual: Slickered and stetsoned ranchers in Bridger-Teton National Forest load surplus timber for fences (**right**). Sizzling elk steaks will provide a feast (**below**). Hunting guide Warren Stilson takes a trail break with a camp robber perched on his hat (**above**). Although initial opposition to national park and forest has faded, a few independent-minded residents still "don't like the Government tellin' us what to do with the land."

was in progress. Jeeps and trucks, piled high with antlers shed by the bulls in the course of the winter, were converging on a central collecting point near Flat Creek. There, men wearing leather gloves were stacking the antlers, wiring them together. Everything was bustle and good cheer.

The following week, weather permitting, the antlers would be sold at auction, the profits to go to the Boy Scouts. The sale usually finds jewelry makers bidding against Asians, who grind the antlers into powder and sell it for its supposed aphrodisiacal properties. The Scouts get from $4,000 to $16,000 from the auction, and in their best year, 1973, they took in $19,600.

Casual Garb Acts as an Equalizer

Then I repaired to the town square, where the Jackson Hole Historical Society was holding its 20th annual Boardwalk Cookout and Bake Sale, the proceeds of which would be used to mark untended graves scattered around the county. It was impossible to tell by looking at them who, among the hard-working servers and several hundred hungry customers, was a ranch hand or ranch owner, a passing tourist or millionaire property holder from the East. All of them wore the same western garb, and all of them projected the same friendly informality.

I was reminded of Mardy Murie's words: "Local people, from the beginning, have welcomed dudes and treated them like anybody else. This still holds. There's very little class distinction here." And of those of Nona Galey, Frank Galey's wife: "Another fascinating aspect of Jackson Hole is that your cocktail waitress is likely to be a Ph.D., and you'll meet her at the nicest party."

The next day I drove again to Mardy Murie's home, nestled in a forest glade just south of Grand Teton National Park headquarters at Moose. I recalled our first meeting, on a sparkling winter day months before. Her exposed-beam living room, brightened with Indian rugs and cheered by a multitude of art objects such as Eskimo animal figurines, had been a warm haven from the icy wind pouring from the crest of the Tetons and hissing across the snowdrifts. Now it was mid-May, but real spring still seemed some time away. With other of Mardy's guests, I decided to walk to the Snake River before dinner.

Heading for adventure, a guide coaxes packhorses across Crystal Creek. More than 65 outfitters lead wilderness forays for hunters and occasionally for campers.

Gathering of the clan at Christmas brings four generations of Hardemans together (**right**). Patriarch Gerrit, left, came from the Netherlands in 1911. Earl, third from left, followed his dad as a rancher, though he could do better by selling his land, worth $5,000 to $10,000 an acre, to developers.

Over the years Earl has seen western hospitality change. "Once," he says, "you had no fear of anyone. I mean, if you met a traveling cookie salesman, you bought him a drink. You made the man feel happy. Now, with all the people, you kinda shy back."

Sizable patches of snow still covered the soil beneath the trees; there was no bright carpet of wild flowers yet, only a few steersheads—tiny plants just a couple of inches high, with a single perfect flower at the tip of each stem. And, indeed, each of the blossoms was shaped exactly like a steer's head. But the wildlife was all about. Skirting a beaver pond, we scared up two elk that dashed away through the shrubbery. As we drew nearer to the river, a cow moose, partly hidden in the alders, stood rock still watching us pass. As we reached the riverbank, a pair of goldeneyes winged upstream.

During dinner and afterward Mardy spoke of the future of Jackson Hole. I confessed my disappointment with the appearance of the town. "Jackson," she said, "has a chance of being something very wonderful or a miscellany of obnoxious structures that attract the more obnoxious types. You should see it in the summer—it's just a big carnival. It's fascinating in a way because you see everything, and I mean *everything*, go by. I wonder what 90 percent of them come for?"

She turned the conversation to one of her pet peeves, the proposal to extend Jackson Hole Airport's runway to accommodate big jets, which would seriously add to noise pollution in the park and spur further development in the area. "The Ski Corporation [promoters of Teton Village] and other businesses are pushing hard for a big airport," she said. "But the question is, who should set priorities—the people who stand to make a few million dollars or the people who want to live in a nice environment?"

KENNETH GARRETT (FACING PAGE)

"**Colter Bay has everything!**" say the tourists who throng the Jackson Lake complex (**facing page**) in the national park. And that's the problem, complains conservationist Mardy Murie (**above**), snowshoeing near her log home in Moose. The paved campgrounds, trailer park, and marina "go too far in catering to the sophisticated habits of Americans." Many visitors disagree; they find at the bay a beautiful blend of modern amenities and nature's handiwork.

Plans and More Plans Chart the Future

In 1968-70 a Teton County master plan was developed with widespread citizen participation. In 1972 it was made part of a subdivision ordinance, but subsequently the county commissioners overrode the planning commission and approved large-scale developments that did not comply with the master plan—an action that led to confusion and litigation. Then, in December 1974, the county picked the San Francisco planning firm of Livingston and Blayney to develop a comprehensive land-use plan. A $280,000 contract was signed in June 1975; within two years a plan was to have been formulated with citizen participation, submitted by the firm, and, it was hoped, adopted by the board of county commissioners.

"As we see it," Larry Livingston told me when I saw him in his attractive San Francisco office, "our primary consideration is to protect the unique environment of Jackson Hole—not to plan or tidy up its urbanization. We *must* find room for some private development. But we have to find the right places for it, where it will cause an absolute minimum of damage to the natural resource."

On the other hand, Livingston explained,

"We don't want to sterilize the Jackson Hole scene, and have all the pastures revert to sagebrush. Historically and aesthetically, grazing is part of the Jackson Hole scene."

An essential feature of the plan would be a scheme to minimize the "windfall and wipeout" problem, which could permit some landowners, having received favorable zoning, to reap huge speculative profits. Other landowners, their property having been zoned agricultural or open space, might find their land values drastically slashed.

Coincidentally with Livingston's work, the National Park Service has been conducting a study, in consultation with other federal agencies and local interests, of a bold proposal to bring much of Teton County's 75,000 acres of private land under Government protection. The plan, if approved, would permit the use of federal funds to acquire an interest in any portion of the area that might come under the threat of inappropriate development. This protection would be coordinated with any eventual county master plan; at the same time, since (with very minor exceptions) only easements would be purchased, the lands involved would remain on the county tax rolls. And the plan would not freeze *all* development in the area, which would happen if private lands were simply absorbed by the National Park, as some have suggested be done.

Pocketbook Politics Rules Reactions

On one of my last afternoons in Jackson Hole I drove over to Wilson to talk with Skip Wright-Clark. Owner of a 400-plus-acre cattle ranch and the oldest (1910) two-story house in the valley, Skip had been described to me as a young man vitally concerned with the environment. This I found to be true as he talked to me forcefully and articulately about his fears and hopes for Jackson Hole.

I asked him if some of the opposition to planning was not ideological. "No way," he replied. "It's right in the wallet. And a lot of it's stupid. Some of the biggest landowners, the ones who scream loudest about property rights, have more to gain by good planning than anyone else.

"Density will kill this valley," he went on. "It has about 10,000 residents right now, and it can't survive with many more than that. More people could ruin the cow business. Everybody in the cow business in the U. S. today is in trouble—low prices for cattle, high prices for feed. But that's cyclical. The cow business will last here as long as it wants to—unless it's forced out by people pressure.

Strong Laws May Hold the Answer

"The only realistic solution for Jackson Hole is stiff regulations in codes on sanitation, building, and so on. You can't go flying into court on purely aesthetic, emotional grounds. You've got to base planning on criteria that are unshakable—water quality, floodplains, avalanche paths, slide areas, fault zones. With that kind of plan we can avoid the California syndrome where you pay 2 percent down for a piece of land, have 200 years to pay, turn it over in five years, and make a 500 percent profit. That causes nothing but troubles, and we have them now.

"What's wrong in the rest of the country is wrong in Jackson Hole," Skip continued. "Pity is, you never get laws *before* you have troubles. But we're getting there. The master plan is law, the subdivision ordinance is law, perhaps the study by Larry Livingston can help. I hope so."

As I drove away from Skip's house through a late-May snowstorm ("In Jackson Hole," one wag had told me, "spring is two weeks of poor skiing"), I reflected on what he had said about the "California syndrome." Rampant development had, indeed, vandalized beautiful areas of my home state. And I fervently hoped that the likes of Skip Wright-Clark, Mardy Murie, Vince Lee, Ginny Huidekoper, John Turner, and so many others I had met, would prevail, and that glorious Jackson Hole would never become one more corroboration of Oscar Wilde's dictum that "man kills the thing he loves." □

Explosion of powder accompanies a daring jump off Crabtree Rock, named for a skier who broke both legs in an earlier attempt. Short lift lines and long runs helped 12-year-old Jackson Hole Ski Area tally a booming 57 percent increase in business last year—an omen of growth that worries many. "It was inevitable that other Americans would find Jackson Hole," says Mardy Murie. "I just wonder what they'll find when they get here."

Ethiopia Yields First

"Family" of Early Man

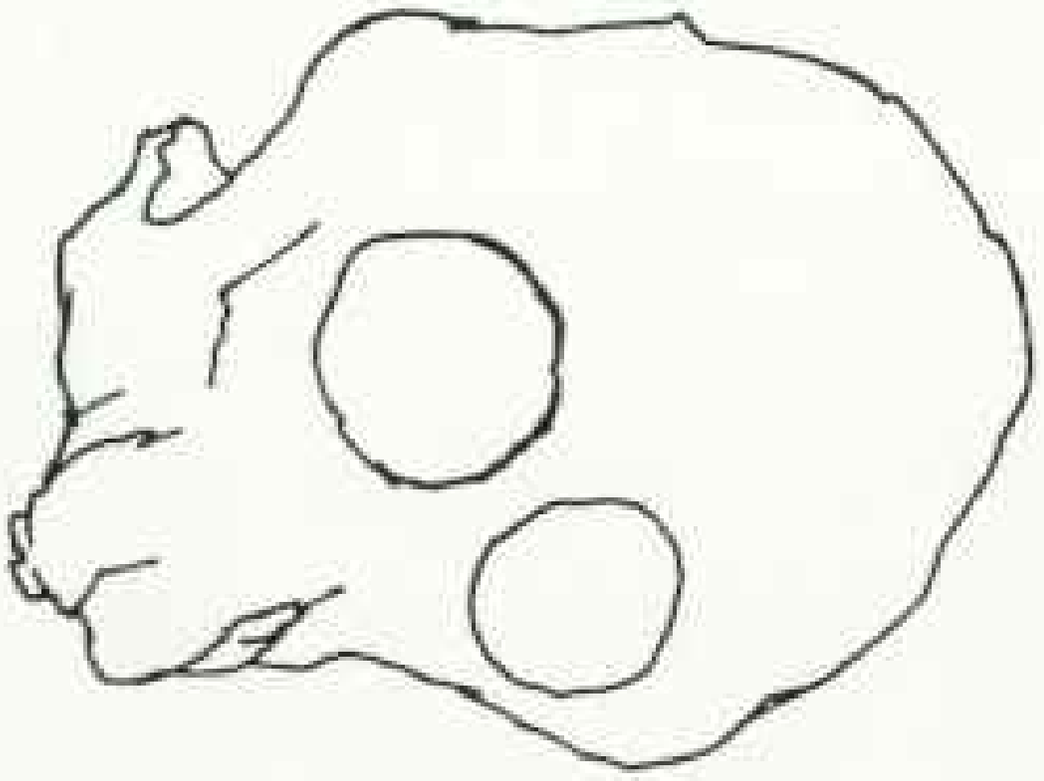
By DONALD C. JOHANSON, Ph.D.

Photographs by DAVID BRILL

Once gifted with sight, this fragmentary skull belonged to a child who laughed and cried and walked upright on the plains of northeastern Ethiopia three million years ago. Two milk teeth remain in the cranium (**drawing below**), which was deformed yet preserved by time's slow forces.

Near the remains of the child lay those of another youngster and perhaps five adults, presumed victims of a common catastrophe (pages 806-807). The specimens, which the author assigns to the genus *Homo,* are among the oldest such ever found. Now scientists can trace the development, from youth to maturity, of an early species strikingly like our own.

Here author Johanson guides an air scribe to clean away the sandstone matrix from the cranium, discovered at Hadar, in the badlands home of the Afar people. Dr. Johanson has also discovered the most complete skeleton of early near man yet known. Dubbed "Lucy" (page 802), the bones apparently belong to a female of *Australopithecus,* the hominid genus that coexisted with early *Homo.*



THE GOING-AWAY PARTY of the night before still rich in my memory, I watched with some wistfulness as the camp we called home began to disappear. Tents were folded unceremoniously; crates of scientific instruments and precious specimens had already been loaded into waiting Land-Rovers.

Three times before in as many years, I had said good-bye to this sun-parched piece of Ethiopia, and I marveled again on that day last December that such a time-ravaged, barren place could have such a hold on my emotions. Yet here had come discoveries to set any anthropologist's heart soaring, discoveries that are writing new chapters in the annals of early-man research.

In our luggage, packed as gingerly as if it had been nitroglycerin, lay one of the world's most momentous collections of fossilized bones: some of the oldest remains of the genus *Homo*—the creature called man—ever unearthed. And not just a few fragments, but pieces enough to identify men, women, and children—perhaps a family—who had died together three million years ago. The find was unprecedented—the earliest group of associated individuals ever found.

Never, I was thinking, had I been so excited about a discovery. Never. . . . But then my mind leaped back a year and I recalled the exultation I had felt at the first great discovery of our years-long quest. I relived the day.

It was November 24, 1974, and the sun stood scorchingly overhead. Our Land-Rover wallowed through a maze of ravines and gullies. Finally, where the track dead-ended at a sandy hill, I said to graduate student Tom Gray, "This is the place."

I had intended to devote this Sunday morning to bringing my field notes up-to-date. But Tom had persuaded me to help him relocate a spot where we had collected fossil animal bones the year before. We spent some time surveying, gathered up what bones we found, and started back toward the Land-Rover. As we walked, I glanced over my shoulder—and there on the

Getting close to his work, author Johanson clears a mandible of a Pliocene horse that he spotted when only an inch of it showed. From a tent city beside the Awash River (**below**), Johanson and the International Afar Research Expedition have explored eroding canyons since 1972;

the National Geographic Society now helps support the work. Here, like a time capsule, the earth preserves myriad prehistoric creatures.

ground I saw a fragment of an arm bone.

"Look at that, right there," I said to Tom.

"An arm bone of a monkey?" Tom guessed.

My pulse was quickening. Although the bone was very small, it lacked the characteristic bony flange of the comparable anatomical portion of a monkey. Suddenly I found myself saying, "It's hominid!"

Something else caught my eye. "Do you suppose it belongs with those skull fragments next to your hand?" Startled, Tom sent his glance after mine. It was high noon that memorable day when the realization struck us both that we might have found a skeleton. An extraordinary skeleton.

We looked up the slope. There, incredibly, lay a multitude of bone fragments—a nearly complete lower jaw, a thigh bone, arm bones, ribs, vertebrae, and more! The searing heat was forgotten. Tom and I yelled, hugged each other, and danced, mad as any Englishmen in the midday sun.

We were working with surface materials three million years old. We knew that a skeleton of that antiquity, whether of the genus *Homo* or—as it later turned out—another genus of hominids, would be one of the most meaningful finds in the history of man's search for the rootstock of his species.

The ride back to camp seemed endless. Roaring into camp, with dust billowing behind the Land-Rover and the horn honking, we could see people in the dining tent.

"We found it, we found it!" I shouted. "You won't believe it! A hominid skeleton just lying there, waiting to be collected."

We had brought back some fragments, and everyone crowded around to have a look. Lunch was forgotten.

That evening the camp bubbled with excitement. We cooled beer in the Awash River, and a special goat barbecue was laid on.

For the rest of that 1974 expedition, our major effort was screening and collecting all the bone fragments at the spot that we called Afar Locality 288. Taken together, the recovered parts made up nearly 40 percent of a single skeleton. The form of the pelvis identified it as a female. She was small of stature—the short leg bones suggested a height of three and a half to four feet. She had cut her wisdom teeth, so she was grown when she died.

Later geological study confirmed that the sediments from which the skeleton emerged dated from about three million years ago.

Surely such a noble little fossil lady deserved a name. As we sat around one evening listening to Beatles' songs, someone said, "Why don't we call her Lucy? You know, after 'Lucy in the Sky With Diamonds.'" So she became Lucy. But she is also known as Denkenesh, an Ethiopian name meaning "You are wonderful"—well deserved, since her discovery marked a milestone in the study of mankind's prehistory (pages 802-803).

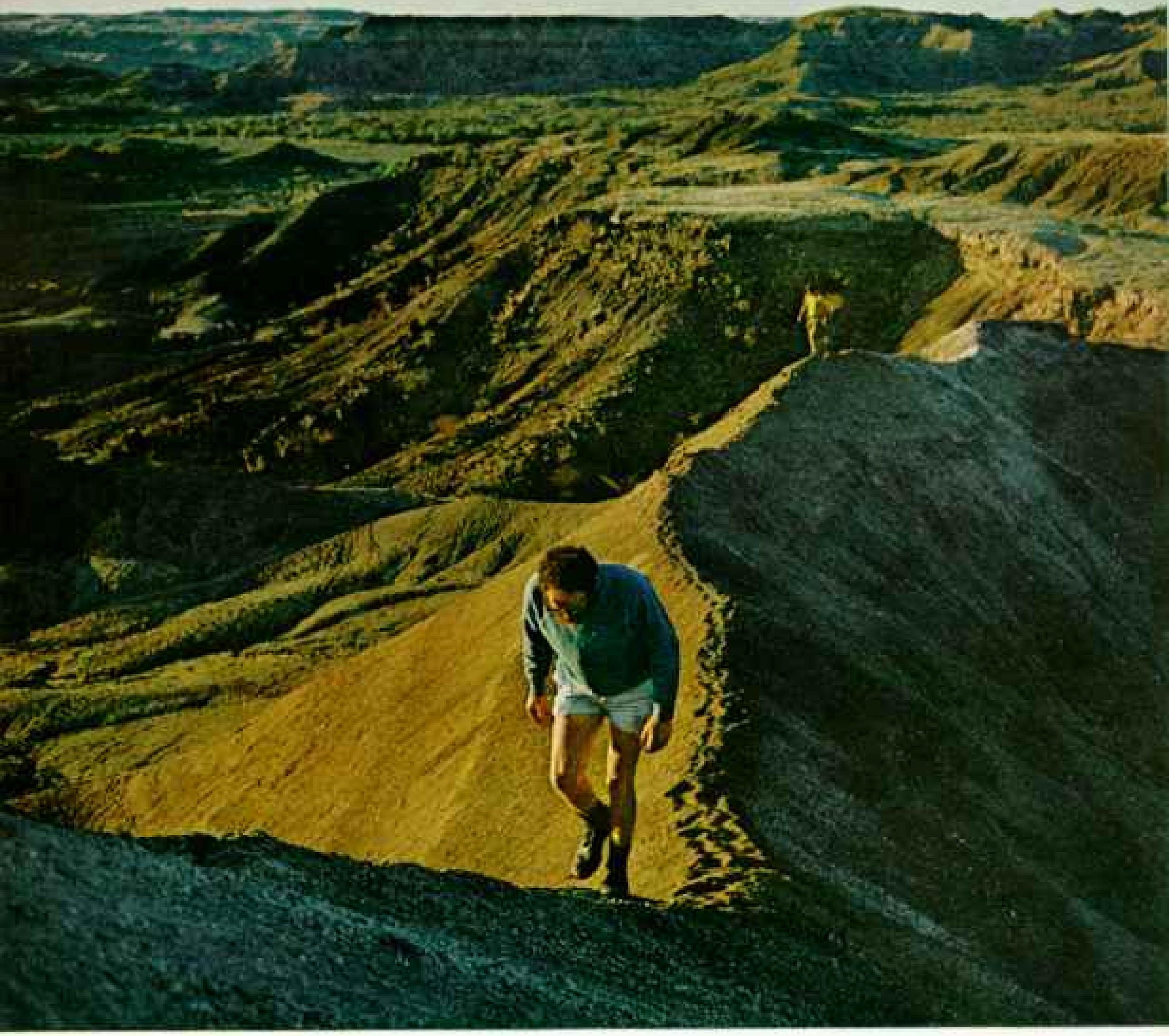
For two decades eastern Africa has been mined for treasures beyond material value. On the high deserts, crumbled cliff slopes, and weathered ridgetops, they have been reappearing—the earliest manlike creatures.

What became of the elephant?

IS A MILLENNIUMS-OLD skeleton buried behind these severed tusks? Or did it lie exposed on this side, where it disintegrated? Only extensive digging or more erosion will tell.

While erosion helps to expose fossils, it can also create recovery problems for scientists. Often rain washes clay downslope, covering other strata like frosting on a cake. Removing such clay (**left**), expedition co-director Dr. Maurice Taieb, far left, and Ethiopian workers dig down to sedimentary strata that reveal a verdant prehistoric paradise. In that distant time meandering streams, born in the Ethiopian Plateau ten miles to the west, carried sediment across lightly forested plains. Flowing waters that fed an enormous lake sorted and deposited gravel in the stream channels and sand at their mouths.

Of the two- and four-legged creatures living then, a few died where sediment would rapidly bury and preserve their bones. Now the geological graves are opening, giving wondrous clues to a vanished age.



After eons, the sun's warmth is touching them again, bone fragments that can be laboriously reassembled into legs and arms and skulls, even, uniquely, the half-complete skeleton of Lucy.

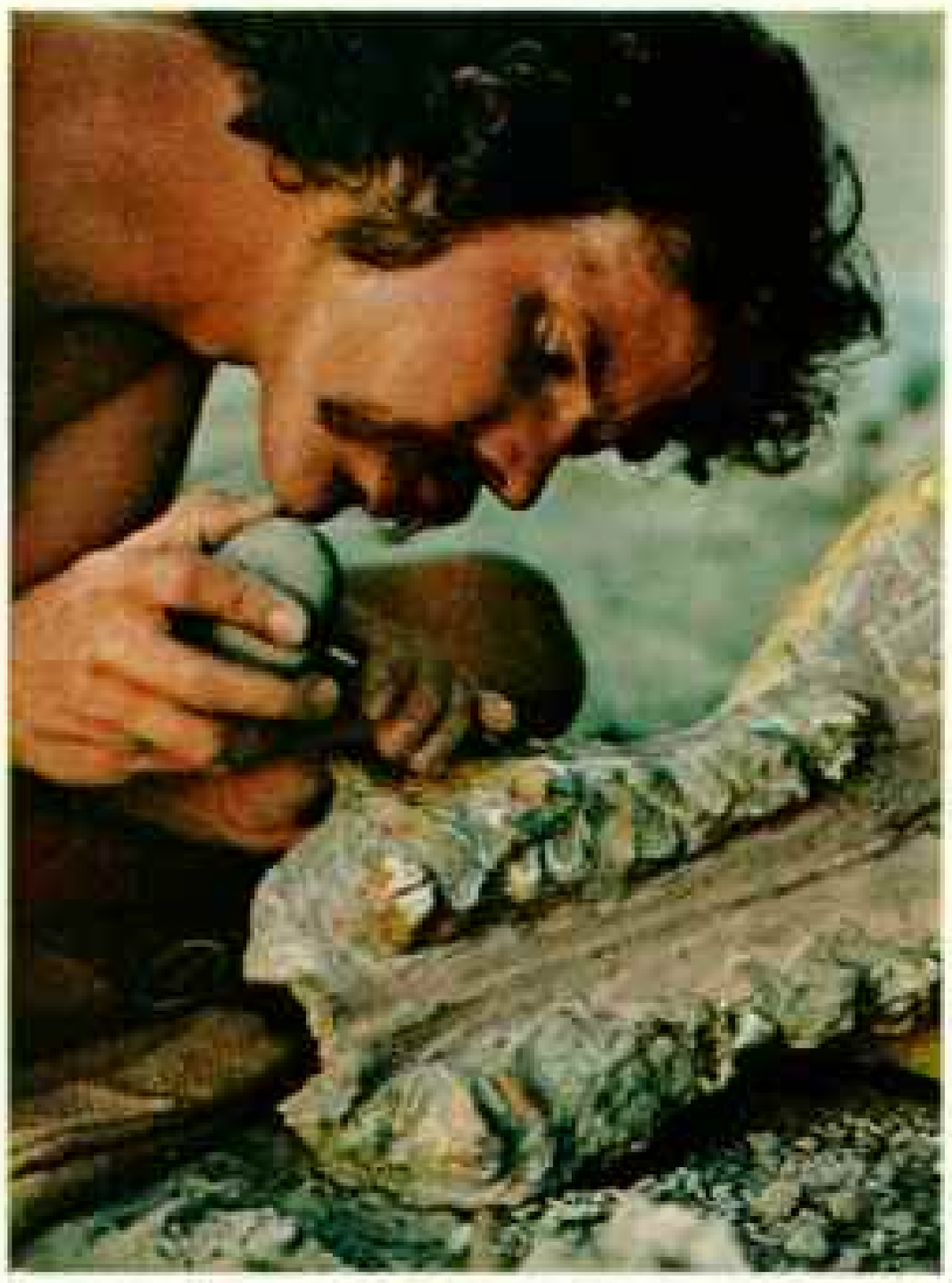
By their various shapes, sizes, and articulations, these aged residues of limbs and craniums are defining for us in jigsaw-puzzle pieces the drama of hominid development over a long span of time.

Until recently, Kenya and Tanzania have held a near monopoly on early-man and near-man discoveries in eastern Africa. Now, however, with the discovery of Lucy and the bones of some twenty other individuals, Ethiopia assumes an increasingly important place as a source of hominid material from the earliest prehistoric horizons.

National Geographic, December 1976

Prospecting for lava and tuff, geologists Dr. James Aronson and Bob Walter take samples for potassium-argon dating. Over the millenniums, volcanoes intermittently shrouded fossil-bearing sediments with datable layers. The scientists also hope to learn which volcanoes spewed which layers.

An ancestor of the modern hippopotamus gets its upper molars cleaned by graduate student Tom Gray (**below**). By comparing species here with those of known age from other African sites, he obtains a check on geological dates at Hadar.



It was a blistering April day in 1972, with temperatures above 120° F., when French geologist Maurice Taieb first took me by Land-Rover over the gravel hills of northeastern Ethiopia (map, facing page), home of the Afar people.*

"Beka! Stop!" Ali Axinum, our guide, ordered at last. Leaving our overheated vehicles, we followed Ali to the edge of a series of bluffs. We forgot our tired bodies and windburned faces, gazing out over a vast landscape of deeply eroded badlands. Evening accented the panorama with heavy shadows.

Next morning we reached the Awash River, ribboned with forest as it knifed through barren sediments. Here would be an ideal spot for a survey camp. The area was called Hadar, from the name of a tributary stream.

To our delight, in the adjacent valleys and on the ridges we found an immensely rich concentration of fossil animal bones (following pages). As we lay under the trees, eating sardines, tuna fish, and stale bread, we looked at one another with satisfaction. "I knew you would like this place," said Maurice.

Even from that first reconnaissance, we estimated the antiquity of the deposits at between three and four million years. I knew that the fossil samples we collected—among them early forms of pigs, elephants, horses,

*The author is Curator of Physical Anthropology and Director of Scientific Research at the Cleveland Museum of Natural History. He is also Associate Professor of Anthropology at Case Western Reserve University. Dr. Taieb is in charge of research at the Laboratoire de Géologie du Quarternaire, Centre National de la Recherche Scientifique, Meudon-Bellevue, France.

They shared the land with early man

"AN ASTONISHING ARRAY," the author calls the Hadar fossils—many of them ancestral to today's African species. The remains of a Pliocene elephant (**right**), cleaned by paleontology assistant Claude Guillemot, included tusks, skull, backbone, and femur. Other mammals: pigs, giraffes, antelopes, rhinoceroses, hyenas, otters, and big cats.

Still locked in sandstone, the jaw of a horse (**below**), found by Dr. Johanson, flashes translucent, scarcely worn enamel on its incisors, indicating immaturity at death. Baboon cranium (**lower left**) resembles those of modern species. A fragmented yard-wide shell (**lower right**) is all that remains of a tortoise that crawled at lakeside three million years ago.

and rhinoceroses—had been ascribed such an age at other sites in eastern Africa.

Maurice's preliminary survey convinced him that the exposed layers had been laid down at an ancient lake site. He noted that the sedimentary strata would permit accurate geological mapping in relation to overlying volcanic outcrops of known age. We should be able to arrive at precise dates for the deposition of the fossil-bearing sediments. Here, clearly, was a paleontological "hot spot."

Armed Nomads Order Team to Leave

In the following months Maurice organized the International Afar Research Expedition. He and I, assisted by Yves Coppens, raised funds and assembled a small team of scientists and students, and in October 1973 we again set up camp near the Awash River. Alemayehu Asfaw of the Ethiopian Antiquities Administration joined us.

We had been mapping and collecting for only a few days when Ali came to tell us that six Afar men were headed toward camp. Walking at their deliberate pace, each swathed in a white cloth with a rifle across his shoulder, the nomads appeared. Regarding these strikingly handsome young men, I found it hard to credit their reputation as dangerous and savage people. We invited them into camp. Greetings were exchanged, and we all squatted around in a circle.

We were informed that the local tribesmen were not pleased with our presence at Hadar. We were told to leave. Instead we offered the young emissaries tea, and for several hours engaged in unhurried and reserved conversation about our objectives. The men agreed to carry our message to the tribal elders. We were greatly relieved that the Afar tribesmen, upon hearing the details, agreed that we could remain to pursue our work.

From that day on, our relations with the Afar people were consistently friendly, and a number of them have assisted us each year. Their knowledge of Hadar and their keen sense of vision, honed by a nomadic existence, often bring astonishing fossils to light. Dato, Muhammed Arab, Gura, Abraham, Ali Muhammed—these and others have located a number of important specimens.

Meticulous surveys produced countless fossilized bone fragments, but none yet of early man. Then, finally, late in the afternoon of October 30, 1973, I made a discovery that was to be a foretaste of the great things to come.

As we finished up our survey in a narrow valley, my eyes became fixed on a small bone fragment glistening in the sun. I moved it carefully, and its form became clear—part of a leg bone, a proximal tibia, mature but curiously small—too small, apparently, for a hominid. But aspects of its form put me on the alert. A few feet away, in a small gully, lay the lower end of a thigh bone. It was from the same individual! As I articulated the two fragments, forming a knee joint, I was stunned: The anatomy was unmistakable; it was a hominid fossil!

Finally we had found our first fossils of manlike creatures in Hadar. Careful study satisfied us that they were relics of probably the smallest early hominid known in Africa, but clearly from a bipedal creature of great antiquity, perhaps approaching three and a half million years. It appeared that we had found the oldest definitive evidence for the two-legged gait peculiar to hominids.

Bipedalism has been postulated by anthropologists as possibly the earliest and most important aspect of hominid development. This unique trait freed the forelimbs for manipulation and carrying, making and using tools, and for hunting. Challenged by new opportunities, man's brain began to develop.

New Year Brings Better Luck

It was disappointing that the 1973 season produced no hominid teeth or jaws, usually the best-preserved fossils. When we returned to Hadar again in October 1974, we had not long to wait. Alemayehu, our Ethiopian colleague, quickly located a hominid jaw fragment containing two teeth. Then, only a day later, he came running to my work tent to find me.

"I've got another one," he announced breathlessly, "a smaller one; there are six teeth. It's just nearby." The two of us hurried to an area near camp where an earlier survey had drawn a blank.

"There, just there. Can you see it?" Scarcely visible lay an upper-jaw fragment with all the teeth from the canine to the last molar intact on one side.

Other people joined us. Everyone combed the vicinity. Alemayehu, who had wandered away, came rushing over a small hill, waving

madly, shouting, "There's another jaw; hurry!"

About twenty yards from the first discovery, an upper jaw in two parts lay partially exposed, only a couple of feet separating the halves. "This side is complete, all the teeth are here," I said. Incredibly, the other side, too, retained all its teeth. Freeing both fragments, we saw that they fit perfectly: a virtually intact palate with all 16 teeth in place!

Student Barbara Brown's excavations provided evidence that the two palates probably came from the same geological level. Yet one was small and the other large. Was one from a female and the other from a male? Or were they just examples of variation in dental and facial size?

Jaw Shape Hints at Genus

Characteristics of the teeth we gathered suggested affinities with known fossils from a later period. Such fossils—the jaws more rounded in front, and the front and back teeth more evenly proportioned than the parallel group of australopithecines, or near men—have been assigned to the genus *Homo*, which includes modern man. This could make our specimens, more than three million years old, among the oldest evidence for the *Homo* lineage in the world.

Next day we returned to the same site. Soon there was a shout from Melissa, our Ethiopian screening and excavation foreman. He had discovered the remains of yet another individual—half of a lower jaw.

Unbelievable! In three days, four hominid specimens, representing four individuals, had been found, and the area had won from us a distinctive name—"Hominid Valley."

Surely, such luck could not continue, and we were satisfied with what we had to show the famed anthropologists Dr. Mary Leakey and her son Richard, and Richard's wife, Meave, when they came for a visit.

Then, the very day after our guests left, Lucy showed up!

And what a find she was! In Lucy we had a three-million-year-old partial skeleton far more complete than anything found previously. Only in excavations dating from no more than 100,000 years ago have comparably intact skeletons been unearthed.

The stratigraphy at the site suggested that Lucy died near a lake margin. Remains of fossil animals indicate that she lived in an environment of lush grasslands, perhaps with open-savanna woodlands. Fossil turtle and crocodile eggs were found, and fossilized crab claws. It is entirely plausible that Lucy may have eaten such animal foods.

Since her long trip back to the United States (on loan from Ethiopia), we've given Lucy very special study. Even now, though, we are not absolutely sure where her skeletal structure fits into the spectrum of early hominids. She has provoked as many new questions as she has given answers to old ones. Lucy apparently was capable of walking upright, yet relative to her hind limbs her forelimbs were longer than in modern man.

What should she be called? *Australopithecus* no doubt, but perhaps not the typical small australopithecine called *Australopithecus africanus*. *(Continued on page 805)*

Miniature inferno releases atoms of argon from Ethiopian tuff for dating at Cleveland's Case Western Reserve University. Measuring the argon accumulated in the samples from radioactive decay of potassium, Dr. James Aronson determines the dates of volcanic eruptions, thus placing age limits on fossils deposited above and below.

"Lucy in the Sky With Diamonds"

THE SONG OF THE BEATLES, blaring through the Hadar wilderness from a tape recorder in 1974, gave a name to this startling three-million-year-old skeleton. Until Lucy was found, the earliest skeleton this complete dated from no more than 100,000 years ago.

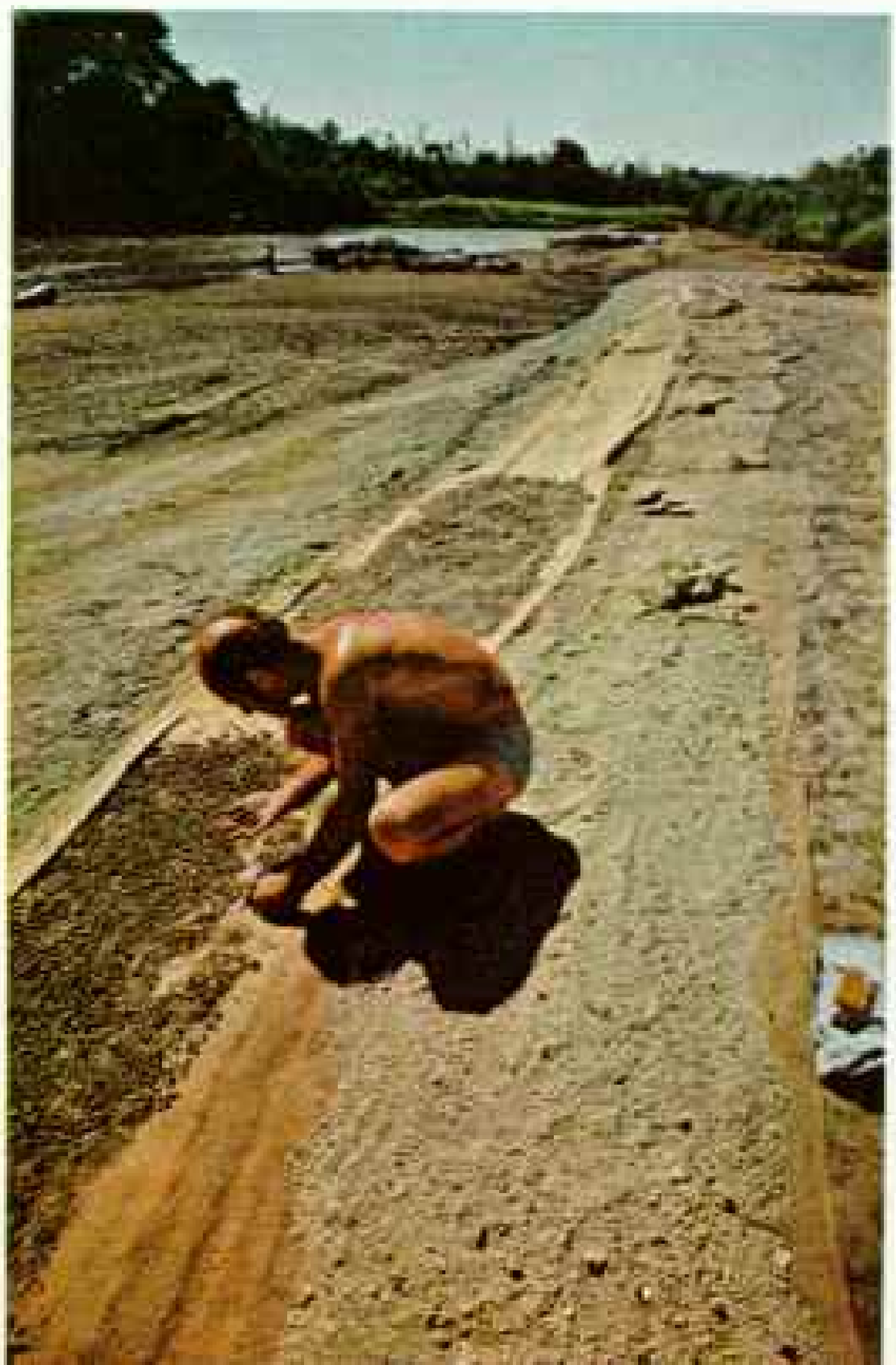
Lucy and her kind walked upright, foraging along an Ethiopian lakeshore. The crescent indentation on the inner edge of the pelvis tells her sex. The angle of the thigh bone and the flattened surface at its knee-joint end—so different from quadrupedal apes—prove she walked on two legs. Like many other primates then and now, she suffered from arthritis, a disease revealed by lipped edges on several vertebrae.

Still, Lucy is far from being a member of the genus *Homo*. Fully grown, she is less than four feet tall. Her arms in relation to her legs are longer than a modern human's but not as long as an ape's, though she may have climbed trees for sleeping or safety. Not enough of the cranium survives to measure brain size, a clue to identification. The lower jaw's V shape and its narrow incisors resemble those of *Australopithecus*, the genus of near man whose bones have come to light at other African sites.

Did Lucy or the genus *Homo* "family" use tools? None have been found at the site, but as the author points out, "We haven't looked for tools yet, and we tend to find only what we look for." This fall, as the expedition entered its fifth season, two archeologists went along, searching for crudely chipped stone tools like those discovered at other early-man sites in Africa.

So as not to miss any bit of Lucy, workmen sift 50 square meters of hillside 288, where her bones were found (**below**). Here they sack gravel to be washed at riverside. During two fall seasons, expedition members screened more than twenty tons by hand and discovered hundreds of other fragments that may fit into Lucy's skeleton.

At least 99.9 percent gravel, wet-screened sediments from the 288 locality (**right**) could yield the 0.1 percent bone that would tell more about Lucy. Claude Guillemot looks for fossilized bones as small as this quarter-inch lizard jaw (**below**), here resting on a fingertip. Along with crab claws and crocodile and turtle eggs, it points to possible proteins in Lucy's diet. To identify plants available to her, geologic samples now undergo laboratory analysis for fossilized pollen.



Spine-tingling thrill of discovery engulfs the author as he realizes that an unexplored ridge, designated 333, is yielding an unprecedented cache—bone after bone of an early human group who died together. Searching with Dr. Becky Sigmon, he holds aloft the end of a femur (**left**) to colleagues down the hill. Later he pinpoints features of the femur (**below**) characteristic of *Homo*, but not of *Australopithecus*. Matrix still encrusts the bone, turned bluish during fossilization (**lower**).

Granted, she bears similarities to *Australopithecus* specimens from South Africa, but primitive aspects of her teeth, jaw, pelvis, and other parts suggest that Lucy may be more closely related to older hominid forms.

In 1975, with support from the National Geographic Society, the National Science Foundation, the Centre National de la Recherche Scientifique, the L. S. B. Leakey Foundation, the Harry Frank Guggenheim Foundation, and the Singer-Polignac Foundation, we were able to enlarge our group to 25 participants. Rumors of wandering rebel bands injected uneasiness into our field preparations. However, the Ethiopian Government again gave us every cooperation, and local Afar governors pledged their support for our safety and success.

Bob Walter, a student of Dr. James Aronson, our geologist who is concerned with age sequences, teamed up with Jean-Jacques Tiercelin in searching for volcanic rock suitable for potassium-argon dating. We now have excellent dates for the Hadar finds, dates substantiated by the fossil remains and by paleomagnetic work by Tom Schmitt.

Hunch Comes True—in Spades

Continuing our exploration near the Awash River, we turned to another part of the Hadar site. Nicole Page's skilled reading of the aerial photographs proved invaluable. On November 1, I set out for the new area with photographer David Brill and a visiting scientist, Dr. Becky Sigmon.

Climbing into my Land-Rover, David asked, "When do we find our next hominid?"

"Today," I replied.

In less than an hour, anthropology student John Kolar spotted an arm-bone fragment. From some distance away, Mike Bush, a medical student, shouted that he had found something just breaking the ground surface. It was the very first day on survey for Mike.

"Hominid teeth?" he asked, when we ran to him. There was no doubt.

We called that spot Afar Locality 333 and scheduled full excavation for the next day.

Morning found me at 333, lying on my side so that I could wield a dental pick to excavate the upper-jaw fragment Mike had found. Michèle Cavillon of our motion-picture crew called to me to look at some bones higher up the hill.

Two bone fragments lay side by side—one a partial femur and the other a fragmentary heel bone. Both were hominid.

Carefully, we started scouring the hillside. Two more leg bones—fibulae—showed up, but each from the same side. The same side? That could only indicate two individuals.

Then from high on the slope came a cry, "Look at the proximal femur—it's complete!" Turning, I saw, outlined against the blue sky, the top end of a thigh bone. Even from a distance I could tell that it was not Lucy-size; it was much larger. Slowly I groped up the hillside and held the femur (page 804).

Mike wanted to come look, but was distracted by finding two fragments composing a nearly complete lower jaw. The entire hillside was dotted with the bones of what were evidently at least two individuals.

Slow Work Belies Race Against Rains

We held a strategy meeting. Maurice established that the bones we found on the surface had originally been buried several yards up the slope. Mike chose a crew of seven workers to survey carefully every inch of the area and collect all bone material, sifting even the loose soil.

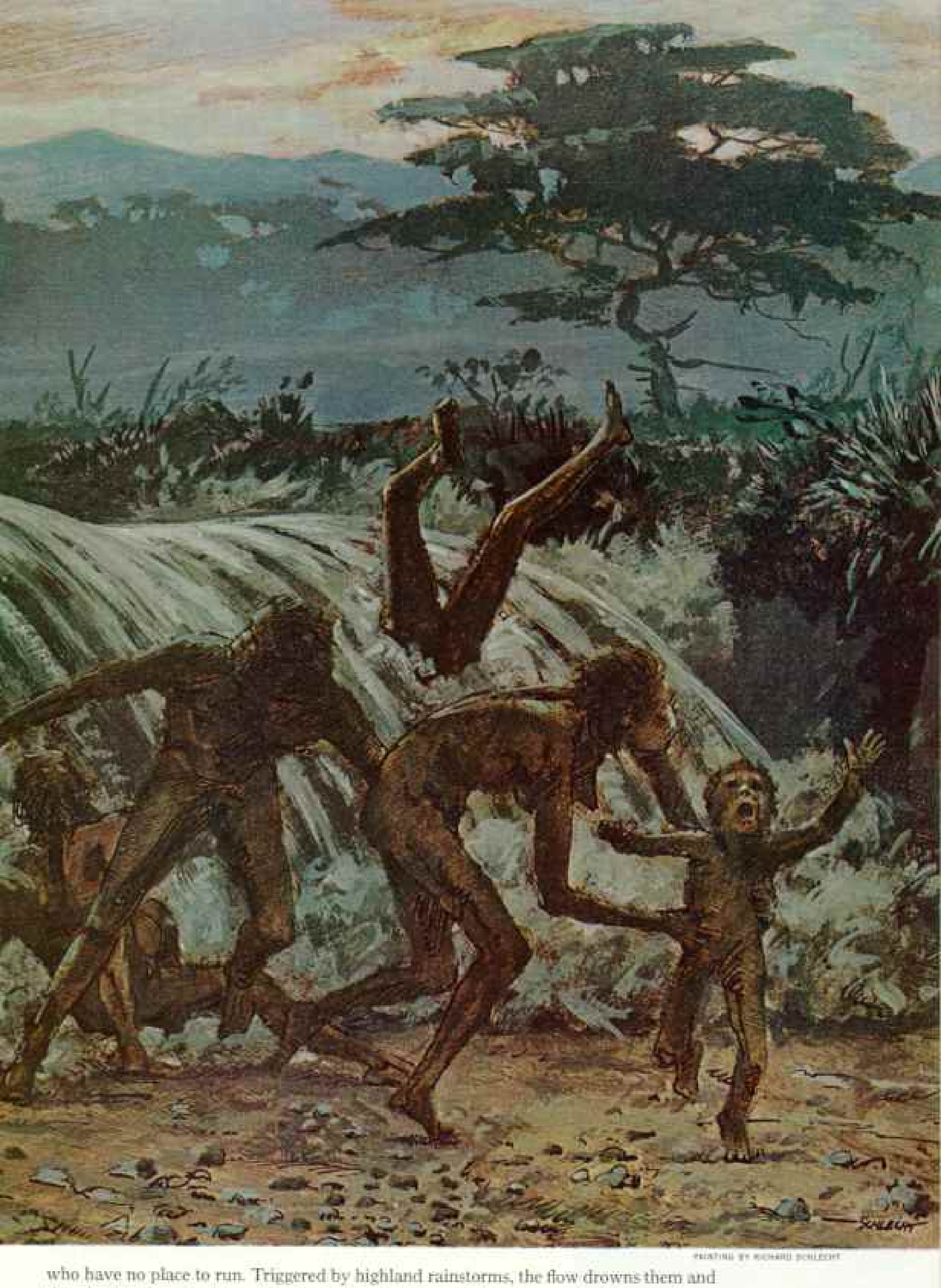
Time was of the essence. Rainstorms during the months of our absence could wash away fragments that would be lost forever down the ravines. I felt I was moving through a dream: Each day produced more remains.

The picture became tangled. Another upper jaw of an adult came to light. The wear pattern on the lower jaw we'd found did not match either of the uppers. At least three individuals had to be represented. More mandible fragments appeared that could not be definitely fitted to either upper jaw. Extraordinary! We had evidence of perhaps as many as five adults of the genus *Homo*.

Apart from teeth and jaws, we recovered scores of hand and foot bones, leg bones, vertebrae, ribs, even a partial adult skull. A baby tooth turned up, suggesting the presence of a sixth hominid at the site. Then a nearly complete lower jaw of a baby appeared, as well as an almost intact palate with baby teeth. Not heavily worn, the teeth suggested that their possessor was only about 3 years old.

So we had evidence of young adults, old adults, and *(Continued on page 811)*

Crashing through the stillness of a primeval dawn, a flash flood races down a dry channel, overwhelming a terrified group



PAINTING BY RICHARD SCHLECHT

who have no place to run. Triggered by highland rainstorms, the flow drowns them and then buries them under sediment. Such a disaster, postulated by geologists, would account for the sediments and numerous *Homo* specimens found at Afar Locality 333.

Clues by the handful to

REACHING across the millenniums, hand bones from 333, arranged as a composite pair (**above**), bear an uncanny resemblance to our own—in size, shape, and function. The backs of the metacarpal heads have no ridges, so these individuals did not walk on their knuckles as African apes do. The thumb rotates, making it possible to manipulate tools with finesse.

Prehistoric foot bones also appear. A fossil fifth metatarsal (**upper left**) corresponds closely to that of modern man.

Right and left halves of a lower jaw (**left**), found two feet apart, belonged to the same individual. Through the ages some teeth were lost. When the

the nature of early man

MARIE-CÉCILE BEAUREGARD

soil from 333 was screened, a missing premolar (**lower right**) came to light; it slipped perfectly into the broken jaw. In size and shape the jaw could fit a *Homo* skull discovered in Kenya by Richard Leakey and reported in the June 1973 NATIONAL GEOGRAPHIC.

When Dr. Johanson finds only half a jaw, he uses a mirror (**upper right**) to learn the whole truth: The mandible is U-shaped, like those of humans today, not V-shaped like those of australopithecines. One evening, for a lark, members of the research expedition made clay casts of their own teeth; one woman's jaw bore a startling resemblance to a three-million-year-old specimen.

(Continued from page 806) children—an entire assemblage of early hominids. All of them at one place. Nothing like this had ever been found!

For six weeks excitement reigned. The Land-Rover would return to camp, some of the workers on top singing and waving. Mike, grinning, would produce collection bags laden with the latest finds.

Grouped Fossils Raise Questions

One day I especially recall. Mike beamed and said, "You won't believe this!" With shaking hands he removed tissue paper from what seemed a large ball. We saw an amorphous mass of sand and bone. I turned it over. It was the skull of yet another child!

"The forehead is there, an ear opening, two baby teeth, at least one eye orbit!" I announced excitedly.

Finding this group of hominids in a cluster raised obvious questions. Were the individuals related? If so, in what way? A family? We will probably never have sure answers. But it seems reasonable that the five to seven individuals must have been buried at the same time. Maurice pointed out that the geology of the site—layers of lakeshore and riverine sediments—suggested that the group had been struck down all at one time. "They could only have been buried together," Maurice declared. "Some natural catastrophe. I think maybe a flash flood, perhaps while they were resting or sleeping" (painting, pages 806–807).

Possibly Afar Locality 333 has presented us with evidence that man's earliest ancestors congregated in groups. Maybe not in families in the modern sense, but in cohesive units of adults and children.

From a scientific viewpoint the 333 collection holds unparalleled promise: new insights into the anatomy of early hominids and, from individuals of different ages, interpretation of aspects of growth not possible previously. The numerous hand bones we found surely will tell us something about these persons' capabilities for manipulation and perhaps for toolmaking (pages 808-809).

In philosophical terms the 333 assemblage confirms my own personal belief that man as an intelligent being has his origins in cooperative behavior. Life beside the ancient lake at Hadar three million years ago was surely not easy or safe. Those early hominids had to compete for food and protect themselves against large carnivores. Providing for a regular supply of food and ensuring safety were best achieved through cooperation.

Details to support such theorizing, hidden in the fossil record, may, of course, never come to light.

The Locality 333 individuals lived together. Exactly how, we don't know. And they died together. In Ethiopia, and elsewhere, further finds surely will furnish new evidence of early man's social proclivities.

Puzzle Remains—and Hope Endures

Our work at Hadar furnishes an important supplement to the finds of the Leakeys at Olduvai Gorge in Tanzania and Kenya's Lake Turkana (Lake Rudolf), and the valuable discoveries of teams led by Clark Howell and Yves Coppens in the Omo River basin in southern Ethiopia. All this work, taken together, has provided a great body of information. Not all of it fits neatly into an obvious pattern, but the more we learn, the closer we come to comprehending the interrelationships among the early hominids. As we are privileged to gain additional glimpses into man's remote past, it is my hope that we will substantiate the common origin of modern man.

On the evening ending our 1975 field season, we decorated the camp with leafage from the riverine forests. Choice goats were bought and prepared by Kabede, our cook. Beer was cooled, and everyone was at ease. Vigorously, joyously, the local Afar sang and danced for us.

As I walked to my tent, it comforted me to realize that Hadar would wait for us, the forces of nature slowly uncovering more fossils from the layers of time. And there would always be more to learn in the quest for understanding of mankind's origins. □

The search goes on, and the horizon of early man keeps moving backward. Sifting for that past, Ethiopian laborers—themselves expert fossil spotters—screen the 333 locality. With the cooperation of the Ethiopian Government, expedition members continue their work at one of the most exceptional early-man sites ever discovered.

To Torre Egger's Icy Summit

By JIM DONINI

Photographs by the author, JAY WILSON, and JOHN BRAGG

NOBODY HAD CLIMBED Torre Egger before—and there were reasons. Though only 9,800 feet high—a midget by Himalayan standards—this spire in the southern Andes confronts the climber with a sheer wall of ice-encrusted granite some 4,000 feet high. It was rated one of the most difficult unclimbed mountains in South America. Capricious storms lash its faces with hundred-mile-an-hour winds, allowing only brief intervals for climbing. Chunks of falling ice are a constant hazard; the helmet worn by John Bragg (**left**) as he inches up the peak is essential equipment.

A ten-man British team was stymied by Torre Egger's storms and technical difficulty in 1974. A nine-man New Zealand expedition, starting by another route at the same time we did, gave up when a member perished after falling into a crevasse.

Our expedition, sponsored by the American Alpine Club, included only John, Jay Wilson, and me. This meant that the burden of carrying hundreds of pounds of food and equipment up the mountain would rest on just three men. But it also meant that all of us could hope for a privilege that bigger groups reserve for only a few—reaching the top.

JIM DONINI

ICY SPIRES *on the border of Argentina and Chile, the three main peaks of the Cerro Torre group have long enticed mountaineers. Torre Egger, in the middle, is flanked by Cerro Torre, left, and Cerro Stanhardt.*

The ecstasy and the agony

AHHH-H-H! Soaking my fatigue-wracked bones in a makeshift tub of hot water, I enjoy an interlude of relaxation at our base camp in Argentina's Los Glaciares National Park (**map, below**).

If my body is at momentary ease, my mind

JOHNATA HUNTER LABRUNE / AND JAY WILSON

is not. A terrific storm has just driven us off the mountain, forcing us all the way down for a week. As soon as the weather clears, we will return up our fixed ropes to the previous high point of our climb.

In a more taxing situation two weeks later (**right**), I complete a strenuous section of the climb, on ropes now sheathed with newly formed ice. We spend 16-hour days climbing and hauling heavy loads of equipment ever higher for a final push. Hand-manipulated clamps that grip the rope—Jumars—enable us to move up with relative ease and safety.

Still, the physical strain is draining. In nearly three months on the expedition, my weight has gone from a spare 162 pounds to a rib-protruding 145. This can't go on forever. Our patience, not to mention our supplies, is running low. We keep hoping for a break in the almost incessant storms blowing off the southern Patagonian ice field. When the break comes—*if* it comes—we'll have to work fast and make our move for the summit.

DEEP IN OUR SNOW CAVE scooped out of a glacier, we wait out day after day of bad weather. Only three of our first fifty days have been suitable for sustained climbing. We're so sheltered we can't even hear the winds roar outside. Annoyingly, moisture drips continuously off the ceiling. Here Jay Wilson reads beneath a tent fly we've set up to ward off the dripping. It doesn't work. Periodically, one of us crawls out through the cave's entrance tunnel to check the weather.

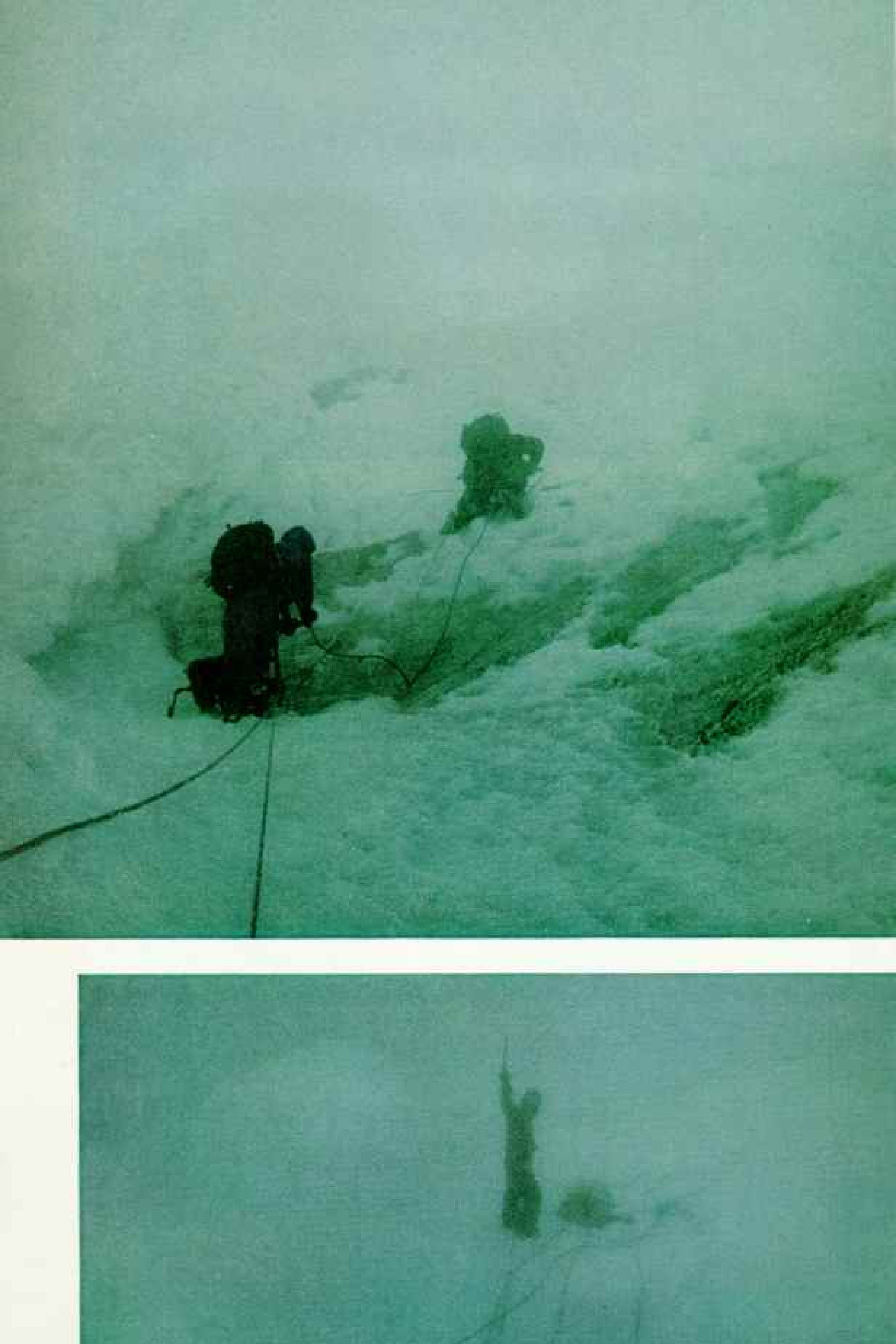
"I don't know which is tougher, the climbing or the waiting"

JOHN ERASC (ABOVE AND FACING PAGE) AND JAY WILSON

Snow keeps covering the entrance (**right**), which has to be extended repeatedly. In time, the tunnel becomes seventy feet long.

Just above the cave the real climb begins—about 4,000 feet of sheer granite with hardly a ledge big enough for a tent. One of the toughest segments of the climb comes at an overhanging wall about 1,200 feet below the summit (**facing page**). To get past, I've got to hang from pitons that will hammer in only a quarter of their length. I'm aware that my weight could easily cause the shaky pitons to "zipper" right out. Gravity keeps pulling me away from the wall, but I must try to swing pendulumlike over to the snow-covered ledge at right. After four hours of exhausting effort, I'm forced to lasso the ledge and pull myself to it. I have gained only forty feet.

A BRIDGE OF SAPLINGS, carried from our base camp, takes us safely over the crevasse in which the New Zealand climber was killed (**left**). Later and far above, our Whillans Box (**right**)—"home" for the last six nights—sits on a ledge we spent hours chopping out of the ice. Pitons anchor the sturdy, aluminum-framed shelter to the wall. It's a lot of extra trouble, but it beats sleeping in the open, exposed to a 60-mile-an-hour wind, as we were forced to do earlier (**below**). Times like these make you wonder what you're doing here.



SUMMIT DAY, February 22, 1976, begins on a promising note. The heavy rains are over and the sun breaks through the dense clouds and mist. We set out, ascending the fixed ropes toward our previous high point, about 250 feet below the top. But now, just as the summit is within reach, the weather begins to go bad again. A thickening mist wraps around us, and the wind drowns out our voices (**left**). Should we turn back—and perhaps be forced all the way down again? No. We sense that this may be our last chance.

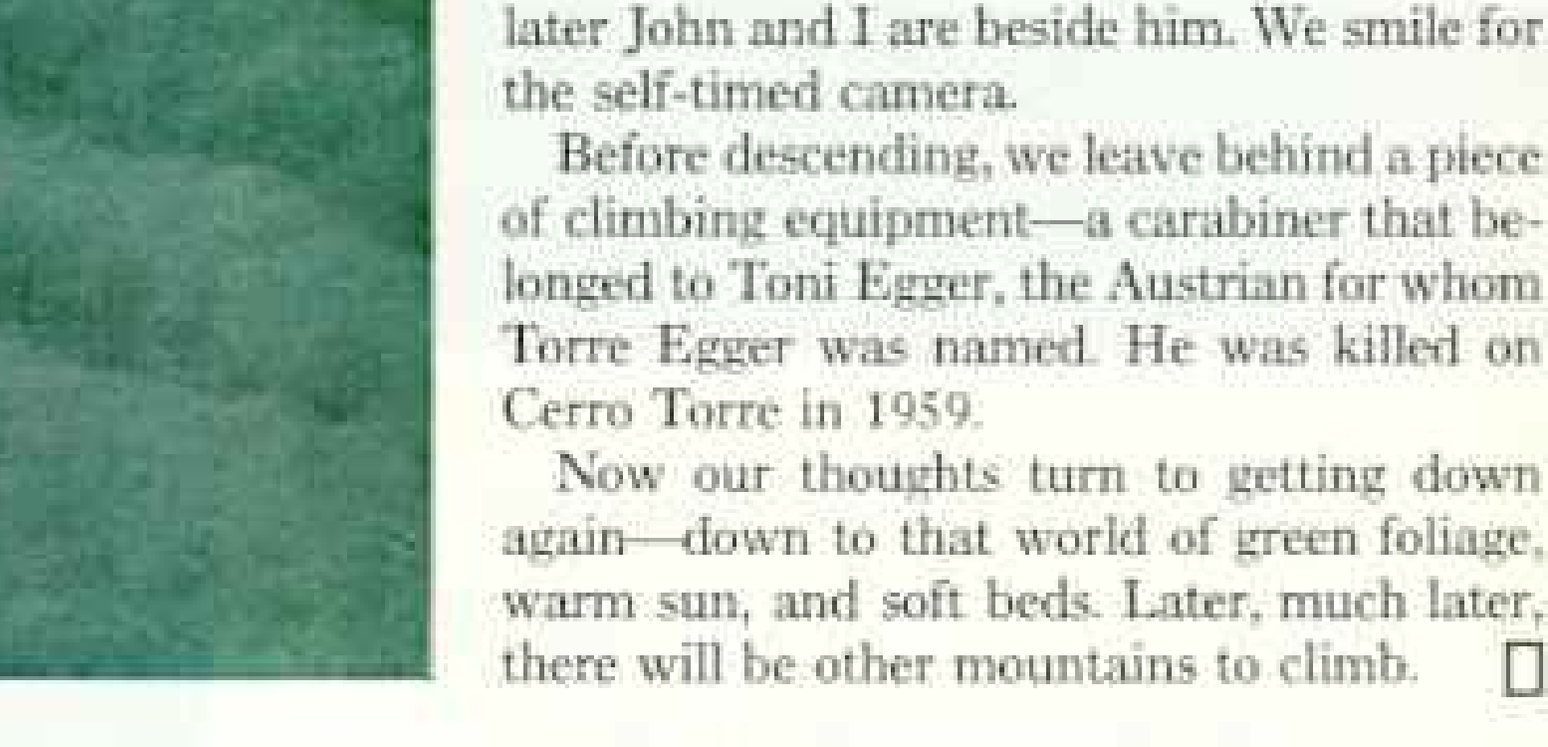
Several hours later we leave the security of the fixed ropes for the final push. There are times when commitment, not reason, dictates reality—this is such a time. We really shouldn't be up here in these conditions. But here we are, moving slowly upward, communicating by instinct, separate from one another in our ice-hardened parkas, but functioning, somehow, as a unit.

Suddenly the angle eases and we find ourselves on a narrow ridge of ice. We can hear Jay about a hundred feet above us, shouting something. Soon we see him through the mist. He raises his ice ax—he's on top! Moments later John and I are beside him. We smile for the self-timed camera.

Before descending, we leave behind a piece of climbing equipment—a carabiner that belonged to Toni Egger, the Austrian for whom Torre Egger was named. He was killed on Cerro Torre in 1959.

Now our thoughts turn to getting down again—down to that world of green foliage, warm sun, and soft beds. Later, much later, there will be other mountains to climb. □

JOHN BRAGG (RIGHT) AND JIM DUNN



From Baltic to Bicentennial by Square Rigger

ARTICLE AND PHOTOGRAPHS BY
KENNETH GARRETT

Seemingly all grace and ease, Poland's "Dar Pomorza" sails by the sweat and strain of her cadets. Like his shipmates, here bracing a yard, the 22-year-old U.S. author-photographer learned the sailor's life on a voyage that took him from Gdynia to New York—and from greenhorn to old hand.

BACKS STRAIN. Feet slip on rain-slick decks. Hands fight to grasp the cold, wet line. The chain of exhausted cadets struggles to a standstill.

A shadow in the night, the deputy captain leans into the line. With a *"Ho-Raz!"* he sets us in motion again. Rhythm and song impart strength and spirit to brace the yards.

Four bells. It's 2 a.m. Rain drives with savage force. The frenzy of whistles and chants and pounding feet never ends. There are no winches, only brute power as now we trim the staysails.

Leaping into the darkness, I grasp a line and swing back to the deck with half a dozen straining bodies; watchmates take up the slack. The line is steel-taut, cruel to grip. I leap again and again, until it seems one more swing will tear my arms out. Squalls and wind shifts keep all hands on deck the entire night as our square-rigger beats to windward out of the English Channel into the Atlantic.

It is our first night out of Plymouth, a fast start for the 1976 tall-ships race to America. Chilled and wet, back aching, fingers swollen, I am learning firsthand what it's like to go down to the sea in ships.

Voyage for a Lifetime of Memories

Three weeks earlier I had flown from my home in the United States to Poland, invited by the Polish Merchant Navy Academy in Gdynia to sail with their full-rigged ship, *Dar Pomorza*. It was a young sailor's dream.

April skies grayed the wharves and warehouses that rim the harbor of Gdynia, one of the largest port facilities on the Baltic Sea. Amid the jumble of cranes I picked out a triad of tall masts crossed with the telltale yards of a square-rigger. Soon, at dockside, I got my first look at the ship that would be my home for nearly three months.

I took in the graceful lines of her white hull, from raking bowsprit and clipper bow to up-curved poop. I studied her towering masts, the clean white sails hanging loosely from her yards, the maze of rigging. Beautiful. And big! I had sailed before—in craft ranging from my father's nine-foot dinghy to 46-foot racing yachts. But nothing had prepared me for nearly 300 feet of square-rigged ship.

On deck I got a close look at the mainmast —12 feet around. Lines encircled it, lines thick and thin, brown hemp and white Dacron, belayed on a brass-shielded teak pinrail. My eyes followed the steel shrouds of the standing rigging up toward the top of that mast. I felt queasy in the pit of my stomach. Would I lose my nerve up there, nearly 140 feet above the deck? How would I ever learn all those lines, let alone their Polish names?

Cadets were going about their work on deck and aloft, readying the ship for sea. They obviously knew what they were doing.

Polish-U. S. Ties Strong

The crowd alongside the ship had multiplied. A brass band struck up. A company of black-uniformed cadets from the Merchant Navy Academy marched down the quay, bringing a bronze urn. This was ceremoniously carried aboard, a small cargo weighty with significance. It contained soil from the birthplace of Gen. Casimir Pulaski, who gave his life in the American War of Independence —fatally wounded leading cavalry in the seige of Savannah in 1779. Our ship would carry the urn to the United States, where it would rest in the Fort Pulaski museum in Savannah, Georgia.

"Poland has a big investment in America," Dr. Daniel Duda, the academy's president, had told me. Not just American Revolutionary heroes such as Pulaski and Tadeusz Kosciuszko. The first Poles came to Jamestown a year after Capt. John Smith, in 1608. And in the first decade of the 20th century, a major wave of Polish immigrants helped spur America's industrial growth in such cities as Chicago, Cleveland, Detroit, and Buffalo. "That's why Poland is taking such a large part in your Bicentennial," Dr. Duda continued. "We are sending eight sailing ships across the Atlantic to visit American port

With a bone in her teeth, *Dar Pomorza* scuds before the wind off the English coast, leading on the first leg of the 1976 tall-ships race. German-built, the ship was awarded to France after World War I. Her name means "Gift of Pomerania"; citizens of that region contributed funds for Poland to buy her from her French owner. At her best in a good blow, she carries 20,000 square feet of sail to drive her 1,561 gross tons.

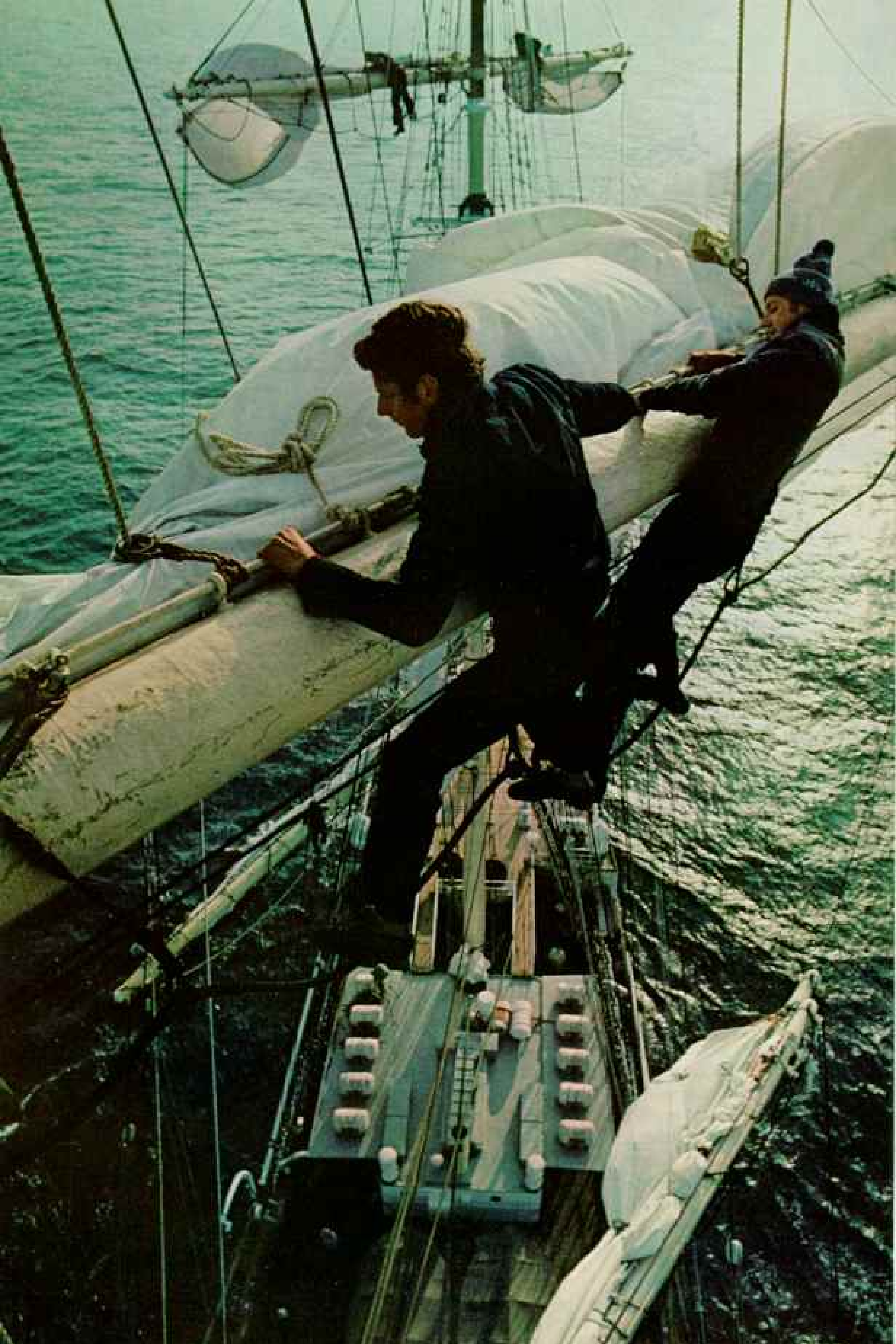
Old tasks for young salts remain central to the training of cadets aboard ships of sail. On *Dar Pomorza* future merchant marine officers practice adjusting their sextants (**below**), basic tools of navigation.

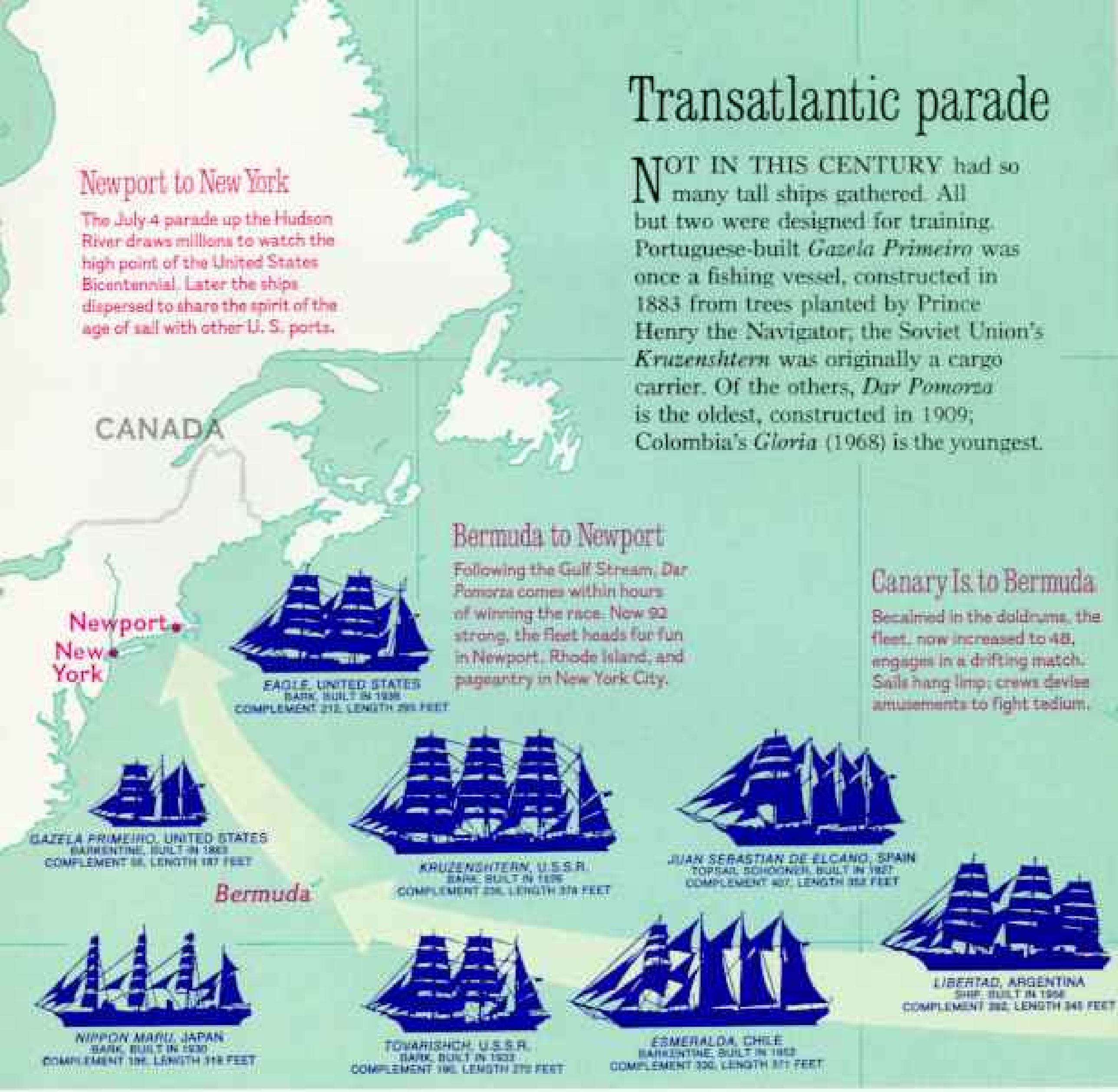
To make inert rope into useful line to control 25 sails, cadets master an encyclopedia of knots and splices—tying fancy knots into such forms as a bracelet (**bottom left**).

Navigation and knots might be learned ashore, but sails can only be furled from one place—aloft. Two cadets (**right**) fist in the main-topgallant.

MERLE SEVERY, NATIONAL GEOGRAPHIC STAFF (BELOW)

Just down from the mast, Kenneth Garrett takes a breather (**right**). Following the rule "one hand for the ship, one for yourself," the author-photographer wears a vest with pockets for carrying camera lenses and gear aloft.





Transatlantic parade

NOT IN THIS CENTURY had so many tall ships gathered. All but two were designed for training. Portuguese-built *Gazela Primeiro* was once a fishing vessel, constructed in 1883 from trees planted by Prince Henry the Navigator; the Soviet Union's *Kruzenshtern* was originally a cargo carrier. Of the others, *Dar Pomorza* is the oldest, constructed in 1909; Colombia's *Gloria* (1968) is the youngest.

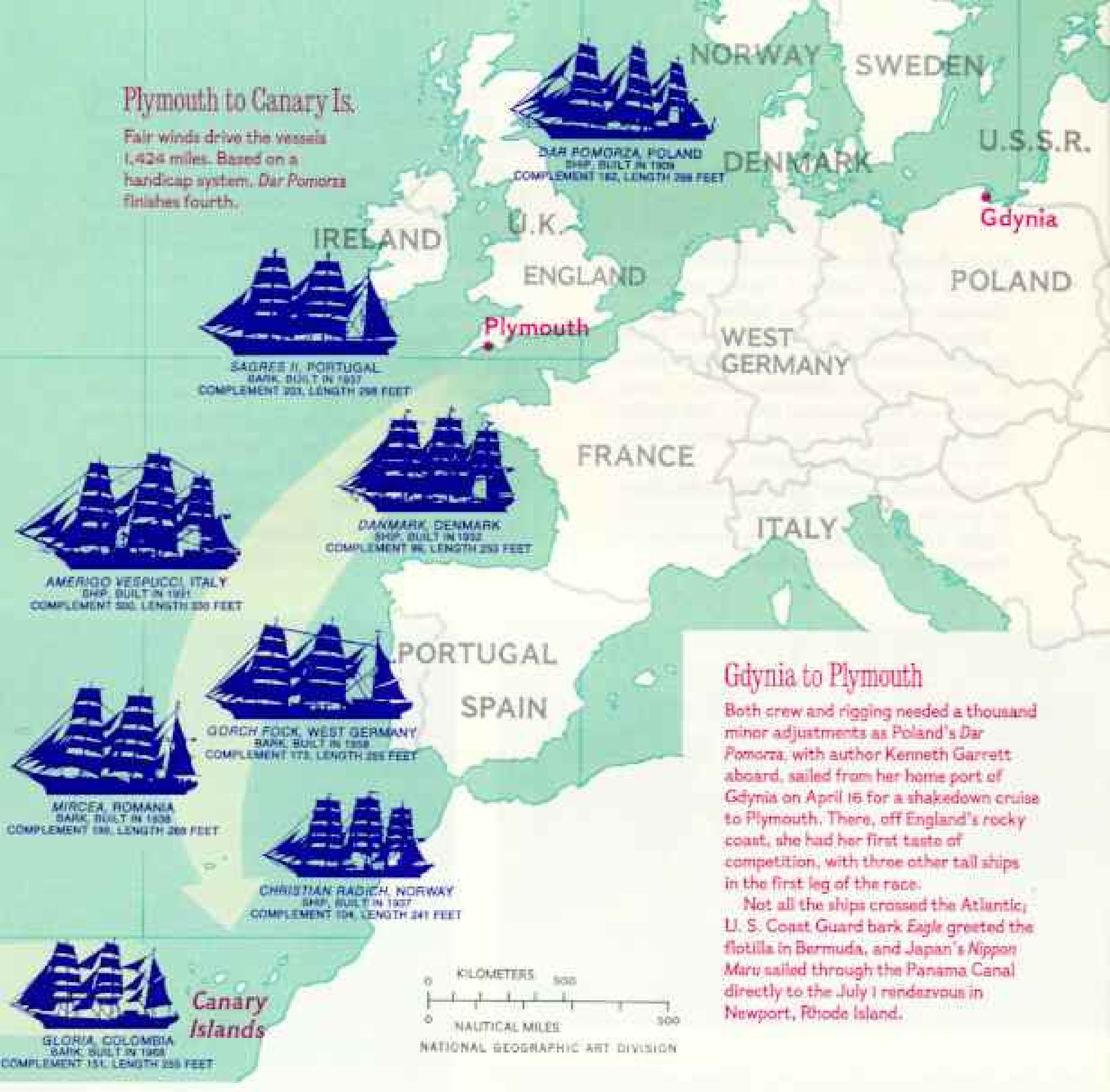
cities. The pride of our fleet, of course, is the ship you are sailing on."

Whistles. Commands. Mooring lines were cast off. I felt the throb of the diesel as slowly, almost imperceptibly, *Dar Pomorza* slipped out of her berth, away from waving, smiling, sobbing families and friends on the quay. Our voyage had begun—a voyage of more than 6,000 miles that would take me from the chill waters of the Baltic and the North Sea south to the verdant Canary Islands off Africa, across the Atlantic to the green waters of Bermuda, and on to the States. There, in New York City, Operation Sail would parade tall ships and small ships, the greatest assemblage of sail since the 1800's, in an international celebration of America's 200th birthday.

Two hours after departure, it was time to go below for the evening meal.

"Does anyone speak English?" I asked cautiously as I found my assigned mess table. The nine cadets facing one another made space for me. Several volunteered that the guys next to them spoke a little. In fact, they all did, for English is the international language of the sea, and they must learn it.

Maciej, to my left, disappeared. He returned with a set of utensils, mine for the voyage. While we sawed slabs from a hard-crusted, round rye loaf and buttered them,



sliced off chunks of sausage, and poured pre-sweetened tea, he fielded my questions with halting ease. Tall and thin, with curly brown hair and a well-muscled neck, Maciej seemed the table's spokesman.

Cadets Curious About America

My nine messmates—all members of the 35-man first watch—were third-year students, like myself between 20 and 25 years old. Working together as a team throughout their years at the academy, they knew each other's strong and weak points as well as they knew the working of our ship.

Their questions came faster than mine. How much do phonograph records cost in the U. S.? How much are Levi's? What's New York like? Are its girls as pretty as Poland's?

Maciej showed me around the ship. The permanent crew—cooks, baker, sailmaker, bosuns—are quartered forward, the dozen officers in mahogany-paneled cabins aft. The 105 cadets crowd the half deck where we had our evening meal. This big room converts from dining room to bedroom, gym, recreation room, and movie theater. Tables disappear against the overhead when hammocks sprout at night. The heating is as ineffective in winter ("enough to take the frost off the table," quipped Maciej) as the ventilation is

in summer. Each cadet has two small lockers for personal effects, with a storage bin below deck for hammock and additional clothing.

Space is at a premium throughout the ship. The galley, on deck just abaft the foremast, is smaller than my kitchen at home. Yet it cooks and bakes for 150 people.

The third day out I awoke to a glass of Polish vodka from a bottle smuggled aboard. Happy Easter! On special occasions, those on land traditionally drink a toast to those at sea. We were pleased to return the compliment.

At breakfast, pastries and fruit from home supplemented the ham, veal sausage, and beet relish supplied by the galley. Flowers decorated the tables. From aft came the captain to share the traditional sliced egg and words of cheer at each table.

Swab thyself becomes the order of the day when a squall dispels a listless calm and alleviates water rationing (**below**).

Keeping duffel in shape calls for much needle-and-thread work. Cadets meticulously iron uniforms (**bottom**) before going ashore on a long-awaited liberty. But for the most part, daily life is to stand watch, learn, and chip and paint endlessly.

Hard work begets sleep, and cadets have no trouble with that. The light comes early (**right**) for a crew about to be roused for an engagement with a new day's rust.

Capt. Kazimierz Jurkiewicz had sailed on this ship as a student 45 years before. He rose to be her master. Today was his last Easter aboard. After this voyage he would retire. As he extended personal welcome to me, I noticed the enormous size of his hands, the powerful chest, the radiant contentment on his face. He exuded dignity, warmth, and friendliness.

With him came the deputy captain, years his junior. Tall, dark-haired, inspiring confidence, Tadeusz Olechnowicz would be *Dar Pomorza*'s next master.

Toasts and cheers again rose through the room as a cadet carried around a basket of *pisanki*, exquisitely decorated Easter eggs, one for each table. They had been blessed at a special Mass for mariners embarking on challenging voyages.

Another round of cheers. A bulletin from the radio officer announced the latest results in international soccer. Again the Polish team had won. In Poland, soccer is the only sport more popular than sailing.

Breakfast carried on with sea chanties, Polish, English, and mongrel. "Is Easter a big festival in the States?" my messmates queried. With them, I learned, it was an all-day party.

Greenhorn Becomes a Tutor—by Request

I quickly adjusted to the daily routine. The three watches worked in rotation. One day we had 12 hours on duty, the next two days we had six—maintenance chores by day, tricks at the helm, lookout, and peeling potatoes at night. On the days when we had six hours' watch, we also had three hours of

class—mainly navigation, meteorology, and English. Other than giving guest lectures on American family life and education, I skipped the English, only to find the class continuing at the mess table. Maciej and the others would bring notebooks and ask me to explain baseball terms, to label the parts of a car. If I threw them a tongue twister, they ate it up, even figuring out how much wood a woodchuck would chuck.

Climb to the Sky Tests Author's Nerve

One day Maciej suggested we go up the mast. I hedged: "Let's wait until my dinner digests." But peer pressure prevailed.

How do you look nonchalant, swinging out over the rail and on up the ratlines of what seems to be the world's tallest rope ladder? As I neared the first platform, all pretense fell away. You literally have to hang on your back to climb out and over this obstacle.

Steeling myself not to look down, I studied the sturdy handholds. "Just like my grade-school monkey bars," I tried to convince myself. It was near freezing, yet my hands oozed nervous, slippery sweat.

No turning back. So it was out and over, and after an eternity I stood on the platform, hoping Maciej wouldn't notice my quaking legs. Above me towered the topmast. Then another platform. And above that, the topgallant mast. Not today. But the next day I stood at the very top of the 14-story mainmast. Maciej congratulated me, and I felt a warm glow.

A notebook entry for April 21 records fitful progress: "Getting used to the mast. Today I went out on the yards. Not so good."

The trouble with a yard is that it's not only high up but extends out over the water, being wider than the ship. The footrope swings freely, seeming to gallop when watchmates step on and off. And handholds are scarcer the higher you get. Of course, you're up there to work, not hold on. You balance on your stomach, leaning over the yard to fist in the heavy, abrasive sail and secure it in gaskets.

"One hand for the ship, one for yourself," runs the maxim. But it was some time before I freed one hand, let alone two, for work aloft.

Eight days out of Gdynia, a dawn fog lent an aura of mystery to our first landfall, the white cliffs of Dover. Because the congested waters of the stormy English Channel are a navigator's nightmare, the master prudently reduced sail to arrive at sunrise.

But this was no sight-seeing cruise. Our new suit of Dacron sails, bent on the yards just before departure, still needed adjustments. A shackle on backward, a line reeved improperly, a topsail in need of attention—cadets were sent aloft as Captain Jurkiewicz scrutinized the 25 sails one by one.

"I first sailed with our master more than twenty years ago," the deputy captain told me, "and I am still learning from him. Note how he always keeps a critical eye on the sails and yards. I look aloft and see nothing wrong. He misses nothing."

Sail Handling Seems Like Chaos

Two days later, off the Isle of Wight, breakfast found the cadets grumbling. It was Sunday, day of minimal duties, and all hands were to be routed out for race training.

Two long bursts on the bell sent the cadets scampering: first watch to the mizzenmast and helm, second watch to the mainmast, third watch to the foremast. Over the loudspeaker, the master boomed: *"Zwolnić gordingi!*—Release the sails!" The cadets streamed up the ratlines and spread out along the yards. Swiftly they untied the gaskets, shook out the sails, and scrambled down.

I fell in beside Maciej on the foredeck, watching him out of the corner of my eye to follow his moves and make sure I didn't do anything stupid. I tried to associate the Polish commands with the resultant actions.

They came fast and furiously. With a shrilling of whistles, rattling of chains, rushing of lines, and groaning of yardarms, the upper

Too close and too greedy, a shark that appeared alongside *Dar Pomorza* while she lay becalmed took bait and hook to end up as shark's fin soup. Pilot whales and dolphins escorted the ship from time to time, as did flying fish. A pair of doves came aboard briefly. And off the English coast the author had a special visitor. A tiny wren alighted on his ankle and scurried up his trouser leg. Warmed and rested after a 45-minute visit, the wren emerged and took off for shore.

topgallant yards were hoisted into position. Square sails were sheeted home, the flapping and crackling staysails muscled in against the 25-knot wind.

It's chaos—but controlled chaos, with the sequence precise. And few sights can compare with that of sails billowing out on all three masts simultaneously in a great white cloud, as in clipper-ship days.

Eight minutes from bare sticks to full sail. From dead in the water, the ship sprang to life—seven, eight, nine knots—with the thunder of water under her bow.

We rested a few minutes while the ship ran before the wind. Then came tacking drill—sailing at an angle into the wind, first on one side and then the other.

Up mainsails, down staysails, helm hard over. As the ship came up into the wind and fell off on the other side, the forestaysails, raised quickly, pulled the bow around. On foredeck, poop, and amidships, lines of cadets braced the yards, swinging them around. The ship heeled as she picked up speed, sailing close-hauled on another leg of a zigzag course.

More tacks, more sail handling, and our morning—and crew—were exhausted. But for me, the three hours of intense drill had sped by, leaving only excitement.

Competition From Rivals Spurs Crew

Drill over, we greased and adjusted gear to reduce the effort and improve the time. But competitive spirit does more.

The master came over the loudspeaker with sail-setting times, by watches. The first watch is always fastest because the mizzen sails are smaller. But the competition between the second and third watches on the main and foremasts is keen.

The afternoon drill cut the time to six minutes. The next day we got it below the master's goal of four minutes.

"This training is fine," commented one of the instructors. "But really all we have to do is tell the students that on one side of them will be a German ship and on the other a Russian, and they'll pull for all they're worth."

This morning, after our all-night struggle beating from Plymouth out to the Atlantic, the radio report puts *Dar Pomorza* ahead of two Russians and a Norwegian. We have pulled for all we're worth, and everyone is bone-weary. Hammocks cannot be slung during the day, and many off-watch cadets curl up on the cold deck and sleep in their overcoats. During the night we have made enough westing to clear Brittany's Île d'Ouessant on our present tack, which means a single watch can handle everything.

The wind is holding strong. At 14 knots, our ship is driving hard, the seas hissing by our lee rail. The awesome noise of crashing waves, singing winds, and straining gear is music to my ears. I feel alive, good about having come through the night's trial. No longer an outsider, I am accepted as a working member of my watch.

During the midday meal we hear a tremendous crash—a wave pounding over the lee rail. As Maciej and I juggle dishes up the companionway, we hear a torrent of words follow the rush of water across the deck. The chief cook is hopping mad because the wave came right into his galley and carried pots banging into the scuppers.

We stand at the rail, Maciej and I, studying the waves, commenting on them.

"There's something fascinating about the sea," Maciej tells me. "When I'm at sea for long, I want to be home. But when I'm at home, I want to be back at sea. I think maybe I'll go to sea for five years after school. Of course, many sailors say that and wind up staying at sea for life."

From the chill English springtime, across the Bay of Biscay, to the warm waters off North Africa, we are accompanied by winds from near gale trailing off to flat calm.

"Our Waterloo," wryly comments the deputy captain as it becomes clear we will not be first into port. But there is more to this ship than just racing.

"Beginning a sea career under sail is the best way to learn the basics of seamanship," the master tells me. "On a sailing ship you get down to essentials—like learning the alphabet before trying to read. In my opinion, many young men today are too soft. Training under sail lets them know the meaning of hard work. It takes a lot of courage to go out on the yards in heavy weather. The students grow a lot during this trial."

Then, on a balmy day, observes my messmate Mariusz: "You can tell we're nearing port. Look at the activity." The rasping of scrapers and sandpaper releases the fragrance of mahogany, trapped beneath cracked and

yellowing lacquer on the poop rail. Brasswork gleams as its patina yields to elbow grease and polish. Wet paint glistens in the sun. Our ship shines with a pride that belies her 67 working years.

Ten days, ten hours, ten minutes out of Plymouth we finish the 1,424-mile run to the Canary Islands. The island of Tenerife thrusts its 12,198-foot volcanic cone into a crowning cloud gilded by the setting sun. The lights of Santa Cruz wink on, around the harbor and far up the hillside. Morning light reveals a skyline studded with new high rises and construction cranes. The weather is beautiful, the welcome gracious and Spanish.

The yacht club opens its facilities to us: dinghy races, swimming events, tugs-of-war, basketball, and volleyball for the sports enthusiasts; poolside lounging for others.

Sailors browse in the duty-free shops, buzzing over an official protest by another captain against the winning Soviet ship for allegedly using her engine. "She's a remarkably fast boat at night," says the protesting skipper.

Sailors Swap Ships for a Time

Meanwhile James Myatt of the Sail Training Association is engineering a long-awaited crew interchange. To James the skippers entrust the responsibility of swapping 360 trainees from tall ships and small ships alike for two days of sailing. A note from the deputy captain instructs me to join the shuttle bus at 7:30 a.m. the next day. I will be sailing on the ketch *Great Britain II*. Maciej is assigned to the British cutter *Outlaw*.

The bus is a rolling Tower of Babel, filled with excited talk. I find a seat. "May I sit here?" I ask, not knowing if my seatmate speaks English.

"Please do," comes the reply. Our conversation bounces amiably from topic to topic, including the inevitable "Where are you from?" He is Russian, one of five to sail with the Polish schooner *Zew Morza*.

Great Britain II is 78 feet of racing machine. In her three years in the water she has won two round-the-world races. Our crew of 21 includes 11 nationalities. Goodwill gets us over communication hurdles.

Running before the wind under heavy canvas, the first day's sail gives everyone a trick at the helm and plenty of socializing. Upon our arrival at Los Cristianos, at the south end of Tenerife, I seek out Maciej aboard *Outlaw*. The skipper, Bob Fewtrell, and his wife, Ann, welcome me aboard. Sliding into the galley, I find myself in a sing-along in six languages.

The return sail the following day is directly into the wind, 45 knots' worth. I learn why *Great Britain II* is called the "maroon submarine." Flying under a double-reefed mainsail and a number *(Continued on page 842)*

"**Six days shalt thou labor** and do all thou art able, / And on the seventh—holystone the decks and scrape the cable." So goes a ditty in Dana's *Two Years Before the Mast*, published in 1840. Aboard *Dar Pomorza*, the job hasn't changed a whit. The size of it can be imagined by the amount of new decking on order—52 cubic yards of teak.

A congregation of sail fills the harbor in Hamilton, Bermuda (**below**), in the aura of a century past. If the tall ships provoke nostalgia, as well as train cadets, they have also become a vehicle for extending goodwill beyond borders and politics. That idea was nurtured by English lawyer Bernard Morgan and developed by the Sail Training Association in England, which organized the race. The group also advocates sail training for youths outside navies or merchant fleets. Its own topsail schooner, *Sir Winston Churchill*, was crewed from Bermuda to Newport by young women.

In Bermuda, aboard the English cutter *Outlaw* (**right**), Capt. Hans von Stackleberg of the *Gorch Fock* jokes at a party where a dozen nationalities are represented.

NATIONAL GEOGRAPHIC PHOTOGRAPHER JOSEPH J. SCHERSCHEL (BELOW) AND KENNETH GARRETT

"**The unchangeable sea** preserves for one the sense of its past, the memory of things accomplished by wisdom and daring among its restless waves," wrote novelist

GILBERT M. GROSVENOR, NATIONAL GEOGRAPHIC STAFF

Joseph Conrad in the March 1924 GEOGRAPHIC. Those memories persist in Bermuda waters with *Esmeralda* (foreground), black-hulled *Kruzenshtern*, *Sagres*, and *Gorch Fock*.

(Continued from page 837) four genoa, we boil along to windward at 13 to 14 knots. The wind freshens. Too much.

"Drop the number four," screams skipper Dave Cobb. Moments after we jump onto the foredeck, the main halyard parts, dropping the boom into the forward cockpit, known as the "gorilla pit." Had we still been there we might have been crushed.

Mike Coakley is hanking on the smaller number five genoa when a wave smashes him against the forestay. We carry him back to the cockpit. It takes him until nightfall to regain his usual complexion and smile.

The event gives special point to what Adrian Bomback, another of the English crew, has been telling me about the virtues of sail training in small boats. "You're closer to the elements, there's a greater exchange between skipper and trainees when your crew is no more than 15, and you can achieve the same goals in less time."

Not that I find agreement with these views at a subsequent party for tall-ship captains.

"On the bigger ships you *have* to work together," comments Kjell Thorsen, master of Norway's *Christian Radich*. "When I bring a crew back, I get calls from home. 'How have you done it? My boy has grown up. He even respects his mother.' Some people complain about the cost. But if you can't spend money on the next generation, what are you going to spend it on?"

Doldrums Bring a Long Wait

As we leave the Canary Islands for the next leg of the race, to Bermuda, *Dar Pomorza* is first across the line, again outdistancing her tall-ship competitors, now increased from three to seven. A Sunday start means lots of action, but we still have our weekly treat —cake and movies.

Cruising before the wind at 10 to 12 knots now for three days, optimists are calculating that we'll cover the 2,517 miles to Bermuda in just over ten days. Was Columbus equally optimistic when he sailed from the Canary Islands half a millennium earlier?

Four days out we are rudely confronted with the limitations of sail. We're becalmed in the doldrums. Six days pass. Cadets, proud of their new duty-free calculators, refigure our estimated time of arrival: "At our present rate, we'll be in Bermuda by Christmas."

"Christmas!" I echo in horror.

I relay this hot-off-the-calculator date to the master, who responds coolly, "We'll be very thirsty before then. In ten days we have used two-thirds of our freshwater supply." He tells me bathing water is to be cut off.

"Don't worry," he adds. "The cook is preparing tripe soup today. We have a superstition on this ship that tripe brings wind."

The radio officer's weather report indicates no possibility of wind today. But by late morning a large black cloud sweeps in from our starboard quarter, lifting the sails and jumping the ship from two knots to ten. A cloudburst sends listless cadets scurrying for soap and shampoo.

As smiles spread through the ship, no one is happier than "Uncle Salinaga," the chief cook. Famous for "fender cutlets," "shoe-sole roasts," and "out-the-porthole soup," today he is a hero for his tripe soup. Is it only coincidence that the next time we have tripe the wind again blows up from nothing to a gale?

But even tripe cannot change our luck for long. More doldrums. The Bermuda high-pressure system stretches from New York to England, and we are precisely at its center.

Playing chess, writing letters, or just lolling about in undershorts in the shade of a launch, the cadets occasionally break the monotony with a wrestling match, or dip buckets overside on lines for a water fight. They grouse about sailing ships with no wind, the heat, the eternal chipping and painting, the discipline. Especially Jurek. He has to do 30 hours' extra duty for spilling his paint bucket while high on the mizzenmast. But the atmosphere aboard is relaxed. It's a professional merchant ship, not a military one.

For two weeks we have been rolling lazily in the softly sloshing swells, sails slatting, rigging creaking. Mariusz, with bushy black hair and thick eyebrows, usually is as silent as this sea, volunteering little talk and responding to questions thoughtfully, quietly, with an air of precision. But as we lean on the rail tonight, gazing abstractedly at the phosphorescent water gently curling away from the bow, he unbends.

"On this voyage, I have 30 navigation problems to solve. This evening is perfect for that: a clear horizon and a cloudless sky. But the only thing I can think of is my family. My parents are on vacation in Poland today."

Another crystalline sunrise and all we can see is flat water. But we are not alone. The talk back and forth on the radio creates an invisible community on the high sea. Radio voices conjure up the personalities behind them: Kjell Thorsen's bull-throated voice projects the image of a hearty Norwegian captain; the crispness of *Tina IV*'s skipper, a resolute German. Ships begin to report shortages of water and supplies. Skippers come on the air offering aid.

We drift helplessly until the race deadline. Now our 30-year-old diesel proves more dependable than the wind. On the evening of June 16, three days after this leg of the race is over, we motor into Bermuda waters.

Crew Trims Ship for U. S. Arrival

Our optimists' rosy picture of two weeks on Bermuda beaches resolves into the specter of four days' work. We have the hull to repaint for the festivities awaiting us in the United States. The prospect of losing shore leave after three weeks in the doldrums raises howls of outrage.

Maciej and the first-watch leader dig out their uniforms and, more fully dressed than I have seen them in weeks, head aft to present the students' protest to the deputy captain. Two hours later they emerge from his cabin. Both sides win. A compromise solution provides for painting *and* student liberty.

Tenerife acquaintances rekindle the festive spirit despite preparations for the next leg. Maciej and I, returning to *Outlaw*, find the cutter swamped with joking, singing mariners from a dozen countries. When the captain from *Gorch Fock* jumps aboard, his effervescent smile captivates all. Maciej comments, "He really looks like I expected him to from hearing him on the radio."

Ships from North and South America join us in Bermuda, swelling our fleet to 92, tall and small. Host of New York's Operation Sail, the U. S. training ship, *Eagle*, arrives, sporting the Coast Guard emblem on her white hull.

For Bermuda's racing start, we must sail off to the northeast to clear a reef before rounding up to the northwest for the run to Newport, Rhode Island. The starting line extends scarcely a mile. With 18 ships juggling for position, most seeking the windward edge, and the reef giving no room to fall off, it will be tight.

Ninety-three-year-old *Gazela Primeiro*, oldest tall ship in the fleet, bears down on our port side under full sail and engine. Murmurs rise on our ship. Remarks an instructor, "Going in like that, she's looking for trouble."

She finds it.

No sooner do we break out topsails than the order comes to take them in. Three blasts of our horn warn nearby ships that our engine is "full astern." Trouble ahead!

In the mass of sail off our bow, I see *Gazela Primeiro* drive between *Mircea* and *Christian Radich*. *Mircea*, holding course, forces *Gazela Primeiro* against *(Continued on page 850)*

Outward bound on his last voyage as master of *Dar Pomorza*, Capt. Kazimierz Jurkiewicz, as always, scans the sails and rigging for subtle adjustments that will let his ship sail her best.

Dean of the tall-ship masters and admired by all, he seemed to the author "a kind but strict grandfather at sea, in port a fine host and great fun."

Tall ships crunch in collision at the start of the Bermuda-to-Newport leg (**left**). Vessels had crowded too closely around the windward end of the line, the most favorable racing position and the farthest from the danger of a reef. But the ships proved more dangerous to one another.

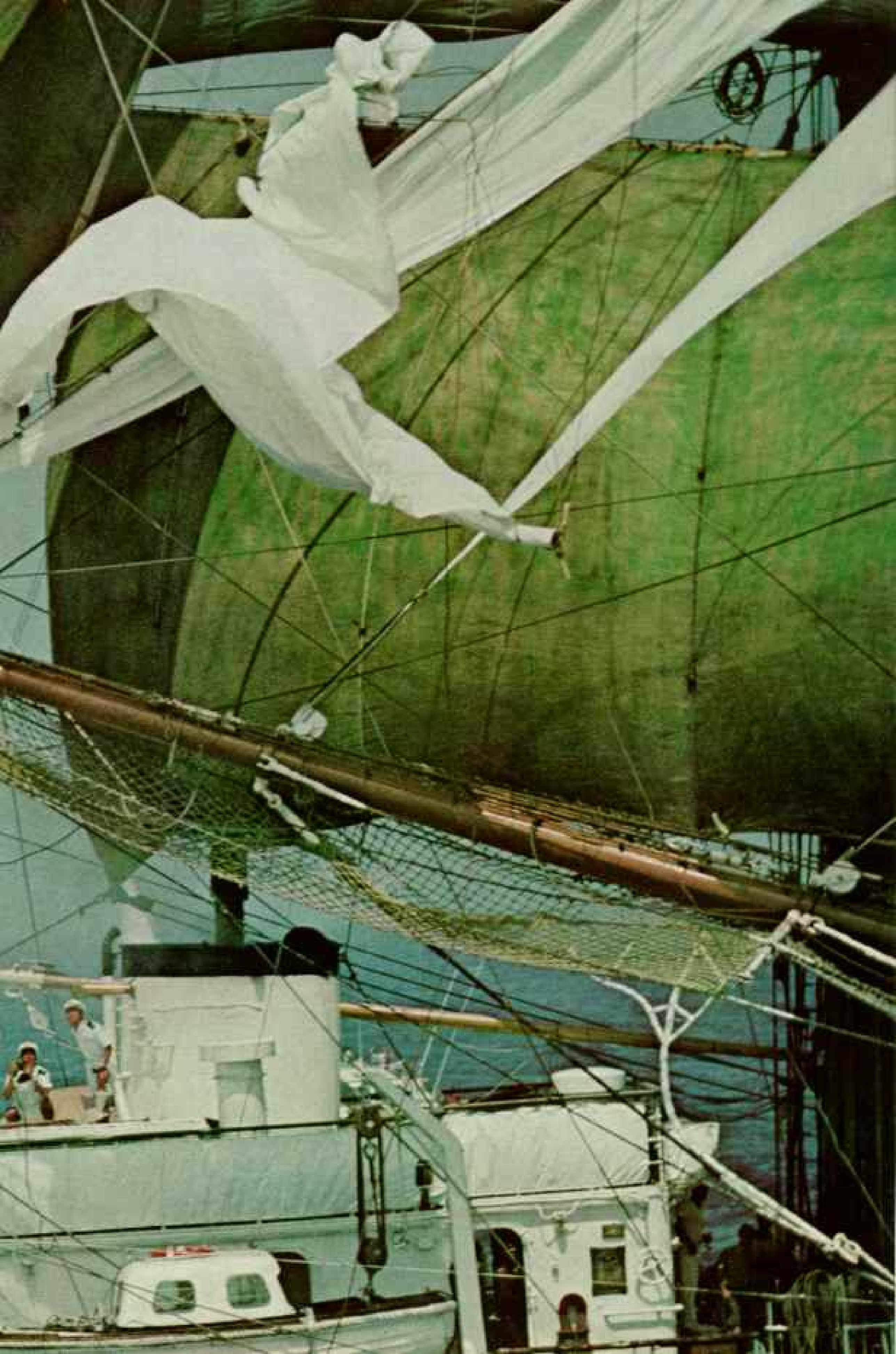
In this photograph some ships are already disentangling from two of three collisions. At top, *Mircea*, running perpendicular to the starting line, backs off from little *Gazela Primeiro*, which it had overrun and dismasted. *Gazela* had been forced into *Christian Radich*, but that collision was minor. The next two ships, a schooner and *Sagres*, with red crosses on her sails, avoid trouble.

At the bottom, *Libertad* with dark sails fouls *Juan Sebastián de Elcano*, which unavoidably hits her amidships. As the white-sailed schooner backed off, her forestay snagged on a yardarm of *Libertad*, and down came *Juan Sebastián*'s fore-topmast, carrying the three upper square sails.

In the rigging, Jesús Benito Sanz fell with the mast, plunging not to the deck and certain death, but into a sail and onto a lower yard. His mates raced to aid him (**above right**). Brought to the deck in agony (**below right**), he was injured seriously but not fatally.

As the ships disentangle (**following pages**), *Libertad*'s main course is torn like an old sheet. Officers photograph what they can hardly believe.

ROBERT W. GROSVENOR, NATIONAL GEOGRAPHIC STAFF (LEFT AND TOP RIGHT); TIMOTHY J. EXLER (RIGHT); MIKE CARLTON, BERMUDA NEWS BUREAU (FOLLOWING PAGES)



Sails feather Narragansett Bay as *Dar Pomorza* makes for her anchorage off Newport. The spectator fleet crowds around, darting in and out, lobbing aboard

welcoming broadsides of canned beer, and somehow—perhaps only by providence —surviving. The cadets, too, survived four days of constant celebration.

(Continued from page 843) the much larger ship, *Christian Radich*, her bowsprit shearing away rigging, which brings down *Gazela Primeiro*'s main-topmast.

Farther ahead, *Libertad* and *Juan Sebastián de Elcano* collide. Piercing *Libertad*'s mainsail and sweeping lifeboats over the side, *Juan Sebastián* catches her forestay on a yardarm when backing off. Down crashes her fore-topmast (pages 845-7).

The two crippled ships retire. *Libertad* fits a new mainsail while continuing to race, but is eventually disqualified. Rumors fly about casualties. With relief, we learn no one was killed. One crewman on *Juan Sebastián* was injured, but is in fair condition.

"I avoided accident because I have learned not to take unnecessary risks," Captain Jurkiewicz tells me. "A whole fleet of students watched those collisions today. I hope they all gained a lesson in seamanship."

The Sea Offers a Preview of Life

Seamanship. Sail training. Over coffee, I ask my messmates what they think of these.

"This is my fourth voyage on this ship, and I always enjoy it," Jędrzej begins. "Sure, a lot of the sailing fun gets lost in the drudgery of chipping, painting, and splicing. But it's a good lesson in life."

Jurek picks up: "After devoting four and a half years at the academy to becoming officers, we're required to serve three years in the merchant service. That's a lot of time. On my first cruise half a dozen boys found the life so miserable they quit. Valuable experience for them too. They quickly learned the sea was not for them."

"My father is a merchant captain," adds Włodek. "When he started out, running a ship was simple. Today it's so complex we must become scientists to operate one. The intellectual challenge is greater. I prefer that."

"But technology has also become our enemy," rejoins Mariusz. "Take containerized freight. In less than two days a big ship is in and out. No time in port to explore and make friends. And as economic conditions at home improve, fewer young men are willing to make the sacrifices a career at sea demands."

While we were stopped by the Bermuda starting-line collisions, the German *Gorch Fock* jumped ahead. Our only hope of overtaking her is by strategy. So rather than head northwest for Newport, we sail due west. Captain Jurkiewicz explains: "What little wind we have will probably die in a day or two. We'll head for the Gulf Stream. If we reach it, we'll have three knots of current to push us along while the others are becalmed. It's a gamble. If the winds hold, we'll lose because our distance is greater."

The wind does die, and we move up in position day by day. When a breeze finally blows in from the southwest, we get several hours' jump on the other ships. By the following morning, the cadets speculate with mounting excitement, we'll be in first place.

But at 5:55 p.m., the Sail Training Association comes on the radio: "For all Class A [tall] ships the race will officially terminate at 1800 hours [6 p.m.] today." The STA is afraid that otherwise we'll be late for the Newport festivities. We wait in suspense. Have we passed *Gorch Fock*?

The STA comes back with preliminary standings—*Gorch Fock* first, *Dar Pomorza* second by only a few hours. If only they hadn't stopped the race. . . .

In the early-morning fog off Newport we overtake *Gorch Fock*. After the traditional salute and hip hip hoorahs, Deputy Captain Olechnowicz extends his congratulations by radio. Captain von Stackleberg radios back: "*Dar Pomorza* could very well have been first. My congratulations to Captain Jurkiewicz, the best in the fleet. It is an honor for me to be able to sail with him."

Christian Radich also appears out of the fog. And the ships of West Germany, Poland, and Norway move together in triumphant amity. As we near harbor, the horizon is white with sails. "An incredible sight," says Maciej. Motorboats and sailboats cluster around and convoy us in.

Polish Captain Wins Seaman's Honor

At the Newport awards ceremony, our master is again honored. He alone receives an STA award for seamanship. A more touching note follows as Kjell Thorsen of *Christian Radich* rises to present, as a joint gift from all the tall-ship captains, a painting of *Dar Pomorza* sailing north past the cliffs of Dover —a return voyage for a retiring captain. All Poland can be proud of Captain Jurkiewicz, the most respected master in the tall-ship fleet.

Visitors jam our vessel, many speaking

Polish, all fascinated with being aboard a square-rigger. Maciej signals me over to meet a man of Polish birth who has driven up from New Jersey.

"I was a cadet on this ship in 1934," Leon Lukas tells me. "At that time Captain Jurkiewicz was an instructor on the second watch. In those days we judged men by their manliness and roughness. He was a good man to have by your side in fun or fight. He was strong enough to lift the end of a 1,000-pound spare anchor off its rest."

Scheduled to sail at 8 a.m. on the first of July, we are up and working at six. Through the eerie morning fog, we can make out a spectral *Gorch Fock*, moored behind us to the same buoy. Fog will postpone the parade.

Visitors Leave in a Crush of Boats

The distinctively striped *Eagle* first, *Dar Pomorza* second, the ships ease out into the early-afternoon haze, the cannon of Newport's forts booming in salute as we pass. The spectator boats, beyond counting, fascinate me. I climb the foremast to watch them weave in and out with crisscrossing wakes, like water bugs skittering over a pool. In all the maelstrom of power and sail I see only one minor accident. Surely a Bicentennial miracle!

Rounding up into the wind on our time-dictated course to New York, we furl the sails and proceed under diesel power. Orders come from aft—the night watch to peel potatoes immediately after supper and only the helmsmen and lookout to stand deck watch. It comes as a welcome respite for the students, whose exhaustion shows through their excitement. "I couldn't take more than four days in Newport," volunteers Jurek. "The pace in America would wear me out."

"Nonsense," counters Maciej. "Give me four weeks there—tennis, golf, swimming, parties—I'd not be too tired for that." He fails to add that his feet are swathed in gauze, applied by the ship's doctor to protect his tennis-blistered feet.

"I had a great time visiting a home," another student chimes in. "On the way we got stuck for two hours in a traffic jam. But everyone got out of their cars laughing and talking; even the couple late for their own wedding." A cadet who was late returning to the ship says nothing. He glumly contemplates losing his shore leave in New York.

The powerful flash from Ambrose Light beckons in the distance. It is late on the night of the second as we approach the city, but no one sleeps. "Can we see the Statue of Liberty from here? The Empire State Building?" cadets ask.

We can't, and all day on the third we lie at anchor off Sandy Hook, Manhattan's landmarks tantalizingly hidden, while the tall ships assemble and an international naval review churns the waters of New York Harbor. All day spectators, cramming an endless stream of boats, circle our ship admiringly, hailing officers and crew.

Toward evening a small boat chugs over. Its skipper flings his arms wide at the sight of a square-rigger in the sunset. "You're beautiful!" he shouts. No one minds that.

Independence Day awakes with a misty orange glow, a disturbing glow that enshrouds the Verrazano Narrows Bridge. But poor visibility and unfavorable winds will not deter six million *(Continued on page 857)*

THOMAS NEBBETT

Sharing a hat, a moment, and a dance with a sailor's dream, a cadet from *Gorch Fock* has banished all thought of chipping, painting, hauling, and climbing. Here in the Newport Cadet Hospitality Center, says the author, "international friendships were easily made—smiles need no translation."

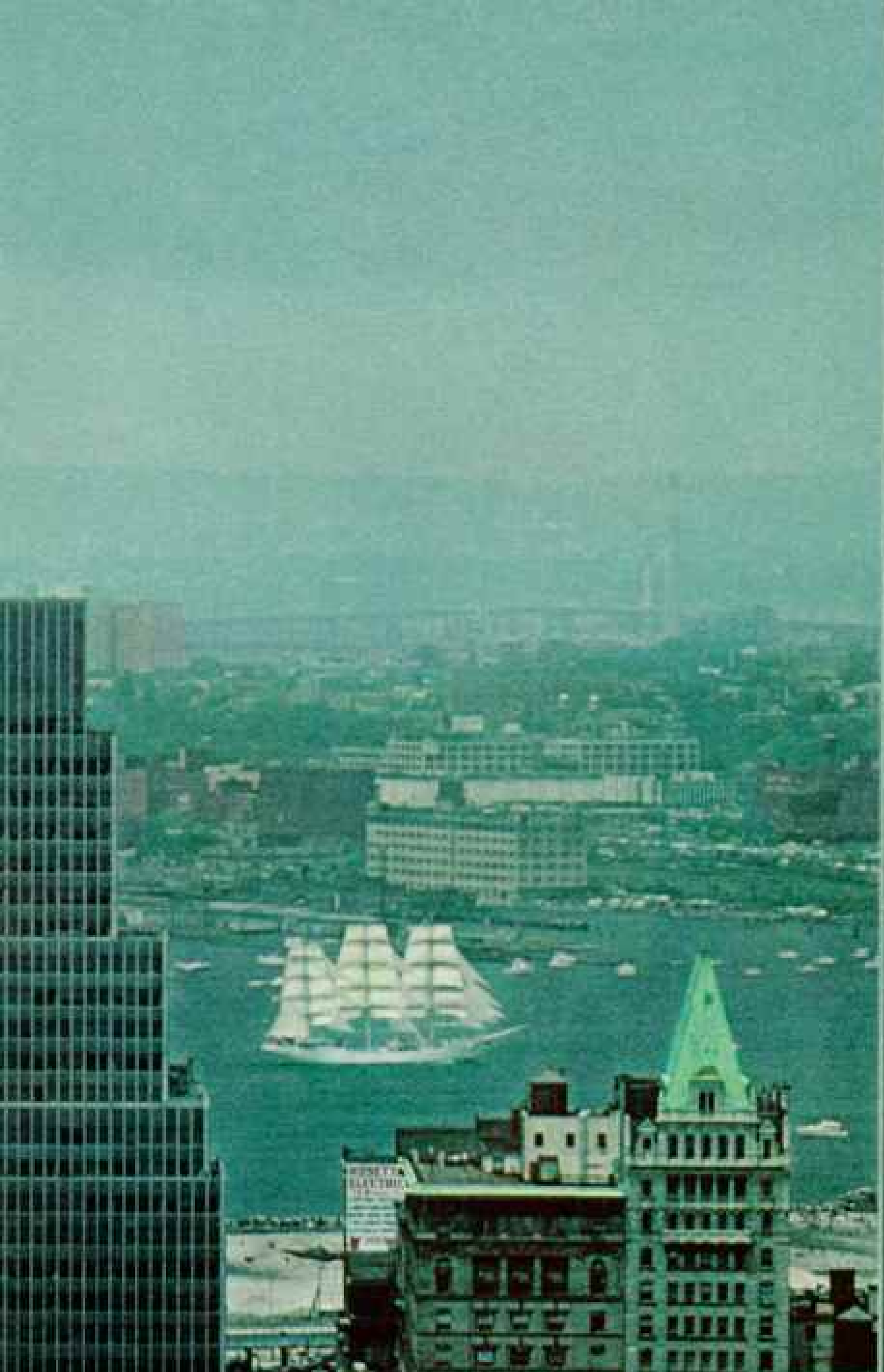
KENNETH GARRETT (ABOVE) AND W. E. GARRETT, NATIONAL GEOGRAPHIC STAFF (BELOW AND FOLLOWING PAGES)

Come hail or high water, sails must be furled. A cadet works aloft in *Dar Pomorza*'s rigging during an unexpected addition to New York Harbor's welcome—a storm that opened up with gusts, rain, and a barrage of icy grapeshot.

Leading the fleet, the U.S. Coast Guard bark *Eagle* (**left**) clears the Verrazano Narrows Bridge. As she crossed New York Harbor and sailed up the Hudson, shore batteries and warships fired salvos in salute.

Specter from the past, *Danmark* cruises up the Hudson River to her second home (**following pages**). She was visiting the 1939 World's Fair in New York when World War II broke out. She stayed for the duration and trained some 5,000 U. S. Coast Guard cadets.


PACE
UNIVERSITY



As liberty lights the world, fireworks light the Statue of Liberty. Lights on small boats seem reflections of the display. It was a glorious Fourth, one that will be long remembered as a day when "the pursuit of happiness" seemed no vain hope.

(Continued from page 851) Americans who have turned out for Operation Sail's 27-nation parade up the Hudson River.

For seven hours we pass in review, flanked by thousands of pleasure craft and by saluting naval ships from the world over. Two and a half months and more than 6,000 miles in coming, *Dar Pomorza's* students are going to remember this day for their grandchildren.

As we finally approach our berth, darkening clouds pelt us with hailstones and pour down rain. Captain Jurkiewicz triggers jubilation as he comes over the loudspeaker: "In thanks for your fine performance today, and across the ocean, any punishments incurred on this voyage are herewith abolished."

American Barbecue Caps the Voyage

New York's stone canyons swallow 20,000 sailors with ease, but not before a ticker-tape parade paralyzes lower Manhattan.

Veiled in confetti, cradling her baby in one arm, waving the other, a young mother cheerily calls out, "What country are you from?"

We are from all nations, east and west, north and south. We come from five continents, young men and women of all faiths and shades of political persuasion. We have come to celebrate 200 years of U. S. freedom.

My voyage is to end in New York, but it is not good-bye. My messmates have shared their home with me. Now it is my turn. When the ship docks in Baltimore, I invite them to my home in the Washington, D. C., suburbs.

Instead of Polish sausage and rye bread, it's barbecued hamburgers, potato chips, salad, and chocolate cake prepared by girls from the neighborhood. Questions fly in an easy give-and-take. Rock music throbs; dancing begins. American informality and Polish festive flair carry us deep into the night. No one wants to stop.

It is 4 a.m. as we drive into sleeping Baltimore. Conversation falters. It is painfully quiet. How do you say good-bye to nine brothers? □

SOUTHWEST AUSTRALIA'S WILD GARDENS:

Bizarre and Beautiful

A picture story by
PAUL A. ZAHL, Ph.D.

BOUND ON ALL SIDES by sea or desert, on a continent long isolated from earth's other great landmasses, southwest Australia lies in splendid isolation, home of one of nature's most fantastic displays of flora. Undisturbed by botanical intrusions, the region's 6,500 plant species have developed in strange and astounding directions.

To eyes accustomed to the soft-petaled forms of more conventional flowers, the multifarious shapes seen here appear alien—otherworldly, in fact; yet most of these species belong to plant families found in other parts of the world. Using the common stock of earth's floral resources, nature has shown a sorcerer's hand in weaving a finespun tapestry. Orchids shaped like birds and insects shade their delicate profiles under the towering canopy of hardwood forests. Flaming eucalypts appear like apparitions out of the tumbled rocks and dusty shrubs. Myriad other flowering bushes and trees, from the coastal plains to the desert's edge, delight the senses with brilliant colors, a parade of quirky and splendid shapes, a collage of waxy, fuzzy, sticky, and prickly surfaces.

Named for Proteus, a Greek sea god who could change his form at will, the family Proteaceae embraces a wide variety of shapes, even within the same genus. Included in that family, numerous species of the genus *Banksia* range from small sand shrubs to trees more than fifty feet high. The banksias are among the most popular wild flowers, and intrigue visitors to southwest Australia. These ten-inch-long blossoms of a cut-leaf banksia (**right**) resemble giant bottle brushes.

BANKSIA PRIONOTES

AN ABOMINATION OF NATURE, or a thing of beauty? The latter, it would seem, to hapless insects mysteriously drawn to the brink of the Albany pitcher plant's florid "jaws" (**above,** right). *Cephalotus follicularis* grows wild in the swamps of Australia's southwestern extremity and enjoys world fame among botanists as the only member of its family. Unlike the widely dispersed sundews or the Venus's-flytrap of the southeastern United States, *Cephalotus* has no moving parts, belonging instead to the "pitfall" group of carnivorous plants that rely strictly on physical allure and ingenious design to attract and then capture their prey.

Once a visitor has passed a fringe of downward-pointing teeth, escape is unlikely. The inner walls are too slick for most insect feet, and flying insects rebound off the inner surface of the lid. Victims end up in a pool of digestive fluids (**right**). The nimble-footed spider (**above**) defies these designs, somehow adapting itself to living safely around the plant and nabbing a free meal from the bounteous mouth of *Cephalotus*.

CEPHALOTUS FOLLICULARIS

MICHAEL A. MONCOMBE (ABOVE)

PROBING FOR NECTAR amid the close-packed flowers of a Menzies' banksia, a yellow-winged honey eater (**above**) nourishes itself while bearing pollen from flower to flower. Once known as "native honeysuckles," the nectar-rich banksias appeased many a human sweet tooth as well when only the Aborigines roamed this part of the continent.

Its psychedelic blossoms cast against the shadow of mountains in the Stirling Range National Park, a Baxter's kunzea (**right**) is among a multitude of flowering shrubs seen in one of Australia's outstanding plant preserves. Spurred by threats of farming incursions, conservation efforts are mounting among Western Australians to protect their unique floral heritage.

BANKSIA MENZIESII; KUNZEA BAXTERI

BRENDA PUCCINELLA

BARBARA CICCARESE

BORIS LINDERELLA

FANCIFUL FORMS attest nature's startling floral diversity. Shimmering in lethal beauty, each leaf of a silver-dollar-size pigmy sundew (**left**) is ringed with dewy tentacles that enfold insect prey. Elsewhere, the perfect symmetry of a scarlet banksia (**lower, far left,** enlarged two times) and the disarming loveliness of a common donkey orchid (**lower, left center,** enlarged three times) present more benevolent aspects of nature's face.

Floral emblem of Western Australia, the Mangles' kangaroo paw (**below,** actual size) decorates thousands of gardens across the state. This close-up shows the pollen-laden anthers.

A peculiar relative of the lily family —and a type of plant rarely found elsewhere in the world—the blackboy (**right**) sports a flowering spike 10 to 12 feet high, a snack bar for swarms of insects and insect-hungry birds.

XANTHORRHOEA PREISSII (RIGHT); ANIGOZANTHOS MANGLESII (BELOW)

BANKSIA GRANDIS

TRYPHACTUS

TRANSFORMED from nectar-laden stalks of color to warty hulks with extruding eyes, the fruiting cones of bull banksias (**above**) hoard a wealth of seeds. In some species of banksia, the seeds may stay embedded within their capsules for years until released by the heat of a passing bushfire.

About 25 species of fringe lily (**left**) grace Australia's temperate southwest corner. Lavender sachets of tasseled satin, they are unlikely first cousins to tulips and onions, which also belong to the lily family.

A butterfly's view of a fuzzy lambstail (**right**) dramatizes a protective device typical of many of the arid interior's flora. Rows of small, densely packed flowers are almost buried in soft, woolly calyxes that maintain a layer of still, humid air at the surface—thus assuring survival against hot dry winds sweeping in from the vast central desert.

LACHNOSTACHYS

POISED FOR PROPAGATION, the cowkicks plant (**below, left and right**) ingeniously deposits a load of pollen on a syrphid fly. Triggered by the fly's weight, the cocked column flips down to dust the insect's back. Then the fly will wriggle free to carry the pollen to another plant.

Drawn by radiant color and attractive scent to a fan-leaved sundew, an ill-starred leafhopper (**bottom**) is now a soon-to-be-discarded dry husk. Seconds after landing on the leaf, it had become hopelessly stuck in the digestive fluids secreted by tiny red glands at the tips of the tentacles. As it struggled to free itself, a series of intricate response mechanisms caused the surrounding tentacles to bend and hold it, and within a few hours the meal had begun. □

STYLIDIUM SCHIZANTHOIDES
DROSERA PLATYPODA

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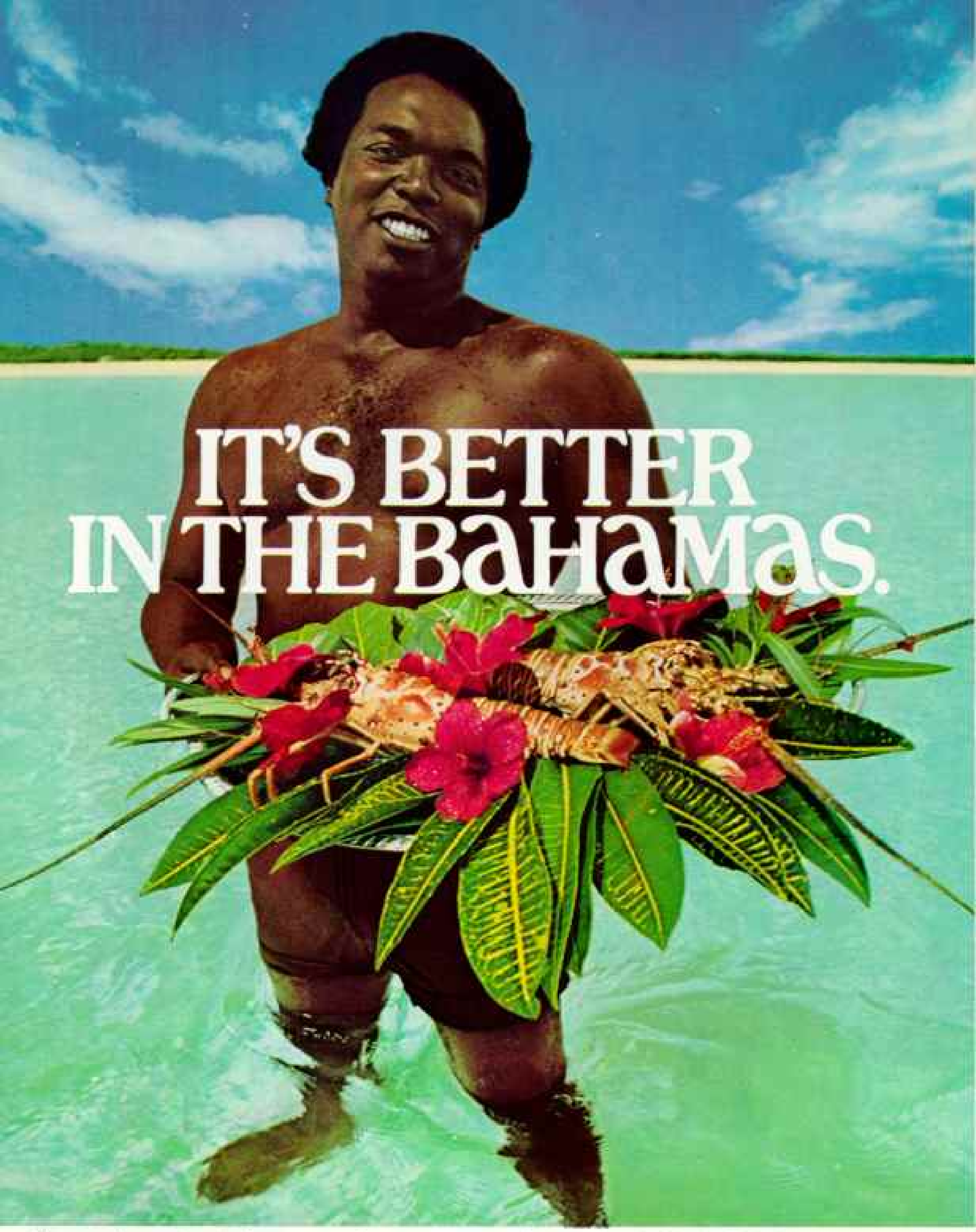

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◄ STUFFED CHERRY TOMATOES

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1 tablespoon chopped parsley
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1 cup mashed avocado
1/4 cup finely chopped onion
1/4 cup HELLMANN'S Real Mayonnaise
2 tablespoons lemon juice
2 tablespoons finely chopped green chilies
1/2 teaspoon salt
1 small tomato, finely chopped and drained

Combine all ingredients. Cover; chill 1 hour. Serve with sliced raw vegetables and corn chips. Makes 2 cups.

▲ ZIPPY ONION DIP

1 cup HELLMANN'S Real Mayonnaise
1/4 cup chopped green onion
2 tablespoons finely chopped celery
1 tablespoon chopped ripe olive
1 teaspoon Worcestershire sauce
1 small clove garlic, crushed

Combine all ingredients. Cover; chill 1 hour. Serve with sliced raw vegetables and crackers. Makes 1 1/3 cups.

◄ HOLIDAY MELBA DESSERT

1 can (8 oz) sliced peaches, drained and diced (reserve syrup)
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1 envelope unflavored gelatin
1/2 cup heavy cream
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1/2 cup chopped nuts

Add enough peach syrup to raspberry syrup to measure 1 1/4 cups. Sprinkle gelatin over syrup; heat, stirring constantly, until gelatin is dissolved. Beat in cream and Real Mayonnaise; chill until slightly thickened. Fold in peaches and nuts. Turn into 3-cup mold. Chill until set.

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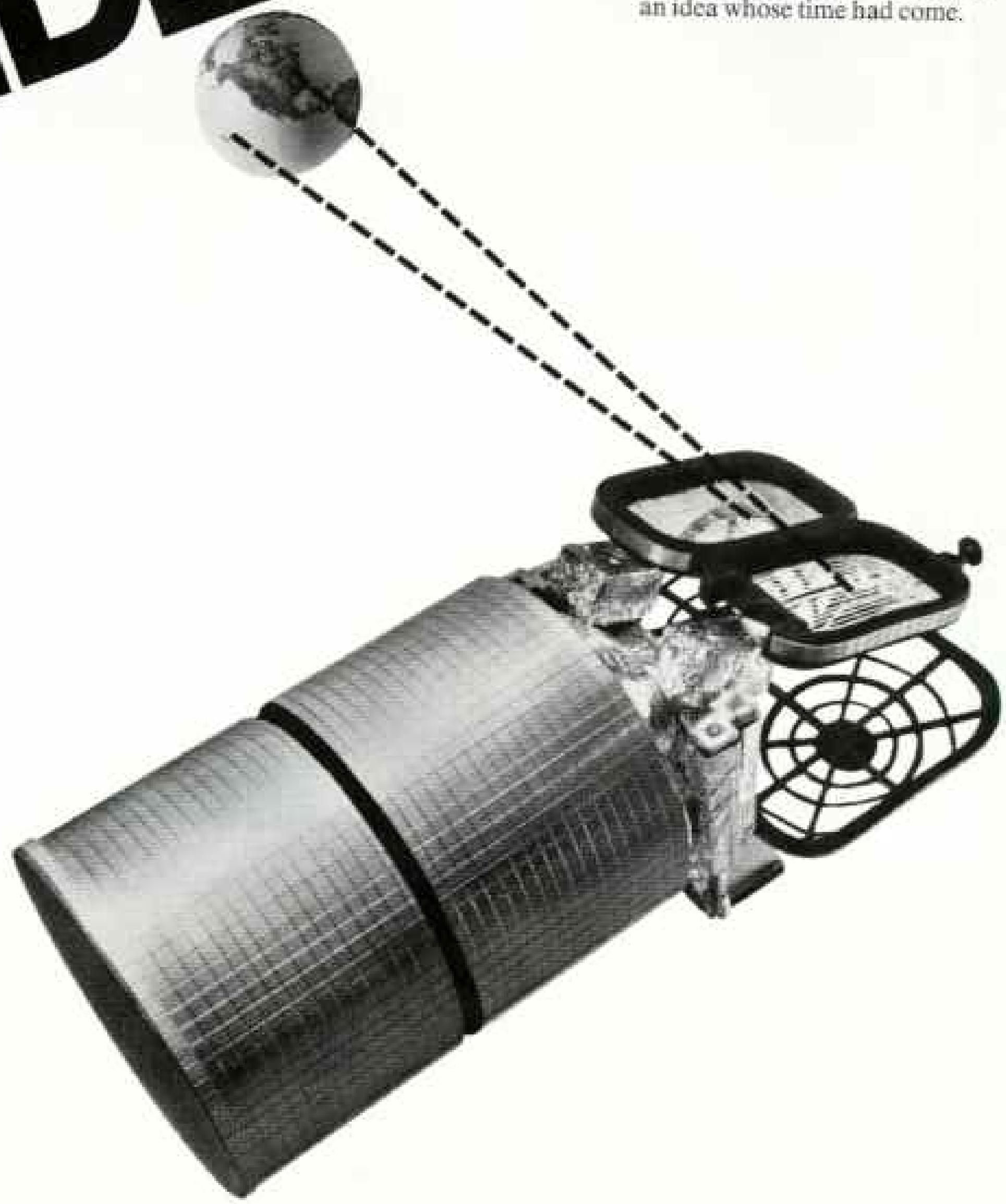

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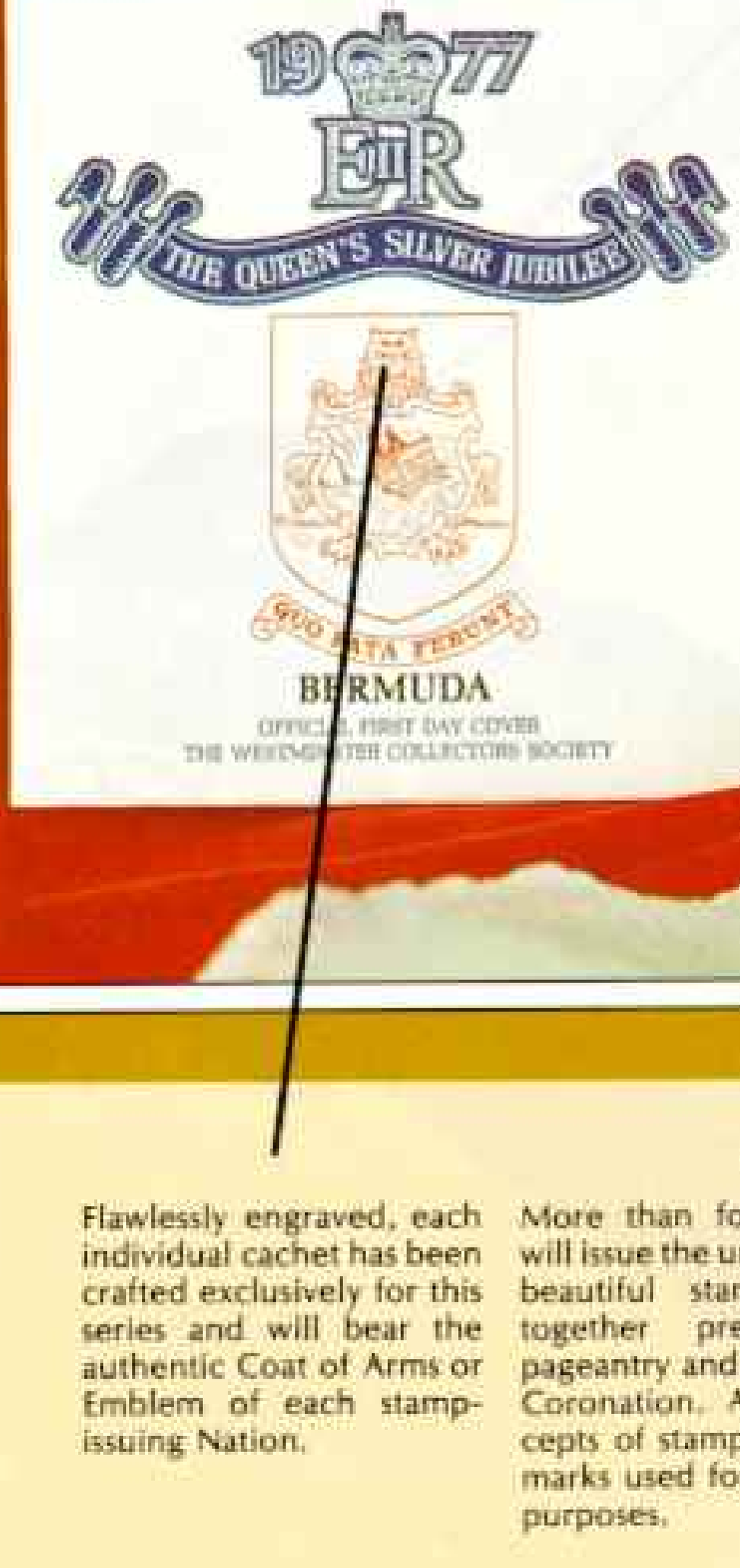

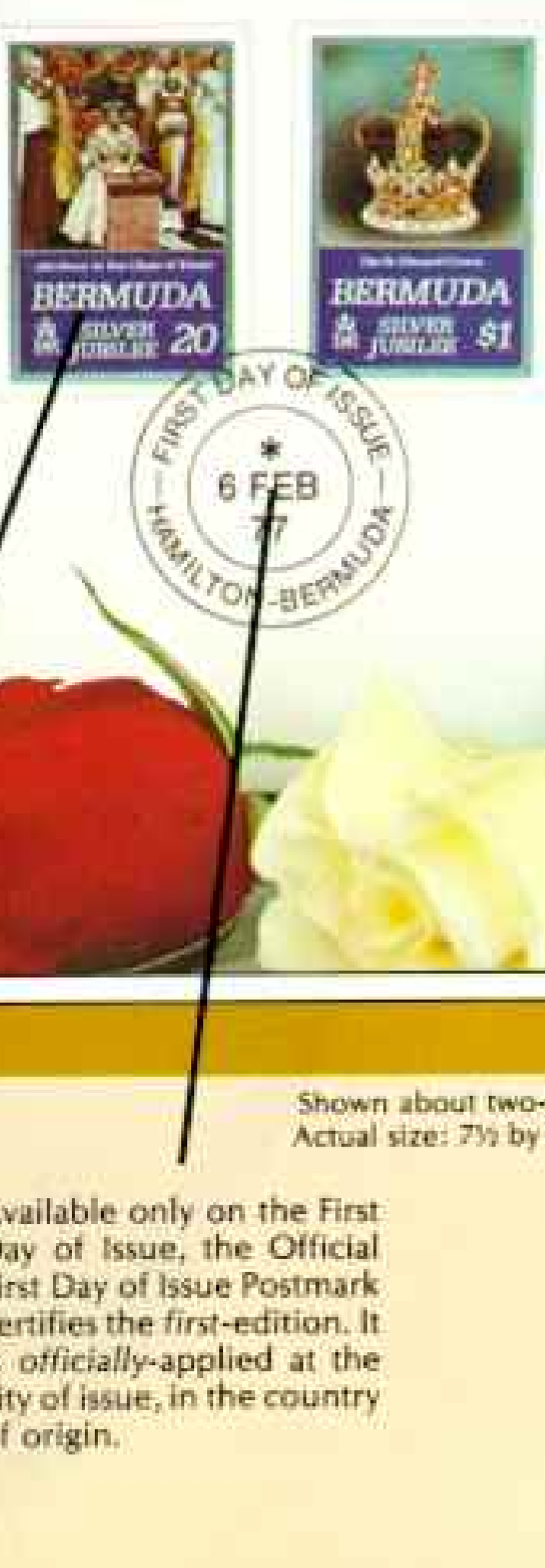

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Subscription rolls close February 6, 1977.

A quarter of a century ago, a great domain — nearly one-fourth of the earth and nine times vaster than the Roman Empire at its zenith — lay under her scepter.

Now, as Her Majesty, Queen Elizabeth the Second, prepares to celebrate her Silver Jubilee, she is Queen of fewer lands, but not of fewer hearts. In her person The Crown remains a human link among a quarter of the world's peoples. The symbol of mutual cooperation that stems from a common history. The heritage of an Empire on which the sun never set. The focus of an allegiance given through love and respect but never through compulsion.

Heiress of a thousand years of history

By the Grace of God, Queen of the United Kingdom, its territories, and more than ten other independent Nations, she reigns but does not rule. Head of the Commonwealth of more than thirty realms and republics, she presides but does not direct. Yet, hers is a voice which is heard. The advocate of a happier, more just, and more gentle world for her peoples and the whole of the human family.

Truly an anchor in the tempest of the modern age, the Queen is heiress to noble ideals as timeless as the Coronation Ceremony at which she — like her predecessors since William the Conqueror in 1066 — was crowned at Westminster Abbey. A Coronation which, as in every age, affirmed the people's acceptance of their Sovereign, and the Sovereign's dedication to the people.

An unprecedented philatelic event

It is therefore fitting that to celebrate *The Queen's Silver Jubilee* in 1977, more than forty members of the Commonwealth will preserve the pageantry and meaning of the Coronation in an *international* series of nearly eighty different stamps.

Significantly, the scope and concept of this collection are *unparalleled* in philatelic history. For, *never before* have so many Nations cooperated to issue a series of individual stamps which, when viewed as a complete collection, captures an event of this magnitude.

And, *never before* has there been a collection which traces step by step the events of the Coronation. Or portrays the individual Crown Jewels and Coronation Regalia in all their beauty.

Individually designed by the Commonwealth's most prominent artists — perhaps the greatest assemblage of talent ever gathered to a single purpose — each issue will be a masterpiece of the philatelic art. Together capturing with uncommon sensitivity the glittering panoply of tradition, religious rite, and chivalrous pageantry just as it happened nearly twenty-five years ago.

Ascension Island opens this timeless story with the golden State Coach departing from Buckingham Palace pulled by eight perfectly matched Windsor Greys enroute to Westminster Abbey.

In Montserrat's issue, the actual moment of crowning by the Archbishop of Canterbury seems to echo within the Abbey's hallowed walls.

And, vividly portrayed by the issues of Turks and Caicos Islands, loyal subjects cheer the Queen and Royal Family as they wave from the Palace balcony following Coronation.

From beginning to end, this great ritual unfolds. Inspired by a thousand years of history. Recorded in painstaking detail by official stamps of Canada, Barbados, New Zealand, Hong Kong, Australia, Gibraltar, and others. A collection worthy of *The Queen's Silver Jubilee*, and an inspiration for our times.

Available to you: the First Editions

The unprecedented character of this tribute to *The Queen's Silver Jubilee* makes your opportunity today to acquire *first editions* all the more significant. For it is a collection certain to command the attention of collectors and historians for many years to come. And the *first editions* . . . First Day Covers . . . will be but a *small fraction* of the total number of stamps sold to the public.

First Day Covers of the individual stamps marking *The Queen's Silver Jubilee* will be available only on the exact date the stamps are first issued, and never again. In many countries, the First Day of Issue will be February 6, 1977: the precise twenty-fifth anniversary of Her Majesty's accession to the Throne.

Applied as part of lavish Jubilee ceremonies attended by leading officials and citizens of each Nation, the coveted, one-day-only, First Day of Issue postmark will indelibly certify the First Day Cover for posterity and guarantee its authenticity and limited edition character.

The superb, limited edition of the Westminster Collectors Society

Appropriately, the Westminster Collectors Society will issue *The Queen's Silver Jubilee* in one complete collection of over forty official First Day Covers. Of special importance to collectors, this is the *first* collection ever authorized by the Society, which was established under the auspices of Fleetwood, America's oldest purveyor of First Day Covers, to encourage a greater appreciation of British and Commonwealth culture, history, and tradition.

As befits a collection of this importance, each First Day Cover will be lavishly engraved. Each will bear the Coat of Arms or Emblem of the issuing Nation, as well as the imprimatur of the Society. And each will be made of a special paper exclusively created for *The Queen's Silver Jubilee*.

This exquisite collection will be issued *solely* for subscribers, with an absolute limit of one collection per subscriber. And the total number will be forever limited to the exact number of original subscriptions, postmarked not later than February 6, 1977. The collection will not be available after that time except from collectors who acquired it at the time of issue.

A deluxe collector's album will protect and display your collection

Collectors who take advantage of this limited opportunity to acquire the Official First Day Covers of *The Queen's Silver Jubilee* will receive, without additional cost, a lavishly bound collector's album. To enhance the historical and educational value of the collection, an authoritative reference guide will be included. And, specially prepared information will accompany each issue.

A convenient plan of acquisition

Each subscriber will receive the First Day Covers of *The Queen's Silver Jubilee* at the convenient rate of three per month, beginning in March, 1977, and concluding in early 1978. The original issue price of $3.25 per First Day Cover will be guaranteed for the entire collection. In view of the high denomination of the stamps, it is an exceptional value.

As a convenience, moreover, collectors may pay for the first month's shipment now, or charge it to their credit card account.

A collection for all seasons

A modern world which has split the atom and put man on the moon has found itself starved for the color, the romance, the chivalry, and most of all the sense of history which *The Queen's Silver Jubilee* Collection will preserve for the future. For you, and for future generations of your family, it will be a source of great satisfaction and inspiration.

Subscription Deadline: February 6, 1977

Please remember that this is the *only* time that this collection can ever be issued. To take advantage of this historic opportunity, postmark your application no later than February 6, 1977. Applications should be mailed directly to Fleetwood, 1 Unicover Center, Cheyenne, Wyoming 82008, under whose auspices the Society was established.

ADVANCE SUBSCRIPTION APPLICATION

The Queen's Silver Jubilee

Deadline for application: February 6, 1977.
Limit: One subscription per person.

Fleetwood
Cheyenne, Wyoming 82008 C3

Please accept my subscription for the Collection of Official First Day Covers of *The Queen's Silver Jubilee* issued by the Westminster Collectors Society. The collection will consist of approximately 42 flawlessly engraved First Day Covers which will be sent to me under protective cover at the rate of three per month beginning in late March, 1977. The total price of $3.25 per cover ($9.75 per month) is guaranteed for the entire collection. A handsomely designed collector's album will be sent to me at no additional cost.

☐ I enclose $9.75 for the first month's shipment. I will be billed for future shipments as they are made.

☐ Please charge $9.75 for each month's shipment to my credit card below at the time each shipment is made:
☐ MasterCharge ☐ American Express
☐ BankAmericard

Card Number _____
Expires _____
Signature _____
All applications subject to acceptance by Fleetwood

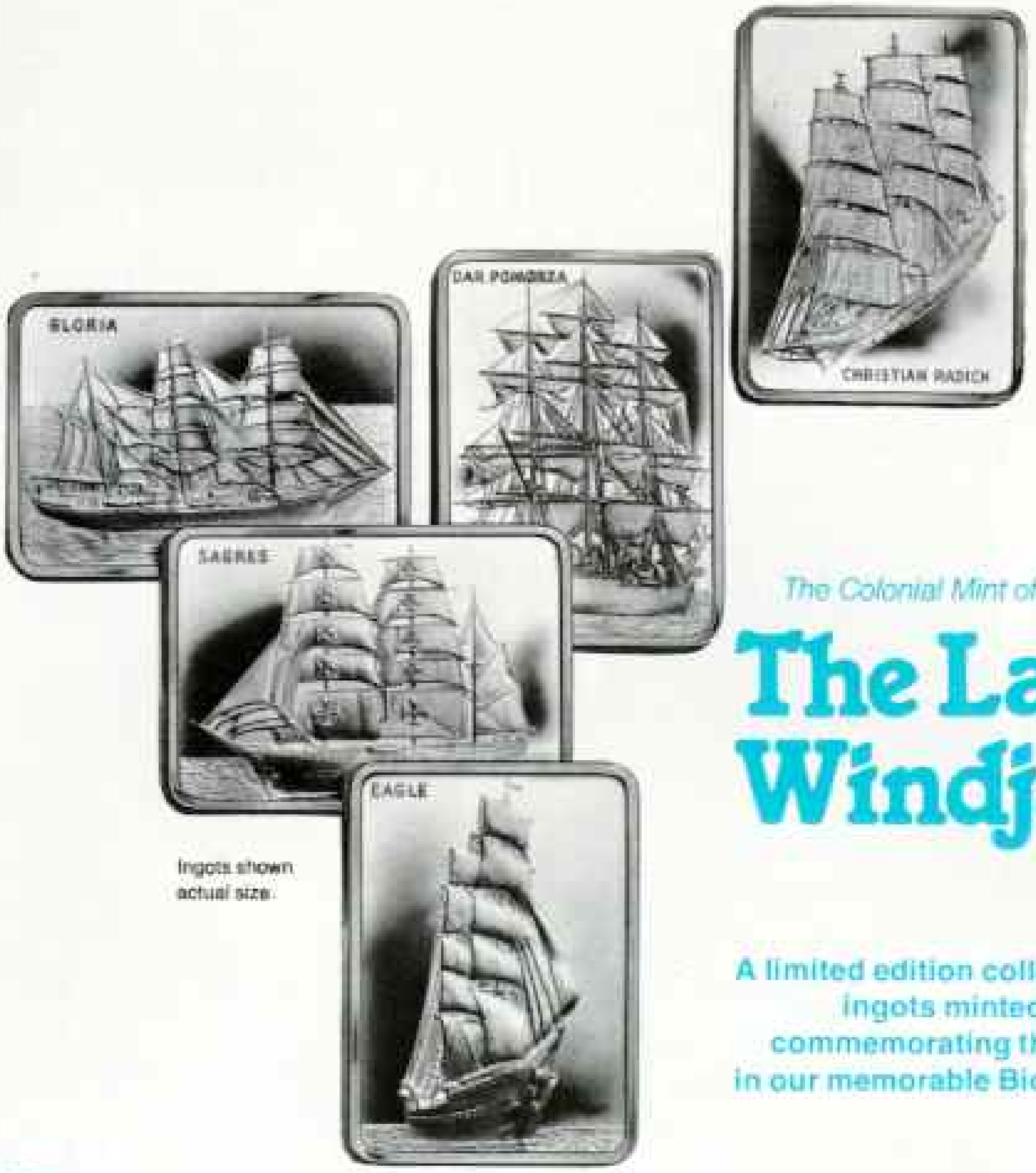
Mr.
Mrs.
Miss _____
PLEASE PRINT CLEARLY

Address _____

City _____

State _____ Zip _____

The Westminster Collectors Society was established under the auspices of Fleetwood, since 1929 America's foremost purveyor of First Day Covers, a division of Unicover Corporation



Ingots shown actual size.

The Colonial Mint of Williamsburg announces . . .

The Last of the Windjammers

A limited edition collection of fourteen proof ingots minted in .999 fine silver commemorating the majestic "Tall Ships" in our memorable Bicentennial parade of sail.

During 1976, the largest flotilla of sailing ships ever seen in this hemisphere joined in an historic marine parade honoring our nation's Bicentennial. In this great parade of sail were the 14 most majestic Windjammers in the world. These ships have been captured forever in this collection of pure silver ingots honoring *The Last of the Windjammers*.

The precise detail and sensitive rendering of each magnificent ship is the work of Arnoldo Marchetti, creator of the coveted American Bicentennial Medallions.

A PRIVATE TREASURY OF .999 FINE SILVER THE FINEST AVAILABLE

Each ingot will be minted in a proof finish, the ultimate achievement of the minter's art. In addition to the artistic value of this collection, prudent investors will appreciate the intrinsic worth. With this collection, subscribers will have amassed a private treasury of 7,000 grains of pure silver.

Your first ingot will be the American barque *Eagle*. Among the others will be West Germany's *Gorch Fock*, named after the immortal author of sea stories and Norway's *Christian Radich* which after World War II was found half submerged and was raised and refitted.

COLLECTOR CASE AND PORTFOLIO INCLUDED

Each subscriber will receive a deluxe collector case personalized with your name, number and date. You'll also receive a portfolio containing reference biographies of each Windjammer.

GUARANTEED PRICE PROTECTION AND FULL RETURN PRIVILEGES

The issue price for each ingot is $19.75 and this price will be guaranteed for the entire series regardless of any increase in the cost of silver. You are further guaranteed that you may return any ingot within 15 days for an unquestioned refund.

SUBSCRIPTION APPLICATION

The Colonial Mint
228 B Monticello Avenue
Williamsburg, Va. 23185

Please accept my subscription for *The Last of the Windjammers* ingot collection. I would like my collection issued:

☐ MONTHLY. $19.75 per ingot plus $1.75 shipping and handling for fourteen months. Enclosed is my payment for the first ingot—Or please charge this and future payments to my credit card.

☐ COMPLETE COLLECTION IMMEDIATELY. $275.00 including case and portfolio. Postpaid.

☐ BankAmericard ☐ Master Charge
☐ American Express

Account Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Inter Bank ☐☐☐ Exp. Date _____

Name _____

Address _____

City _____

State _____ Zip _____

Signature _____

Subscriptions subject to acceptance by The Colonial Mint. New York State residents add appropriate sales tax.

IS THIS THE ULTIMATE CAMERA?

The Mamiya M645

The M645 is so lightweight and compact, it handles like a 35mm camera. But delivers medium-format (6 x 4.5cm) results with 120 or 220 roll film.

But don't take our word for it. Read what the experts have to say. Then find out for yourself.

"If there are several cameras available from which to choose, one does not hesitate to pick the M645." *Petersen's Photographic Magazine*

"You can shoot almost anywhere, hand-held, with this very smooth functioning SLR dream machine. Mamiya M645 will replace 35mm photography..."

Camera 35

"Now, it's no longer necessary to spend a fortune to move up to a first class, larger format camera."

Foto Magazine (Sweden)

"Fine workmanship, excellent balance and superb operating convenience."

Industrial & Commercial Photographer (England)

"Mamiya M645...A new star about to shine."

Australian Photography Magazine

Actual size: 35mm format vs. M645.

For more information, U.S. residents write:

BHMC

BELL & HOWELL/MAMIYA COMPANY
7100 McCormick Rd., Chicago, Illinois 60645

Residents from countries other than U.S.A. write:

Mamiya Products Exclusive Export Agent:

J. OSAWA & CO., LTD.
Shibaura 4-2-8, Minato-ku, Tokyo 108, Japan

You can expand your holiday horizons. Our free adventure kit shows you how.

Out of town for the holidays. The very idea rings with promise. Until you think of all the travel hassles.

There are those of us, however, who know that getting there is half the fun.

Beechcraft's high-flying Duke gives a full measure of pleasure to any holiday trip. Beginning the moment you step on board.

You'll have more hours to schuss a secret slope. To really explore your favorite city. To spend in the warm company of far-off family or friends. To get right down to the serious business of getting away from it all.

The Duke will take you to every major metropolitan airport and thousands more that the airlines don't serve. Chances are, you'll land very near your holiday destination.

The Beechcraft Duke is a limited-production aircraft. Its pressurized, air-conditioned cabin lets you fly over the highest mountain ranges in a comfortable, living room environment. Custom furnishings reflect your own good taste.

Beechcraft Duke. The best excuse anyone ever had to go out of town for the holidays.

Just to get you started, we've put together an updated and expanded version of our popular Beechcraft Adventure Kit. You'll find it an informative, entertaining guide to out-of-the ordinary places and events in the U.S. We'd like to send you one free of charge.

THIS IS NOT A COUPON

But we do urge you to write to us on your letterhead instead.

We'll send your Beechcraft Adventure Kit by return mail, absolutely free. And we know you'll like it.

Write to Beech Aircraft Corporation, Department A, Wichita, Kansas 67201.

Please include name, address, occupation, and title. Also, please let us know if you're already a pilot.

Beechcraft Duke

Commemorating the 150th Anniversary of John James Audubon's classic "Birds of America" engravings...

The SONGBIRDS

Cardinal

Baltimore Oriole

- A series of 12 Bells depicting America's Most Beautiful Songbirds
- Exclusive Original Works of Art
- Hand Decorated and trimmed in 22 kt. gold
- A Limited Edition Available Only in this 150th Anniversary Year of Audubon's "Birds of America"

Birds grace our world with beauty and song and inspire us with their freedom of flight. Now the minstrels of the meadows, woodlands, deserts and streams—the songbirds of America—have been captured brilliantly in a series of finely crafted porcelain bells.

Honoring John James Audubon

No one has ever devoted such energies and talents to capturing the beauty of birds as John James Audubon.

To honor Audubon's task in the 150th anniversary year of his "Birds of America" engravings, the Danbury Mint has chosen 12 of the most beautiful songbirds of America and portrayed them on fine porcelain bells.

Exclusive Works of Art

Jo Polseno, one of the nation's foremost wildlife artists was commissioned to execute the original watercolor enhancing each bell. Working directly from life, the artist has portrayed each bird in authentic and exacting detail.

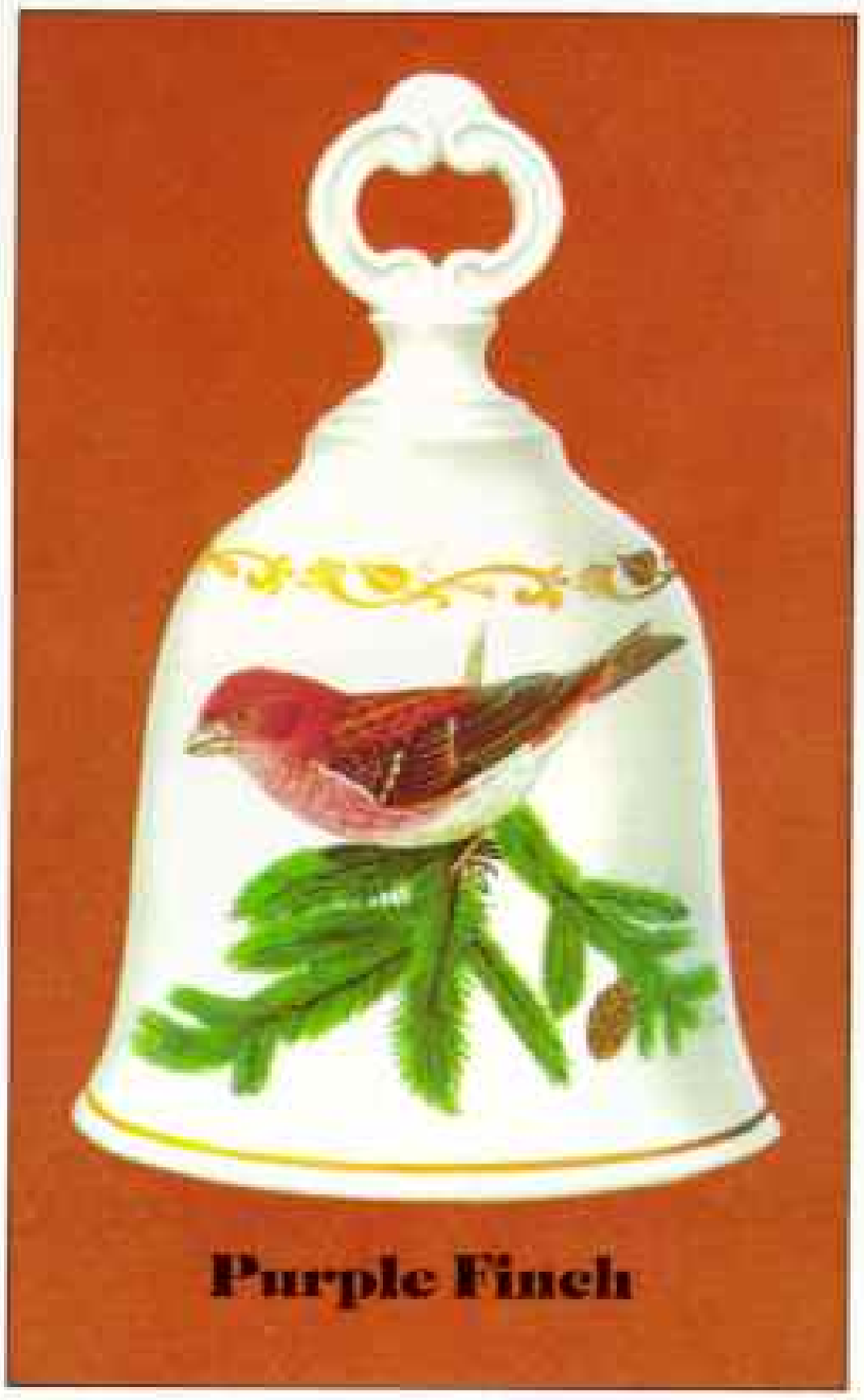
Finest Bavarian Porcelain

The finest Bavarian porcelain has been used in creating these exquisite bells. The unique shape of the bell complements the

OF AMERICA

Bell Collection

Actual size of bells 5" in height.



delicate scenes portrayed. Each bell has been hand decorated with two bands of precious 22 kt. gold.

A Limited Edition

The Songbirds of America Bell Collection is being issued as a strictly limited edition. It is available only by advance reservation and only until December 31, 1976. **Any reservations received after the edition closes must be declined and returned.**

Heirloom Collectible

Audubon's bird paintings have been prized and highly valued by collectors and bird lovers for more than a century. The Songbirds of America Bells may well be equally revered by future generations. But, you must act now to acquire this unique collection.

PREFERRED RESERVATION APPLICATION
All orders must be postmarked by Dec. 31, 1976.

The Danbury Mint
10 Glenlinning Place
Westport, Ct. 06880 NG

Please accept my subscription to **The Songbirds of America Bell Collection.** I understand there will be 12 fine porcelain bells in this limited edition series and that the bells will be issued approximately one every two months at a guaranteed price of $35.00 each.

I understand that I need remit no money now: I will be billed for the first bell 30 days prior to shipment and invoiced on a pre-shipment basis for each bell every two months thereafter. I may cancel this subscription at any time and any bell may be returned for a full refund if upon receipt I am not completely satisfied.

Name _____

Address _____

City _____ State _____ Zip _____

Signature _____

PARKER

World's most wanted pens

Every collector's item was young once.

The Parker 75 ball pen in precious metal was destined from birth to become a collector's item. It combines ageless beauty and unsurpassed performance with gold or silver's tradition of enduring value. An exceptional gift to be cherished for a lifetime. In 22K gold electroplate, $15; in solid 14K gold, $450. Solid sterling silver, $17.50. Also available in brushed stainless steel, $7.50. This Christmas, in leading stores, look for the Parker People who will help you with your selection, then personalize it, and gift-wrap it . . . all with our compliments and a smile.

PARKER 75

A gift of immediate and lasting value.

Christmas pictures. Color by Kodak. For the first time in an instant.

Actual size picture.

Imagine! The color of Christmas, Christmas day. Lush, inviting color by Kodak, yours in clean, dry self-timing instant pictures. Pictures that develop in minutes, the image protected by an elegant, textured Satinluxe™ finish.

Imagine, two new Kodak instant cameras. Both with automatic exposure control and electronic shutter.

See them now at your photo dealer's. Prices start at less than $54. And give someone a real first: the first instant Christmas with color by Kodak.

Give Kodak instant cameras and film.

NOTE: PR10 instant film (made by Kodak) can be used only in Kodak instant cameras. Price is subject to change without notice.

"The restaurant was open. Our rare steak was rare. And it didn't cost us an arm and a leg. Amazing."

Robert J. Nicolazzi
District Sales Manager

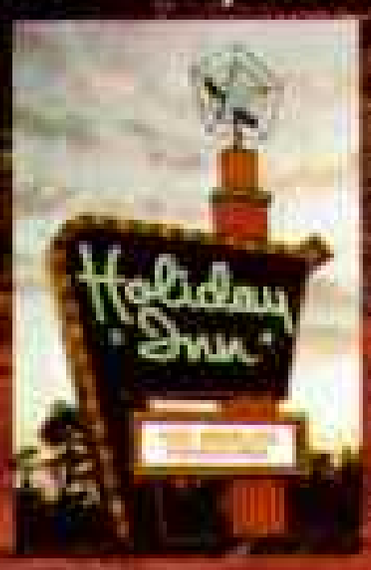
"Chris and I love to travel. We stay at Holiday Inn.® A big part of the reason is those 152 Holiday Inn standards they have on everything, including their restaurants.

"Holiday Inn restaurants are always open 16 hours a day. So when we want to eat early, we eat early. When we want to eat late, we eat late.

"When we order steak rare, we get it rare. Pure and simple. And amazing when you stop to think it works like this at *every* Holiday Inn.

"The same for our room. It's always big. And comfortable. And clean. And filled with creature comforts that really work. Chris said to tell you you'll like the nice thick carpets. I love that big TV. I also love the fact that I can charge our room and all our meals on the American Express card. Like they say in the ads, I never leave home without it. When Chris and I pull into a Holiday Inn,® we know we can count on it, just like every Holiday Inn we've been to. Never a disappointment.

"No surprises must be standard #153."



At every Holiday Inn, the best surprise is no surprise.™

Once again, TV service technicians give these opinions about Zenith:

I. Best Picture.

Again this year, in a nationwide survey of the opinions of independent TV service technicians, Zenith was selected, more than any other brand, as the color TV with the best picture.

Question: In general, of all the color TV brands you are familiar with, which one would you say has the best overall picture?

Answers:

Zenith	**34%**
Brand A	21%
Brand B	12%
Brand C	8%
Brand D	7%
Brand E	4%
Brand F	2%
Brand G	2%
Brand H	2%
Other Brands	2%
About Equal	10%
Don't Know	4%

Note: Answers total over 100% due to multiple responses

The Celebrity II, Model SH2331X, pictured here. Simulated rosewood with Bermuda Shell white front. Simulated TV picture.

II. Fewest Repairs.

In the same opinion survey, the service technicians selected Zenith, more than any other brand, as the color TV needing the fewest repairs.

Question: In general, of all the color TV brands you are familiar with, which one would you say requires the fewest repairs?

Answers:

Zenith	**38%**
Brand A	18%
Brand D	9%
Brand B	6%
Brand C	5%
Brand E	3%
Brand F	2%
Brand G	2%
Brand H	2%
Other Brands	2%
About Equal	11%
Don't Know	10%

We're proud of our record of quality. But if it should happen that a Zenith product fails to live up to your expectations, or if you want survey details, write to the Vice President, Consumer Affairs, Zenith Radio Corporation, 1900 N. Austin Avenue, Chicago, Il. 60639.

ZENITH

CHROMACOLOR II

The quality goes in before the name goes on.

FOR CONVENIENT KODAK PROCESSING, GO FIRST CLASS.

Just put your Kodak color film in a Kodak mailer and mail it to Kodak.

Kodak will mail your slides, prints or movies back to you. You can have them delivered right to your own home.

That's convenient.

That's First Class.

At Kodak, we are dedicated to processing your Kodak film carefully. Like all quality processors, we take pride in our work. And that pride shows up in your pictures.

So, the next time you buy Kodak film, pick up some Kodak mailers. And start going First Class—to Kodak.

KODAK MAILERS

When I was a child, I spake as a child, I understood as a child, I thought as a child: But when I became a man, I put away childish things. — *I Corinthians*

SCM SMITH-CORONA
SCM CORPORATION

THE RED DEVIL BATTERY SIGN

A Work for "The Presentational Theatre"

by

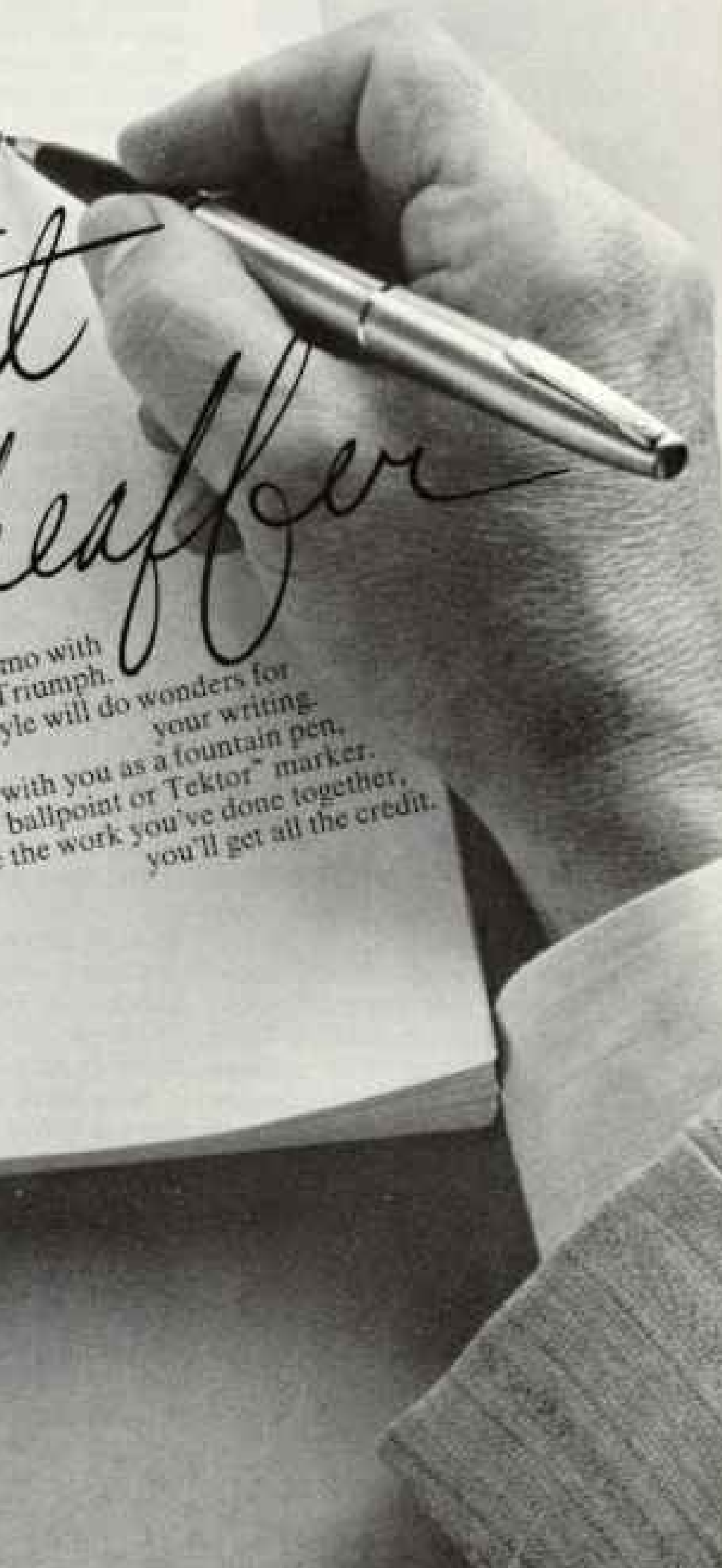
TENNESSEE WILLIAMS

Tennessee Williams

...Signs it

with a Sheaffer

Collaborate on your next play, letter or memo with a Sheaffer® Triumph.
Its dramatic, yet understated style will do wonders for your writing.
It'll work hand-in-hand with you as a fountain pen, ballpoint or Tektor™ marker.
And when the critics praise the work you've done together, you'll get all the credit.



SHEAFFER EATON TEXTRON
Sheaffer Eaton Division of Textron Inc

When it comes to buying a 35mm SLR, foresight is less expensive than hindsight.

The time to find out what you need in a 35mm SLR is before you buy it, not after.

Because a camera that meets your needs is a good buy. And a camera that doesn't is a bad buy at any price.

Match-needle or electronic auto-exposure? Minolta makes both kinds, so our only concern is that you get what's best for you.

A match-needle camera costs less. To set exposure, you line up two needles in the viewfinder. It's easy, fast and accurate, but you do the work. Minolta's match-needle models, the SR-T 200, the SR-T 201 and the SR-T 202, differ in price, according to their operating features.

Minolta's electronic automatic models are the professional XK, the deluxe XE-7 and the economical XE-5. In these cameras, shutter speeds are controlled electronically with unprecedented precision. Even if the light changes the instant before you shoot, the camera will set itself for correct exposure. Among Minolta electronic SLR's, you get a wide choice of features, including interchangeable viewfinders and focusing screens, shutter speeds to 1/2000th of a second, and multiple-exposure capability.

How much information should the viewfinder display? The more information in the viewfinder, the more you know about the technical details of how the camera is taking the picture.

The important thing about Minolta SLR's is that in every single one, you can compose, focus, set exposure and shoot without ever looking away from the viewfinder. So you won't miss shots of even the fastest-moving subjects.

How does the camera feel and sound? A camera shouldn't take "getting used to." Your fingers should fall naturally and comfortably into place over the controls.

Advance the film wind lever. If a new camera has a "grainy" feeling, how will it feel after a couple of thousand shots?

How about noise? Close machine tolerances and careful damping of moving parts in Minolta cameras give you a noticeably smoother, more solid response when you push the shutter button. And Minolta's automatic SLR's have a newly designed electronic shutter that's a joy to hear because you almost can't hear it.

The lens system. You need a choice of lenses broad enough to meet your present and future needs. Minolta offers almost 40. From a 7.5mm "fisheye" to a 1600mm super-telephoto.

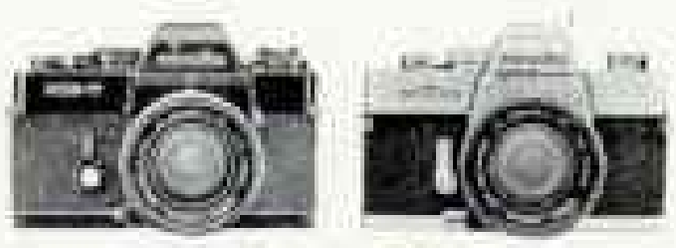
How easy is it to change lenses? You shouldn't miss any shots while changing lenses. So Minolta has developed a patented bayonet mount that locks on in less than a quarter turn, instead of the three or more turns required by a screw mount.

And unlike others, the Minolta bayonet mount doesn't require realignment of f/stops every time you change lenses.

How do you judge craftsmanship? Take a close, careful look at the details. Everything should be tucked in neatly. Finishes should be even and unmarred. No machining marks should be visible, even inside.

Cameras have reputations. Check them out. By all means, ask your friends about Minolta. Since it's the largest-selling imported camera brand in the U.S., chances are someone you know owns one.

If you'd like more information about Minolta 35mm SLR's, write to Minolta Corporation, 101 Williams Drive, Ramsey, N.J. 07446. In Canada: Anglophoto, Ltd., P.Q.



Minolta

The more you know about cameras, the more you'll want a Minolta.

What full-color magazine delights and informs 1,260,000 children?

WORLD—National Geographic's *first new magazine* in 56 years! It treats youngsters 8 through 12 to fun that teaches, learning that lasts.

This bright, exciting magazine opens a whole wide, wonderful world every month, all year long. Young minds go to faraway places, meet unusual people, learn amazing facts, experience heart-pounding adventures in up to 36 big 8½-by-10¾-inch pages. Regularly scheduled features will awaken new interests, sharpen mental skills, and expand vocabularies.

And you'll be glad to know—in these difficult economic times—that you can subscribe to WORLD at a piggybank price. Twelve great issues for less than two cents a day: $5.85 a year in the U. S., $6.00 in Canada, $6.85 elsewhere. Or save even more with a three-year subscription (U. S. only) for $15.00. This modest sum, invested in a child's future now, will pay great dividends later, during the teenage years.

Special features make a world of difference

- supersize pictures
- instructive games
- mazes and puzzles
- how-to instructions on crafts and hobbies
- "Far-out Facts"
- true-life adventures
- engrossing articles on history, science, nature and geography
- and much, much more

Mail this order form today.

NATIONAL GEOGRAPHIC SOCIETY
Dept. 2112, Washington, D. C. 20036

Please send a WORLD subscription to the person named below. Enclosed is subscription fee of $_____ for

☐ one year ☐ three years

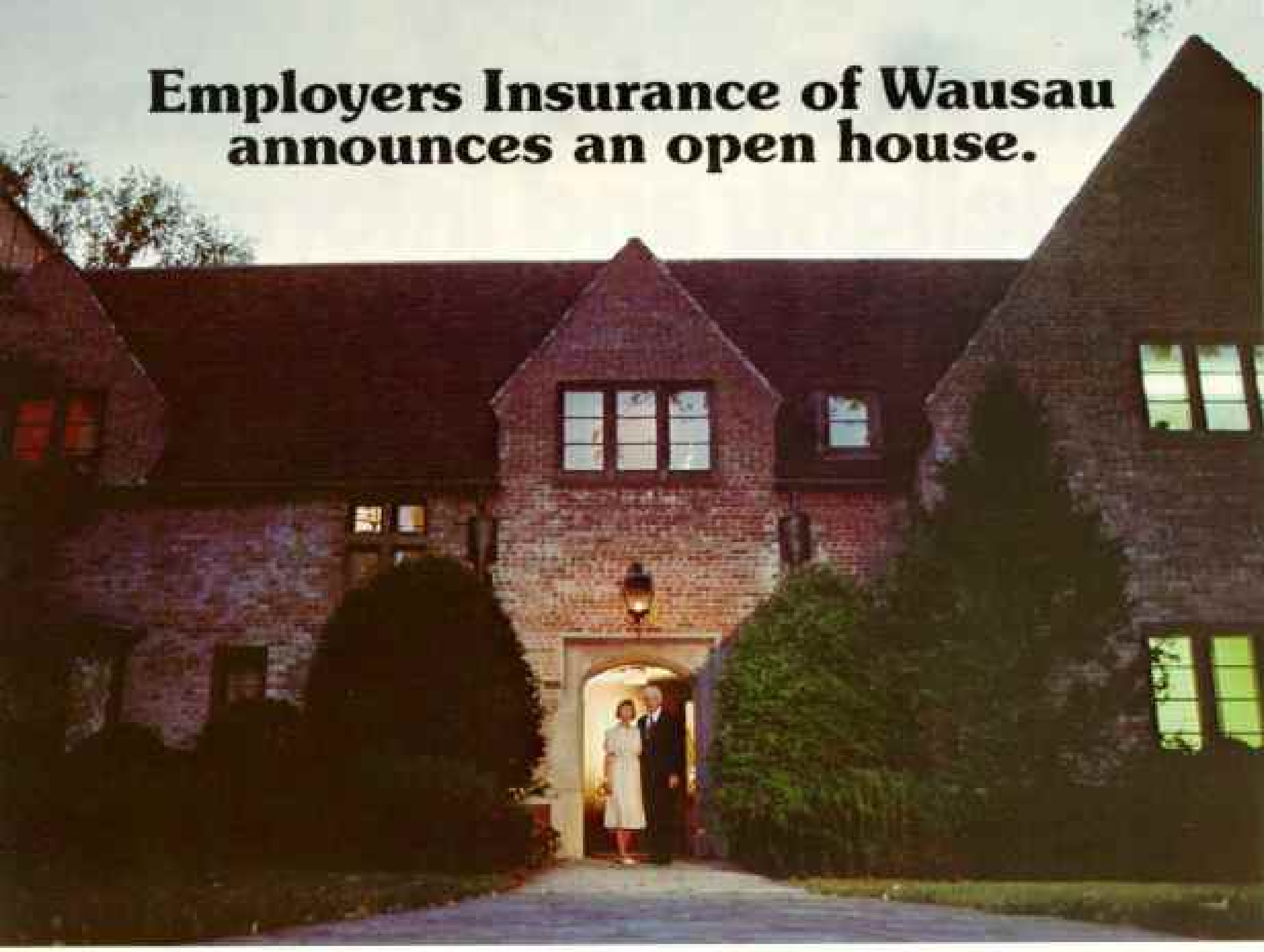
_____
Name

_____
Address

_____
City State Zip

Available only from National Geographic

Employers Insurance of Wausau announces an open house.



Not ours.

It's Alice and John Foresters' house, on Franklin Hill, here in Wausau, Wisconsin. Open to the public now, as the Leigh Yawkey Woodson Art Museum.

It features a permanent collection of life-size Royal Worcester porcelain birds, designed by sculptress Dorothy Doughty, between 1935 and her death in '62. One of only eight complete 100-piece sets in existence.

In addition, traveling shows—from old masters to young turks—are exhibited in the museum's capacious new west wing.

Special guests at the museum's recent dedication ceremonies were 24 of America's premier wildlife artists, including naturalists Dr. Roger Tory Peterson and Owen Gromme.

If you're ever in Wausau, drop in at the Foresters' house. The Woodson Art Museum, at 12th and Franklin. Just up the hill from the railway station.

All of us at Employers of Wausau are proud of our home town. And our home-town way of doing business. But that's another Wausau Story.

Employers Insurance of Wausau

Wausau, Wisconsin

Let her carry you to the Cities of the Dawn

From New Orleans, jazziest city in America, sail to the lands of the ancient Mayans. Prowl through their long-abandoned temples. Try to solve their still undeciphered hieroglyphs. The Cities of the Dawn are exotic, exciting, and still nearly unexplored.

At Carras our job is making luxury more elegant. Our passengers are usually seasoned travelers. They can compare us with other cruise ships. And when you compare us, we shine.

We carry fewer passengers. That means spacious cabins, each with a bathroom and a bathtub. Our dining room is large enough to accommodate all passengers at one sitting. Our cuisine is the envy of famous restaurants. And our decks, being less crowded, are delightfully strollable.

We've also added theme cruises: Sail with the Stars (for movie buffs); Symphony of Islands and Seas (a musical feast); The Sea a Stage (the play's the thing); Away from the Blues (and all that jazz!).

Free round trip flight to New Orleans from any city in the continental U.S. or Canada provided by Carras for selected sailings.

MTS Daphne is registered in Greece, land of Poseidon, the god of the sea.

EMBARK!
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JANUARY 15
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FEBRUARY 26
MARCH 12 (Mardi)
MARCH 26
APRIL 2
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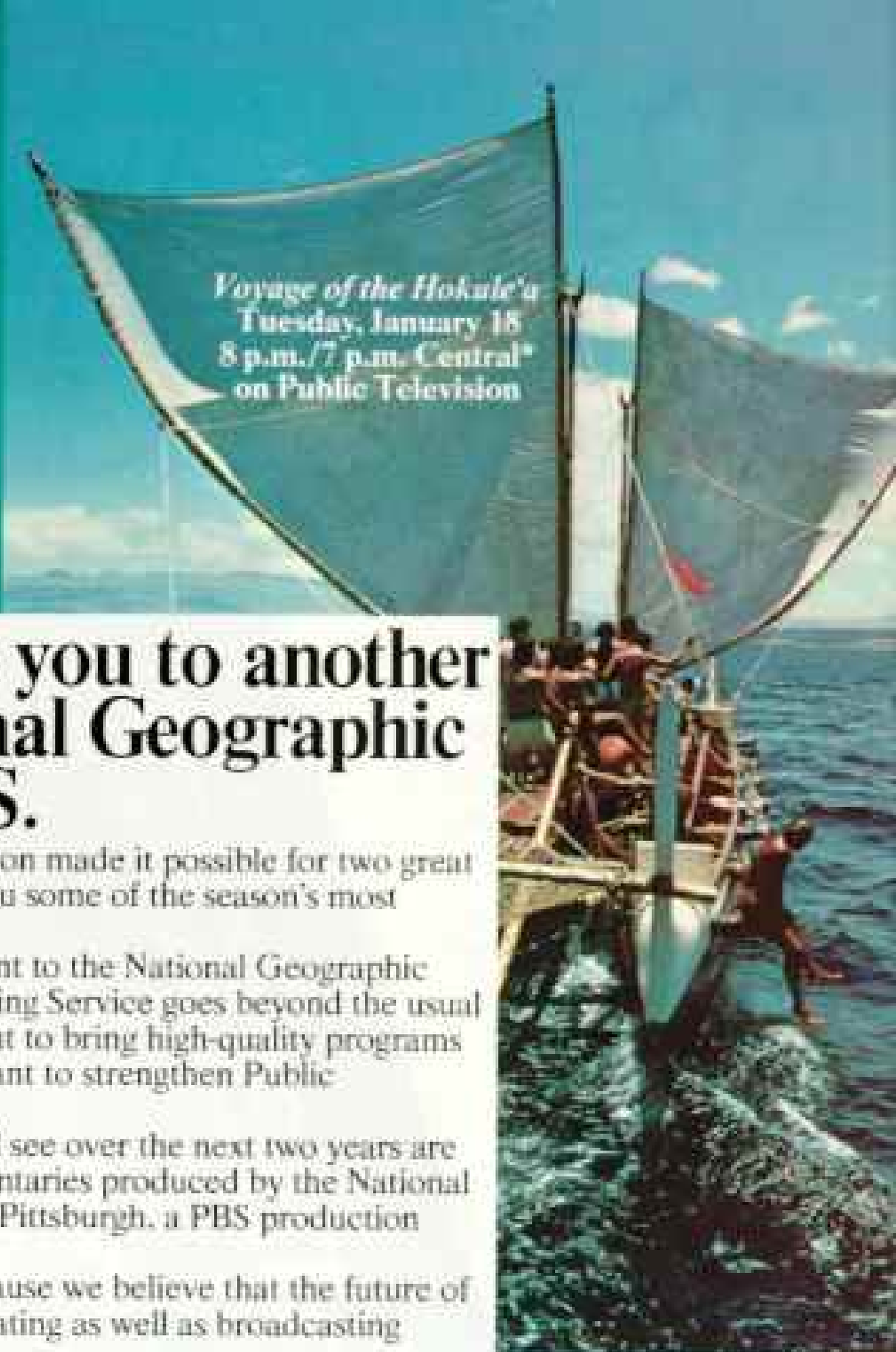
Treasure!
Tuesday, December 7
8 p.m./7 p.m. Central*
on Public Television



Voyage of the Hokule'a
Tuesday, January 18
8 p.m./7 p.m. Central*
on Public Television

Gulf welcomes you to another exciting National Geographic Season on PBS.

Last year Gulf Oil Corporation made it possible for two great American institutions to bring you some of the season's most exciting television.

Gulf's three-year commitment to the National Geographic Society and the Public Broadcasting Service goes beyond the usual corporate grant. We not only want to bring high-quality programs to the American audience; we want to strengthen Public Television, too.

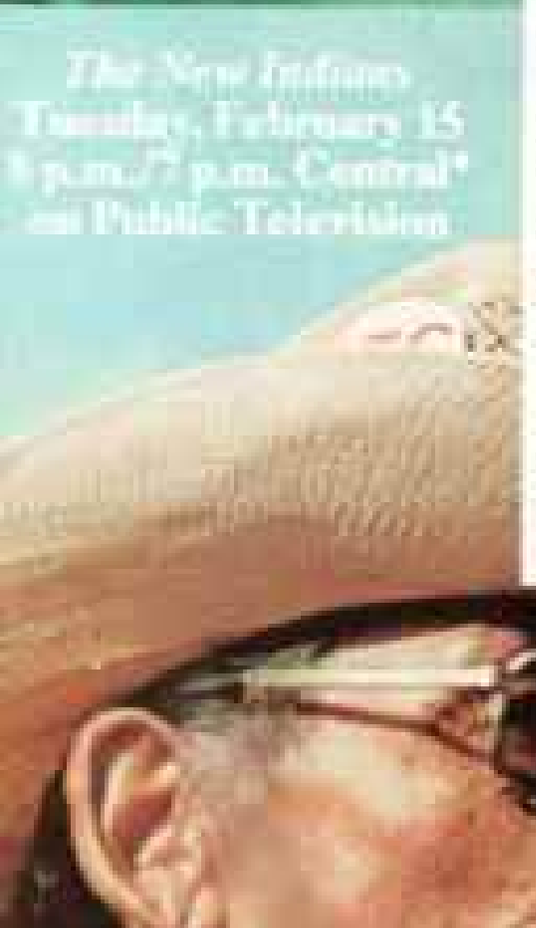
The eight new specials you'll see over the next two years are original American-made documentaries produced by the National Geographic Society and WQED/Pittsburgh, a PBS production center.

Gulf funded the project because we believe that the future of Public Television depends on creating as well as broadcasting exceptional programming.

We're also committed to bringing a wider audience to PBS. So we've provided funds to promote the National Geographic Specials on both a national and local level. Judging from the response to the first season, millions of Americans are now more aware of the exciting programs they can see only on Public Television.

Now we're ready for the Second National Geographic Season on PBS. We hope the millions who enjoyed the National Geographic Specials last year will be back this year.

It's another exciting season on Public Television.



The New Indians
Tuesday, February 15
8 p.m./7 p.m. Central*
on Public Television

The Volga
Tuesday, March 8
8 p.m./7 p.m. Central*
on Public Television

Gulf

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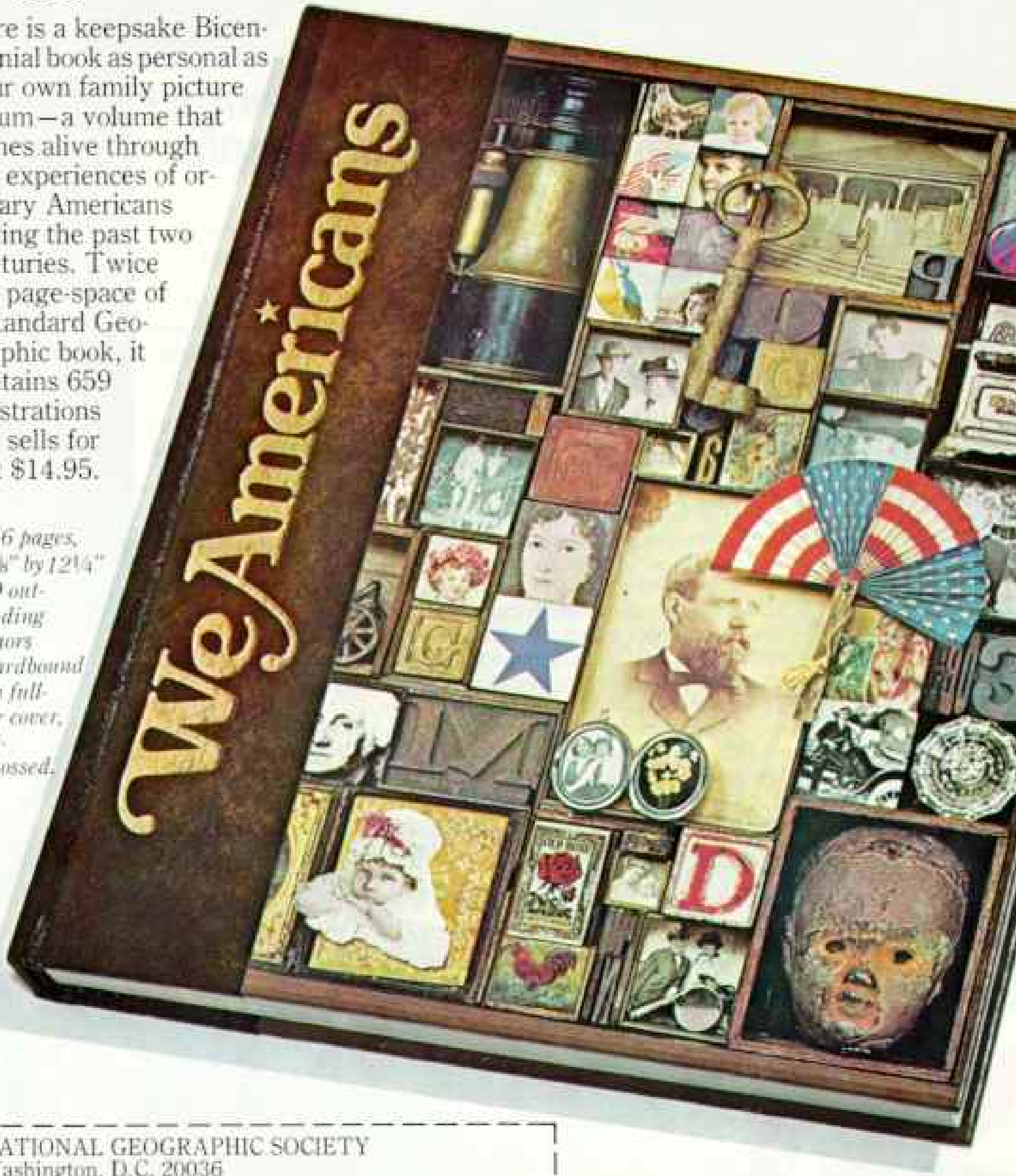
*Check local listings.

Relive the American adventure in National Geographic's biggest best-seller...

Here is a keepsake Bicentennial book as personal as your own family picture album—a volume that comes alive through the experiences of ordinary Americans during the past two centuries. Twice the page-space of a standard Geographic book, it contains 659 illustrations yet sells for just $14.95.

- *456 pages, 10⅝" by 12¼"*
- *20 outstanding authors*
- *Hardbound with full-color cover, gold-embossed.*



NATIONAL GEOGRAPHIC SOCIETY
Washington, D.C. 20036

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NATIONAL GEOGRAPHIC SOCIETY

A Kodak Carousel projector makes a handsome gift. Any way you look at it.

Look at it both ways. On the outside it's as handsome as a costly stereo. Some models, like this one, come with a smoke-tinted dust cover and sliding lens cover. So you don't have to hide it away between shows.

On the inside, Carousel projectors have quiet dependability. Quiet so nothing distracts from the enjoyment of the show. Dependable because it's gravity that drops each slide into place, without fuss or bother.

New Transvue tray

Kodak Carousel projectors are available with all sorts of features to make slide showing easier, more enjoyable. Like automatic focusing, so you usually only have to focus the first slide. Like push-button remote control, in both forward and reverse. Like the new Transvue tray with illuminated slide numbers (shown) that tell you which slide you're projecting while in the dark.

See Kodak Carousel projectors at your photo dealer's. The Custom 850H, shown, is less than $275. Other Kodak Carousel projectors from less than $95.

Prices are subject to change without notice.

Kodak Carousel projectors.

Ten things that will happen when you test drive Oldsmobile's new Delta 88.

1. Your first look will impress you.

The new proportions. Crisp. Contemporary. Clean. And the practicality of those lines will come to you as you drive this roomy new car.

2. Getting in is easier.

It's the way we've redesigned the door openings. Which also makes getting out easier. Which you may not want to do once you've experienced driving it.

3. You'll sit comfortably.

The chair-height seats are designed to provide a more comfortable driving position than you may ever have experienced before.

4. You'll like the visibility.

Look around you and you'll see that the generous glass area makes the new 88 easy to see out of. And also makes it easy for people to see how great you look in a new 88.

5. You see all instruments.

The instrument panel is designed to put all instruments in easy view and easy reach. So there is a distinct feeling of control in the driver's seat.

6. The ride is smooth and comfortable.

Olds engineers used computers to select the right combination of springs and shock-absorption rates. Result: a ride that's smooth and stable even over rough roads.

7. Suddenly it is very quiet.

Drive over a bumpy road or past a noisy construction site and give Delta 88 a real test. New body and engine mounts help isolate vibration; while new sound-absorption materials help insulate the passenger compartment.

8. Find a place to make a U-turn.

It's the best way to see and feel the 88's new tighter turning radius. You'll really appreciate it in a tight parking situation.

9. Make sure you take your family along.

Because you'll want them to experience (along with you, of course) the improved head room, and the increased leg room in back.

10. Improved gas mileage.

You can't experience it in a test drive. But smaller, lighter engines provide improved fuel economy in the new Delta 88: 25 mpg in the EPA highway test and 18 in the city test with the standard 231 V-6 engine, automatic transmission and rear axle. (EPA estimates. Your mileage depends on how you drive, your car's condition, and its equipment. In California, EPA estimates are lower.)

P.S. Some things you can't see. Like improved corrosion resistance. Or our new Central Diagnostic Connector that your Olds dealer can plug into and quickly check many electrical functions. It's all there in the 1977 Delta 88. The car it took Oldsmobile over 3 years to build for you.

Now take a few minutes to discover in a test drive its efficient new combination of roominess, comfort, and maneuverability.

Oldsmobile

DELTA 88.

Can we build one for you?

This Christmas, give your kids something they'll still be playing with next Christmas.

The Stamp Collecting Gift-Pak.

It isn't just an ordinary Christmas gift your kids will get bored with. It's something to work with and get involved in. It's fun. It's stimulating. And it's got a lot of things in it. Colorful stamps in different sizes and shapes, hinges to mount them with, albums to put them in, guides, stories.

There's enough in the Gift-Pak to keep them busy for a year. And by the time they get through it, they'll have a hobby for a lifetime—one they can share with you and their friends.

They'll also learn things from stamp collecting that they don't learn in school.

Paul Revere wasn't the only one who spread the alarm. So did Sybil Ludington. A 16-year-old girl!

They'll learn that the country of Poland is called Polska there.

And how to say hello in Hindustani. (Namaskar.)

Did you know that Monaco could fit in New York's Central Park? Ask your kids. They'll know.

And that's just the beginning.

When your kids collect stamps, they become more curious, more organized, more appreciative of beauty. And their imagination just soars.

By next Christmas, your kids will grow. And not only by inches.

What it contains to keep your kids interested.

A *For the Fun of It.* A how-to book all about stamps and collecting.
B *50 Stamps from 50 Countries.* A starter kit containing cancelled stamps from almost everywhere. Also, mounting hinges, a 20-page album.
C *The Mint Set.* A collection of U.S. commemorative stamps from last year—all 29 of them. Also, a handsome album and interesting stories about the stamps.
D *Treasury of Stamps.* An album to hold the new commemorative stamps issued in 1977. Your kids will have fun collecting them all year.

The Gift-Pak, only $5.50 at your Post Office.

The Stamp Collecting Gift-Pak

Your Postal Service