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THE MASTHEAD of this issue shows a change of command in the magazine's leadership, the first in ten years. Wilbur E. Garrett, whose rare talent has been responsible for our matchless visual "look," has been named the GEOGRAPHIC's seventh Editor by the Board of Trustees. Bill and I have worked together for the past 26 years, and I have never ceased to marvel at the genius and energy, imagination and perseverance he brings to improving the magazine.

Joseph Judge becomes the sole Associate Editor. Joe heads our writers, editors, researchers, and News Service and chairs the Planning Council, where future subjects are discussed and chosen. I am grateful for his deft handling of this column since 1974.

As Editor, I counted many blessings, among them my close relationship with President Robert E. Doyle, whose counsel was welcome and always wise. He carries into retirement 46 years of Society service. We are assured of his continued guidance as Vice Chairman of the Board of Trustees, as I assume his responsibilities as President.

The greatest blessing, as always, remains our extraordinarily talented photographers and writers, illustrations and text editors, cartographers and artists, researchers and all others of the GEOGRAPHIC staff family.

Scanning our magazine, I am struck by the surge of knowledge in the 1970s—of the universe itself, computers, the new biology of genetic engineering, the landscapes of the moon and Mars, the shifting continents and deep oceans, and so many other frontiers.

I am struck, too, by the rapidity of political change, especially in the developing world, as big-power politics shifted arena from continent to continent, a resurgent Islam appeared, and the gap between the haves and have-nots widened under world inflation and soaring energy costs.

Challenges of environment and energy dominated this period. Our magazine filled hundreds of pages with articles on both themes, from the Alaskan tundra to the Everglades, from windmills to nuclear power.

However the world turns in the 1980s, with whatever dramatic further developments, the magazine under strong new leadership will continue to examine the issues and mirror the peoples and places that make the history.

Bill E. Garrett

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My Chesapeake— Queen of Bays 428

Allan C. Fisher, Jr., discovers ecological trouble brewing in the "demi-Eden" of this great estuary. Photographs by Lowell Georgia.

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"An architectural King Kong" in its first three years attracts more visitors than the Louvre and Eiffel Tower combined, delighting some, dismaying others. Photographs by Marc Riboud, text by Cathy Newman.

The Gauchos: Last of a Breed 478

Robert Laxalt and photographer O. Louis Mazzatenta document the vanishing way of life of South America's renowned horsemen.

Bamboo, the Giant Grass 502

It is strong, light, and a gourmet's delight, and no other living thing grows so tall so fast. Luis Marden travels worldwide to survey what he regards as the most useful plant on earth. Photographs by Jim Brandenburg.

Albania Stands Alone 530

In a rare glimpse of a nation that isolates itself from the world, Turkish photojournalist Mehmet Biber finds it sternly ruled, self-sufficient, and defiant of both West and East.

Life on a High Rock Ledge 558

Seemingly barren mountain faces in northern New England in fact support a host of hardy plants and animals, naturalist William H. Amos demonstrates.

COVER: *In the samurai tradition, Japanese fencers duel as sport with bamboo swords. Photograph by Jim Brandenburg.*

An aerial photograph of a bay at sunset. The water is a deep, dark blue, and the sky is a vibrant orange and yellow. A long, dark bridge-tunnel structure extends across the water, with a large, dark, triangular shape in the foreground, possibly a shadow or a part of the bridge's structure. The overall mood is serene and dramatic.

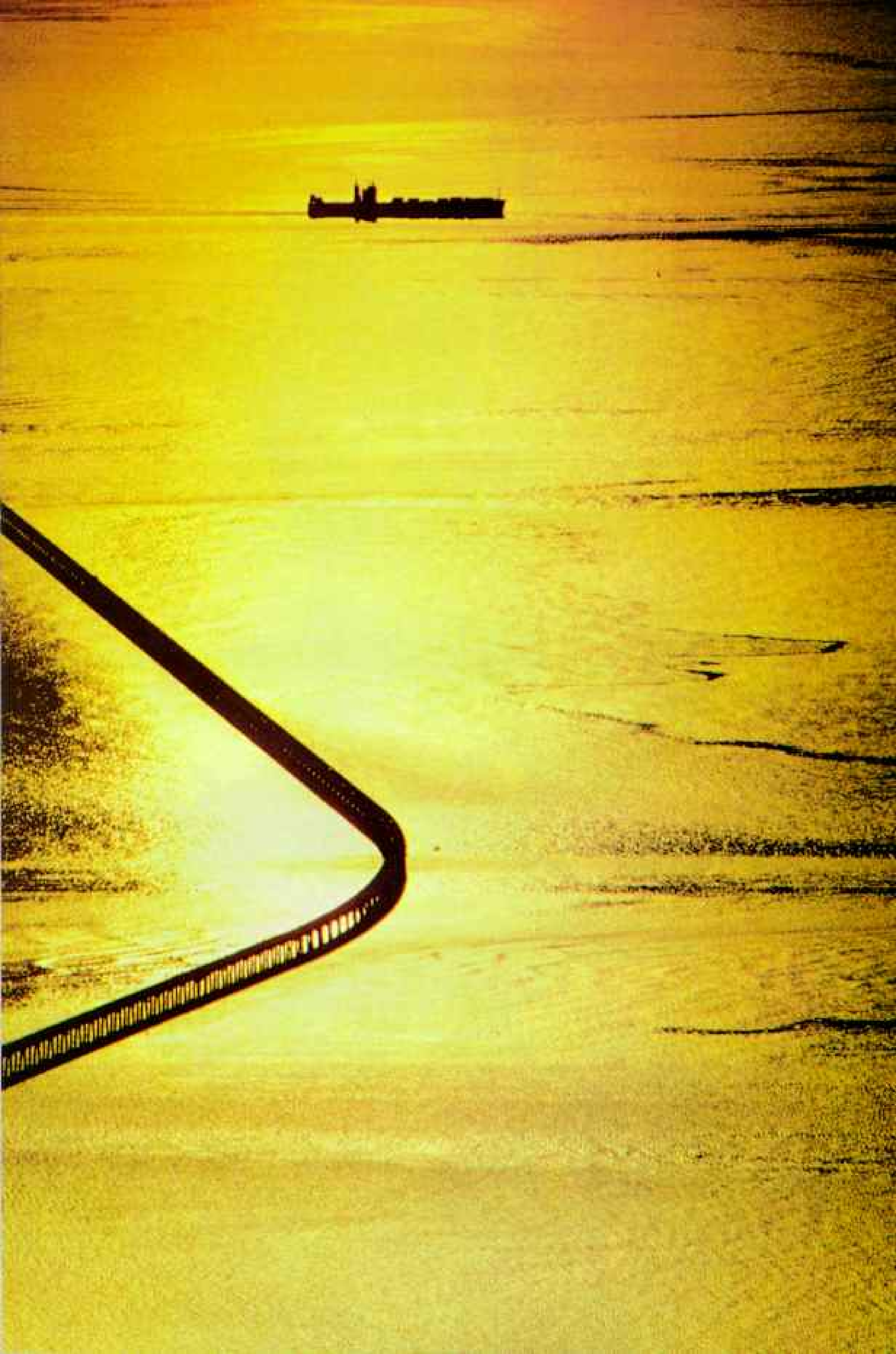
My Chesapeake— Queen of Bays

By *ALLAN C. FISHER, JR.*

ASSISTANT EDITOR

Photographs by *LOWELL GEORGIA*

*As evening yields its last light,
a lone freighter enters the Bay.
Behind it the 17.6-mile
Chesapeake Bay Bridge-Tunnel
links the Virginia Capes,
gateway to this threatened Eden.*





FOR MOST of my life I have lived near or on the Chesapeake Bay, largest estuary on the East Coast, a place of surpassing beauty and, to the eye at least, remarkably unspoiled despite ecological problems. We who are privileged to dwell there, even in the cities on its shores, feel the Chesapeake imparts something special to our lives. At our doorstep we savor tranquillity and changelessness. Walking, sailing, touring, we enter a more gracious past, return to the founding years. Fish and crab are still there to be taken, osprey and eagle still there to watch, and when autumn turns the shores into gantlets of flame for our boats to run, we welcome the beloved invaders, the more than 800,000 waterfowl that winter on the Chesapeake each year.

No wonder our hearts remain attached to that water world with the tenaciousness of its barnacles. We pride ourselves on a world that has always evoked superlatives, beginning with the first white men known to have seen it, Spanish explorers who described it as the "best and largest port in the world" and reverently called it the "Bay of the Mother of God."

Here our nation was cradled, beginning with the first permanent English settlement at Jamestown in 1607. Capt. John Smith, who explored and mapped the Chesapeake the following year, outdid the Spaniards in encomiums when he published in 1612 his "Description" of the land he found after entering through Capes Charles and Henry:

"Within is a country that may haue the prerogatiue over the most pleasant places of *Europe, Asia, Africa, or America*, for large and pleasant navigable rivers: heaven and earth never agreed better to frame a place for mans habitation. . . ."

Smith's map, published in the same year as his "Description," used the spelling "Chesapeack," derived from an Indian word meaning "great shellfish bay." But those of us who live there today usually refer

to it simply as "the Bay," as if there were no other, and we always capitalize it, just as Smith did.

Let's face it, Smith was one of the nation's first real estate publicists. But in size alone the Chesapeake impresses. It extends nearly 200 miles, with a width varying from four to thirty miles. Some 150 rivers, creeks, and branches empty into it, forming a filigreed maze of land and water, particularly on the Eastern Shore, that one could spend most of a lifetime exploring by boat without ever going back to the same cove or cranny. The tidal shoreline totals more than 8,000 miles (map, pages 439-41).

You people of Maine, you Californians and Oregonians, you who know the fjords of Norway or the steep-sided isles of the Mediterranean will look in vain for craggy shores and stark silhouettes on the Chesapeake. This is gentle, low-lying country, a timeless meeting place of woodland, field, and water with long vistas of solitude on the reaches of broad tidal rivers. We who love it do not miss the overstatement of crag and rock; this low country permits a big sky, lots of room for clouds and stars and wind.

Many boatmen call the Chesapeake the finest cruising grounds in the world, and it has been my fortunate lot to poke a bowsprit into nearly all its tidal rivers and scores of its creeks. Years ago I took my ketch into a large but virtually landlocked cove in the heart of Maryland's Eastern Shore, etched its lovely waters in memory, and later built a home on one of its peninsulas. There I watch the infinitely varied progression of Chesapeake seasons:

Spring—White blossoms of wild plum and shadbush rime shores where so recently snow has lain. Ospreys take sentinel positions in the dead tree near my dock, where muskrats cut furrows in still waters.

Summer—Heat blankets woodland and water, but in the afternoon black thunderheads mushroom swiftly in the western sky; sometimes

(Continued on page 446)

Ready for fancy finger work, Helen Taylor receives a heap of Chesapeake blue crabs at the annual crab-picking contest in Crisfield, Maryland. The record: 79 ounces picked and packed in 15 minutes in 1975. Though yields of shellfish and finfish have declined dramatically, leading to intensive new scientific studies, the nutrient-rich Bay remains the "immense protein factory" described by Baltimore journalist Henry L. Mencken.



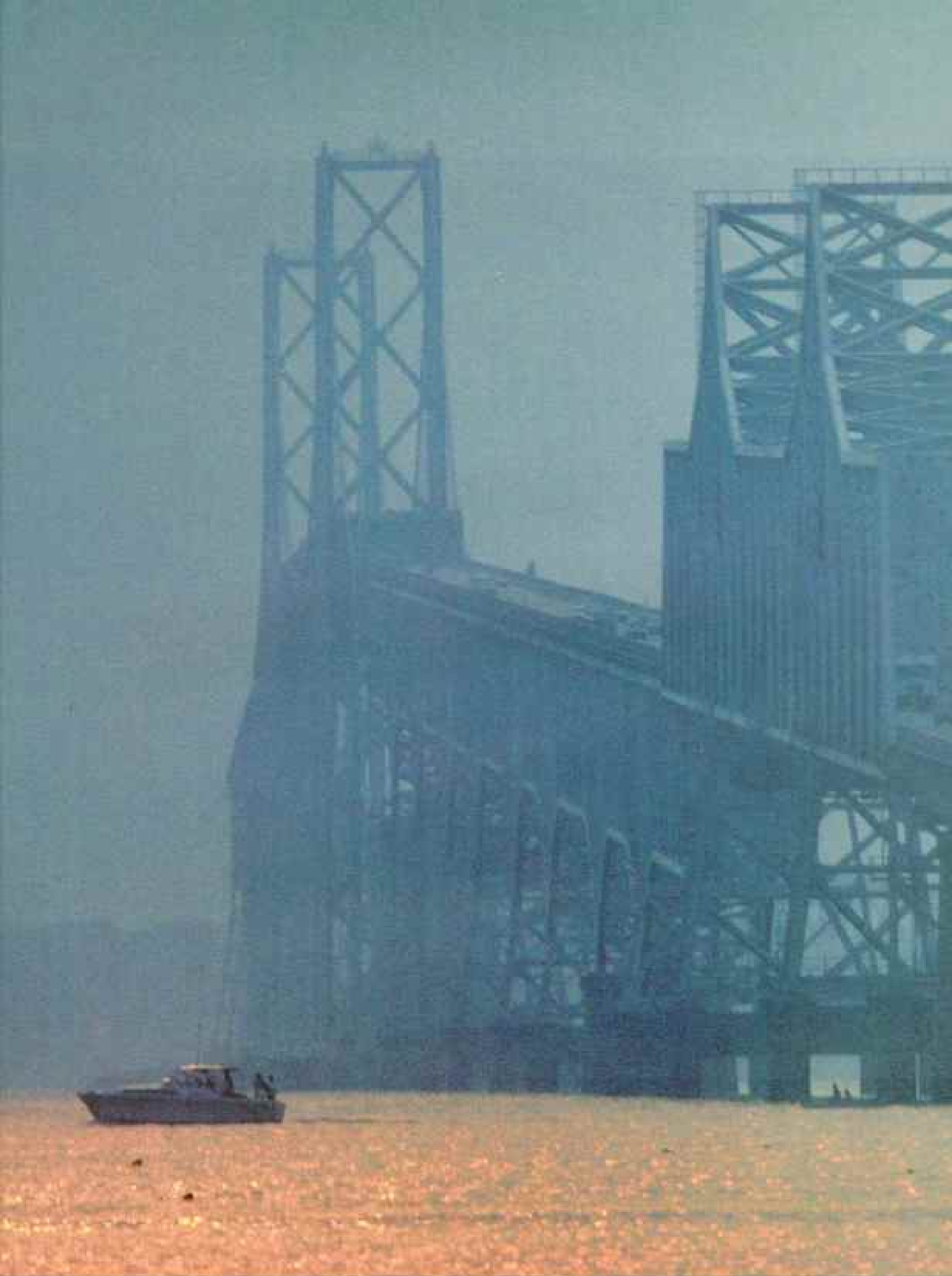
Handsomely into the wind, log canoes get off to a smart start on a weekend race out of St. Michaels, Maryland (above). A vanishing species, unique to the Bay, these onetime fishermen's craft owe their survival to a few sailors who revel in the challenges of handling them. Though crew members balance on springboards (right) to keep the canoes on even keel, the tall-masted, narrow-beamed vessels are easily overturned in gusty winds (facing page).

On the East Coast, only Long Island Sound exceeds the Bay in number of pleasure craft. But no place, say many seasoned sailors, tops the Chesapeake for cruising.

With a multitude of tidewaters reaching inland, the Bay was a magnet for early American settlers and soon became one of North America's leading shipbuilding centers. Many were the schooners from her shipyards that, like the Baltimore clippers, earned fame by slave running, smuggling, and other pursuits joining "deviltry and speed."







Great escape from the city for Baltimore and Washington weekenders, the 4.4-mile twin spans of the Chesapeake Bay Bridge have also changed forever life



on the Eastern Shore—increasingly a country retreat for the well-to-do. A short drive east, seaside communities like Ocean City, Maryland, are now booming resorts.





EARLY SATELLITE COOPERATION (RENDERING AND NOBIS FROM LANDSAT DATA)

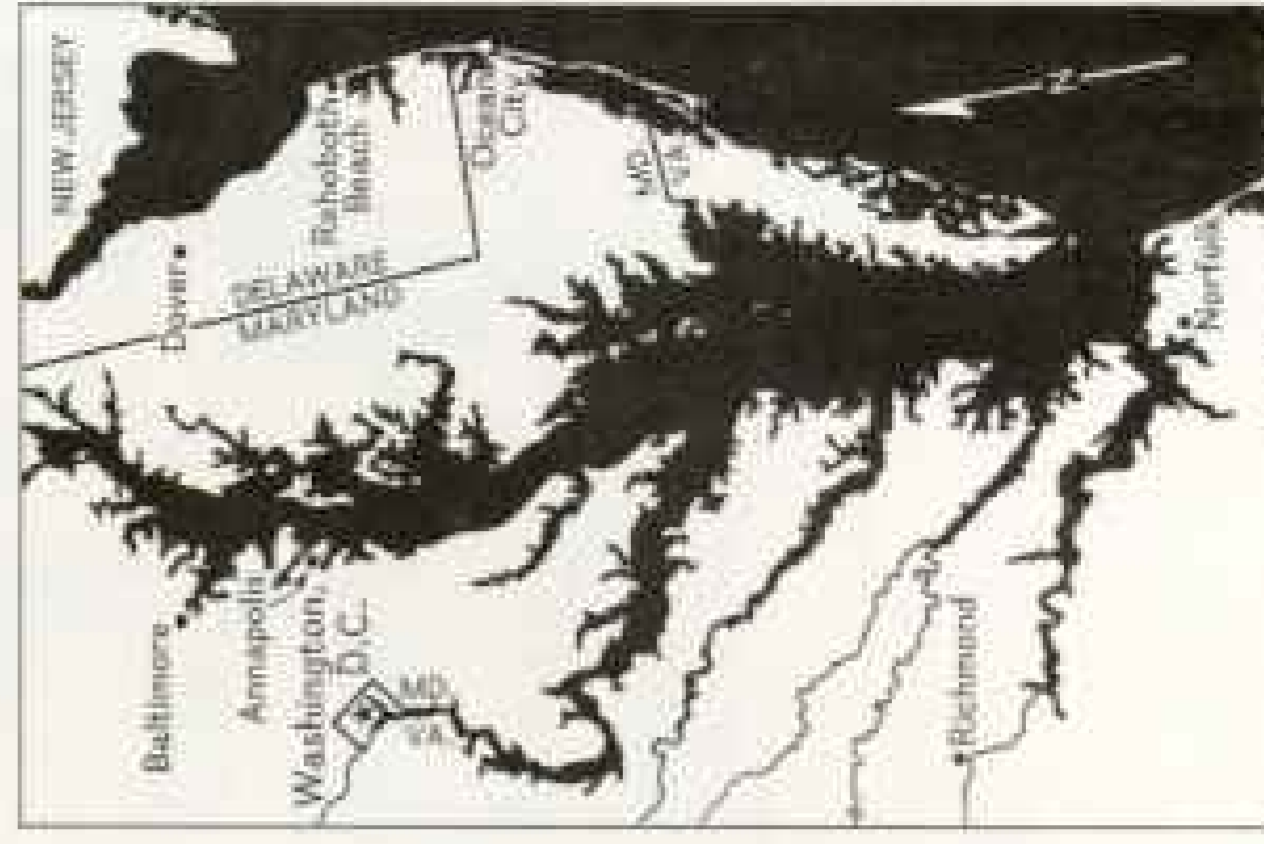
Infrared portrait of a great estuary

AS IF SMILING for a celestial photographer, the Bay lay revealed on two remarkably cloud-free days in October 1972, as an earth-resources satellite traversed 570 miles overhead. From its remote sensors comes a mosaic of four skillfully blended images. The geographer's bonanza bears not only countless physical details, but also the dynamics of an ecosystem.

In the false-color image, vegetation appears as various shades of red. Thousands of patches of light blue are the freshly harvested fields of October and give the Delmarva Peninsula a pale, mottled complexion. Larger concentrations of blue show the asphalt and rooftops of large urban areas. What

resembles a fringe of mildew along the southwestern flank of Delmarva is actually incredibly fertile wetlands, haven for waterfowl and shellfish.

The effects of man's activities on Bay ecology are dramatically illustrated by the upper reaches of the Potomac, Rappahannock, and James Rivers, which, heavily sedimented after a day of driving rains, appear light blue. Cleared for agriculture and urban development, their watersheds are much more susceptible to erosion than is forested land. It is widely believed that heavy charges of silt, flushing into the Bay, tend to smother aquatic vegetation, thus disrupting the food chain. The situation might be eased, experts say, by planting bands of trees next to riverbanks.



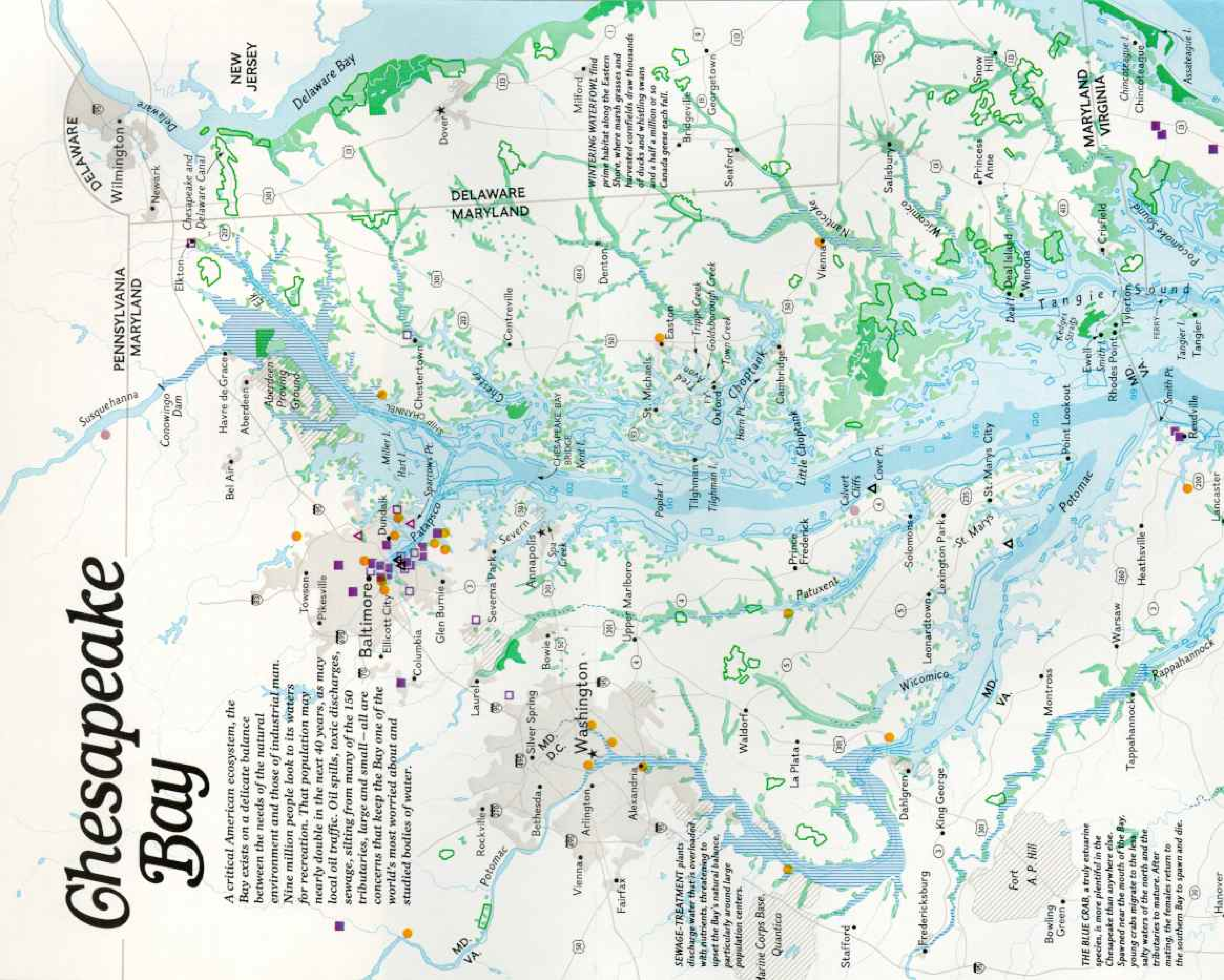
Chesapeake Bay

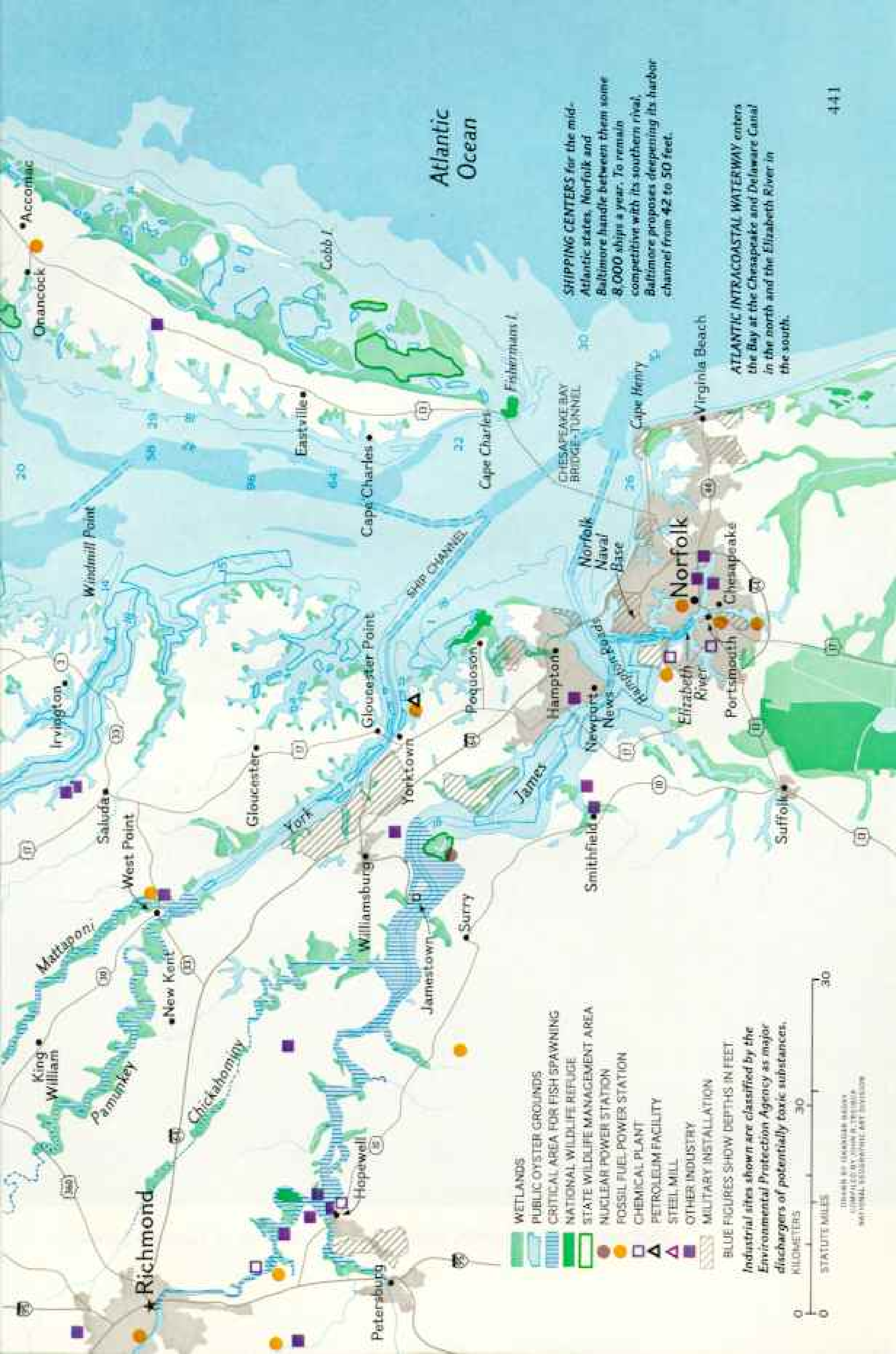
A critical American ecosystem, the Bay exists on a delicate balance between the needs of the natural environment and those of industrial man. Nine million people look to its waters for recreation. That population may nearly double in the next 40 years, as may local oil traffic. Oil spills, toxic discharges, sewage, silt from many of the 150 tributaries, large and small—all are concerns that keep the Bay one of the world's most worried about and studied bodies of water.

SEWAGE-TREATMENT plants discharge water that is overloaded with nutrients, threatening to upset the Bay's natural balance, particularly around large population centers.

WINTERING WATERFOWL find prime habitat along the Eastern Shore, where marsh grasses and harvested cornfields draw thousands of ducks and whistling swans and a half a million or so Canada geese each fall.

THE BLUE CRAB, a truly estuarine species, is more plentiful in the Chesapeake than anywhere else. Spawning near the mouth of the Bay, young crabs migrate to the less salty waters of the north and the tributaries to mature. After mating, the females return to the southern Bay to spawn and die.





- WETLANDS
- PUBLIC OYSTER GROUNDS
- CRITICAL AREA FOR FISH SPAWNING
- NATIONAL WILDLIFE REFUGE
- STATE WILDLIFE MANAGEMENT AREA
- NUCLEAR POWER STATION
- FOSSIL FUEL POWER STATION
- CHEMICAL PLANT
- PETROLEUM FACILITY
- STEEL MILL
- OTHER INDUSTRY
- MILITARY INSTALLATION

BLUE FIGURES SHOW DEPTHS IN FEET.

Industrial sites shown are classified by the Environmental Protection Agency as major dischargers of potentially toxic substances.

0 0 30 30

KILOMETERS STATUTE MILES

MAPS BY GEORGE BERRY
 COURTESY OF NOAA/RTD/EDS
 NATIONAL GEOGRAPHIC ART DIVISION

Atlantic Ocean

SHIPPING CENTERS for the mid-Atlantic states, Norfolk and Baltimore handle between them some 8,000 ships a year. To remain competitive with its southern rival, Baltimore proposes deepening its harbor channel from 42 to 50 feet.

ATLANTIC INTRACOASTAL WATERWAY enters the Bay at the Chesapeake and Delaware Canal in the north and the Elizabeth River in the south.



Visitors from the north, hundreds of thousands of Canada geese,



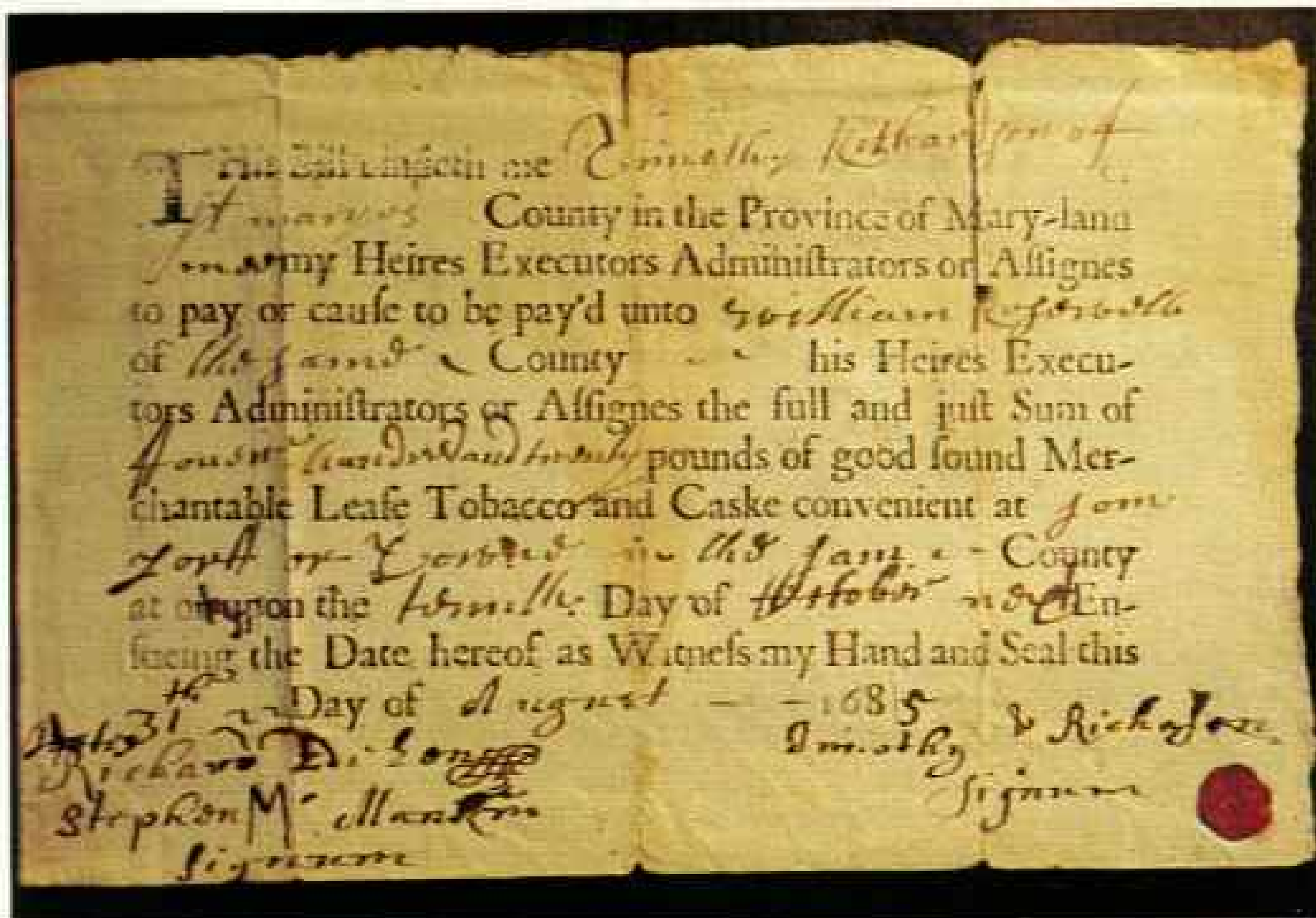
like these at Oxford, Maryland, winter in the Bay's tidewaters.



"Merchantable Lease Tobacco," like that promised in a 17th-century note (below), long kept colonial purses fat and European smokers happy. Though diminished in importance, it is still a major crop along the Bay's western shore, where young Richard Lee Burch (left) impales stalks on a

stick for curing in the family barns.

A tiny flaw in a block of type (bottom right) identifies it as the "M" in the 1685 document. Thought to be the oldest found in this country, the type was discovered at an archaeological site (bottom) in old St. Marys City—Maryland's first capital.



MARYLAND HALL OF RECORDS, ANNAPOLIS



(Continued from page 431) they miss us, often they hit violently but run away. With suicidal impulse, crabs seek out my pots, and at dusk cruising sailors ghost their boats into my sheltered cove, there to dream away the languorous nights.

Autumn—Leaves of sumac, sweet gum, and dogwood flare redly in the woodlands; our huge oaks turn yellow. Then, on a crisp October morn, my wife and I hear what we have been waiting for, the *ronk-aronk-ronk* of Canada geese riding a north wind to winter haven on the Chesapeake. Soon hundreds overnight in our cove, with ducks and whistling swans, and at times their communal calls keep us awake.

Winter—In the night sleet comes with a soft sibilance; it changes to snow. Within days gray ice seals the entire cove, and we feed corn to hungry waterfowl that cannot forage. Finches, chickadees, and titmice flutter about our feeders, vying for position, and vultures perch like ominous specters in the dead tree.

MANY PEOPLE live like that on the Chesapeake and its tributaries. But—there's trouble brewing in our demi-Eden.

This huge estuary is a very complicated ecological system. Into it the rivers pour fresh water, and into it the tides push the salty waters of the sea. They mingle in a 2,500-square-mile mixing bowl, with salinities varying from near zero at the mouth of the Susquehanna, in the Bay's north, to 30 parts per thousand, almost that of the ocean, where the Bay joins the Atlantic.

Here live myriad creatures that prefer little salinity, others that like more, some that are casual visitors, others that reproduce here but wander elsewhere, and still others that spend their entire lives in, on, or beside the Bay. In all, some 2,700 species inhabit it.

It is an amazingly resilient environment. Nearly all its water dwellers tolerate some fluctuation in salinity, and many show remarkable adaptability when drought cuts the freshwater input or storms and spring freshets multiply it. Basically the fresh water flows south in the Bay's upper layers, and the saltier water flows north, or up the Bay, in the lower layers. Tides, winds, and seasons complicate these currents, but among

the final results is a flushing and cleansing exchange between estuary and ocean.

That cleanout keeps the body of the Chesapeake healthy, but not necessarily its many arms. Today the Bay is like a lovely, vigorous woman showing early signs of serious malaise.

Almost no sturgeon now are caught in my Chesapeake. Two fish that once spawned there in astronomical numbers, the shad and striped bass, have declined severely. The 1979 shad catch yielded only \$236,955, and the stripers, locally known as rockfish, have not reproduced well since 1970. Oyster spat, or young, have not been surviving as they should, and the crab, though a hardy critter with normal ups and downs in population, is not there in the abundance of yore. Aquatic grasses, sources of food and cover for some species, have been dying.

Even so, in recent years the annual catch of shellfish and finfish has averaged more than 500 million pounds. The Chesapeake is still a very fecund place.

"The whole system is fairly healthy, and the open Chesapeake in particular is in good health," says Dr. L. Eugene Cronin, who heads the Chesapeake Research Consortium. "But many of the tributaries have troublesome problems, and there are indications of larger problems in the future."

Dr. Walter R. Taylor, acting director of the Chesapeake Bay Institute, a part of the Johns Hopkins University, agrees. Of the problems in the tributaries, he says, "I can see where if they are not controlled they will spill out into the Bay. The Bay has a remarkable ability for recovery. But how near are we to the edge?"

That's not an easy question to answer. Many factors affect the tributaries, often interacting in complex ways that may change with temperature, salinity, season, weather, even time of day. The suspected culprits include sewage, nearly all of it treated now but still a massive source of chemicals, nutrients, and organic matter; pesticides and herbicides in runoff from farms; heavy metals, often toxic, from industrial and other discharges; sediment from soil erosion and organic solids; and nutrients such as nitrogen and phosphorus, from farm fertilizers, which stimulate algal blooms, mats of floating growth that decompose and take from

the water the dissolved oxygen that fish and other creatures need.

A good understanding of just what is happening, and why, to shad, rockfish, oysters, grasses, still eludes scientists. But there's no doubt about the fundamental cause of the Bay's malaise. Ask any of its watermen, that special breed of good ole boys with reddened faces, callused hands, and drawling, accented speech, the homespun traditionalists who wrest from an often hostile Chesapeake its seafood bounty. Ask my archetypical waterman friend, Edward "Epps" Abbott, 67, who since childhood has harvested waters near the lovely little Eastern Shore town of Oxford, Maryland.

"Who's to blame? Everybody who wants to know the villain should go look in their mirrors. The biggest harm to seafood is people," says Epps. "But as to just how all those discharges and runoffs do it, seems like nobody knows nuthin' yet. Me, I admit I don't. The more I'm on the water the less I claim to know about it. All I know is, if sumthin's out there I kin catch it."

As the little comic strip character Pogo said, "We have met the enemy, and he is us." Moreover, our pressures can only increase. "Environmentalists would like people to disappear," comments Dr. Taylor. "Well, they're not going to."

There are only two large metropolitan centers on the Chesapeake, Baltimore in the northern part and the Norfolk-Newport News-Portsmouth-Hampton complex in the southern. Both lie on the western shore, and the only sizable community between them is Annapolis. The Eastern Shore has only a few small cities, such as Easton, Cambridge, and Salisbury, and a wide scattering of quaint villages, the haunts of watermen, farmers, retirees, and cruising yachtsmen.

But the U. S. Army Corps of Engineers has made a study of pressures that can be expected between now and 2020. To ecologists these projections read like a horror story.

The region's population, now about nine million, will nearly double, as will land needed for residential purposes. Boating activity will increase fivefold. Bulk oil traffic throughout the Bay will double. Demand for electricity may go up as much as 13.5 times.

And what will happen to the bounty of the Chesapeake at present rates of harvesting? By the year 2000, maximum sustainable yields (the greatest harvests that can be taken without affecting subsequent yields) will be exceeded for blue crabs, spot, rockfish, white perch, shad, weakfish, flounder, and eel. By 2020, catches of oysters, soft-shell clams, menhaden, and alewives also will exceed maximum sustainable yields.

In money terms, oysters long have been the Chesapeake's most valuable resource, worth more than 20 million dollars in the 1978-79 season. Back in 1885 Maryland watermen harvested 15 million bushels of these prized shellfish, but the catch has been on a long decline ever since. In the 1978-79 season, the yield was only 2,197,409 bushels, although that still exceeds any other state. Virginia, which once outproduced Maryland, suffered a severe invasion of oyster disease organisms in the 1950s.

Many years ago virtually unrestrained harvesting reduced oyster beds, but both Maryland and Virginia have long practiced conservation. They limit catches on public beds, and they strew bottom areas with old oyster shells, which the young spat attach to and grow on. The states even dredge up many newly attached spat and dump them in other areas to mature.

Yet the rate of the spat's "set," or attachment to old shell, has not been good in most recent years. Dr. Peter E. Wagner, director of the University of Maryland's Center for Environmental and Estuarine Studies (CEES), explained the problem.

"If you look at pollution measured by coliform count, there has been sensational improvement in water quality because of higher standards for sewage processing," he said. "Formerly that kind of pollution closed down 37,000 acres of shellfish bottom in Maryland; now the figure is 6,200 acres. But if you look at oysters as a crop, you have to say the Bay's in trouble. It is not necessarily correlated to the health of the species or the cleanliness of the waters. We know that the oysters are fertile, but the number of spat per bushel of shell is way down. Why? There is no hard evidence as yet.

"Is what we are seeing something natural or cyclical? Is it pollution? Chlorine? Overfishing? Does something kill the spat? If we

have many more years such as we have been having, there won't be any oysters. We must bridge our ignorance, and we must propagate oysters and plant them in the Bay."

The oyster begins life as a free-swimming larval form, and when it attaches on the bottom, it's only about the size of a pinhead. But it changes quickly to a shelled organism and grows about an inch a year.

Oysters live in areas where the annual salinity averages from five parts per thousand all the way up to the salinity of the ocean. Briefly they can tolerate lower salinities. The Bay normally gets more than half its fresh water from the mighty Susquehanna, but for ten days during and after tropical storm Agnes in 1972 the river's flow averaged 15 1/2 times greater than normal. Some two million bushels of marketable Chesapeake oysters were destroyed, and in some areas of the Bay the oysters were totally wiped out.

The same thing happened to soft-shell clams. Watermen call them "manoes," and on the Chesapeake they historically weren't thought worth eating. But in the 1950s the invention of a hydraulic dredge made large-scale clam harvest feasible, and a market in New England developed. Yet, inexplicably, in 1969 clams began dying in parts of the Potomac River and the Eastern Shore, and Agnes killed most of what remained.

Each year in early autumn, before the opening of the oyster-dredging season, the University of Maryland's CEES sends Dr. George Krantz and a team of colleagues out on the waters to sample oysters on 146 bars, or "rocks," to use the watermen's term. On the day I shipped aboard *Aquarius*, a 65-foot research vessel, we dredged up samples from the Choptank and its arms.

By law only sailboats can dredge oysters from public bars in Maryland waters. Today that means the old skipjacks, last of the nation's working sailboats (pages 464-5). But such restrictions do not apply to *Aquarius*, and at each bar her crew would lower a dredge, haul up oysters, and dump them on deck, where experts examined them for disease, size, and quality of meat.

Dr. Krantz said the Bay-wide trend for spat set had been down since 1968, and the last good year for a set in Maryland had been 1977. "These levels are just not adequate

to sustain the oyster fishery," he said.

In the Tred Avon River at Oxford a weathered, graying waterman, Bobo Tennant, came aboard to show us a bar where he had found "bad" oysters. Bobo, like most oystermen, isn't a dredger; he's a tonger. From the gunwale of his boat he scoops oysters from the bottom with rakelike metal tongs on long wooden shafts. Watermen call this backbreaking labor "tungin'."

Aquarius dredged up a sample at the juncture of Oxford's Town Creek and the Tred Avon, and sure enough, after the oysters were shucked, their meat looked puffy, watery, and transparent, not firm and plump; they were unfit for market.

"Particulate matter has washed down here from Oxford's storm sewers and marinas on Town Creek," Dr. Krantz said. "This organic matter, settling in deeper water, has deprived the oysters of oxygen for most of the summer. The water begins to clear,



"We eat the losers to improve the breed," joked an official of Crisfield's 1979 Crab Derby. Here Number 137, a "jimmy," or male blue crab, leads in a slippery heat (right). In a more scholarly approach, Bob Miller of the University of Maryland inserts a tracking tag through a muscle, where it will not be lost during molts.

however, after the first hard frost, so the oysters will recover and be in good health by Christmastime."

To Oxford's credit, its sewage-treatment plant has recently been improved and upgraded and is considered efficient.

George Krantz operates an oyster hatchery at the CEES Horn Point Environmental Laboratories on the Choptank, and he has planted some 30 million spat experimentally. While they're no substitute for natural spawning and growth, he said, hatcheries could help during years of poor spat set and might even save the industry.

Young oysters have not been surviving in Virginia waters either. Dexter S. Haven, of the Virginia Institute of Marine Science (VIMS) at Gloucester Point, part of the College of William and Mary, told me scientists used to find 2,000 baby oysters on a bushel of shell in the lower James River; that declined to only 200 per bushel, although they noted

some improvement last year. The sharp decline has also occurred in the York River and other Virginia tributaries.

Poor spat set has proved so puzzling that scientists, when asked about it, often reply with questions of their own. "Is it chlorine?" asked Mr. Haven. "The James gets much more treated sewage than it used to. About when this decline started, we were using more pesticides and herbicides. Are they responsible? I believe a combination of factors is putting oyster larvae in great stress."

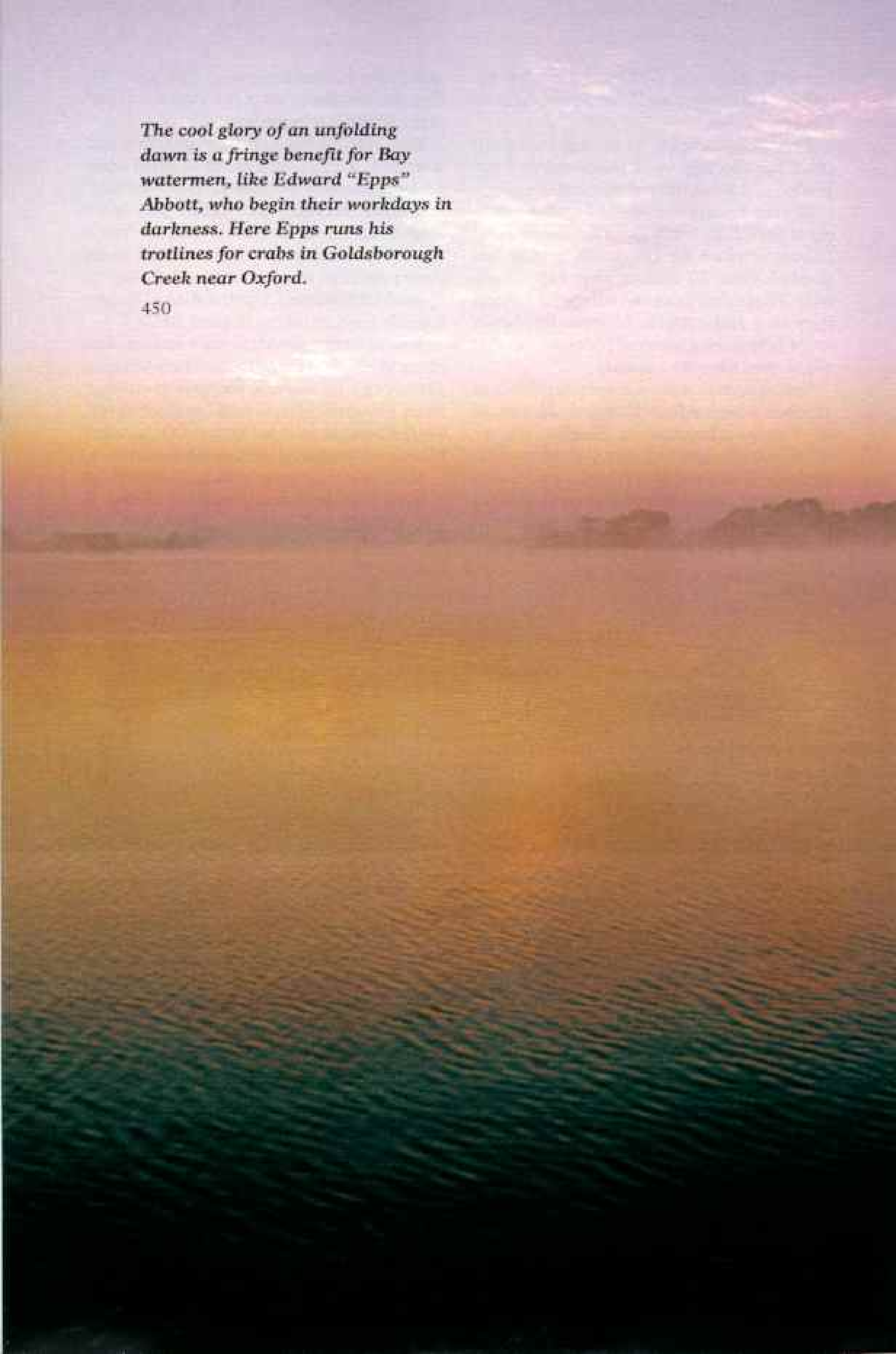
A devastating oyster disease known simply as MSX, first noted in the Chesapeake in 1959, can't be blamed for spat mortality. MSX primarily affects adult oysters; moreover, it cannot exist in low salinity, so most Maryland waters have not suffered from it.

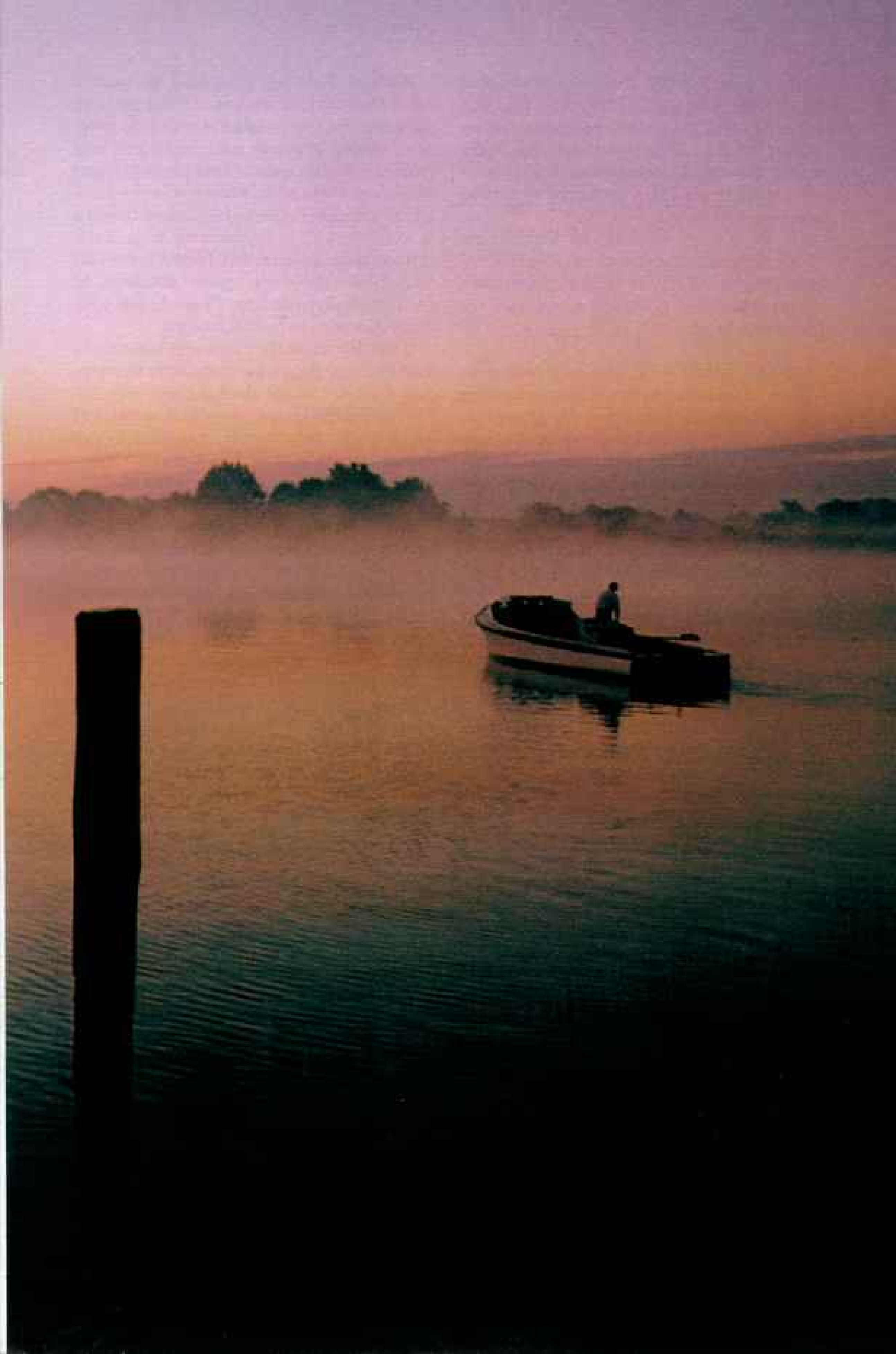
MSX is an organism affecting the cells of oysters. "We don't know how the disease is transmitted, and we can't culture it," said Dr. Frank O. Perkins of VIMS. "Is it a



The cool glory of an unfolding dawn is a fringe benefit for Bay watermen, like Edward "Epps" Abbott, who begin their workdays in darkness. Here Epps runs his trotlines for crabs in Goldsborough Creek near Oxford.

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mutation, or was the organism introduced here? Is there an intermediate host bringing in the disease? We know it can be carried by water, but it could be by an organism in the water. If we could transmit the disease from one oyster to another, we might be getting somewhere, but so far we can't."

So the yield is down in all Virginia regions. Virginians, a proud lot, don't like to admit it, but to stay in business the state's oyster processors now buy about half the Maryland catch.

LIKE OYSTERS, the esteemed blue crabs begin life as free-swimming larvae. Something *Homo sapiens* does may be affecting them too; in recent years catches have been down, but the pugnacious crab is not in critical short supply like the oyster. Crab abundance always has been cyclical. Generally, commercial fishermen take them by crab pots; in Maryland tributaries trotlines must be used.

Catching crabs on lines is more interesting and challenging than emptying pots. My friend Epps Abbott is an expert, and I like to go out with him in Goldsborough Creek, where he's run trotlines for 22 years. "I come in here after my daddy died," he said. "I move the line about, but always in this creek from May to September. If you keep runnin' around, you're always where they ain't."

Goldsborough lies just downstream from my own Trippe Creek, and I thought I knew those waters well until out with Epps one black predawn morn in his 35-foot workboat. At times I wasn't sure where we were, but Epps steered as if it were high noon.

Still in complete darkness, Epps dropped overboard one end of a half-mile-long trotline, weighted with a window sash weight and marked with a floating plastic bottle. As the boat moved slowly ahead, he payed out line baited every four feet with pieces of eel that had been pickled in brine. At the end of the line, he dropped another sash weight and marker. Farther up Goldsborough, he put out a second "lay" or "set," this one baited with bull lips.

"Yep, you heard me right," Epps said. "Bull lips from a slaughterhouse. Good bait and a lot tougher 'n eel. The darn bull lips will last a week 'cause crabs can't chew 'em up as easy."

With daylight we went back to the first set. Epps lifted the line over a roller fitted on the gunwale, and we idled forward. At a regular, almost hypnotic pace, each bait rose from the depths, passed over the roller, and submerged behind us. Most pieces of eel had a crab clinging to them. Just before the crab broke water, Epps slipped a dip net under it if it looked legal size: five inches across the back shell. In these quick decisions he seemed almost unerring. Piles of squirming crabs mounted in bushel baskets.

That day he would catch only three and a half bushels; the prime crabs were bringing \$20 a bushel at the dock, others only \$8. "When I first started, you could sometimes catch eight, ten, twelve, maybe fourteen barrels of crabs, not just bushels," Epps commented. "Nowadays six, seven bushels, that's pretty good crabbin'."

After completing a run down one line, we both by tacit consent looked long and appreciatively at the newborn sun's golden effulgence on puffy clouds and mirroring water. "Nice time of day," said Epps. "It's pure out here, ain't it? A healthy life, and it's your own. You can do what the hell you want."

He made it sound like a prayer of thanksgiving, and I have heard other watermen speak that way. This nation has no prouder or more independent men. Maryland and Virginia together have some 18,000 full-time watermen; probably more than that work part-time on the water. There are still many veterans like Epps who neither know nor want any other life, and it still attracts sons from such old fishing communities as Tilghman, Smith, and Tangier Islands.

Like all his sturdy breed, Epps is an acute observer, full of untutored knowledge. As he crabbed, he reminisced.

"It's true you can't catch nary a crab up at the heads of some creeks where we used to get 'em real good, and the grasses been dyin' off everywhere. Some think it's chemical runoff from the farms doin' it. But you can't have farmers 'n' watermen fightin'. You need both of 'em.

"There used t' be piles of dead grass two feet high around many a shore, all natural die-off of thick growth. We used it to pack soft-shell crabs in. Now you kin walk miles around the shore and not see any.

"But the grasses come back in some creeks

last year. I remember growin' up we had seven-year cycles of grasses. Nature's been takin' care of things out there all these years. Guess you have to depend on cycles.

"An' when I was a boy, you knew that the first moon in May they'd be soft crabs sheddin' around the shore. Now you never see 'em until June. The cycle's different." Epps cocked his head at me and grinned. "Maybe those men walkin' around on the moon did somethin', tipped 'er sideways, 'cause now it seems all the seafood's over in Japan."

Watermen invariably comment on the loss of aquatic grasses. Dr. Peter Wagner told me that his CEES investigators believe whatever is inhibiting the grasses comes from the surrounding watershed, but the what and how of it remain unknown. Recently his Horn Point laboratories have been planting grasses in small artificial ponds lined with material from the Bay's bottom and filled with Bay water polluted in various ways. Eventually that approach may yield clues.

OF THE 200 SPECIES of finfish that frequent the Chesapeake Bay, the striped bass, or rockfish, has long been the most popular among both commercial and sport fishermen. It's a fighter, and it tastes delicious. It is even the official state fish of Maryland. When it fails to reproduce, everyone worries.

Perhaps 90 percent of the East Coast's striped bass spawn in the Chesapeake, though they wander in the Atlantic as far north as southern Canada. They are anadromous fish, meaning they go up the Bay's rivers to release their milt and roe in the less salty water. Before eggs evolve into juvenile fish, the species undergoes a normal mortality rate of 99.99 percent. It survives because of prodigious reproduction in "dominant years," when nature permits a larger than normal "class" to attain maturity.

But there hasn't been such a year since 1970. Again, the same questions are asked. Is it because of chlorine? Chemicals? Nutrients? Sediment? Many watermen suspect the latter. In the Potomac and Patuxent, for example, striped bass have been spawning farther and farther downstream, and increasing loads of sediment may be the reason. Every time a home is built on the Bay,

four tons of sediment end up in the water.

So, like oysters, the stripers remain enigmatic. "Despite all the study that's been done, no one really knows why the trend is down," said William "Pete" Jensen of Maryland's Department of Natural Resources.

University of Maryland biologists believe they've uncovered a basic truth about dominant-year reproduction of rockfish. In late fall a hard freeze holds dead vegetation upstream in the rivers and creeks. A cold winter keeps it there. Then in spring a quick melt of snow and ice and heavy rainfall wash the vegetation downstream in volume. Zooplankton feed on it and multiply; young rockfish voraciously devour the zooplankton and thrive. Lo, a dominant year.

The theory, developed largely by Drs. Walter Boynton, Don Heinle, and Tibor Polgar, correlates well with weather records and successful years for rockfish juveniles.

The meat of the gourmet's delectable rockfish, and other fish as well, can have traces of arsenic, cadmium, copper, lead, and chromium, as well as a long list of chemicals and pesticides. Such trace amounts may not harm humans, but Dr. George Krantz, who breeds rockfish in addition to oysters, has found that these substances may kill the eggs or result in deformed offspring that do not survive.

American industry uses between 45,000 and 50,000 chemicals, with about a thousand new ones being introduced each year. Among them, an insecticide named Kepone has levied a heavy toll on the Bay. In 1975 it was discovered that Kepone was poisoning workers at a chemical plant in Hopewell, Virginia, on the James River. The chemical also had been dumped in the river, where it had gone undetected for eight years while spreading throughout the river's organisms and food chain. For a time the lower James, a particularly fecund place for oyster spat, had to be closed to all fishing, and some species still cannot be taken there.

Like most chemicals, Kepone has an affinity for bottom sediment. "It is not being flushed out very rapidly, and it degrades, or breaks down, extremely slowly," said Dr. Michael Bender of VIMS. "At the rate things are going, it may take a hundred years or so to cleanse the river."

Although Kepone isn't fatal to the James's



Time still hangs gracefully over the Eastern Shore. Country estates, like this one (right) on a tributary of the Tred Avon River, hark back to when colonial Maryland was a region of far-flung tidewater plantations accessible only by creek or inlet.

Although land here is expensive and a lure for investors, the main crops of corn and soybeans go literally for chicken feed. Once sold, this land (above) will probably remain under cultivation, its harvests bought by area poultry growers.





inhabitants, it invades them and it lingers. Dr. Bender told me that a fish, oyster, or crab for human consumption cannot have even one part per million of the chemical. Some creatures contain more than others, and nobody really understands why. It probably has to do with their habits. For example, the popular croaker, or hardhead, can have too much Kepone in it, and so can the largemouth bass; yet shad, catfish, and oysters will not exceed the limit.

Bottom mud and sediment in all industrial harbors contain toxic chemicals, and Baltimore's fouling has been building up for more than 200 years. Both the state and city would like to deepen the channel of this big natural port from 42 feet to 50 feet, which would require dredging 120 million cubic yards of material.

Where do you put such a huge amount of toxic spoil? Officials evolved a plan that includes using 52 million cubic yards to enlarge and join Hart and Miller Islands, two small, uninhabited islets on the open Bay just north of the harbor entrance. The spoil would be contained behind dikes.

This proposal triggered a controversy that has raged for several years. In favor: state and local agencies, the booster Greater Baltimore Committee and other business groups, and, significantly, that environmental watchdog, the Chesapeake Bay Foundation, never any patsy for the establishment. In opposition: powerful Congressman Clarence D. Long, in whose district Hart and Miller lie, aroused constituents, and many national environmental groups.

Recently fish and crabs have returned to parts of Baltimore harbor, and once again grasses have begun to grow. Water-quality controls are working, and industry's cleanup has been led by Bethlehem Steel, whose plant and shipyards form the harbor's largest complex.

Since 1950 Bethlehem has spent more than 90 million dollars on water-pollution control at its Baltimore operation alone, and

For a song, the lucky Chesapeake scavenger might steal away with a bargain from one of the hundreds of area flea markets that deal in everything from trash to treasures.









Steeped in colonial history, Annapolis, capital of Maryland, is also the Chesapeake boat set's most popular port, as evidenced by crowded Spa Creek (left), which gives way to the U. S. Naval Academy and the Severn River, in background. This year the academy graduated its first coed class. No mollycoddling allowed, women pull their own weight in sports (above) and military training. On liberty, middies admire a motionless live mannequin (top), who exhibits discipline of a different stripe.

some 65 million dollars to clean up smoke and gases from stacks.

Bethlehem has an arrangement with the city that is unique in the world. Each day the steel plant pipes some 100 million gallons of treated water from Baltimore's nearby sewage plant and uses it in industrial processes. Then Bethlehem cleanses the water to Environmental Protection Agency standards and releases it into the harbor. In return the steelmakers give the Baltimore and Washington, D. C., sewage systems their "pickle liquor," an iron-rich waste by-product of steelmaking ideal for removing phosphorus from sewage.

AT THE OTHER END of the Bay, in the Norfolk-Newport News-Portsmouth-Hampton complex, another environmental donnybrook has been going on for five years. This involves a proposed 850-million-dollar oil refinery on the Elizabeth River, very near the lower James and its oyster beds but in a heavily industrialized area.

The effect of some chemicals on water quality may be debatable, but about oil there's no doubt: It's sheer poison. A major spill of 250,000 gallons of fuel oil off Smith Point in 1976 coated beaches and wetlands on both sides of the Bay. Biologists counted 10,000 dead waterfowl, and estimate as many as 50,000 birds may have perished.

Hampton Roads Energy Company seeks to build the refinery, which would produce 175,000 barrels of fuel a day. Robert E. Porterfield, vice president of the company, told me the East Coast needs ten refineries of that size. He said there already are 18 commercial oil-handling facilities within a ten-mile radius of the proposed plant, including a naval fuel depot next door.

The company has met all the complex requirements of state, federal, and local law, yet has not been able to turn a shovelful of dirt because of lawsuits brought by environmentalists.

"They wanted the regulatory agencies, they wanted the laws, but when all conditions have been met and the agencies have completed the permitting process, they still object," said Mr. Porterfield bitterly.

An opponent of the new refinery, Dr. J. Parker Cross, Jr., sounded equally bitter. "I

don't think it'll ever be built," he said flatly. Dr. Cross, a physician, heads the Committee Against Refinery Effects (CARE). He said the area already had a high death rate from pollution-linked diseases, and he added, "Counties in the United States that have refineries have a higher incidence of cancer of the throat, trachea, and lungs." Several local medical societies have passed resolutions supporting CARE. The danger to the Bay's marine fisheries, Dr. Cross felt, was only too obvious.

On a tour of the harbor by boat, photographer Lowell Georgia and I passed the nation's largest floating dry dock. It held the *El Paso Southern*, a 948-foot tanker for liquefied natural gas. This giant thermos bottle and eight others transport LNG from Algeria to a terminal at Cove Point, midway up the Chesapeake's western shore. They unload at a huge pier a mile offshore, and pumps force the liquid through an underwater pipeline to storage tanks on land. After re-gasification the fuel passes into a transmission system serving seven states.

Environmentalists demanded and got the underwater pipeline. The two gas companies building the terminal wanted the line atop an overwater trestle. The companies also agreed to establish a buffer greenbelt around the plant.

LNG has a good safety record. In liquefied form it will neither burn nor explode, although it's capable of both if it leaks and vaporizes. The plant had an explosion and fire in 1979 that killed one man and injured another, delayed ship schedules, and closed down normal operations for two weeks.

At Calvert Cliffs, only a few miles up the Bay from the gas terminal, Baltimore Gas & Electric Company has a nuclear power plant with a 1.6-million-kilowatt capacity. First on the scene, BG&E was concerned about the proposed gas terminal's proximity, feeling that an explosion there would be a threat to the stability of the reactor. After reviewing the plans, government authorities permitted construction of the LNG plant.

Ironically, the nuclear plant has had three leaks of radioactive gas in 1980, so presumably the two giants now eye one another with equal wariness.

Three Mile Island, site of the notorious Pennsylvania nuclear power plant that last

year suffered a serious reactor accident, is not on the Chesapeake, but it does lie on the Susquehanna. Ever since that incident, when the reactor overheated, releasing radioactive gas and flooding a building with radioactive water, scientists have been concerned with the possibility that some contaminated water might reach the Bay. None has been detected so far.

ECOLOGICAL PROBLEMS, even personal problems, invariably are forgotten when I sail the Chesapeake. I adopt an old Bohemian proverb: "Don't worry, just wonder." My Chesapeake is still so very lovely, with so little visible sign of malaise, that I become intent on clouds and wind, leaping fish and crying gulls, the scend of waves and the set of a sail.

Lowell Georgia, a resident of Colorado, had little experience with the Bay until his assignment to illustrate this article, and I wanted him to know the wonder I had long enjoyed. So we chartered my old love, *Andromeda*, a roomy 43-foot Gulfstar motor sailer that I once owned. With her for an October cruise came her present owner and skipper, Brian Noble.

Our first night out we tied up in the Patuxent River, and early the next morning set a course for isolated Smith Island, one of the last strongholds of Chesapeake watermen and the old way of life (following pages). The wind blew lightly but with a raw edge, and a solid overcast hid sun and sky. Those notorious summer squalls can be seen before they hit, but other winds are more treacherous, blowing briskly and exhilaratingly for a time, then without warning increasing in violence.

That's just what happened. Wind speed jumped to 35 knots, at times 40. We ran before it, surfing atop nine- and ten-foot waves; better that, we felt, than coming about and fighting to lower our big mainsail, which can't be reefed and had foolishly been left aloft too long. Approaching Smith from the Bay proved much too risky because of the exposed, narrow channel entrance, so we slipped through Kedges Straits to the north of the island, hoping to use Smith's lee for shelter. The wind didn't even know low-lying Smith was in its way, but wave action

was reduced, and down came the main after a hard battle.

Smith, in Maryland, is really a tight cluster of islands, with three tiny towns: Ewell, Tylerton, and Rhodes Point. A maze of channels through marshes connects the islands, and one channel bears the improbable name Big Thorofare. Just to the south lies smaller Tangier Island, almost identical in its way of life but historically a rival because it lies in Virginia waters.

For 300 years no one but watermen have occupied these lonely islands; the most common family names, all of English descent, are the same as in colonial times: Tyler, Evans, Bradshaw, and Marshall on Smith, and Pruitt, Crockett, Parks, and Dize on Tangier. Nearly all male residents follow the water; they want no other way of life, and indeed there is no other business.

In Tylerton, amidst shanties for packing soft-shell crabs, we eased into the dock of the Chesapeake Bay Foundation. At Smith and three other places on the Bay, CBF maintains educational centers where students can obtain practical knowledge of the Chesapeake. Despite the foul weather, center manager Bill Goldsborough had 17 high-school students from Pikesville, near Baltimore, out in a marsh.

"Use all your senses, as a naturalist would," said Bill, and he had the youngsters listen for sounds, taste marsh plants, even crawl about looking for mud snails, fiddler crabs, and ribbed mussels.

I excused myself from these chill pursuits on the basis of my considerable seniority, and, while the wind blew with an unremitting malevolence that kept everyone ashore, I yarned with the natives, who proved friendly. They aren't, though, if you're a marine policeman or game warden, officers who regulate what they catch and shoot.

The late Stanley Marshall of Smith, a man who had the courage of his convictions, gave up crabbing and oystering to become warden of a wildlife refuge at the island's northern end. Many islanders considered him a turncoat and traitor, and one of his brothers refused to speak to him. For generations Smith watermen had considered that area their own, a place to hunt waterfowl at will, even with illegal "market guns," huge old blunderbusses mounted on





Remote and vulnerable, the little town of Tylerton, Maryland, clings as stubbornly to the shore of Smith Island as it does to a vanishing way of life. Along with Tangier Island to the south, Smith is the last of the Bay's inhabited offshore islands. For 300 years the Bay has provided a living for the proud and independent watermen who dwell here.

The Chesapeake—a drowned river valley still in the process of drowning—is exacting a heavy toll for its bounty. In the past century, hundreds of acres of the Smith Island cluster have been reclaimed by the water, and the rate

of erosion is on the increase. The U. S. Army Corps of Engineers is studying possible ways of stabilizing the shoreline, but the prospects of holding back the forces of nature appear bleak.

Insulated from mainland influences, Smith Islanders, like those on Tangier, still speak a dialect echoing earlier times. In Ewell, another of the three towns that make up Smith's population of 560, watermen wait out a storm by playing dominoes in a local general store. When winds reach more than 30 knots, they wisely stay ashore, since the Bay's shallow waters are easily churned into life-threatening waves.

Champion oyster shucker, Ruth Smith exults after winning the 1979 national title at the St. Marys County oyster festival. Most oystermen tong their catch of the Bay's most valuable seafood. Maryland law restricts dredging of public beds to sail-driven vessels like the few remaining skipjacks (right).



the bows of boats and capable of killing a dozen birds at a time.

Paul Marshall, a retired waterman who now carves waterfowl from wood with remarkable artistry, confessed to me he was one of the last to use an outlaw gun. "I still have my daddy's gun and my granddaddy's," he said. "My daddy's weighs 113 pounds and is nine feet long; the other's even longer. We loaded 'em with anything from number two shot to buckshot, and we used a quarter pound of big grain powder in 'em."

In his cluttered little shop Paul carved as he talked, with work in varying degrees of completeness all about him and stuffed birds seeming to watch intently from shelves amid the shadows. "I never was able to kill more than 10 geese at one shot," Paul said, "and my granddaddy said he never killed more than 12 at once. I do know of 108 ducks being killed by three guns firing at about the same time. You'd sneak up on 'em while they rafted up on the water. Did the guns kick? I've knowed a gun to jump overboard, and even if it didn', it'd push the boat back a long ways."





TANGIER and Smith Islands both are threatened by gnawing, relentless erosion. Of Smith, Paul Marshall said, "The south shore and the west shore are hit pretty bad. As much as 50 feet a year washes away in some places, and ice just cuts it to pieces. So many little islands I used to hunt on are gone. Some marshes are washed out and become gravelly beaches, and bars have washed away and got deeper, and no grass will stick on 'em."

Tangier loses as much as 25 feet a year from its west shore, and erosion soon will cut into the airstrip, vitally needed by islanders in medical emergencies or when the Chesapeake is ice locked.

The two islands have asked the Corps of Engineers to try to do something to stabilize their shores. "If we don't stop the erosion now, 10 years from now we won't have an airport and 30 years from now we won't have an island," said Tangier's Mayor Robert J. Thorne.

That can be the fate of islands in the Bay. In his novel *Chesapeake*, James A. Michener writes of the gradual disappearance of fictional Devon Island in the Choptank River. He got the idea for his Devon from an island that did erode and vanish off the mouth of the Choptank. In colonial times Sharps Island was a rich plantation of 600 acres, but the last of it succumbed to tides and storms

Commerce is the lifeblood of Baltimore, and the Bay a vital artery.



within the memory of men still living.

You have only to fly over Poplar Island, just north of where Sharps used to be, to see the great striations of submerged sandbars built up of material torn away from Poplar. In just a few decades that island too probably will be gone.

Over a hundred-year period, Maryland has lost approximately 25,000 acres of Chesapeake shoreline to erosion, and Virginia has lost 20,000 acres. The Corps of Engineers says the Bay has 410 miles of shore with critical erosion problems.

My Chesapeake, unfortunately, is ephemeral. In the grand scheme of geologic time, perhaps 10,000 or 20,000 years from

now, sediment from its rivers and shores and vanishing islands will fill it in, and it will be no more. Nothing man can do can arrest that fate.

Long before then, will my Chesapeake be a dead inland sea? Will we have poisoned it? I don't think so. Man is not the unthinking, insensitive despoiler he once was. A thousand years from now, I believe, shad and rockfish will seek out Chesapeake rivers to spawn, oyster spat will drift slowly down to the bottom through clean waters, foolish crabs will rise to the dip nets of watermen, ospreys will plunge into blue waters, and Canada geese will ride the north wind to a haven on my sheltered cove. □

Here, as elsewhere, the Chesapeake's health depends on man's goodwill.

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Pompidou Center, Rage of Paris

Photographs by MARC RIBOUD

Text by CATHY NEWMAN

NATIONAL GEOGRAPHIC STAFF

IT WAS LOVE at second sight. At first the Georges Pompidou National Center of Art and Culture caused a veritable furor.

"Paris has its own monster, just like the one in Loch Ness," sniffed a critic for the newspaper *Le Figaro*. Another, echoing the uproar, dubbed it "an architectural King Kong."

But the public had the last word. Three years after its debut in 1977, this nuts-and-bolts bouillabaisse—which includes an industrial-design center, art museum, institute for music research, and library open to the public—attracts more visitors than the Louvre and Eiffel Tower combined.

Built on the Plateau Beaubourg, site of a parking lot for the now defunct Les Halles market, the Pompidou Center has jolted its neighborhood into new life. Bistros, galleries, and boutiques flower in a once scruffy district.

The late President of France Georges Pompidou proposed creation of the cultural center in 1969 and later launched a competition to select a design for the building that now bears his name. An architectural jury of nine sifted through 681 entries from 50 countries and singled out the proposal of an Englishman, Richard Rogers, and an Italian colleague, Renzo Piano.

The architects produced a building turned inside out. Mechanical services

and structural supports wrap around a brazenly transparent box six stories high and two blocks long. Garage ventilation ducts adorn the plaza.

"We wanted it to be fun and easy to read," says Richard Rogers. So he and Piano color-coded the building. Air-conditioning pipes were painted blue, electrical ducts were yellow, and water pipes, green.

And to carry all the people, they designed a glass-enclosed escalator that slinks caterpillar-like up the front and arches high over the more traditional rooftops of Paris (*facing page*).



"Paris," a cutout tin artwork by Spanish-born surrealist Oscar Dominguez, appeared in the center's 1977 "Paris-New York" exhibit.



Like a sly nudge in the gray ribs of its neighbors, the Pompidou Center rattles



with color within sight of the Seine and, at top center, the Cathedral of Notre Dame.





“**B**EN'S STORE” sells the idea that everything, and anything, is art (*left*). This record store-gallery was a hangout for young artists in Nice before its purchase by the museum. In U. S. sculptor George Segal's “Gottlieb's Wishing Well” (*above*), a plaster phantom hangs out permanently by a lit-up pinball machine.

Like much of its art, the museum refuses to take itself too seriously. “We want it to have popular appeal,” says director Pontus Hulten. “We don't want a museum with a marble entrance emblazoned with gold letters that would intimidate people.”



SUPPLE CURVES of "The Shepherd of the Clouds," Jean Arp's plaster sculpture, front a whimsical painting by Joan Miró (below).

Space is flexible at the center. The neo-Erector Set construction allows rooms to be tailored to the event. "We're learning to fine-tune the space to fit the art," says Germain Viatte, chief curator.

But the 200-million-dollar showcase also reaches beyond its home base, sending exhibits on the road to other French cities and to foreign countries.



GIANT AMONG WOMEN, Niki de Saint-Phalle's "La Waldaff" stands in high-heeled splendor, a marriage of humor and polyester.



CARRYOUT ART is sold in a gift shop in the forum. An escalator, at rear, leads to the Industrial Design Center's exhibits. But the

biggest crowd puller at the Pompidou Center is the open-stack library, replete with an audiovisual complex that features free lessons in 75 languages.





IMPROMPTU CARNIVAL of mimes, clowns, jugglers, and fire-eaters (*left*) performs in the plaza—and then makes a pitch for coins. A side-street vista reveals a maze of bright blue pipes (*above*). Where does the street end and the museum begin? “That’s just the point,” says Pontus Hulten. □

LAST OF A BREED

The Gauchos

By ROBERT LAXALT

Photographs by

O. LOUIS MAZZATENTA

SENIOR ASSISTANT EDITOR

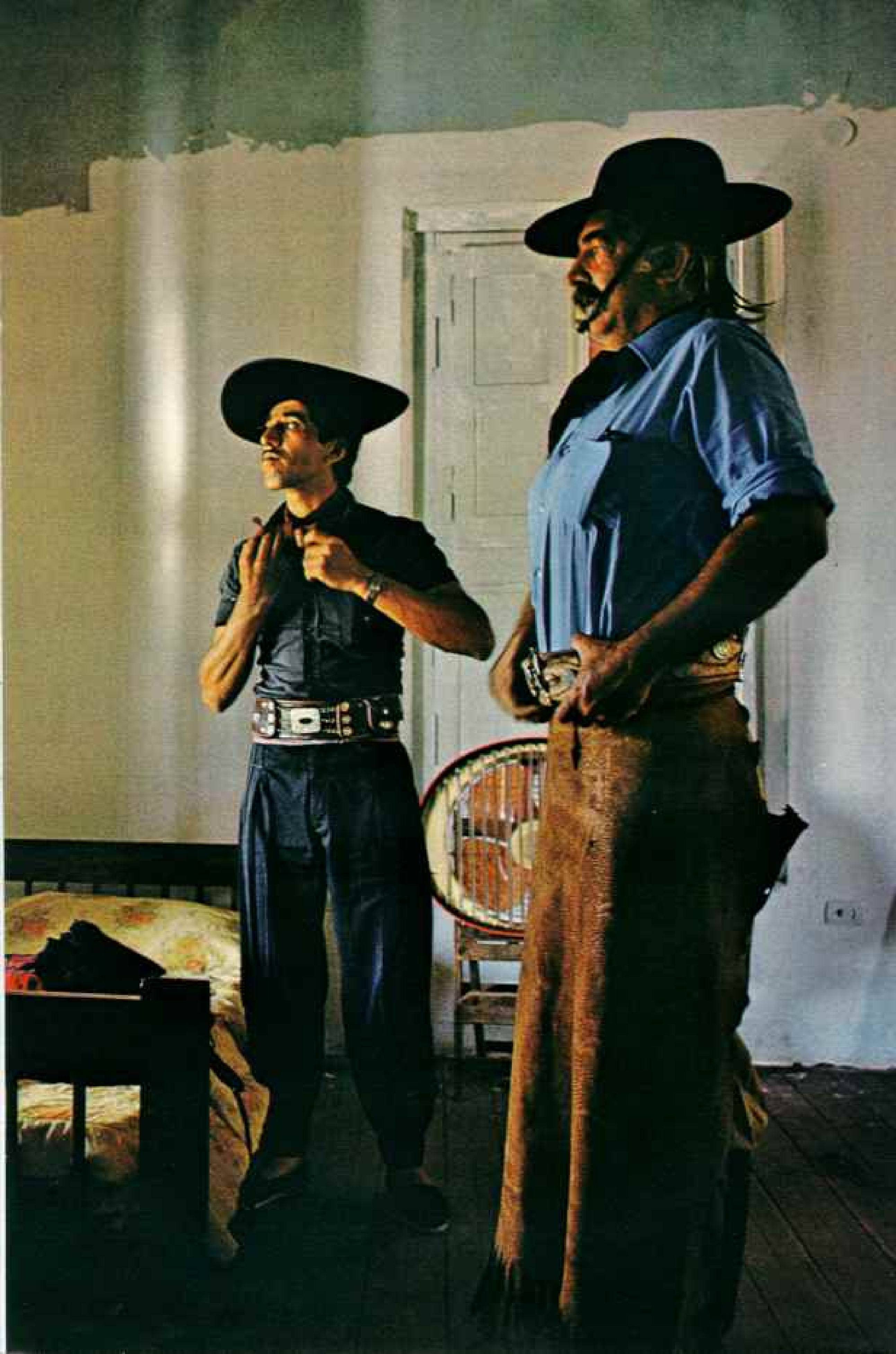
I GOT UP in the first light and pulled on cowboy boots and a warm jacket against the Argentine winter. It was early September, and the whitewashed ranch buildings of Estancia Aguay were shrouded in cold mist.

The gauchos were already up and about. They had wakened in the darkness to a breakfast of *maté*, the bitter Argentine tea that is said to dispel fatigue, and *mbaipoi*, a porridge of cornmeal and meat. By the time Victor Carrillo, the ranch manager, and I had our warming coffee, they were already saddling their horses.

Varjona, a gaucho I had gotten to know, touched the brim of his low-crowned hat and murmured, "*Buen día*." He was a classic gaucho of Argentina, of mixed Spanish and Indian blood, with fierce black mustache and upward-tilting eyes against a copper skin. Though not yet 20, he had already

Tense as toreros before a bullfight, gauchos dress for a rodeo near Ituzaingó, Argentina. Once lawless nomads of the plains, then heroes of wars against Spain, gauchos became symbols of freedom—and remain today a romantic evocation of skillful horsemanship and manly conduct.

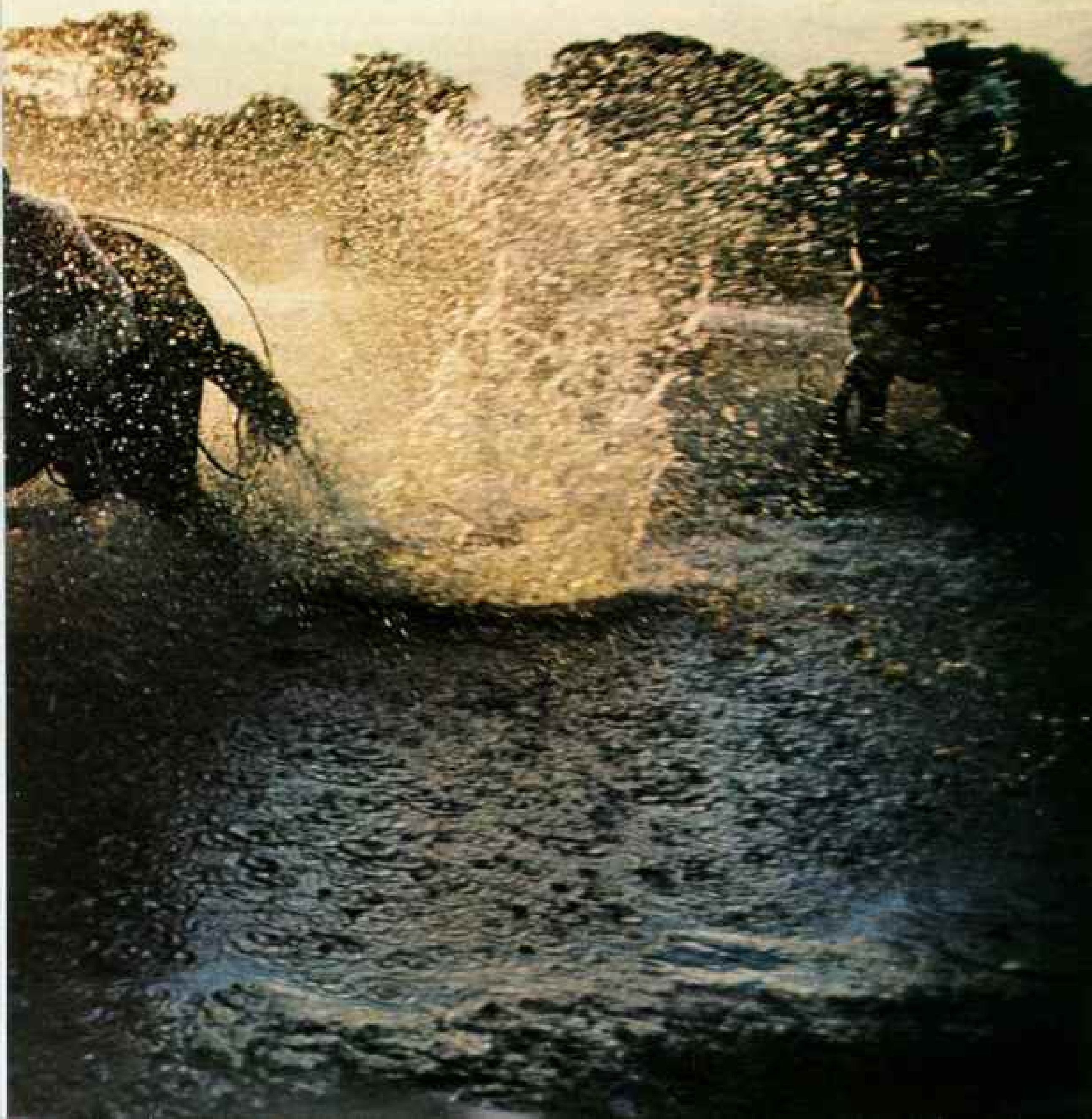






WILD SPIRITS TAKE FREE REIN as Argentine gauchos race across a lake near Berón de Astrada. The riders belong to a group dedicated to the memory of Gen. José de San Martín and the gauchos who fought beside him in the early 1800s for independence. In 1978 seven made a 300-mile round-trip ride to Yapeyú, where San Martín was born 200 years earlier.

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Flinging his lasso at a rushing steer, a gaucho shows his style at a rodeo in Bagé, Brazil (right). The rawhide rope and sharp knife are among the man's most prized possessions (below). The name "gaucho," first given to renegades of Spanish and Indian blood, now belongs to cowhands of diverse ancestry in several countries (map).



gained a reputation as a superb horseman.

While a *peón*, a ranch hand, saddled my horse, Varjona finished putting on his own multilayered saddle topped with a thick sheepskin fleece. Kneeling, he buckled spurs onto bare ankles and sandaled feet. When I remarked on this, I learned that the early gauchos actually clutched a stirrup strap or shank between their first and second toes, a practice that eventually caused their toes to curl downward.

Varjona reached behind him to make sure his wicked 14-inch knife, called a *facón*, was firmly in place. Sheathed in hard leather, it was slanted between belt and sash, ready to his hand for work or fighting. The horse's mane was roached except for one hank of hair at its withers. Grasping it, Varjona sprang lightly into the saddle and was away at a lope to join the other gauchos.

Lariats Replace Boleadoras

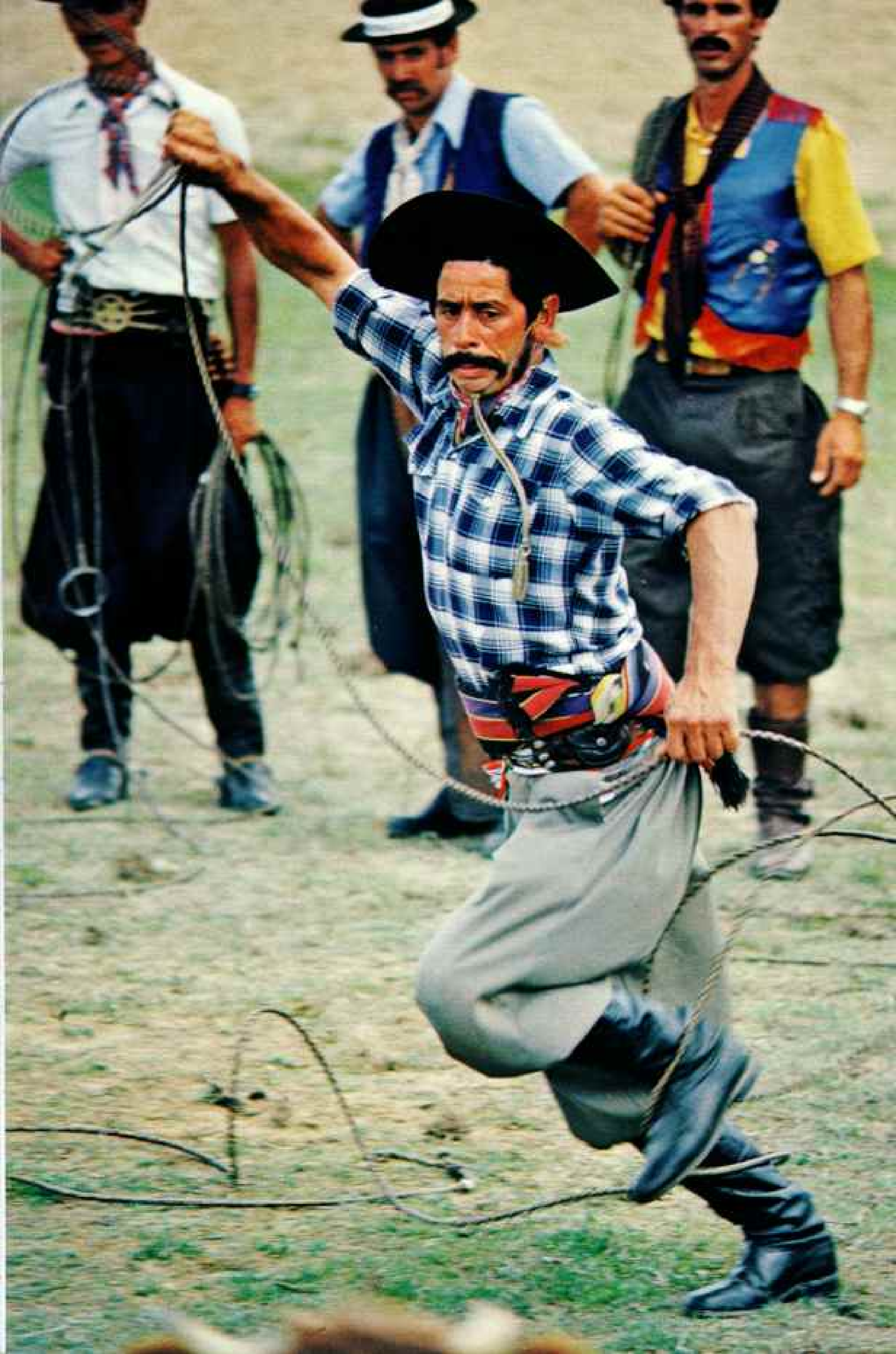
A molten red sun was rising off the flat horizon of the grassland. The riders passed in shadows across its face and vanished into the mist, like phantoms of all their gaucho forebears who had ridden out onto the rolling plain.

Victor and I followed them at a trot. The sun was burning off the mist to reveal a sparkling winter morning. Black-and-white lapwings swooped over our heads. Hawks perched on fence posts and tiny white-collared owls eyed us gravely from the tall grass. Ostrichlike rheas fled with springy, high-stepping strides at our approach.

"A century ago," said Victor, "the pampa was filled with rheas. Gauchos on horseback caught them with *boleadoras* for their feathers. Now the hunting of rheas is forbidden, for there aren't many left."

Victor explained that the *boleadoras*, a symbol of the South American gaucho, were round stones wrapped in leather and attached to three long rawhide thongs. They were whirled about a gaucho's head, and when thrown, tripped up the legs of rheas, wild horses, and even wild cows that gauchos once killed by the thousands for their hides. "Today," he said, "they are usually only ornaments in a gaucho's dress-up costume. The lasso has taken their place."

The grassland that lay before us was overwhelming in its immensity, an unending



Explosion of horsepower sends a gaucho flying during a bronco-busting contest (right). The distinguishing marks of his breed, both at this rodeo in Bagé and at work on the range, are the bombachas, or baggy trousers, leather apron, broad-brimmed hat, and spurs, here being lashed to his boots (below). Once gauchos rode barefoot, holding stirrups between the toes.



ocean of grass stretching farther than the eye could see. Neither hill nor stone formation rose to break the distant horizon. The old-timers claim they found their way across the grassland not only by the Southern Cross but also by the winds. Hot equatorial wind came from the north, dusty wind from the west, high wind from the east, and cold wind from the south. Now, they said, broken up as it is by fences and pastures, the plain could be navigated by anyone.

I wondered about that as we passed into a pasture encompassing a thousand acres.

The gauchos were rounding up cattle for branding, castrating, and dehorning. The horsemen were tiny figures in the distance, their yips and shouts faint to our ears. We broke into the ground-eating lope for which the short-coupled criollo horse of South America is famous.

Soon we were in the midst of furious activity, helping the gauchos cut out a portion of the herd and drive it to a corner of the pasture. The gauchos were a blur of bright sashes and bandannas and striped outer pants that served as chaps. I marveled at their



horsemanship. Man and horse seemed fused into one. Twirling their nimble mounts to right and left, they seemed to anticipate every move the herd would make.

But there were incidents. Once a dozen cows and calves bolted away in a dash for freedom. In an instant Varjona and another young gaucho were after them. Varjona reached the stampeding animals first and headed them off in a way I never expected. Instead of circling the bunch, Varjona rammed his horse at full speed into the leader of the runaways. The impact caught the

cow at shoulder height, and it flew into the air in a near somersault. The runaways floundered to a stop and began milling about. With the dazed cow following behind, they were soon on their way back to the herd.

I asked Varjona where he had learned the trick of ramming. "From my grandfather," he said. "It is rarely done now. It is dangerous. If you miss by a hair, then you and your horse will be the ones who will go down." He shrugged. "But I am a gaucho, and danger is part of a gaucho's life."

I asked him whether he had ever wanted to be anything but a gaucho. He shook his head emphatically. "Once a friend of mine went to the city, to Buenos Aires, because a gaucho is supposed to be something special there. They admired him, all right, but when it came to getting a job, they gave him one washing dishes. Can you imagine! Women's work."

The branding and dehorning irons were immersed in a fire of cow chips and already red hot. Braided rawhide lassos were uncoiled and thrown. Unlike the American cowboy, who holds one loop in his throwing hand, the gaucho grasps several coils, the end tied to an iron ring behind his saddle. As thrown in this gaucho way, the lasso can snake out for as much as ten yards with great accuracy.

One by one the calves were caught, hauled to the fire, and thrown down. Their ears were punched with marks to designate the year of their birth, and their budding horns were burned out with a straight iron. Bull calves were castrated neatly by two gauchos who handled their *facóns* as skillfully as scalpels.

So it went, and in the hours of hard riding I learned the practicality of a gaucho saddle. It has neither horn nor cantle, but I was locked firmly into the thick sheepskin fleece. When we returned to the ranch, I was not saddlesore in the least.

I wondered if the same were true of my horse, so I watched carefully as Meza, a gaucho with a saturnine face, unsaddled him. It was a complicated procedure.

"The fleece goes on top," he said. "We call it a *cojinillo*. It is to protect the rider. The rest of the gear protects the horse." He peeled off the layers: A piece of soft leather called *correón* to which narrow metal stirrups are attached; two bars of leather called *bastos*, making up a saddle frame that rests on each side of a horse's backbone; a supple square of cowhide called a *carona* that prevents the saddle frame from hurting a horse's back; a *matra*, a kind of blanket of rough woven

wool; and finally the *sudadera*, a waterproof sweat pad next to the horse's moist hide.

I told Meza that I was impressed with the care taken to protect a horse from bruising. "A gaucho without a sound horse is no gaucho at all," he said. "We say only three things are sacred to a gaucho. His horse, which is his freedom from the earth. His *facón*, which is his companion and protector in a fight. And his *china*, his woman."

I was tempted to ask him which came first in a gaucho's life, but decided that that question had already been answered.

Horse Training Begins Early

One day I watched the gauchos bring in the fresh mounts they would use for the next week's riding. The herds revealed the gaucho penchant for horses matching in color—bays, blacks, and sorrels. Whites and grays were notably absent.

Gregorio Aguirre, the *domador*, or horse trainer, explained how he trains horses suitable for gauchos. Since a horse ranks first in gaucho priorities, it is a delicate process. "When a foal is two months old," he said, "some *domadores* will keep it tied to a post near where they live, so that it becomes accustomed to man. Every day, it will be stroked by hand for hours on end. Our forebears learned this lesson from the Indians, to gentle a horse forever with kindness instead of brutality."

Aguirre said that when the horse is a year old, it is turned out to pasture again. When it is three, it is brought in and tied halter to halter to a trained horse until it knows what is expected of it. He said he knew one *domador* who always dried the young horse with his own shirt, so that the animal becomes familiar with the trainer's scent. "Then the horse is mounted for the first time," Aguirre said. "It may buck then, but rarely if ever after. A horse that bucks is a disgrace to its trainer."

I was already familiar with how sacred a gaucho's *facón* is. On my first visit to a South American *estancia*, I had wandered down

Generation to generation, gauchos such as 65-year-old Simón Gaspar have lived sparsely in such dwellings as this dirt-floored adobe house provided for him by his employers. Foreman of a remote section of a large estancia near Salta, Argentina, Gaspar bounces his great-grandson.





Islands of luxury in a prairie sea, houses built by wealthy 19th-century cattlemen often rivaled Mediterranean villas in elegance. Since 1900, however, most pampa estates



have been subdivided. *Estancia La Margarita (above)*, a 5,000-acre Argentine cattle ranch near San Miguel del Monte, was once part of a 250,000-acre property.

Market-bound steers raise a cloud of dust on a cattle drive in Corrientes Province. Some 15 million head a year are slaughtered in Argentina, the leader in South American beef exports. Only cooked or canned meat may be shipped to the United States, however, since Argentine herds suffer outbreaks of foot-and-mouth disease. To the original stock of Spanish cattle, ranchers here have added new breeds such as Hereford, Aberdeen Angus, zebu, and Santa Gertrudis.



with the ranch foreman to the gauchos' row of little living quarters. It had been a long day, and the weary gauchos were gathered in a circle outside, sipping their maté from gourds with metal straws called *bombillas*. One gaucho's *facón* was resting on a log beside him.

I asked the foreman if I could inspect the *facón*. Obliging, he knelt and reached out for it. In an instant the figures of the gauchos became taut, their tension almost palpable. The foreman's hand stopped in midair. He murmured, "*¿Permiso?*" The gaucho whose *facón* it was considered for a moment and then nodded. When the *facón* was handed to me, I drew the long blade from its scabbard, tested its razor-sharp edges, and quickly replaced it.

As we were walking away, the foreman

said with chagrin, "That was stupid of me. I just forgot. It is forbidden ever to touch a gaucho's *facón*."

Later I was to learn that the *facón* is no more an ornament than the U. S. cowboy's pistol was in the lawless days of the West. At a lonely crossroads near Luján in Argentina, I went to a *boliche*, a store that is the gaucho equivalent of a saloon.

The *boliche* was a tiny, century-old structure with hitching rails outside. Its gloomy interior was lighted by a lone kerosene lantern, revealing sagging floors, a scarred wooden bar, and crude wooden tables. There were two gauchos inside, drinking raw gin and playing a card game called *truco*. They accepted my presence with distance, but they seemed peaceful enough despite the ever present knives stuck under



their belts. The bartender, a formidable woman named María Natividad, informed me otherwise.

"You can finish your drink," she said in a low voice, "but it would not be advisable to be here when the others come. It's Saturday night, you know." She nodded at the hulking back of one of the gauchos at the card table. "And he is seeking revenge."

A Lesson in Knife Fighting

An *estanciero*, a ranch owner, filled in the pieces of the puzzle for me that evening. Saturday night was when the gauchos gathered after the week's work. The *boliche* was like their private club, and they resented strangers. The hulking gaucho had had a brother who was disemboweled in a knife fight over a girl. I had been wise to leave.

In these days of heavy penalties, killings are rare. Gaucho combatants will settle most often for drawn blood. Still, killings do occur and the rule of self-defense still holds. My *estanciero* friend took me to an old gaucho with a long history of killing, warning me that he rarely spoke to anyone, much less a gringo. But luck was with me.

After sharing *maté* from the same gourd, he told me: "When there is surely to be a fight, you cannot hesitate. In the same movement, you must draw your *facón* and slash your enemy's face to show that you mean business. If it does not end there, you must fight to kill. Then your knife must wave in your hand like a snake. And when you strike, it must be like a snake—once, and mortal."

Though many of the duels seem to be over



women, paradoxically a gaucho's china is rarely seen in public. Her role is confined to household, cooking, and children.

At the estancias I visited, I had watched the chinas sweeping out living quarters with great gusto and washing clothes in a stone tub. But when I tried to approach them, they fled inside and closed the door.

In the hinterland, however, I stopped at a remote *puesto*, a sort of line camp situated at the far reaches of vast range holdings—so isolated that the preferred language is Indian Guaraní rather than Spanish. There a gaucho named Baez was entrusted with the task of keeping watch on cattle, particularly the ones who needed treatment after eating toxic species of plants.

I talked with his wife, Catalina, a lively young woman with dancing black eyes, about a gaucho china's day, and she said, "Cook, sweep, wash clothes, take care of the garden, take care of my children. That is my day, every day."

She said the little family had not been to a town in many years. "In fact, I have never been to a church."

"Not even for your wedding?"

"Weddings are for rich people," she said. "Anyway, many gaucho women do not get married to their men." She laughed at my puzzlement. "If I were married, and he," she said, pointing to her husband, "turned out to be lazy or a drunkard or a wanderer, I would not be free to leave him."

At Estancia Aguay, I told Mary Ann Carrillo, Victor's wife, about my conversation. "It is an old, old thing," she said. "In the days before the pampa was settled, the gaucho was a nomad, usually running from the law. He had no time for things like marriage and children. The women preferred it that way. They value their freedom."

I saw examples of the independence of gaucho women in the fastnesses of the Andes foothills in the northwestern Argentine province of Salta. Here estanciero Marco Aurelio Campos explained to me that Salta horsewomen are known as *amazonas* or

gauchas. It is said that ever since they fought alongside the gauchos in the 1800s for Argentina's independence from Spain, they have shared equal standing with men. In this region of thorny underbrush, where saddles are fitted with flaring, protective batwings of stiff leather called *guardamontes*, the gauchas are regarded as fine horsewomen. To see them riding over a brutal mountain, clad in low-crowned black hats and the brilliant red-and-black ponchos of Salta, is a sight not easily forgotten.

Gauchas are not to be found in many other places, and in other countries of South America gauchos themselves do not quite fit the rugged image the Argentines have created. They are known by different names from country to country. In Argentina and neighboring Uruguay, both working horsemen and ranch owners are called gauchos. But in Chile a cowhand is a *huaso*, or "man of the country," and in Venezuela and Colombia, a *llanero*, or "plainsman." In the state of Rio Grande do Sul in Brazil, he is called *gaúcho*, and revels in a dangerous form of rodeo called *jineteada*.

And in Paraguay a gaucho is usually called a *vaquero*. Unlike Argentina, where gauchos consider planting women's work, in Paraguay a gaucho is also a farmer. Nearly every gaucho with a family has his little garden of corn, rice, and beans. At one estancia near Asunción I talked to a Paraguayan gaucho in straw hat and jeans about the Argentine distinction. "That is foolish," he said. "A man's duty is to feed his family." He explained that he made about \$50 a month, and though he was provided with some food staples, it was not enough.

Tourist Items Reflect Gaucho Myth

Paraguayan ranch owner Frederico Robinson, a contained, London-born man with a weathered face and a crisp British accent, approved of the Paraguayan gaucho's practical interest in farming. "The Paraguayan gaucho is not romanticized like the gaucho of Argentina. The Argentines," Robinson

Quick as a polka, the chamamé is performed in Ituzaingó by a dance club organized to preserve gaucho music. Dancing at village festivals offers gaucho women a rare break from drudgery. Many, fearing disastrous marriages, prefer the independence of common-law relationships.



In or out of the saddle, gauchos live in a male world. A group of Paraguayan cowhands, called vaqueros, take a break after lunch on a bunkhouse porch at Estancia Villa Santa near



Concepción. Around them hang parts of their saddle gear, including the sheepskin fleece, at left, that allows them to ride comfortably for hours. At Estancia Los Manantiales, Miguel Angel Bonze (lower left) makes leather straps for his saddle, while Ramón Herebio (upper left) plays a game of checkers with markers sliced from a bicycle inner tube.



said, "have laid a cloak of sentimentality over their gauchos."

In sophisticated Buenos Aires, capital of Argentina, I saw how deeply the gaucho folk hero is embedded in the national character. The fashionable shops along Avenida Florida are filled with boleadoras, souvenir silver spurs with outsize rowels, bright ponchos, and wood carvings, books, and paintings portraying the gaucho. Every *porteño*, citizen of Buenos Aires, seems to be a fierce and possessive authority on things gaucho. The word has even become incorporated into an act. When a *porteño* seeks a favor from a friend, he will say, "*Hacéme una ganchada*. Do me a good turn."

It was not always so.

"There was a time when the gaucho was regarded as nothing more than a renegade and outlaw," Juan José Güiraldes told me in his colonial manor house near San Antonio de Areco in Buenos Aires Province. A descendant of the landowning aristocracy, he nevertheless refers to himself as a gaucho. He wears the typical gaucho dress costume of his province—short, black embroidered coat of fine wool, flared pants called *bombachas*, and high leather boots.

The era he was referring to began more than two centuries ago, when outlaws forced to flee from Buenos Aires went to the open grassland. Intermixing with Puelche, Araucanian, and Charrua Indians, they learned their amazing skill in capturing and



Heads or tails are both fair game when gauchos throw a steer (left) to search it for ticks and read its age by its teeth. Gauchos must work hard on this 90,000-acre ranch near Salta to keep track of some 3,000 branded cattle. At midday, foreman Fernando Galeano (below) makes an asado, or barbecue, of beef on a stick.



training the wild horses that were descended from Spanish conquistadores' runaway mounts in the 1500s. These were the root-stock of the criollo horse of South America.

"In the early 1800s," Güiraldes said, "two things happened to transform the gaucho from outlaw to hero. Argentina decided to throw off the yoke of colony to Spain, and military leaders like José de San Martín and Martín Miguel de Güemes saw the potential of a ferocious mounted guerrilla force in the gauchos. They served in our War of Independence. They were pitiless in battle, indifferent to suffering, and had huge powers of endurance. All they needed to survive were a horse, a knife, and a lance."

The third element in the transformation

of gaucho into hero was an epic poem, *The Gaucho Martín Fierro*, written in 1872 by José Hernández.

*A son am I of the rolling plain
A gaucho born and bred. . . .
And this is my pride: to live as free
As the bird that cleaves the sky. . . .*

Such unforgettable lines sped through the country. "Hernández provided a code of conduct for a young nation seeking an identity," Güiraldes said. "*Martín Fierro* embodied the independent spirit and rough virtues that Argentines most admired."

My host's uncle, Ricardo Güiraldes, also celebrated the gaucho character in his novel *Don Segundo Sombra* in 1926. But by that



time the free-roaming life of the Argentine gaucho had changed. The noble and the wealthy had seen the lucrative potential of raising imported cattle and wheat on the pampa. The unpeopled plains had been divided up, and gauchos had attached themselves to estancias as herders of cattle and defenders against Indian attacks.

With the expansion of cattle raising in South America, the gaucho and his counterparts flourished not only in Argentina and Uruguay, but also in Peru, Chile, Bolivia,

Colombia, Venezuela, Paraguay, and the southern regions of Brazil. At the same time, the classic Spanish and Indian bloodline of the gaucho underwent a change.

"With the big European immigration around the turn of the century," blood-horse raiser Marcelo de Coud told me at his estancia in the pampa near Buenos Aires, "Scots, Irish, English, Italians, and Basques became gauchos. The Basques were the most readily accepted of all. They were austere, strong in body and mind, and good with



Bone-thin calves flee before a drive to fresh grazing grass—and a fattening life—at Los Manantiales. Crossbreeds of zebu and Brahman cattle are favorites in subtropical Paraguay.

“Our Santa Gertrudis was developed in Texas to produce a huge beef animal resistant to heat and disease,” said Argentine-born Abbott Reynal in Buenos Aires. The introduction was successful not only at the King Ranch’s sprawling estancias in Argentina but also in Rio Grande do Sul of Brazil.

King Ranch has also introduced the American quarter horse to South America, crossbreeding with the native criollo horse. “The criollo that Argentine ranchers breed is quite small,” Señor Reynal said. “But its qualities of endurance crossed with the quarter horse provide a bigger and stronger animal for the gaucho.”

Folkways May Be Vanishing

Change has come also to the institution of gaucho song and dance, which has disappeared or become much altered in other South American countries such as Brazil, where the samba rules. Even in Argentina the tradition has begun to fade, and the humid Argentine pampa is one of the last strongholds of old gaucho music.

There, in a barn filled with the savory scents of barbecued lamb stretched out on a crosslike frame of branches, I watched gauchos in a festival of song and dance. Though the wandering gauchos of times before danced alone for their pleasure, modern-day gauchos prefer dancing with their women. I watched as black-clad gauchos and chinas in wide red skirts performed such passionate courting dances as the *gato*, full of whirling turns and staccato heel-tapping confrontations.

El Gordo, a gaucho with a broad impassive face, sang a shouting song called “Una Milonga,” describing the lonely gaucho life of old. Another gaucho clad in black sang a counterpoint. Since the song was filled with archaic idioms, I asked him to tell me of what he had sung.

“It is a lament,” he said, and then told of a gaucho warrior who fought in the Desert War of 1878-80 against mounted Indians

horses—all qualities that the gaucho admired. The Basques had a special name. They were called *acriollado*—one of us.”

Human bloodlines are not the only ones that have changed on the pampa. The original criollo descendant of Spanish cattle has been joined by shorthorn, Aberdeen Angus, Hereford, Holando-Argentino, Brahman, zebu, and Charolais. The latest breed, the Santa Gertrudis, was introduced by the King Ranch of Texas, one of the world’s largest ranching networks.

with their streaming black hair, fearsome lances, and deadly boleadoras. After the war, the gaucho chances upon a deserted village and laments the disappearance of the last fierce adversary he would know—the Indian. “You see,” a gaucho said, “after the Indians, the gaucho had no more wars to fight. Peace lay heavily on his heart.”

He was wrong about that. Unknown to the gaucho, because it was subtle and insidious, the most threatening adversary of all was undermining his way of life.

Roads Intrude on Pampa Life

In the humid pampa generations of equal family inheritance and division of land have reduced the average estancia to less than 2,000 acres. Gone is the open pampa where Martín Fierro roamed “free as the bird that cleaves the sky.” It is now crisscrossed with fences.

The gaucho's last bastion is the Argentine interior, where estancias can still encompass 100,000 acres or more, and modern ways and people are still far away. But paved roads are already beginning to penetrate the vast grasslands.

“The beginning of the end,” ranch owner José Antonio Ansola told me in Corrientes Province. “When the roads are here, the old gaucho way of life will be gone. No longer can we live untouched by the corruption of outside influences.”

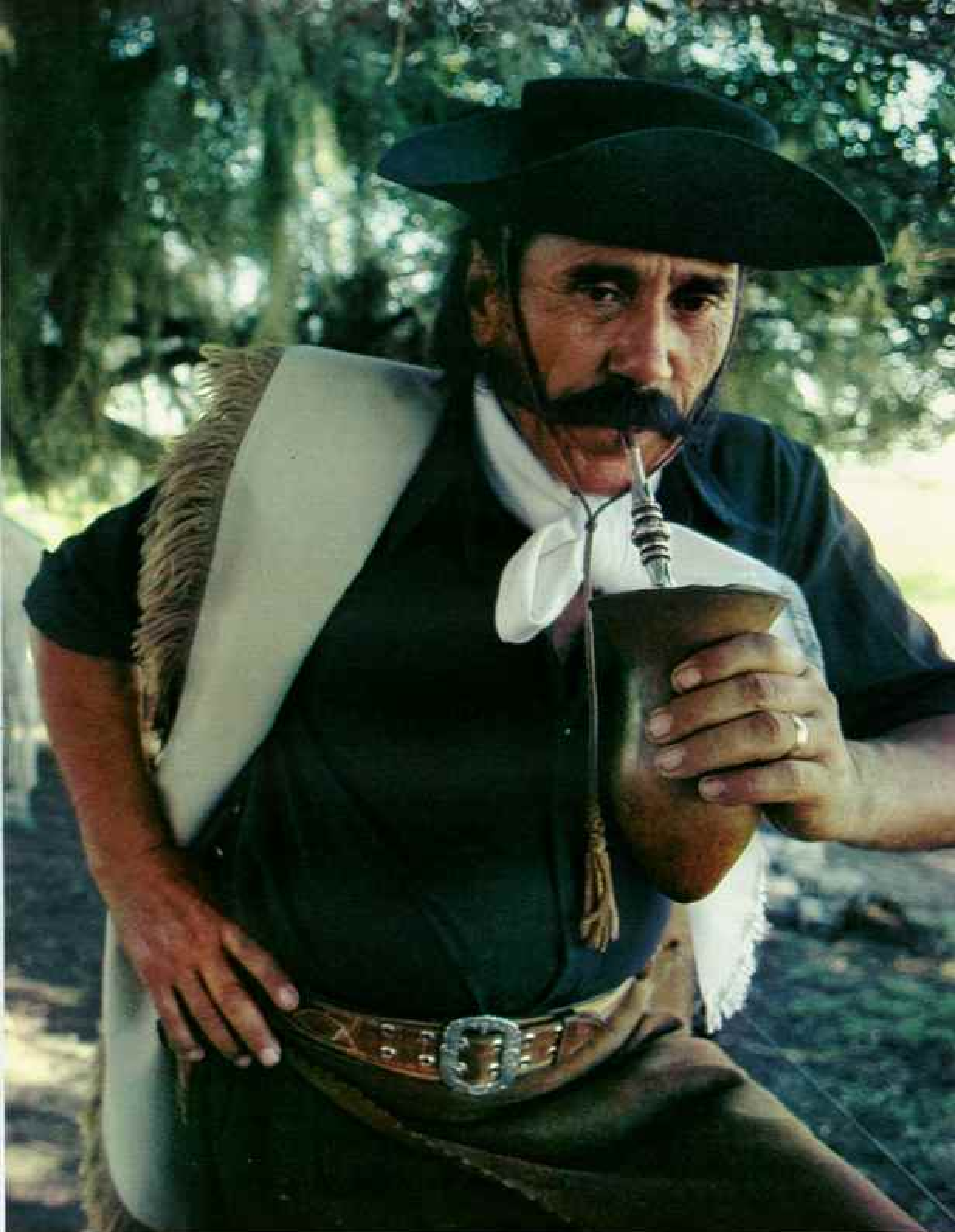
In the Argentine manner, Don José is another man who describes himself as a gaucho. Basque by heritage, his face is creased with age and a lifetime of exposure to sun and wind. His attire is out of the past—a long gray cape, elaborate belt of inlaid silver, and high leather boots that cup over his knees. Among the last of a breed, he rides with his gauchos on trail drives lasting for weeks, sleeping on the ground and living on maté and barbecued meat cooked over cow chips on the nearly woodless pampa.

“All this must change when the outsiders come with all their modern ways,” he said with an overpowering sadness in his eyes. “Adiós, gaucho.”

There was nothing I could say to bring solace to him. But to myself, I thought: *Here at least, in this land of lonely plains and few people, it has managed to hold on longer than most good things.* □



Between fact and fiction, gaucho Sady Cardozo works both as a ranch hand and as a greeter of tourists at



Pôrto Alegre, Brazil. Braced by hot maté, the bitter herb tea gauchos have savored for two centuries, he stands midway between two worlds: the hard life of the gaucho cowhand and the romantic life of the gaucho myth.

A person wearing a black kendo helmet (bushy) and a black gi (uniform) is shown from the chest up, holding two bamboo swords (shinai) diagonally across the frame. The background is a dense bamboo grove with tall, green stalks and leaves. The lighting is natural, suggesting an outdoor setting.

Shouldering the arms of kendo, a Japanese sport taken from ancestral samurai combat, fencers bear slatted bamboo swords through a bamboo grove. Raw material for implements of peace and war, this botanical cousin to rice, corn, and Kentucky bluegrass may be the world's most useful plant.

BAMBOO, THE GIANT GRASS



IN THE SEA GREEN twilight the great jointed stalks of grass stand like jade columns supporting a submerged palace. The foot-thick culms glisten in the submarine light and rise for a hundred feet among dagger leaves that stir with a susurrus like surf on a distant shore. A passing breeze rubs the tapering stems together, and subdued groans, stuttering creaks, and a small scream fall from the moving canopy.

Are you Alice, sipping from the bottle labeled "Drink me," and shrunk to elfin size? Or have you wandered into Gulliver's Brobdingnagian world, where even the grasses of the field reach for the sky?

No, you are of normal size, walking in a grove of bamboo, the giant tree grass that is the most versatile, and to me the most beautiful, plant on earth.

By LUIS MARDEN

Photographs by

JIM BRANDENBURG

Bamboo is all things to some men, and some things to all men. It enriches the soil; binds the earth against raging floods and the shocks of earthquakes; gives man tools to work with, instruments to make music, toys to divert his children, and weapons with which to fight his fellow creatures. Bamboo provides us paper, a stylus to set down praise of its own beauty, and the brush to make ink-limned images of its graceful culms and lanceolate leaves.

No growing thing has so many and so varied uses as bamboo; one scientist has even distilled from it a diesel-engine fuel. Scholars have compiled catalogs of well over a thousand applications for the elegant grass, which occurs naturally in every continent except Europe and Antarctica but seems happiest in southern Asia (map, page 506).

In the world there are about a thousand species of bamboo, of some 50 genera. They range from plants the size of field grass to giants of 120 feet in height and a foot in

thickness. They grow from the sea-level tropics to 13,000-foot mountain slopes. Though they vary widely in color, shape, and size, they share one common characteristic, the woody culm, or stalk. A few are solid but most culms are hollow, divided by walled septa, or nodes (page 514). The light, stiff, and strong culms are what make bamboo so valuable to so many.

The most striking characteristic of bamboo is its vertiginous growth. No other living thing grows so tall so fast. Near Kyoto a Japanese scientist measured the world's record. A culm of *ma-dake* (*Phyllostachys bambusoides*), Japan's commonest bamboo, grew almost four feet in 24 hours. By watching closely, one should have been able to see it grow.

An engineer living near Washington, D. C., had a clump of 18-foot-high bamboo growing up a stairwell inside his house.

"We would measure the new shoots at the beginning of an evening's bridge session," he said. "When the evening ended, I would say to my partners, 'We have played one and a half inches.'"

The Chinese, precursors in culture and technology, were the first to appreciate the beauty and usefulness of bamboo. Their ancient dictionary, the *Erh Ya*, written a thousand years before Christ, referred to bamboo as *ts'ao*, a grass.

My own interest in bamboo arose many years ago when I was moved to attempt to make a fishing rod of split-and-glued bamboo, and became fascinated by the virtues of the material I was using. A long time ago some nameless genius had the idea of splitting a culm of bamboo into strips, tapering them, then gluing them together to make a strong, slender, and superlatively springy implement that could cast an artificial fly a great distance, even against a stiff breeze.

Here, as in so many other things, the Chinese were far in advance of the West; one book tells of them splitting and gluing

A forest playground in Nepal climbs like a boy's imagination. Throughout Asia the larger varieties of bamboo have been called "poor man's timber." They are easy to harvest, transport, and assemble as framework, siding, roof tiles, fences, matting, irrigation pipes, and rafts. Fast growing and self-renewing, bamboo can be adapted to a thousand uses with but a few simple tools.







LIFE MAGAZINE

Beginning and ending by a stream, the “lovely bamboo,” as *Arundinaria amabilis* loosely translates, is the most prized of bamboos for fishing rods. Cleaned by scouring with sand along China’s Sui River (above), it embodies the virtues of straightness, resilience, and strength.

From inches-high species to tree grass rising a hundred feet and more, indigenous bamboos are widely spread (map left). Many transplants are cultivated for use or ornament.

bamboo long before the birth of Christ.

Though now largely supplanted by glass and carbon fiber, the best split-bamboo fishing rods are made from tonkin cane, which, despite the name, comes from southern China. It remains the world’s most valuable bamboo species for a variety of purposes.

Dr. F. A. McClure, who at the time of his death in 1970 was a research associate at the Smithsonian Institution and the world’s greatest authority on bamboo, traveled to China as a botanical explorer in the 1920s. There he sought the home of tonkin cane. Years later he described his search to me:

“I began by recalling a jingle common round Canton [Guangzhou]:

*‘Waitsap muk,
Kwong Ning chuk,’*

which is to say in Cantonese: ‘For wood go to Waitsap [Huaiji], for bamboo to Kwong Ning [Guangning].’ Both are places on the Sui River, which flows toward Canton from the northwest. I started upriver, inquiring as I went. As I neared Waitsap, the bamboos on both sides of the river changed. Unlike the graceful, nodding bamboos farther downstream, these were stiff, erect, and spiky. From a distance the plantations looked like young fir trees.”

The farmers called it *ch’a kon chuk*—tea stick bamboo.

Now, bamboo has a peculiarity. Most of it flowers only at long intervals—30, 60, or even 120 years apart. At about the same time, all plants of the same species—wherever they are in the world—will burst into flower. Then the drooping branches look like heads of wheat (page 514). When this happens, the culms die, but the groves survive because some rhizomes live on and the fallen seeds take root. For a bamboo seedling to reach full growth and maturity may take five to ten years; meanwhile the growers face economic disaster.

The farmer’s misfortune was the scientist’s good luck. McClure found whole areas of tea stick bamboo in bloom, and he was able to collect flowering specimens, which, together with branching nodes and sheaths from young culms, the botanist needs to make scientific identification.

McClure identified it as an *Arundinaria*, a genus named from a type native to the

United States, and now he gave his new species the name *amabilis*, lovely. *Arundinaria amabilis* McClure, the lovely bamboo.

NORTHWEST the road ran from Guangzhou toward Huaiji, between paddies diked with red earth. Young rice shoots thrust yellow-green fingers from the brown water, and along the dike a frieze of white geese German-stepped against the sky. Endless rows of pine and eucalyptus, planted in their millions in China's massive afforestation scheme, furred the hills of Guangdong (Kwangtung).

Beside the road clumps of yellow-stalked bamboo nodded, and my companion, Mr. Chen Shu-yu, poetic and hospitable like all his countrymen, said: "The bamboos bow in greeting to you." I bowed in return.

At dusk the road swung closer to the wide, fast-flowing Sui River, and the scattered clumps of bamboo closed ranks and became a dense plantation. Through the gloaming I saw that the bamboo, now dark green, had lost its feathery grace and had grown stiff and upright, standing in serried ranks like Christmas trees: the tea stick, or lovely bamboo, found by Floyd McClure.



Basket for a five-raisin picnic is woven as a curio for sale on Taiwan and demonstrates how finely and precisely bamboo can be split (above).

Pigs in a radial poke are hauled down a hillside in Hong Kong (right) to be fattened for market. Bamboo's high strength-to-weight ratio ensures most of the load is pork.

That quality has had loftier uses. The Demoiselle, an early French plane, had a bamboo airframe, as did many gliders of the late 1800s.



In Huaiji, a county seat of gray-tiled-roof houses, I was the guest of the regional Revolutionary Committee. The town lies 165 feet above sea level, but on both sides of the Sui River the hills rose row on row, clothed with bamboo and fading into the gray curtain of whispering rain.

We boarded a riverboat and motored downstream with the current. The river, gliding swiftly and silently, glistened like slate, and a pearl gray mist made ghosts of the bamboo thickets along the shore.

"The best tea stick bamboo grows at heights of 1,500 to 2,000 feet," said Mr. Chi

Jui-wu, vice-chairman of the Revolutionary Committee. "The feather-headed bamboo you see along the riverbanks is yellow bamboo, thinner and more flexible than tea stick. We make scaffolding of it. Bamboo, for many purposes, is lighter and stronger than steel.

"We grow eight kinds of bamboo in Guangdong Province, but here tea stick is king. I don't know why we call it tea stick; possibly the pale yellow of the dried culm resembles the color of freshly brewed tea."

In China nature does imitate art. A sandspit at a bend of the river ahead seemed to



hang suspended between earth and sky, and in the flat two-dimensional world of grays and blacks the diagonal slash of a raftsman's pole completed a composition from China's ink-painting masters.

"Before liberation and the establishment of the People's Republic in 1949," said Mr. Chi, "there were only 17,000 acres of tea stick bamboo in Guangdong; now we farm 42,000 acres of it. Our production is about 40,000 tons a year, six times what it used to be. We export about 5,000 tons. Tonkin, as the trade calls it, goes all over the world, but Europeans are our best customers. They use it in horticulture, as supports for tomatoes, melons, hops, and fruits. Scandinavia imports it for ski poles and to mark the borders of roads buried under snow. These are the small, finger-thick sizes. Bigger ones make poles for vaulters, and the largest, as much as two inches in diameter, go to makers of fishing rods and furniture."

In the 1930s tea stick bamboo was introduced into the United States and planted in botanical gardens in Georgia, Louisiana, and Puerto Rico, but it never attained the size and quality of the Chinese parents.

F AINTLY through the curtain of rain I could see figures of men and women among the glistening bamboos on the slopes, felling the mature culms and throwing them down to the river's edge, where they were bound into bundles and laid in overlapping layers like shingles on a roof, forming immense rafts nearly a hundred feet long.

Rounding a bend, we came upon a moving floor of bamboo, hundreds of rafts tied together. Beyond, below the tile roofs of a village, bundles of drying bamboo stood in hourglass columns on the bank.

Ashore on a beach we watched workers seated on small stools in six inches of water, scrubbing each culm with a handful of sand.

"A culm must be three to five years old before cutting," said Mr. Chi. "Bamboo will sprout and reach its full height in six to eight weeks, and then the culms look beautiful, glossy, green, without a blemish. But new culms are mostly water, and if you cut them, they will shrink and crack as they dry."

The man before us circled a culm with a cloth full of sand. Inching the pole from the

water, he scrubbed vigorously, turning it as he scoured. The long shaft, blotched and spotted as if from skin disease with black and white patches of fungus and lichen, emerged sage green and shining.

"The culms dry in the air and sun for ten days," Mr. Chi continued. "Then we ship them by boat downstream to Nanhai, near Guangzhou, where they are straightened over a fire and cut to length."

IN CHINA there are some 300 species of bamboo, of 26 genera. Of these, tonkin is the most known and prized overseas, but within China the single most useful bamboo is a large cane called *mao chu*, hairy bamboo (*Phyllostachys pubescens*), from the fine hair covering its culm sheaths. Fully two-thirds of the bamboo China produces is *mao chu*, which is used to make furniture and even as reinforcement rods in heavy construction.

At the Technological College of Forest Products in Nanjing (Nanking), I listened to Dr. W. Y. Hsiung, China's leading bamboo authority.

"Every day our written language reminds us of the antiquity of China's partnership with bamboo. The radical *chu*—a character indicating sense—depicts two leafed twigs of bamboo." The doctor made rapid brush strokes: 竹. "Chu by itself means bamboo, but this radical enters into hundreds of other words and phrases.

"Our earliest records, long before the invention of paper in the second century B.C., were written on slips of green bamboo. It is easy to scratch or incise on bamboo's smooth skin, unique in the plant kingdom. To make a bamboo book, strips were strung together with silk or ox sinew. One such bundle of 312 slips was recently unearthed in a Han Dynasty [second century B.C.] tomb.

"Why is such importance given to bamboo in China? Because of its beauty and its multiple good qualities. We call bamboo the chief member of the trio of 'winter friends,' bamboo, winter plum, and pine. The three occur together throughout Chinese art and literature as symbols of resistance to hardship. The plum flowers while snow is still on the ground, the pine flourishes in poor soil and clings to precipitous cliffs, and the bamboo remains green throughout the year,

bowing under the weight of winter snows but quickly springing upright again when the snows are gone.

"Philosophers say the smooth expanse between nodes represents virtue; a long distance between faults, and the hollow interior bespeaks modesty and humility."

In the garden of the college I saw culms of a dozen species, some as thin as a pencil; others, like hairy bamboo, almost eight inches thick; yellow bamboo; pale green bamboo; black—really a dark purple-brown—bamboo; another, square in cross section; and a bamboo with internodes that ballooned like grotesquely swollen bottles.

"This is *fu du chu*, Buddha's belly bamboo, *Bambusa ventricosa*, named by your great Dr. McClure," said Dr. Hsiung with a smile. "It is planted purely for ornament."

One prolific bamboo I saw, *Sinarundinaria nitida*, grows in dense thickets high in the mountains of Sichuan (Szechwan) Province and furnishes food for the rare giant panda. In a wildlife disaster still to be fully assessed, Chinese scientists have found 140 dead pandas in those remote interior hills, apparently victims of the inexorable biological clocks of two related bamboo species. Reaching the end of their century-long life cycles, the bamboos have been flowering and dying en masse; it may take several years before the groves have recovered enough to provide a dependable food source again. Meanwhile, experts fear, a significant proportion of the world's panda population—totaling perhaps no more than a thousand—may perish of starvation.

"BAMBOOS FALL into two main categories," Dr. Hsiung said, "first classified according to growth pattern by Dr. McClure as sympodial, or clump, and monopodial, or runner, bamboos. All bamboos come up from rhizomes, underground stems that send up shoots. Clump types multiply symmetrically outward in a circle; the runner kind sends its rhizomes in all directions, throwing up new culms here and there.

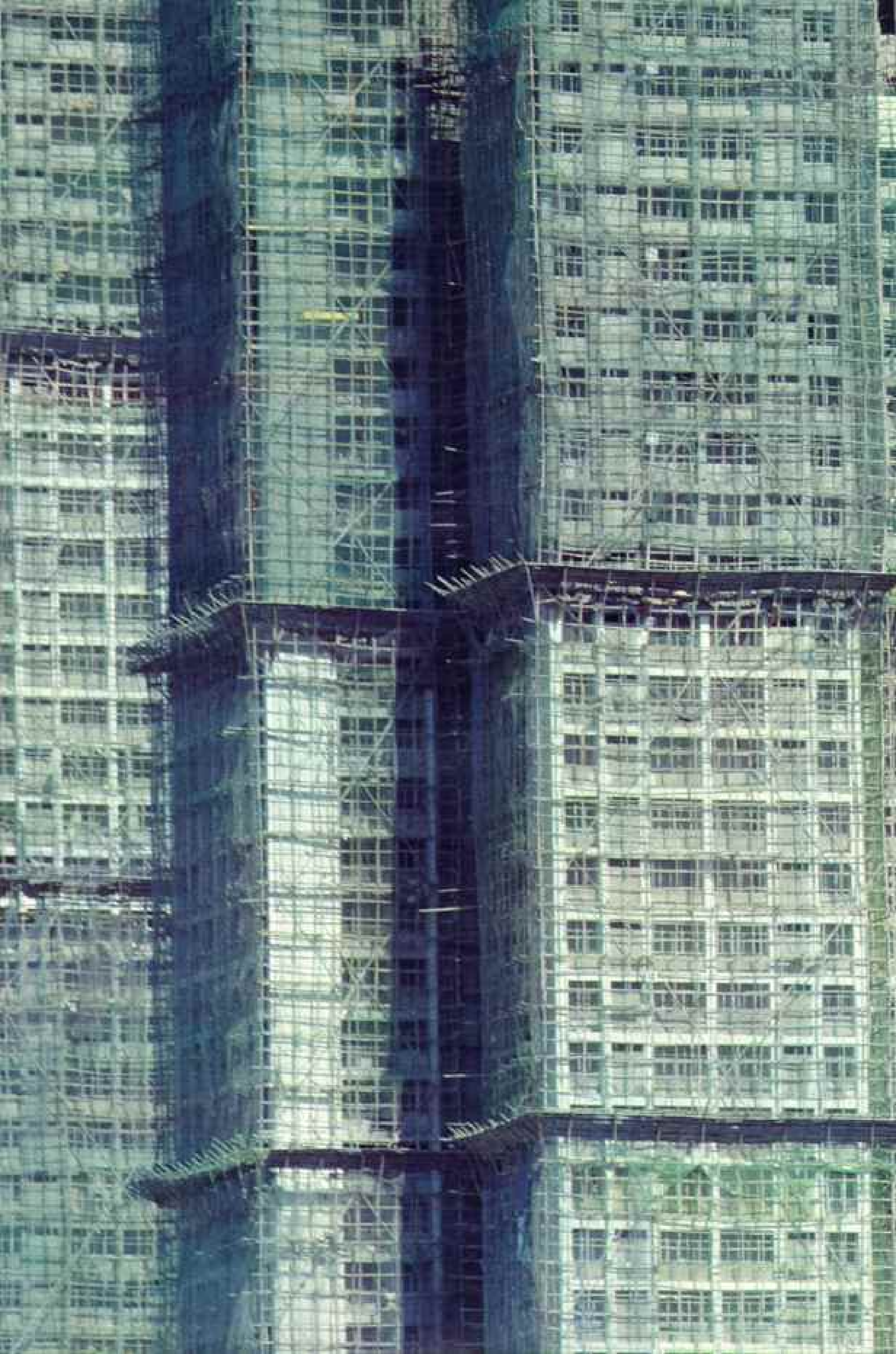
"Clump types are usually tropical, and the runners, temperate zone plants."

In the United States hardy bamboos from China or Japan are used for ornamental plantings. Gardeners struck by the beauty

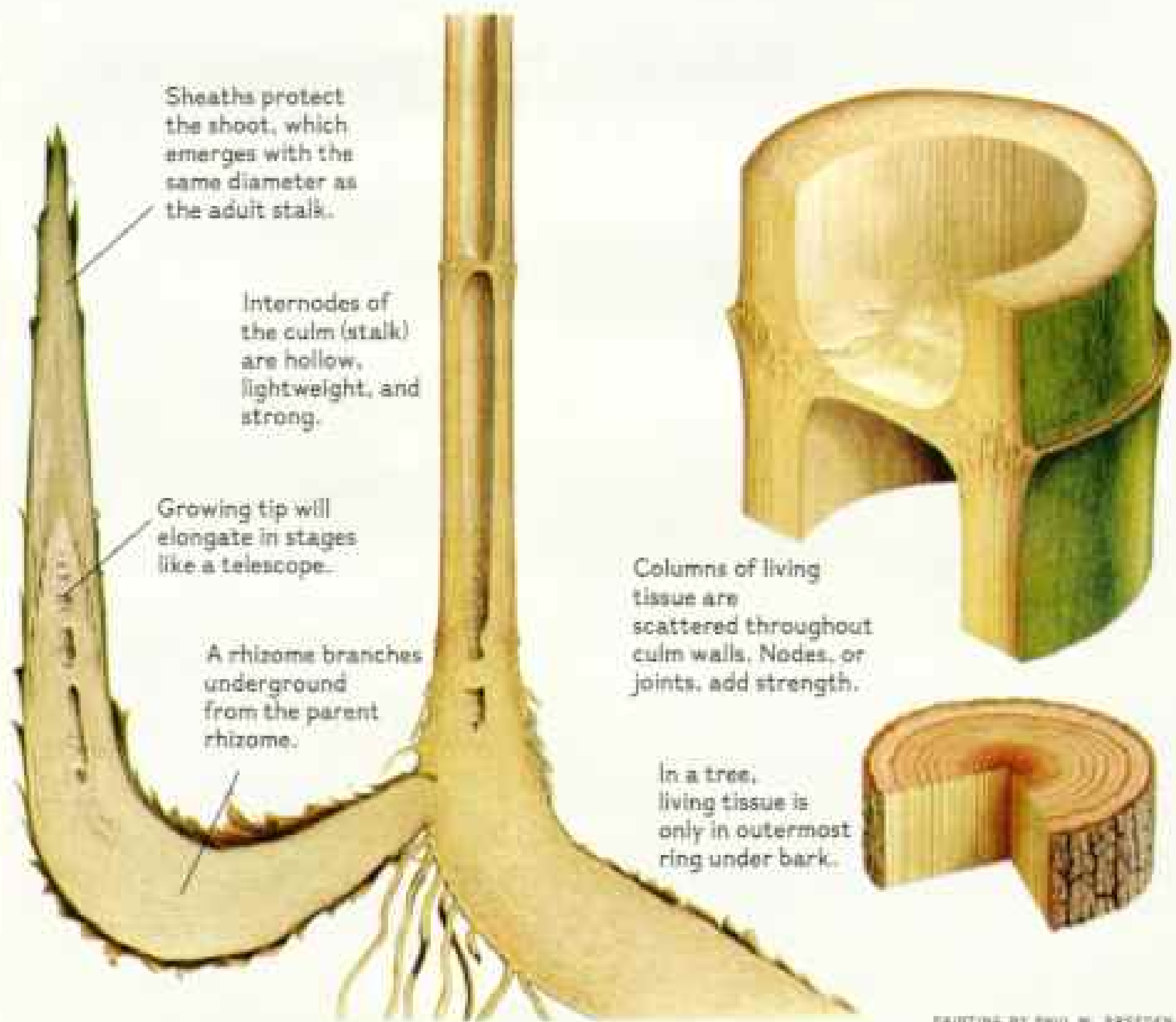


The fainthearted need not apply to Hong Kong's guild of high-rise bamboo scaffold riggers (top). The guild operates like an exclusive craft union, admitting few apprentices to learn the art of lashing bamboo poles with strips of split bamboo (above).

Scaffolding is tied to building facades, rather than being self-supporting from the ground. It has withstood typhoons when steel framework has crumpled. The result on a warren of apartments is old technology made high technology (overleaf).







To flower once, then die is the fate of many bamboos, though some species have a life cycle of 120 years. Each has its own timetable. A plant in the Himalayas (top) goes to seed at almost the same time as all others

of that species worldwide. Groves are fully reestablished from seeds and the few surviving plants in about five years.

Clump bamboo's structure and growth are shown in cross section (above).

of bamboo are eager to plant it, then are dismayed when it runs wild, poking its head up on a neighbor's property. There are remedies: Confine the underground rhizomes by sinking metal or plastic edging down two feet or, when the brittle new shoots come up in the spring, kick them over.

Typically, bamboo sends up new shoots every year; in between, the rhizome develops underground. Unlike a tree, bamboo does not acquire more girth as it grows; the new sprout emerges full diameter. It reaches full height in 60 to 90 days.

Chinese value bamboo shoots for food because of their crisp texture. "The farmer goes into the bamboo groves in spring," said Dr. Hsiung, "and by walking barefoot over the ground, he can feel the hard bumps of the sprouts. If he wants the tenderest shoots, like blanched asparagus, he piles a little mound of earth round the emerging sprout, so that it never sees the light of day."

I had heard that in the old China there was a spring ceremony or pastime. People would go to the bamboo groves on a quiet night to listen for the audible *pop* of bamboo sprouts bursting their sheaths as they emerged from the ground—a sure sign of spring.

All Chinese hospitals have a department of herbal medicine where ancient remedies are used together with medicines from the Western pharmacopoeia. A Nanjing physician told me that the rhizome of the black bamboo, compounded with other plants, treats kidney ailments.

"If you heat a freshly cut black bamboo and drink the moisture that runs out of it," he added, "it acts as a febrifuge to bring your temperature down. The culm of a bamboo used for bridges, *Sinocalamus affinis*, burned to ashes, will cure prickly heat."

In some tropical bamboos a secretion called tabasheer forms and hardens between the nodes. Chinese, Indians, and other Asian peoples prescribed this for coughs and asthma, as a cooling tonic, and even—

Faster than a speeding beanstalk:
The species *Phyllostachys glauca* was photographed at sunset and again at dawn. The double exposure shows a spurt of 15 inches in 14 hours.



that Golden Fleece of Eastern medicine—as an aphrodisiac. Since tabasheer is nearly 97 percent pure silica, which is chemically inert, it probably requires an additional large dose of faith. But, as often happens in folk medicine, there is something there, and researchers have recently found that tabasheer acts as a catalyst in some chemical reactions.

As bamboo finds its place in medicine, so does it too in engineering. Chinese bridges, hanging from cables of twisted bamboo, are ancestors of all the world's suspension spans. The use of bamboo cables for towing ships in China was first described by Marco Polo for the 13th-century Western world:

"The cables . . . are made of . . . the long stout canes of which I have spoken before, fully fifteen paces in length. They split them and bind them together into lengths of fully 300 paces, and they are stronger than if they were made of hemp."

Indeed, stronger. The great bridge over the Min River in Sichuan hangs from bamboo cables nearly seven inches in diameter, wound round capstans so that they can be tightened like tuning a guitar. The Min bridge, still in use after more than 1,000 years, is justly renowned as one of the engineering marvels of the world.

CHINA, the world's oldest continuous civilization, sent much of its culture to Japan more than a thousand years ago.

Most of Japan's 662 kinds of bamboo, of 13 genera, flourish in the mild climate of Kyushu, the southernmost island, but the bamboo capital is Kyoto. Here I met Dr. Koichiro Ueda, Japan's premier bamboo scientist, known throughout the island-nation as "Dr. Bamboo" (facing page).

On Kyoto's outskirts Dr. Ueda led me into a dense thicket of the most curious bamboo I have ever seen. From the ground to a height of four or five feet the nodes seemed to go

mad; they zigzagged diagonally up the culm, leaving triangular internodes that swelled in convex blisters.

"*Kikko-chiku*—tortoiseshell bamboo," said Dr. Bamboo, "a variety, *heterocycla*, of the hairy bamboo. We are not sure what causes it, but sometimes the trait is recessive and the culms revert to standard shape. Groves that persistently produce the tortoiseshell form are very valuable; it is much in demand for ornament."

Particularly distorted tall culms of tortoiseshell fetch high prices in Japan.

IN JAPAN, even more than China, people use bamboo for decoration. The classic wood-and-paper Japanese house utilizes bamboo in ceilings, moldings, rainspouts, gutters, and, particularly, as the corner post of the tokonoma, the viewing alcove where works of art are displayed.

In Kyoto an amazing number of things are made of bamboo: baskets, flutes, bows and arrows, dueling staves, plant pots, pipes, boxes, benches, chairs, flower stands, dolls, scarecrows, garden fences, and artifacts for the tea ceremony.

In a collection in Japan I saw for the first time a bamboo wife, invented centuries ago in China to bring solace to hot nights. It is a woven basketwork cylinder about five feet long, which the sleeper embraces and throws one leg over, so that cooling breezes can pass through.

Among the myriad uses of bamboo listed in the literature, I had come across a curious entry: "Torture." Man's inhumanity to man has made use even of mankind's best friend in the plant world. Many bamboos have culm sheaths covered with a down of fine hairs. Beware of touching these! They will get under the skin and produce intense irritation. Bacteria on the hairs could even cause blood poisoning. I had read that in ancient times sheath hairs were mixed with food to get rid of an enemy.

The Order of the Sacred Treasure was conferred on Dr. Koichiro Ueda of Kyoto for his scholarly work on bamboo. With field journal in hand, he examines distorted culms of tortoiseshell bamboo, whose rare genetic aberration increases its value to collectors. Nowhere have the usefulness and beauty of bamboo been more fully exploited than in Japan.





The crisp texture and subtle flavor of bamboo shoots have made them a favored part of Oriental, especially Chinese, cuisine. Grown as an export crop on Taiwanese farms, they are harvested (above) when newly sprouted and tender. Sorted and packed by Sincere Foodstuff Enterprises Co. Ltd. (far right), many are shipped to a growing market in the West.

Most desirable, like the heart of the artichoke, is the innermost growing tip (right), its embryonic nodes and

internodes visible as gently scalloped surfaces. These delicacies are reserved for Eastern markets.

Giant pandas are the true gourmands of bamboo, their main diet in the wild, and they consume culms, leaves, and all. The recent flowering of umbrella bamboo, one of their staples, has raised concern for the survival of pandas in China, since their environment has already been disrupted by the increasing pressures of human activities.







A bamboo sampler

AMONG the thousand or so species, seven from around the world are shown here. Begin with the specimen on the extreme left.

Green striped (*Bambusa vulgaris* var. *striata*): Probably originated in Asia. Most widely cultivated; used in making paper.

Black (*Phyllostachys nigra*): Native of China. Used primarily in decoration.

Mottled (*Ochlandra stridula* var. *maculata*): From Sri Lanka. Natural splotches are simulated in other varieties by scorching or acid-treating the culms.

Golden (*Phyllostachys aurea*): Ornamental species. Internodes compact at base and elongate toward crown.

Giant (*Dendrocalamus giganteus*): Native of Burma. May be a foot across; makes good lumber, utensils, and water vessels.

Square (*Chimonobambusa quadrangularis*): Thorn-like roots project from nodes. Other species are grown in square forms to achieve a similar effect.

Tortoiseshell (*Phyllostachys pubescens* var. *heterocycla*): Resembling turtles cowering head to tail, this mutation can only be propagated from rhizome cuttings.

PAINTINGS BY PAUL M. BREEDER

AN EVEN MORE lurid use of bamboo I had heard of was staking a man over a growing bamboo shoot. This would, the accounts said, impale the victim as it grew. In one of Dr. Ueda's books I had seen a picture of a bamboo shoot growing through a sheet-iron roof.

"I took that picture," said the doctor. "The shoot had pushed through a joint. But I do not believe that a shoot would ever grow through a man. It would simply turn and come up beside him, as I have seen it do at the edge of a house."

The doctor had pointed out to me a white waxy substance coating the internodes of first-year culms. In former times in Japan and China this wax made candles to light the homes of great lords. Bamboo continued to give light to man down to modern times.

When Thomas Edison, one of the last of the great empirical inventors, was working on his electric lamp, he tried more than 6,000 materials for the filament: paper, leather, pomegranate peel, spaghetti, cotton, silk, vegetable fiber, even the hairs from a man's beard. The best, he found, were charred fibers of ma-dake, Japan's commonest bamboo, growing around a Shinto shrine, Iwashimizu Hachiman, on a hill in Kyoto.

Ironically, when I visited Iwashimizu shrine there was no ma-dake in sight. All the *Phyllostachys bambusoides* in Japan had been flowering and dying for years.

I was prepared for this because the ma-dake growing in Washington, D. C., gardens had been flowering at the same time.

The curious trait of gregarious flowering makes all the bamboo of a given species burst into flower at about the same time. Botanists say the plants have a genetic imprint, as children of one family may all have blond hair and blue eyes.

A Japanese scientist has traced the flowering of black bamboo back more than 1,000 years. The first recorded was in A.D. 813, and documents showed it had blossomed every 120 years.

In communities that depend on bamboo, flowering is a disaster. A few culms may survive, but most die, and the grove must carry on from the surviving rhizomes and fallen seeds. Culms from seedlings are small, perhaps the size of a knitting needle, and



Jungle firepower of a Hmong tribesman in northern Thailand (above) uses the lethal principle of a modern rifle: high-velocity and lightweight ammunition. Propelled by a crossbow, the bamboo arrow is capable of hitting a target the size of a playing card at 50 feet—more than accurate enough to dispatch a fowl (right). The bamboo fletching is folded in a shape similar to that of a high-performance aircraft wing.

each succeeding culm is larger than the one before, until maximum size for the species is reached. Most bamboos send up culms every year; meantime, the rhizome extends its growth underground.

The real tragedy of flowering used to take place in India. Most bamboo fruits look like grains of wheat, but an Indian bamboo, *Melocanna baccifera*, produces a fruit like a small pear. When *Melocanna* flowers at intervals of about 30 years, the big pulpy fruits drop to the ground. Rats devour them and multiply prodigiously. In former times

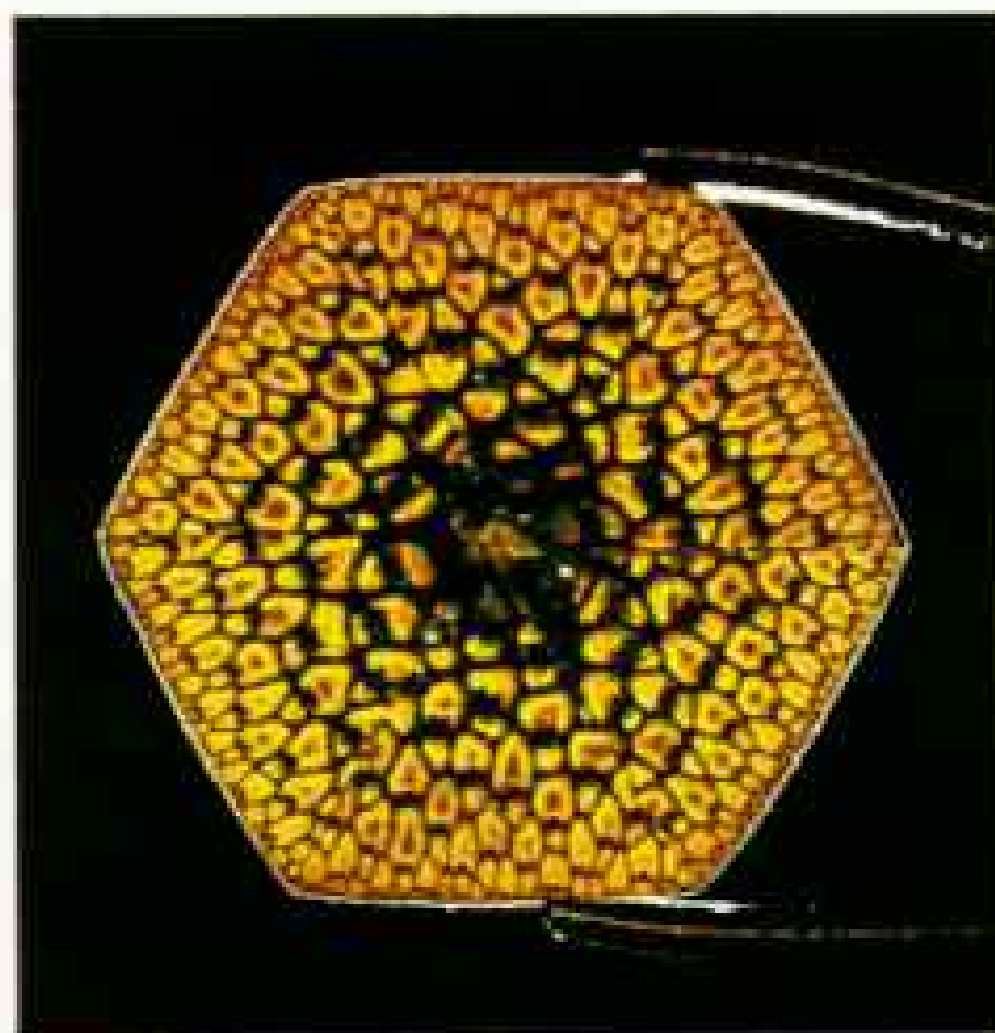






"Sixty-five hours of honest work" after Hoagy B. Carmichael begins, he has handcrafted a bamboo fly rod to a customer's exact specifications. Holding a strip in a steel form (left), he planes tapers to within a thousandth of an inch. He then mates the triangular strips prior to gluing (above). In cross section (below), the rod shows little sign of joints or glue, only the fiber bundles that give the rod its flexible strength.

Carmichael, a former film and TV producer, was apprentice to the late Everett Garrison, the Stradivari of rod makers. He brings as much talent to his art as his father gave to writing such classic songs as "Star Dust."



the rat explosion triggered outbreaks of plague or devastated wheat and rice crops. Thus the flowering of *Melocanna* meant disease, starvation, or both.

On the other hand, flowering of other bamboos has helped avert famine, when the people roasted and ate the seeds.

When I saw *Melocanna* growing in the foothills of the Himalayas, I was disappointed not to find it in fruit.

"The alarm clock is set for 1992," the forest officers told me. "Come back then."

IN NEW DELHI I talked with Mr. S. A. Shah, deputy inspector general of forests for India.

"Bamboo is the poor man's multipurpose timber," he told me. The Indian farmer literally lives with bamboo from birth to death. As in China and Japan, the Indian countryman used to have his umbilical cord cut with a bamboo knife. He is rocked to sleep in a bamboo cradle; as a man, he farms with tools made of it; he feeds it to his cattle, and eats it himself. Ultimately, he is carried to his grave on a bier made of bamboo.

"In India we have the world's largest reserves of bamboo, some ten million hectares [25 million acres]. This is one-fifth of our forest reserves. We cut selectively from wild bamboo stands. But always the countryman has priority, and he is allowed to take what he needs for his daily life. To the Indian farmer, bamboo is literally the staff of life and, in the end, his support in death."

From New Delhi I journeyed north by train to Dehra Dun, site of one of the world's most important forestry research institutes. Founded in 1878, the institute today is an imposing series of buildings on a 1,100-acre campus, some 2,000 feet above sea level in the foothills of the Himalayas.

Mr. R. C. Ghosh, director of forestry research, showed me round the laboratories, workshops, botanical gardens, and museum. At the New Forest campus we walked through bamboo groves of 35 species. Here I saw for the first time the king of bamboos, *Dendrocalamus giganteus*, of Burma, which grows 120 feet high and a foot in diameter. The largest culm I saw was 98 feet high and 11 inches thick; it would weigh more than 200 pounds.

A bamboo from Assam, *Dendrocalamus*





“To stir the tea” in Japan is to stall by marking time. The literal instrument is a bamboo whisk (facing page) for whipping green-tea powder into a frothy brew during the ritual tea ceremony.

Not quite as simple as it first appears, woven covering for a vase (left, above) begins with bamboo solid at the neck, then carefully split to make vertical stringers.

Ready to shade a paddy worker, a bamboo hat (above) is hung on rice drying over a bamboo frame.

A hieroglyph of romance in Kyoto (left) links Hiroko and Mitsuo under a stylized umbrella as of November 3, Showa 49, or 1974.

hamiltonii, once figured in a curious bit of fraudulent trade. For centuries the Chinese have valued rhinoceros horn (really an overgrown hair) as an aphrodisiac and a remedy for impotence.

"The Assamese used to dig up the rhizome," said Mr. Ghosh, "trim it carefully, and ship it to China as genuine rhinoceros horn. It was almost impossible to tell the difference. Whether real or false, the horns still had to be smuggled out, as the Indian species of rhinoceros had been hunted nearly to extinction."

As always happens, the defrauders got greedy; they turned out too many and the trade collapsed.

Less colorful but of infinitely more use to India and to the world were some of the other uses I saw bamboo put to in the workshops and laboratories at Dehra Dun: supplanting steel as reinforcement for concrete; laminated with plastic under pressure to make building walls, windmill blades, and the hulls of boats; replacing steel bolts in construction. Most impressive of all was paper of a dozen kinds, from heavy brown kraft to fine coated printing stock.

In India 66 percent of all paper used comes from the giant grass. The yield of an acre of bamboo does not equal that of a softwood such as pine, but remember that a culm reaches full growth in two to three months and is harvestable in three to four years; a tree might take 20 years. On a paper-hungry planet rapidly being denuded of its forests, bamboo may yet be a savior.

SCIENTISTS on the frontiers of technology, in such fields as aerospace, are making increased use of an exciting new generation of construction materials called two-phase, or composite, materials. These consist of man-made fibers embedded in a matrix that holds them in parallel bundles. Fiberglass has been known for a long time, and, recently, man-

grown fibers of boron, carbon, and other elements have produced materials with amazing stiffness and strength-to-weight ratios. Engineers involved in the work call it the "new science of strong materials."

New, did they say? What are these two-phase materials but man-made analogues of bamboo? The strength of the miraculous grass lies in bundles of fibers running the length of the culm held in a matrix of pith, precisely as in the new "strong materials." Here, again, nature anticipated man.

THE PHILOSOPHER SAID that those who are ignorant of history are doomed to relive it. Modern scientists, well knowing their natural history, turn increasingly to bamboo for both instruction and for use. For strength, lightness, stiffness, and, above all else, for cheapness, bamboo can well hold its own with man-made counterparts.

It may prove to be the ideal material for rapidly spinning flywheels that would store noiseless, pollution-free energy, and perhaps someday bamboo may even be put to use in spaceflight and rocketry. The humble grass may yet leave its parent world on a tongue of flame, shielding its inseparable companion, man, even in the unthinkable cold of space.

Until they invented paper more than two thousand years ago, the Chinese wrote their literature and history on bamboo slips. The smooth green skin of bamboo continues to invite inscription, and a few years ago the Orvis Company, a celebrated maker of fishing rods in the United States, found in a shipment of bamboo from Guangdong a culm inscribed with a column of characters. A field worker, knowing the cane he cut would travel across the sea, had scribed:

"Peoples of the brotherhood of man! May our friendship last 10,000 years!"

Bamboo, steadfast friend of man down the centuries, had spoken. □

Though symbol for a bright idea, the practical light bulb did not pop into mind overnight. A main problem was to find a suitable filament. After trying thousands of materials, Thomas Edison in 1880 hit upon carbonized bamboo. The electric lamp, until then a curiosity, was put into commercial production. A century later, some of those now antique bulbs can still burn with glowing bamboo.



Albania, Alone Against the World

ARTICLE AND PHOTOGRAPHS BY
MEHMET BIBER

LET US FULFILL all our obligations and smash the blockade," admonishes this sign in the Albanian town of Shkodër—but Albania's isolation from the world is the result of internal policy. Without allies and surrounded by nations that have historical ambitions to its land, Albania is organized to go it alone under the stern dictates of Enver Hoxha, who has held power for 36 years. The pickax and rifle symbols dominate public scenes. A dogmatic Marxist-Leninist, Hoxha broke with the Soviet Union, which he considers "revisionist," in 1961, and severed his ties with the People's Republic of China two years ago. The self-sufficient road is often a hard one. Private automobiles are banned, so Albanians travel by bicycle.

Visits by journalists are rare. Last year Mehmet Biber, a Turkish photographer then living in Istanbul, obtained a visa only months after journalist Sami Kohen, another Istanbul resident, had paid a visit. From conversations with Mr. Kohen and his own experiences, Mr. Biber brought back this first full report from Albania to appear in an American journal in many years.



TE REALIZOJME
TE GJITHA
DETYRAT
TE
SHPARTALLOJME



BILOKAZËN





THE JET AIRPLANE flew south from Yugoslavia out over the cobalt Adriatic, turned 90 degrees, and headed landward—toward Albania.

In antiquity, Rome's legions, coming down the Appian Way to Brindisi on the heel of Italy and crossing the Strait of Otranto, landed here and marched east on the great military highway to Thessalonica and Constantinople. Goths and Normans invaded. The Byzantine, Bulgarian, Serbian, and Venetian empires held sway. Next the Ottoman Turks ruled for nearly five centuries and made Albania the only predominantly Muslim country in Europe. Then came the armies of Mussolini and Hitler.

Today no international highway crosses

Albania. Her 300 kilometers (185 miles) of railroad pass no frontier. No foreign plane is permitted to fly across her airspace. Commercial flights, such as our half-empty, bi-weekly flight from Belgrade, must come from seaward and in daylight hours only.

I looked around the cabin at the score of fellow passengers—an elderly woman, a diplomat, an Austrian professor of the Albanian language (only distantly related to other European tongues), and businessmen coming to buy minerals or to sell machinery. Where did I fit the prescription for visitors set by Albania's dictator, Communist Party chief Enver Hoxha? He had declared his country "closed to enemies, spies, hippies, and hooligans, but open to friends (Marxist



or non-Marxist), to revolutionaries and progressive democrats, to honest tourists . . . who do not interfere in our affairs."

More apt was a travel agent's comment: "Only madmen, diplomats, and journalists go to Albania." I was a Turkish journalist and had waited nearly a year to get my visa request approved.

We came in over the beach and coastal plain near Durrës and saw, beyond terraced hillsides, a jagged line of misty peaks riding across the horizon like a gigantic electrocardiogram. I wondered what I would find in this tiny nation of 2.7 million people, the size of Maryland with fewer people, and as little known as Tibet.

For millennia descendants of ancient

Love, Albanian style, means piling into a truck and heading downtown for a brief civil-marriage ceremony. In 1967, when Hoxha proclaimed that the nation's only religion should be "Albanianism," more than 2,000 Islamic, Greek Orthodox, and Roman Catholic institutions were closed.

"Organize," exhorts a placard as Albania's soccer team plays Scotland in Tirana, the capital (following pages), in 1979 during the first European Cup game held in Albania. A request by Scottish journalists to accompany their team was denied as an "arrogant and arbitrary ultimatum."

A high-angle, wide shot of a massive crowd of people, likely at a stadium or arena. The crowd is densely packed and fills the entire frame. In the center, a large white banner with the word "ORGANIZIM" written in bold, red, capital letters is held up. The people are dressed in a variety of casual and semi-formal attire, including shirts, jackets, and hats. The overall atmosphere appears to be one of a significant public gathering or event.

ORGANIZIM





TE STUDJOJME VEPRAT
E SHOKUT ENVER HOXHA

TE SHROJME NE KONFERENCEN E 22 TE
PARTISE TE RRETHIT NE DETJERA TE REALIZUARA

ABONIME
DREKTORIT E POLICIAVE TE
REKREACIONIT NE BARRAZHAT
DREKTORIT E POLICIAVE TE
REKREACIONIT

SHKOLLAT
DREKTORIT E POLICIAVE
TE REKREACIONIT

tribes, traditionally known as Illyrians, have hung on in this most rugged land in the Balkans—"mountains" in Turkish. Amid peaks rising to 2,764 meters (9,068 feet), they followed an implacable clan code of honor that wiped out entire families through blood feuds lasting generations.

Today this Land of the Eagle is totally collectivized. Last stronghold of Stalinism, it is Europe's most dogmatic Communist country, locked in the grip of a leader who has impelled the Continent's most backward nation out of the ashes of World War II in a drive to modernization, from stick plow to tractor, from handicraft and rushlight to factory and dynamo.

Here I would find an unusual social experiment: an entire generation growing up sealed off in a hard-line socialist laboratory,

challenging the world, self-isolated, uncontaminated by East or West.

Unconsciously I stroked my goatee—and was startled by the sudden realization that I might lose it! Albania forbids entry to men with long hair or full beards, and to women in short skirts, flared trousers, and other displays of bourgeois decadence. Tales abound of hapless visitors being packed off to the airport barber to be shorn.

But the soldier who met me at the airplane door was more intent on my passport than my goatee, and I descended in the noon sun of a September day into one of Europe's smallest and sleepest airports, shaded by palms and orange trees heavy with fruit.

Kopi Kycyku greeted me in Turkish. A member of the Foreign Ministry's hospitality committee, *(Continued on page 543)*



NATIONAL MUSEUM OF TIRANA

They owe it all to Enver Hoxha. In his hometown of Gjirokastër, a banner (left, top) lauds the first secretary of the Party of Labor, who helped lead his countrymen to victory in World War II—Albania was the only Axis-occupied nation to win freedom without the aid of foreign troops. Hoxha allied with Stalin but reviled Khrushchev, depicted cringing at far left in a painting (above) glorifying a strident Hoxha at a confrontation in Moscow.

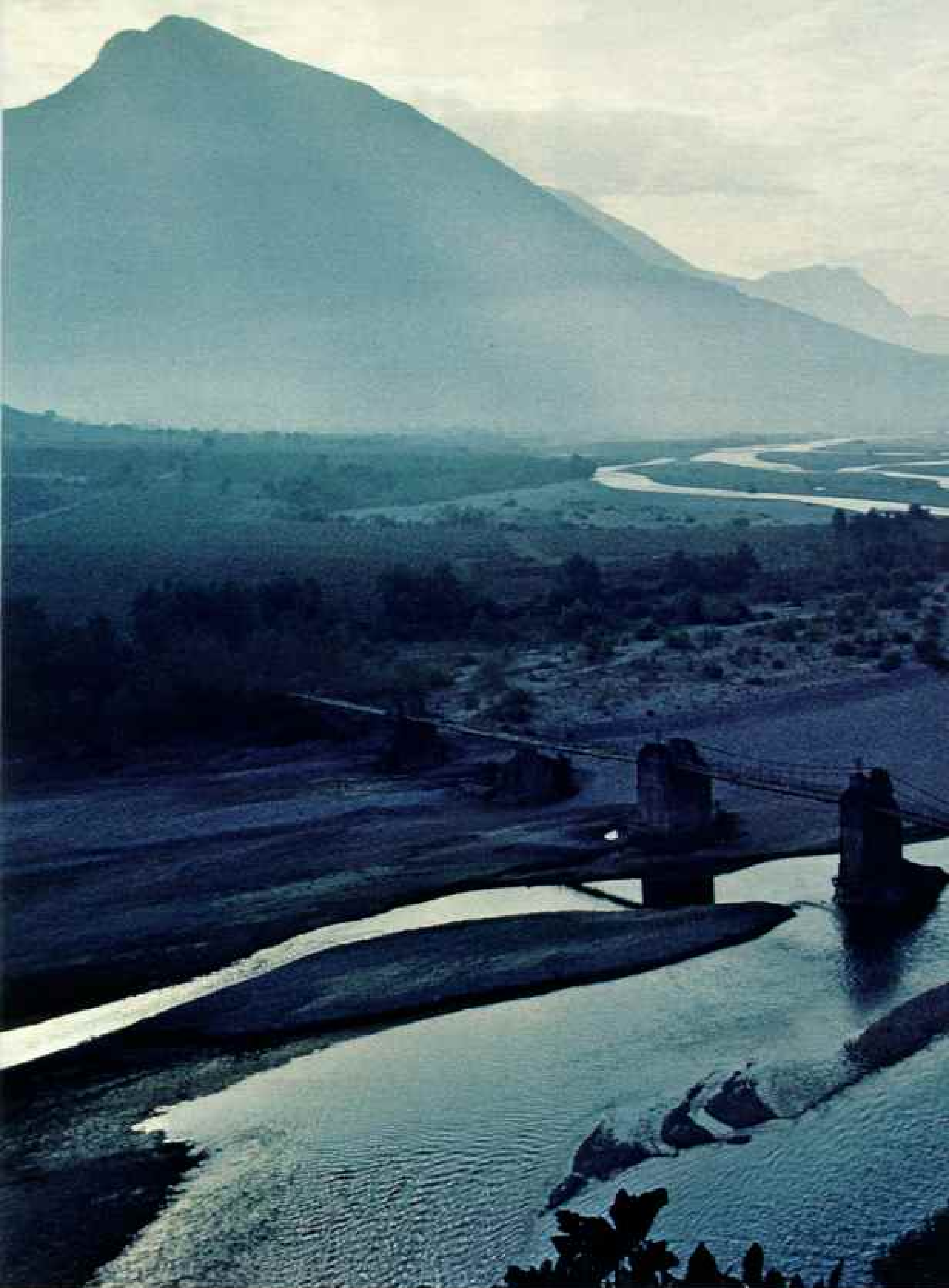




SELDOM FREE, Albania, as part of the kingdom of Illyria, was conquered by Rome in 167 B.C. Other invaders followed until the Ottoman Turks took control in the 15th century. Albania finally attained independence in 1912, but was again occupied during both World Wars. Standing alone at last, Albanians now work one month a year on labor projects, such as a railroad here being built by music students (left).

AREA: 28,748 sq km (11,100 sq mi). **POPULATION:** 2,700,000. **ECONOMY:** Chromium ore, electricity exported. **RELIGION:** Historically 70% Muslim; state decrees atheism. **MAJOR CITY:** Tirana, capital, pop. 300,000.



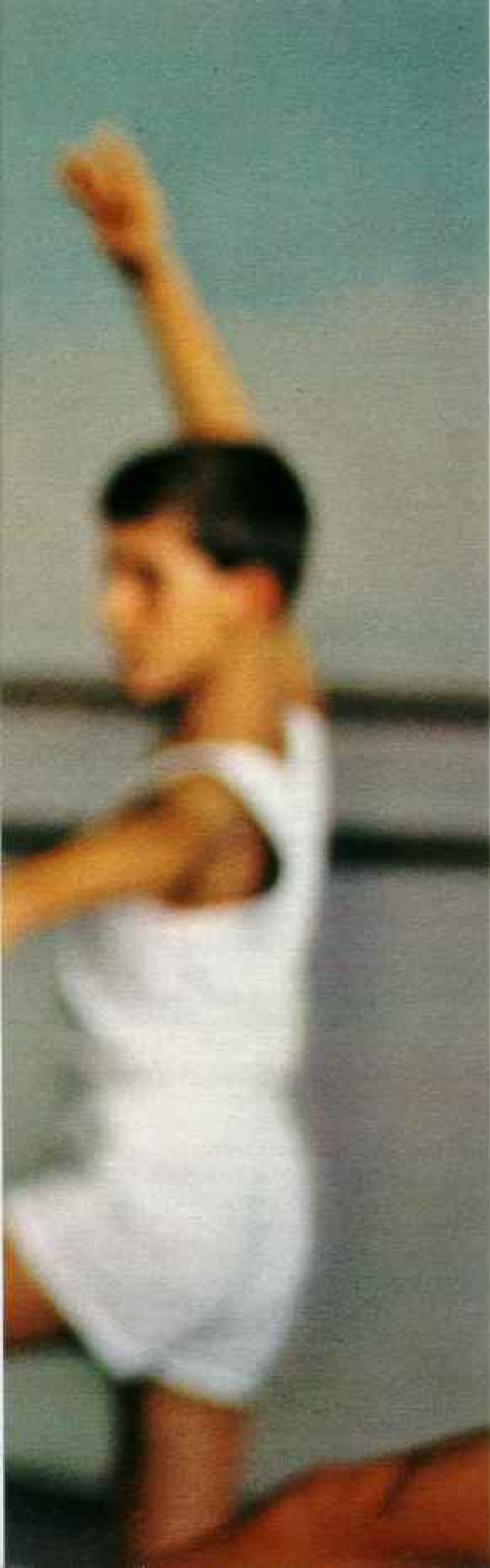


In a land of mountains, blood feuds still smolder among tightly knit clans.



Here the winding River Vjosë flows beneath a footbridge near Tepelenë.





(Continued from page 537) he would bring to my guide-interpreter each morning the day's plan. Now he brought me espresso, expedited formalities, and ushered me into a Polish-made Fiat for the half hour's ride to Tirana, the capital. Along the way brigades of peasants looked up from their labor in the fields. But we met little traffic on the road.

Traffic Cop Without Traffic

Life in Tirana centers around Skanderbeg Square, with its monument to the 15th-century hero who fought against the Ottoman Empire. The modern Palace of Culture faces it, as do several royal buildings of King Zog, who ruled in the late 1920s and 1930s. One of those now houses offices of the satirical magazine *Hosteni*; another, the old Parliament building, is a children's theater.

For a kilometer from Skanderbeg Square to University Square stretches the Boulevard of Fallen Heroes, flanked by huge statues of Lenin and Stalin, the Communist Party headquarters, major ministries, and the soccer stadium. In the early afternoon the square looked deserted: an official car, a military vehicle, a bus, several bicycles, a scattering of old women sweeping the street. Yet in the center of the square stood a policeman solemnly directing traffic.

Albania allows no private cars, and its capital has only a score of cabs, all state owned. Most were lined up near the square. Albanians seldom use them.

We pulled up in front of the Hotel Dajti, built by the Italians in the early 1940s when the avenue was called Viale Savoia. It is one of Tirana's two hotels for foreigners, and locals may not lodge in it.

My balconied room was decorated with a beautiful kilim rug. Downstairs in the gift shop, such a carpet sold for \$20 a square meter in foreign currency. I checked the TV room—only local programs could be received. I studied press releases spread on a table in the big hall and paused before a display of journals: the magazine *New Albania*;

Touch of class: A Tirana student learns ballet in a special fine-arts program. Before "liberation," four out of five Albanians were illiterate. Today, the same proportion can read and write.

Zëri i Popullit (*Voice of the People*), the party newspaper, and a sampling of Albania's dailies, all similar in content. Paperback editions of Enver Hoxha's books were available in several languages—but not one foreign newspaper, magazine, or book. It was as if the outside world did not exist.

Emerging from the hotel at dusk, I returned to Skanderbeg Square. What a change! It seemed that half of Tirana's 200,000 people had gathered here after work. Some strolled the parklike walks along Stalin Boulevard, others conversed in small groups or clustered around kiosks to buy Albanian cigarettes, soft drinks, and papers. Young men and women flirted. Parents streamed to the Palace of Culture for a concert, play, or exhibition, while students crowded its national library. And amid the square's chaos of buses, bicycles, and pedestrians, the policeman shrilly shepherded traffic with his whistle.

For about two hours the heart of Tirana throbbed with life, then fell silent again. Even the traffic officer had gone home.

Nation Spurns "Revisionist" Giants

The following morning Bashkim Babani, my guide-interpreter, a thin man in his mid-30s, took me through the Palace of Culture. Albanians are proud of this building, started by the Russians and left unfinished when they pulled out of Albania in 1961 as a result of an ideological split. Said my guide: "The Soviet revisionists and imperialists cut all aid to us and imposed an economic blockade, thinking we would soon perish. But we mobilized our forces and completed this building. It stands today as a symbol of our triumph."

Breaking with "Khrushchev's group of renegades," Hoxha turned to the Soviet Union's bitter foe, China's Mao Zedong.

Albania became China's closest friend, her champion in the United Nations, and received between one and two billion dollars of economic and military aid. That lasted until 1978, when China's growing rapprochement with the "imperialist" United States and "revisionist" Yugoslavia broke the "eternal friendship." Claiming to perceive behind the "hypocritical smiles" of Mao's successors "the perfidy . . . of one who stabs you in the night and mourns you

by day," Albania now remained the only citadel of "true Marxism-Leninism."

Where would Albania turn this time?

From Tirana to the smallest village, in the streets, on buildings, in factories, schools, and farms, slogans proclaim the answer.

A banner in Skanderbeg Square reads: "Without any foreign aid and any credit from abroad, we rely entirely on our own forces." On the old city hall: "We shall break the blockade and encirclement of imperialism and revisionism." Atop the Prime Minister's office: "Long live our people's power." A foreign-language class studies Hoxha's slogan on the blackboard in English: "Let us build socialism with a pick in one hand and a rifle in the other."

Hurling defiance to the world—seeing themselves opposed by giant China and menaced by the U.S.S.R. and its Eastern-bloc satellites; fearful and suspicious of neighboring Yugoslavia and Greece and the West—lilliputian Albania will go it alone.

How can she do it?

By mobilizing production. Plants often work three shifts to use machinery 24 hours a day. I saw tractors work fields by headlight, then go by truck at night to another farm complex for the morning plowing. As part of this "technical revolution," some engineers, technicians, and workers add several hours to their daily eight, lengthening their 48-hour, six-day workweek.

"Do you get extra pay for overtime?" The question was put to a worker in a Tirana factory making spare truck and tractor parts.

"No, we don't ask for it. We volunteer because we believe this work is the way to break the blockade. This revolutionary spirit will lead us to victory."

Mark Toma retired at 60 three years ago. But now he is back at the same factory.

"We are united in this goal, to contribute to making our economy self-dependent. I am still strong. I cannot sit idle while the whole nation struggles."

Did he receive pay?

"I'm already getting my pension."

Civil servants, students, even party officials and diplomats put in at least one month's labor a year in factory or on farm.

Workers' brigades compete in topping production quotas. This brings rewards in medals, citations, and extra days of vacation

at a resort. Bulletin boards are full of "grumble sheets," intended to improve morale and production through "self-criticism."

At the Enver Hoxha factory in Tirana, my colleague Sami Kohen was proudly shown the first Albanian-made tractor. When the Chinese cut off aid, they left this factory, a hydroelectric dam, mines, and other major projects unfinished.

"The Chinese technicians even took all the plans," the manager said angrily. "Then they tried to sabotage the factory by refusing to deliver needed machinery. But we completed the plant and got the machines and parts from other countries. Not as foreign aid or on credit. We had enough of such help from the Russians and Chinese. If we need something, we buy it from any country—in cash. Or we trade for it. That way we maintain our independence."

In fact, the Albanian constitution of 1976 forbids credit deals, prohibiting bank loans from East or West.

Living Well, Albanian Style

Few other countries could have chosen this hard way to development. But Albania is ruled by an iron hand. And Albanians are used to privation. Hardship of earthquake and flood followed the horrors of war. When the Russians pulled out, severe drought raised the specter of starvation; many commodities were restricted.

Today, though Albania is far from prosperous, she has no serious shortages and no rationing. People are plainly dressed, but none are in rags. Families live in small flats or cottages, poorly furnished by Western standards. But compared with yesterday's misery, Albanians don't doubt that they do better today. And they take pride in their will to survive on their own terms: "We prefer to feed on grass if need be. We will never stretch our hand to the imperialists."

"We experienced difficult days," 71-year-old Kristo Teodori told Sami Kohen, on a visit to a cooperative at Finiq in southern Albania. "I spent my youth in misery, right on this plain. I worked hard for the landowner, yet could scarcely make a living. Today, thanks to Enver Hoxha, we live well."

The old man shares a three-room house with his son, Jorgo, 47, his daughter-in-law, and her sister. Over Turkish coffee and

cognac, he said the cooperative today comprises 17 villages with 8,000 inhabitants and 3,400 hectares of land, producing wheat, corn, rice, cotton, vegetables, fruit, pigs, and cows. Before the "liberation" this was 80 percent swamp.

The land belongs to the state; houses, tools, and seeds all belong to the cooperative, and each farmer gets a share of the output. The sale of any surplus helps maintain a health center, schools, shops, a theater, and sport facilities. The family's three working members earn enough for essentials, so Kristo Teodori can spend part of his monthly pension of 420 leks (\$85) on cigarettes and cognac. "I call it 'Enver Hoxha's bonus.'"

Hoxha's regime launched its agrarian reform in 1945, taking land from owners and distributing it to peasants. Collectivization was completed in the 1960s. The results: drained and flood-controlled river valleys, irrigated farms, and hillside terraces. Mountainous Albania's arable land, once a scant 10 percent, has been doubled, malaria wiped out, health and social services vastly improved. Four decades ago Albanians could expect to live 38 years. Today they can look forward to 68.

In its challenge to the world, Albania also can rely on its mineral and energy resources. After South Africa and the Soviet Union, Albania stands third in production of chrome. Limited in needs, it is self-sufficient in energy—oil, some coal, abundant hydroelectric power from its dammed rivers. I saw power lines marching to all parts of the country. Mountain hamlets have been electrified, and Albania even sells surplus electricity to neighboring Yugoslavia and Greece.

Industrial, mineral, and agricultural products fill the "Albania Today" exhibition in Tirana. "Everything here is the product of our labor and sacrifice," said Hysen Vaqarri, the exhibition director. "We even produce enough food for export. Nor does the world energy crisis affect us. We manufacture everything from radios to kitchenware. We do all this with our own forces—without foreign support."

So intent are they on self-reliance that Albanians eschewed aid from the International Red Cross when an earthquake devastated the Shkodër region in northern Albania in April 1979.

Throughout Albania I watched students, both male and female, building roads, putting up houses, tilling farmland, working in factories. Albania's railroad system is extending northward primarily through student labor (pages 538-9).

"This physical labor lets us students get to know our country and people better, increase our practical knowledge, share our theoretical education, and lets us help build socialism."



Building feminism along with socialism, a Party of Labor tenet, has been hard in a tradition-steeped society. University women in Tirana practice for a Liberation Day parade (above). In Kavajë, workers inspect fine carpets (right), which are exported or sold in tourist hotels.

So said Gjergj Murra, Bashkim Çami, and Zeliha Kraga, history students at the State University in Tirana. Besides six class hours daily, they take one full day of military training a week.

"What do you do after class?"

"Study the day's lessons."

"And in your free time?"

"We stroll . . . go to the theater or movies . . . listen to classical music."

Courses last eight months. Then, besides the month of physical labor for students, there is a month of military service, girls as well as boys. All high-school graduates must serve a year in a factory or on a farm before they can get a job or enter university.

"And after graduation?"

"A year's training before getting a job. A graduate in medicine serves in a hospital. An engineer in a factory. Philosophy or language majors usually teach."

University administrators said that 80 percent of the population was illiterate in 1938; today 80 percent can read and write. The university began in 1957 with 3,600 students. Enrollment today is 16,000, in seven faculties: engineering, political science, geology, history, economics, medicine, and natural sciences.

But no school of law. Why not?

"Our system has no need for lawyers," came the answer. "Our citizens require no third person to defend them. The judges of the People's Courts, elected by the people, take their rights into consideration."

Ominously, the Ministry of Justice disappeared in one of Enver Hoxha's many administrative reforms.

Marxism-Leninism is the core subject in all the faculties, leading to the student's "ideological formation." Essential courses include the history of the Albanian Party of Labor, economic policies of capitalism and socialism, dialectical materialism, "revisionist" philosophy—and, of course, the works of Enver Hoxha. The five-year plan determines university admissions, with quotas by region and family occupation—one-third each for workers, farmers, and intellectuals. Those whose families were landlords or tradesmen under the previous system have a harder time.

"What if students fail their exams?"

"Our youth is idealistic. At the end of the





Garlands of peppers festoon a farmhouse near Lake Ohrid, part of Albania's



boundary with Yugoslavia. A million and a half Albanians live across the border.



Harder work and more sacrifice are constantly urged by daily newspaper readings. Apple pickers hear the Voice of Youth as their day begins (above). Terracing

slopes by the Adriatic Sea (below) took heroic efforts, but citrus groves there help the nation feed itself. Albanians have doubled their cultivated land in 35 years.





year 96 percent pass. Those who fail are transferred to a farm or factory. Remember, our five-year plan designates how many doctors, engineers, geologists, scientists, and teachers the country needs each year. This university may not produce fewer. We must have the best young people to attain our goals in accordance with the plan."

Working for the State

"The plan." The phrase seemed to evoke awe whenever used. Indeed, in so dogmatically centralized an economy as Albania's the plan *is* sacred.

The plan is based on complete state ownership. Every shop, restaurant, and kiosk belongs to the state. Every taxi driver, barber, waiter, baker, and artist works for the state. Farmers work either on state-run farms or on state-sanctioned cooperatives.

Coming from inflation-plagued Turkey, I found an undeniable appeal in certain aspects of Albania's economy. No income tax. No inflation. No dependence on outside energy sources. And since everything is tightly

controlled by the state, no price hikes—or wage increases.

Factory workers and farmers usually get 600 to 700 leks a month (a dollar is worth five leks); a university professor about 1,000. Wage leveling imposes a ceiling of 1,200 leks, except for top officials.

By Western standards, salaries are low. But so are many prices. In the shops I found meat from 12 to 18 leks a kilo (\$1.10 to \$1.60 a pound), bread 2 leks (18¢ a pound); a pack of local cigarettes costs 2 leks (40¢).

Clothing strains the family budget. I looked at Albanian-made men's suits costing a month's salary, and which I wouldn't want to buy. Shoes are 100 leks, shirts 50 leks—but the quality is poor. The plan limits Albania's 250 million dollars of imports largely to essential machinery, spare parts, and raw materials, balanced by exports.

Albania keeps rents low—usually not more than 5 percent of family income. But officials admit to a shortage of flats, particularly for newly married couples.

Health services and education are free, and Albanians spend little on transportation or amusements. Even Tirana offers little entertainment: a few theaters, presenting ideological films, plays, operas, and folklore programs, but no nightclubs, which smack of bourgeois decadence.

Tirana has more restaurants than other towns, but few can afford to dine out often. Albanians have their own strong grape spirit, *raki*, as well as brandy, wine, and beer. But they are not heavy drinkers. In Tirana a boy might take his girl friend to a park, weather permitting, or to see a film on the favorite theme, the antifascist National Liberation War.

Sami Kohen saw one factory-organized dance at the Palace of Culture. Young couples were stepping sedately to old fox-trots and tangos played by an amateur orchestra. Discipline and calm prevailed.

In fact, Albania's "cultural revolution" sets the tone for youthful behavior and appearance. Not only long hair and miniskirts, but also blue jeans, narrow trousers, and makeup are taboo. No drugs, premarital sex, off-color jokes, or chewing gum. Rock music and loud jazz are frowned on.

Foreign visitors usually spend the evenings in the Hotel Dajti bar, taverna, and

restaurant, where the cuisine is relatively good. "Apart from embassy cocktail parties, there is hardly any other place to go, anything to do, or anybody to talk to," groused a young Western diplomat, whose previous post was Paris.

I turned this into an opportunity to learn more about the roots of Albania's suspicions about the outside world.

"If I were an Albanian, I'd be suspicious too," my informant began. "Time and again predatory neighbors have invaded: Serbia, Montenegro, and Greece took big slices of Albanian territory. Remember, a million and a half Albanians live in Yugoslavia today, half as many as in Albania itself. For 70



A partisan's pride reflects from scarf and medals during a celebration commemorating victory over the Axis powers in 1944. Partisans of the Marxist-based National Liberation Front fought the occupying Italians and their German successors. They also waged a successful civil war against anti-Communist groups for control of the country.

years Greece claimed northern Epirus, which is southern Albania. While Western diplomats twiddled their thumbs, Mussolini marched in and took over the whole country in 1939. Later, Tito wanted to make Albania into a seventh Yugoslav republic. A history like this leaves deep scars."

Albania today has no diplomatic relations with the United States, Britain, or West Germany. Would this policy change now that Albania has fallen out with the Soviet Union and China?

"The United States is an arch-imperialist superpower, as threatening to us as social imperialist Russia and revisionist China," a senior official of the Albanian Foreign Ministry told Sami Kohen. "The Americans made approaches to us after the break with China, but we do not want to have anything to do with them."

"Britain still holds 40 million dollars' worth of Albanian gold seized after World War II," complained a journalist. "Germany refuses to pay us damages for the Nazi occupation, assessed at 4.5 billion dollars. We shall never accept diplomatic relations with either country without payment."

Future Holds More of the Same

Today's Albania is shaped in the image of Enver Hoxha, now past 70. What after him? With the editor of *Hosteni*, the humor magazine, I recalled the Soviet Union's changes after Stalin and China's after Mao. Was there any possibility Albania might also soften after Enver Hoxha?

"You compare us with those revisionist countries?" he retorted, not amused. "No, nothing will change after Comrade Enver passes away. The party and the nation are strongly united. His teachings give us our direction. We shall not deviate from it."

Rather than opening to the outside world, the self-isolated Albanians keep constantly on a war footing. Besides two years' military service for young men and women, all able-bodied citizens, whatever their profession, must serve a month or more every year in the armed forces. Frequent military exercises at all factories, farms, and offices prepare the people against attack.

Everywhere I traveled—on the seacoast, in mountain passes, in fields, in city parks, amid blocks of flats—I saw civil-defense

bunkers. They look like—and grow like—mushrooms, their popular name. “More steel and concrete goes for bunkers than for housing,” a diplomat told me.

I knew that Enver Hoxha was concerned about the future of Yugoslavia after Tito—and the nightmare of a Soviet occupation. Does Albania really feel threatened?

“We must be prepared for the worst,” an Albanian journalist told me.

“But could tiny Albania hold out against the attack of a major power?”

Albania’s weaponry, mostly Chinese made, is outmoded, and diplomatic observers in Tirana say the country may be looking for arms in Europe.

“Even if the enemy is numerically superior, we can stop them. The whole nation will mobilize instantly. Our mountains and rivers make Albania a natural fortress. Any attack would cost the invaders fearfully.”

I thought of the stone houses in Gjirokastrë and other mountain towns, windowless walls below and loopholes above—each house a fortress, the heritage of centuries of blood feuds. And I recalled the 15th-century citadel at Krujë—the stronghold from which Skanderbeg conducted 25 years of guerrilla warfare against the Ottomans.

Born Gjergj Kastrioti, and sent as a youthful hostage to the sultan’s court, he had risen to high command in the Ottoman Empire. Renamed for Alexander the Great (Iskander Bey in Turkish), whom the Turks admired, Skanderbeg defected and led 300 Albanian knights to reclaim his inheritance. He renounced Islam and stemmed the Turkish tide in Europe until his death in 1468.

He lived on as a symbol of resistance. And it was under Skanderbeg’s banner—the black double-headed eagle on a blood red field—that Enver Hoxha’s partisans forged the independent Albania of today.

State Forbids “Opium of the People”

Rain grayed Lake Scutari and shrouded the wild North Albanian Alps that sentinel the border with the Yugoslav Republic of Montenegro.* Alongside the lake’s outlet, which is navigable all the way to the Adriatic, spreads Shkodër, the ancient capital of Illyria. Brooding over it, a medieval citadel recalls Venetian masters. A monument in a park there honors five Albanian partisans

who sacrificed themselves holding off 300 Nazi invaders. Near it I was taken to visit Shkodër’s Atheism Museum.

Under Marx’s slogan, “*Feja është opium për popullin*—Religion is the opium of the people,” the director, a cold, harsh-voiced man in gray, told me that religion had obstructed Albanian independence.

Because the Turks identified nationality with religion, Albanians of Muslim faith (some 70 percent of the population) were considered Turks. The Orthodox Christians (about 20 percent) were called Greeks, and the Roman Catholics (about 10 percent)

*See “Montenegro: Yugoslavia’s ‘Black Mountain,’” by Bryan Hodgson in the November 1977 issue.



Mountain tradition colors the finery worn by a woman of Albania’s northern cultural group, the Ghegs. The Party of Labor, dominated by the southern group, the Tosks, has worked to stamp out customs such as infant betrothals. But the “law of the mountains”—including death or life-long ostracism and ridicule for offenses against women and children—lives on.

Latins. Services were thus conducted, not in Albanian, which was forbidden and didn't even get its Roman alphabet until 1908, but in three foreign languages: Arabic, Greek, and Latin. "During the struggle to build our Albanian nation," he continued, while showing me exhibits on clerical abuses, "the churches served as a fifth column for fascism, imperialism, and counterrevolution."

Hoxha's regime executed the clergy, sentenced them to labor camps, or assigned them to "productive work." Other Communist countries curb religion; Albania forbids it, proclaiming itself in 1967 "the first atheist state in the world." All 2,169 mosques, churches, monasteries, and other "centers of obscurantism and mysticism" have been closed, torn down, or transformed into recreation centers, clinics, warehouses, or stables. Shkodër's great cathedral reverberates to the shouts of 2,000 basketball fans.

Albania's new generation knows only atheism. Marxist-Leninist faith replaces religious faith. Enver Hoxha's books, serialized in newspapers, quoted on the radio, gleaned for slogans, serve as a New Testament. Hoxha is hailed as a messiah—infinately wise, farsighted, and benevolent, but also implacable toward his foes.

Leader Maintains High Profile

Living apart from his people in a heavily guarded compound off Fallen Heroes Boulevard, and riding in a curtained Mercedes, Enver Hoxha is omnipresent. His portrait looks down from walls everywhere, even from truck and tractor. His name is carved on hillsides in letters hundreds of feet high. His birthplace—a two-story stone house in Gjirokastër—is a national shrine.

A master of Stalinist self-preservation, Hoxha has ruthlessly liquidated all opposition in the People's Socialist Republic of Albania. The revolutionary elite, convinced that human nature can be shaped by incessant indoctrination, has set out to forge a new Albanian citizen who will unquestioningly make any sacrifice in his nation's fight against "savagely imperialist-revisionist encirclement" to build a socialist society free of the heresy of individualism, independent thought, or alien morality.

While striving to remold its citizens, this tiny, once backward nation has pulled itself



Telling a timeless story, a woman spins yarn from wool. Though all



farms are collectivized, rural families are allowed to own a cow and a few sheep and are allotted small plots that produce a disproportionate share of the nation's crops.

up impressively by its bootstraps. Take the big metallurgical plant at Elbasan, called the Steel of the Party; the hydroelectric station at Fierzë, dubbed the Light of the Party; a student enrollment of 700,000 against 56,000 in 1938; two radio transmitters in 1945 climbing to 52 in two decades; average life expectancy nearly doubling in four decades—certainly striking achievements.

The regime is also trying to dismantle the patriarchal clan structure that has provided social cohesion in Albania's mountain wilds.

In doing so, it is stamping out vendettas, which, as late as 1920, accounted for one out of four male deaths. It has suppressed blood vengeance for adultery. (Highland tradition gave the husband the right to shoot his wife and her lover. Her family, in ritual approval, gave him a bullet!)

The reformers put an end to infant betrothals and the sale of 12-year-old brides, and attacked customs chaining Albanian women, traditionally considered "long of hair and short of brains," to an inferior role.



One umbrella is enough for travelers near Lezhë. Resisting a rain of

No corner of Albanian life, material or spiritual, has escaped Hoxha's drive for control. People with names "inappropriate or offensive" from a political, ideological, or moral viewpoint must change them. Not even the dead elude Hoxha's reforming zeal. Burials, paid for by the state, are in common ground, without the traditional separation by religion.

Turn over the glittering coin of increased literacy and you find the dark side of increased thought control, for the Directorate

of Agitation and Propaganda determines what Albanians will read, just as the state determines who will work where, who will be rewarded, and who will be punished.

Wary Society Closes Its Doors

The harsh hand of history has embedded suspicion in the Albanian psyche. After three weeks in Albania, I realized how little I had been able to penetrate the facade of this portentous social experiment.

Never in my travels about the world had I experienced so closed a society, had I felt so much an island. Accompanied and watched constantly, I felt that the conspicuous yellow car I traveled in was like the clapper that warned of the medieval leper's approach.

My guide, Bashkim Babani, would step behind me to see what my camera was recording. He let me photograph the outside of industrial plants but not observe them at work, visit a hydroelectric dam but not the powerhouse. At a distillery I was given raki to drink but could not see its making. Requests to visit families and homes were politely parried or ignored.

No pictures of bunkers, no donkeys, nothing primitive of course. But Bashkim even stopped me from duplicating scenes on Albanian postcards. One citizen objected to my photographing children in front of Tirana's puppet theater. Bashkim discouraged taking pictures of a wedding procession. The regime downplays such traditional festivities. Nor do I recall ever seeing a pet dog or cat, bourgeois luxuries.

Once I struck up a direct conversation with a peasant in Turkish. Bashkim immediately switched to Albanian and translated the answers into the usual party jargon.

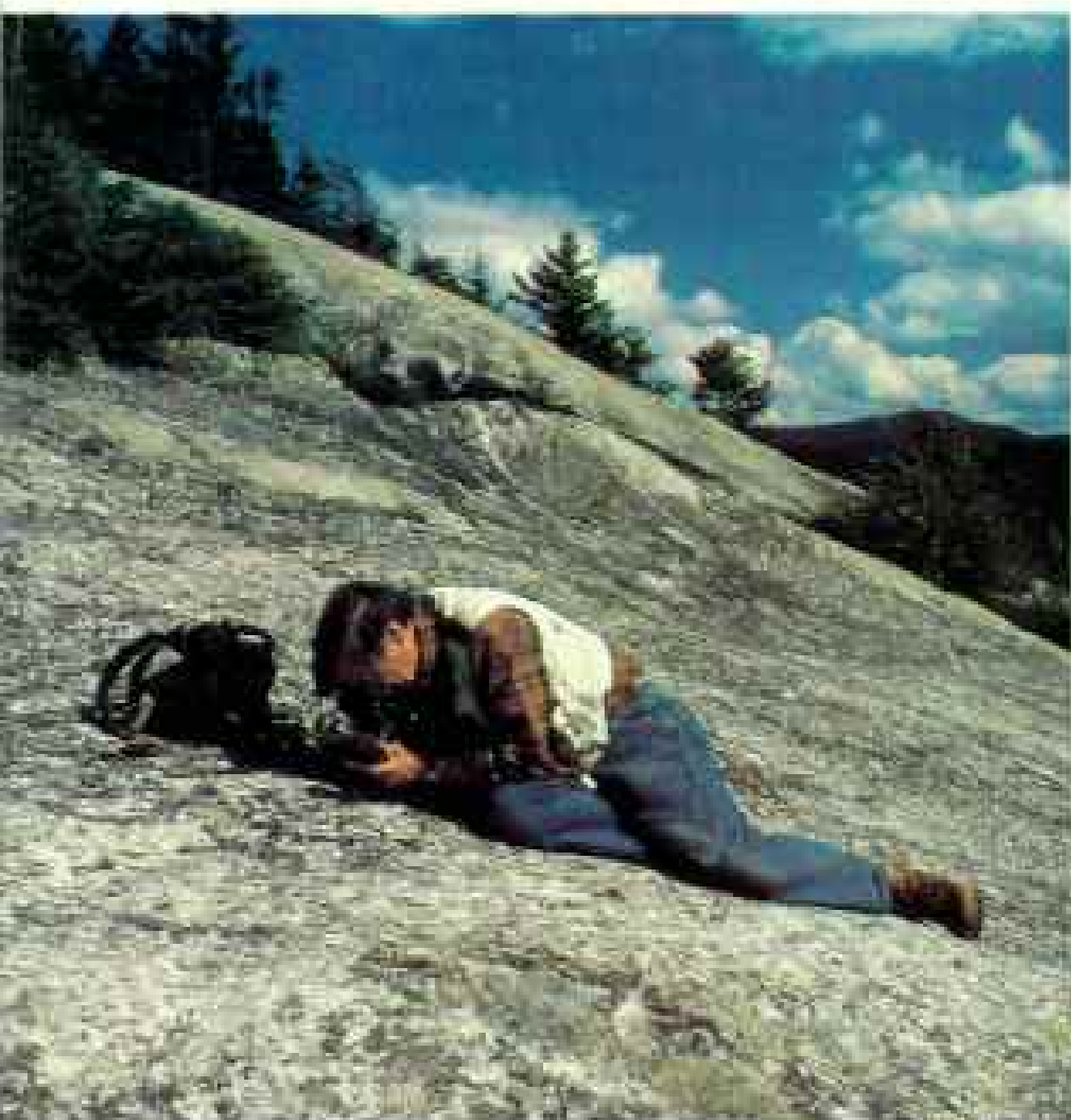
Nor could I penetrate his defenses. He was correct and cordial, as were most Albanians. Only once did I encounter a breach of hospitality—when a teenager on a collective grape farm near Shkodër spat in front of me and hurled an antiforeign slogan in my face. I tried to prime the pump by telling Bashkim of my life in Istanbul with my wife and son. But he never parted the curtain, as on Enver Hoxha's Mercedes, to allow me a glimpse of his life and private thoughts. Indeed, he seemed to embody the very attitude, the very mask, that his nation so defiantly wears. □



foreign gods, Albania goes it alone.

Life on a Rock Ledge

ARTICLE AND PHOTOGRAPHS BY
WILLIAM H. AMOS



ROBERT C. AMOS

Long, quiet vigils with a camera put the author (above) in touch with a bustling world of small creatures on Vermont's Wheeler Mountain. Though barren looking, a granite ledge supports a rich cross section of nature: the hunters and the hunted, the industrious and the languid, all vying for life in a harsh realm.

ALONE on the bare mountainside. Footsteps behind me. A face as startled as my own. Greetings exchanged, the young stranger asks: "What on earth are you doing, staring at the rock like that?" Why, says his tone, would anyone lie still as sleep peering into a tiny crevice and aiming a camera into it? Why indeed?

One summer afternoon a few years ago I sat on a granite ledge high on Wheeler Mountain in northeast Vermont. The sun soothed aching muscles as I became part of that upland world.

Gradually features close by swam into my awareness: patterns of lichen and moss mats on the rock, the dashing of a single ant. A rock locust whirred by, and a deerfly persistently circled my head.

In the miles stretching below, I could see only a single cabin by a small lake, could hear only the distant whistle of a train. My attention kept coming back to the clean gray granite all around me—to the ants, the mosses, a rainpool. What tiny creatures led hidden lives here?

I recalled William Blake's eloquent challenge of long ago:

*To see a World in a Grain of Sand
And a Heaven in a Wild Flower,
Hold Infinity in the palm of your hand
And Eternity in an hour.*

Now, as with an insect's eye, I have searched the miniature "forests" of lichen and moss, the cracks and pools in grainy granite. I have met their minute inhabitants, and if ever man reaches another planet where life exists, no stranger sights will greet his gaze, nor a more unlikely pattern of survival be found.

Certainly an exposed ledge in northern New England—raked by wind and rain, scorched by sun, scoured by ice—seems hostile to life. But sterile, it is not.*

You notice large things first: tilted firs and spruces; dwarfed birches sprouting from moss mats; blocks of granite split loose from the mountain, seemingly about to crash into the valley below.

*The author, Chairman of the Science Department at St. Andrew's School in Delaware, wrote "Unseen Life of a Mountain Stream" in the April 1977 NATIONAL GEOGRAPHIC.



FILAMENTOUS ALGAE, 100 X



GENUS SCAPHEREMAEUS, 80 X (ABOVE); ANDRYACA RUPESTRIS, 15 X (RIGHT)

Nature's pioneers are usually small, often microscopic. Thin but crucial links in the rock-ledge food chain, filamentous algae (left) grow in a pool of rainwater caught in a rock depression. Lichens, among the first forms of life to take hold on the rocks themselves, harbor beetle mites (below left) that lay their eggs in the plants that grow over and protect them. Like rivers of green, mosses sprout in crevices and spread across the ledge, catching dust and nutrients that will in turn nourish larger plants. Moss tips (below) are dark with spores ready for release and regeneration. As the environment matures, birds and animals come to dwell (painting overleaf) in this now startlingly rich habitat.





FOX SPARROW

RUBY-THROATED HUMMINGBIRD

BALSAM FIR

MOTH
(*CARPETA DIVISATA*)

SHIELD LICHEN

BROOM MOSS

SLUG ON
MUSHROOM
(*RUSSULA EMETICA*)

MEALY GOBLET LICHEN

WOOD SORREL

AMERICAN TOAD

BRITISH SOLDIER LICHEN



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- RING LICHEN
- ROCK TRIPE
- DWARF SPRUCE
- DWARF BIRCH
- BALSAM FIR
- RED-TAILED HAWK
- FRAYED LICHEN
- RED SQUIRREL
- REINDEER LICHEN (WHITE) IN GRIMMIA MOSS
- BUNCHBERRY
- BLUEBERRY
- RAINPOOL
- REINDEER LICHEN IN GRIMMIA MOSS
- MOTH (LYCOMORPHA PHOENIX)
- CLUB MOSS

Visiting and revisiting Wheeler, I took a closer look at the rock-ledge community. I would start with the true pioneers—the mosses and lichens that shelter all the tinier creatures.

On a rock ledge, flat and rounded surfaces are divided by crevices, from hairline cracks to gaping splits. What instantly caught my eye were the scattered moss mats. Each had found an irregularity or a threadlike crack in which to anchor. Neither wind nor rain nor abrasion by ice dislodged these small, dark hummocks dotting the granite face.

THE PIONEER MOSS *Grimmia*, unlike most mosses, is a highly drought-resistant plant. Its leaves end in long white hairs that may serve both to reflect sunlight, thereby reducing evaporation, and to provide dead air space for insulation. One botanist found that *Grimmia* survived complete drying for two years. When desiccated, it forms dead-looking clusters. But give it rain, or a soaking from runoff, and greenness is restored.

Ubiquitous *Grimmia* generally takes hold even before the hardy lichens. Succeeding life depends on it; the smallest clump of moss will trap dust and finely ground minerals. Soon an erect lichen, perhaps reindeer moss, grows out from the center of a *Grimmia* tussock.

Over the years the mat expands. Different, bigger mosses appear in the center, and when the mat is large enough, a small herb—often just a weed—grows from the center. Beard grass sprouts, and still later a small shrub, such as sumac, takes hold. When the mats are several inches thick, a dwarfed high-altitude tree may finally take root.

Often I would lie prone on the ledge, lift a mat of moss, and peer beneath. Small shapes rushed through the tangled vegetation and black material of decay. With a magnifier I watched reddish beetles burrow quickly out of sight. A snail dragged an almost transparent shell into which it could retreat to ward off rain or heat. At the limits of vision were primitive scarlet thrips and even more archaic white springtails, each so small several



COEILLUS PICTUS, MAGNIFIED 15 TIMES



GENUS FORMICA, 8 X



CIUNELLA LUBRICA, 12 X



GENUS PHIDIPPUS, 10 X

Dances of life—and death—take many forms. The light-footed harvestman (top) cages its victims with its limbs, then

drops to dine. Scurrying red and black ants (left) turn ledge cracks into busy highways. As it crawls, the apple-seed snail (center) rasps in food with a filelike tongue. The jumping spider (right) can leap 40 times its body length.

could walk about on the head of a pin. A sinuous shape erupted from the coarse soil, propelled by many legs. A centipede up here? I had thought of them as creatures of moist woods, not barren rock.

Under the moss clumps, discoveries came without end. Tiny chambers hid a complete colony of minute ants, their larvae, and pupae. Were they secure? Not from predators sharing their dark world—the centipede, active and deadly, whipping about with nervous energy, penetrating loose soil with ease; and the beetles and larval insects that hunted beneath the moss mat. I could imagine the frenzy of capture and defense as one of these carnivores broached the nursery chamber of the tiny ants.

The clump of *Grimmia* I lifted was in contact with lichen crusts extending across the rock to another moss clump. The tiny animals, it dawned on me, may wander widely across the ledge, continuously sheltered beneath the primitive vegetation. At night they may cross the scoured granite itself to another protected spot. For a tiny insect or a mite only a third of a millimeter long, the mountain ledge is a boundless universe.

I brought back a small clump of moss to my home laboratory near St. Johnsbury, Vermont, washed it in a cup of springwater, and placed a drop of the water under the microscope. The drop teemed with life. Here was a typically slender roundworm, there another—knobbed, sluggish, and stoutly built—unlike any I had ever seen. A third shape flashed through the field, a protozoan scurrying about on hairlike cilia “legs.” Amoebas abounded, among them types that construct exquisite cases out of minute sand grains or from secretions. How does a blob of cytoplasm produce a perfectly symmetrical case in which to live?

A darting, seal-shaped gastrotrich scuttled into the field of the eyepiece. Rotifer eggs were everywhere, the larvae already active within the transparent shells.* Minutes after I added water to the dried, shriveled husk of a water bear, it grew into the stubby, appealing, claw-legged little invertebrate I had seen before. Diatoms and green algae lent color to the scene.

All this in a single washing of a thimbleful of soil from beneath a hand-size mat of moss! Here were populations beyond reckoning.

“It seems you spend all your time kneeling or lying down,” joshed my wife, Catherine, one day on Wheeler.

I was looking through a magnifying monocular into a clump of one of the mosses that comes along after *Grimmia*. A “large” shape, a black wolf spider rushing through the moss, startled me. Ants coursed across a stone scarp. Some of the busy red and black insects entered what appeared under the magnifier to be a canyon, carpeted with glistening sand grains. I was reminded of a file of horsemen in a Western movie riding over fallen “logs” (bits of dried vegetation or a balsam fir twig) and dodging “sagebrush” (single moss stems or an erect lichen or two).

RETURNING AGAIN AND AGAIN to Wheeler Mountain, I realized how slowly plants colonize a rock ledge. Initials I found scraped in the lichen cover by thoughtless hikers appeared only weeks old. Yet they were dated 1963 and 1971: In more than 15 years the lichen had barely begun to renew itself.

Certain northern species are estimated to live 4,500 years. Many lichens grow outward at no more than a millimeter a year. It can take millennia for a new rock face to develop a full lichen cover. I know that even a single scuff of my boots may leave scars that will take half a dozen lifetimes to repair. So I walk cautiously and lightly, for I do not want to leave my footprints in time.

What *is* this oddity called a lichen? Not a single organism, it is composed of two very different kinds of plants, a fungus and an alga. A lichen’s scientific name usually is derived from that of the fungus partner, for 95 percent of a lichen’s structure is fungal, the remaining 5 percent being microscopic green or blue-green algae. Most of the fungi and many of the algae found in lichens exist only in this symbiotic association.

Wet a lichen after a long spell of dryness and it will revive—photosynthesis in the algae and a bit of growth in the fungus, as well as respiration. The algae manufacture sugar, most of which is quickly transferred to the fungus, converted to alcohol, and stored. About 25 percent of the sugar presumably is used by the algae for sustenance.

*Biologist John Walsh gave a close-up view of these tiny aquatic animals in the February 1979 issue.

As still as the stone, a rock locust also matches its granite perch with camouflaging color. Come rain, the dry blackish moss at left will brighten the ledge with green.



TIMEMACHOPUS SAXATILE. 1/12/84

Some lichens are flattened and cling tightly to rock surfaces: These are the crustose varieties. Others, rather leaflike, are called foliose. Some stand erect and are fruticose, like the scarlet-tipped British soldier.

Some lichens actually live *within* the rock, in hairline fractures. Strands of fungus, as well as secretion of their acids, erode the rock until bits and flakes break off and fly away in the wind or scud downslope in the next rain. Slowly, inexorably, these simplest living things are chipping away at the enormous cliffs. Once the granite is freshly exposed, a new lichen will in time take hold, and the cycle will repeat.

One afternoon my younger daughter, Alison, lounging on the sun-warmed ledge, idly flicked away chips of loosened granite. She lifted one flake and exclaimed, "There's some green underneath." Beneath the surface of Alison's flake existed the conditions essential to plant growth: warmth, moisture, and light. "A miniature greenhouse," she correctly commented.

Indeed, we later saw under the microscope green, one-celled algae joining with a brushlike fungus in an almost globular shape, forming a lichen.

A lichen provides only the most frugal habitat for small animals. Yet beneath the stereomicroscope, the common gray-green

foliose lichen became a crumpled moonscape. Wandering through crevices, crawling over ledges, were dozens of tiny dark brown mites with glistening, rounded backs. I have never found these mites on the surrounding rock or on other lichens.

I estimated five of these minute animals to a square centimeter, totaling 50,000 per square meter. That meant possibly 500 million on this single lichened rock face!

A rock crevice provides another singular habitat. A crevice can hold water, collect organic matter, and provide an anchorage for plants. A multitude of crawling animals—ants, centipedes, beetles, and more—use it for a thoroughfare. Snails find its moist shadows attractive, and its narrow confines spell safety from predatory birds.

Ferns, too delicate even for moss mats, grow profusely in the deeper, wider splits. On beds of fir needles in larger crevices we kept findings signs of mammals—droppings, hair, nests, and burrows. Major cracks, often linked, form a labyrinth where mice and shrews and larger animals can run. Here is protection for their young and security during hibernation through the long winters.

Mosses, lichens, mites, ants, beetles, rodents: *Barren* rock ledges? Hardly! Every depression or crevice was a secure niche in which life could take hold and survive.

STANDING ON THE CLIFFS, looking out over wooded hills, I wondered who gazed upon this panorama centuries and millennia ago. The rock ledges have remained exposed since the retreat of the last great glacier, its melting heights tumbling as slush and frigid water into tumultuous rivers far below. Falcons flew here soon thereafter. Insects and lichens prospered. And red squirrels and bears and finally men came to roam these heights.

Recently, on the cliffs, a young woman climbed past me with a companion, both, I suspected, from the city. "Lord!" she said, not irreverently. "What a place! I've never seen anything like it. Nobody will believe me, and I don't even have a camera." I hope that visitor may read this: What is written and pictured here is partly done for her. For myself, I cannot believe that my memories of Wheeler Mountain can ever be misted over by other sights, other days. □

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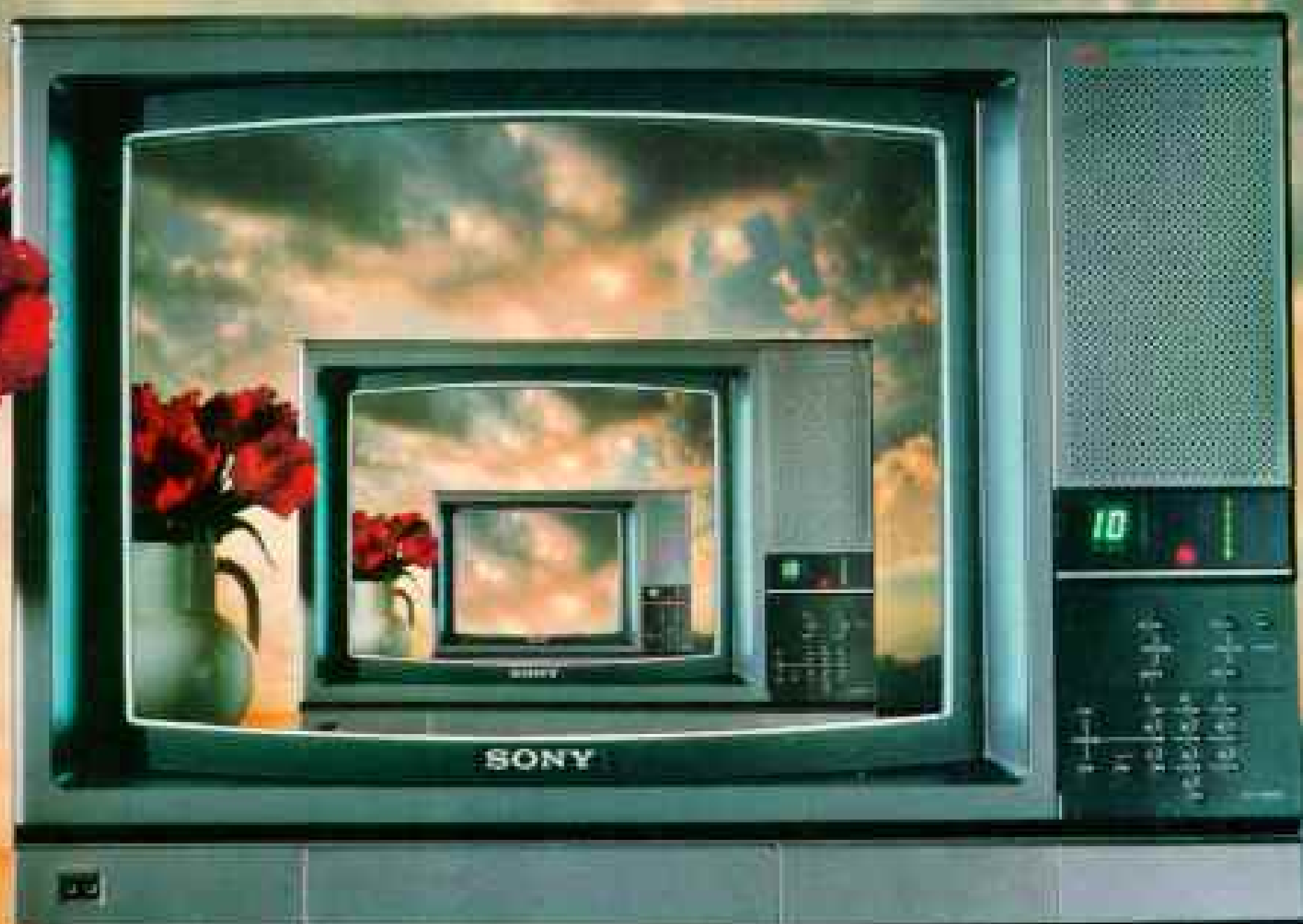
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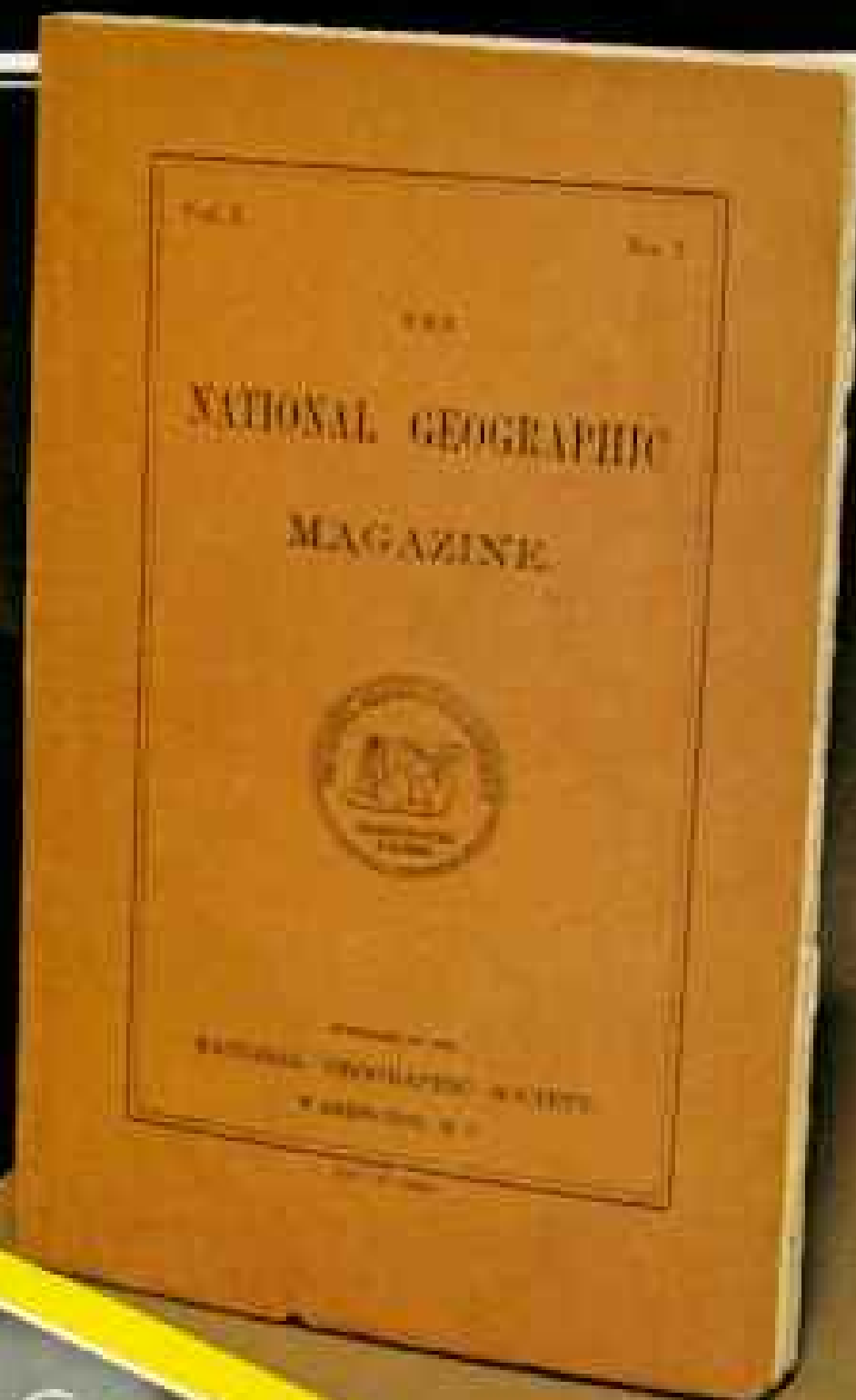
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Smithsonian Institution

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Please print additional names on separate sheet of paper.

Cadillac announces V8-6-4 Fuel Injection

**As you drive,
the 1981 Cadillac automatically
goes from 8
to 6 to 4 cylinders.**



Cadillac

CADILLAC MOTOR CAR DIVISION, U.S.A.

Is V8-6-4 Fuel Injection standard equipment?

Yes, the V8-6-4 fuel-injected engine is the standard gasoline engine for all 1981 Cadillacs.



How does it operate?

As you leave your driveway, all 8 cylinders in your gasoline-powered 1981 Cadillac are in operation. Then, as you reach intermediate speeds on a street or avenue and your power requirements lessen, the car automatically switches to 6 cylinders. And then, when you reach cruising speeds and your power needs decrease further, the car automatically switches to 4-cylinder operation.

Does any other carmaker offer anything like this?

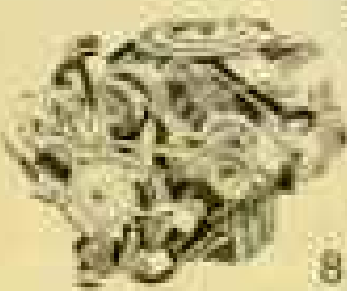
To our knowledge no other carmaker offers it—foreign or domestic.

Can you feel the car going from 8 to 6 to 4 cylinders and back again?

Some people can. Some can't. The perceived sensation is slight. Because, in a sense there is no shifting. Fuel valves simply close or open as instructed by the computer.

The idea of 4 cylinders in a Cadillac bothers me—should it?

No. The system only goes to 4 cylinders when your power needs are relatively low. To pass another car, push down on the accelerator and the system instantly goes into 8 cylinders for added power. Then, as your power needs decrease again, the system will return to 4 cylinders.



How reliable is it?

This system has been proven in over a half-million miles of testing. It's that reliable. All electronic components are solid-state, including the digital computer itself.

Is this the same as overdrive?

No. Overdrive is a function of gears. V8-6-4 is a function of the number of cylinders receiving fuel. However, overdrive is a feature associated with the V6 engine available on 1981 Fleetwood Broughams and DeVilles.

Cadillacs are equipped with GM-built engines produced by various divisions. See your Cadillac dealer for details.

Can I tell how many cylinders are active at any given time?



Yes. Push a button and Cadillac's MPG Sentinel on the instrument panel shows a digital display of the number of cylinders active at that moment. The MPG Sentinel will also show instantaneous mpg and average mpg.

Is it true that this combination could help a person to become a more efficient driver?

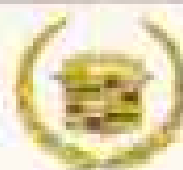
Absolutely. Knowing your active cylinders and instantaneous mpg can help you adjust your driving habits accordingly. And thereby help you become a more efficient driver. You can further demonstrate it to yourself by resetting the MPG Sentinel before a trip. Then push a button at trip's end and the MPG Sentinel will tell you how well you did by displaying your average miles per gallon to the nearest tenth.

All this is standard in 1981?

All this and more. Buy or lease, see your Cadillac dealer for a test drive.



Trust Cadillac to lead the way.





BANKNOTES OF ALL NATIONS



The official legal-tender banknote in pristine, uncirculated condition—contained within a protective "pocket" in a special cachet.

The postmark on each cachet will be applied by the post office in the capital city of the country of issue.

The stamp of the issuing country, canceled in that country.

By arrangement with government officials throughout the world:

BANKNOTES OF ALL NATIONS

An unprecedented collection of perfect, uncirculated banknotes impossible to assemble in any other way.

Each banknote individually sealed in a stamped and date-canceled cachet, officially postmarked in the capital of the country of issue.

A fascinating and comprehensive collection containing a perfect, uncirculated, legal-tender banknote from every country in the world.

A Limited Edition

Advance subscription deadline: November 30, 1980

Further limit of one collection per person

There has, quite simply, never been a collecting opportunity like this before . . . and only seldom a collecting experience so richly fascinating.

For 'Banknotes of all Nations' is an unprecedented, exceptional collection comprising

- Perfect, uncirculated examples of banknotes from every country in the world, except where government regulations prohibit.
- Each banknote sealed in its own individual cachet. Each cachet stamped and postmarked in the capital city of the country of issue.
- And each banknote accompanied by informative reference material about the issuing country and about the banknote itself—both as a unit of currency and as an astonishingly complex artistic achievement.

Furthermore, 'Banknotes of all Nations' provides significant benefits for the subscriber.

By acquiring it, you will own a definitive, comprehensive, officially authorized collection that cannot be duplicated—except with enormous difficulty and cost. (Imagine for a moment the time and expense involved in just traveling to each country and trying to build a collection of this caliber, personally.)

You will also own a collection which will retain its status, fascination and appeal through the years—as valid for future generations of your family as for yourself.

And you will possess a collection issued *only in limited edition*—available *only by direct subscription*—and *only for a limited period of time*.

Fascinating banknotes from distant lands

Each banknote has an original, distinctive design powerfully evoking the traditions, the beauty, the heritage, or the achievements of the issuing country. A design of extraordinary interest for all who study it closely.

For here is an astonishing profusion of flowing patterns . . . medallions . . . scrolls . . . rosettes. Heraldic coats of arms. Superb engravings—themselves magnificent works of art—portraying national heroes and leaders, seascapes and landscapes, monuments and treasures. Secret watermarks . . . security threads . . . and a rainbow palette of colors—often as many as twenty on a single note. All creating a work of great beauty and complexity, to frustrate the would-be counterfeiter and to embody each nation's pride in its currency. So that each banknote is a source of fascinating information and of great beauty for the discerning collector.

Among the finely engraved banknotes to be included are: The 1000 Lire note of Italy, bearing a magnificent portrait of the great composer Giuseppe Verdi. The 10 Franc note of France, with its superb portrait of Voltaire. The colorful 50 Escudos of Portugal. The large 10 Dollar note of Hong Kong. The 5 Bolivares note of Venezuela with its portrait of Simon Bolivar.

More than 120 countries are represented in an array of international banknotes richly imbued with the romance of collecting: a romance—and an *interest*—heightened by each note's special cachet, stamped and officially postmarked in the capital of the country of issue.

In addition, authoritative reference information will accompany each cachet, describing the banknote carried in that cachet and providing background data about the country which issued it. These richly informative commentaries will enable you and your family to enjoy each banknote to the fullest degree. And as you do so, you will acquire all sorts of fascinating knowledge about the countries of the world and their currencies.

As a subscriber, you will receive your complete collection at the convenient rate of two cachets per month—sent in a protective mailing package. The price of each cachet will be just \$8.25. This includes the perfect, uncirculated legal-tender banknote, the cachet, the stamp, the foreign postmarking, and all customs charges, as well as a handsome case to hold and protect your complete collection.

Available for a limited time only

The 'Banknotes of all Nations' collection is being issued in limited edition. It is available *only* from The Franklin Mint and *only* for a prescribed period of time, with a further limit of one collection per subscriber. The total number of complete sets to be issued will thus be permanently limited to the number of valid subscription applications postmarked by a firm and final world-wide deadline date.

This is an advance announcement of 'Banknotes of all Nations,' and the attached subscription application is valid *only* if postmarked by November 30, 1980. Later announcements will be made, both here and abroad, but the subscription rolls will be closed forever in February 1981. After that time, the 'Banknotes of all Nations' collection will never be offered again, anywhere in the world.

Important

The advance subscription deadline for the 'Banknotes of all Nations' collection is November 30, 1980. Please be sure, therefore, that you complete and return the Advance Subscription Application at right by that date.

Note: Since Governments on rare occasions authorize revisions on short notice, some of the banknotes shown in this announcement may be subject to change. The stamps illustrated will not necessarily be those affixed to the cachets.



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ADVANCE SUBSCRIPTION APPLICATION

BANKNOTES OF ALL NATIONS

Valid only if postmarked by November 30, 1980.

Limit: One subscription per person.

The Franklin Mint
Franklin Center, Pennsylvania 19091

Please enter my subscription for 'Banknotes of all Nations,' consisting of a perfect, uncirculated, legal-tender banknote from every country in the world that regularly issues banknotes, except where government regulations prohibit. Each banknote will be issued in a stamped and date-canceled cachet, postmarked in the capital of the nation of issue. The cachets will be sent to me at the rate of two per month, and the issue price for each cachet is \$8.25* (I will also receive a handsome case to house my collection, and authoritative reference material, at no additional charge.

I need send no payment at this time. I will be billed \$16.50* in advance, for each monthly shipment of two cachets.

*Plus my state sales tax and 75¢ per cachet for postage and handling.

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15

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GE's Circlite™

Imagine, some good news about energy. GE's Circlite is as bright as an ordinary 100-watt bulb, but uses only 44 watts of electricity.

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Just screw the adapter into your present fixture. Then add the light — the unique circular fluorescent with a pleasing



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Only GE makes the Circlite



system, so only your GE lighting dealer has it. He'll show

you how it can start saving energy for you in your home tonight. Now that's what you call good news.



We bring good things to life.

GENERAL  ELECTRIC

This extraordinary collection of world banknotes is available only for a limited period of time—and only from The Franklin Mint.

Introducing The 1981 Caprice Classic.

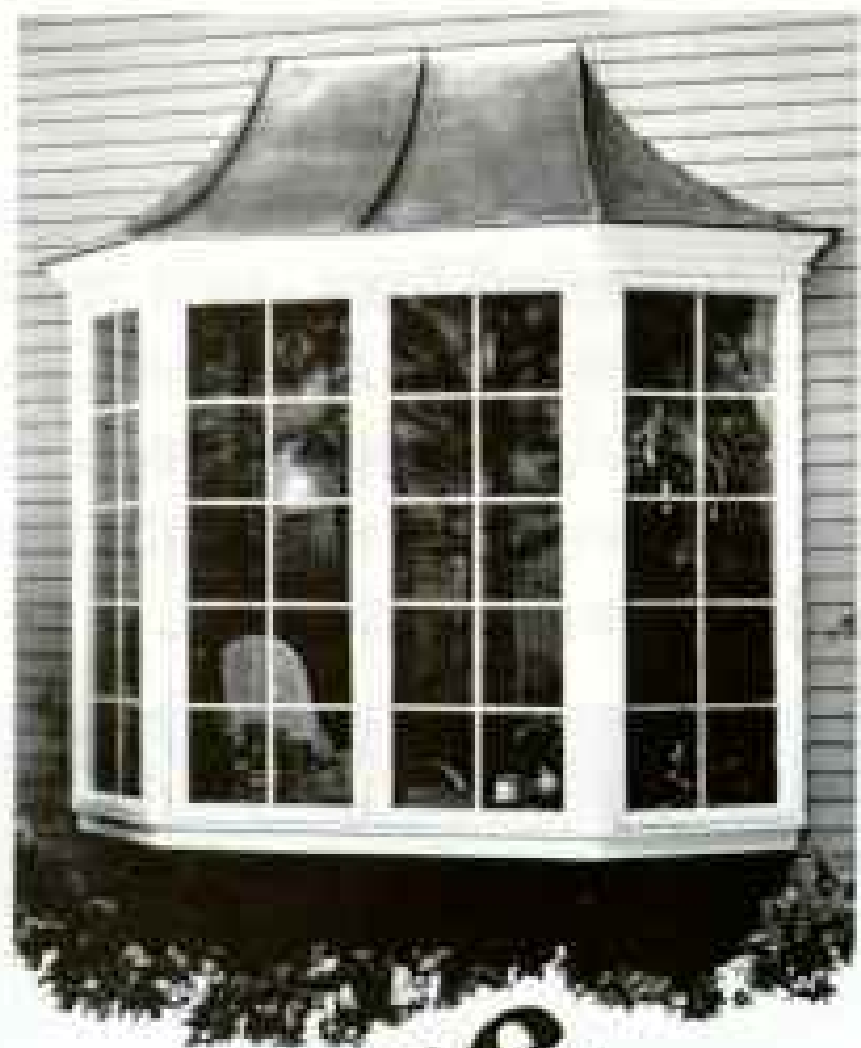
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You can spend more. The question is, why?

Chevrolet

Chevrolets are equipped with GM-built engines produced by various divisions. See your dealer for details.



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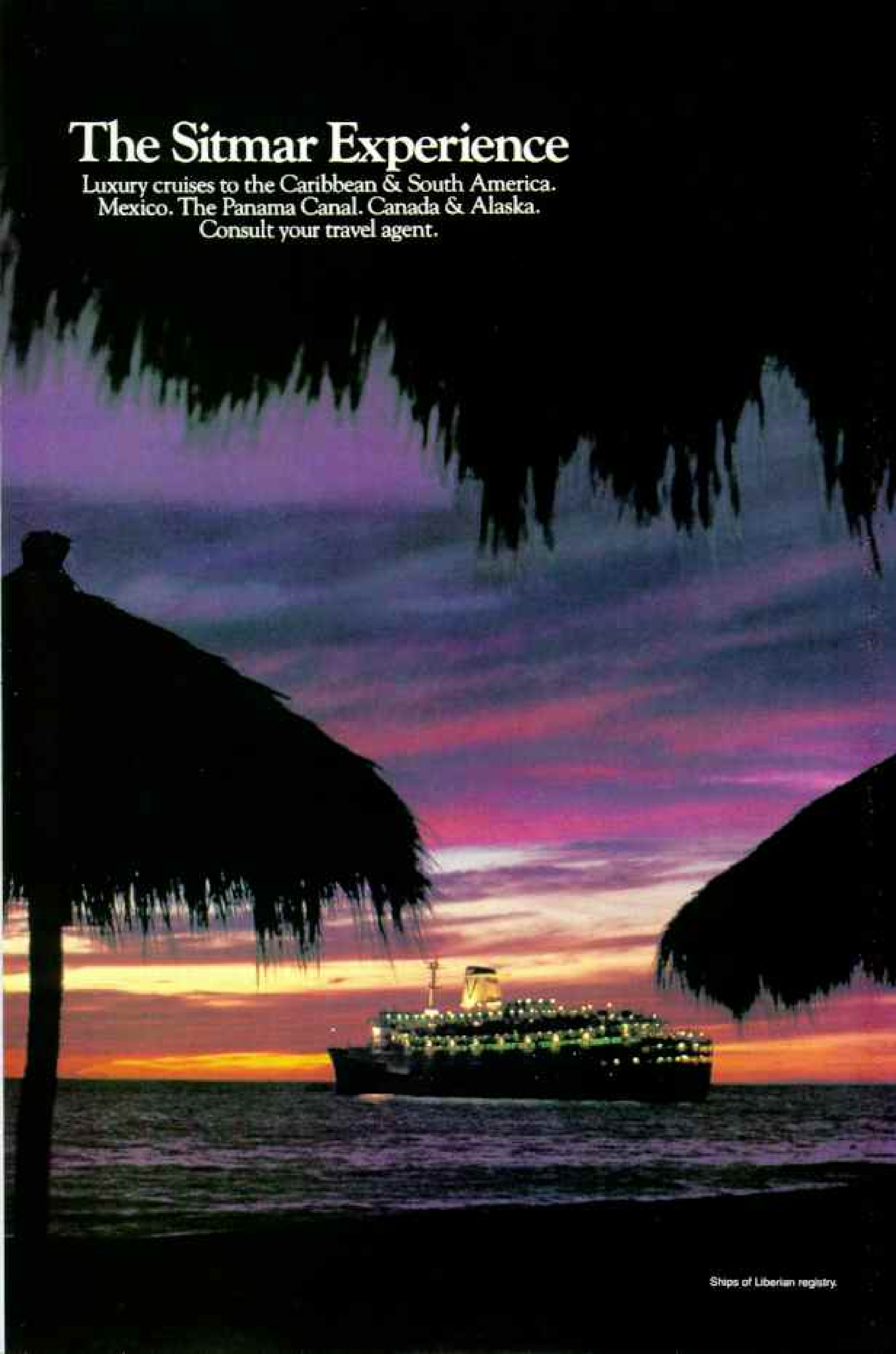
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 For then
 and now.



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Consult your travel agent.



Environmental activist Bela Kerecz:

“Bethlehem Steel is going to dump millions of gallons of this polluted water into Baltimore’s waste water treatment plant. “The city’s all for it.”

“It’s a real success story,” says Bela Kerecz, a pollution abatement engineer in Bethlehem Steel’s research department.

Bob Mohr, plant manager of Baltimore’s huge Back River waste water treatment plant, calls it “A unique example of government and industry cooperation.”

What they’re talking about is how a waste product called “pickle liquor” is going to solve an environmental problem—and save millions of dollars for both Bethlehem and the City of Baltimore.

Everyone benefits

Bob Mohr explains: “Federal and state laws require cities to limit phosphorus in the treated waste water they discharge. They also require Bethlehem Steel to properly dispose of spent acid water, or pickle liquor, which results from making sheet steel.

“By using Bethlehem’s pickle liquor to reduce the

phosphate level, the City of Baltimore will save the cost of chemicals needed with conventional methods. And Bethlehem will eliminate the need for an acid-reclamation plant, a major capital expenditure.”

More government/industry cooperation needed

This pickle liquor project is what government/industry cooperation should be all about: *working together to protect public health at the lowest possible cost to taxpayers and to industry.*

Bethlehem’s policy is to work with state and Federal agencies toward developing and implementing cost-effective environmental control programs.

However, Bethlehem believes that some regulations are overly restrictive or have requirements that are not realistic. For example, does it make good economic and energy sense to require indus-

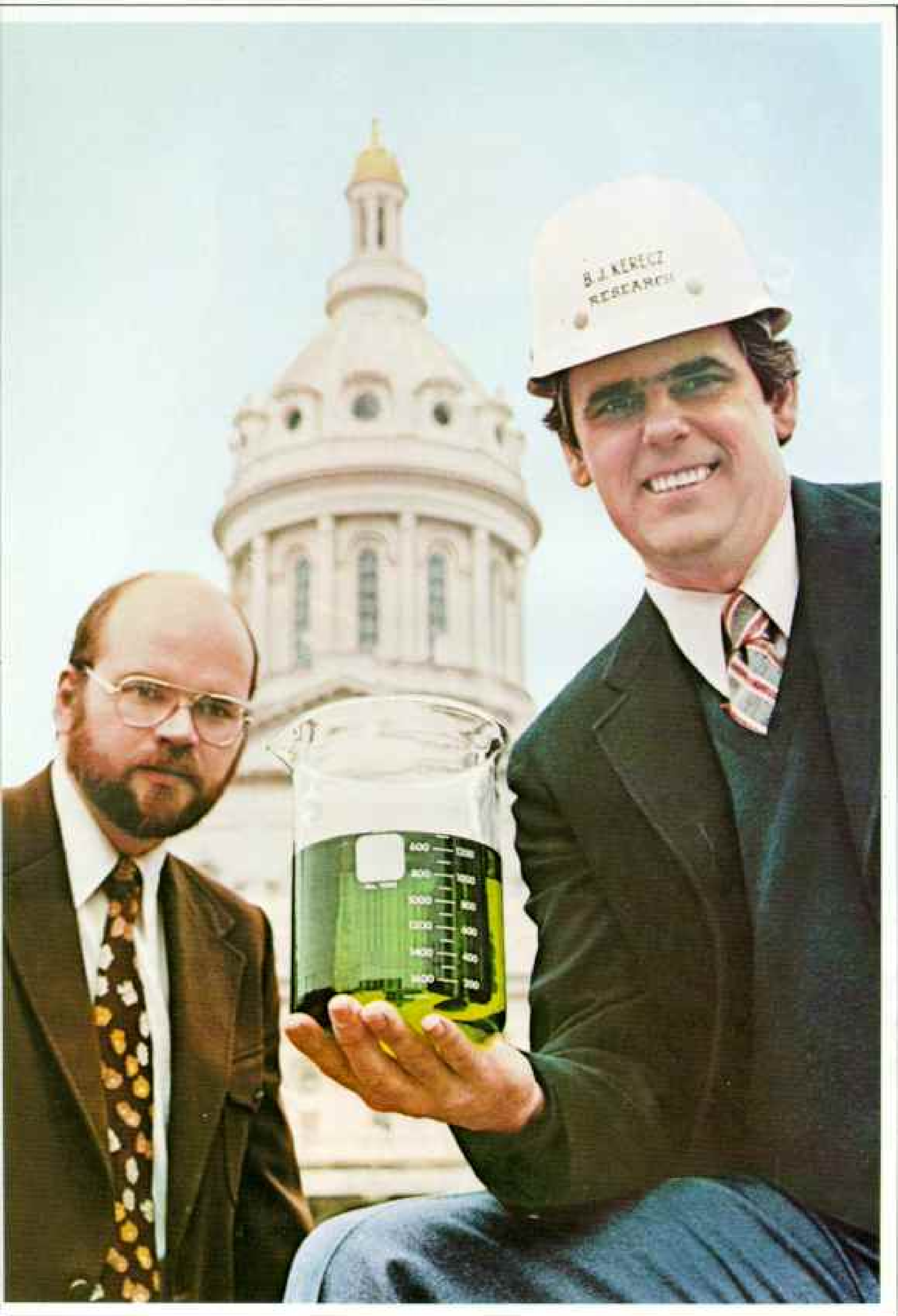
try to “purify” the air and water beyond what is necessary to protect public health?

Our position is clearly explained in our booklet, *Steelmaking and the Environment*, which includes our *Statement on Environmental Quality Control*. If you would like a copy, write: Public Affairs Dept., Room 476, Martin Tower, Bethlehem Steel Corporation, Bethlehem, PA 18016.

Bethlehem 

How pickle liquor solves the problem

Bela Kerecz, one of Bethlehem Steel’s thousand employees active in our environmental control program, explains: “Pickle liquor contains iron sulphate. We knew that under properly controlled conditions the iron would combine with the phosphate in the waste water to form insoluble iron phosphate. The iron phosphate, in turn, would settle as a solid which could be disposed of readily. The small amount of dilute acid in the pickle liquor would be neutralized by the normal alkalinity of the treated waste water. “In 1978, a four-month-long cooperative experiment, conducted at Baltimore’s Back River waste water treatment facility, was successful and led to the signing of an agreement between our Sparrows Point Plant and the City of Baltimore.”





The Nikon EM.
It's easy.
It's inexpensive.
And, it's a Nikon

The electronic Nikon EM may very well be the world's easiest-to-use fine 35mm camera.

You simply focus and shoot. And, you get great photographs... even if you're not a great photographer.

If you would rather think of the EM as the world's finest easy-to-use camera, you would be right, too. This light, small precision camera is every inch a Nikon. And, as you probably know, Nikon cameras are the overwhelming choice of professional photographers.

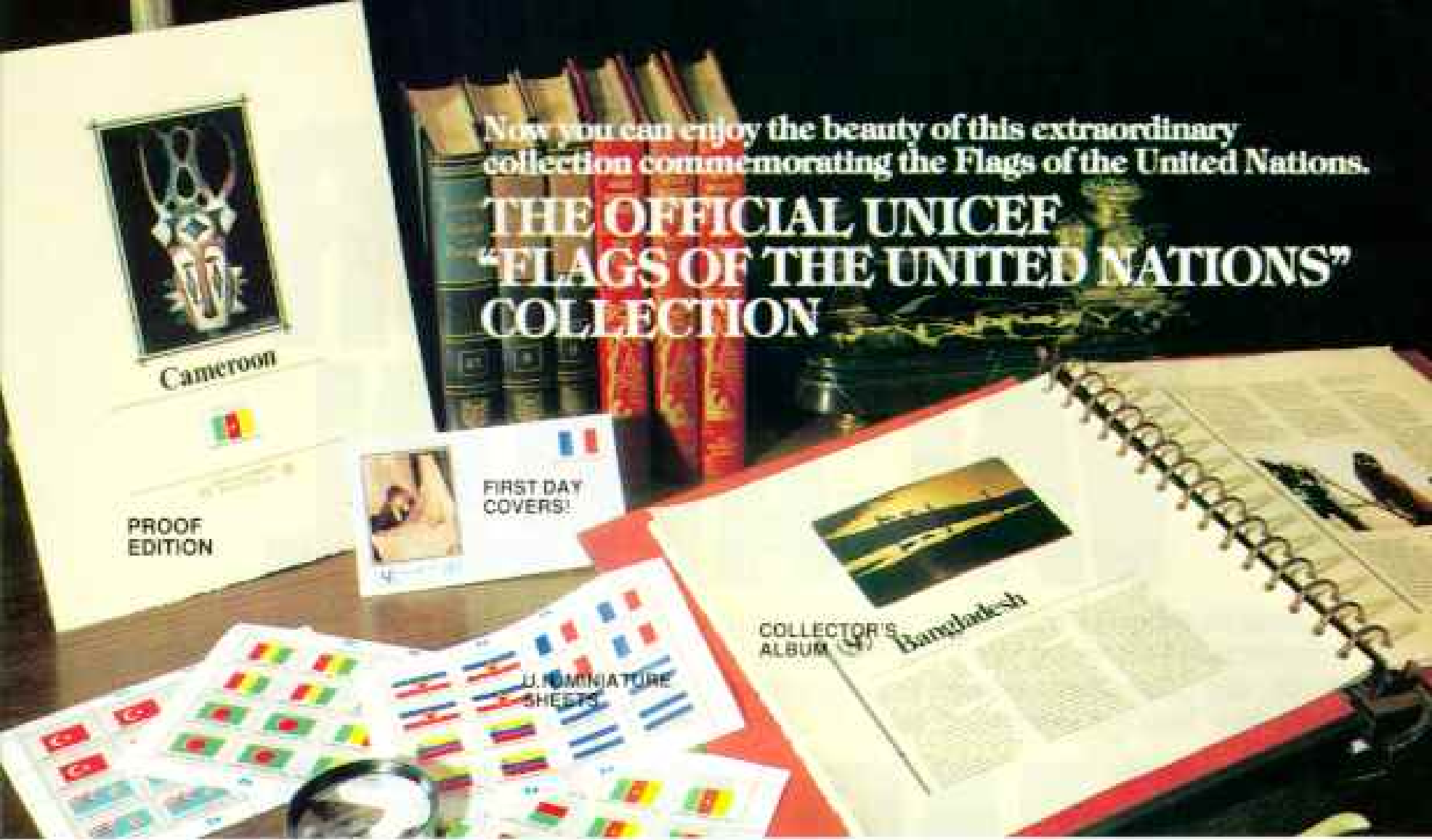
You'd never suspect such a fine camera could be so inexpensive. Fact is, the Nikon EM is one of the lowest-priced automatic 35mm reflex cameras you can buy. It also accepts a low-cost Nikon automatic flash, motor drive and all of the nearly 70 magnificent Nikon lenses.

Try the Nikon EM yourself, soon. You'll find it easy to use and easy to own. And, very hard to resist.

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THE OFFICIAL UNICEF "FLAGS OF THE UNITED NATIONS" COLLECTION



THE FIRST PHILATELIC COLLECTION EVER ISSUED BY UNICEF!



THE FIRST SERIES OF STAMPS EVER TO HONOR THE WORLD'S FLAGS!



THE FIRST SERIES OF ART GRAPHICS FROM EVERY COUNTRY OF THE UNITED NATIONS.

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The First Day Covers will bear the new U.N. flag stamps, cancelled with the official First Day postmark. Each First Day



Cover will display a superb full-color art masterpiece that is representative of the nation whose flag appears on the stamp. And, as a hallmark of authenticity, each cover will bear the UN and UNICEF insignia.

RARE U.N. MINIATURE SHEETS!

The flag series will be issued in the desirable Miniature Sheet format—only the third "Miniature" issue in the entire history of the United Nations. The Miniature Sheets contain 16 stamps, four from each of four nations. Knowledgeable collectors will be interested in the se-tenant block in the center of each sheet, a philatelic rarity in which four different stamps are joined together.

HANDSOME COLLECTOR'S ALBUM!

Your subscription includes a luxurious Collector's Album. You will receive six album pages devoted to each country, including maps, fascinating historical narratives that describe the country, its culture and traditions, and the works of art that appear on the Covers and in the Proof Edition Lithographs.

A COLLECTOR OPPORTUNITY THE DELUXE EDITION!

This historic UNICEF Flags of the United Nations collection will also be available in Special Deluxe version: Consisting of elegant Proof Edition Lithographs, issued on a heavy, high-quality art stock. The litho will show exceptional detail and definition in the same way that a proof-quality coin displays vivid detail.

TIME IS OF THE ESSENCE!

The U.N. has issued Miniature Sheets only twice before in its history.

Based on experience, we anticipate tremendous interest. For example, at the U.N.'s last issue of Miniature Sheets in May, 1979, collectors lined up for blocks and the issue was completely sold out on the first day. Now, just a year later, they are available only at a price that is more than 3 times the original issue price.

While no one can guarantee that the Flag Stamps will increase in value, the previous Miniature Sheets of U.N. stamps did appreciate dramatically. Because UNICEF has been allocated a portion of the issue in advance, charter subscribers will be guaranteed their collections.



RESERVATION REQUEST UNICEF Flag Stamps Program



4511 Box 4480, U.N. Plaza, New York, NY 10163

YES, enroll me as a charter subscriber to the Flags of the United Nations collection. My first shipment will be mailed about four weeks after the issue date of September 26, 1980. If I decide to keep it, I will pay \$9.95, and will receive approximately eight shipments a year. Each will include two First Day Covers, and every other shipment will include a mini Miniature Sheet. I can return any shipment within 10 days.

- 35014 37010
- Check here if you prefer the Deluxe Edition, at \$19.95 which combines the regular **Flags of the United Nations** collection with the superb Proof Edition Lithographs. 35020 37036
- Check here if you prefer the Proof Edition at \$14.95 with Proof Edition Lithographs instead of First Day Covers. 35022 37028

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DIAL YOUR VACATION.

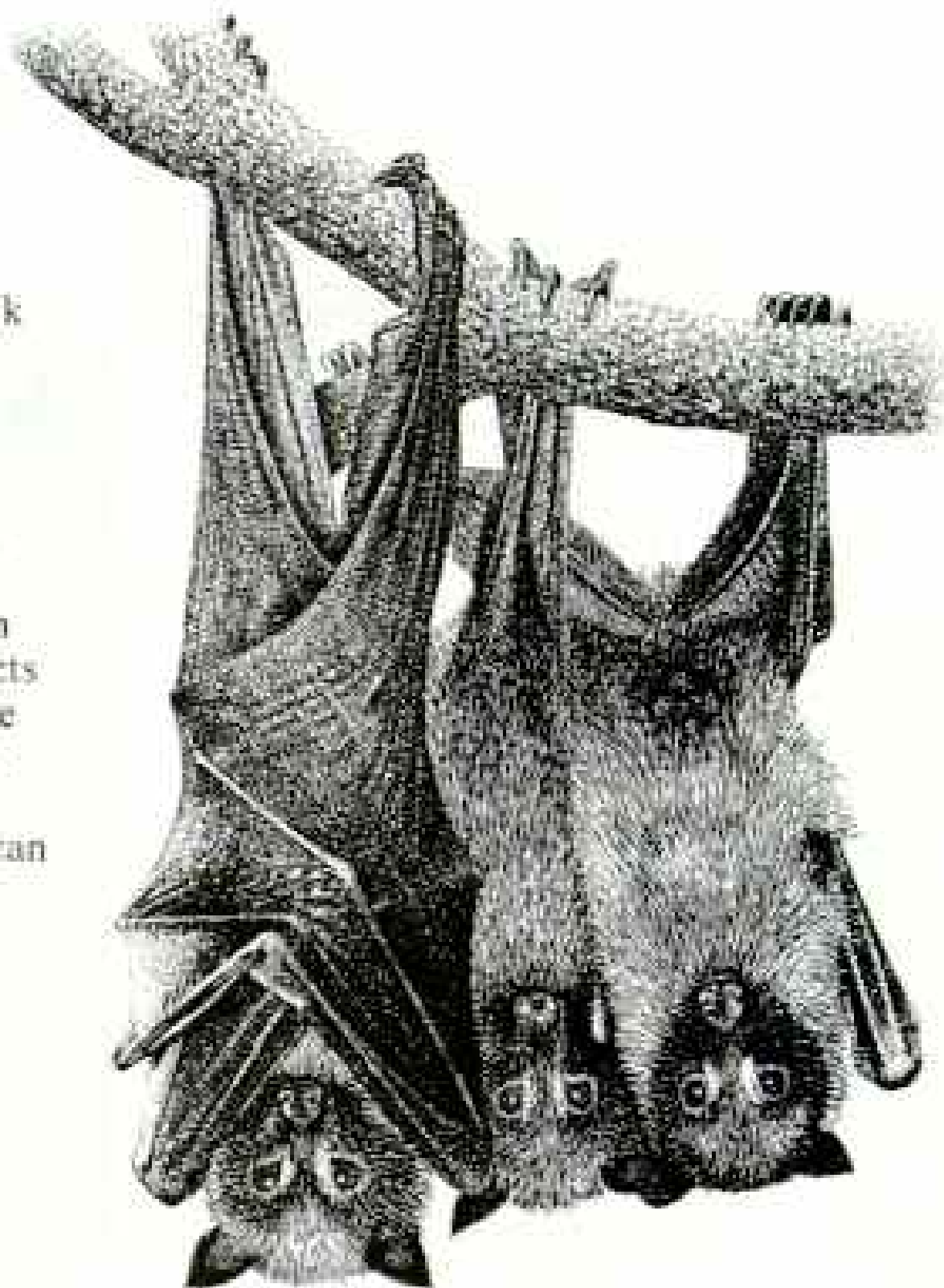
A great vacation in Maryland is right at your fingertips. Our toll-free number gets the information you need. We'll send you our tourist kit that includes: accommodation guide, our calendar of events, a campground guide, maps, history, restaurants. Just call Maryland Tourism, and we'll send it. Come see My Maryland.

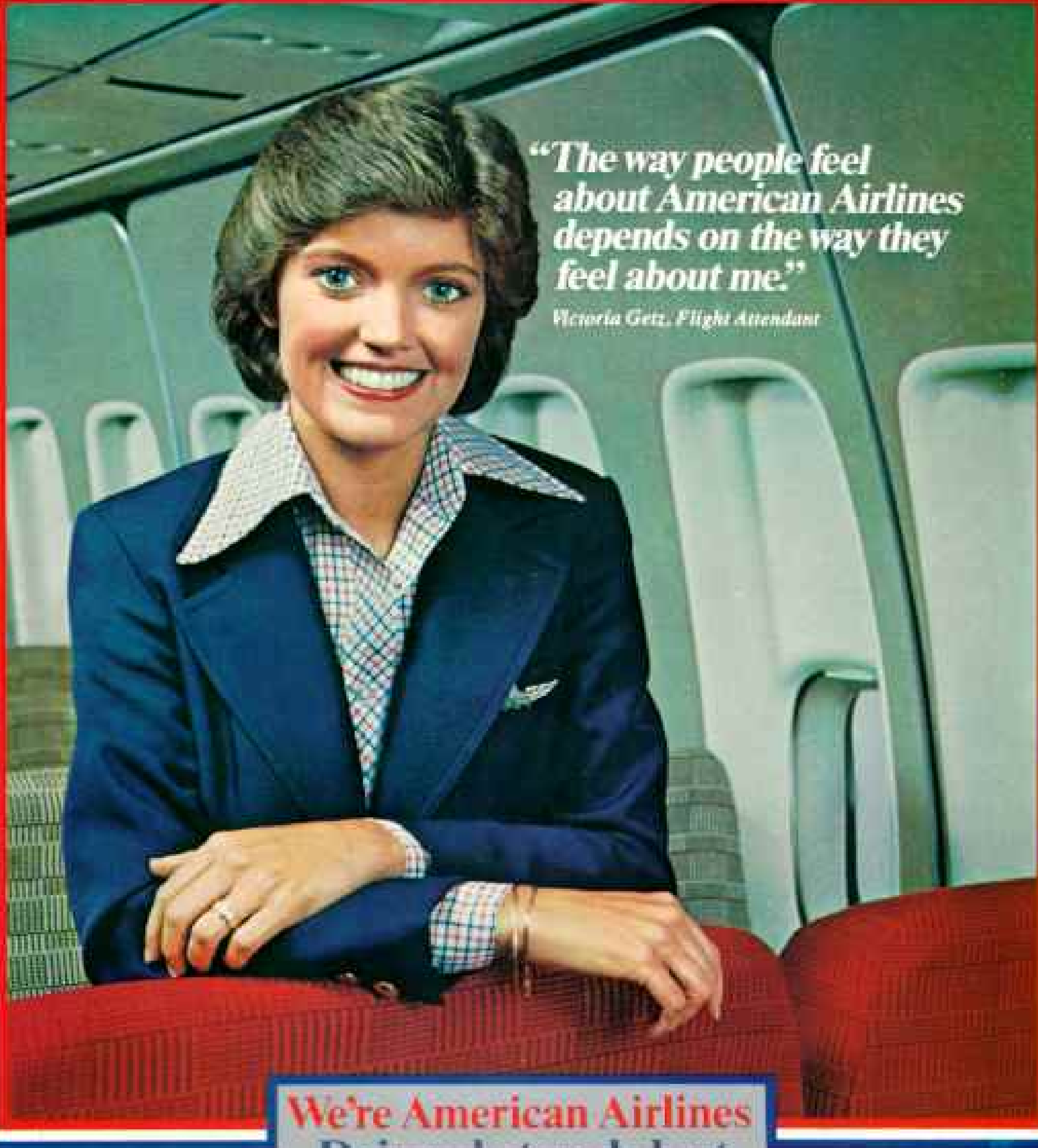
MARYLAND

800-638-5252

(Inside Maryland call toll-free 800-492-7126)

Hanging by their toes, flying foxes await dusk to unfold their wings. Biggest of bats—the wingspan of one species reaches five feet—they thrive on tropical fruits. With eyes ten times as sensitive as man's, these fruit bats forage by sight. But sonar guides most bats. Bouncing high-frequency beeps off objects, they dart and dive for their supper. Mexican free-tailed bats snap up 20,000 tons of insects a year in Texas alone. Other members of the order Chiroptera ("hand-wing") nab lizards, gaff fish, sip nectar. Vampires drink blood. Though carriers of rabies to Central American cattle—rarely to man—vampires belie their horror-movie image. Timid, delicate, they tame quickly with skilled handling. To shed light on a nocturnal world, scientists brave eerie caves and cobwebbed attics. Readers appreciate such demanding, on-the-spot coverage. They receive it every month in the pages of NATIONAL GEOGRAPHIC.





*“The way people feel
about American Airlines
depends on the way they
feel about me.”*

Victoria Getz, Flight Attendant

We're American Airlines
Doing what we do best

In 1955, when Vickie Getz was 10 months old, American founded the industry's first training school for professional flight attendants.

It's a school where 200-thousand people apply each year. (Less than one percent are accepted.)

It's a school where students are taught to make your flights safe and enjoyable. (They already *know* how to be *nice*.)

And it's a school whose graduates never stop learning. (They regularly study new procedures and review old ones.)

It takes a special kind of training to be an American Airlines Flight Attendant. And a very special kind of person.

It takes the best people to make the best airline. Vickie Getz is one of them, and we thought you'd like to meet her.



Set your life to music.

Nothing can define a mood or enhance a moment like music — with it, even the most ordinary situations become beautiful.

Sony's Interlock Sound Systems make it easy for you to get the most out of your music and your life because they were created with you in mind.

The system begins with you

The Interlock Sound Systems are so advanced, so precise, so efficient, yet so simple, they had to be designed by Sony. The heart and soul of the Interlock Sound System is the RT-66. A highly sensitive AM/FM stereo receiver with a built-in cassette deck that delivers more recording options than many individual components.

The receiver features Direct

Access Program Sensor Tuning so you can preset up to five of your favorite FM stations and return to them with the touch of a button.

The cassette deck features Dolby* noise reduction and metal tape capability which gives greater sensitivity to highs and lows. And an Automatic Music Sensor that lets you preselect up to nine programs on a single cassette. So you literally can set your life to music.

The beauty of simplicity

Match this advanced unit with one of Sony's Direct Drive turntables and a set of bass reflex speakers (with the exclusive Transcend Tweeter) and you have put together a beautifully simple Inter-

lock Sound System that can fulfill all your personal stereo needs. And which will enable you to surround yourself with the kind of music that will enrich your life and make every moment more special.



SONY
THE ONE AND ONLY



**MILLIONS ON EARTH ARE EXPECTED TO WATCH
CARL SAGAN'S "COSMOS,"
BUT YOU NEVER KNOW WHO ELSE
MIGHT BE WATCHING.**

Carl Sagan, the distinguished astronomer and Pulitzer Prize-winning author, invites you to join him for "Cosmos," a 13-part series starting September 28th on public television.

"Cosmos" is described as the most ambitious project ever undertaken for PBS. It takes you on a journey through space and time to explore the great cosmic questions.

One moment, you find yourself in a spaceship billions of light-years from Earth among the galaxies. The next, walking the marble floors of a library in ancient Egypt. And the next, exploring the possibilities of extraterrestrial life.

Since television signals travel through space, Sagan has been asked to speculate on what beings of other worlds might think of his series.

"I would hope," he said, "that they would see this as an attempt by humans to understand something of their origins and their destinies."

So watch for "Cosmos," appearing on PBS. Somewhere out there, "they" may be watching, too.

ARCO



Atlantic Richfield Company

"COSMOS" is produced by Carl Sagan Productions and KCET, Los Angeles. Made possible by grants from the Corporation for Public Broadcasting, the Arthur Vining Davis Foundations and Atlantic Richfield Company.



Inside every great slide there's a great enlargement.

You put a lot of time and effort into your slides, because you want quality results. Now get the most enjoyment out of them—in framed enlargements for your desk, your den, as wall decor.

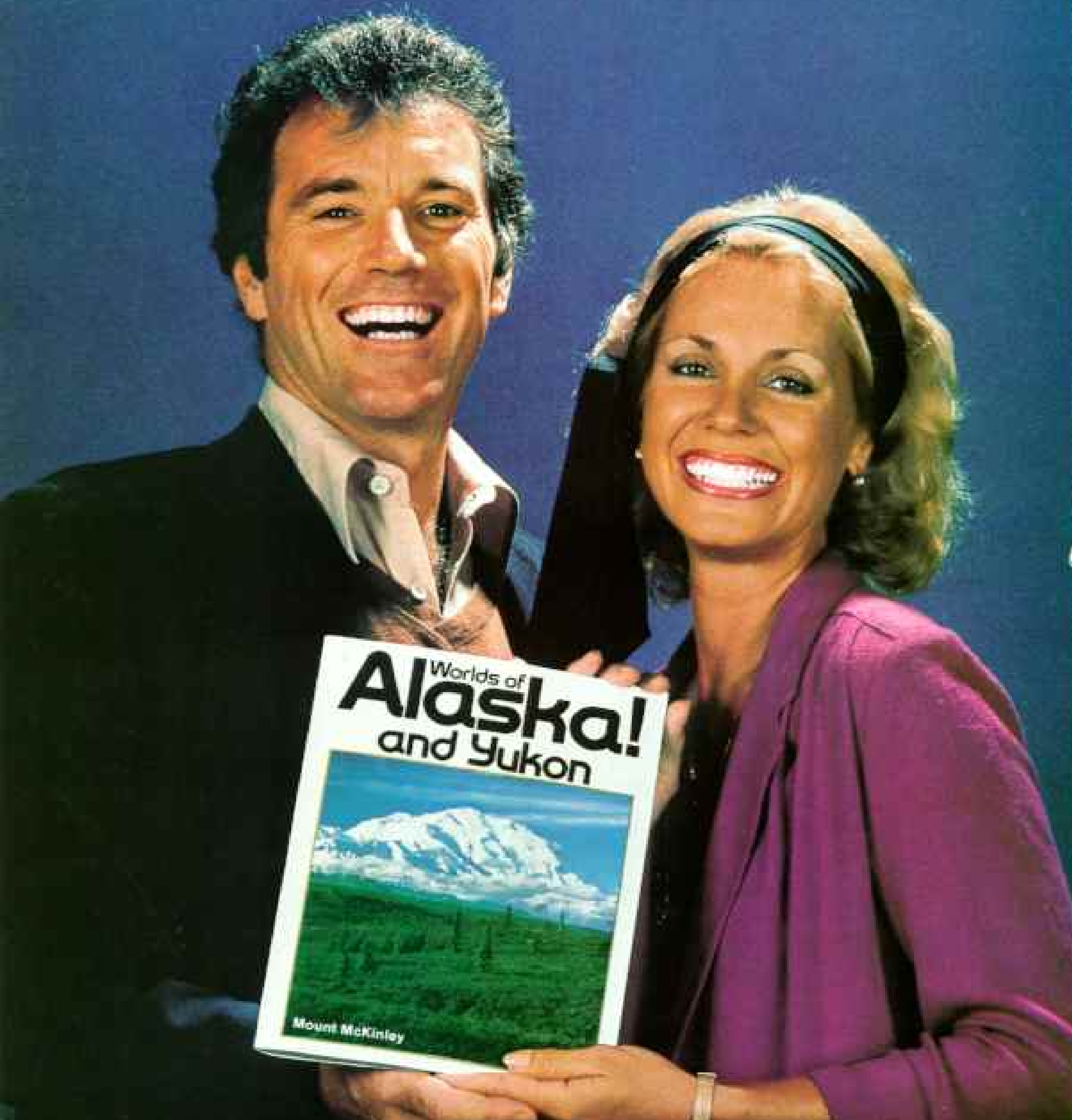
Just take your favorite slides to a store with a sign that says, "We use Kodak paper... for a good look." They'll make up as many enlargements as you like, in almost any size. And to help make them

look their best, they'll put Kodak paper behind them. You'll know it's Kodak paper by the words, "This paper manufactured by Kodak," on the back of your prints.

Make the most of your favorite slides in colorful enlargements, available wherever you see the Kodak paper sign.

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Your first trip to Alaska is free.

Just send for this new vacation-planning book.

Your free copy of the new 1981 edition of "Worlds of Alaska!" will take you there—and help you plan the vacation of a lifetime.

"Worlds of Alaska!" contains 132 full-color pages of evocative description, action photography, invaluable information and thoughtful details that will help you make the most of your Alaska vacation. You'll discover all the places you want to see and all the things you want to do, carefully organized and graphically illustrated with photos, maps and charts. More

than 1,200 visitor services are listed, and advertisements describe the most current offerings from Alaska's tour, transportation and lodging companies.

Read "Worlds of Alaska!" and discover a land of limitless adventure. You'll be ready for the best vacation ever—in Alaska!

Mail this tear-off flap.

We'll send "Worlds" to you...FREE! →

If the flap has been removed, just write: Alaska State Division of Tourism, Pouch E-401, Juneau, Alaska 99811.

Fill out information below.

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(Delivery begins November 10, 1980. Allow 3 weeks for 3rd Class mail delivery.)

Please send my free book by 1st Class return mail. I'm enclosing in an envelope this flap and U.S. \$2 for 1st Class postage.

Additionally, I am interested in more specific information on:

- Travel to Alaska by:
- | | |
|---|--|
| 1. <input type="checkbox"/> Car, Camper, Motorhome | 12. <input type="checkbox"/> Fishing |
| 2. <input type="checkbox"/> Air | 13. <input type="checkbox"/> Sightseeing & Attractions |
| 3. <input type="checkbox"/> Cruiseship from California | 14. <input type="checkbox"/> Adventure Travel (guided hiking, trekking, boating, canoe & raft trips) |
| 4. <input type="checkbox"/> Cruiseship from British Columbia | 15. <input type="checkbox"/> Fly/Drive Programs |
| 5. <input type="checkbox"/> State Ferryliner | 16. <input type="checkbox"/> Guided birding, wildlife and photo trips |
| 6. <input type="checkbox"/> Motorcoach or Rail | 17. <input type="checkbox"/> Winter Sports & Vacations |
| 7. <input type="checkbox"/> Hotels & Motels | 18. <input type="checkbox"/> Alaskan Food Products |
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| 9. <input type="checkbox"/> Tours to Alaska from U.S. or Canada | |
| 10. <input type="checkbox"/> Tours within Alaska | |
| 11. <input type="checkbox"/> Camping in Parks & Forests | |

We would like to learn more about people who are interested in Alaska. We'd appreciate your help by answering these optional questions.

20. What year are you likely to visit Alaska?
 1981 1982 1983 1984 & beyond
 I'm undecided about visiting Alaska
21. Your age: _____
22. Level of education completed:
 Grade School High School College Graduate School
23. How many would visit Alaska with you? _____
 How many under age 10? _____
24. I plan to travel by Group Independently
25. In the past 3 years have you taken a vacation trip outside the North American continent? Yes No

Thank you!

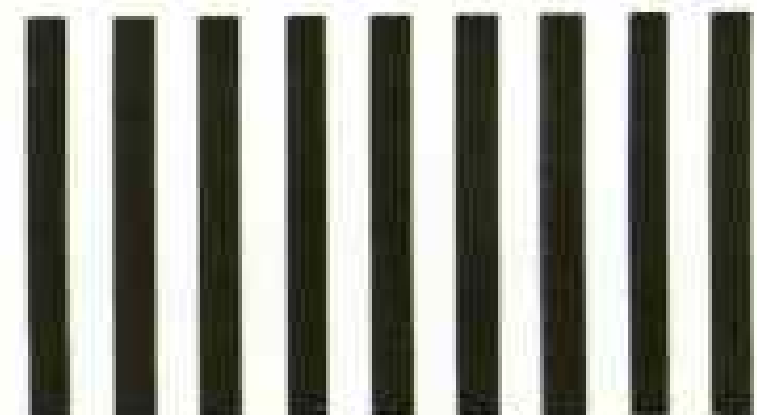
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Monte Carlo is your car.

Even the most casual glance tells you the new Monte Carlo is a personal car as individual as you. But keep in mind it's a car engineered to exist in a world of hard facts.

Standard for 1981 is the new Computer Command Control system that constantly monitors engine performance.

The entire underbody is sprayed with undercoatings and the body literally bathed with rust-resistant primers.

Doors, hood and deck lid are double panels of steel.

A full-perimeter frame with cushioned body mountings helps isolate you from road noise and vibration.

Thick coil springs are at each wheel.

A standard 3.8 Liter V6 rests under the hood. And a 3.8 Liter turbocharged V6 is available.*

Power steering and brakes, automatic transmission, and a tasteful, comfortable, superbly organized interior are also standard.

But perhaps the most important thing to keep in mind is that the low, lean, aerodynamic Monte Carlo for 1981 comes to you for the refreshingly affordable price of a Chevrolet.

Buy or lease it from your Chevrolet dealer. And express the pride you have in yourself.

*Monte Carlo is equipped with GM-built engines produced by various divisions. See your dealer for details.

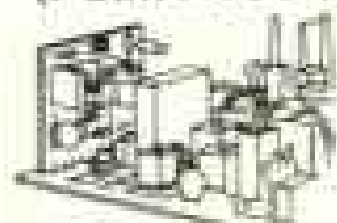
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1981 Monte Carlo.
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Circuit gives you all the picture resolution a station is capable of transmitting.



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*70 more lines of resolution than previous Zenith models. The PRP Circuit is available on 19" and 25" diagonal System 3 models.

Shown: The Paragona XII, model SM251X. Ultramodern styling with smooth, curvilinear silver color front. Simulated grained rosewood top and ends. Simulated TV picture.

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SYSTEM 3

The quality goes in before the name goes on®

The GE Computer Radio.

At 6:00 A.M. it's smarter than you are.

6:00

TIME

The Great Awakening from General Electric. For starters, it's smart enough to let you set the time directly...no flipping around the clock.

6:15

WAKE-UP 1

You can program it to change stations for you. So it will rock you to sleep with Strauss, switch to your news station, and wake you at 6:15.

7:53

WAKE-UP 2

Then it comes back on to wake up your better half to Beethoven at 7:53. All with push-button ease.

OFF

ALARM OFF

When you forget to set the alarm...The Great Awakening remembers to remind you.

1410

RADIO AM

You can scan all the AM or FM stations by pressing a button or, to tune in one station, just punch in the frequency of your choice on the keyboard.

102.7

RADIO FM

You can also program up to six stations into the memory. And recall any one with the touch of a finger.

15

SNOOZ-ALARM

For a little extra sleep, press the Snooz-Alarm.[®] It lets you sleep an extra minute or an extra hour. You tell the memory how long.

E

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The Great Awakening is so smart it even tells you when you've made an error. But it's easy to correct...just press a button.

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Six-mode exposure control.
System versatility.
Newer electronics for
wider applications.



The Canon A-1 is one of the world's most advanced automatic SLR cameras. Combining the finest in optical and mechanical engineering with the most sophisticated electronics, it's technology applied to give you the ultimate in creative control. At the touch of a button,

Depending on your subject, you can choose from six independent exposure modes to achieve the results you want:

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3 Programmed: When you need to shoot fast, just focus. The A-1 will select both speed and aperture for great results.

4 Stopped-Down: For extreme close-up or specialized photography, a bellows, a microscope or almost anything can be attached to the A-1. It's still automatic.

5 Flash: Totally automatic flash photography, of course, with a wide variety of Canon Speedlites to choose from.

6 Manual: Yes. For those times when you absolutely want to do it all your-



self. To experiment. To explore the possibilities.

There are over forty fine Canon lenses ranging from Fish Eye to Super Telephoto, plus accessories to meet every need. If you can't photograph your subject with a Canon A-1, it probably can't be photographed.

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**"A mine here
means basic
minerals for
everyday life."**

Some people hear of a gravel pit starting up, think of environmental problems, and want it stopped. Others favor the project for economic benefit, needed materials. Who's right? Maybe both, partially.

Mining can disrupt normal patterns—creating noise, dust, heavy traffic. Surface mining coal, sand and gravel, copper, iron, other minerals, often buries natural vegetation, wildlife habitats. It can blight scenery, disrupt farm lands, sometimes leave great craters in the ground.

Underground mining doesn't tear up the surface but it, too, can produce unsightly tailing piles that can despoil hillsides and pollute streams.

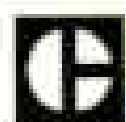
To be sure, mining has an unattractive side.

But, obviously our lives would be greatly changed without mining. We need coal for electric power, metals for tools, vehicles and appliances. We need stone for construction, sand and gravel in concrete for roads, bridges, buildings. Mining provides the raw material for all these things.

But mining need not be destructive. Land is wonderfully adaptable. Surface mine upheaval can be smoothed out, topsoil removed and replaced. Deep mine waste can be landscaped. Gravel pits made into lakes and parks. The mining industry is working to minimize mining impact. Supportive legislation can set standards so miners can reclaim lands within a competitive framework. They are restoring mined lands to productive use for farming, recreation and things like industrial parks, or building sites.


Caterpillar makes machines used in mining and land reclamation. We believe responsible action aimed at long-term multiple land use gives us mines, the minerals we need and the land.

**There are
no simple solutions.
Only intelligent
choices.**



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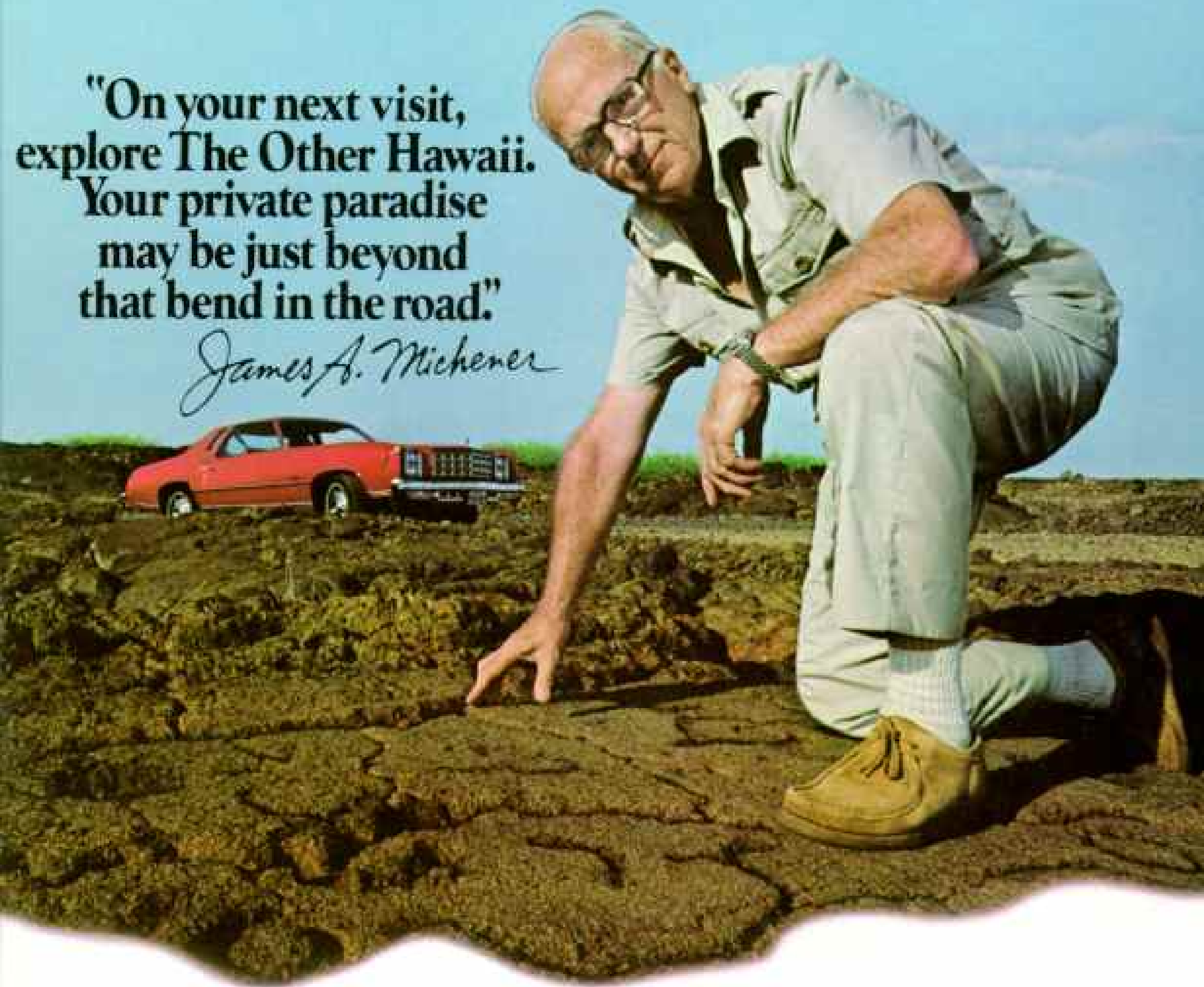
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creates a
terrible eyesore."**

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may be just beyond
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