VOL. 186, NO. 4 OCTOBER 1994

NATIONAL GEOGRAPHIC

OUR NATIONAL PARKS

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NATIONAL GEOGRAPHIC

OCTOBER 1994

OUR NATIONAL PARKS

By John G. Mitchell
Photographs by Melissa Farlow and Randy Olson

How well are we guarding these special places? A comprehensive report on a threatened heritage.

Hanseatic League

By Edward Von der Porten
Photographs by Sisse Brimberg

Banding together in the Middle Ages, German merchants wrested power from feudal lords—and helped give rise to a middle class. The spirit of their far-flung enterprise inspires newly free nations.

Siberian Mummy Unearthed

By Natalya Polosmak
Photographs by Charles O'Rear

Locked in an icy burial chamber beneath the Siberian steppes for 2,400 years, a Pazyryk gentlewoman comes to light along with possessions chosen for eternity.

The St. Lawrence: River and Sea

By Thomas J. Abercrombie
Photographs by Tomasz Tomaszewski

Highway of trade and summer sailors, the St. Lawrence sweeps from Lake Ontario to the wide arms of the Atlantic, where Great Lakes cargo ships give way to whitecaps and whales.

The Improbable Seahorse

By Amanda Vincent
Photographs by George Grall

Sought after live as aquarium specimens and dead as aphrodisiacs, these odd fishes found in coastal waters worldwide face growing pressure from habitat destruction.

COVER: Fired by a fading sun, an ocean of fog envelops Washington's Mount Rainier National Park—one of countless wild panoramas that mask a park system in trouble. Photograph by Kurt E. Smith.

Cover printed on recycled-content paper.

Sanctuaries of calm. Monuments to beauty. Touchstones of

OUR NA

a once wild continent. America's parklands remain one of the nation's most farsighted ideas—but they are ailing.

SUNRISE GILDS THE SOUTH RIM OF THE GRAND CANYON. RON SANFORD

TIONAL PARKS

"When, like a merchant taking a list of his goods, we take stock of our wildness, we are glad

Timeless winds compose crescendos and diminuendos of light and shadow at Great Sand Dunes National Monument, Colorado. Towering 700 feet, the dunes are the highest in North America.

DICK DURRANCE II, DRINKER/DURRANCE GRAPHICS

Grizzled with frost, a bison rests near Old Faithful geyser in Yellowstone, the world's first national park, founded in 1872. Rescued from extinction, some 4,000 bison roam the park.

DICK DURRANCE II

to see how much of even the most destructible kind is still unspoiled." —JOHN MUIR

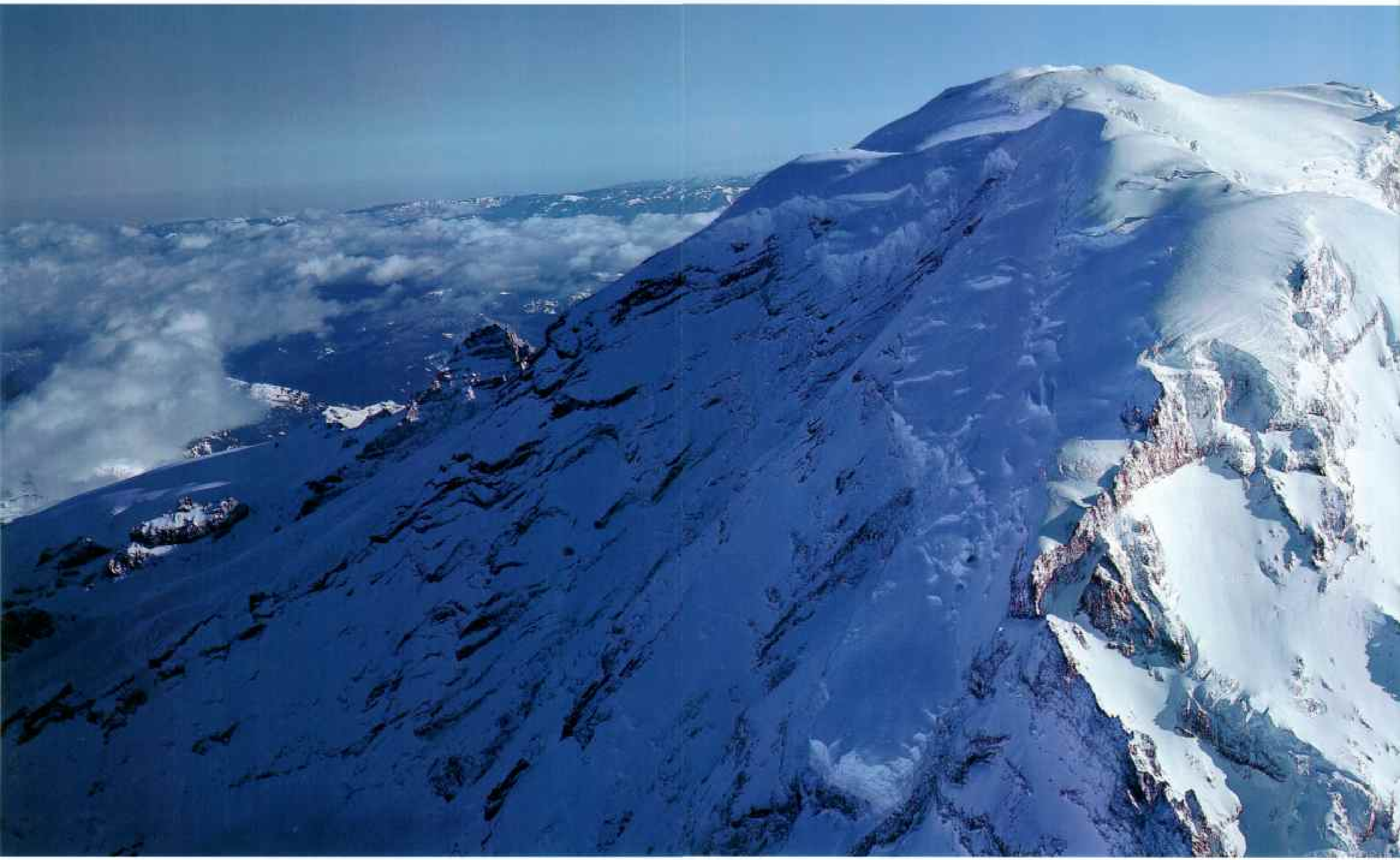
HARALD SUND

Waves of solitude wash the beaches of Washington's Olympic National Park, a major preserve of temperate rain forest. Olympic boasts nearly 60 miles of the most primitive coastline in the lower forty-eight.

SUSAN G. DRINKER, DRINKER/DURRANCE GRAPHICS

The singed scalp of Yellowstone sprouts fireweed—an early phase in fire-cycle succession. Since the park's huge 1988 blaze, burned vegetation has begun recycling back to fir and lodgepole pine forest.

"Leave it as it is. You cannot improve on it; not a bit. The ages have been at work on it, and



man can only mar it."

—PRESIDENT THEODORE ROOSEVELT

WHITEWASHED WITH WINTER, MOUNT RAINIER CROWNS ITS NAMESAKE PARK IN WASHINGTON.

HARALD SUND

At the end of the last century the first wave of the American conservation movement called on the government to set aside vast areas of wilderness, particularly in the West. John Muir and Theodore Roosevelt foresaw the onslaught of urban settlers in the region and moved swiftly to protect lands that remain, even to this day, splendid and unique.

The early conservationists set these lands aside as national parks—a simple idea that is itself as uniquely American as jazz and baseball. These parks were, and are, America's secular cathedrals. Today they present more a continuing challenge than a mere reflection of our rich birthright.

While many of the early conservationists believed they had protected the parks forever, they had in fact taken only the first steps. The national parks are beset by threats from without.

Everglades National Park is dying. The steady sheet flows of water heading south from Lake Okeechobee are now diverted into canals for agricultural and urban use, while much of the water that does reach the Everglades is tainted with phosphorous fertilizer.

A brief flight over Olympic National Park reveals lines as straight as those on a map. The lines reflect clear-cuts abutting the park's borders. Such devastation leads to blowdowns in ancient forest stands and topsoil runoffs that clog essential spawning beds for trout and salmon.

Yosemite National Park is the center of an ecosystem pressed by urban sprawl; 30 million Californians live within a day's drive of the natural world's most spectacular seven square miles—Yosemite Valley. Isolated vacation homes in the foothills of the Sierra Nevada have been replaced by suburbs for Central Valley communities. In another Sierra park—Sequoia—brochures warn hikers to avoid strenuous exercise throughout the summer months because of hazardous air pollution.

To meet these challenges from without, a new wave of conservation must be let loose—one that recognizes that we cannot protect lands merely by setting them aside. The new movement to protect our parks must focus on entire ecosystems.

There is another threat from beyond park boundaries: the alarming lack of financial support. Maintenance continually deferred has created a construction and repair time bomb. Yet small amounts of security can be achieved through new entrepreneurial efforts, such as allowing some of the entrance fees to stay in the parks rather than pass on to the federal treasury.

BY BRUCE BABBITT SECRETARY OF THE INTERIOR

A RAINSTORM COCOONS THE SUN IN CALIFORNIA'S YOSEMITE VALLEY. KB COOPER

Additional support can be gained through further reform of our concessions policies.

Our national parks are important. They are important not just because they provide good, inexpensive vacation sites for millions of Americans, though that fact alone makes them worthy of protection. Our national parks are important because they are a gateway to the conservation ethic. In these, our most precious sites, we can engage our people in a discussion of natural conditions, and of our place in relation to them. The prospect for a heightened environmental ethic in the United States depends, in large measure, on how we use our national parks. So read on. And then, go visit.

"The desert waits—mesa, butte, canyon, reef, sink, escarpment, pinnacle, maze,

NATURE, STRIPPED TO THE BONE, MIRRORS ITSELF AT DEATH VALLEY NATIONAL MONUMENT IN CALIFORNIA. HAROLD SUND

dry lake, sand dune and barren mountain—untouched by the human mind."

—EDWARD ABBEY

MOUNTAIN HEMLOCKS SALUTE A RISING SUN AT CRATER LAKE NATIONAL PARK.

CHARLES MAYO

"In wildness is the preservation of the world."

—HENRY DAVID THOREAU

"Every walk to the woods is a religious rite, every

A RANGER MEASURES OUT HER DAY WITH FOOTSTEPS AT OREGON CAVES NATIONAL MONUMENT.

RANDY OLSON

bath in the stream is a saving ordinance."

—JOHN BURROUGHS

Early one morning in June last year, I went to the top of Acadia National Park, on the rocky coast of Maine, to watch the rising sun put a blush on the face of America. The top of Acadia is held aloft by a mountain called Cadillac. At 1,530 feet, it is said to be the highest promontory on the eastern seaboard of the United States. Summertime, dawn's early light strikes Maine first before moving on to touch any other part of the coast or the country. It is a good place for beginnings, this Acadia. It is where, 40

summers ago, I paid my first visit to a popular showcase unit of the National Park System and thereby began a long and rewarding association with an institution I have come to admire, for all its infirmities, more than any other. So it seemed only right that I should return to these wind-scoured ledges before moving on in a season of journeys to measure the state of our national parks.

The time for assessment seemed right as well, for there had been a turnover in Washington, D. C., a changing of the guard. It was thought that perhaps the change might roll back a certain darkness that had lingered too long over the park system, dimming the morale of its dedicated employees and threatening to degrade the natural and cultural values of its physical resources. And there was this document called the Vail Agenda.

The agenda had come out of a government-sponsored symposium at Vail, Colorado, in October 1991, on the 75th anniversary of the National Park Service. In an unprecedented display of bureaucratic introspection, the Vail report warned against signs of "eroding" professionalism and "politicized" decision-making. It described an agency lacking the capability to pursue and defend its primary mission of resource protection. It lamented the emerging role of the ranger—not in that essential slot as interpreter of the great American story that every park is obliged to tell but as "traffic cop" to an overwhelming stream of "windshield" tourists.

And inevitably, since it was June and vacationing Americans were on the road again, there were press reports that the parks were in peril, pinched between too many visitors and too few dollars to fix what had to be fixed.

Yet as I stood atop Cadillac Mountain last time up, awaiting the dawn, the perils of this or any other park were far from my mind. I was thinking instead of what I had seen of Acadia the day before—the cool, fir-scented Maine woods; the motorless carriage roads and mountain trails, tide pools and beaver ponds, porphyritic headlands bursting the ocean into galaxies of golden spray. I was

LEGACY AT

MELISSA FARLOW

thinking that the old place still looked pretty good after all these years; after almost double all these years if one takes it back before my time to the park's beginning.

That was in 1916, the year President Woodrow Wilson established the National Park Service, and for a while Acadia would be known as Sieur de Monts National Monument. Then, there were 20 other national monuments, 14 national parks, and one reserve. But that was hardly enough to satisfy America. By the time I started checking them off, the Park Service had some 200 units in its portfolio. And today, spread across 80 million acres of the federal domain, there are 367 in categories undreamed of hardly a generation ago: 51 national parks, 102 national monuments and memorials, 108 national historic sites and historical parks, 24 national battlefields and military parks, 18 national recreation areas, 14 national seashores and lakeshores, plus a full roster of national rivers, parkways, trails, and preserves (map, pages 31-32). The numbers keep growing.

"Originally there was just a two-rut wagon road up here," says Carl Sharsmith, 91, a ranger who's worked in Yosemite since the 1930s. Today Yosemite Valley has 4,600 parking spaces—and controversial plans to limit summertime visits. "It'll happen," Sharsmith says. "It's got to, dammit."

Daybreak, Cadillac Mountain. The sun rises out of the Atlantic into a sky filled with lavender clouds. How many other sunups or sundowns have measured my time in the national parks? And how many parks? A hundred, maybe more. The windshield tourist in me has lost count, but the notebook reporter can surely scroll out a few unforgettable ones:

Yosemite in the amber light of an October afternoon, aspen leaves like spilt butter against the glistening rock. The Everglades at dusk, a flicker of lightning at the far edge of the Shark River Slough.

Moose in a bend of the Yellowstone River. Wood storks over the Big Cypress.

Moonstruck at *(Continued on page 27)*

RISK

BY JOHN G. MITCHELL
SENIOR ASSISTANT EDITOR

PHOTOGRAPHS BY
MELISSA FARLOW
AND RANDY OLSON

Dreamy mists soften an autumn morning in Tennessee near the southern edge of Great Smoky Mountains National Park. Not all of Appalachia's haziness is so benign; visitors'

car exhaust and industrial pollution from hundreds of miles away are poisoning the park's trees. "During our ugliest days you can't even see the next ridge," says a park official.

RANDY OLSON

Bright lights, little city: Tourists spawn a rural rush hour at Pigeon Forge, Tennessee, near the entrance to Great Smoky Mountains National Park. Such gateway communities have

boomed, fueling complaints about congestion. Among Pigeon Forge's un-natural attractions: a five-story fiberglass dinosaur and Dolly Parton's Dollywood.

RANDY OLSON

"It's a little sad that things have come to this," says Zachary Moore (above), a Park Service policeman who manned roadblocks in Yosemite after a visitor shot and wounded a ranger in 1993. Violent crime, though still relatively rare, has elbowed its way into U. S. parklands. Another citified intrusion: long, sweaty lines in Yosemite's stores.

MELISSA FARLOW (TOP); RANDY OLSON

(Continued from page 21) Pictured Rocks, star-spangled in the Kobuk Valley. The cliff house at Canyon de Chelly, the cannon at Gettysburg, the covered wagons at Scotts Bluff. The icy ramparts of Denali presiding over six million acres of Alaska wilderness. The granite facade of No. 26 Wall Street, presiding over the half acre of New York City where the Bill of Rights was born.

To be sure, there was no way I could now return to these parklands expecting to experience each one as I had the first time around. Over the years so many external threats and internal problems throughout the system have grown progressively worse—abrading the quality of air and water, usurping the pursuit of solitude, gridlocking the gateways with traffic and commercial glitz.

Still, to take the proper pulse of the parks, I would have to go back to a few of those places I'd been before, whatever the changes, and to some of the places I'd not yet seen. From Acadia I'd follow the sun west-by-southwest across America to the Golden Gate. And along the way, or by the end of it, I'd hope to discover a park system not merely holding up to the years Acadia style but one that might soon be made strong enough to endure the unimaginable tests of the century to come.

The Great Outside

Thanks to interstate highways and the growth of the sunny South, a huge number of Americans live within a day's drive of Great Smoky Mountains National Park, athwart the Appalachian backbone of North Carolina and Tennessee; and enough of them turn out annually to keep the place at the top of the list of the nation's most visited national parks (not counting parkways and urban recreation areas). More than nine million people were on top of Old Smoky in 1993. I was one of them.

What draws visitors here in such numbers isn't just motorcar convenience or the anticipated skytop view. What pulls the crowd—what provided the rationale for creating a national park here in the first place—is Great Smoky's magnificent half-million-acre forest, the most diverse in all North America and likely the nation's last large reservoir of old-growth broadleaf stands. No fewer than five overlapping but distinct forest habitats clothe the mountain coves and slopes as they rise from barely 900 feet to more than 6,500, from pine and oak to spruce and fir. To experience a similar range of life zones closer to sea level, you'd have to back off these mountains and drive all the way from southern Georgia to northern Maine. In Great Smoky, in appropriate site or season, are all the autumnal forest colors of deciduous New England, the feathery evergreen winterscape of the North Woods, the showiest spring displays of wild rhododendron and laurel, 2,000 varieties of mushrooms, 1,600 kinds of flowering plants, more than 500 species of lichen and moss.

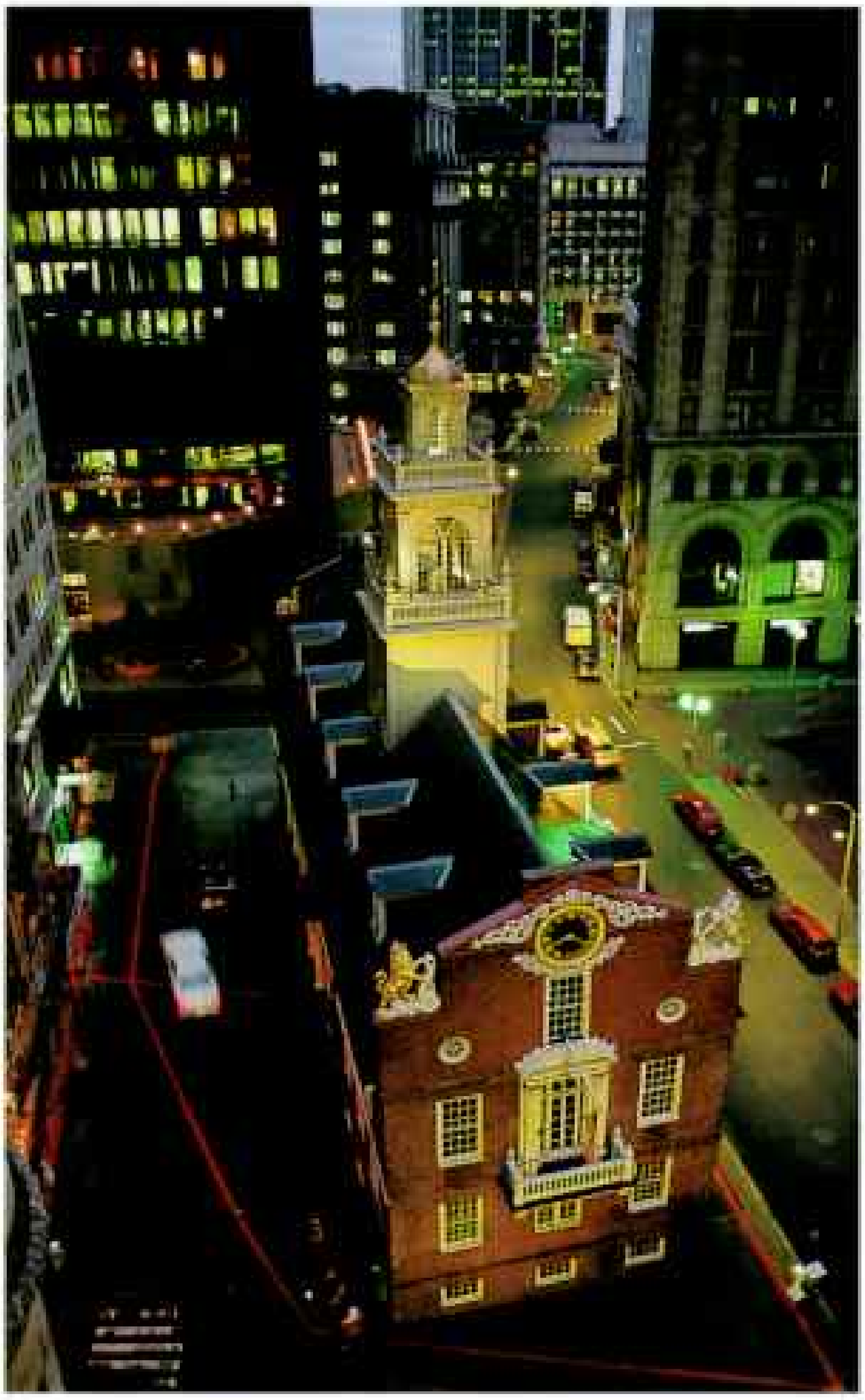
But there was something else that drew me here, a rumor that this forest was in danger of dying—not from an excess of visitors trampling the terrain inside the park but from an excess of plagues drifting into the treetops from the Great Outside.

At park headquarters, a few miles into the forest above Gatlinburg, Tennessee, I called on then Superintendent Randall Pope and put to him the question I had been asking, and would continue to ask, of his peers across the country. What are your toughest problems? Where are the gravest threats?

"Air quality," said Pope. "That's number one. And number two's the invasive pest."

I'd already had a preview of the pest problem, driving down the Blue Ridge Parkway that links Great Smoky with Skyline Drive and Shenandoah National Park in Virginia. Nearing the parkway's North Carolina terminus, but still high on the ridge, one is suddenly confronted with the spectacle of an entire mountaintop sheathed in a forest of sun-bleached snags, a deadening of Fraser firs, defoliated, white skeletons stabbing the sky.

The Fraser fir occurs only in the southern Appalachians. According to Superintendent Pope, two stands of mature firs remain in the park, each under attack by the same pest that has laid waste the firs of the Blue Ridge—the balsam woolly adelgid, an exotic insect that probably invaded the U. S. years ago, riding piggyback on imported European conifers.



A colonial gem in a concrete jungle, the Old State House (above) is part of Boston National Historical Park. Urban parks can offer novelty to the citybound: At Gateway National Recreation Area, New York City youngsters discover camping.

The balsam woolly adelgid should not be confused with the hemlock woolly adelgid, an Asian invader that feeds on the eastern hemlock. The hemlock woolly has already decimated virgin stands in Shenandoah Park and is now traveling south, windborne, to place Great Smoky's old-growth hemlocks at risk.

The park's pest problems don't begin and end with adelgids but march right on through the alphabet. Pope presented me with a list: anthracnose, a fungus of unknown origin, attacking the flowering dogwood; stem canker, another alien, fatal to butternuts; the European sawfly, defoliator of mountain ash; and coming soon (there have been infestations all around the park), the dreaded gypsy moth, another European, with a voracious appetite for oak.

Periodic infestations of one kind or another are, of course, part of the way nature works in checks and balances. But the variety and volume of these Appalachian pests have resource managers concerned that human interference—as in the introduction of alien plants—

BOTH BY RANDY OLSON

may be tipping whatever balance mother nature intended. Some of the pests are not easily or affordably battled or may require control measures that, if used, would be harmful to other life-forms in a particular ecosystem. And managers such as Pope are further frustrated by the fact that arboreal species might be less vulnerable to insect and fungus infestations if they weren't already so weakened by that other parkland intruder, dirty air.

Molly Ross, a special assistant in the U. S. Department of the Interior, was serving as assistant chief of the Park Service's air quality division when I spoke with her earlier at Park Service headquarters in Washington, D. C. Ross referred me to a number of sources and reports clearly indicating that the adverse impact of dirty air was affecting the visitor's experience as well as the integrity of natural resources throughout the entire park system. But what rang in my ears was Ross's observation that the system's highest levels of two top pollutants—sulfur and nitrogen—were being regularly recorded at monitoring stations in Shenandoah and Great Smoky Mountains National Parks.

Sulfur dioxide, a contributor to acid rain, has long been implicated in massive diebacks of red spruce at the higher elevations of the southern Appalachians. The heaviest emissions of sulfur dioxide can usually be traced to fossil fuel power plants, of which there are more than a score, upwind, in the Ohio and Tennessee Valleys. *(Continued on page 35)*

U.S. Parks: Stretched Thin

Curator of America's natural and cultural treasures, the National Park Service administers 367 units ranging from swamps to sunken battleships, from the humble Georgia birthplace of Martin Luther King, Jr., to the immense tundra wilderness of Alaska's Wrangell-St. Elias National Park and Preserve. But just as the agency's mandate has widened since its founding in 1916, so too have the cracks in park management. Chronic funding shortfalls have created a five-billion-dollar backlog in basic park repairs and improvements. And with its personnel swamped by a massive surge of visitors, ranger morale has frayed. "In order not to destroy the very values people are seeking, there are going to have to be new controls," warns one agency veteran. "Otherwise, there'll be no point in visiting these places." Higher user fees, long-planned visitation caps, and more partnerships with the private sector are looming.

RANDY OLSON

Research

The new National Biological Survey has drained the Park Service's meager research budget. A Yellowstone geologist (above) shoves off to plumb a hot spring using a crude measuring tape tied to scrap metal.

Crime

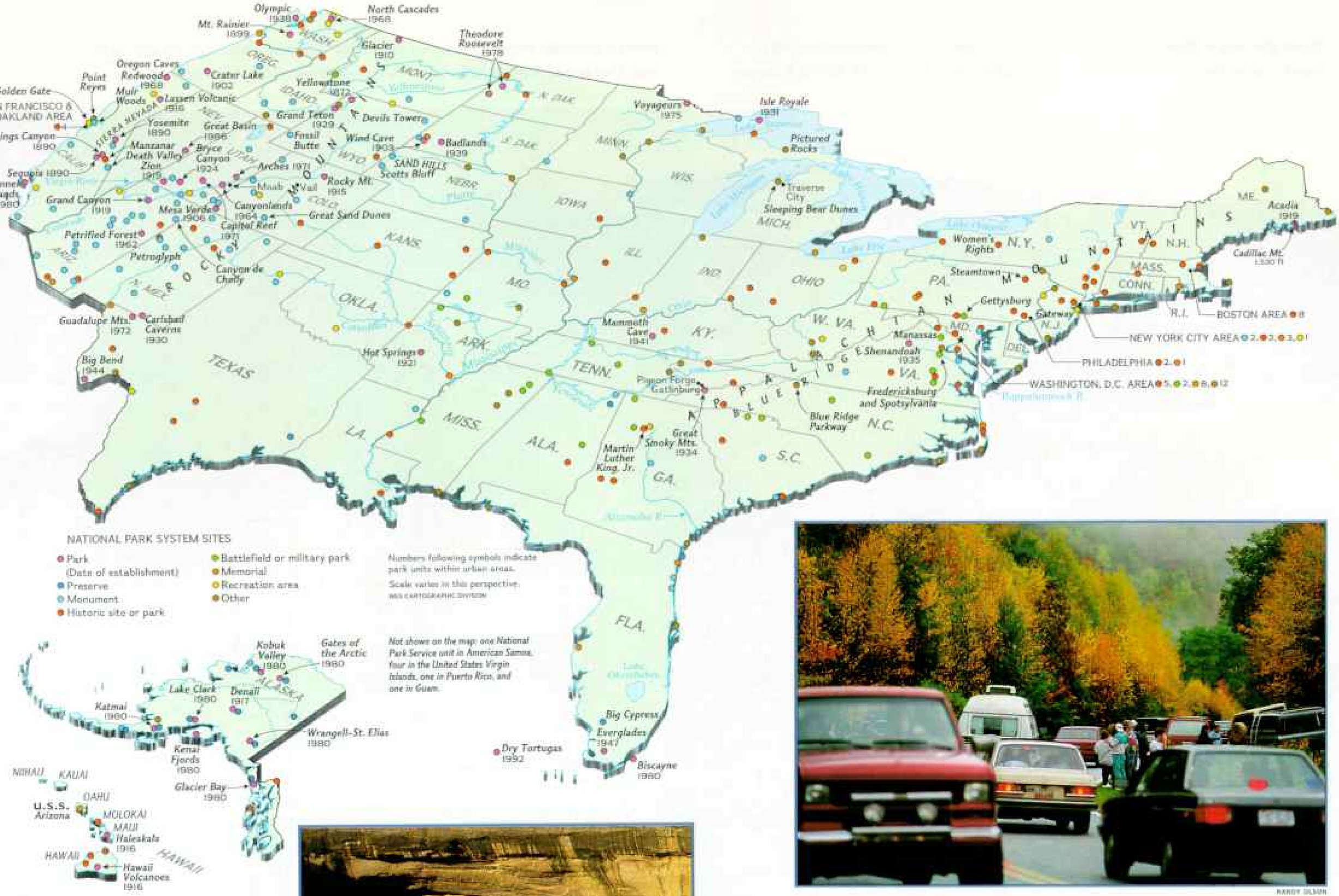
Where crowds go, crime follows—even in the wilderness. To cope, parks are requesting millions of dollars more for law enforcement. At Devils Tower National Monument (right) a ranger erases graffiti.

RANDY OLSON

Biodiversity

Native plant seeds collected at Glacier National Park (right) are replanted along park roads to discourage invading weeds. Nonnative plants and animals, human disturbance, and patchy ecological data bedevil wildlife management. At least 140 park units contain threatened or endangered species.

MELISSA FARLOW



Endangered Past

Current budgets allow only a tiny fraction of ruins like those at Mesa Verde National Park (right) to be stabilized. Meanwhile pothunters have picked clean major archaeological sites in the Southwest.

MELISSA FARLOW

RANDY OLSON

Overcrowding

Annual visitation in the park system—200 million in 1980—ballooned to more than 270 million in 1993. Backcountry areas are less affected, because most visitors stick to their cars. In Great Smoky Mountains National Park (above), 95 percent of the public never ventures far beyond the paved roads.

Bugles give way to birdsong at San Francisco's Presidio, a U. S. Army post recently transferred to the Golden Gate National Recreation Area. To cut costs, the Park Service wants a nonprofit corporation to run the facility. The post's buildings are also up for rent. One tenant: a think tank run by former Soviet President Mikhail Gorbachev.

RANDY OLSON

(Continued from page 29) Nitrogen oxide is a product of combustion from all kinds of sources, particularly power plants and motor vehicles. It is also an ingredient of ground-level ozone, not to be confused with that beneficial layer of ultraviolet-screening ozone in the stratosphere. Ross told me that nearly a hundred species of plants and trees at Great Smoky Park have begun showing signs of foliar injury—leaf damage and, in some cases, growth suppression—from ozone. The reports she referred me to tell of similar ozone impact at almost all the parks near urban areas, in the mountain parks of California, including Yosemite, and even at the seemingly resilient Acadia in Maine, which regularly posts warnings that ozone levels are nearing or exceeding safe health standards.

And at Great Smoky dirty air adds insult to injury and taints the name itself. The Cherokee used to call these uplands the Place of Blue Smoke. The "smoke" was actually a haze of natural hydrocarbons and water vapors interacting with sunlight above the humid forest. But now you throw pollutants into the bargain, and the Place of Blue Smoke becomes Smog Alley. "We're losing our views," said Molly Ross. "Visibility is down by as much as 60 percent in the summer. We lose the color, the detail, the sight of the ridgelines, one after another. Going, going, gone."

The Neighbors

Fredericksburg and Spotsylvania National Military Park, in Virginia, commemorates four major engagements of the Civil War, including the action at Chancellorsville and the Battle of the Wilderness. Since it is only a few hundred cannon shots down the pike from Washington, I poked by there one morning to talk with then Superintendent Maria Burks about the problems that might be plaguing her stewardship of these hallowed grounds. Burks explained that while the park contains fewer than 8,500 acres, its discrete battlefields and sites trace 120 miles of boundary in a region rapidly given over to suburban development.

"And what that means," said Burks, "is that we now have hundreds and hundreds of neighbors."

Unfortunately, not all the neighbors understand that the purpose of "Fred-Spots" park is to preserve the landscape, structures, and relics of a pivotal chapter of the American story, rather than render recreational open space. Off Fredericksburg's Lee Drive, not far from where the eponymous Robert E. pushed Maj. Gen. Ambrose E. Burnside back across the Rappahannock River in 1862, a cluster of high-density town houses has become a thorn in Fred-Spots' side. The project, smack-dab against the park boundary, was built primarily for young families with children but designed with no outdoor spaces in which the children might play.

"Families come and stay a couple of years and then move on," Burks said. "You can't build a constituency with that kind of turnover, and you've got all these children with no place to play. Well, the park becomes their playground. It's heartbreaking. We have earthworks out there that are destroyed, holes in the ground. There are tree houses. Dirt bikes. It was bad planning. We've lost that part of the resource."

Residential and commercial developments are butting up against park resources at several other national battlefields in Virginia and down along the Blue Ridge Parkway toward Great Smoky. "The tip of that berg is just now coming out of the ground," said one parkway official. He was telling me about one huge ridgetop subdivision planned for development so close to the parkway "you'll be able to look through their kitchen windows and see what they're having for dinner."

Peripheral pressures on the parks, however, are not limited to suburban town houses and pseudo-wilderness ranchettes. As I would soon discover, the borders of our national parks can also be threatened by highway construction (as at Petroglyph National Monument in New Mexico), proposed dams (on Utah's Virgin River, upstream from Zion National Park), and gravel mining (at Sleeping Bear Dunes National Lakeshore in Michigan), among other troublesome enterprises. Not the least troubling of which is the gateway community—the town or village that

Ghosts rise from history-haunted fields during a Civil War reenactment near Manassas, Virginia. Conservation requirements bar such events from Manassas National Battlefield Park and other federal sites, but county parks continue the tradition.

rises at the gate of a national park to provide the visitor with amusements as well as essential services and to stake its claim in that increasingly lucrative goldfield called industrial tourism.

The mother of all gateways is Gatlinburg, Tennessee. While I had heard much about it over the years, usually under a wrinkling of the raconteur's nose, I was not quite prepared for the scene that awaited me as I drove north out of Great Smoky Mountains National Park, rounded a bend in the road under an overarching canopy of green, and suddenly squirted out of the forest down the main street of an ersatz Alpine hamlet crowded with more than a hundred motels, nearly 800 rentable chalets, condos, and cabins, 75 restaurants, 400 gift and specialty shops, one space needle, and an aerial tramway said to be the largest in the United States.

To be sure, Smoky needs *some* kind of gateway community on its Tennessee edge. Unlike many of the other big parks, bristling with concessioned resorts, Smoky contains within its boundaries no overnight accommodations beyond the standard complement of campgrounds, some remote backcountry shelters, and one hike-in lodge hours from the nearest pavement. But does the park need this much gateway, especially when Pigeon Forge is just a few miles up the road? Pigeon Forge with its bungee jump, speedway, helicopter rides, factory-outlet malls, and Dollywood (as in Dolly Parton)—the "entertainment capital of the Smokies" and a destination in its own right. Last year Dollywood's turnstiles admitted more than two million paying customers.

With Gatlinburg and Pigeon Forge as role models, gateway communities throughout the park system seem to be moving beyond the basic services to egregious entertainments. At West Yellowstone, for example, an entrepreneur has opened an ursine theme park, featuring grizzly bears imported from out of state. And near Manassas National Battlefield Park in Virginia, the Disney people last year began pushing an ambitious plan to build the kind of theme park that supposedly would allow visitors to experience American history as if they were there when it really happened. (More than one critic immediately wondered if anyone in his right mind would want to experience what happened to 28,000 Americans, in gray and in blue, more than 130 years ago at Manassas.)

MELISSA FARLOW

Apart from the smoke and mirrors of entertainment, gateways providing bed and board outside the parks can reduce pressures for a clutter of services inside. As a partial solution to weekend gridlock, for example, the general management plan for Yosemite Valley places great emphasis on developing more accommodations in adjacent communities, with leave-the-driving-to-us shuttle service into the park. But holding the line at bed, board, and buses may be too much to expect in most emerging gateway situations. In which case the question becomes, in the words of one senior Park Service official, "How much more tarnish can the system withstand?"

THE VISITORS

For an individual whose landscape druthers tend to run toward blue-watered boreal places, I am somewhat at a loss to explain a shameless passion for slickrock mesas and sun-puckered prickly pear. An acquired taste, no doubt; a hangover from earlier days and nights of canyon hopping in the parks and wildlands of southeast Utah. And that passion is what brings me now back to Arches National Park. That and a prickly question that continues to confound and divide the public, if not some elements within the Park Service as well. The question: In a crunch,

RANDY OLSON

Fear glints in the eyes of a red wolf (above) during a predator reintroduction program in Great Smoky. Most animal-human interactions in parks aren't so noble. In Glacier a mountain goat has cultivated a toxic taste for spilled radiator antifreeze.

which squeaky wheel gets the grease—the visitor or the resource?

Arches is a salubrious place to explore any question, or none at all. Located outside Moab, in the red rocks of the Colorado Plateau, the park is a geologic crown jewel, a storybook of erosional history, a striking display of sandstone spires and fins and pinnacles, and likely the grandest repository of natural arches in the world. By western standards it is not a large park (some 73,000 acres), but it is an accessible one, with a visitor center right off a major highway and a fine road bearing the visitor lickety-split to such eye-filling landmarks as the Three Gossips, the Parade of Elephants, and the Fiery Furnace. And if one is willing to press on without benefit of pavement, there is Delicate Arch, the park's signature feature, perched like a giant, salmon red wedding ring at the brink of a sandstone bowl. Through the ring, one can see the La Sal Mountains, snowcapped much of the year, pasted against a bluebonnet sky.

Given its user-friendly accessibility, Arches

MELISSA FARLOW

is precisely the sort of unit that the Park Service might select as a proving ground if it wanted to develop a process for protecting a park's resources from visitor impact without unduly restricting the visitor's opportunity to enjoy them. Or, how to grease two squeaky wheels at the same time.

Those wheels had been bumping down an uneven road almost since America's—and the world's—first national park was anointed at Yellowstone in 1872. Being remote, like Yellowstone, the earliest parks didn't attract any visitors to speak of. The U. S. Army was effectively in charge, and the charge was protection. When the National Park Service took over in 1916, Congress ordered it by law to "promote and regulate the use" of the parks in conformity with their fundamental purpose, that purpose being: "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

But before long the idea of promoting use and providing enjoyment began to outrun that other idea of regulating use so as to leave the resource unimpaired for future generations. The immediate challenge was to build a constituency for expansion of the system, and the only way to do that was to pipe the people into the parks. From time to time over the years the preservation ethic might briefly gain some ascendancy (as it did during

RANDY OLSON

Going home with a little help from some friends—volunteers from a private conservation group—orphaned elephant seals return to the surf at Point Reyes National Seashore, California. In an age of lean budgets, volunteers are crucial to most parks' operations.

World War II, when lean times and gasoline rationing restricted travel), only to be overwhelmed by pressures to accommodate an ever increasing number of visitors and motor vehicles (as in the period of postwar park construction).

In 1954, when I first added my heft to the numbers, the National Park System counted 50 million visitors. Forty years later the count is at 270 million, and while there are many more parks now that receive these visitors, use is not spread uniformly throughout the system. Some of the most popular parks, such as Grand Canyon, are experiencing visitor increases ranging as high as 25 percent in a single year. At the millennium, park planners are predicting, the total system-wide count could reach 340 million; by the year 2010, a half billion. The concept of instituting a peak-season reservation system for the big-draw parks—not just for admission to campgrounds but to the parks themselves—has been bruited about the Park Service for years, invariably without effect. Senior officials have told me privately that while the agency possesses the technical ability to set some necessary limits, it has repeatedly balked at imposing them for fear of offending congressional guardians of public convenience.

Short of putting the biggest parks on a reservation-only basis, however, the Park Service is implementing some curbs on what the visitor is permitted to do. Here in southeast Utah, for example, in the backcountry of

Canyonlands and Capitol Reef National Parks, there are places where—quite legitimately—I once traveled by four-wheel drive, scrounged juniper branches for firewood, and unrolled a sleeping bag without so much as a ranger's by-your-leave. But those freewheeling days and nights are gone forever. Now, in much of the slickrock backcountry, it's travel by foot and supper by stove light.

Sundown. The Moab Community Center. I have come here to hear how the public feels about Arches National Park, and how the Park Service aims to protect the park's resources without spoiling the visitor's experience. Listening to comments from the floor, I get the impression that opinions are more or less split between people who want more resource protection by restricting use and those who believe there is too much restriction already and maybe not enough use. Consider, for example, the conflicting perspectives of Ken Sleight and Harvey Wickware.

Ken Sleight is a laconic, river-running, packhorse-tripping outfitter with a ranch doubling as country inn up in the nearby La Sal Mountains. Though he is personally engaged in the tourism industry, Sleight believes that unrestrained tourism will ultimately be the undoing of the region's wildlands in general, and Arches National Park in particular. "That roaded corridor up in Arches is a sacrifice area," he says. "What we have to do now is hold the line. We've already compromised so much away; why pretty soon there won't be anything left."

The more voluble Harvey Wickware is a 34-year veteran of the Park Service now retired to Moab after his last post as superintendent of nearby Canyonlands National Park. So there will be no confusion as to where he is coming from, Wickware proudly tells me that the Reagan Administration dispatched him to Canyonlands in 1987 "to take the park back from the environmentalists." He says, "The citizens of this country have a right to use their parks." He says, "If Canyonlands would just be properly developed, 400,000 visitors a year—that's current use—could be increased to four million without in any way hurting the resource. Sometimes the best way to protect a resource is to develop it. A popular place like The Windows, in Arches, needs to be heavily structured—up to the point of providing concrete walkways with handrails, so the visitors don't wander off."

High noon. Arches National Park. I am with park Superintendent Noel Poe at a place called Park Avenue (supposedly because the fins and spires here inspire some people—present company excepted—to think of city skylines). Poe is explaining to me that while his park shares many of the problems affecting other parks, Arches bears the additional burden of being lavishly attractive as a backdrop for television commercials and feature films, such that this Park Avenue might just as well be renamed Madison Avenue or Hollywood and Vine. Poe says the park issues about 25 commercial filming permits a year. (Among the more famous shoots: *Thelma & Louise*, *Indiana Jones and the Last Crusade*.) But Poe is getting particular about how much Hollywood the park can sustain. He says, "Columbia Pictures was in Moab shooting *Geronimo*. They approached us about staging a battle in the park—250 Indians on horseback against 250 cavalrymen. We said, 'No way!'"

From Park Avenue we proceed to The Windows, four large arches accessible via short trails. This is where Noel Poe explains why it is not such a good idea to let 500 Hollywood horses loose in the park, and why he is also obliged to say 'No way!' when visitors—there were 775,000 of them last year—want to wander away from the designated trails.

"Cryptobiotic soil," says Poe, pointing to a dark-colored crust that appears to cover much of the ground that hasn't already been trampled by off-trail trekkers. "It's composed of microscopic organisms—bacteria, fungi. It's about the only thing out here that fixes nitrogen. All our plant life—the rabbitbrush there, the sage—needs nitrogen. But when you walk on that crust, even one footprint, you kill it. Eventually, if you kill enough of it, you're going to have a Sahara desert."

At certain places along the natural-surface Landscape Arch trail, I see that Poe's maintenance people have strung lengths of rope, thigh high, to discourage bushwhacking. This is low-profile resource protection, causing hardly a ripple in the visitor's experience. Yet

Come rain or shine—or steam—anglers descend on Yellowstone's Firehole River every summer to test the waters for trout. Because of heavy fishing pressure, the park has

imposed a catch-and-release policy. One study suggests that cutthroat trout in the nearby Yellowstone River get hooked, on average, 45 times during their five-year life span.

RANDY OLSON

MELISSA FARLOW

Marie Jake tends her sheep and goats in the family's sunstruck backyard—Canyon de Chelly National Monument in Arizona. Born park custodians, some 150 Navajo still live, farm, herd, and pray in the canyon, tribal land held in trust by the government.

in my mind's eye, I suddenly see beyond the rope to a future Arches made of Harvey Wickware's concrete walkways, complete with handrails. Of course, that kind of development already exists, not only in the heavy-use sections of Yellowstone, Yosemite, and Grand Canyon National Parks, but in some of the less visited units too.

In my sweep across the country I had stopped at Sleeping Bear Dunes National Lakeshore, near Traverse City, Michigan. Touring the dunes with Ray Kimpel, the park's senior management assistant, I was impressed by the Park Service's effort to concentrate the visitor's off-trail dune scrambling in one well-worn area while confining use to boardwalks and viewing platforms in more fragile locations. But at the Platte River Campground, whose rehabilitation at a cost of some five million dollars would soon be completed, I was stunned. Here, in the shade of towering red pines, beside the murmur of this beautiful river, the visitor would picnic not on a bed of pine needles but on a poured concrete slab. I told Kimpel that while I could understand the need for concrete in this day and age, I'd personally prefer a picnic with duff underfoot. Kimpel said he agreed. "But you know," he added, "nowadays structures have to be built to last. Because we're just not getting the maintenance money to keep things up."

So now, in Utah, I stand beneath a towering red-rock arch, beside fragile cryptobiotic soil, and wonder: Will this be the price we must

pay for our increasing numbers? Are handrails and hardtop the legacy we want to leave "for the enjoyment of future generations?"

The Budget

It has been said that the Grand Canyon is the eighth wonder of the world. Evidently a lot of people around the world would rank it closer to first, because the national park that embraces the canyon's most awesome declivities is possibly the foreign tourist's single most popular U. S. destination, apart from specific cities. Last year nearly five million people visited Grand Canyon National Park, and three out of every ten were citizens of foreign countries. The presence of such a high proportion of folks from abroad struck me one morning as I moseyed along a trail on the South Rim. So, wondering what the alien perception might be of this place and its problems, I sought out a small number of English-speaking Asians and Europeans and put a few queries to them. And this is what I discovered, along with an almost uniform response that the canyon was beautiful yet frightening and that one and all were having a very good time.

I learned that these visitors were not aware of many of the problems affecting the national park. Perhaps because Americans measure elbowroom a bit differently than Asians and Europeans, the park did not seem crowded to them. (It did to me.) No, they had not noticed an impairment of visibility caused by air pollution; the view seemed fine. Nor were they aware that the noise pollution from helicopter and light-aircraft overflights elsewhere in the park was spoiling the fun for seekers of backcountry solitude. (In addition to the nearly five million ground visitors, another 800,000 see the canyon from the air.) Nor had they heard that fluctuating releases of water from Glen Canyon Dam, upstream on the Colorado River, were eroding the floor of this canyon.

Well, then, had they noticed anything at all out of order? Yes, several of the visitors told me. They had noticed that the roads seemed to be falling apart.

From Grand Canyon to Acadia and back across the country to the parks of the sundown sea, infrastructure decay—accelerated by deferred maintenance—is clearly punishing not only the park system's roads but its trails, septic systems, employee housing, and visitor facilities as well. "We're getting old and tired," Superintendent Randall Pope had said of Great Smoky Park's 800 miles of erodible backcountry trails, "and we can't keep up with it." And at Sleeping Bear Dunes, Superintendent Ivan Miller told me: "We have scores of historic 19th-century buildings here, and they're all just moldering into the ground."

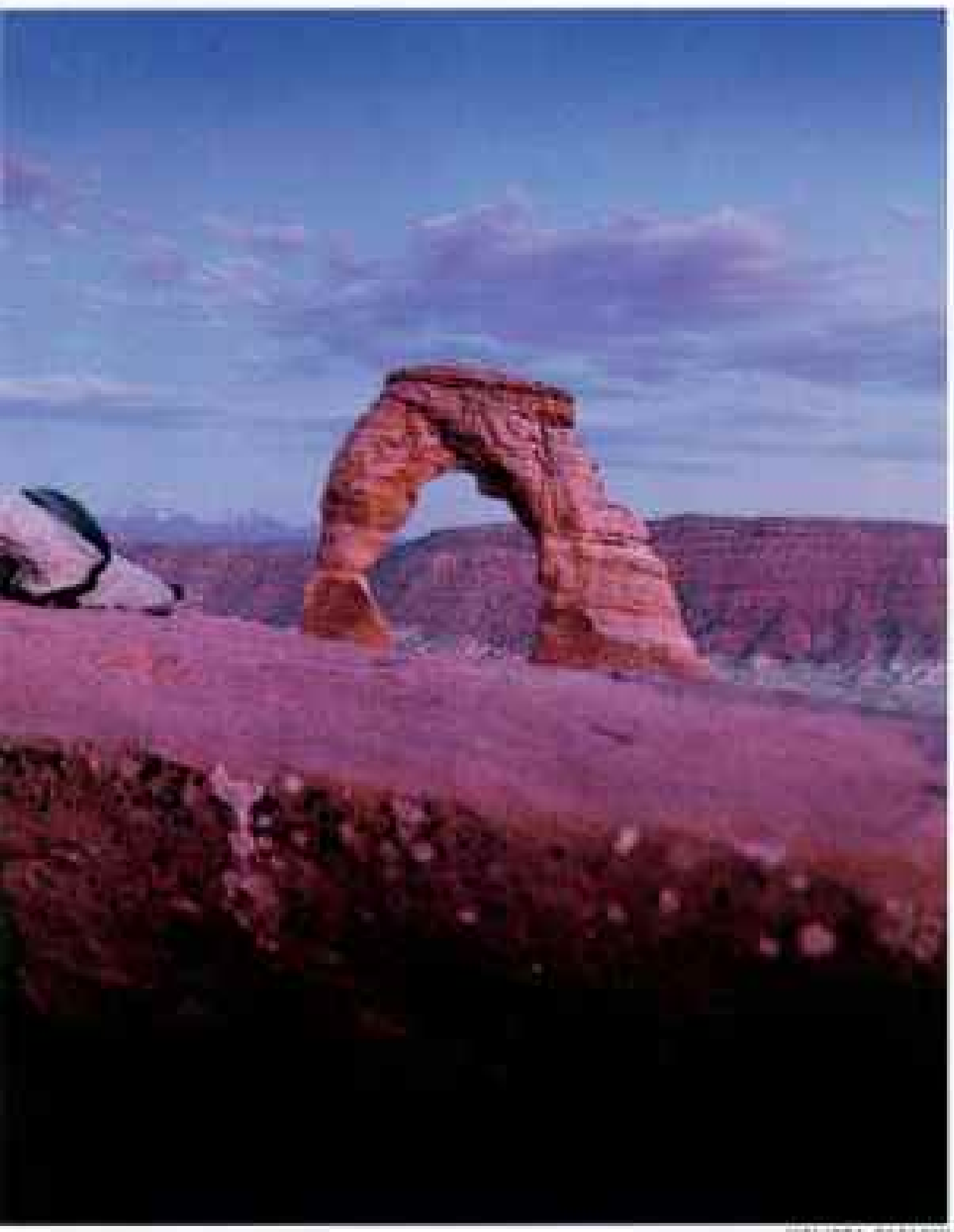
In round numbers the Park Service is custodian of a physical plant the real value of which may well exceed 40 billion dollars. To keep that plant functioning in fiscal year 1994, the service and its congressional overseers have earmarked almost 40 percent of the billion-dollar operating budget for maintenance. But that's for Band-Aids: paint, nails, and lawn mowers. To fix up the big items, to rehabilitate or replace the system's roads, buildings, and campgrounds, you have to turn to the construction budget, which stands this year at about 200 million dollars spread over 80 separate projects. Yet even 200 million dollars hardly begins to take care of the big rehab and replacement needs, for there is already an accumulated list of more than 220 separate construction projects, with a price tag approaching three billion dollars. Grand Canyon National Park, for example, appears high on the list as being in need of some 19 million dollars to resurface its South Rim roads and about 24 million dollars to construct adequate employee housing. Yet the federal treasury this year has yielded to the park only a bit over six million dollars for the housing and nothing for the roads.

If the construction backlog sometimes seems to mimic the national debt—that three billion dollars is expected to approach six billion dollars by 1996—then part of the problem must be traced to Congress and its proclivity for substituting its own political priorities for decisions made by professionals in the Park Service. When it comes to budgets, the House and Senate Appropriations Committees have the largest say.

In the 1994 budget Congress heavily trimmed or jettisoned many of the Park

A desert twilight hushes a crowd at Utah's Arches National Park, where even solitude enters into the calculus of management. A poll shows that tourists tolerate some 30 other people while communing with nature at Delicate Arch—so its parking lot will be sized accordingly. Communing electronically, a visitor tapes a video sunset at Yosemite (below).

RANDY OLSON



MELISSA FARLOW

Service requests that had worked their way into the top tier of the agency's priority list, then put in 45 projects of its own, as it had done to varying degrees in previous years. These substitutions generally come off the bottom of the service's priority list or have no priority whatsoever among service professionals. To Washington insiders, such projects are known officially as congressional add-ons. Outsiders speak a different language. They call it park barrel politics.

The Agenda

Roger Kennedy, the National Park Service director, was speaking of priorities, and getting construction projects in the right order was only a part of one of them. I had doubled back from my westering tour to talk with the director just 120 days into his new job. I wanted to discover, if I could, where this former boss of the Smithsonian's National Museum of American History might be planning to take the Park Service and the system, before taking myself on one last sortie to California, where Kennedy's agency would soon be facing one of its toughest tests at the edge of the Golden Gate. We sat in high-back rocking chairs in his office in Washington. His priorities, he said, were people, places, and partnering—the latter being Park Service jargon for its increasing dependence on partnerships with state, municipal, and private entities to help preserve significant resources.

"Doing right by the people in the Park Service—that's the first job," he said. "Do it, and other good things will flow from that."

In my peregrinations around the park system, I had encountered rangers, naturalists, cultural specialists, and resource managers totally dedicated to their individual tasks and collective mission, yet they were acutely uneasy, if not downright unhappy, about their working and living conditions. Almost half the full-time rangers, for example, have to make do on salaries under $27,000 a year, and even that comes only after five years' service. "It is now no secret," complains the nonprofit National Parks and Conservation Association, "that most rangers cannot afford to 'take their pay in sunsets.' Instead they are taking their leave. There is an exodus of experienced park rangers to . . . the Bureau of Land Management and the U. S. Forest Service." BLM and the Forest Service offer higher starting salaries and faster career tracks. Grand Canyon Chief Ranger Ken Miller told me: "We've become a training ground for other agencies—and it's costing us."

Kennedy said he wants to upgrade the rangers' housing as well as the pay scale. "We have some of our people living in shacks and tents—the kind of conditions lawmakers would legislate migrant farmworkers right out of. It's a national disgrace, and it's been a national disgrace for a long time."

Turning to the sorry physical condition of so many of the national parks, Kennedy told me: "We've got to catch up with the rot. The irony is that as the nation focuses on paying down the mortgage, the walls are falling in and there are holes in the roof. And it isn't a matter of just doing it next year. We've been 'just doing it next year' for too many years."

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"I loved that cabin," says seasonal ranger Gwen Hoppe (above) of the waterless, plywood shack she occupied at Mesa Verde National Park, Colorado. Private huts are coveted by park employees; crowded housing is a major cause of resignations. At Boston National Historical Park, 15 rangers shared one coed shower until the lavatory was remodeled.

ABBOTT OLSON

Beyond fixing up the old places, Kennedy is afraid that the Park Service is not adequately conveying to the public the meaning of national parks, and how each one has a story to tell about the American land and the national experience. Perhaps more than any of the system's deficiencies, the failure of effective interpretation had struck me powerfully in my travels across the country. Sure, I'd encountered some excellent interpretive exhibits in a handful of visitor centers: Sugarlands at Great Smoky Mountains, Fossil Butte National Monument (Wyoming), Point Reyes National Seashore (California). But more often than not, in large parks as well as small, it seemed to me the exhibits exuded a kind of antiquarian mustiness, and visitor centers appeared more functional as comfort stations than as informal classrooms where people might rediscover a part of America by understanding a sense of the place.

Director Kennedy's third priority, partnering, is nothing less than an exercise in institutional survival—the idea being that as the system takes on new units and added responsibilities, but with little real growth in available manpower or federal money, the Park Service must find new ways to share the burdens of stewardship. In short, go-it-alone gives way to going-for-partners. The book on partnering was written at Boston National Historical Park, a complex of sites and structures associated with the American Revolution and the founding of the United States. The park is unusual in that only three of its sites are owned by the Park Service. Five others are owned and managed by private or municipal entities, including the City of Boston's Faneuil Hall (the "Cradle of Liberty"), Old South Association's Old South Meeting House (where the Boston Tea Party was hatched), and the Bostonian Society's Old State House (site of the Boston Massacre in 1770). And just a few blocks from the Freedom Trail that threads these partners together is the Boston African American National Historic Site, where the privately owned African Meeting House stands as the oldest black church building in the United States. Of his partners and cooperators, park Superintendent John Burchill says: "They bring the kind of political and financial support you need to survive."

The Golden Gate

Nearing sundown. Golden Gate National Recreation Area. It is October. The wind is brisk and the great blue bay at San Francisco is speckled with sailcloth. I have come to the top of Battery Spencer, a tumbledown installation left over from the days when coastal artillery held the latchkeys to Fortress America. This is not the very highest spot in the Marin Headlands, but it is high enough to give you a view you will never forget: Far left, in the bay, that skullcap island called Alcatraz; then, clockwise, the skyline of the alabaster city, seen through the cables of the Golden Gate Bridge; next, the wooded Presidio, far end of the bridge; then the Pacific Ocean where the sun will soon set; and finally, behind us, the scrub-covered ridges of Marin County rolling north to the wilder shanks of Mount Tamalpais and Muir Woods.

And all of this save the sea, the cityscape, and the bridge is Golden Gate National Recreation Area. All of it and lots more that we cannot see, 114 square miles of it; urban beaches and forest canyons and pastoral grasslands; threads of history running back through truculent times from the Nike missile to the bow and arrow; memories of Miwok Indians, Spanish friars, gold-fingered argonauts; encounters at reedy lagoons steeped in the life-affirming stink of the littoral. Half again as many visitors come here as pass through Great Smoky Mountains National Park, which makes the Gate second only to Blue Ridge Parkway as the most heavily used of *all* the units of the National Park System.

Actually, I am almost jumping the gun on the Presidio. The Army's 1,500-acre post across the Golden Gate, a casualty of base closure, won't officially be transferred to the Park Service until this fall. At the time of my visit the service was unveiling its draft plan to make the Presidio a part of Golden Gate National Recreation Area. The fallout from that will be drifting in the wind for a long time.

The plan proposes taking the Presidio,

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Undeveloped beach draws a mile-long line of motor homes to Redwood National Park, which lacks a public campground. By contrast, mounds of motel laundry attest to overbuilding at Sequoia National Park (opposite, below). Sequoia plans to move the motel village by 1998.

including most of its more than 500 historic-landmark buildings, and beating the swords of its military past into plowshares to help secure the future of the world's human and natural resources. While there'd be intensive efforts to restore the post's woodlands, develop new hiking and biking trails, and construct a shoreline park on the site of a 1920s airfield, the plan's major thrust would be along less traditional lines. In the interest of preserving the Presidio's historic structures and finding appropriate uses for them, Congress would be called upon to create a public-benefit corporation—a super-partner that would fill the buildings with rent-paying tenants in the business of improving environmental, cultural, and social conditions at home and abroad. There was speculation that the Letterman Army Medical Complex, stateside way station for the wounded from our wars in the Pacific, might be adapted as a center to explore the interdependence of health and environment. All good and lofty goals. But very expensive.

According to official accounts, it is going to cost 490 million dollars just to implement the plan, and 25 million dollars a year in operating funds through the year 2000. Of the 490 million dollars, the public-benefit corporation will have to raise 332 million dollars, over time, through leasing to tenants; the rest of the bill would be picked up by Uncle Sam and private donors. As for the 25 million dollars a year for operations, Golden Gate Superintendent Brian O'Neill suggested that the figure should be counted as an overall federal savings, inasmuch as it has been costing the Army 45 million dollars annually to operate the Presidio as a military base.

Still, numbers like these have raised anew a contentious question: What rightful business does the Park Service have messing around in the streets of San Francisco or of any big city for that matter? Especially when, for lack of funds, staffs are stunted, programs shelved, roads unrepaired, and resources unprotected in the older, more traditional parks out there in the boondocks. I can hear the critics saying: Why, you could take that 25 million dollars a year projected for running a 1,500-acre urban park at the Presidio and, at current spending levels, operate all the parks in wild Alaska, totaling 55 million acres.

The Presidio raises other questions. No one seriously doubts the national significance of saving this 218-year-old military post from the auction block, but is salvage to be the

"The forests of America, however slighted by man, must have been a great delight to God; for they were the best he ever planted," wrote John Muir, a patriarch of the National Park

System and a lover of redwoods. Fluid light haloes the giant conifers in Lady Bird Johnson Grove, a living monument to the loftiest ideals behind the park system.

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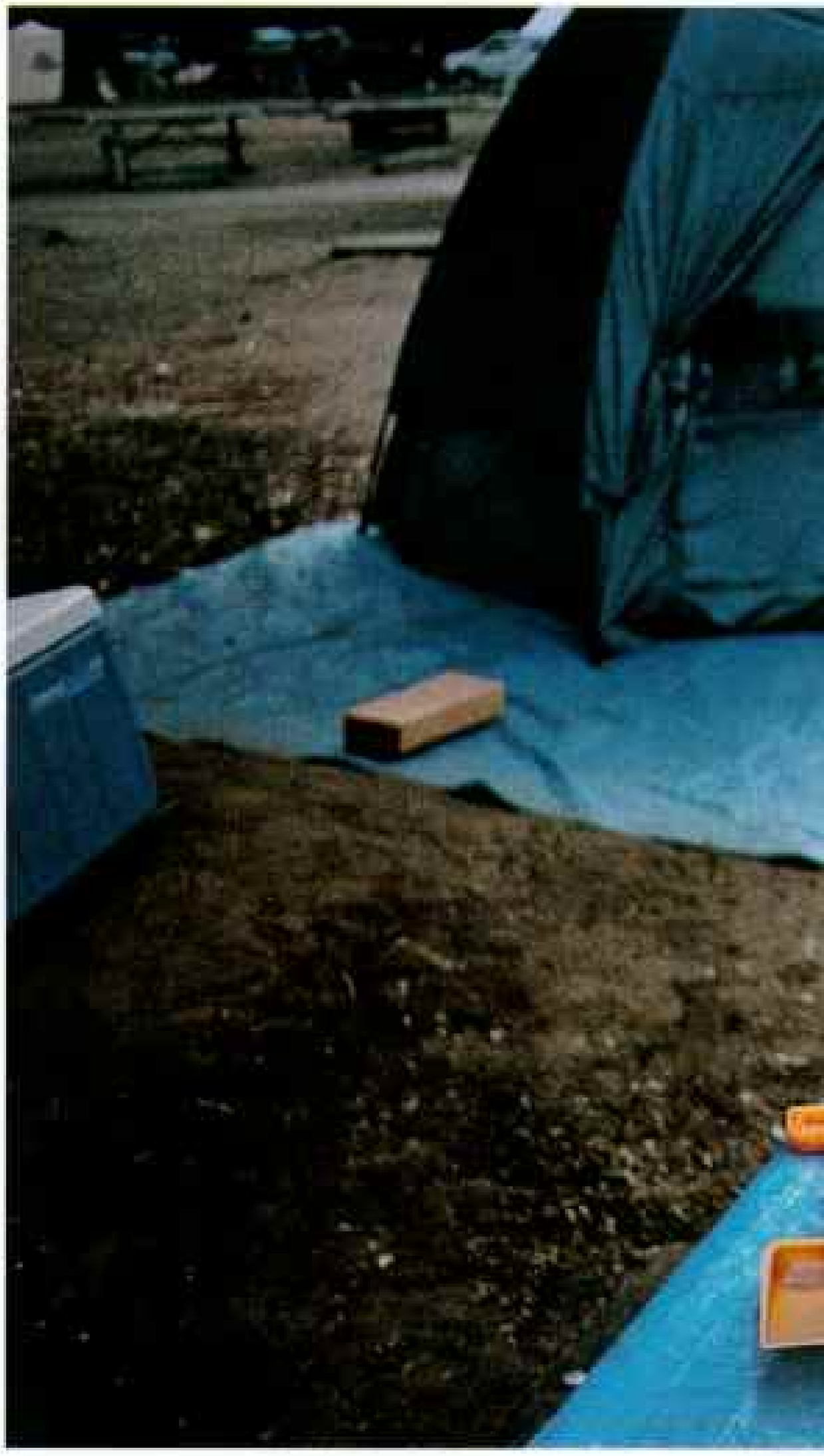
Squeezed in her tub, a young camper bathes alfresco in Yosemite Valley, where campsites can require reservations two months in advance. Such parks were created "for the enjoyment of future generations." For many, that 78-year-old promise is eroding.



wave of the park system's future? The nation is accumulating a growing inventory not only of obsolete defense installations but also of economically depressed communities and regions. Some of these communities and regions, through their congressional delegations, are beginning to clamor for a piece of the park-making action. Suddenly parks are seen as cash-register successors of dead or dying industries. When a Steamtown National Historic Site was established at Scranton, Pennsylvania, a few years back to interpret the story of steam railroading in America, purists in and out of the service wondered, why *there?* And why include rolling stock from Canada? For the park system, the purists warned, this was only the beginning of a "thinning of the blood."

Park making can be a trendy process. It is possible that so long as the nation's economy remains sluggish, the creation of new parks to help jump-start depressed communities may briefly gain favor, much as the establishment of urban recreation areas suddenly surged, then faded in the 1970s.

But it is unlikely that any trend will long preempt the unfinished agendas of traditional park makers in Congress and the private nonprofit conservation community. There is still much support for creation of a tallgrass prairie park somewhere in the eastern precincts of the Great Plains. Conservation groups are determined to have a California desert national park south of Death Valley. Other voices can be heard demanding park status for the Maine woods, the Escalante canyons of Utah, the Sand Hills of Nebraska, the Altamaha River of Georgia. And even if there could be an eventual end to the making of natural parks, where does one draw the line on historic and cultural ones? The story of America is an unfinished book. Who among the straw-hatted, hoop-skirted visitors at Yosemite's Bridalveil Fall a century ago could ever have guessed that some day there would be a park system with one unit, in upstate New York, honoring women's struggle for equal rights and another called Manzanar, in California, to keep us mindful of the nation's shameful internment of Japanese Americans during World War II?

There are no straw hats today at Battery Spencer. But there are hatless Japanese Americans, and Chinese Americans, and Hispanic Americans, and Italian Americans, and—who can tell just from black hair and cheekbones?—American Americans. And seeing

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them all here, separately and together attending sundown, I recall what Golden Gate Superintendent Brian O'Neill was telling me just yesterday—that the Park Service's fundamental challenge will be to make every single individual in an increasingly diverse population "a real stakeholder, emotionally and intellectually, in the National Park System."

I see stakeholders here at Battery Spencer. That young woman, for instance, the one who handed me her camera and asked if I'd take a picture of her and two friends, with the bridge in the background. After the picture we talked. This was her first visit to a national park, and she found it quite wonderful. Just being here, she said, made her proud to be an American. Tomorrow she would be going to Point Reyes; the day after, to Yosemite. I told her Yosemite was so wonderful, seeing it for the first time was enough to make some people cry.

"I don't cry easy," she said, "but I hope I'll be one of them."

Now the orange sun is down. Soon it will pass westward over the Pacific, touching parks I have never known and may never see, Hawaii Volcanoes and Haleakala, and the Pearl Harbor grave of the battleship *Arizona*, crossing time zones and continents to post one more dawn on that ledge at Acadia. □

THE HANSEAT

Europe's First Common Market

"Town air is freedom" was the boast in the 13th century, when the people of Lüneburg began building their town hall. Evolving from a group of

IC LEAGUE

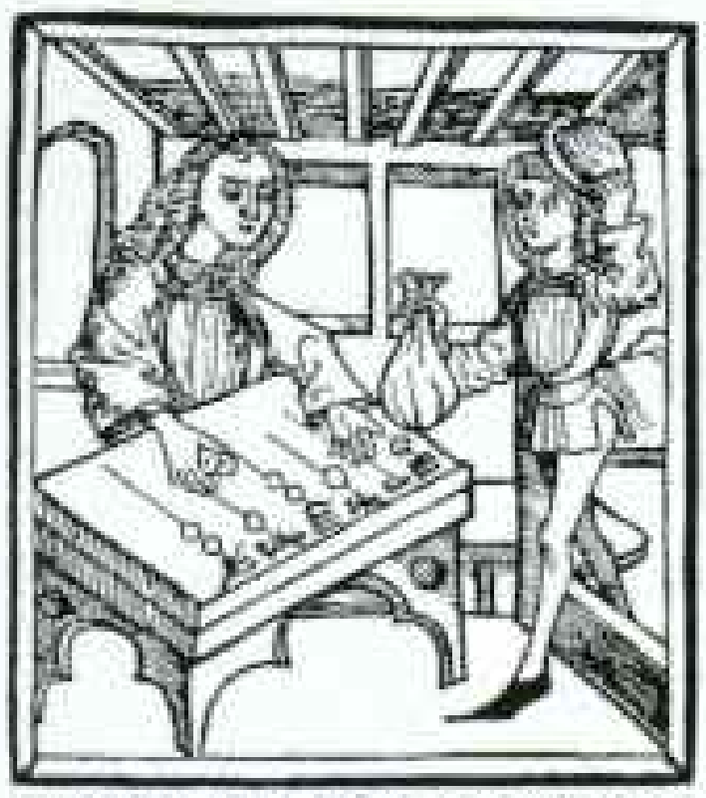
By EDWARD VON DER PORTEN

Photographs by SISSE BRIMBERG

seafaring traders, a league of dozens of such German towns marked the triumph of commerce over feudalism in northern Europe.

THE STORM STRUCK in morning darkness. My bunk tossed me up, then dropped out from under me. My back slammed into the steel bulkhead. For a blank moment I didn't know where I was. The sunset the night before had promised a calm voyage from Helsinki, Finland, to Gdańsk, Poland. But in the hours before first light the 418-foot ferry *Pomerania* was pitching wildly.

As I struggled to my feet, knees bent to withstand each new surge of the deck, I peered out a porthole at the lead gray Baltic Sea. The bow lifted clear of one whitecap, slammed down into a trough, then punched into the next 20-foot curler. White water exploded over the foredeck and bridge.



16TH-CENTURY WOODCUT OF MERCHANT WITH ABACUS (WOODCUTS BY PERMISSION OF EDITION LEIPZIG)

This wasn't what I had hoped for when I set out to retrace the routes of northern Europe's first great seaborne empire based on commerce—the Hanseatic League. From the 13th to 17th centuries German merchants in some 200 far-flung towns—from Bergen on Norway's North Sea coast to Novgorod in Russia—belonged to a powerful confederation bound by a common language, currency, legal system, and strong traditions of civic and individual rights. Like the sailors of the league, I would have preferred a safe, quiet voyage.

I shuddered at the thought of a Hanseatic merchant ship in such a storm. Less than a fifth the length of this ferry, the beamy old ship known as a cog would have been tossed like a keg on the combers. I imagined the helmsman wrestling with the 12-foot-long tiller as the cog's single square sail shredded and her oak planks twisted against the frames. The challenge: to keep the ship from being thrown on her side and overwhelmed. On the high sterncastle the captain would be watching fearfully for wave-battered headlands, praying to save his crewmen and their cargo of salted herring and Swedish iron from destruction.

At that moment, however briefly, I felt the uncertainty and danger

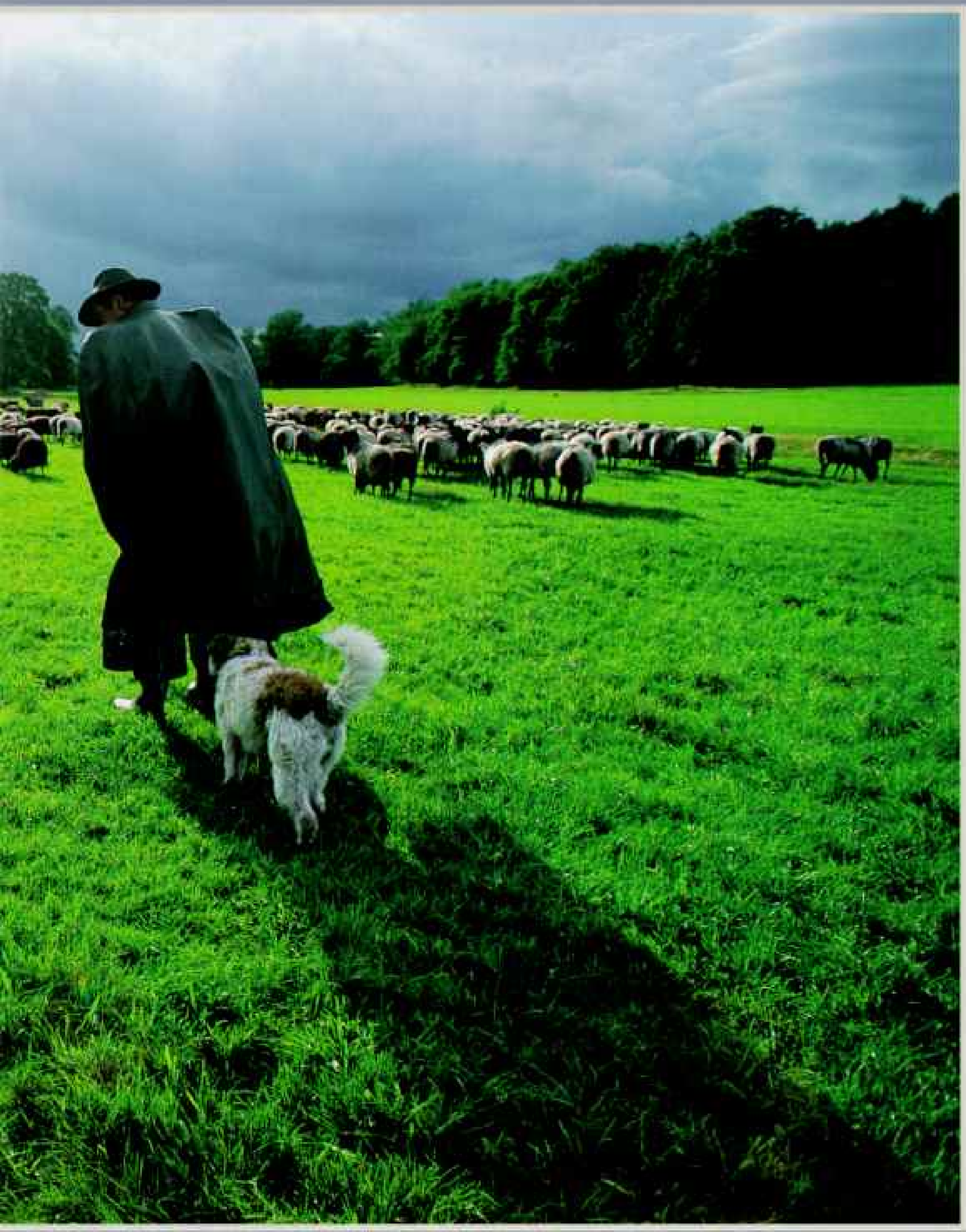
that pervaded the lives of such men. I understood how such harrowing experiences could forge a secretive brotherhood of merchants that grew into something far greater—a largely peaceful, international network of finance and trade. Not until our own time, when the member nations of the Common Market (now the European Union) vowed to open borders, merge currencies, and create a single, unified market, would the Continent see anything like it.

Wax seals on a 15th-century treaty mark the collective assent of Hanseatic towns, including Lübeck, at left, Hamburg, right, and Rostock, center.

The next bleak dawn rose over the lighthouse, cranes, and towers of Gdańsk, the old Hanseatic town of Danzig. Here, as in many other parts of the Baltic region, there was suddenly much talk of a *new* Hanseatic movement. Now that Poland had discarded once and for all its communist economy, Germany had been reunited, and the nations of Estonia, Latvia, and Lithuania had been released from the yoke of Soviet control, people set about reviving the centuries-old trade links with Western Europe.

"The Baltic Sea for too long was part of the Iron Curtain," an Estonian official told me. "But now it is becoming again a magnificent bridge between east and west."

The spirit of the Hanseatic League was still alive.



Now a national treasure, the forests and glades of Germany's Lüneburg Heath once hummed with a beekeeping industry and a saltworks—enterprises that provided homegrown products of Hanseatic trade, which helped finance the northern Renaissance. The heath still supports a strain of sheep that thrives on local heather.

MY FATHER came from Hamburg, a Hanseatic town, though I never recognized this heritage during my all-American childhood in Brooklyn. Not until I embarked on a career as a marine historian did I develop a deep curiosity about my medieval forebears. But what exactly was the Hanseatic League?

"It began with north German merchants doing business in foreign cities," said Klaus Friedland, a retired historian from Kiel University. "To protect their trade and exclude outsiders, they formed guilds, which step-by-step came under the control of their hometowns."

These same German towns, meanwhile, were forming regional associations that coalesced into the Hanseatic League, governed by the *Hansetag*, or parliament of town representatives. Simple enough, I thought, until Friedland pointed out that the league had no constitution, no bureaucracy, and no treasury, and that the law upon which many of these towns depended was a mere collection of charters, changing customs, and precedents.

To further complicate matters, the Hansards, as the league's citizens were called, appeared to celebrate no independence day nor great moment that defined them. They had no famous leaders to admire, no crusaders, no great causes to die for. No literature, so little passion. Who were they? And how did they create their bold mercantile empire in the midst of feudal chaos?

I began my search for answers in the Imperial and Free City of Lübeck, the first German port on the Baltic Sea, established in 1143. Inside the twin towers of the city's stocky gateway, five- to seven-story salt warehouses front the Trave River, part of a moat that once protected the old town from predatory nobles and bands of brigands. The gables of densely packed houses rise along narrow cobblestone streets toward St. Mary's and St. Peter's Churches at the hilltop city center. It is a scene so evocative of Hanseatic wealth and power that it earned Lübeck recognition as a world heritage site by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

"She was the queen of the Hanseatic League," Georg Greilinger said of the city. Greilinger manages the Seamen's Guild House, a meeting place built in 1535 for sailors, captains, and shipowners. Today restaurant patrons sit on the same oak-plank benches warmed by Hansard seafarers four centuries ago. "Look around," he said. "Doesn't old Lübeck look wealthy?"

The merchants liked it that way. Though they were practical, self-effacing men, they celebrated their prosperity by erecting brick Gothic churches to new heights. Then they exulted in their secular power by raising a town hall to rival the churches, creating a skyline of "high towers whose golden radiance strikes the observer from afar," as a 15th-century visitor marveled.

Then as now the heart of the city was the market square, which was filled the day I visited with vendors selling mackerel, smoked herring, and eel from the Baltic; potatoes, carrots, and cabbage from the nearby farms of the state of Schleswig-Holstein; and sausages with names such as *Thüringer Rostbratwurst*, *Schinkenwurst*, and *Riesenknacker*. In medieval times the shoemaker set up his stand here

At the medieval crafts fair in Lüneburg, eight-year-old Neels Lamschus bags salt, much as an apprentice might have done for a German salt merchant in the 13th century. Processed at nearby salt pans, Lüneburg's "white gold" was the base of the city's prosperity for two centuries, until cheaper French

Nautical historian EDWARD VON DER PORTEN is former director of the Treasure Island Museum in San Francisco. Photographer SISSE BRIMBERG, who learned about the Hanseatic League as a schoolgirl on the Baltic Sea, returned to her native Denmark for part of this assignment.

salt began taking over its markets in the late 1300s. Other Hanseatic mainstays were furs, wax, dried or salted fish, grain, beer, and, most important, textiles. Lüneburg's neighbors, Lübeck and Hamburg, were major entrepôts.

beside the beltmaker, goldsmith, cloth cutter, and money changer.

Hanseatic traders had a reputation for being dour, uncultured materialists. "I eat and drink good food and drink with relish," one 16th-century merchant admitted to his diary. "I go to church, am willing to listen to the sermon, but do not pray very diligently and long. I am not very interested in the Holy Writ, but more in earthly affairs. . . ."

Yet to me the Hansards seemed more complex. Though they passed laws against conspicuous displays of wealth—at least by lower ranking merchants and craftsmen—they seized every opportunity to acquire silver, furs, and gems. They also kept up with the latest fashions, demanding the best Chinese silks and Russian sables. On formal occasions the rich merchants sported fur-trimmed coats and fancy shoes with toes that pointed up, while their wives wore close-fitting long dresses and tall, conical hats with a veil draped from the point. If well-to-do Hansards donated generously to their churches, they also coveted having their portraits painted by Hans Holbein the Younger in London or Albrecht Dürer in Antwerp.

THE LEAGUE

"It is shameful that merchants should rule over high-born and noble men" was a familiar complaint as medieval German traders known as Hansards wrested power from their noble rulers in the 13th century. United for protection and profit, they used boycotts and occasional force to monopolize markets run from Hanseatic towns and outposts throughout the Baltic and North Sea regions. By the 1600s, when Hanseatic sea power had been eclipsed by the Dutch, the league was in decline.

The presence of Hansards in Norway, from the arrival of merchants in the 1200s to the departure of the last "secretary" in 1761, outlasted the league itself by a century.

To Lofoten Is.

KINGDOM OF NORWAY

Bergen

Oslo

Tønsberg

Barrier to Hanseatic control over vital shipping lanes, an imperious Denmark was brought to heel in the war of 1361–69.

Roskilde Fjord

Malmö

Copenhagen

Falsterbo

KINGDOM OF DENMARK

NORTH SEA

To Shetland Is., Faroe Is., and Iceland

From the Steelyard, a privileged enclave on the Thames near London Bridge, the Hansards exported English wool while importing wine from the Rhineland and finished textiles from Bruges.

York

Hull

Boston

King's Lynn

Yarmouth

ENGLAND

Ipswich

London

Thames

English Channel

To Lisbon and the Mediterranean

Kiel

Trave River

Lübeck

Rostock

Stralsund

Wismar

Krummesse

Hamburg

Bremen

Lüneburg

Elbe-Lübeck Canal

Weser

Elbe

Greifswald

Kampen

Amsterdam

Deventer

Osnabrück

Münster

Hildesheim

Braunschweig

Magdeburg

Goslar

Dortmund

Soest

Bruges (Brugge)

Antwerp

Cologne

Meuse

Rhine

Dinant

Rouen

Paris

Seine

To Marseille

Bruges, site of the Hansards' most important foreign outpost, was the center of the Flemish textile market. To the east, German-speaking league towns lined the lower Rhine.

KINGDOM OF FRANCE

HOLY ROMAN EMPIRE

To Venice

To the Balkans

KINGDOM OF SWEDEN

Lake Ladoga

Turku

Helsinki

Gulf of Finland

RUSSIA

Stockholm

Reval (Tallinn)

Novgorod

Dorpat (Tartu)

Lake Peipus

The port of Visby—entrepot for goods from east to west—grew rich early as the league's strategic Baltic stronghold. It declined in the 1300s as the Hansards used larger ships.

Hub for Russian furs and exotic goods from as far away as China, Novgorod played much the same role for the Hansards as it had earlier for Viking river traders.

Visby

Gotland

BALTIC SEA

Riga

LIVONIAN KNIGHTS

Behind the shields of the Teutonic Knights, the Hansards thrust eastward into the realms of the Poles and Balts, establishing German ports from Danzig to Reval.

Hanseatic League town (named)

Hanseatic League town

Main trading outpost (Kontor)

Trading outpost

Hanseatic trade route

Political boundaries as of 1396

Present-day shorelines and drainage are shown.

0 100 MILES

NGS CARTOGRAPHIC DIVISION

PAINTING BY KINUKO Y. CRAFT

Königsberg (Kaliningrad)

Vilnius

Kovno (Kaunas)

TEUTONIC

Danzig (Gdansk)

For decades Polish grain poured through the port of Danzig into Hanseatic ships.

Vistula

Thorn (Torufi)

To Krakow

Oder

Breslau (Wrocław)


BRYGGEN

And though their conduct was restricted—the masters of the trade guilds minutely regulated every aspect of their work, from the training of apprentices and hiring of journeymen to manufacturing techniques, trade ethics, and prices—they never seemed to lose their sense of mischief. The social clubs that thrived along these cobbled streets were forced to reprimand members for throwing plates, flashing knives, spiking the punch, and playing dice. Young men were said to "drink much, smash glasses, devour great quantities, [and] leap from one barrel to another." Betting, too, could get outlandish. One merchant wagered ten guilders that he could go a year without combing his hair. There is no record of whether he won.

Walking down the street today, a visitor can still catch a whiff of hops from the basement of the massive Rathaus, or Town Hall, next to the market. Down below, brewmaster Udo Lämmer makes beer. Dressed in red overalls, he hustles from one vat to another, opening this valve and closing that, to filter the steaming liquid.

"In the old days the beer wasn't so good," he said. "They experimented a lot. One medieval recipe said to throw the head of a freshly slaughtered cow over your left shoulder into the vessel. It must have been horrible!" The science of beermaking grew with the league, he added, and the league grew with the beer. Every town had its brewers, and some, such as Hamburg and Bremen, exported beer to ports all around Scandinavia and the Baltic—enough beer, remarked one scholar, to keep every Swede permanently inebriated.

Lübeck's greatest export, though, was its law, versions of which I encountered in city after city along the Baltic shores. What the Magna Carta is to the English-speaking world, Lübeck law was to league towns—the bedrock statement of civic and individual freedom. In typically Hanseatic fashion, however, its exact nature was vague.

"Lübeck law was never assembled in a single document but was

For Catholic Europe's meatless Fridays, Hansards cornered the market on Norwegian cod, still exported from Norway's Lofoten Islands. In Bergen, the German quarter harks back to a time when monkish Hanseatic merchants lived in unheated warehouses by the quay.

constantly added to," said Johannes Schildhauer, a retired history professor. "It was a nobleman's general grant of privileges as they were understood to prevail in Lübeck at the time."

The foundation of Lübeck law rested on the town's charters, granted by the Holy Roman Emperor himself. These charters defined the town's boundaries and gave it the right to trade and coin money, build walls, catch fish, mill grain, hold markets, and enforce its own laws, rather than submit to the arbitrary demands of an overlord.

Northern Europe at that time was dominated by illiterate kings, dukes, and barons, whose private armies engaged in vicious feuds and endless warfare. In the countryside millions of landless serfs were bound to drudgery and servitude. The urban Hansards, by contrast, zealously guarded their independence. "Town air is freedom" was their civic maxim. If a serf could escape the countryside and survive a year and a day within a town's walls, he could no longer be claimed as property by a nobleman. Thus the spread of Lübeck law represented an overturning of aristocratic privilege—and a foreshadowing of modern middle-class society.

Heady profits for Hansards rose on the quality of a key export: German beer. "Purity laws" of that time, though recently scuttled by the European Union, are still favored by Germans, including patrons of the Ratskeller in Lübeck (above). Beer profits funded cultural projects, including church paintings like this biblical feast depicted in medieval fashions (opposite).

The secret of Hanseatic prosperity was the cheap transportation of bulk cargoes. You can still see how it was done a few miles south of Lübeck on one of Europe's oldest lock canals.

"Back it up," said Betty Hartmann as the barge *Svenya* eased into a lock at the village of Krummesse. She was standing at the bow of the spotless 260-foot craft, speaking into a microphone.

"All right, but make the line tight," replied her husband, Karl-Uwe, from the pilothouse. They spoke to each other with a familiarity born of 30 years of marriage.

The Hartmanns, who own the *Svenya* and live aboard, were hauling 850 tons of corn to Lübeck from the French village of Neuf-Brisach. On the last leg of their weeklong, 700-mile journey, they were cruising on the Elbe-Lübeck Canal, wider and deeper now than when it was built between 1391 and 1398 by peasants belonging to the Duke of Lauenburg. Flocks of ducks parted on the glassy water to let the Hartmanns by.

A strategic shortcut between the Baltic and North Seas, the canal replaced old wagon trails from Lübeck to Hamburg, making it economical for the first time to move bulk goods between eastern and western Europe. In the Hanseatic era, canal traffic brought mostly foodstuffs and raw materials from the east: Polish grain and flour, salted Baltic herring, Swedish timber and iron, and Russian candle wax and furs. From the west flowed salt from nearby Lüneburg, Rhineland wine and pottery, and bales of woolen and linen cloth from England and the Low Countries.

Today's barges carry coal, steel, and gravel, as well as grain. But every year there are fewer German vessels on the water, said

THE BANQUET OF AHASUERUS, BASED ON AN ACCOUNT IN THE BOOK OF ESTHER, BY AN UNKNOWN ARTIST, 1496, ST.-ANNEN MUSEUM, LÜBECK

Its square sail reflected in Denmark's Roskilde Fjord, a latter-day Hansekogge *tests the waters on a run out of its home port of Kiel, Germany. With fleets of these sturdy vessels, the Hansards combed the markets of the Baltic and North Seas. Built for profit, the beamy cogs could carry as much as 200 tons of cargo.*

Karl-Uwe, who grew up on such a boat. In unified Europe Germany has lifted its protective tariffs, and foreign barges—especially Dutch and Belgian—are undercutting German ones.

"We used to know everybody on the rivers, like a big family," said Betty, scratching the ear of their dog, Zohra, who was curled up on a little rug in the pilothouse. "Now there seem to be a lot of strangers."

The merchants of the league were better known for their long-distance voyages. They sent ships as far west as Lisbon, Portugal, and as far east as Tallinn, Estonia, to connect with the trade of the Mediterranean and the Russian rivers and the Black Sea. With a carrying capacity of 60,000 tons by the end of the 15th century, the Hanseatic fleet surpassed all others.

About 20 ships a year made the trip from Lübeck to Bergen, Norway, where German merchants established one of the league's four main trading outposts, or *Kontore* (the others being in London, Bruges, and Novgorod). In these all-male communities, traders from Lübeck, Bremen, and other Hanseatic ports made a living buying stockfish, or dried cod—as much as 6,000 tons a year from the Lofoten Islands up north—and selling the ubiquitous grain, cloth, salt, and beer.

BERGEN WAS A HARDSHIP POST. Unlucky teenagers just arriving were initiated by a series of "games." These included hanging newcomers by the waist in the heat and smoke of a great fire liberally sprinkled with horsehair, leather scraps, and other pungent debris, while forcing them to answer mocking, trivial questions. Then they were repeatedly dunked naked into the frigid harbor and flogged with birch switches—harsh treatment even in that era. Afterward they might send a bloody shirt home as evidence of success, before settling down to business.

"It was dirty, physical work for 14- and 15-year-olds," said Marco Trebbi, curator of Bergen's Hanseatic Museum. "One of their jobs was unloading barrels of cod-liver oil from Norwegian boats, emptying them to be sure no water had been hidden at the bottom, then refilling them with the strong-smelling oil."

The Germans lived along the harbor front in a compound of 30 long, narrow tenements. Each unheated building, patrolled by dogs, contained a three-story maze of storerooms, counting rooms, master's quarters, winches, and cupboard-like double-deck bunks with sliding doors. Crammed two to a bunk, apprentices slept sitting up on seaweed mattresses, facing each other.

"Perhaps the odor of fish, oil, and seaweed covered the stench of unbathed men living in such close conditions," Trebbi said as he stepped down a tight spiral stairway from one claustrophobic room to another. The fish smell, at least, clings to the log walls of the 18th-century tenements that have survived.

You can still buy stockfish in Bergen, now a university town of 220,000 and popular destination for foreigners visiting nearby fjords and glaciers. But the stockfish industry is a shadow of what it was in Hanseatic days. Svenn Olsen is one of only two fish sorters left.

"They have to be nice and clean on the outside, no stains from blood," he said, picking up a dried codfish from a large pile in a chilly warehouse on the harbor. He flipped over the fish—as long as his arm and as stiff as a board—ran his fingers over its skin, inspected its color, felt its weight, then placed it onto a smaller pile and picked up another,

Ignored by modern history and Allied bombers during World War II, Lüneburg retains many unscathed treasures from its Hanseatic past. Abbot's Tower, built in 1532, used a wheel to lift river water, which was piped to the town's breweries. In Lübeck, an early Hanseatic altarpiece escaped the bombing of magnificent St. Mary's Church.

DETAIL OF CRUCIFIXION SCENE BY CONRAD VON SOEST, 1409–1410, ST.-ANNEN MUSEUM, LÜBECK

as he has for nearly 40 years. There is an art to discriminating the 23 grades of quality, the highest of which still carry names from Hanseatic days: "Lub" for Lübeck, "Bremer" for Bremen, "Hollander" for Amsterdam and other Dutch cities.

To keep the trade firmly in German hands, senior merchants forbade junior members of the Kontor from marrying or leaving to live in the Norwegian town. The penalty was simple: death. Nevertheless, contact took place, and some merchants who returned to Germany provided for Norwegian women and children in their wills.

"Do you know Ludolf Kramer?" Marco asked, handing me the elaborately carved wooden lintel decoration that had once graced merchant Kramer's doorway. "We have a 20-year record of complaints about him sent to Bremen, his home city. He wore a fur-trimmed red coat, carried a silver box with a local lady's portrait on the lid, consorted openly with women, insulted the city council, and held a party on a ship in the harbor enlivened by firing cannon all night long." Rules were clearly harder to enforce with some individuals than others.

CLERK AT HIS DESK

In old Lübeck, the home of schoolteachers Manfred, far left, and Maryvonne Finke, far right, retains the character of its 14th-century origins. "Hansards used their houses mainly as warehouses and offices," says Manfred, talking with architect Rolf Hammel-Kiesow. "They lived in the smaller rooms."

AT ITS HEIGHT in the 14th and 15th centuries the Hanseatic League was as powerful as any monarchy in Europe. If necessary it could use force, even a blockade of trade, Johannes Schildhauer told me in Greifswald. "But war was an instrument which they used on the rarest occasions. After all, it jeopardized trading profits."

The Hansetag chose to fight, however, when Denmark's King Valdemar IV Atterdag in 1361 attacked Visby, a Hanseatic town on the island of Gotland, threatening the entire Baltic trade. Meeting in Greifswald that year, merchants from a score of Hanseatic towns vowed to turn their cogs into warships. They built wooden castles—high platforms—on the bows and sterns to foil enemy boarders and ringed them with stout palisades to protect their archers. Then they buckled on their armor and sailed for Denmark.

Their fleet of 52 ships was led by Johann Wittenborg, mayor of Lübeck, who turned out to be a better merchant than military strategist. Splitting his forces, he allowed the Danish king to catch part of his fleet by surprise and lost a dozen cogs. Upon his return to Lübeck, Wittenborg was arrested as the scapegoat. Tried and convicted of charges that remain unknown, he was beheaded in the market square.

The league persevered, nevertheless, spurred by Valdemar's mocking reference to their alliance of towns as "77 geese," noisy but harmless. League forces eventually sacked Copenhagen and forced Valdemar into the humiliating Treaty of Stralsund in 1370.

A more colorful villain menaced Hanseatic vessels a few decades later—the towering, hard-drinking pirate Klaus Störtebeker. Born to a noble family near Hamburg and knighted for bravery, he was stripped of his title for debauchery. Hanseatic merchants, infuriated by the pirate's bold looting of their ships, put together a small armada in 1402 to capture him.

Störtebeker's fleet was anchored near the mouth of the Elbe River. In a daring act of sabotage, Hamburg pilot Peter Krützfeldt rowed out at night to disable the rudder of Störtebeker's flagship, the *Mad Dog*. When the Hanseatic armada attacked the next day, the merchants' biggest warship, the *Brindled Cow*, charged straight for the *Dog*. Störtebeker, unable to maneuver, managed to fire off a few broadsides. But his ship was soon boarded, and he was taken prisoner.

Hauled back to Hamburg, Störtebeker and 70 other pirates were beheaded, but not before he passed into folk legend as a Robin Hood of the sea, a hero of the lower classes.

For all their successes the merchants of the Hanseatic League—conservative to the core—created some of their own worst problems. By dividing inheritances among their many children, they prevented the concentration of capital—a crucial factor in the expanding commerce of the Renaissance. By refusing to give government positions to lower ranking craftsmen, the stiff-necked senior merchants provoked bloody uprisings within the walls of their own towns. And the league's insistence on monopoly created resentment in foreign countries, where nationalism was on the rise. Perhaps most important, the Hansards lacked the support of a centralized power in Germany, leaving their operations vulnerable. Russia's Ivan III seized Novgorod's Kontor in 1478, and Queen Elizabeth closed the Steelyard, the walled Hanseatic enclave in London, in 1598.

There were other problems as well: the Black Death, riding on fleas, raced from one crowded German town to the next in 1350,

Putting up a good facade with an abundance of blind windows, Hanseatic burghers made their houses seem grander than they were. The buildings' narrow design ensured street frontage for as many townsfolk as possible. Under the tall saddle roofs of these restored houses in old Lübeck were store-rooms filled with their owners' wares, hoisted to the lofts with pulleys.

killing one in four men, women, and children; herring declined in the Baltic in the 15th century; then the harbor at Bruges filled with silt, cutting the town off from the sea; and the Thirty Years' War (1618-1648) shattered the political map of Europe.

By 1670 the league was all but finished.

YET ITS SPIRIT never died. "From the Atlantic to the Urals, there is a Hanseatic renaissance," said Gustav Robert Knüppel, former mayor of Lübeck. The city of Rostock, now Hansestadt Rostock, renamed itself in the spirit of the old league, as did several other towns in former East Germany. Rostock's soccer club, the Hansa, chose a cog as its symbol. Workmen in Gdańsk, meanwhile, started restoring a ceremonial gatehouse as a hall for Hanseatic meetings. And in 1992 Estonia's capital, Tallinn, played host to a modern-style Hansetag, or regional parliament, where the mayors of each city, wearing the gold chains of their office, marched in procession to banquets.

There is even talk of turning the Baltic area, with some 50 million people, into one of Europe's new economic super-regions. Representatives of ten Baltic nations met three years ago at Rostock to discuss ways of promoting trade among them.

"Our Hanseatic heritage is part of our genetic information like our fingerprints," said Trivimi Velliste, a former foreign minister who helped Estonia win independence from the Soviet Union in 1991. "We can't help feeling a connection with the rest of northern Europe."

Poised on the eastern edge of the Hanseatic world, Tallinn, called Reval in medieval times, was treasured as the gateway to Russia. The Danes conquered the town in the early 13th century, then sold it to the Teutonic Knights, who soon brought Lübeck law and league membership. Rising boldly from a sheltered bay, the city's gray stone walls and fortified hilltop citadel still give Tallinn the look and feel of a frontier settlement.

"We are definitely living on the edge," said Velliste. "I am very worried about the future. But if Russia remains a democracy, we Estonians would like to do the same job that we did in Hanseatic times, to be a middleman between east and west."

"The idea has a lot of sex appeal," said Konrad Lammers, an economist at Kiel University. "But I'm afraid the economies of the West, such as Sweden, Norway, and Denmark, are too far ahead of those in the underdeveloped East, such as Estonia, which has a per capita income only a tenth as much. Integrating these two worlds could take a generation or two to accomplish."

Young Estonians, though, aren't waiting for their elders to lead the way. As a market economy takes shape in their formerly communist

On the wave-lashed Elbe, the Free and Hanseatic City of Hamburg remains the heartiest survivor of league days. Its reach extends to some 1,200 ports, many times more than in the 1500s. Now free from Soviet restrictions, old ports like Tallinn, Estonia,

and Gdańsk, Poland, cast admiring glances at Hamburg and dream of a Hanseatic resurrection. Thirteen nations with 385 million consumers have ports on the Baltic and North Seas: a market to stir the Hansard spirit from its grave.

nation, the stars of the new trade, retail, and financial sectors are all in their 20s, said Rain Lõhmus, 27, vice chairman of Hansabank in Tallinn. "Young people are more flexible and have less to lose."

Mart Vainu, 25, dreamed of becoming a music critic but instead started a business. Today his Balbi Ice Cream Company employs more than a hundred people, most under 35, and imports ice cream for sale throughout Estonia. "So now I am a businessman," he says, "though my first love is still music."

These were promising voices, I thought, for the future of the region. In them I heard the same confidence that once moved young Hansards to leave the comfort of their towns and to venture life and fortune in tiny ships on the treacherous seas. So much may still happen, I know, to dash the dreams of this generation. Yet I hope that the enterprising spirit of the old league—alive and well again in northern Europe—will answer these yearnings for freedom and prosperity. □

A MUMMY UNEARTHED FROM THE

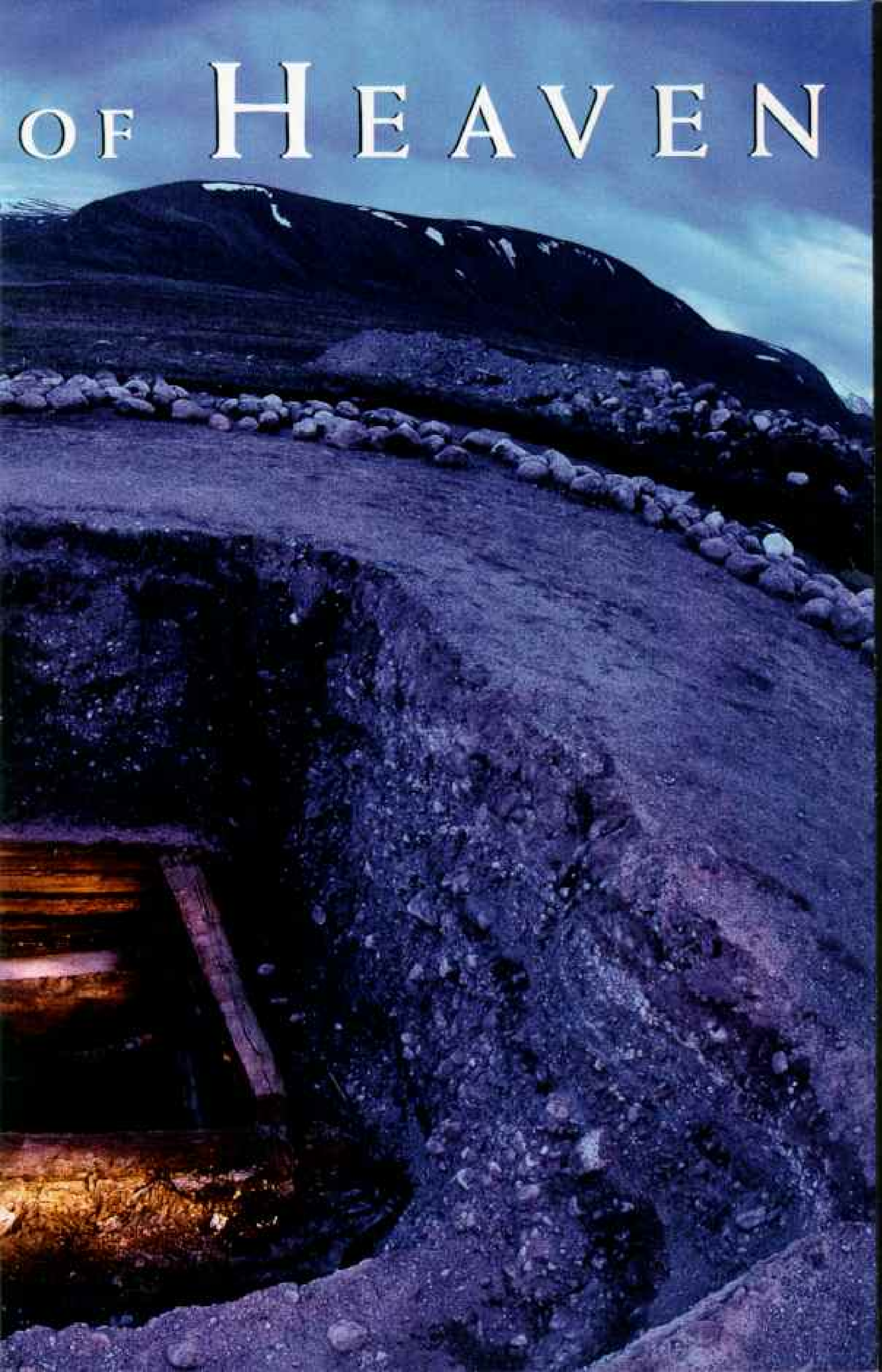
PASTURES

Under capricious skies in southern Siberia a rare unlooted tomb lies ready to illuminate the culture of the ancient Pazyryk people. These semino-madic herders laid their well-appointed dead here in the high steppes, the Pastures of Heaven, as close as their world came to the great beyond.

By NATALYA POLOSMAK

Photographs by CHARLES O'REAR

OF HEAVEN



Thawing a 2,400-year deep freeze

Solid ice dissolves around a jawbone as author Natalya Polosmak, at bottom, and Yelena Shumakova drizzle hot water into the log coffin. In three days they had melted through two feet. "My impatience was growing," says Polosmak. "I wanted so much to find out what I had."

Death preserves a vanished life

Her eternal slumber cut short, a woman wrapped in fur and lying on her side finally appears. Flecks of gold foil shimmer around her (right).

Beneath a tunic, Polosmak found soft skin and tattoos—only the second known from this culture. On a shoulder (left) lines showed a mythical creature (traced bottom, at near left) in a style similar to that of the Scythians, a powerful people from the Black Sea region. A wrist (far left) bore flourishes of a deer (middle).

Quickly flooded by rain or melting snow and frozen while still new, the well-insulated grave remained icebound thereafter. This helped preserve the body along with an unusual cache of possessions. Befitting a woman of influence, items included silk and wool clothes, a hair-and-felt headdress—the first found intact—gilded ornaments, and a hand mirror with a deer carved on its wooden back. "We wouldn't be as happy if we had found solid gold," says Polosmak. "These are everyday things. Through them we see life as it was."

DRAWINGS BY YELENA BHUMARDVA AND WILLIAM H. BOND

Tall for her time at five feet six, the woman, with her headdress, needed a coffin nearly eight feet long. We will likely never know what killed her. "Death shadowed every step these people took," notes the author.

AT SUMMER'S END we wrenched her from the cold earth. We lifted the body of the woman from her casket, eased it onto a stretcher, and covered it with white gauze, pinning the edges of the cloth like the wings of a specimen butterfly. Six

of my students, serving as pallbearers, hefted the stretcher onto their shoulders. And then they carried her across the alpine meadow, from the false eternity of the 2,400-year-old tomb to a plywood hut.

I watched the procession, and the body floating above the waves of wildflowers, with that same twinge of guilt I always feel when I disturb the sanctity of a grave. And yet, as chief archaeologist on this site, my heart sang for what we had found: an unlooted tomb of the ancient Pazyryk culture, preserved in ice. Not just bones and pottery but the first mummified human discovered in the region in 44 years.

I knew she was an important person, for six elaborately harnessed horses lay sacrificed against the solid timbers of her luxurious burial chamber. I called her simply "the lady." Her robe was still soft and pliant. The objects that surrounded her, made of wood, horn, felt, and leather, were the implements of everyday life that rapidly deteriorate in most graves. We had intercepted a suspended moment, time-traveled to an ancient tableau

so perfectly intact that we could literally smell her last symbolic meal of mutton, unfinished on a low wooden table by her side. In the years ahead we will write the next chapters on the Pazyryk culture. With recent advances in DNA testing, we can begin to clarify the origins of these early horsemen of the Eurasian steppes.

Our camp was pitched on the remote and treeless grasslands of Russia's Ukok Plateau, 7,500 feet high on the southern border of Siberia and within the recently formed Autonomous Republic of Altay (map, page 89). The snow-covered mountains of three nations surrounded us like backdrops for a god-size opera set—China to the south, Mongolia to the east, Kazakhstan to the west.

Ukok is a place of overwhelming sky, rattling hailstorms, and blistering sun. In summer it is nearly empty of people, and in winter, when Altay shepherds drive their flocks here for pasture, temperatures descend to minus 20°F, and winds howl with such ferocity that they sweep snow from the grass, uncovering it for sheep and horses.

The name Ukok, local people tell me, means "the end of everything." They believe these pastures lie within the second layer of heaven, a step above ordinary people and events. It is a sacrilege to shout here, for it would offend the spirits.

The Pazyryks thrived in these steppes and mountains of the Altay in the sixth through the second centuries B.C. They were horsemen whose passion was the hunt, shepherds ready to fight for better pastures, and

In solemn procession excavators bear the shrouded body to their camp. "We called her *ledi*—the lady," says Harvard student Jeanne Smoot, in the red kerchief. "We had worked around her every day all summer and felt very close to her."

artists who knew the natural world—snow leopards, eagles, reindeer—with affection.

Dozens of such tribes rose on the steppes of Eurasia in this era, creating a deceptively uniform culture labeled Scytho-Siberian after the most famous of the groups. The Greek historian Herodotus faithfully detailed much of the life of the Scythians, a powerful, seminomadic people who lived north of the Black Sea between 800 and 100 B.C. and shared with the Pazyryks and others an artistic style dominated by animal motifs. But the steppes are so vast—more than 3,000 miles from the Black Sea to the Great Wall of China—that each culture probably thrived within a rough circle that overlapped with the next and seldom went far beyond. It is probable that the Scythians never came in contact with these horsemen of the East.

THE SUMMER OF 1993 was my fourth season on Ukok, part of the continuing research by the Russian Institute of Archaeology and Ethnography in Novosibirsk into the early habitation of southern Siberia.

Pazyryk studies have long been a mission at the institute. Vladimir Kubarev, a colleague, has uncovered more than 150 small Pazyryk kurgans, or burial mounds, in the past 20 years, but most had been looted, the artifacts strewn about, the bodies nothing but bones. Vyacheslav Molodin, my archaeologist husband, has examined frozen Siberian burials that date from the Bronze Age to the medieval times of Genghis Khan, including Pazyryk tombs.

But the last major discovery of Pazyryk artifacts was when Sergei

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NATALYA POLOSMAK is a senior research fellow of the Institute of Archaeology and Ethnography in Novosibirsk, Russia. Freelancer CHARLES O'REAR, a veteran of 20 articles for NATIONAL GEOGRAPHIC, photographed "Bacteria" for the August 1993 issue. He lives in St. Helena, California.

Suspense circles the grave moments before the opening of the coffin, taped to prevent further splitting. "We were expecting anything, just anything," recalls Polosmak, who waited at the top of the tomb with her dog. Timbers of the burial chamber, behind plywood sheets, held solid throughout the work.

Archaeological studies of the region's tombs began in the 1920s. Pazyryk, an informal label for the culture uncovered, comes from a local word for mound.

Winter gusts scour the 7,500-foot-high Ukok Plateau so fiercely that grass stands free of snow. Here Pazyryks pastured their sheep in cold weather and buried their comrades in deeply dug tombs. Similar tombs unearthed across the Altay region belong to the same pastoral group, one of many that roamed the Eurasian steppes during the first millennium B.C.

Rudenko and Mikhail Gryaznov opened five large kurgans in Ust Ulagan Valley, the last of them in 1949. These were the tombs of chieftains. They did not yield the solid gold of Scythian tombs but a treasure in organic material: mummies, one richly tattooed; an elaborate funeral chariot; the oldest known wool carpet; wood carvings. Now their artifacts occupy an honored place in the Hermitage museum in St. Petersburg.

My mission in 1990 was to reopen this research on a large scale, but it was my first season back in the field since the birth of my son, Ivan. I had taken three years off, and I didn't know where to start.

"Go to Ukok," Kubarev told me confidently. "No one has dug there before."

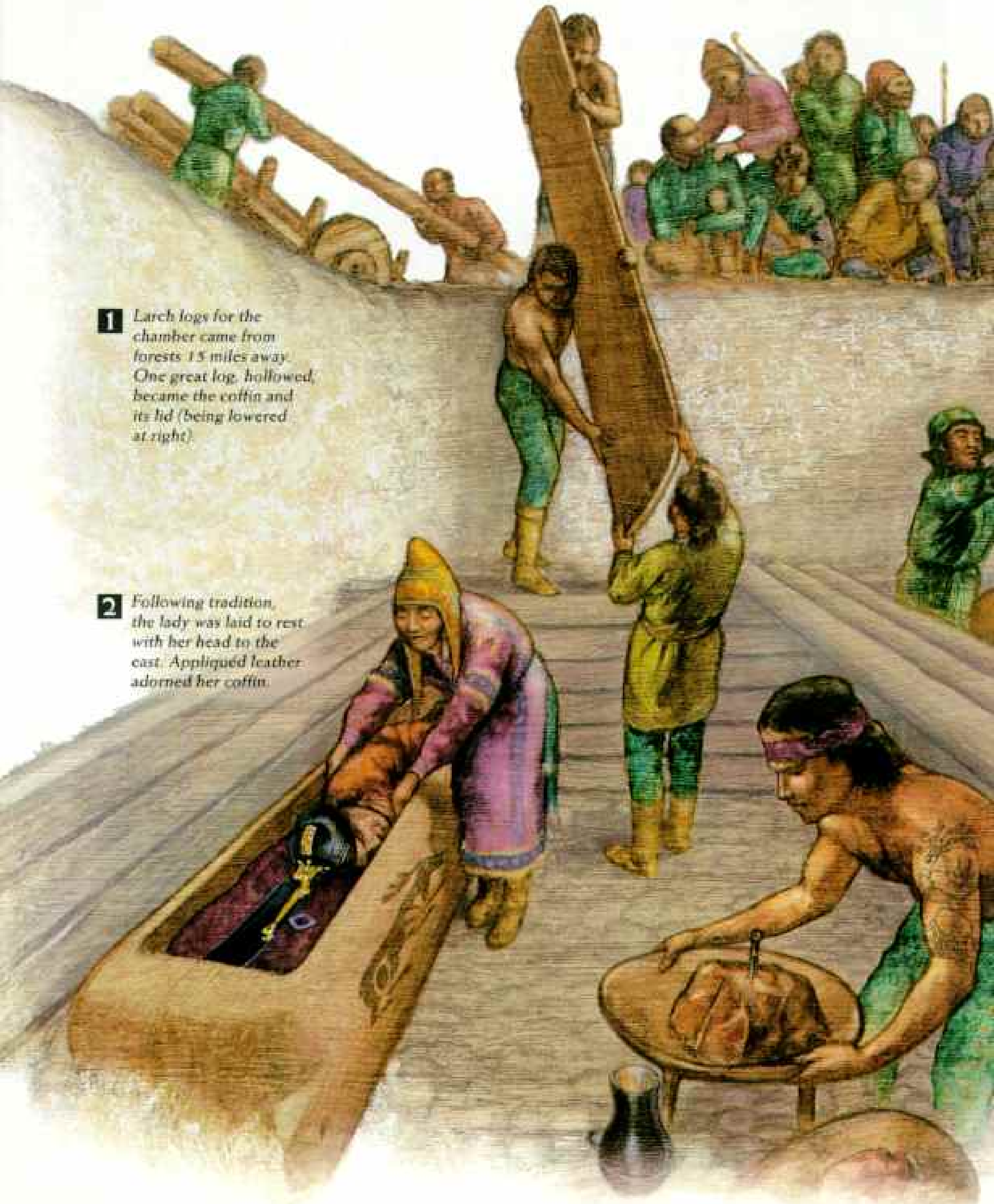
Ukok was at the highest altitude the institute had tackled; surely there would be frozen tombs there. And it was near the Chinese border. Silk had been found in other kurgans, and I wanted to document cross-cultural links.

So in the spring of 1990 I found myself sitting with five students on an ear-splitting, five-hour helicopter flight from Novosibirsk through dangerous mountain passes into a bleak landscape. *(Continued on page 95)*

Provisions for the final journey

The funeral was no small enterprise. Most of the community must have pitched in, surrounding the deceased with familiar things in a log chamber that resembled her winter home. They had waited until spring, just before their move to summer grazing, so they could dig the grave in thawed ground.

With preparations complete, people may have shared a meal around the open grave, happy that the lady died in winter pasture so near the heavens.



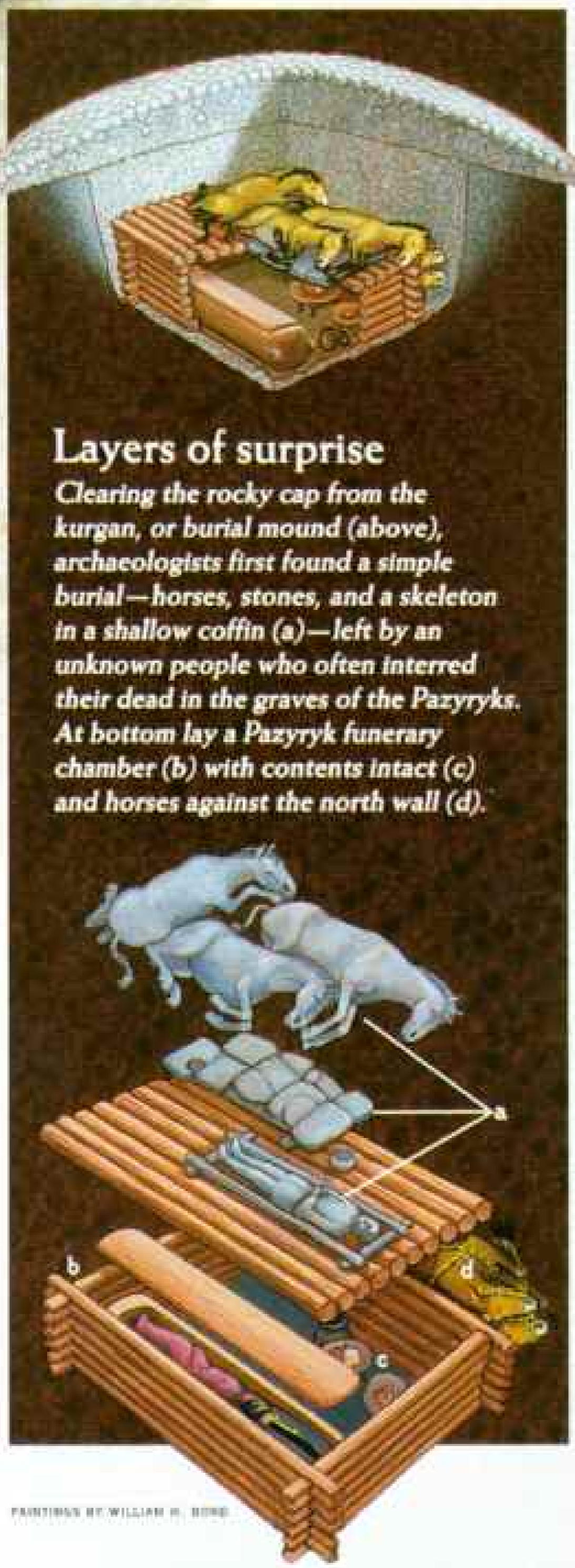
1 *Larch logs for the chamber came from forests 15 miles away. One great log, hollowed, became the coffin and its lid (being lowered at right).*

2 *Following tradition, the lady was laid to rest with her head to the east. Appliquéd leather adorned her coffin.*

4 *Horses in splendid regalia were led to the lip of the grave and dispatched with a blow of a battle-ax to the forehead.*

5 *Carefully lowered, the horses were positioned outside the chamber.*

3 *Food and drink were set near the coffin to sustain the lady on her way.*



Layers of surprise

Clearing the rocky cap from the kurgan, or burial mound (above), archaeologists first found a simple burial—horses, stones, and a skeleton in a shallow coffin (a)—left by an unknown people who often interred their dead in the graves of the Pazyryks. At bottom lay a Pazyryk funerary chamber (b) with contents intact (c) and horses against the north wall (d).

PAINTINGS BY WILLIAM H. BOND

Patches of a chestnut coat cling to the skull of a horse, which lies on the skull of another atop the ribs of a third. In this world and the next, a Pazyryk would not have been far from the steeds that made a seminomadic life possible.

(Continued from page 89) I had a map on my lap and my nose against the window. The pilots kept asking, "Where, where?" I didn't know. So I just told them, "OK, over there."

It was more adventure than science. I didn't know how we'd survive. Ukok was parched and gloomy that spring, and when the helicopter left . . . there we were, cold, hungry, alone. We hauled our gear to the river and slept in a deep, inky silence that we would grow to love.

In the morning as the others slept, I walked into the hills with my black-and-white cocker spaniel, Peter the Great (Pete), to confirm that there really were kurgans here. I had no sooner returned to camp than, suddenly, border guards were on us, checking documents. A very young lieutenant jumped out of a truck, demanding, "Who's the chief here?"

"I'm the chief," I answered, feeling very small and unchieflike.

He looked skeptical. I explained that I was only looking for kurgans.

"Fine," said Lt. Mikhail Chepanov with a sudden smile. "Come on, get in the truck, we'll show you kurgans."

And in the end, it was thanks to the border guards that we survived our first years. They would pick us up for a sauna bath, or *banya*, and give us fresh bread and firewood.

As vivid as the day they were carved, rams of cedar hold a bridle's iron bit. Gold once covered these figures, along with a host of others that hung from the harnesses, transforming the horses into a dazzling tribute. "These decorations were so expressive," says Polosmak. "They were the work of a real artist."

ISLANDS OF PERMAFROST—permanently frozen ground—remain on Ukok from the Ice Age, but ice formed in kurgans as well, because of their structure. The Pazyryks would build a subterranean chamber of larch logs, like a little cabin, to hold the casket and artifacts. They would top the grave site with a mound of rocks as high as nine feet.

In winter rain or snowmelt filtered through the rocks and loose soil to flood the hollow chamber and surrounding earth, forming a block of ice capped by a lens of permafrost. In summer, the rocks dissipated heat and kept the ice from melting. Looters often aided ice formation by digging a shaft to get at possible gold, easing the flow of water.

We labored for weeks that first summer before our spades hit the burial chamber and dug into solid ice. Inside were two skeletons with European features—a man about 40 years old and a girl about 16. Father and daughter? Warrior and concubine? I don't think so. Each had similar weaponry—battle-axes, knives, bows. Ten horses accompanied them.

The girl was unusually tall and strong, well built. Perhaps she was a weapons carrier for the man, a sort of battle page. But Herodotus wrote that it was common among at least one Siberian group for women warriors, skilled with the bow and the javelin, to ride into battle with men.

The 1990 find was big news among foreign archaeologists gathered for a conference on Paleolithic finds at Denisova Cave, another Altay site excavated by our institute. Japanese newspapers and a Harvard University magazine related the story. We had arrived.

We found nothing as dramatic in the next season, 1991, and the Japanese television crew who kept watch had little to show. The following summer we found a tomb from the eighth or seventh century B.C., but it was too old to be Pazyryk, too shallow to be frozen.

In the deep, long winter of Novosibirsk, I sat with my books and my artifacts, wondering what the Pazyryk people had really been like. In my imagination they were standing around me, their eyes imploring, "Natasha, you have to tell about our lives. You must do it."

The 1993 season began badly. Spring came late, and the mountain passes were clogged with snow at the end of May. The trucks that brought supplies could not break through, and we began on a kurgan within walking distance of where they halted, rather than the one

VLADIMIR MYLNIKOV

Meat, bones—even the smell—of the lady's symbolic last meal emerge from receding ice in the burial chamber. The larger wooden tray held a serving of horsemeat, pierced by a bronze knife, the smaller contained mutton. Still locked in ice, bones and a stick for stirring most likely shifted from the trays as water seeped into the tomb.

I had originally wanted to excavate.

The morning after we arrived it snowed so hard that for hours we couldn't open the doors of the plywood huts we had built for ourselves. Our world was pure white, like the initial stage of creation—when the skies had not yet separated from the earth.

The kurgan, about 20 feet wide, looked ruined, its center collapsed. It lay less than ten yards from the barbed-wire inner border fence of Russia, in the no-man's-land before the real border with China, five miles south. But I felt, intuitively, that I should dig.

The beauty of Ukok refreshed us. Our camp was pitched between small lakes that were covered with a thin layer of ice each morning. As it melted, two swans would glide out to feed by the banya. A family of marmots lived on the hillside. They would sit like small piles as Pete and I passed. Snowdrops and edelweiss sparkled on the steppes as spring turned the plateau into an endless garden.

In two weeks we had removed the surface rocks from the kurgan, and I could see from the remains of a big hole in the corner that it had been looted. But when we dug the next day, we came upon a shallow coffin made of wood and stone. Inside was a skeleton, a body that had been buried in the top of the kurgan above the Pazyryk chamber. It was a man, interred with three horses not long after the first burial. It was *his* grave that had been looted, not the lady's.

Such graves had been found before. Other groups apparently considered it honorable to place their own dead in Pazyryk kurgans. They may have been subordinate, even subjugated peoples, and they often looted the Pazyryk graves. Their burials were modest, with no artistic artifacts.

Was the wooden chamber below intact? I held my breath as we cut through to the lid. The undamaged lid! The bottom grave was both frozen and unlooted. My heart danced, and we talked far into that sleepless night, giddy with anticipation.

BENEATH THE LID the grave was a solid piece of ice, the logs frozen into a unit. But under the sun the ice soon turned soft and granular. Pete, thirsty, kept licking the blocks of ice we dumped at the side of the pit. I watched him carefully for a while to see if he suffered any ill effects. He's still around.

Together with Yelena Shumakova, my staff artist and conservator, I probed on until we could see dark shadows in the ice. Then we switched to pouring hot water. Kostya Bannikov and Dima Anufriyev, my two musclemen, hauled buckets of water from the lake and heated them with blowtorches. Tei Hatakeyama, a young archaeologist from Tokyo, and irrepressible Jeanne Smoot from Harvard University labored at our side.

First to appear was the top of the casket; then came two small, short-legged tables that had floated to the top of the chamber when water first entered. On the smaller table, built from the scar tissue of a birch tree, was a fist-size piece of mutton—the fatty tail part of the sheep the Kazakhs call *kurdyuk*. On the larger table, also of wood, was a chunk of horsemeat with a bronze knife sticking from it.

As we poured the hot water, a broth formed and filled the air with the foul odor of meat that had begun to rot before it froze. It was the last meal, intended to sustain the lady in the afterlife.

The casket itself was a hollowed log of larch that curved gently, like a cradle, and was covered with leather appliqués of deer. In one corner of the chamber was a wooden vessel whose handle was the carved image of two cats meeting head-on—unprecedented in Pazyryk finds—with a wooden stirrer and the remains of a dairy product, maybe yogurt. We also found an elegant vessel made of horn, translucent against the sun.

The horses pressed against the chamber's outer wall emerged with patches of chestnut hair intact and the holes of the executioner's ax, or *chekan*, in their skulls. In their stomachs remained a partly digested mix of grass, twigs, and pine needles. Mathias Seifert, a Swiss dendrochronologist who spent the summer on Ukok, collected these stomach contents and took core samples of the wood in the chamber; from them he was able to determine that the burial had been in spring.

At the beginning of July, magazine and television teams from National Geographic arrived, joining a small TV crew from Brussels' Royal Museum of Art and History. Anatoly Derevyanko, the institute director, came to witness the critical moment.

"It's a real miracle," he said slowly. "Everything is intact."

The next day we pulled out the six-inch-long bronze nails from the casket top and lifted the lid to reveal a smooth, opaque block of ice. Good. No one had ever found an unlooted coffin full of ice.

Each morning the bottom of the pit was full of water from the melting ice. A bucket brigade bailed, sometimes for an hour, as Ukok's energetic mosquitoes tormented them. Pete lay with his head on the edge of the pit, growling at any other animal that ventured close. The dead horses stank. My impatience grew. Would it be just a skeleton or a corpse—or a mummy?

Both Scythians and Pazyryks sometimes mummified their dead. The body was gutted, the skull split and the brain removed, the muscles scraped away. The remains were embalmed with an aromatic mixture of herbs, grasses, and wool and the skin sewed back together.

At 10:35 on Monday morning, July 19, something emerged through the ragged edges of a hole in the ice—a bare jawbone,

Lighter than an armful of flowers, a vessel exquisitely crafted from horn rests on a carpet of color probably very similar to what surrounded the grave in the brief summer days of the Pazyryks. The translucent vessel was too difficult to make to be used every day; it may have held a ceremonial drink left with the food for the lady.

but with the flesh of a cheek intact. That afternoon a shoulder appeared, covered by a fur blanket. I peeled back the fur to reveal flesh, not bone, and a brilliant blue tattoo of a magnificent griffin-like creature.

For a moment I could only stare and grin, my mind churning. This was our gold, our loot. We had a mummy, and only the second tattooed Pazyryk body ever found. The first, from the second kurgan of Rudenko, had mostly disintegrated in the centuries since its burial.

The body emerged from the ice like a temple rubbing. It was in excellent condition, although some skin was missing and bones were visible. Next day a sodden, elaborate headdress appeared, taking up one-third of the casket. It was made of molded felt on a wooden frame and decorated with eight gold-covered carved cats.

Scraps of gold foil lit the dark coffin like candles. A small stone dish with remnants of coriander seeds—a medicinal herb to ease the lady's journey—lay beside the headdress. A pool of black substance, perhaps hair dye, was beneath her skull. And then I saw a pair of graceful wooden

swans on the headdress, like those that had broken the spring ice on the lake, and I knew for sure that it was a woman. I had wanted it. And now I could tell everyone that I had felt, simply felt in my heart, that it would be.

I walked back to camp that evening, Peter the Great at my side, marveling anew at the beauty of the wildflowers. There had never been so many on Ukok—alpine aster and cyclamen, oxeye daisies and wild garlic. Cranes flew overhead in ragged formations, trumpeting. Nature was exulting.

In the next few days we picked off the disintegrated blanket of marten fur and examined the burial robe beneath. It was long and flowing, with a woolen skirt of horizontal white and maroon stripes and a yellow top of silk, perhaps from China, with maroon piping. I wasn't surprised to find it whole; when we discovered a pair of woolen pants in the 1990 kurgan, I simply washed them out in the lake. Some of my colleagues were horrified, but it was exactly the right thing to do; they had spent centuries in similar water.

In the crook of the lady's knee was a red cloth case containing a small hand mirror of polished metal with a deer carved into its wooden back. Beads wound around her wrist, and more tattoos decorated her wrist and thumb. She was tall, about five feet six. She had doubtless been a good rider, and the horses in the grave were her own. As we worked, the fabric gradually revived around her limbs, softening the outline of her legs, the swell of her hip. And somehow, in that moment, the remains became a person. She lay sideways, like a sleeping child, with her long, strong, aristocratic hands crossed in front of her. Forgive me, I said to her.

A full gallop speeds Russian soldier Sasha Vasilyev to his post on the Kazakh border, just a few miles from the author's excavation. Trucks that haul supplies to the post over ax-edged mountains have little other use on this trackless steppe, where horses provide more practical transport. Like the Pazyryks, local sheep herders tend their flocks from horseback, wintering here in log cabins and moving to felt yurts in summer pastures.

THE WEATHER flows unimpeded across this vulnerable landscape, a moraine that seems barely relieved of the mighty glaciers that covered it 10,000 years ago. The glacial memory seems palpable. Even in summer it can be 40°F.

At night in my cabin, snug in fur blankets and surrounded by the wisdom of old books, I pondered this woman and what her life had been like here on the Ukok Plateau. Based on my studies, aided by the

tales of ancient historians and my own intuition, I began to reconstruct those times.

The lady came on horseback, in her last October, with her family and perhaps 30 to 35 other families, driving herds of sheep to Ukok for winter pasture. Perhaps she brushed the cobwebs from the door of a log cabin built into the shelter of the foothills, a substantial home to weather the harsh Ukok winters. She helped unpack the horses and pull the furs off the supplies that the horses dragged in low carts.

The Pazyryks were not fully nomadic. In summer good pasture was everywhere, and they lived in temporary houses like yurts—round, felt-covered dwellings. In winter, when pasture was scarce, they fought for access to a place like Ukok.

She covered the floor of her home with colorful felts. Her family sat on pillows or cushions and ate from low tables that also served as plates. A smoky cook fire smoldered in the center of the lodge, night and day. Perhaps grime-faced children ran in and out. Round-bottomed mugs of milk products sat in holders made of rope. In the evening the family snacked on cedar nuts as she stirred tea made from wild roses and blackberries.

Their food was mostly boiled meat, bouillon, and dairy products such as cottage cheese and koumiss—the fermented mare's milk still drunk in Central Asia. When the lady ate, she grasped a hunk of mutton in her teeth and sawed away the excess with a knife, as Mongols do now. Wild onions and garlic added flavor. She made flat bread from grain, perhaps barley brought from the lowlands. Her husband hunted in the wide, majestic mountains for food and furs as well as for the sheer joy of it: steppe cats and snow leopards, geese and hares, wolves and lynx.

At night she would tuck her children under thick blankets of fur and rest her head on a wooden pillow, to preserve a heavy and complicated hairdo or wig, not easy to dismantle at night. No doubt she radiated a powerful odor; bathing was unknown.

When the lady rode, she dressed in hip-length, snow-white felt stockings—decorated with appliqués of animals—and a skirt over them. Younger women may have worn pants. Despite the apparent availability of silk and other imported fabrics, the Pazyryks preferred practical outfits that developed as tribes learned to hunt and do battle from horseback.

Trade flowed through the mountain passes, especially in autumn, when farmers collected crops and shepherds slaughtered animals for meat, skins, and furs. The lady put on fancy clothes and went to fairs and markets, mixing easily with other ethnic groups that had come to barter with the shepherds.

When she died, from natural causes at the age of 25 or so, the entire community rallied to prepare her funeral. A crew set off for the nearest forests, about 15 miles away, to bring larch logs for the enclosure and to select a stout coffin tree. Others searched for rocks in the streambeds.

Workers dug the grave with wooden tools, finding frozen ground the final few feet. They lined up the chamber logs, adjusting notches and grooves before lowering them into the pit for assembly, orienting the

With infinite patience Marina Moroz restores a felt saddle cover in her camp laboratory. Five days earlier she received this fabric fresh from the grave in lumps encrusted with horsehair and dirt. Cleaning revealed two winged lions—the head of one under Moroz's brush. Pennant shapes along the lower edge of the fabric, at left, point to possible Near Eastern influence.

Foreign lands probably also supplied the winged lion. Awkwardly copied on another saddle cover (bottom), the motif looks more canine than leonine.

chamber east-west to follow the cycle of the sun and thus of birth and death. Then they covered the casket bottom with felt, laid the body and artifacts inside, and slowly eased it into the chamber, for what they thought was eternity.

All day, perhaps for many days, the families must have sat by her grave, singing songs, glorifying her life and her deeds. Then, with the grave still open, they shared a dinner of mutton and horsemeat, sitting around her, drinking koumiss in her honor. They may have burnt cannabis beneath a felt tent, breathing the fumes to enter a higher level of spirituality.

The horses picked for sacrifice had to be handled gently or they might sense death and bolt. The first one, its bridle gleaming with golden griffins, was led to the side of the grave, where the executioner slew him with a sharp blow to the forehead with a chekan. Some were strong and did not fall until the second blow. Then their knees buckled under them, and they were lowered by a rope harness beside the others; their front legs

were curved under, their heads oriented to the east.

What remained was to push the earth back into the pit and construct the mound: small rocks and earth at the base, then boulders for the final layer.

In late spring, before lambing time, the shepherds, hurrying before the rivers thawed into rushing water that blocked the herds, headed back to summer pastures below, leaving the Ukok grass to recover. The graves they left behind staked a claim: "This is the land of our ancestors; this land is ours."

"Only a window was between us—and a couple thousand years," remembers Marina Moroz, who paid her respects at the lady's camp sanctuary. "By chance she had returned to our world, covered with mystery." The many clues interred with the lady promise to put her life and times into clearer light.

THE LADY ALMOST got me in the end.

The helicopter to take us back to Novosibirsk was due on August 2. We were packed, watching the skies and waiting for the familiar chopping sound. Instead, black clouds blew in, and heavy snow turned Ukok into blinding whiteness.

It snowed for three straight days, and we couldn't even see the cabin beside us. On August 7 the chopper landed, and we loaded on the lady and her artifacts. About 90 miles from Novosibirsk we heard a loud explosion. The engineer came from the cockpit and said, in a strange, calm voice, "Please fasten seat belts. There is some difficulty."

One engine had lost power, and we were whirling at 3,000 feet at the mercy of physics. Since the rotor blade kept spinning, it gave the helicopter enough lift to glide onto a soft, plowed field.

The bus from the institute picked us up, and no one was seriously hurt. Luck held out, but I couldn't help but wonder how much meddling we had done to the spiritual balance of the world above Ukok.

I believe that thoughts and ideas do not vanish, that they still exist in the layers of the atmosphere that blanket the earth. Perhaps all the souls of the Altay are still here, with us.

If there was somewhere for Pazyryk souls to go, it was above Ukok, for they knew nothing higher. The Pastures of Heaven were the closest they could reach to the place where their souls ascended after death.

May the lady find some rest in our understanding. □

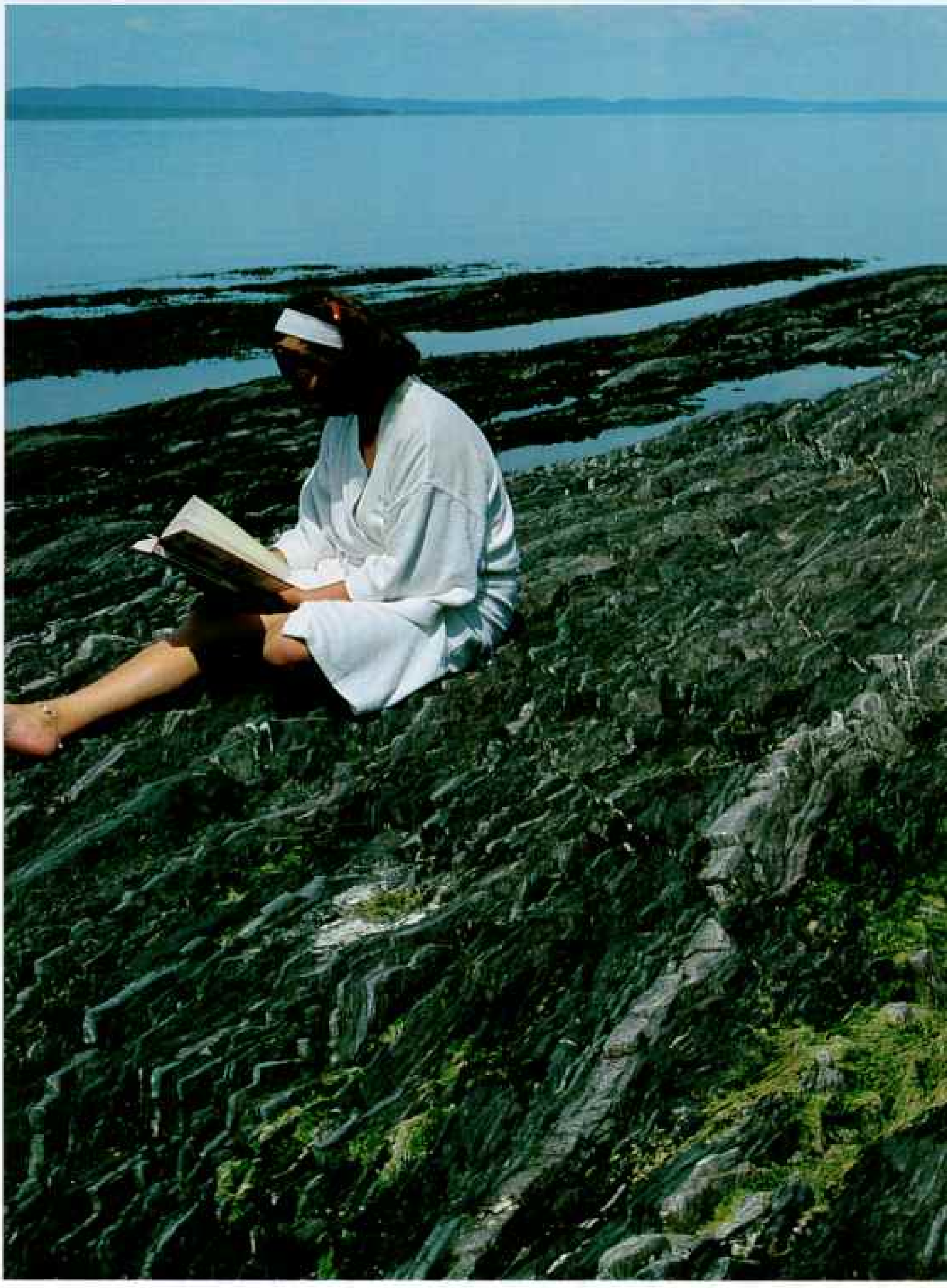
National Geographic EXPLORER will air "Ice Tombs of Siberia" on October 9 at 9 p.m. ET on TBS Superstation.

The St. Lawrence:

By THOMAS J. ABERCROMBIE Photographs by TOMASZ TOMASZEWSKI

River and Sea

Where it broadens into an inland sea, the St. Lawrence receives a pair of inbound cargo ships. Industry and tourism churn upstream. Here the river's quiet is gently broken in towns whose streets blend the crunch of gravel with the lilt of greetings in French.



Masks of mud from a nearby bog bring new faces to a health spa in Notre-Dame-du-Portage. Besides aiding complexions, the heated mud relieves rheumatism and arthritis, says owner Claude Defoy, one of a few entrepreneurs coaxing upscale vacationers to the working river's eastern stretches.

THROUGH A VEIL of snow our small helicopter whined over the moon white landscape toward the freighters locked in the pack ice south of Trois-Rivières. Buffeted by March winds, we twice circled the helpless ships, then eased down onto the flight deck of the icebreaker *Pierre Radisson*, flagship of the Canadian Coast Guard's St. Lawrence fleet.

I made my way to the wheelhouse.

"Welcome to the worst winter in 12 years," said Capt. Gerard Guesneau, commander of the four icebreakers working around the ships.

He was a tall man in a thick blue sweater; his sharp features were partly masked by dark glacier glasses to protect against the glaring horizon. He started up the morning's campaign against the Canadian winter.

"Starboard, one-half."

"Starboard, one-half," said the helmsman.

"This wide, shallow section of the river, Lac St.-Pierre, is always a trouble spot," Captain Guesneau said. "A gale like this blows the ice together as fast as we can break it up."

The *Radisson* picks up speed through the crush, its bow tossing aside chunks of ice the size of cottages. Snow, sky, and shoreline blur. Behind us the *Federal Kumano*, a bulk carrier from Manila; a tramp steamer flying a Panamanian flag; a Hong Kong container ship; and

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THOMAS J. ABERCROMBIE retired last spring after 38 years with NATIONAL GEOGRAPHIC as a photographer and senior writer. Polish photographer TOMASZ TOMASZEWSKI's most recent assignment for the magazine was on Sweden (August 1993).

a Canadian tanker break out and file along as we ram toward Sorel, ten miles upstream.

Twice, the 50-mile-an-hour gusts choke up the channel. Then Captain Guesneau takes the throttle himself and backs down gently until the high black bow of the *Federal Kumano*, sparkling with hoarfrost and hung with icicles, looms high over our stern.

Guesneau rakes the throttle forward and the *Radisson*'s engines give a 14,000-horsepower growl to blast away the pack ice. And the wintry convoy continues on its way.

The St. Lawrence is a big-shouldered river that can challenge a navigator anytime of the year. I would discover this when I returned in summer and chartered a 37-foot cutter to follow the river's 750-mile course to the sea. I would find a river of many moods, often

- Conquered by the British in the battle for New France in 1759, Quebec City clings to its Gallic language—and hopes for independence from Canada. With similar tenacity, early April ice chokes the river where it squeezes past 330-foot-high Cap Diamant.

sophisticated, occasionally wild and stormy, but never less than majestic.

Short as major rivers go, the St. Lawrence makes up for it in volume; its flow is nearly that of the Rhine, Volga, and Nile combined. Its narrowest pinch, under the Quebec City bridge, measures a half mile; crossing the river's mouth is a voyage of 90 miles. There locals refer to it as *la mer*, the sea.

The river spills from the eastern edge of

Lake Ontario, then snakes northeastward, sketching the frontier between New York State and Canada's Ontario Province. By the time it reaches Montreal, it has dropped 226 feet through the complex of weirs and locks of the St. Lawrence Seaway.

As part of the Great Lakes St. Lawrence Seaway System, the river provides access as far inland as Duluth. Each year ships make some 2,300 trips along the river section alone.

I began my summer journey in the Thousand Islands—actually there are around 1,800 of them—which make a patchwork of the river as it leaves Lake Ontario. The islands, some hardly more than large rocks, hold farms, estates, and summer cottages that can cost into the millions of dollars. On five-and-a-half-acre Heart Island, for instance, broods a 120-room castle guarded by gates and turrets. It was constructed at the turn of the century by George Boldt, wealthy manager of New York's Waldorf Astoria Hotel. Today it is operated by the Thousand Islands Bridge Authority as a tourist attraction.

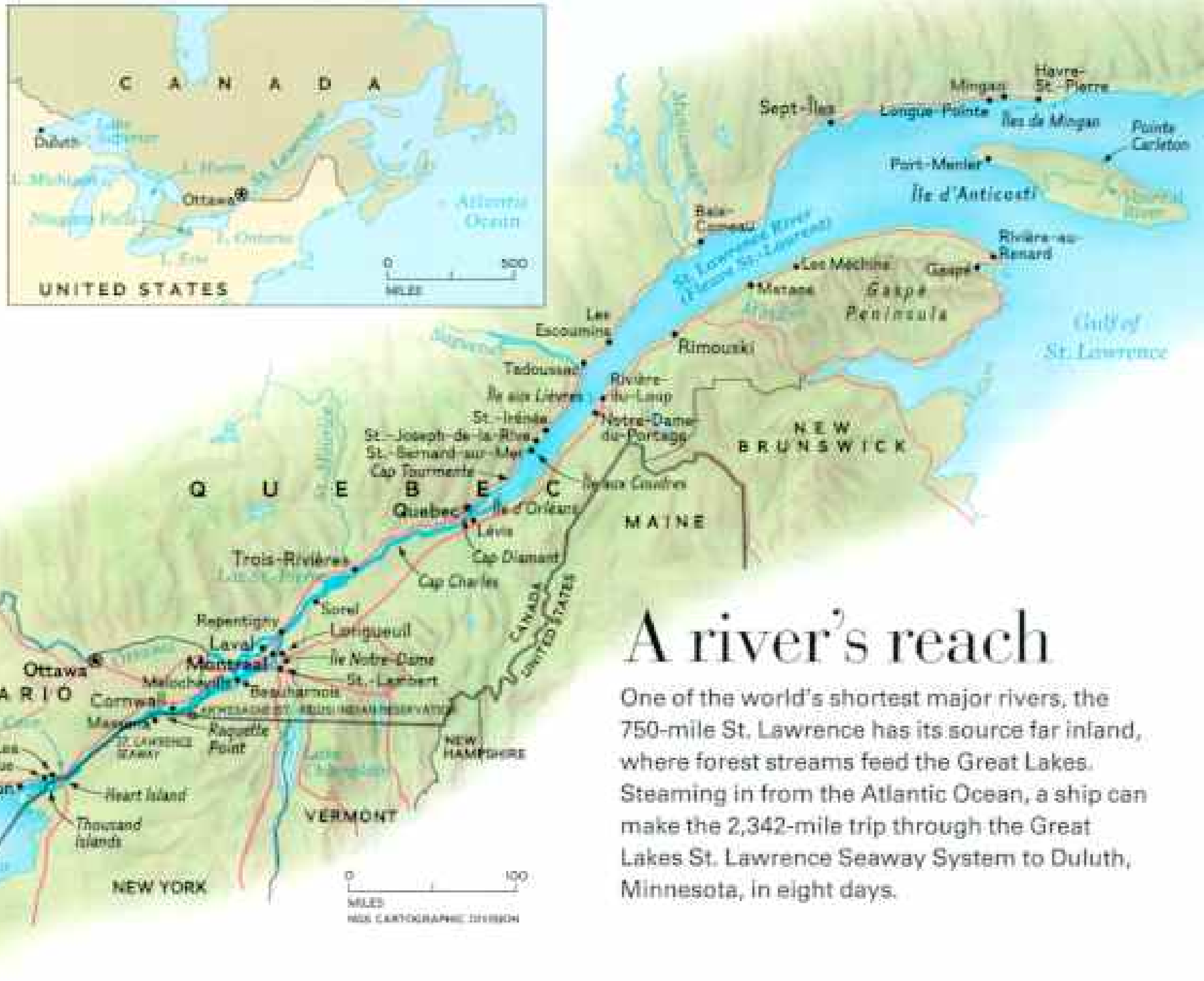
The islands have their rakish traditions. Fishing guide Roy Tomkins, 79, piloted his workboat eastward from Gananoque through the Navy Islands to Ivy Lea and the cluster of islets that guard Smugglers Cove.

"Back durin' Prohibition, Thousand Islands folks made a little extra money bringin' Canadian whisky across into the U. S.," Roy said, easing a bit to starboard to avoid an unmarked shallows. "If you had to disappear in a hurry, right here was a good place to do it.

"Chasin' rumrunners through these tricky channels, more than one revenuer drove his speedboat up onto the high 'n' dry."

When I was there, bootleggers were still plying the St. Lawrence. This time the contraband, tobacco, moved from south to north after stiff taxes raised the price of Canadian smokes to more than six dollars a pack. Entrepreneurs legally bought duty-free exports of Canadian cigarettes in the U. S. for a fraction of the Canadian retail price. Then they sent them back across the river to Canada on midnight runs in fast boats. The traffic slowed earlier this year after Canada reduced its cigarette tax.

The bootleggers took advantage of another maze of islands around the Canadian town of Cornwall. Here the provinces of Ontario and Quebec meet the state of New York—and the



A river's reach

One of the world's shortest major rivers, the 750-mile St. Lawrence has its source far inland, where forest streams feed the Great Lakes. Steaming in from the Atlantic Ocean, a ship can make the 2,342-mile trip through the Great Lakes St. Lawrence Seaway System to Duluth, Minnesota, in eight days.

boundary of the Akwesasne Mohawk nation overlaps all three.

" 'Smugglers' they call us in the newspaper stories. That's a white man's lie," Mohawk leader Loran Thompson said at his home on Raquette Point on the U. S. side of the river. We sat powwow style under a spreading silver maple in his backyard overlooking the river. "This is legal commerce within the boundaries of our sovereign nation, defined and guaranteed by treaty—way back in 1784."

At Loran's marina the cashier recorded me on videotape when I looked around. Blackboards behind the counter posted wholesale cigarette prices, in case lots: "ROTHMANS RED, 730 $; PLAYERS ULTRA LITE, 740 $. . ." At the dock young men fueled 200-horsepower outboards, loaded up big cardboard boxes from Loran's tobacco warehouse, then motored off slowly downstream to wait for darkness and the run north.

◆ Backyards open onto cargo-ship channels in the Thousand Islands, where the river emerges from Lake Ontario and sweeps past the New York shore, at left. In 1976 the fuel-oil barge *Nepco 140* ran aground here, spilling 300,000 gallons. Islands still show the stains.

ENTERING QUEBEC PROVINCE, the St. Lawrence becomes the Fleuve St.-Laurent, for this is the heart of French-speaking Canada. Guiding my cutter *Foxtrot* through the final locks of the seaway, I dropped down 42 feet and followed the strong currents under arching bridges, noisy with trains and traffic pouring into workaday Montreal. I tied up at the Club Nautique at Longueuil, a trendy suburb just across the river, and took the Metro into Montreal.

Strolling among the chic office crowds along Rue Ste.-Catherine or sipping Campari at a crowded *café terrasse* in the city's ethnically mixed *quartiers*, one tastes a European flavor. A 1977 law in Quebec Province requires that all outdoor signs be written in French. This was the reaction of some six million French Canadians surrounded by 225 million Canadian and American anglophones.

Here the maple-leaf flag of Canada flies less often, replaced by the cross and fleur-de-lis banner of Quebec, symbolizing church and

◆ Taking his message on the road (right), a separatist celebrates Quebec's *fête nationale* in Montreal, where independence is hotly debated. Casting wary eyes south during the War of 1812, Canadians built Kingston's Fort Henry (bottom) to defend against U. S. invaders. Now visitors see costumed students drill with their mascot, David.

France. Coming from Ontario, this seemed a bit like another country.

It will be if Jacques Parizeau and his separatist Parti Québécois have their way. I met the leader of the opposition in Quebec's National Assembly at his office at Place Ville-Marie, set in Montreal's futuristic steel-and-glass skyline. Dressed in conservative gray, with trim mustache, Dr. Parizeau wielded the relentless charm of a senior diplomat.

"We are not talking revolution here, not radical change. Canada and Quebec are civilized Western democracies," Dr. Parizeau stressed. "We want to preserve and strengthen our unique Québécois culture, to vote our own laws, to control our own tax revenue. Of course we would keep the close ties with English Canada, the United States, and NATO that we have always had." Such separations are not without precedent, I thought, remembering the "velvet divorce" of the Czechs and Slovaks.

ALWAYS LONG ON ORIGINALITY, Montreal's more whimsical attractions include the annual boat race organized by sailing instructor Yves Plante. "The rules limit you to $100 [about $75 U. S.] for materials. You have three hours to build your boat," Yves explained, "then into the water, and the race begins."

Early Sunday morning, 42 skippers and their crews arrived at the Olympic Basin on Île Notre-Dame to unload plywood, plastic sheets, cardboard, old barrels, and rope. During the busiest three hours I can remember, my crew and I cobbled together a dinghy of rough plywood and rigged it with a spritsail cut from a six-dollar tarp.

Before a faint breeze I coaxed our dinghy to the finish line, but well behind the winner, carpenter Alain Guibert's long, narrow outrigger with a 2x4 mast, propelled by a billowing plastic square sail.

"Above all, the race proves yachting is not just for the rich," Guibert said. "For the price of a pair of Reeboks and a hard morning's work, anyone can be a sailor."

Heavy industry defines much of the upper St. Lawrence. Effluent from scores of paper mills, chemical plants, smelters, and refineries has stained its sparkling waters for decades, choking local fish populations, even poisoning the endangered beluga whales hundreds of miles downstream.*

Federal and provincial environment ministries began a major effort to clean up the river in 1988, targeting the 50 worst industrial polluters. The program has already cut their toxic dumping by nearly 75 percent. Yet many

*See "Beluga: White Whale of the North," by Kenneth S. Norris, NATIONAL GEOGRAPHIC, June 1994.

Bound for open sea, a freighter slides by the brooding forms of the Mingan archipelago. The procession is endless: Last year cargo vessels from 50 nations made 2,300 trips along the river by way of the St. Lawrence Seaway, paying tolls based on weight and type of cargo.

- A season's worth of trophies rolls down the main street in Longue-Pointe's fall moose parade (opposite). The biggest head and widest spread take prizes.

Proud of a catch he grew himself, Marc Boulanger (above) holds a 14-pound salmon raised at his indoor fish farm at Matane. He produces up to 150 tons a year. Although the Matane River cannot support commercial fishing, anglers flock to its banks.

environmentalists are not satisfied, claiming that more needs to be done to restore the river to health. Purging the muddy river bottom of heavy metals, they say, will take generations.

I joined activist Daniel Green aboard one of his weekend Toxic Tours. President of SVP, the French abbreviation for Society to Conquer Pollution, Green conducts boatloads of concerned citizens into the area around Melocheville and the Beauharnois Locks, just upstream from Montreal, for a firsthand look at the river's worst pollution hot spot. We worked close along the sullied southern shore, where huge pipes flushed out acrid wastes.

"From 1976 to 1993 these plants, including Elkem and Pittsburgh Plate Glass, trickled out a ton of mercury, 40 tons of lead, and 260 tons of zinc into our waters," Green said. He showed us the Domtar paper mill, which supplies fine stock to Canada's mint. "During the same period Domtar dumped 4,900 tons of sulfates. Even our dollar bills are tainted."

SAILING TOWARD QUEBEC CITY one morning, *Foxtrot* danced along the wide river at eight knots.

Suddenly a booming fanfare vibrated the clear blue sky. It seemed to come from the wooded shore. I squinted through binoculars at a black structure in the trees. It was a giant music speaker! An excursion boat—from Delaware, I noticed—passed the bluff. "The Star-Spangled Banner" boomed across the water. As *Foxtrot* drew abeam of the cape, the speaker saluted us with another familiar refrain—the folk song that has become Quebec's unofficial "national" anthem. The words go: "People of this land, / Your time has come. . . ." On shore the blue-and-white colors of Quebec now waved, the same flag that fluttered from the *Foxtrot*.

Next day, docked in the city, I drove to Cap

◆ "This is a place for artists," says 78-year-old Stanislas Bouchard, who retrieves a prize from his riverside pumpkin patch with his wife. The family has farmed here for four generations. "But young people, now they leave for studies and work. They don't come back."

Charles to seek out the home of Delphis Duhamel, now retired from the furniture industry.

"I started this hobby of saluting passing ships in 1964, partly to spark our children's interest in geography," Duhamel said when he showed me the breathtaking panorama from his front yard. In lockers around us hung flags of all nations. A weatherproof console protected his tape player and cassettes of 150 anthems. Then, through powerful binoculars, Duhamel confirmed an approaching ship.

"*Setif II*. Home port: Algiers."

His wife, Monique, hoisted the green-white-and-red colors of Algeria, then, on a lower halyard, his daughter, Claire, raised the international code flags, "U," "W," and "1," that signal "pleasant voyage." Martial strains burst from Duhamel's 35-foot-wide speaker. The vessel returned the courtesy with three long blasts and two short from its powerful ship's horn.

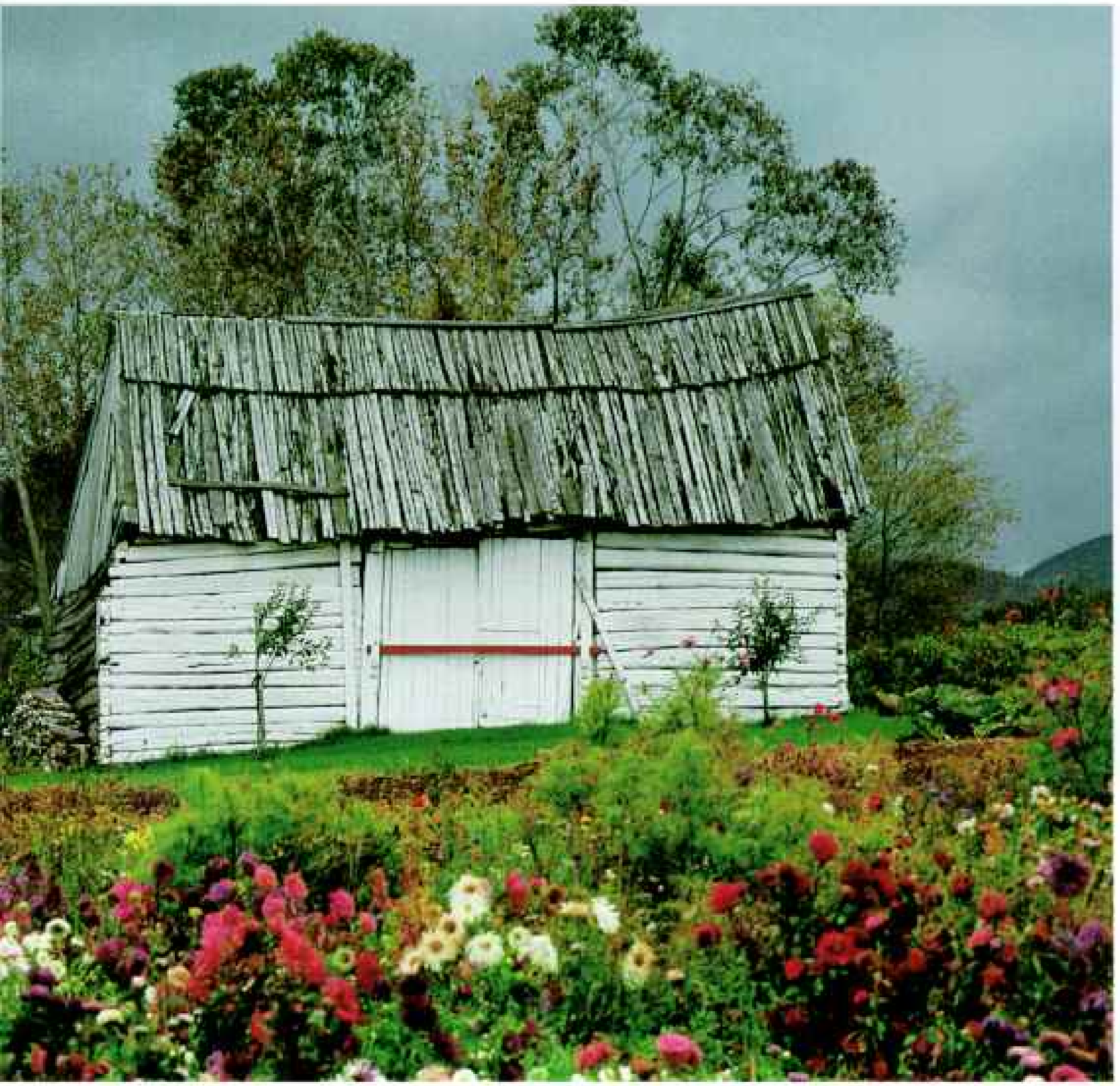
I arrived in Quebec City in time for St. Jean-Baptiste Day, the fete that celebrates French Canada's patron saint. Shouting young patriots flooded the narrow streets of the provincial capital with blue-and-white banners. Posters everywhere proclaimed, "WE ARE AS GREAT AS OUR DREAMS." "*Québec je t'aime*," read one T-shirt. Another declared, "I am *proud* to be a frog."

Fireworks flashed color over Parc des Champs de Bataille, the old battlefield where French Canada was lost to the British in 1759. Cheers broke out as spotlights picked up a lone sky diver who glided down over the historic city trailing a Quebec flag the size of a house.

AFTER QUEBEC CITY the river widens into its broad estuary and shores recede into distant gray lines. Here changeable weather can surprise even a cautious skipper. Scudding past the long green fields of Île d'Orléans, I estimated our next port, St.-Bernard-sur-Mer on the Île aux Coudres, as an easy five hours.

But, rounding Cap Tourmente, we began beating into unpredicted head winds. The howler began building short, eight-foot waves. Our small ten-tonner began bucking like a bronco, slowing headway to a knot. After an hour of pounding we retreated back to shelter behind Orléans. Next day we tried again. This time, with the breeze astern, the same trip was a pleasant promenade.

Île aux Coudres and the region around it were once famous for building *goélettes*, the schooners that plied the river for four centuries, beginning in the mid-1500s. Sailing into St.-Bernard-sur-Mer, I counted half a dozen forlorn wooden skeletons abandoned along its beaches. But on the mainland you can still hear the hum of ripsaws and the thumping of caulkers' mallets. In the village of St.-Joseph-de-la-Rive, shipwrights are restoring one of



the old schooners, the 110-foot *Mont Royal.*

"Vessels have been launched from this beach since 1793," said Capt. Yvon Desgagnés, a retired shipping executive who runs the maritime museum. "My father launched the last to be built here, in 1952.

"The goélettes were designed stout and flat-bottomed so the crew could beach them at high tide and then unload them at low tide with a horse and wagon. Carrying passengers, lumber, quarry stone, flour, molasses, they were the trailer trucks and buses of their time."

As the river broadens, it becomes a magnet to wildfowl. You will see colonies of Atlantic puffins along a deserted island cliff or hear the thunderclap of wings as a half million snow geese splash into a gray morning sky.

On Île aux Lièvres, a day's sail north of Île aux Coudres, I met Jean Bédard, a specialist in duck behavior. He directs a nonprofit organization, the Société Duvetnor, which draws its name from the French word *duvet*, meaning the "down" of birds. The organization provides a sanctuary for the common eider, Canada's largest duck, and other seabirds.

Together we hiked nature trails on the island's salty shores and through inland forests of balsam. Then, in a small workboat, we cruised other little islands in the reserve. Here each spring nest some 11,000 pairs of eiders.

To fund his efforts, Dr. Bédard leads nature tours and painstakingly gathers eiderdown from nests on the island.

"We take a small portion of the fleece from

each nest. Remove too much and the eggs could die of the cold," he said.

"It's backbreaking work, dawn to dusk for two weeks in early June to harvest the nests. And it's a, well, messy job." Total production: 150 pounds.

"But it sells for about $200 a pound," he said. "Last year we netted $15,000."

The lower St. Lawrence is also whale country. *Foxtrot* slipped now into the crescent harbor of Tadoussac, where Basque whalers worked the waters soon after Jacques Cartier, credited with discovering the river, landed in 1535. A giant Victorian hotel graces the shoreline. It is booked up most summers as the town enjoys a new whaling boom. This one is more profitable than butchering for blubber and sperm oil—and kinder to the great beasts. It is whale-watching.

Here at Tadoussac freshwater currents racing from the cliff-lined Saguenay River into the salty flow of the St. Lawrence estuary spin a maelstrom of rips and eddies. A plague for navigators, these roiling, oxygen-rich waters stir up a banquet for whales that gather here each summer to feast on shrimp, krill, squid, herring, cod, and salmon. The biggest, the blue whale, swallows four tons of krill a day.

Some 20 miles northeast of Tadoussac, we began to spot belugas. After years of decline their population in the St. Lawrence has stabilized at an estimated 500, although the playful milk white swimmers remain on the endangered list. The Canadian Department of Fisheries and Oceans issues guidelines for boaters cruising these waters.

"Avoid heading directly toward a whale," the rules state, ". . . maintain a distance of 300 meters (1,000 feet)." Under sail, idle motors "to signal your presence or turn on your echosounder." Sonar frequencies, inaudible to humans, reach a beluga's ears loud and clear.

One day when *Foxtrot's* Fathometer was already pulsing—to track the underwater cliffs off Les Escoumins—a pair of shining belugas appeared barely 30 feet off our starboard bow. Then another, and another. Soon a dozen whales surrounded the boat, pacing us at five knots just under the surface. They obviously had not heard about the 1,000-foot rule. Turning my head toward a splash, I found myself staring into a cherubic face barely 15 feet away that gave an almost human glance. I wondered which of us was more fascinated.

CROSSING TO THE SOUTHERN SHORE, I pushed *Foxtrot* downriver to the small harbor of Les Méchins, long a sailors' town and still living off the sea. The cranes of a shipyard swung almost as high as the village steeple. Across from the church, ten-ton anchors, a big ship's wheel—even a gaily painted diesel engine—decorated the village square.

While most of Canada's shipbuilding industry has been swamped by lower cost East European and Asian competitors, Les Méchins is doing well.

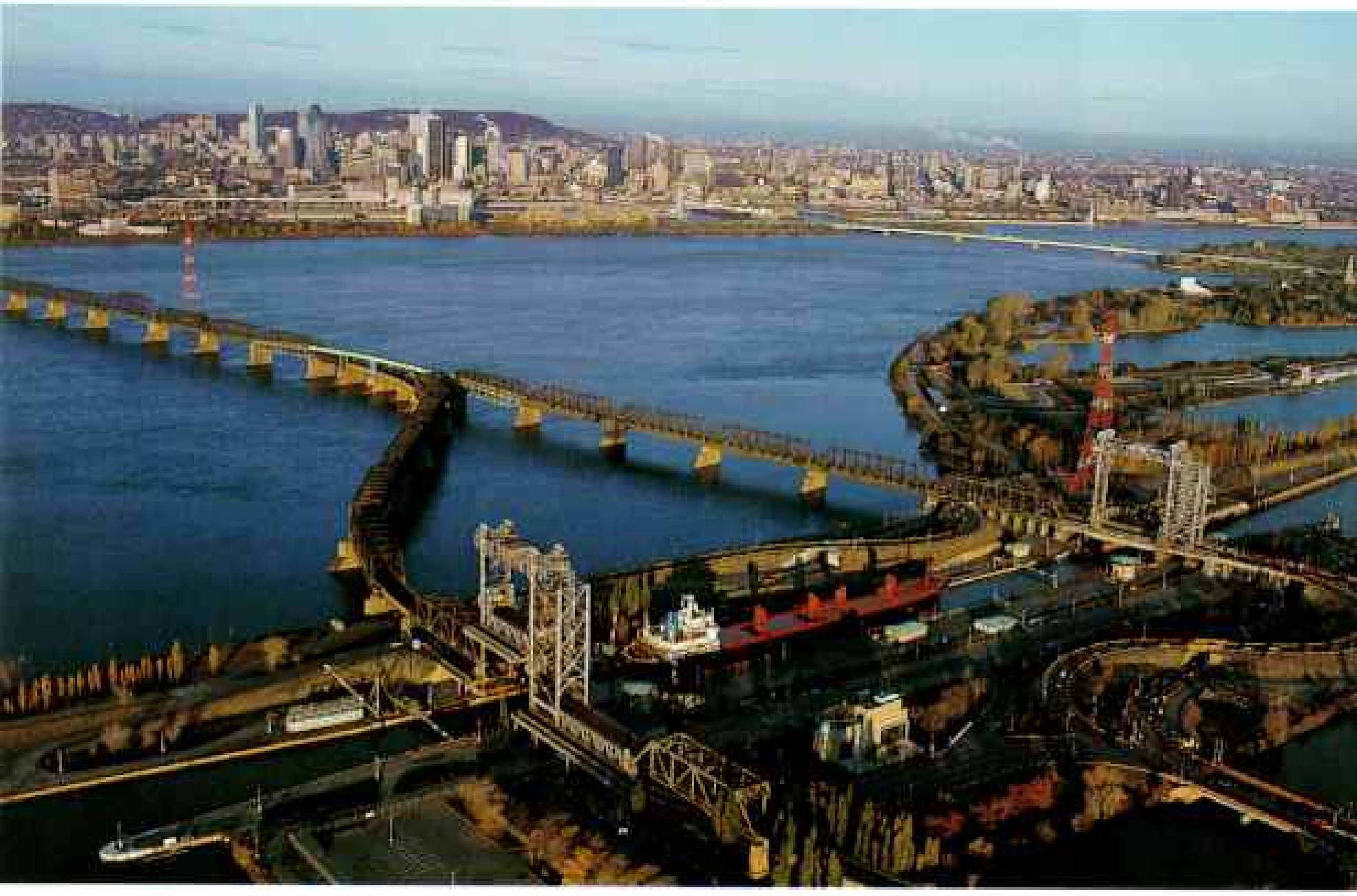
Business was also good at Sept-Îles, downstream on the north side of the river. A huge natural harbor and a location where the St. Lawrence broadens to some 80 miles have made this city a busy transshipment point. Here iron ore, grain, and other products are shifted from smaller lake and river carriers to giant oceangoing vessels. Only Vancouver, on Canada's west coast, handles more tonnage.

If economic tidings are good in Sept-Îles, they are just the opposite along the Gaspé Peninsula, south across the St. Lawrence. An alarming decline in the river's cod is devastating the fishing industry there. When the catch dropped to 2,600 tons in 1993 from 16,200 tons in 1990, the federal government in Canada closed cod fishing in the Gulf of St. Lawrence to trawlers.

Hardest hit were the tidy Catholic villages that punctuate the rugged peninsula. Here *morue*, or "codfish," is the nickname Gaspesians call one another. Steeple by steeple I sailed along the coast, then, steering by radar through an early evening fog, felt my way into Rivière-au-Renard, the river's busiest fishing port. Most of its fleet of 50 trawlers and a score of smaller coastal boats was tied up at the quay, two and three abreast. The mood along the wharf was as thick as the weather.

"At best this is a killer of a job, 24 hours a

◆ Clay from Savannah, Georgia—used to coat paper at Canadian mills—blankets a dock at Trois-Rivières (left). River cleanup efforts have begun to take hold: Fifty industrial plants cited in 1988 have slashed their toxic effluent by 75 percent. Bypassing rapids at Montreal, ships enter the St.-Lambert Lock (below), the first of seven locks that lift ships 226 feet en route to Lake Ontario.



Tree swallow season is still a month away for a cat pawing across April snowpack near Mingan. Tourists who rent waterside trailers won't make their way back until June, but from this point they'll be rewarded with views of the blue, minke, and finback whales that summer in the Gulf of St. Lawrence.

day, ten days at a time, on the open sea," Capt. Albert English said when he invited me aboard his trawler *Annie Annick* for a hot coffee. "Now we are out of work altogether.

"A boat like this costs a man's life savings and a bit more," he said. He pointed out two radars, a Loran-C electronic plotter, the VHF radio, Fathometers, depth recorders, fish-finding sonar, autopilot, fluxgate compass: "There's $60,000 in electronics alone.

"I'm one of the lucky ones. I was able to lease *Annie* to another skipper, who has a shrimping license. He'll rework nets and trawling gear and keep her working."

With three Gaspé trawlers I rode out a gale in the shallow, exposed harbor of Port-Menier, the only refuge on lonely Île d'Anticosti. The island, larger than the state of Delaware, lies 50 miles north of Rivière-au-Renard, in the St. Lawrence's yawning mouth. Six-foot swells swept around the short breakwater, keeping our crews on deck 48 hours straight, wedging planks and old truck tires between the hulls and the steel dock.

"Anticosti is called the Graveyard of the Gulf for good reason," one of the fishermen told me. "More than 400 vessels have foundered along these treacherous coasts."

Anticosti has a bizarre history. Various schemes to colonize it, beginning as far back as 1680, ended in failure. Then in 1895 a wealthy French chocolate maker, Henri Menier, bought the island for $125,000. Menier established a village around his sumptuous

◆ "I barely notice the trains anymore," says Jeanne D'Arc Duchesne, at right, whose view is interrupted twice a day by a freight train. As he crawls through St.-Irénée, even the engineer bows to the river's preeminence, stopping for folks carrying canoes.

manor house and ruled there like a baron.

He stocked the island with game and tried to establish a logging enterprise. In 1926 a paper-pulp company took over from Menier's heirs and ran the island for half a century. Only in 1984, after buying out the loggers, did the Quebec government turn local administration over to an elected council in Port-Menier, while setting aside huge reserves for hunting, fishing, and tourism. Today the island's population numbers less than 300.

Reefs and rock cliffs ring the 138-mile-long island; a hundred lakes and a score of salmon rivers water its woods and hills. One waterfall, roaring into Vauréal canyon, measures 80 feet higher than Niagara.

With rugged outfitter Lucien Martin, a third-generation islander, I set out down some of the dusty logging roads now maintained for visitors by a provincial organization, SEPAQ, dedicated to encouraging outdoor activities.

"The 220 white-tailed deer that Henri Menier installed here in 1916 have multiplied to 125,000 today," Luc said. "We bring in 3,600 hunters a year. Most have no trouble bagging their two-deer limit."

We stopped for fresh St. Lawrence cod, shrimp, and snow crab at a restaurant SEPAQ maintains in a refurbished lighthouse at Pointe Carleton, a two-hour drive along the wind-swept north coast from Port-Menier.

Below the lighthouse Luc showed me through one of the half dozen wrecks that curse Anticosti's shores, the *Wilcox*, a World War II minesweeper the logging company had converted into a supply ship. Pitched onto the white stone beach by a sudden storm in 1954, its graying planks still defy the elements.

"Years ago I crewed aboard this ship during its summer rounds to the island's isolated lumberjack camps," Luc said.

We climbed back up the fragrant wooded bluff in silence, lost in our own thoughts.

Raising sail out of Anticosti, I gave another shipwreck wide berth, the long, rusting hulk of the freighter *Faillette Brown*. Splashing through a flotilla of eider ducks, fat as geese, I set the autopilot once more for the Gaspé coast to the south. A peppering of nervous black scoters kept their distance, taking turns diving for their breakfast. Farther out, a six-ton minke whale arched gracefully above the sparkle. In the distant ship channel the long gray shadow of a cargo ship carrying wheat to Russia slipped silently along the horizon.

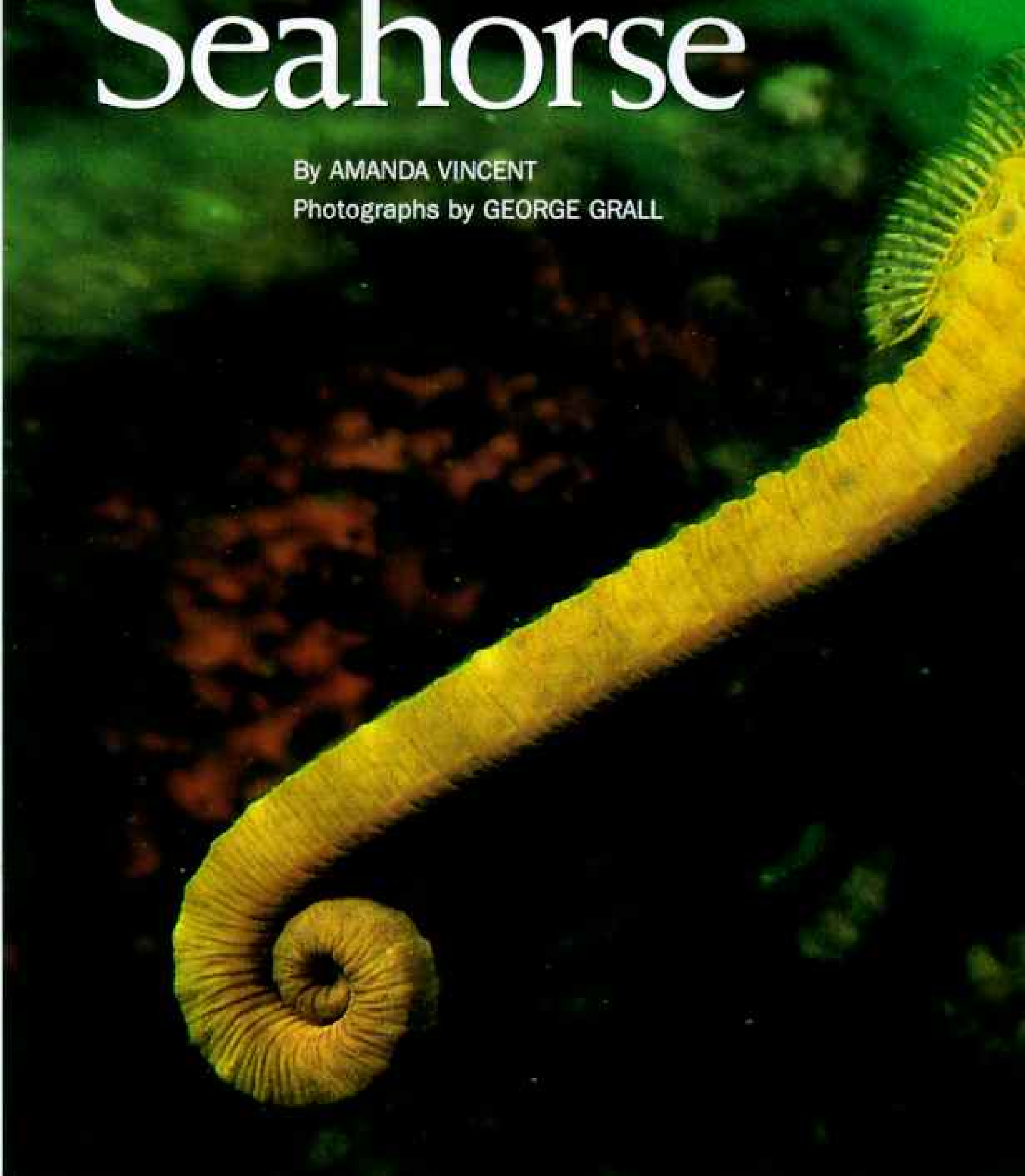
Turnpike for freighters, refuge for wildlife, playground—a reservoir of history and cradle of a stubborn culture—the river continues to flow through calm and storm, bearing commerce and crisis.

But, for the moment, riding the crisp autumn breeze, where the mighty St. Lawrence finally surrenders to the sea, it seemed there was room for all. □

The Improbable Seahorse

By AMANDA VINCENT

Photographs by GEORGE GRALL



Yellow as a flashing
caution light, a
seahorse flees danger
in Australian waters.
Changing hues from
drab to neon, these
fishes also put a
twist on parenting:
Males get pregnant
and give birth.

DIVING WITH SEAHORSES in Sydney Harbour, Australia, one southern summer, I witnessed behavior that raised these quirky little fishes still higher in my estimation. It was December 1991, and I was closely watching two seahorses. One had been attacked during pregnancy by an unknown animal—perhaps a mollusk. The assailant had pierced the seahorse's brood pouch, plundering the embryos inside. The injury took several weeks to mend, so I expected the victim's partner to seek another mate. But to my surprise the partner remained resolutely faithful, shunning all suitors.

The damaged pouch finally healed, and once more the couple mated. Another male seahorse was pregnant.

Male pregnancy? Yes, indeed. No male animal on earth is known to be more specialized for parental care than the seahorse. In fishes, males are usually the caring parent, guarding and fanning the eggs to provide oxygen. Male seahorses behave in the best tradition of fishes, only more so. In seahorses the male—like all other male animals—produces sperm, and the female, eggs. What sets seahorses apart is that the female deposits her eggs in a brood pouch on the male's tail. He alone nurtures the embryos, eventually releasing a string of miniature seahorses.

Tail tethered to a branch of soft coral, a color-changing *Hippocampus reidi* can keep one eye on watch for food and the other peeled for predators in Caribbean waters off the island of Bonaire. Independent eye movement—another trait shared with chameleons—and acute vision help seahorses ambush prey in their habitats of coral reefs, sea grass beds, and mangroves.

My life with seahorses began in 1986, when I was a new Ph.D. student at the University of Cambridge in England. To a biologist intrigued by the evolution of sex differences, and to someone with feminist beliefs, seahorses were irresistible. Little did I then realize how much I would come to care about them.

Nor was I aware of how novel my research would be. When I started, no one had followed the lives of seahorses in the wild, and we had only basic knowledge about their biology and behavior—descriptions of the solemn ballet of courtship and mating, for example, and of male labor and birth. "You mean they're real?" people would ask, as if seahorses belonged with mythical creatures like dragons and unicorns.

From Canada to Tasmania, most coastal areas with sea grass beds, mangroves, or coral reefs can lay claim to a seahorse species or two. Worldwide there are perhaps 35 species, all in one genus, *Hippocampus*. Wherever seahorses exist, they are at risk. In preparing this article, I uncovered a huge legal trade in seahorses—dead and living—primarily for medicines and aphrodisiacs in Asia but also for aquariums, curios, and foods around the world. Seahorses are further menaced by destruction of their habitats, as shorelines are stripped of mangroves, sea grass meadows are dredged and filled, and coral reefs are blasted.

My early work at Cambridge was with a species from the Florida Keys. Keeping seahorses, I quickly learned, is fraught with difficulty. Confronted with their insatiable appetite for live food, I spent half my time culturing tiny fishes, various shrimps, and other small crustaceans. Then too seahorses contract manifold bacterial, fungal, and parasitic ailments—and fish veterinary science is in its infancy.

By dint of fanatic devotion I did manage to run a series of experiments using hardier dark Sri Lankan seahorses. Their identity, like that of many other species, was in doubt, so I christened them LBJs—little black jobs—before deciding that they probably corresponded to *H. fuscus*.

Male animals are often more conspicuous,

Except for the female *H. abdominalis*, at far right, the 12 species represented are life-size adult males.

H. ingens

H. hippocampus

H. reidi

H. fuscus

H. erectus

H. zosterae

PACIFIC OCEAN

NORTH AMERICA

ATLANTIC OCEAN

SOUTH AMERICA

Worldwide distribution

Bobbing in the coastal waters of six continents, seahorses have adapted to blend with local environments. *H. hippocampus* develops prominent skin filaments to match algae in waters throughout the Mediterranean Sea, while tiny *H. bargibanti*—the world's smallest seahorse—grows bumps much like the texture of coral off New Caledonia. The eastern Pacific's *H. ingens*, the world's longest seahorse, can grow to 14 inches.

The home range of the male *H. whitei* seahorse, found off Australia, is limited to about a square yard; the range of his female partner is roughly a hundred times as large. The difference in area reduces competition between the two for food.

In the range of danger

Seahorses are wanted—dead or alive. At least 20 million individuals from the world's roughly 35 species are captured and processed annually for medicines and aphrodisiacs in Asia and for aquarium exhibits, curios, and delicacies worldwide. Dredging and pollution of coastal waters do additional damage by destroying seahorse habitats.

The total number of these fishes, all in the genus *Hippocampus*, is unknown. Yet experts fear that trade and environmental practices already threaten the survival of populations around the globe.

PAINTING BY NATIONAL GEOGRAPHIC ARTIST CHRISTOPHER A. KLEIN

H. comes

H. histrix

H. abdominalis

Female

Embryos

Male

Brood pouch

H. bargibanti

H. whitei

H. breviceps

EUROPE

AFRICA

ASIA

INDIAN OCEAN

AUSTRALIA

The pregnant male

Deposited by the female, eggs are fertilized in the male's brood pouch, here shown in a cutaway view. Each egg embeds in the pouch's soft tissue, including—in most species—a single membrane dividing the pouch. *H. abdominalis*'s large pouch has as many as five membranes, giving more surface area for egg implantation.

Pumping and contorting, a male *H. whitei* (below, at right) attempts to show his mate an empty pouch, ready to receive eggs. These seahorses copulate for mere seconds as the female deposits as many as 200 eggs in the male's ballooning pouch (opposite). She will visit him each morning until the young are born in about 21 days.

colorful, vocal, and aggressive than females. Biologists usually explain these sex differences as arising from competition among males to defeat rivals and attract mates. Most female animals are thought to be too busy producing eggs or providing care to compete hard for males; instead they put the emphasis on choosing good mates.

I reasoned that if this understanding was correct, then perhaps—since male seahorses are preoccupied with pregnancy—female seahorses would compete more intensely for mates and might develop those traits we think of as typically male. To test this, I set up a kind of dating service in the lab. Repeatedly I introduced one male to two females and one female to two males.

Contrary to my predictions, and although both sexes did compete for mates, it became obvious that males are more determined to get pregnant than females are to give eggs away. Males are more active than females in courtship competition—so much so that they have developed special forms of combat.

An eager male is not a tolerant seahorse. He aims his snout at his rival's head, as if lining up a target through a gun sight, and delivers a blow with an upward snap of his snout. Keeling over, the rival shoots backward, swings upright again, and counterattacks. Any female passing between them risks a stray blow.

Tail wrestling seems almost tame by comparison. Seahorses holding tails usually let go easily, but a male intent on mating may refuse to release his rival. The two protagonists thrash about for as long as a minute until one submits by turning a dark color and flattening himself on the seabed.

So despite male pregnancy all seahorses studied to date have the same conventional sex roles in competition as most other animals. This intrigued me because females wait around for males to finish brooding. I wondered why females didn't compete more—and why they never accepted the extra males I offered. To answer these questions, I needed to study a whole community of seahorses, and this could only be done in the wild. Australia is full of pregnant males, so off I went.

"FINDING SEAHORSES is one of my few truly useful skills," I assure my new research assistant, Laila Sadler. She follows my fins as I sink into the predawn murk of Sydney Harbour. It's October, the start of a breeding season that lasts until April. We meander through tangled sea grass, and I peer into the gloom, cursing the elusiveness of seahorses.

Suddenly I spot it—the distinctive tail tip locked onto a looping blade of sea grass. A few inches above the tail, a fishy eye rolls. In between, the rotund form of a pregnant male marks our first seahorse sighting of the year. I tickle the tip of his tail, encouraging him to release his holdfast in favor of my fingers. Gently, I pop him into a nylon bag and attach a marker to the sea grass. We take our seahorse ashore to measure (four and a half inches fully extended), weigh (a quarter ounce), and tag with an identity necklace, a numbered disk hanging on a length of cotton thread. Minutes later he's back in his sea grass meadow.

AMANDA VINCENT, a Canadian zoologist, is now a research fellow at Somerville College in the University of Oxford. This is her first article for NATIONAL GEOGRAPHIC. GEORGE GRALL, staff photographer at the National Aquarium in Baltimore, Maryland, documented life on a wharf piling in the Chesapeake Bay for the July 1992 issue.

Laila and I soon know each one of the hundred *H. whitei* seahorses in our small bay. Using scuba, we track them daily, learning our way around their community and monitoring their reproductive behavior. The early morning starts are tough. We crawl out of bed at 4 a.m., struggle into our still damp wet suits, shrug on our diving gear, and trudge into the turbid water.

Taking a prenatal peek, a seahorse is just an instant away from birth. Males labor for as long as two days to deliver the young, which emerge from their egg sacs and are propelled toward the opening of the brood pouch, where they are expelled in spurts. Whatever the species, all newborn seahorses are about the same size—a quarter to a half inch.

We find that seahorses initially occupy the outer edges of the sea grass meadow, drawn by the opportunity to feed on the shrimps that swarm there. New arrivals settle into the colony with no obvious aggression—resident seahorses simply jostle to make room.

My first target is often male number 35. His ballooning pouch makes it awkward for him to weave among the sea grasses, and he may cling to the same shoot for days. Yet so well camouflaged is he that I sometimes spiral around him several times before spotting his tail, the only part visible from all angles.

Seahorses can blend with their surroundings by growing skin tendrils and becoming shrouded with algae and microorganisms. Most deceptively, many species can change color to match their background perfectly. White, yellow, red, purple, green, whatever it takes. Now and then they get it wrong. One seahorse turned a lurid orange, matching the fluorescent tape of our survey grid. There he clung, a startling flame in a drab world, the exception to seahorse invisibility.

Number 35 and I bob about together. He ambushes passing crustaceans, giving a mighty suck with his long, tubular snout. I fall into watery meditation. Hours may pass.

We are both waiting for his mate to appear, but few things hurry a seahorse. Adapted for maneuverability in complex sea grass habitats, seahorses swim slowly. At last female 10 meanders toward him. The male's home range is about a square yard, whereas his female's can be a hundred times as large, thus reducing competition between them for food. She swims past other males en route, but they ignore each other. Each male is awaiting his own female.

When female 10 nears her pregnant partner, sparks fly—or at least colors change. In seconds they both brighten, changing from drab brown to creamy yellow. They sidle up to each other, heads tucked coyly, grasp the same sea grass shoot with their tails, and begin a slow twirl around the Maypole. Then, with linked tails, they embark on a stately promenade to the next shoot for another twirl or two. Ten minutes of togetherness, and they part company. I close my underwater notebook and seek out the next male.

The greeting ritual between partners takes place every morning during the male's three-week pregnancy and echoes the early stages of courtship. It is the one social interlude in an otherwise solitary day. Partners greet only each other, evidence that seahorses are good at telling

individuals apart. In addition to reinforcing the pair bond, greetings probably cue a female to her mate's impending delivery, enabling her prompt preparation of a new clutch of eggs. Because males are not kept waiting, they are continuously pregnant throughout the season.

From start to finish a male seahorse does all the parenting. His is indeed a real pregnancy, closely resembling that of mammals, including humans. Just as a woman provides her fetus with oxygen, transfers nutrients, and regulates conditions in the uterus, a seahorse does no less for the embryos in his pouch. Remarkably, the hormone prolactin, which stimulates milk production in women, also governs seahorse pregnancy. Perhaps this explains a tantalizing note in the March 1753 issue of *Gentleman's Magazine:* "The ladies make use of them [seahorses] to increase their milk."

Males of the smallest species have fewer than ten offspring. Then there was James from the Caribbean—surely the world record holder for "most young in one pouch." His pouch was only half a tablespoon in volume, but in it were packed 1,572 babies; end to end they would have stretched more than 12 yards.

Occasionally one member of a pair dies or simply disappears. Penguins take seahorses, and crabs are a menace, but fishes often spit them out—too knobbly. Violent storms cast seahorses adrift to wash ashore or die of exhaustion. A newly single female stays in her home range, whereas a bereft male starts roaming once his pouch is empty. Days later, having displayed fruitlessly to female after female, widower stumbles upon widow. *Et voilà*, a new pair!

Seahorses provide the only known example of monogamy in fishes living in sea grasses or mangroves. As far as we know, our pairs never divorce. Nor do they cheat. This is exceptional: New genetic research techniques are revealing that animals we thought of as firmly paired, including many birds, are often not sexually faithful after all. We can be sure of seahorse fidelity because a female's body visibly deflates when she transfers eggs, while the male's pouch inflates; these changes always occur simultaneously. In very few, if any, animals do

Chip on the old block, a newborn *H. whitei* holds fast to its father's coronet. Completely independent after birth, young seahorses grab the first thing they come in contact with. The father, now free of responsibility for the new arrivals, is again ready to be impregnated by his partner in a bond that remains monogamous for at least the duration of the season.

In a tangle of tails and twigs, newborn seahorses drift with their moorings. They feed on larval crustaceans and other zooplankton, sucking them in through pipette-like snouts. Fully formed dorsal fins allow them to swim freely, but many are washed away in turbulent storms or picked off by predators, such as larger fishes, crabs, and waterbirds.

both sexes make it so obvious they have mated.

Why are our seahorses rigidly monogamous? For slow-moving animals that are as thinly spread as these, finding new mates would take substantial time and energy. So males, it seems, sequester their females by mating in synchrony with neighboring males. The compensation for females may be greater reproductive efficiency: Egg transfer is quicker, and broods are larger.

At the end of the breeding season our seahorses move offshore. We think they overwinter in deeper water. We untag them before they leave, lest their necklaces throttle them as they grow. So we don't yet know whether pairs endure from one year to the next.

ONCE YOU START NOTICING THEM, images of seahorses crop up everywhere. You'll see them stenciled on walls in the Paris Métro, carved on boat prows in Thailand, displayed at campgrounds in Florida. I was not, however, expecting to read about seahorses when I glanced up at an electronic bulletin board in central Berlin in late 1990. Seahorses, the news flash said, were "the most valuable fisheries export of the Philippines."

This bolstered my suspicion that the trade in seahorses was not trivial. I had read the advertisements by Japanese companies in *Australian Fisheries*, offering "top prices" for seahorses. I had seen the piles of seahorse key chains—rings punched through their eyes—in a beachfront shop in Thailand. And on a menu in Hobart, Tasmania, I had been horrified to find "Wok-fried seahorses (when available)."

But this was all I had. No hard facts. Just hints and rumors, albeit more and more of those. Gambling on my hunch, NATIONAL GEOGRAPHIC sent me to Asia to investigate.

My quest began in Manila, at the Philippines Bureau of Fisheries and Aquatic Resources, where I discovered that roughly one million dried seahorses were shipped out of the country through official channels in 1987, the last year this information was recorded separately. In exploring the fishery, I traveled to Batasan Island, a mangrove-fringed coral speck in the central Philippines. There I met Custodio Torrein, whose harvest of black and yellow seahorses accounts for nearly two-thirds of his annual income of about a thousand dollars.

"I'm the best collector on Batasan," Torrein asserted. "If the other fishermen collect 25 seahorses in a night, then I get 60."

He dives alone in the dark at low tide, when, he said, seahorses are easier to find. He kills the larger seahorses for the Chinese medicine trade, drying them in the sun. Each fetches about 60 cents, twice what the same size seahorse brings if sold live to the buyer who supplies an aquarium wholesaler on nearby Cebu island. Given that Torrein has six children under the age of 12, providing for his family takes priority over keeping large seahorses alive.

Dead seahorses also go to Cebu. Visiting one dried-fish exporter on the island, I saw huge bags of seahorses amid great heaps of *bêche-de-mer* (sea cucumbers), all destined for Hong Kong. Many of the seahorses had oddly angled heads and straight tails. They had died dangling from string tied around their snouts, their tails flailing. Slowly, they desiccated.

Apart from the Philippines, seahorse exporting countries include Australia, Belize, Brazil, China, Indonesia, Kuwait, Malaysia, Mexico,

A spotted *H. abdominalis* is conspicuous amid three camouflaged *H. breviceps*, whose skin tendrils match the surrounding algae (opposite). Blushing a vivid orange, a male *H. reidi*—recently delivered of young—twirls with his partner in a courtship ritual that may last nine hours, when he again becomes pregnant.

Pakistan, Singapore, Spain, Tanzania, Thailand, the United Arab Emirates, the United States, and Vietnam.

"NORTH IS GINSENG and south is seahorse" goes the Chinese adage, yet the *Divine Peasant's Herbal Compendium*, on which Chinese medicine is based, makes no mention of seahorses. The first recorded use in China was about 400 years ago, long after the Roman natural historian Pliny the Elder reported that "ashes of the seahorse . . . mixed with soda and pig's lard" cured baldness.

Today mainland China is the biggest consumer of seahorses, mostly for pharmaceuticals, followed by Taiwan, Hong Kong, and Singapore. Seahorse-based remedies are said to alleviate problems ranging from asthma and arteriosclerosis to impotence and incontinence. Reputedly they even reduce the phlegm that prompts spitting. Seahorse does not come cheap: In one Hong Kong pharmacy prices ranged from $120 a pound for small brown "inferior" seahorses to $400 a pound for large bleached ones.

By tradition the Chinese pharmacist chops a selected seahorse, grinds it into a powder, and mixes it with other plant and animal ingredients to suit the patient's needs. But, as I found in southern China, this is changing fast.

"Time is becoming more valuable than money," said Mai Zhen Qiu, deputy manager of the thriving Guangzhou Drug Company, explaining the current boom in packaged medicines. Under Mai's guidance I bought several preparations containing seahorse—one claimed to cure "sexual desire going down . . . dizziness . . . aching pain and lassitude of loins and legs . . . postpartum debility, mental distress, and poor appetite." One aphrodisiac was called Monk Jumping Over the Wall. Does it work? I can't say.

Disposable income is a new luxury in China, fueling enormous demand for medicinal animal products. One knowledgeable source estimated that the nation consumed more than 20 tons of seahorses—about six million animals—in 1992. This would represent a tenfold increase over the past decade. What will the next decade bring?

Taiwanese records show imports of about three million dried seahorses in 1993, probably a severe underestimate, given the smuggling across the Taiwan Strait. Hong Kong? At least as many. The U. S., a large consumer of live seahorses for aquariums, imported nearly 200,000 dried ones from the Philippines alone in 1987, perhaps for use in Chinatowns. Other importers include Japan, Singapore, Malaysia, and South Korea.

Merchants invariably told me that demand for seahorses exceeds supply. As a result new fisheries are opening. In their first four months of collecting seahorses in 1992, villagers in Mulimunai in southeastern India brought in nearly a hundred thousand.

The seahorse fishery turns out to be far larger than I had ever imagined. Current evidence indicates a global trade of more than 20 million seahorses annually, although gaps and glaring inconsistencies in the data warn of an even higher total. Most countries do not specifically record seahorse imports and exports, and smuggling is undocumented. No one knows what proportion of the world's seahorse population 20 million is, but losing that number is equivalent to eliminating my Sydney breeding colony 200,000 times every year.

Everything I know about seahorses convinces me that exploiting them at the current rate could lead to widespread population collapse. Fishermen everywhere spoke of diminishing takes or ever smaller seahorses, which suggests a problem. Removing seahorses, which are both predators and prey, could disrupt their ecosystems. And when some collectors harvest seahorses, they tear up sponges and corals as well.

"Such habitat destruction," warns the Indian Central Marine Fisheries Research Institute, "may lead the entire [Indian seahorse] fishery to a vanishing point."

Efforts to protect seahorses will pay dividends because their sea grass, mangrove, and reef habitats also help sustain the world's commercial fisheries. But seahorses should not have to justify their existence; their magic speaks for itself.

How can we ensure their survival? Banning the seahorse trade seems unworkable—too many people depend on it. One option is to modify fishing practices. I was impressed that Custodio Torrein, the Filipino fisherman, holds the pregnant seahorses he collects in a net cage in the sea, harvesting them only after they give birth. We can also protect wild seahorses by establishing reserves in consultation with local people. And perhaps aquaculture can be made viable; the Nha Trang Oceanographic Institute in Vietnam has had some early success where other attempts have failed.

Whatever we try, we will need to understand seahorse biology. My recent research, begun as a theoretical inquiry into sex roles, should lead to improved management and conservation of seahorse communities worldwide. □

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Spotlighted with special probe devices, the Macintosh computers in Lorraine's lab can instantly tabulate scientific data such as temperature, pressure and pH levels.

Lorraine Bratcher's chemistry class is a lot more exciting because she's always blowing things up.

Using Macintosh computers, Lorraine's students now collect and analyze data in create reports they can share with the class.

Forum

Belugas

The June article on whales by Kenneth Norris (no relation) reminded me of an experience at the New York Aquarium many years ago. As my son and I watched, a beluga played with a chewing gum wrapper, gently inhaling the tiny paper, holding it in its mouth for about three seconds, then exhaling it—again and again. The action was so gentle and seemed timed like movements in a ballet exercise. I believe that planning and cause and effect were understood by the beluga, as it tried to use a fraction of its tremendous pent-up energy and intelligence.

LYNNE NORRIS
New Albany, Indiana

The slap at offshore oil drilling was uncalled for in the caption on page 30. Pollution and environmental disruption from such drilling under current standards is minimal. It is well documented that offshore platforms, like sunken planes and ships, are serving as artificial reefs, attracting a variety of sea life. I'm sure the beluga wouldn't object to an increased food supply.

DONALD D. GARDNER
Marietta, Ohio

Central Pennsylvania

Michael Long wrote a terrific article about Pennsylvania, and Bill Luster took some great pictures. But the photo on pages 34-5 shows a man riding what any farm kid knows is a tandem disc, not a harrow, as the caption calls it. A harrow drags and a disc cuts, and we don't usually ride a harrow.

RUSSELL L. STUMP
Manito, Illinois

The picture shows a disc harrow, which, as several readers pointed out, is in many rural areas called simply a disc.

Like Michael Long, I grew up in Altoona. I married someone in the Air Force, never imagining that I would return. When my husband retired this year, he told me our next move was up to me. With the world to choose from, I researched the best cities to raise children in and the best cities to live in. But I had this feeling, "It's time to go home." Maybe, I thought, it's the desire to be near family. Being a family therapist, this concerned me. An unresolved dependency? No. It was the land, my roots. My ancestors are German and English and Welsh. My parents were proud of their history and so am I. I hope to pass on the pride and heritage to my two children.

MARY LEE KELLY
Williamsport, Pennsylvania

I had hoped to read something about famed Horseshoe Curve, noted on the map. Once my older cousins took my brother and me to catch a glimpse of a train going over the mountain pass and around the famous curve. My mother's last words as we left the house were "Stay clear of the railroad tracks!" Needless to say, we hopped the fence to put our ears on the track and listen for oncoming cars. Back home, my mother scolded me sharply for disobeying her. How did she know, I asked her. Without explaining, she summarily sent me to the bathroom to wash the black smudge from my left cheek.

NEIL HALPERN
Seattle, Washington

Cotton

Having toiled in the cotton fields of the San Joaquin Valley, I was particularly pleased with "Cotton, King of Fibers." Jon Thompson superbly demonstrates the multiplicity of environments and peoples that can be revealed through examination of a single commodity. I wish to add that, at least in the United States, all taxpayers are indelibly involved in cotton production through federal crop support and water subsidies. A fuller treatment would have included the inordinate capacity of cotton to deplete soil nutrients.

WILLIAM PRESTON, *Professor of Geography*
California Polytechnic State University
San Luis Obispo, California

Imagine my delight on returning home from my job at a cotton gin to find your article. Imagine my dismay when it deteriorated into an environmental diatribe against cotton farmers. Cotton farmers raise their families on the land they are supposedly destroying; they drink the water they are purportedly polluting, handle the chemicals, and have every motivation to farm in a safe manner. The day that the only cotton available is organically grown will be the day that only the super-rich can afford jeans and T-shirts.

JUDY J. ARNOLD
Kingsville, Texas

As a former plantation owner in southern Georgia who raised cotton in Sumter County, I think two events chased cotton out. One was the appearance of the boll weevil after the War Between the States. But the really important event was that laborers, both black and white, found they could prosper in the North. Many left, and cotton died. The death of cotton forced many growers, including me, into the more prosperous direction of peanuts, cattle, or pine trees.

D. A. CARRISON
Hemet, California

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Some articles don't need maps, but both cotton and powwows are naturals for explanatory maps with illustrations. You are, after all, the National GEOGRAPHIC Society.

JEREMY REISKIND
Winston-Salem, North Carolina

Deafness is certainly a serious condition that may result from unprotected workers operating noisy weaving looms, but a more direct threat to the health of the worker handling cotton in its raw condition is the respiratory ailment byssinosis. This condition occurs when minute fibers of cotton are inhaled deep into the lung tissue. A person exposed to high levels of these fibers without adequate protection (not a makeshift hood over the face as shown on page 80) would risk contracting a health-threatening, even life-threatening, ailment.

K. S. WATSON
Natal, South Africa

Powwows

The powwows visited by writer Michael Parfit and photographer David Alan Harvey demonstrate that by accepting and looking beyond an irretrievable past, Native Americans can help propagate their present culture. Native and other cultures will retain vitality only by centering on themselves, not by searching every horizon for enemies to blame. Culture is, after all, the stories we tell about ourselves, not the stories others tell about us. It's important to remember the past. But as indicated by women in dresses adorned with jingles made from the lids of snuff cans, it's even more important to live in the present. Survival is victory.

J. M. SCHELL
Westminster, Colorado

I praise Michael Parfit's honest portrayal of Native Americans. Often we hear someone speaking about the recent rebirth of Native American culture as if it had vanished. It never disappeared but endured under a dominant white culture. While the edges of the culture evolved, the core remained true in the hearts of the people.

PAUL GILBERT
New York, New York

I would ask that future articles about Native American life be written by someone from within that community. Non-Native Americans need to hear native voices directly rather than through the filter of an outsider, no matter how culturally sensitive or accomplished.

CANDACE S. BROUGHTON
Cattaraugus, New York

Russian Voyage

As editor of *Guide to the Russian Armed Forces*, I would point out two things regarding the Russian Navy, which was mentioned in Miles Clark's fascinating article. The men who boarded the craft were not a "naval party" but members of the Maritime Border Guard, formerly part of the KGB. Also the Russian Navy no longer has light cruisers. Hence it is unlikely that they could have been sighted. More likely they were patrol craft operated by the border troops.

NORMAN POLMAR
Alexandria, Virginia

I was very impressed with your presentation but sorry the author did not mention when passing Saratov the forced exile in 1941 of a half million Volga Germans. The dissolution of the Volga-Russian Autonomous Republic by Stalin prompted an official apology from the Soviet government in 1964.

JACOB F. RUF
Olathe, Kansas

Forum

One of the letters in the June issue, in an effort to give perspective on the use of federal lands for logging, pointed out that Florida grows oranges, Iowa grows corn, and Oregon grows trees. However, there are some differences. Florida citrus farmers and Iowa corn farmers buy their land, cultivate and fertilize their land, plant their fruit trees or corn, and anxiously wait for a harvest subject to the whims of insect pests and weather. They do not have the luxury of purchasing the use of federal lands for a pittance, stripping the land of its resources, and leaving it barren. They do not have the luxury of free roads built by the Forest Service.

SUE F. WALKER
Todd, North Carolina

England's Lake District

I enjoyed Bill Bryson's fine expository writing on England in the August issue, but the final sentence on page 30 incorrectly states that 3.5 million British pounds equates to 2.4 million dollars U. S. May I suggest that you recheck your arithmetic, or possibly this was done intentionally to further entice American tourists.

BERNARD N. WAXMAN
Revere, Massachusetts

Americans need no additional enticement to visit England, but we certainly need to sharpen our math. We mistakenly divided, rather than multiplied, pounds by the exchange rate at press time—$1.42 to the pound. The figure should read $4,970,000. Erroneous dollar figures on pages 21 and 31 should be multiplied by 1.42 to get pounds, then again by 1.42 for the correct dollar equivalent. Our staff is now enrolled in remedial arithmetic.

Letters should be addressed to FORUM, *National Geographic Magazine, Box 37448, Washington, D. C. 20013-7448, and should include the sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.*

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To some, the new Lumina may come as a genuine surprise.

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With so many standard featur room for six adults in there.

The Lumina you were just admiring (go ahead and take another look, we'll wait for you) comes with a range of standard equipment that, not too long ago, would have been thought impossible for a car in its price range.

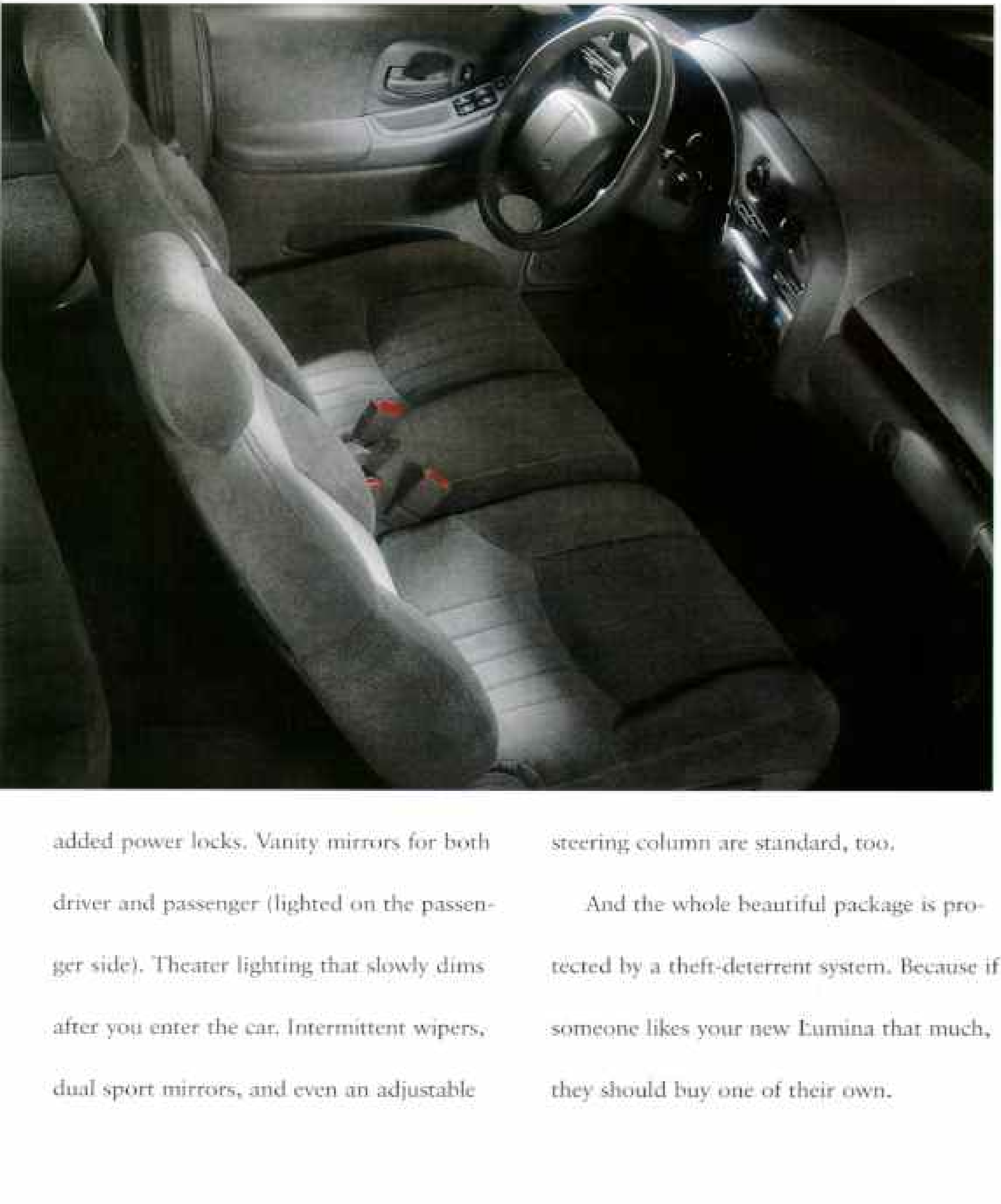
At the top of the list is a sophisticated 4-speed automatic transmission. Combined with a fuel-injected, 160-horsepower V6, it delivers power to the front wheels as quickly as your right foot can ask it to. So you'll be comfortable with all that power, a quick-cooling air conditioning system with CFC-free refrigerant also comes as standard equipment.

We designed seating areas that not only look comfortable, but actually are comfortable – even for hours at a time. And

we made the front seats adjustable four different ways, so you can find the perfect driving position.

Then we got off our seats and turned our attention to the rest of the cabin. We

es, it's surprising there's still



added power locks. Vanity mirrors for both driver and passenger (lighted on the passenger side). Theater lighting that slowly dims after you enter the car. Intermittent wipers, dual sport mirrors, and even an adjustable steering column are standard, too.

And the whole beautiful package is protected by a theft-deterrent system. Because if someone likes your new Eumina that much, they should buy one of their own.

Dual air bags. Crush zones. An secure investment, doesn't it.

In talking to thousands of people about what was most important to them in a new car, one message came through loud and clear: Make it safe.

This rather ordinary-looking piece of hardware helps monitor the status of the supplemental restraint system (standard dual air bags, to you). For added reliability, contact points are plated with 18K gold. (Too bad you'll probably never see it in your new Lumina.)

The new Lumina proves how carefully we were listening.

Our idea of a safe car is one that helps you avoid an accident in the first place. That means engineering a car that behaves predictably; one that gives you confidence in even the most challenging driving situations.

It's a simple fact: the more you trust your car, the more assured your driving. So we gave the new Lumina crisp, accurate handling through its fully independent suspension and front and rear stabilizer bars.

We reduced body roll in turns and front end dive in sudden stops. We even made the low-end throttle more responsive, to help you maneuver more decisively through traffic. To increase structural integrity, we reduced the number of individual components and stamping operations required to build the body. So the new Lumina not only feels more solid, it actually is more solid.

Sunny today, showers tonight. Fortunately, available anti-lock brakes in the new Lumina are a lot more dependable than the weather.

The standard dual air bags went through rigorous testing, simulating real-world driving situations.

Inside, we designed an instrument

ti-lock brakes. Sounds like a

A stiffer steel frame makes the new Lumina more predictable and responsive.

package where everything is right where it should be. We placed controls within easy reach. Every surface and instrument was tested, and interior lighting calibrated, to be harmonious, glare-free and easy on the eyes. That reduces the chance of fatigue, even on long trips. Finally, we made anti-lock brakes available at all four corners.

But even the most careful drivers sometimes run head-on into the unavoidable. So every new Lumina is equipped with dual air bags.*

A steel safety cage surrounds the entire cabin. Side-guard door beams are welded into all four doors. And we designed crumple zones into both front and rear, to absorb the force of a collision before it reaches you. Perhaps most important of all, we figured out a way to add all these safety features into the new Lumina without adding thousands of dollars to the price.

If you're looking for a definition of Genuine Chevrolet, there it is.

The coolant in the standard air conditioning unit is CFC-free.

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Like Father, Like Son: To the Top of Everest

ANNIE GRIFFITHS BELT

Brent Bishop, 27, reached the 29,028-foot summit of Mount Everest last May on an expedition that also hauled trash off the world's highest mountain. He followed in the bootsteps of his father, Geographic staffer Barry C. Bishop (below), who, with five companions, made the first American conquest of Everest 31 years ago on a climb sponsored in part by the Society.

Thus the Bishops (right) became the first U. S. father and son to achieve the top of the world. The elder Bishop described his adventure in the October 1963 NATIONAL GEOGRAPHIC. He went on to earn a Ph.D. in geography from the

LUTHER G. JERSTAD

University of Chicago and to become a vice president of the National Geographic Society and chairman of its Committee for Research and Exploration. He retires this year.

Young Bishop (right) attained the summit with teammates Scott Fischer and Rob Hess on his first expedition in the Himalaya. "We got lucky planning the final assault from 26,200 feet," says Brent. "The wind died down, and we had perfect snow conditions. Rob, Scott, and I left the South Col at 12:45 a.m., made the summit by 9:45, and were back at the South Col by 12:30 p.m." Another teammate, Steve Goryl, a day behind the group, was held up by high winds at the South Col and made the summit four days later.

Brent first donned climbing boots as a five-year-old to clamber up

SCOTT FISCHER

nearby hills with his father. Proud of his Everest success—he is one of only 600 climbers to achieve it—Brent still found the experience exhausting. "With the lack of oxygen, it's an effort to do anything. It's cold; your body is dying a little bit every day you're up there. And on the way down, I passed the bodies of five climbers, left where they had died during previous expeditions because they couldn't be safely brought down. That woke me up; hey, this is a dangerous place."

With a master's degree in environmental management, Brent was anxious to try a plan to get trash off the mountain. Under his scheme Sherpa porters who toted supplies to high campsites received bonuses for carrying down a total of 5,000 pounds of trash. Most of it was oxygen bottles, like the Russian one he holds on his lap, discarded by earlier climbers.

Throughout his climb Brent thought of his father. "It was really motivating," he says. "It gave me a tremendous amount of respect for what he did." He also remembered that his father suffered frostbite and lost all his toes and the tips of his little fingers. Brent now quips, "I worried that maybe I was genetically predisposed to frostbite." But he made it with toes and fingers intact and has returned to his job as a guide in the Tetons.

National Geographic, October 1994

Geographica

Olmec Head Emerges From a Mexican Ravine

The archaeological field season in Veracruz was drawing to a close last May when a magnetic locator "started buzzing like crazy," Ann Cyphers Guillén recalls. As she and her team scraped several inches of dirt from the bottom of a ravine to find the cause, a huge nose and eyes appeared.

Guillén had discovered a six-foot-high Olmec head lying on its side, the seventeenth found in Middle America and the tenth at the Olmec site of San Lorenzo (GEOGRAPHIC, November 1993).

The basalt head with a carved helmet bearing a claw and square beads was created between 1200 and 900 B.C. At some point it tumbled into the ravine and disappeared beneath a thin layer of dirt.

"Olmec heads appear to be portraits; their features differ just as any two faces do," says Guillén, a National Autonomous University of Mexico scholar. "The helmet may be an insignia of rulership."

Guillén jokes that local people had thought she was "a terrible archaeologist" because she had not found an Olmec head. "Now they say I'm the greatest archaeologist in the world."

SYDNEY E. STUART, NGS

STEVEN PUMPHREY

A New Clue to Climate of a Certain Vintage

Most wine buyers worry about bouquet, flavor, color. Neil Ingraham and Eric Caldwell worry about hydrogen and oxygen isotopes.

The scientists, working at the Desert Research Institute in Nevada, will be using a new computer model that predicts temperature and precipitation throughout the western United States. To validate the model, they needed more detailed data than normal weather records provide, and they turned to California wines from a nonirrigated vineyard in the Napa Valley. They have analyzed wines dating back to 1961 for differences in the ratio of light and heavy isotopes of both hydrogen and oxygen; the ratio varies depending on rain, wind, and other factors. "Grape vines soak up water and store it in the grape. A bottle of wine is a perfectly preserved sample of precipitation," Ingraham says.

Oriole by Another Name Just Isn't the Same

What's in a name? A great deal to an oriole—or a Baltimorean.

In 1973 the American Ornithologists' Union (AOU)—the ultimate arbiter of common and scientific names for North American birds—wiped out the Baltimore oriole. Research showed that the bird, found in the eastern United States, and the Bullock's oriole, found in the western U. S., interbred where their ranges overlapped in the plains. So the AOU merged the two species into one: the northern oriole.

Residents of Baltimore, Maryland, especially fans of its baseball team, the Orioles, were outraged. More recent studies offer them hope. The data show no gene flow east or west, suggesting that there really are two species. And now an AOU committee is debating whether to split the birds again and restore their old names.

There is precedent. The AOU's *Check-list of North American Birds* and its 1994 supplement identify 1,968 species, including some revisions. The blue-rumped parrotlet again is the Mexican parrotlet; four honeycreepers got back old Hawaiian names; and the black petrel was renamed the Parkinson's petrel.

RICHARD THOMPSON

National Geographic, October 1994

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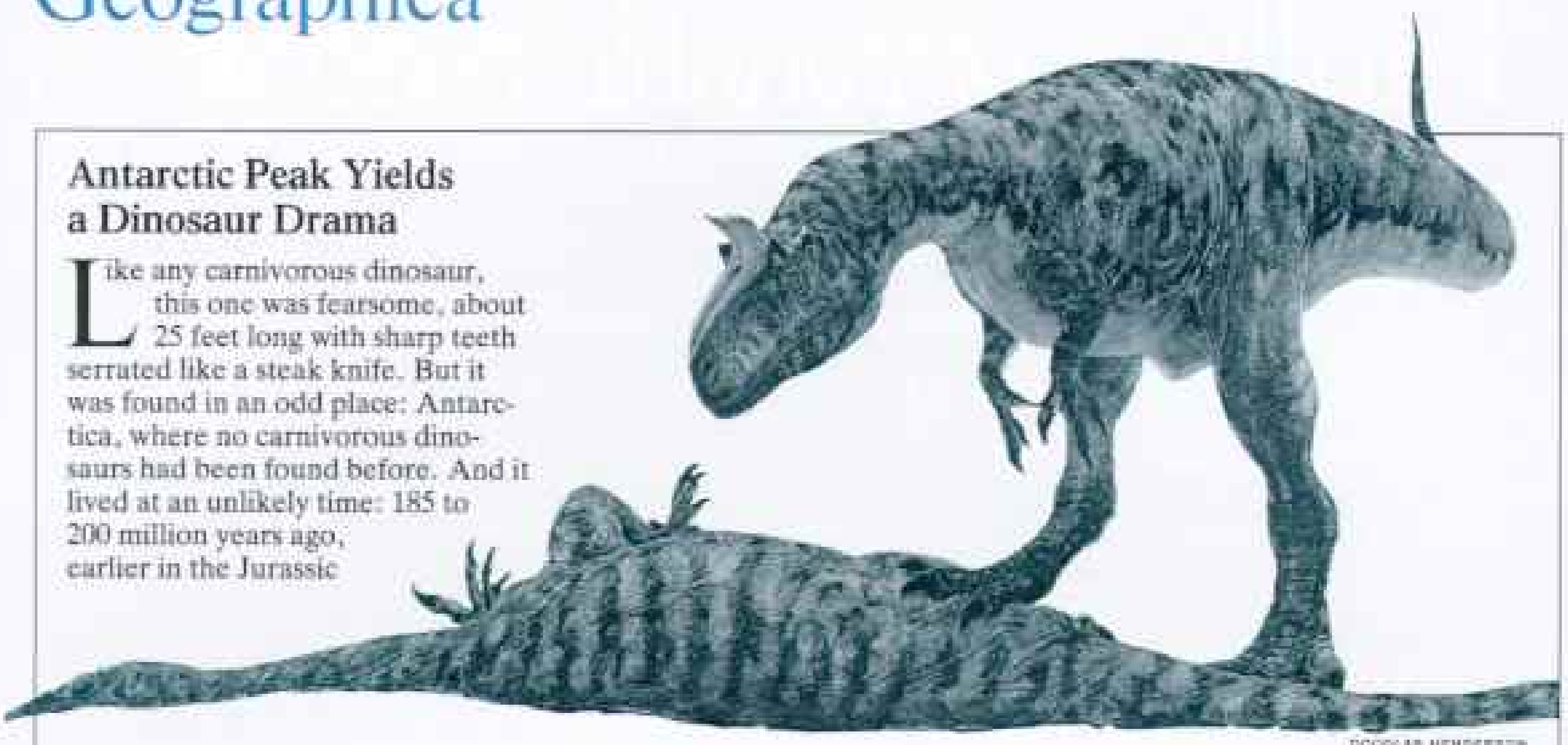
Antarctic Peak Yields a Dinosaur Drama

Like any carnivorous dinosaur, this one was fearsome, about 25 feet long with sharp teeth serrated like a steak knife. But it was found in an odd place: Antarctica, where no carnivorous dinosaurs had been found before. And it lived at an unlikely time: 185 to 200 million years ago, earlier in the Jurassic period than most other meat-eating dinosaurs anywhere. It may have died an untimely death from choking on its dinner. Amid its huge bones was a jumble of remains of a prosauropod, a herbivorous dinosaur about the same size.



DOUGLAS HENDERSON

William R. Hammer of Augustana College in Illinois and his team had been searching for fossils of extinct amphibians near the Beardmore Glacier, 400 miles from the South Pole, when a colleague suggested that he check out some fossils on Mount Kirkpatrick, 12,500 feet above sea level.

The carnivore he found there had an intricate crest running across the skull, not along the length like those of other crested dinosaurs. "It may have served as a mating display, like a peacock's tail," says Hammer.

Because of the crest and the biting cold that never topped minus 25°F at the site, he named the genus *Cryolophosaurus:* frozen crested lizard. The species is *ellioti*, after a colleague.

Most other large meat-eating dinosaurs have been found in the Northern Hemisphere. At the time *Cryolophosaurus* lived, Antarctica was farther north, still part of the supercontinent Gondwana. The dinosaur's death site lay at about 60° south latitude. "We envision the climate as resembling that of British Columbia today—at least seasonally warm. I suspect in cold months the animals migrated or hibernated," Hammer says.

IRA BLOCK

Railroading's Early Glory Lives On in Savannah

"To say that Savannah, Georgia, is likely to have the most complete and elegant railroad [complex] in the country (besides it also being one of the largest), may be a matter of some surprise to northern and western railroad men," a New York railroad journal said in 1855.

Six buildings still stand from the original pre-Civil War manufacturing and repair facility, built for the Central of Georgia Railroad when vast loads of cotton rolled over its 192 miles of track. With additional structures, including a 1926 roundhouse (above), the complex was used until 1963 and is today the most significant collection of early U. S. railroad buildings in existence.

The Coastal Heritage Society is renovating the facility, acquiring vintage rolling stock and creating exhibits to explain the heyday of rail to a jet-age audience.

A Complete Census of Mesoamerican Flora

When botanists in Costa Rica were surveying plants, they stumbled across an unfamiliar tree with pointed leaves (below). New to science, *Ruptilocarpon caracolito* belongs to a family of trees previously known only in Africa.

The discovery came during a project to collect and identify every plant in Central America and southern Mexico—some 18,000 species—and to describe them in a seven-volume compendium called *Flora Mesoamericana*. Begun in 1980, the project is the brainchild of Peter Raven, director of the Missouri Botanical Garden, which is publishing the *Flora* with the National Autonomous University of Mexico and the Natural History Museum in London. "Because Mesoamerica is a land bridge connecting two continents, it's an incredibly rich region," says co-editor Gerrit Davidse.

—Boris Weintraub

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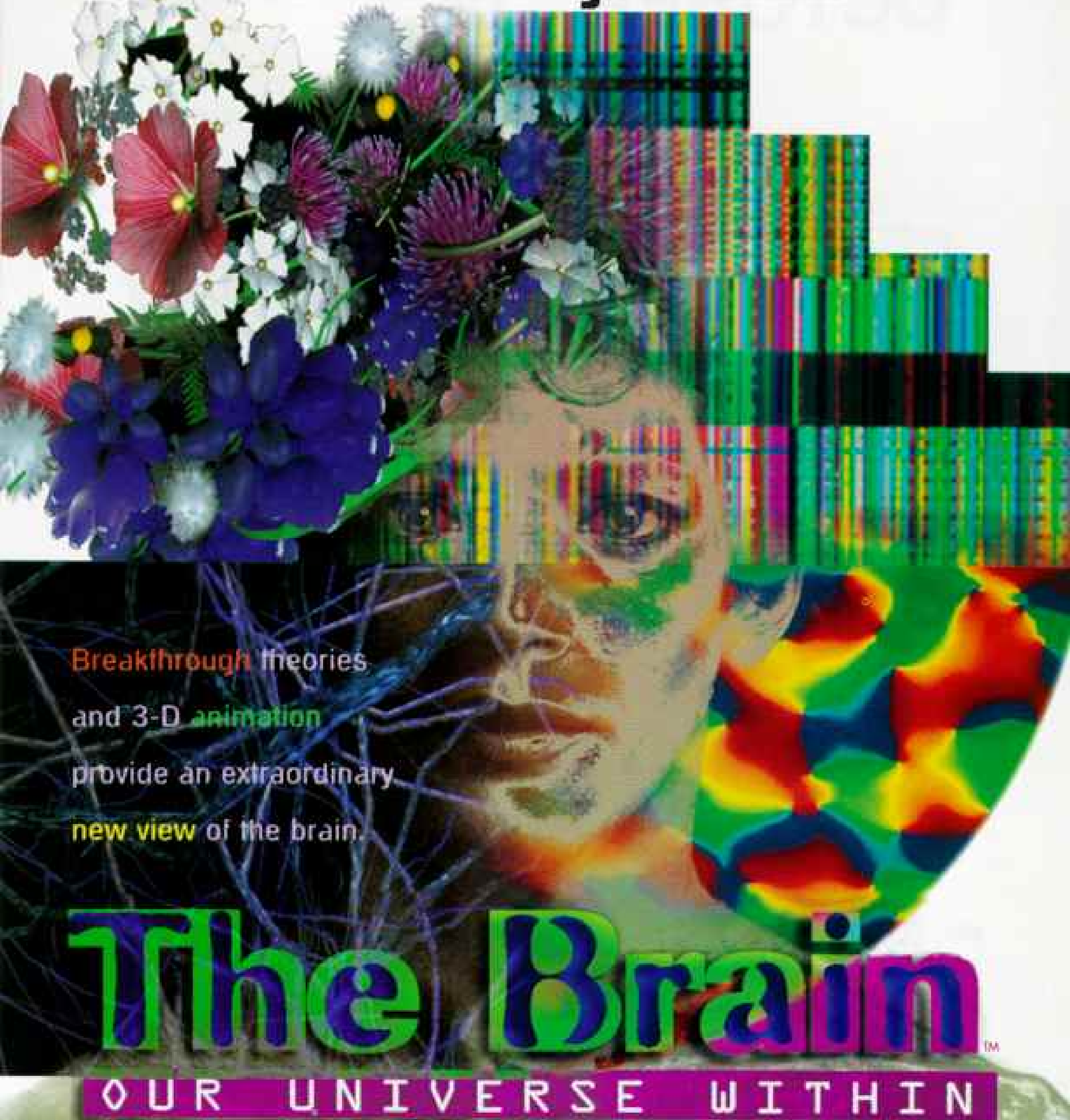

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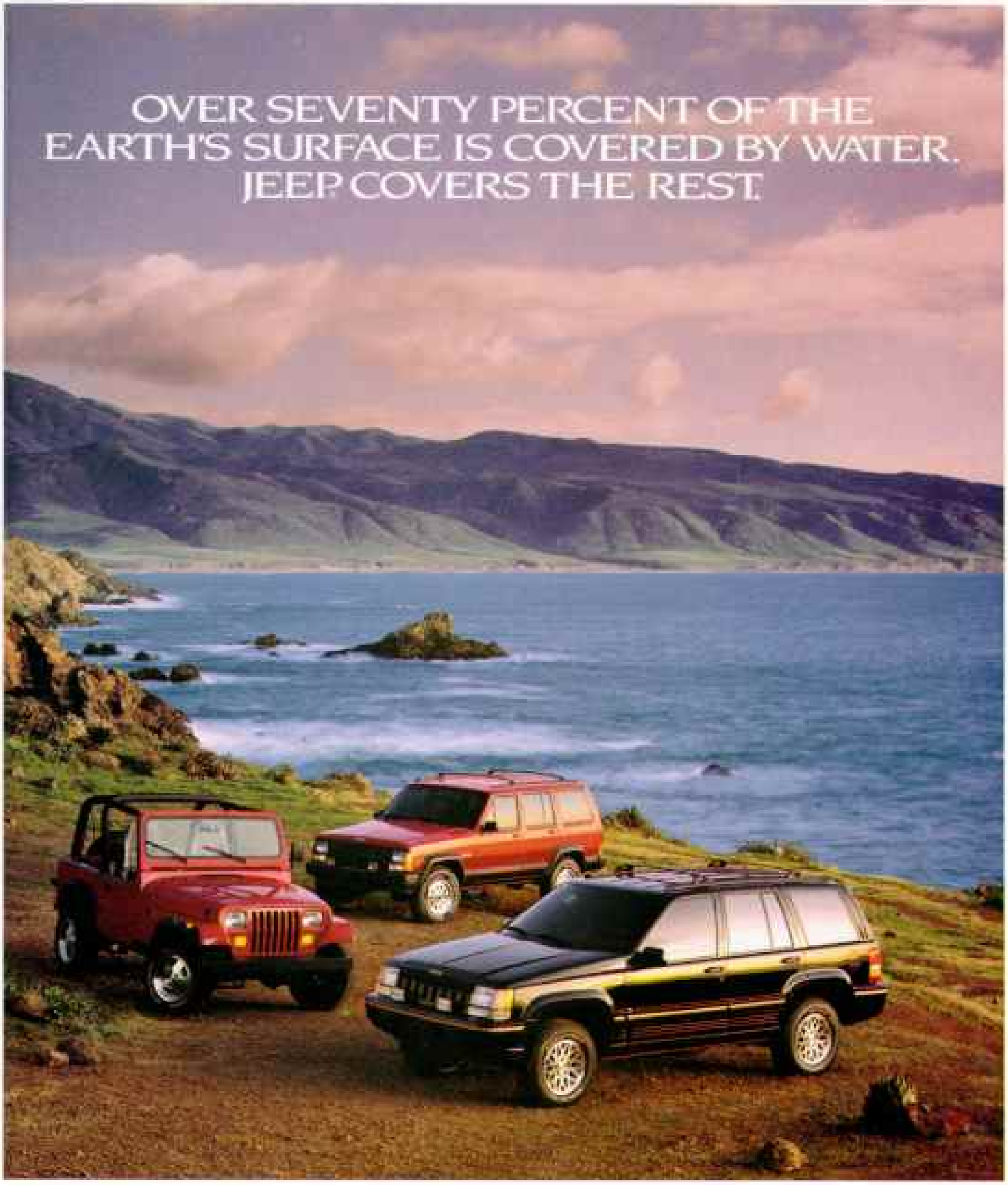

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On Television

ALL FROM RIVER FILMS

Rooted in Place: Life and Death in a Chinese Town

The quest of filmmaker Phil Agland to chronicle the daily personal dramas of a small Chinese town took five years. For two years Agland negotiated to get permission to film without restriction. Then he lived and worked in mountainous Yunnan Province with his crew for another two years before returning home to England to edit his 55 miles of footage.

His film "China: Beyond the Clouds" brings home the joys and struggles of families he came to know in the market town of Lijiang and surrounding countryside (top).

The central drama of the two-part program, to be aired on back-to-back nights on PBS, follows the consequences that flow from a murder. Seventeen-year-old Asan, nephew of the town's personable butcher, Mr. Mu, is killed by members of a local gang. The slaying reflects a nationwide problem: juvenile crime, aggravated by rising unemployment.

The killing strikes at people's sense of security, creating an anxiety one grandmother allays by renting her house as a police station. "It's so nice having you boys here. I feel so much safer," she says as the camera pulls back to reveal 25 officers.

The murder case and how the still evolving justice system deals with it do not obscure the evocative beauty of the canal-laced wooden town, crowded with diverse ethnic groups.

In the marketplace (center), two women of the Naxi minority barter. Their ancestors once dominated the Lijiang region; today Han Chinese make up the majority. A member of the Yi minority, one of China's largest, Mrs. Lu (left) farms on Jade Dragon Mountain, while in town the clinic of acupuncturist Dr. Tang (right) serves as an informal center for passing on news and gossip from all quarters—as the seasons of village life turn and turn again.

"China: Beyond the Clouds" will be broadcast October 3 and 4 from 8 to 10 p.m. ET on PBS.

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so it's right that
how they're built."

"What do people love about our cars? What are their gripes?" And they're not just asking for her advice. They're acting on it. Which makes sense. Because General Motors is out to build the cars and trucks customers really want. And who knows more about GM customers than the dealers, like Lisa, who make their living listening to them?

Earth Almanac

No Trash Talk for Polyester—It's Recycled

Polyester leisure suits, in the world of fashion, are dead and buried. But a refined recycling process is granting polyester a new life, especially in the great outdoors.

Because polyester is oil based, it normally has an environmental strike against it. But two years ago a manufacturing breakthrough resulted in a super-thin fiber that enabled outdoor outfitters to market polyester sportswear made from recycled plastic bottles. It takes about 25 bottles to make one polyester sweater, like these sold by Patagonia, first retailer in the field. For greater durability, the sweaters contain 20 percent "virgin" polyester.

A New Jersey firm, Wellman Inc., the world's largest recycler of plastic bottles, produces the only 100 percent recycled polyester fiber. Bottles made of a plastic called PET—pure enough to drink from—are chipped, melted, and filtered. The liquid is extruded into fiber as thin as human hair.

"More than 60 mills and manufacturers buy the fiber we make from recycled bottles," says Wellman's Judith Langan.

MARIA STENZEL

STEPHEN DALTON/OXFORD SCIENTIFIC FILMS

Multinational European Accord Gives Bats a Boost

Homing in on an insect meal (above), a bat takes advantage of a complex system of echolocation. But no bat's radar system can detect national borders. Flying across one, the animal may leave a country that protects bats and enter one that doesn't.

Last January the Agreement on the Conservation of Bats in Europe took effect; 13 nations have now signed—from Norway to Portugal. Spearheaded by Britain, the pact aims for coordinated protection of Europe's 30 bat species, both in their summer breeding range and in winter hibernation sites.

Case in point: This greater horseshoe bat migrates seasonally between the Netherlands, Germany, Belgium, France, and Luxembourg.

"These bats have declined dramatically in Europe," says Tony Hutson of Britain's Bat Conservation Trust. "Where once there were thousands, now only hundreds remain. Caves and abandoned mines are important roosting sites, but all across Europe caves are being disturbed by developers and spelunkers, and mines are being sealed up or reworked for other minerals. This agreement will help safeguard the network of roosts and feeding sites needed to maintain healthy bat populations."

Mamba Love It Isn't—It Takes Two to Tangle

Swaying to their own serpentine beat, a pair of black mambas begin to wrap around each other—seemingly mating, or at least courting. That's what Adrian Warren thought when he photographed the mambas—Africa's longest venomous snake, up to 14 feet—in Rwanda's Akagera National Park.

But appearances deceive. These are two males wrestling over rights to a nearby female. "The winner repeatedly pins the loser's head to the ground," says Harry Greene, a herpetologist at the University of California at Berkeley. "The loser loses interest in mating." Greene says male combat also occurs among other snakes, such as copperheads. In actual mating, male and female are entwined but remain on the ground.

ADRIAN WARREN

National Geographic, October 1994


"The first time I gave her a diamond ring my hands trembled. This time, hers will."
I'll always remember that face.
The smile bordering on a tear.
Eyes as lively as the diamond
I nervously slipped on her finger.
And now that we have come
so far together, perhaps it's time
to celebrate that love, again,
with a diamond as exceptional
as our love.
Exceptional woman.
Exceptional diamond.
An exceptional diamond of two carats, or more, is so rare that fewer than one percent of women will ever own one. If you are considering an important diamond gift for your wife, like this ring featuring a brilliantly cut 2.05-carat center stone, simply call for your guide to a diamond's quality and value, as well as the name of your local expert diamond jeweler. 1-800-241-9444.
De Beers
A diamond is forever.

EarthAlmanac

COLIN HUNTER, SEA MAMMAL RESEARCH UNIT

Tracking the Sea's Dive Masters: Elephant Seals

Until recently the sperm whale was considered the superlative submarine athlete. Presumably to do Jules Verne-like battle with giant squid, sperm whales can dive nearly a mile to the seafloor. They can stay submerged for about an hour. But now there's a new champion—the southern elephant seal. The seals can match the whales' depth, and they can stay down twice as long.

In icy Antarctic waters southern elephant seals depend on such prowess to feed on squid and fish. Since 1990 the Sea Mammal Research Unit in Cambridge, England, has measured their performance. "They have generated some amazing data," says project coordinator Mike Fedak. Rather than radio collars, which don't fit well on the seals' slippery bodies, the scientists glue tiny data-logging transmitters atop their heads (above). Researchers have successfully used the transmitters on other seal species as well as on beluga whales and narwhals.

The transmitters beam the seals' positions to a satellite. It relays the data to a computer, which can create an image of the dives, like this one (above right) showing the tracks of five seals in various colors.

Shown in red, one female began at South Georgia Island, at left, and swam to the Antarctic Peninsula, upper right, where she dived nonstop for 40 days to about 2,500 feet. She swung over to the Falkland Islands, arrow at right, then headed back to South Georgia—covering 3,300 miles in 240 days.

SEA MAMMAL RESEARCH UNIT

Do Lawyers Waste Paper? Yes, Ipso Facto

Does the legal profession need its own sawmills? Perhaps California's 116,000 lawyers do. Each uses an average of one ton of paper per year, which adds up to two million trees. Some 300 million sheets—enough to bury San Francisco's financial district nine sheets deep—are filed with state courts alone. And paper accounts for about 35 percent of the state's 40 million tons of annual solid waste.

In 1992 the Sierra Club Legal Defense Fund petitioned the California Judicial Council to require all lawyers to use recycled paper and to print court documents on both sides. Last November the council finally ruled that recycled paper must be used for original documents—but not until next year. The rule will not apply to copies until 1996. The council offered no mechanism for enforcement, nor was the two-sided printing question addressed.

In such a progressive state "it's sad for these delays to happen," says Deborah Reames, the Defense Fund attorney who filed the petition. She notes that Colorado, Florida, and Montana have already adopted such measures.

—JOHN L. ELLIOT

DAVID CLARK

National Geographic, October 1994

Corncrake *Genus: Crex* *Species: crex* ***Adult size:*** *Length, 27–30 cm* ***Adult weight:*** *Males average 168 g; females slightly less* ***Habitat:*** *Grasslands and herbage in the northern Palearctic* ***Surviving number:*** *Estimated at fewer than 6,000 in Western Europe; unknown but declining elsewhere*
Photographed by Bobby Smith

WILDLIFE AS CANON SEES IT

The corncrake is rarely seen but its rasping "crek crek" call was once a familiar sound on warm summer nights. Wintering mainly in southeastern Africa, corncrakes return to their northern habitat to nest on the ground in meadows and hayfields and raise a brood of 8–12 tiny black chicks. Habitat changes brought about by modern farming methods and land development have caused corncrakes to decline rapidly over the last century. To save endangered species, it is vital to protect their habitats and understand the role of each species within the earth's ecosystems. As a global corporation committed to social and environmental concerns, we hope to foster a greater awareness of our common obligation to ensure that the earth's life-sustaining ecology survives intact for future generations.

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NATURE

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This program is funded, in part, by Canon U.S.A., Inc.

Canon

The ***Wildlife As Canon Sees It*** photo book is available for US$25.00 from Mediahouse Inc., C.P.O. Box 1333, Tokyo, Japan.

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DAVID DUBNUET

Camera fever runs in the family of staff photographer SAM ABELL (right, in northwest Australia). While he was growing up in Sylvania, Ohio, his father and grandfather were both photo enthusiasts, and young Sam's happiest moments were spent in his dad's basement darkroom—a converted fruit cellar. When, as a boy, he couldn't stay up late to finish developing their pictures, he'd wake in the morning to find the completed prints by his bedside.

In 1967 Sam won a college photography internship at National Geographic. In 1970, a year after his graduation from the University of Kentucky at Lexington, he came back to the Society, bringing his special sensibilities to subjects as diverse as the Shakers, Lewis Carroll, Leo Tolstoy, and the Appalachian Trail.

A collection of Sam's most powerful photographs, *Stay This Moment*, was jointly published in 1990 by Eastman Kodak and Thomasson-Grant.

"I think of it as a mid-career retrospective," Sam says of the book. "Its publication was a real high point for me."

Then he had an idea: National Geographic had become a world center for photography; why not put together a book featuring the Society's best work? Sam pursued the idea with writer-photo editor Leah Bendavid-Val, a longtime collaborator, and *National Geographic: The Photographs* was born. For Sam Abell—whose father and grandfather showed him how to look at life through the viewfinder—it was a labor of love.

TOMASZ TOMASZEWSKI

"If the wind had changed, we would have whipped everybody there," claims writer THOMAS J. ABERCROMBIE (right) of a build-your-own-boat race on the Olympic Basin in Montreal. Though an experienced sailor, the author of this issue's St. Lawrence story finished "very near last" among the race's 42 competitors. "Fortunately, they only kept track of who won."

Contest rules limited participants to spending just $75 (U. S.) in materials and three hours in construction. National Geographic Society President Gil Grosvenor—himself an able carpenter—pitched in with Tom's son, Bruce, and vast quantities of duct tape to help Abercrombie bring the boat in under budget. Bringing it in under sail proved a bit more difficult.

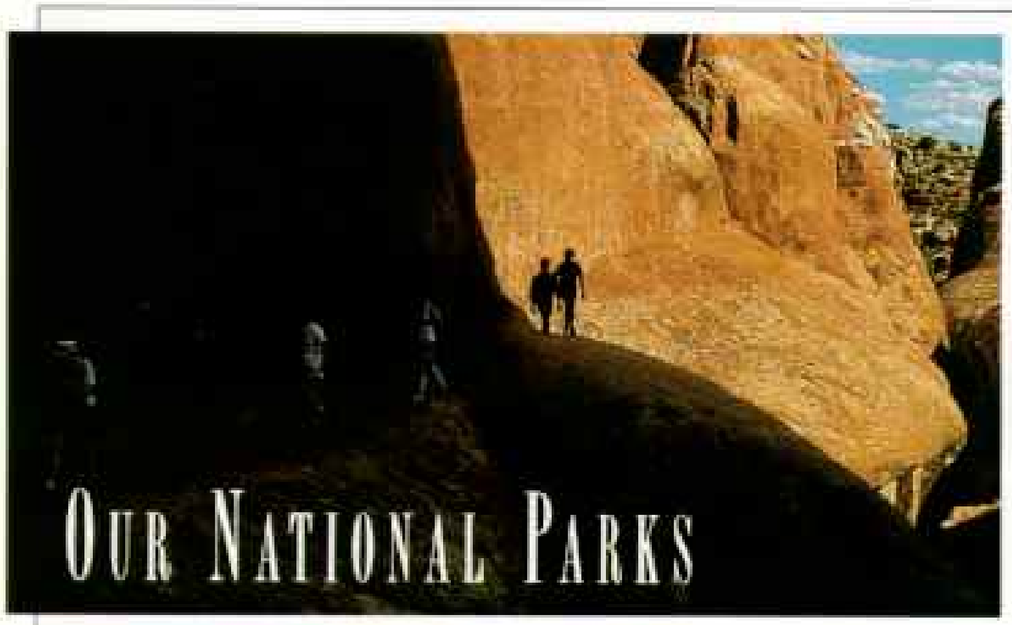
The race involved two legs—rowing upwind and sailing downwind. "Our all-purpose spritsail was less efficient than the other competitors' square sails," Tom recalls. "At least I made good time on the rowing."

As well he should. As a native of Stillwater, Minnesota, Tom grew up with oars in his hands. After majoring in art and journalism at Macalester College, he worked as a newspaper photographer in Fargo, North Dakota, and Milwaukee, Wisconsin. In 1956 Tom came, as a photographer, to NATIONAL GEOGRAPHIC, adding writer to his job description a year later. He wrote and/or photographed 42 articles in his award-winning career, reporting on places from Switzerland to the South Pole. But the Middle East was his real beat, and Tom gave readers memorable looks at Saudi Arabia, the Persian Gulf, and the route of 14th-century traveler Ibn Battuta. Though he retired this year, he will continue to write for the magazine on a freelance basis.

Tom is married to his high school sweetheart, Lynn, a photographer who, after raising their two children, often joined Tom on assignment. They live by the water in Shady Side, Maryland, where their boat has all kinds of sails and seats more than one person.

NATIONAL GEOGRAPHIC (ISSN 0027-9358) IS PUBLISHED MONTHLY BY THE NATIONAL GEOGRAPHIC SOCIETY, 1145 17TH ST. N.W., WASHINGTON, D. C. 20036-4688. $24.00 A YEAR, $2.95 A COPY. SECOND-CLASS POSTAGE PAID AT WASHINGTON, D. C., AND ELSEWHERE. POSTMASTER: SEND ADDRESS CHANGES TO NATIONAL GEOGRAPHIC, P. O. BOX 2174, WASHINGTON, D. C. 20013.

Geoguide



BOTH BY MELISSA FARLOW

On a tour of a park, ask one of the rangers what problems the facility faces. How can they be solved? What volunteer efforts could help maintain the site in top condition?

• Yellowstone National Park, the nation's first, lies along the Continental Divide. In an atlas, find the mountain range that forms most of the Continental Divide in the U. S. and Canada.

Depending on where it falls along the Continental Divide, a drop of rainwater eventually flows into one of four large bodies of salt water—one of two gulfs, a bay, or an ocean. Which bodies of water are they?

SANDSTONE FORMATIONS DWARF VISITORS AT ARCHES NATIONAL PARK IN UTAH (UPPER LEFT). TO REDUCE TRAFFIC AT YOSEMITE NATIONAL PARK, THE PARK SERVICE PROVIDES SHUTTLE BUSES—THEMSELVES OFTEN OVERCROWDED, AS ONE LITTLE GIRL (LEFT) DISCOVERS. THE GRAPH BELOW SHOWS THAT THE NUMBER OF VISITORS TO NATIONAL PARKS HAS BEEN STEADILY CLIMBING.

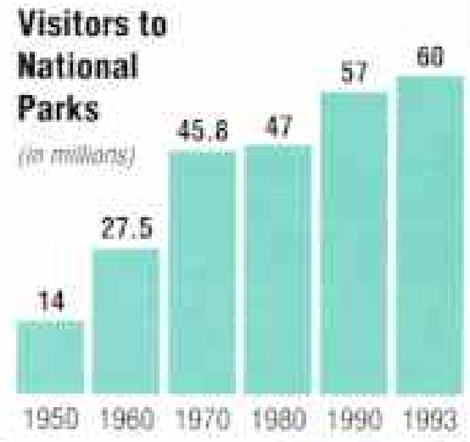
• The graph at right shows the increasing number of visitors to U. S. national parks since 1950. About how many times more people visited parks in 1993 than in 1950? In what ways might a park suffer from a surge of visitors? What might explain why parks are more crowded now than they were 40 years ago?

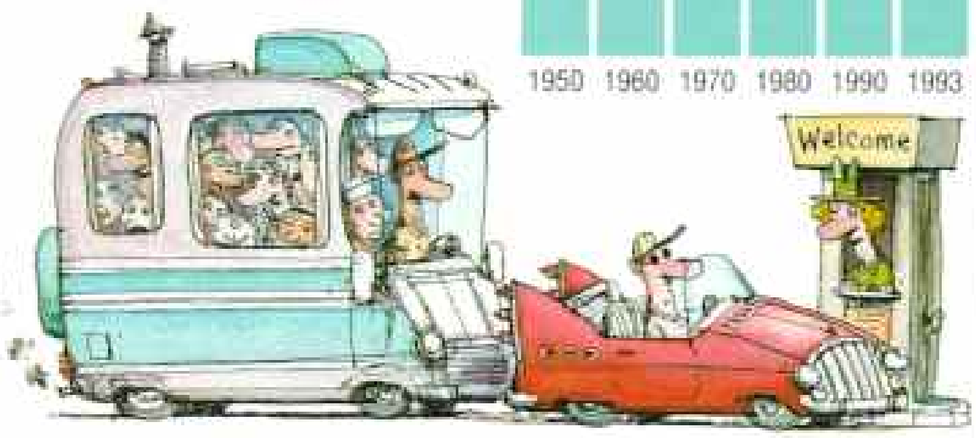
• How should parks deal with the growing crowds? Should the number of visitors be limited? If so, what would be a fair system?

Or should more roads, hotels, and paved walkways be built to serve more and more citizens who want to see their parks?

• The National Park Service oversees more than national parks. It is also responsible for monuments, parkways, memorials, recreation areas, trails, and various other facilities. The map on pages 31-32 shows these sites. How many different geographic terms—such as mountain, seashore, and lake—can you find in the names of National Park Service sites? How many sites are shown in your state?

• Chances are that at least one of the Park Service's nearly 370 facilities is close enough for you to visit in a day.





RICHARD THOMPSON

USE THE GEOGUIDE PAGE ALONG WITH THE ARTICLE "OUR NATIONAL PARKS" IN THIS ISSUE TO HELP CAPTURE THE INTEREST OF YOUNG READERS AND STIMULATE DISCUSSION WITH THEM. GEOGUIDE IS FEATURED FOUR TIMES A YEAR.

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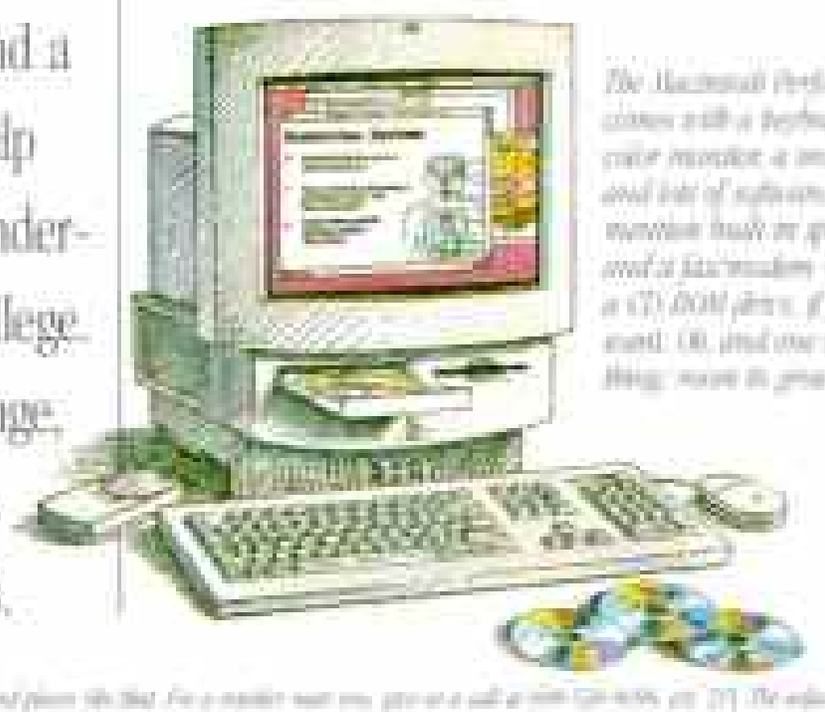

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