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COVER: Netted for easy handling, a red wolf pup gets kid-glove treatment at a captive-breeding facility—best hope for many endangered species. Photograph by Joel Sartore.

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DEAD OR ALIVE

The Endangered Species Act

Heartbeats from extinction, many creatures owe their survival to a tough and controversial federal law. Two that are barely holding on are the black-footed ferret and the whooping crane. One of the original species protected under the 1973 law, the whooper is still so close to extinction that each fatality, like this bird in New Mexico dead of avian cholera, is a setback. With the law up for reauthorization, the nation is weighing not just its benefits but also its costs.

By DOUGLAS H. CHADWICK

Photographs by JOEL SARTORE

"In the relations of man with the animals, with the flowers, with the objects of creation, there is a great ethic, scarcely

perceived as yet, which will at length break forth into light."

—VICTOR HUGO

WHALERS called gray whales devilfish, for they were the quarry most likely to ram boats and thrash them apart. What that name doesn't tell is that the boat breakers were often trying to protect their young, which the men harpooned first in order to draw mother whales closer.

This one came straight for us, rearing its head from Laguna San Ignacio, one of the sheltered bays in Baja California, Mexico, where gray whales congregate to mate and give birth. Warm, salty water from the spout showered over me. Then some 35 feet and 35 tons of leviathan stopped with its nose just touching the gunwale of our 20-foot boat, soft as a kiss. An eye opened three feet from mine and stayed there while I ran my hand across the strange, barnacled brow; stayed while, gathering courage, I put my hand in the mouth and explored the texture of its baleen; stayed for I don't know how long. I just kept talking to this overwhelming presence whose curiosity dwarfed mine.

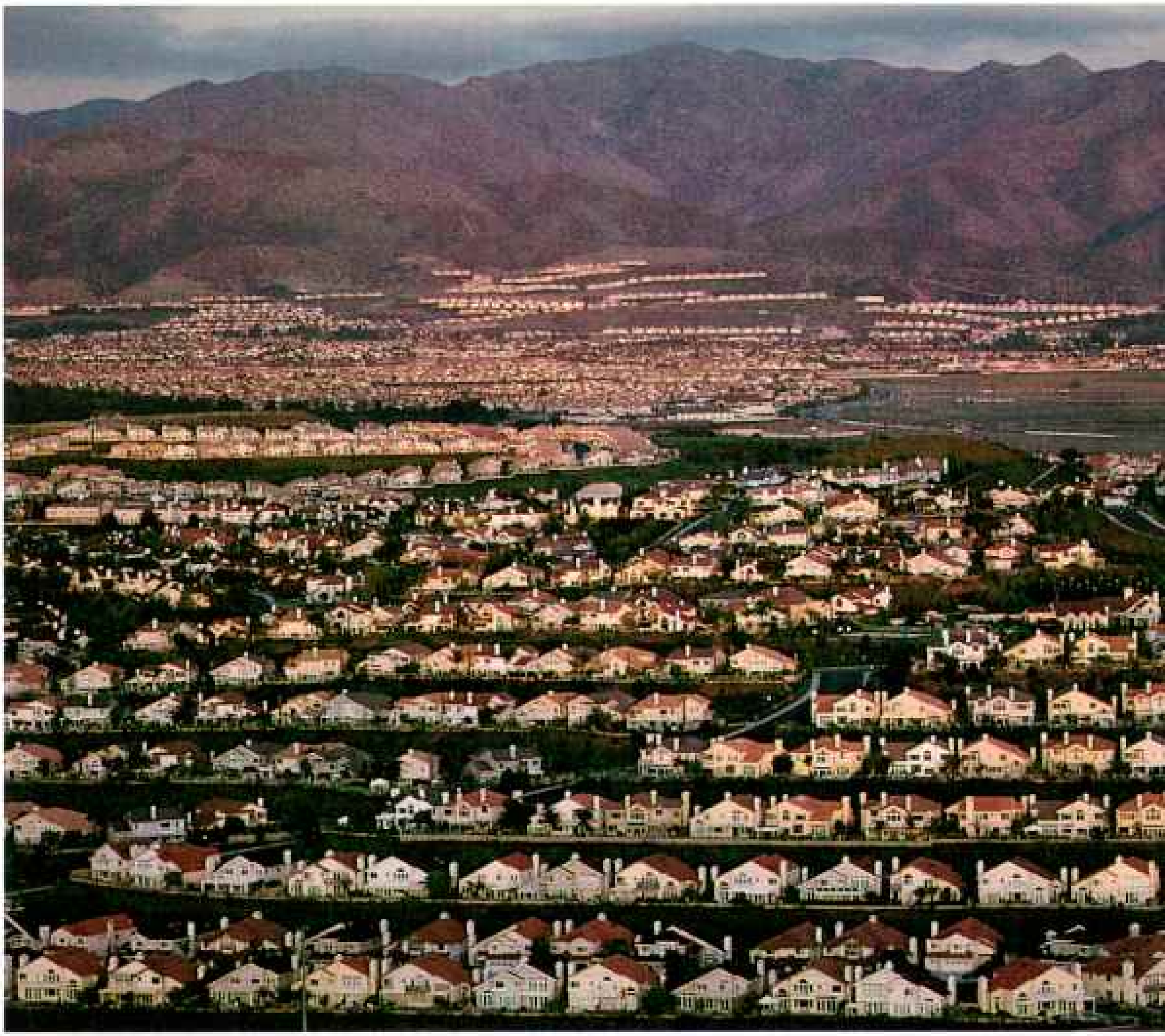
We humans cannot help seeing ourselves in other creatures. We and they share too many qualities to ignore, beginning with the miracle of our existence. For the same reason, we can't help but feel a powerful sense of loss when a life-form vanishes, never to return. Suddenly our planet seems a bit more lonely and our underpinnings a little less solid.

In the United States at least 500 species and subspecies of plants and animals have become extinct since the 1500s. Natural causes appear to have claimed just one of the animals, a marine snail that used to live off New England's shores. We barely got to know the others. Ever hear of the sea mink? Emerald trout? Heath hen? But by the 1950s almost everybody knew about the passenger pigeon, the last one of millions dying alone in a cage a few decades earlier. Everyone knew that oblivion had nearly claimed the bison, whooping crane, and southern trumpeter swan too. Those animals had been snatched back from the brink at the final minute. It could be done if somebody cared enough. During the 1960s and early '70s, an era of newfound environmental awareness, the nation as a whole was ready to try.

Congress responded with the Endangered Species Act (ESA) of 1973. Based on the assumptions that each life-form may prove valuable in ways we cannot yet measure and that each is entitled to exist for its own sake as well, the act gave the federal government sweeping powers to

WOLVES HAVE IT, LIZARDS DON'T

Charisma: Animals with it, say critics, claim an eagle's share of Endangered Species Act (ESA) funds. Both U. S. wolf species have benefited from captive-breeding programs. The red wolf's numbers have risen slowly from 17 to about 275. Hundreds of listed species, however, are still waiting for recovery programs. With 3,700 candidates—like the San Diego horned lizard—waiting to board the ESA lifeboat, many think the ark may be in danger of sinking.



THEIR HOUSE OR OUR HOUSE

South of Los Angeles the implacable sprawl of single-family homes has reached critical mass. Or so think local environmentalists, who are challenging new developments to safeguard dwindling parcels of coastal sage scrub, habitat of the California gnatcatcher. Increasingly, developers compromise by setting aside land for imperiled species.

In the nearby Mojave Desert, fragmentation of fragile habitat has added to the woes of the once hardy desert tortoise—a threatened species since 1990.

prevent extinction. Here was nothing less than a rudimentary bill of rights for nonhumans, an attempt to guarantee a future for as many as possible, even if doing so required real sacrifice on our part. No commitment of this order had ever been made before.

With each passing year this milestone has come to touch more of our nation's inhabitants—plant, animal, and taxpayer alike. Whereas the 1973 list of threatened and endangered species in the U. S. had 109 names on it, the total is now well over 900 (more than 1,400 counting foreign species). Waiting in line are 3,700 officially recognized candidates, which may qualify for ESA protection but have not yet undergone a full review.

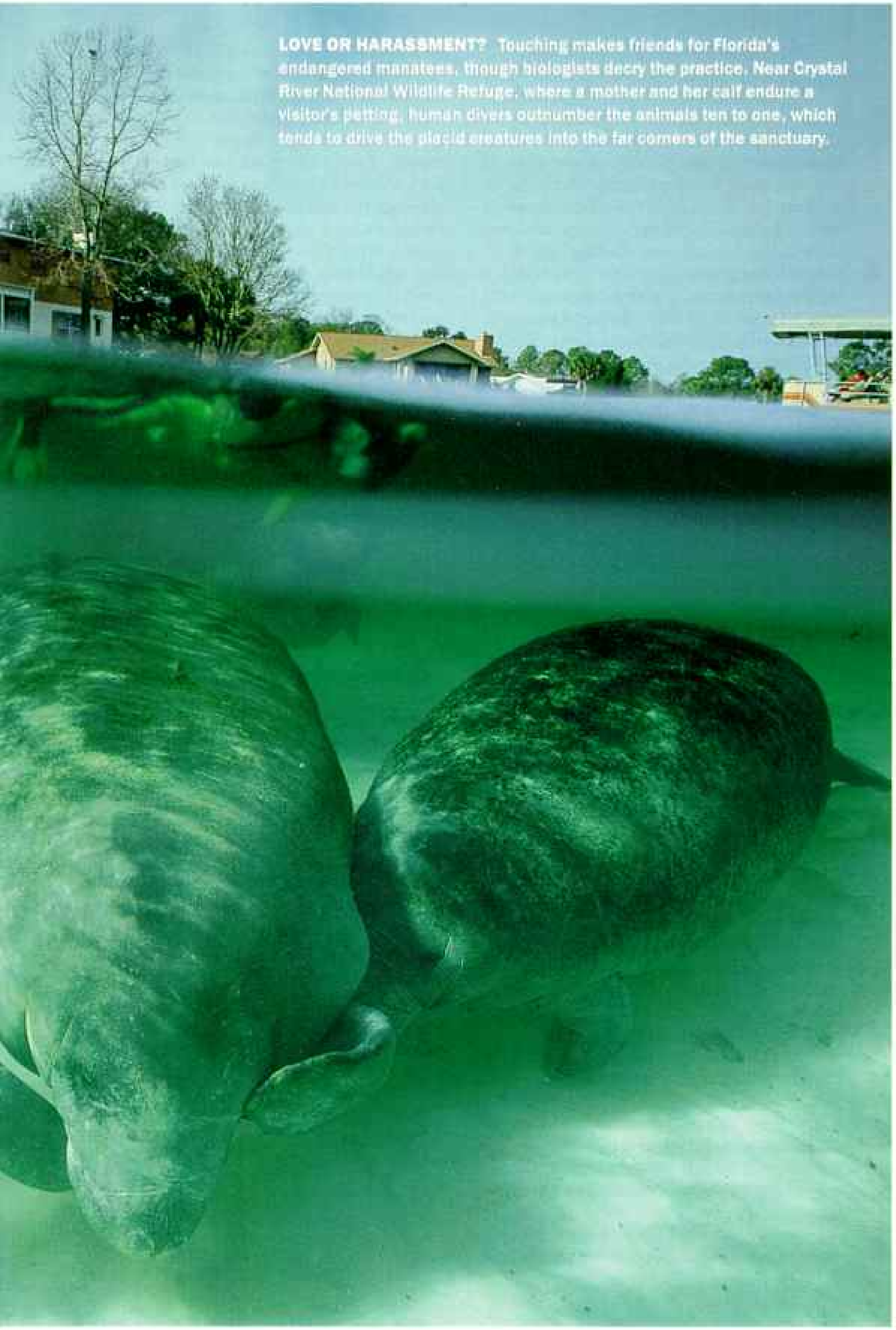
The bottleneck has been the lack of money. During the first 18 years, annual funding for the endangered species program averaged 39 million dollars, about enough to build a mile of urban interstate highway, or about 16 cents a year from every taxpayer—one dime, a nickel, and a penny toward a safety net for the 150,000 species estimated to inhabit the United States.

BUT THERE ARE OTHER COSTS to society in the form of business delayed or foregone. Many an additional dollar is spent complying with regulations and planning more carefully than we have in the past. As the world's most potent single piece of environmental legislation, the Endangered Species Act is reshaping the way our society lives upon the land, and it is fueling bitter debate over economic balance, nature's balance, property rights, and the limits to growth. With the act coming up for its sixth reauthorization in Congress and both bills and lawsuits being advanced to weaken its core provisions, conservationists worry that the endangered species program itself may be endangered.

To generalize about scarce creatures and the situations they face is not easy, for they are as varied as life itself. My journey to become better informed about the act, its consequences, and its future lasted more than a year and took me from snowcapped backcountry to vacant lots in cities. En route I pulled in to a roadside business in the old mining town of Beatty, Nevada. I thought the spring-fed swimming pool out back just might hold an Amargosa toad or two; the entire planet has only three or four dozen.

"You came to a brothel lookin' for what?" asked the ladies in the parlor. Yet they gave me a bucket and a strainer from the kitchen, and I went off toad catching with a guide wearing lacy black garters. I caught—and released—three of the amphibians lounging around poolside. At least when I was searching for whales at San Ignacio, no one was whispering "You get all kinds" behind my back.

Wildlife biologist DOUGLAS H. CHADWICK is the author of *A Beast the Color of Winter* and *The Fate of the Elephant*. A frequent contributor to NATIONAL GEOGRAPHIC, he most recently wrote "The Harlequin Duck" for the November 1993 issue. Nebraska photographer JOEL SARTORE has crossed the country for GEOGRAPHIC stories that include "Federal Lands" (February 1994) and "Eagles on the Rise" (November 1992).



LOVE OR HARASSMENT? Touching makes friends for Florida's endangered manatees, though biologists decry the practice. Near Crystal River National Wildlife Refuge, where a mother and her calf endure a visitor's petting, human divers outnumber the animals ten to one, which tends to drive the placid creatures into the far corners of the sanctuary.

SAVE THE WHALES! Save the Bald Eagle! Save the Grizzly! Such were the rallying cries that helped bring about the ESA, so I began by looking at how those particular animals have fared since the act's passage. From a low of a few thousand, California gray whales have increased to about 24,000, sufficiently recovered to have departed the endangered species list last June. In place of whaling, a new industry has grown up around simply enjoying the coast-hugging giants. Some 300,000 people spend five million dollars a year whale-watching in California alone. While credit must also go to Mexico and the International Whaling Commission, this is just the kind of success story the ESA was designed to produce. The whales win and people win, and both will for generations to come.

As for bald eagles, breeding pairs in the lower 48 states have increased from about 400 in the early 1960s to more than 4,000 today. Last June the status of our national symbol was declared sufficiently improved in most of that area to be changed from endangered to threatened, a less critical listing that means the subject faces the likelihood of becoming endangered. Because the eagle's plight spurred a ban on the metabolism-warping pesticide DDT, other imperiled species such as peregrine falcons and brown pelicans have bounced back as well. Yards that had fallen eerily silent once again harbor bluebirds and robins, and we have started paying more attention to the chemicals in our environment. Maybe what happened is that the eagle saved us.

But with the grizzly, reduced to fewer than a thousand animals in the lower 48 states, the rescue work quickly gets more complicated. Outlawing commercial hunting or some dangerous contaminant won't do the trick. Neither will setting aside a nice little reserve somewhere. These animals need enormous tracts of untamed landscape to survive. Efforts to restore and stabilize their numbers have increased regulations on grazing, logging, mining, oil and gas operations, road use, and even camping on millions of public acres such as national forests, while environmentalists brandish the bear's threatened status to keep further development away from shrinking wildlands.

Montana rancher Dick Christy thinks his constitutional rights got mauled somewhere along the way. In June 1982, after leasing land from the Blackfeet tribe, he put 800 ewes and lambs out to graze on Chief Mountain, just east of Glacier National Park. Dick encountered five grizzlies over the next month. Two, he learned, had been in trouble with livestock elsewhere and had been relocated on the mountain. All of them were eating his lamb chops.

Before the ESA the result would have been five dead bears. Times change. Eighty-four dead sheep after he started, Dick pulled out and sold off the rest of his flock. He figured his losses at more than $10,000. On top of that he was hit with a $2,500 fine, because he'd killed a grizzly. "We'd just bedded down the sheep and were having a cup of coffee when two bears came trotting toward the herd," he told me. "I shot the lead one. I did it to protect my animals. But I could argue that I also fired in defense of my life, my wife's, and the herder's."

SPEEDBOATS SINK A SPECIES

Hit-and-run victims on Florida's busy waterways, injured manatees maintain vital buoyancy only with the aid of inflatable wet suits at Orlando's Sea World. At a marine pathology lab in St. Petersburg the lacerations on a dead manatee tell Scott Wright, center, that the animal was diving to escape when the propeller struck. With only about 2,000 of these docile herbivores surviving along Florida's coasts, last year's 50 or so deaths by collision are especially alarming.


DNF
SWEAT

NO PLACE TO NEST A prodigy of adaptation, the endangered least tern survived the test of evolution by nesting on barren sandbars, protected from predators by the swift flow of surrounding rivers. These moated habitats are created by naturally occurring spring floods, which humans now spend millions to prevent.

Dick spent another $60,000 on an unsuccessful legal appeal of his case. "I lost my rights as a private-property owner," he insists. "Yet those bears were fully protected. I'm a victim of the Endangered Species Act."

And now he has another endangered species close to his ranch. Another big predator: *Canis lupus*, the gray wolf.

IN 1979 A FEMALE WOLF showed up in a valley along Glacier Park's western edge, where I have a cabin. Under the ESA, gray wolves in northern Minnesota and nearby areas had been expanding their range and numbers. But none had managed to survive for long anywhere else south of Canada in half a century.

That lone gray wolf in the West stuck around. She even got a name: Kishinena, after a bright creek that runs west off the Continental Divide. She was like a ghost, though, shying from roads, turning back if her path so much as cut cross-country ski tracks. And even in midwinter, when she came into heat, nobody ever heard her howl. When a third winter began and found her still alone, it looked as if she might grow old that way. Then researchers lost track of her. But one day in February a female's prints were intertwined with those of another wolf. A missing toe on one foot indicated that the newcomer's trip had been a tough one. The newcomer died in an accident not long afterward. Yet the next wolf sighting was of seven pups, and they and their mother went on to form what became known as the Magic Pack.

Now at my cabin at night I often hear songs coming from the wolf pack's encampments. When I happen upon the carcass of, say, an elk, I may find sign of either wolves, grizzlies, or cougars, and sometimes all three. Having wolf leftovers to scavenge could be a boon to grizzly survival. On the other hand, these wolves have attacked grizzly cubs and young cougars. As we skied along a wolf trail through a deer wintering area, Diane Boyd, a University of Montana researcher, told me, "African lions will home in on circling

vultures and go take over a cheetah's meal. Here the wolves scan the sky for ravens and bald eagles, and it looks like the pack might be chasing cougars off a fair number of fresh kills." Because a long-silent female wolf met a three-toed male in a time when the law was on their side, the meaning of wild just expanded for this part of the world.

At least seven packs currently roam Montana, most of them descendants of the Magic Pack. A few have followed the mountains south into central Idaho and the wildland ecosystem anchored by Yellowstone National Park. After years of controversy the government decided to speed up the natural recovery by reintroducing wolves into those areas. The populations were designated "nonessential experimental," which allows landowners to eliminate wolves that leave the recovery areas and bother livestock. Still, what some count as another success for the ESA is viewed by many stockmen, big-game hunters, and other rural Westerners as an example of a law pushed beyond all common sense.

The continent's smaller wolf species—*Canis rufus*, the red wolf, native to the Southeast—was persecuted until the 45- to 80-pound predators began to mate with coyotes for want of their own kind. The Fish and Wildlife Service took in the last holdouts for captive breeding just in time: Only 17 true red wolves stood between the species and extinction. "We've got more than 60 back out in the wild now," Gary Henry, the recovery coordinator, said while we watched an adult male lope through his new range in North Carolina's 150,000-acre Alligator River National Wildlife Refuge. "As they move out from here, it's no longer biology but human attitudes that count."

As expensive as it is tricky, captive breeding is one reason nearly half the limited funds available for recovery have gone to a dozen or so species such as the California condor and the black-footed ferret. With more and more life-forms teetering on the edge, managers struggle with the terrible choice of which ones to throw the lifeline to.

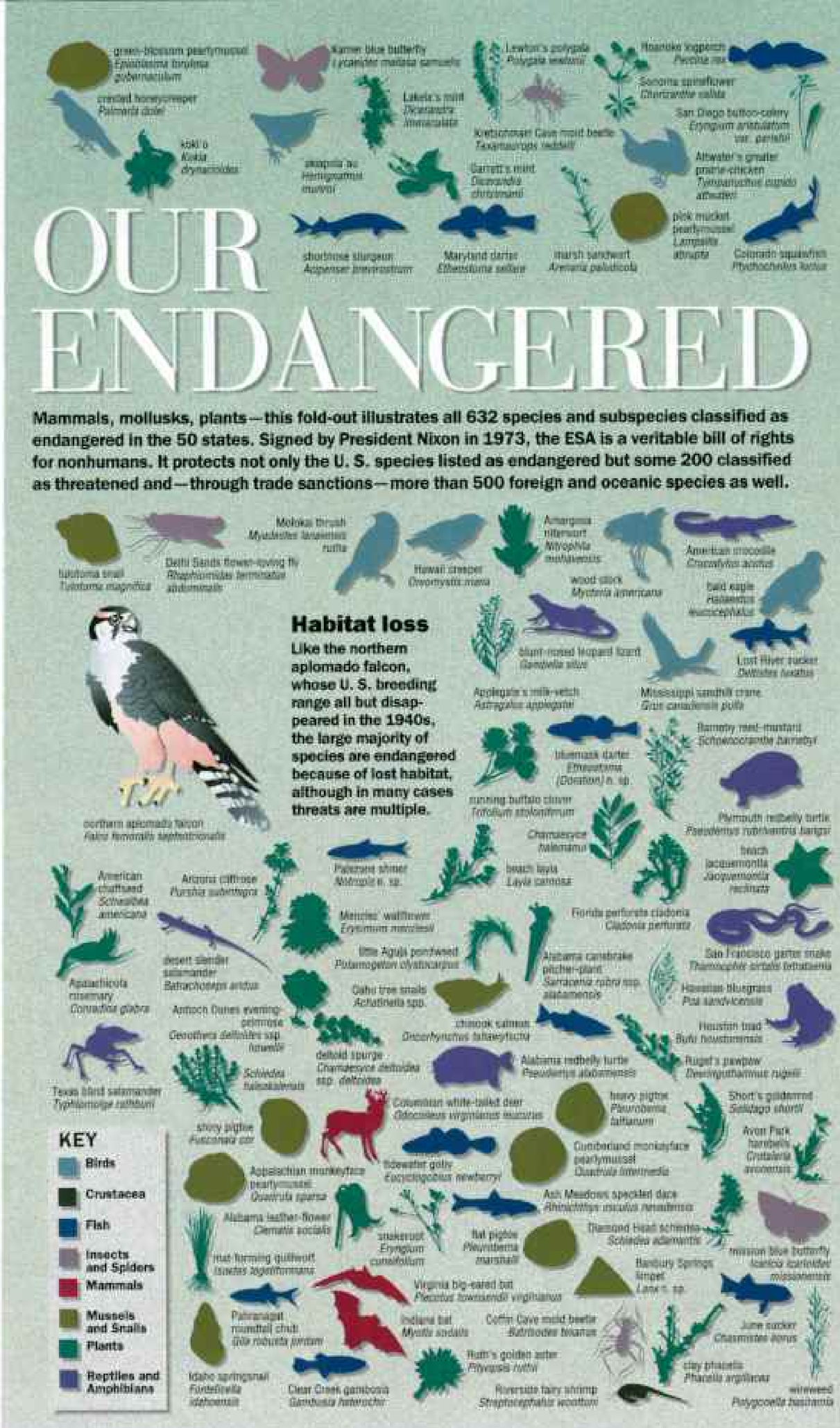
THE FIRST endangered species legislation was a 1966 bill that called for saving U. S. wildlife but provided few powers to do so. Three years later the Department of the Interior was asked to add species imperiled worldwide to the endangered list. The new international focus was partly responsible for the formation of CITES, the Convention on International Trade in Endangered Species, which aids hard-pressed creatures by controlling the traffic in items such as leopard pelts and elephant ivory that cost them their lives.

The Endangered Species Act of 1973 set forth the basic rules that apply in the U. S. today. Two agencies, the Fish and Wildlife Service and the National Marine Fisheries Service, are responsible for reviewing the status of species in trouble to see if they warrant listing as either threatened or endangered. The decision is to be based solely on scientific data rather than on economic and political factors. Once a species is listed, no branch of the federal government—not even the Department of Defense—is to proceed with a project that might harm the creature without first consulting the wildlife or fisheries service.

Consultation forces agencies to cooperate in finding ways to avoid damage. Often this is as direct as rerouting a proposed road. If a quick fix won't work, they may try mitigation—offsetting the harm caused at the project site by doing something to bolster the species elsewhere, perhaps by setting up a sanctuary. When no alternatives exist, the wildlife or fisheries service may squelch the project altogether.

Critics complain that the ESA too often blocks development. Yet statistics show that it ends up only modifying development. Out of 98,237 interagency consultations between 1987 and 1992, just 55 projects were stopped cold. Officials look first to federal lands and other public domains such as state parks to carry out protection and recovery efforts. But because wildlife is a public resource, the government has some authority to prevent the destruction of listed species on private property as well.

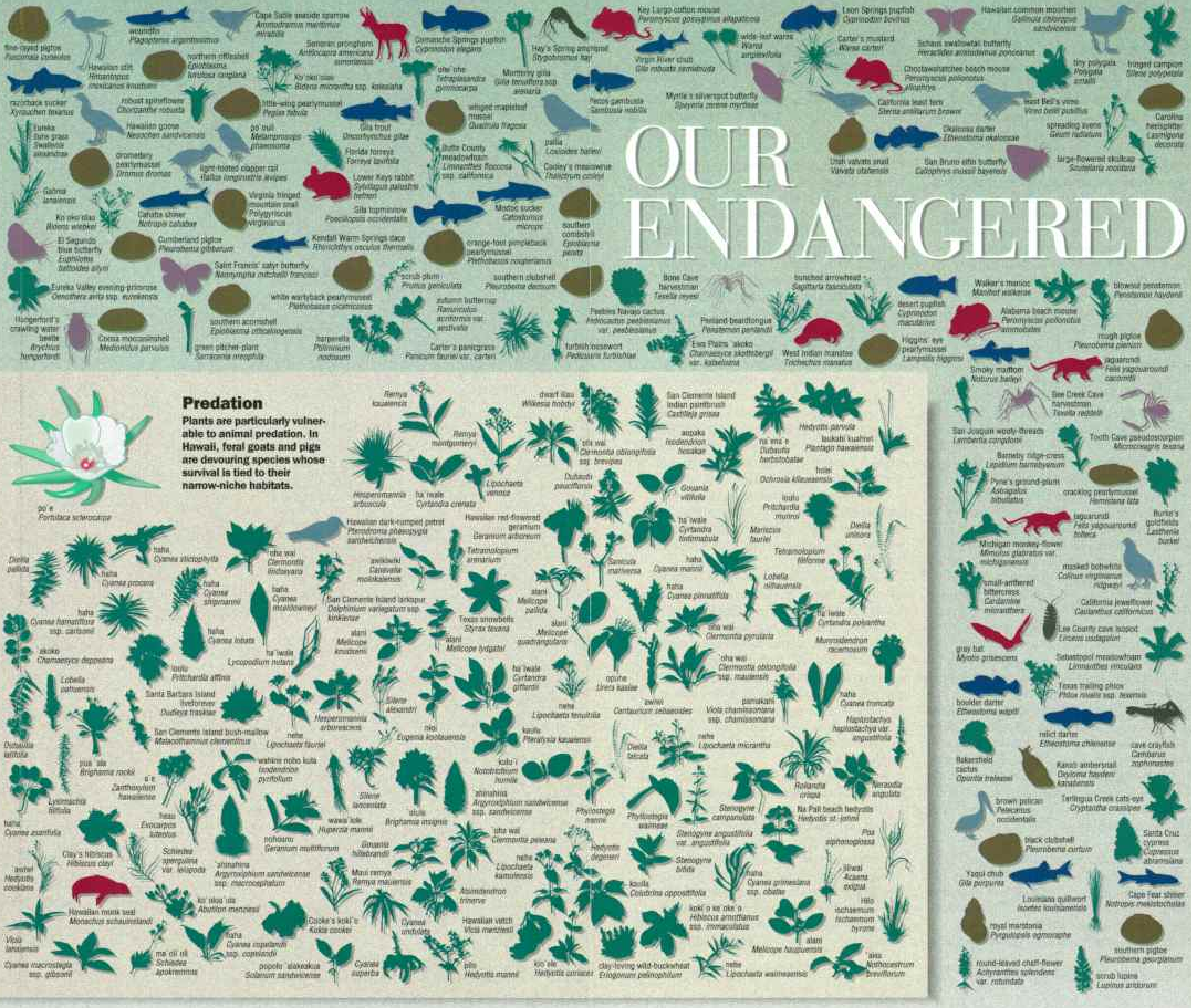
As director of the Riverside County (California) Habitat Conservation Agency, Brian Loew is obliged to save the Stephens' kangaroo rat, an endangered, long-tailed, hopping rodent whose arid grassland and chaparral habitat has become the yards in new subdivisions. "You don't know the real ESA until you deal with mom and pop who want to put in a trailer they've saved for all their lives, and you tell them they might have to change their plans *(Continued on page 22)*



OUR ENDANGERED

Predation

Plants are particularly vulnerable to animal predation. In Hawaii, feral goats and pigs are devouring species whose survival is tied to their narrow-niche habitats.



SPECIES

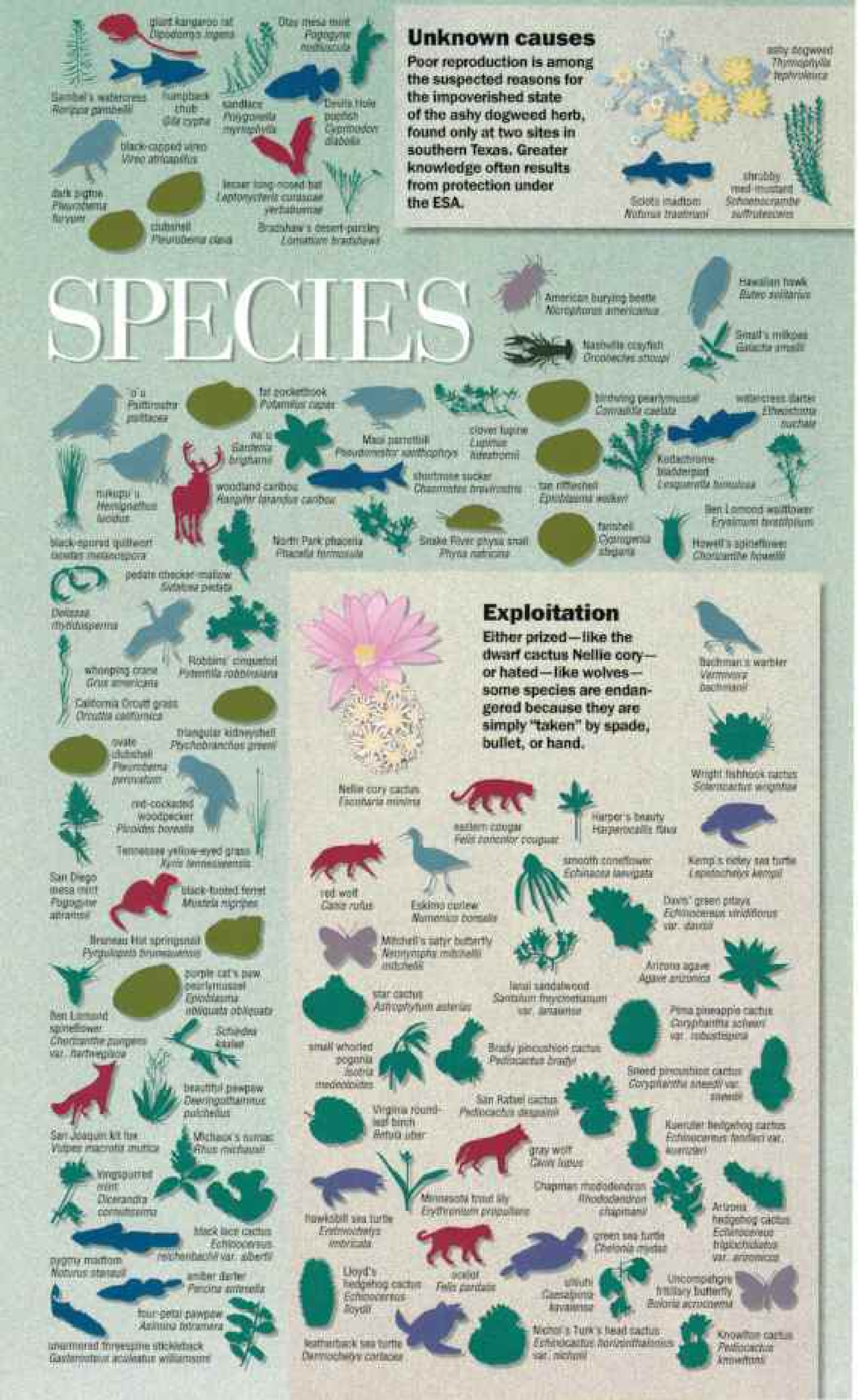
Competition

Vying for food and space with hardy newcomers introduced by humans, native species are often the losers.

Disease

Five bird species are threatened by disease, all of them in Hawaii, where mosquitoes carry avian malaria and pox from introduced species to vulnerable natives.

ILLUSTRATION BY BILL PITZER
RESEARCH BY DAVID W. WOODELL, WES
BASED ON LIST OF SEPTEMBER 1, 1994



(Continued from page 15) because of a 'rat,' " he told me. "I've come home to death threats on my answering machine."

"At least you don't have the Delhi Sands flower-loving fly," I said, referring to the ESA's first protected fly, listed in 1993.

"But we do!" Brian replied. "It's on the border of Riverside and San Bernardino Counties in a beat-up, weedy spot set aside as an enterprise zone with tax incentives for industrial development. So here we go, trying with all our might to save rats and flies in an area of high unemployment. What a thankless job. Some of the hard feelings stem from the fact that a few environmentalists use the ESA just to fend off developments they don't like. Got a problem with the mall proposed next door? Go out and find a rare species there. If they're not careful, they're going to undermine support for what has become the strongest land-use law in the nation."

THE 1966 ENDANGERED LIST consisted chiefly of birds and mammals, warm-blooded vertebrates like us. Yet most of the recently listed species and candidates are plants and invertebrates. We have gone from saving the kind of big, charismatic beasts we name football teams for, like eagles, bears, and panthers, to saving things with eyes that never blink, or no eyes at all.

For example, the U. S. has 297 different kinds of freshwater mussels, the greatest variety in the world, concentrated mainly in the Southeast. Of these, 56 are listed as threatened or endangered, 74 more are seriously declining, and 21 may already be extinct. Does it matter? What good is something called a fine-rayed pigtoe anyway?

I went to find out and learned that, for starters, it offers an excuse to spend a muggy August afternoon searching for specimens in the cool waters of Virginia's Clinch River. "Shiny pigtoe," Dick Neves shouted, holding two fist-size mussels aloft, "and a fine-rayed pigtoe, both endangered." Then Neves, a mollusk expert with the National Biological Survey, snorkeled again into the waters off Pendleton Island, a mussel stronghold purchased a decade ago by The Nature Conservancy.

I dove after him to see a pocketbook mussel whose mantle had an outgrowth that mimicked a tiny fish, complete with eyespots and finny tail. This tissue pulsed rhythmically so that the "fish" looked as if it were actually swimming. When a real fish rushes in to gulp the lure, the mussel releases a burst of microscopic larvae that clamp onto the fish's gills. After hitchhiking awhile, they drop off and begin life on the bottom. Which is how animals that never move keep replenishing their population upstream against the current.

Pretty slick. The question was what good are they? I could see from droppings along the riverbank that mussels are an important food source for raccoons, muskrats, wading birds, and waterfowl. They feed otters and strong-jawed fish as well, while a variety of smaller fish use the old shells as escape cover and egg-laying sites.

But let's define worth the usual way and look at why these creatures are called pearly-mussels. The lustrous inner shells kept as many as 150 factories busy producing most of the buttons manufactured in the country until plastic took over. Today the U. S. annually sells Japan and other nations some 50 million dollars' worth of the shells from certain large, common varieties. They make the best beads for putting in oysters to stimulate the formation of pearls.

Although the argument that you never know which humble organism will hold the cure for cancer may be a bit overworked, freshwater mussels happen to be notably resistant to tumors, and medical researchers are exploring the causes. The canary-in-the-coal-mine rationale for saving obscure species also fits mussels especially well. The endangered list holds far more aquatic animals than land-dwelling ones, because almost everything we do as a society sooner or later ends up in the creek. Being filter feeders, freshwater mussels play important roles in keeping water clean and storing nutrients within a river system. Straining sediment and algae at the very bottom of the food chain also makes them highly sensitive indicators of pollution.

The mollusks, some of which live a century, accumulate toxics from pesticides, waste-treatment plants, chemical spills, and every New Improved Blitz-All that householders put down a drain. Mussels downstream from coal mines are dying from acid runoff and concentrations of heavy metals. They get buried by sediments from strip mining, dredging, intensive agriculture, and overuse of shorelines by livestock. Those adapted to

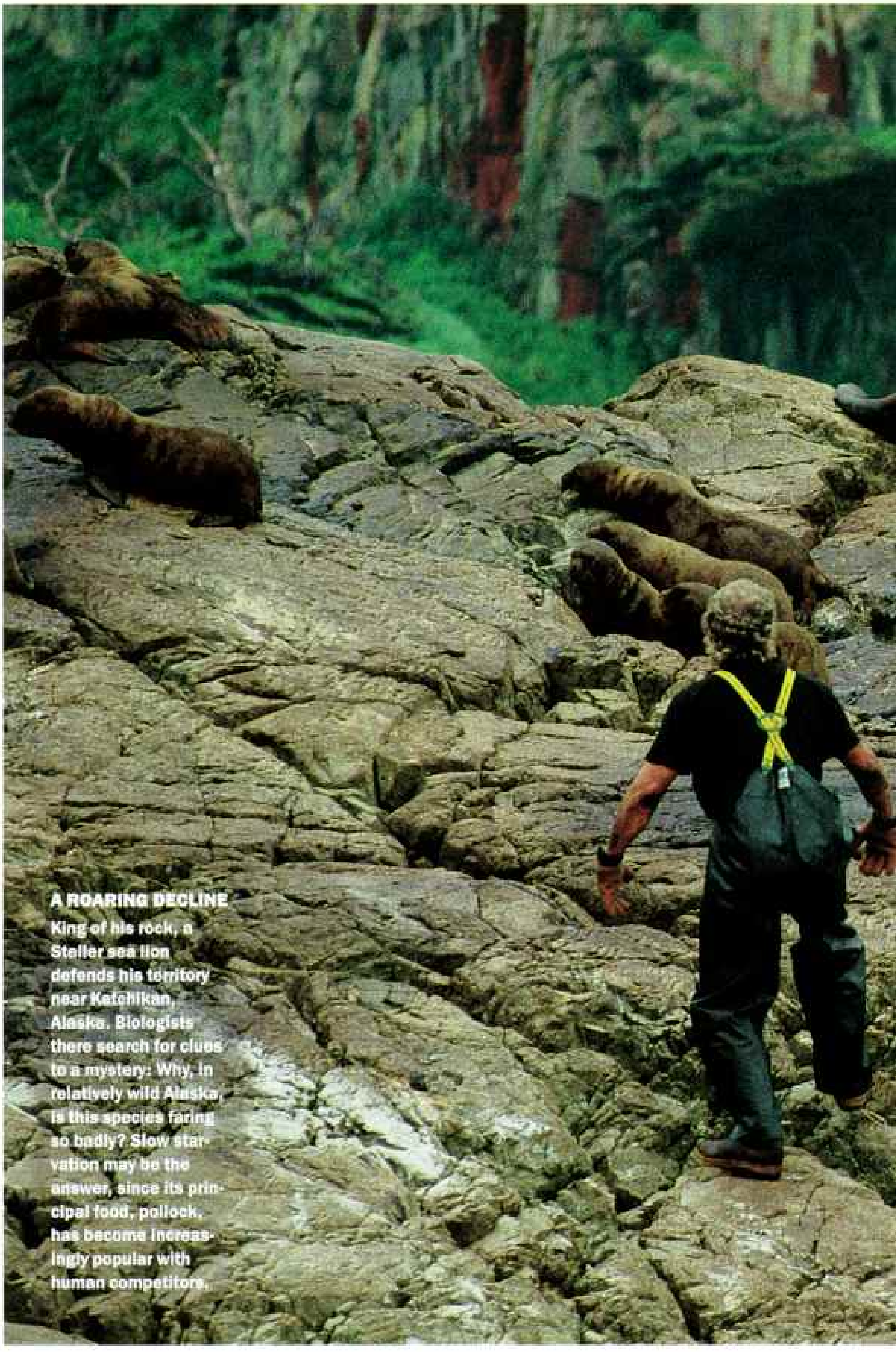
PROTECTION'S BIG SUCCESS A steady increase in the population of bald eagles—like these wintering at Nebraska's Lake Ogallala—attests to the work of regional recovery programs and the gradual benefits of the 1972 ban on DDT. In June 1994 our national bird was declared ready to move from the endangered to the threatened list.

fast-moving water, as most are, vanish when dams turn rivers into a series of lakes. They dwindle as all these pressures also take out the fishes that act as hosts to mussel young. And now they face the zebra mussel, a stowaway from the Black, Caspian, and Azov Seas. Like kudzu, fire ants, and many other exotics—the U. S. is contending with 4,500 alien species at the moment—the zebra is multiplying, unchecked by natural enemies, smothering native mussel beds as it spreads.

"We're simply going to have to write off some mussel species and try to get the others through this spasm of extinction any way we can," Dick Neves, seeker of pigtoes and pocketbooks, said back at his lab, where he is testing methods for freezing the larvae into a state of suspended animation. Perhaps there, in vats of liquid nitrogen, they can hold on until they have clean, flowing rivers to live in again. The Tennessee watershed now has 54 dams. Number 55, proposed for the Duck River, was recently shelved, partly because of three endangered mussels.

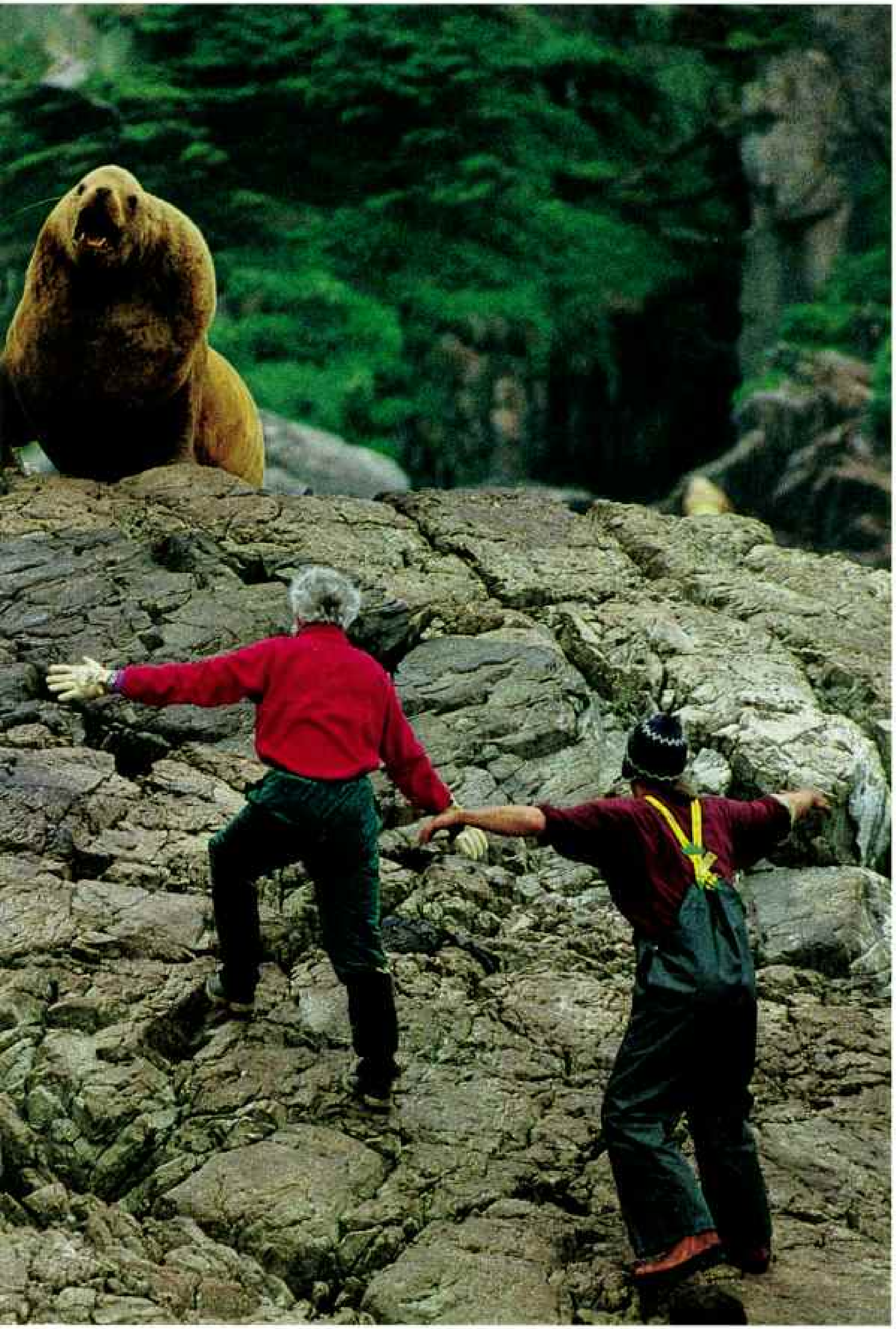
A CITIZENS GROUP sued to stop construction of the Tellico Dam on the Little Tennessee River in 1971. "Tellico was a classic boondoggle," Dave Etnier, an ichthyologist at the University of Tennessee, recalled. "The costs of building it far outweighed the projected revenues." In addition to prime farmland and family homes, society stood to lose the site called Tanasi (Tennessee), sacred core of the old Cherokee nation. The main beneficiaries appeared to be speculators who had bought up future lakefront. The citizens' lawsuit was unsuccessful.

Dave reached down while snorkeling one day and lifted an unfamiliar, three-inch-long, bottom-scooting fish up into the light. He named it the snail darter. It made its home on shoals around the Tellico site and apparently nowhere else. Then the ESA passed, and *Percina tanasi* was soon listed as endangered. A court halted work on the nearly completed, multimillion-dollar dam. And all at once the whole nation was either ridiculing or



A ROARING DECLINE

King of his rock, a Steller sea lion defends his territory near Ketchikan, Alaska. Biologists there search for clues to a mystery: Why, in relatively wild Alaska, is this species faring so badly? Slow starvation may be the answer, since its principal food, pollock, has become increasingly popular with human competitors.



marveling at the ESA. The new law had more teeth than an American alligator (status: threatened, but rapidly recovering from past commercial hunting and poaching). More teeth than the even longer fanged American crocodile (status: endangered, reduced to about 400 survivors at Florida's southernmost tip).

The Supreme Court upheld the ruling in 1978, noting that Congress had clearly intended protection of species to be absolute. But Congress responded by setting up a Cabinet-level committee empowered to permit the extinction of a species if salvaging it would cause undue social and economic hardship. This group, which included the chairman of the Council of Economic Advisers and the secretaries of agriculture and the army, among others, was dubbed the God Squad.

The God Squad ruled unanimously that Tellico should not be built. But Congress pushed through a special measure to finish the dam anyway. By then biologists had removed groups of the darters to similar habitats in nearby rivers. Although the transplants have met with only mixed success, widespread searches turned up other wild populations after all. *Percina tanasi* has been reclassified as merely threatened.

PROTECTION'S BOGEYMEN

Two species earned questionable notoriety as job busters: The tiny snail darter won celebrity in 1978 for stalling the construction of Tellico Dam on the Little Tennessee River. Though the dam was built, the ESA was henceforth seen in many quarters as an enemy of progress. The northern spotted owl, listed as threatened in 1990, was expected to cause thousands of job losses by disrupting logging in the forests of the Pacific Northwest. The actual cost of protection of its habitat to the regional economy is not yet known.

NO CREATURE since the snail darter has focused as much attention on the ESA as the threatened northern spotted owl of the Pacific Northwest's old-growth forests. After a government report suggested that almost eight million acres be put off-limits to chain saws, loggers hitched pants with empty pockets to suspenders saying "Save a Logger, Eat an Owl," and families marched in the streets shouting "We're the ones endangered!" A mere subspecies of bird was taking away thousands of jobs and millions of dollars in timber sales, making the entire region another victim of the conservation movement.

That's one side. The other is that if cutting was to continue at the pace seen through the 1980s, the woodsworkers would soon end up unemployed because most of the decent-size trees would be stumps. The Amazonian rain forests that Americans send money to save have been reduced by about 30 percent. The Northwest's original temperate rain forests, among America's biologically richest ecosystems and owned mainly by the public, are nearly 90 percent sawed apart. From this viewpoint, the owls and loggers alike are victims of a system that chose short-term, clear-cut-and-run profits over sustainable harvests.

Shadow-laced, moss-softened, damp, and deep, those primeval woodlands are also habitat for pine martens, pileated woodpeckers, and *Phenacomys*—voles that live up in towering conifers; for Pacific yew, eliminated as a "trash" shrub in clear-cuts until its bark yielded the cancer-fighting compound paclitaxel; for Roosevelt elk; and for marbled murrelets, recently listed as threatened. Plus seven migratory fish in the salmonid family: chinook, coho, chum, pink, and sockeye salmon, steelhead, and sea-run cutthroat trout.

Coho spend their first year or two in fresh water. Then, in preparation for life at sea, they grow massive amounts of new nerve

A WHALE OF A VICTORY Seeking contact with a now friendly species, a gray whale follows a whale-watching boat in Laguna San Ignacio, a winter nursery for the great beasts off Baja California, Mexico. Restored to healthy populations, California grays were recently taken off the endangered list. Atlantic grays, however, were long ago whaled into extinction.

fiber. This ability is unusual in vertebrates of such maturity, and investigators hold hope that it may lead to help for the 80,000 Americans who suffer disabling brain and spinal injuries every year. Not that anyone who has tasted fresh salmon or connected a fly line to the live voltage of steelhead needs to be convinced that such fish are worth saving. As late as 1992, commercial and sport fishing for salmonids added up to a billion-dollar-a-year industry, employing an estimated 60,000 people in the region, more than are employed in logging. Instead of jobs versus owls, the issue has become jobs versus jobs.

SCENE NUMBER ONE from a land originally blessed with an uncommon abundance of natural resources: Timberman Gary Briggs, from Roseburg, Oregon, leans out his pickup window to say howdy and starts right in on the President's Forest Plan, drawn up to resolve the old-growth controversy. "It lowers the annual timber cut in federal forests from 4.5 billion board feet to 1.1 billion," he informs me.

"Well, I used to cut 60 million myself each year with a crew of a hundred. When the state said we couldn't cut within 25 feet of streams anymore, that was bad enough. Now the feds say to protect the owls and salmon we need a 300-foot setback from streams, even on company lands. I think that's a 'taking' of private property."

A logger comes up to ask if Gary has more work for him after this timber sale. You can see the worry—the fear—in the man's face; see his kids there, the bills coming due for the house, the truck. "How can I tell him I'm gonna go broke myself in six months, way things look," Gary says when the man leaves. "This was a way of life for three generations in my family. I never even considered doing anything else. Now I wish to hell I had."

Scene Number Two: On an autumn evening I go to an old cannery in Clifton, Oregon, to meet Jack Marincovich, head of the Columbia River Fisherman's Protective Union. He grew up netting fish here in the lower river with his father, Andrew, who sees our boat off in the fading light.

Jack shouts over the engine as we let out several hundred feet of gill net: "The thing I notice is that the water is a little lower, slower, and warmer each year." It is still lovely, though, reflecting a sky of moonlight behind rain clouds. Geese and gulls and a great horned owl call from the dark shores. When Jack hauls in after two hours, the net holds one small chinook and three coho, or silvers. We make another set, bring it in around midnight. Empty. Jack turns for home. "These days our catch doesn't hardly pay gas for the boat," he grumbles. "It's sure not a livin' anymore. It's barely a pastime."

An ardent conservationist once said, "The salmon fisheries of the Columbia River are now but a fraction of what they were 25 years ago." That was President Theodore Roosevelt, arguing for fishing regulations in 1908. In 1991 the sockeye of the largest tributary, the Snake River, were listed as endangered after just four returned to spawn. The following year, the fall and spring-summer runs of Snake River chinook were declared threatened. In 1994 one lone Snake River sockeye returned to spawn.

Dams bear much of the blame. The sockeye have to negotiate eight big ones. In addition, generations of commercial fishermen overharvested their resource, just as the loggers did. And the overall equation includes such factors as our demand for french fries; each bite means more irrigation water sucked from the Snake to grow potatoes in Idaho's drylands.

Salmonids are also declining from California to northern Washington in rivers that have few or no dams. More than a hundred West Coast stocks (populations unique to a particular spawning stream) are extinct south of Canada, and more than 200 appear headed in that direction. The Pacific Rivers Council, an Oregon-based advocacy group, recently petitioned to list all Pacific coho stocks as endangered in the lower 48.

I traveled with David Bayles, a council public-lands specialist, up Canton Creek toward the mountainsides where newborn brooks learn to run and play. I was eager to get there, but we no sooner did than Dave was pointing out streams muddied by runoff from steep, bare, bulldozed slopes. "We're in spotted owl country," he observed. "What's left of the big timber is mainly up here in the headwaters, and they contain most of the spawning areas." The sediments that smother salmon eggs and young come from the clear-cuts and, even more, from the Northwest's 250,000 miles of dirt logging roads.

DETOURS AHEAD? Before a highway gets widened in Nebraska's Sand Hills, botanists are dispatched to instruct workers on how to safeguard the threatened western prairie fringed orchid. On rare occasions roads have been diverted to save imperiled vegetation, whose advocates complain that the ESA grants far less protection to plants than to animals.

Calls to save both owls and salmon went out early in the seventies. The Forest Service and other agencies sidestepped them, promising greater sensitivity, new committees, more studies. In its 900-mile journey from the sea, a Snake River sockeye passes through more than 40 federal, state, local, and tribal jurisdictions. It took the ESA to force all the competing interests to get serious about fixing a common problem. It usually does. Trouble is, when the act is triggered, that typically means the species at risk has slipped into critical condition, and more drastic, heavy-handed measures may be required to revive it. Inevitably, the heavy hand leads many Americans to view the ESA as the symbol of everything they dislike about bureaucratic regulations and big government in general.

"We have some good resource laws on the books," says John Turner, former director of the Fish and Wildlife Service. "The National Environmental Policy Act, the Clean Water Act, the Federal Land Policy Management Act. But they haven't really been enforced. If they had been, we wouldn't see so many endangered species, especially on federal lands. The ESA takes all the heat because it has to do all the work."

How well is this much praised, much maligned act really working? Fair, insofar as only six out of the hundreds of species listed as endangered have met with extinction. But way too slow, insofar as only seven have completely recovered. Only half the listed species even have recovery plans drawn up for them. For some that do, the recovery goal is a population lower than when the creature was first declared threatened or endangered. In the meantime, an unknown number of species have vanished while waiting in line as candidates.

THE CENTER for Plant Conservation says that one in every five of the 20,000 plant species in the U. S. is imperiled and as many as 700 could be gone within a decade. Such figures seem to suggest that what are really endangered at

CLEANUP CREW A dead mourning dove is prepared for interment by the nearly extinct American burying beetle, which belongs to a family of insects that help convert carrion into nutrients in the food chain. Freshwater mussels, the most endangered group of animals in North America, not only cleanse streams but also serve as monitors of water quality.

this point are entire ecosystems, from tallgrass prairies to wetlands. Staging costly, last-minute rescues one creature at a time—referred to as ambulance-chasing, emergency-ward, or three-toes-over-the-cliff conservation—can slow the rate of extinction. But if the goal is to preserve America's biological diversity (meaning the natural array of species along with the processes and interactions that sustain them), wouldn't we be better off managing ecosystems to keep the greatest number of plants and animals from becoming imperiled in the first place?

Mike Scott, a researcher at the University of Idaho Cooperative Fish and Wildlife Research Unit, was asking me this question as he sat in front of a computer terminal and punched up a map of Idaho's vegetation. Over that he added maps showing the distribution of animal after animal, from lizards to big game. Using a powerful program called a geographic information system, Mike and his colleagues can superimpose hundreds of layers of such data to build a portrait of where biological diversity is most concentrated.

Comparing species-rich areas with the location of parks and preserves often reveals surprisingly little overlap, since many reserves were fashioned mainly around scenery and recreation. "We call our technique gap analysis because it points out the gaps in our national network of protection," Mike said. "Planners can see how, if they take care of, say, these two spots here, they will have 50 percent of the native diversity covered; add that spot, and the coverage rises to 70 percent, and so on. We don't need vast amounts of acreage to get to 90 percent protection. We just need to choose carefully."

Small, isolated patches of otherwise suitable habitat begin to lose species over time because of inbreeding and influences from surrounding areas. Thus a thousand-acre chunk usually is far more valuable to wildlife than ten hundred-acre fragments; two fragments linked by a corridor are more than twice as valuable as each one by itself. Connectivity. Multispecies planning. Ecosystem management. Surrounded by satellite images and glowing screens, I was a long way from paw prints on the forest floor. And yet in this digitized realm I sensed tracks leading back toward the ancient understanding of nature as an indivisible whole.

ACCORDING to Nathaniel Reed, former assistant secretary of the interior, "If ecosystem management is to succeed, it will only be with the willing assistance of private landholders." After all, the habitat on which many threatened and endangered species exist is owned by corporations and individual citizens.

They own nearly all of Orange County, where traffic sprays across southern California foothills remolded to fit beneath layers of houses. In his Santa Ana office Tom Mathews, the county's director of planning, spread the most detailed digital map I had yet seen on his office table. He wanted to show me how remnants of California's coastal sage scrub community constitute only about 15

A RIVER RUNS EMPTY

Dipnetting for survivors on Washington's Klickitat River, Native American fishermen often leave empty-handed as salmon runs on the mother Columbia continue to fall. Once a highway for salmonids, that heavily dammed river has become an obstacle course for several imperiled species.

AFTER THE DAMS Images of then and now fill a Native American center at Celilo, Oregon, where old photographs recall an era changed forever by the Bonneville and other dams in the Columbia basin. Though upstream hatcheries release millions of salmon smolts, most die in a gantlet of dams on their journey to the sea.

percent of the plant's former range. I'd been out since dawn watching the scrub's most celebrated resident, the California gnatcatcher, a twitchy-tailed little blue-gray bird that flits through brush low to the ground and mews like a kitten.

You can't not like a gnatcatcher. But as it became scarce, real estate developers were starting to call it the "southern spotted owl." Anxious to demonstrate the ESA's flexibility, Secretary of the Interior Bruce Babbitt agreed to list the bird as threatened rather than endangered and to allow an "incidental take" as long as it would not harm the species as a whole. This meant that the building industry could proceed with controlled development—if it would participate in a plan to conserve coastal sage scrub and help ensure the gnatcatcher's recovery.

California already had a tough conservation planning process in place, and Orange County required builders to set aside 50 percent of new housing tracts as open space. The next step was to match those rules for growth to the gnatcatcher's. The selling point was that developers, like the birds, need certainty about the future. They can't afford to redesign projects every time another species in the area gets listed, and so much sage scrub habitat has already been lost or fragmented that some 70 of the plants and animals dependent upon the habitat are in rocky shape along with the gnatcatcher. Make that 69; it looks as though Orcutt's spineflower just winked out once and for all.

"Linking up scattered islands of sage scrub has been the tough part," Tom told me. "But we can plant native vegetation to build a habitat bridge. A whole cottage industry in habitat restoration is springing up in southern California." He tapped the map, calling it the kind of database that answers without rhetoric and emotion the questions people have been arguing over. Do we have enough open space? Do we have enough of the right kind in the right place? "Not only for gnatcatchers," he added, "but also for our riparian areas, our wetlands. And for the quality of life we want here. If we can pull this off in a region with 16 million people and land worth as much as a million bucks an acre, it ought to work for species protection and land-use planning anywhere in the country."

HIGH-DECIBEL SANCTUARY

Because butterflies lack ears, the endangered El Segundo blue can coexist painlessly with the jets roaring out of Los Angeles International Airport. With its primary habitat isolated in dunes near the runways, the butterfly has been saved from extinction partly by human aversion to noise.

I wondered if Tom Mathews's database could possibly fetch an answer to the arguable question of our own human numbers. The U. S. population is likely to swell by at least 50 percent in the next half century. We tend to think of rapid human increase as something going on in developing countries, but the U. S. is a full participant in the surge predicted to extinguish a quarter of the planet's species by the year 2050. We're home to the third largest population on the globe and, between births and immigration, have the highest rate of increase among wealthy nations. Watching Steller sea lions (status: threatened, probably soon to be changed to endangered) from a research vessel, I learned that they have declined by 70 percent in the Gulf of Alaska; harbor seals there are faring just as poorly. Why? It may be that they are starving to death because we have claimed so many fish in the vast sea for ourselves. I couldn't help wondering how many sea lions—or owls or gnatcatchers—130 million more of us will leave room for.

MANATEES SWIM from the coast 150 miles up the St. Johns River in Florida to where a hundred million gallons of crystalline water issues each day from a hole in the earth. And there in a channel of light, the sea cows that sailors once mistook for mermaids swim and rest through much of the winter beside longnose gar and striped mullet. Wayne Hartley and I floated above them in a canoe. The ranger was making one of his thrice-weekly surveys to keep track of manatee comings and goings in Blue Spring State Park.

Sometimes Wayne does this in a wet suit. But on a recent swim, an 11-foot-long gator

WHOOPS!

Unplanned product of a foster-parent program for endangered whooping cranes, a "whoophill" in New Mexico was sired by a whooper out of a sandhill crane. Having failed to produce a single breeding female, biologists have abandoned their efforts to create a viable new flock of whooping cranes, whose numbers in the wild have crept from 51 in 1973 to about 165 today. Rather than struggling to restore a creature so near extinction, many think that efforts should be concentrated on species in the early stages of danger.

with an attitude problem had tried to join him, and Wayne definitely wanted to go by canoe for a while. "I just named that new baby manatee swimming over there Dianne," he said in a tone a little like that of a godparent about to pass out cigars. "She's the calf of Dana, and that cow in the shadows under the live oak is Dana's sister, Delain." I too could tell most of the manatees apart. Every one I saw was clearly marked by scars from boat hulls and propellers.

The West Indian manatee forages along the coast from Louisiana to the Carolinas. With the onset of cold weather some of the animals move up Florida's rivers toward springs where the water remains relatively warm. Manatees have habitat problems—declining water quality, riverbank development, and destruction of the sea grasses they graze on in estuaries and bays. Yet one of the main reasons they are endangered is just plain . . . what shall I call it? Yahoo-ism? Too many powerboaters go too fast, even in waterways with speed limits to protect the last 2,000 manatees, and boat use keeps booming as Florida's human population increases by 2,000 about every three days.

Still, there is another side to our own species' makeup. During my visit I met all kinds of champions of these utterly harmless, vulnerable beasts. Wildlife professionals who volunteered time for public education. Staff at Sea World in Orlando who kept injured manatees afloat in special wet suits and bottle-fed orphaned babies round the clock. And the 38,000 citizens in the Save the Manatee Club, which raises funds through its Adopt-A-Manatee program.

I asked members Kim and David Coleman of South Carolina if they had one. "One? We've adopted 19," replied Kim, "in the names of friends and family members, including an 84-year-old grandfather. He couldn't be more tickled. This isn't some big environmental statement with us. We just love manatees." In the end, that's still what compels us, isn't it? Not ideas like ecosystem management and biodiversity, however sound they may be, but the extraordinary human capacity for empathy, transfigured into compassion toward lives other than our own.

One afternoon I paddled off from Blue Spring with my family in a canoe to explore the St. Johns River. We could have covered more distance if we had taken a powerboat. But tiny frogs would not have climbed from lily stalks onto our craft and ridden with the children in the bow. The reflections were so perfect that we dipped paddles straight into clouds and tree branches blossoming with ibis and egrets. Then a splash next to the boat broke our reverie, and an osprey flew up from the ripples carrying a silver fish. And all the while, gentle eddies would suddenly appear like footprints on the water. They told of big, smooth bodies passing below.

They were manatees, and their message seemed clear to me: Ease back on the throttle a little, can't you? Look around. Take some time to understand what you've already been blessed with before rushing on in a haze of noise and fumes to get more.

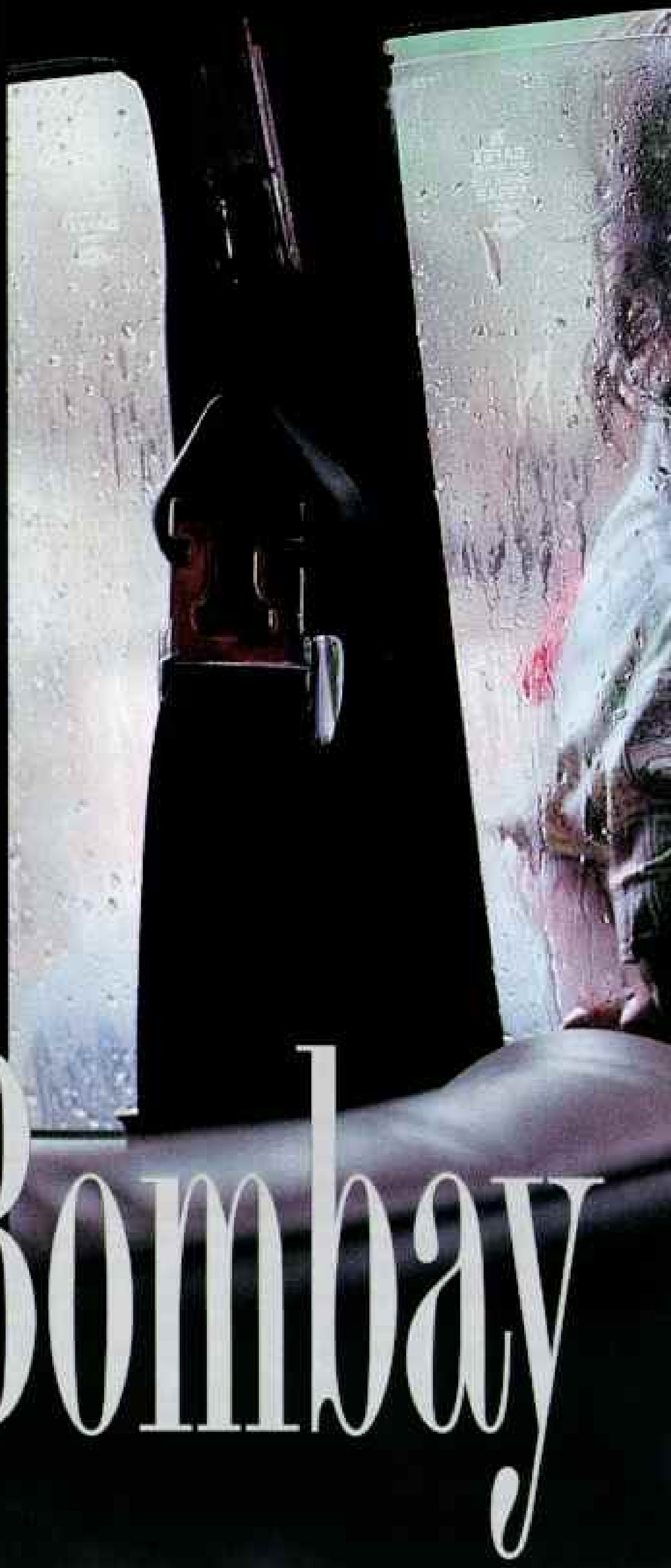
From this point forward, it is what we give back to nature, not what we take from it, that will make our nation a better place to live. □

By JOHN McCARRY

Photographs by STEVE McCURRY

Bombay

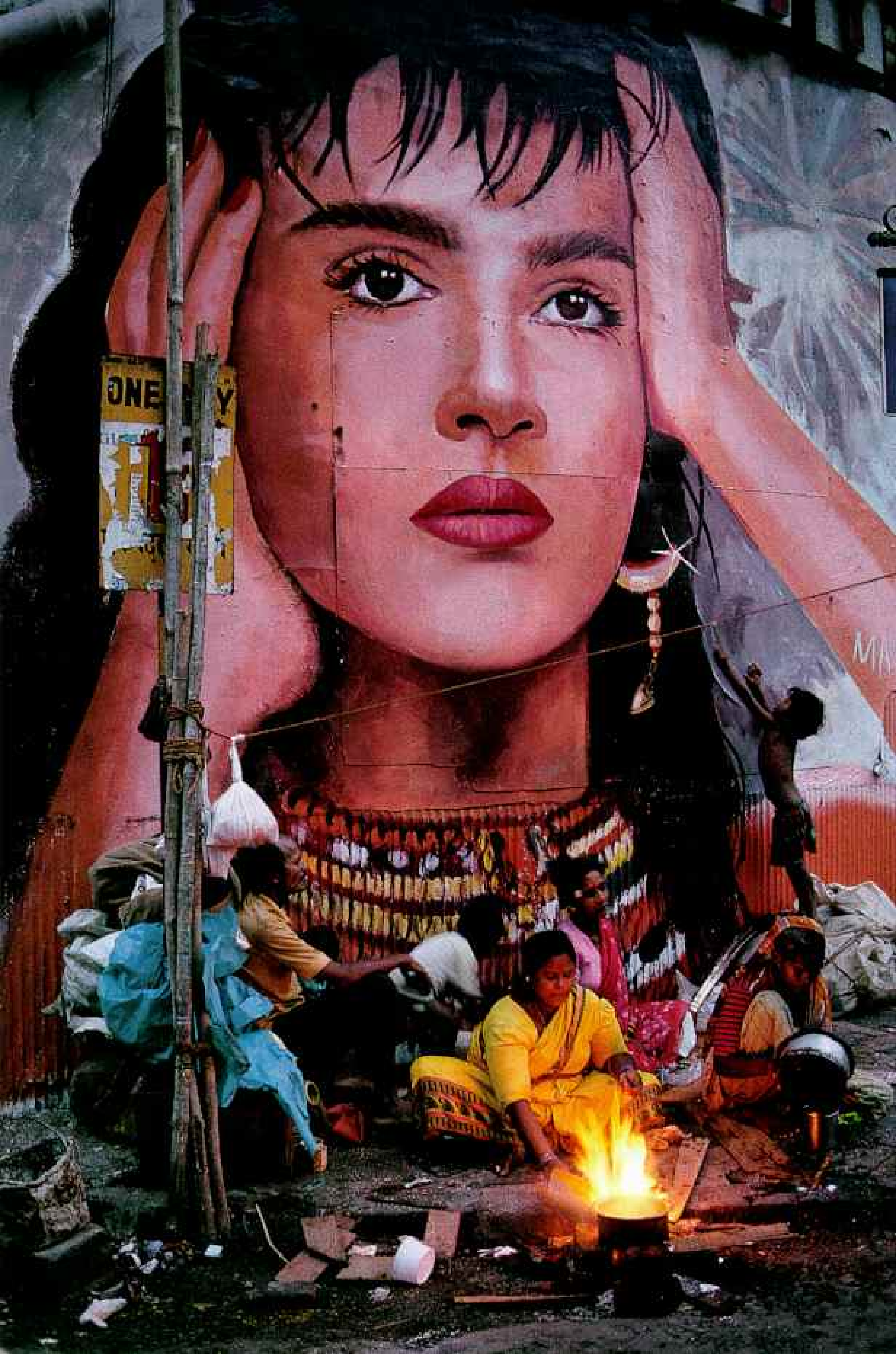
Jam-packed and alive with commerce, India's richest city lures newcomers by the hundreds each day. Arriving with little more than dreams, some hit it big. Others remain on the outside looking in: Half of Bombay's 13 million people live on the streets or in ramshackle huts, and thousands—like this woman and child—survive only by begging.



India's Capital of Hope

Twilight shoppers crowd the streets under the Minara Mosque, heart of Bombay's most populous Muslim quarter. Religious violence in

1992 and 1993 shook Bombay, where the majority Hindus and minority Muslims generally enjoy a peace unmatched in the rest of India.



Sultry mural of pop singer Sharon Prabhakar looms behind Rita Joseph Das, cooking rice and lentils on the street where she has lived for 18 years. Rita's husband sells rat poison in city markets while she tends to their five children and dodges the occasional policeman seeking to roust them from their spot. "My heart is disillusioned," she says of life on the sidewalk. "But at least my husband has a job."

LIKE MUCH OF BOMBAY, R. Kalyanaraman's downtown office looks more like a movie set than the real thing. The carpet is plush, the desk gleaming. Kalyanaraman—India's leading manufacturer of mosquito repellents and disposable diapers—leans forward to tell me, "People here in Bombay are beginning to say that within 20 years the standard of living in India will equal that of the United States. Nonsense. In my opinion, it will take only five."

Almost at the same time that I jot Kalyanaraman's heady prediction into my notebook, a bomb explodes on a commuter train packed with passengers as it pulls into Matunga Station at the other end of town, killing three people, injuring 40, and reminding the citizens of Bombay of the riots and bombings that ravaged their city almost a year before.

For the 13 million residents of India's commercial capital, such juxtapositions of confident optimism and senseless violence are the stuff of daily life. The business leaders of Bombay, newly invigorated by Prime Minister P. V. Narasimha Rao's bold free-market reforms, are preparing to lead India into the 21st century. At the same time, tensions between Bombay's two million Muslims and nine million Hindus threaten to yank the city back into dark passages of India's past. How will the city, and the nation, reconcile these two contradictory urges?

History provides a basis for hope, because if making money is Bombay's karma, so, strangely enough, is tolerance. When the English received what is now Bombay from the Portuguese in 1661 as part of a royal dowry, no one in England gave the place much thought. King Charles II had been led to believe by his lord chancellor, the Earl of Clarendon, that Bombay was an island of no importance "within a very little distance of Brazil." The king was happy enough to lease Bombay to the East India Company—a group of London-based merchants who were to pave the way for the British raj—for ten pounds a year.

In 1669 Gerald Aungier became an East India Company president, and Bombay, then populated mostly by local fishermen, fell under his control. Visiting his new dominion, Aungier saw that this string of seven small islands was not only *not* near Brazil but was situated next to the largest deepwater harbor on India's west coast.

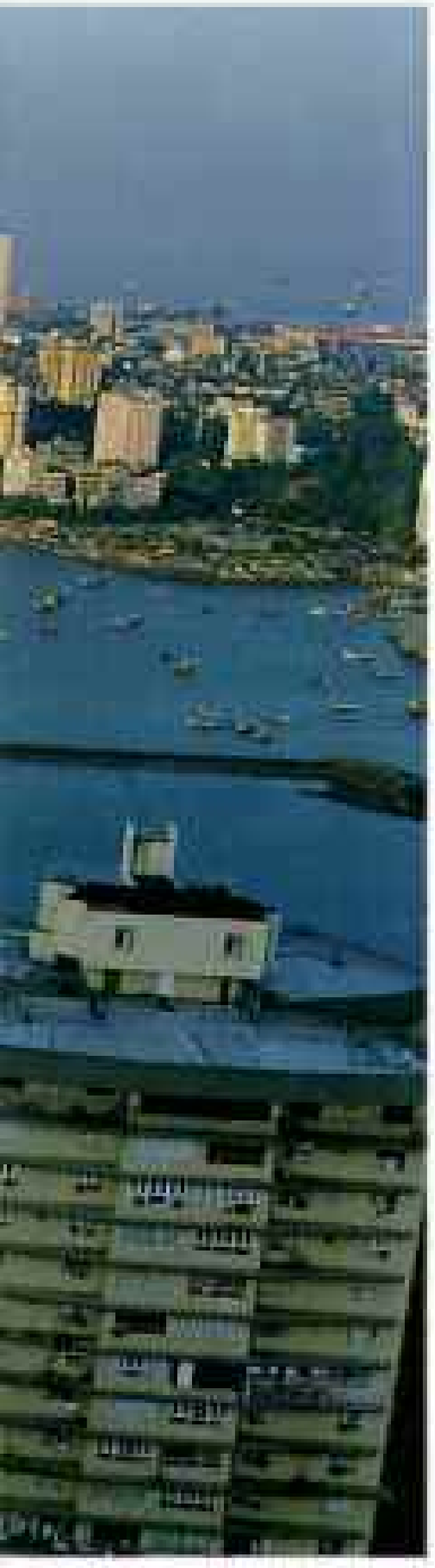
Aungier promptly set about developing the harbor. To do this, he needed native laborers. Hoping to entice them to this swampy, malaria-ridden outpost, he offered Indian settlers complete religious freedom—something that had been denied by the Portuguese as well as by neighboring Indian princes. Governor Aungier's proposal worked. By the time of his death eight years later, Bombay's native population had increased sixfold to 60,000.

A kind of New World in the Indian subcontinent, dynamic Bombay has flowered into India's most cosmopolitan city. Parsis, Zoroastrian worshipers from Persia, settled there; so did Jains, Buddhists, Sikhs, Hindus, Muslims, Jews, and Christians. True to Aungier's original promise, all continue to follow their own customs and pray to their own gods.

Now Bombay has no more room to grow. Though the seven islands Aungier visited have since been joined by land reclamation, the result is not quite two-thirds the size of New York City. This has not stopped people from moving in, however. Their greatest motive: jobs. Of an estimated 300 newcomers arriving each day, only a small percentage fail to find work.

JOHN MCCARRY has spent most of the past five years living and working in the Indian subcontinent. He has written five articles for NATIONAL GEOGRAPHIC. His last was on the people of the Madeira Islands (November 1994). STEVE MCCURRY has photographed more than a dozen stories for the magazine. His most recent was "Afghanistan's Uneasy Peace" (October 1993).

Soaring above the fetid streets, sun-splashed luxury apartments—some worth millions of dollars—look across Back Bay to the financial district, where frenzied traders (below) use hand signals and lung power to buy and sell shares on Asia's oldest stock exchange. Energetic Bombay propels India's fast-growing economy.



While employment may not be a major problem in Bombay, housing is. Roughly half of all Bombayites live in city slums. Abdul Zehnez is one of them. I met Abdul as I was walking along a road that leads to the Bombay docks. He was playing a game of cards with some neighbors in front of his home—a movable shack made from discarded bits of tarpaulin, tin, and cardboard, which he shares with his wife and five children. His card-game companions live in similar shacks, and hundreds of these ramshackle shelters line both sides of this busy road for a mile or more.

Afflicted with polio as an infant, Abdul is paralyzed in both legs and moves about on a board with four casters. Having won his hand, he paused from his game to tell me that he had come to Bombay from a village in West Bengal 15 years before and immediately found work as a fishmonger. "In my village I had to beg for a living," he said. "But here I can work."

When I asked Abdul if he planned one day to return to his home village, he looked at me as if I were mad.

"Why would I want to go back there?" he asked. "I'm a Bombayite now, and in Bombay I'm free."

ABDUL'S FREEDOM is inextricably linked to the city's wealth. Bombay's per capita production of goods and services is roughly three times greater than that of Delhi, India's second most prosperous city. Bombay alone pays a third of India's taxes.

Yet you must look hard for signs of this prosperity. Despite the economic boom, the city gives an overwhelming impression of decay. The pompously imperial buildings erected by the British seem about to collapse under the weight of the humanity that has been stuffed inside them. The battered 1950s-style black-and-yellow taxis that clot the

Bombay

Christened Bom Bahia, or "good bay," by Portuguese explorers, the settlement was deeded to England as part of a 1661 royal wedding dowry. The British filled the water between Bombay's seven islands with land and later built India's first railroad and first city water system. Industrialized and modern, Bombay was an ideal organizing base for Mahatma Gandhi and the Indian independence movement. With engineers reclaiming land from the Arabian Sea until the 1980s, Bombay grew to its current 180 square miles.

A human tide wades through waters off Chowpatty Beach during the Ganesh Chaturthi festival, birthday of Bombay's patron deity. More

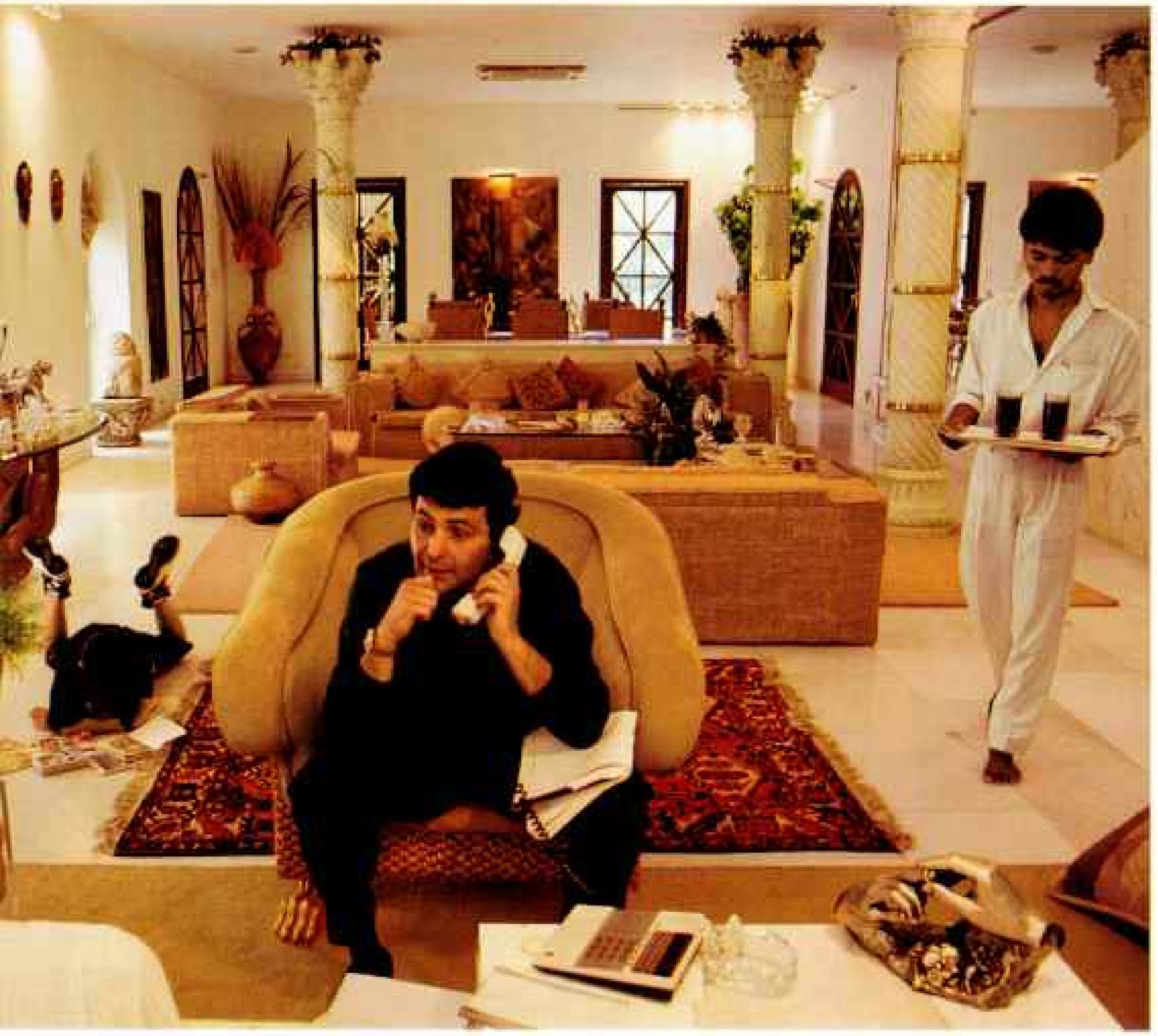
than half the city's population turns out each September to honor the elephant-headed Hindu god of prosperity, intelligence, and good luck.

avenues look as if they were about to cough, splutter, and collectively come to a stop. The Benetton outlets, foreign-car dealerships, and croissant-serving cafés are all but swallowed up by this chaos and lack of space.

Miraculously, the city keeps finding ways to regenerate itself. Perhaps there is an allegory to this process in the funeral practices of the Parsis, who, as shipbuilders and cotton-mill owners, did more in the last century to make Bombay into a city than even the British who nominally ruled them. According to a custom first established by the prophet Zoroaster more than 2,500 years ago, the Parsi dead cannot be buried or cremated, as this would defile the three elements most sacred to them: earth, fire, and water. Instead the dead are laid out in circular walled enclosures called Towers of Silence, where they are devoured by waiting vultures.

Nothing ever goes to waste in Bombay. I was reminded of this the day I went to Dharavi, generally regarded as Asia's largest slum, where an estimated 600,000 people live wedged within less than one square mile. I soon discovered that it is very easy to get lost in Dharavi, with its maze of alleys often passable only by turning yourself sideways. Squeezing past clusters of naked children and stray dogs, I peered into improbably small houses where families of 12 or more lodged. Most of these structures were divided into two stories by rough platforms, with no more than five feet of headroom either on the

Hindi heartthrob Rishi Kapoor, scion of India's most famous family of actors, relaxes at home between filming sessions. "Indians like to cry at the movies," says Kapoor, who flirts and croons through a half dozen starring roles a year. "So our movies are like soap operas." Bombay's Hindi film industry, "Bollywood," creates about 175 movies a year—one-fifth of India's total and enough to keep artists busy painting promotional posters (below).



ground floor or in the loft, and with no furniture to speak of, lest it preempt the floor space needed for sleeping.

Although most people in Dharavi do not have indoor plumbing, they do have jobs, and sometimes three or four. Strolling down 90 Feet Road—so called because this mile-long stretch of pavement is 90 feet wide—I saw all sorts of shops and businesses aggressively competing for the hard-earned cash of the area's residents. Beyond the shops, reeking tanneries churned out leather to be made into fashionable garments for export to Europe, the United States, and Asia.

At the end of the road I came upon a glittering tower of neatly stacked aluminum cans that once held ghee—clarified butter made from cow or buffalo milk, used in Indian cooking. Beyond them I saw lofty stacks of collapsed cardboard boxes, mountains of plastic bags, pyramids of steel barrels. I had arrived at the site of one of Dharavi's principal industries—recycling.

A young man appeared suddenly beside the tower of cans and eyed me suspiciously. "What do you want?" he asked.

I said I wondered how he happened to have so many cans.

"I found them," he said. "And now I'm going to sell them." On his thin, tawny forearm was the tattoo of a swastika, one of the holiest symbols in Hinduism because it represents the seat of God.

The man went on to tell me that selling other people's old cans was a great business. "I used to be a truck driver in Gujarat," he said, "but I gave that up nine years ago to try my luck in the Bombay garbage trade." Now 30, he is confident that he made a wise career move. "After all," he explained, "trash is

Intent on holding on, rail commuters barely notice a feeble man on the platform at Victoria Terminus—VT, in local parlance. Trains roll in

and out of VT 20 hours a day. At peak times they average one every two minutes—crammed to what railway officials call "150 percent capacity."

this city's only inexhaustible resource."

I asked how much he made selling cans.

"Twice as much as I made as a truck driver—15,000 rupees a month, and sometimes even more."

Fifteen thousand rupees is $480 U. S. A pretty good salary—especially since a college professor's average pay is only 8,000 rupees a month. I raised a skeptical eyebrow.

He shrugged. "That's nothing. There are people out here making 60,000 a month doing the same thing."

LIKE ABDUL THE FISHMONGER and this prospering garbageman, most of Bombay's newest citizens are from rural villages. Many of them are refugees from natural disasters such as floods and droughts. Others are refugees from the exacting demands of their own local societies. Village life in India is, for the most part, strictly codified, an existence in which the needs of the individual are made subordinate to those of the group. Unfailing devotion to one's community—whether it be sect or family—is the essential way of life. Bombay, with its promise not only of work but also of the anonymity of big-city life, offers an escape from those small but heavy tyrannies.

Consider the not-so-anonymous career of Asha Sachdev, a film star. I met Asha on the set of a Hindi film. Bombay, the capital of Hindi filmmaking, produces 175 such films a year. In all, India churns out about 900 motion pictures yearly. Called *masala* movies, which means "spicy mixture," the typical Indian film has a bit of everything: Handsome hero, beautiful girl, dastardly villain, some tragedy, some slapstick, a lot of singing and dancing, and always a happy ending.

Clad in a negligee, Asha spoke with me while a makeup person spritzed her with water to give her that sweaty, all-worked-up look. The set was crowded with dozens of stagehands, some of them busy moving lights or fetching tea but most of them standing around, staring at Asha. Without the slightest hint of irony, Asha said, "Bombay is the only city in India where privacy is possible. This city lets you breathe."

Perhaps Bombay is a city where people are simply too busy to care what others are up to. For an Indian woman this is especially liberating. In Bombay, unlike other places in India, a career woman is generally free to live alone, to drive her own car, to marry the man she loves rather than the one her family has chosen for her. "Eve teasing"—an expression used in India to describe the act of harassing women on crowded streets and buses—is a chronic problem elsewhere in the country but is relatively rare in Bombay.

This blasé indifference to others, whether female or male, can be summed up in a word constantly heard in the rough-edged Hindi of Bombay streets: *bindaas*. Although the word can be translated as "I don't give a damn," it corresponds almost exactly to the American "cool." A true-life example: Chic young woman enters fashionable Bombay discotheque; famous and handsome film actor invites her to have a drink with him; woman tells him to kiss off; bystander turns to another and says, "She's so totally bindaas."

Goggles and scarf shielding him from choking dust and smoke, a shipbreaker at a Bombay dockyard helps turn foreign castoffs into an Indian resource. Old merchant ships bought from abroad can be stripped of steel—vital to Indian industry—in a few months. Traffic is heavy at nearby cargo docks: Bombay brings in 40 percent of India's trade revenue.

A second, far more historic catchword is "self-reliance." Introduced into the lexicon of Bombay during the struggle for independence from the British, the term remains emblazoned on some of the city's older double-deck buses, serving as a reminder that Bombay was the birthplace of the independence movement. It was here, on December 28, 1885, that 72 lawyers, journalists, and academics met to found the Indian National Congress, the country's first national political movement and the ruling party in India when independence from British rule was achieved in 1947. For the first 30 years of its existence, Congress operated out of Bombay, where it was financed by wealthy merchants. Embittered by the British Empire's economic policy of forcing Indian consumers to buy British goods made from their own raw materials, Congress leaders such as Mahatma Gandhi called on Indians to buy products only from Indian manufacturers.

After independence, "self-reliance" came to be interpreted as an excuse for state planning. Subsequently, practically all important business decisions have had to be scrutinized and approved in triplicate by the appropriate office in New Delhi, India's capital. What happened, says Alyque Padamsee, a national mass-media expert, is that in the end, "the British raj was simply replaced with a permit raj. With the exception of breathing, New Delhi decreed that everything must have a permit."

The extent to which paperwork overshadows everyday life is staggering: Bombayites are officially required to possess a document to drink a glass of whiskey and to obtain a government permit before they can hold a dance in public.

Already soaked by rain, revelers during the Janmashtami festival (below) are doused with colored water by people on nearby balconies. Summer's first downpours come as a welcome break from smothering heat, but irritation mounts as monsoons dump 75 inches of rain between June and September. When roads flood (right), it's not always by accident: Street urchins sometimes plug storm drains with rags, then wait for drivers to offer them money to help push their stalled vehicles.

Lately, however, things have begun to change—at least for big business. After 40 years of isolationist socialist planning, the Indian government has begun opening up the nation's stiffly protectionist economy, slashing a good deal of red tape in the process. Encouraged by Prime Minister Rao's initiatives, multinationals are jumping into the Indian marketplace to sell their toothpastes and toasters and hair dryers to the country's 250 million urban, middle-class consumers.

JUST AS BOMBAY was midwife to the nation's independence, so it has become midwife to the nation's new role as economic powerhouse. As Darryl D'Monte, former Bombay editor of the *Times of India*, told me, "Perhaps the most important change to take place in India today is that decision-making has begun to shift from the bureaucrats of New Delhi to the businessmen of Bombay."

Bursting with practically every religious, linguistic, and ethnic group found in the Indian subcontinent, Bombay has long been the most integrated of all Indian cities. Business relationships and friendships among people of different backgrounds—less common in other parts of India—are facts of Bombay life. Thanks perhaps to colonial Governor Aungier's live-and-let-live legacy, the city largely avoided the sort of bloody religious confrontations that have occurred elsewhere in India.

The illusion that Bombay might somehow be exempt from communal conflict was shattered in December of 1992, when the Muslims of the city took to the streets after some militant Hindus in the town of Ayodhya destroyed a 16th-century mosque—believed by Hindus to have been built on the sacred birthplace of their god Rama. The Muslim riots were answered with even more ferocious Hindu riots the next month. People fought with knives, swords, stones, and firebombs. The mayhem culminated in March 1993 with

Garbage fouls washday water in Dharavi, Asia's largest slum. India's government has pledged to help residents of Dharavi—where a hundred people might share one toilet. Private developers plan to upgrade slum housing by building high-rises such as those behind tents and shacks in Mahim (above right). But, says social worker Priti Patkar, "It will take decades for conditions to improve. Every time a family moves out, there's another one ready to move in."

a series of bombings that ripped through the city center.

After 14 weeks of the worst urban violence since the 1947 partition of British India into the states of India and Pakistan, more than 1,100 people were dead, and the city's losses in manufacturing, investment, and financial trading were estimated in the hundreds of millions of dollars.

The havoc done to personal lives has been incalculable. I spoke to Nur Jahan Sheikh Mohammed Iqbal at the crowded burn unit of Lokmanya Tilak Municipal Hospital, where, 11 months later, she was still recovering from the riots of January 1993. Like most of the victims of those events, Nur Jahan is Muslim and poor. Disregarding Islamic modesty, she pulled up her loose-fitting tunic and showed me a back covered with raw, pinkish skin.

I asked Nur Jahan if she could tell me what had happened. She said, matter-of-factly, that she had been sitting at home with in-laws when they saw a crowd of Hindus shouting and marching in the street. "When we realized that they were coming toward us," she said, "we quickly shut the door and blocked it with our bodies. One of the ruffians climbed up onto our roof—it's not much of a roof, just scraps of tin—and pulled it apart. Just as I looked up over my shoulder to see what was happening, he threw acid on me."

Had there been problems before between Muslims and Hindus where she lived? "No. Never. We were all friends. I just don't understand why this is happening to our city."

No one does. Theories, though, are about as numerous as people in Bombay. Some argue that the riots were as much a lurid game of economic competition as a sudden explosion of historic religious hatred. Even in normal times, Bombay is a battleground for rival gangsters competing for illegal rackets, political patronage, and, perhaps most important, real estate. In Bombay, where land prices can run as high as in New York City or Hong Kong, real estate is an especially coveted commodity. One theory has it that organized crime bosses helped instigate the religious showdown so they could burn down slums and thereby free the land for lucrative building projects.

As far-fetched as that idea may sound, conspiracy theories are not uncommon in this city, where corruption has developed into a high art. An efficient shadow system to the cumbersome official one, corruption appears to run from the very top to the very bottom of society. One young woman told me of being stopped by a traffic cop for running a

red light. When it became apparent that the policeman wanted nothing more than a bribe, she clumsily handed him a 50-rupee note ($1.60 U. S.) tucked inside her driver's license. He promptly returned the license, along with 25 rupees in change, and dismissed her with a smile.

Many wonder if the political system will be as open to reform as the economy. But there is one man not waiting for a change in official policies to begin his own crusade. This is the Roman Catholic priest and environmental activist Father Francis D'Britto of Vasai.

One morning I boarded a local commuter train and set out for Vasai, once a sleepy farming village remote from the clamor of downtown Bombay but now at the edge of the metropolis. As the train rattled farther from the city center, the claustrophobic assemblage of buildings began to break apart. For the first time since I had come to Bombay I saw trees freed from the constraints of parks and sidewalks—a scattering of palms, then whole groves of banana trees. Eventually we entered fertile farmland, a vast expanse of electric-green paddies. The rich smells of living things gushed through the open windows and doors.

The train at last reached Vasai, and I found a ricksha and gave the driver directions to Father D'Britto's parish. The priest, a romantic-looking individual with a goatee and spectacles, was waiting for me. I got out my notebook; he held up his hand. "First you must eat some soup." He offered me a bowl of minestrone, Indian-style. "The vegetables came from my brother's garden," he said.

Later, he took me on a jeep tour of the place where he was born and raised. We traveled along narrow country roads of reddish

The Victorian age lives on in Raj Bhavan, built for Bombay's British rulers and now home of P. C. Alexander, governor of the state of Maharashtra, and his wife, Ackama. Worried by strains on city services from the swelling population, Alexander's government is transferring some state offices to the satellite city of New Bombay, now taking shape 25 miles to the east.

soil, over rolling hills, past sparkling streams and pretty Portuguese-style farmhouses. Leaving the car at the bottom of a rocky hill, we climbed to a Hindu temple at the top. From one side of the temple we could see a postcard image of agrarian life; from the other, the advancing sprawl of Bombay.

"Vasai is the lungs of Bombay. It is through these trees that God puts breath into the city's body." The priest shook his head. "But now these lungs are being consumed by cancer."

Father D'Britto informed me that in the mid-1970s the Bombay Metropolitan Regional Planning Board agreed to prohibit any further building on the arable land remaining in Vasai. Later, politicians and contractors allegedly cut a deal to seed the area with housing projects. These Soviet-style apartment complexes have greatly taxed the region's meager water supply. Consequently, many wells have turned salty as seawater has seeped into them; others have dried up.

"There are 250 water trucks drawing from our wells day and night," Father D'Britto said. "Naturally the wells are drying up. But what can we do? The government's policy appears to be to industrialize and urbanize. They want to favor the builders, the rich."

In 1989 Father D'Britto began his campaign to keep Vasai green—and wet. As a result, he has been accused of being a dangerous "communalist" and has received threats in the middle of the night from anonymous callers. Undeterred, he has continued to write and speak about what he perceives to be the corruption that has taken over the life of Bombay. He has organized rallies and marches to protest the exploitation of the region's land and water. "Someone has to bell the cat," he said.

Father D'Britto is especially proud of the 500 or so young activists that he has rallied to his cause. "Twenty-five miles away in Bombay," he said, "young people are into drugs, drink, and dance. Here in Vasai, young people are high on social justice."

So are a lot of people who live downtown. For such a large, muscular city, Bombay has a touchingly tender soul. As Ashok Row Kavi, founding editor of *Bombay Dost*, the only publication for Indian gays and lesbians, remarked to me, "Bombay is Manhattan with a heart; it's what I like to call the Big Mango."

VISITING BOMBAY months after the riots had ended, I found the physical damage to the city to be all but undetectable. The stock exchange, devastated by one of the March bombings, was buzzing as usual. The streets, so recently in flames, rang again with the cheerful shouts of hawkers. Yet the psychic scars, I discovered, continued to run deep.

Almost without exception, every conversation that I had with a Bombayite would at some point turn to the topic of the riots. And everyone who broached the subject inevitably had two things to say: One, that no one saw it coming, and two, that every Bombayite was determined never to let it happen again.

I am sure all Bombayites would tell you that they love their city more than any other place in the world, that they would never

Their hopes high for the coming year, worshipers of Lord Ganesh carry florid clay statues into the sea. Displayed in homes for ten days, the

idols are then submerged during the festival's final hours, purifying the faithful and sending Ganesh's spirit back to the realm of the gods.

wish to live anywhere else, that they are Bombayites before all other things. Rich, middle class, poor; Hindu, Muslim, Christian, Jew—what is the common thread? What is it that makes one a Bombayite?

Monisha Shah, a young television executive, told me, "Being a Bombayite is something anyone is eligible to be—even you." But how does that alter the people who come here? This is a question Bombayites have only now begun to ask themselves. Possibly for the first time in its frenetic history, the city's inhabitants have paused from their obsessive moneymaking to look within. It may well have been the tragedy of the riots that jolted them into this collective sense of introspection.

THE NIGHT BEFORE I left Bombay, I was invited to a small get-together at the home of James Ferreira, one of India's best known fashion designers. James is a member of a community of Christians who converted during the days of Portuguese rule. He lives in Girgaum, once a village unto its own, now just another working-class Bombay neighborhood. Yet slipping off the community's crowded commercial boulevard into the narrow lane that leads to James's house, I found myself suddenly immersed in the lazy calm of a small town. The lane is lined with imposing wooden houses embellished with intricate latticework. Day and night their tall, shuttered doors are left open so neighbors can drift in

Cloaked in tradition, women draped in Muslim *burkas* ponder a bright shopwindow, while a woman in a patterned sari passes by. "Bombay is an interweaving of different worlds," says Mira Nair, Indian director of the films *Salaam Bombay!* and *Mississippi Masala*. "Somehow, people make something of their lives, and the city triumphs over chaos. There's no place in India like it."

and out to gossip and have a cup of milky tea strengthened with cardamom pods.

Invited to James's house that night was a cross section of Bombay's smart set: a Sikh businessman, a young Hindu woman who works in public relations, a Parsi landscape designer, a Muslim who creates wardrobes for Hindi films. We sat upstairs beneath a peaked roof, chatting and laughing and listening to jazz. The air, slightly scented from incense and flowers and the earthy smells of nighttime in India, swam in the wake of ceiling fans.

Here in Girgaum the sounds of the city seemed very far away. Occasionally, above the laughter and music, we could hear the sickly plaint of a car horn or the suffocated rattle of a train. Otherwise the world was a tranquil, happy one that we had created for ourselves in this lofty, ancient house.

Then we heard the murmur of voices somewhere outside. We followed James onto a narrow balcony and, looking down, saw that a hundred people, maybe more, had gathered in the street a few houses away. Their faces were half-lit by candles, their voices intoned a prayer. After a while they began to move down the lane.

James told us that that afternoon a 16-year-old girl, the daughter of a Hindu neighbor, had committed suicide. As the procession snaked past James's house, a woman screamed and began to fight the current of the crowd. Two other women took her arms and attempted to calm her.

Sobered into silence, we watched and listened as the neighborhood of Girgaum grieved. Hindu, Sikh, Parsi, Muslim, Christian—we watched until we, too, began to mourn. But what was it exactly that we mourned? The death of this stranger? Or something else?

Standing on James's balcony, looking into the pained faces of his guests, I thought of the riots. It seemed to me then that the anguish of the entire city had somehow been given voice in the cry of that lone woman. A shout of despair over unnecessary death, it had swallowed the night with its sheer force, and us along with it.

It occurred to me that the riots, however ironically, had brought a civilizing force to the city. Having learned to give a damn, Bombay perhaps will rediscover the one community to which all Bombayites can belong. □

Unearthed After 7,000 Years

Chile's Chinchorro Mummies

More than 6,000 years before the Inca Empire, an ancient Pacific coast culture began mummifying its dead. Lying on his reed burial mat, a young boy's body is stuffed with earth and covered with an ash paste, his skull topped with a wig of human hair. Such methods have preserved crumbling shadows of a vanished people.

By Bernardo Arriaza
Photographs by Enrico Ferorelli

EXCEPT WHERE NOTED, ALL MUMMIES AND ARTIFACTS PHOTOGRAPHED AT ARCHAEOLOGICAL MUSEUM OF SAN MIGUEL DE AZAPA

A fisherman's dog dug up a thousand-year-old corpse near Camarones Cove; his master posed it like a macabre sun worshiper. By the time this individual died, the Chinchorro had long since abandoned mummification. Instead the climate, the world's driest, preserved the body, hair, and clothing, along with human bones from countless other burials along the shore.

"MARVIN, look at this head!" I pointed to a break along the jagged natural sutures of a skull so young that it had not knitted tightly together. I gently lifted the skull sections. They disengaged easily, confirming that someone before me had forced the cranium apart, as if prying open an orange. Packed inside the cavity, in place of the brain, was a wad of dry grass and reeds.

For me that moment stands out as sharply as the date it occurred: October 25, 1983. Under the guidance of Marvin J. Allison, an anthropologist then at the University of Tarapacá's archaeological museum in Arica, Chile, I was embarking on my first examination of a Chinchorro mummy.

The Chinchorro (named in the 1960s for a beach in Arica where similar mummies had been found) were prehistoric fisherfolk who lived in scattered villages along the desert coast of Chile and Peru.

The tiny body lying on the table in front of me was that of an infant no more than a few months old. Covering its face was a black painted mask distinguished by a pug nose with incised nostrils, beady eyes, and a puckered mouth. The baby had just been exhumed from a grave in Arica, having slumbered there for 5,000 years.

To the Chinchorro, deliberate preservation of their dead through mummification appears to have been a deeply religious act—a study in devotion. They likely believed that mummies were the bridge between the world of the living and the supernatural realm of the dead. What makes the Chinchorro so remarkable is the elaborate way in which they prepared their loved ones for the hereafter.

Karen Wise of the Natural History Museum of Los Angeles County, who is excavating a cemetery at Ilo, Peru, puts it this way: "Chinchorro mummies are one of the wonders of Andean archaeology and of mortuary studies anywhere in the world."

Mention the word "mummy," and you're bound to evoke thoughts of ancient Egypt and the glittering tombs of pharaohs. Yet the Chinchorro people had been immortalizing their dead fully 2,000 years before mummification emerged in the Nile Valley. The earliest radiocarbon date obtained for a Chinchorro mummy, a child from a site in the Camarones Valley about 60 miles south of Arica, is 5050 B.C. During the next 3,500 years Chinchorro mummification evolved through three distinct styles—black, red, and mud-coated—before the practice died out.

Whereas the Egyptians considered only kings and other exalted citizens worthy of mummification, the Chinchorro accorded everyone in the community, regardless of age or status, this sacred rite. Infants—and even fetuses and newborns—received the same meticulous attention as adults.

It took me hours to examine the masked baby, even though its legs were missing, so I can only imagine how much time and effort went into making this black mummy.

First a mortuary assistant would have cleaned and eviscerated the corpse and detached the head. Using a stone knife, he (or possibly she) removed the skin, flesh, and organs, including the eyes, but ignored the hands and feet—too tricky to work on. After cutting into the skin, he probably rolled it back, much as one might take off a sock. He set the skin aside for reuse, perhaps soaking it in seawater to keep it soft and workable.

Not all bodies were necessarily cleaned by hand. Some may have been left to decay in one of the swampy hollows in Arica; given enough time, birds and insects would have done an immaculate job of picking the bones clean.

Having opened the baby's skull, he removed the brain. Most Chinchorro mummies have *(Continued on page 78)*

BERNARDO ARRIAZA met his wife, Vicki Cassman, when the Chilean government invited her to help preserve the Chinchorro mummies. This year Arriaza and Cassman organized a Chinchorro symposium at the Second World Congress on Mummy Studies in Colombia.

ENRICO FERORELLI, who is fluent in five languages, grew up in Italy. Before turning to photography, he exercised his linguistic talents, serving as an official announcer of the 1960 Olympic Games in Rome.

Ancestor of the mummy makers

Seashells three miles from the ocean alerted University of Tarapacá archaeologists Iván Muñoz (holding skull) and Juan Chacama to a grave site near Arica.

The 9,000-year-old skull (right) revealed the Americas' first known occupational disease: auditory exostosis, a thickening of bone in the ear canal caused by repeated exposure to cold water, probably a result of diving for shellfish.

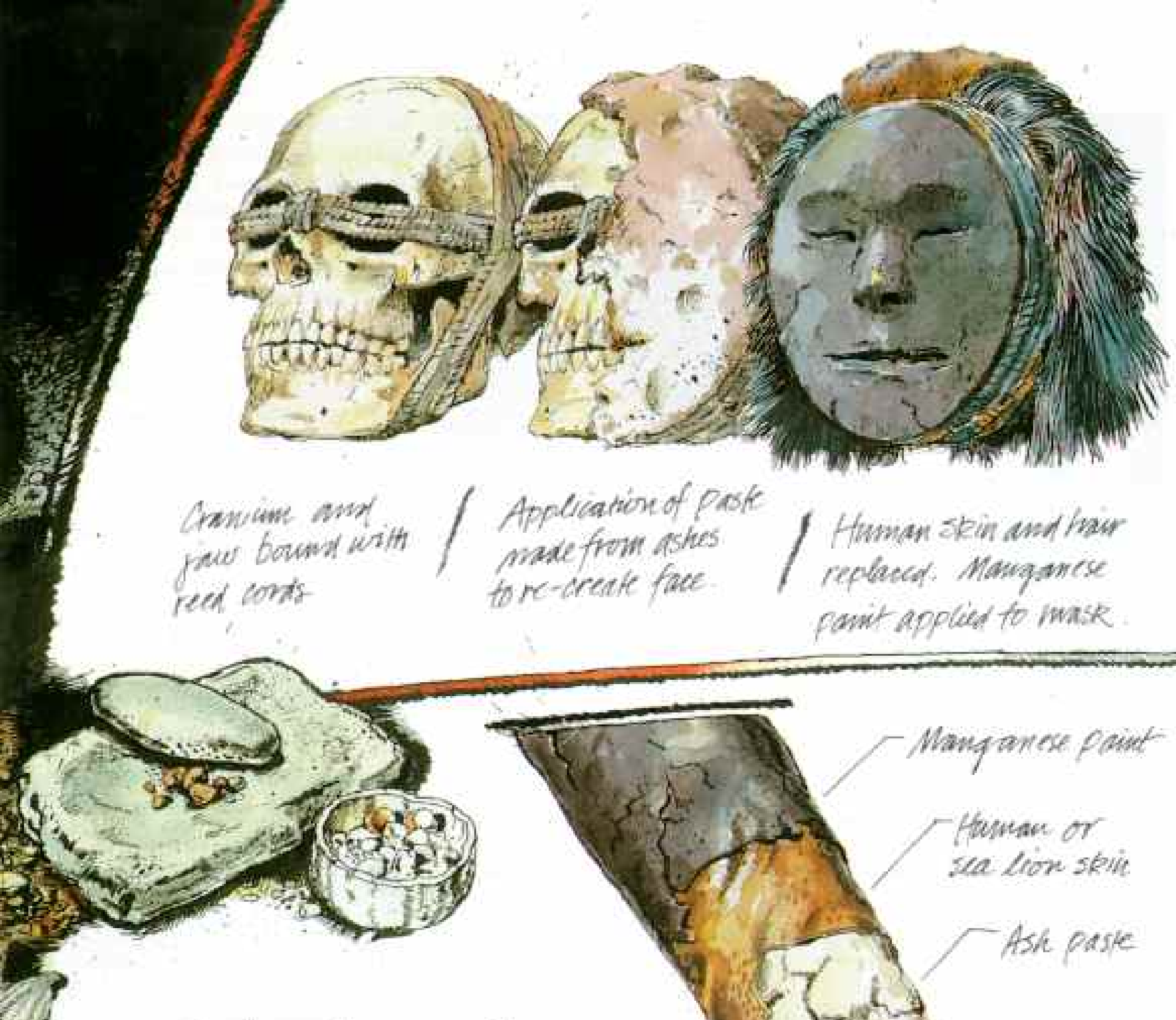
Mummies found here and at eight other coastal sites (map opposite) show evidence of bone infection, degenerated vertebrae, and possibly syphilis.

The culture left no written language. Scientists call it Chinchorro after a beach in Arica, where many remains were found.

Chile's Chinchorro Mummies

A Chinchorro family?

Framed by whale bones that marked their burial plot 5,000 years ago, two adult and two infant mummies await genetic tests, which will determine their relationship. The defleshed bodies were wrapped in cords and modeled with ash paste. Paint clings to the male's mask (above). His legs are reinforced with sticks (left), hinting that he may have stood on display before burial.



A body under reconstruction

Early Chinchorro mummy makers began with defleshed corpses and the rawest of materials. Reassembled, the skeleton was mounted with reed cords onto an internal stick scaffolding. Body cavities were filled with ashes and dried plants, bound reeds gave volume to the limbs, and an ash-paste shell was covered with skin and manganese paint. Such black mummies were created between 5000 and 3000 B.C. For the next thousand years bodies were simply eviscerated, stuffed with earth, covered with paste, and painted red.

PAINTING BY RICHARD SCHLECHT

Crumbling after decades in storage at a Santiago museum, mummies are repacked by curators (right). Earth-stuffed mummies appear solid in X rays studied by the author.

(Continued from page 72) intact skulls, so the usual practice must have been to scoop the brain out through the foramen magnum, the hole at the base of the head. He may have buried the brain, along with the eyes and other organs, or just discarded it.

NOW FOR THE creative part. An expert artisan, most likely with help from an assistant, filled the skull cavity with straw (ash from the hearth was sometimes used as a filler as well). He lashed the cranium to the lower jaw with cords of *tortora* reeds, all-purpose plants with edible roots. A straight stick braced the spine and acted as a hitching post for the skull. Around this stick he wound a reinforcing "neck" of reeds. The baby's leg bones would have been secured to the trunk with sticks extending from the ankles to the chest.

The artisan bulked out the skeleton, and stabilized it further, by tying twigs and reeds to the bones. To regain lost volume in the trunk, he stuffed the chest cavity with grass and a paste made of ash, water, and a protein binder such as sea lion blood, bird eggs, or fish glue. Much of the body was covered with this light gray paste, which in addition was used to model the sexual organs.

With the care of a potter, the artisan coated the front of the skull with a layer of paste, which hardened into a mask. He sculpted a nose and made neat elliptical incisions for the eyes and mouth.

Many Chinchorro mummies have an O-shaped mouth reminiscent of Edvard Munch's painting "The Scream." One explanation is that the artisans failed to tie the skulls tightly enough to close the mouth, which would have fallen open in death. Or maybe this was a deliberate practice, to give the face character and make the person seem to come alive. ("The Scream," it turns out, was inspired by the expression on a natural Andean mummy in a Paris museum.)

Reattaching skin restored the human look, as did a short wig of human hair pasted to the skull. Inevitably shrinkage occurred after skinning; if the artisan came up short, he patched the gaps with animal skin.

Having thus rebuilt the body into a rigid, durable, and convincingly human form, he added the final, glorious touch: a coat of black manganese paint.

One villager—it might have been the same person who cleaned the baby's bones—combed the beaches for powdery black sand, collecting it in a gourd or leather pouch. Using a crude mortar and pestle (several were found in the cemetery), he ground the sand up finely and added water. The artisan applied this liquid with a brush made of fine blades of grass. When dry, the paint had

a dull finish, so the body was buffed to a high sheen with a smooth piece of wood or possibly a wave-worn pebble.

We owe the discovery of this Chinchorro mummy to the Arica water company. Workers had been digging trenches for new pipes in the sandy bluff known as El Morro that looms over the town. Three feet or so below the surface they hit upon a cemetery filled with mummies. When the construction supervisor asked staff members from the university's Archaeological Museum of San Miguel de Azapa to come to the site, we did not expect to find anything out of the ordinary. By then we had become expert at exhuming bodies that had dried out naturally and been preserved, like insects in amber, in their parched resting-places beneath the Atacama Desert.

This time we got the surprise of our lives—elaborately reconstructed bodies. What the water company crew members had unearthed back in October 1983 was exquisite evidence of the oldest system of artificial mummification in the world.

To preempt the inevitable looters, Vivien Standen and Guillermo Focacci, archaeologists and colleagues of ours at the university, worked feverishly to rescue the mummies. From an area roughly 75 feet square they raised 96 bodies, all buried in extended positions, lying on their backs.

Most were well preserved, and a few, extraordinarily so; some, however, had been damaged by later prehistoric burials in the cemetery. El Morro also produced a bonanza of artifacts, from fishhooks and lines to harpoons and atlatls. These goods were distributed evenly among the graves—another sign of Chinchorro egalitarianism.

Over the next two years Marvin, Vivien, and I documented every detail about the mummies, from head to foot, in an effort to figure out what went into making them. In studying the bodies themselves, we made some remarkable discoveries: the earliest evidence, for

PHOTOGRAPHED AT REGIONAL MUSEUM OF IQUIQUE (ABOVE);
PHOTOGRAPHED AT CHILEAN MUSEUM OF PRE-COLUMBIAN ART, SANTIAGO

At rest in a reed shroud since 2000 B.C. (above), a woman is wrapped in cords and a layer of bird skin, possibly pelican. An earlier black-period mummy of a child (left) is held straight by a long stick that emerges from the head.

instance, of an occupational disease in the Americas and proof of osteoporosis in Chinchorro women.

Now, as a professor of physical anthropology at the University of Nevada in Las Vegas, I am devoting myself to learning more about the origins and daily lives of these time travelers of the Atacama coast.

They first came to light in 1917, when Max Uhle, a German archaeologist working in an area adjacent to El Morro, exhumed several extraordinary-looking bodies. They were mummies meticulously created by people belonging to the Chinchorro culture. Some archaeologists argue that the term Chinchorro should apply only to those coastal people who practiced the art of artificial mummification. But I prefer to include their forebears, who lived in the same coastal villages but were not yet mummifying their dead.

So far a total of 282 Chinchorro mummies have been removed from burial sites along the narrow coastal strip from Ilo in southern Peru to Antofagasta in northern Chile. Of these, 149 were created by Chinchorro artisans, and the rest were the work of nature.

If, as it now seems, the Arica-Camarones area represents the bedrock of the Chinchorro culture, then the cemetery at El Morro is its mother lode: No other site in the region has yielded a larger or better preserved collection of artificial mummies.

Until recently Chinchorro mummies remained obscure, largely because the archaeologists who found them were more interested in artifacts than bodies. In my experience people associate South American prehistory with one group—the Inca. Let us also picture the Chinchorro, whose spiritual beliefs dictated that a person's transition to the world beyond could never be left to luck.

When I was a youngster growing up in Coltauco, a small town in the vineyard country south of Santiago, my father used to regale me with stories about the dry north, where he had once worked for a British company mining nitrate. Places like Arica were a world beyond, exotic destinations far removed from the Chile I knew. When applying to college, I chose the University of Tarapacá, which is as far north as you can go if you want to receive a science degree and still be in Chile.

In Arica, ancient remains are as common as casinos in Las Vegas, so when a part-time job—and the chance to earn extra money—came up in the Museum of Azapa, I jumped at it. I became so immersed in the work that after graduating I stayed on at the archaeology museum as a full-time research assistant. Mummies have preoccupied me ever since.

"ARICA," says Guillermo Focacci, "is a cemetery of past cultures, one layer on top of another, going back literally hundreds of generations."

If you drive north from Santiago, you'll understand why people clustered in spots like Arica. The first time I made the trek, I was shocked by the change from the soft greens of Coltauco to the harsh browns and yellows of the Atacama Desert. I shouldn't have been, for every Chilean knows that the Atacama is the driest place on earth—but experiencing a wasteland is different from imagining one.

Seemingly endless chains of sandy mountains cut me off from the cool ocean washing the shore a few tantalizing miles to the west. In this breathless landscape the only feature that

National Geographic, March 1995

Its head encased in mud, a child from late in the Chinchorro era was found on a stick frame used in life to carry it papoose style (opposite). Even fetuses were mummified (above, center), bearing eerie resemblance to carvings of the same period.

pleased my eye was the occasional defile, green with trees and grasses, cut by one of the valiant streams that tumble from the peaks of the Andes and somehow resist vaporization in the Atacama cooker before surrendering to the Pacific.

These streams make life possible, and wherever they meet the sea—Arica is such a place—life can be easy. Thanks to the cold Peru Current surging up along the Atacama coast, ocean and shore teem with life: anchovies, corbina, and flounder; sea lions; crabs, mussels, clams; seaweeds and sea grasses; pelicans, gulls, and other birds.

I cannot imagine a more inviting niche for prehistoric settlers than these coastal oases. The Chinchorro people, the first humans known to occupy them, arrived at least 9,000 years ago. But from where?

Most likely they started out in the Andean highlands and followed the streams down to the coast. Calogero Santoro, an archaeologist at the University of Tarapacá, found shells and fish bones dating from 10,000 years ago in a rock shelter at 16,000 feet in the mountains east of Arica. So there must have been contact between coastal people and highlanders. Drier conditions at the end of the last ice age may have caused food shortages in the mountains. Hunters would have made forays to the seashore; eventually the abundance of resources lured them there for good.

By 7000 B.C. one group of Chinchorro, perhaps an extended family of about 30 people, had put down roots in Arica. Iván Muñoz and Juan Chacama, also of the University of Tarapacá, recently obtained almost identical carbon dates for the remains of a naturally mummified individual—named Acha Man for the site—and a nearby cooking hearth. The hearth lay at the center of one of eleven circular stone foundations outlining the dwellings of this oldest documented Chinchorro community.

Such finds have changed our views about prehistoric settlers along the Pacific coast. They were not, as was previously believed, hunters and gatherers who migrated over great distances. Rather, they stayed put in permanent fishing villages.

With food and fresh water always at hand, the Chinchorro had some time and energy to spare. They used it to care for their dead. Living in one place meant they could establish cemeteries and hold religious ceremonies surrounding death, and mummification became an enduring expression of their beliefs.

THE BABY whose skull had so intrigued me illustrates the mastery of Chinchorro artisans. It is one of the eight El Morro mummies we found in the black style, which emerged around 5000 B.C. and lasted more than two millennia.

About 2800 B.C., however, black went out of fashion. The religious symbolism of colors may have changed, or possibly black manganese was becoming hard to find. For the next thousand years the preferred medium was red ocher, which is ubiquitous in the rocks near Arica. El Morro contained 27 red mummies.

The mummification process changed too. Although the bodies were still packed with plant material and reinforced with sticks, they were no longer dismembered. Instead the preparer removed the organs through neat incisions that were then sutured with human hair, using a cactus needle.

Another striking difference was in the length of the wig. Strands of black human hair as much as two feet long were bound into bundles with reed cords. The artisan attached these clumps to the back of the head with ash paste, which was later painted red. The effect is that of a motorcyclist whose hair flows out from beneath a shining helmet.

In contrast to their bodies, the faces of these mummies were often painted black. A few red mummies from other sites wore masks of green—the color of oxidized copper pigment.

Three El Morro mummies of the red period were unusual for the way their skin was reattached. All were children, and all had the usual helmets. But, inexplicably, half-inch strips of skin—human as well as sea lion or pelican—had been wrapped like bandages around their trunks and legs, giving them the look of the classic mummy in Hollywood movies.

Having put so much into creating their mummies, the Chinchorro would surely have made the most of them. I believe they felt there was a spirit of reciprocal altruism between the living and the dead: By displaying and caring for the mummies, the Chinchorro secured protection. Food offerings would likely have been made, and close relatives of the deceased may have assuaged their grief by visiting the bodies. This veneration may have gone on for months. Some mummies have several layers of paint, indicating that they were subject to wear and tear and needed periodic retouching.

Mourners may have held the mummy aloft and paraded it around, which would help explain the emphasis on sturdy construction. There may have been another reason: A mummy would need to be robust to survive in the afterlife.

When the grieving finally ended, the mummy was wrapped in a shroud of twined reeds and laid to rest in a shallow grave with a few belongings—a fishing line, a carved wooden figurine, even the beak of a pelican. Mummies were sometimes buried in groups of up to six, possibly family members, lying side by side stretched out on their backs.

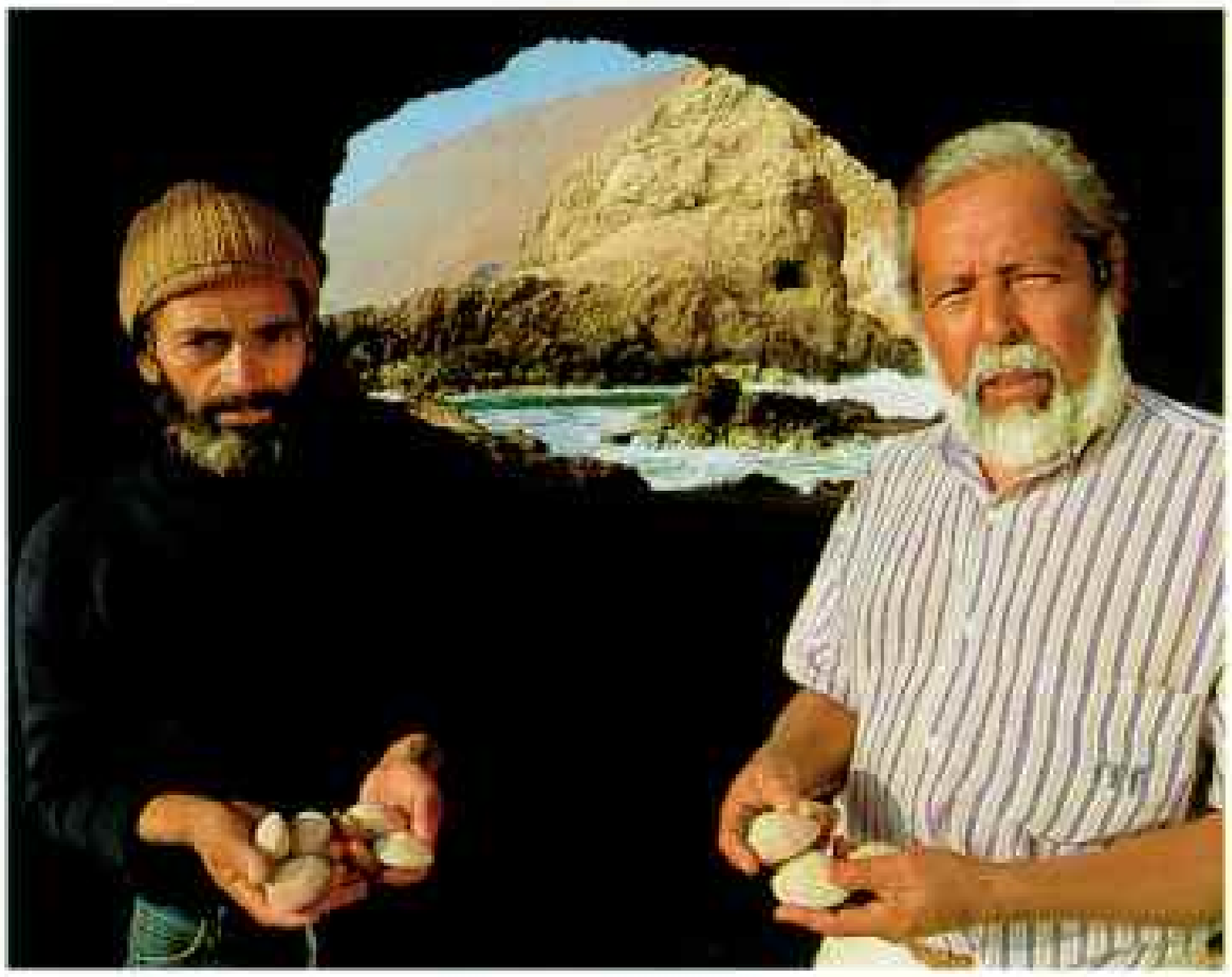
HONORING THE DEAD is, of course, at the core of our humanity. But why did the Chinchorro go to such lengths?

In the absence of a written record we find likely clues in the religious beliefs and practices of later South Americans. Sixteenth-century texts refer to *huacas*—sacred objects that included natural mummies, considered deities by some Andean peoples and said to bestow

fertility. The living, who traced their roots through the huacas, kept them clothed and fed.

The Inca themselves, with much pomp, paraded the naturally mummified bodies of their royal rulers during religious festivals—"the beastly act of venerating the bodies of the dead," wrote the Spanish priest Bernabe Cobo in the 1650s. To the Inca—and presumably the Chinchorro as well—the bodies of the dead linked the living to the supernatural world; preserving the body was essential for the survival of the soul.

Bodily survival along the Atacama coast was not without risk. The Arica-Camarones area



Fresh water, vegetation, and access to the ocean: The Chinchorro found it all in river valleys that pierce Chile's shoreline, as at Camarones Cove (above). Runoff from the distant Andes still sustains ribbons of life to the sea, and shellfish remain a main food. Fisherman Dagoberto Vivanco (far left) retrieved a serving of the Chinchorro's staple, almejas, *for University of Tarapacá anthropologist Luis Briones.*

is prone to earthquakes and tsunamis, and then, as now, the sea must have claimed lives because of treacherous currents and undertows. The Chinchorro likely viewed natural calamities as supernatural events. They may have believed that by preserving and venerating the victim's body—their conduit to the supernatural—they could protect themselves from the same fate.

Desire to keep the body of a loved one until the pain of the loss diminished may also have

Archaeologists found fishing gear of stone, bone, and cactus needles bound by original cord (above). Spear heads (right) were mounted on sticks; a knife-like tool pried shellfish loose. Chinchorro fishermen still use ring-necked nets (opposite).

PHOTOGRAPHED AT NATIONAL MUSEUM OF NATURAL HISTORY, SANTIAGO

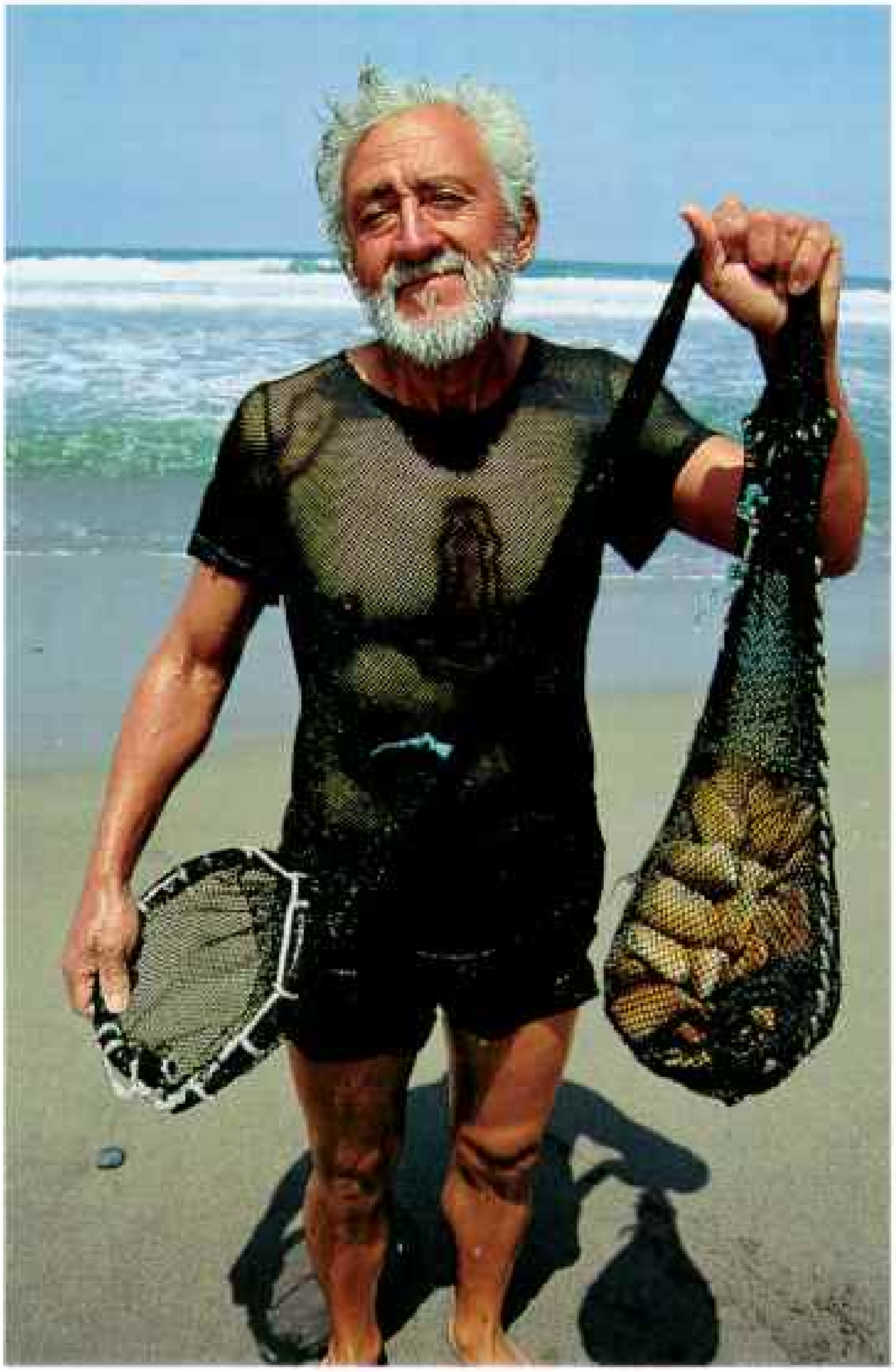
Chinchorro sites are strewn with fishhooks filed down from mussel shells. While shells and tools are commonly found near

Chinchorro mummies, not until the culture's final stages were graves apparently stocked with supplies for the afterlife.

spurred mummification. Some of my colleagues believe it began with the children, and indeed the earliest artificial mummies we have yet found are Chinchorro children. Loss of the young must have been deeply felt—anatomical studies of El Morro mummies show that 24 percent were children who died in their first year of life.

Honoring mummies consoled bereft family members, reinforced the sacredness of kinship, and brought the community together, all of which made life more harmonious.

Gradually, however, beliefs about the afterlife changed. By 1700 B.C. the Chinchorro had adopted a much simpler



mummification style, involving only external treatment of bodies. The corpse was just daubed with a protective layer, about half an inch thick, of paste made of sand and fish glue or other binder. At El Morro the two dozen mud-coated mummies must have been interred before their mud shells hardened, because all were cemented into the grave pit.

We can only suppose what triggered this break in tradition. Trade with outsiders may have exposed the Chinchorro to new ideas, or they may have begun to associate decomposing bodies with disease. Whatever the reason, about 1500 B.C. the mud-coated era ended, and with it the practice of elaborate mummification in the Americas. Meanwhile, in distant Egypt, the boy-king Tutankhamun had not yet been born, let alone mummified.

For physical anthropologists mud-coated mummies—largely unaltered bodies complete with organs, bones, and tissue—offer a significant advantage. By studying these remains and the natural mummies, along with artifacts and other evidence from grave sites, we are beginning to paint a picture of life in a Chinchorro community.

"THE CHINCHORRO were masters of the ocean," says Virgilio Schiappacasse of the National Museum of Natural History in Santiago, who is one of the Chilean pioneers of Chinchorro research. "What impresses me most is their sophisticated tool kit."

Certainly the fishhooks they carved out of mother-of-pearl are as delicate as they are functional. The iridescent hooks glinted temptingly in the water, doubling as lures. Fishermen also made hooks out of cactus spines. They used stone sinkers and fishing line made of strands of tortora reed intertwined with hair. Divers stored their clams and mussels in reed nets that look much like the ones shell fishermen carry today.

Analysis of the bone chemistry and bowel contents of the mummies shows that the Chinchorro were sustained by the same diet for five millennia. They derived about 75 percent of it from the sea, according to Arthur Aufderheide of the University of Minnesota. Land animals and plants supplemented the daily intake of sea lion meat, fish, shellfish, and seaweed. From bone fragments in refuse areas, we know that the Chinchorro hunted guanaco and deer. Karl Reinhard of the University of Nebraska has identified seeds of wild tomatoes and mint in the bowels of several mummies. Reinhard also reports that 19 percent of the mummies in his survey contained tapeworm eggs—no doubt because the Chinchorro ate their fish raw or only partly cooked.

If stomachaches were a fact of life, toothaches were not. In our collaboration Marvin

Allison, Vivien Standen, and I found that the Chinchorro's teeth had minimal cavities, because seafood is low in the carbohydrates that cause tooth decay. However, their teeth were highly abraded. When they ate shellfish or seaweed, they inevitably also consumed sand, which scoured away plaque but wore down teeth.

In examining the skulls, we saw that many had bean-like bumps in the ear canal, a condition known as auditory exostosis. The bony growths are caused by exposure to cold water. If chronic, as in people who dive repeatedly without ear protection, deafness can result. More than a fifth of the Chinchorro had auditory exostosis; nearly all were adult males, which indicates that harvesting from the sea was men's work. Even Acha Man, who lived 9,000 years ago, had the telltale bumps, making his the first known case of an occupational disease in the New World.

Eighteen percent of the men whose bones we studied, but none of the women, had fractures in their lower back. Clearly, slips and falls on the rocky coast were another hazard for divers. While not incapacitating, the condition would have caused nagging pain. Spinal arthritis, also brought on by physical stress, affected almost a third of the population, women as well as men.

One in five Chinchorro women suffered from compression fractures of their vertebrae—the result of declining bone density. We usually think of osteoporosis, in which weakened bones collapse under the weight of the body, as a disease of the aged. With the Chinchorro it was different.

Because of the high infant death rate, women must have had numerous children, starting in their teens. Babies grow at the expense of their mother, extracting minerals, such as calcium, and other nutrients from her blood and bones. So consecutive pregnancies, perhaps combined with a low-calcium diet, could have prevented the mother's bones from regaining their normal mineral content. Her skeleton became brittle, predisposing her to the trauma of spinal fractures.

Giving birth was debilitating, but handling death may have been perilous. Forty percent of Chinchorro people were afflicted with infections on their legs so severe that the bone itself sustained damage, which is how we were able to detect the problem. To me the bone lesions suggest an infection similar to yaws, perhaps caused by contact with decomposing flesh.

Imagine a Chinchorro woman eviscerating a cadaver, when her cranky toddler suddenly demands attention. To quiet the child, she hands him food and wipes away his tears with her unwashed hand.

THESE TROUBLES ASIDE, the Chinchorro, unlike later agricultural peoples in the region, seem to have been surprisingly healthy. The structure of their skeletons and condition of their bones suggest an average life expectancy of about 25 years. Many adults would have reached their 30s; a few may have made it to their 50s, a long life for anyone in prehistory.

As I see it, theirs was something of a paradise. Although the day revolved around fishing and hunting and occasionally attending to mummies, there would have been time for other activities: teaching children how to make fishhooks, harpoons, and reed mats to cover the small, circular huts; exploring the seashore and its many caves; visiting relatives in the cool mountains.

And I can envision, in the solitude of the night, a Chinchorro storyteller holding his audience spellbound with mythic tales of heroic ancestors. In the midst of this gathering the mummy of a beloved relative gleams in the moonlight, filling the Chinchorro with hope and reassurance by evoking the protective powers of the supernatural.

Now the Chinchorro mummies need our protection. The moment we lifted them out of their underground cocoon, we began exposing them to damage through handling and changes in weather. Many El Morro mummies have deteriorated more in the past decade than in the previous 5,000 years.

Proper storage is costly and difficult. The mummies consist of different materials, which complicates preservation, and are so desiccated that the slightest knock to an arm or leg can break it off. The best solution would be to minimize vibration by housing them in separate containers, insect-proof microenvironments in which light, temperature, and humidity are strictly regulated.

Without such protection one of the most startling archaeological collections in the New World will continue to deteriorate irreversibly—and the power of the Chinchorro mummies to reveal further secrets of our humanity will fade. □

Cracking a 5,000-year-old grin, a black-period mummy shows what it's made of: bones, cord, ash paste, skin, paint, and wig. Chinchorro mummies are still rising from Chile's sands, in a fragile yet enduring bid for immortality.

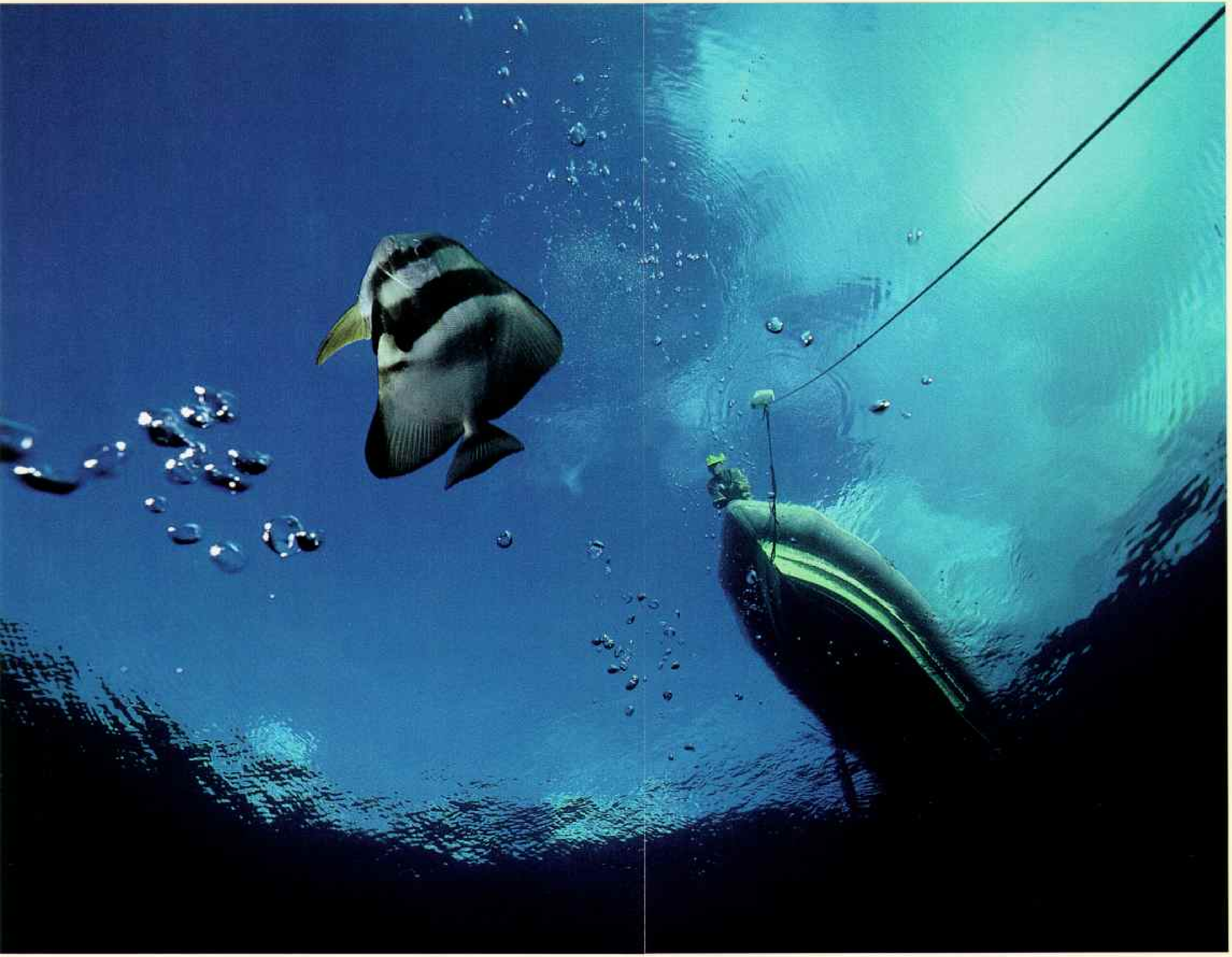
PHOTOGRAPHED AT MUSEUM OF NATURAL HISTORY, VALPARAÍSO

Journey to

ALDABRA

TEXT AND PHOTOGRAPHS BY DAVID DOUBILET

In a far corner of the Indian Ocean four islands rise. Their names are like whispers on the wind: Aldabra, Cosmoledo, Astove, Assumption. Remote and undisturbed, preserving murmurs of ancient life, they are an oceanic refuge where batfish chase bubbles beneath a mirror-calm surface and frigatebirds swoop for prey. To explore them requires a voyage by sea and, I discovered, a passage back in time.



At ebb tide under an equatorial sky, the shallow lagoon of Cosmoledo empties through

a pass and flattens a swatch of sea ruffled by trade winds.

COSMOLEDO

the journey begins

ON THE AFTERNOON of our third day out from Mahé, principal island of the Republic of Seychelles, the low smudge of Cosmoledo crawled up over the horizon. Our dive boat, 115-foot-long *Fantasea II*, rolled lightly as we searched for an anchorage. Very few vessels make this journey, so with friends Asher Gal, Howard Rosenstein, and Meri and Gary Bell, I prepared for a dive into the unknown.

Cosmoledo and the nearby atoll Astove lie about a hundred miles from Assumption and its large companion, Aldabra. Aldabra first appears on a 1501 Portuguese chart, though the island may well have been visited earlier by Arab traders sailing their dhows to East Africa.

With poor anchorages and scant fresh water, Aldabra and neighboring islands offered little to passing ships and were mostly left alone. Eventually imperial powers, first France, later Great Britain, took nominal control of the islands. By 1874 Charles Darwin and other scientists knew enough of Aldabra's giant tortoises to petition the governor of Mauritius to preserve and protect them.

A modern threat appeared in 1966, when Britain proposed building an air base on Aldabra. Scientific societies in Britain as well as in the United States rallied to the island's defense. Ecologist David R. Stoddart, then of Cambridge University, led an intensive study, concluding that "Aldabra is the least disturbed atoll in the world and . . . the richest."

Aldabra was spared and in 1982 was named a world heritage site by UNESCO. Seychelles has taken additional steps to protect all of the islands, part of its territory, and they remain, for the most part, the unspoiled natural laboratories they were in Darwin's time.

That first afternoon off Cosmoledo, I made a deep dive along the reef face. At 120 feet I found an anemone closing up for the night. Its soft pink outer skin enfolded its gray tentacles, while a pair of clownfish—with immunity from the anemone's venom—began to burrow inside for safety. I emerged at twilight. Our vessel rode quietly at anchor under a quarter moon. Yellow light slipped from its portholes and spread over an empty sea.

Walls of snappers and grunts gather, dissolve, and regather at Cosmoledo.

If I hold my breath so no bubbles escape, they glide past in perfect formation.

ASTOVE

an anchored mirage

ONLY TWO MILES LONG, Astove seems to float upon the sea. Looking to "get away from it all," an Englishman named Mark Veevers-Carter brought his wife and three children to the atoll in the late 1960s to live off the land and raise copra. About a dozen Seychellois lived there then also. When Veevers-Carter developed tooth trouble in March 1970, he arranged to ride a passing cargo ship to Kenya, where, sadly, he died in the dentist's chair. Because he had brought the island's only radio with him to be repaired, his family did not learn of his death until the cargo ship returned more than a week later.

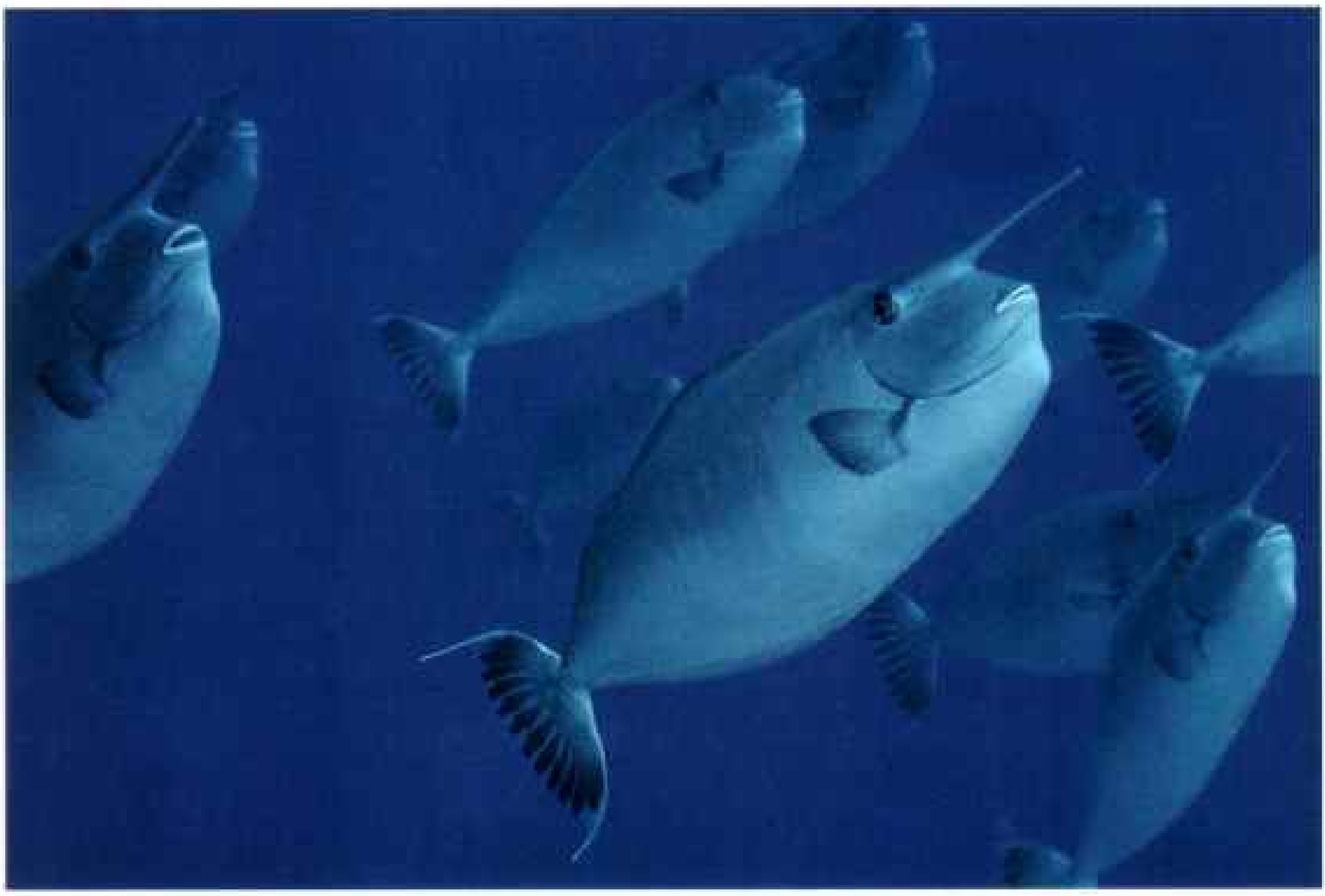
Untended for decades, the abandoned farm's coconut palms now seem to suspend the island from a vacant blue sky. We cruised along the reef face seeking an anchorage, but Astove's flanks were impossibly steep. We took our inflatable boat to the reef's edge and went over into clear, dark water.

The reef fell away into blackness. My friends were tiny figures below. I was swept by vertigo and the sense that I was falling. Shafts of sunlight came over my shoulder and speared into the depths.

Then the reef turned a corner, the current increased, and we entered a small forest of sea fans. The current obligingly pushed a clear broth of microscopic life past the branching, tethered coral. Feeding with the sea fans, schools of anthias fish darted into open water, swerved back toward the reef face, and darted out again. The reef seemed to breathe.

ON THE WEST SIDE of Astove we came to a tenuous anchorage and hung off the reef in a shifting wind. As reef it was nondescript, except that it hosted a circus of fish. Powder blue surgeonfish with dark masks and neon yellow dorsal fins grazed on shallow-water corals. The reef sloped down 25 feet, then dropped precipitously. I looked over the edge and watched a parade of unicornfish rise from below. They patrolled for plankton in the thin blue corridor along the reef's edge. As they swam by, each fish gave me an impassive walleyed stare.

Then I noticed a sweetlips being tended by a cleaner wrasse. Sweetlips feed on mussels and shrimps and other crustaceans. They lunge at the bottom to seize their prey, often injuring their soft mouths on sharp coral. I watched as, one by one, sweetlips paused over a flat coral head—aid station of the wrasse. The wrasse would perform a jerky, bobbing dance, and a sweetlips would relax and slowly open its mouth. Darting into that gaping cavern, the wrasse delicately picked at the sweetlips' raw, red wounds and removed bits of loose flesh, promoting healing while getting a meal.



ASSUMPTION

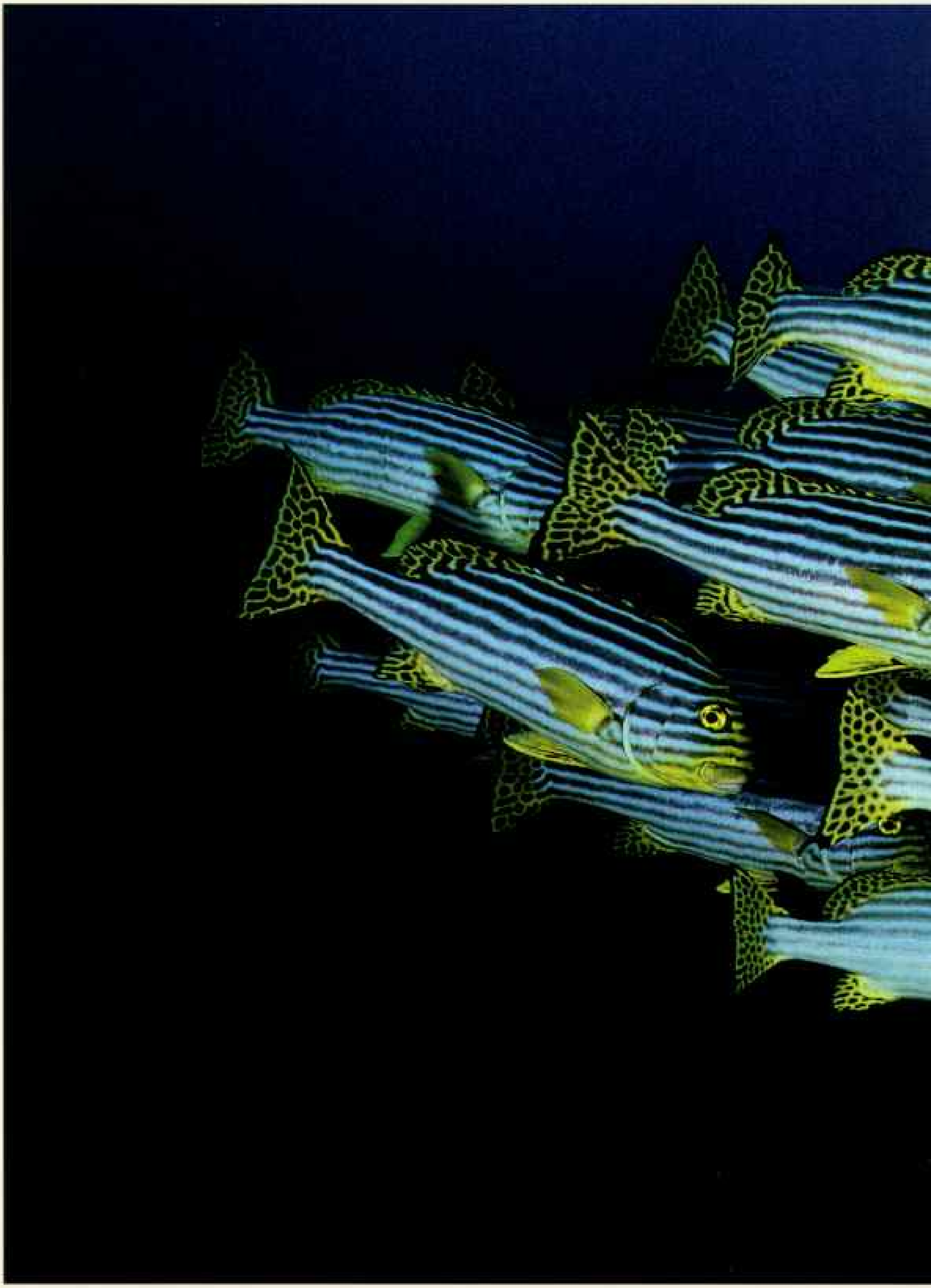
sanctuary from wind

WE MOTORED out of pounding swells into the calm, sheltered water of Assumption. In the lee of a brilliant white beach our vessel swayed easily at anchor as if laminated on a transparent sea. Nearly 40 years before, another white vessel, Captain Jacques-Yves Cousteau's *Calypso,* sought sanctuary here. Aboard was a young director, Louis Malle, making Cousteau's epic documentary film, *The Silent World.* Also aboard was Luis Marden of the GEOGRAPHIC, shooting still pictures that were to make the first modern underwater magazine picture story. I have thumbed to tatters a copy of the February 1956 issue. To me, it's priceless.

Memories of it went with me as I put on my fins and tank, slipped off the dive platform, took my camera, and went into a perfect sea. The reef sloped away to a white sand bottom furnished with couch-size coral heads. I went deep, near the limit of visibility, then ascended to shallower water, where I saw a large, lumpy sea cucumber. I turned it over and found an inch-long *Periclimenes* shrimp using its purple claws to pick tiny food crumbs from the knobby, mottled skin of the cucumber.

As noonday shafts of sun pierced the water, I felt wrapped in blue light and displaced in time. It was the same hypnotic blue light that I saw when I was ten years old—light reflected from the screen of the old 85th Street Trans-Lux theater in Manhattan. The film showing was *The Silent World.* That film and Luis Marden's pictures changed the course of my life.

This is DAVID DOUBILET's 38th article for NATIONAL GEOGRAPHIC.



At dusk a school of nine-lined sweetlips cruising along the reef of Assumption seems

to mimic a much larger fish in shape and pattern—and so may confuse predators.

ALDABRA

the green

CHANNELS LIKE WITCHES' HANDS reach into the green cauldron of Aldabra. A crust of land surrounds a lagoon so large that Manhattan could float in it like a bathtub toy. Aldabra has one of the greatest tide ranges of any atoll—as much as ten feet. At ebb tide, water pours out at ten knots, fish race for the passes, and parts of the lagoon dry completely.

Fantasea II set her two large anchors in Grande Passe, the main channel, each on 300 feet of chain. The ebb coursed past the hull faster than water ever moved past it when the boat was under power. We had reason for concern; savage currents had threatened Cousteau's *Calypso* here. When the tide reversed, our boat swung, and the chains twisted into a steel braid. But the anchors held. I dived on the incoming tide, into water the surreal shade of blue Jell-O. As the tide turned again, water poured off the reefs in a million small waterfalls.

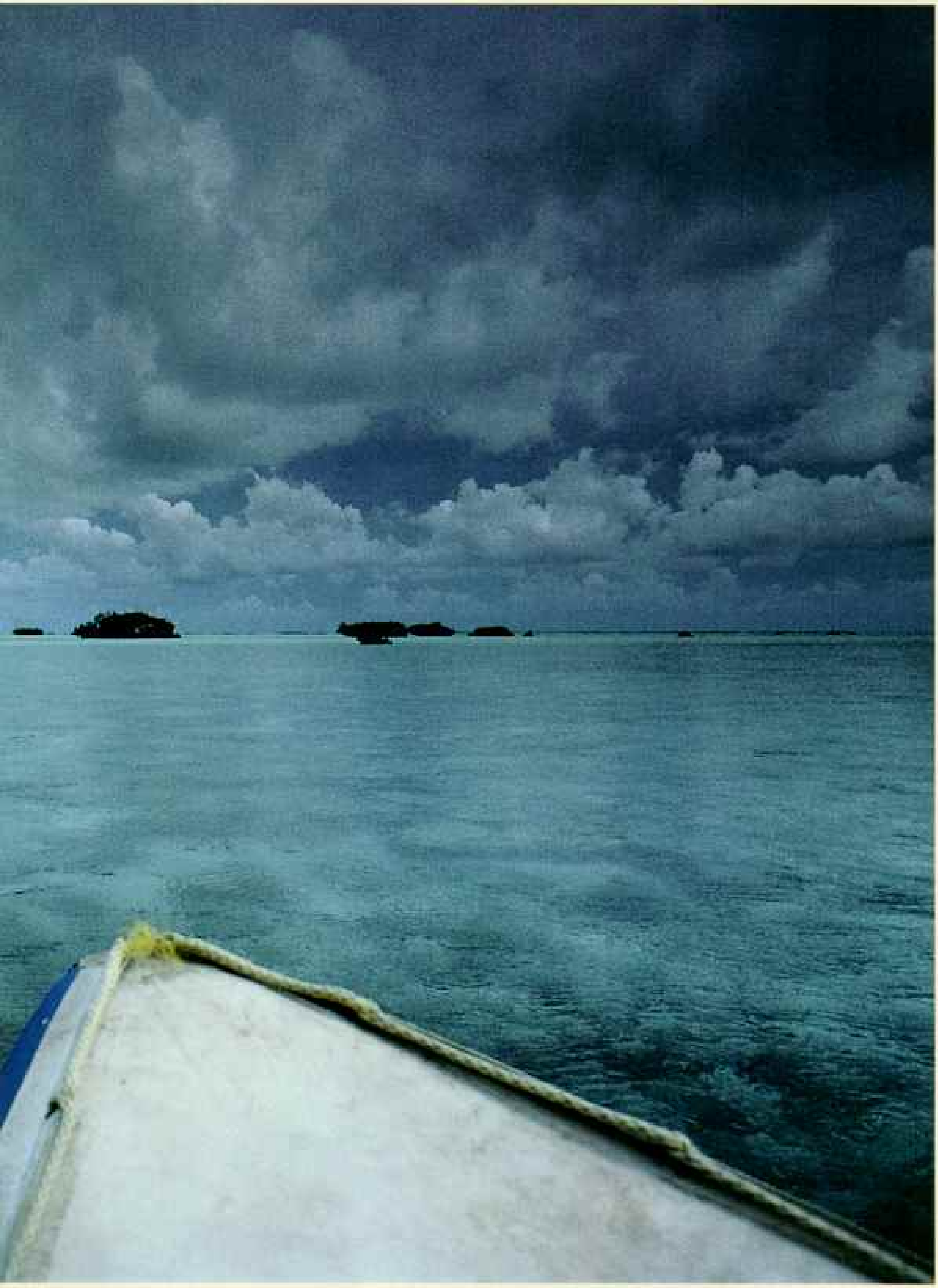
At slack tide I dived where the pass branches. A tawny shark arose from the current-raked sand bottom and swam to catch the first pulse of the coming flood.

GIANT TORTOISES PARKED everywhere in the cool shadows of scrub trees. Aldabra has the world's largest and only wild population—some 150,000—of this species, which reaches 110 pounds on average. A related species on the Galápagos Islands represents earth's other surviving wild giant tortoise population. We arrived on Aldabra at mating time. In a ponderous face-to-face encounter, one pair seemed to share a tenderness as old as prehistory. By evening the grove sounded with bellows of reptilian rapture.

The atoll's immense lagoon is lined with mangrove trees, which make a sanctuary and breeding ground for birds and fish. Swimming with dive master Betty Almogy, who had joined us, I entered into the shadowy half-light where the exposed mangrove roots studded the bottom. To explore these ghostly chambers, we had to keep to the schedule of the tides, in on the flood, out on the ebb.

At slack water between the cleansing flows, I found a school of black surgeonfish skittering through shallows just beyond the mangroves, feeding on algae.

At noon clouds boil up over the shallows. "Aldabra" comes from the Arabic word for green,

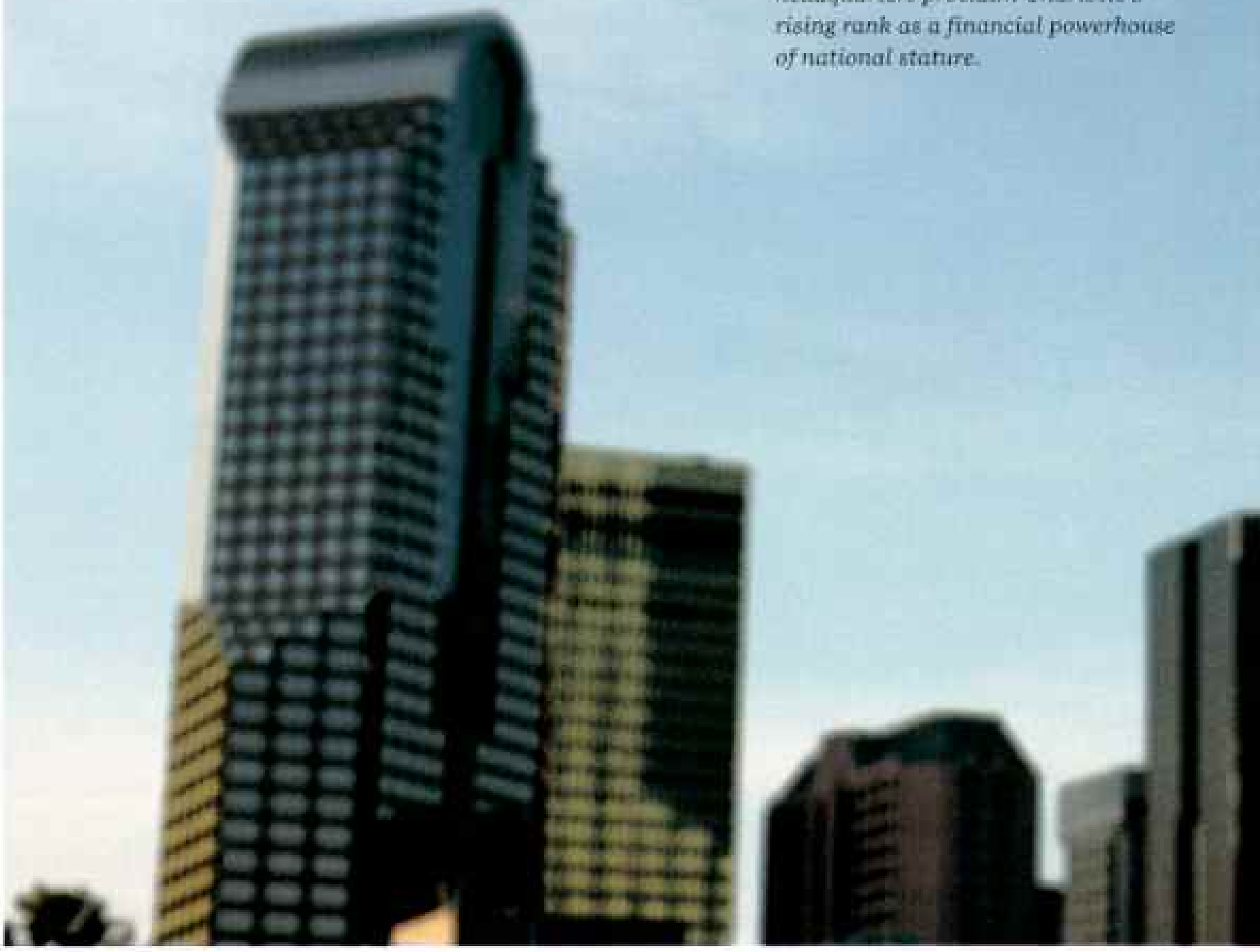


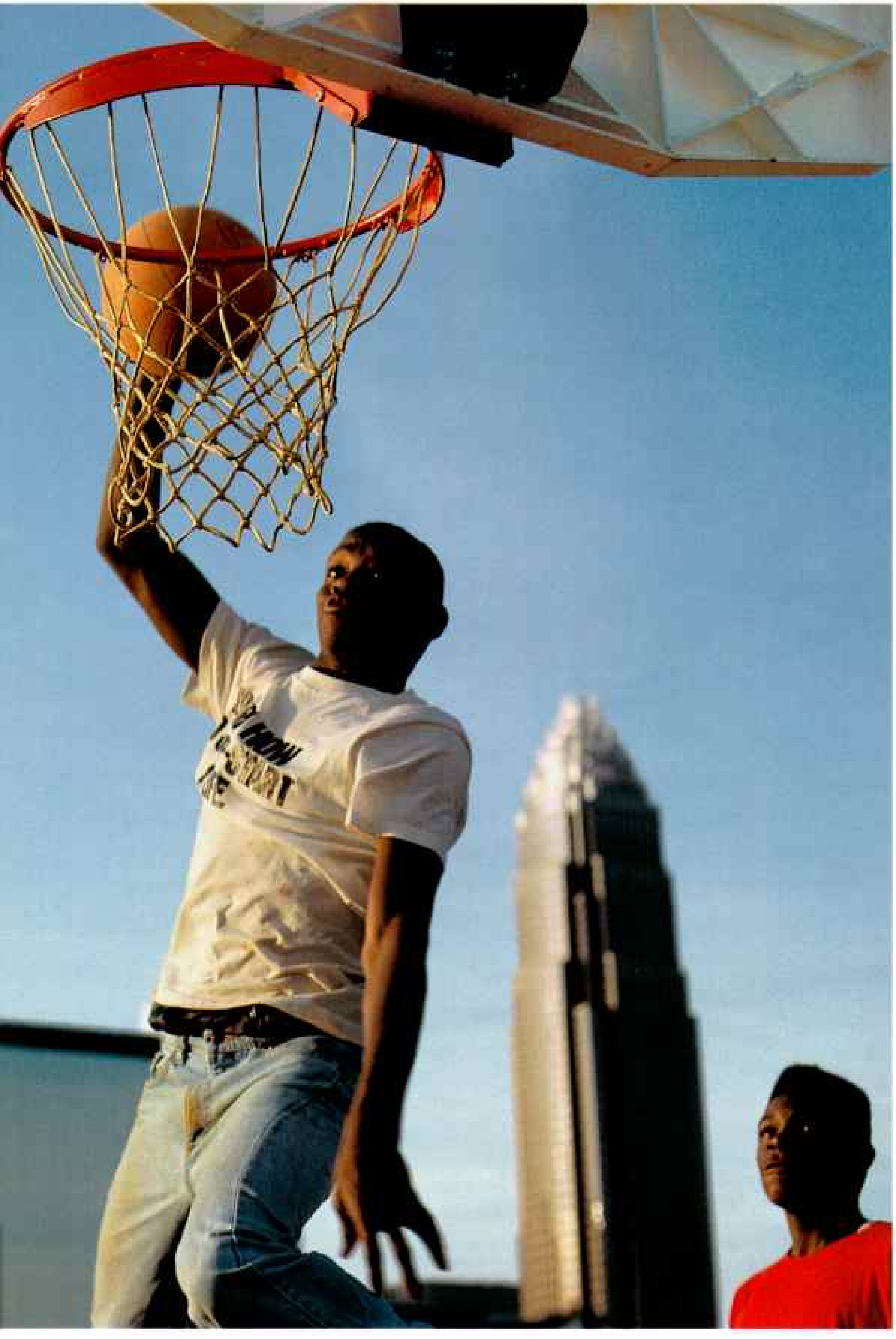
but to me it names an oceanic planet I had finally come home to. □

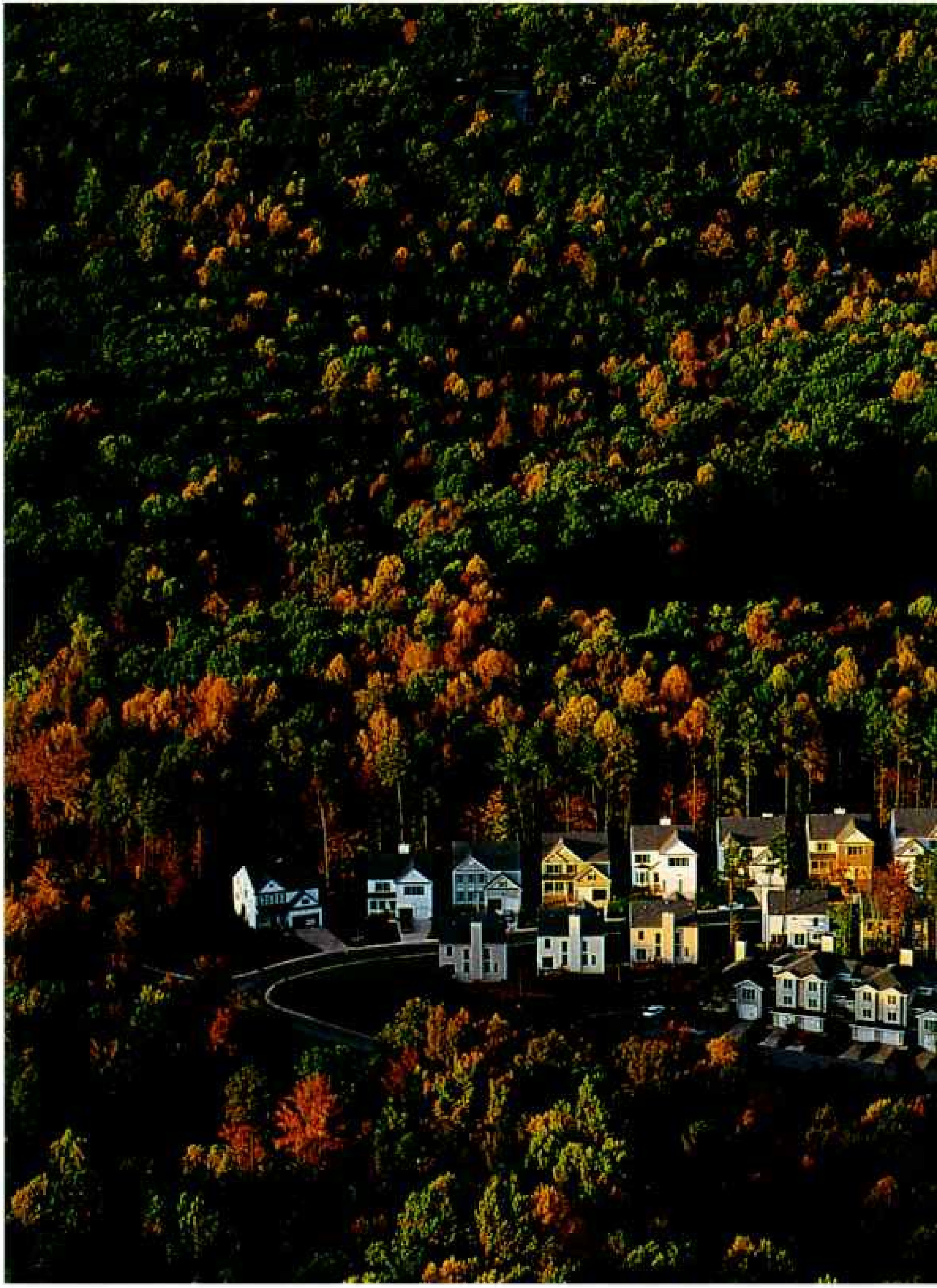
North Carolina's Piedmont

On a Fast Break

Change is charging through that industrious swath of red-clay geography called the North Carolina Piedmont. While traditions like slam-dunk basketball endure, glittery new bank headquarters proclaim Charlotte's rising rank as a financial powerhouse of national stature.







Subdivisions pop up like mushrooms after a rain in Cary, a popular destination for the hordes of migrants lured by the region's technical jobs and woodsy setting. The influx during the past 25 years has boosted Cary's population from 8,000 to 62,000.

"There are now so many newcomers [to the South] that they're no longer just the seasoning in the stew," observes sociologist John Shelton Reed. "They've become a lumpy ingredient in their own right, one that shows no signs of dissolving."

By CATHY NEWMAN
NATIONAL GEOGRAPHIC SENIOR STAFF

Photographs by PETE SOUZA

IF THE ECONOMY ever goes belly-up, head for Martha Ward's pantry.

"When you've got something in a jar," says Martha, "you know you can eat."

That's her first law of survival, a genetic legacy from her Scotch-Irish and German forebears who followed the Great Philadelphia Wagon Road from Pennsylvania down the Piedmont curve to North Carolina. They arrived with other settlers in the 1700s and wrung a living—just barely—from its red-clay hills.

Like a banker displaying a vault, Martha opens the door to her pantry in Needmore, a hamlet of farmhouses and trailer homes set in the rolling Piedmont Plateau. Inside are 16 shelves of shoulder-to-shoulder Mason jars. Pears (two kinds), apples (three), pickles (bread-and-butter, sour, dill). And infinitely more, not to mention a Cadillac-long freezer stuffed with meat.

Her blue eyes light up a round, friendly face as she hands me a jar of blackberry jam. "I grew up on a tenant farm. We were poor but never on welfare. My father would tie on a sack before he'd accept clothes from anyone."

Outside, beyond fields planted in corn and beans, grazes a living testament to Martha's second law of survival: a black Angus, her "emergency cow," insurance against any form of calamity. Its predecessor was sold not long ago to pay unexpected medical bills.

Arthritis has slowed Martha, now 60, a step or two. Fingers that picked cotton and cleaned looms for decades are swollen into sausages. She's retired from her last job as restaurant cook. But she'll can fruits and vegetables as long as her fingers will flex.

"Honey, I've got my emergency cow, and my pantry is full." She leans forward, lowering her voice. "You can't trust them jobs."

Martha's tiny homestead sits atop the 900-mile-long Piedmont Plateau, which extends from New York to Alabama. In North Carolina the Piedmont balances between mountains and sea, a 150-mile-wide stretch of rolling country that takes in the state's major cities, more than half its people, and the lion's share of its industry. Its spine is Interstate 85, anchored by Charlotte to the south and the Raleigh-Durham-Chapel Hill triangle, 140 miles to the north.

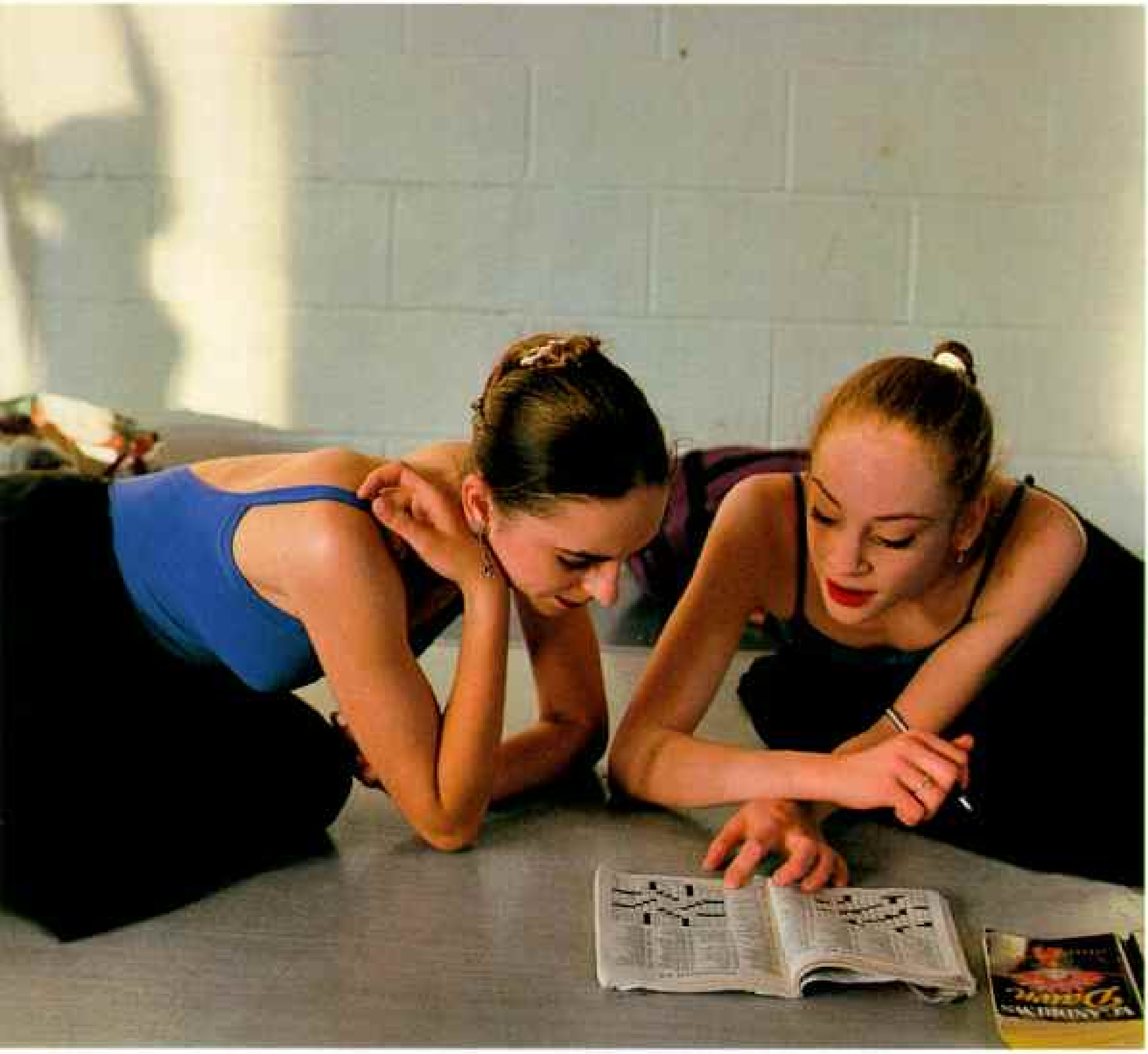
To find its soul, leave the interstate and drive 10, 20, 30 miles out to textile towns like Belmont, Gastonia, Lowell or farm towns like Vale, East Bend, Yadkinville.

Here is the bedrock Piedmont—land of fish camps, flattop haircuts, and kids cruising on Saturday nights with the bass cranked so loud it rattles the plate-glass windows on Main Street. Where the soft drink of choice is Sundrop or fizzy-sweet Cheerwine, and the worst thing a man can do is "get above his raisin'."

Here the small-town weeklies proclaim "HE IS RISEN" on Easter, and the defining question is not, "What do you do?" but

Rehearsal break takes a puzzling turn for Amy Aldridge and Georgia Tucker, ballet students at the North Carolina School of the Arts in Winston-Salem. Conferring high school, college, and graduate degrees, the school attracts aspiring musicians, filmmakers, designers, technicians,

PETE SOUZA served as White House photographer for President Ronald Reagan. This is his second assignment for NATIONAL GEOGRAPHIC.



actors—and dancers. Georgia, at right, has since graduated and now studies with the Houston Ballet Academy. She calls her alma mater "very prestigious," but when the school was founded in 1963 some politicians derisively labeled it "the tippy-toe school."

"Where do you come from?" and "What church do you go to?"

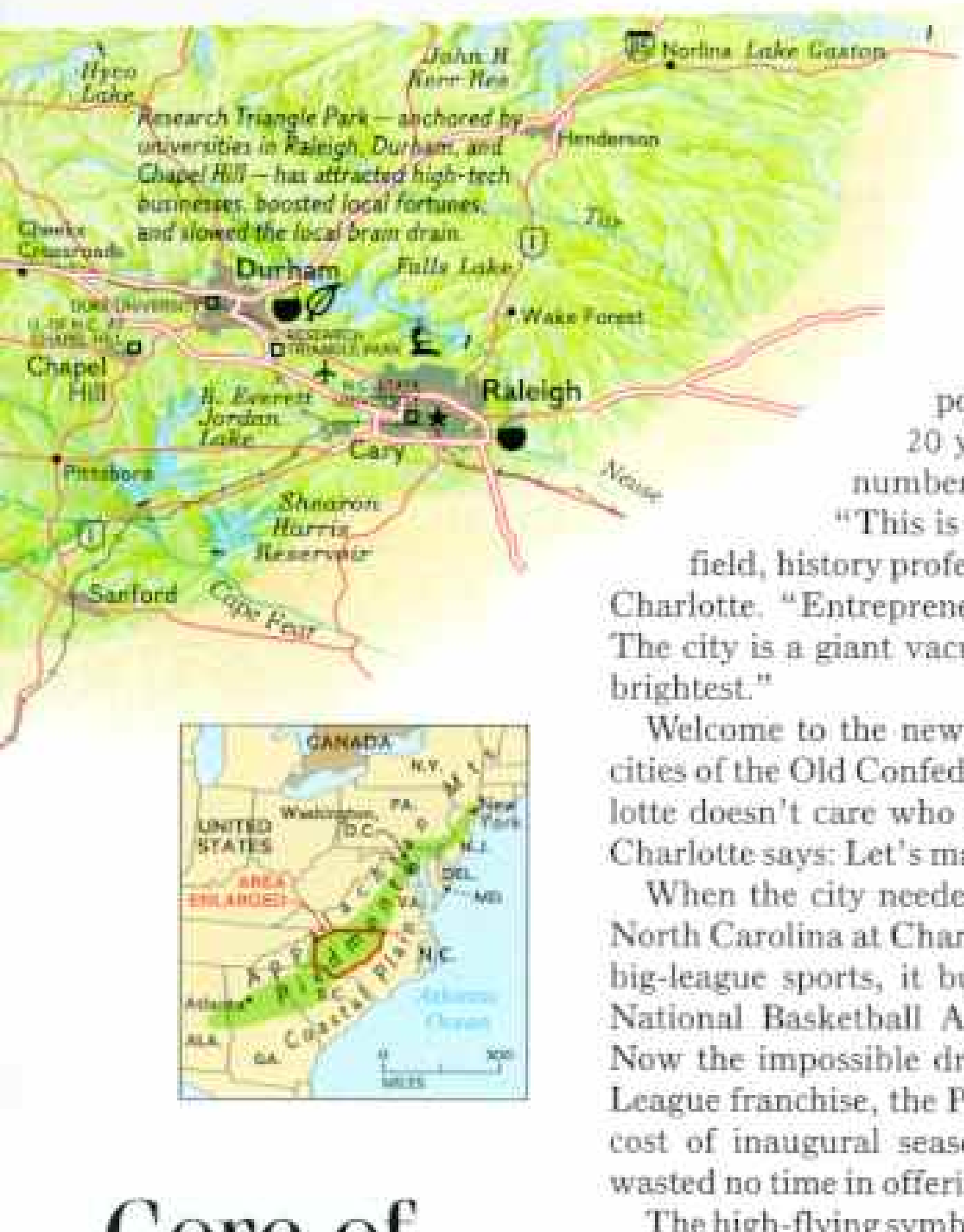
Spiritual tastes run to Southern Baptist and fundamentalist, with a bit of glen-plaid Presbyterian thrown in for the upper crust. "Be an Episcopalian if you must," says Paul Escott, a professor of history at Wake Forest University, "but you don't want to be an atheist."

Millennia weathered the Piedmont's underlying rock into red clay. Never forget that clay. It defines the region like a colored map. Sweet-potato orange. Slick when wet. Rock hard, cracked when dry. Easily exhausted, it mandated the small subsistence farms of early settlers. Plantations of the rich Atlantic Coastal Plain were impossible here. But that red dirt yielded a crop more precious than anything turned with a hoe.

Enterprise.

To see what enterprise fashioned, I start in the region's Oz-like Emerald City, Charlotte. Until the 1849 California gold rush, Charlotte reigned as gold-mining center of the young nation. The mines led to the founding of a branch of the U. S. Mint and launched the city's career in finance.


Chemical and electrical products
Research and development
Financial center
Textile products
Furniture
Tobacco products
International air service
Dam
Scale varies in this perspective.
Winston-Salem used to call itself Camel City; now, with its vibrant community of artists, the city aspires to be known as the culture capital of the South.
George Washington once dismissed Charlotte as "a trifling place"; today it is North Carolina's largest city, with 450,000 residents, 7 percent of the state's population.
Along the fall line—where the Piedmont drops to the Atlantic Coastal Plain—rivers plunge, and so does the state's population: Only 30 percent lives east of the fall line.
Winston-Salem
Greensboro
High Point
Burlington
Eden
Kernersville
Elkin
East Bend
Yadkinville
Lenoir
Hickory
Statesville
Lexington
Thomasville
Archdale
Asheboro
Salisbury
Mount Ulla
Kannapolis
Concord
Albemarle
Charlotte
Monroe
Vale
Lincolnton
Gastonia
Mount Holly
Lowell
Kings Mountain
Belmont
Catawba
Yadkin
Lake Norman
Lake Wylie
High Rock Lake
Badin Lake
Lake Tillery
Pee Dee
Uwharrie
Deep
Dan
N.C. SCHOOL OF THE ARTS
N.C. AGRICULTURAL AND TECHNICAL STATE UNIVERSITY
NORTH CAROLINA ZOOLOGICAL PARK
CHARLOTTE MOTOR SPEEDWAY
UNIVERSITY OF N.C. AT CHARLOTTE



Core of Carolina

Rolling from the Appalachian Mountains to the Atlantic Coastal Plain, and from Alabama to New York, the Piedmont Plateau supports North Carolina's rich tobacco and textile trade—but white collars are displacing blue ones. An early sign of the times: In 1956 Wake Forest College relocated from its eponymous hometown to Winston-Salem, a move financed by industrialists who wanted their city to have a major school (left).

Then they played out. Today's gold sits above ground. Charlotte has surpassed Atlanta as Wall Street of the South. Its two homegrown banks, First Union and NationsBank, have combined assets of 230 billion dollars—more than the annual gross national product of Sweden.

Growth has compounded. The city's population has doubled to 450,000 in the past 20 years; median family income, in ten. The number of firms has tripled in the past four.

"This is the southern frontier," said David Goldfield, history professor at the University of North Carolina at Charlotte. "Entrepreneurs coming in and putting down money. The city is a giant vacuum cleaner, sucking up the best and the brightest."

Welcome to the newest South. Unlike such ancestor-obsessed cities of the Old Confederacy as Savannah and Charleston, Charlotte doesn't care who your grandparents are or how you dress. Charlotte says: Let's make a deal.

When the city needed 16 million dollars for the University of North Carolina at Charlotte, it raised 30 million. When it wanted big-league sports, it built a 23,500-seat coliseum and landed a National Basketball Association team, the Charlotte Hornets. Now the impossible dream has come true: A National Football League franchise, the Panthers, has come to Charlotte. (With the cost of inaugural season tickets topping at $6,000, the banks wasted no time in offering loans.)

The high-flying symbol of Charlotte's rise is Hugh McColl, head of NationsBank. Twenty years ago his bank lagged second in the state behind Winston-Salem's Wachovia. Now it's third in the country—closing in on second.

McColl holds court in the tallest building in town, the 60-story NationsBank corporate headquarters, a spare-no-expense tower of glass and pink granite locally dubbed the "Taj McColl."

One morning I was ushered into McColl's walnut-paneled office on the 58th floor. Fog hid the view. A hard-charging former marine from South Carolina, McColl gets to the point quickly.

"I came here to work," he said. "Charlotte was the one place you could make money."

He has. Last year NationsBank made more than a billion dollars. Aided by southern banking laws that allowed regional expansion while keeping northern banks at bay, it covers the South like kudzu—1,900 branches from Florida to Maryland.

He could play on any stage from New York to San Francisco. Why here?

"This is home. We are not distracted by pseudosophisticated things. We don't go to power lunches or drink martinis. It's an environment in which you can know your people and friends."

McColl impatiently twists a plastic straw around his finger. Money waits to be made.

Time to descend. The fog lifts; sunlight glints off rival banks.

"Let me know if I can help you," McColl said, showing me out.

A small loan? I joked.

Hugh McColl didn't laugh. "I love loaning money," he said.

But bustling Charlotte cannot dominate North Carolina the way, say, Atlanta tends to dominate Georgia.

"A region of city-states," David Winslow, a professional fund-raiser from Winston-Salem, calls the Piedmont.

Ask the resident of one city-state his opinion of another, and the fur flies.

What about Winston-Salem? I challenged *Charlotte Observer* publisher Rolfe Neill.

"Tired blood," said Mr. Neill of Winston's Old Money.

Charlotte? I prompted long-time *Winston-Salem Journal* publisher Joe Doster, now retired.

"Hustlers," said Mr. Doster of Charlotte's New Money.

Nearly everyone in North Carolina knows Senator Jesse Helms's response to the state zoo near Asheboro. "Who needs a zoo? Fence in Chapel Hill," referring to the liberal, intellectually elite hometown of the University of North Carolina.

"Regionalism is not a concept people have embraced," sighed Dee Walston, former columnist for the Durham *Herald-Sun*.

Raleigh, Dee?

"Mayonnaise. A bland city wrapped around a capitol."

THE LEAP FROM RED CLAY to cities like Charlotte began with the South's struggle to rebuild after the Civil War. Atlanta newspaper editor Henry Grady preached the gospel of industry. The South shouldn't raise cotton; it should make cloth. The Piedmont, ripe for conversion, had the magic mix: water power, cheap land, cheap labor.

The workforce came right off the farm. "He's in public work," they'd say with a hint of sadness, meaning, in a local phrase still heard today, he'd taken a factory job.

No matter how menial the job, people gave it their best shot. A woman who worked in cotton mills for 35 years told me: "Daddy taught that when you accept that job, those nine hours belong to the man you work for." Factories that moved South cashed in on the inbred work ethic. As a bonus they got laborers whose independence prejudiced them against unions. Needless to say, factory owners never put out a welcome mat either.

The payoff: Last year the Piedmont turned out 350 million towels, 475 billion cigarettes, 1.7 billion pairs of hosiery, and 350,000 kitchen cabinets. But the traditional pillars of its economy—textiles, tobacco, furniture—no longer support the weight they once did. In the seventies, companies began investing in faster, smarter machines. Those machines spelled fewer people.

Simultaneously, southern labor no longer was cheap. There were Taiwan, Malaysia, Mexico—places where eager hands work for a few dollars a day.

As in much of America, factory employment shrank as productivity increased. In 1974 the North Carolina textile industry employed 300,000; by 1993, only 206,000.

To see that workforce shrinkage in human terms, I take the road to Cooleemee, a plain-as-soap-and-water town of 971, stuck somewhere between Charlotte and Winston-Salem but on the way to neither.

Boxlike houses cling to a slope. A small shopping center passes

Loving hands reach out to caress little Brittany Robinson, cradled by her sister, Pam, outside Whites Grove Christian Church in Norlina. Parishioners mingle after a special Sunday afternoon service held to raise money for a new building to replace the

original structure, built in 1898.

In a state of loyal churchgoers, religion is a glue for social cohesion and a badge of identity. Family ties to a particular church—often the site of joyful reunions—can date back a century or more.

for downtown. There is the U-Stop-In Grill, the F & F Barbecue, and not much else. Except fierce pride.

For years the town nestled warm and snug in the embrace of a cotton mill. The mill owned houses and rented them cheaply to workers, ran a company store, the school, the water system. It fixed leaky roofs. Painted fences. In hundreds of towns across the Piedmont, whatever the problem, the mill took care of it.

In 1962 Burlington Industries bought the Cooleemee mill. Seven years later its whistle blew for the last time.

"The men spent all day building up steam in the boiler on that last day," remembered Linda Jordan, whose husband worked there. "Around five they let it rip. I ran out on the porch. I knew I'd never hear that sound again. Time was moving on."

Throughout the Piedmont the paternalism of family-owned mills yielded to big corporations. Efficiency ruled. Layoffs and plant closings followed. As disbelief faded to sorrow, folks in Cooleemee drifted to other factory jobs in nearby towns. And there was always the pantry to tide you over.

"I liked to spin. I do believe I could still," said 87-year-old

No more classes, no more books, no more teacher's pathophysiology exams: At least not for nursing students Karen Kauffman, at left, and Kari Quarfordt, who graduated last May from the University of North Carolina at Chapel Hill. With medicine

a robust business in these parts, Karen found a nursing job nearby, but Kari headed west for a job in Denver. "I love North Carolina," she explains, "but life was too easy there. Everyone seemed to be perfect. . . . And I wanted to grow up."

Mabel Head, holding out long, tapered fingers that had flown along the frames twisting together ends of cotton fiber that would be drawn through rollers and into thread.

As I sat in her mobile home, she spoke quietly of picnics by the river and the laughter of the girls in the spinning room.

How had the town held together through the bad times? I asked.

She thought awhile.

"Well now, Cooleemee was always like one big family," Mabel said finally. She reached for my hand and gripped it tightly.

THE PIEDMONT had lured industry with cheap labor and cheap land. North Carolina still ranks near bottom in average manufacturing wage. But with automation, low-skill jobs have begun to disappear. Now managers try to hire workers who can read the computers that monitor production. Because of a lack of available technical training, the managers have trouble finding them.

Fortunately, as early as the 1950s, the state realized it should put some of its eggs in other baskets.

The golden egg turned out to be Research Triangle Park, the dream child of the late Governor Luther Hodges and a group of North Carolina businessmen and academics. The park—a 6,800-acre tract carved from worn-out tobacco land and centered among the brain trusts of North Carolina State University at Raleigh, Durham's Duke University, and the University of North Carolina at Chapel Hill—operates as an economic-research zone and has turned the surrounding three-county Raleigh-Durham-Chapel Hill triangle into one of the hottest growth areas in the nation.

Some 34,000 people work in its 70 or so companies tucked among neat lawns and shrubs. Sociological spillover from RTP, as Research Triangle Park is known locally, ranges from politics (an influx of country-club Republicans) to revamped laws allowing sale of liquor by the drink. Biggest dividend: a regional image newly minted from redneck to high-tech.

Surely I imagined it, but in RTP the very air seems rarefied. Here AstroTurf was developed; also bar codes, the cancer drug Taxol, and the AIDS drug AZT. In sleek buildings, "beakerheads" (scientists) discuss MOS (metal-oxide semiconductors). They ponder NSRI (norepinephrine serotonin re-uptake inhibitors). Recently, thoughts have turned to SRI (socially responsible investing).

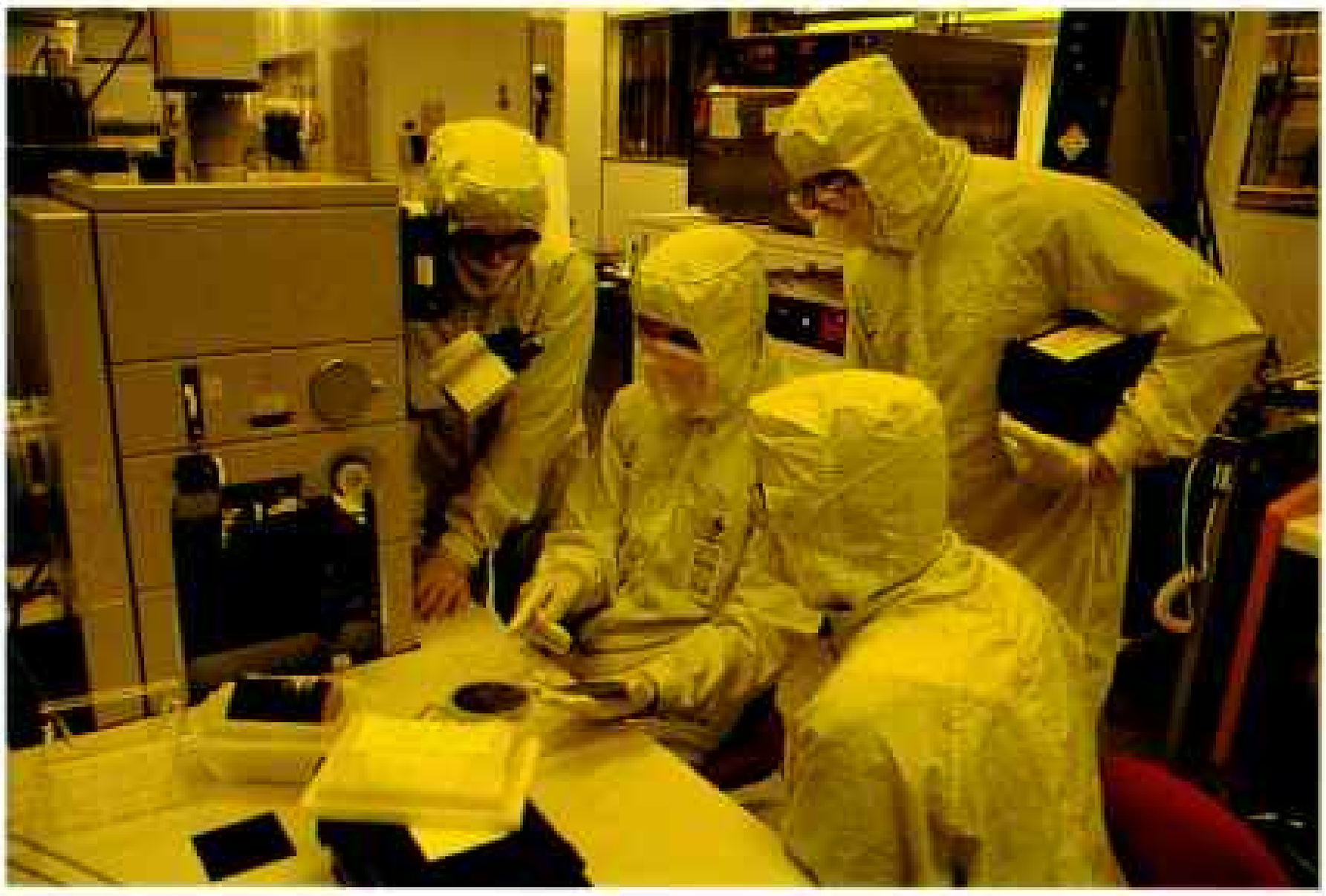
Each dawn offers the hope of discovery. At Glaxo, a British pharmaceutical firm, I found Julie Tomlinson, manager of the robotics lab, working with an experimental AIDS drug.

"I've lived in Chicago, Fort Lauderdale, and Boston," Julie told me as she demonstrated how her robots could, at the touch of a button, whirl around, pluck a test tube from a rack, and run tests. "Boston has wonderful cultural resources, but traffic is horrible. You can't drive, and if you do, you can't park, and if you do, they tow your car. I like the relaxed way of life here. I've got mountains three hours to the west, beaches two hours to the east."

Such livability has a habit of self-immolating. Population in the three-county Triangle already is 690,000 and may top one million by the year 2000. Yankee afflictions like land speculation and traffic jams have become as much a part of the landscape as dogwood and magnolia.

Too well-rounded for his own good, a snorkeler takes a pricey plunge at the Duke University Diet and Fitness Center in Durham. For $5,000, clients spend four weeks with nutritionists, psychologists, physicians, and massage therapists, who gently counsel that the key to weight loss is a lifestyle overhaul.

Skin cells, hair, or dust could ruin a computer chip, so technicians wear "bunny suits" at MCNC, one of 70 companies in Research Triangle Park. Employing some 34,000 people, businesses at the park have developed products as disparate as AstroTurf and drugs that fight AIDS.



"We need growth," former Governor Terry Sanford says, "but not at the expense of looking like New Jersey."

The most spectacular example of growth fertilized by RTP is Cary, a squeaky-clean community near Raleigh, where people live in PUDs (planned unit developments) and the town hires professionals to paint "CLASS OF 1994" on the water tower. Cary's population has jumped from 8,000 to 62,000 in 25 years. In some months it issues more building permits than Charlotte.

But if the folks who move to this blow-dried community are content, 66-year-old, native-born Lynn Banks is not. "I don't know my neighbors any longer. I'm going to move," said Banks, as we sat in his home only five blocks from downtown Cary.

Because of the refurbished economy, higher paying foreign firms have added their luster: Sumitomo from Japan, Canada's Northern Telecom, and a German invasion, including Siemens electronics. (So many German corporations flank I-85 near Charlotte that locals call that stretch of highway the autobahn.)

Fields where bird dogs once flushed coveys sprout subdivisions. And now there are as many places to eat sushi as barbecue in a five-mile radius of Research Triangle Park.

Heads-up pursuit is second nature to financial executive Hugh L. McColl (above), hunting doves south of Charlotte. The intense former marine built NationsBank into the third largest bank in the U. S.

Legislation is the aim of Daniel T. Blue, Jr., who in 1991 became the first black speaker of the North Carolina House of Representatives. He confers with Representative Ed Bowen, who seconded Blue's nomination for the first of his two two-year stints as speaker.

ONLY 20 MINUTES from RTP's gleaming towers, rural poverty carries on. Margaret Hardcastle lives in Cheeks Crossroads, a community of six houses. She has no running water or plumbing. Waste is thrown out in a bucket.

"We are pushing for a sewage line, but it would cost about $500,000 and the county won't do it," said Stephen Dear, executive director of the Rural Communities Assistance Project.

Mrs. Hardcastle can't afford a bathroom, so volunteers were building an outhouse for her, using an old Peace Corps manual as a guide. "Looks good to me," she said. Even so, several neighbors weren't happy about the outhouse next door.

"Do you feel shame at having an outhouse in your yard?" I asked. She pulled herself up tall and looked me in the eye.

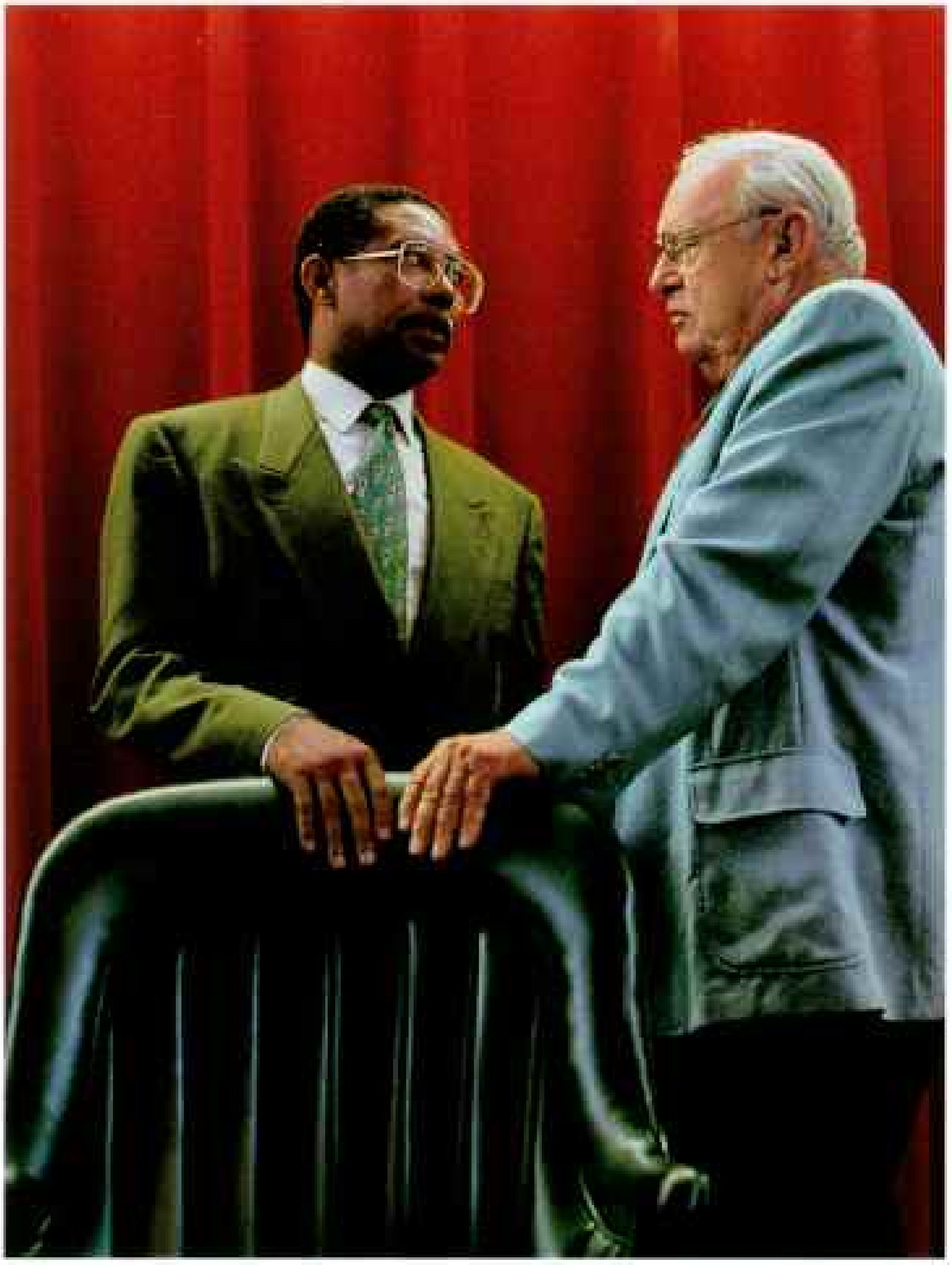
"There's dignity in everything you do," she said. "It's just in how you do it."

Mrs. Hardcastle is far from unique. In North Carolina, 125,000 people live without indoor plumbing; one-sixth of the population is below the official poverty line.

In the Piedmont, Old South and New South are like two tectonic plates rubbing uneasily against each other.

Take politics. How, I wondered, could a state elect such polar opposites to the U. S. Senate as Terry Sanford, progressive, and Jesse Helms, hard-right conservative? (The two served concurrently from 1986 to 1993.)

"Four percent," Mr. Sanford told me at breakfast in Durham. Sanford, who also served as governor and president of Duke University, meant that victory margins here are slight. "Our progressive instincts turned out to be built on a very thin margin," he sighed. "In truth, we were never very far from the demagoguery of the rest of the South."



Some contrasts were less grim. One night I opened my menu in a Chapel Hill restaurant to find: "Collard greens, topped with shavings of imported Parmesan cheese."

BECAUSE the economic rules keep changing, folks around here have learned to make do. Drive through any Piedmont mill town, and you see front-lawn signs of the ingenuity that supplements a factory check: UPHOLSTERY, TAXES, even TATTOOS.

A farmer too knows better than to bet on a single crop.

For Hassell Brown, keeping up meant taking a job in town coaching high school sports while farming tobacco on weekends. "Some years you have a disaster—hail, drought, bugs," he said, standing beside his newly plowed field in East Bend, a small town in Yadkin County, on the Piedmont's western fringe. His off-the-farm job guaranteed the electric bill, heat, food, a pension.

But "the problem," as farmers who grow the region's major cash crop call it, is the increasing unpopularity of tobacco.

In 1964 the surgeon general issued a report linking smoking with lung cancer, laryngeal cancer, chronic bronchitis, and emphysema. Subsequent reports increased the list of hazards and decreased the use of tobacco. Since 1975 tobacco acreage in the Piedmont has dropped from 140,000 to 76,000.

If there are any qualms about growing a crop deemed a health hazard by the surgeon general, you won't hear them in Yadkin County, which harvested eight million pounds of the leaf last year.

"Everybody here's raised up on it—it puts shoes on kids and sends them to college," said Mark Smitherman, who farms 30

acres of tobacco. "Tobacco bought my car. Bet you couldn't buy a car on corn." A farmer can clear a thousand dollars an acre on "backer." Nothing else comes close.

In a region that grows 200 million pounds of tobacco a year and where five cigarette manufacturers employ 21,000 people, worry about the unpopularity of nicotine floats like a plume of smoke.

THE SMOKE HAS CLEARED in Durham and Winston-Salem, two Piedmont cities once dependent on tobacco. Durham officially kicked the single-industry habit 14 years ago, when health care replaced cigarette manufacturing as the primary industry. Bull City, so called for a brand of plug tobacco, was re-nicknamed the City of Medicine.

Ironically, the basis of Durham's new claim to fame—Duke University and its Medical Center—was underwritten by tobacco money. Until the Sherman Antitrust Act busted his monopoly in 1911, Durham tycoon James B. Duke controlled 90 percent of the world's tobacco production. In 1924 he set up a 40-million-dollar foundation creating the university bearing his name. "Mr. Duke

Free spirits roam at will in the quiet Chronicle neighborhood of Belmont, one of the Piedmont's oldest textile towns. Named for a nearby yarn mill, Chronicle was built just after the turn of the century as company-owned employee housing, then a common practice

in the industry.

Faced with increasingly expensive upkeep in aging neighborhoods, most textile manufacturers have gotten out of the landlord business. Chronicle homes are being renovated and sold, with mill employees getting the right of first refusal.

always said education is, next to the church, the most civilizing influence we have," his grandniece, philanthropist Mary Duke Biddle Trent Semans, told me over a porcelain cup of tea.

Even a hypochondriac like me feels secure in Durham. The city has five hospitals and 1,700 doctors; its physician-to-population ratio is five times the national average.

The Duke Medical Center sprawls over 175 acres, a maze of 25 buildings. It offers state-of-the-art therapies for serious diseases—among them bone-marrow transplants for childhood cancers.

There are seven rooms in the pediatric bone-marrow transplant unit at Duke, seven poignant chambers of human frailty.

I asked Dr. Joanne Kurtzberg, co-director of the program, how she could work in a place where half the patients never make it.

She indicated a photograph on her wall—a girl with dancing eyes and a dark helmet of hair. "We do it because of Jana."

At the age of nine, Jana Haislip was diagnosed with leukemia. "My heart was ripped away," her father, Jackie, said. "You see, she was our only child."

When told, Jana looked directly at her doctors and asked, "Am I going to die?"

No, said a young doctor getting down on his knees to meet her gaze. "You're going to live and have 18 grandchildren."

School opened the other day in her hometown of Robersonville, North Carolina. Jana, now 13, attended cheerleader tryouts.

"I didn't make it," she confided to me.

A tough break, I agreed, but, as her mother said to me, "Isn't it nice to have normal problems?"

Jana has no remaining trace of the disease.

FOR WINSTON-SALEM the wake-up call came on January 15, 1987, when Ross Johnson, head of the biggest game in town, RJR Nabisco, announced he was moving the headquarters of the food-and-tobacco giant to Atlanta.

When the company moved, Winston-Salem squared its shoulders and diversified its portfolio. Today the Reynolds Tobacco division (left behind in the move) shares the corporate limelight with Bowman Gray School of Medicine/Baptist Hospital, Sara Lee, PepsiCo, Lee Jeans, and Wachovia Bank.

In Winston-Salem I caught a whiff of noblesse oblige. In 1946 city leaders decreed the need for a major college; five years later they broke ground on a new 19-million-dollar campus and reeled in Wake Forest, a thriving Baptist school located 110 miles to the east.

"It may sound crass," admitted publisher Joe Doster. "You go buy yourself a university. . . but it shows vision."

When legislation established the North Carolina School of the Arts in 1963 as the country's first state-supported residential school of the performing arts, civic leaders here met a site-selection committee with a million dollars in seed money and the promise of a campus. They got the school.

Culture has always been part of the social climate in Winston-Salem, Doster assured me, when I asked if *Giselle* mixed well with grits. "Going to the Stevens Center here is like going to the theater in New York," he said. "Except instead of 'Hello, Dahling,' it's 'How Y'all?' "


12
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FALLIN'S
Wholesale
Star Cable
JR's
Classic
AUTOS
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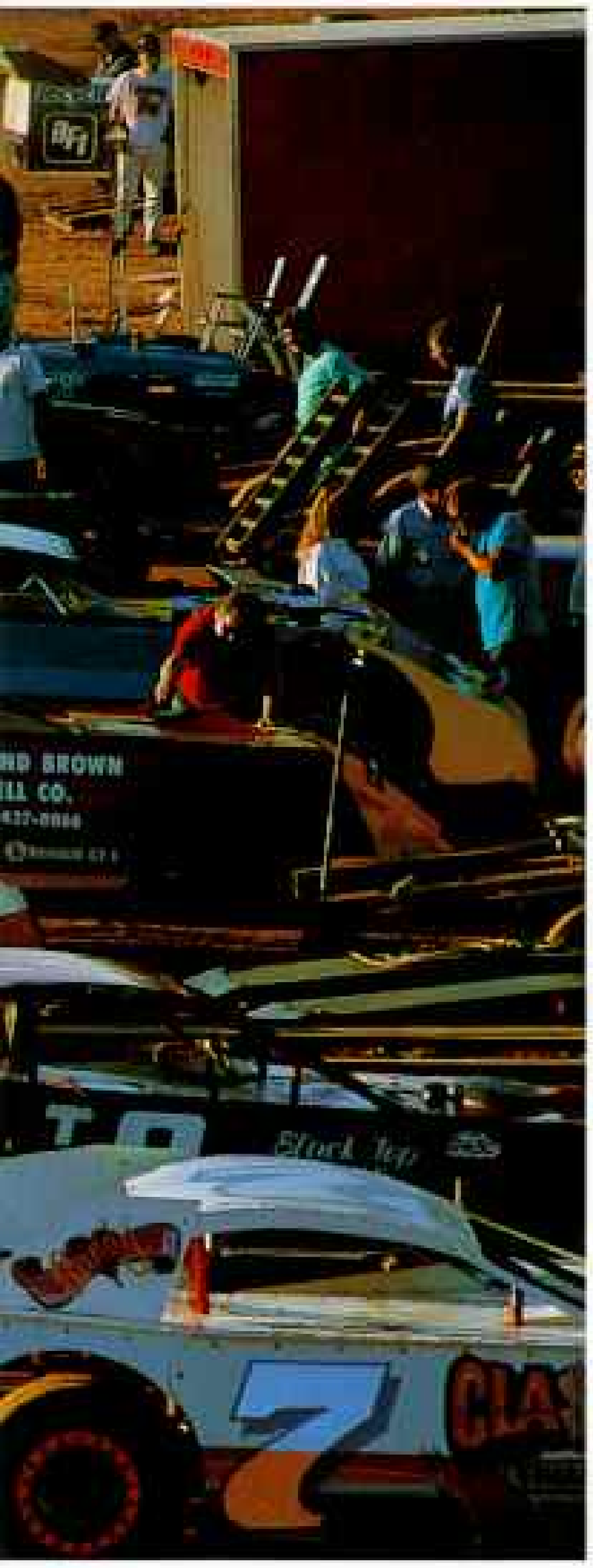
BINGO



Gearing up for a showdown, weekend racers do it more for love than money at Friendship Speedway in Elkin. Stock-car racing is wildly popular in Carolina, as is driver Richard Petty (left), who retired in 1992 with 200 victories—a record. To fans trying to push him into politics in congested Washington, D. C., Petty says, "You couldn't pay me to be senator." Why not? "The gridlock," says the racer.

BY GRACE of geography, the Piedmont had few slaveholders; the red clay militated against plantations. Racism existed, but at a lower key than in Mississippi or Alabama.

Chuck Stone once wrote a widely quoted newspaper column in Philadelphia; now he is a journalism professor at the University of North Carolina at Chapel Hill. His move reflects the recent reversal of the black out-migration of the fifties. "Integration here wasn't as painful as in other southern states," he says. "There were no clubs, dogs, water hoses. There was even a decorum. You didn't get the vitriol of Little Rock or Birmingham."

Yet Greensboro, North Carolina, took its place on the civil rights roll of honor along with Selma and Montgomery, Alabama, and Jackson, Mississippi.

Franklin McCain, a black hero of that era, went with me for coffee one morning to the exact spot at Woolworth's lunch counter where, as a college freshman, he made history in 1960.

"Joseph McNeil, David Richmond, Jibreel Khazan, and I walked from the library at North Carolina A & T," he recalled. "We looked at each other, moved to this counter, and sat down. I ordered coffee and a doughnut."

The white waitress refused. Blacks were supposed to eat downstairs, at the hot-dog stand.

The next day 30 black students joined McCain. The following day 63. By Saturday 400 sat in shifts. The sit-in spread like prairie fire to other restaurants in town, to other cities in the state, then to the rest of the South. On July 22 the white business community quietly moved to integrate Woolworth's and other restaurants.

McCain is now a Charlotte businessman. (The store has since closed; a section of the counter now has an honored spot in the Smithsonian Institution.)

"Something had to happen," he reflects. "I watched how white people treated black people as if they were one step below human."

In the Piedmont you now see the fruits of that struggle. Black Congressman Melvin Watt represents the 12th District that includes portions of the region's major cities. Dan Blue, the black former speaker of the state House of Representatives, represents Raleigh. Harvey Gantt, Charlotte's first black mayor, ran for the Senate against Jesse Helms and lost by a mere 6 percent.

But, as in the rest of the country, blacks have lower average incomes and a shorter life expectancy than whites. "When I was governor," Terry Sanford told me, "I was sure the race problem would be solved in 30 years. I was wrong."

THE GREAT PIEDMONT ROMANCE plays out on an oval of asphalt or red clay. It cuts across class and gender, bonding rich and poor, Yankee and Southerner. It is the love between man and car: stock-car racing.

In the small towns of the Piedmont, the Saturday night sport wasn't football. It was the wheel-to-wheel combat of hot-rodding.

Races graduated to dirt ovals where fans watched souped-up cars driven by guys like Junior Johnson, who honed their skills running moonshine down back-country roads.

Now, major races outdraw the Super Bowl. Junior Johnson no longer builds engines himself; he owns a whole team. Corporate megabucks roll in. High-octane drivers like Dale Earnhardt earn

Holding fast against antismoking sentiment, James "Granddad" Dearmin lights up during a break from unloading farm trucks at Pepper's Tobacco Warehouse in Winston-Salem. A fellow worker carts a 275-pound "sheet," or bundle, of tobacco

leaf from the scales. Virtually shut down for most of the year, the century-old building springs to life for three months in late summer and early fall, when as much as a million pounds of tobacco is auctioned off to cigarette manufacturers.

three million dollars a year from appearances and endorsements.

To see for myself, I drive (slightly above the speed limit) to the Charlotte Motor Speedway to join the Richard Petty Driving Experience. Petty, the "King," winner of 200 races, has lent his name to a course for wannabe stock-car drivers. Our group of 22 includes a retiree who jokes that his blood pressure tops any speed he'll hit.

I zip up my fire-resistant suit, pull on gloves, helmet, goggles, and shoehorn myself into the car through the window (for safety reasons there are no doors).

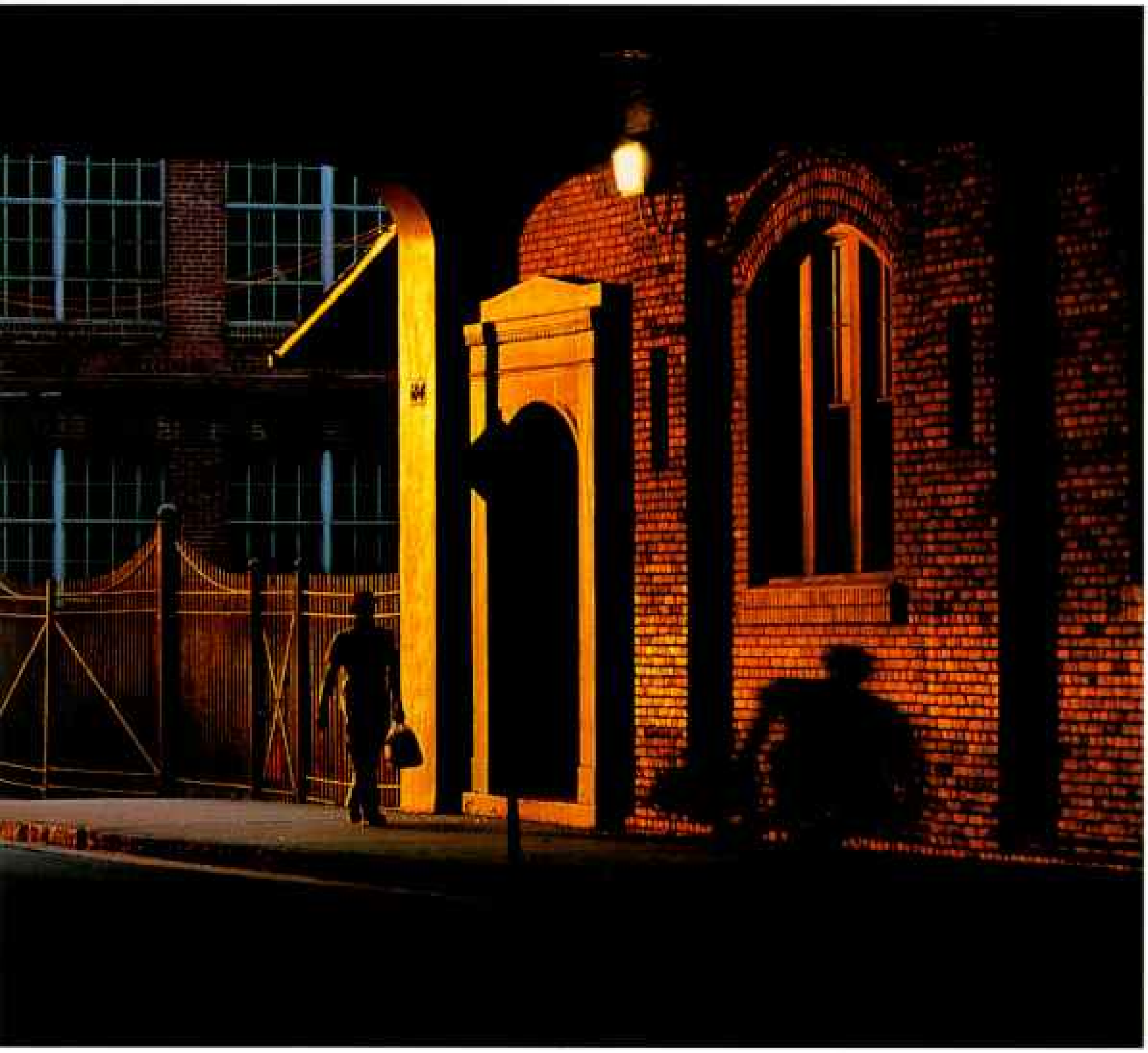
The stock car I settle into is candy-apple red. Except for the screaming colors, a stock car looks something like what you'd run the kids to school in, hence its name. The resemblance ends there. With a top speed of 180 miles per hour, this 600-horsepower baby can really move.

"I can't breathe," I tell the guy who immobilizes me in a five-point safety harness.

"Just right," he nods.

A flip of the ignition and the car growls to life. Foot on clutch.

The glow is fading for the once vigorous tobacco industry in Durham, now down to a few buildings on Morgan Street. Though still a major force in the state economy, tobacco production suffers from foreign competition and



dwindling sales attributed to health warnings against smoking. The Piedmont rebounded by courting new industry with a kind of drive that history professor David Goldfield sees epitomized by Charlotte: "southern chutzpah."

Shift to first, second, third, fourth . . . and I am rolling along the track apron, tailing instructor and NASCAR driver Barry Graham.

This beats any video game. I relax, loosen my death grip on the wheel, enjoy the powerful rumble of engine, tap the accelerator, remember to keep eight lengths behind Barry's car, and, as afterthought, check the tachometer, though the numbers don't mean a thing to me. (There is no speedometer. It's a distraction.)

I look up. I can't be doing more than 40, but the distance between Barry and me is shortening. Six lengths. Five. Is it four? Better downshift and slow down. Uh oh, I'm not sure how. Panic strikes. Afraid of rear-ending him, I nudge the car toward the middle of the track. Relief settles in, then evaporates as I see Barry's arm pop out, frantically waving me back to the apron. The flagman averts his eyes.

Two seconds later a crescendo of thunder roars past on my right.

I have pulled into the path of a second set of cars and am barely out of their way as they scream by at 130 miles per hour. I turn red with embarrassment, then white with terror. I follow Barry back to the pit at a crawl.

"Mistakes happen," I say, fishing for sympathy. "Has anyone else done that?"

He reflects for only a second.

"No. Can't say that they have."

AT THIS TRACK two weeks earlier, on Memorial Day, I had watched the big boys chase in circles at the Coca-Cola 600 in front of 163,000 fans.

Wasn't the Indianapolis 500 being run on the same day? What about those Indy drivers?

"Prima donnas," sniffed Bill Veeder, a retired city manager of Charlotte and a racing fan.

Stock-car drivers are not prima donnas. In the pit area I watched racing immortals Junior Johnson and Richard Petty sign autographs as if they enjoyed it.

"You see 'em light up. It's like I'm giving 'em something," Petty said when I complimented his patience. He flashed that winner's circle smile.

"There's a place here for the guy who works in the mill. A place for the guy who owns the mill," Charlotte Motor Speedway manager, Humpy Wheeler, shouted above the scream of engines.

The guy who owns the mill probably hangs out in one of 64 trackside executive suites. In suite 141, I met Ronnie Brewer, a High Point furniture manufacturer, who arrived in a chauffeur-driven, champagne-stocked black limo. "Racing's no longer chicken bones and Bud," said his wife, Linda, flashing bloodred nails, a tiny rhinestone centered on each.

You could forget the limo and buy one of the 52 condominiums overlooking the track (great asphalt views). Price when built by the speedway owners in 1986: $115,000. Most recent sale: $320,000.

I helped myself to a chocolate-covered strawberry and wandered off to the infield in search of the guy who works in the mill.

Bill Scoggins cracked open a beer in front of an old school bus he'd converted into a motor home. He'd driven down with his cousin from Mount Ulla, North Carolina, a blink of a mill town.

"I've been coming to this race for 23 years," he told me in a soft drawl. "When I come here, I don't worry about business problems—or anything else." He gestured toward the tunnel connecting the speedway entrance with the infield.

"When I come through that tunnel, I leave Mount Ulla behind."

As the stands emptied and night deepened, I watched the headlights of pickups, station wagons, and campers scatter to towns and cities across the folds of the Piedmont—to a red-clay realm where people demand more of themselves than of others.

Because the soil grudged them a living, those who settled here two centuries ago learned to make do in other ways. Hardship was never too much to pay for the independence they craved. From Charlotte to Cooleemee, their spiritual heirs continue the quest—while keeping a little something in a jar, just in case.

"Out east, we have scrub oaks," novelist Doris Betts mused one afternoon in Chapel Hill. "They are spindly, useless. No good for lumber or even firewood. We have a saying—they're no good for anything except holding the world together.

"That's like our people. No good for anything except. . . ."

She smiled, " . . . holding the world together." □

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(John)

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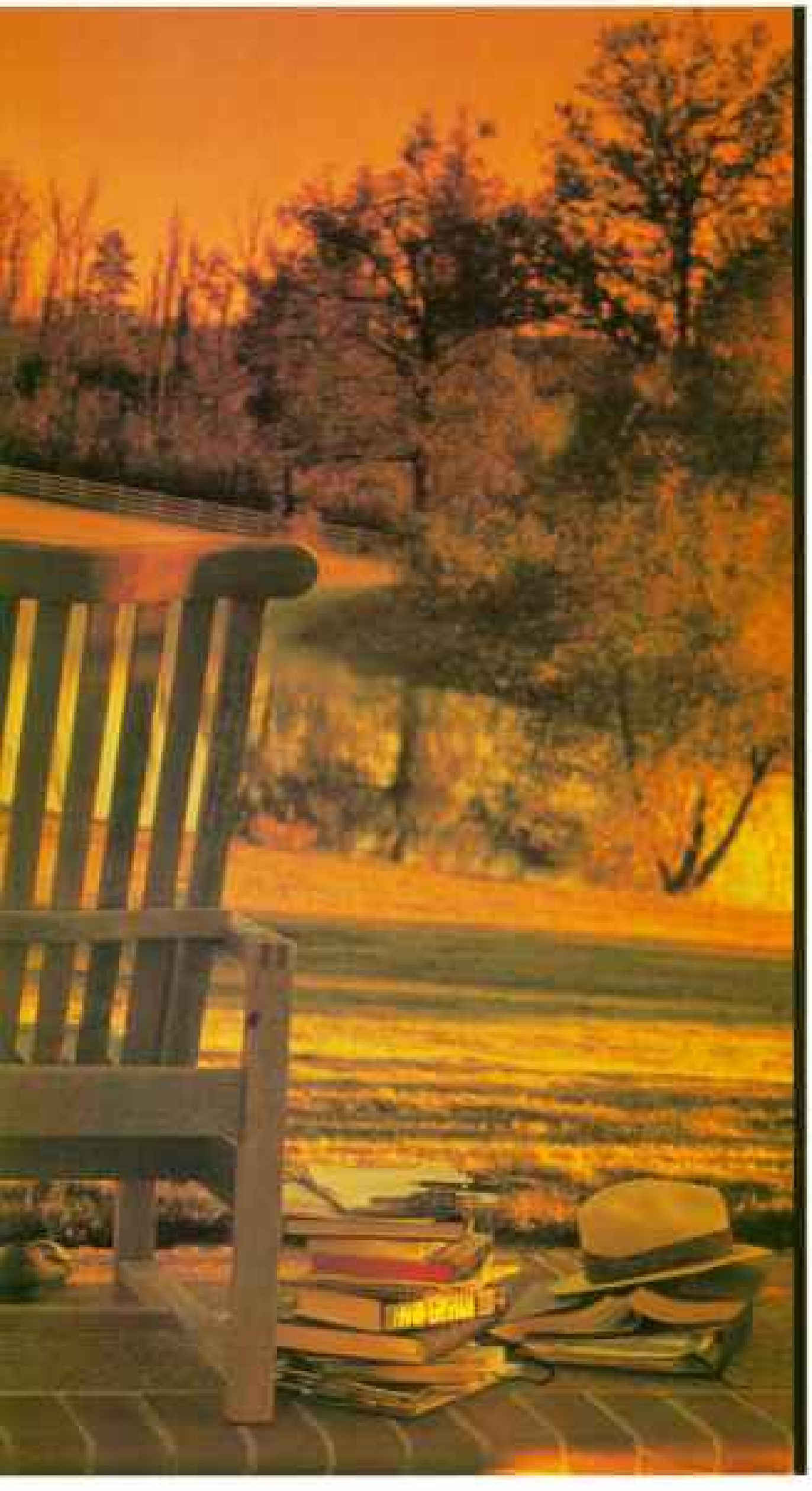

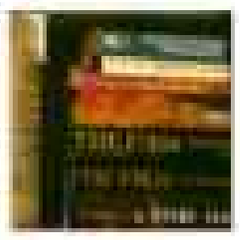

With an iced tea on the back porch of his Mississippi home. In the quiet writing space above his garage. Even at the baseball diamond where he coaches the "Mighty Marlins," his son Ty's little league team. Author *John Grisham* can take his new IBM ThinkPad® 360CE anywhere to work on his next big idea. Whether it's for a new novel, or, more importantly, for the Marlins' crucial '95 season opener.

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Geographica

IOWA DEPARTMENT OF TRANSPORTATION (TOP)

Saving Memories Along the Lincoln Highway

In the beginning the Lincoln Highway was a line drawn across a 1913 map of the United States, and a vision.

The line stretched between New York City and San Francisco. The vision belonged to businessmen such as Carl G. Fisher and Henry Joy, who imagined a paved road over which motorists could drive their newfangled automobiles coast to coast. Creating the Lincoln Highway Association, they mapped and began to promote a 3,389-mile route that, wags said, connected the nation's worst mudholes—like the one slowing this Model T near Ames, Iowa, in 1919.

Federally and state financed, the Lincoln was "the first transcontinental highway, a new kind of path, conceived with the automobile in mind," says Drake Hokanson of Wisconsin's Lakeland College, author of a book about the road.

Interstate 80 has largely supplanted the original road, but a new Lincoln Highway Association wants to preserve what's left. "We're trying to let people know what the Lincoln is," says Joyce Ausberger of Jefferson, Iowa, who with her husband helped form the group. "We want folks to see the lay of the land—how the road follows the dips and rolling hills—and to keep alive something of the past."

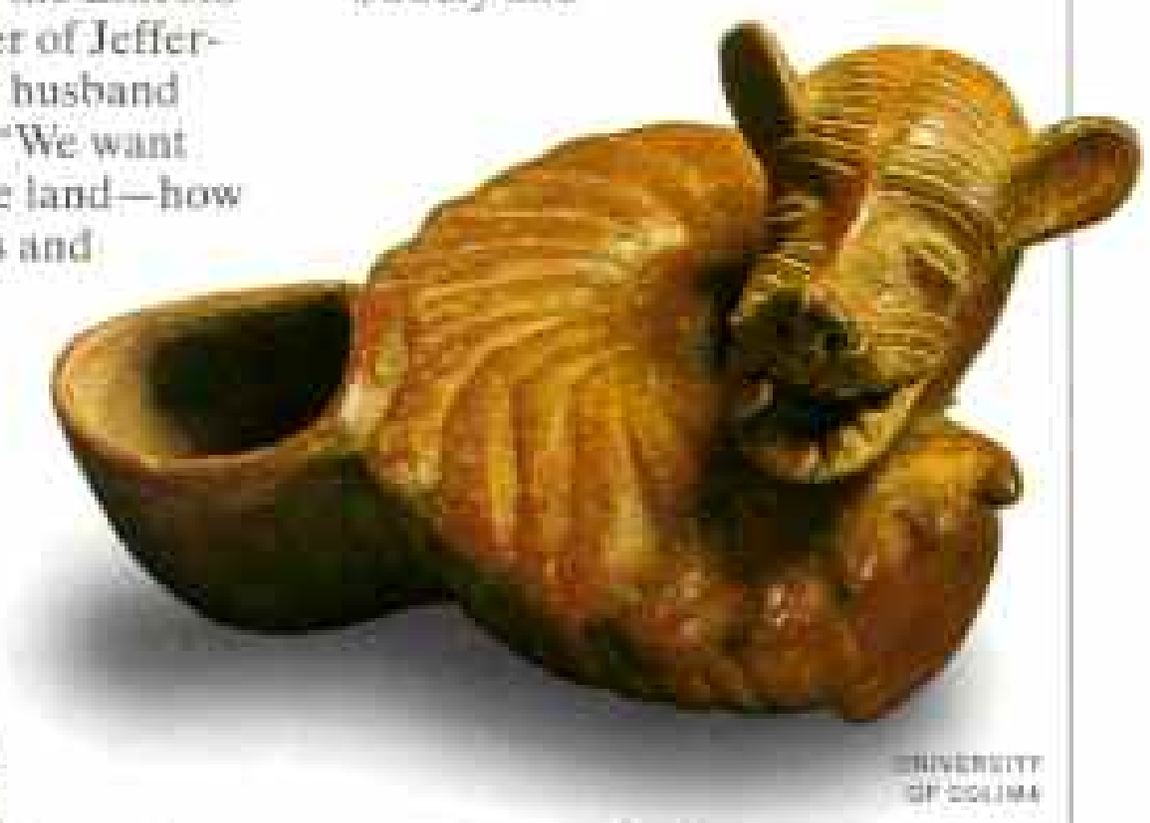
The 700 members in 38 states aim to list surviving segments on the National Register of Historic Places, along with old gas stations, hotels, and cafés. They are painting replicas of the old red-white-and-blue route markers, and are looking for some of the 3,000 posts bearing bronze busts of Lincoln set along the road by Boy Scouts in 1928.

How a Mexican Dog Made Its Way to Peru

Venerable folklore in both Mexico and Peru esteems the distinctive hairless dog as a "living hot-water bottle" whose warmth eases the pain of rheumatism. But how did the widely separated nations come to have this animal, rarely seen elsewhere, and to consider it valuable for the same therapeutic quality?

Ceramic "hairlesses" like this one (below) have been found in tombs of the Colima culture on Mexico's Pacific coast, indicating that the Colima people possessed real hairless canines perhaps as early as 250 B.C. But no ceramic dogs, or any other representations of them, are known to have been created in Peru before A.D. 750, when they began to appear in settlements of the Moche people, says Alana Cordy-Collins, an anthropologist at the University of San Diego. Traders who sailed large balsa rafts along the coast between Mexico and Peru may have introduced the dogs to the Moche. The traders sought a spiny oyster shell from Mexico for ritual use. "We believe they traded textiles for the shells and brought the dogs home too," Cordy-Collins says.

Cuddly and warm they may be, but accounts from early Spanish conquerors in both Mexico and Peru report that the dogs once also served another purpose: food.



UNIVERSITY OF COLIMA

National Geographic, March 1995

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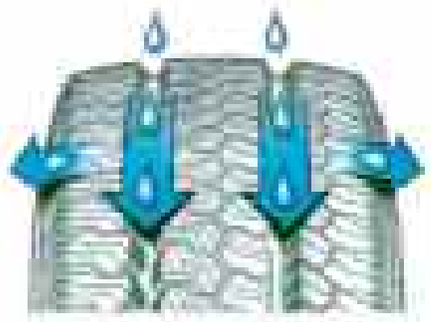

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Geographica

ALEX MARUCCI

The Scratch for Thatch: Roofers Look Abroad

English thatchers have dotted the countryside with their handiwork since before the Middle Ages, making the thatch roof one of England's most visible symbols. Recently, however, some craftsmen have had to go far afield in the search for quality thatch.

Wheat straw was traditionally used in the south and west—where thatch roofs are most common—until its popularity waned in the 1960s in favor of water reed, found in the eastern Fens. But nitrogen fertilizers, heavily used in the grain-growing areas that surround the Fens, have seeped into parts of that marshy land, causing reeds to grow faster than normal. This weakens the cell wall, making the reeds more susceptible to rot—and less durable for roofing. Thatchers must increasingly rely on water reed imported from Austria and Turkey, says Mick Dray of Devon, working on a cottage with his son, Richard, at center, a fifth-generation thatcher.

At least 30,000 English barns, cottages, and other buildings sport thatch tops. Depending on design, and regional variables of wind and rain, a roof of water reed thatch can last more than 80 years.

ROBBIE McCLARAN

Reach Out and Touch a New Oregon Tide Pool

Amid the spectacular natural beauty of the Oregon coast, a man-made attraction that opened last September enables visitors (lower left)—even those in wheelchairs—to touch the sea without getting their feet wet.

It all happens at Yaquina Head near Newport, where from 1917 to 1983 quarries provided tons of crushed basalt for roadbeds. The operation ate into the scenic lava headland until Congress authorized purchase of a hundred acres and ordered the Bureau of Land Management to reclaim it as an outstanding natural area. The BLM has transformed the eyesore into an intertidal zone with 1,500 feet of gently sloping paths. It tore down a seawall, lowered the quarry floor, created a narrow opening to the sea, and, last June, let the tide pour in.

Green algae and barnacles already grow on the rocks; occasionally a young Dungeness crab or a harbor seal wanders in. Designers hope that most of the area's 250 coastal marine species will colonize the site within five to ten years.

Did Pigs Help Ancient People Settle Down?

The first humans to give up the hunter-gatherer way of life settled down on the eastern Mediterranean coast to grow wheat and barley, then tamed sheep and goats for meat and milk, most archaeologists believe. But excavations at a 10,000-year-old village east of the modern city of Diyarbakir, Turkey, paint a different picture. Residents of round stone houses there hunted wild sheep and goats and ate nuts and legumes but also raised pigs, perhaps 500 years before the earliest known domesticated sheep and goats.

BROOKE WALKER

The dig at Hallan Çemi, led by Michael Rosenberg of the University of Delaware with funding from the National Geographic Society, reveals a community that lasted several hundred years. Evidence that villagers domesticated pigs includes teeth (above) that are generally smaller than those of wild pigs. Most of the pig bones came from males; females were likely spared for breeding. Methods learned in raising pigs were later applied to wild sheep and goats, Rosenberg believes.

National Geographic, March 1995

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Chrysler's Finesse concept car was the first incarnation of cab-forward engineering

ties in the world, but each Chrysler Concorde is in itself something of a mobile design center. We suggest you begin with a walk around the grounds. Note the wind-cheating profile of innovative cab-forward design—longer wheelbase, wider track, aggressively raked windshield. As you step in, observe that cab-forward also enlarges the rear doors for easier entry and exit. Once inside the spacious interior, take a hands-on tour of ergonomically placed controls on the instrument panel, seats, doors and ceiling. (Don't miss the dual front seat air bags; they're standard.*)

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Geographica

Plant That Ended an Australian Trek

In an epic journey of 1,650 miles, Robert O'Hara Burke, William John Wills, John King, and Charles Gray in 1860-61 became the first Europeans to cross Australia's uncharted interior south to north (GEOGRAPHIC, February 1979). But tragedy struck on their return: Burke (bottom), Wills, and Gray died as they traveled home from the Gulf of Carpentaria to Melbourne.

SYDNEY FILMWORKS

Historic accounts attribute the deaths to starvation. Now two Australian scientists, relying on 20th-century medical knowledge and clues in the explorers' journals and letters, offer a new theory. John W. Earl, a biochemist at Sydney's Royal Alexandra Hospital for Children, and Barry V. McCleary, an agricultural scientist, say that the Burke-Wills party had plenty of native food. But they believe the explorers prepared it improperly and died of beriberi, caused by a deficiency of thiamine—vitamin B_1.

Their own rations of flour and salted beef running low, the Burke-Wills party received the seedlike sporocarps of the nardoo fern (above) from Aborigines, who ground them with water to make a thin palatable paste. The scientists discovered that nardoo sporocarps contain large amounts of thiaminase, a fast-acting enzyme that breaks down and destroys thiamine. But mixing nardoo with water stops the enzyme's action.

The trekkers, however, ground the nardoo dry, the way Europeans prepare grains, thus releasing the thiamine-destroying enzyme. The explorers experienced weakness and pain in their legs, then developed wasted muscles and hypothermia so that they could not move. One by one, all but King died.

THE GRANGER COLLECTION

PATRICK HALLEY

Roses Bloom Deep in a Canadian Mine

Gardens are short-lived in the chill of Flin Flon, Manitoba, 400 miles northwest of Winnipeg. But now residents of this mining town enjoy fresh fruits, herbs, and roses year-round. The bounty grows 1,170 feet beneath the surface in what was a vacant chamber of a bustling copper and zinc mine.

The experiment was conceived by Wayne Fraser, environmental director for the Hudson Bay Mining and Smelting Company mine, and Brent Zettl of Prairie Plant Systems Inc. to test the quality, yield, and cost of subterranean gardening. "The chamber is totally isolated from the surface, so the environment can be controlled cheaply and accurately," Zettl says. The mine installed high-intensity lights, a drip irrigation system, and computers. Zettl maintains the temperature at 78°F by day and 69°F at night and monitors moisture and soil conditions from his office in Saskatoon, Saskatchewan, 280 miles away.

"Woody plants grow at a phenomenal rate," notes Zettl. Three months after planting, 80 rose plants produced 1,100 flowers, instead of the normal 700. The results are sold in local markets. Miners like Joe Sewap (above) take great pride in "their" garden. And well they should: They have dibs on any surplus.

—BORIS WEINTRAUB

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— Dr. Sheila Cory

Director of Instructional Technology and Media, Chapel Hill, North Carolina

This is the technology plan Sheila's team created. Along the way, they used Apple's Teaching, Learning and Technology, a multimedia kit that guides you through the entire planning process – from choosing the right technology, to implementing it, to evaluating its overall effectiveness in your school.

Apple Systems Engineer Dave Staton. Sheila says that Dave "went above and beyond our expectations in helping us plan our network. He studied our blueprints, outlined options – he even lent me books from his own library."

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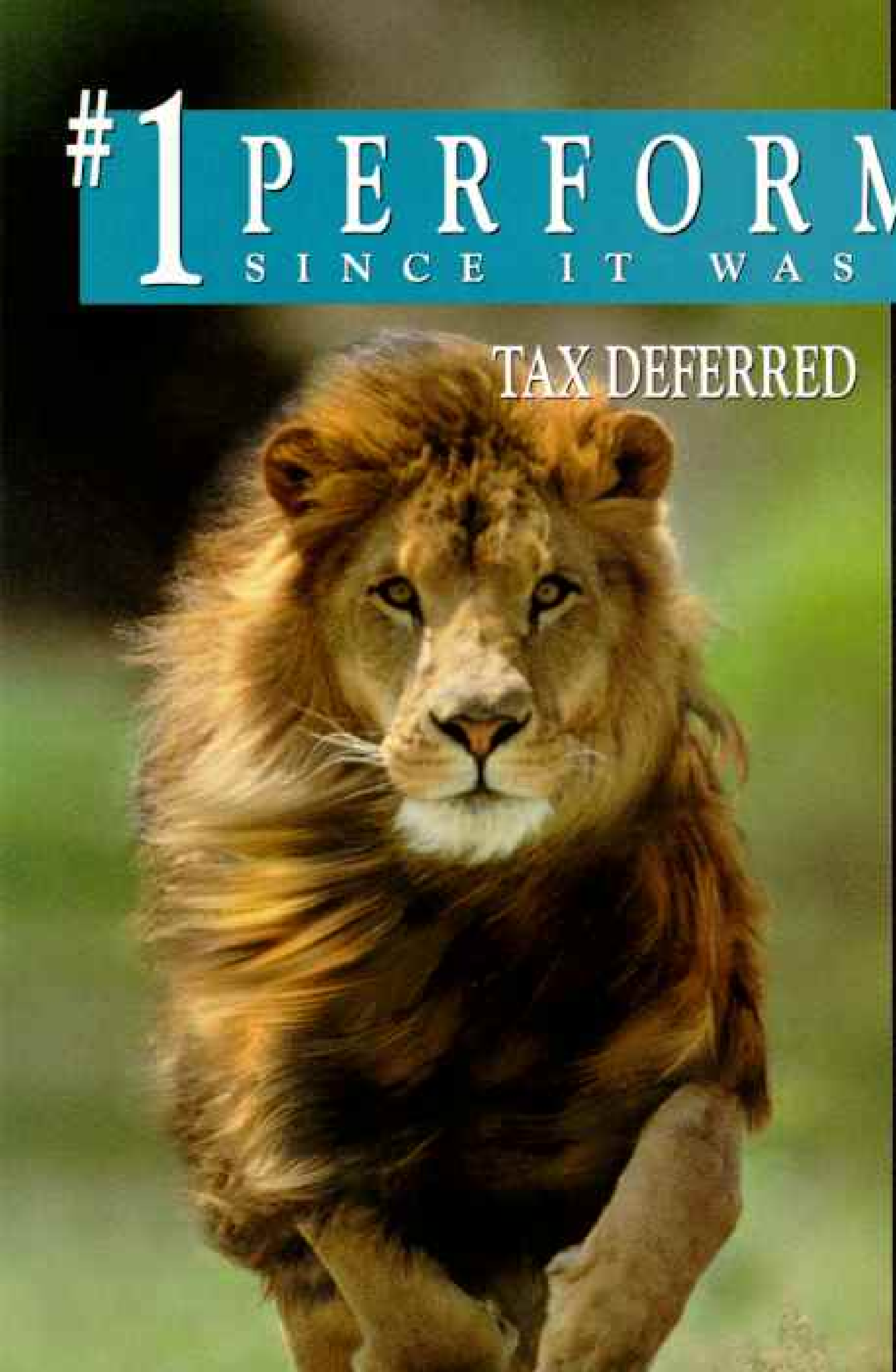

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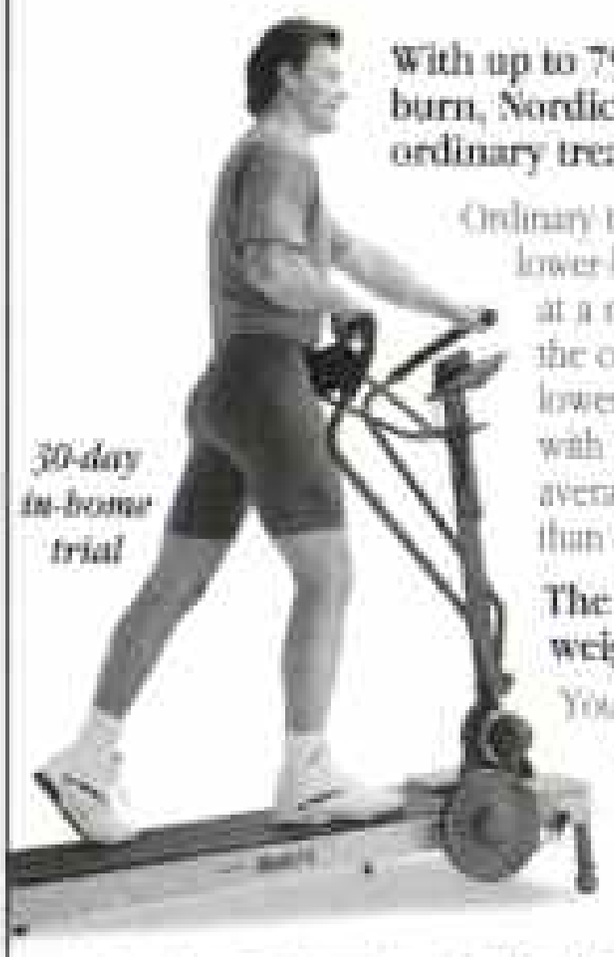

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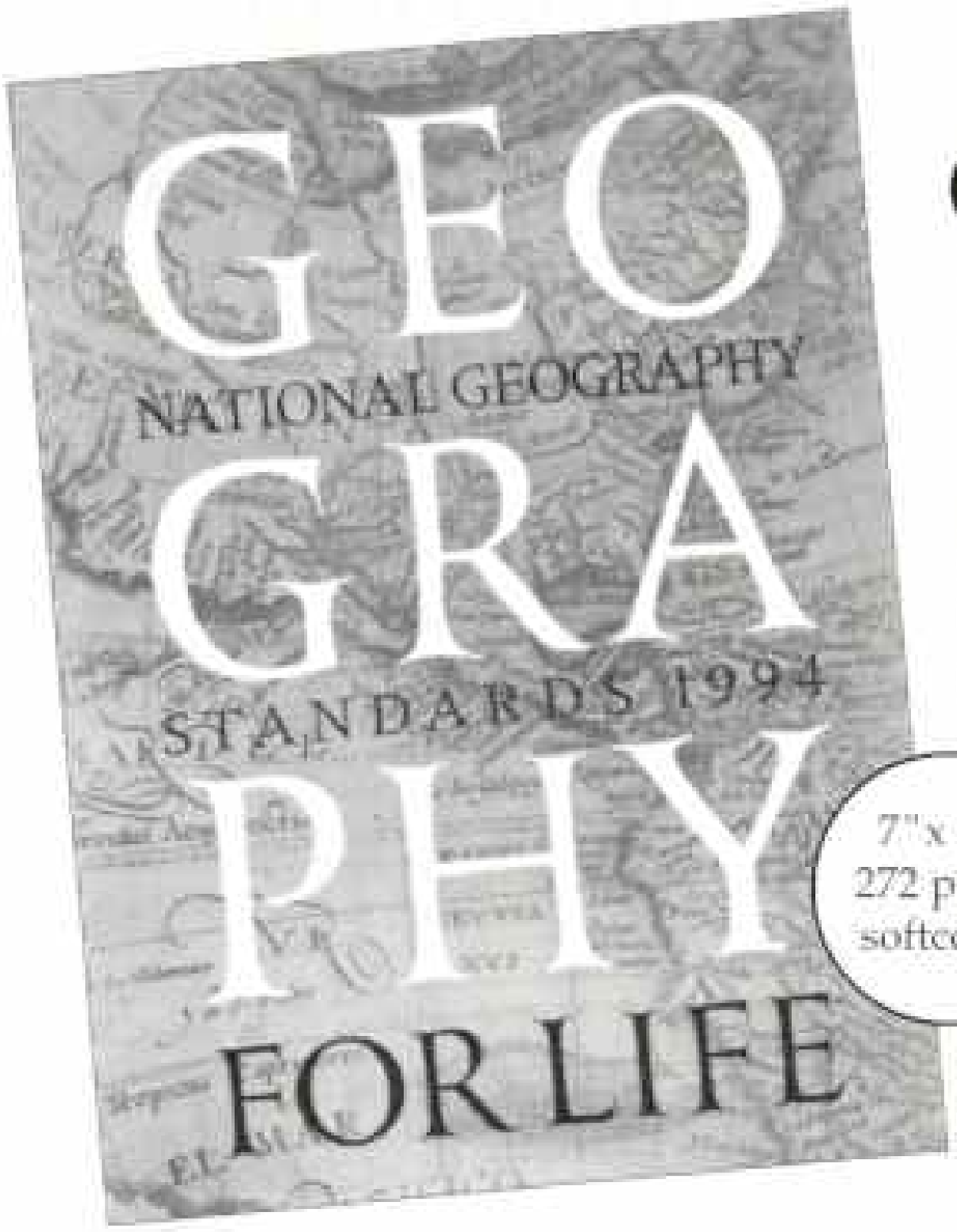

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Return of the Buffalo

As a livestock producer raising cattle on native grasses of the Great Plains, I share an interest in the American bison (November 1994). There is a place for the buffalo as a low-cholesterol novelty food, but don't expect production of buffalo to approach that of cattle in total pounds of edible product. As for the environmental aspects, the implication that buffalo don't trample around streams or overgraze is a bit hard to swallow. I suppose they drink through straws, and when grass becomes grazed below three inches, they go on a fast until regrowth occurs.

ALLAN T. THOMPSON
Fairfield, North Dakota

It is doubtful that the buffalo will ever become a docile, domestic animal. But we should encourage buffalo ranching in the short-grass prairie regions of North America. It's interesting to note that after the Plains Indians were confined to reservations, the federal government regularly supplied them with beef. They complained they didn't have their normal strength from eating the "white man's buffalo." It is understandable. According to the U. S. Department of Agriculture, buffalo meat has less fat than beef, with generally more protein and more thiamine. To top it off, buffalo meat tastes great.

ALAN HUTCHISON
Thundering Herd Buffalo Products
Reno, Nevada

Buffalo were not meant to be raised like cattle. Creating a beefier buffalo and marketing it as a piece of America is not focusing on what we are trying to preserve. If buffalo does become a commodity, no doubt genetic tinkering and breeding will diminish the very qualities that make it revered. It would be a shame to see this sacred beast reduced to a grilled burger sandwiched in a bun. Let us focus on the Poppers' plan to create a natural preserve where buffalo can roam freely as they once did.

STEVE ABRAHAMS
Philadelphia, Pennsylvania

During my game-management career, I worked for the New Mexico Department of Game and Fish on a plan to create a bison range of about six million acres between Vaughn and Roswell. There was a broad sweep of land being used to graze cattle and sheep. It could support bison, elk, and antelope. The tract could conceivably extend north through northeastern New Mexico, eastern Colorado, eastern Wyoming, and into Montana to a prospective Big Open preserve, as mentioned. I sincerely believe that now is the time to get started on what could be a world-class big-game range. It could be acquired piece by piece as the present ranches opt to sell out.

SAMUEL H. LAMB
Kaneohe, Hawaii

The Big Open is nothing more than the Poppers' dream. As the information highway rolls through, people in the rural West are able to diversify their employment opportunities, and children are no longer leaving to gain employment. Unemployment here in eastern Montana is around 4 percent. What the Poppers and other biocentrists want to do is replace the cattle industry with buffalo. The Big Open is thought of as pure buffalo chips by the people who live here.

SCOTT E. CASSEL
Saco, Montana

In a grassroots movement, thousands of cards and letters have made their way to the U. S. Senate, calling for legislation to bring back the buffalo nickel. For millions of Americans, including Ted Turner (he told me) and myself, their first contact with the buffalo and its spirit was through the nickel honoring it. We want it back.

MITCHELL SIMON
New York, New York

The Indians themselves had already begun to destroy the buffalo herds in the 1840s, according to an article by Dan Flores in the *Journal of American History* of September 1991.

ROBIN HIGHAM
Manhattan, Kansas

The National Bison Range at Moise, Montana, in existence for many years, probably has done more than any other place to further the propagation of buffalo.

BOB VAN GIESON
Missoula, Montana

The first description of the American bison appears in Álvar Núñez Cabeza de Vaca's account of his tribulations in the South and Southwest from 1528 to 1536. Early Spaniards called bison *vacas corcovadas*, humpbacked cows.

STEVEN STRANGE
East Hartford, Connecticut

When the Ancient Greeks Went West

Rick Gore's article on Greece's western colonies was a joy to read and once again reveals the GEOGRAPHIC's ability to convey events from the perspective of those involved. However, I think that the discovery of a grid pattern in city streets of Megara Hyblaea does not so much represent "the equality of citizens," as it does the desire for

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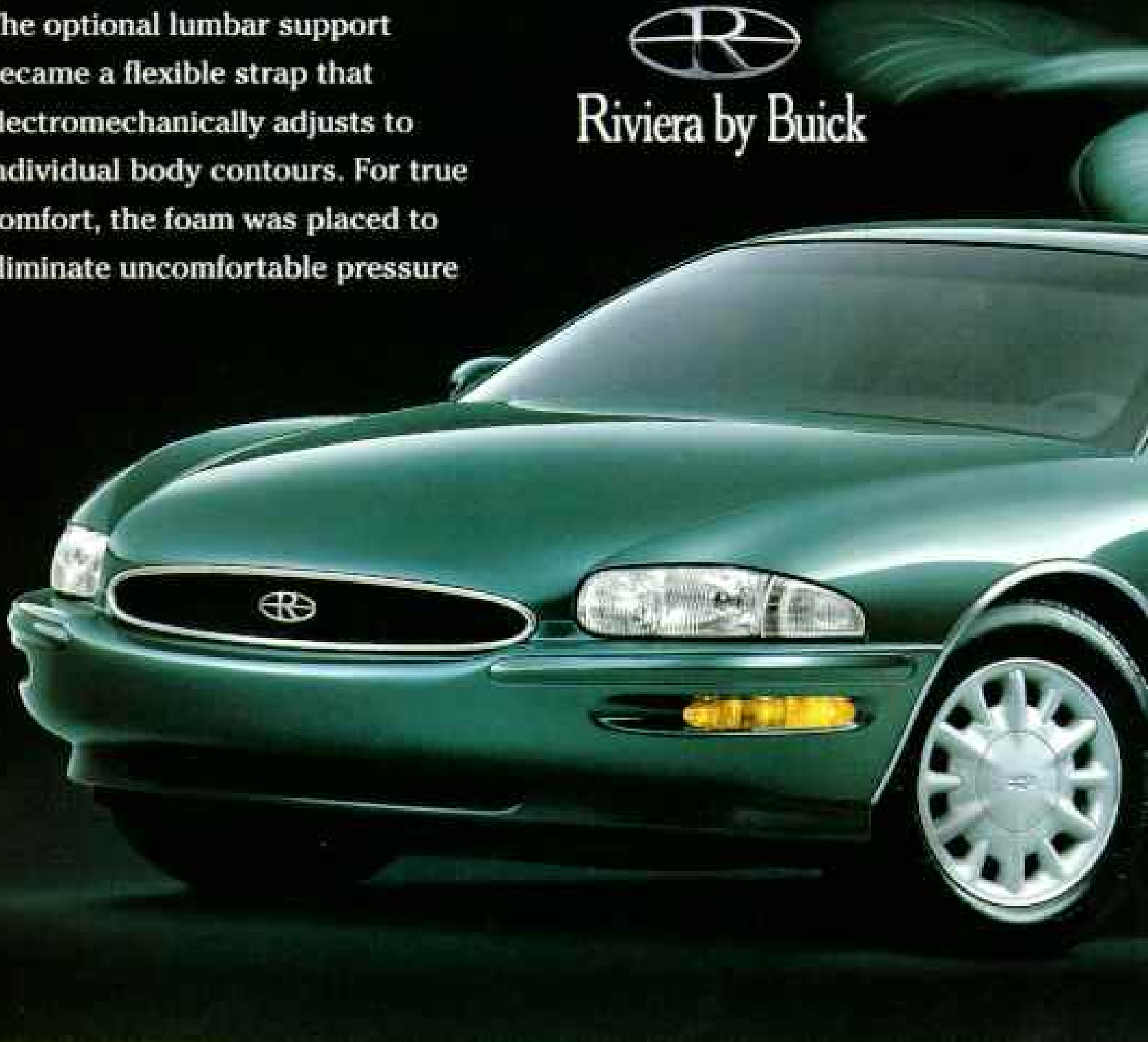

centralized control of a populace in a new urban setting, usually a colony. The grid pattern in western settlements likely represents the founding of colonies on the authority of a mother city by settlers dispatched with orders based on careful planning. To suggest that a grid represents democratic ideals seems somewhat stretched to me.

JERRY SAUER
Toronto, Ontario

Those who believe that urban planning was invented by Greek colonizers in the west should visit Mohenjo Daro in what is now Pakistan. This Indus Valley city was modern even by today's standards and predates Megara Hyblaea by about 2,000 years.

TURNER ROGERS
Semmes, Alabama

Thank you for the splendid picture of the temple at Segesta (pages 36-7). The temple is interesting close-up too, as it was never finished. The steps at the base are still rough. Quarry workers left knobs projecting to facilitate the transportation of the stone to the site. Later, stone carvers were to flute the columns and finish the steps. But "later" never came because of war. Forty or so years ago the steps were a lovely place to have a picnic.

MARGARET W. ROMANI
Los Angeles, California

Photographer Sisse Brimberg says they still are.

The headless statue of a woman nursing twins appears to be wearing a maternity garment designed to facilitate breastfeeding (page 31). If the cutouts are for that purpose, the Sicilian Greeks were 2,000 years ahead of the modern maternity-dress designers who came up with this practical modification.

VYTAUTAS MATULIONIS
Cleveland Heights, Ohio

In the photograph of the town of Lipari (pages 28-9), the large building at upper right is where I spent ten long months of starvation and humiliation, a "guest" of the Mussolini government, as a political internee from my native Yugoslavia. Indeed I credit the serene weather mentioned for saving many lives.

STEPHEN EVANS
Kingman, Arizona

It should have been mentioned that the attack of Athens on Syracuse in 415 B.C. was one of the most important battles of the Peloponnesian War. Moreover, ancient Greeks had colonized the east—Asia Minor—a few centuries before setting off toward the west.

Finally, it is widely known here that there still exists a population in southern Italy that uses a Greek dialect as its mother tongue.

CHRISTOS MANAIAKIS
Athens, Greece

A number of Greek-speaking communities in the Calabria region and in Sicily trace their heritage to the ancient Greeks' western migrations.

Madeira

While in Madeira we were impressed not only by its beauty but also by the friendliness of the residents. The schools offer English courses, and many young people were anxious to converse with us. Madeirans love their flower gardens. The lovely gardens in Funchal are well kept and expertly displayed. In the small village of Monte, terraced gardens and topiaries are everywhere.

ROY G. CHRISTENSEN
Rio Rancho, New Mexico

My grandparents emigrated from Santa Cruz, Madeira, so it was gratifying to read about the island's recent surge toward a more prosperous future. Maybe this will eliminate the necessity for future generations to find the solution to their socioeconomic problems via emigration. They would thereby avoid the fate of my grandmother, who typified the author's statement that "Madeirans can be contemplative to the point of morbidity." I will never forget her many tears as she reminisced about the beautiful island of her birth.

ROBERT TEIXEIRA, JR.
Fall River, Massachusetts

John McCarry's article illustrates vividly what is happening all along the southern fringe of the European Union. Although money from Brussels pays for infrastructure—from roads to hospitals—there has been a widespread loss of traditional activities and small-scale farming practices.

One might also mention the decline of the unique wildlife of Madeira—from the disappearing laurel forests that support the laurel pigeon found nowhere else in the world to the highly endangered Mediterranean monk seal still surviving in small numbers in the Desertas Islands to the southeast of Funchal.

JOSÉ PEDRO TAVARES
Nottingham, England

I was surprised to read on page 93 that the island is one of Europe's most densely populated regions. Madeira belongs to Africa. Geographically speaking, Europe ends at Gibraltar.

TOMAS ROMERO-CARDENAS
Dartmouth, Nova Scotia

While Madeira is part of Africa geographically, it is an autonomous region of Portugal and in that political sense European.

Letters for FORUM should be sent to National Geographic Magazine, Box 37448, Washington, D. C. 20013-7448, or by fax to 202-828-5460, or via the America Online computer network to ngsforum@aol.com. Include full name, address, and daytime telephone. Letters selected may be edited for clarity and space.

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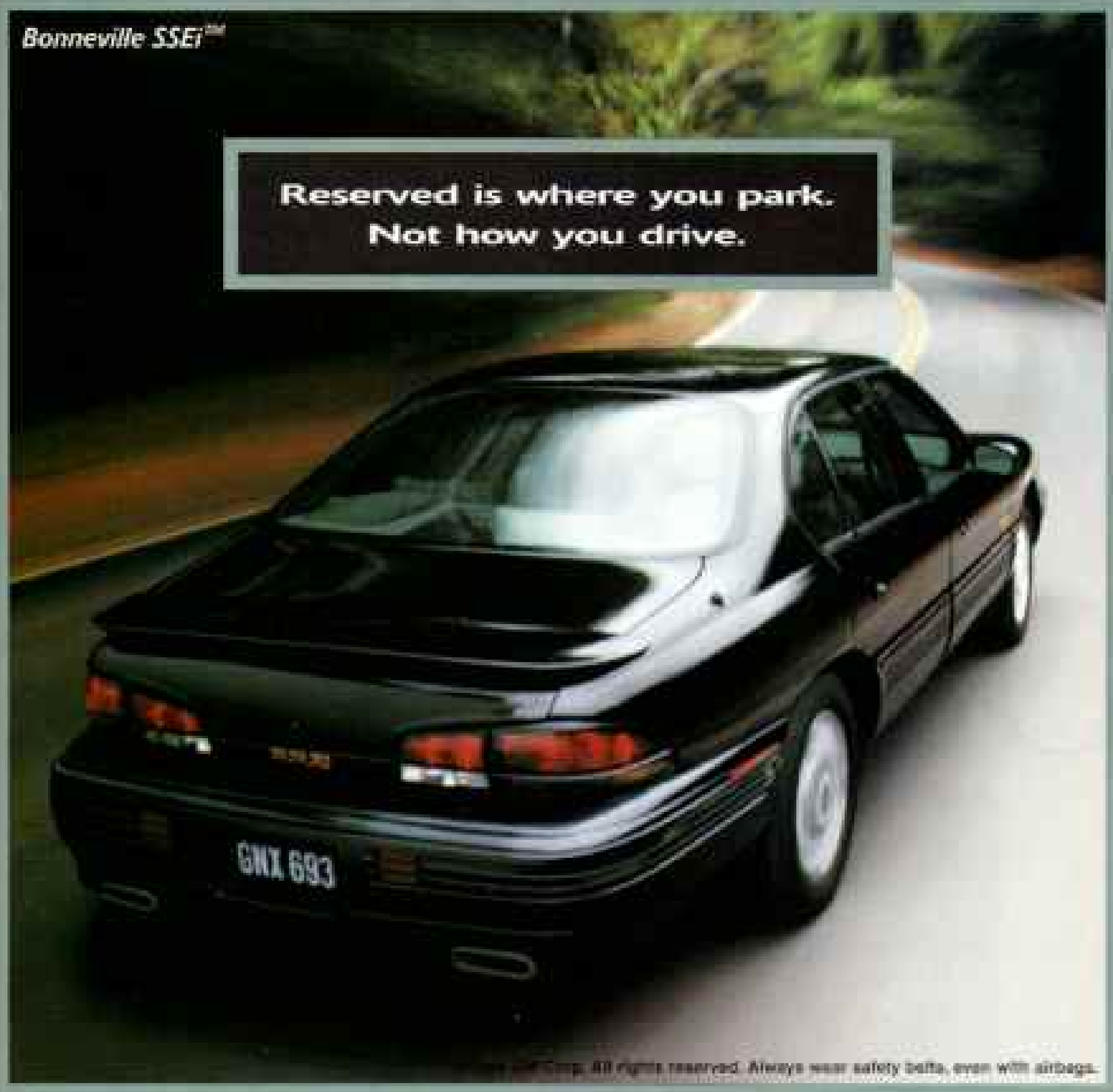

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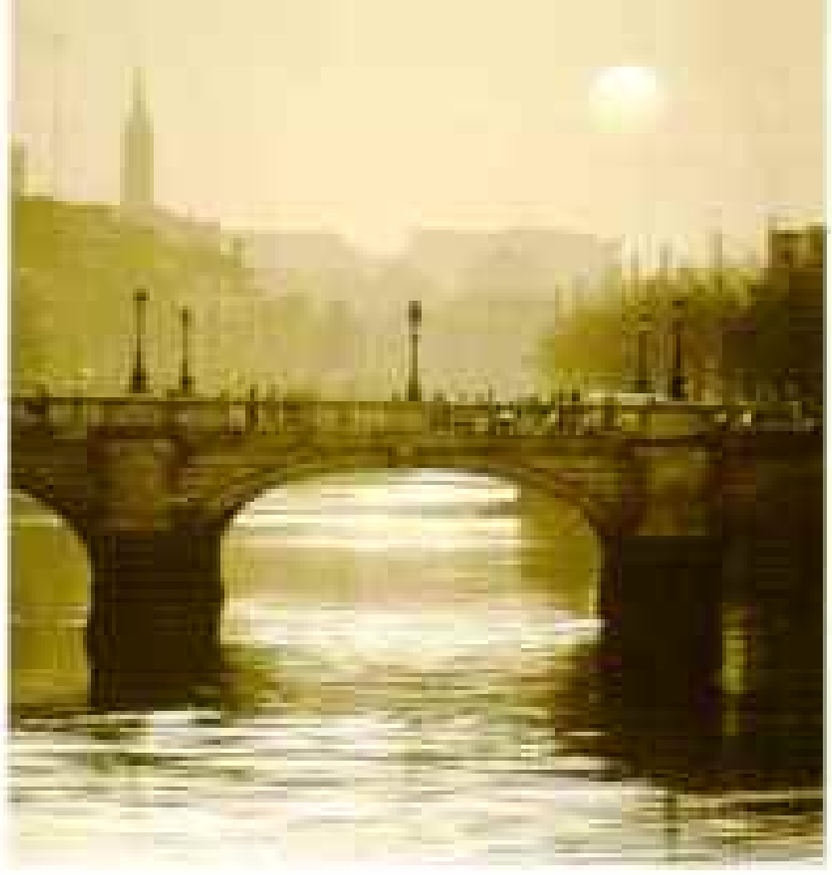

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Cruising the Oceans With Great White Sharks

"If we ever reach the stage where we've eliminated the big predators, then we've destroyed the wild," says Paul Atkins, who with his wife, Grace, has made a film about the ultimate marine predator—the great white shark.

Rather than relying on divers filming from inside steel cages (a method that affects shark behavior), the National Geographic Special "Great White Shark" uses remote cameras to record natural patterns of predation.

A great white breaks the surface while feeding, giving researchers off South Africa a chance to attach a barbed identification tag. Marine biologist Greg Marshall manages to tether a small camera to the tag. When the shark dives, the "critter-cam" goes along to record life on the prowl from a predator's view.

At the Farallon Islands off San Francisco scientists float a surfboard with a camera mounted underneath. Cruising below, a great white rises, expecting the silhouette to be a dinner of young elephant seal. The speed and power of the attack is a reminder, if one is needed, of just who rules the oceans.

"Great White Shark" airs Wednesday, March 1, at 8 p.m. ET on NBC and is the Home Video Club selection for July.

Close Encounters With Grizzly Bears

On Sunday morning, September 18, 1983, Trevor and Patricia Janz were walking through a light snowfall in Waterton Lakes National Park, Canada, when they experienced a hiker's worst nightmare—a grizzly mother with cubs, feeding on an animal carcass.

What happened next is captured in "Bear Attack," part of the EXPLORER program "Deadly Encounters." The segment shows how humans can protect themselves in the domain of the grizzly. Says Stephen Herrero, who has studied bear behavior for 25 years: "If you surprise a grizzly and contact seems inevitable, you've got to protect your face and neck. Lie face down, put your hands behind your neck, and play dead."

"Deadly Encounters" airs Sunday, March 19, at 9 p.m. ET on TBS Superstation.

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If your doctor says you've got symptomatic benign prostate enlargement, help can be in the palm of your hand.

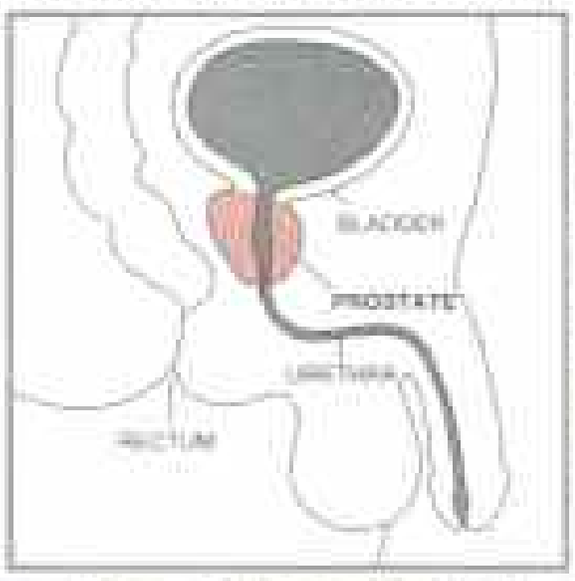
Many men mistakenly believe that an enlarged prostate is treated the same way for all men. But today there are more options than ever. By speaking frankly about your symptoms, you and your doctor can decide what is appropriate for you.

Is this you?	Yes	No
Do you get up more than once or twice a night to urinate?	☐	☐
Do you often have sudden, uncontrollable urges to urinate?	☐	☐
Do you have a hesitant or slow urine stream?	☐	☐
Do you have a frequent need to urinate?	☐	☐

If you answered yes to even one question, tell your doctor. Your symptoms may be caused by a condition called benign prostate enlargement (BPH). But remember, only a doctor can evaluate your symptoms and their possible causes. *While BPH is not cancer and does not lead to cancer, the two conditions can exist at the same time.*

Symptomatic BPH can be treated in several ways. In addition to surgery and monitoring the condition with regular checkups, now your doctor has oral prescription medicines. One oral medicine is PROSCAR, the only medicine for the treatment of symptomatic BPH that can shrink the prostate.

PROSCAR works by blocking a hormone that can cause the prostate to enlarge. *But it is important to know: PROSCAR doesn't work for everyone. Although the prostate may shrink, there may not be an improvement in urinary symptoms. However, in clinical studies with PROSCAR, some men have seen an improvement in their urinary symptoms after 2 weeks. Others have found that PROSCAR took up to several months to help them.* Because all men are different, you and your doctor will need to determine how PROSCAR is working for you.



The prostate surrounds part of the urethra, the tube that carries urine from the bladder. As the prostate enlarges, it can squeeze the urethra and cause urinary problems.

Today you don't have to live with the discomfort of symptomatic BPH. Ask your family doctor or a urologist if PROSCAR is right for you. **For free information that will help you discuss your symptoms with your doctor, call 1-800-770-4825.**

For the treatment of symptomatic BPH

PROSCAR® 5mg
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Please see the patient information on the next page.

PATIENT INFORMATION ABOUT PROSCAR® (Prahs-car)

Generic name: finasteride (fin-AS-tur-eyed)

PROSCAR is for the treatment of symptomatic benign prostatic hyperplasia and for use by men only.

Your doctor may prescribe PROSCAR if you have a medical condition called benign prostatic hyperplasia or BPH. This occurs only in men.

Please read this information, as well as the leaflet which accompanies your medication, before you start taking PROSCAR. Also, read the leaflet each time you renew your prescription, just in case anything has changed. Remember, this leaflet does not take the place of careful discussions with your doctor. You and your doctor should discuss PROSCAR when you start taking your medication and at regular checkups.

What is BPH?

BPH is an enlargement of the prostate gland. After age 50, most men develop enlarged prostates. The prostate is located below the bladder. As the prostate enlarges, it may slowly restrict the flow of urine. This can lead to symptoms such as:

- a weak or interrupted urinary stream
- a feeling that you cannot empty your bladder completely
- a feeling of delay or hesitation when you start to urinate
- a need to urinate often, especially at night
- a feeling that you must urinate right away

Treatment options for BPH

There are three main treatment options for BPH:

- **Program of monitoring or "Watchful Waiting".** If a man has an enlarged prostate gland and no symptoms or if his symptoms do not bother him, he and his doctor may decide on a program of monitoring which would include regular checkups, instead of medication or surgery.
- **Medication.** Your doctor may prescribe PROSCAR for BPH. See **"What PROSCAR does"** below.
- **Surgery.** Some patients may need surgery. Your doctor can describe several different surgical procedures for BPH. Which procedure is best depends on your symptoms and medical condition.

What PROSCAR does

PROSCAR lowers levels of a key hormone called DHT (dihydrotestosterone), which is a major cause of prostate growth. Lowering DHT leads to shrinkage of the enlarged prostate gland in most men. This can lead to gradual improvement in urine flow and symptoms over the next several months. However, since each case of BPH is different, you should know that:

- Even though the prostate shrinks, you may NOT see an improvement in urine flow or symptoms.
- You may need to take PROSCAR for six (6) months or more to see whether it helps you.
- Even though you take PROSCAR and it may help you, it is not known whether PROSCAR reduces the need for surgery.

What you need to know while taking PROSCAR

- **You must see your doctor regularly.** While taking PROSCAR, you must have regular checkups. Follow your doctor's advice about when to have these checkups.
- **About side effects.** Like all prescription drugs, PROSCAR may cause side effects. Side effects due to PROSCAR may include impotence (or inability to have an erection) and less desire for sex. Each of these side effects occurred in less than 4% of patients in clinical studies. In some cases side effects went away while the patient continued to take PROSCAR.

  Some men taking PROSCAR may have a decrease in the amount of semen released during sex. This decrease does not appear to interfere with normal sexual function. Rarely, some men have reported breast swelling and/or tenderness or allergic reactions such as lip swelling and rash.

You should discuss side effects with your doctor before taking PROSCAR® (Finasteride) and anytime you think you are having a side effect.

- **Checking for prostate cancer.** Your doctor has prescribed PROSCAR for symptomatic BPH and not for cancer—but a man can have BPH and prostate cancer at the same time. Doctors usually recommend that men be checked for prostate cancer once a year when they turn 50 (or 40 if a family member has had prostate cancer). These checks should continue while you take PROSCAR. PROSCAR is not a treatment for prostate cancer.
- **About prostate specific antigen (PSA).** Your doctor may have done a blood test called PSA. PROSCAR can alter PSA values. For more information, talk to your doctor.
- **A warning about PROSCAR and pregnancy.**

  PROSCAR is for use by MEN only.

  PROSCAR is generally well tolerated in men. However, women who are pregnant, or women who could become pregnant, should avoid the active ingredient in PROSCAR.

  If the active ingredient is absorbed by a woman who is pregnant with a male baby, it may cause the male baby to be born with abnormalities of the sex organs. Therefore, any woman who is pregnant or who could become pregnant must not come into direct contact with the active ingredient in PROSCAR.

Two of the ways in which a woman might absorb the active ingredient in PROSCAR are:

Sexual contact. Your semen may contain a small amount of the active ingredient of the drug. If your partner is pregnant, or if you and your partner decide to have a baby, you must stop taking PROSCAR and talk to your doctor. If your partner could become pregnant, proper use of a condom can reduce the risk of exposing her to your semen (discuss this further with your doctor).

Handling broken tablets. Women who are pregnant or who could become pregnant must not handle broken tablets of PROSCAR. PROSCAR tablets are coated to prevent contact with the active ingredient during normal handling. If this coating is broken, the tablets should not be handled by women who are pregnant or who could become pregnant.

If a woman who is pregnant comes into contact with the active ingredient in PROSCAR, a doctor should be consulted.

Remember, these warnings apply only if the woman exposed to PROSCAR is pregnant or could become pregnant.

How to take PROSCAR

Follow your doctor's advice about how to take PROSCAR. You must take it every day. You may take it with or between meals. To avoid forgetting to take PROSCAR, it may be helpful to take it the same time every day.

Do not share PROSCAR with anyone else; it was prescribed only for you.

Keep PROSCAR and all medicines out of the reach of children.

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Earth Almanac

Binky the Bear Teaches Visitors a Lesson

Zoogoers belong behind the bars sometimes. In Anchorage last year at the Alaska Zoo, people twice jumped fences to get close to Binky, a polar bear. Binky made them pay and became an Alaska folk hero.

In July an Australian woman

MARK THIESSEN

ERIC SOHL, KTUU-TV, ANCHORAGE

climbed a four-foot fence, then a three-foot one to reach Binky's enclosure. Instantly, he thrust his jaws through the bars and bit her. She suffered a broken ankle and leg wounds and lost one purple-and-white tennis shoe—a trophy Binky carried for hours (above right). Six weeks later, two local teenagers leaped barriers at night to reach Binky's cage. He bit one on the leg.

Gleeful Alaskans dubbed Binky the victim, praising him with T-shirts, jokes, a rap song, and newspaper letters. One, reacting to the teenagers' stupidity, suggested a truly Alaskan punishment: "Write 1,000 times . . . 'I am glad I was not driving a supertanker that night.' "

Pollution Watchdog: On-road Tailpipe Sniffer

In 38 states, motorists must have their vehicles' emissions tested every year or two. Some don't. Others readjust their engines to enhance performance after the test. And pollution-control components sometimes fail or need adjustment.

To identify those who slip through the cracks, private firms working with local governments are aiming remote-sensing devices at tailpipes as they whiz past. Here, a Remote Sensing Technologies van tests cars in Sacramento, California. Its equipment shoots an infrared beam through a car's exhaust, capturing its chemistry. The beam hits mirrors across the highway and bounces back to a detector, which relays data to computers inside the van. They analyze the amount of hydrocarbons, carbon monoxide, and carbon dioxide in the exhaust.

Outside, instruments monitor wind speed and direction, which can affect results. And a digital camera records license plates so owners of heavily polluting vehicles can be notified—an option some states soon plan to implement. Tests have been done in 11 states so far.

JAMES A. SUGAR

National Geographic, March 1995

"We've got three trucks and we've never had

People and nature can live in harmony, according to John Sawhill, President of The Nature Conservancy. For instance, bison at the Conservancy's Tallgrass Prairie Preserve in Oklahoma share miles of pristine grassland with tourists and scientists. To protect and preserve the land, The Nature Conservancy gets corporations, landowners and private

and 300 bison,

a single traffic jam.

citizens to work together to help. The goal: safeguarding the environment without destroying jobs or businesses. That's a goal General Motors shares. So we're supplying funds, talent and even the GMC Trucks used to maintain Tallgrass. John says, "The Conservancy gets results you can walk around on." And the results are truly spectacular.

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Earth Almanac

No Water Hazard for This Golfer

When inventor Patrick E. Kane boarded a cruise ship in 1990 to celebrate his wedding anniversary off the coast of Mexico, he was looking forward to driving golf balls from the deck for exercise and recreation. But once at sea, the purser gave him the bad news. Shipboard golf had been halted by a bogey called MARPOL, an international treaty. One section, signed by 68 nations, prohibits the dumping of plastic—including golf balls—at sea.

"I was a little bit hot under the collar," says Kane. Back home in California he began puttering in his kitchen, determined to create an environmentally friendly golf ball. After two years of trial and error he hit upon a successful combination of ground citrus peel and collagen, an animal protein. He molded the mix into a ball he calls Aquaflyte, which is now patented. Kane hopes to sell it to cruise lines and beach resorts.

How far does the ball fly?

"With short to mid irons, its performance is the same as a regular ball. With longer irons and woods, it travels about a 25 percent shorter distance," he acknowledges. After the balls hit the water, "they dissolve and become natural food for marine life."

WILLIAM COSTELLO

Mass Grave of the Long-lost Great Auk

Extinction is forever, but poignant touchstones linger. Huge seabirds called great auks had long been slaughtered for meat, oil, and feathers when John James Audubon painted these two around 1835. Flightless and helpless on land, great auks bred throughout the North Atlantic. Audubon learned of a massive colony on an island off Newfoundland from fishermen who "destroy great numbers of the young for bait." In 1844 the last known great auks were killed off Iceland.

The island described to Audubon was probably Funk Island, a flat, 80-acre rock that held some 200,000 great auks. "It was North America's first fast-food take-out," says Bill Montevecchi, a biologist at the Memorial University of Newfoundland. Explorer Jacques Cartier and others salted great auks and stored them in barrels. Fishermen stripped the birds' feathers for mattresses. Thousands of carcasses were heaved onto a two-acre field. "Today it is covered with grass, still fertilized by great auk carcasses," says Montevecchi. Within this cemetery—now a seabird sanctuary—nest puffins, along with perhaps a million murres.

NEW-YORK HISTORICAL SOCIETY

War of the Ant Queens

Locked in mortal combat, two queen ants of different species vie for a thriving colony. The nest's current queen, at left, pinioned by the invader's jaws, is dying. The victor, having fought her way alone past a palace guard of worker ants, will now take over the colony by enslaving its inhabitants—the ultimate form of social parasitism.

How does this scheming queen of *Polyergus breviceps* conquer *Formica gnava* ants? With a "chemical heist," says Howard Topoff, studying the ants in Arizona. In the fight, the *Polyergus* invader licks her victim's body to absorb its pheromones, or communication chemicals. The victor acquires her foe's scent—and thus her power.

RAYMOND A. MENDEZ

When their queen dies, *Formica* workers begin feeding the usurper. After her eggs hatch, the workers will raise her young. When mature, those *Polyergus* workers attack other *Formica* colonies and carry back their pupae for more slaves.

—JOHN L. ELLIOT

National Geographic, March 1995

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JOEL SARTORE

"Here came this great, friendly, inquisitive spirit out of the water to greet us," remembers freelance writer DOUG CHADWICK of his encounter with a gray whale off Mexico's west coast during his coverage of the Endangered Species Act. "Everyone in the boat said I should kiss it, so I did. They made Joel Sartore stop taking pictures and just sit and enjoy the whale and its energy."

Reporting on what he describes as the "cultures" of other species is second nature to the Montana-based journalist who maintains a cabin retreat in the shadow of Glacier National Park. His first portrait of a species for GEOGRAPHIC was a 1978 study on mountain goats—a subject he revisits in next month's issue. A biologist by training, Chadwick notes: "I've searched all the great prairies and woodlands of the U. S., and it's very hard to find an ecosystem healthy enough to support all its native species."

For safety, stock cars are made without doors, so senior staff writer CATHY NEWMAN shoehorned herself through the window when she attended Richard Petty's driving school at Charlotte Motor Speedway for her article in this issue. She found the course a mental squeeze too. "I was in a terrible crash in 1974 and broke my back in two places. I couldn't work for six months. Even now I'm a little uncomfortable at the wheel."

Cathy, a Florida native who majored in English at Northwestern University, started her career at the *Miami News*, writing wedding announcements. She worked her way up to editor of the "Lifestyle" section. In 1978 she joined the GEOGRAPHIC staff, first writing captions, then articles. She and her husband, retired newspaperman Jim Fain, live in Washington, D. C., with their nine-year-old son, Jeb. "I'm fortunate," says Cathy. "While I'm away on assignment, three months or so a year, my husband holds down the fort. When Jeb was little, he thought all mothers traveled—and all fathers stayed home."

PETE SOUZA

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Dhole *(Cuon alpinus)* **Size:** Head and body length, 90cm; tail, 43cm **Weight:** 17kg **Habitat:** Forests and scrublands throughout Asia **Surviving number:** Unknown
Photographed by Anup Shah

WILDLIFE AS CANON SEES IT

Dholes, also known as the red dog of Asia, are highly social animals. When chasing prey through dense forest, pack members keep in contact with each other with a unique whistling sound. Like the endangered African wild dog, dholes have been relentlessly persecuted, and although now protected in some areas, they continue to be threatened by habitat loss, disease and reduction of prey. 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.