VOL. 188, NO. 4 OCTOBER 1995

NATIONAL GEOGRAPHIC

MOUNTAIN GORILLAS OF AFRICA

Threatened by War 58

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

NATIONAL GEOGRAPHIC MAGAZINE


QVC

SURFING A WORLD OF POSSIBILITIES

Five hundred screens firing images from the global information highway could well boggle the mind. Technology is ready to put that many channels on the cable-TV map. These and other electronic avenues are redirecting how we work, play, and reach out to one another.

TELEVISIONS AND VCRS USED FOR THIS MULTIPLE EXPOSURE ARE COURTESY OF MITSUBISHI ELECTRIC AMERICA.

BY JOEL L. SWERDLOW
NATIONAL GEOGRAPHIC SENIOR WRITER
PHOTOGRAPHS BY LOUIE PSIHOYOS
ART BY ALLEN CARROLL
SENIOR ASSISTANT EDITOR

Information Revolution

IN RAY BRADBURY'S *Fahrenheit 451*—which was written in the early 1950s, just after televisions and computers first appeared—people relate most intimately with electronic screens and don't like to read. They are happy when firemen burn books.

Cram people "full of noncombustible data," the fire captain explains. "Chock them so damned full of 'facts' they feel stuffed, but absolutely 'brilliant' with information. Then they'll feel they're thinking, they'll get a *sense* of motion without moving."

Bradbury's novel no longer seems set in a distant future. Thanks to growth in computer capacity, television and computers are merging into DIGITAL streams of sounds, images, and text that make it possible to become absolutely brilliant with information.

To know where information technologies are taking us is impossible. The law of unintended consequences governs all technological revolutions. In 1438 Johannes Gutenberg wanted a cheaper way to produce handwritten Bibles. His movable type fostered a spread in literacy, an advance of scientific knowledge, and the emergence of the industrial revolution.

Although no one can predict the full effect of the current information revolution, we can see changes in our daily lives. Look in any classroom. Today's teachers know they have to make lessons fast-moving and entertaining for children raised on television and computer games. Rick Wormeli, an award-winning middle-school teacher in Fairfax County, Virginia, tries to capture the attention of his students by sometimes dressing in yellow shorts, a cape, and red tights and calling himself "Adverb Man." Once, to jump-start the day, he appeared in scuba gear and drenched himself in water. "I try to be as vivid as I can, combining style with substance," he says.

LOUIE PSIHOYOS specializes in photographing complex stories. Previous GEOGRAPHIC assignments include "Dinosaurs" (January 1993) and "The Intimate Sense of Smell" (September 1986).

DIGITAL
Humans and computers use different signals to communicate. A song, for instance, leaves the singer as sound waves. Plotted on a graph, each tone has a distinct numerical value that can be converted to a group of 1's and 0's in the digital language that a computer uses. In the circuits of a computer's memory, 0's travel as low-voltage electricity, turning off switches called transistors; 1's, at a higher voltage, turn on the switches.

Often the changes that accompany new information technologies are so subtle we barely notice them. Before the written word, people relied on their memories. Before telephones, more people knew the pleasure of writing and receiving letters, the small joy of finding a handwritten envelope in the mailbox from a friend or a relative. Before television and computers, people had a stronger sense of community, a greater attachment to neighborhoods and families.

Television has glued us to our homes, isolating us from other human beings. Only one-quarter of all Americans know their next-door neighbors. Our communities will become less intimate and more isolated as we earn college credits, begin romances, and gossip on the Internet, a worldwide system that allows computers to communicate with one another. The Age of SOFTWARE will offer more games, home banking, electronic shopping, video on demand, and a host of other services that unplug us from physical contact.

The decline of human-to-human contact is apparent around the world. Throughout the Middle East, café life—where people used to tell stories over a cup of tea—is disappearing. Bistros are going out of business in Paris; many close earlier in the day. Henri Miquel, owner of Le Dufrénoy, shuts down at 8 p.m. instead of midnight. Where do patrons go? "They rush off to watch television," he says.

Is meeting face-to-face more valuable than corresponding electronically? Some neighbors still stop by when a family crisis strikes, but other people offer condolences via e-mail, written messages transmitted between computers. Whichever we prefer, the electronic seems to represent the future. Television teaches many of us to favor the image over the actual. The Internet pushes life beyond the old physical barriers of time and space. Here you can roam around the world without leaving home. Make new friends. Communicate with astronauts as they circle the earth. Exchange the results of laboratory experiments with a colleague overseas. Read stock quotes. Buy clothes. Research a term paper. Stay out of the office, conducting business via a computer that becomes your virtual office. Virtual community. Virtual travel. Virtual love. A new reality.

William Gibson, whose 1984 novel, *Neuromancer*, pioneered the notion of virtual living, now says that electronic communication provides a "sensory expansion for the species by allowing people to experience an extraordinary array of things while staying geographically in the same spot." Gibson warns, however, that the virtual can only augment our physical reality, never replace it. He applauds the countermovement toward what has been called skin—shorthand for contact with other humans.

People who correspond with each other electronically often feel the need for skin and try to meet in what they call real life. Karen Meisner, while an undergraduate at Connecticut's Wesleyan University, was playing a computer game on the Internet in early 1991. During the game she met Pär Winzell, a student at Sweden's Linköping Institute of Technology. He knew her by her game name, Velvet. They began to exchange electronic messages outside the

game, sharing thoughts with more directness and intensity than would have been possible in the early stages of a "real-life" relationship. Karen knew something special was happening; they discussed meeting each other. It seemed scary. Then Karen sent an e-mail: "I'm coming to meet you." They have been married for two years.

Technology can also foster skin contact between those who live near one another. Senior citizens in Blacksburg, Virginia, use their computers not only to chat but also to organize get-togethers. "It's like wandering into the town center to meet friends and to check the bulletin board," says Dennis Gentry, a retired Army officer. "Only you can do it in pajamas anytime you want."

The desire for skin can be seen in downtowns and shopping malls—people want human contact even when they could buy things via television or the telephone. Although computers and fax machines make it easier to work at home, business districts continue to grow. More people than ever crowd into major cities, in large part because companies that provide goods and services benefit from being near one another. Employees also seek the relationships that come only from being with other people.

NEED FOR SKIN does not negate the electronic screen's power to mesmerize. No brain scan or biochemical study has identified a physical basis for our seemingly insatiable hunger for electronic stimulation. Computers are often more alluring than television, which already has a grip on us. Young Americans today spend about as much time in front of a television as in a classroom. At midnight 1.8 million children under age 12 are still watching television. The average adult American watches more than 30 hours every week.

Parents could restrict their children's electronic consumption. But we, too, are addicted. Give up electronic links for a day? No telephone, television, or computer? Try a week. Few can do it. Momentum is in the opposite direction. When a two-year-old clicks at the keyboard and the next day says, "Mommy, Daddy, more 'puter," his parents feel something good is happening.

Our dependency on the "electronic needle" will increase if wireless, palm-size receivers become available. These devices—a combination telephone, computer, fax, and television—will provide hundreds of video, audio, and text channels. Handheld receivers that link to e-mail, Internet services, and fax communications are already on the market, but too expensive for most people. Such technological innovations do not permeate a society until someone can profit from them. The first fax was sent from Lyon to Paris in 1865, but use of faxes did not become widespread until technology made text encoding and transmission much cheaper, 120 years later.

Reliance on the electronic screen is part of something larger, the spread of technological civilization. George Steiner, a cultural historian who teaches at Cambridge University, warns that this civilization produces a creeping sameness that threatens local cultures.

The source of most of this uniformity is the advertising and entertainment industries. Worldwide sales of American movies and television programs now total more than five billion dollars a year. A New Delhi newspaper calls these media "termites eating away at our traditional values."

SOFTWARE

A computer is only as smart as its software, the meticulous instructions, or programs, that tell it what to do and how to do it. Some programs control basic operating functions such as processing and storing data or finding bugs. Others deal with the many specialized demands of users, which include playing games, communicating with other computer users, manipulating text, creating images, and organizing data.

INTERACTIVE MULTIMEDIA

Palm-size discs of plastic, CD-ROMs can serve up a movie-like mix of sights and sounds that invites viewer interaction. They can also store massive amounts of information. All 20 tomes of the *Oxford English Dictionary* fit on just one CD-ROM—as a long track of pits etched into the surface. In a computer the disc spins while a laser reflects off it, reading the pits as 0's and the intervening planes as 1's.

But human nature resists the sameness that comes with electronic communication. The place in which we live—its resources and history—maintains a tremendous pull on us, even when we are not conscious of it. When told we are the same, we turn to geographic roots and tribal groupings to find a sense of belonging. This helps explain why ethnic loyalties enjoy a resurgence even as individuals bind themselves to the electronic screen. Such resistance may prevent the apocalyptic *Fahrenheit 451* from emerging, but as the novel predicts, information technologies threaten the book.

Stakes are high. From texts written on papyrus 4,000 years ago through today, books have provided memory and depth. Until the current electronic challenge, they have been the central vehicle through which most societies have perceived themselves. Perhaps that is why Bill Gates, chairman of the Microsoft Corporation and computer guru, arranged to have his account of the information revolution published the old-fashioned way—on paper, between hard covers. Of all the issues associated with the information explosion—such as privacy, copyright, libel, and computer theft—the battle of the book may have the greatest impact.

At first glance books are in good shape. Sales in the U. S. are the highest ever. Chains of huge bookstores—many offering 150,000 titles—are prospering. Technology, furthermore, encourages reliance on the written word. Tens of billions of words pass through the Internet daily. The ease of printing and photocopying digital information has raised paper usage to record levels.

But TV and computers spawn aliteracy among many people, who are unwilling to read anything of substantive length requiring concentration. Brevity. Five-second sound bites. Channel surfing. Instant gratification. Fast-moving images. Constant stimulation. Shorter attention spans. A world in which the worst sin is to be boring.

Books are taking on new forms, relying on technological zip, which makes the traditional book look like a horse and buggy. This appeals to the new expectations of readers. **INTERACTIVE MULTIMEDIA** books offer seamless sequences of sounds, images, and words. Learning a foreign language? Listen to spoken pronunciation as you read. Studying algebra? See equations move across an electronic chalkboard. Want to learn more about a specific word in the text? Click on it and explanations fill your screen.

Sales of electronic encyclopedias exceed sales of printed ones. Electronic dominance over print will increase if "netbooks," which could provide wireless connections to libraries, become available. Flip one on and read whatever you want wherever you are. Netbooks will never become popular, however, without improvements in screen technology. On-screen reading is currently 20 to 30 percent slower—and much less comfortable—than print reading because of glare, flickering images, and other problems.

Although people love today's print-on-paper books, those who resist new technology can be left behind. In the early 1500s, nearly a century after Gutenberg's movable type, many people continued to believe that value and beauty came only from handwritten manuscripts. These laboriously crafted works have an artistic appeal that printed books cannot match. Federigo da Montefeltro, a leader of the Italian Renaissance, said he "would have been ashamed to own a printed book." Such attitudes isolated people from new ideas and scientific information that were available only in printed format.

Technological changes in books are part of a larger change in our aesthetic sensibilities and creativity. Video images and computer screens appear in plays and operas. Choreography and architecture rely on computer programs.

The novel, which began as epic poems in Homer's era, will also evolve. In an Internet story every reader can add new material. The traditional notion of "author" and "original," which arrived when written books replaced oral folklore, disappears. At Brown University, students in the Hypertext Fiction Workshop listen to John Coltrane and study how Matisse perceived space. They are learning how to integrate sound and visuals into stories.

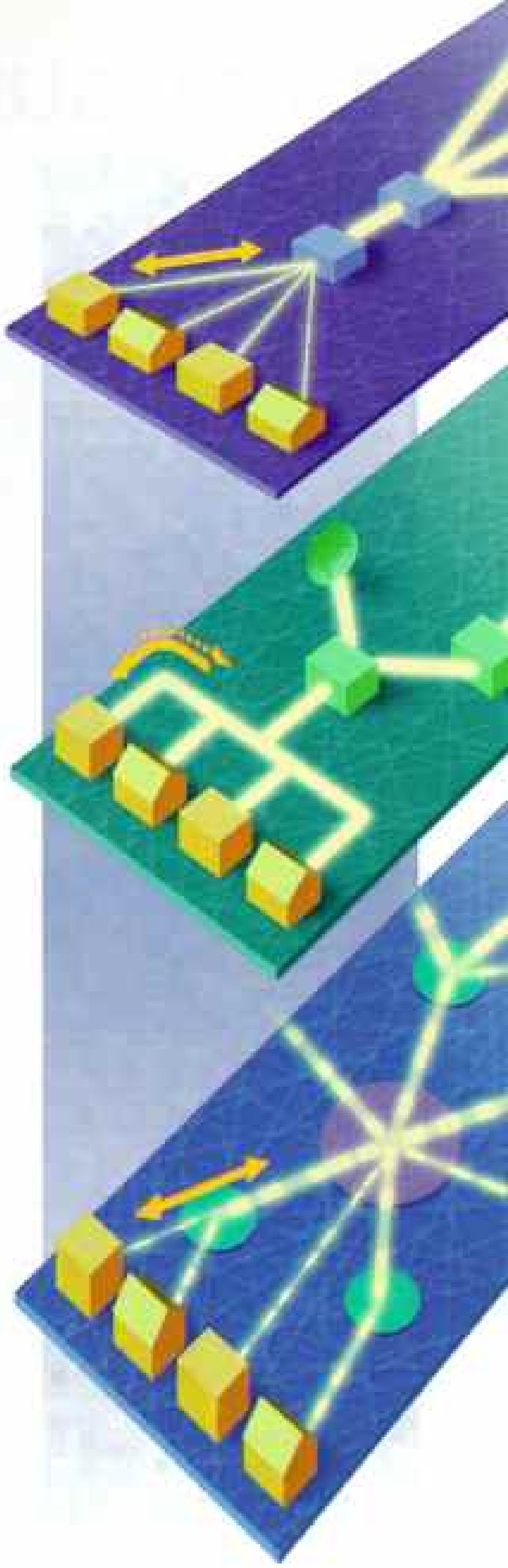
Novelist Robert Coover, who teaches the workshop, decries "the tyranny of the line." He lauds the "hypertext novel," in which a story has no predetermined beginning, middle, or end. Readers choose among pathways within plots that form a mosaic. Although only 10,000 or so of these novels sold in the U. S. last year, sales have increased 40 percent since 1993. Bob Arellano, one of Coover's former students, recently completed *@Itamont*, an electronic novel soon to be available on CD-ROM. The novel offers two beginnings. Those who click on "Innocence" read about a young couple's first kiss; those who choose "Experience" read about a murder. Both stories then weave in and out of the same narrative territory. Neither has a given middle or end. The readers, in Arellano's words, "walk through story space in their own way."

Young people may find mosaic plots exciting, but for those schooled to think in a linear fashion, hypertext novels can be tedious and confusing. No hypertext novel can achieve what the brain does naturally. In Fyodor Dostoyevsky's *Crime and Punishment*, Raskolnikov sees a pretty young woman on the street. He walks toward her. Her skirt is torn. As he gets closer, he sees that her face is flushed and swollen. Readers react to this timeless passage in different ways, creating their own combinations of texture, mood, detail, and emotion. We do this effortlessly.

Information technologies, for all the attention they receive, lag far behind the power of the human brain. Researchers estimate that the normal brain has a quadrillion connections between its nerve cells, more than all the phone calls made in the U. S. in the past decade.

BUT HUMAN POWER is becoming increasingly ineffective in controlling the way information technology shapes our economic and political lives. Geographic location of resources, labor, and capital means less as scattered countries use information technologies to work together. Many cars have parts made in a half dozen countries; stores sell look-alike clothes sewn on four continents. The reason? Management can control quality and coordinate production without regard to place or distance. Money moves most easily. Stocks, currency, and bonds traded on worldwide electronic markets amount to an estimated three trillion dollars each day, twice the annual U. S. budget.

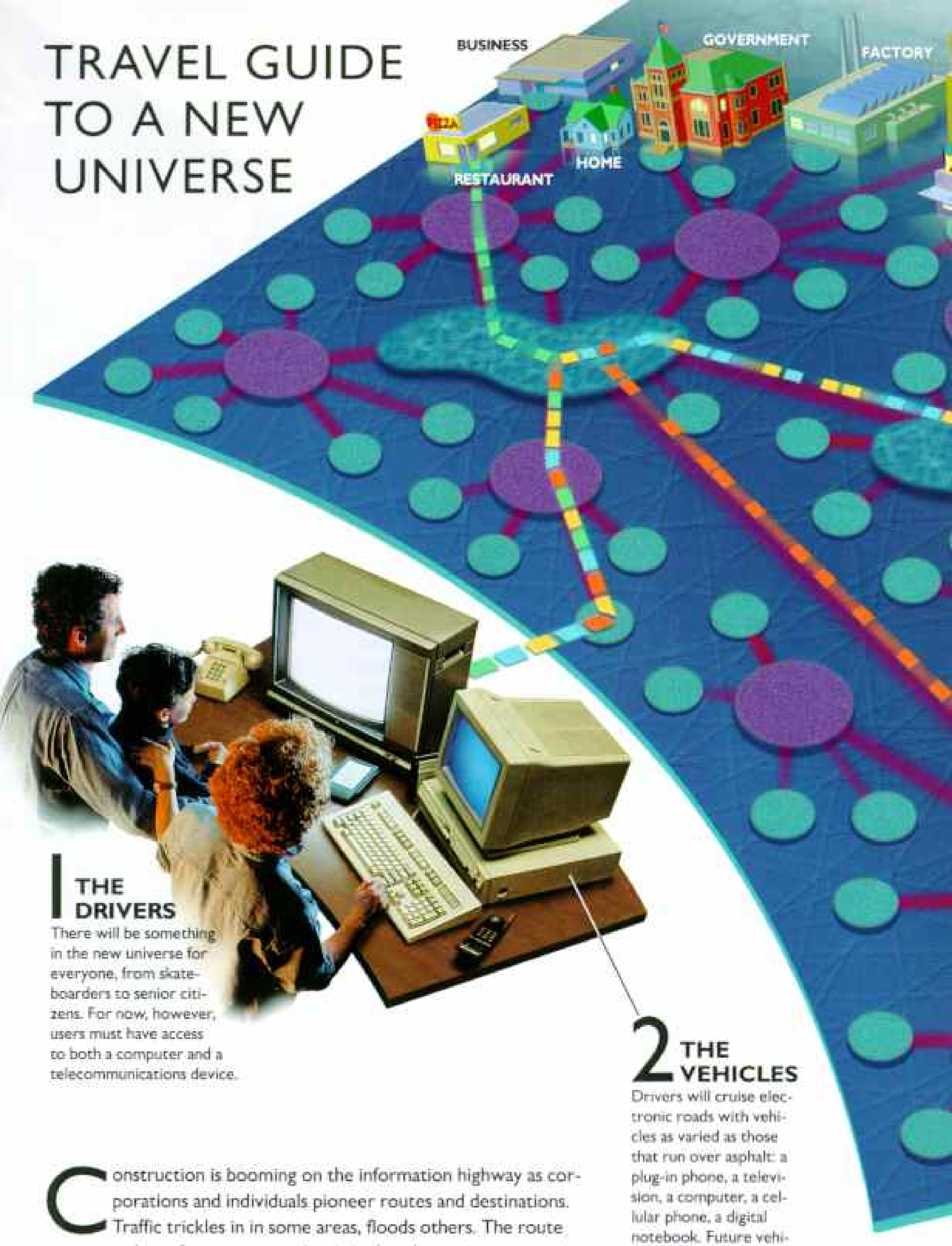
Two generations ago, political analysts gauged global economic relationships by counting movements of railcars between countries. Now they count traffic on telecommunications NETWORKS. What they are discovering is unexpected. According to studies by Gregory Staple, a communications lawyer in Washington, D. C., Canada made more calls to Hong Kong than to France in 1993. A third of India's traffic went to Arab nations. *(Continued on page 14)*



NETWORKS

Stretches of the information highway lie along several networks, each with its own traffic. Phones (top) typically carry conversations and faxes. Usually one-way, cable TV (middle) is now testing interactive programs. The Internet, a global web of computer connections, uses various networks to deliver text, sound, and images. The future promises greater interconnectedness.

TRAVEL GUIDE TO A NEW UNIVERSE



1 THE DRIVERS

There will be something in the new universe for everyone, from skateboarders to senior citizens. For now, however, users must have access to both a computer and a telecommunications device.

2 THE VEHICLES

Drivers will cruise electronic roads with vehicles as varied as those that run over asphalt: a plug-in phone, a television, a computer, a cellular phone, a digital notebook. Future vehicles may combine new and familiar features, and drivers will use what best suits where they are and what they need to do.

Construction is booming on the information highway as corporations and individuals pioneer routes and destinations. Traffic trickles in in some areas, floods others. The route may yet take unforeseen turns, but it is already moving communications into a new age. "Two years ago, if I wanted to know about a company's products, I'd call and say, 'Can I have some brochures? Could you have a salesperson call? Who's your distributor?' " says MIT senior research scientist David Clark. "Today I do it all on the Internet. It's the most efficient way to do business."

5 THE RIDE

More drivers with less experience are taking a spin now that advances in information technology have made the ride easier and more worthwhile. This maze samples ways in which people can travel today and may travel in the not too distant future.

VIDEO ON DEMAND
Order a movie at 3 a.m. Start, stop, rewind, play parts again. Someday that may be common, but the setup will be complicated and expensive. Each family might have to watch five or six movies a week to make it cost-effective.

SHOPPING
Take out a credit card and shop at one of the hundreds of companies with electronic storefronts. Such transactions use a system of instant debits and credits connecting consumers, merchants, and banks.

REMOTE CONTROL
Gaze on a star sighted through a remote-controlled telescope. Scientists are now using such equipment, especially in deep-space probes. One day doctors may use similar technology to operate on faraway patients.

ELECTRONIC MAIL
Write a note, push a button, and someone in the e-mail system gets the message in seconds. This happens millions of times a day on the Internet.

HYPERTEXT
Select a highlighted phrase on a computer screen and jump directly to another file related to that topic. The link may lead to Bangkok or Buffalo or Brussels —making distance disappear in a universe of almost immediately accessible information.

COLLABORATION
Gather colleagues through their computers. Miles apart, they make instantaneous changes on the same document and discuss the work as it progresses. This type of shared workspace is now becoming available.

INTELLIGENT AGENTS
Dig through mountains of information with a "personal intelligent agent"—a customized program that searches networks for specified topics, saving hours of human toil and frustration. These aides are currently at work in some large databases.

4 THE SERVICES

One-third of U. S. homes have computers, which can offer access to an expanding cosmos of connections. Businesses buy, sell, and advertise on-line. Religious groups reach out to members. Museums, schools, and libraries add research capacity to the network. Hospitals send X rays, government offices share records, and banks transfer assets at lightning speed.

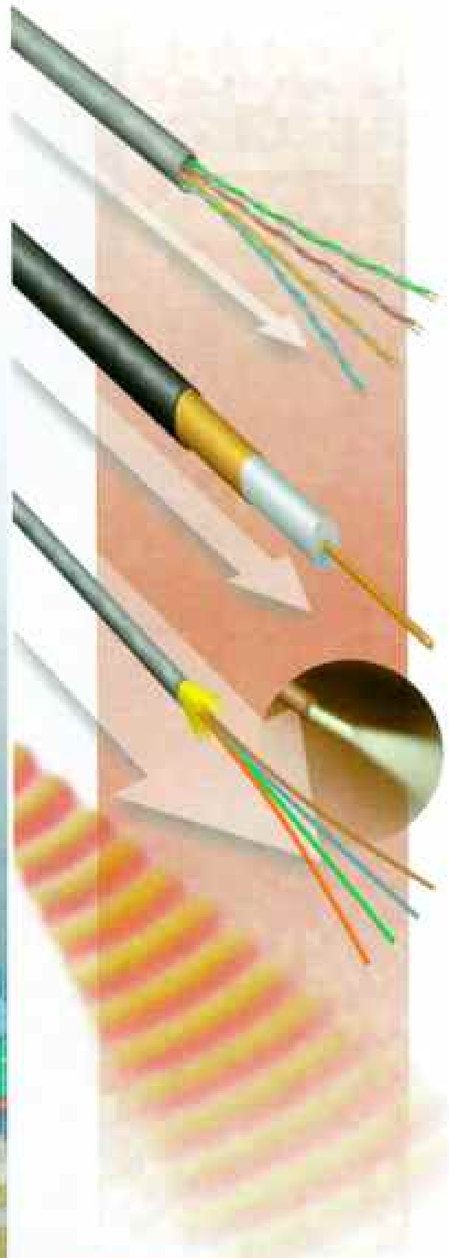
WIDE AREA NETWORKS
Satellites and high-capacity fiber-optic lines connect cities and countries.

METRO AREA NETWORKS
Subscribers in a telephone company's area code share this kind of network.

LOCAL AREA NETWORKS
Nine out of ten large U. S. companies connect their workers with a network that facilitates the sharing of information.

3 THE ROADS

With fortunes at stake, communications companies compete fiercely for traffic. Whatever becomes the major thoroughfare—the phone system, cable TV, or some other network—access will need to be nearly effortless before use becomes widespread.



BANDWIDTHS
A network delivers only what will fit down its pipeline. The carrying capacity, or bandwidth, of different pipelines varies greatly. Telephone lines in most homes are twisted copper wires with a narrow bandwidth (top). Cable TV uses coaxial cable, a tube of conductors that can carry a hundred times the load of a copper phone line. Long-distance phone calls pulse along fiber-optic cables capable of carrying tens of thousands of times that of copper. Satellite signals (bottom) carry more than coaxial cable but less than fiber optics.

(Continued from page 9) Speed of information transmission did not create this international economy. Lowering of costs did. Instantaneous international communication has existed for more than a century. In 1872, when Jules Verne's fictional Phileas Fogg was trying to travel around the world in 80 days, a telegram from the detective chasing him traveled the globe in minutes. But until recently, international wires were used only by economic and political elites. A 1965 transatlantic cable could carry 130 simultaneous conversations. Today's fiber-optic cable can carry more than 500,000, dramatically lowering costs.

A growing number of workers in this info-environment must be able to absorb, manipulate, and market information. Peter Drucker, a management expert whose ideas have influenced the world's largest corporations, estimates that by the year 2000 such work will be the primary task of at least a third of the U. S. workforce.

This information economy favors small entrepreneurial ventures that can quickly adapt to new technologies. This is why, to cite a phenomenon evident in American cities, an estimated two-thirds of the private companies in Los Angeles did not exist in 1970. Mike Forti, an L.A. businessman, has sales pending for more than 30 million dollars' worth of American equipment to Gazprom, Russia's gas company. He makes all his deals via fax, telephone, and e-mail from his home. He rarely meets his colleagues.

Yet Forti's business began with old-fashioned friendship. While he was studying how to participate in the world economy, a friend asked Forti if he was interested in doing business with his brother-in-law's firm in Moscow. Forti's next venture, arranged through other friends, involves selling equipment in India. The power of skin created the opportunity for a business conducted electronically.

TO STAY COMPETITIVE in this international economy, a country must open itself to information and ideas. Government attempts to control information—Romania even tried to restrict the use of typewriters—inevitably fail, not only because of economic pressures but also because technology continually assaults authority. Satellite broadcasts saturate Iran with *Charlie's Angels* and other forbidden programs. Rebels in the jungles of Mexico's Chiapas state post statements on the Internet. The Indonesian government bans the work of Pramoedya Ananta Toer, whose novels are acclaimed throughout the world, but Indonesians can flip on their computers and print out his writing.

A lesson in the power of information comes from China and Burma, whose soldiers killed thousands of demonstrators in the late 1980s. The soldiers obeyed orders. But their governments reportedly isolated select units of soldiers and told them elaborate lies to keep them from knowing the demonstrators' pro-democracy goals. One Burmese student who escaped such killings in September 1988 later chatted with an army private. "I had no idea," the soldier said. "I thought you were communists and foreigners trying to take over the country."

Some governments, particularly in the developing world, try to mix economic openness with authoritarian politics. They may enjoy temporary success. But in the long run—as Taiwan, Chile, and others demonstrate—free-flowing information nurtures democracy.

At the same time, massive amounts of information are changing

democracy itself. Personality and publicity have superseded political parties. Issues must be presented quickly, with visual aids. Important problems, such as the relationship between unemployment and crime, rarely capture public attention. We want more than the news; we want the new news, things that are new since we last heard the news. Government officials, academic experts, and other leaders have less of a monopoly on information. Public opinion plays a larger role in public policy and diplomacy.

The availability of information can have an immediate impact. You can call the Right-to-Know Network by dialing 202-234-8570 on a modem, register for a free account, and then instantly find out which of some 300 toxic chemicals have been emitted in your area. This information had been buried within regulatory bureaucracies but now stimulates lawsuits, local action, and government responsiveness. Kathy Grandfield, a paralegal in Sedalia, Missouri, wondered whether a nearby chemical plant caused her family's flu-like illnesses and the death of birds in her yard. She discovered from Right-to-Know that chemical emissions may have been a contributing cause. She and her neighbors—who also had similar symptoms for years—worked together to help clean up the plant.

Will those who master these tools unfairly influence public policymaking? And who will control access to extraordinary new **BANDWIDTHS** that allow information to travel faster and cheaper to more people? The Internet grew out of a Defense Department communications system designed in the 1960s to survive nuclear war. Because such rationales no longer exist, marketplace forces have replaced government funding. The Internet could become advertiser driven like broadcast TV and radio, but no one knows how this would affect the accessibility and content of services.

High costs are splitting us into information haves and have-nots, thereby threatening democratic principles. Countries, too, are being divided into haves and have-nots. In many developing nations, a majority of people have no telephones or computers. Even if they did, their machines would be idle unless governments were able to invest billions of dollars in telecommunications infrastructure—primarily cables, satellites, and transmitters. And this would not bridge the gap—a third of all people in developing nations cannot read.

SOME OF US WILL CROSS into the new world; others will remain behind. New worlders will pull even further ahead as technologies evolve, possibly even computers that mimic human reasoning and sensory perception. No one knows what kind of network will succeed the Internet, or what increasing **COMPUTER POWER** will make possible. We may eventually rely on digital navigation genies who sort through junk and decipher messages. One trend is clear: A growing cultlike faith in information, a belief that if we hook up to the Internet we'll be smart. Full of facts. Brilliant with information. Sense of motion without moving. It's right out of *Fahrenheit 451*.

Technology promises more and more information for less and less effort. As we hear these promises, we must balance faith in technology with faith in ourselves. Wisdom and insight often come not from keeping up-to-date or compiling facts but from quiet reflection. What we hold most valuable—things like morality and compassion—can be found only within us. While embracing the future, we can remain loyal to our unchanging humanity. * * *

Information Revolution

COMPUTER POWER

Chips are the tiny silicon components of a computer's brain. As engineers squeeze more transistors onto the surface of each chip, computing power increases dramatically. In the chip that drives the computer's operations—the microprocessor or central processing unit—power means speed. Intel marketed the first microprocessor in 1971. Measured by ability to perform calculations, speed has increased with each new chip.

INFORMATION REVOLUTION

SCENES FROM THE FRONT LINES

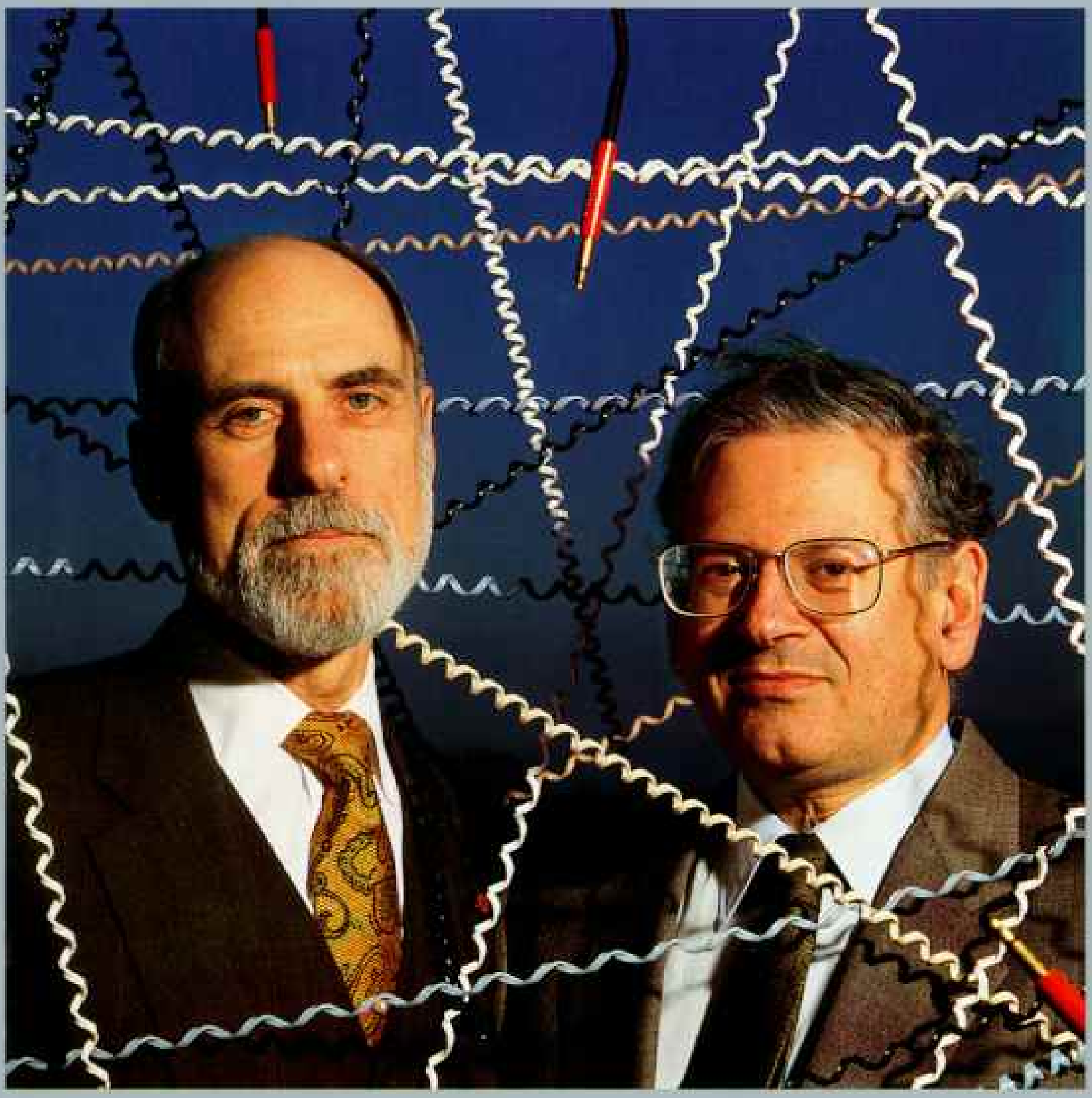
TOWERING AMBITIONS

"This CD-ROM can hold more information than all the paper that's here below me," says Bill Gates, 55 feet high on 330,000 sheets of single-spaced text outside Microsoft, the Seattle-area software company he started 20 years ago. Today three-quarters of the world's personal computers run on programs developed by Microsoft, a giant as well in the CD-ROM field with such products as a multimedia encyclopedia and surveys of baseball and art. Gates sees the medium as "one of the harbingers of the information superhighway." Many new computers have a disc player and come factory loaded with a selection of titles. With more encyclopedias now sold in this format than as hardback books, the CD-ROM also promises to save a lot of forests.

SPECIAL EFFECTS

Kids can't help reaching out to touch figures that seem to exist in three dimensions at the SONY IMAX movie theater in New York City. "I still do that sometimes," confesses program director Mary Jane Dodge. "The images meet you somewhere between the screen and where you're sitting." Liquid-crystal lenses in headsets blink on and off 48 times a second. Triggered by infrared signals, they alternate left and right, synchronizing with two film tracks to provide the illusion of depth. Speakers in each headset project sounds to match the positions of the images, which play on a screen eight stories tall. "If the superhighway comes and people are doing more in their homes, this will always be a good reason to go out," says Dodge.

Plugged into the future of entertainment, SimGraphics engineers make animation easy for TV, video, and CD-ROM producers. Software developed at the company's California workshop instantly translates face and body movements to an on-screen VActor, or virtual actor, saving hundreds of dollars a second over traditional computer animation. A VActor can also interact with a live audience. "A lot of times it takes people a while to believe that it's communicating with them," says chief operating officer David Verso. "Even if they don't get the concept, they think it's funny."



GOOD CONNECTIONS
Lines of communication have engaged computer scientists Vinton Cerf, left, and Robert Kahn ever since they designed the foundations of the Internet in 1973. The outgrowth of a U. S. Defense Department project, the Net has exploded into the civilian world. More than 20 million users in 180 countries make up its community. "I get notes constantly from people saying, 'Thank God for the Internet,' " says Cerf. "And then there will be a list of things that they do—like teachers getting source material from other teachers so they can stand on each other's shoulders instead of their toes."

SPIN DOCTOR

Shining examples of progress to physicist Hal Rosen, leader of the IBM team that invented them, the next generation of CD-ROMs will likely leave older versions in the dust. With as many as six recording layers, each disc has enormous storage capacity. Rosen sees the possibility of a 20-layer disc someday. "That would be like putting a full public library on your desktop," he says.

LONG-DISTANCE INFORMATION

"We have by far the largest, most sophisticated communications network anywhere in the world," says AT&T spokesman Dave Johnson, "and we manage it from this room." Here in Bedminster, New Jersey, TV screens update the status of domestic and global connections every five minutes. "A black map to us is a beautiful map," says Johnson, noting that a colored line signals something out of the ordinary. Constantly monitoring traffic, the network reroutes phone calls automatically at the first sign of trouble. Humans usually intervene only in a catastrophe, such as an earthquake. A news broadcast on the video wall helps them evaluate the situation. When all goes well, each of the 190 million weekday calls goes through in seconds.

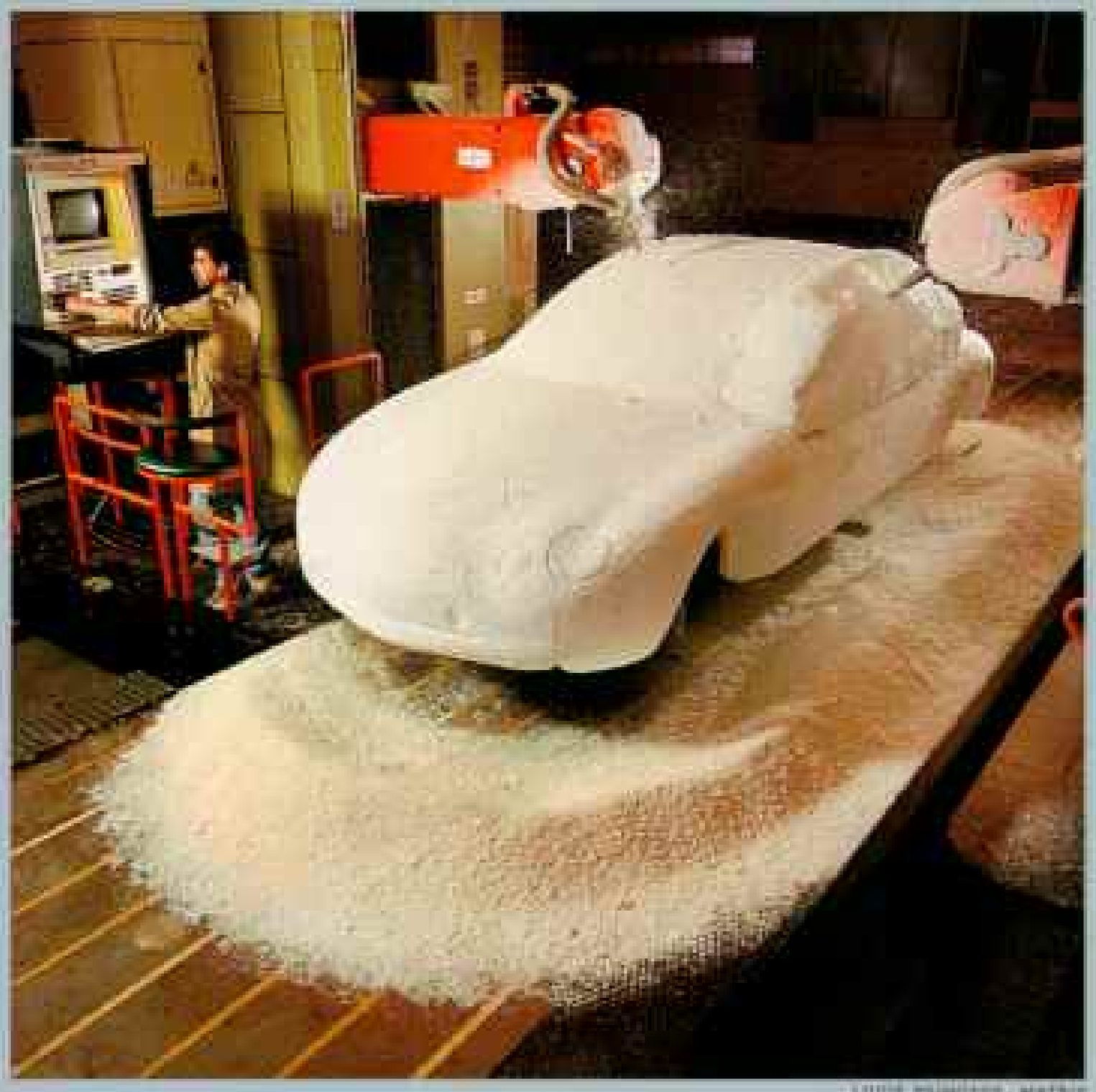
Some of the same communications technology brings the island of Hawaii to second grader Akil Fergus, at National Geographic headquarters during the annual JASON Project. The ultimate field trip, JASON allows student audiences to interact with a scientific expedition. This year's live broadcasts caught two volcanic eruptions: one on earth at Kilauea and the other on Jupiter's moon Io, sighted through a telescope at Mauna Kea. Selected students took over the remote controls to measure lava temperatures and drive a vehicle being tested for use on Mars.


TRUNK SUBGROUP OOS
14:45 – 14:50

BODYWORK

With a programmed paintbrush Walid Saba styles a new Taurus in one of Ford's Dearborn, Michigan, design rooms. Managers review the sketches full-size on the back wall for aesthetics and give fast feedback. The process of 3-D computer modeling now also enables engineers to do crucial calculations in the early stages of design. "If I'm violating the center of the hood and the engine is coming right through the sheet metal, obviously that won't work," says Saba. Used by themselves until recently, paper diagrams and clay models took as long as six weeks to create and circulate, idling members of the team as they waited for the next step. Today everyone is rolling in a week and a half.

Collaboration with colleagues abroad has likewise become more efficient. Armed with a digital design sped from somewhere in Ford's worldwide system, a milling machine in Turin, Italy, turns out a plastic foam model. "That's your check mark that everything looks good," says Saba. "The design has got to give you interesting vibes. It's our number one priority." Another top priority is to reduce the time from concept to customer. Today's computerized tools have already helped shave almost two years off the five required just a few years ago and should soon eliminate one more.



LOUIS PSIHOYOS, MATRIX

WIRED WARRIORS

The U. S. Army is sneaking up on the next century at Fort Benning, Georgia, as it tests "smart gear" now being developed for combat. With traditional equipment, "once people start moving around on the battlefield, you know only what you can see—which sometimes is two or three of your buddies, and that's it," explains Maj. Paul Hilton, who oversees the testing. Toting computers as well as weapons, his soldiers look through their eyepieces and see the position of each member of the squad on a map of the area. Wired in, their weapon sights and helmet-mounted video cameras capture images for transmission. Ultimately, a network will link similarly outfitted infantry to tanks, helicopters, and command posts, allowing rapid assessment of the battle, more effective troop movement, and more accurate artillery targeting.

TECHNICAL ASSISTS

Santa Barbara just got a lot friendlier for Reginald Golledge, a geography professor at the University of California. After he lost his sight a decade ago, he and two colleagues began work on a navigation aid, now operational. In a backpack Golledge carries a computer that coordinates satellite signals, a digital map, and a virtual world of audio cues: Landmarks such as buildings, sidewalks, and trees announce themselves through his earphones as he walks down the street. "To the left I'll hear 'McDonald's,' from the right 'the library,' and then from a distance," he says in a soft voice, " 'Kentucky Fried Chicken.' " He still must find smaller objects with his cane, though.

Sounds and sights of an intersection in Eugene, Oregon, re-created in another virtual world, teach five-year-old Christopher Cobbs how to cross the street in his wheelchair. He and other disabled children play this lesson like a game, watching the score grow as long as they stay within the lines and don't get run over. "We get them addicted to the joy of being free," says research scientist Dean Inman, center, who developed this project. Once Christopher had mastered the virtual crossing, "we took him down to the real one and said, 'Show us how you do it.' And away he went."

MIND BENDERS

"'Cyberspace' came from the heart of science fiction. That's my native literary culture," says William Gibson (right), the Vancouver author who coined the word. Working on a manual typewriter, he introduced the new dimension in his 1984 book *Neuromancer* after watching kids in video arcades hunch over their games as if caught up in an imaginary space beyond the screen. "*Neuromancer* and the Macintosh computer came out in the same year," he recalls. "A lot of kids find that flabbergasting. They just don't realize how new this stuff is." In Gibson's futuristic Sprawl, the megacity of the U. S. East Coast, social Darwinism plays out among contract samurai who face off in the physical world and information cowboys who ride through cyberspace, the vast computer matrix. "I hope by the end of the book readers will say, 'This is not only kind of fascinating and horrible, but it's an awful lot like the world we live in,' " he says.

Gibson now writes his novels on a computer but still has no connection to a network. "The idea of the reader being able to respond instantly makes me want to scream."

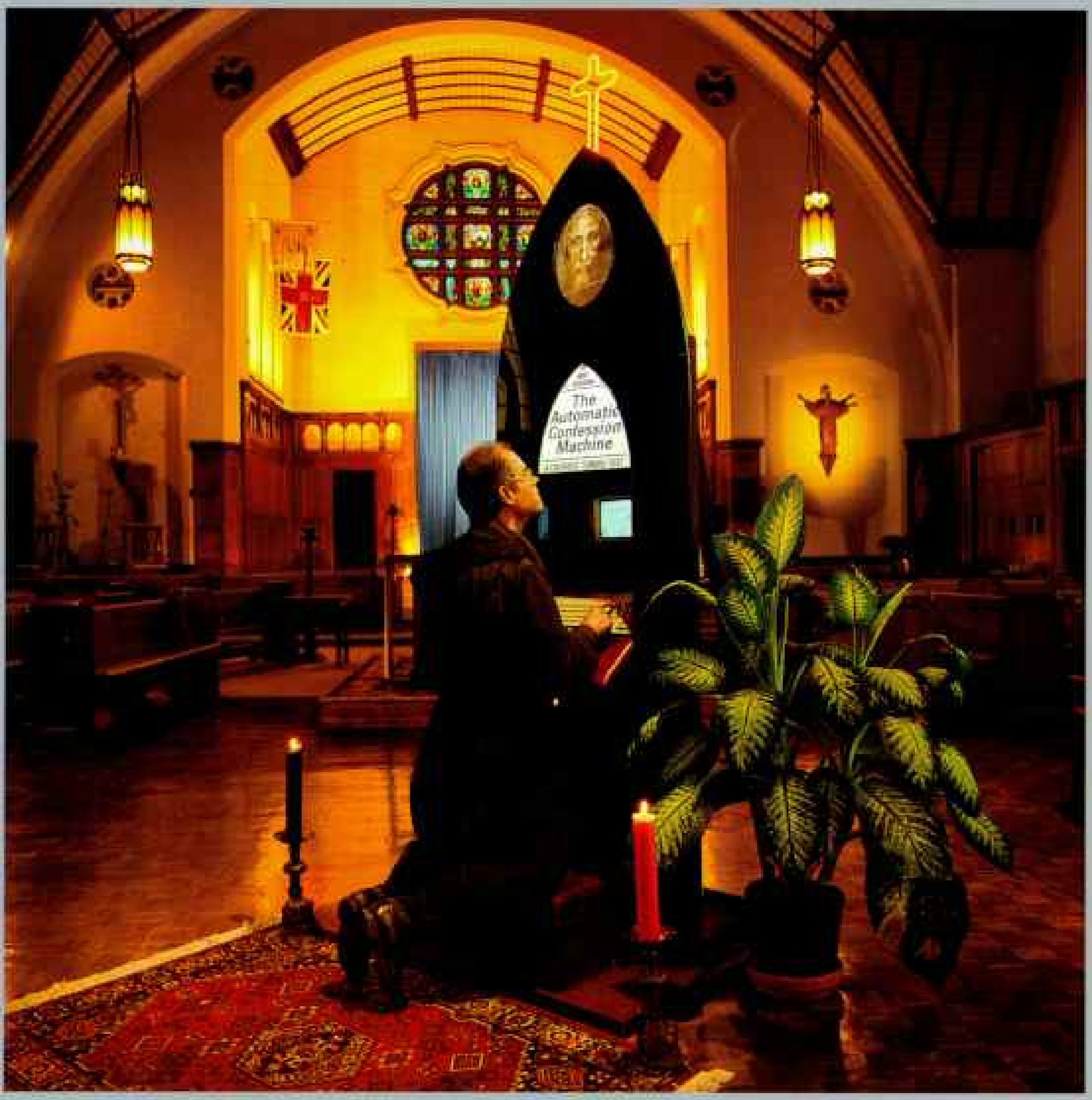
At the Horse Shoe Coffee House in San Francisco, Rhone Peterson saddles up in cyberspace under the name Gremlin. A quarter buys four minutes on a local network. "Everyone from your basic street-type glitter punk to people in the corporate world, they just get on and talk," he says.

CONCEPT AND PHOTOGRAPHS BY LOUIS PSIHOYOS; MONTAGE BY LEE SAPIE; COMPUTERS BY ROBERT BAUMER/APPLE; SETTING, BOSTON ATHENAEUM LIBRARY

MONKEY BUSINESS

What library in the world would open its stacks to a hundred unruly researchers—even if they were working on serious simian prose? Using a computer, digital imaging artist Lee Varis seamlessly inserted the crowd into a photograph of a reading room to create this fake. "There's no way you could do this traditionally. It's just too complicated," he says. Pasting cutout chimps on a print, then reshooting and retouching, would create an imperfect illustration, not a photographic illusion. As computers become more powerful and software easier to use, more manipulation is possible and even probable. So where does that leave the viewer? More dependent than ever on the integrity of a publication to ensure the authenticity of its images.

For more information on how this image was created, see "Behind the Scenes" in next month's issue.



SILICON ABSOLUTION

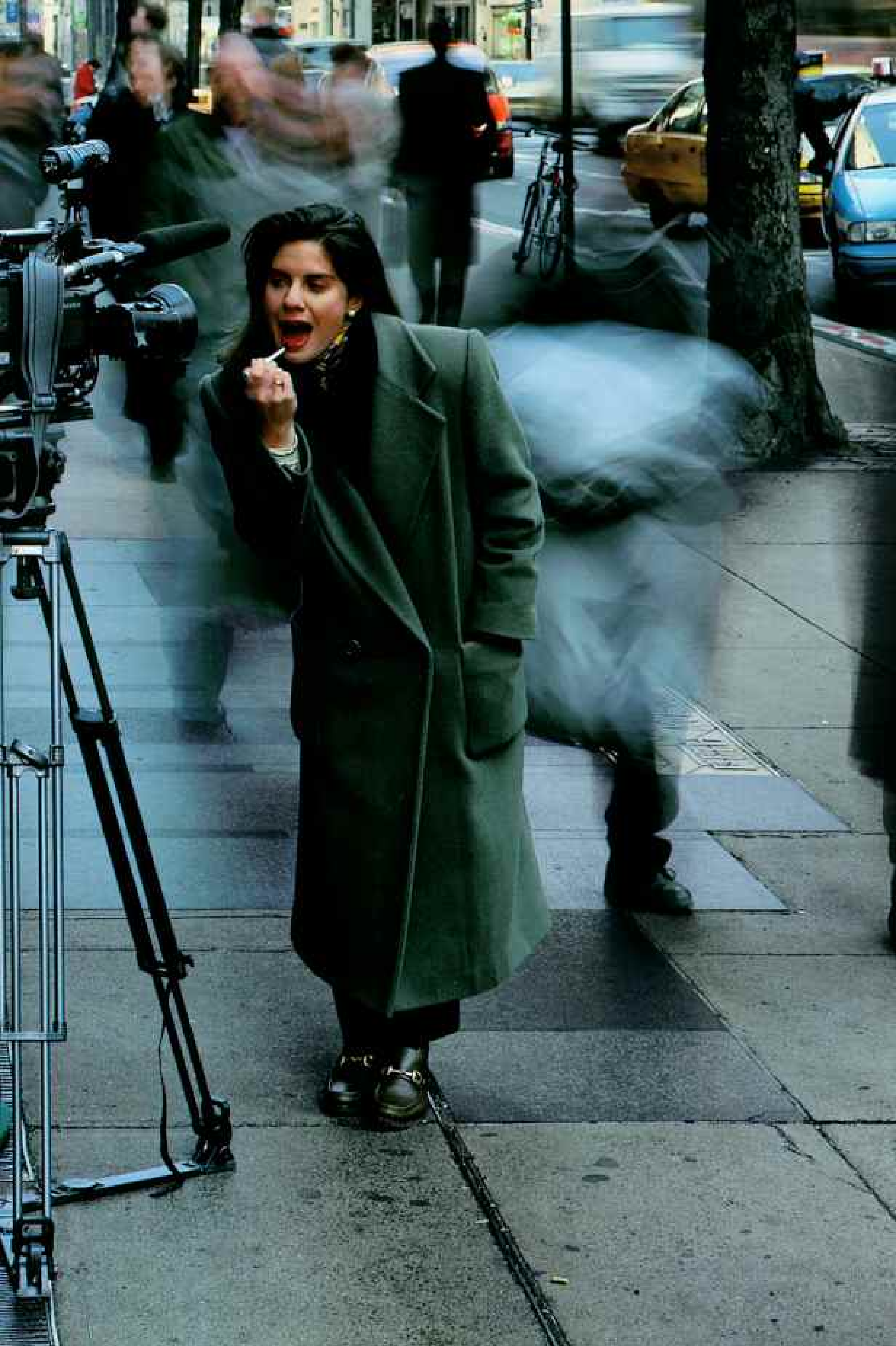
Art tweaks life as Greg Garvey uses his "Automatic Confession Machine," modeled on a bank ATM. The Montreal artist created this work as a warning against the intrusion of technology into the most private aspects of life. The keyboard includes a list of sins and a help function, which "informs you that the Lord helps those who help themselves," he explains. "As with all computers the user manual is abstract to the point of being noninformative."

ALTARED STATE

A kiss is just a kiss, except when it happens in cyberspace during the first virtual reality wedding. Headsets transport Monika Liston and Hugh Jo from San Francisco to Atlantis, while a background projection gives guests a window to the fantasy. The entertainment company where Monika works took care of the technical details. "When the software developers first asked us what we wanted to do, it was like, 'Oh my gosh, what do we say?' " recalls Hugh. "The kinds of ideas were infinite." There was no question about the ending though: a real kiss after the virtual one.

SOLO PERFORMANCE

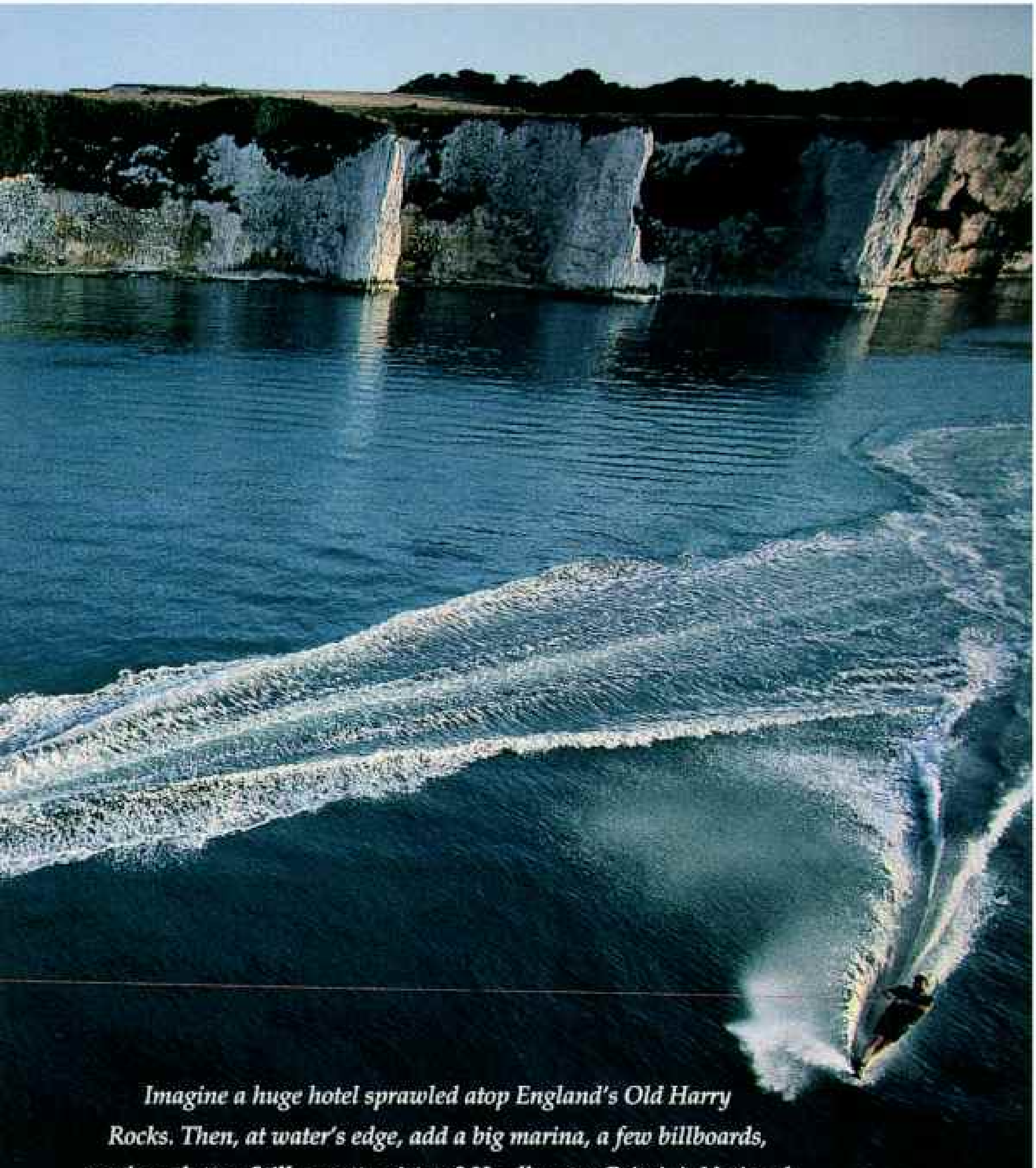
Everything and everybody does double duty at cable television station NY1—where a lens works as a mirror for reporter Carol Anne Riddell, preparing to tape her own story. One-person crews provide the speed and flexibility to cover news in all five of New York City's boroughs 24 hours a day. "You never see neighborhood stories anywhere else like you see here," says Riddell. "There's much more of a sense of the city as a community because of that." Like many avenues in the new information age, NY1 is reshaping communications and connections in ways that will bring unpredictable changes to the landscape of human experience. □



By ALAN MAIRSON
NATIONAL GEOGRAPHIC EDITORIAL STAFF

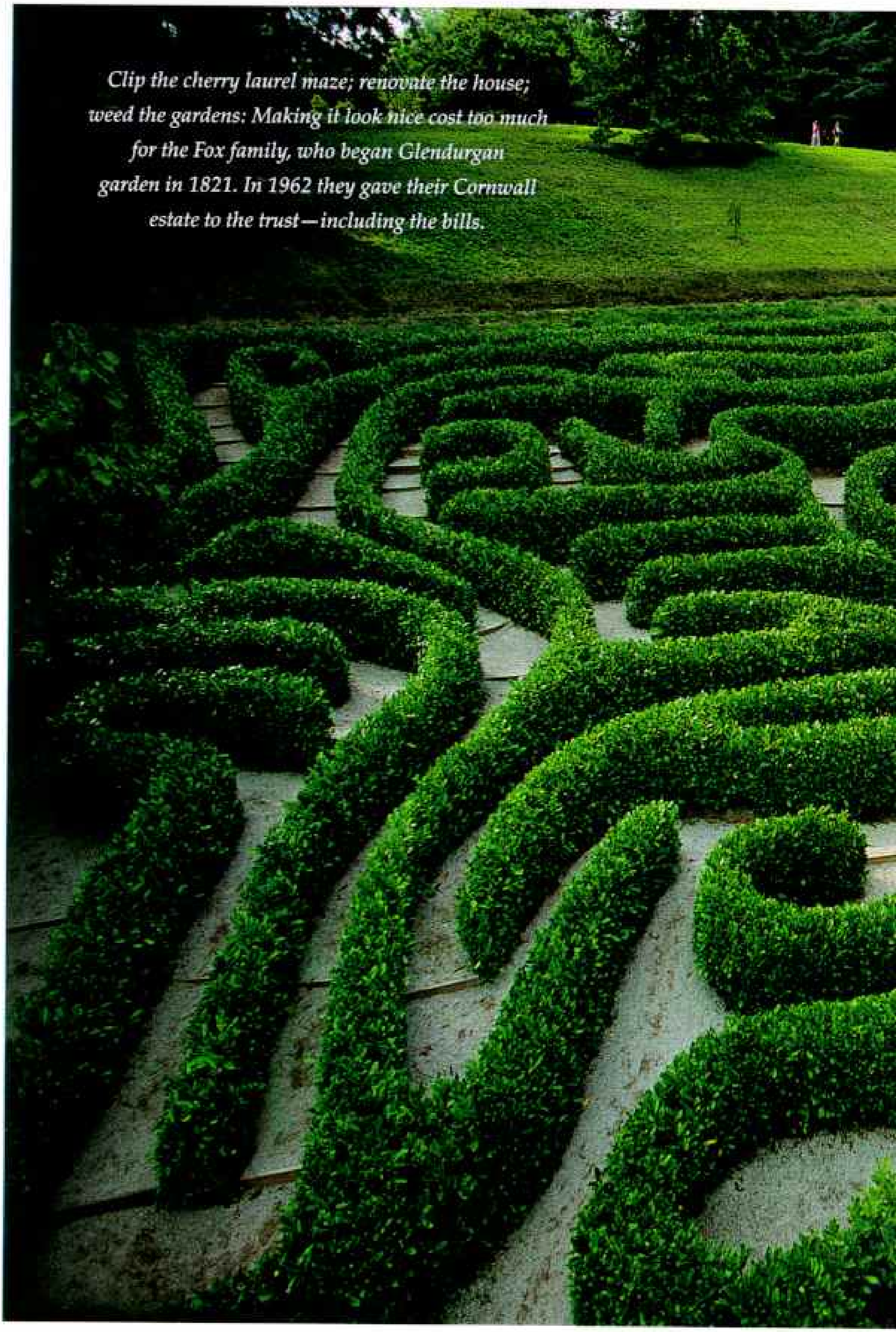
Photographs by CARY WOLINSKY

SAVING BRIT



Imagine a huge hotel sprawled atop England's Old Harry Rocks. Then, at water's edge, add a big marina, a few billboards, random clutter. Still a pretty picture? Hardly, says Britain's National Trust for Places of Historic Interest or Natural Beauty, a private organization that owns and protects these Dorset cliffs—just one small part of its ambitious conservation project.

AIN'S SHORE


Clip the cherry laurel maze; renovate the house;
weed the gardens: Making it look nice cost too much
for the Fox family, who began Glendurgan
garden in 1821. In 1962 they gave their Cornwall
estate to the trust—including the bills.

They insist on tidy beaches and well-groomed coastal grasslands. They wrote the book on looking "nice" and being "appropriate." And if Mother Nature behaves like a hellion along the coast, they don't hesitate to step in and teach her some manners.

They are the National Trust for Places of Historic Interest or Natural Beauty, Britain's largest conservation organization—and largest private landowner. This year the trust celebrates its 100th anniversary. Known primarily for its huge portfolio of stately homes and gardens, the trust also owns or controls 550 miles of coastline and, as part of its save-the-coast campaign called Enterprise Neptune, plans to acquire at least 500 more. A bit more than a thousand miles would equal one-third of the entire coastline of England, Wales, and Northern Ireland.

Last summer I took a whirlwind tour of some of the trust's coastal properties; and there were places—quite a few, actually—where I couldn't shake the nagging suspicion that the National Trust was actually being managed by my mother.

Consider just two of the discoveries that led me to this conclusion:

When a group of duck hunters in Northern Ireland wanted to build some duck blinds on the foreshore of Strangford Lough, they had to get approval from the trust, which controls this area between high and low tides.

"They said we must keep the duck blinds within the context of the shore," says Paddy Livingstone, a member of the Portaferry Wildfowlers Association. "They didn't want us to build them with concrete blocks. They wanted them built with natural stone that belongs to Strangford Lough. And we had to collect the stone from different places so we didn't make one great big hole."

And then there's Brownsea Island, off the south coast of England. A green 500-acre oasis in the middle of Poole Harbour, Brownsea in recent years has been overrun by rhododendrons, an alien species. Big and leafy,

---

Cary Wolinsky has captured images of England for several Geographic stories, including "Wool" (May 1988) and "Cotton" (June 1994).

they have beaten up the island's less aggressive vegetation, most notably the Scots pine. That's been bad news for the endangered red squirrel, which feeds on pinecones. Unwilling to brook such aggressive behavior, the trust sent in bulldozers to tear out the rhododendrons, thereby giving the Scots pine and the red squirrel a fair, fighting chance.

So there it is. Make it look nice, behave yourself, play fair. That's every mother's mantra, but it had unusual resonance for me. My mother, born and bred in New England, is an unreformed Anglophile who has visited Britain 50 times in the past 45 years. At mealtime when I was a kid, if I chewed with my mouth open or burped, Mom would glare at me and say, "Would you do that if you were having tea with the Queen?" And when the family was really driving her nuts, she would threaten, half seriously, to run away to England and find a stone cottage by the sea where she could enjoy a more civilized life.

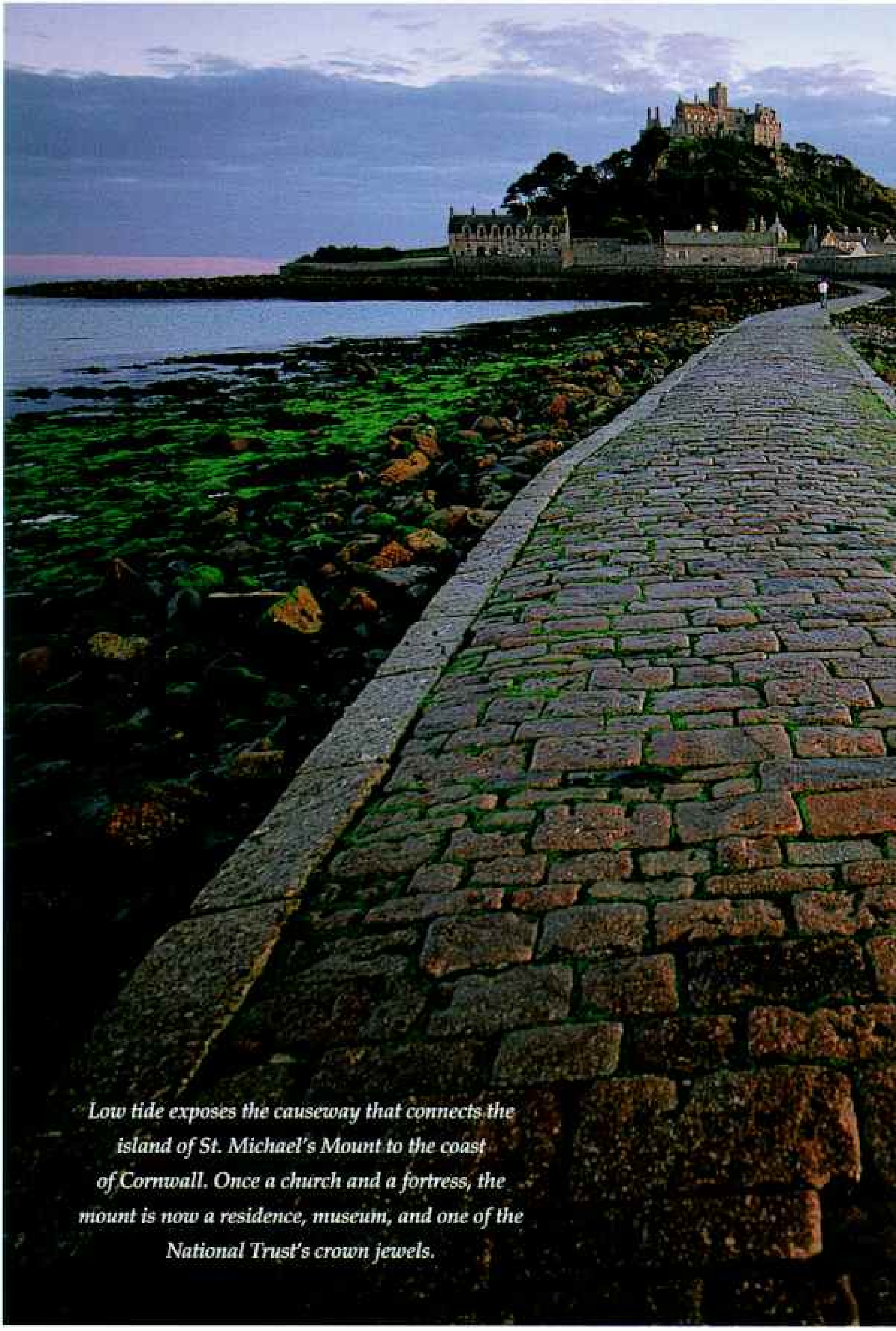
All my life I've considered England to be world headquarters for appropriate behavior, but only last summer did I get to meet the Miss Manners of her coast.

The National Trust received the Kingston Lacy and Corfe Castle Estates in Dorset from Ralph Bankes, who bequeathed more than 16,000 acres to the trust in 1981. With nature reserves, cottages, farms, heathland, beaches, and the ruins of the castle, the gift is one of the largest properties ever acquired by the trust.

Geoff Hann is a countryside manager at Corfe Castle, and I found him one morning at his home office near Studland Beach. If clothes make the man, then Hann is a split personality: The dark blue tie and the eyeglasses dangling around his neck make him look like a bureaucrat; his hiking shoes and the extra zippered pockets on his khaki pants are straight from the pages of some field-sports magazine. Appropriate for a man who manages nature.

"Nature conservation is about picking a spot in time, of picking what you want to preserve," Hann explained. "Now, we could go back thousands of years when half of Britain was covered in trees and scrub—but you would lose some of the flora and fauna produced by farming *(Continued on page 48)*

Skeletal remains of Dunstanburgh Castle emit faint echoes of the 15th century—galloping horses . . . the clash of lance on armor . . . soldiers' screams during the Wars of the Roses. Later scavenged for its stone and timber, the ruins in Northumberland now loom near a golf course.



Low tide exposes the causeway that connects the island of St. Michael's Mount to the coast of Cornwall. Once a church and a fortress, the mount is now a residence, museum, and one of the National Trust's crown jewels.

Sea holly
Formby

Mussenden Temple
Downhill

Common seal pup
Strangford Lough

Mussenden Temple was built in 1785 by a Protestant who also allowed Catholics to pray there.

Scotland

The Scots established their own, much smaller, National Trust in 1931.

Edinburgh

Dewberry
Formby

Wind pump
Horsey

Exmoor pony
Seacombe Valley

Fossil ammonite
Robin Hood's Bay

Giant's Causeway

Downhill

MOYLE

COLERAINE

LIMAVADY

LARNE

Northern Ireland

NORTH DOWN

Belfast

ARDS

Strangford Lough

Portaferry

DOWN

NEWRY & MOURNE

Lindisfarne Castle

Farne Islands

Beadnell Lime Kilns

Dunstanburgh Castle

Bamburgh Castle

NORTHUMBERLAND

North Sea

TYNE & WEAR

The Leas

CUMBRIA

DURHAM

CLEVELAND

Hummersea

Saltwick Nab

Robin Hood's Bay

Knipe Point
Newbiggin

NORTH YORKSHIRE

Razorbills
Farne Islands

Huge herds of rare gray seals migrate to the Farne Islands each fall to breed.

Sandscale Haws

Heathwaite

LANCASHIRE

The National Trust holds most of the hunting and fishing rights in the intertidal zone around Strangford Lough.

Irish Sea

IRELAND

MERSEYSIDE

Formby

Liverpool

Caldy Hill

Close to Liverpool's industrial hum, Formby dunes are a sandy slice of serenity, home to oystercatchers, other wading birds, and a variety of rare plants.

Dinas Gynfor

Fedw Fawr

Mynachdy

GWYNEDD

Porthdinllaen

Blakeney Point

Salthouse Broad

Scolt Head

Stiffkey Marshes

Felbrigg

Horsey

Marram grass
Formby

Ten-spot ladybird
Formby

Early purple orchid
Brownsea Island

Natterjack toad
Sandscale Haws

Carreg Samson cramlech
Long House Farm

Enginehouse
Wheal Coates

Oxeye daisy
Brownsea Island

Cargo vessel
Cotehele

Hairy bird's-foot trefoil
Predannack

Sea buckthorn
Formby

Dartford warbler
Isle of Purbeck

Dinas Oleu
Barmouth
Cardigan Bay
Cwm Soden
Llanborth Farm
Mwnt
Dinas Island
Treseissyllt
St. David's Head
Long House Farm
Marloes
Kete
Stackpole
Worms Head
At Stackpole the trust runs a residential nature camp for students.
Celtic Sea
WEST GLAMORGAN
Cardiff
AVON
Foreland Point
Lundy
Baggy Point
Exmoor
SOMERSET
Welcombe Mouth
The Dizzard
Boscastle
Tintagel
Porthcothan
The National Trust owns or controls more than a third of the coast of Cornwall.
DEVON
Cotehele
Torbay
Plymouth
Wheal Coates
St. Michael's Mount
CORNWALL
Bosigran and Rosemergy
Kenidjack
Porthcurno
Mount's Bay
Predannack
Lizard Peninsula
The Gribbin
The Dodman
Falmouth
Glendurgan
Bolt Head
Little Dartmouth
Prawle Point and Gammon Head
DORSET
Kingston Lacy
Langton Matravers
Isle of Purbeck
Poole
Brownsea Island
West Bexington
Orcombe Point
Corfe Castle
Studland and Old Harry Rocks
Swanage
Spyway
Seacombe Valley
ISLE OF WIGHT
English Channel
WEST SUSSEX
EAST SUSSEX
Botham
Brighton
Birling Gap
Fairlight
KENT
Sandwich Bay
Dover
Langdon Cliff
NORFOLK
Dunwich Heath
Orford Ness
SUFFOLK
Pin Mill
ESSEX
Northey Island
Ray Island
London
England
Wales

Green dots represent National Trust coastal sites; red dots denote sites mentioned in this article.

0 30
MILES
NGS CARTOGRAPHIC DIVISION
PAINTED BY CHRISTOPHER A. KLEIN

"One thousand miles of coast," says the trust, "have been developed beyond all hope of conservation"—including much of England's south-eastern shore.

Protecting the Coast

In 1965 the National Trust launched Enterprise Neptune, a project with a daunting goal: to acquire one-third of the coast of England, Wales, and Northern Ireland—more than a thousand miles of shoreline in all. In its mission to protect the region's natural and cultural inheritance, the trust wields the unusual power to declare its land "inalienable." Once a property is so designated, only an act of Parliament can force the trust to relinquish its title to the land.

over many centuries." Not only that, people have lived along parts of Britain's coast since the end of the last ice age.

To preserve the estate's rich biological mix, Hann tries to keep the grass along the cliffs growing at different lengths, to create what he calls a "grassland mosaic." Long grass provides a habitat for such animals as the marbled white butterfly, while very short grass gives wildflowers like the early spider orchid enough room to grow.

Hann needs animals that will graze on tall, coarse grass to maintain this mosaic. Sheep, he found, won't touch it. Cattle will eat it, but they leave too much stubble behind. So Hann decided to try a few Exmoor ponies—and they gobbled the grass, stubble and all.

"I once had an Exmoor, so I knew what their capabilities were," Hann said. "But I didn't know quite how rare they were—only 200 breeding mares in the world at that time. So I thought, we'll kill two birds with one stone. We can conserve the grassland and preserve a rare breed."

To see that grassland, we hopped in his Land Rover and drove up to Seacombe Valley, a gentle dimple of land overlooking the English Channel. On this hazy August morning the valley was blotched with brown and green growth.

But that's the style of a grassland mosaic. In the spring the valley would erupt with wildflowers, transforming itself into a textured tapestry of color. And that, said Hann, sure beats a boring blot of scrub. "It's a prettier picture," he said, gazing at his handiwork. "And that's the way we want it."

Filling out its pretty pictures, the trust positions people to live along the coast in modest numbers and in appropriate locations. But to accomplish that, they often need to shuffle their tenants like pieces in a jigsaw puzzle.

Nigel Smith is one piece of that puzzle. Back in 1943, when he was 23 years old, he wanted to be a dairy farmer. After checking out the land available on the Corfe Castle Estate, he rented 23 acres of heathland, blanketed with heather.

"I couldn't get a farm," remembers Smith, who had little money at the time, "so I had to make one." He plowed up the heather, planted grass, bought 12 cows, started milking. By 1990 Nigel's farm had grown to 200 acres.

Because heathland has such sandy, stingy soil, most people then classified it a few notches above worthless. Nowadays, though, conservation groups like the trust consider heath an endangered habitat, and the change in perspective couldn't have come at a better time for the Smiths. Nigel was about to retire and leave his son, Mark, in charge of the farm, which needed expensive repairs. The trust, hungry to restore heather to the heath, made the Smiths an offer: If they agreed to give up their farm, the trust would move them to another one—a farm called Spyway.

Perched between the hamlet of Langton Matravers and the Channel, Spyway lets you see it all—the water, the farms, the streets of Swanage, the curve of the coast as it sweeps toward Old Harry Rocks.

Although the trust is renovating Spyway, Mark Smith is a bit edgy about the move. As part of the deal, he explains, he has had to give up dairy farming, which can produce unacceptable concentrations of manure, and run beef cattle instead. Mark's worry?

"The security," he says intently. "With dairy, you get a milk check every month. But with the beef job it's whatever the market decides to do."

As we talk, hikers stroll by, with kids and dogs in tow, on the coastal footpath that runs through the middle of Spyway farm. Mark stares at them, then turns and sizes up one of his stone sheds. It has no roof yet, just a blue plastic tarp flapping loudly in the wind.

"Look at that place," Mark says, nodding toward the shed. "Wouldn't that make an ideal tearoom?"

OCTAVIA HILL is not a place but the name of a person—one of three founders of the National Trust. A social worker who labored tirelessly to improve living conditions for the urban poor, she dreamed of creating in the countryside what she called "sitting rooms" for the poor.

Hill, along with Robert Hunter, a lawyer, and Hardwicke Rawnsley, a clergyman, established the National Trust for Places of Historic Interest or Natural Beauty in 1895. Its purpose, quite simply, was to set aside the best and most beautiful parts of Britain for the public and for posterity.

The trust's first acquisition was 4.5 acres of Welsh cliffland overlooking the town of Barmouth and the waters of Cardigan Bay. The property, called Dinas Oleu, was a gift

from Mrs. Fannie Talbot, who wanted the land in "the custody of some society that will never vulgarise it. . . . I wish to avoid the abomination of asphalt paths and the cast-iron seats of serpent design."

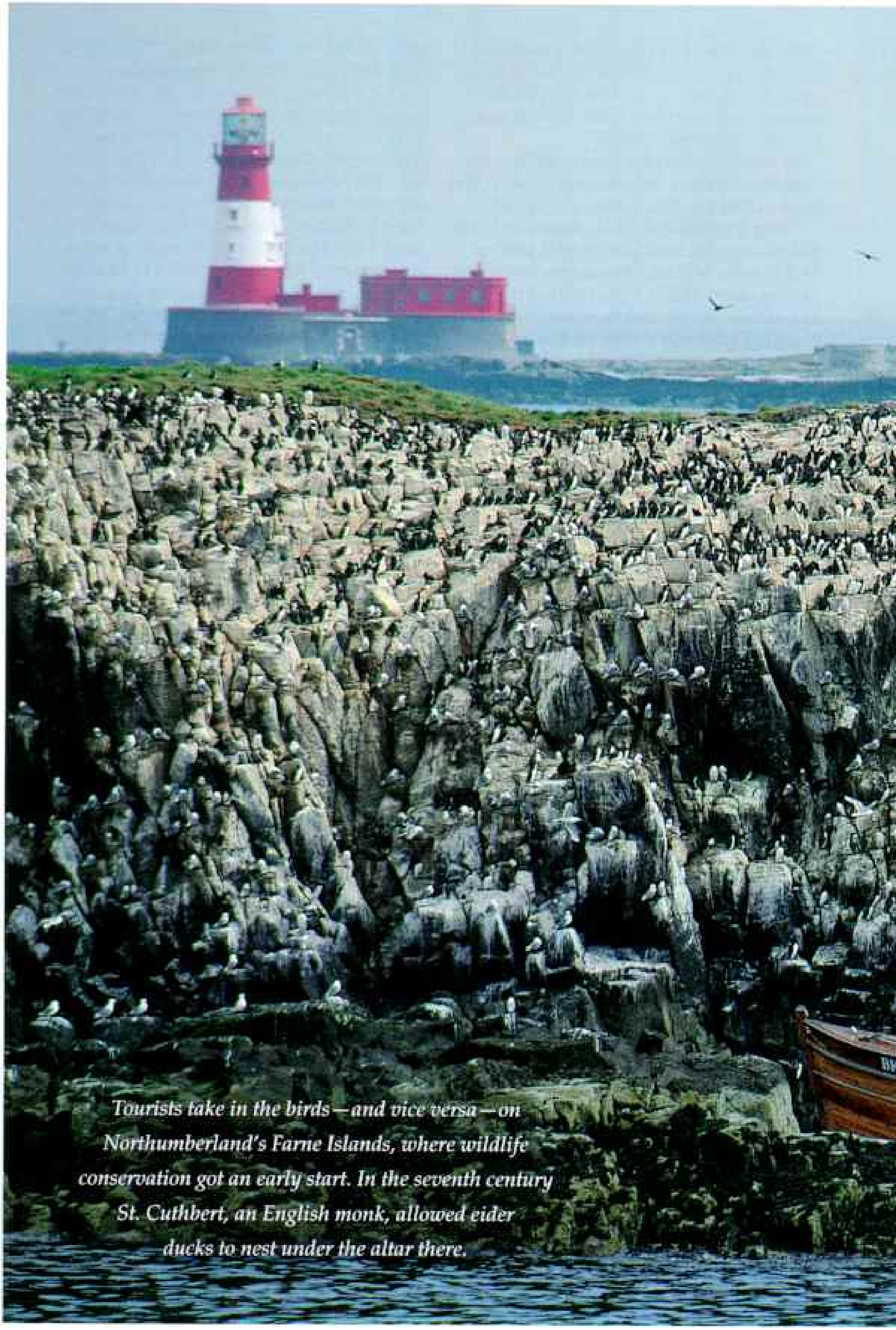
In 1896 the trust paid £10 for its first purchased property, a 14th-century house in East Sussex. And the rest, as they say, is history.

Today the National Trust owns more than 590,500 acres of land and protects another 79,500 acres with legal covenants that restrict development. That's 1.6 percent of the land in England, Wales, and Northern Ireland (Scotland has its own separate National Trust). The trust owns holiday cottages, tearooms, and restaurants, as well as castles, hamlets, and villages. It runs a theater company, an art foundation, and various employment training programs. It publishes handbooks, magazines, a glossy annual report, and a mail-order catalog that features bone-china mugs, silk scarves, and crystal perfume bottles. It has a gift shop in Japan and an American affiliate called the Royal Oak Foundation. It has 2,800 permanent staff, 28,000 volunteers, and 2,250,000 members. In Britain the trust is ubiquitous.

Of all the trust's programs, few have been as ambitious and successful as the campaign to save the coast for—and from—the public. The program began in the early 1960s when the trust commissioned a survey to evaluate the opportunities for conservation along the coast of England, Wales, and Northern Ireland. Out of more than 3,000 miles of coastline, the trust judged a thousand to be neither beautiful nor interesting; another thousand, cluttered with marinas, trailer parks, hotels, and factories, to be ruined beyond redemption; and the remaining shoreline—of which the trust already owned 200 miles—to be of outstanding beauty and worthy of protection. In 1965 the trust launched Enterprise Neptune to acquire these segments.

To appreciate the ambitious scale of this project, imagine this: If an organization in the United States acquired one-third of the shoreline in the lower 48 states, it would control the equivalent of the entire Gulf Coast—and then some.

Strong enough to stomach thistles and other rough forage, an Exmoor pony prevents scrub from suffocating wildflowers on the Dorset coast. Trust wardens have been successfully breeding these rare and ancient ponies to aid in conserving cliffside grasslands.



Tourists take in the birds—and vice versa—on Northumberland's Farne Islands, where wildlife conservation got an early start. In the seventh century St. Cuthbert, an English monk, allowed eider ducks to nest under the altar there.

"We're a nation of seafarers and an island nation, so the very nature of the project motivates people," says Richard Offen, the energetic manager of the Enterprise Neptune appeal. "There is no place in England that is farther than 70 miles from the coast, and everybody has fond memories of seaside holidays as a child. Contributors see themselves as preserving their memories."

Warm sentiments about the shore certainly nurture the Neptune campaign, but success has come in large part from a 1907 act of Parliament that gave the trust the power to hold land "inalienably." That power protects land from government seizure for a highway, say, or a hospital. It also means that the trust cannot accept a property and later dump it for financial or aesthetic reasons.

"Inalienability," says Offen, "is the one thing that other national trusts throughout the world envy us for."

ST. MICHAEL'S MOUNT probably would have never fallen into the trust's hands if not for inalienability. A castle perched on an island hill, the mount looms a few hundred yards off the Cornish coast. If it looks inviting, inspiring, and a little bit intimidating, that's probably by design. Since an abbot first built a small church on the site in 1135, the mount has served as a military outpost, a priory, and a residence. After 1659 it became the home of the St. Aubyn family; today it is the home of John St. Aubyn and his wife, Susan, known more formally as Lord and Lady St. Levan.

At low tide you can walk along a stone causeway from the mainland to the mount, but the morning I arrived it was high tide, so I had to take the launch. As tourists trudged up a steep stone path to the castle, I took the private way to see the lord of the manor. Up I went, through gardens neat as knickknack shelves; to a door that looked battering-ram tough. I knocked and waited for a butler, but when the door swung open a minute later, it was Lord St. Levan himself, in a blue blazer and boat shoes. He is a tall man with a noble nose and easy smile.

"Have you been waiting long?" he asked cheerfully, shaking my hand and inviting me in. He led me up a dim, winding staircase lined with large paintings—portraits of viscounts and dukes and barons and various kin dressed in ruffles and curly white wigs. Three flights up, we settled into the Snuggery, a spacious sitting room overlooking Mount's Bay. Two portable electric heaters sat on the threadbare carpet, and newspapers and mail were stacked on a table nearby. We sat, sipped tea, and talked about his arrangement with the trust.

"My father was concerned about the long-term future of the castle and the island," he explained. "He didn't have any financial problems at all, but looking a long way ahead, there might be one member of the family who might let everybody down." If so, it wouldn't be the first time. Six generations earlier, another John St. Aubyn fathered 15 illegitimate children by two mistresses (although he eventually married the second one). When he died, he left behind debts that the family paid by selling his collection of etchings and engravings.

To avoid similar threats to the mount's well-being for future generations, the family made a deal. In 1954 they gave the mount to the National Trust, which ensured that the place would never be sold or tastelessly exploited. In return, the trust leases the family 16 rooms (out of more than 120 in the castle) as well as one of the gardens.

These days Lord and Lady St. Levan spend their time raising funds for charity, supervising their staff, presiding over civic events, and, the day I was there, holding a tea for the Cambridge University Gilbert & Sullivan Society. The future will no doubt be filled with plenty of tea, biscuits, and pâté, because the family's lease with the trust extends for a thousand years.

"It is," Lord St. Levan told me with a sheepish grin, "a very happy arrangement."

PICK ALMOST ANY STRETCH of coast in Britain and, by the end of this year, Robert Steel will have been there. Steel, a 75-year-old grandfather and retired surveyor, is scheduled to complete a 4,444-mile walk around the coast of England, Wales, and Scotland as a fund-raiser for the trust.

The walk is actually his fifth in a series. He has already hiked across Britain's mainland three times—twice on the diagonal, once down the middle. And in 1990 he walked 2,000 miles around the perimeter of England, raising £130,000 for Enterprise Neptune.

Electrical jetsam litters the shingle spit of Orford Ness in Suffolk, once a secret site for military weapons development. Decades ago engineers tested triggers for atomic bombs inside the fortified "pagodas," now crumbling ruins from the Cold War.

To cover the distance on his Orbita Britannica trek, Steel will walk 22 miles nearly every day for seven and a half months—more than 200 days of putting one foot in front of the other. "You can go a bit around the bend," he told me before he set out, "unless you take steps to keep yourself sane." (Steel does math problems in his head.)

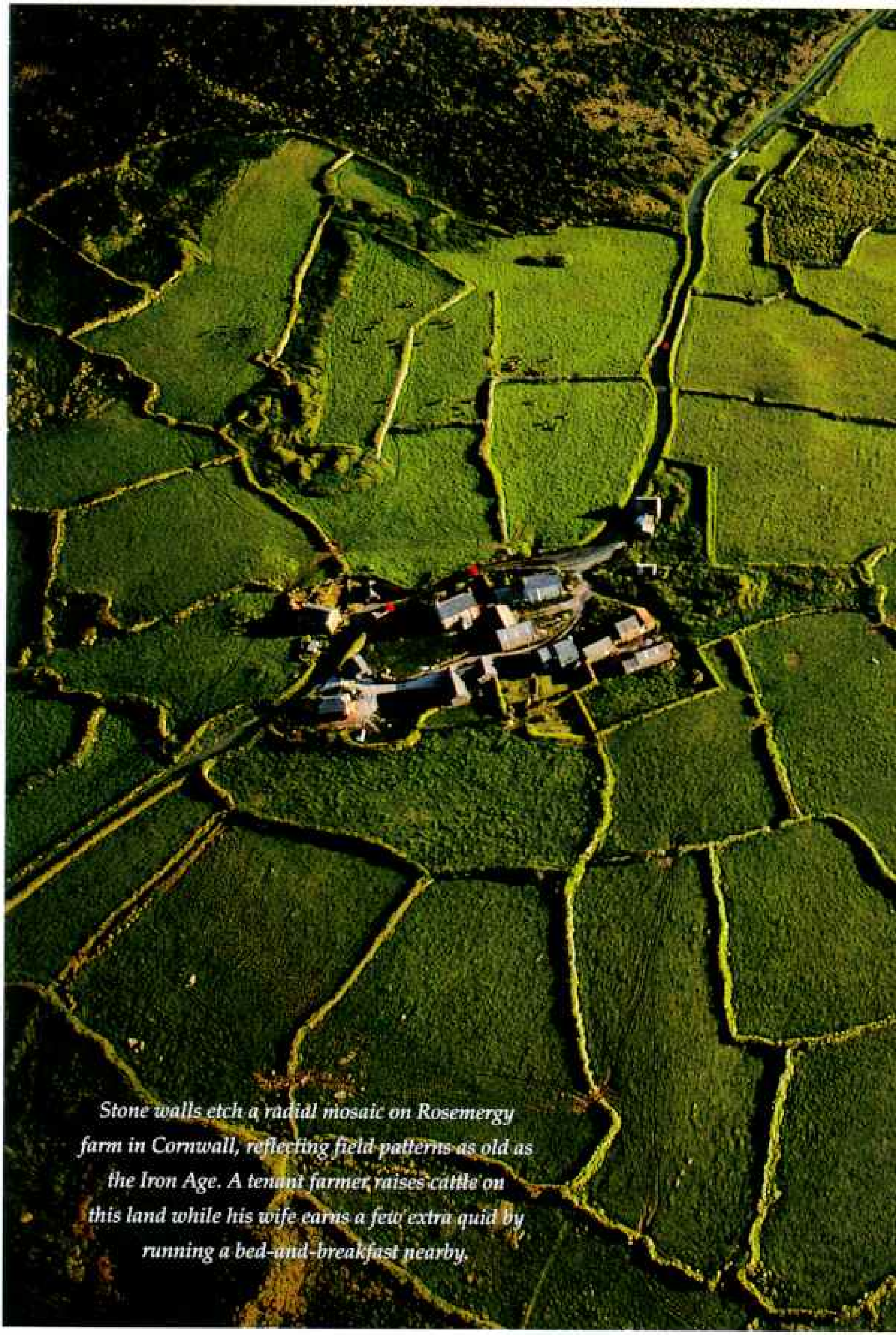
Staying sane was hardly a problem when I went walking one day along the Cornish coast, more than a third of which is owned by the trust. The hike was all of nine miles long and was planned and organized by the local chapter of the Ramblers, a walking club.

It was drizzling and chilly that Saturday morning, but 40 people showed up anyway, with smiles and their waterproof Wellingtons. Around 11 a.m. we put up our hoods and hit the trail, walking across fields dappled with wild fuchsia, cowslip, and brambles. We hiked past several abandoned tin mines, plenty of farms, and mile after mile of rocky cliffs, their long faces carved raw and craggy by the ocean's dull knife. All day we stayed close to Cornwall's serrated edge, weaving in and out like a conga line.

Why does such a rugged coast, and coastlines in general, evoke warm feelings in so many people? I've heard plenty of theories. Some say that on the coast nature speaks an eloquent truth, or that coastal erosion reminds us of our mortality and the sanctity of life, or that we flock to the sea because it is the cradle of life, mankind's watery womb.

Whatever. I like the coast because, on a pristine stretch, I can stand on solid ground, turn my back on civilization, stare at nothing but the sea and sky—and stop thinking. I don't judge, classify, analyze, evaluate, remember, or forget. The mind stops. I rest.

And, of course, parts of the British coast, especially some of the trust's gold-chip properties, are simply fun to look at—rare, bold, whimsical, beautiful. At the Giant's Causeway in Northern Ireland, for instance, clusters of basalt stacks poke out of the water like uneven fistfuls of Allen wrenches, making you wonder if that's the tool God used to put



Stone walls etch a radial mosaic on Rosemergy farm in Cornwall, reflecting field patterns as old as the Iron Age. A tenant farmer raises cattle on this land while his wife earns a few extra quid by running a bed-and-breakfast nearby.

Ideal camping site—or Cornish eyesore? Robert Steel, a long-distance hiker who raises money to help the National Trust preserve the shoreline, asks folks why they crowd the coast this way. "They tell me, 'We want to see what you see when you walk.' And I say, 'I don't come to see your campers.' "

the world together. In Dorset and at Dover white cliffs provide irrefutable proof that England is actually a giant wedge of Stilton cheese. And when you gaze down from the edge of Cornwall's Lizard Peninsula, the drop is so long and dramatic it's easy to think that maybe Shakespeare *was* right: That all the world's a stage—a damn big one at that.

And I like the British coast because there are so many spots where the outline of the land is so distinct that your mind can't help but flash to a mental map of the country, and you see yourself standing there on the outer edge. It's an out-of-body experience induced by geography.

GRASSLAND MOSAICS. Well-groomed gardens. Contextually sensitive duck blinds. Why does the National Trust usually insist on making everything nice and tidy? I asked David Russell, the trust's chief forestry adviser, who is now conducting a review of its countryside policy.

"It is part of the character and culture of the British people to try to organize and manage land and the things in it to conform to a particular pattern or idea," he told me. "On the whole we're uncomfortable with allowing free reign to nature and what nature might produce. We're uncomfortable with the possibility that it would make a mess. And that leads to this culture of feeling an irresistible urge to manage and modify everything to achieve some desirable end."

In recent years, though, the trust has seemed to experiment a bit, acquiring properties that, at first glance, seem . . . well, inappropriate. Consider County Durham, once England's leading producer of coal. Over the years coal mines along the shore dumped gobs of colliery waste—shale mostly—into the North Sea. Unable to digest it, the sea spit it back onto the shore like a bad lunch. Today blankets of gray, pasty clay cover several of Durham's beaches.

The trust decided years ago to steer clear of these blighted beaches. But now, with the coal mines shut down, the sea is slowly absorbing the sludge. Realizing the beaches might be clean sometime in the next century, the trust began to acquire them in 1987.

At Orford Ness, the trust again stepped into strange and less-than-picturesque territory. Jutting out from the Suffolk coast, Orford Ness is a flat shingle spit that once was a secret site where the military tested weapons.

During World War I the Royal Flying Corps built a few clusters of buildings here—barracks, offices, an airplane hangar—and used another stretch of the spit as a bombing range. During the Cold War, to test triggers for the atomic bomb, the government built huge concrete containment structures that resemble pagodas.

The site was abandoned in 1971, but Orford Ness remained off-limits to the public. Today the place has a rough, haunted feeling. The buildings look blown out, with broken glass littering the floors and wind howling through holes in the walls and ceilings. On the old bombing range, corroded bullets and heavy chunks of shrapnel lie scattered among the stones.

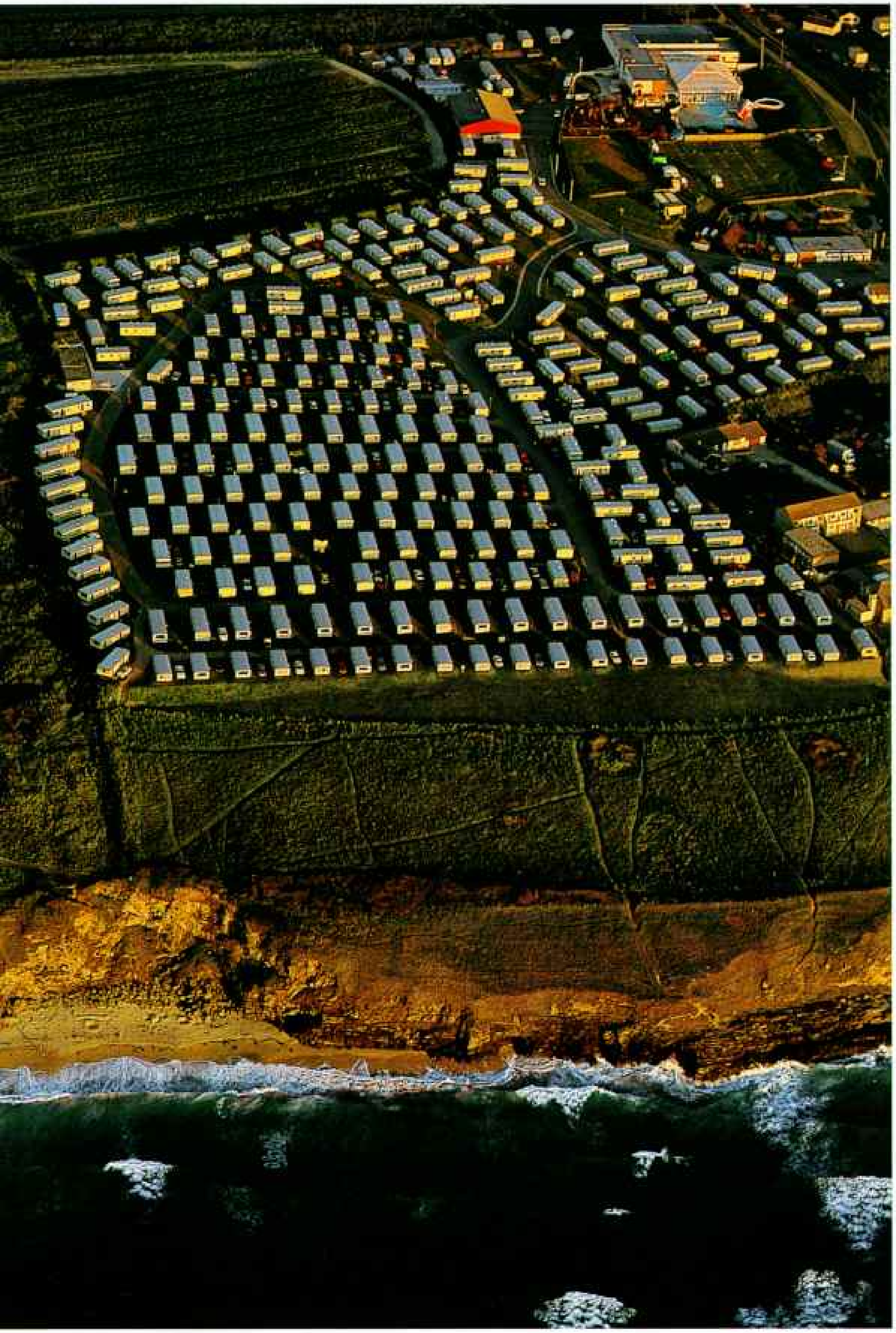
On this seemingly barren spit, birds are one of the few signs of life. Orford Ness has become an important breeding habitat for such species as the marsh harrier, avocet, red shank, and shoveler.

In 1993 the Ministry of Defence sold Orford Ness to the National Trust, and when the site opens late this year, most of the buildings will remain in their decrepit condition. The managers plan to leave them alone. "Nonintervention," they call it, and for the trust that represents a big switch.

"The trust is often criticized for tidying up everything, but we're not into that here," says Grant Lohoar, the first warden at Orford Ness. "No tearoom, no potpourri. We're not going to follow the set pattern."

Why not?

"Because," he said, "we don't believe it would be appropriate." □



THE MOUNTAIN GORILLAS OF AFRICA

A Fragile Home Threatened by War

Among the last of its kind, a young gorilla peers from its leafy refuge in Rwanda—a nation bloodied by ethnic slaughter. Conservationists fear that Rwanda's instability could endanger the gorillas' survival. Others ask: How should the plight of the world's rarest ape be weighed against more than 500,000 human dead?

PHOTOGRAPHS BY MICHAEL NICHOLS

Marching across the front lines of an ecological disaster, Rwandan refugees carry loads of firewood through the denuded fringes of Virunga National Park in Zaire. Refugees have stripped thousands of acres of rain forest within sight of mountain gorilla habitat—a crisis that pits the desperation of humans against the well-being of the endangered apes. "Trees used to block the views everywhere," says a Zairean forest ranger. "Now I see hills I didn't even know existed."

Gentle Gorillas, Turbulent Times

By GEORGE B. SCHALLER

ON JANUARY 22, 1991, my wife, Kay, and I sat on the summit of Mount Visoke, one of the eight Virunga volcanoes that straddle the borders of Rwanda, Zaire, and Uganda. We had come to help with a mountain gorilla film. That morning we had left the Karisoke Research Center, the base of Dian Fossey's gorilla work from 1967 until she was killed by unknown assailants in 1985. Her hut of green corrugated metal remained, littered with remnants of her past. Still on the wall was a plastic Santa Claus, a poignant reminder that she died at Christmastime. Beside her cabin, shaded by moss-laden boughs of hagenia trees, was her grave, along with those of 17 gorillas, one dog, and one monkey.

But it was not a day for us to dwell on tragedy. Instead of the swirling gray fog and rain-drenched slopes that are so common here, the volcanoes rose stark and clear above a shimmering forest. To the west, in the saddle between Mikeno and Karisimbi, the two highest volcanoes, was a place called Kabara. Kay and I had lived there in 1959 and 1960 while conducting the first intensive gorilla study. Now, after three decades, we had returned to an idyll of our past.

The gorillas on the slopes of the Virunga volcanoes—some 300 animals—inhabit a small forested island surrounded by a sea of people. Twenty miles to the north is Uganda's Impenetrable Forest, now protected as Bwindi Impenetrable National Park, another island with perhaps 300 gorillas. These 285 square miles represent the entire world of the remaining mountain gorillas. Years ago, when I watched the gorillas' leisurely life, the animals eating and sleeping and tumbling in play, I was glad that they could not fathom their rarity and my concerns. We have a common past, but only humans have been given the mental power to worry about their fate.

Now the radiance of those months returned as intense memories. Once again Kay and I followed a swath of head-high vegetation until soft grumbles signaled contented gorillas ahead. We recalled old gorilla acquaintances: Big Daddy, the silverback leader of a large group, his power majestic even in repose, and Junior, a reckless young male that liked to linger near us. Once a female with an infant on her back had climbed with startling innocence upon a low branch to sit with me, probably the first

Saddled with their infants, two female gorillas lumber between feeding stops in Volcanoes National Park in Rwanda, home to more than a hundred of the world's 600 mountain gorillas. Years of conservation efforts in Rwanda, Zaire, and Uganda have so far halted the gorillas' decline into extinction. "It's one of Africa's success stories," says one expert. "Yet it can collapse anytime."

GEORGE B. SCHALLER, science director of international programs at the Wildlife Conservation Society in New York City, has written ten books about his work, most recently *The Last Panda*. MICHAEL NICHOLS has photographed apes in Africa, Asia, and U. S. zoos for the GEOGRAPHIC. His last story was on the Ndoki forest of central Africa (July 1995).

Revenge made rubble of a Hutu official's villa in northern Rwanda. A brutal power grab by extremists in the Hutu-dominated government sparked the massacre of hundreds of thousands of Rwandans in 1994—most of them minority Tutsi. "Don't look too closely at our beautiful country," says one survivor, "because it is full of skeletons."

time that a wild gorilla and a human were amicably side-by-side. However, to me that gorilla study had meaning beyond the gathering of new facts. Gorillas had long been viewed as symbols of savagery, "exceedingly ferocious" in temper, as a 19th-century missionary phrased it. My task was not to capture or master them but solely to interpret their life. So I approached them with empathy and respect, wanting nothing from them but peace and proximity. And they accepted my presence with an astounding generosity of spirit. The recent decades have been a turning point, indeed a revolution, in our relationship with animals. Humans have begun to overcome cross-species barriers, achieving intimacy with humpback whales, chimpanzees, lions, mountain sheep, wolves. The gorillas of popular image were a fantasy. It pleases me that I helped change perceptions.

The gorilla, of course, is more than an animal. These apes are a primal part of human heritage. Our kin. We traveled down different evolutionary paths, the gorillas creating their own world, complete and coherent, and humans shaping theirs. No one who looks into a gorilla's eyes—intelligent, gentle, vulnerable—can remain unchanged, for the gap between ape and human vanishes; we know that the gorilla still lives within us. Do gorillas also recognize this ancient connection?

Our reveries that day on Mount Visoke were shattered by a walkie-talkie message from the lowlands: The Rwandan Patriotic Front—led by ethnic Tutsi—had invaded from Uganda. We were ordered to leave the mountains immediately. Led by primatologist Diane Doran, the director of Karisoke at the time, we descended to the town of Ruhengeri. Caught in the middle of a battle between rebels and the Rwandan Army the following day, we were evacuated by French paratroopers.

Land mines and booby traps planted by defeated Hutu forces have maimed farmers and killed cattle in Volcanoes National Park. Conservation groups are encouraging the de-mining of gorilla habitat with cash; soldiers probe for the plastic mines with machetes, earning the new Tutsi-led regime $8 for every explosive removed.

Ironically, Kay and I also had to terminate our project in 1960 because of war. The Belgian Congo, now Zaire, gained independence that year, and with it came years of unrest. And in Rwanda, a Belgian protectorate until 1962, the Hutu tribe waged a civil war against the ruling Tutsi. Many Tutsi fled the country, living in exile until they invaded their former homeland in 1990. The renewed war climaxed in the carnage of April 1994; soon after, the Rwandan Patriotic Front achieved victory and formed a new government.

The mountain gorillas have a long past but only a century of history, much of it turbulent. This history began in 1902 when a German officer, Capt. Oscar von Beringe, first encountered the apes—and shot two. In the next quarter century, collectors and hunters captured or killed more than 50 gorillas in the Virunga region. Carl Akeley of the American Museum of Natural History shot five gorillas in 1921, but he was so impressed with the apes that he prompted the Belgian government to establish Africa's first national park, Albert National Park, for them in 1925.

Belgian protection gave the gorillas relative peace until the turmoil in 1960, when the Belgian park staff fled. Civil war, insurrection, and the division of Albert Park into Zairean and Rwandan sectors demoralized the guard force. Cattle invaded the fragile uplands, and poachers roamed the forests. Their wire snares cut deep into the gorillas' flesh, but some managed to tear free. In one group of 11 gorillas two animals had only one hand each; another's hand was deformed. Gorilla hands and heads were sold as souvenirs to tourists. And the gorillas lost much forest. In 1958 the Belgians in Rwanda turned over 27 square miles of gorilla habitat to farmers, and in 1968 another 38 square miles, or 40 percent of the remaining forest, was given to a

No one who looks into a gorilla's eyes —intelligent, gentle, vulnerable— can remain unchanged. . . .

European-sponsored agricultural scheme. It was a desolate time, to which the gorillas could be only mute and passive witnesses.

Gorilla numbers plummeted. In 1960 I estimated about 450 in the Virunga region. Censuses during the 1970s showed around 275, and by 1981 there were only 250. During this critical time Dian Fossey, assisted for varying periods by Craig Sholley, David Watts, Kelly Stewart, Ian Redmond, Alexander Harcourt, and others, was at Karisoke. Dian harassed poachers with obsessive zeal. And she made the world aware of the gorilla's plight. Her heroic vigil helped the apes endure. However, her unyielding confrontational approach with local people, one that she termed "expedient action," ultimately cannot save wildlife. Conservation depends on the goodwill of the local population.

A NEW ERA in gorilla conservation began in 1978 when Amy Vedder and Bill Weber of the Wildlife Conservation Society in New York arrived to establish gorilla tourism and an education program for the Rwandans. The following year their work was incorporated into the Mountain Gorilla Project, financed by an international consortium of conservation organizations. This integrated program of antipoaching, tourism, and education, all in cooperation with a receptive Rwandan government, had a marked impact on local attitudes.

A well-trained guard force maintained the national park. The education program created widespread awareness not just of the gorillas but also of the need to protect forests. The Virungas in Rwanda represent less than half of one percent of the country's land area but 10 percent of its water catchment. Without the forests to store water, streams would disappear during the dry season and deprive the dense human population of water. Four gorilla groups were soon habituated to tourists' viewing them at close range. Fees for tourists were high, yet so enthralled were visitors that gorilla viewing became at one time Rwanda's third largest earner of foreign exchange. Similar programs were later initiated on the Zaire and Uganda sides of the volcanoes.

The Mountain Gorilla Project also had an unforeseen impact. The people of Rwanda became proud of their apes. The gorillas became part of Rwanda's identity in the world, a part of the nation's vision of itself.

The 1980s were a golden time for the 30 or so gorilla groups on the Virunga volcanoes, and the population grew again, to about 320. The innovative program initiated by Amy Vedder and Bill Weber had become a classic story of conservation success, one that has been emulated in its approach many times.

Then the most recent civil war violated the gorillas' peaceful existence once again. Yet in spite of the turmoil, with soldiers of both factions traversing the forests, the gorillas have not been decimated. Indeed the Rwandan Patriotic Front expressed public concern for the gorillas' safety even while it was fighting. The new prime minister, Faustin Twagiramungu, has affirmed his country's commitment to the apes. Given the urgent and crushing social needs of Rwanda, this declaration is remarkable. For one species to fight for the survival of another, even in times of stress, is something new in evolution. In this, more than all our technology, lies our claim to being human. * * *

Mt. Muhavura
Mt. Mgahinga
Mt. Sabinyo
Mt. Muside
Mt. Visoke
Mt. Mikeno
Mt. Karisimbi
Mt. Nyiragongo
NORTH

Area of undisturbed forests
Dark green band on Mount Karisimbi is wild bamboo.

Area disturbed by agriculture
Includes some lowland tree cover—much of it banana and fuelwood plantations.

Recent lava flows
Mounts Nyamiagira and Nyiragongo are active volcanoes.

High-altitude oases

A cloud-penetrating-radar image made from the space shuttle *Endeavour* captures the tenuous domain of the mountain gorilla. Orbiting radar can detect subtle changes in surface texture—an invaluable tool in mapping vegetation. Hemmed in by humanity, the slopes of the Virunga volcanoes are covered with the hagenia forest and bamboo thickets that make up the apes' remnant habitat. Mount Nyiragongo harbors no gorillas.

RUTGERS CENTER FOR REMOTE SENSING AND SPATIAL ANALYSIS, JET PROPULSION LABORATORY, AND EARTHSAT

A chill moon squints through clouds and woodsmoke at Kibumba refugee camp, Zaire. In the waning days of civil war 10,000 Rwandans spilled over the Zairean border every hour. The feet of some 750,000 Hutu exiles have since packed the cinder plains near the Virungas to asphalt hardness.

Gorillas and Humans: An Uneasy Truce

By PAUL F. SALOPEK
NATIONAL GEOGRAPHIC EDITORIAL STAFF

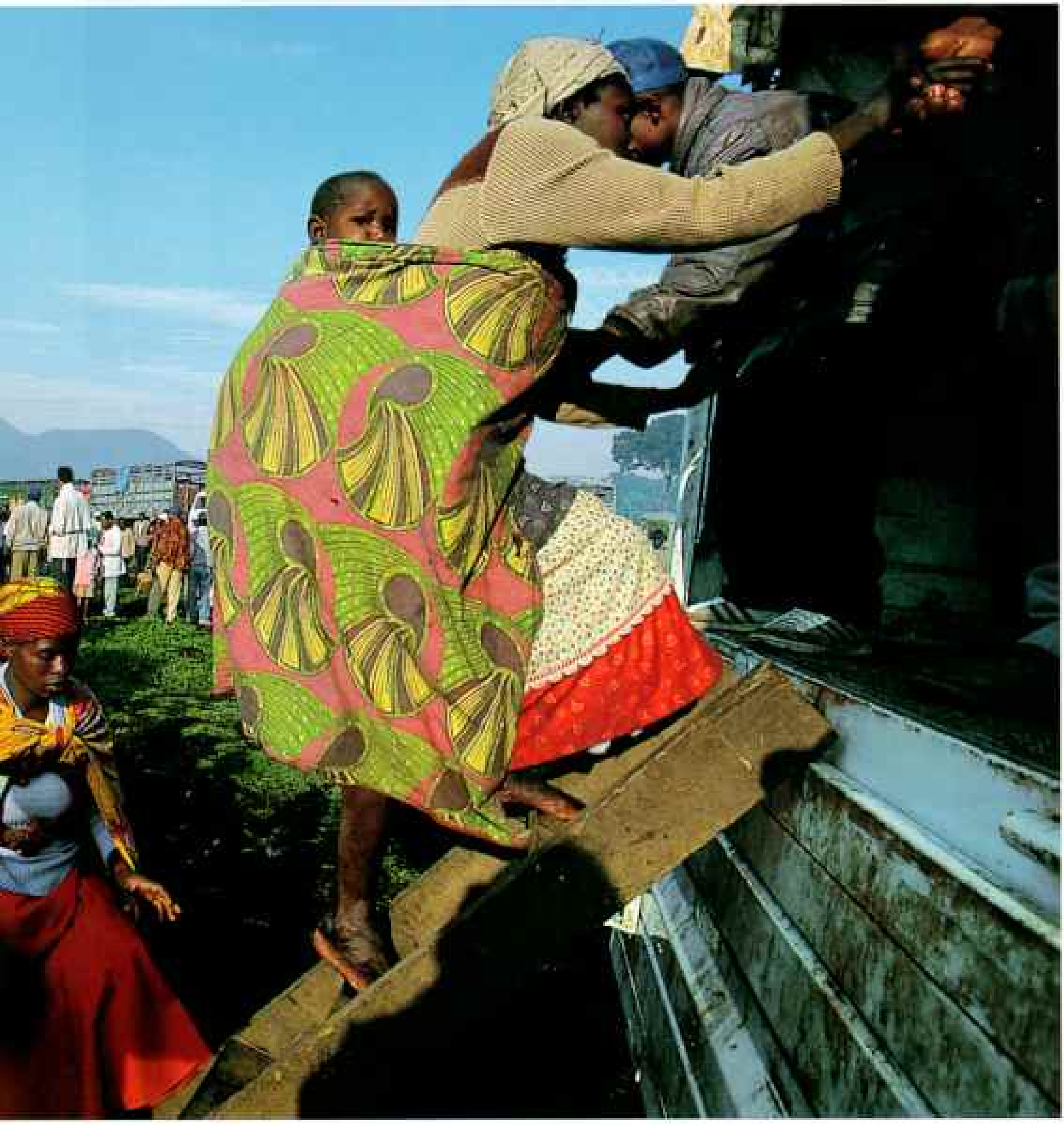
IN THE DRY SEASON the Virunga volcanoes are the palest shade of blue, translucent as old glass, a hue almost too delicate to hold the eye. Barely 40 miles long, the chain of peaks rises above the borders of Rwanda, Zaire, and Uganda like jagged shards of sky. On the upper slopes of the volcanoes, primeval forests of bamboo and hagenia trees shelter half the world's remaining population of mountain gorillas. Higher still, a soft wind blows over subalpine meadows from the south, from Rwanda. This wind carries the silence of the dead.

At least 500,000 people died in Rwanda's four-year civil war. Entire families, most of them from the minority Tutsi tribe, were massacred last year in an orgy of violence that culminated in the overthrow of the Hutu-led government. Yet even while this human tragedy dominated the world stage, environmentalists warned of another potential disaster.

The Virungas were a battle zone. The Rwandan side of the volcanoes had been seeded with land mines. And thousands of soldiers and refugees had trampled through the forests, exposing the gorillas to both gunfire and lethal human diseases. The world's most endangered great apes, it seemed, would only slip closer to extinction.

For several weeks last spring, often on foot, I roamed the gorilla parks that encompass the Virungas, expecting the worst. But instead of casualties, I found gorillas in robust shape, going about their unhurried lives without disruption on the watercolor slopes of the volcanoes.

Only one out of an estimated 300 Virunga gorillas has been confirmed killed in the fighting. A silverback, Mrithi, was shot in 1992 by frightened soldiers who mistook him for the enemy. The world's only other mountain gorillas, some 300 animals out of the line of fire in the Impenetrable Forest of Uganda, have actually fared worse. Four adults were speared to death by poachers this year.



Tugged by homesickness, refugees in Zaire are trucked to their home villages by the United Nations—part of the whirlwind of humanity still swirling around the Virungas, which provided a rugged escape route during the war.

Back from the dead: Identified from a computerized Red Cross list of 40,000 displaced children, a young refugee is reunited with his mother in Gaseke, Rwanda. "Reactions vary," says a Red Cross worker. "Rwandans are stoics."

How did the Virunga gorillas survive? By virtue of rugged topography and the lobbying efforts of conservation groups. By the price tag that gorillas have come to represent in tourist dollars. And, more profoundly, by the grace of the Africans themselves: the peasant farmers, the unpaid park wardens, the gorilla trackers who faced bullets to protect them.

That quiet heroism—or, in the least case, tolerance—was a source of wonder as I set out in the aftermath of war to visit places whose names ring like a machete cutting bamboo—Karisoke, Kinigi, Bukima, Nyagakenke.

KARISOKE RESEARCH CENTER, RWANDA

"Teenagers," Craig Sholley grumps. "Same the world over."

Sholley—an American gorilla expert and former director of Rwanda's Mountain Gorilla Project—is crouched with photographer Michael "Nick" Nichols, an unflappable Rwandan tracker named Alphonse Nemeye, and me in a prickly nettle patch near the looted ruins of Karisoke, the research post founded by the late primatologist Dian Fossey. Above us the equatorial sun beats down like a hammer. Fifteen feet ahead swaggers our problem.

The ape is perhaps seven years old and weighs close to a hundred pounds. She has separated from a group of 18 gorillas to challenge us, shambling forward on her knuckles, half aggressive, half curious, coughing a warning. Sholley, head bent in submission, grunts back. Pursing her lips nervously, the shaggy adolescent bats a wrist-thick stalk of senecio shrub down onto our heads. Sholley shakes a fern frond in retaliation. The gorilla sits, pretends to feed on wild celery—a nervous tic, like biting fingernails, that experts call displacement behavior. Sholley peels his own celery stalk, smacking his lips loudly. "She's showing off," he whispers over his shoulder.

As if on cue, the gorilla cartwheels backward into a wall of leaves, rump over teakettle, leathery black heels flying. Her companions hoot and grunt like a ragged cheering section.

"This," Sholley says, trying to stifle a laugh, "is what keeps me coming back."

Gorilla charm. Superficially, at least, there isn't much about mountain gorillas to find endearing. Unlike the clownish and hyperactive

"I had five minutes to pack," says Rosamond Carr, 80, an American expatriate who was evacuated from her Virunga plantation by UN troops during the war. Carr has returned to open an orphanage: "I never had children. Now I have 40."

chimpanzee, the gorilla is sleepily low-key—a hulking introvert. Gorillas do play, of course. But even their humor seems tentative, embarrassed. For the most part, they live out their 30 to 40 years lounging in high-altitude shrubbery, pensively munching on thistles and bamboo shoots. About the only thing that sparks real aggression is sex. Males will go to almost any extreme—fights to the death, infanticide, incest—to jockey for breeding rights over the females in his group.

Still, it is their monkish calm that has recently captured the Western imagination and earned gorillas a cult following in the conservation movement.

"Why do people love gorillas?" Sholley asked me when I first arrived in Africa. "Because we project our desires onto them." Later he refined this idea. "If people tend to think of gorillas as a blank slate, it's because when we look at them we see a lot of what we'd like to be. The gentleness. The tolerance."

The day after Sholley's grunting match, I raise this point with Fidele Nshogoza (following pages), a taciturn man who has been monitoring gorillas at Karisoke for 18 of his 44 years. Nshogoza, who got his start at Karisoke by washing dishes for Fossey, can recite gorilla genealogies back three generations. We are tagging after a group led by a silverback named Titus. From a distance comes the hollow *thup-thup-thup* of gorilla chest slapping.

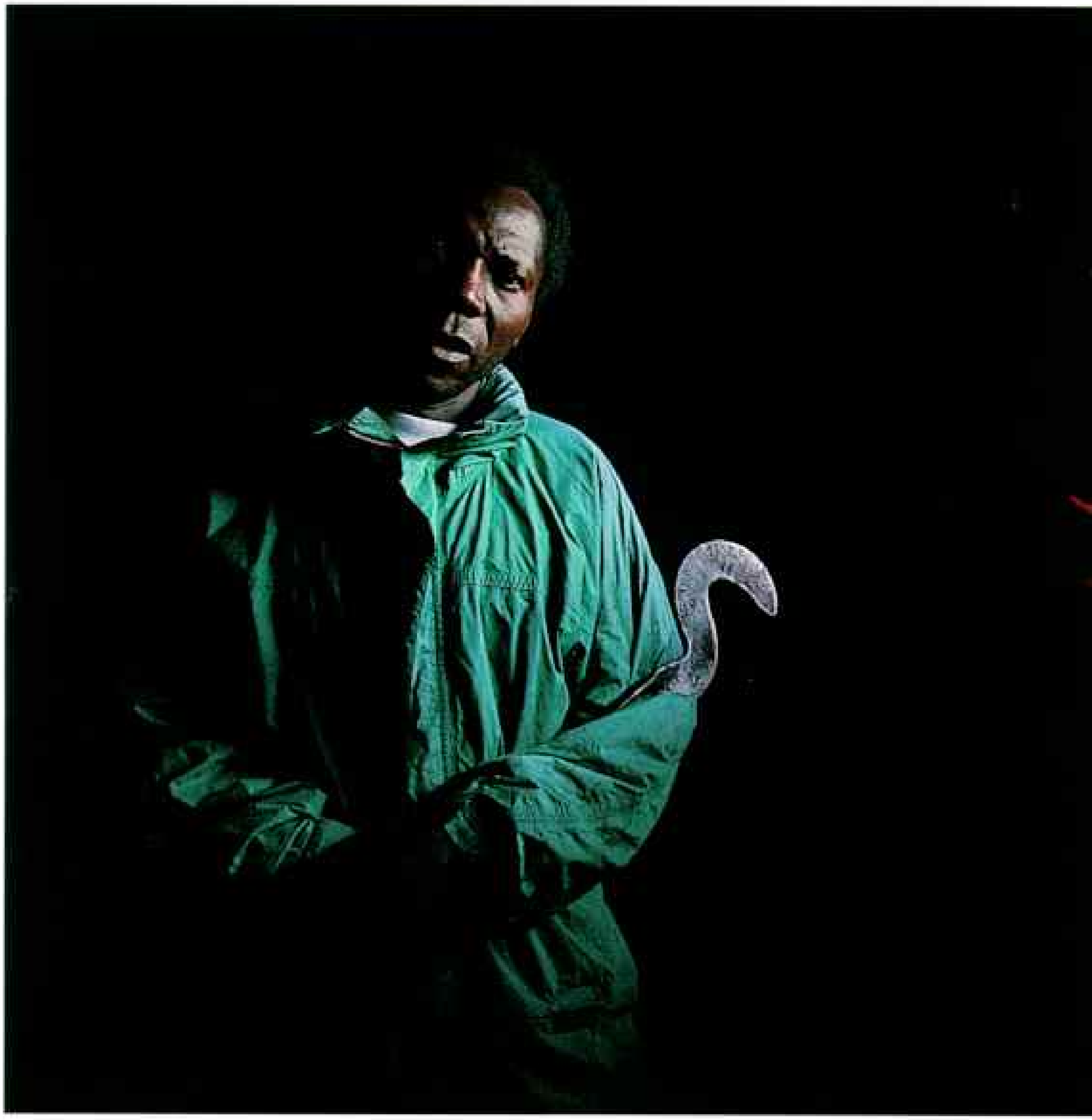
"When I was a boy, I heard that gorillas were men who were very bad and who went to live in the forest," Nshogoza tells me during a break on a hill above Fossey's old research station. "But the gorillas are better than us."

Better?

Nshogoza nods gravely. "They are peaceful. They have no tribes. When they fight, it is for a good reason. We cut one another with machetes for zero."

He points his own machete to the smoke-blue passes that lead toward Zaire. An ethnic Hutu, he fled over the volcanoes after the 1994 Tutsi victory. Two of his children almost died of cholera in a Zairean refugee camp. His house in the village of Kanyamiheto was ransacked by soldiers. And his elderly father was an early casualty of war—enfeebled, he starved to death in his home when Tutsi forces overran the area.

Nshogoza's story is typical of those I heard



in Karisoke, where 25 men—Hutu and Tutsi—have trickled back from Zaire to monitor the gorillas. The taproot of ethnic strife in Rwanda runs deep. The majority Hutu are farmers, a stocky people who have tilled the valleys surrounding the volcanoes for generations. The Tutsi, by contrast, descend from tall warrior-herdsmen who brought cattle and conquest to the region centuries ago. Their kings ruled over the Hutu virtually until independence in 1962, and last year's massacre was only the latest—and most brutal—of Hutu score-settling.

"I am happy to be back watching gorillas," Nshogoza says, his voice thickening as the noose of his memories tightens. "I don't want to think about the war. I only wish the scientists would come back too."

Embarrassed by tears, he stares down at his gum boots, then averts his face, staring over his shoulder. At two mountain gorillas.

They have crept up behind us, perhaps drawn in by our voices. Nshogoza identifies them as members of Titus's group, descendants of Fossey's celebrated patriarch Uncle Bert, killed in 1978 by poachers. The gorillas and Nshogoza gaze at each other with easy familiarity, even tenderness. And for the first time in our two-day acquaintance I hear his grudging laughter.

"Dian would cry if she saw us today," says Fidele Nshogoza, a gorilla tracker at Karisoke, the late Dian Fossey's research center. War has battered Karisoke. Many staff fled to Zaire. Nshogoza—with his children—is among those who returned.

KINIGI, RWANDA

The fierce loyalty of Rwanda's wildlife guards and trackers has been a key to the apes' survival. But shrewd packaging hasn't hurt either.

By the start of the civil war in 1990 the gorillas had become both a national totem and a national meal ticket for Rwanda—bald eagle and cash cow rolled into one. Gorilla-watching provided the third largest source of foreign exchange, after coffee and tea, as much as ten million dollars each year. Dian Fossey was convinced that Rwandans were interested only in poaching gorillas, but soon after her death in 1985 the animals were being displayed on postage stamps and idolized in pop radio tunes. In Kigali, the capital, I saw silverbacks staring somberly from photographs in bullet-scarred hotels.

"Gorillas are our only renewable resource," says Nsengiyumva Barakabuye, the new tourism officer at Volcanoes National Park, headquartered in the village of Kinigi. "Some have said, 'Give the park to returning refugees!' But we will never do that. The gorillas are too valuable."

Barakabuye is an intense, bamboo-thin Tutsi, one of 700,000 exiles who have poured back into Rwanda since the war. In Zaire, where he was born, he grew up playing in the western jungles of the Virungas, longing to become a forest ranger. Barred from a park service job by his Rwandan nationality, he spread the gospel of rain forest conservation to Zairean villages for the World Wide Fund for Nature. Then came the war and its bittersweet consequences: seven dead relatives and the chance to help rebuild the shattered park service of his homeland.

One afternoon I travel with Barakabuye to visit Kinigi—the destination, in better days, of thousands of foreign tourists eager to plunk down nearly $200 to spend an hour with habituated gorillas.

We jounce up lava-rock roads in a rented pickup steered by its owner, a hulking man named Didi. Sullen-faced farmers watch us pass. The dark corduroy mounds of potato fields loom above, nudging against the park's forest boundary at 8,500 feet. After clearing two roadblocks manned by the Rwanda Patriotic Army, we roll into the park compound with the truck's radiator steaming.

Barakabuye comes here daily, but his jaw muscles still clench at the sight of the ruined facility. We poke about collapsing tourist bungalows and a roofless restaurant. Puddles of rainwater reflect skeletal beams against a gray sky. Human excrement fouls the concrete floors. There is broken glass. On the walls, charcoal graffiti denounces the new Tutsi regime as "cockroaches." Barakabuye shows me the office of his Hutu predecessor, a small cubicle ankle deep in ashes: Looters had

Roughhousing doesn't ruffle Titus, foreground, the silverback leader of a gorilla group habituated to humans at Karisoke. "In laypersons' terms, he is a great baby-sitter," says a gorilla expert. Only one gorilla has been confirmed killed during almost four years of warfare in Rwanda. Both sides in the conflict agreed not to target the apes.

burned flyers about gorilla biology, photographs of the gorillas, and all but a few copies of a poem by Fabien Iyamuremye, a seventh grader, titled *La Beauté du Parc des Volcans*.

"We must rebuild fast, fast, fast," Barakabuye declares, sifting through the damp scab of burned papers. "We must give the gorillas back to the world. We must give them back to the Rwandans. We want to make Rwandans proud again."

BEFORE THE WAR Rwanda was one of the brightest conservation stars in Africa. The 48 square miles of Volcanoes National Park were protected by a crack antipoaching corps. World renowned through its association with Dian Fossey, the Karisoke Research Center had become an autonomous, scientific mini-state within Rwandan borders. And an association of conservation groups was spending an average of $1,250 a year on the health and safety of each ape—four times the Rwandan per capita income.

Today organizations like the International Gorilla Conservation Program and the Dian Fossey Gorilla Fund are trying to pick up the pieces of that model program. Two-thirds of the Rwandan park service staff is dead or in exile. Only two national park vehicles out of 50 made it through the war. And just about the only gorilla tourists these days are United Nations peacekeepers.

"We need outside help," Barakabuye acknowledges. But he gives me a hard look to make sure there is no misunderstanding. "The park, including Karisoke, is Rwandan. We want more Rwandans to see the gorillas. We want more Rwandan control."

Leaving the rubble of Kinigi behind, we rattle to the base of the volcanoes in Didi's ancient truck. The fuel needle is on empty, so we coast the whole way down.

BUKIMA RANGER STATION, ZAIRE

The gorilla is a young male—only three or four years old—and a broken snare set for bushbuck is gouging into his left foot. Crushed together for weeks, his toes have lost their hair. The naked flesh is the color of a bruised peach. Dribbling spittle onto his black index finger, the gorilla rubs saliva into the wire cut.

"It can die from infection," whispers Augustin Kambale, a guard at Virunga National Park in Zaire, a fearless man with a shaved head, an M14 rifle, and degrees in biology and chemistry. "We must save it." Peering over his shoulder, I can't see how.

Kambale huddles with two trackers. After a brisk exchange in French, he decides to rescue the gorilla on the spot, before septicemia sets in: "We will circle him, throw our bush jackets over him, and pull the snare off."

The injured gorilla eyes us warily and limps off, trailing the frayed, snapped end of the wire behind. We follow. As the trackers begin circling, holding their old army coats out like matadors, I notice a shadow, very big and very still, in a nearby bamboo thicket.

"Silverback," I hiss to Kambale, who pauses, his own coat already shrugged half off. "*Le grand chef*," he mutters, squinting through the feathery bamboo.

It's the big chief all right, an ape named Ndungutse—or "benefits," as in ecotourism dollars—that dominates this local band of 30 gorillas. At about 400 pounds, Ndungutse has a head as big as a bull's and a back the size of a door. The stricken youngster had been keeping close to the burly patriarch the whole time.

In the end—to my enormous relief and the trackers' clear disappointment—Kambale calls off the rescue. We slip and skid down the mountain to Bukima village, where Kambale radios for help at the ranger station.

Weeks later I hear that a veterinarian based in Rwanda has darted the youngster, saved his foot, and christened him Bahati—Swahili for "luck."

Luck, however, is a dwindling commodity in Zaire. Attempts to oust President-for-life Mobutu Sese Seko from power have plunged the country into near anarchy, derailing, among other things, a promising gorilla conservation program. The Zairean park service has habituated six gorilla groups for tourism. But with government soldiers machine-gunning hippos for meat within sight of the Virungas, visitors are understandably scarce. Park rangers like Kambale haven't been paid in months; they have been kept working only by handouts from conservation groups and the World Food Program.

This chaos is compounded by Zaire's refugee crisis. At the time of my visit seven huge camps sprawled on the Zairean side of the Virungas, mini-cities of fluttering blue and green plastic tarps. Together they sheltered some 746,000 ethnic Hutu—one-tenth of Rwanda's

Getting a head start in its threatened mountain world, an infant gorilla uses its mother as a ladder. Until the war Rwanda parlayed the apes' fame into an industry: Gorilla-watchers could book regular flights from Europe.

total prewar population. Most of the exiles had spilled over the Zaire border days before the Tutsi rebel victory in July 1994. Fearing reprisals, many have refused to go home. Meanwhile they have hacked down, for firewood, several square miles of Virunga National Park—a world heritage site that encompasses one of the oldest rain forests in Africa.

"Even though the deforestation hasn't hit gorilla habitat yet, the sheer scale of the problem puts them at risk," a UN environmental expert tells me. Whipping out a pocket calculator, he tallies the damage. "Very, very roughly? Two hundred thirty truckloads of trees are coming down per day."

Kibumba camp, the largest tent-city with 200,000 people, sends out 16,000 wood gatherers every morning. They have stripped the nearby foothills of almost every tree. Mountain gorillas live in forests only a four-hour walk away.

"We know the cutting is very bad," says Elie Sebigoli, a Rwandan park warden languishing in Kibumba. "But we have to cook to eat."

Sebigoli is a big Hutu man with a friendly round face, who, in a world of barrel latrines, scabies, and rationed corn, talks ebulliently about gorillas. He knows the haunts of gorilla bands in the Virungas. He says he used to travel from village to village in Rwanda, showing conservation films on a portable screen.

Will he ever go back?

"They will kill me," he says of the Tutsi, as if by rote. "There will be no coexistence. No reconciliation. Never."

Sebigoli has built his family's green plastic shack to face the cone of Mount Karisimbi. The volcano rises, ethereal, above the camp's hovels, a majestic reminder of home.

Sebigoli assures me that he hurt no one in the war. He blinks slowly, staring at the peak, when I tell him that his old office at Volcanoes National Park headquarters is in ruins, scattered with the charred poems of schoolchildren.

NYAGAKENKE, UGANDA

"A stool," Ezekiel Nsanzumuhile says tonelessly, standing before his cracked mud hut. "Two plastic water jugs. A cook pan." He holds each item up as if it were an exhibit in a trial. "A bamboo basket. A pot. That's all."

Nsanzumuhile lists his worldly possessions

for me and jabs a spidery finger to the soaring slopes of Mgahinga Gorilla National Park, Uganda's small slice of the Virungas. He tells me that his four-acre farm and the house his family lived in for 20 years were seized to make way for new parkland in 1992.

"I have two wives and eight children," he says. "The gorillas get saved, and we starve."

Mgahinga's expansion—actually the reclamation of former parkland that's been encroached on since the 1950s—is an unprecedented sign of gorilla clout in East Africa. Over the past seven decades, as the regional population exploded, half the Virunga ecosystem in Rwanda was converted to agriculture. But to save habitat for gorillas here in Uganda, almost 2,000 farmers have been ejected from 3,500 acres of prime land.

From the doorway of his new homestead, Nsanzumuhile can see his former fields on the green slopes of the volcanoes. It's a beautiful view—luminous, quivering sheets of grasses—that only reminds him of what he's lost. Like his 25 goats, which he sold to pay for the food he can no longer grow.

"When I was young, we used to see gorillas eating in the trees, it was nothing," Nsanzumuhile remembers. "Now the white people come and see them, and the government says they will help us. We will be porters.

Vulnerable, inquisitive, and gentle, mountain gorillas—like this family group near Karisoke—strike a chord in humans that transcends kinship. "It's not just our loss if they disappear," says a Rwandan park administrator. "It's everybody's."

But I have seen no benefits from tourists."

Ugandan officials insist that Mgahinga's expansion is more than an attempt to grab gorilla business from Rwanda and Zaire. "We want to do things right," said Alfred Labongo, a national park service planner I met in Kampaia, Uganda's capital. "We want to bring the local people into the park system. We want them to feel the parks are theirs, for Africans."

Mgahinga (and the nearby Impenetrable Forest) will offer neighboring villagers 10 percent of the revenue from gorilla tourism. This money will pay for schools and water projects. Labongo is also issuing local villagers licenses to collect medicinal plants, keep bees, and harvest edible bamboo inside national parks. In the new Uganda, even forest-dwelling Pygmies must carry user permits.

Whether or not this economic approach to conservation will succeed remains to be seen. But if it fails, it is hard to imagine how the gorillas in Uganda or anywhere else can hold out. The humanity surrounding their remnant forests is swelling fast: Rwanda's prewar population of seven million represented a sevenfold increase in this century. The number is predicted to double again in just 25 years.

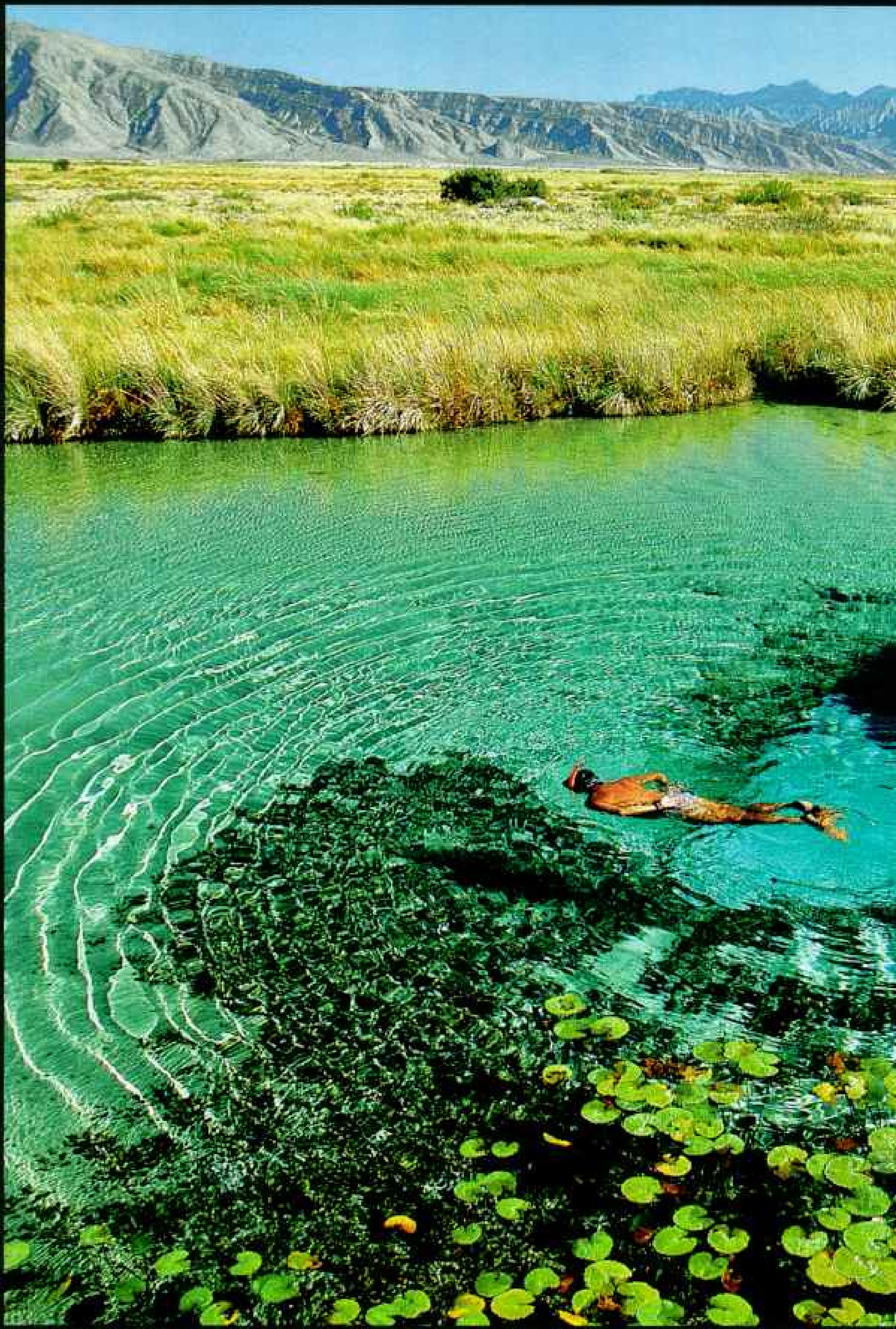
"Think too far ahead about gorilla conservation and you get depressed," admits Craig Sholley. "But just remember that for the first time ever, gorillas and people depend on each other for survival. Now you can't separate the fate of the two."

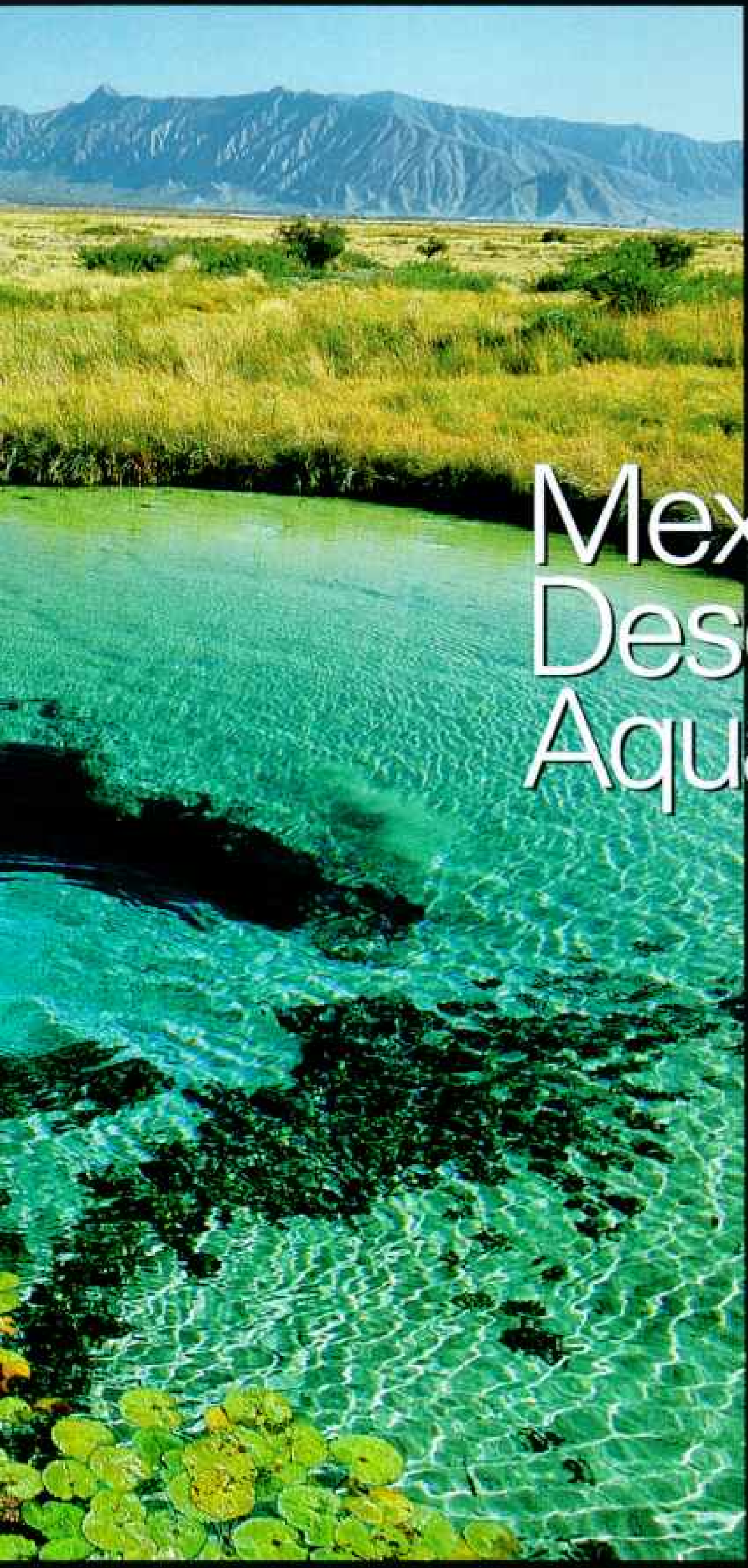
Remarkably, even those who suffered the most in Rwanda's years of violence—a Kigali taxi driver whose entire family was killed, a Ugandan park ranger who lost a leg to a land mine—cheer on this economic alliance.

Yet for me, it will always be the gorilla's capacity to bridge the gulf between humans and animals that argues most strongly for their preservation. This thought strikes home on a steamy afternoon when Sholley and I join a group of tourists slogging through the mud of the Impenetrable Forest.

Soft cathedral light filters down through the rain forest canopy. Copper-winged butterflies float by, snatching stray sunbeams. Suddenly, up ahead, the Ugandan guides freeze. Twenty feet away, wreathed by a thicket of wild celery, a female gorilla cradles an infant on her lap. The baby, dependent on its mother for its first three or four years, is the size of a human toddler. Both pause, and regard us with shining, umber eyes that seem ageless, depthless.

I'm not sure what people see in those liquid irises—recognition? lost innocence?—but the young German woman next to me giggles with delight. A travel-jaded Australian on safari through Africa stands speechless, her mouth agape. I realize I have stopped taking notes, and that I am grinning. And that Craig Sholley is grinning back at me. □



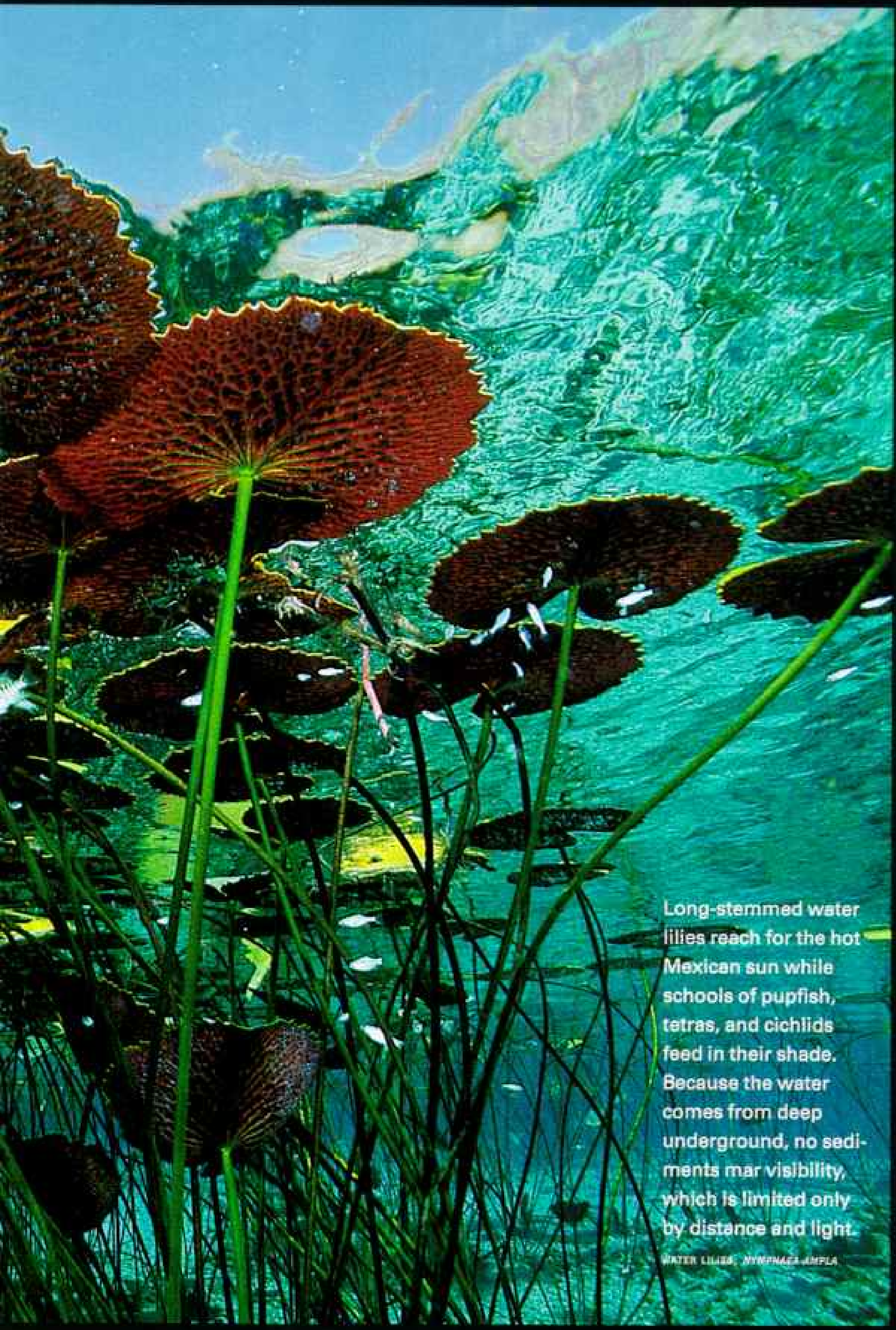


CUATRO CIÉNEGAS

Mexico's Desert Aquarium

Smack in the middle of the blazing Chihuahuan Desert, a snorkeler scans the bottom of a spring-fed pool for aquatic life. Known as Cuatro Ciénegas, or "four marshes," this unique region of sparkling waters was recently set aside by the Mexican government as a biological reserve.

Article and photographs by GEORGE GRALL



Long-stemmed water lilies reach for the hot Mexican sun while schools of pupfish, tetras, and cichlids feed in their shade. Because the water comes from deep underground, no sediments mar visibility, which is limited only by distance and light.

WATER LILIES: *NYMPHAEA AMPLA*

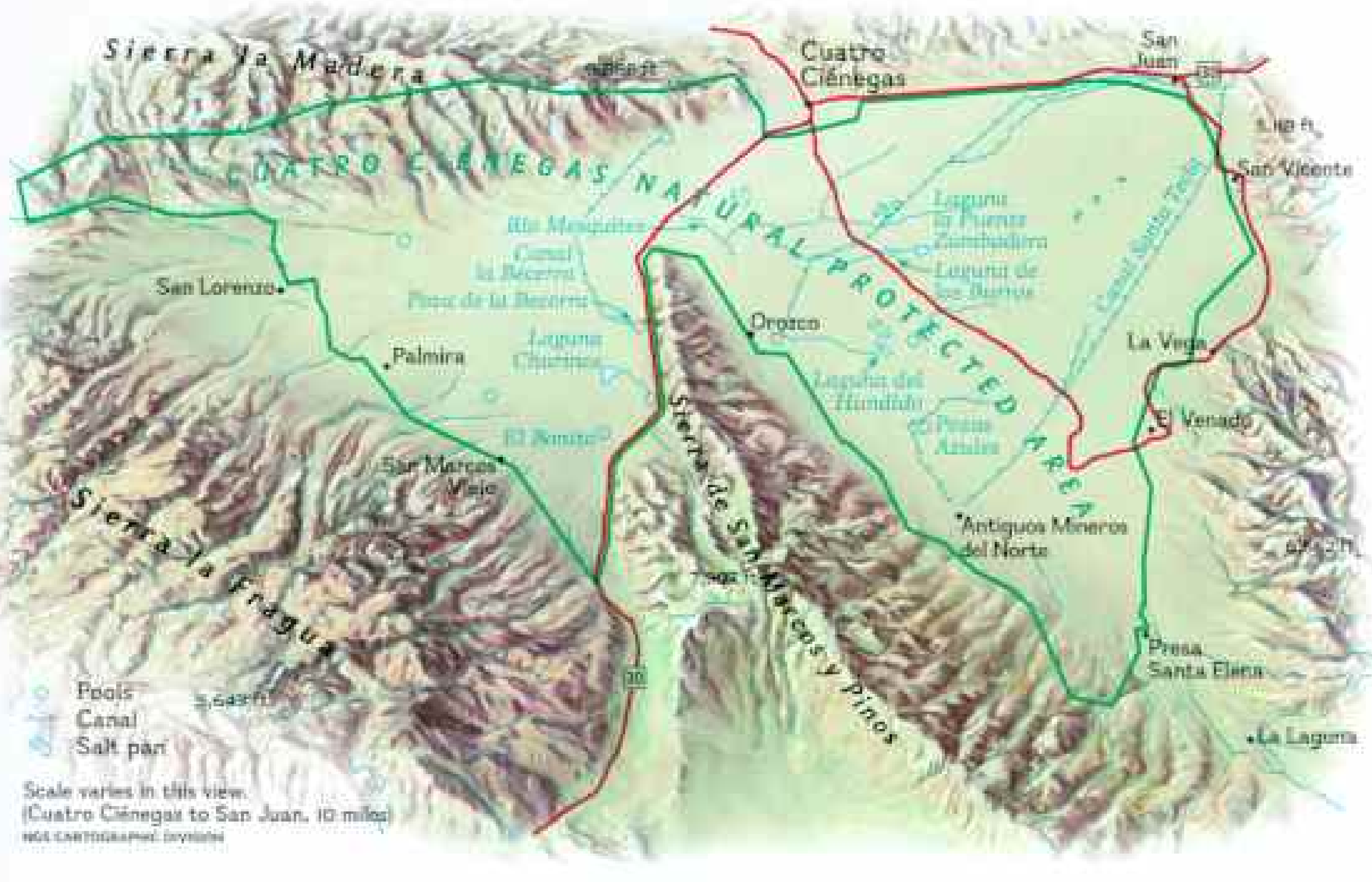
A Desert Realm of Fish

■ A small valley in the Chihuahuan Desert, Cuatro Ciénegas harbors within its 500 or so square miles one of the world's rare inland-desert wetlands.

Underground water—some warm, some cool, most of it highly mineralized—flows to the surface through a little-understood system of subterranean channels, probably from deep aquifers. While human beings have been exploiting this water for centuries, only recently have biologists discovered that an amazing number of other species have been exploiting it as well.

When I first came here in 1978 to photograph box turtles, the count was not in. Now more than 60 species found only here have been identified, ranging from cactuses to snails, scorpions, fish, and reptiles. What's more, hundreds of nonendemic species make the valley a biological garden.

Where there is water, so are there fish—in the *lagunas* (lakes), in the *pozas* (pools), and in the many canals, such as those tapping the blue waters of Pozas Azules (bottom right). Countless pozas are natural aquariums, with only a few hundred gallons of water. Even the larger lagunas are seldom more than 250 feet wide or 25 feet deep. In Poza de la Becerra—"pond of the young calf"—tetras swirl about diver Jesus Lopez.



Salt and Water of the Earth

■ A chilly Rio Mesquites zigzags through a marsh of salt grass, sedges, and bunchgrass east of the Sierra de San Marcos y Pinos (above right). In the foreground lies one of the valley's many salt pans, or *salinas*, formed when runoff collects in depressions then evaporates. The region's salt marshes are alive with snakes, turtles, and fish. In the surrounding desert scrub, and in mountain chaparral, graze wild horses and burros, introduced from Europe by the conquistadores.

Local naturalist José "Pepe" Lugo examines a bone-dry travertine limestone channel (above left), one of many mysteriously dried-up waterways. "Some of the pozas have also dried up," he says. A resident of the region for 75 years, Lugo had a number of species named after him by biologists grateful for his

knowledge and tireless assistance. He worries that use of the valley's surface water and the pumping of aquifers for irrigation may be causing the water table to fall, though scientists have not confirmed this.

When I talked with W. L. Minckley of Arizona State University, acknowledged dean of Cuatro Ciénegas biology, he agreed that the valley's aquatic habitats are threatened, not just by local water users but also by increasing recreational use. "Both national and international efforts are needed to preserve this spectacular wetland for posterity," he warns.

The Cuatro Ciénegas region has been inhabited for some 10,000 years; the first canals were probably dug by Spanish settlers in the 1600s. Most of the valley's water is too laden with minerals for human consumption, and farmers using it for irrigation usually have to mix it with fresh water.

Adapted to Life in a Poza

■ Like a desert-bound Galápagos, Cuatro Ciénegas has enjoyed the relative isolation and geologic stability necessary to foster a remarkable variety of endemic species. Of the 16 fish species in the small valley, eight are found only here.

Two varieties of the cichlid *Cichlasoma minckleyi* are sustained by one of the most diverse populations of endemic aquatic snails in North America. Clustering around springheads (above right) and hiding in sediment created by their own feces, most of the snails are about an eighth of an inch across. To uncover them, one variety

MEXINNUS SPP.

of this three-inch-long cichlid (left) cruises along the bottom, fanning the sediment. Swallowing snails whole, it is able, with a set of powerful teeth halfway down its muscular throat, to crush their shells and consume their flesh. I was often amazed to hear, from halfway across a poza, the underwater grinding sounds of cichlids feasting.

A second variety of this cichlid species, with smaller throat teeth, lives off what appears to be sand along the bottom of pozas and lagunas. But it is actually the rich detritus of snail feces and bacteria that grow in them. With mouth agape, the cichlid (far left) targets a spot on the lake bed, then plunges tail-deep into the sediment (center). After feeding, the fish ejects with a puff the matter it cannot digest.

George Grall is the staff photographer for the National Aquarium in Baltimore, Maryland. His work on seahorses appeared in the October 1994 GEOGRAPHIC.

PALAEMONETES SUTTKUSI (ABOVE); CYPRINODON ATRORUS (BELOW)

TERRAPENE COAHUILA

Survivors and Their Aquatic Turfs

■ Unique in its ways, the Coahuilan box turtle—like this pair in Laguna de los Burros—spends much of its time underwater. While other box turtles evolved as land creatures, the Coahuilan remained aquatic, or may have returned to the water from land as local desertification occurred. Omnivorous, it feeds on plants and small fish—anything it can catch.

A spring pool embraces two worlds: one above and one below the waterline. Surrounded by cattails, most pools are alive at the surface with Mexican ducks and migratory waterfowl. Underwater their character is dictated largely by water temperature. Fed by a cool spring, Laguna del Hundido is often green with stonewort algae, which in turn swarms with endemic shrimp. An inch-long female grass shrimp (above left) carries eggs in her abdominal pouch, through which developing embryos are visible.

Pugnacious and posturing, a male Coahuilan pupfish bites a rival's anal fin (left). During breeding season males will not tolerate one another's presence.

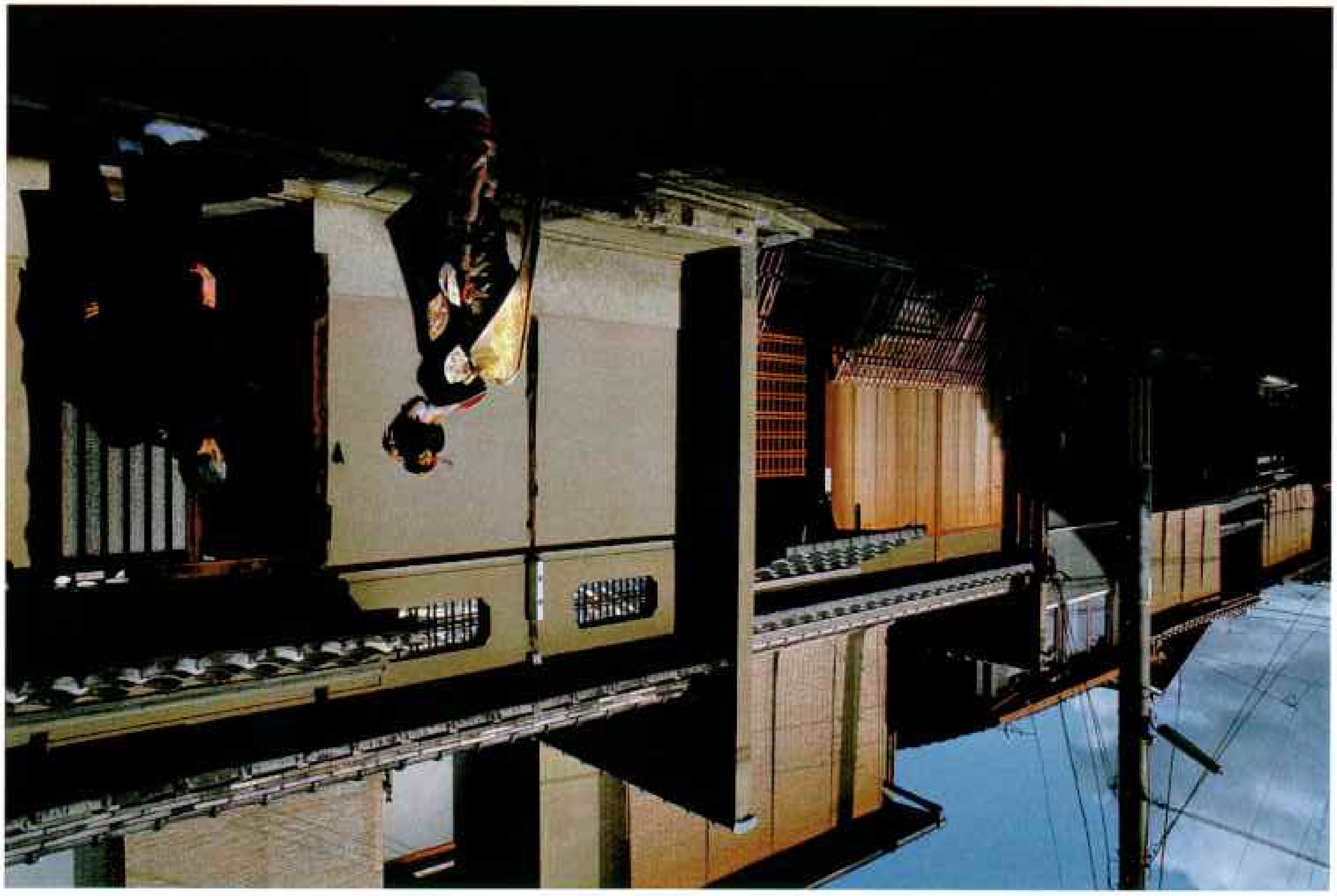
Hardy survivors, little more than an inch long, Coahuilan pupfish can withstand especially high temperatures and salinity. During rare spells of rain, or when variation in a spring's outflow causes local flooding, they swim into the temporary waters, only to be stranded in hot, saline cracks and pools. Awaiting rescue, a few live to fight another day.

Spawned by water and wind over the ages, the valley's gypsum dune fields are the only ones in Mexico. Formed downwind of saline lakes, the dunes—like these near Laguna Churince—are a dwindling habitat for many desert species. Intensive mining for use in wallboard and fertilizer had substantially reduced the dunes by November 1994, when Cuatro Ciénegas was decreed a natural refuge. Conservationists hope that further encroachment will be regulated and that Mexico will be able to protect one of North America's rarest environments. □

SEALED LIPS *symbolize a geisha's code of honor. Entertainers of Japan's male elite through music, dance, song, and conversation, geisha are valued as much for discretion as for beauty. These icons of Japanese culture have practiced their* gei, *or art, for 250 years. As modern ways supplant tradition, true geisha have dwindled to fewer than a thousand.*

GEISHA

Article and
Photographs by Jodi Cobb
NATIONAL GEOGRAPHIC PHOTOGRAPHER



BOUND BY DUTY—*and formal kimono—a* maiko, *or apprentice geisha, visits Kyoto teahouses on the first day of her career.*

THE GEISHA DISTRICTS OF KYOTO present a blank face to the world: seamless rows of aged wooden facades, tiny two-story houses whose bamboo shades blind the windows, blocking any glimpse inside. It was in brothels here and in the pleasure quarters of Tokyo and Osaka that geisha first appeared in the 17th century as dancers and musicians. The earliest geisha were men, but by the mid-18th century the profession was dominated by women—the tradition that remains today.

The modern geisha is the aristocrat of the huge industry that has evolved through the centuries to cater to Japanese men's sensual desires. But she is not a prostitute. If she provides sex, it is at her discretion or as part of an enduring relationship. Her business is to sell a dream—of luxury, romance, and exclusivity—to the wealthiest and most powerful men of Japan. Inside the most expensive restaurants and teahouses, as men conduct delicate business negotiations, geisha pour the sake and keep the conversation flowing—at a cost of thousands of dollars.

The few women who enter the geisha world today are drawn by a romantic image or a love of traditional arts. But before World War II most geisha had no choice, they were born into the trade or were forced to join it just to survive.

In a society where a woman's place was either in the home or in the brothel, geisha carved out a separate niche, creating a community of women that became known as the "flower and willow world." They dressed in lavish silk kimonos and strove for perfection in makeup and courtly manners. In their 19th-century heyday, they were pacesetters of fashion and popular culture, the supermodels of their time. But as Western culture overwhelmed postwar Japan, the geisha froze in time, clutching tradition as their appeal.

A geisha, which means "a person who lives by art," studies tea ceremony, calligraphy, and an instrument called the *samisen*, and trains for dance performances that are the only public exhibition of her talents. In these extravagant shows geisha move through a series of restrained and elegant poses, displaying little exuberance.

But the art that geisha reveal at the private parties they attend nightly is another matter. As the men sit down to dinner, geisha kneel at their sides, flirting and smiling, offering delicacies and pouring sake. When the alcohol kicks in, ties and tongues loosen. The geisha play party tricks, strum samisen, and sing bawdy songs. They provide an illusion of romance in a work-obsessed culture that has little opportunity for the real thing.

For all her artistic accomplishments, it is the geisha's skill in conversation that Japanese men claim to appreciate most. She is fluent in the news of the day and the gossip of the theater or sumo world. She has studied the male ego and tends it like a garden. She knows a man's moods and his seasons. She fusses, and he blooms.

The world of geisha does not give up its secrets easily. The geisha's impassive white mask shows little emotion, and her strict code of silence and fierce protectiveness toward clients conspire against revelation. It is a formidable barrier for a photographer to penetrate. I was fortunate to find a geisha who wanted the world to see the worth of these women whose lives have been hidden for so long. This 54-year-old beauty persuaded reluctant geisha to participate, took me to the geisha houses, backstage dressing rooms, and private parties that few outsiders have ever seen.

As I discovered the women behind the masks, I came to know their truth. Through discipline and talent, the geisha has created a life of beauty. She has made herself into the image of the perfect woman, the embodiment of Japanese culture and refinement, a living work of art. That is the source of her pride and her salvation.

Adapted from the book *Geisha*, by Jodi Cobb, to be published this fall by Alfred A. Knopf, Inc.

COLORFUL CHAOS *reigns in a tiny Kyoto geisha house as three maiko, joined by young helpers and an "auntie," prepare for their evening's work. Relaxing between dance performances (right), two maiko show the close ties that can form in this insular world where women rule—so rare in Japan.*

"An obi is like a man's necktie. You tie it tight, and you become upright and rigid. I'm like a businessman putting on his suit in the morning, preparing for his daily battle, forgetting his personal life. When I put on makeup and a kimono, I turn into a geisha in my mind also. In a kimono, I am a professional."

— TOKYO GEISHA

MASKED BY MAKEUP *and fierce reserve, an 83-year-old geisha dancer and her young counterpart prepare for the stage. Spikes of paint accentuate a maiko's nape, considered sensual by Japanese men. Since young maiko today often abandon the rigors of geisha life, the average age of career geisha is now more than 40.*

"I have seen how geisha prepare their makeup, but I don't like to. I want the romantic ideal, not the reality. I don't want to know their tricks. I don't want to know their sad stories. I want to keep it as a dream, and they want to keep it as a dream for me. That's the business."

— KYOTO CLIENT

FLUTTERING FANS *and lashes enchant crowds at the annual Cherry Blossom Dances performed by maiko of Gion, the most famous of Kyoto's five geisha districts. Parasol in hand, a Tokyo dancer awaits her cue. Daily classes and discipline precede such spectacles—the only time geisha display their art in public.*


B-21

GLIMPSED IN PASSING *on streets or in cabs, geisha and maiko lead hectic, costly lives. Though paid handsome wages and tips for their nightly parties, much goes toward kimonos, which run thousands of dollars each. Since geisha can't marry, many take older lovers for financial and emotional support.*

"I'm tired of people's eyes. I'm tired of pretending to be someone I'm not, tired of flattery. I would love to be thought of as a frank and honest person, speaking and acting as I really feel. But this business won't allow that."

— KYOTO GEISHA

ORNATE JEWEL *in the austere elegance of a Kyoto banquet room, a maiko dutifully pours beer. As a geisha strums the three-stringed* samisen, *laughter bares the blackened teeth—once the custom for women—of a geisha dressed as an 18th-century courtesan. Male egos are indulged at such parties, which wives rarely attend.*

DRAPED FOR PRIVACY *in the traveling clothes of a 12th-century noblewoman, a geisha walks in Kyoto's annual Festival of the Ages. Once Japan's trendsetters of fashion and taste, geisha today are both scorned as antifeminist anachronisms and revered as custodians of a treasured past.*

"In this world the man holds the higher position, and the woman follows him. That's the way it should be. I must help and support him but not let him know. That is woman's virtue: to be strong on the inside but not let it show."

— TOKYO GEISHA □

The Two Worlds of Fiji

Evening calm ushers a fishing boat past a reef off Viti Levu, largest of 300-plus islands in this South Pacific success story. Yet tranquil surfaces cannot mask a troubling gulf between native Fijians and citizens of Indian origin.

By ROGER VAUGHAN

Photographs by JAMES L. STANFIELD

Goats came with Westerners in the 1800s; Fijian culture survived them both. At Yasawairara village, traditional houses of woven-mat walls and thatch roofs are gradually being replaced by cinder-block homes – better protection against typhoons. Coconuts and fish remain staples of the village's economy, supplemented by cash from cruise-ship visitors.

WHEN SOLDIERS marched into the Fijian Parliament, Jai Ram Reddy, the attorney general, thought it was an act.

"A member of the opposition was saying 'Political power comes from the barrel of a gun,' " he told me much later. "A few minutes afterward, soldiers came running in double file, wearing masks. I wondered if someone was filming a movie."

It wasn't a film. It was a coup. The troops marched to the front of the room, guns ready. "Ladies and gentlemen, this is a military takeover," an army captain said. "We apologize for any inconvenience caused."

The coup's leader, a 38-year-old lieutenant colonel named Sitiveni Rabuka, strode to the podium saying, "Please stay calm, ladies and gentlemen. Stay down, remain calm."

The coup, which displaced the upstart descendants of Indian immigrants, who now make up nearly half the Fijian population, happened back in 1987. But it, and the polite way it was conducted, still helps define this nation of hundreds of bits of coral and lava scattered over 125,000 square miles of the South Pacific. Beneath the serene surface of lazy sunshine and warm rain, life in Fiji is laced with conflict and uncertainty—but under that is more serenity. And under that . . . well, nothing is simple in Fiji.

Fiji is a nation of islands. Many of them are low coral or limestone hideaways of palm trees, trade winds, and white sand. The rest are volcanic towers cloaked with rain forests and sugarcane fields.

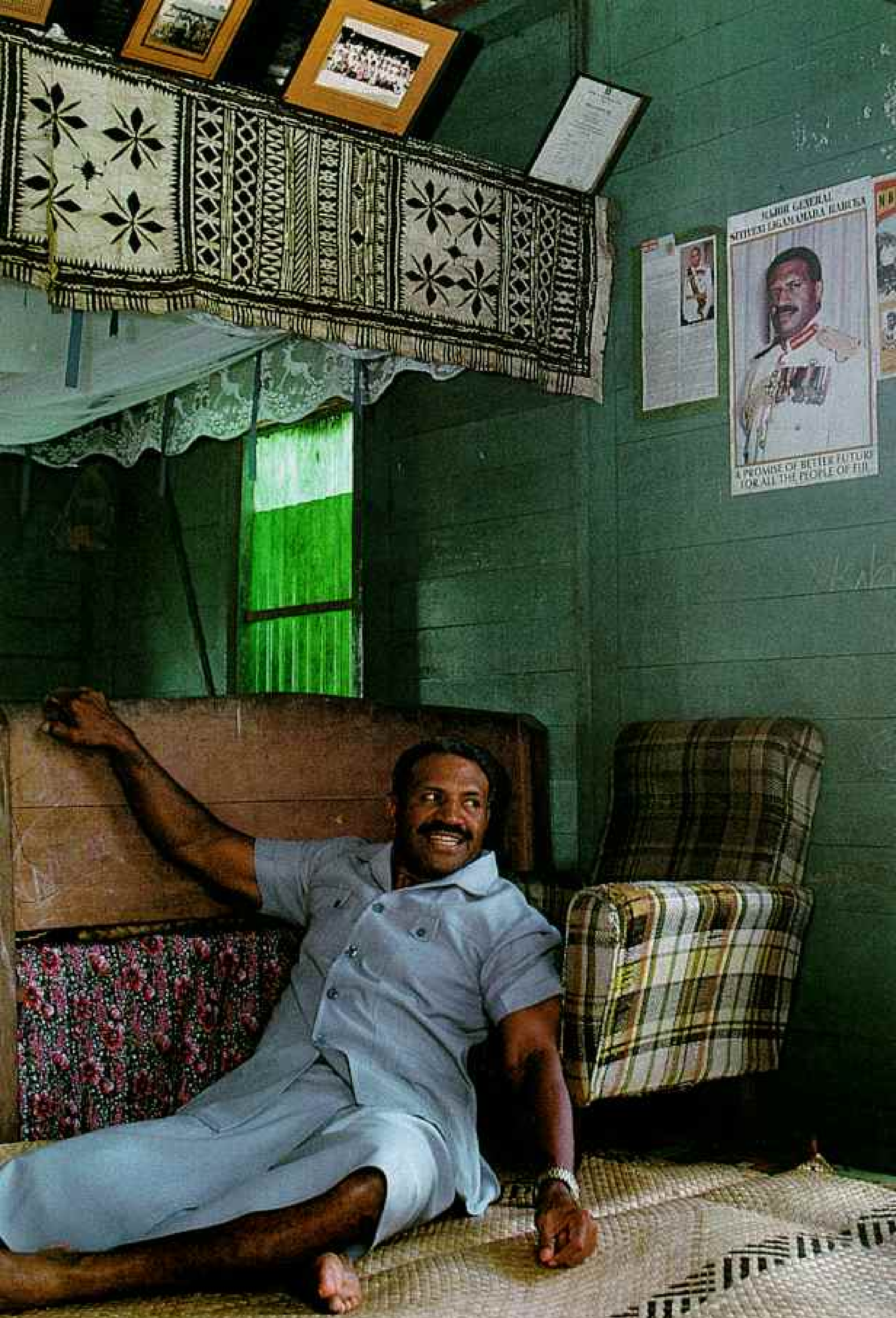
Most of the landmass of Fiji—about as much acreage as New Jersey—is made up of two volcanic heaps: Vanua Levu and Viti Levu, the biggest island. Vanua Levu has one booming town built around a sugar mill, but the rest of the hilly island is hardwood forests and villages connected by eyeball-rattling dirt roads. Viti Levu, by comparison, seems almost cosmopolitan, with centers of industry, commerce, government, and agriculture. But even Viti Levu is strikingly two-sided: On the wet eastern slopes rain forest fills the hills with deep green mystery and mist, while just 50 miles to leeward, grassy slopes and rock outcrops create a landscape that looks like southern California.

The islands' human history is as complex as their geography. First settled about 3,000 years ago, they became a racial mixing ground of Polynesians, who today dominate the central Pacific islands, and Melanesians, who predominate from New Guinea to New Caledonia. Charred, chewed human bones, dating to 500 B.C., provide the earliest evidence of Fiji's legacy of cannibalism.

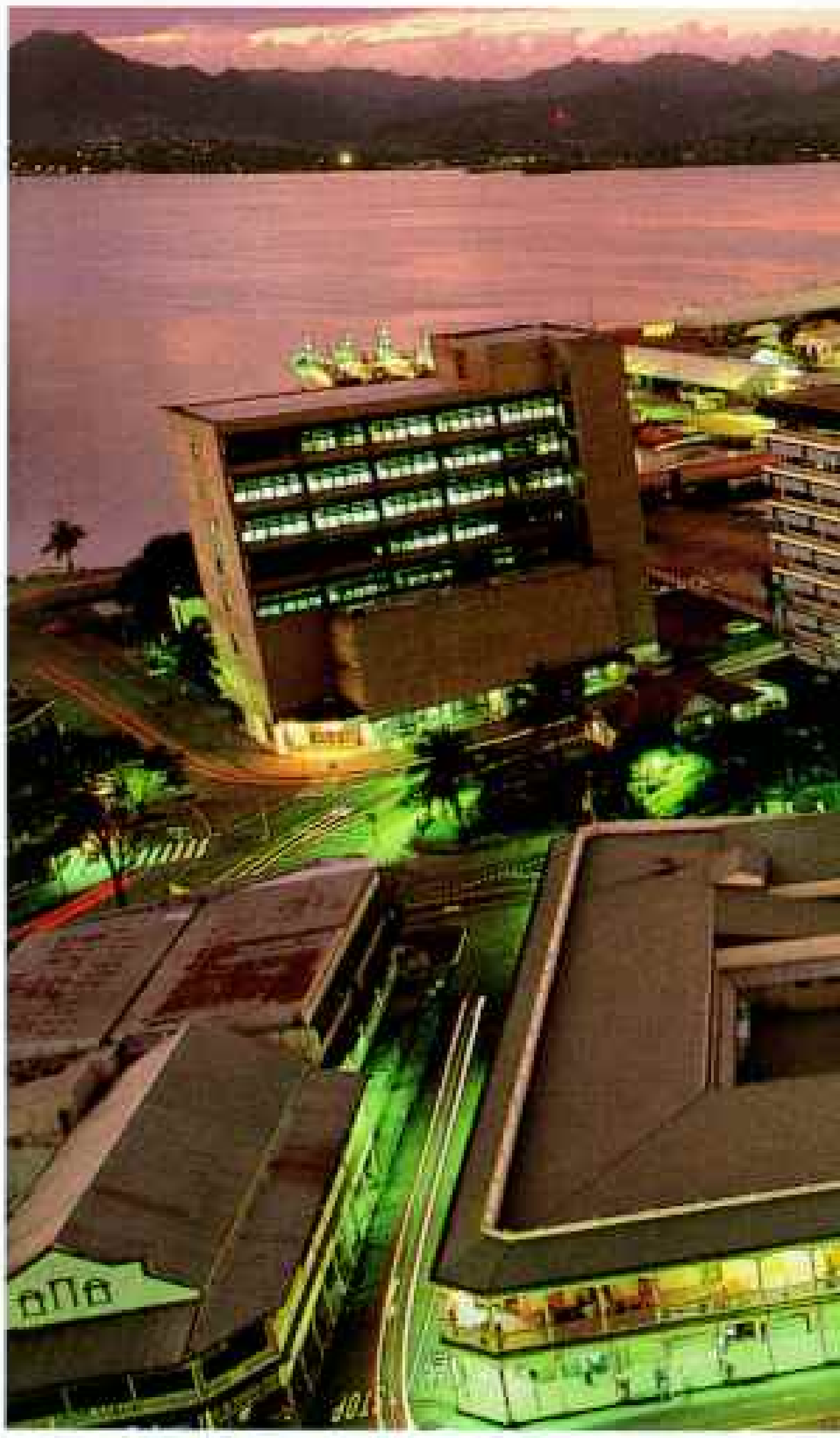
Dutch explorer Abel Tasman stumbled across the islands in 1643, followed by Captain James Cook in 1774. Captain William

The great divide of Fiji's politics is personified by Jai Ram Reddy (above), a leader of ethnic Indians, and Prime Minister Sitiveni Rabuka, a native Fijian (right). Rabuka led a 1987 coup that ousted an Indian-dominated parliament. Reddy demands reform of laws that now limit Fiji's Indians to a minority role in government.

ROGER VAUGHAN has written books on such subjects as the America's Cup and conductor Herbert von Karajan. JAMES L. STANFIELD, a former GEOGRAPHIC staff photographer, has traveled to nearly 120 countries during 53 assignments.


A PROMISE OF BETTER FUTURE
FOR ALL THE PEOPLE OF FIJI

Largest city between Honolulu and Auckland, Suva dazzles with cosmopolitan offices, shops, and entertainment. With 140,000 residents in its metropolitan area, the capital wraps around a superb deepwater harbor. By sea and air, Fiji serves as a hub linking Pacific nations.



Bligh was pursued by two Fijian canoes as he struggled home in 1789 after the famous mutiny on the *Bounty*. Tales of cannibalism kept Europeans away for the most part until the discovery of sandalwood forests brought loggers in the early 19th century. Fiji became a British colony in 1874. Five years later the colonists started a process that would change the nature of the islands forever.

On May 14, 1879, exactly 108 years to the day before Rabuka marched into parliament, a ship arrived from Calcutta, bearing 463 indentured servants to work in sugarcane fields. They were the first of a flood. By 1917, more than 60,000 Indians had landed in Fiji.

After Fiji became independent in 1970, some Europeans left. But the Indians remained, and now share the hundred inhabitable islands with Fijians almost evenly.

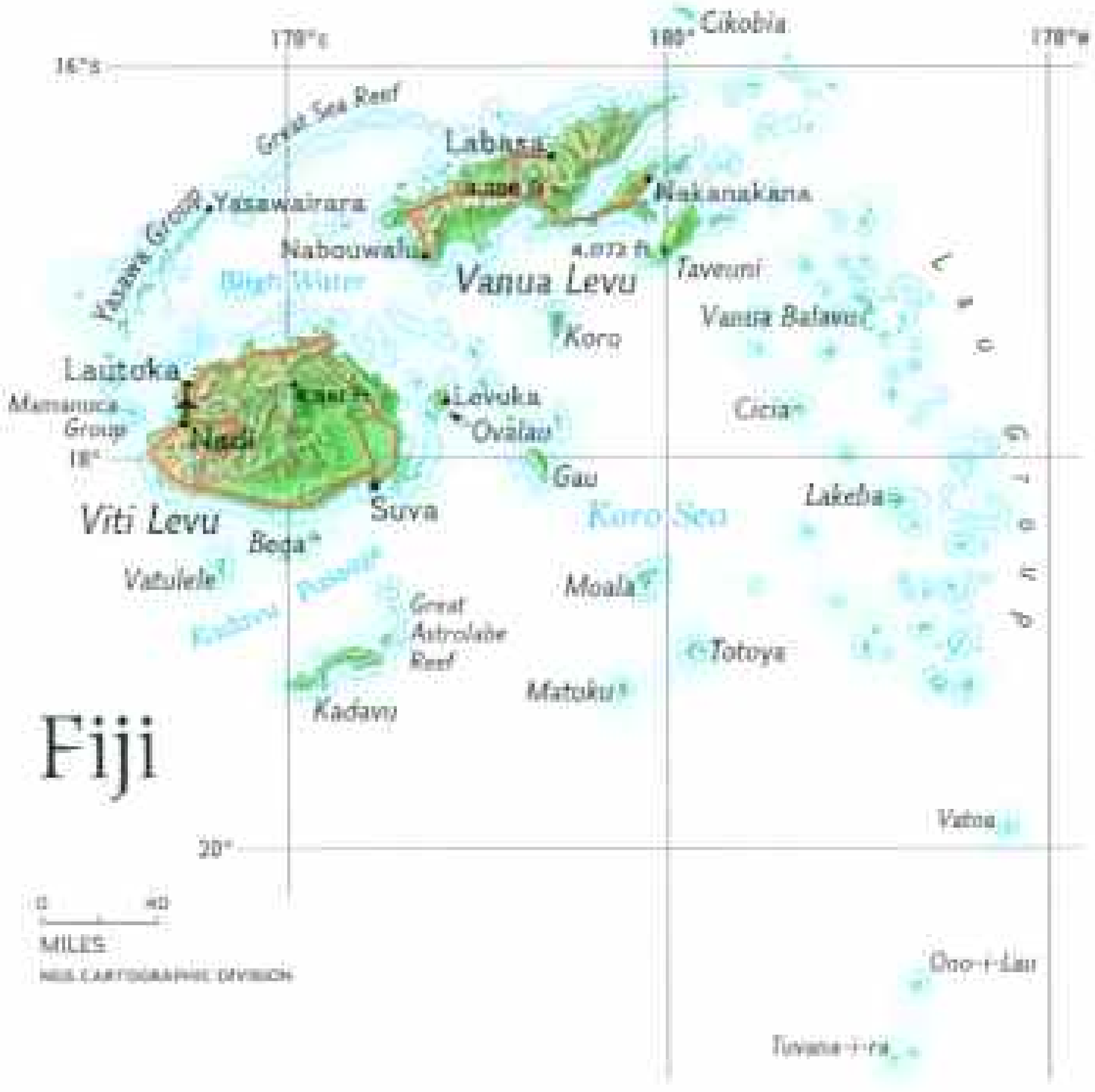
Today the two groups are like siblings who exaggerate their differences for the sake of identity. Fijians, the stereotype has it, are laid-back landowners, steeped in tradition; Indians are industrious and pragmatic: the shopkeepers, the lawyers, the doctors, the busy tenants of the land.

"The British established an atmosphere of separate development," said Jai Ram Reddy. "They were the intermediaries; the Indians and Fijians were never meant to integrate. When the British left, the two races had to deal with each other for the first time."

Yet, like most generalizations about this place, the definition of Fiji as a nation torn by race is not wholly accurate. As I traveled its roads, it became obvious that while racial division may dominate politics here, it is only part of a complex puzzle.

THE FIRST ROAD I TOOK into the varied worlds of Fiji began at the town of Nadi, on the dry west coast of Viti Levu, and ended at the capital city of Suva, in the humid east. The coastal two-lane blacktop was like a cross section of the nation. I shared it with Japanese luxury cars, log trucks, vintage buses, crawling tractors, careless dogs, fearless pedestrians, and occasional overloaded sugarcane trucks, which looked like mammoth, mechanized porcupines. When one of these creatures attempted any kind of grade, all movement on the road slowed to a crawl. The luxury cars fretted at my bumper like nervous horses, but everyone else just settled back in the diesel smoke and waited. That was typical: A writer once referred to Fiji's pace as "life in the languid lane."

This was the image I had expected. Glimpses of the languid lane revealed an easygoing, traditional way of life. The road led through villages built around the two fundamentals of Fijian life: a Methodist church and a rugby field. Indian villages maintained a Hindu temple. In each village 50 to 400 people grew their own vegetables, and, in



Fiji

AREA: 7,056 sq mi.
POPULATION: 773,000.
CAPITAL: Suva.
ETHNIC MAKEUP: Fijians 51%, Indo-Fijians 45%, other 4%.
LANGUAGE: English, Fijian, Hindi.
RELIGION: Christian, Hindu, Muslim. **PCI:** $2,140. **LITERACY:** 92%.
ECONOMY: Tourism, sugar, copra, apparel, gold, fishing, lumber.

some places, still cooked on wood fires and bathed in nearby streams. A few of the one-room homes were made of traditional woven-mat walls and thatch roofs. But most of them had been replaced by concrete blocks and corrugated metal. As I drove slowly through these communities, cattle and goats moved out of the way at their own pace. People waved, smiled, and shouted the traditional Fijian greeting: *"Bula!"*

This is one of the best words in the world. Whether I was walking in the somewhat run-down streets of Suva, the Manhattan of Fiji, or hiking in the forest, "Bula!" broke the ice.

Once, while walking on a remote dirt track, I encountered an enormous Fijian. He was hiking down the trail in the opposite direction, carrying a bundle of firewood with his left arm as if it were twigs. In his right hand was a huge cane knife. He was sweating and scowling. The man looked fierce. I tried the magic word. "Bula!"

He stopped, grinned, and asked where I was from. "The U. S.!" he said. "Aha!" Like many Fijians I met, he had family there. We talked of relatives and parted friends.

This tranquillity seemed widespread. The combination of sustained land ownership, a gentle climate, natural bounty, and blessed isolation appears to have produced secure, friendly, very relaxed people. But I began to discover a rigid structure of old and new tradition that holds this life together.

IN DEEP FOREST on Vanua Levu, near the remote village of Nakanakana, a large white helicopter shattered the morning stillness as it descended upon the rugby field. Sitiveni Rabuka, erstwhile coup leader and now prime minister, stepped out, dressed in a traditional short-sleeved jacket and matching mid-calf skirt. It was time for a district meeting, designed to get the prime minister out among the people.

The meeting was largely ceremony. It began with the presentation of a sperm whale's tooth to Rabuka, a traditional gift of honor, then got around to an encounter with a drink called *yaqona*, also known as *kava*.

Much has been written of kava, mostly by non-Fijians. It is a brown, nonalcoholic drink made of water and the crushed roots of a pepper plant and drunk from a coconut cup called a *bilo*. It has a mild anesthetic effect, gently numbing lips, mouth, and mind. It tastes like a combination of muddy river water and yesterday's tea. This may be why it is customary to drink kava quickly. In ceremonies like the district meeting, one claps once before chugging the contents of the bilo, then claps three more times, as if in triumph.

Fijian life is riveted together by such traditions. Many of the transitions of everyday life are marked by elaborate rituals, and everyone's place in society is clearly defined. Community leadership is still largely hereditary, and Fijians revere their chiefs. This adds complexity to modern life: The prime minister is a commoner, and this concession to today's world does not yet seem entirely appropriate to some Fijians. As I visited various communities with Rabuka, kava ceremonies told the story: At one village Rabuka was served his kava first; at another the first bilo was offered to the village chief.

In one town I was startled when several women in colorful dresses suddenly began a merciless teasing of Emori Tudia, the prime minister's large and dignified personal secretary. This was a custom, Rabuka explained, called *tauvu*. It is a kind of sister-city relationship, in which people from one village have teasing rights with those from another.

The women teased Tudori about his appetite, but this was a relatively mild gibe. Strong men have been known to wince at the unexpected appearance of female tauvu cousins, who can be embarrassingly naughty. In the spirit of tauvu, government officials have been playfully kissed at inopportune moments, and on more than one occasion have had their heads draped with petticoats at social gatherings. Rabuka sees this as a healthy leavening.

"The Israelis and Arabs should have tauvu," Rabuka told me. "They are from the same tribe, the same island. Maybe we can educate them."

Tauvu is one of many early customs, legends, and taboos that coexist with a dominant Methodist faith that was brought to the islands by missionaries in 1835. Within half a century the Fijians dropped cannibalism for Christianity.

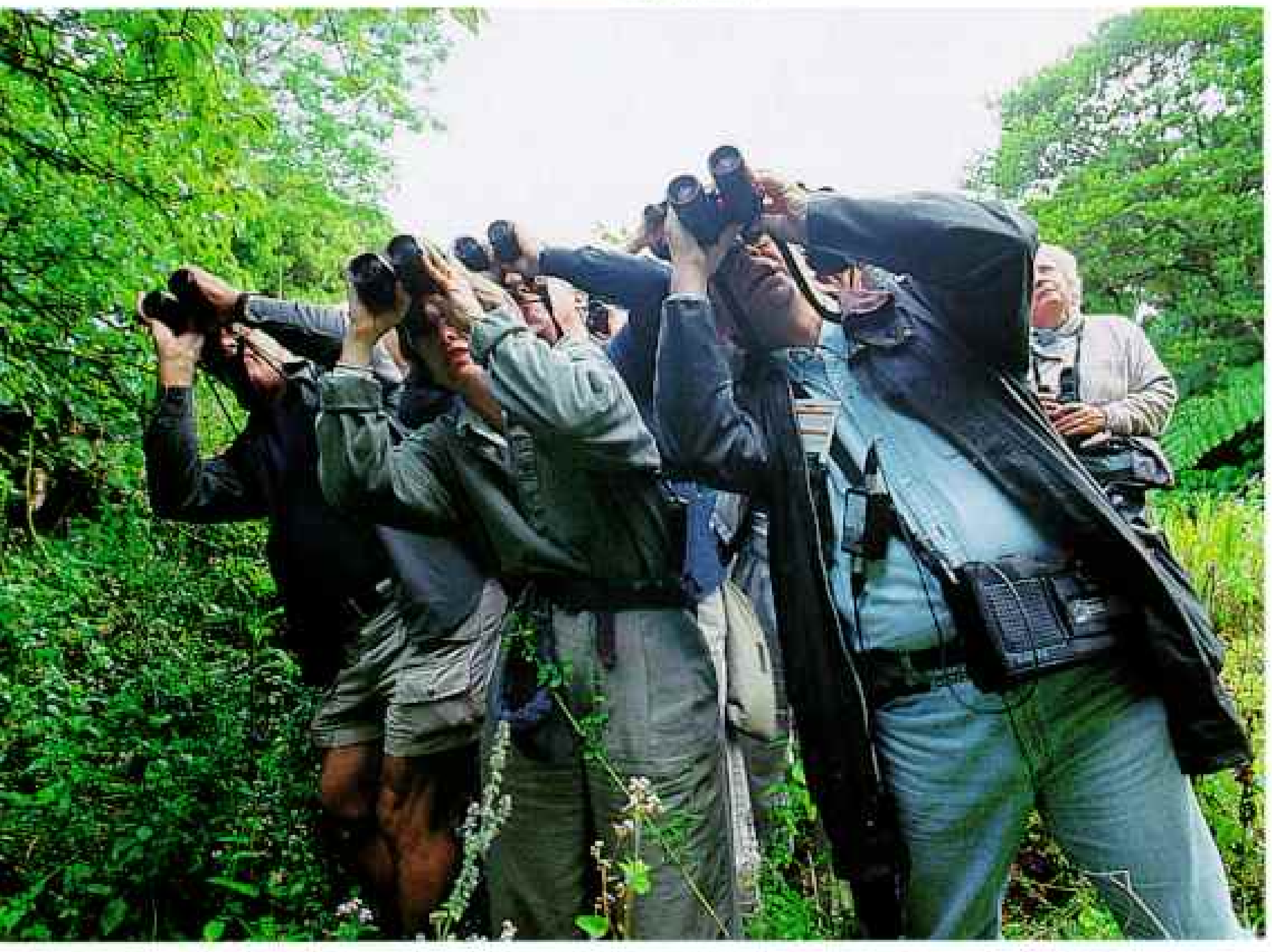
Why, I asked a young Fijian aristocrat named Ratu Tanoa, did his people give up their old ways so fast?

"We Fijians are logical people," he answered. "The English showed us their knives. They were much better than ours. If

PHOTO SOLITAIRE/US

Aiming double-barreled optics at feathered quarry, birders on a tour from the U. S. visit Taveuni, known as Fiji's Garden Isle. Virgin forest offers prized sightings of such species as the collared lory, or kula bird, found only in Fiji. Early European settlers stripped the islands of sandalwood trees but soon turned to plantation crops, so large tracts of forest have survived.

Villagers on Taveuni have created a park with trails and shelters to attract backpackers. Fiji has asked the United Nations to consider some parts of the country as world heritage sites. Ecotourism is new to the recipe of beach resorts and cruise ships that has boosted tourism past sugar as Fiji's leading industry. Yet since only 25 percent of the country's arable land is farmed, specialty crops such as ginger have room to increase economic growth.



Just a short boat ride from Fiji's international airport lies the South Seas dreamworld of the Mamanucas, volcanic islets in a living sea of coral reefs, turtles, and tropical fish. Known to the international diving set as a prime destination with great unexplored potential, Fiji is also growing in popularity with charter-boat sailors, surfers, and windsurfers.

the English knives were better, it followed that the English god had to be better."

Tanoa took me to a symbolic place on a small island just off Viti Levu. There, in a Methodist church, is a big stone. It's about four feet high. In its concave top is a puddle of water.

"This stone was used for killing captured enemies," Tanoa said. "The guy kneeled, his head was placed in the depression, and"—he raised his fists—"the club came down. This stone has been washed with a lot of blood." He paused. He smiled.

"Now," he said, "it's a baptismal font."

Another day I brought up the subject with a Fijian woman. "We keep culture alive for identity," she said. "As Christians we try to ignore certain myths and legends, but we can't. We combine both. Without culture, we just float around."

THE LANGUID LIFE of kava, teasing, and a rich culture is seductive. One afternoon I went for a dive off the island of Taveuni, near Vanua Levu, then went ashore with the boat captain's son. In the bush we picked a bag of wild limes and a handful of hot chilies and stuffed our pockets with lemon leaves. Back on the boat we made lemon tea. On the way home our trolling line caught dinner—a four-foot mahimahi.

Later I dived even deeper into Fijian life and traveled two and a half days by boat from Viti Levu to Lakeba, the largest island in Fiji's Lau Group, a collection of about 60 low volcanic and limestone islands strung out along a north-south line. Here are spectacular beaches with thick groves of palm trees—classic images of paradise.

About 2,000 people live on Lakeba, in eight small villages. A boat calls weekly with mail and supplies. In the villages running water is uncommon, and toilets are communal. There are several shops and a telephone exchange, a hospital, a small prison, a company called Fiji Pine Ltd that plants and harvests trees, and a post office. In the evening at each village a small generator provides a few hours of electricity, just enough for lightbulbs. Everyone travels by hopping on and off the backs of trucks that circle the island like unscheduled buses. Some people hand the driver a few coins as they depart, and some don't.

One morning I watched women pole their boats out into the cove at high tide and set a long net inside the reef. Six hours later, after the tide went out, they walked the shallows with their children in tow, collecting trapped fish. They sat in the water to clean them while the children played. One small boy held a boxy green triggerfish in the air like a toy airplane, then put it in a pool and gave it a push. The fish moved its tail twice, then drifted. The boy laughed with delight.

The peaceful scene reminded me of the day

Verdant patchwork of sugarcane fields cloaks Viti Levu's west coast. Forebears of today's cane cutters came from India under British rule as indentured workers. Indo-Fijians now form nearly half the population. Most growers lease small holdings from native Fijians, who by law own 83 percent of the nation's land under a communal system.

of the prime minister's district meetings on Vanua Levu, after I escaped the endless speeches and found a warm lawn. There I sat in the sun and had an easy conversation with two old men.

"Come live here a couple months," one of the men said. "All free. Coconuts, vegetables from garden, breadfruit and papaya from bush, plenty chickens, pigs, fish from sea, water from river . . . everything you want."

And if you don't have what you want, you borrow it. In this economy, sharing the wealth is customary. If you need a chicken, you take your neighbor's. If necessary, you invoke *kerekere*, a request that can't be denied. As I lounged on the grass, this life seemed ideal. When I suggested that I wouldn't mind doing some work to contribute to my upkeep, the two old men chuckled. I obviously didn't get it. Work, at least as I understood it, wasn't part of the deal.

BUT NOTHING IS SIMPLE IN FIJI. What I thought of as work may have been foreign to them, but hard labor wasn't.

"There's an old story about a colonial," said Martin Livingston, a fifth-generation descendant of Scottish immigrants who runs a resort on Vatulele, a small island south of Viti Levu. "The colonial comes upon a Fijian lying in a hammock drinking from a coconut, a fishing line around his toe. 'Get up!' the colonial says. 'Why?' 'Because you've got to go to work and earn money.' 'Why?' 'So you can make investments, educate your children, and establish a retirement fund so you can go to a South Pacific island and lie in a hammock with a fishing line around your toe, drinking from a coconut.' "

The story is apocryphal but significant. Many visitors from industrialized nations—including the British colonists—have described Fijians as lazy. That impression is addressed in an anthropologist's book in a chapter cautiously titled "The Preference for Leisure." The author argues that Fijians, far from lazy, are "virile, resourceful . . . energetic" people, who adapt to the steamy climate and the variable demands of a subsistence lifestyle by resting when they can and working hard when they must.

I got the same impression when I visited a national Methodist conference, a major annual event. Only about 600 church officials are required to attend, but the meeting attracts more than 10,000 people who simply want to be there.

The July conference was held in the tiny village of Nabouwalu, on the south end of Vanua Levu. The village is accessible only by riding four hours on washed-out dirt roads or by water. No problem: Fijians will ride a log if it gets them where they want to go.

Rusty old ferries pulled into Nabouwalu's dock twice a day, each crammed with more than 600 men, women, and children. Rain squalls rolled through every 20 minutes. Dressed in multicolored robes, members of 200 choral groups, there for a competition, stood in mud in long, serpentine lines. The singers washed their feet in puddles before entering the church.

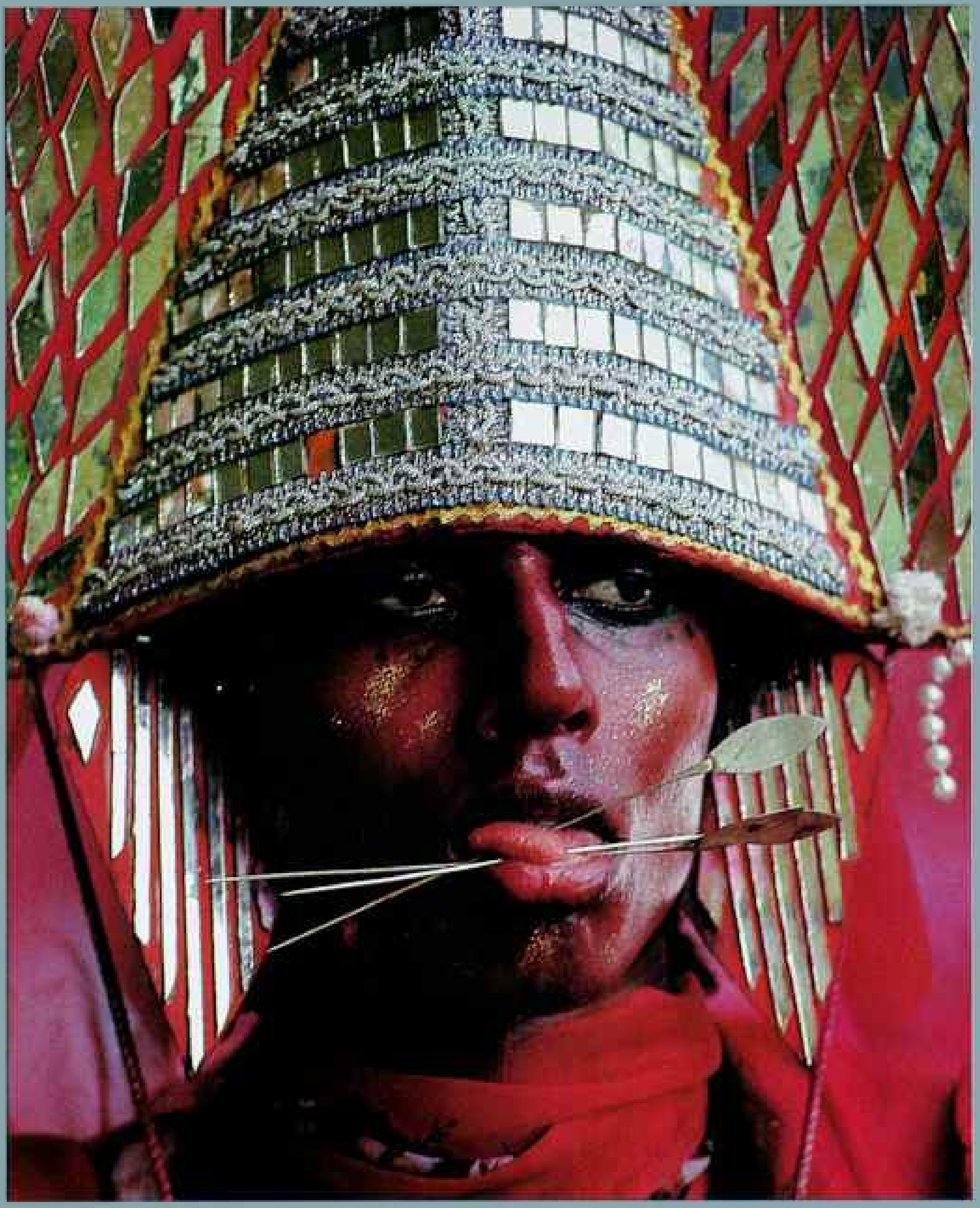
I learned later that Nabouwalu had suffered severe damage from a storm the previous January. Yet village volunteers had worked virtually 24 hours a day for six months to repair the damage and prepare the church. They saved the emergency canned rations they had received after the disaster for the conference.

The conference and at least one severe tropical storm are annual visitors to one island or another. Both are inevitable, both have enormous impact, and both require exhausting toil. Work? No problem.

So Fijians seem to shirk not labor but employment—the nine-to-five grind that the industrialized world has made an ethic. And why not? Until the British brought sugarcane and the work-for-cash idea to Fiji, there wasn't any reason to live that way. It struck me that the British arrival created a niche in the life of the islands that was like any niche in an ecosystem—a space that can only be filled by life adapted to the purpose. Fijians were not adapted to fill the cash-economy niche, but Indians learned well.

I found this side of island life at dawn near Nadi, on Viti Levu.

Sun peeked through a forest of sugarcane 12 feet high, and dewdrops sparkled as they dried. The 41 cutters of Lovu Field 4 Portable Line Gang had been working since 5:30, their long, wide-bladed cane knives rising and falling in rhythm, the steel pinging musically against the stalks. About four million tons of cane are cut in Fiji annually, all by hand, by gangs like this one, the vast majority of them Indian. Seventy-five percent of



Purification by Fire

The body is transcended and the soul made pure by mortification of flesh in the annual Hindu fire-walking ceremony called Teemeethi. A devotee wears the headdress of the goddess Kali, who drives evil away from this Indian ritual honored in Fiji for nearly 70 years.

The fire goddess Draupathi is symbolized by leaves from a neem tree, borne in a pot of water from the sacred Ganges by a worshiper crossing a bed of hot coals. The ceremony, open to any Hindu, is central to Fiji's Indian community, as reflected in the face of a woman deep in prayer.

Fire walkers prepare with fasting and prayer. They bathe in the ocean, then walk to the temple after marking themselves with turmeric powder and holy ash and piercing their bodies with metal objects. One man is pierced through the skin of his upper arm while another, kneeling, forces wire through skin on his throat. They may then walk over the coals several times in thanks for blessings of "power and long life, health and wealth."

Fiji's cane growers are Indian, and most of the land they use is leased—ten acres is all a typical Indian family can afford—from native Fijian landowners.

At 6:30 a man came scuffing through the dewy trash of harvested cane past a harnessed pair of bullocks that were dreamily chewing cane stalks and drooling. The man carried a pot and a bucket. Bula! Break time. The ping of the knives ceased, and the men gathered around for tea or kava. They sat on the blanket of damp cane trash, passing a sharpening file. The big knives sang softly on the file, and voices murmured in the early light. Some of the talk was of the uncertain future: In 1997 cane farmers' leases begin expiring, and some Fijian owners are hinting they may not renew.

I talked with the supervisor of the line gang, a friendly, diminutive Indian who patrols his domain like a peacock. While he watched his men drink the kava and head back to work, he shook his head with worry.

"What will the Fijians do with the land?" he asked. "They will not farm it. It is not good. The coup and the new constitution made us second-class citizens."

Indians are often described as more anxious than other Fijians. They have good reason. Few Indians own land here, even after five generations, because the law reserves 83 percent of the land for native Fijians. The

A grateful U. S. awarded Sgt. Sairusi Koto the Silver Star for "gallantry in action" for his World War II rescue of American soldiers in the Solomon Islands. Many Fijians joined Allied forces, reviving warrior traditions damped by British colonial rule. Fiji's military serves as UN peacekeepers in numerous hot spots.

first British governor of Fiji legislated this ownership to prevent Fijians from losing their own islands. To further protect them from exploitation, he suggested that laborers be brought from India.

Many Indians now live in the cities, where they run most of the businesses. Here they have another reason to be anxious: increasing urban crime. The evening I visited the home of Jai Ram Reddy on Viti Levu, the only things that marred the sight of the sun sinking lemon yellow behind Fiji's Mamanuca islands were strands of barbed wire stretched high and tight across the view. Reddy was afraid of crime too.

Is this tranquillity? No. Are the inequities a recipe for racial violence? Perhaps. But when the chance for violence came, once again Fiji proved unpredictable.

The 1987 coup happened after Indians, who had grown to 48 percent of the population, won control of the government. Now it was the Fijians' turn to become anxious. What would happen to Fijian control of the land? A few early incidents of Indian muscle flexing brought Sitiveni Rabuka marching into parliament.

"You have a choice," Rabuka told me. "Be dragged along or drive." (He liked driving so much that when, a few months after his coup, he found himself disagreeing with the decisions of the interim government, he led another coup.)

If violence was to blaze, the months around the coups were the time. "The match was applied to the tinderbox," one Fijian said. "But it wouldn't catch." A few Indian businesses were vandalized and burned, and there were fistfights in Suva, but no shots were fired, and no one was killed.

Fijians like to tell a story about something that happened in the beautiful high country above Nadi during the first coup. That afternoon, the story goes, a young Indian ran into two Fijian boys, who gave chase. The Indian boy, who was much smaller, fled through steeply rolling meadows where groves of trees gather in catchments. As the bigger boys closed in on him, he followed the road over a hill and toward a low bridge that spans one of the highlands' many streams. He hesitated a moment, saw the Fijians come into sight, and threw himself off the bridge. The two Fijians began laughing at the sight of the Indian boy floundering in the stream until they realized he was drowning. Then they dived in, rescued him, and sent him home.

The moral of the story is unclear. Is it about kindness or paternalism? Is this the way the Fijians wish their Indian neighbors to remain—protected but scared? After the coups as many as 30,000 Indians left Fiji—a

Social lubricant and formal libation, yaqona—or kava—is squeezed from pepper plant roots at a ceremony, for men only, on Vanua Levu. But women too drink the soothing beverage, which can be served on all occasions. Eating enemies was also once a custom, but a woman's smile accents today's hospitality.

devastating brain drain for the economy—though some have now returned. Rabuka promises a genuinely democratic constitution, but the one he helped write in 1990 limits Indian political power. Overtly racist commentary is common; I remember a dinner with a group of young Fijians, one of them a 747 pilot. He told of an Indian engineer he'd worked with, who knew every part in the plane but who couldn't operate a screwdriver. He launched into a protracted tale of the expensive hair transplant the Indian had gotten in Australia, spicing the story with gestures his listeners recognized as typically Indian, and his attempt at an Indian accent had them reeling with laughter.

"I told him they do it just as well in Fiji using hair from a dog's rear end," the pilot roared. "When I said it was half the price, he nearly cried!"

Yet one suspected that if that engineer ever had a serious problem, the 747 pilot would be first in line to help. The whole of Fiji is like a small town whose citizens argue over the school board and gossip behind one another's back but turn out, friend and enemy, for the cancer benefit. It is part of the place's ultimate and charming ambiguity that both Reddy and Rabuka have recently embraced the somewhat vague term "national unity."

"The coup did many bad things," Reddy said that night in the barbed-wire sunset, "but it made both Fijians and Indians realize that coexistence is not enough. The two races must become one nationality. It's time."

BUT NOTHING IS SIMPLE IN FIJI. A layer of serenity, a layer of conflict, a layer of tradition, a layer of change. The cash economy, with which the Indians are more comfortable, is making inroads among Fijians, with some turmoil. George Taylor, a Californian who owns and operates the Marlin Bay Resort on the island of Beqa, says that in the past people in his employees' villages would gather to do some traditional sharing with their newly enriched neighbors on payday. But that has changed. "Today villagers are no longer willing to give to those who do not

All the world's a playground for a rural youngster on a makeshift raft of mulberry branches. Softened by seawater, their bark will be stripped and pounded to make tapa cloth for home decorations, clothing, and artwork. If racial politics can be resolved, Fiji holds the keys to a fortunate future.

want to work," Taylor told me. "The Fijian tradition of kerekere is slowly disappearing."

Many villages have turned their traditions of specialty crafts—like the making of tapa, or bark cloth, and palm mats—into lucrative tourist businesses. Two *Blue Lagoon* films were made in the Yasawa Group, and there the village of Yasawairara has tapped that image. The community receives an annual fee from Blue Lagoon Cruises to let tourists use the beach and earns additional money by performing theatrical folk dances called *meke*. On their way back to the boat the tourists run a gantlet of women lined up on the beach to sell handmade shell goods. The shell market brings in as much as 500 Fijian dollars ($360 U. S.) a boatload but is hard on the mollusk population.

In another salute to modern times, the nation has launched a television network (the American hit sitcom *Friends* is a favorite). Video cassette players have been part of Fijian life for almost 20 years. But will television change the islands' intricate culture? "We've done tests," one broadcaster told me with confidence. "There won't be much effect."

Modern technology has been used not just for entertainment but also to penetrate the world of the spirit. Security guards at the Parliament House shot video footage of a shadowy figure they claimed was a ghost. Who was it? No one knew. But a newspaper promptly reported that the ghost, speaking through a clairvoyant, called for Fijians to put more emphasis on traditional values.

ALL THIS LED ME to think about walking on fire.

Both Indians and Fijians have rich spiritual lives. The Indians brought Hinduism and Islam to the islands; the Fijians have the Methodist Church and their older traditions. But it's another oddity of Fijian life that both races honor the rite of fire.

I had thought that for Fijians walking on fire would be one of the most cherished—and sacred—pieces of the old Fijian culture. But once again reality was ambiguous.

Beqa is the island of fire walking. The origin of the talent is legendary: A warrior about to kill an eel paused when the eel spoke and offered the warrior and his descendants power over fire if he spared the eel. The warrior took the deal. Today the warrior's male descendants dig a circular pit ten or more feet across, fill it with large rocks, then pile kindling and logs on top. The fire burns for hours, heating the rocks. The fire walkers tidy the pit, put on traditional grass skirts, then walk barefoot on the rocks.

When I saw the ceremony, the walkers joked and jived their way through the ritual, and a couple of 11-year-old boys danced across the rocks, then retreated behind a bush to giggle.

The Indian ceremony of fire was far more intense. It is most prominently performed at an annual Hindu festival in Suva. There I watched Indians push long metal needles through the skin of their arms and backs, cheeks and tongues. Thus prepped with pain, they lashed each other with whips and danced to relentless drummers in a three-mile procession from the ocean to the temple on hot asphalt under a burning sun. Then they walked—it was more like a run—again and again across a 20-foot-long pit of coals that felt hot enough, even at my considerable distance, to grill chicken. Many of the participants limped noticeably afterward.

Among these islands of languid hard work and polite racial conflict, the layers of ambiguity do not end. Fire walking was no exception: The Hindu festival is strictly religious, while Fijian fire walks are now usually paid performances.

In other words, the Fijians, so steeped in island tradition and culture, so free from cash, are the ones who sell their fire walking as spectacle. The Indians—so industrious and pragmatic—suffer for the spirit. Nothing is simple in Fiji. □

HERBERT G. PONTING

■ FROM THE ARCHIVES

Antarctic Late Show

A geisha's silent strum enthralls members of Capt. Robert F. Scott's British Antarctic expedition. Photographer Herbert G. Ponting presented a slide show to occupy his teammates, confined by weather to their Cape Evans camp. A globe-trotting cameraman, he had just published a book of his Japanese photographs before setting off with Scott in 1910. Over the next two years Ponting took nearly a thousand photos. Expedition members, he noted, coined a verb in his honor: To pont, meaning "to pose, until nearly frozen, in all sorts of uncomfortable positions."

In January 1912 Scott and four men finally reached the Pole; they did not survive the trip back. Ponting, who had returned safely to England, spent the rest of his life keeping Scott's memory alive. The GEOGRAPHIC published the photographer's Antarctic landscapes and wildlife studies in December 1922 and March 1924.

It's not so much a car

as it is a wake-up call for an entire industry.

A startling exception

to a blindly accepted rule.

The idea that room for five

must, by definition,

leave no room for imagination.

Cab-forward design

is that exception.

Chrysler engineers set out to build a car.

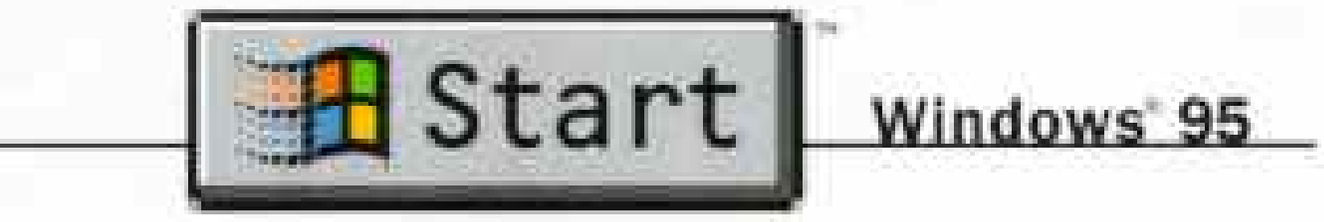
They wound up building

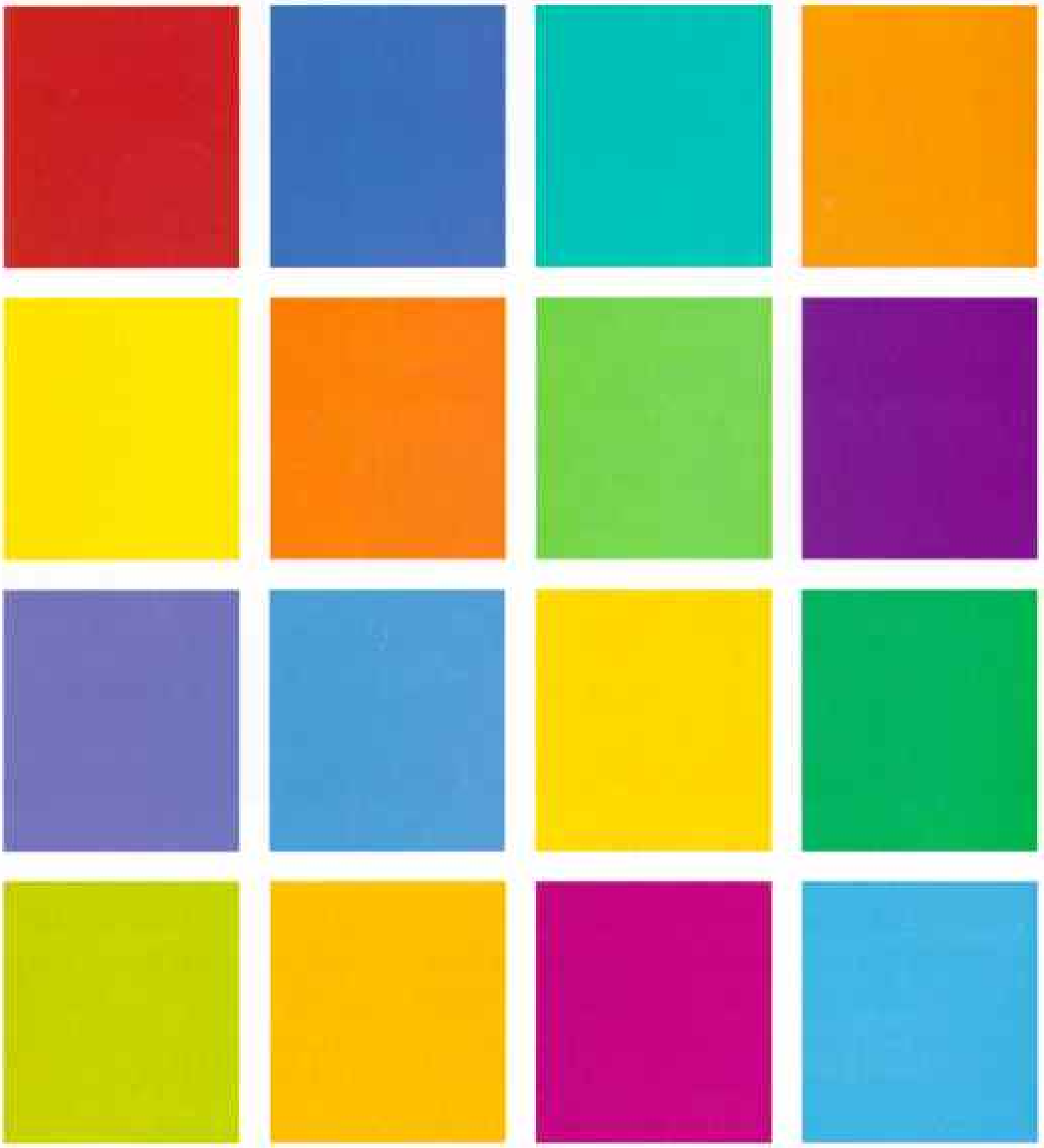
an alarm clock.

234 HP 24-VALVE V6 ENGINE, INDEPENDENT TOURING SUSPENSION, SPEED-SENSITIVE STEERING, 16" CAST ALUMINUM WHEELS, 4-WHEEL DISC ABS, LEATHE

Chrysler Concorde *LXi*

MED SEATS. ELEVEN-SPEAKER PREMIUM SOUND SYSTEM. CAB-FORWARD DESIGN. INQUIRIES. 1-800-4-A-CHRYSLER. WEBSITE. http://www.chryslercars.com





Windows 95 makes multimedia even more multi.

Microsoft®

WHERE DO YOU WANT TO GO TODAY?™

WE'RE MAKING SURE OUR RESEARCH

The task is challenging. But the rewards are many. That's why at Bayer, we've made our commitment to health care research a crusade. That's why we'll spend a billion dollars this year in areas such as pharmaceuticals, medical imaging, diagnostics and genetic engineering. Working on treatments for

DEVELOPS HEALTHIER FUTURES.

medical challenges ranging from the common cold to cancer, Alzheimer's and AIDS. Nearly 100 years ago we invented a wonder drug called aspirin, that helped improve the quality of life in the 20th century. Now, utilizing our expertise and experience, we plan to do the same for generations to come.

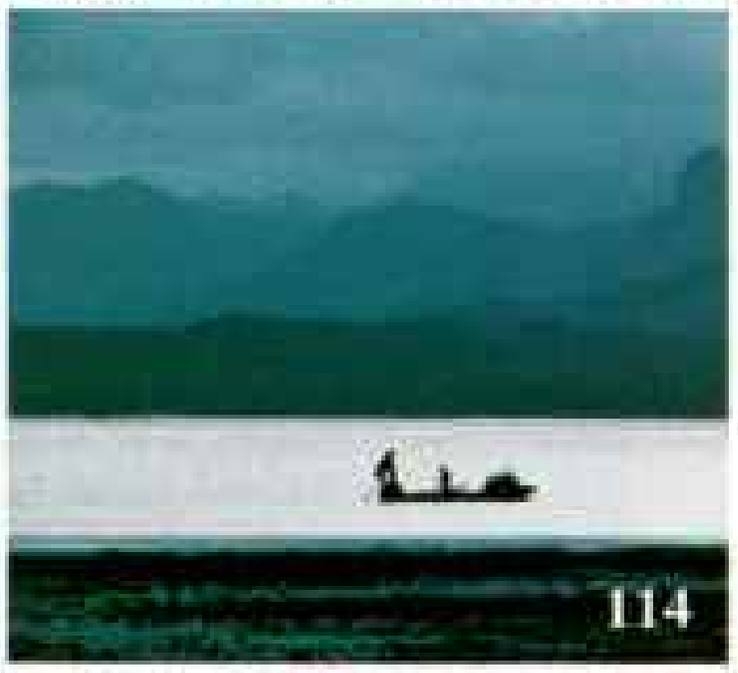
Bayer

WE CURE MORE HEADACHES THAN YOU THINK.

Bayer is an international, research-based company in health care, chemicals, and imaging technologies.

NATIONAL GEOGRAPHIC

OCTOBER 1995



The Cover

Eye to eye with extinction, a young mountain gorilla finds shelter on the slopes of Rwanda's Virunga volcanoes.
Photograph by Michael Nichols

Cover printed on recycled-content paper.

USA Proud Sponsor of the 1996 U.S. Olympic Team

IF THEY EVER BUI
STATESIDE, YO

Most likely, they won't. But in the new Pontiac® Bonneville® SLE, you will be prepared. Feel a connection to the road that formerly only came with higher-priced, European performance sedans. Bonneville's 205-horsepower engine, more horsepower than a BMW 525i, inspires a powerful feeling of dynamic authority over the road. Speed-sensitive steering and a fully independent sport-tuned suspension support your position of power. Flash your lights to pass, and understand what it means to own a lane in a car that

LD AN AUTOBAHN U'LL BE READY.

anticipates your instincts. But fully realizing the performance is only part of the experience. Add a design this sophisticated for thousands less, and no translation is necessary. The new Bonneville SLE. **For more information, call 1-800-2PONTIAC.**

PONTIAC CARES with a 3-year/36,000-mile no-deductible bumper-to-bumper limited warranty, plus free 24-hour Roadside Assistance and Courtesy Transportation. See your dealer for details.

PONTIAC BONNEVILLE

WE ARE DRIVING EXCITEMENT.

Behind the Scenes

MARK THIESSEN

■ TEST YOURSELF

1. Russia's primary space-launch facility, the Baikonur Cosmodrome, is in the desert of which former Soviet republic?

2. In 1993 Tansu Ciller became the first female prime minister of what Muslim-majority NATO country?

3. Porto-Novo is the commercial center of which African nation?

4. The Equator and prime meridian intersect in what gulf?

5. Pashtu and Dari are the official languages of which landlocked country in central Asia?

ABRIDGED QUESTIONS FROM GEOGRAPHY BEE

How's Your Geography IQ?

CHAMPION OF THE SEVENTH ANNUAL National Geography Bee, 13-year-old Chris Galeczka, at center, knew there was something wrong during a visit to a Florida theme park last year. Strolling with his family along a court of world flags, he realized Cape Verde's was upside down. "It was understandable," said Chris, who browses atlases and almanacs for fun. "Cape Verde recently adopted a new flag."

Chris, the second bee winner to hail from Michigan, was a finalist in 1994. But when he started competing again this year at his junior high school's first-round contest, he was just one of six million youngsters nationwide hoping to make it to the May 31 finals, sponsored by WORLD magazine and Chrysler Corporation, at Society headquarters. There he tackled 18 questions, including those above, snagging a $25,000 scholarship and a slot on the U.S. team at the July 1995 International Geography Olympiad at Epcot in Orlando.

Answers: **1.** Kazakstan **2.** Turkey **3.** Benin **4.** Gulf of Guinea **5.** Afghanistan

Books Yes, Cats No

"WHERE ARE the Geographic cats?" asked shoppers, misled by this sign at the Phoenix Civic Plaza last fall. It seems that Society publications were being sold next door to a cat show. Our "warehouse sales" draw huge crowds, eager to buy discounted products and to meet our staff.

■ UPCOMING SALES

Washington, DC, Oct. 6-8
Minneapolis, MN, Oct. 20-22
San Francisco, CA, Nov. 3-5
Seattle, WA, Nov. 24-26
Denver, CO, Dec. 1-3

Let's make things better.

Anyone who makes anything is driven by a common instinct.

From the infant attempting its first scribble to the multinational manufacturer.

It is an instinct as fundamental as taking your next breath.

It is taking the next step and making whatever it is you are making, better.

As we seek to understand, we create, we enhance, we progress.
And as we do so, we make the world a better place.

Whether we are infants making better drawings, scientists making better medicines, governments making better laws, manufacturers making better products.

All are making someone somewhere somehow happier.

So, when people say "Let's make things better", they speak from the head. And from the heart.

We at Philips will strive to embrace this duality. In everything we do.

In all our dealings with our customers, our suppliers, our shareholders and all who share our planet.

And while we've long been known for making better things, perhaps from now on we'll be known for making things better.

Jan D. Timmer, President & CEO

PHILIPS

MICHAEL NICHOLS

Return to Rwanda

FOR PHOTOGRAPHER Michael "Nick" Nichols, his assignment for this issue was like going home. In 1987 his family lived in the Rwandan village of Bisoki while he worked on a book on gorillas. His guide, Shabani, became his friend, and Shabani's son, Fidele, played with Nick's son, Ian. When Eli Nichols was born in the States in 1989, Nick sent a snapshot to Shabani.

Returning to Bisoki in 1994, Nick learned Shabani had died in a Zairean refugee camp. He located Fidele (above), who exclaimed, "I still have your picture!" The boy had little else.

"They lost all they had," says Nick, who bought Shabani's widow clothes and tools. "But Fidele had held onto that photo. He kept asking, 'How is your family? How is Ian?' "

Calling King Kong

"THIS IS FAY WRAY; I need some information about King Kong." The call came in from the great ape's costar, who also appeared in our article on skyscrapers (February 1989). Now she asked, "Could I get the January 1994 issue with the photo of a building in Japan shaped like Kong? I'm still fond of that ape; I like to know what he's up to."

■ FOR INFORMATION

Call:
1-800-NGS-LINE
(1-800-647-5463)
Toll free from U. S., Canada
8 a.m.–8 p.m. ET Mon.–Fri.
Special device for the hearing-impaired (TDD): 1-800-548-9797

Write:
National Geographic Society
1145 17th Street N.W.
Washington, D. C. 20036-4688

■ RECENT HONORS

Sigma Delta Chi
award, one of journalism's top honors, to Assistant Editor Mike Edwards for "Pollution in the Former U.S.S.R." and "Chornobyl" (August 1994).

Red Earth Ambassador of the Year
award to Editor Bill Allen on behalf of the magazine for its coverage of Native Americans, including powwows (June 1994) and bison (November 1994).

Council of Scientific Society Presidents
award to the magazine and the Society for "bringing the experience of discovery to millions."

■ QUOTE TO NOTE

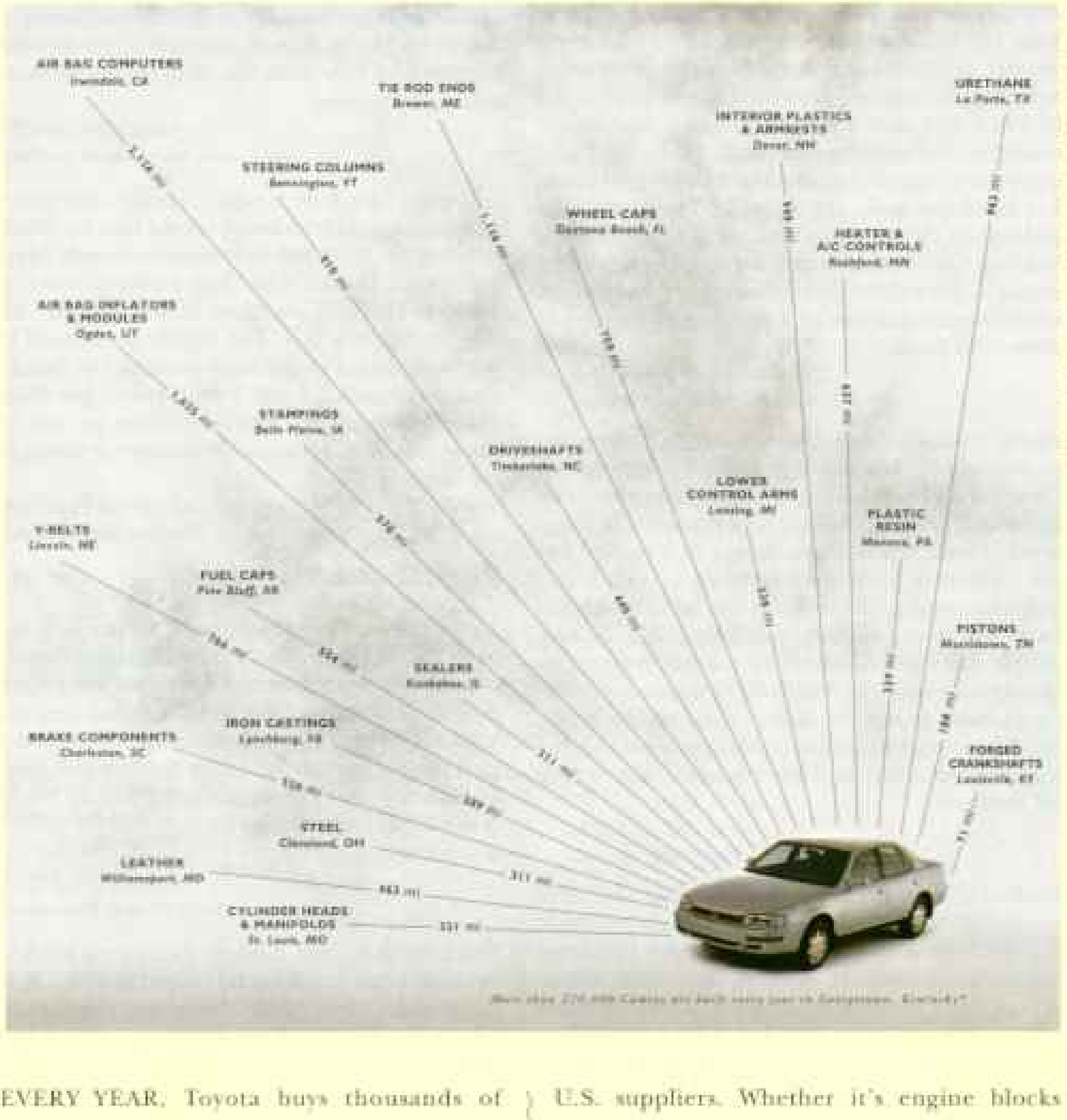
Lots of the questions come from the magazine, so if you read that, you know a lot of the stuff.

—GEOGRAPHY BEE CHAMP CHRIS GALECZKA

Here Comes the Ride

THEY HADN'T LOOKED for a photographer to shoot their Las Vegas wedding, but Greg and Sondra Lambert found one anyway—in the backseat of their rented limousine. Maria Stenzel, far right, had spent the day photographing altar-bound couples for a future article on the city. When this couple got in, they agreed to Maria covering their prenuptial ride. In fact, the trio got along so well, the Lamberts asked Maria to be a witness at the ceremony.

Before you buy a Camry CHECK THE MILEAGE.



EVERY YEAR, Toyota buys thousands of parts from communities right across the country. In fact, we buy more than $5.6 billion per year in parts for both domestic and overseas production, from more than 440 U.S. suppliers. Whether it's engine blocks from Ohio, batteries from Tennessee or wiper systems from New York, our investment in local industries is paying off in the form of thousands of jobs across the United States.

INVESTING IN THE THINGS WE ALL CARE ABOUT. **TOYOTA**

For more information about Toyota in America write Toyota Motor Corporate Services, 9 West 57th Street, Suite 4900,126, New York, NY 10019

Forum

The Brain

I commend Joel Swerdlow and photographer Joe McNally for their interesting and accessible article (June 1995). As a neuroscientist, I find that many popular articles blur the line between theory and fact. Happily, this one presented recent work in the field in a way that was both accurate and understandable. Perhaps the author played up the "love as peptides" aspect, but surely we no longer believe that mind and body are separate. The body is the medium of the mind, as oils are a medium for a painting. One can no more determine the quality of mental activity through neuroscience than one can determine the qualities of a painting by looking at tubes of oil paint.

LYNN NIELSEN-BOHLMAN
University of California at Davis

My eight-year-old daughter had a right hemispherectomy after Thanksgiving last year because of Rasmussen's encephalitis. We had lost her for three years while waiting for this awful disease to be diagnosed. Medications and seizures had turned her into a monster. Now she is learning to walk and is back in second grade and can finally focus on her work. There is little information on this disease, and publicity is welcome. I have heard from other parents who have also had to make this overwhelming decision to remove half of their child's brain, and the support we share is priceless. Just like the people in your article, I have learned how fragile our lives are.

NANCY CLEMENTS
Northfield, Vermont

Readers will be glad to know that Dr. Theodore Rasmussen is alive and well and emeritus professor of neurology and neurosurgery at the Montreal Neurological Institute, McGill University, where he performed the pioneering work that led to treatment of the condition that bears his name. Now beneficial results can be obtained with a much smaller resection of the affected hemisphere to disconnect the diseased tissue from the healthy.

RICHARD LEBLANC
Montreal Neurological Institute
Montreal, Quebec

Thirty-six months ago I was diagnosed with primary brain cancer after removal of a glioblastoma tumor, an aggressive and deadly form of brain cancer. I firmly believe a positive mental attitude is the reason I am still alive with no signs of the tumor. I am, however, experiencing a "post-radiation reaction," which has decreased my mental ability and caused short-term memory loss. My doctor believes it is caused by a breakdown of the neurotransmitters, which prevents the memory of some incidents from being filed away in my brain and causes extreme mental fatigue. Your article helped me to better understand what I am facing and gave me hope that research may find a cure for my condition.

ALLISON S. MEYER
Roca, Nebraska

As a psychiatrist I know that drugs for schizophrenia and other serious illnesses are tremendously beneficial, but it is a historical fact that the main classes of drugs used for severe mental illness were discovered by chance. A theoretical mechanism to explain how they work was then developed, not the other way around.

JAMES FINLAYSON
West Tarbert, Isle of Harris, Scotland

Although I am now almost three decades removed from college, I recall being taught that the ancients believed the earth had four elements: earth, fire, air, and water. The body had four humors, which governed health and emotion: blood, phlegm, black bile, and yellow bile. The author mentioned Hippocrates' belief in the four humors but listed the elements instead. I was so pleased to see that my brain's storage and retrieval abilities are still functioning. Now if I could only remember where I left my car keys.

DENISE DAOUPHARS GURIAN
Medway, Massachusetts

Puget Sound

As residents of San Juan Island, we are well aware of its fragile beauty. It's too bad that our locals did not discuss with Bernard Ohanian the pollution problems facing us from our Canadian neighbors. Victoria, British Columbia, dumps 26 million gallons of raw sewage daily into the Strait of Juan de Fuca, a few miles from my front porch! We have cruised these waters for 30 years, and the pollution is obvious.

JOHN CHARTERS
Friday Harbor, Washington

You note that Capt. George Vancouver led British explorers into Puget Sound proper in 1792. In fact, the sound is named after Vancouver's first mate on *Discovery*, 2nd Lt. Peter Puget, son of a London banking family.

FRANK LEAFHEAD
Wetherby, West Yorkshire, England

What's happening in Puget Sound is happening all over the rural U. S. Substitute mining for fishing and mountains for islands and oceans, and you have the western slope of Colorado. From Denver to Grand Junction, every mountain valley has its subdivision.

KELE LAMPE
Paonia, Colorado

For more about Colorado, watch for an article on the state's Front Range next year.

Go ahead. Make a wish.

Now call your Allstate Agent. Because life insurance planning can help make wishes for family security, college funding and a comfy retirement come true. Plus, an added interest bonus on your Allstate Universal Life Insurance may be in the stars for you, just for insuring both your home and car with Allstate. Your Allstate Agent wants to be your agent for life.

You're in good hands.

Allstate
LIFE INSURANCE

Added interest bonus is subject to availability and satisfaction of eligibility requirements.

California Sea Otters

The slaughter of California sea otters did not begin with the Russians as the article implies. Spanish missionaries in California paid Indian converts to deliver pelts that were shipped to Mexico City, thence to China via the Manila galleons.

ROBERT H. JACKSON
Department of History and Geography
Texas Southern University
Houston, Texas

As a wildlife biologist with experience in wildlife rehabilitation, it has become obvious to me that unnecessary human contact equates to a lower success rate for released adults. It will be difficult to improve upon Monterey Bay Aquarium's 38 percent success rate as long as infant otters are "cuddled in round-the-clock shifts."

JIM HEFFELFINGER
Tucson, Arizona

When studying sea otter mortality on Amchitka Island, Alaska, in 1954, biologists from Purdue University and the U. S. Fish and Wildlife Service noted the U-shaped pouch of extra skin on the chest and its use. It is unlikely that so many food items as shown (page 61) could be collected and brought to the surface without this pouch.

CHARLES M. KIRKPATRICK
Professor emeritus of wildlife ecology
Purdue University
Lafayette, Indiana

Blaming commercial divers for the loss of shellfish is just a blind attempt to save the most destructive creature on this earth. No commercial diver would threaten his own livelihood by taking immature shellfish. The sea otter eats everything it can find. There is little commercial shellfishing left in California, and if protection of the sea otter continues, soon there will be none.

LLOYD BRITELL
Brooksville, Florida

Galilee

I found the pro-Israel bias—or was it anti-Palestinian prejudice?—surprising. I am not used to such transparent side-taking in the usually even-handed GEOGRAPHIC.

DONALD NEFF
Washington, D. C.

I must take issue with your pro-Arab, anti-Israel bias.

AHARON SUBAR
Mumsey, New York

My thanks to writer Don Belt for his evenhanded article. While institutional discrimination against Israel's Arab citizens is to be deplored (page 79), the unintentional effect that Israel has had on human rights in the Middle East has been more pervasive and pernicious. I was born in Egypt in 1960 and grew up listening to pseudo-patriotic songs concocted by the Nasser regime's hacks, with such lines as "The freedom of our lands is above all freedoms," meaning that democratic rights such as voting and unionizing were suspended in the name of the war effort against Israel. As rulers throughout the region resisted change, opposition became more militant and violent, and more people found solace in religion. Others, like myself, simply left for more benign climes. Israel's safety depends on the stability of its neighbors, and there can be no long-term stability without the checks and balances of democracy.

MOHAMED RAGHEB
Ottawa, Ontario

The author missed the extent to which Israeli Arabs have become integrated into Israeli society. This in no way contradicts the fact that more needs to be done to equalize their status and opportunities with those of the Israeli Jews.

ILAN SHAVIT
Neve Monosson, Israel

It was a bit unfair to present the Arab citizens in Israel as such deprived people. They live in a democratic country and enjoy liberties their brothers in the Arab world don't even dream about. Their youth are studying in the universities while the Jews spend three years serving in the army.

ALON VOLKMAR
Maalot, Israel

I think the wrong words were used to describe the actions of the Muslim army led by Saladin, who defeated the crusaders' army at the Horns of Hattin. The phrase "slaughtered thousands of Christian soldiers" gives the wrong impression about Muslims. It was the crusaders who invaded Muslim holy places and killed thousands of Muslim citizens in the El Aqsa Mosque and turned part of it into a stable for horses.

HUSSEIN ABUKHUDAIR
St. Louis, Missouri

Forum

I love NATIONAL GEOGRAPHIC, but I think there are too many letters to the Editor that are merely gratuitous thank-yous by loyal readers saying how much they enjoyed a story. I much more enjoy letters from readers who disagree with a point in a story, correct a fact, or add a new dimension to it. Many times these letters are from readers with excellent perspective, usually the result of firsthand experience with the subject.

ROBERT BERENS
Troy, Michigan

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.

The writers of "Friends"™

© 1995 Warner Bros. All rights reserved.

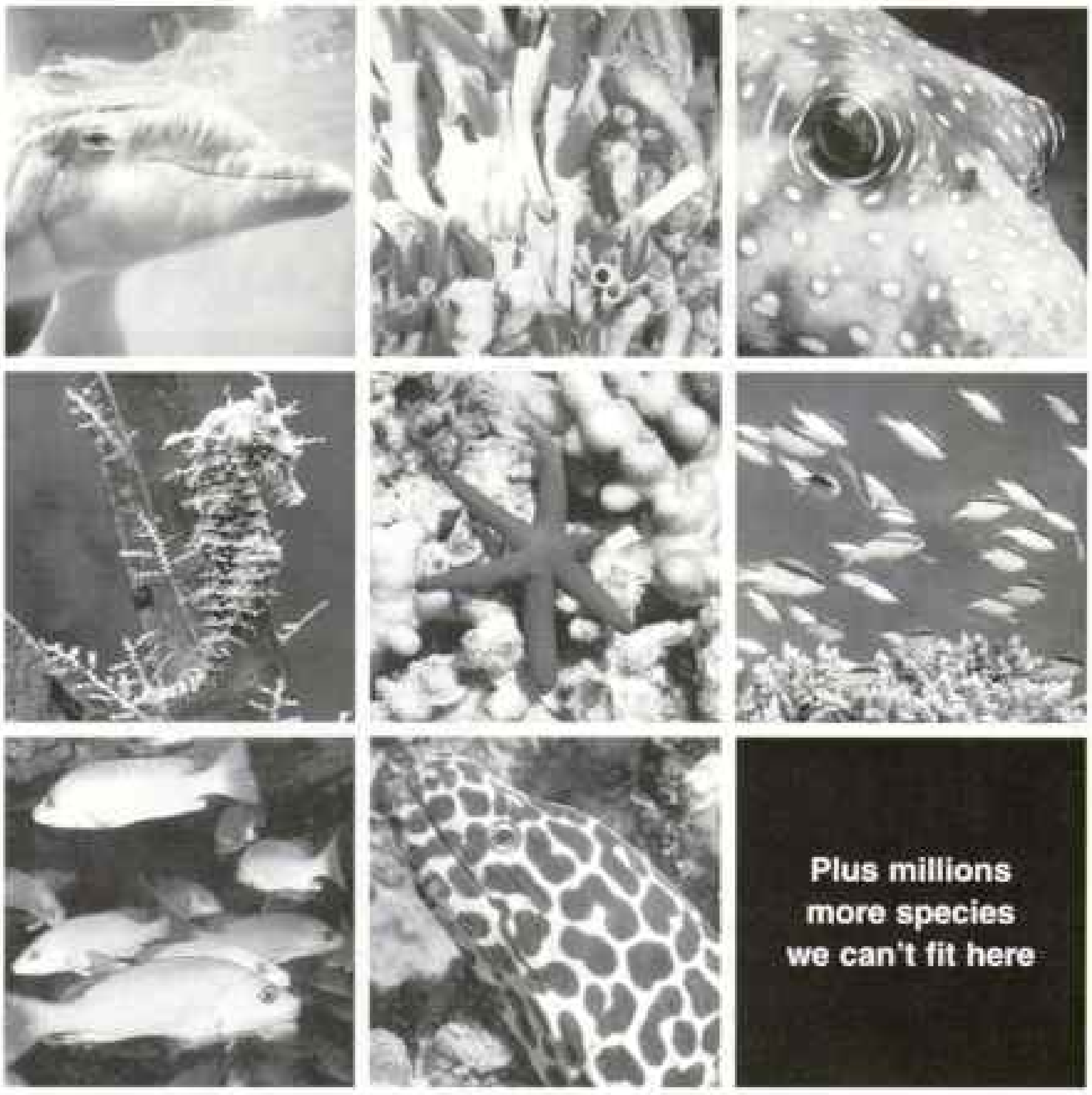
To Write an Award-Winning Television Show Requires
The Combined Efforts of Many Creative Voices,
All Melded Into One Singular Vision.
It Is No Wonder Then, That the Writers of *Friends*
Each Use a Different Waterman Pen,
What Better Way to Mix Style and Individuality
With Extraordinary Results.

WATERMAN

There are over 100 styles and finishes to choose from, each with a lifetime guarantee. Which Waterman are you? For information on the store nearest you, call 1-800-523-2486.

Neiman Marcus

bio•di•ver•si•ty



It rules our oceans. But it's threatened!
And that means big trouble for our life on Earth.
Learn why on the next *Radio Expeditions* special coming this October from
the **National Geographic Society** and **National Public Radio®**

Call your local NPR® station for broadcast times.

Also available on Audio Cassette and CD.
For more information
call 1-800-353-2875

RADIO EXPEDITIONS®
Oceans of Life

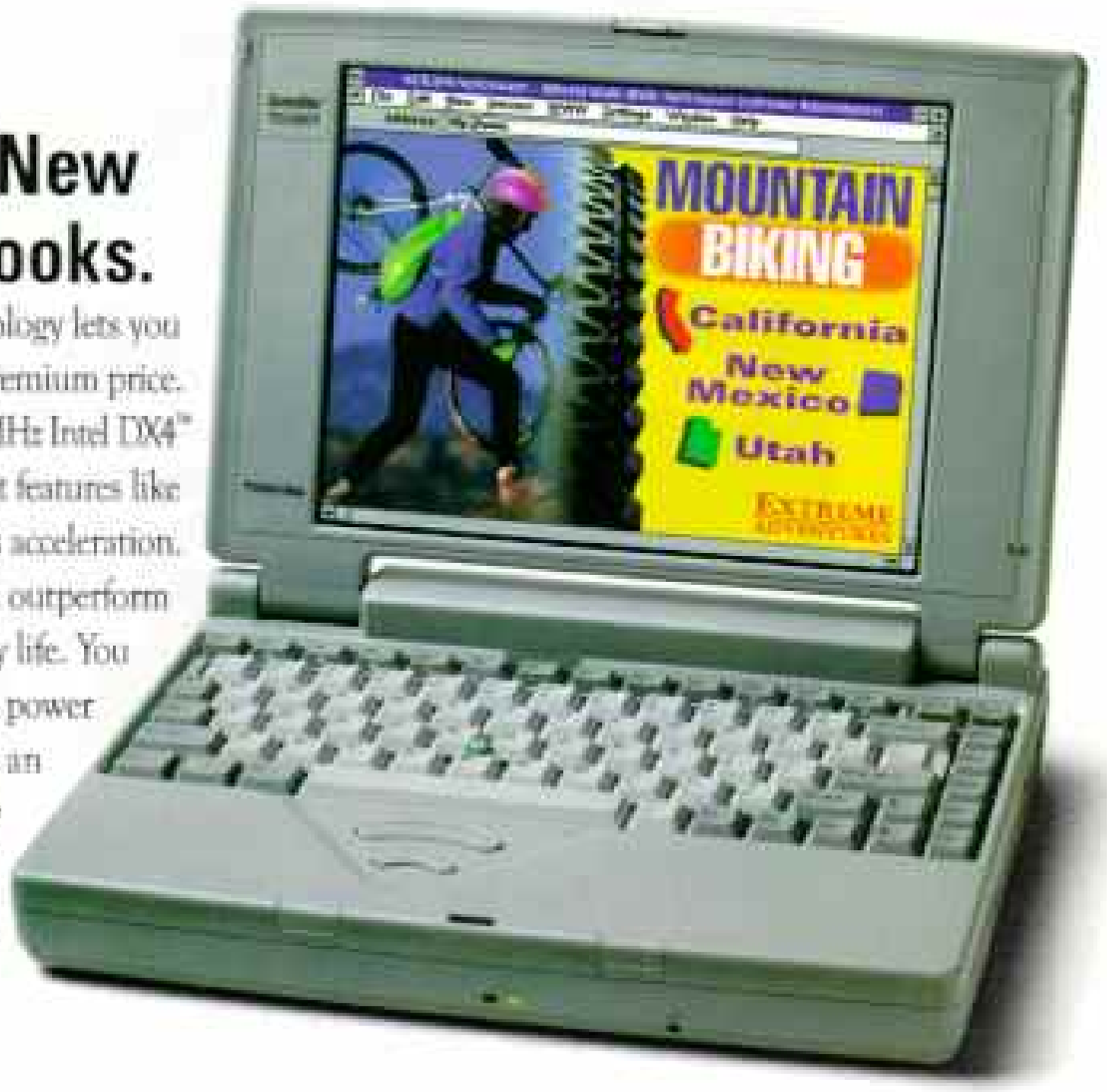
NATIONAL GEOGRAPHIC SOCIETY

NPR 25 Years of Radio Excellence.

Visit the RADIO EXPEDITIONS World Wide Web site at http://www.npr.org/RE/

SUPPORTED BY A GENEROUS GRANT FROM THE TERESA AND H. JOHN HEINZ III FUND OF THE HEINZ FAMILY FOUNDATION OF PITTSBURGH.

CONSERVE CASH.
SPLURGE ON POWER.



Introducing the New Satellite® Notebooks.

The new Satellite® with Toshiba's Turbo 75 technology lets you enjoy premium performance — without paying a premium price. The new Satellite® notebooks combine a powerful 75MHz Intel DX4™ processor with speed-enhancing and power-efficient features like fast-page RAM access, local-bus video and graphics acceleration. The result? Blistering system performance that can outperform 100MHz systems while optimizing precious battery life. You also get a big 10.4" diagonal color display, a built-in power supply so there's no bulky external AC adapter, an AccuPoint™ integrated pointing device, Plug and Play expansion, rugged construction and more.

Call 1-800-457-7777 for your nearest dealer.

Satellite®

T2130CT*:
- 10.4" dia. color TFT LCD active matrix display
- 520 Million Bytes (=500MB) HDD
- 8MB of RAM expandable to 32MB

T2130CS*:
- 10.4" dia. color dualscan STN display
- 520 Million Bytes (=500MB) HDD
- 8MB of RAM expandable to 32MB

T2110CS*:
- 10.4" dia. color dualscan STN display
- 350 Million Bytes (=330MB) HDD
- 8MB of RAM expandable to 28MB

ALL MODELS:
- 75MHz Intel DX4™ processor
- Integrated math coprocessor
- 16KB cache
- Two stacked PC Card slots (two Type II or one Type III)
- Plug and Play connectivity
- NiMH battery with Toshiba MaxTime® Power Management
- Built-in power supply
- AccuPoint™ integrated pointing device
- 3.5" floppy disk drive
- Under 7 lbs.
- Optional Free Replicator
- Pre-installed software: Microsoft Windows® 95 or MS-DOS® with Windows® for Workgroups and Fax-ware®
- 1 yr. limited warranty

intel inside

In Touch with Tomorrow
TOSHIBA

Toshiba. The World's Best Selling Portable Computers.

†T2110CS. Reseller prices may vary. All prices and specifications are subject to change. *The T2130CS and T2110CS are sold at selected resellers as the T2130CE and T2110CE with Microsoft Windows® 95 and additional pre-installed software.

NATIONAL GEOGRAPHIC

Geographica

LEECH, *HAEMOPIS CAECA*, AND WATER SCORPION, *NEPA ANOPHTHALMA*, SERBAN SARBU AND CRISTIAN LASCU; PSEUDOSCORPION, *RONCUS DRAGOSETZ*, PATRICK LANDMANN, GAMMA-LIAISON

Lost World of New Creatures Found in a Romanian Cave

IN TOTAL DARKNESS a leech locates and consumes an earthworm (top). A water scorpion (center) will stab prey with its beak, then suck out the insides. Antennae waving, a centipede stalks a pseudoscorpion (bottom). The bizarre creatures inhabit Movile Cave, discovered nine years ago at a depth of 60 feet when workers sank a shaft for a power plant in southern Romania.

Movile Cave may be unique: a closed subterranean ecosystem nourished by hydrogen sulfide rising from earth's interior. Its animal occupants, evolving over the past five million years, live with little oxygen and no light. As a result, they lack pigmentation—and eyesight.

"Nothing gets in from the surface," says Thomas Kane of the University of Cincinnati, who has studied the cave with Society funding since 1992. "Yet it's loaded with animals; we've found 47 species, 32 previously unknown." At the base of the food chain, bacteria metabolize hydrogen sulfide in a process called chemosynthesis, which has also been observed at deep-sea vents in the Pacific (GEOGRAPHIC, November 1994).

"We've got three trucks and we're 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.

Boat Adrift Crosses the Indian Ocean

IN AUGUST 1994 a 32-foot crayfishing boat slipped from its mooring in Western Australia and drifted off. Last April 1 it washed up in Xai-Xai, Mozambique, some 4,300 nautical miles across the Indian Ocean.

Amazingly, when *Classic* appeared in Xai-Xai, it was identified by an Australian backpacker, Kathleen Brennan. She had recently vacationed in the boat's home port north of Perth.

"Everyone was talking about the boat that washed up," reports its owner, Denis Bennetts, "so she went out, had a look, and said, 'That's Mr. Bennetts's boat from Ledge Point!' When

they called me on April Fools' Day, I thought it was a joke."

Oceanographers believe that *Classic* was picked up by Indian Ocean currents that carried it 20 miles a day.

BETTY PRESS, WOODFIN CAMP

O'Kon's suspicions date from a canoe-and-raft trip he took in 1989. "When the river is at flood stage, from June to January, it's impossible to cross in a boat," he says. "It would be logical to build a bridge there."

He found ruins of abutments on shore and carved stone devices he believes guided ropes for a three-span suspension bridge. He has concluded that the piles are remains of seventh-century piers for a 600-foot-long structure linking Yaxchilán with farms and towns in what is now Guatemala.

Merging his field observations with aerial photos and historical maps, digitized on computer, O'Kon created the basis for this rendering. He calculates that the bridge led straight to the ceremonial heart of Yaxchilán.

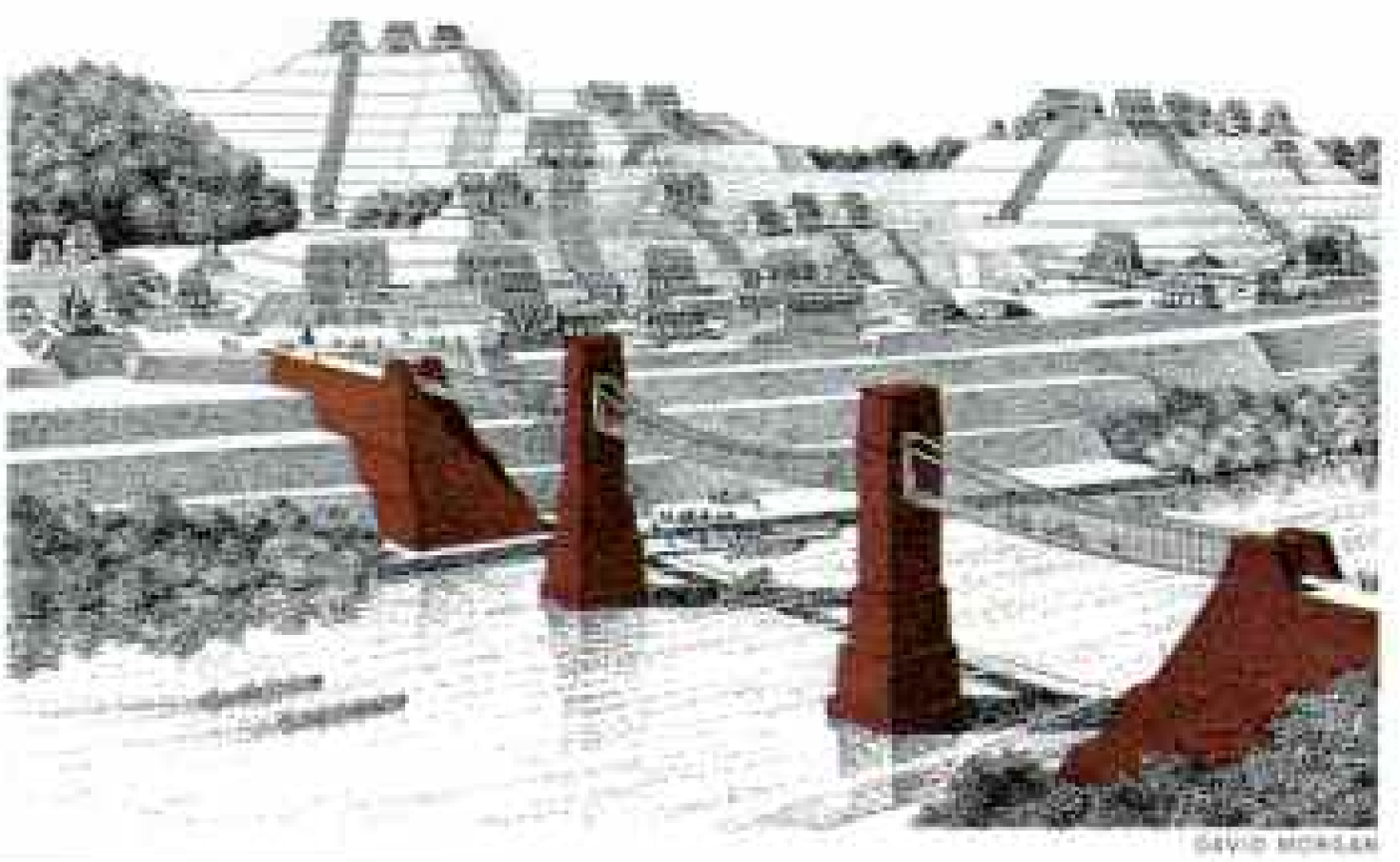
Masai Diet Wards Off Heart Disease

MILK AND MEAT meals of the Masai of Kenya and Tanzania would terrify an American fearing cholesterol and heart disease. Yet Masai cholesterol levels are one-third lower than the U. S. average, and heart disease is almost unknown. New research offers a clue: Masai also eat a soup laced with bitter bark and roots that contain cholesterol-lowering substances called saponins.

"Masai don't worry about cholesterol; it's a nonissue to them. And they love fat," says Timothy Johns of McGill University in Montreal. Supporting his findings, studies show that urban Masai without access to the bitter plants do develop heart disease. —BORIS WEINTRAUB

Engineer's Analysis: A Bridge to Maya Past

TWO MYSTERIOUS PILES of stones sit in the middle of the Usumacinta River near the ancient Maya city of Yaxchilán in Mexico. A century after explorers discovered the ruins of the city, James O'Kon, a structural engineer and amateur archaeologist from Atlanta, Georgia, may have found an answer to the riddle of the rocks.



DAVID MORGAN

This Is The Quietest Dishwasher Made In America. Or Haven't You Heard?

DW960UQ
Dishwasher

Of course you haven't, and you never will. That's because, through extensive consumer sound evaluations of wash actions among leading manufacturers, the Ultimate Quiet Series Dishwasher from Jenn-Air was found unequivocally the quietest made in the U.S. In other words, it's really, really quiet.

Complete with UQ Series Insulation System and Quiet Liner Tub, the only thing you'll hear in the kitchen is compliments. And since it's from Jenn-Air, the sleek design destines it a conversation piece. We just made sure you'll hear the conversation. For a brochure showing the Jenn-Air line, call 1-800-JENN-AIR.

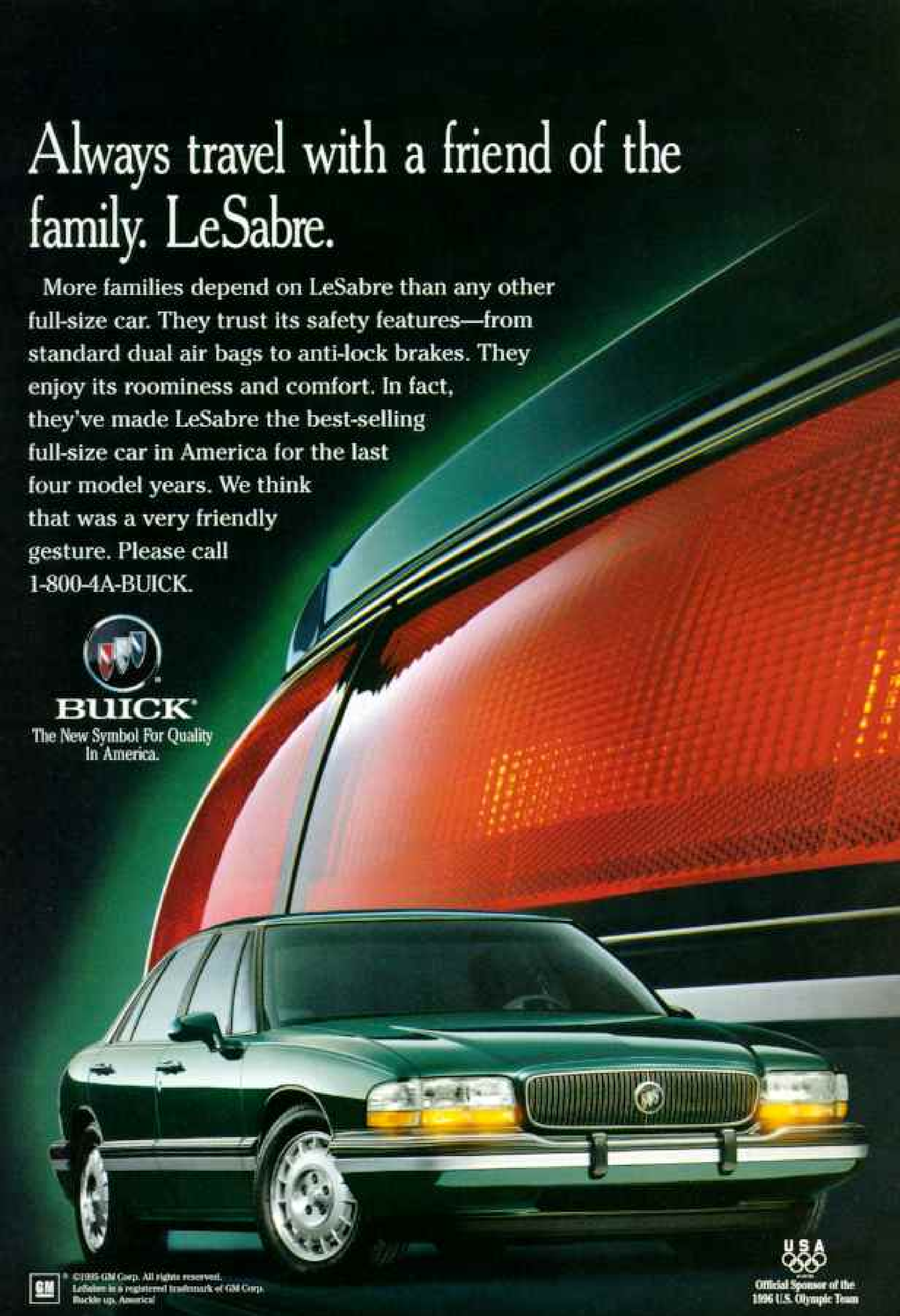
JENN-AIR

THE SIGN OF A GREAT COOK®.

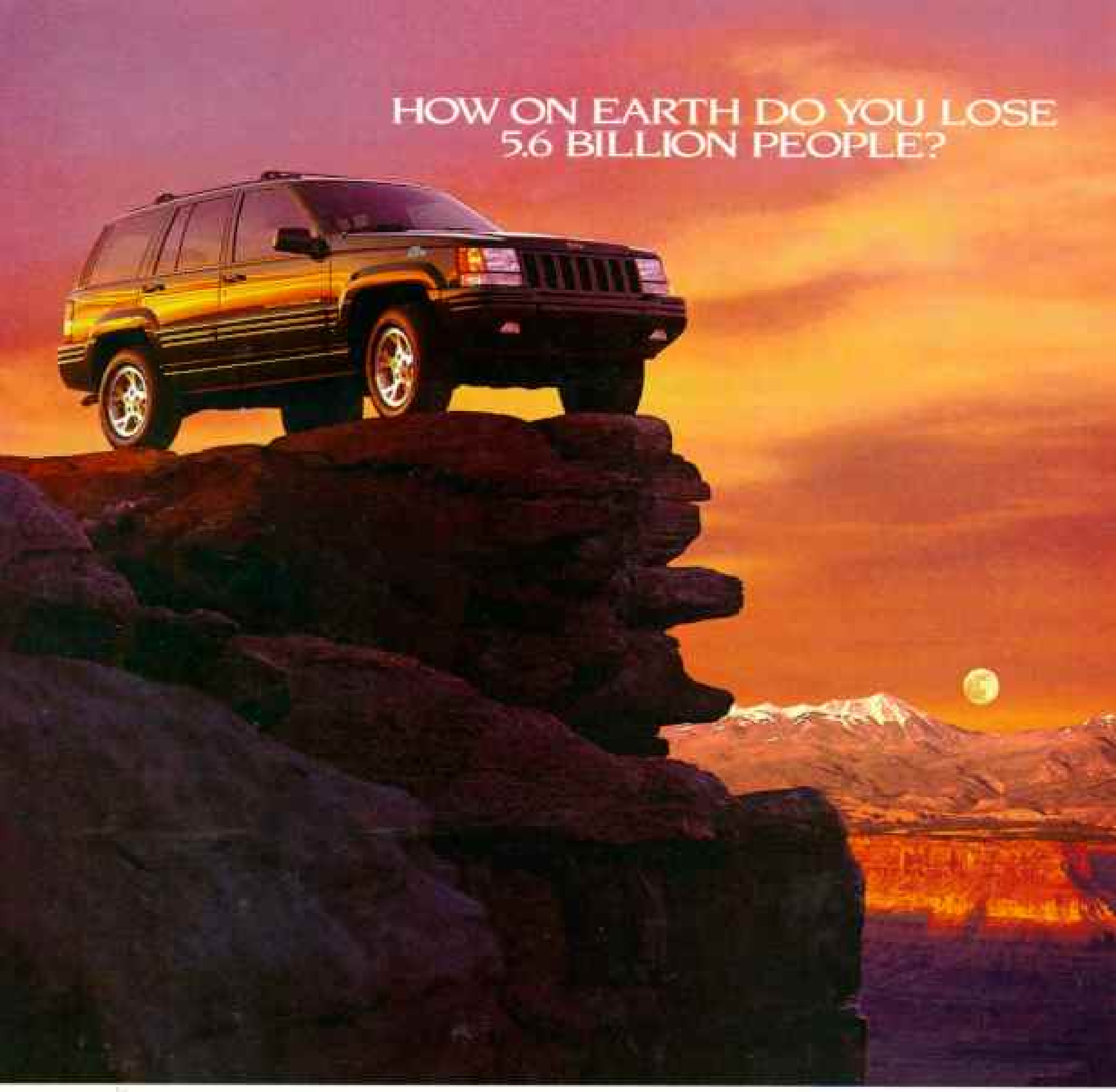
Always travel with a friend of the family. LeSabre.

More families depend on LeSabre than any other full-size car. They trust its safety features—from standard dual air bags to anti-lock brakes. They enjoy its roominess and comfort. In fact, they've made LeSabre the best-selling full-size car in America for the last four model years. We think that was a very friendly gesture. Please call 1-800-4A-BUICK.

BUICK
The New Symbol For Quality In America.



Official Sponsor of the 1996 U.S. Olympic Team



Some people have a habit of losing things. With the new Jeep Grand Cherokee Limited 4x4, the only "thing" you'll get in the habit of losing is the human race. Not to mention all the headaches and problems that go along with it.

It all starts with the most powerful engine available in its class*—our 5.2 litre 220 horsepower V8. To convert that power into traction, there's the new "on-demand" exclusive Quadra-Trac* all-the-time four-wheel drive system.

Grand Cherokee's interior lets you lose yourself in luxury with features like the new Jeep Memory System, which allows different drivers to set preferences for the driver's seat position, outside mirrors, and radio settings at the touch of a button.

To get more information or find the dealer nearest you, call 1-800-925-JEEP, or visit our Web site at http://www.jeepunpaved.com and find out what it really means to get away from it all.

Jeep

THERE'S ONLY ONE

*Automotive News, 1993 Compact Sport Utility Class. Always wear your seat belt. Jeep is a registered trademark of Chrysler Corporation.

Black-capped Vireo *(Vireo atricapillus)* **Size:** Length, 12 cm **Weight:** Approx. 10 g **Habitat:** Woodland and scrub in USA and Mexico; winters in western coastal regions in Mexico **Surviving number:** Estimated at less than 2,000 in USA, unknown in Mexico

Photographed by Wyma Meinzer

WILDLIFE AS CANON SEES IT

A black-capped vireo pauses momentarily from foraging. Insects are the usual fare of this little songbird, but seeds are also eaten during winter months when it migrates south. Habitat conversion has not only reduced suitable nesting areas, it has also increased the invasiveness of brown-headed cowbirds, a species that lays its eggs in vireo nests. Known as brood parasitism, this destroys the vireos' own nesting success. 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.

On Television

UNITED STATES MARINE CORPS

ALEX MARUCCO

■ EXPLORER, OCTOBER 22

Their Words Were Their Weapons

"IF IT WASN'T FOR the Navajo code there would have been a lot more casualties," said Keith Little, a Fourth Division Marine radioman who served on Iwo Jima during World War II as a Navajo code talker.

Sam Tso, also a young radioman with the Marines—who had spoken only Navajo for most of his childhood—returned to Iwo Jima 50 years later (above, right). "All this time I keep thinking, is it real or did I just dream about it?"

Tso and Little's story is brought to light in the EXPLORER film "War Code: Navajo." Filmmaker Lena Carr, herself a Navajo, won a Cultural Diversity Award from the National Geographic Society to tell of the crucial role played in the war by Navajo speakers. More than 400 served as radiomen in the Pacific (above), wielding a top-secret weapon—their language.

Generally thought to be unrelated to any Asian or European tongue, Navajo is an Athapaskan language with complex syntax and subtle tonal qualities. Using Navajo words that stood for letters of the English alphabet, the Native American radiomen spelled out messages. They devised word games to further confuse the enemy—*ginit* (hawk) for dive bomber, *nimasii* (potato) for hand grenade.

As Americans raised the flag on Mount Suribachi, the word went out in Navajo: "*Dibe binaa naadzii*—The eye of the sheep has healed."

■ PROGRAM GUIDE

National Geographic Specials
NBC. See local listings.

National Geographic EXPLORER
TBS. Sunday, 9 p.m. ET
October 1: "Nightmares of Nature: Man-Eater"; "Treasures of the Titanic"
October 8: "Nightmares of Nature: The Deep"; "Route 66: The Mother Road"
October 15: "Nightmares of Nature: In Cold Blood"; "Kenya, Cradle of Champions"
October 22: "War Code: Navajo"; "Nightmares of Nature: Squirm"
October 29: "Nightmares of Nature: A Cry in the Dark"; "Piranha!"

National Geographic Videos and Kids Videos
Call 1-800-343-6610

Children's Programming
CBS. Saturdays at 12:30 p.m. ET

ASK YOUR DOCTOR FOR A TRIAL OF CLARITIN®-D

Nondrowsy prescription relief for runny noses; itchy, watery eyes; sneezing; and stuffy, congested noses.

Clear relief from seasonal nasal allergy symptoms including nasal congestion.

Clear relief that won't make you drowsy. In studies, the incidence of drowsiness, 7%, was similar to placebo (sugar pill), 4%, at the recommended dose.

Clear relief for 24 hours with convenient *twice-a-day* dosing (every 12 hours).

Clear relief with a low occurrence of side effects.

Common side effects of CLARITIN®-D are sleeplessness, 16%, and dry mouth, 14%—the only two side effects that occurred more often with CLARITIN®-D than with placebo (sugar pill). Other side effects, including headache, sleepiness, and nervousness, occurred about as often as with placebo (sugar pill).

CLARITIN®-D contains pseudoephedrine sulfate, which also is in many over-the-counter (OTC) and prescription medications. Too much pseudoephedrine sulfate can cause nervousness, sleeplessness, dizziness, and other related side effects. Therefore, be sure to tell your health-care provider if you are taking any OTC or prescription medications, including decongestants.

There are some people who should not take CLARITIN®-D. Other people need to be especially careful using it. Therefore, be sure to tell your health-care provider if you have high blood pressure, heart disease, diabetes, glaucoma, thyroid or liver problems, or difficulty urinating, or if you are taking MAO inhibitors (prescription medicines that treat depression), or if you become pregnant or are nursing a baby. Also, CLARITIN®-D must not be chewed or broken.

Available by prescription only. Call 1-800-CLARITIN (1-800-252-7484) for a $5.00 coupon and important FREE information about relief from seasonal nasal allergies including nasal congestion.

Consult your doctor for important information concerning this product.

Twice-a-day

Claritin®-D

(loratadine 5 mg/pseudoephedrine sulfate, USP 120 mg)

Extended Release Tablets

Clear Relief

Please see adjacent page for additional important information.

Schering / KEY

CLARITIN®-D

brand of loratadine and pseudoephedrine sulfate, USP

Long-Acting Antihistamine/Extended Release Decongestant Tablets

BRIEF SUMMARY (For full Prescribing Information, see package insert.)

CAUTION: Federal Law Prohibits Dispensing Without Prescription

INDICATIONS AND USAGE: CLARITIN-D Tablets are indicated for the relief of symptoms of seasonal allergic rhinitis. CLARITIN-D Tablets should be administered when both the antihistaminic properties of CLARITIN (loratadine) and the nasal decongestant activity of pseudoephedrine are desired (see **CLINICAL PHARMACOLOGY**).

CONTRAINDICATIONS: CLARITIN-D Tablets are contraindicated in patients who are hypersensitive to this medication or to any of its ingredients.

This product, due to its pseudoephedrine component, is contraindicated in patients with narrow-angle glaucoma or urinary retention, and in patients receiving monoamine oxidase (MAO) inhibitor therapy or within fourteen (14) days of stopping such treatment (see **Drug Interactions** section). It is also contraindicated in patients with severe hypertension, severe coronary artery disease, and in those who have shown hypersensitivity or idiosyncrasy to its components, to adrenergic agents, or to other drugs of similar chemical structures. Manifestations of patient idiosyncrasy to adrenergic agents include: insomnia, dizziness, weakness, tremor, or arrhythmias.

WARNINGS: CLARITIN-D Tablets should be used with caution in patients with hypertension, diabetes mellitus, ischemic heart disease, increased intraocular pressure, hyperthyroidism, renal impairment, or prostatic hypertrophy. Central nervous system stimulation with convulsions or cardiovascular collapse with accompanying hypotension may be produced by sympathomimetic amines.

Use in Patients Approximately 60 Years and Older: The safety and efficacy of CLARITIN-D Tablets in patients greater than 60 years old have not been investigated in placebo-controlled clinical trials. The elderly are more likely to have adverse reactions to sympathomimetic amines.

PRECAUTIONS: General: Because the doses of this fixed combination product cannot be individually titrated and hepatic insufficiency results in a reduced clearance of loratadine to a much greater extent than pseudoephedrine, CLARITIN-D Tablets should generally be avoided in patients with hepatic insufficiency. Patients with renal insufficiency (GFR < 30 mL/min) should be given a lower initial dose (one tablet per day) because they have reduced clearance of loratadine and pseudoephedrine.

Information for Patients: Patients taking CLARITIN-D Tablets should receive the following information: CLARITIN-D Tablets are prescribed for the relief of symptoms of seasonal allergic rhinitis. Patients should be instructed to take CLARITIN-D Tablets only as prescribed and not to exceed the prescribed dose. Patients should also be advised against the concurrent use of CLARITIN-D Tablets with over-the-counter antihistamines and decongestants.

This product should not be used by patients who are hypersensitive to it or to any of its ingredients. Due to its pseudoephedrine component, this product should not be used by patients with narrow-angle glaucoma, urinary retention, or by patients receiving a monoamine oxidase (MAO) inhibitor or within 14 days of stopping use of an MAO inhibitor. It also should not be used by patients with severe hypertension or severe coronary artery disease.

Patients who are or may become pregnant should be told that this product should be used in pregnancy or during lactation only if the potential benefit justifies the potential risk to the fetus or nursing infant.

Patients should be instructed not to break or chew the tablet.

Drug Interactions: No specific interaction studies have been conducted with CLARITIN-D Tablets. However, loratadine (10 mg once daily) has been safely coadministered with therapeutic doses of erythromycin, cimetidine, and ketoconazole in controlled clinical pharmacology studies. Although increased plasma concentrations (AUC 0-24 hrs) of loratadine and/or descarboethoxyloratadine were observed following coadministration of loratadine with each of these drugs in normal volunteers (n = 24 in each study), there were no clinically relevant changes in the safety profile of loratadine, as assessed by electrocardiographic parameters, clinical laboratory tests, vital signs, and adverse events. There were no significant effects on QTc intervals, and no reports of sedation or syncope. No effects on plasma concentrations of cimetidine or ketoconazole were observed. Plasma concentrations (AUC 0-24 hrs) of erythromycin decreased 15% with coadministration of loratadine relative to that observed with erythromycin alone. The clinical relevance of this difference is unknown. These above findings are summarized in the following table:

Effects on Plasma Concentrations (AUC 0-24 hrs) of Loratadine and Descarboethoxyloratadine After 10 Days of Coadministration (Loratadine 10 mg) in Normal Volunteers

	Loratadine	Descarboethoxyloratadine
Erythromycin (500 mg Q8h)	+ 40%	+46%
Cimetidine (300 mg QID)	+103%	+ 6%
Ketoconazole (200 mg Q12h)	+307%	+73%

There does not appear to be an increase in adverse events in subjects who received oral contraceptives and loratadine.

CLARITIN-D Tablets (pseudoephedrine component) are contraindicated in patients taking monoamine oxidase inhibitors and for 2 weeks after stopping use of an MAO inhibitor. The antihypertensive effects of beta-adrenergic blocking agents, methyldopa, mecamylamine, reserpine, and veratrum alkaloids may be reduced by sympathomimetics. Increased ectopic pacemaker activity can occur when pseudoephedrine is used concomitantly with digitalis.

Drug/Laboratory Test Interactions: The in vitro addition of pseudoephedrine to sera containing the cardiac isoenzyme MB of serum creatinine phosphokinase progressively inhibits the activity of the enzyme. The inhibition becomes complete over 6 hours.

Carcinogenesis, Mutagenesis, Impairment of Fertility: There are no animal or laboratory studies on the combination product loratadine and pseudoephedrine sulfate to evaluate carcinogenesis, mutagenesis, or impairment of fertility.

In an 18-month oncogenicity study in mice and a 2-year study in rats loratadine was administered in the diet at doses up to 40 mg/kg (mice) and 25 mg/kg (rats). In the carcinogenicity studies pharmacokinetic assessments were carried out to determine animal exposure to the drug. AUC data demonstrated that the exposure of mice given 40 mg/kg of loratadine was 3.6 (loratadine) and 18 (active metabolite) times higher than a human given 10 mg/day. Exposure of rats given 25 mg/kg of loratadine was 28 (loratadine) and 67 (active metabolite) times higher than a human given 10 mg/day. Male mice given 40 mg/kg had a significantly higher incidence of hepatocellular tumors (combined adenomas and carcinomas) than concurrent controls. In rats, a significantly higher incidence of hepatocellular tumors (combined adenomas and carcinomas) was observed in males given 10 mg/kg and males and females given 25 mg/kg. The clinical significance of these findings during long-term use of loratadine is not known.

In mutagenicity studies with loratadine alone, there was no evidence of mutagenic potential in reverse (Ames) or forward point mutation (CHO-HGPRT) assays, or in the assay for DNA damage (Rat Primary Hepatocyte Unscheduled DNA Assay) or in two assays for chromosomal aberrations (Human Peripheral Blood Lymphocyte Clastogenesis Assay and the Mouse Bone Marrow Erythrocyte Micronucleus Assay). In the Mouse Lymphoma Assay, a positive finding occurred in the nonactivated but not the activated phase of the study.

Loratadine administration produced hepatic microsomal enzyme induction in the mouse at 40 mg/kg and rat at 25 mg/kg, but not at lower doses.

Decreased fertility in male rats, shown by lower female conception rates, occurred at approximately 64 mg/kg of loratadine and was reversible with cessation of dosing. Loratadine had no effect on male or female fertility or reproduction in the rat at doses approximately 24 mg/kg.

Pregnancy Category B: There was no evidence of animal teratogenicity in reproduction studies performed on rats and rabbits with this combination at oral doses up to 150 mg/kg (885 mg/m² or 5 times the recommended daily human dosage of 240 mg or 185 mg/m²), and 120 mg/kg (1416 mg/m² or 8 times the recommended daily human dosage), respectively. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, CLARITIN-D Tablets should be used during pregnancy only if clearly needed.

Nursing Mothers: It is not known if this combination product is excreted in human milk. However, loratadine when administered alone and its metabolite descarboethoxyloratadine pass easily into breast milk and achieve concentrations that are equivalent to plasma levels, with an AUC_{milk}/AUC_{plasma} ratio of 1.17 and 0.85 for the parent and active metabolite, respectively. Following a single oral dose of 40 mg, a small amount of loratadine and metabolite was excreted into the breast milk (approximately 0.03% of 40 mg after 48 hours). Pseudoephedrine administered alone also distributes into breast milk of the lactating human female. Pseudoephedrine concentrations in milk are consistently higher than those in plasma. The total amount of drug in milk as judged by the area under the curve (AUC) is 2 to 3 times greater than in plasma. The fraction of a pseudoephedrine dose excreted in milk is estimated to be 0.4% to 0.7%. A decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother. Caution should be exercised when CLARITIN-D Tablets are administered to a nursing woman.

Pediatric Use: Safety and effectiveness in children below the age of 12 years have not been established.

ADVERSE REACTIONS: Experience from controlled and uncontrolled clinical studies involving approximately 10,000 patients who received the combination of loratadine and pseudoephedrine sulfate for a period of up to 1 month provides information on adverse reactions. The usual dose was one tablet every 12 hours for up to 28 days.

In controlled clinical trials using the recommended dose of one tablet every 12 hours, the incidence of reported adverse events was similar to those reported with placebo, with the exception of insomnia (16%) and dry mouth (14%).

REPORTED ADVERSE EVENTS WITH AN INCIDENCE OF ≥2% ON CLARITIN-D IN PLACEBO-CONTROLLED CLINICAL TRIALS

PERCENT OF PATIENTS REPORTING

	CLARITIN-D n=1023	Loratadine n=543	Pseudoephedrine n=545	Placebo n=822
Headache	19	18	17	19
Insomnia	16	4	19	3
Dry Mouth	14	4	9	3
Somnolence	7	8	5	4
Nervousness	5	3	7	2
Dizziness	4	1	5	2
Fatigue	4	6	3	3
Dyspepsia	3	2	3	1
Nausea	3	2	3	2
Pharyngitis	3	3	3	3
Anorexia	2	1	2	1
Thirst	2	1	2	1

Adverse event rates did not appear to differ significantly based on age, sex, or race, although the number of non-white subjects was relatively small.

In addition to those adverse events reported above (≥2%), the following less frequent adverse events have been reported in at least one CLARITIN-D treated patient:

Autonomic Nervous System: Abnormal lacrimation, dehydration, flushing, hypoesthesia, increased sweating, mydriasis.

Body As A Whole: Asthenia, back pain, blurred vision, chest pain, conjunctivitis, earache, ear infection, eye pain, fever, flu-like symptoms, leg cramps, lymphadenopathy, malaise, photophobia, rigors, tinnitus, viral infection, weight gain.

Cardiovascular System: Hypertension, hypotension, palpitations, peripheral edema, syncope, tachycardia, ventricular extrasystoles.

Central and Peripheral Nervous System: Dysphonia, hyperkinesia, hypertonia, migraine, paresthesia, tremors, vertigo.

Gastrointestinal System: Abdominal distension, abdominal distress, abdominal pain, altered taste, constipation, diarrhea, eructation, flatulence, gastritis, gingival bleeding, hemorrhoids, increased appetite, stomatitis, taste loss, tongue discoloration, toothache, vomiting.

Liver and Biliary System: Hepatic function abnormal.

Musculoskeletal System: Arthralgia, myalgia, torticollis.

Psychiatric: Aggressive reaction, agitation, anxiety, apathy, confusion, decreased libido, depression, emotional lability, euphoria, impaired concentration, irritability, paranoia.

Reproductive System: Dysmenorrhea, impotence, intermenstrual bleeding, vaginitis.

Respiratory System: Bronchitis, bronchospasm, chest congestion, coughing, dry throat, dyspnea, epistaxis, hemoptysis, nasal congestion, nasal irritation, sinusitis, sneezing, sputum increased, upper respiratory infection, wheezing.

Skin and Appendages: Acne, bacterial skin infection, dry skin, eczema, edema, epidermal necrolysis, erythema, hematoma, pruritus, rash, urticaria.

Urinary System: Dysuria, micturition frequency, nocturia, polyuria, urinary retention.

The following additional adverse events have been reported with the use of CLARITIN Tablets: alopecia, altered salivation, amnesia, anaphylaxis, angioneurotic edema, blepharospasm, breast enlargement, breast pain, dermatitis, dry hair, erythema multiforme, hemoptysis, hepatic necrosis, hepatitis, jaundice, laryngitis, menorrhagia, nasal dryness, photosensitivity reaction, purpura, seizures, supraventricular tachyarrhythmias, and urinary discoloration.

Pseudoephedrine may cause mild CNS stimulation in hypersensitive patients. Nervousness, excitability, restlessness, dizziness, weakness, or insomnia may occur. Headache, drowsiness, tachycardia, palpitation, pressor activity, and cardiac arrhythmias have been reported. Sympathomimetic drugs have also been associated with other untoward effects, such as fear, anxiety, tenseness, tremor, hallucinations, seizures, pallor, respiratory difficulty, dysuria, and cardiovascular collapse.

OVERDOSAGE: In the event of overdosage, general symptomatic and supportive measures should be instituted promptly and maintained for as long as necessary. Treatment of overdosage would reasonably consist of emesis (ipecac syrup), except in patients with impaired consciousness, followed by the administration of activated charcoal to absorb any remaining drug. If vomiting is unsuccessful, or contraindicated, gastric lavage should be performed with normal saline. Saline cathartics may also be of value for rapid dilution of bowel contents. Loratadine is not eliminated by hemodialysis. It is not known if loratadine is eliminated by peritoneal dialysis.

Somnolence, tachycardia, and headache have been reported with doses of 40 to 180 mg of CLARITIN Tablets. In large doses, sympathomimetics may give rise to giddiness, headache, nausea, vomiting, sweating, thirst, tachycardia, precordial pain, palpitations, difficulty in micturition, muscular weakness and tenseness, anxiety, restlessness, and insomnia. Many patients can present a toxic psychosis with delusions and hallucinations. Some may develop cardiac arrhythmias, circulatory collapse, convulsions, coma, and respiratory failure.

The oral LD_{50} values for the mixture of the two drugs were greater than 525 and 1809 mg/kg in mice and rats, respectively. Oral LD_{50} values for loratadine were greater than 5000 mg/kg in rats and mice. Doses of loratadine as high as 10 times the recommended daily clinical dose showed no effect in rats, mice, and monkeys.

Schering Corporation
Kenilworth, NJ 07033 USA

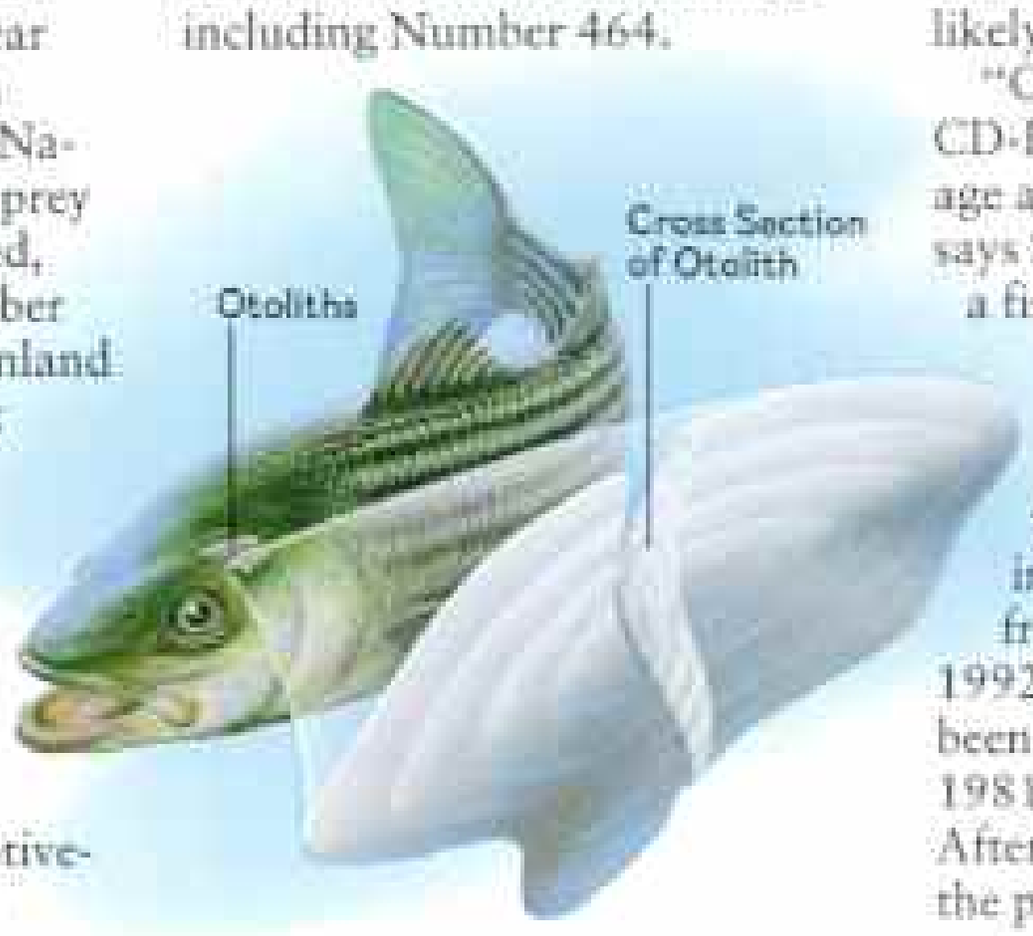
Rev. 1/05 17798526-J65

JOEL SARTORE (ABOVE); PAINTING BY PETER A. SAWYER

Marauding Red Wolves May Legally Be Shot

NEW POLICY has changed the rules for one endangered species, the red wolf. This male, examined in May 1994 by U. S. Fish and Wildlife Service biologists, was part of a captive-breeding program. He and his pack had been released a year earlier on a North Carolina island near Alligator River National Wildlife Refuge. But prey proved scarce, yearlings died, and this gaunt male—Number 464—was freed on the mainland for better hunting. Late last April a landowner caught him digging under his dog pen and killed him.

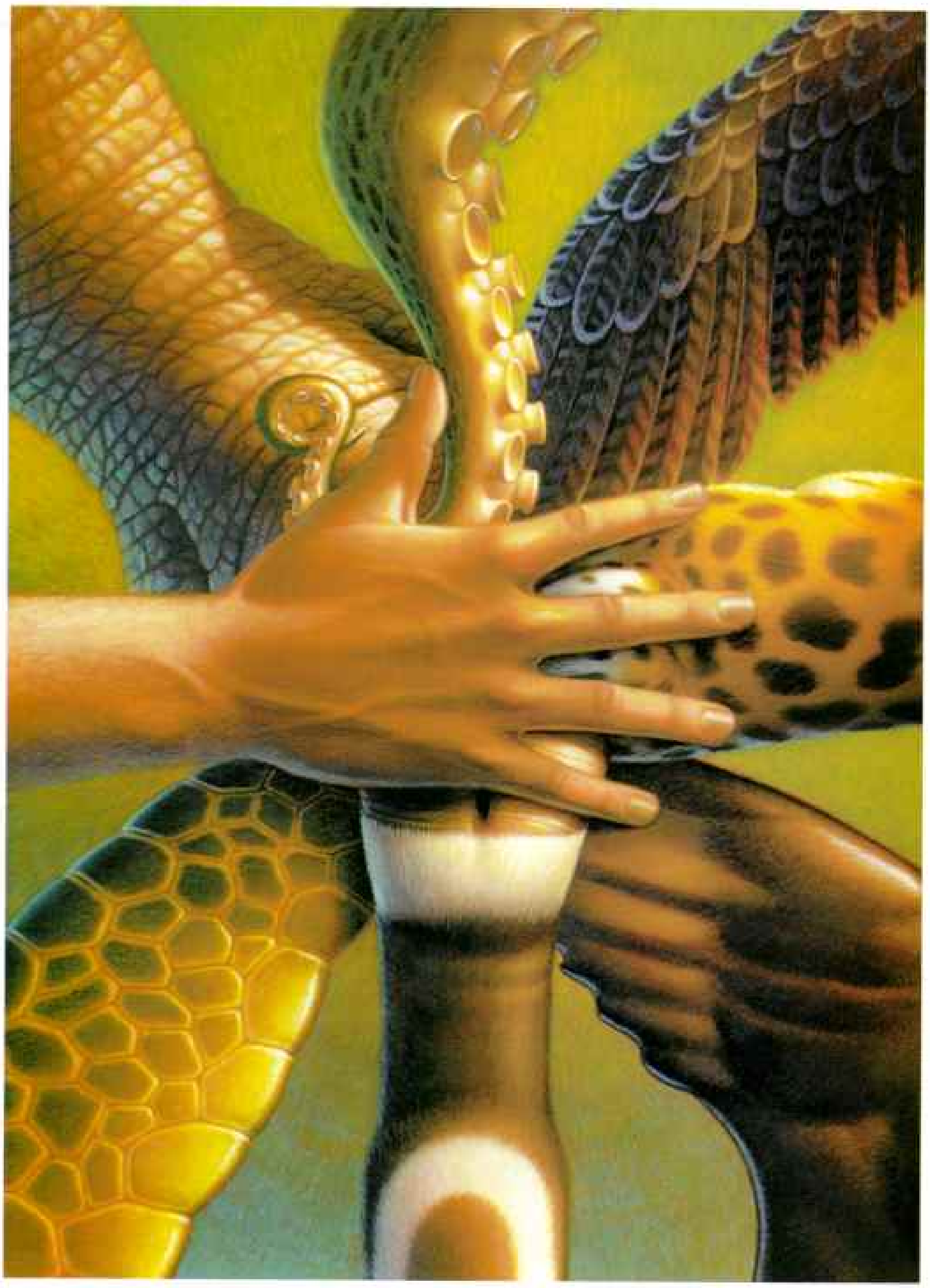
By 1970 habitat loss and hunting in the U. S. Southeast had wiped out these small, shy wolves in the wild. Since 1987, captive-bred red wolves released in northeastern North Carolina and the Great Smoky Mountains have multiplied to some 60 animals. Last April 13, after years of complaints filed by landowners, the service ruled that red wolves caught attacking livestock or pets on private land in 14 North Carolina and Tennessee counties could be killed—including Number 464.



Rocks in Fish's Head Tell Tales

WHY WERE STRIPED BASS nearly wiped out of the Chesapeake Bay during the 1970s? Otoliths, or ear stones, inside the fish's head told researcher David Secor that severe overfishing, rather than pollution, was the likely culprit.

"Otoliths are like biological CD-ROMs chronicling a fish's age and environmental history," says Secor. They can also reveal a fish's birth site, the waters it has traveled, even which days it fed. All fish absorb calcium carbonate, which forms layered stones in their inner ears. Layers from striped bass caught in 1992 revealed that none had been hatched between 1972 and 1981, suggesting intense fishing. After a five-year moratorium, the population has recovered.



IF WE'RE GOING TO SAVE THE PLANET, WE ALL NEED TO LEND A HAND, PAW, FIN, HOOF, AND WING.

These days, everyone is becoming more environmentally conscious. From recycling at home to driving more fuel-efficient cars, we're all doing our part to clean up the planet. But we still have a long way to go. And together, we can make a big difference in the lives of all creatures, great and small.

At Chrysler Corporation, we're doing our part by recycling. Every year we recycle thousands of tons of wooden pallets, cardboard, and paper. Even our cars are 75 percent recyclable.

Our engineers are also working to reduce emissions and improve air quality. Even though today's gas engines burn cleaner and more efficiently than ever, we're looking at alternative fuels like methanol-gasoline mixtures, natural gas, and electricity to power our vehicles in the future.

But you don't have to wait for technology to have a "green" machine. Keep your air and fuel filters clean for better mileage, performance, and a cleaner exhaust. Maintain recommended tire pressures to increase fuel efficiency. And combine errands, since short trips use more gas per mile than a long trip.

As you can see, there's a lot we can do. So let's all lend a hand to save our planet. After all, it's the only one we have.

CHRYSLER CORPORATION

CHRYSLER · PLYMOUTH · DODGE · DODGE TRUCKS · JEEP® · EAGLE

For more information on Chrysler Corporation and our environmental programs, visit us on the Internet at http://www.chryslercorp.com

JOEL MCDONALD

Sphinx Moths: Hummingbird Mimics

THRUMMING OF TINY WINGS may mean a hummingbird is flitting from flower to flower. But look again. The vibrations may be coming from a two-inch-long white-lined sphinx moth lapping up nectar from bee-balm blossoms. The moth uncoils a long flexible tongue to get at the sweet treat, pollinating the flowers in the process.

Sphinx moths number hundreds of varieties worldwide. Most are nectar feeders, including a species predicted by Charles Darwin. When he learned of a Madagascar orchid with a very long nectar-bearing tube, he reasoned that the orchid could be pollinated only by an insect that could reach the nectar. Darwin speculated about "some huge moth, with a wonderfully long proboscis." In 1903 it was found—a sphinx moth with an eight-inch tongue.

Seychelles Tourists Threaten Unique Palms

WORLD'S BIGGEST SEEDS, huge double coconuts were named *cocos-de-mer* by 18th-century sailors who believed they came from fantastic palms that grew under the sea. In fact, they grow only in the Indian Ocean's Seychelles archipelago, where the government is stepping up efforts to protect them.

Unlike most coconuts, which disperse by floating to other islands, fresh coco-de-mer nuts cannot float, so the palm stayed put and evolved separately. Nuts weigh up to 50 pounds, take ten years to mature, and once were in demand for a reputed love potion. Today tourists pay as much as $200 for the novelties on the black market. Under tighter controls, private owners of nut-bearing cocos-de-mer now must register their holdings so officials can keep better track of the illegal trade.

BILL CURTSINGER

ARTURO FUENTES

NAFTA Group Probes Bird Kill in Mexico

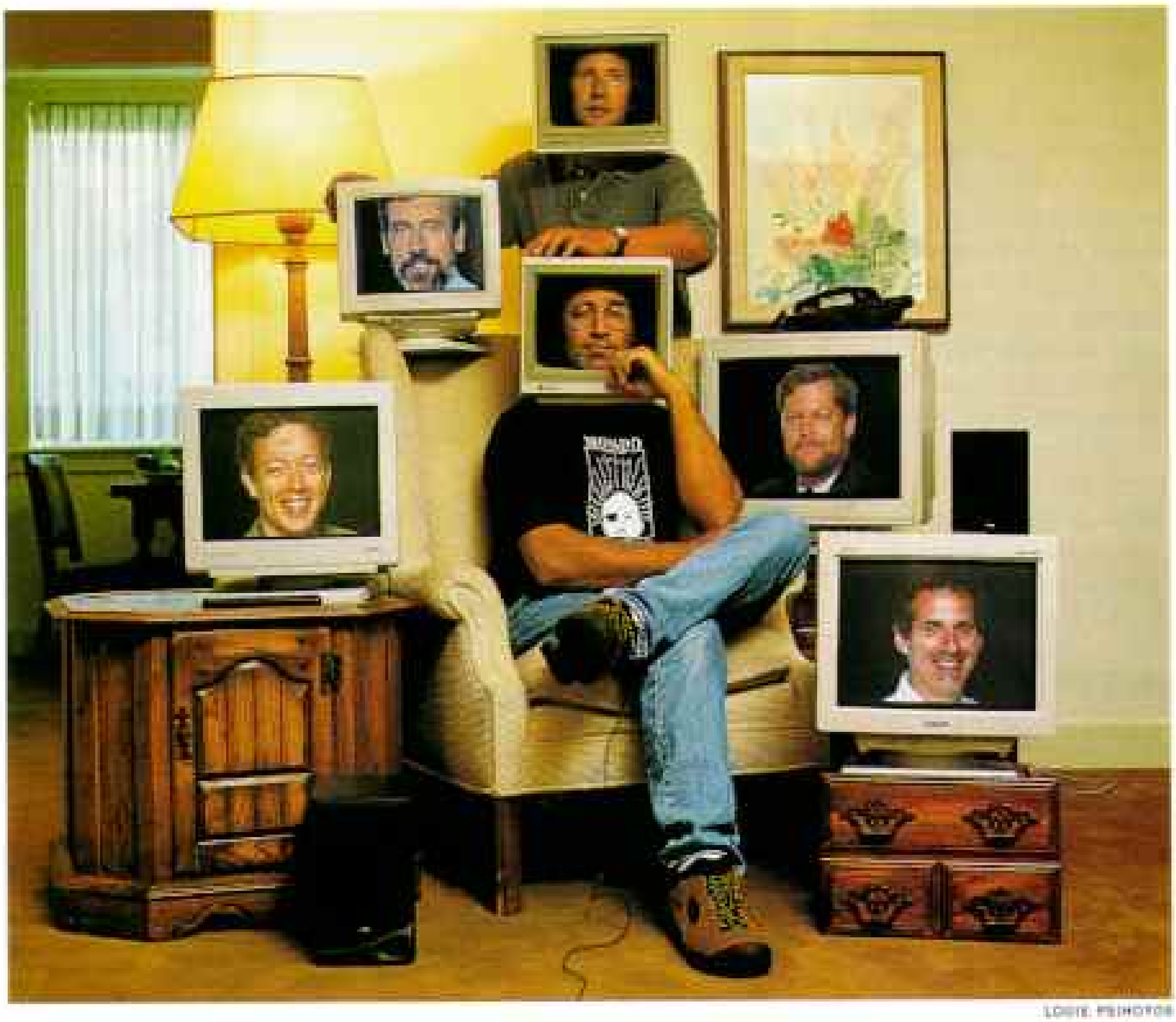
ADDRESSING MORE THAN LOWER TARIFFS, the North American Free Trade Agreement approved in 1993 by Canada, the United States, and Mexico also has a watchdog environmental commission. Does it have teeth? Its first test case is a massive die-off last December of some 40,000 birds in a polluted reservoir in Mexico's Guanajuato state.

"Because many migratory species died, we wanted to get this international body involved," says Mary Minette of the National Audubon Society. Last June the commission accepted a petition by Audubon and two Mexican environmental groups to investigate the Silva Reservoir die-off. Mexican environmental officials believe that a large amount of poisonous red dye had been dumped into the reservoir, killing the birds. Independent conservationists are skeptical, suspecting untreated industrial runoff from local tanneries that contains toxic chromium.

Although the reservoir has been drained, other impoundments may be at risk. Reports of human illness near Silva last year ran high. The commission hopes to find the cause and propose a cleanup strategy. —JOHN L. ELIOT

NATIONAL GEOGRAPHIC

On Assignment



LOUIE PSIHOYOS

■ INFORMATION REVOLUTION

Louie and Friends: Heads Up

"I like to do the impossible," says freelance photographer LOUIE PSIHOYOS, who regularly produces impossible-to-photograph stories for the GEOGRAPHIC on such subjects as trash, sleep, and the sense of smell. "But I would never be able to do it without help," he says. Or without humor, his favorite way to make a point.

Melding those two necessities, Louie set up this self-portrait to include collaborators on his article in this issue. Louie, seated, and his longtime assistant, artist JOHN KNOEBBER, standing, wear gutted computer monitors. Digitized head shots of magazine staffers appear on working monitors: (clockwise from left) layout editor DAVID GRIFFIN, art director ALLEN CARROLL, illustrations editor BILL DOUTHITT, and senior writer JOEL SWERDLOW.

"John and I wanted to shoot a computer story without too many pictures of people hunkered over a keyboard," Louie says. Meeting that objective kept the pair busy with occasional 16-hour days for nearly a year.

At one point they convinced the wealthiest entrepreneur in the world to dangle from the treetops by a rope atop huge stacks of paper (pages 16-17) —the better to illustrate the storage capacity of a CD-ROM.

They also—briefly—shot novelist William Gibson with a laser (page 31). "My hand tingled for three days," says Gibson.

"We're Laurel and Hardy," Louie says of his friend John and their work habits, "by way of the 'The Far Side' cartoon."

John makes his home in Sausalito, California, on a 1950s sailboat he restored. Louie, a graduate of the University of Missouri School of Journalism, lives in Boulder, Colorado, with his wife, Vicki, and sons, Nico and Sam. He recently wrote and photographed *Hunting Dinosaurs* (Random House, 1994), a humorous and informative look at paleontological discoveries.

NATIONAL GEOGRAPHIC (ISSN 0027-9358) IS PUBLISHED MONTHLY BY THE NATIONAL GEOGRAPHIC SOCIETY, 1145 17TH ST. N.W., WASHINGTON, D. C. 20036-4688. $25.00 A YEAR, $3.00 A COPY. SECOND-CLASS POSTAGE PAID AT WASHINGTON, D. C., AND ELSEWHERE. POSTMASTER: SEND ADDRESS CHANGES TO NATIONAL GEOGRAPHIC, P.O. BOX 2174, WASHINGTON, D. C. 20013.

NATIONAL GEOGRAPHIC

Geoguide

The Mountain Gorillas of Africa

■ Under pressure from farming and woodcutting, the land that harbors Africa's 600 or so surviving mountain gorillas has been reduced to two forested "islands." About 300 gorillas live on the slopes of a few volcanic peaks on the borders of Rwanda, Zaire, and Uganda; the others inhabit the nearby Impenetrable Forest. To get a clear idea of just how small the total habitat is, you can make a simple map at home. With the map of Africa on page 69 as a guide, use 15 feet of string to lay out the shape of the continent on a table. If you make the continent four feet from north to south, a chocolate chip placed near the Equator in East Africa will approximate the size and location of the remaining habitat.

■ By encouraging tourists to visit gorillas, conservationists helped protect them from illegal hunting. And now the gorillas are worth much more alive than dead. Why do you think that is so?

■ Many people are working to save the gorillas from extinction. What would the world lose if these gentle apes died out? Why might some people not want to save the gorillas?

■ After the mountain gorillas became a worldwide attraction, schoolchildren in Rwanda began to celebrate them, drawing pictures of the endangered animals and singing and writing about them. How might the concern, love, and enthusiasm of children help gorilla survival—both short-term and long-term?

A Rwandan refugee in Zaire carries firewood (top) cut near the forest home of some of the world's last mountain gorillas. Across the border in Rwanda's Volcanoes National Park (above), Fidele Nshogoza monitors gorillas led by a silverback male. A mother of that group cradles her two-year-old (left) near the Karisoke Research Center.

ALL BY MICHAEL NICHOLS

Can a personal computer grow up with your family?

Technology changes so quickly, it's only natural to wonder whether the computer you buy today will be obsolete tomorrow.

That's why Apple designed the Macintosh® Performa® to work every bit as well tomorrow as it does today.

You grow with your Performa.

Macintosh Performa comes with all the software you're ever likely to need—enough to write letters, do a household budget, bring work home from the office and more.

Because it's a Macintosh, you'll find that Performa is easy to use. Learning games, a dictionary and a multimedia encyclopedia can help your kids from the first day of kindergarten through the last day of college.

If your interests grow or change, thousands of different programs are available to meet your needs.

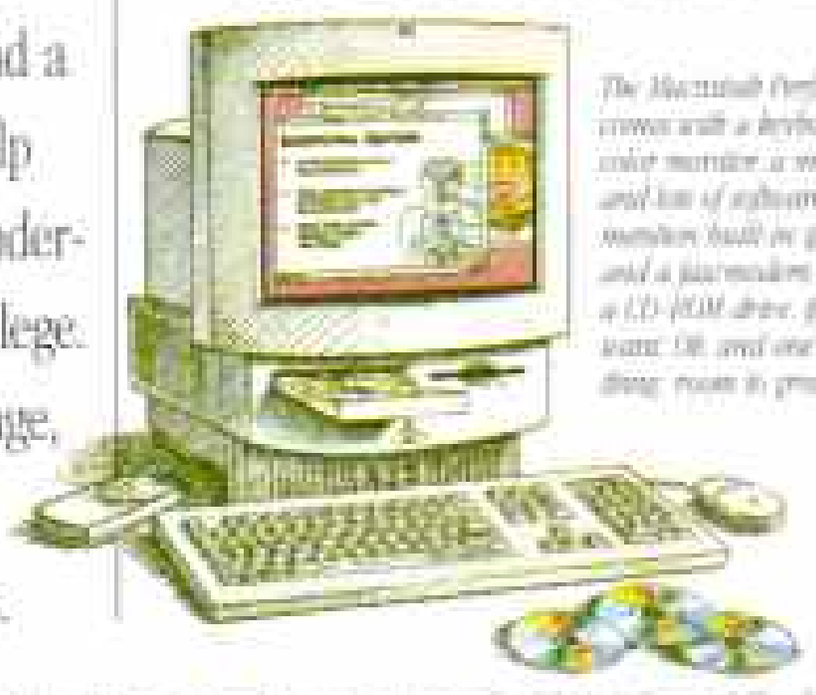
Plus, since more homes and schools use Apple® computers than any other brand, you have access to the newest, most exciting software.

Performa grows with you.

Apple has a unique plug-and-play philosophy that makes it easy to add capabilities to your Performa—today, tomorrow, even years down the road.

What does plug-and-play mean? Exactly what it sounds like. When you want to add a printer, just plug it in. If you need more storage space, just plug in a hard drive. And so on.

There are no cards to fool with.



The Macintosh Performa comes with a keyboard, a color monitor, a mouse and lots of software, but its modem built-in speakers and a fax/modem—even a CD-ROM drive. If you want. Or, and one other thing: room to grow.

There are no complex CONFIG.SYS or AUTOEXEC.BAT files to modify. No other computer makes it this simple to add what you need.

You can also add extra memory, if you need it. You may even want to upgrade your Performa to the sizzling new PowerPC™ chip (making it virtually impossible to outgrow).

And every Performa comes with a year of in-home service and a lifetime of toll-free telephone support (making your future virtually worry-free).

All of which means that year after year, your family can enjoy the kind of power you buy a computer for in the first place. The power to be your best.™

Performa®

The Family Macintosh