

VOL. 190, NO. 3



SEPTEMBER 1996

NATIONAL GEOGRAPHIC

Hawk High Over
FOUR CORNERS 80

SCOTLAND 2 GAZA 28
SCYTHIANS 54 TARANTULAS 98 FIRE 116

NATIONAL GEOGRAPHIC MAGAZINE

WILLIAM L. ALLEN, *Editor*

Associate Editors

ELIZABETH A. MOIZE, ROBERT M. POOLE

SENIOR ASSISTANT EDITORS

ROBERT BOOTH, *Production* • ALLEN CARROLL, *Cartography*

WILLIAM T. DOUTHETT, *Electronic Media* • RICK GORE, *Science* • DAVID JEFFERY, *Legends*

THOMAS R. KENNEDY, *Photography* • PETER MILLER, *Expeditions*

JOHN G. MITCHELL, *Environment* • OLIVER PAYNE, *Manuscripts*

CONSTANCE H. PHELPS, *Layout and Design* • LESLEY B. ROGERS, *Research*

W. ALLAN ROYCE, *Illustrations* • CHRISTOPHER P. SLOAN, *Art* • GEORGE E. STUART, *Archaeology*

EDITORIAL

Assistant Editors: Don Bell, Judith Brown, Mike Edwards, Alice J. Hall, Jane Yessels, Bernard Chanish, Japanese Edition; *Senior Writers:* John L. Eto, Cathy Newman, Joel L. Swardlow, Pim J. Vestling; *Senior Editorial Staff:* Larry Kohl, Thomas O'Neill, Peter L. Porteous, Jennifer Roak, Cliff Tarpy, Meg Nottingham Walsh, Boris Weintraub, A. R. Williams; *Production:* John L. Mohrback; *Editorial Staff:* Cassandra Franklin-Bortajosa, Lisa Moore LaRoe, Alan Morrison, William R. Newcott, Katherine Orment, Margaret S. Zackowitz; *Research:* Michaeline A. Sweeney; *Assoc. Director:* Senior Researchers: Carolyn H. Anderson, Judith F. Ball, Kathy B. Maher, Bertina W. McConnell, Jeanne E. Peters, Abigail A. Tipton; *Researchers:* Eva F. Dasher, Valerie A. May, Christopher Scajora; *Legends:* Victoria C. Duchesneau; *Planning Council:* Mary McPeak, David W. Woodell

ILLUSTRATIONS

Photography: Kent J. Robertsen, *Assoc. Director:* Susan A. Smith, *Asst. Dir.:* Sam Abeel, Joel Cobb; *Illustrations Editors:* Dennis R. Dimick, *Asst. Dir.:* John A. Echave, *Research Grant Projects:* Elizabeth Chang Krist, Bruce A. McElfresh, Kathy Moran, Kurt F. Mutschler, Susan Weikman; *Layout and Design:* David Griffin, *Assoc. Dir.:* William H. Marr; *Typography:* Betty Clayman-DeAtley, Kay Rubor Hawkins, Douglas M. McKinney; *Art:* Christopher A. Klein; *Artists:* Karen E. Gibbs, Hillel J. Hoffmann; *Research:* Engraving and Printing: Janet C. Evans, *Director:* July L. Garvey, Randal B. Bliss

CARTOGRAPHY

John F. Shupe, *Chief Cartographer, Assoc. Director:* Marguerite B. Hunsiker, *Asst. Directors:* Kevin P. Allen, Frances H. Myers, Juan J. Vaidés, *Geographers:* Alice T.M. Rechin; *Editors:* Edward Easton, Maureen J. Flynn, Jonathan E. Kaut, David B. Miller, Gus Platt; *Designers:* Sally S. Sommerall, *Supv.:* Charles W. Berry, John A. Bonner, Robert E. Pratt, Nancy Schweickart; *Researchers:* Harold A. Hanson, *Supv.:* Diandra T. Bevington-Attard, Mary Kate Cannistrà, Deborah J. Gibbons, Linda R. Koets, Lisa R. Ritter, Andrew J. Wahl; *Production:* Richard W. Bullington, Martin J. Golden, *Supvs.:* Barbara G. Carrigan, Barbara P. Holland, Ellen J. Landman, James E. McClelland, Jr., Daniel J. Ortiz, Stephen P. Wells, Alfred L. Zeharth; *Specialists:* Edward J. Holland, Ronald E. Williamson

EDITORIAL SERVICES

Administration: Neva L. Folk, *Asst. to the Editor:* Maria-Teresa Lawrence, *Business Manager:* Sara L. Anderson, Sandra M. Dane, Maria Domeyko, Artemia S. Lampalchakis, Rebecca Martin, Charlene S. Valeri, Kathy Williamson; *Control Center:* Carol L. Dumont; *Travel:* Ann C. Judge, *Director:* Ann E. Chenoweth; *Audiovisual:* Joanne M. Hess, *Asst. Vice President and Director:* Ronald S. Altman, Scott A. Brader, P. Andrew van Duyn; *Communications:* Mary Joanne Jacobsen, *Director, Public Affairs:* Joy Aschenbach, Barbara H. Fallon, Barbara S. Moffet, Bonita M. Swath; *Information Services:* *Correspondence:* Joseph M. Winton, Jr., *Director:* John A. Ritter; *Image Collection:* Maury A. Mulvihill, *Asst. Vice President and Director:* Carolyn J. Harrison; *William D. Perry, Image Sales, Library and Indexing:* Susan Filer Cardy, *Director:* Ann C. Benson, Ellen D. Briscoe, Carolyn Locke, Marta Strada; *Records:* Mary Anne McMillan, *Director:* Ann E. Hubbs; *Translations:* Kathryn A. Bass

ADMINISTRATION

Asst. Vice Presidents: Christina C. Alberghini, Carolyn F. Clewell, Joseph S. Fowler, Douglas E. Hill, Robert E. Howell, Robert V. Roenig, Thomas E. Kulkosky, Carol E. Lang, Frances A. Marshall, Jennifer Moseley, Jimmie D. Prodemore, Stephen R. Vick; *Asst. Treasurers:* Barbara J. Constantz, Richard T. Morland; *Assts. to the Chairman:* Karen L. Hershberger, Karen S. Marsh; *Asst. to the President:* Marilyn J. Williams; *Accounting:* Chia-Chyi Cheng, Michael J. Cole, Larry E. Dowdy, Barbara A. Finn, Janet C. Yates; *Administration:* David C. Beveridge, Mary L. Blanton, Dolores J. Granberg, Carol A. Houck, Myra A. McLaffan, R. Miles White, Barbara A. Williams; *Circulation:* Kitty Camill Colbert, *Asst. Vice President:* Kathleen A. Gallagher; *Development Office:* Margaret Sears, *Director:* Dorothy R. Jacobson, Betty Ellison; *Educational Services:* Robert L. Graham; *Explorers Hall:* Susan S. Horton, *Director:* Nancy W. Beers; *Richard McWalters, Foreign Editions:* Robert W. Hernandez, *Asst. Vice President and Director:* Geography Education: Robert E. Dull, *Asst. Vice President and Director:* Mary Lee Eldon, J. Joe Ferguson, Roger B. Hirschland; *Human Resources:* Barbara Duckworth-Casie; *Information Systems:* James P. McCrystal, *Vice President:* Richard A. Mechler, *Asst. Vice President:* Scott Bolden, Warren Burger, William L. Chewing, Curtis L. Conway, Jr., Fred R. Hart, George F. Hubbs, Robert W. Madden; *Promotion:* Joan M. Anderson, James V. Bullard, Robert L. Feigt, Charles F. Heermann III, Deborah A. Jones

PRODUCTION SERVICES

Hans H. Wegner, *Asst. Vice President, Imaging Services:* Robert E. Alnutt; *Manufacturing:* George V. White, *Director:* John T. Durin, *Assoc. Director:* Pre-Press: Geoffrey T. McConnell, *Director:* Martin G. Anderson, James C. Pfleger, Philip E. Plude, Bernard G. Quarrick; *Printing:* Joseph M. Anderson, Sherrie S. Harrison, Diana L. Yates; *Quality:* Bill M. Aldridge, *Director, Administration:* Joan S. Simms

ADVERTISING

J. Scott Crystal, *Vice President and Director,* Ron Bokhoff, *Western Manager:* Laurie L. Kutische, *Chicago Manager:* Sherburne F. Naulty, *Eastern Manager:* Philip G. Reynolds, *Special Accounts and Southwest Manager:* Andrea Vaughan, *Detroit Manager:* Washington; *Santa L. Moffat, Asst. Vice President, Operations:* Renee S. Clepper, *Research and Marketing:* Gail M. Jackson, *Production:* Pandora B. Todd, *Promotion*

EDUCATIONAL SERVICES OF THE SOCIETY

Book Division: William R. Gray, *Vice President and Director:* Charles Rogod, *Asst. Director:* Barbara A. Payne; *Editorial Director:* John G. Agrone, Leah Benstead-Vel, Martha C. Christian, Elizabeth Newhouse; *Senior Editors:* *Traveler:* Richard Busch, *Editor:* Paul Martin, *Managing Editor:* World: Susan Mondshain Tejada, *Editor:* Scott S. Shuckey, *Managing Editor, Educational Media:* George A. Peterson, *Vice President and Director:* David Beacom, *Assoc. Director, Administration:* Suzanne R. McDowell, *Asst. Vice President:* Carolyn W. Jones

NATIONAL GEOGRAPHIC TELEVISION

Timothy T. Kelly, *President:* Todd Berman, *Marketing/Distr.:* Susan Bode, *Business Affairs:* Lowell Soffer, *Finance:* Andrew Wilk, *Programming/Production:* Patricia Gang, *Film Library:* Nicolas Nizan, *Exec. Producer, Specials:* Michael Rosenfeld, *Exec. Producer, Explorer:* Kathleen F. Teter, *Public Relations*

Copyright © 1998 National Geographic Society. All rights reserved. Narrow, Geographic and Yellow Border: Registered Trademarks © Mercat Registradas. National Geographic assumes no responsibility for unsolicited materials.



NATIONAL GEOGRAPHIC SOCIETY

"For the increase and diffusion of geographic knowledge."

The NATIONAL GEOGRAPHIC SOCIETY is chartered in Washington, D.C., as a nonprofit scientific and educational organization. Since 1890 the Society has supported more than 5,500 explorations and research projects, adding to knowledge of earth, sea, and sky.

REG MURPHY, *President and CEO*

Senior Vice Presidents

GENE FERRONE

NINA HOFFMAN

DALE A. PETROSKEY

ROBERT B. SIMS

Vice Presidents

SUZANNE DUPRÉ, *Secretary and Counsel*

H. GREGORY PLATTS, *Treasurer*

JOHN D. BLODGER, JOYCE M. GOLDEN

DONNA L. HASSINGER, JAMES P. KELLY

JONATHAN W. LANDERS, LAWRENCE B. LUX

GEORGE E. NEWSTEDT

BOARD OF TRUSTEES

GILBERT M. GROSVENOR, *Chairman*

JOEL ALBRITTON

Chairman, The Riggs National Bank

WILLIAM L. ALLEN

THOMAS E. BOLGER

Chairman, Executive Committee, Bell Atlantic

FRANK BORMAN

Chairman and CEO, Pater Corporation

LEWIS M. BRANSCOMB

Kennedy School of Government, Harvard University

J. CARTER BROWN

Director Emeritus, National Gallery of Art

MARTHA E. CHURCH

The Carnegie Foundation for the Advancement of Teaching

MICHAEL COLLINS

President, Michael Collins Associates

A. LEON HIGGINBOTHAM, JR., *Former Chief*

Judge for the Third Circuit, U. S. Court of Appeals

NINA HOFFMAN

JOHN JAY ISELIN

President, The Cooper Union

JAMES C. KAUTZ

Limited Partner, Goldman, Sachs & Co.

J. WILLARD MARRIOTT, JR.

Chairman and President, Marriott International

FLORETTA DUKES MCKENZIE

Former Superintendent of Schools, District of Columbia

REG MURPHY

PATRICK F. NOONAN

Chairman, The Conservation Fund

NATHANIEL P. REED

Businessman-Environmentalist

WILLIAM K. REILLY

Former Administrator, Environmental Protection Agency

ROZANNE L. RIDGWAY

Former Assistant Secretary of State

B. FRANCIS SAUL II

Chairman and President, B. F. Saul Company

ROBERT B. SIMS

TRUSTEES EMERITUS

Owen R. Anderson, Robert L. Breedon, Lloyd H. Elliott,

George M. Eddy, William Green, Caryl F. Haskins,

Mrs. Lyndon B. Johnson, Wm. McChesney Martin, Jr.,

Laurence S. Rockefeller, Robert C. Seamans, Jr.,

Frederick G. Vestingh

RESEARCH AND EXPLORATION COMMITTEE

George E. Stuart, *Vice President and Chairman:*

Frank C. Whitmore, Jr., and Richard S. Williams, Jr.,

Vice Chairmen: Steven E. Statten, *Secretary:*

H. J. de Blij, Donella H. Meadows, Betty J. Meggers,

Bernard Q. McIntosh, David Pimentel, Peter H. Raven,

Robert C. Seamans, Jr., Charles H. Southwick,

John H. Steele, George E. Watson, Henry T. Wright

EDUCATION FOUNDATION

Larry M. Proffer, *Executive Director*

Scott

A millennium of struggle for self-determination has forged a hardy race in a beguiling landscape. Often invaded, never vanquished, Scotland

Plaid to the Bone

maintains a strong awareness of Scottishness, present and past. In a nod to Victorian days, a hunter sporting a top hat and muzzle-loader signals his dog to stay during the opening days of grouse season.



land





With a never-say-die grimace, a brazen lad gives his all during a tug-of-war at the Lonach clan's Highland games in Stratbodon. "We're proud to be Scottish first, British second," says native Riddell Graham. "We're certainly NOT English!"

BY ANDREW WARD

PHOTOGRAPHS BY JIM RICHARDSON

IN THE SPRING OF 1995, production began on *The Bruce*, an epic film about the 14th-century noble Robert the Bruce, who declared himself King of Scotland and defeated Edward II of England at Bannockburn. *The Bruce* is only the latest entry in a mysterious spate of major motion pictures—*Rob Roy*, *Braveheart*, *Loch Ness*, *Mary Reilly*—to be filmed in Scotland, and for its staging of the Battle of Bannockburn the producers needed only a hundred extras to portray the 20,000 English troops Bruce bravely and shrewdly defeated with a mere 6,000 men.

But none of the hundreds of aspiring Scottish thespians and military enthusiasts who had mailed in their résumés and eight-by-ten glossies were willing to play Englishmen. One sent in a photograph of himself playing the bagpipes to demonstrate that he was too Scottish to join King Edward's ranks. "Please," another begged the casting director, "don't make me play the part of an Englishman."

Ever since 1603, when James VI of Scotland inherited the crown of England, Scotland has been an ostensibly equal partner with England. But Scotland has always agonized over its sometimes calamitous, sometimes profitable, often humiliating relationship with its imperious southern neighbor. Even on a map Scotland's glacier-ravaged mass appears to yearn to be elsewhere, straining toward Iceland, Scandinavia: anywhere, it seems, but Great Britain.

ANDREW WARD is the author of *Our Bones Are Scattered*, an account of India's 1857 Mutiny, in which many Highlanders fought and died. Coloradan JIM RICHARDSON began his career photographing small towns in the United States. This is his first foreign assignment for the GEOGRAPHIC.

A day after I arrived in Scotland, I drove to the river port of Perth and stood outside city hall half the night with a crowd of saltire-waving Scottish National Party supporters come to celebrate their candidate's victory.

Stamping my feet to keep warm, I fell into conversation with a retired public relations man named Ben Hyde. Ben was expounding on his family's part in the Battle of Culloden, where 250 years ago Charles Edward Stuart's outnumbered, outgunned, and outmaneuvered Highland army finally met its doom. At least a thousand of Bonnie Prince Charlie's 5,000 men were killed at Culloden, many slain as they lay wounded or burned in their hiding places; thousands more were imprisoned, hanged, or sold to the colonies.

"My mother's people charged the English guns in such numbers," Ben proudly told me, "that they could no longer fire over the piles of their corpses."

Now the crowd around us gleefully taunted John Godfrey, the shell-shocked, cherubic young Conservative candidate, as he arrived to face the music. Up until this by-election, the prosperous Perth and Kinross seat had been a Tory island in a Scottish Labour sea. But tonight Godfrey had been trounced not by Scottish Labour, nor by the Liberals, but by Roseanna Cunningham of the Scottish National Party, a defeat that columnists of all stripes would characterize as not just an affront to the Tories of Westminster but a renunciation of the constitutional status quo.

"What do we want?" shouted a burly Dundee cabbie named Calum Cashley, raising a hammy fist.

"Independence!" they roared back.

"When do we want it?"

"Now!"

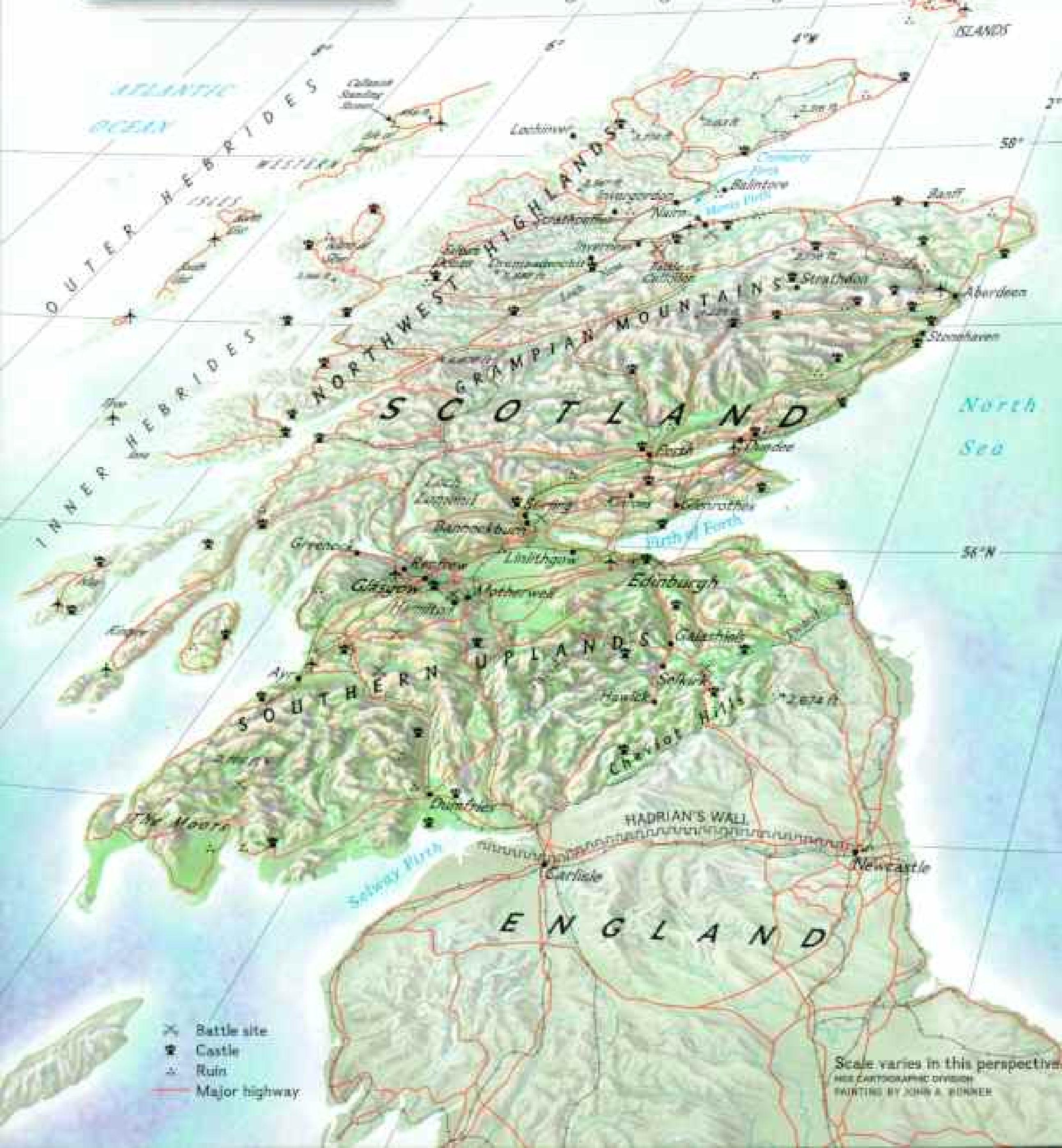
Postcard-perfect Eilean Donan Castle, seat of the MacRaes of Conchra, was rebuilt after British soldiers touched off a cache of 343 barrels of gunpowder in 1719. The family, which still occupies one wing, charges admission to finance upkeep.





Scotland

Fires of nationalism flared in the 11th century when four kingdoms united under the Scots, who had invaded from Ireland 600 years earlier. Struggles with the English continued even after King James IV of Scotland and Margaret Tudor of England were wed in 1503, presaging the union of the parliaments in 1707. Kilted Highland bagpipers fueled by nips of Scotch whisky may be the stereotype, but most Scots live along an industrialized corridor linking Edinburgh and Glasgow.



- ✕ Battle site
- ⬤ Castle
- ⊙ Ruin
- Major highway

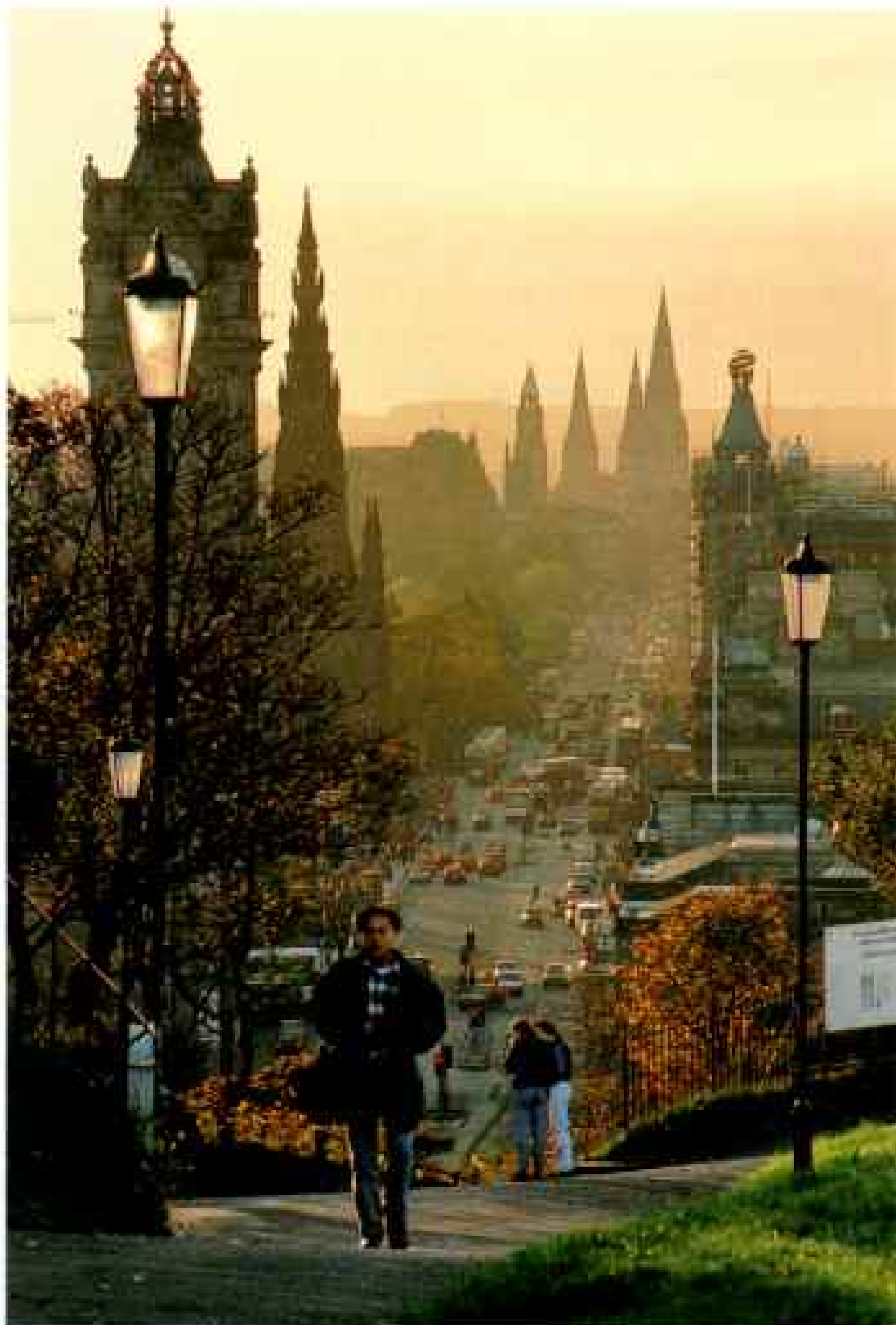
Scale varies in this perspective
 THE CARTOGRAPHIC DIVISION
 PAINTING BY JOHN A. BURNER

IT'S HARD TO SAY how many Scots really want independence from Great Britain, let alone want it now. "The threat of independence is a good thing for Scotland because it frightens the English," said a mordant boilermaker and fish merchant named John Sutherland, who gave me an earful early one morning at the Aberdeen fish market. "But we don't want to go too far. We got to be careful we don't get it."

Since 1707 Scotland has sent its parliamentarians to Westminster, but a recent poll found that 46 percent of Scots want their own parliament and an additional 30 percent want total independence; taken together, that's three-quarters of Scots who favor fundamental constitutional change. Many ascribe the current wave of nationalism to 17 years of Tory governments they have voted against and economic policies that run against their culture's communalist grain. For the Scots, England has been the agency of the mergers, buyouts, rationalizations, privatizations, and other "-izations" that have closed plants and diverted resources and companies south. "All the English do," one Scotsman snarled, "is cut down our branches to warm themselves down there."

Despite Scots' hopes that they would be the prime beneficiaries of the 1970 discovery of North Sea oil, almost all the revenues have flowed into the British treasury. Some Scots have acquired technological skills and environmental expertise that they hope to purvey to the rest of the world even after the East Shetland Basin and the seas east of Edinburgh run out of oil and gas. But most have a hard time contemplating what will become of them when the wells run dry.

Like other postindustrial economies, Scotland is staking much of its survival on tourism, which already employs 180,000 people and generates more than three billion dollars a year. But it has not kept pace with the worldwide tourism boom, and many Scots wonder if



Venerable spires are dimmed by smog as rush-hour traffic chokes Princes Street, the main thoroughfare of Edinburgh, Scotland's graceful and culture-conscious capital.

overseas visitors have grown as weary as they of their nation's tartan image.

After the Battle of Culloden the English ruthlessly suppressed Highland culture, outlawing the carrying of shields and swords, the wearing of kilts, and even the playing of bagpipes. But by 1822 the Highlands were so thoroughly pacified that on his first state visit to Edinburgh King George IV allowed Sir Walter Scott to swathe his royal rotundity in Stuart tartan. The kilt we see today is a far cry from

"We were the trailblazers," says crofter Allan MacRae (below, at left), who helped forge a union of tenant farmers to buy the land they worked. Much of the Highlands, like South Uist Island, became pasturage two centuries ago when lairds forced farmers off the land in the infamous "clearances."



the belted, swaggered, toga-like affair of the old Highland clans. However much it has been dignified with the blood of the Scottish regiments who wore it into battle in almost every corner of the British Empire, the short, pleated skirts at today's Highland games and Burns birthday suppers may well have been invented in 1727 by an English ironmonger named Rawlinson, whose workers' traditional garb proved too hazardous around his furnaces.

The kilts-and-tartan caricature of Scottish culture is still hard to escape on the tourist trail. At a lookout point on the road to Loch Ness, I met Murdo the Highland Piper, who, in his kilt, cap, and waxed mustache, plays

and poses for tourists, peddling postcards of himself for 50 pence apiece. As dark clouds coagulated over the loch below, a tour bus pulled in, and out poured Chinese visitors in a slapstick mood, one of whom rolled up his trouser legs and posed for snapshots in a mock plastic kilt and oversize tam, puffing on Murdo's pipes while the old busker gamely conducted with his fists, chanting, "Hi diddly dee."

Every year the descendants of the Scots who emigrated to the New World return by the thousands to the cobbled maze of Scotland's capital of Edinburgh, seeking ancestral resonances in the old city's infinitude of souvenir shops. I ducked into one such place on High



Street, the Woollen Mill, where a Pakistani Scot named Shebaz Sarwar sells Celtic jewelry, plaid blankets, and tartan scarves.

In the back room a kilted Scot named Jim Sinclair sits at a computer, indulgently looking up the clan associations of the Scottish Canadians, Australians, New Zealanders, South Africans, and Americans who flock to the store.

During my visit an American woman arrived with her teenage daughter and asked if their name had a tartan. Jim entered it into the computer and found that her name was associated with the Rosses. Her daughter eagerly rushed over to the scarf rack, grabbing a Red Ross tartan and holding it up to the light.

Clan Ross once championed Norman claimants to the throne of Scotland and counts among its members the poet William Ross, as well as a signer of the Declaration of Independence. But the girl didn't like the Ross tartan, a simple red with green crosshatches. "It won't go with *anything*," she said.

Her mother gave an exasperated sigh. "Then how about Torgan?" she asked Jim. "I think it was my grandmother's name." And I left them hovering over the computer, searching for a color-coordinated ancestry.

Many Scots have resolved to develop a new iconography that better respects Scotland's authentic culture. But Donald McNiven, who



Love of the hunt unites fellows who meet yearly at Balavil estate near Inverness for grouse season, so hallowed that opening day in August is the Glorious Twelfth. Renowned for salmon, trout, and deer, Scotland lures sportsmen from the world over.

sat up with me one evening to discuss tourism at his Gardenside Guest House in the lush and somnolent spa town of Strathpeffer, worries that playing down kilts and tartans may cost him visitors.

"It's still what a lot of people come for," he said, pouring me a dram. "It's what they expect. And there isn't a lot of other Scottish imagery to sell."

Donald told me about a Frenchwoman who

had driven the nerve-shattering 75-mph road from Paris to Orly Airport, taken a delayed flight to Glasgow, driven in a rental car directly to Strathpeffer, and collapsed in Donald's dining room, dazed and bedraggled.

Donald took her to the top of a ridge called Knockfarrel just as the sun was cracking from under a turbulent sky of deep grays and purples and pinks, illuminating the hills and casting Cromarty Firth into a shadow punctuated



by a constellation of lights on the idle oil platforms moored at Invergordon.

The woman burst into tears at the sheer beauty of it all. "But how can you sell that in advance?" Donald wanted to know. "You have to get them here first."

I WAS WARNED that wherever they may go, visitors to Scotland will tend to encounter members of the same clan—Duncans or MacKenzies, Forbeses or Camerons. Wherever I went, it was the Macdonalds.

On the Outer Hebridean isle of South Uist, I met 68-year-old Donald MacDonald, a Gaelic bard who is among the last people in the Outer Hebrides to live in a thatched cottage. A tall,

thin man with kindly blue eyes, he interrupted his dinner of boiled rabbit to read one of his paeans to a stout, uniformed nurse who had appeared to him in a hospital hallway like "a vessel of good wishes under sail."

Within a few miles of Donald, I encountered the former Seonad MacDonald, who did not care how I spelled her married name. "I'm a MacDonald," she explained. "I only *married* into the MacVickers." At the magnificent, east coast golf course at Stonehaven, I ran into a vacationing policeman named James Macdonald. "You know why they call it golf?" he grumbled after the wind carried his ball into the crashing sea below. "Because all the other four-letter words were taken."

With so many of his kinsmen lining my path, it seemed natural that I should speak to the supreme Macdonald, the Right Honourable Godfrey James Macdonald of Macdonald, Lord Macdonald, chief of Clan Donald, and descendant of the Lords of the Isles.

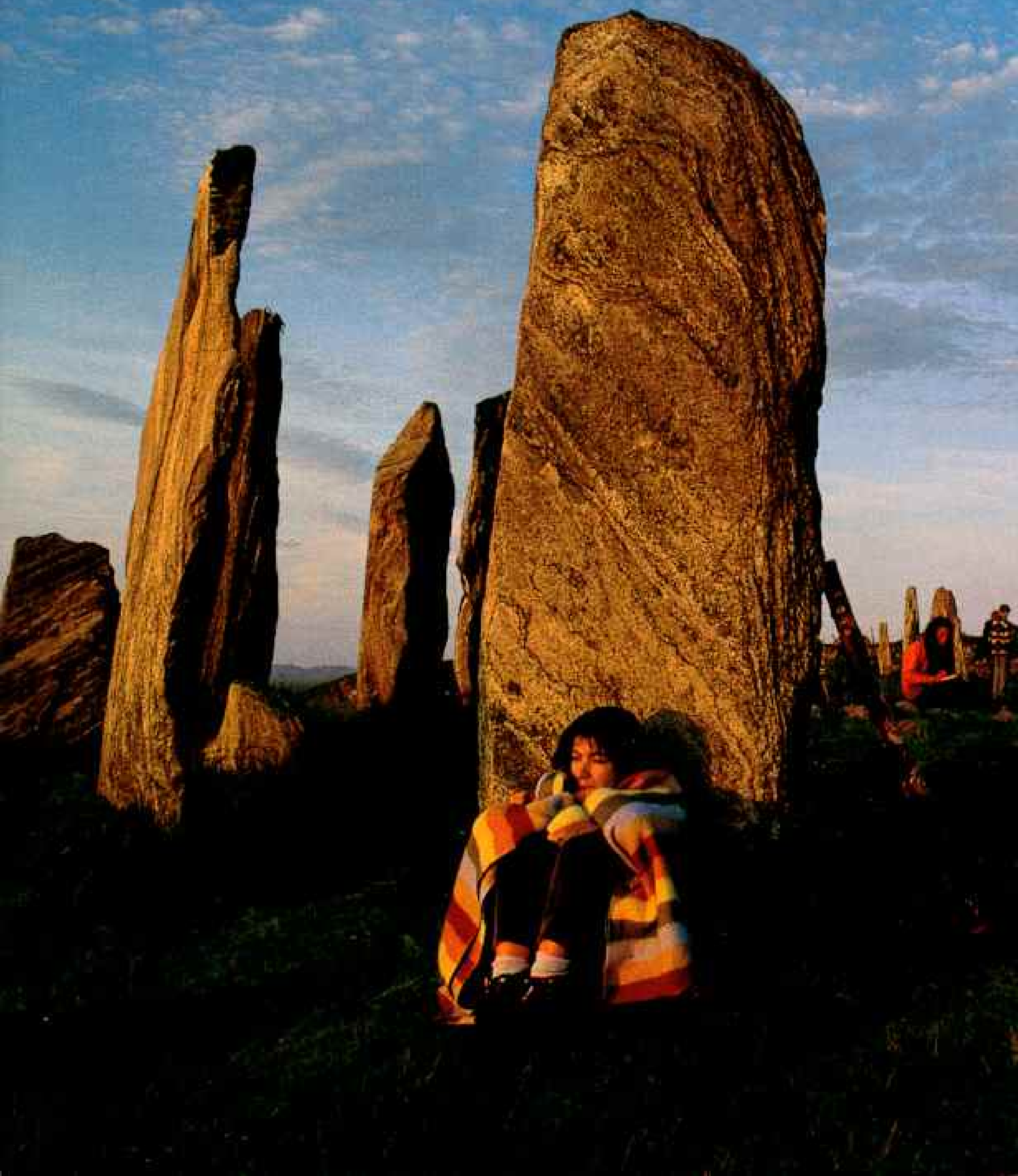
"You go speak to Lord Macdonald," one local wryly advised me. "He waits on tables."

"Lord God," as his detractors call him, has spent his adult life laboring to salvage his family's estate from the ruination of his father's death taxes and centuries of ancestral debts. "Until perhaps 25 or 30 years ago, if you had an estate you could continue to draw credit, and the banks were quite happy," he cheerfully explained as we spoke in a drawing room of Kinloch Lodge, his hotel on the Isle of Skye, where, surrounded by ancestral portraits, wealthy guests dine on his wife Claire's gourmet cuisine. "But nowadays you're judged on your ability to actually *earn* money."

He sold about 20,000 acres to the Clan Donald Lands Trust, which operates the Clan Donald Centre and is sustained, he explained, "with a lot of help from overseas clansmen." A cordial and courteous man, Lord Macdonald looked neither lordly nor chiefly in his shabby blue corduroys and shoes with worn-out soles. Aside from the occasional photograph of children in kilts, the lodge seemed less Scottish laird than English country gentry. In fact Lord Macdonald spoke in cadences so upper-class English that it was a little jarring to hear him insist that he was "a Highlander to the absolute core."

Descended from the 12th-century warrior Somerled, who chased the Norsemen from the Hebrides, the Macdonalds were for seven centuries the defenders, as Lord Macdonald put

A bird-headed cape slumps on a megalith where New Age travelers greet the dawn after observing the summer solstice at the Callanish Standing Stones, a Neolithic Stonehenge-like assemblage on the Isle of Lewis.







it, of the old order. At the Clan Donald exhibit, the Lords of the Isles are described as “men untamed, noble, hearty . . . open-handed and generous.”

But the later chiefs proved openhanded only up to a point, and that was the Highland “clearances,” one of the most squalid chapters in the squalid history of property law.

Between 1760 and 1855 the chiefs cleared the once heavily populated glens of their kinsmen in order to profit from cheviot sheep, banishing thousands of Highlanders to Scotland’s cities and its bleak and windy coasts or herding them onto ships for indentured service in the New World. I asked Lord Macdonald if any expatriates had ever challenged the seemliness of his turning for his estate’s survival to the descendants of the very people his ancestors had evicted.

“Not a bit,” he said. “On two or three occasions people have come up in a sort of joking fashion and said, ‘Your family were responsible for me ending up overseas.’ But no, not a bit. In fact, the links that bind the Highlanders that live in this country and the Highlanders who went overseas are stronger than ever.

“I’m not in any way trying to sound patronizing or anything,” he added, “but one has got to understand the state of the Highlands as it was after 1745. They were grossly overpopulated. Starvation was at an enormously high level. Something had to happen.”

“**W**HEN I SEE THESE CHIEFS in all their pomp and—” Allan MacRae shook his head and stepped away from the hood of his battered Land Rover. “They have a *nerve*, you know. It really



Lofty architecture: Replacing an old train station, St. Enoch Centre (left) is downtown Glasgow's answer to suburban malls. In rival Edinburgh, St. Mary's Cathedral commands New Town, an enclave of Georgian row houses. To Edinburgh, Glasgow is working-class rough. To Glaswegians, the capital is vainglorious and snooty.

makes my blood *boil*. Oh aye," he said, clenching his jaws, "they should hang their heads in shame."

MacRae was standing in his yard in the west coast village of Torbreck, near Lochinver, surrounded by trailers, an old boat, piles of stone, logs, and two collies that kept herding me up against the side of his car. He wore a torn green sweater, frayed blue trousers, and sprung Wellington boots, and he would not shake my hand for the grease on his fingers.

You would not have taken him for part

owner of a 21,000-acre estate, but as director of the Assynt Crofters' Trust that is precisely what he has become. (Crofters differ from renters in that they enjoy certain legal protections and can pass their agricultural, grazing, and housing rights along to their heirs.) In 1993, after a worldwide appeal for funds, MacRae and 124 of his fellow crofters purchased the poor but picturesque coastal estate from its bankrupt foreign owners.

"People were saying, 'Who do you think you are?'" MacRae told me. "But we're only

Birkett's



Treat for the eyes, baby Mairi Chisholm draws admirers in Selkirk. A recent arrival from Edinburgh, her mother shopped as a friend baby-sat. In small towns many mothers safely leave infants unattended during brief storefront shopping forays.

doing what indigenous people are doing all over the world," he explained, "whether it be the American Indians, or the Australian Aborigines, or countless other people trying to reclaim what we see as rightfully ours. I always say you have man's law and you have God's law, and no man-made law can take away a people's birthright."

The disposition of Scotland's old estates is a matter of some urgency, for they have been breaking up at a great rate lately as centuries of debt catch up to families like the Macdonalds. "I often think," MacRae said, "that the next step would be to set up some sort of foundation to draw funds worldwide from all our expatriates so the people can buy their land."

"Well," I told MacRae, insisting now that he shake my hand, "give them hell."

"Oh aye," he said, "very good," as one of his collies herded me back to my car.

Directly across the road from MacRae's croft, an Englishman named Rob Cannell operates an automated environmental monitoring system out of a house that the Implex Environmental Systems company had just purchased from the crofters' trust. Although MacRae does not even own a telephone, Cannell was lured to Torbreck by a recently installed microwave-and-underground-fiber-optic network that the local development agency hopes will bring high-tech companies to the Highlands and the Western Isles.

I asked Cannell if he had run into any hostility. Recently two Scots allegedly affiliated with the Scottish National Liberation Army had been arrested for issuing death threats to English émigrés. But Cannell told me that for all their distrust of conservationists the crofters had been welcoming and encouraged him in his cultivation of shiitake mushrooms on the fallen trunks of the birch trees he has been culling on his 45 woodland acres.

"If we come up here and join in, then the Scots are very welcoming," said an Englishwoman named Jane Heape as I toured her organic goat farm in Banffshire, where she produces cheeses and cashmere wool. "But if we stay in cliques of expatriates, well then they

don't like us much, and can you blame them?"

John Atkinson, a community nurse, can testify to this. Though he is now an advocate for the disenfranchised of Glasgow and Edinburgh, John came from London and used to call himself British. "English people use the terms 'England' and 'Britain' interchangeably, but when I moved up here, I realized, of course, that I was English," he said as we drove through Glasgow's tenement neighborhoods in an evening rain. But when John applied for a job in the prison system, his Scottish friends paid him "the greatest compliment I could have," he said. "They told me they were rooting for me because they didn't want somebody from down south getting it."

BLACKENED into an Edward Gorey gothic by a century of intense industry and blighted by succeeding decades of depression and decay, Glasgow was once regarded not so much as a city as an abscess. But now this muscular, openhearted, sand-blasted metropolis is basking in the glow of its European Community designation as City of Culture for 1990. The title delighted its unpretentious and slyly self-deprecating citizens, if only because it ruffled rival Edinburgh, a city so self-regarding that it refuses to embrace its sobriquet as the "Athens of Scotland" because that would concede too much to Athens.

Glasgow holds one of the U. K.'s greatest art collections outside London and a wealth of free museums covering everything from costume to education to transportation. But what enthralled me about the city was its people. On a weekday morning I visited the shopping center at Drumchapel, one of the far-flung "schemes," or housing projects, to which the working poor were exiled in the 1960s, when the Glasgow Corporation tore down the city's overcrowded and pestiferous tenements. The shopping center appeared more like a village fair than a dreary mall in a drearier scheme. There were lovers walking hand in hand and children teeming over the playground equipment and groups of men debating politics, and even a dog and pony show being directed by a



Blur of graffiti mars a shelter where children of Glasgow's Blackhill public-housing development await the bus to St. Roch's school. Nearly three out of four residents of the apartments, built after World War II, receive housing-subsidy payments.

pair of English circus people who told me that of all the audiences they entertain in Great Britain "these people are the friendliest."

But not the healthiest. One in six children under the age of eight suffers from asthma in Drumchapel, where the second most common cause of death among 20- to 40-year-old men (after heart disease) is suicide. Many of Drumchapel's residents live their lives in a torpor induced by doses of the sedative Temazepam, or "jellies" as they are called by the young addicts who melt the gel with heroin and inject it into their veins.

"You may see a lot of people talking at Drumchapel market," said Gaille McCann, a health development coordinator at Easterhouse, one of Glasgow's largest schemes. "But I expect it's the same people day after day, and for the rest it's the routine of television and depression. I know exactly what it's like. You keep saying to yourself, 'Things are never going to get any better.'"

"But they will get better if people will only

tell the truth about us," said her co-worker, Anne Marie Clews, narrowing her eyes as we sat in the branch office of the Glasgow Healthy City Project. She is tired of journalists who portray her neighbors "as pathetic, worse than poor" and thus excuse their readers for ignoring them. "All we've got is the strength that we can give each other. It doesn't matter how many times local government kicks us down, we're always going to get back up and have another bash."

"We need to lobby government to locate industry here," said Gaille. "We know things are grim, but nobody can take our spirit."

ALMOST AS BESIEGED as the residents of Glasgow's schemes is the Church of Scotland. Scotland's nationhood has always stood on three legs—its church, its schools, and its courts. Scotland's universities are first-rate and its primary schools demonstrably superior to England's. And despite some erosion, Scotland's essentially European



Seedy Blackhill tenements are scheduled for demolition. Demand for space in the Red Road public-housing projects, background, is high. Though drug problems fester, closed-circuit TV and concierge service have greatly reduced burglary and vandalism.

legal system remains distinct from English jurisprudence. But the Church of Scotland, once the nation's most powerful institution, is in trouble.

On windswept Lewis, the largest and northernmost of the Western Isles, I got some sense of the role the church once played in Scottish life when I joined an utterly silent congregation of men in gray suits and women in black dresses for a Sunday service at the Cross Free Kirk. During the clearances, the Church of Scotland's Highland ministers tended to side with the landlords, preaching to their banished flocks that their eviction was God's will. So a great many outraged Highlanders and islanders turned to the more defiant Free Kirk, and nowhere in Scotland is it more powerful than on Lewis, where even public rest rooms close for the Sabbath.

The service was held in a spartan hall. There were none of the trappings of the Roman Catholic or Anglican Church, nor even the austere Church of Scotland itself. The

regular pastor, Angus Smith, was occupied elsewhere that morning. His surrogate was a heavysset elder named Roddy John Campbell, who, at the stroke of 11, entered through a plywood door and mournfully, urgently instructed us on the need to stick to the straight and especially the narrow.

"People ask me," he said, "'Why do you live the way you live in the Free Church? It seems such a narrow way.' I reply that I'm not compromising, because I must appear before the judgment seat of Christ."

In Edinburgh, at the Church of Scotland's Pilrig and Dalmeny Church, the atmosphere was very different. The Reverend W. Iain C. Dunn's rich voice led us into the unexplored territory of *The Songs of a Great People*. The songbook had been prescribed by the mini-skirted young parishioner who helped conduct the service, quoting from the Christian monks of the isle of Iona in a voice so breathlessly sincere that she was all but inaudible to the few elderly congregants who sat in the back rows,



convenient to the rest rooms and the exits.

"Maybe the time has come to face facts," Dr. Dunn told me after the service. "We have six churches in about three square miles, and you could barely fill any one of them with all six congregations put together. Some say the church itself is dead," he sighed. "The young think it's unnecessary and serves no psychological purpose."

IN CHURCH Scots sing thanks "for minds that find new thoughts, new wonders to explore," and some think the Scottish genius for invention has its roots in Scottish Presbyterianism and its emphasis on the individual's unmediated relationship with God. (A case in point was Charles Piazzi Smyth, Astronomer Royal of Scotland, who is said to have ordered the construction of a camera strong enough to record the Day of Judgment.)

Edinburgh's Royal Museum of Scotland holds the trophy room of Scottish ingenuity, case after case of the inventions and refinements that tumbled out of the model-makers' shops of Aberdeen, Dundee, Glasgow, and Edinburgh. There are scores of telescopes and microscopes, a 1780 "electrical machine," a prototype of the seismograph, a "dendrometer" for calculating the extractable lumber from standing trees, and hundreds of other devices to satisfy the Scottish penchant for quantifying the world.

Recalling such thinkers as inventor James Watt and bridge designers Thomas Telford and John Rennie, I wondered how Scotland might relate its engineering genius to high technology. In a glittering strip between Glasgow and Edinburgh called Silicon Glen, multinational computer companies have built a colony of assembly plants. Typical of them is Sun Microsystems' glass-and-steel facility in Linlithgow that appears to have been airlifted directly from Silicon Valley. It employs 600 people, 450 of whom are Scots.

But high technology's roots do not go deep into Scottish soil. Despite Scottish universities' internationally recognized computer science departments, there is little research and development going on. Nick Shelness is an English-born Lotus software executive who

Fiendish "Scot's Maiden," the seventh hole at the isle of Islay's Machrie links, challenges with rough as tall as a man. "Official Loch Ness Monster Exhibition" at Drumnadrochit features a floating fiberglass Nessie.



grew up in the United States, married a Scot, and now works via his modem out of a mill house in Perthshire. He says Scotland is thwarted by a lack of the serendipitous money that circulates in the U.S. "There was a lot of that sort of money in Glasgow at the turn of the century—the kind of dynamism you still find on the West Coast of the U.S. But you never feel it here." Nick thinks Scotland has been victimized by the U.K.'s mania for concentrating business in major hubs. "In Scotland head offices all get sucked down to London out of this ridiculous urge to be near the throne."

NOWHERE IN THE U.K. is much farther from the throne than the isle of North Uist, in the Outer Hebrides, where you don't have to look for an octogenarian to find a witness to the changes this century has wrought. Cathy Johnson is only 35, but as a North Uist fisherman's daughter she remembers when boats and ferries were all that stitched together the isles of her perforated homeland. She saw telephones and electricity come, and roads and cars, and hot water and



Cries of "HU-RAH! HU-RAH!" resound during the Braw Lads Gathering in Galashiels. The annual "border riding" commemorates both the 1337 slaying of an English raiding party and the marriage of James IV and Margaret Tudor a century and a half later.



television. Almost the entire onslaught of 20th-century technology has been compressed into her lifetime.

Cathy is small and soft-spoken, but the even gaze of her large dark eyes conveys some of the determination she had to summon to enter the alien world of computers. Every day a plane lands at the little aerodrome and drops off a stack of American newspapers and business journals. These are picked up by an outfit called Lasair and distributed to islanders like Cathy, who spend an average of 30 hours a week summarizing articles for a California-based data bank.

"This project came out of the blue for a lot of us here," said Cathy's co-worker Anne Macaulay, a mainlander who married an island man. "I thought the only thing here for me would be filling shelves in a shop. It's gotten us out of our rut."

I asked if the spread of technology might somehow damage their island culture.

"No," Cathy assured me as she showed off her computer. "It's perfect for island culture. Crofting has always meant working at many jobs—fishing, weaving, raising sheep."

"Working at home with a computer fits in with the crofter's varied work," Anne agreed. "It's something I can do and still watch after my children and be here for the lambing in the spring."

ONE EVENING I drove to a housing development on the outskirts of Nairn, near the site of the English encampment before the Battle of Culloden. At first glance you might deplore the development as a kind of graveyard of Scottish culture, a mock suburban imposition on the rustic verdure of the town. But here I visited a family of teachers and musicians named Vass who are the embodiment, it seems to me, of the promise and resilience of the Scottish nation.

As I sat in David and Trish Vass's living room, their children greeted me one by one. First into the room was 11-year-old Martin, a loose-limbed, dreamy-eyed boy who plays the recorder. Then came his thin, intense 12-year-old brother, Michael, who almost shivers with pride as he fiddles his reels. Michael's twin sister, Alison, joined us next, a pretty, athletic girl who not only plays keyboards but also has been collecting what looks from her shelf to be every Highland dancing trophy in Scotland. Her eight-year-old sister, Fiona, the family



percussionist, was the last to join us and entered the living room bouncing a soccer ball; one of the delights of the Vasses' guileless performances is the suspense that builds until Fiona, flashing the audience an intermittent gap-toothed grin, strikes her drum.

The Vasses have been performing publicly for only two years but playing together much longer, and the family's musical roots go deep. David's father and grandfather led the singing in the kirk at Balintore on the Moray Firth. Childhood sweethearts, David and Trish formed a band called Heelster Gowdie, or "head over heels," and David's brother studied to become a classical concert violinist.

"But he pushed it so hard," David said, "that the joy went out of music for him. So we see that the children practice, and we try to



Colossal drilling platforms hauled in from the North Sea for refitting glimmer in Cromarty Firth. Most revenues from the oil fields off Scotland go straight to London, another point of contention between Scotland and her big sister, England.

play well. But we're determined that our children never lose the joy of music."

Or their pride in Scotland. "We're keen to maintain Scottish culture," David told me. "I'm disappointed that music has disappeared from most homes in Scotland. We were brought up with our mothers singing to us, and we've brought up our bairns the same way."

"Yeah, but Da," said Martin, "I go to the Youth Club discos Friday nights and dance to rock-and-roll."

"Oh, do you?" Trish said with a faint smile.

"But what do you prefer to play?" I asked the kids as they tuned up their instruments.

"Oh, *Scottish* music," Michael replied, as if it was obvious.

And it was. As they stood in the living room, slowly tapping their Reeboks to the lilting rhythm of "Farewell to Tarwathie," it seemed to me that whatever it may take to reinvigorate Scotland, nationhood has less to do with churches or parliaments, kilts or tartans, than with these children's sweet voices raised in their ancestors' songs. □

Հ
Ն
Բ
Ը



Where Peace Walks a Tightrope

Article and photographs by Alexandra Avakian



WITH PEACEFUL GESTURES — as well as with stones — residents of the Gaza Strip have endured military occupation since 1967, when Israel captured this narrow patch of land from Egypt during the Six Day War. Now, like one of Fatima al-Abed's birds (above), Gaza longs to spread its wings. In peace agreements signed by Israel and the Palestinians, parts of Gaza and the West Bank have been turned over to limited Palestinian control after nearly three decades of Israeli rule. Palestinian President Yasser Arafat faces staggering problems here, ranging from a virulent terrorist presence to a near-total economic dependence on Israel and a desperate need for foreign financial aid. He also battles public despair, which deepened after recent Israeli elections put the entire peace process in doubt. Yet among these hard realities hope survives, as American photographer Alexandra Avakian found when she first visited Gaza in 1988 and began documenting the human story behind the headlines.

— THE EDITOR



Arafat cracks down



I WAS COVERING THESE PALESTINIAN SECURITY FORCES the night they raided the house of a suspected member of Hamas, the Islamic Resistance Movement. An extremist wing of this group set off bombs last winter in Jerusalem and Tel Aviv. All that Arafat's troops found here were the woman of the house and three empty beds, still warm from being slept in.



Close quarters



ISRAEL RULES THE AIR over Gaza, so I needed military clearance to see Gaza City from a helicopter. In the foreground is Shati refugee camp, where some 80,000 people live packed into less than a square mile. One huge problem here is fresh water: Gaza's aquifer is so tainted with seawater that in certain areas when you drink tea, it tastes salty.

Watching history being made

IT IS NOT EASY to see why the Gaza Strip is one of the most fought over places on earth. At the Erez checkpoint—the main northern entry to this 140-square-mile stretch of sand—Israeli soldiers armed with machine guns guard the concrete-and-razor-wire border where Israel comes up against part of the new Palestinian autonomous region. In the distance thousands of cinder-block shanties, set along dusty roads, extend to the sea. Nearer the city of Gaza, potholes and pools of sewage mar the roads. But despite these conditions Palestinian policemen race about in brand-new trucks, and Palestinian flags, once forbidden, fly from every house and shop.

Occupied by Israel since 1967, Gaza has weathered decades of political and economic turmoil. More than half its 900,000 people are unemployed, conditions are generally squalid, and fundamentalist Islamic groups like Hamas threaten stability. But with the signing of the 1993 peace agreement between Israel and the Palestine Liberation Organization (PLO), Palestinians are hoping to create a new state in Gaza and the West Bank. Their

dream persists despite the election of Israeli Prime Minister Binyamin Netanyahu, who has promised to keep it from becoming a reality.

I first visited the Gaza Strip in 1988 as a photographer on assignment for *Time* magazine. It was during the *intifada*, when Palestinian youth lost the patience of their forebears and exploded in seven years of riots and strikes. As I drove in with several journalists, a group of young Palestinians stopped us. They wore red-and-white-checked *kaf-fiyehs*, and they had set their roadblock—a pile of old car parts and broken furniture—on fire. We got out to talk with their leader, a tall 18-year-old whose blue eyes stared at us like cold, impenetrable diamonds. He told us to drive on, but as we did, his group turned on us, throwing scraps from their roadblock in front of our car and smashing our windows. We managed to plow through the pile of junk and escape.

That day I felt an uneasiness that would melt away as I returned to Gaza again and again over the next seven years. I eventually rented an apartment, where I would live for

Unprotected by natural barriers, Gaza lay squarely in the path of ancient armies invading the coastal plain. Between wars the city flourished as a center for trade.

CA 1000 B.C.

Israel secured Gaza after David killed the Philistine champion Goliath.



332 B.C.

When Gaza resisted Alexander the Great, he seized the city and sold its people into slavery.



734 B.C.

Still the primary inhabitants of Gaza, the Philistines were conquered by the Assyrians.



CA 1175 B.C.

A base of Egyptian military operations, Gaza was invaded by the Philistines, a seafaring people who overran the eastern Mediterranean. Our modern word "Palestine" derives from Philistia, or "land of the Philistines."



63 B.C.

Restored by Pompey, Gaza prospered under the Romans, linking Mediterranean markets to the inland caravan trade.

three or four months at a time. Soon I came to discover glimpses of beauty in places like the date palm groves of Dayr al Balah, the sweet-smelling orange blossoms of Bayt Lahiyah, and in the faces of refugee children.

It is hard to believe that beauty exists in a place so scarred by its history. By the time Israel began its military occupation, Gaza had been ruled by outside forces for centuries. Today's Gazans—mostly Sunni Muslim Palestinians—include Bedouin, Gypsies, descendants of African slaves, and Christians. There are also 5,000 Jewish settlers.

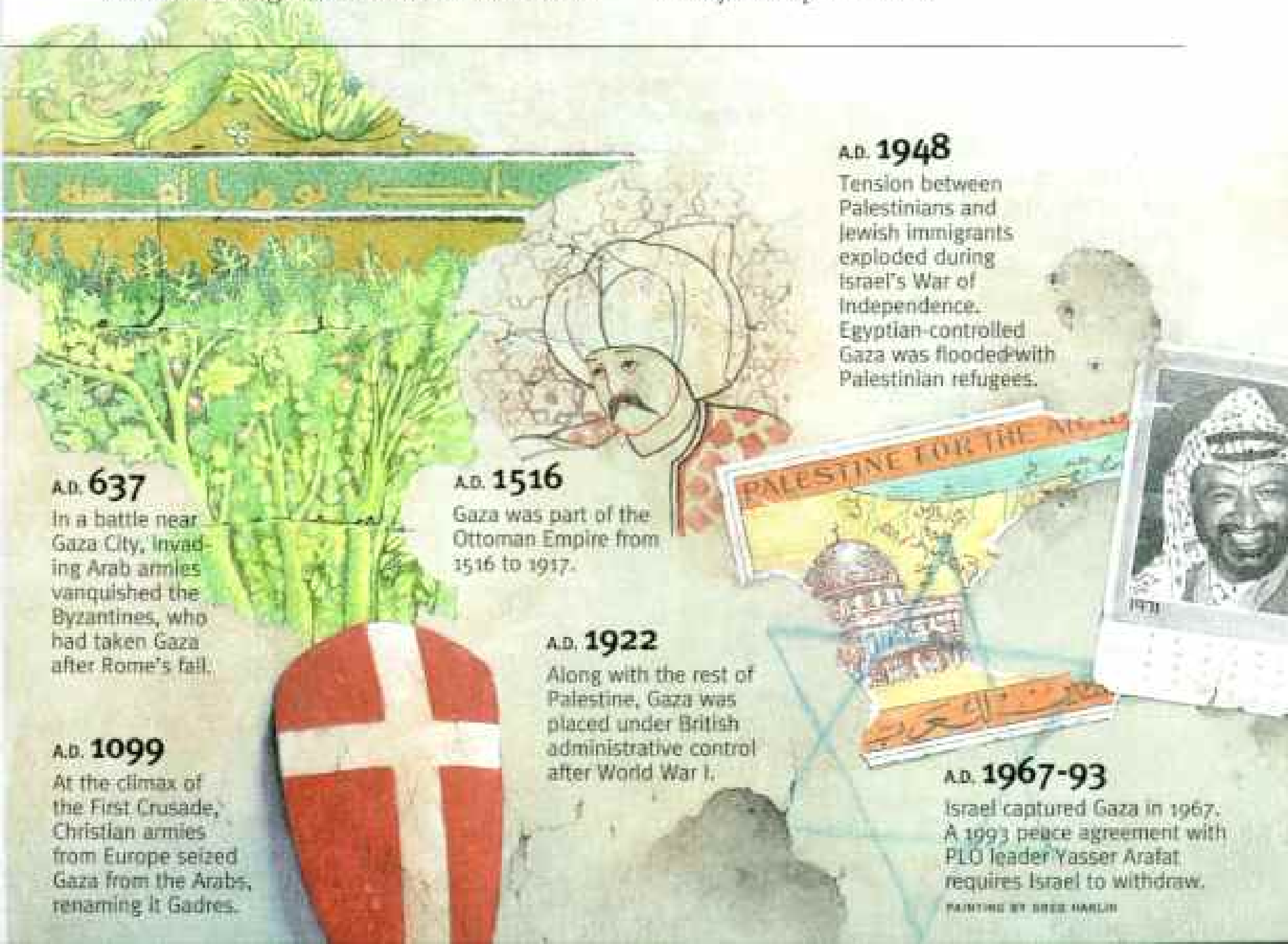
Seventy percent of Palestinians in the Gaza Strip are from families who fled there after Israel's 1948 War of Independence. Often during my visits I stayed in the Shabura refugee camp with a woman, her husband, and their three children. Their home is made of cinder blocks, divided into two rooms and topped with a corrugated metal roof that leaks during storms. Every night they bolted their doors and windows for curfew, and our conversations fell silent as soldiers passed by.

That was before the Israeli Army withdrew from Palestinian cities and villages. In May 1994 when most soldiers left, three days of tipsy euphoria followed. Children waving Palestinian flags clambered all over Israeli

watchtowers, teenagers revisited the prison cells that had once held them, and adults brought food and flowers to the new Palestinian policemen.

That excitement has since given way to hard reality. As Palestinian President Yasser Arafat told me, "We are suffering from the deadly results of 28 years of occupation, and we are facing big economic problems." Trash and streams of raw sewage foul impoverished refugee camps, and frequent Israeli border closings, prompted by suicide bombings, keep tens of thousands of people from work. Still, with the help of foreign aid that is trickling in, Gazans are trying to build their land: Workers replace burst sewage pipes and lay sidewalks, and children swing and slide at a playground that was once an abandoned lot.

In December 1995 an earthquake in the Red Sea sent tremors north, stirring sadness and fear in everyone. The next day a rainstorm hit, and I saw so much joy that I asked a local friend why people were so happy. "Yesterday they thought God was angry with them," he said, "but Gazans believe God loves them when it rains, so they feel better today." It was time for me to leave, though the place, and my hope for its future, will always be a part of me.



A.D. 637

In a battle near Gaza City, invading Arab armies vanquished the Byzantines, who had taken Gaza after Rome's fall.

A.D. 1099

At the climax of the First Crusade, Christian armies from Europe seized Gaza from the Arabs, renaming it Gades.

A.D. 1516

Gaza was part of the Ottoman Empire from 1516 to 1917.

A.D. 1922

Along with the rest of Palestine, Gaza was placed under British administrative control after World War I.

A.D. 1948

Tension between Palestinians and Jewish immigrants exploded during Israel's War of Independence. Egyptian-controlled Gaza was flooded with Palestinian refugees.

A.D. 1967-93

Israel captured Gaza in 1967. A 1993 peace agreement with PLO leader Yasser Arafat requires Israel to withdraw.

PAINTING BY DEED HARLIN



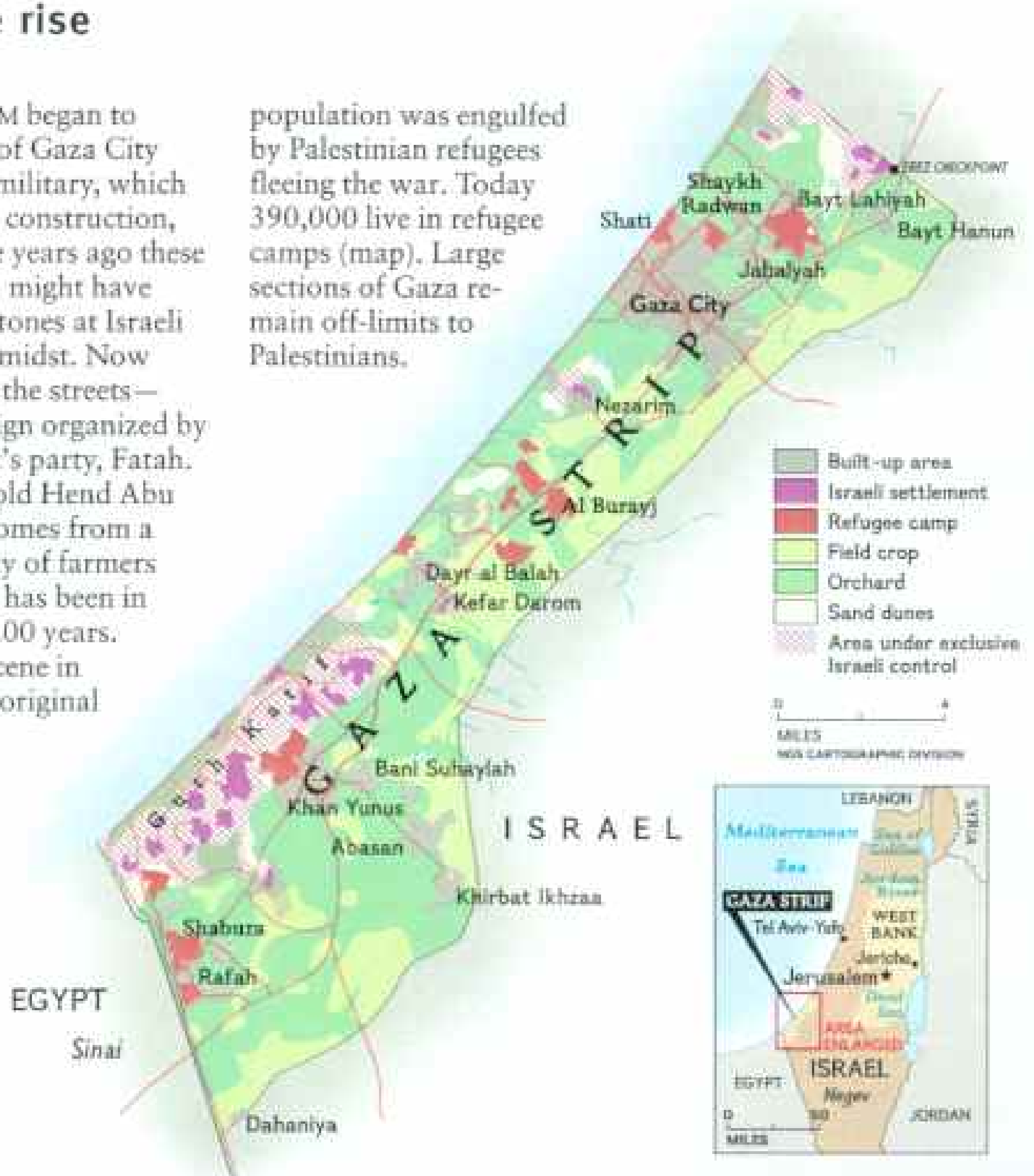
City on the rise

A BUILDING BOOM began to change the face of Gaza City after the Israeli military, which prohibited most construction, withdrew. Three years ago these teenagers (right) might have been throwing stones at Israeli soldiers in their midst. Now they're cleaning the streets—part of a campaign organized by President Arafat's party, Fatah.

Sixteen-year-old Hend Abu Salem (above) comes from a prominent family of farmers and traders that has been in Gaza for some 200 years.

Imagine the scene in 1948, when the original

population was engulfed by Palestinian refugees fleeing the war. Today 390,000 live in refugee camps (map). Large sections of Gaza remain off-limits to Palestinians.









Old beyond their years

SQUALOR and shell-shocked children are commonplace in Gaza. This is especially true in refugee camps like Shabura (left) or Shati (below), where flat stones are all that stand between toddlers and an open sewer in the middle of the road.

Neighborhoods like these are where the intifada—the Palestinian uprising against Israeli military occupation—was born. In those street battles kids were often frontline troops.

Today 52 percent of Gaza's population is under the age of 14, and most families have a lot of children. In Shati camp I visited the al-Abed family (below, left), whose eight kids sleep in one room.

Family albums in Gaza are an extraordinary thing. They're not like photo albums in other parts of the world, where you see the wedding, the baptism, the birthdays. In Gaza you see the wedding, but then on the next page you see the boy who was shot and killed by Israeli soldiers. Or the cousin who was a suicide bomber.





Farming a barren land



REAPING MEAGER RESULTS despite a rainy spring, this family near Al Burayj pulls together to harvest its grain. Since farms here are small and arid, Gaza depends on Israel to supply most of its basic needs. Gazans also depend on Israel for jobs. Thus when Israel closes the border because of terrorism, people in Gaza are cut off from their source of income and food.



Endangered minorities

ONE DAY I VISITED several Bedouin families living in the dunes near Gush Katif, a cluster of Jewish settlements in southern Gaza. At first they wanted nothing to do with me—fearing that the settlers would investigate my presence—but I persisted, and they finally let me in, fed me, and made me feel welcome.

Nomads by tradition, these families are refugees from the Negev desert of southern Israel who were stranded in Gaza after the 1948 war.

Today they have nowhere to go since every square inch of decent ground in Gaza is already taken by someone else. So they've made the best of this place, building huts from whatever they can find.

Of the minorities in Gaza, Bedouin are one of the largest, numbering in the thousands. Many of them are in refugee camps, but a few live in places like this, passing their days slowly, adapting their nomadic ways to a life of standing still.



Dwindling year by year, Arab Christians are also a minority in Gaza, as they are throughout the Holy Land. The Greek Orthodox church in Gaza City still gets a good turnout on Palm Sunday (below), but many Christians are discouraged by the lack of economic opportunity and feel threatened by the rise of Islamic fundamentalism.

One Christian friend, however, is doing very well in his business—supplying satellite dishes to the wealthy families of Gaza. I ran into him recently, and he said, “Business is great, but I’m getting out—if and when I can get a visa.”

“But don’t you want to stay and build your country?” I asked. “No way,” he replied. “You see that grass over there? It’s just like Hamas. You cut it, it grows back even stronger.”

Introduced to Gaza in the first decades after Christ, Christianity has coexisted with Islam here since the seventh century, when a wave of Muslim expansion reached the Mediterranean. Today Christians in Gaza number perhaps 3,000 and are renowned as merchants and artisans of gold.







The old man

ON THE STREETS OF GAZA, Yasser Arafat is called al-Khityar, meaning “the old man.” Arafat likes the nickname—it’s got a paternal ring to it, and he is, after all, the father of the Palestinian movement.

The day I photographed him at a school in Gaza City (left), he looked more exhausted than usual. He works incredibly long hours—often until three or four in the morning—tending to the details of government. His transition from guerrilla fighter to peacemaker has not been easy; recent events have made his position more difficult as he mediates between an increasingly desperate populace and Israel’s new hard-line government.

Arafat has another side that’s not widely known. Over the years he has adopted 28 orphans—most of them survivors

of massacres at the Palestinian refugee camps of Sabra, Shatila, and Tal-al-Zaatar in Lebanon. And now he and his wife, Suha, have a daughter of their own—Zahwa, who was born in 1995.

I’ve spent many hours with Suha and Zahwa (above) at the Arafats’ modest villa in Gaza City. Suha, a native of Jerusalem who holds a master’s degree from the Sorbonne, speaks eloquently of her commitment to young Palestinians.

“Our children have had no childhood. We have an illiterate generation, a traumatized generation—children who know only stones and guns. People are expecting miracles from us, but it will take time to remove the scars of occupation. This new generation—Zahwa’s generation—will need help to build our country.”





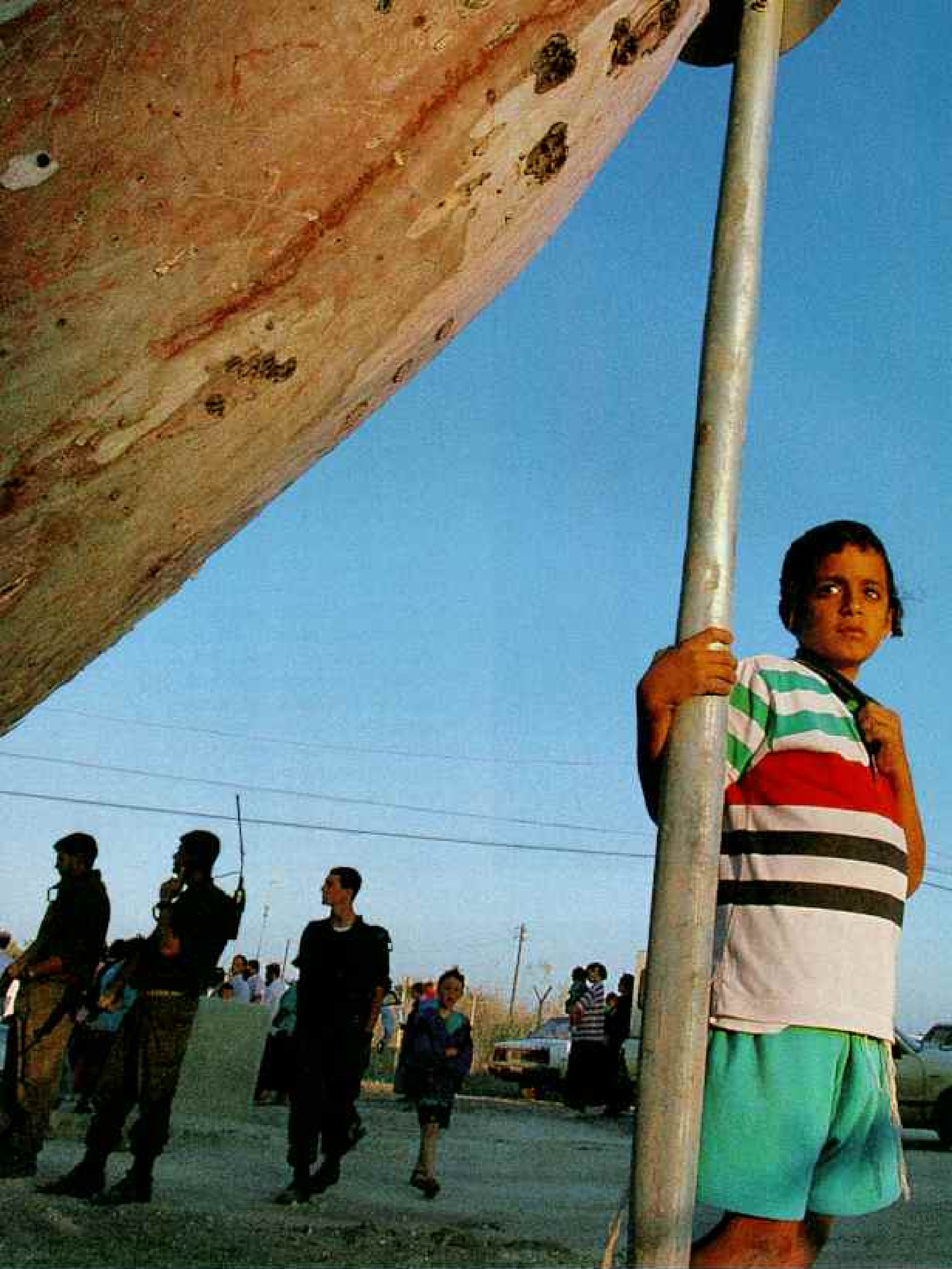
Grassroots of radicalism

I WAS INVITED to a Hamas bachelor party on a side street in Rafah and photographed these men putting up a backdrop (left) for the band that was about to play. The group's name is the Martyrs, and practically every song in their repertoire is about a terrorist who died attacking Israelis, like the suicide car bomber who tried to destroy an Israeli bus on the highway, failed, and wound up blowing himself and his vehicle to bits (below, left).

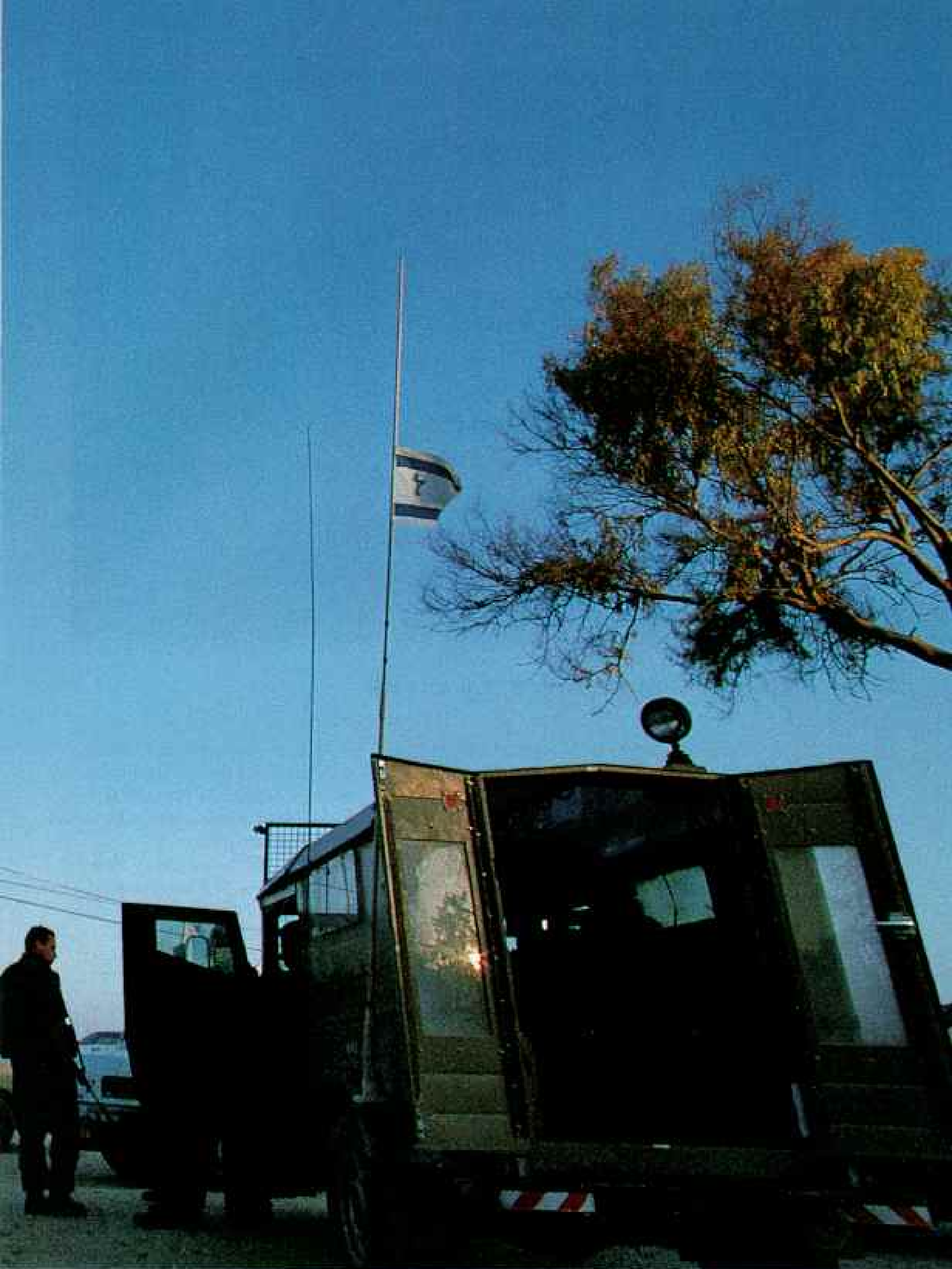
Radical Islamic organizations are popular for a reason. Hamas grew strong during the occupation because it was one of the few groups other than the United Nations that provided social services such as clinics and schools to the people of Gaza.

Then there are the people in between. I visited an Israeli military barracks (below) where the families of collaborators—people who cooperated with Israel during the occupation—are kept for their own protection. They're scorned in Israel, hated with a vengeance in Gaza.





Mourning the dead



EVERYONE GROWS UP FAST in Gaza. This boy is the child of Jewish settlers, and he's watching cars full of Palestinians pass on the highway near his settlement, Kefar Darom. One month earlier eight Jews were killed here and 46 wounded when a car just like any other turned out to be driven by a suicide bomber. Nearby is a memorial to the victims.



Surrounded, by choice

ON ISRAEL'S INDEPENDENCE DAY in 1995, Jewish settlers from the West Bank and the Golan Heights came to Gaza to celebrate (facing page). They were there to show support for Gaza's 5,000 Jewish settlers, who live in small, fortified communities

(above) protected by the Israeli military. Like the off-duty soldiers relaxing on a Gaza beach (below left), most settlers are armed at all times.

Jewish territorial claims date from the time of King David, who secured Gaza after defeating the Philistines. Although rabbinical leaders ruled by A.D. 600 that Gaza was not Jewish territory, settlers today say that Israel held Gaza long enough to legitimize their presence.

"This is the land of Israel," says Datya Itzhaki, a settler from Gush Katif. "We are here to defend it."

In peace negotiations, Israel's previous government recognized Gaza as Palestinian territory and agreed in principle to remove the Jewish settlements. Israel's new Prime Minister, Binyamin Netanyahu, has pledged to expand them.







Love among the ruins

THE ATMOSPHERE in Gaza is heavy with disappointment, like overcast skies on a cold and bitter day. People's spirits have sunk even lower since the Israeli elections. Against this background signs of hope stand out like the first warm wind of spring: That's the way it is in Gaza when people get married.

In Rafah, a town near the Egyptian border, I went to a wedding, and the family of the bride (above) wound up dancing for joy in public. This kind of

display was discouraged during the intifada.

During those years—1987 to 1994—boys were fighting the Israelis all the time. People were dying. Nobody was thinking about romance, much less celebrating it.

But today in Gaza you can't count the number of weddings. Arafat's marriage may have something to do with it. I've heard many people say, "Hey, if the old man can get married, we can too!"



In a landscape soaked with fear—fear of Israel, of violence, even of the Palestinian police—courage stands out. One of the bravest things I witnessed was the willingness of the Gaza fighters to believe in peace. After the peace agreements hundreds renounced violence and kissed their guns good-bye (below). The jubilation didn't last long—the Middle East peace process is like a roller coaster gone berserk—but it showed that warriors can sometimes become men of peace. Israel's late prime minister, Yitzhak Rabin, was that type of man. So is Yasser Arafat.

Today in the Gaza Strip, as in the West Bank, many questions remain: Will Arafat be able to fight terrorism without stamping out human rights? Will Israel allow the Palestinians to achieve sovereignty or crush their hopes?

As for the ones walking a tightrope—the people of an envisioned Palestine and the people of Israel—wish them peace as they await their answers. □

Learn more about the Gaza Strip at <http://www.nationalgeographic.com> on the World Wide Web or on CompuServe at GO NATIONAL GEOGRAPHIC.





SEARCHING FOR

By MIKE EDWARDS ASSISTANT EDITOR



ARRIVING WITH DUST AND THUNDER, FIERCE HORSEMEN FROM THE EAST BURST UPON THE EUROPEAN STEPPE SOME 700 YEARS BEFORE CHRIST. INVINCIBLE FOR FOUR CENTURIES, THESE

PROUD MARAUDERS GREW RICH ON THE DIVIDENDS OF CONQUEST, DECKING EVEN THEIR HORSES WITH GOLD. THEN, MYSTERIOUSLY, THEY VANISHED, LEAVING ONLY TALES OF THEIR COURAGE AND CRUELTY—AND IMPOSING TOMBS LAVISHLY PROVISIONED FOR ETERNITY.



ORANGE NATIONAL HISTORICAL MUSEUM, BIRD STUMP

THE SCYTHIANS

Photographs by SISSE BRIMBERG NATIONAL GEOGRAPHIC PHOTOGRAPHER



Scythian artifacts reflect a savage world in which the strong and swift prevailed and life was lived on horseback. Many of the finest relics, like these, were crafted by Greek goldsmiths who catered to Scythian tastes. Native smiths excelled in working iron—still smelted in present-day Ukraine.



KEY: INSTITUTE OF ARCHAEOLOGY (TOP); HERMITAGE STATE MUSEUM, ST. PETERSBURG

IT WAS ONLY A WINK, showing itself and then vanishing in the gloom. The excavation was a pool of mud, and the archaeologists, abandoning spades as useless, were fishing about with their hands.

There it was, glimmering again.

As Yevgeny Chernenko remembers, "The face of some tiny animal was looking up at me."

Groping, Chernenko came up with a crescent of gold 12 inches across. Washed clean in his trembling hands, it emerged as a pectoral, or chest ornament, bearing 48 exquisitely detailed figures of humans and creatures (pages 64-5). There were winged griffins, horses, lions, sheep, even grasshoppers. No archaeologist had ever glimpsed anything like it.

Thus was discovered in Ukraine what may be the most spectacular of the ornaments of the Scythians, a nomadic people both barbarous and, to judge by their gold, appreciative of beauty.

Migrating from Asia in the seventh century B.C., the Scythians for some 400 years were masters of a great stretch of the European steppe. At its height their kingdom reached from the Danube east across Ukraine, Crimea, and Russia, all the way to the Don River and the Caucasus Mountains.

Although archaeologists have uncovered a great deal of information about them, the Scythians linger more in shadow than light. In their heyday on the steppe did they have a capital? Why did their empire abruptly collapse? The Scythians left no written record that might answer such questions. But did they vanish entirely? On the fringe of their realm, in the folds of the Caucasus Mountains, I met people who speak an Iranian tongue like the one the Scythians employed and who also follow other Scythian ways, keeping, for example, a special reverence for fire.

When Chernenko and his colleagues retrieved the pectoral in 1971, archaeology in the Soviet Union was in a kind of golden era of its own, well supplied with funds. The situation is painfully different today. Since the Soviet collapse in 1991 scholars of all kinds have found themselves in poverty.

Still, a few archaeologists manage to continue searching for answers to

the many riddles, and during two months in the Scythian realm I was able to watch some of them at work, sharing their hopes and disappointments.

Greek writers, especially Herodotus, provided the primary accounts of the Scythians. As warriors they were unmatched, these chroniclers said. They made drinking cups from their victims' skulls.

In about 513 B.C. the nomads attracted the attention of Darius I, King of Persia, who journeyed

more than a thousand miles to chastise them. Darius may have been trying to shore the borders of his empire against plunderers or, as Chernenko speculates, to shut off the supply of grain to his enemies, the Greeks of Athens and other city-states and their allies in the Aegean Islands. The Scythians were not farmers, but they may have controlled the grain trade around the Black Sea, where many Greek colonies were located.

As Darius's legions advanced, the Scythian horde fell back, screened by a rear guard that set the steppe ablaze. Darius, Herodotus wrote, sent an imperious message to the Scythian ruler, Idanthyrsus: Stop running and fight!





Gilded adversaries clash on the crest of a 2,400-year-old comb unearthed from a Scythian burial. As portrayed by the Greek historian Herodotus, Scythians were fearsome fighters given to sadistic customs—including making cloaks from their victims' scalps and using the skulls for drinking cups.

HERMITAGE STATE MUSEUM

Idanthysrus replied that while the Scythians had no cities or croplands to defend, “we have the graves of our fathers; come, find these and essay to destroy them; then shall you know whether we will fight you.”

At last, says Herodotus, Darius beheld his prey drawn up as if for battle. He deployed his thousands of soldiers to attack. But the Scythians showed only contempt for this threatening display: While awaiting Darius’s charge, some broke ranks and began chasing a hare. Darius gave up and turned for home.

No one can pinpoint the place where the nomads supposedly toyed with the monarch of Persia, but I like to think it was within my gaze one hot afternoon not far from the River Dnipro (also called the Dnieper) in Ukraine.

My vantage point was a big goose bump of earth that rose in a square kilometer of golden orbs—a collective farm’s sunflower crop. Forty feet high, the hill was practically an Everest upon the steppe, which rolled to the horizon flat as a carpet. Mounds such as this, called kurgans, marked the graves that Idanthysrus challenged Darius to destroy.

In time, kurgans rising to 65 feet became numerous along the lower Dnipro, the realm of the dominant “Royal Scythians,” as Herodotus called them. Thousands of others, large and small, dotted the broad Scythian territory. Many survive today, despite intense land-taming for farms and towns.

It was near the Dnipro, beneath a kurgan known as Tolstaya Mogila—“fat mound”—that Chernenko discovered

(Continued on page 64)





Storming an enemy settlement, Scythian horsemen cut down their opponents with spear, battle-ax, and bow. Swift horses and state-of-the-art weaponry—like the scale armor (above) reproduced by Ukrainian craftsmen—made the Scythian cavalry a formidable strike force. In this imagined battle a woman leads the charge. Some archaeologists see evidence of female warriors in burial artifacts.

PAINTING BY GREGORY MARCHELL



Clothing ornament from the Kul Oba kurgan in Crimea depicts a hunter taking aim at a hare in what one scholar labeled "a Scythian national sport."

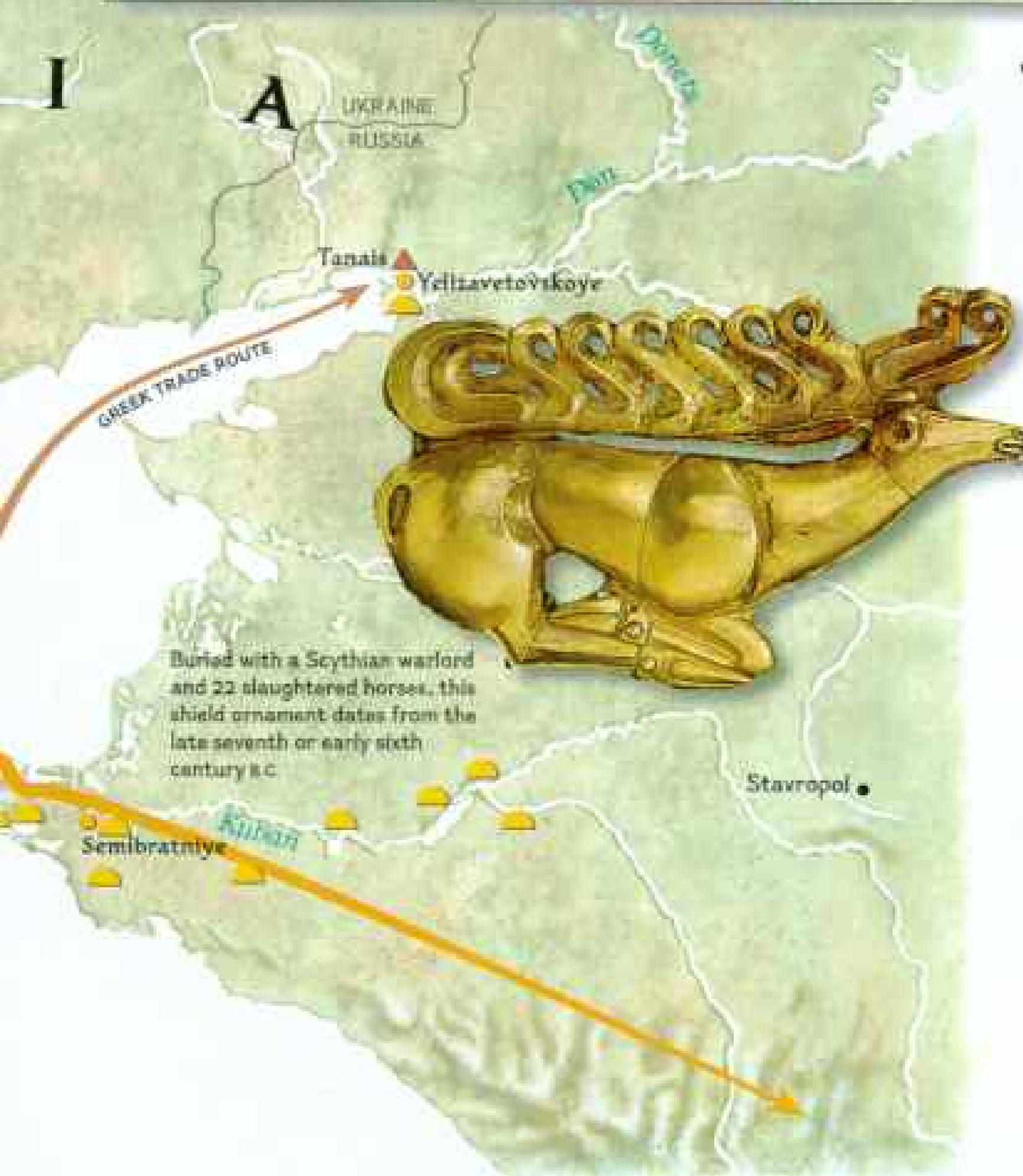


Commercial ties joined Scythia to Greece: From the steppe flowed grain, honey, furs, cattle, and slaves, which the Scythians traded for Greek wine, textiles, weapons, and works of art.

Mammoth burial mounds, or kurgans, multiplied in the Dnieper Valley in the fourth century B.C.

Storm track

Seeking greener pastures, Asian warrior-nomads crossed the boundless steppe in the seventh century B.C., eventually penetrating the region north of the Black Sea. Turning south, the Scythians streamed across the Caucasus, then struck out in all directions. For almost 30 years, reports Herodotus, their cavalry rampaged over southwest Asia, winning lands from the Medes and Assyrians, ransacking cities in Mesopotamia, and raiding as far as Palestine. The Medes, who ruled what is now western Iran, finally forced the invaders out. But this decades-long encounter with the civilizations of the Near East left a lasting mark on Scythian weaponry, art, and outlook.



The Scythians

Though their name became a byword for warring barbarians, these enigmatic people did more than pillage and burn.

At their zenith in the fourth century B.C., the Scythians held sway over an area embracing most of modern-day Ukraine and the plains of southern Russia. Trade linked Greek colonies rimming the Black Sea to Scythian rulers, who acted as middlemen between the northern hinterland and the classical world to the south.

Why this flourishing culture waned is unclear. Some experts suspect that prolonged drought or overgrazing degraded grasslands; others cite hordes of Sarmatians invading from the east. Or perhaps an increasingly sedentary lifestyle undermined the Scythians' nomad spirit, leading to cultural collapse.



Endless steppe, bountiful pasture



Keeping watch over his flock from a horse-drawn wagon, a Crimean shepherd recalls the Scythian herdsmen whose grave mounds rise above the far horizon. Sheep — as well as horses and cows — were mainstays of these steppe nomads, whose very transience made them indomitable.



the spectacular gold pectoral.

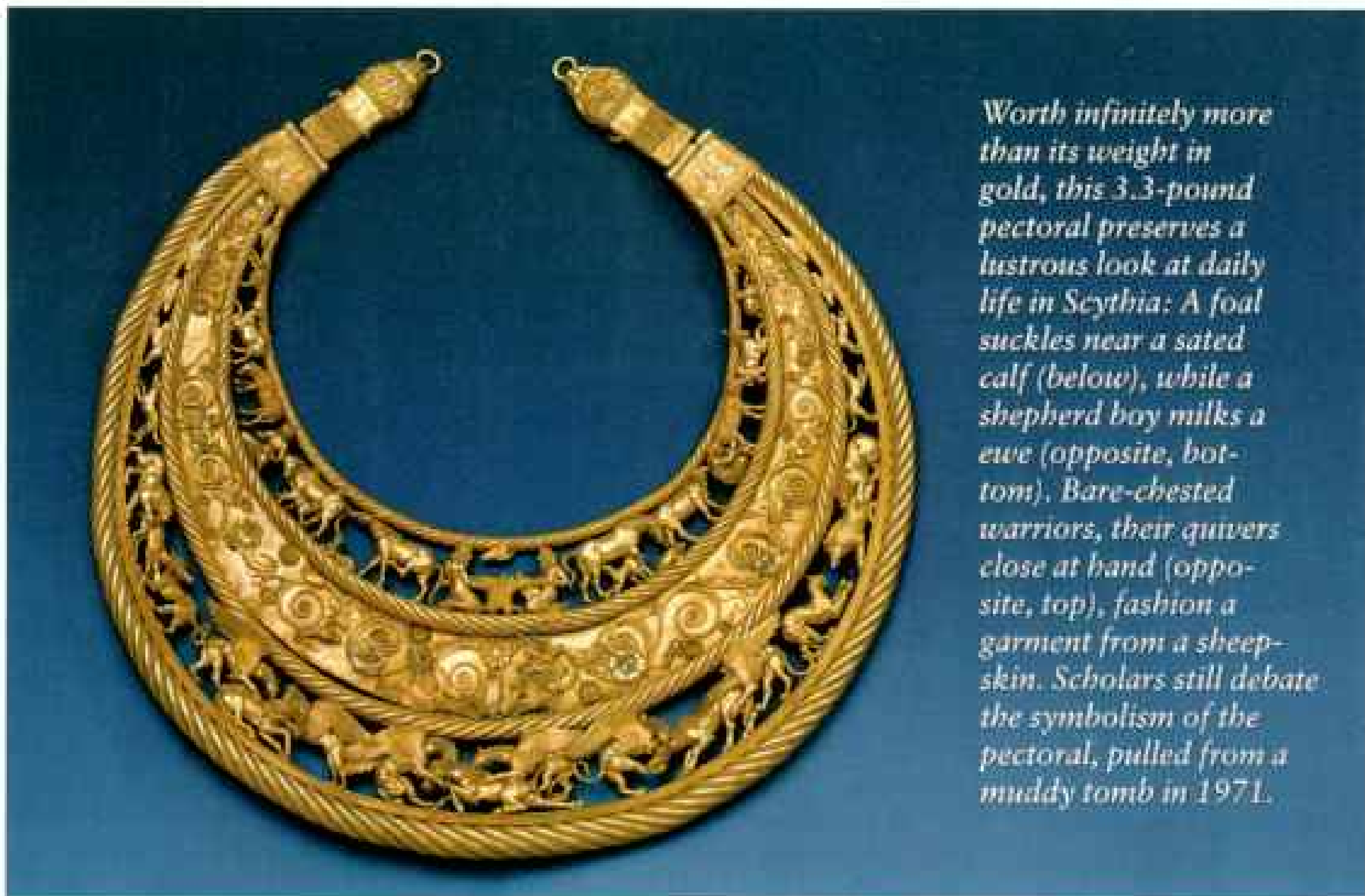
As with virtually every large kurgan, looters had long ago tunneled in; they reached a chamber and stripped its occupant bare of ornaments. We do not know what they bore off, though it must have been quite a hoard, given what they missed. For not one but two troves awaited the archaeologists.

As he fished about in the mud, Chernenko drew the pectoral from what he later concluded was a shallow pit in the tomb floor. Also hidden there was a sword in a gold-sheathed scabbard.

To one side of the main chamber the archaeologists discovered a second chamber, unlooted. Interred there was a woman lavishly adorned: gold diadem, gold bracelets, gold rings for every finger. Though her robe had decayed, still in place upon the skeleton were the small gold plates that had been sewed onto the fabric (page 67). It was the most intact Scythian burial ever found.

Tolstaya Mogila, rising to 40 feet, was not as large as some mounds near the Dniro. And its tomb area was not as elaborate; beneath the biggest mounds, archaeologists have found as many as eight chambers. Hence Tolstaya Mogila is believed to have been the burial place of a regional chieftain, not a king. The woman buried there is presumed to have been his wife.

Other graves have yielded mystifying gold objects shaped vaguely like top hats, though too small to fit an adult head. As Chernenko told me,



Worth infinitely more than its weight in gold, this 3.3-pound pectoral preserves a lustrous look at daily life in Scythia: A foal suckles near a sated calf (below), while a shepherd boy milks a ewe (opposite, bottom). Bare-chested warriors, their quivers close at hand (opposite, top), fashion a garment from a sheepskin. Scholars still debate the symbolism of the pectoral, pulled from a muddy tomb in 1971.

UKRAINE HISTORIC TREASURES MUSEUM, KIEV

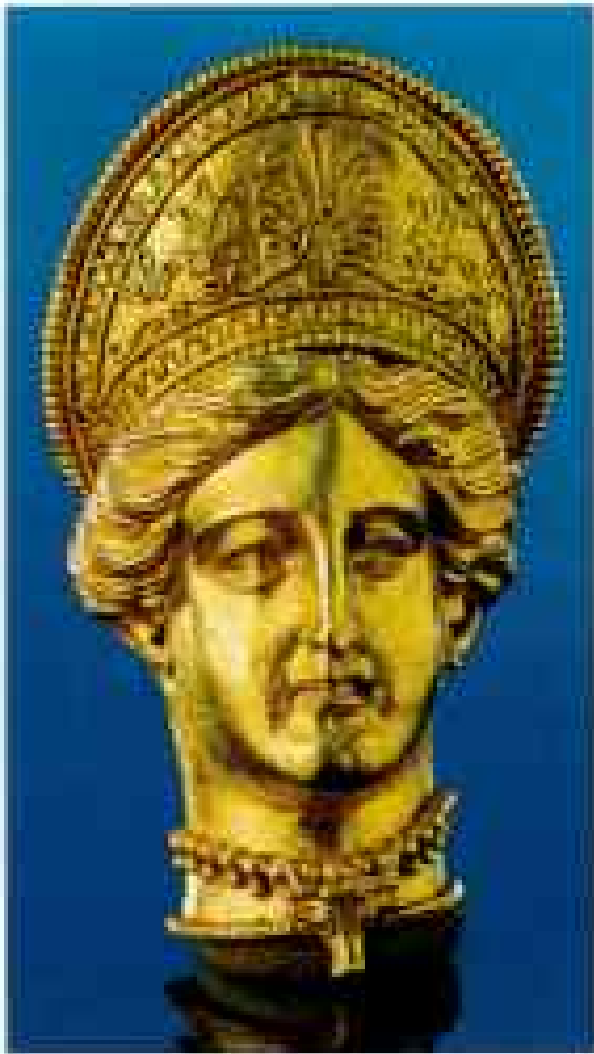
“About all we can say is that they may have been ritual objects, something for priests.” He thinks that they were raised on stanchions during ceremonies.

Who exactly were the people buried in Tolstaya Mogila? Historians know the names of a handful of rulers and their kin, such as Ataias, who issued coins to proclaim his majesty. But of the scores of kurgans that have been systematically explored, only three can be linked to specific persons.



THE SPLENDID gold pieces retrieved from burials were not Scythian-made. “If a craftsman was also a nomad, he wasn’t going to be sitting a long time in a workshop,” Chernenko pointed out. “However, the makers were people who knew the Scythian life.” Most of the best ornaments almost certainly were fashioned by Greek craftsmen in the Black Sea region. “I imagine,” Chernenko added, “that master and client probably met to discuss a design before it was executed.”

The Scythians also traded with the Greeks for wine, and based on the amphorae that litter kurgans and settlement sites, they were a thirsty lot. They traded for pottery too. And with these goods the Scythians did leave a readable record. Amphorae usually bore a maker’s or inspector’s mark pressed into the clay. By consulting a catalog of marks, archaeologists can often fix a tomb’s date to within 10 to 15 years. Pottery also can be dated by



A thimble-size pendant depicts a Scythian goddess as imagined by a Greek jeweler. The piece was overlooked by looters who robbed a kurgan near Velyka Bilozerka of its other treasures. Pillagers made a more glaring oversight at Tolstaya Mogila, where the richly gilded remains of a Scythian noblewoman (opposite) were discovered untouched by thieves. Finding such intact burials is extremely rare. More often, laments a Ukrainian archaeologist, "We find skeletons ripped apart from robbers tearing at the gold."

UKRAINE HISTORIC TREASURES
WIREWORK (ABOVE); UKRAINE NATIONAL
HISTORICAL MUSEUM

its style. Tolstaya Mogila yielded no dated amphora shards, but beside the graves were varnished dishes like those used in Athens from 350 to 320 B.C.

Kurgan finds also reveal that the Scythians possessed combat gear that was state-of-the-art, including armor of spear-deflecting metal scales sewed to leather. They had iron swords, a new commodity. Arrowheads too were made of iron, as well as bronze and bone. Many were barbed, to tear flesh if removed.

One day in Kyiv (Kiev) I was admitted to the locked vault of the Ukrainian Institute of Archaeology, where Gennady Yevdokimov, a veteran of many excavations, opened a box that held desiccated wood. Though in pieces, this was a prize: a Scythian bow. Only two others have been unearthed. This one was laminated—strips of willow and alder joined by fish glue. Just 32 inches long, it was double curved, like the Greek letter sigma (Σ). It may well have been a bow like this that, according to a Greek inscription on a stone in the trading town of Olbia near the Black Sea, once sent an arrow 570 yards—astounding if true.

I HAVE SEEN a Scythian nobleman's face—as a sculptor created it in plaster, modeling from a 2,600-year-old skull. The countenance was long, the cheekbones high, the nose a prominent blade.

I viewed it in the museum of Stavropol, a city close to the Caucasus Mountains. With me was Vladimira Petrenko, a redoubtable grandmother who had overseen the opening of a dozen kurgans. "A northern Iranian face," Vladimira said. An Indo-European face, other experts would say.

The skull was that of an important person; that was apparent from the tomb where Vladimira recovered it. The deceased had been interred with an array of weapons and nine horses to serve him in the next world—though the horses presumably had been killed before the huge grave was closed. With the horse skeletons were bronze bridle pieces. Another tomb she excavated yielded what seemed to be the remains of a carriage and even bells that would have jangled as the conveyance rolled along.

Horse burial is one of several Scythian customs suggesting a cultural kinship to other nomadic peoples—for example, to those known to archaeologists as Pazyryk.* Fire worship suggests this kinship too. Beside one kurgan Vladimira excavated was a stone shrine with a blackened hearth.

It was in the Stavropol region that the Scythian era dawned upon the European steppe in the first half of the seventh century B.C. Vladimira believes the Scythians originated in central Asia and migrated westward in search of better pastures and peoples to conquer. As they moved through southwest Asia, they pillaged Nineveh, Babylon, and other cities and raided even into Palestine. Some historians think that the Prophet Jeremiah had the Scythians in mind when he warned the Israelites that warriors would come who "are cruel and have no mercy; their voice roareth like the sea and they ride upon horses, every one put in array, as men for war against thee."

When the Scythians reached the steppe, they must have exulted in the sight of the rumpled plain spreading before them, for it was a sea of grass, the perfect realm for horsemen such as these, who also kept cattle, sheep, and goats.

One day Nikolay Okhonko, the Stavropol museum director, escorted me into a tangled wood where the terrain was different—all sharp angles. It took me a while to realize we were walking atop a wide, curving barrier of earth and stone—the wall of a city.

"This place was inhabited before the Scythians arrived," Nikolay said.

*See "A Mummy Unearthed From the Pastures of Heaven," by Natalya Polosmak, *NATIONAL GEOGRAPHIC*, October 1994.



Stricken by the sight of their dead king, Scythians spill their blood and hack at their hair in an outpouring of grief. Herodotus, in a graphic account, relates that Scythians bore a king's embalmed corpse from one encampment to the next until arriving at his grave. There, a concubine, select servants, and horses were sacrificed and, along with prized possessions, were entombed with him for eternity.

PAINTING BY GREGORY MARCHESI



"But we don't know who the people were." They are labeled generically as "of the Koban culture," from a regional name. They must have resisted the invaders, for graves have yielded skulls with Scythian arrowheads embedded in them.

But then native and invader mixed. Koban pottery commingles in the earth with Scythian urns, identified by their simple patterns. (Scythian potters seem never to have distinguished themselves. Instead, as trade flourished, the Scythians obtained fine Greek vases and plates, which have been found in many graves.) As vassals the Koban people may have swelled the Scythian tide that rolled on westward, reaching Ukraine later in the seventh century B.C.

"EVERY TOMB is like a new baby," said another archaeologist, Yevgeny Savchenko. "It means new hope, excitement, and maybe disappointment."

All those were in the air in the week I spent with Yevgeny and his colleagues in the middle reach of the River Don, 60 miles south of the city of Voronezh. In Russia this was the northeastern limit of Scythian authority, where the steppe was no longer a sea of grass but a sea of trees. Today the forest has been largely cleared, baring earth black with humus.

Although Scythian kurgans are numerous, the middle Don was mainly populated by another group under Scythia's dominion. Perhaps they were the Budini, who, according to Herodotus, had bright eyes and ruddy



complexions. Some scholars speculate that the Budini were in fact Finno-Ugrians, the rootstock of Finns as well as of fair-haired peoples in Siberia.

Valery Gulyaev, who first dug along the Don 35 years ago, drew for me a picture of lively trade on the river. Excavations reveal that Greek wine and olive oil, gold ornaments, bronze mirrors, and even multihued Egyptian beads came up the Don. Probably they were exchanged for grain, furs, beeswax, and slaves.

Valery was the soft-spoken field general of the middle Don exploration, parsimoniously funded by the Russian Academy of Sciences. While students and other archaeologists raised a tent camp, Valery spent some of his precious rubles to rent a bulldozer.

In a collective farm's field, the bulldozer began to reduce a sizable kurgan. Soviet archaeologists often used bulldozers thus; since the grave, the hoped-for jackpot, is always several feet beneath the mound.

It's a big grave. That message rippled through the camp as bits of the tomb's wooden roof appeared and the perimeter of the pit became apparent. It was 21 feet across.

It hasn't been looted. Such was the speculation after three days, for the bulldozer's scrapes had not revealed the disturbed earth of a looter's shaft. Spirits were high — cautiously so, because a kurgan both large and virginal would be rare indeed.

In camp we fought mosquitoes while dining on mutton shashlik and pasta

that Galina, our resourceful cook, enlivened with mushrooms collected in the woods. For baths we braved a frigid stream. Surely the Scythian life had not been much different: tents, mutton, mosquitoes.

I asked the archaeologists about the status of Scythian women. Yevgeny Savchenko said he believed they had equality with men. As evidence he cited the many graves in which weapons lie alongside female skeletons: "Last year we found a woman buried with spears and 30 arrows," he said. "I think women fought side by side with men."

Valery Gulyaev responded cautiously, "The Greek writers don't mention women warriors among the Scythians." Still, he added, "They had to be armed to defend the place where they lived while the men were away."

On the fourth day the bulldozer retired and shovelers began to probe the collapsed tomb. Soon they uncovered evidence of a looter's shaft. But perhaps the robbers had missed something. The diggers switched to trowels and kitchen knives, poking every lump. A gold bead. An arrowhead. A skull. A brazier for rituals. The inevitable amphora. That was about it. The looters had been extremely efficient.



CHARLES O'BRIEN (OPPOSITE)

Tons of Russian truck test the mettle of Vyacheslav Motorny during a strongman competition in Ukraine, where Scythians also engaged in contests of strength. In the Caucasus Mountains (opposite) Ossetian men gather for a banquet after a friend's funeral—keeping alive a custom that dates from Scythian times.

Today most of the sturgeon are gone; dams thwarted their spawning migrations. And I wouldn't drink from the Dniπρο on a bet. It is laden with industrial and human waste, not to mention traces of radiation from Chernobyl.

South of the city of Zaporizhzhya, in kurgan-studded countryside crimsoned by ripening tomatoes and gilded with wheat, I made my way to a bluff overlooking a Dniπρο reservoir. Under the fierce July sun a volunteer corps of university and high school students was flinging sandy earth from pits. Gennady Toshev, the expedition leader, and archaeologist Svetlana Andruk, his wife, called encouragement.

Mamay Gora, as this locale is named, is the largest known Scythian burial site. It is not exclusively Scythian, however; earlier peoples also made it their cemetery. Seven large kurgans, both Scythian and pre-Scythian, are situated here, and 300 lesser ones. Thousands of common people also were interred, moundlessly, over the millennia.

At a depth of four feet, diggers reached a skeleton. It was well preserved for its age, for it was not Scythian but that of a man who lived long before, perhaps 5000 B.C. "Dig beside it," Svetlana urged. Scythians often interred their dead adjacent to but slightly deeper than earlier burials.

SO FAR, I had been on the fringe of Scythia. It was time to explore the heartland, in Ukraine.

Although Herodotus may not ever have viewed the Dniπρο, he wrote rapturously of it. On a journey in about 450 B.C. he probably reached Olbia, 40 miles west of this river where Scythian royalty sojourned. Presumably repeating accounts he heard, he declared that the Dniπρο's water was "the most sweet to drink" of all the streams in Scythia and its fish, including huge sturgeon, were "beyond all in their excellence and their abundance."





Kurgans assure fodder for eternity



CHARLES O'CONNOR

Archaeology by bulldozer rips open a grave site in southern Russia. Scythians often cut bricks of sod from choice grassland to provide grazing for the departed's livestock in the hereafter. "That is what kurgans seem to have been," speculates one scholar, "symbolic pasture."

Two feet farther down, another skeleton was uncovered. Svetlana concluded that it was of a woman 40 to 45 years old. There was no gold. She had been buried with only an iron wire bracelet and a necklace of small glass beads. "Scythian, fourth century B.C.," said Svetlana, who had seen such meager adornments in other ordinary graves of that period.

"Good work," Gennady called. "Now, ice cream for everybody."

Joke. Gennady and Svetlana were working on a miserly budget of \$3,000, which would have to cover all expenses for two months. Most of the money came from their own pockets. The tomatoes and onions that went into the daily lunch—meatless borscht—were fetched by volunteers on bicycles.

As we ate our borscht in a clutch of small oaks, I spied a certain plant whose long, serrated leaves are well-known to millions of Americans, not to mention the police.

Cannabis has a long history here. Inside a tent the Scythians tossed its seeds on hot stones, Herodotus wrote, and as the vapor rose, "the Scythians howl in their joy. . . ."

That story reminded Svetlana that in one grave she found evidence of

surgery—a skull with three small holes, evidently drilled to relieve swelling. Beside the skeleton was a cache of cannabis to ease the deceased's headache in the next world. A few times she had found skeletons without skulls. "Dis-membering bodies evidently was part of some sort of ritual," she said.

The Scythians were obsessed with rituals. When a king died, his body was borne on a wagon among the people. Herodotus wrote that the lamentations were bloody. Mourners cut off parts of their ears, slashed their arms, and pierced their left hands with arrows. A year after the burial

50 servants and 50 horses were killed and impaled on posts around the royal kurgan, the horses standing upright, the men mounted on them like ghoulish riders.

THE SCYTHIANS buried at Mamay may have resided ten miles away in a settlement that came to be called Kamenskoye, now encapsulated in the small city of Kamyanka-Dniprovsk. At 5,000 acres, Kamenskoye is the largest of about a hundred known Scythian dwelling sites along the Dnipro. It was enclosed by a wall ten miles long. Four decades ago archaeologists decided it had been Scythia's capital. This conclusion assumed that the nomads had settled down, which evidently was true. But further exploration has cast doubt on the capital theory. Kamenskoye's diggers have yet to find the remains of a substantial Scythian-era building, only evidence of walls made of sticks and clay.

Today many scholars agree with Nadezhda Gavriyuk, who is in charge of the Kamenskoye excavation and says: "I'm inclined to think there was no capital." Perhaps the capital was wherever the king happened to be.

"But they must have been quite happy here," Nadezhda said. "They had rich pastures and a lot of animals. We know that from the bones we've



CHARLES O'NEAR (OPPOSITE)

Scrutinizing a coffin, an archaeologist studies an unlooted burial in Crimea, an area rife with modern-day grave robbers. At a site in southern Russia (opposite), ancient plunderers left horse bones, clay pots, and little else. On occasion a tomb reveals a grim twist of fate: Some robbers have left their own corpses in collapsed tunnels.



Too drunk to drive, a Ukrainian farmer wears a smile like the one chiseled on a crude sculpture (below) showing a Scythian lifting a rhyton, or drinking horn. Fabled revelers, Scythians relished fermented mare's milk, called koumiss, and consumed oceans of Greek wine. Their thirst often led to their downfall, asserts Herodotus: Lured to a rival's party, Scythian chieftains drank themselves senseless—and were easily slain.

NIKOVOHRAD HISTORICAL MUSEUM

found." They traded with the Greeks and smelted iron ore—possibly from a local deposit—to make implements.

This was in the fourth century B.C., the wealthiest Scythian era, to judge by the gold pieces found in graves. The population reached its peak in that century, Nadezhda continued. "There may have been half a million people between the Danube and the Don." Other experts are more conservative, estimating the Scythian population in only tens of thousands.

Then, crisis. "The third century is empty here," Nadezhda said. "When we excavate that stratum, we find nothing."

For years it was gospel among Scythian specialists that the once dreaded warriors were driven out by the Sarmatians, another nomadic Asian people. It's known that Sarmatians encroached on eastern Scythian lands in the fourth century B.C. And trouble may have erupted in the west, where, some historians believe, the Scythians warred with Macedonians. There's no evidence, however, of occupation of the Dnipro heartland by Sarmatians or any other people until nearly a century after the Scythians vanished.

Kitchen trash from the late fourth century B.C. suggests to Nadezhda that the Scythian flocks were declining. One theory holds that a change in climate dried up the abundant grass. Perhaps too many Scythians and their herds migrated to the Dnipro, dislodged by encroaching peoples. Tribes may have begun to fight one another for grazing land or political power.

None of this speculation satisfies Yevgeny Chernenko, Ukraine's most respected archaeologist. "The truth is, we simply don't know what happened," he told me. "Scythia may have just collapsed from internal pressures, like the Soviet Union."

The Greek geographer Strabo wrote that some Scythians moved westward to the region of the Danube's mouth, founding an independent Little Scythia. And some migrated south to Crimea.

OTHER SCYTHIANS had long occupied the Crimean peninsula, a realm of joy even for barbarians. Here were not only sun-splashed plains for flocks but also a conifer-clad mountain range rising magisterially beside the green waters of the Black Sea.

I walked one morning on a plateau speckled blue with chicory. It looked out on the spartan high-rises of Simferopol, the Crimean capital. On the plateau, stone blocks traced the outlines of several buildings. Greek masons may have quarried these blocks, but this was a Scythian city. And many experts believe it was a capital. Its largest structure, a mausoleum, yielded some 1,200 small plaques and other gold ornaments.

The city took root late in the Scythian era, in the third century B.C., approximately the time when the steppe Scythians were streaming down to Crimea. We don't have a Scythian name for it, only a Greek one: Neapolis ("new city") Scythica. Was there an old city somewhere? No one can yet say; the Scythians of Crimea, even more than those of the steppe, are cloaked in enigma.

And much of the evidence that might unlock their secrets is being pilaged. I went one day to a Scythian-Sarmatian burial area on a bluff by the sea. To walk there was to zigzag as if avoiding battlefield foxholes. "Looters," explained archaeologist Alexander Puzdrovsky. "These were





commoners' graves. There isn't much gold. But sometimes there is delicate Greek pottery, and collectors want it." Looting is an epidemic in Crimea: hundreds of graves robbed in the past five years.

Much grander things—elegant mosaics and fluted columns—have been unearthed at Chersonesus, whose Greek bones poke through beside the port of Sevastopol, in sight of warships of the former Soviet Black Sea Fleet.

It's easy to imagine Scythian warriors riding to Chersonesus, not to see dramas in its amphitheater but to sample the vintners' best. Much of the wine they consumed was produced in this and other Greek towns on the Crimean coast.

The relationship was symbiotic. "The Scythians needed the Greeks because they wanted wine, golden things, and weapons," Chernenko told me. "And the Greeks couldn't have survived without the Scythians to buy their goods." Some Greeks traded for wheat—evidently grown by Scythian vassals—to ship to Athens and the Aegean Islands.

Why, then, did the Scythians begin to raid Greek towns? At first, in the third century B.C., they burned and pillaged, then withdrew. In subsequent decades they dispossessed the Greeks of several towns and moved in.

Some experts say the Scythians coveted the productive Greek lands. Some say the Scythians were trying to compel tribute. And some believe the Sarmatians, not the Scythians, were the attackers.

Whatever the explanation, these depredations led to disaster. About 108 B.C. the Greeks succeeded in inciting an army from the kingdom of Pontus in Anatolia to attack their tormentors. The Crimean Scythians, a pale shadow of the warriors who had defied Darius four centuries before, were no match for the disciplined phalanxes of Pontus. Strabo reports that the Scythian force was destroyed; the victors marched to Neapolis. Archaeologist Vadim Kutaisev, who dug at Neapolis, told me that blackened earth indicates the city was burned.

OTHER INVADERS—Huns and Mongols—swept out of the east to lay claim to the steppe and Crimea. From the west came Slavs, peacefully, and from the north Vikings and Goths.

Yet, scholars say, a remnant of the Scythians endures in the 700,000 Ossetians, whose homeland today is a two-part enclave straddling the Caucasus Mountains. North Ossetia, the larger part, lies within Russia, while South Ossetia intrudes into Georgia. The Ossetians declare that their ancestors were the Alans, a tribe in which survived the genes of both Scythians and Sarmatians, who came after them from the Asian steppe.

I cannot say, after being among the Ossetians, that all evince the high cheekbones and blade nose that I saw in the Stavropol museum, because the Ossetians have mixed with other peoples. But some do have that visage.

It is not appearance, however, but language and tradition that suggest these links between Ossetia and Scythia.

In a Caucasus canyon, beside a stream tumbling milky with glacial flour, Vitaly Gussalov, a historian versed in tongues ancient and modern, gave me a language lesson. He pointed out that the stream was named Ardon. He emphasized “don” and said, “It means ‘river’ in Ossetian. It is a word from the ancient eastern branch of the Iranian language, the language of the



Scythians and also the Sarmatians." Scholars say river names surviving today in Russia and Ukraine—Don and Dnipro and Dniester—reflect the Iranian "don." Scythian words preserved in Greek texts provide other linguistic connections to the Ossetian tongue.

A couple of hours of driving into the mountains from Vladikavkaz, capital of North Ossetia, brought me to the home of Dakhtsikho Bzikov (names are difficult there). He was 81, still a smoker, indomitably independent. He had withdrawn from a state farm, forgoing a monthly paycheck, to cultivate a few acres that provided all he required.

Like the Scythians, Ossetians revere horses. Dakhtsikho owns two. He spoke of funerals in decades past as we wandered among the old stone walls of his village. "Horse sacrifice at a funeral was done if the man was a good rider," he related. "But usually we'd take the horse to the grave and say, 'We want you to have this horse in heaven.' Then we'd walk it three times around the grave and set it free to roam." His memory warmed up. "I do remember when we killed a horse at a burial. It was about 15 years ago."

I asked, "Didn't the state farm object to this as wasting a horse?"

"Who was going to ask *them*?" he shot back. "It was our tradition, from our ancestors."

Tradition also makes fire sacred. No true Ossetian would douse a blaze; it must be allowed to die by itself. Scythians purified graves with torches. Ossetians kindle a blaze beside the grave.

I happened upon a funeral in the village of Nar, huddled under cedar-fringed ridges. An open coffin held the body of Mouldar Khetagurov, a truck driver who had died in his sleep. He had high cheekbones and a blade nose.

An elder eulogized Mouldar in raspy Ossetian. "Everyone in the valley knew he was a good worker," he said. "He tried to make his mother comfortable. According to Ossetian belief, he has gone to the real world, where we hope he will look down and wish us happiness and good harvests."

In a slow procession the casket was borne to a cemetery on the village flank. Then the men sat down to a feast.

That evening Mouldar's kin returned to the cemetery in acknowledgment of their roots. I know this because when I viewed the grave again the next day, beside it were charred wood and a smear of ash. □



Drinking wine mixed with their own blood, two warriors swear lifelong allegiance during a brotherhood rite (above). Joined by tradition to Scythian ways, workers at a horse farm in Ukraine collect mare's milk for making koumiss, recalling words attributed to the ancient writer Ephorus: "Some of the Scythian Nomads . . . feed only on mare's milk . . . [They] remain invincible and unconquered by outsiders because they have nothing to be enslaved for."

HERMITAGE STATE MUSEUM



Hawk High Over Four Corners

Photographs by ADRIEL HEISEY



MAPLES RIDGE, UTAH (NAVAJO: GZÉ NA'NEEST'EE')—MOUNTAIN THAT IS COILED; ABOVE, SHIP ROCK PINNACLE AND DINE, NEW MEXICO (TSE BI'A')—WINGED ROCK

"This country turns its bones to the sky. Ancient turmoils scrawl across every expanse, and hidden energies heave at its tough hide." From the seat of his aircraft—open to the weather and the world—photographer Adriel Heisey senses that the land is alive. He passes slowly, heading into the wind at "raptor height."

Heisey came here as a pilot whose job was to land in remote terrain and bring out members of the Navajo Nation who required medical care. He flew many missions, and "the ground beneath my wings spoke to me." So he built an experimental aircraft designed for photography. Once two young Navajo men watched him take off into a hard, cold wind. When he struggled back, one pulled out a webbed talisman known as a dreamcatcher. "We sold 'em all, except this one. It's to keep you safe when you fly."





EDITOR'S NOTE: This article begins an occasional and personal series on American landscapes, places photographers and writers are deeply attached to. The truth they report is of the heart as well as the mind.

By T. H. WATKINS

NEAR THE POINT at which U.S. 160 crosses the San Juan River there is a sign that will direct you a quarter mile or so to an official monument. It is a large slab of concrete on the top of which are implanted the official seals of four states: Utah, Colorado, New Mexico, Arizona. The monument marks the point at which the corners of the four states intersect. It is the only place in the United States where this happens. This is the Four Corners.

One afternoon in the middle of January, I walked around on that slab, moving slowly from state to state while a glacial wind ripped over the mountains under a high ceiling of gray clouds, swirling through the deserted tourist compound, kicking up a dusting of snow and abandoned gum wrappers, crackling and snapping the monument's four flags. It was one of those winter days when you can see as far as the horizon will let you, and as I circled the monument, the sense of all the space radiating out from where I stood was almost palpable. I was boxing the compass of more than 100,000 square miles of American land, luminous with color, endlessly various and fascinating in its forms. Much of this I have come to think of as my own country, yet at this moment I felt as if I was truly comprehending its dimensions for the first time.

I have spent several years exploring this western landscape, driving its roads, flying over it, hiking into its canyons, camping along its rivers, soaking it up, taking it in, sometimes writing about it, most of the time just thinking about its warps and tangles of rock and sky. This is not an idle passion. It stems from a deeply held conviction that the Four Corners country has something essential to offer us, both as individuals and as a society of human beings trying to balance what we want and what the earth has to give.

I am hardly alone in my love for this place, or the only one who seeks to find its lessons. For many, part of its seduction is the comfort to be found in all that quiet, empty, inhuman space, a quality that has spoken to whole generations of tourists and acolytes. Ernie Pyle, the great World War II reporter, found that comfort when he came here for the first time nearly 60 years ago, when the Four Corners monument was just a small, square concrete post and no more than one car a week tested that era's



A stone band saluting sunset, West Mitten Butte is to tourists an icon of the mythic West, to geologists a relic of prehistoric sand dunes, and to some Navajo a water basket left by the Holy People.

A window in a red rock wall deep within Ventana Mesa opens the canyon beyond to sunlight, making an exclamation point of light and shadow that changes shape with the slow rise of the sun.

VENTANA MESA, ARIZONA (NAVAJO: TL'OH YICHI—MESA OF RED GRASSES)

winding dirt road from the town of Shiprock. "The only way to feel the country is to pause in it," he wrote. "I'm not one of those . . . fanatics who think everything can be solved by seeing, hearing, and knowing nothing. But in the desert it's likely to occur to you that our daily lives in the cities are full of seeing, hearing, and worrying over a great many things that are of no damn consequence whatever."

To the comfort of solitude add pure joy in the existence of incomparable beauty, for this landscape is an ancient geologic battlefield scarred by the wounds of time and littered with the detritus of unimaginable violence. Successive waves of sedimentation have given it multicolored plateaus and mesas of sandstones and limestones and shales. Mountain building has given it the San Juans of Colorado. Volcanism blew the tops off the San Francisco peaks in Arizona. In Utah, bubbles of magma forced the land above them to blister into huge laccoliths like the Abajo Mountains and the great mound of Navajo Mountain. Diatremes, gas-charged eruptions of magma, left towering volcanic remnants like Ship Rock in northwest New Mexico.

The final touches in shaping all this tumbling-down and shoving-up country have been the work of weather and erosion—wind-driven sand to help mold the rocks into unearthly forms, temperature fluctuations so great they fracture exposed stone, peeling slabs from it like ice calving off a glacier, and the rivers, always the rivers in this arid land, doing their eternal work of carrying the land to the sea, bit by bit. The San Juan, the Dolores, the Virgin, the Escalante, the Dirty Devil, about a dozen more, most feeding into the great stem of the Colorado, have written their signatures into the ever rising stone. They have carved some of the most impressive canyon systems to be found anywhere on the planet: Dark Canyon, Marble Canyon, Grand Canyon, and many, many more, their names like starred entries in time's encyclopedia of immutable change.

A place of earthly trauma, then, where the forces of time have created scenes that inspire awe and get people to musing about the pitiful insignificance of their own lives. But there are gentler moments too, sudden surprises of life, as I discovered more than ten years ago in a little-known place near the Arizona-Utah border called Water Canyon. The spot is not on most maps, and our group of hikers had to be guided to it by a pair of local lads from Colorado City. The higher we climbed up the bed of the creek that had made the place, the more narrow the canyon became, red rock walls closing in on both sides, opening up every now and then into elegant little alcoves of beautifully sculptured stone swirled with maroon and ivory bands, the creek's white banks as smooth and unmarked as a beach at dawn, ferns clustered in dark wet corners, trickles of water and bright green swatches of moss oozing down the rock faces.

All this was cool and lovely and inviting, but nothing I had not

T. H. WARKINS, editor of *Wilderness* magazine, is the author of numerous books, including *Stone Time: Southern Utah, a Portrait and a Meditation*. ADRIEL HEISEY, a former pilot for the Navajo Nation, lives in Tucson, Arizona. This is his first article for the GEOGRAPHIC.



anticipated or experienced before. Then we neared the top of the canyon and entered a thick grove of maple. It was late fall, and the leaves had turned. They fluttered and tossed in the breeze. The color of each leaf was unlike anything I had ever seen before, a thin, nearly translucent

purple, and there seemed to be millions of them swarming about our heads and shoulders like a flock of lavender butterflies. I found myself raising my arms and turning in a circle, laughing in simple pleasure at so much unexpected beauty.

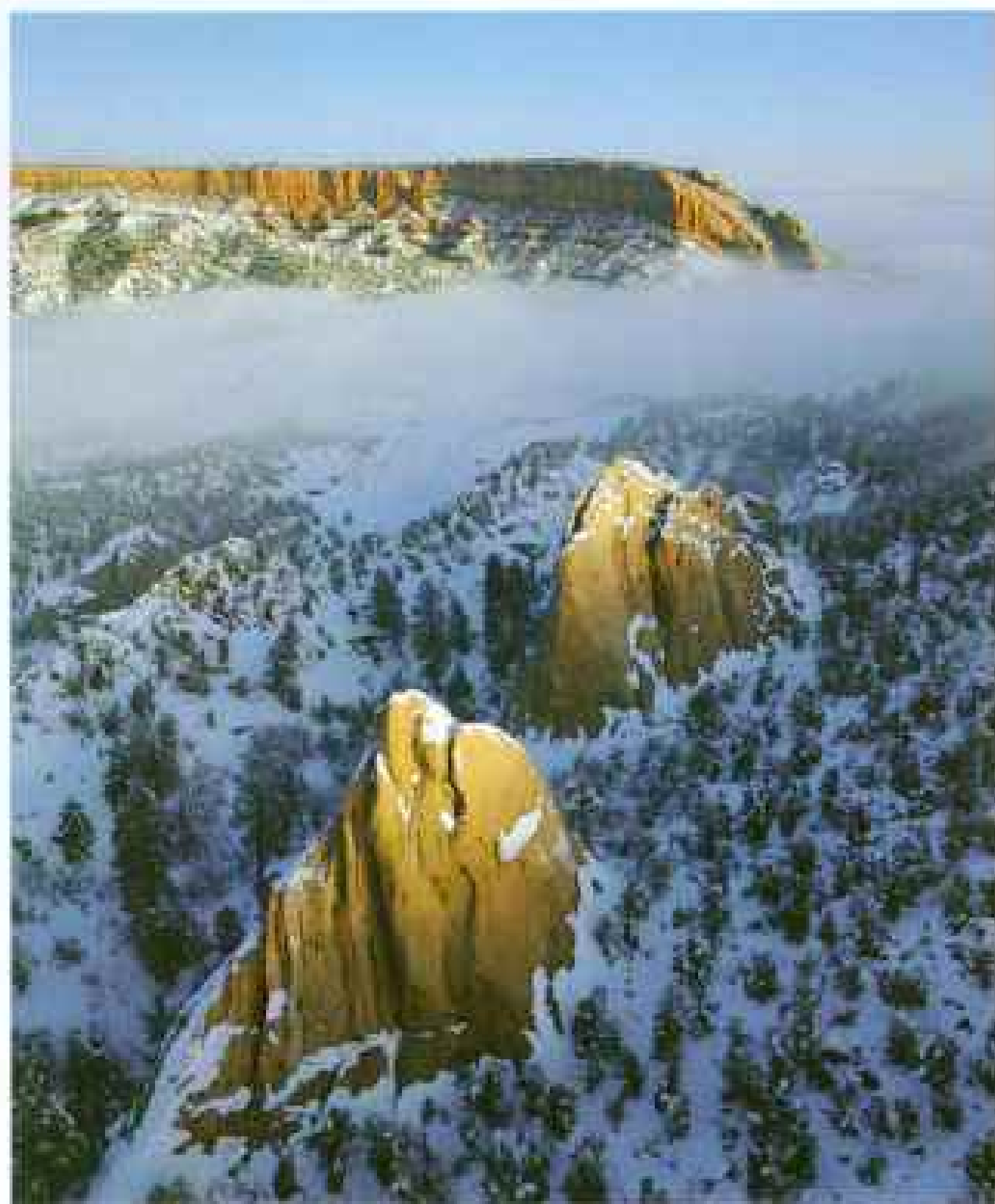
PILGRIMS to the Four Corners seek solitude here because they can find it in few other places, certainly not in cities that have grown even more crowded and worry-ridden than in Ernie Pyle's day, and finding that isolation can, they hope, help them discover themselves. They seek to know something of the earth's past, and find it written in the rocks.

People have not been content merely to experience the Four Corners, of course. But giving the land names, putting a ruler to its dimensions, pocketing it with towns, plugging its waters with dams, and lacing it with highways does not make it ours, nor does it give us the wit to comprehend its truest meaning.

The Navajo, whose huge reservation encompasses nearly a quarter of the Four Corners country, have their own way of measuring. It may not be ostensibly as precise as our own way, but it probably cuts closer to the essence of the land's magic. If a Navajo stands at the center of his heart's homeland, he looks to the La Plata Mountains in southwestern Colorado, to Blanca Peak in the Sangre de Cristo Mountains, to Mount Taylor in western New Mexico, and to the San Francisco peaks in northern Arizona. To the Navajo's way of thinking, these are not just geographic points pinning down the four corners of the place where he happens to live, they are the bounds within which lie the ancient spiritual traditions of his people. In the Navajo cosmology, the landscape here is numinous with meaning and power, and when a person lives in harmony with the land and its spirit, he is said to be walking in beauty.

The Navajo, like other Native American people who know this country—the Hopi, the Ute, the Paiute, the Apache, the Zuni, and others—have been making a living here for a long time, and many retain that combination of love, respect, and fear that enables them to accommodate their human needs to the wilder needs of the land itself.

You can get a sense of how the traditional Indian people have invested the land with a mute power when you take U.S. Highway 666 north from Gallup, New Mexico. Turn left at Indian Route 13 in the northeastern corner of the Navajo Reservation, drive five miles west, then park your



HUNTERS POINT, ARIZONA (NAVAJO: TSE NASHCHIF—RED ROCK CIRCLE)

Smooth blankets of cold air stir and wrinkle with the arrival of sunlight on frozen land. Lakes of fog undulate in the valleys, while solar warmth melts the night's snowfall on vertical rock facing east.

car at the head of a little dirt track that intersects the highway. Walk a mile or so along the track under the high, narrow fin of stone leading to Ship Rock, whose sculptured mass rises 1,800 feet from the surrounding plain like a schooner under full sail. Stand there, listen to the wind sweeping across the flat land, look up the face of that extraordinary thrust of eroded and fractured volcanic rock, let the simple strength of the thing seep into your bones, think of the elemental forces that drove it through the earth's crust into the waiting empty sky, and feel then something of the fundament out of which the earth was made.

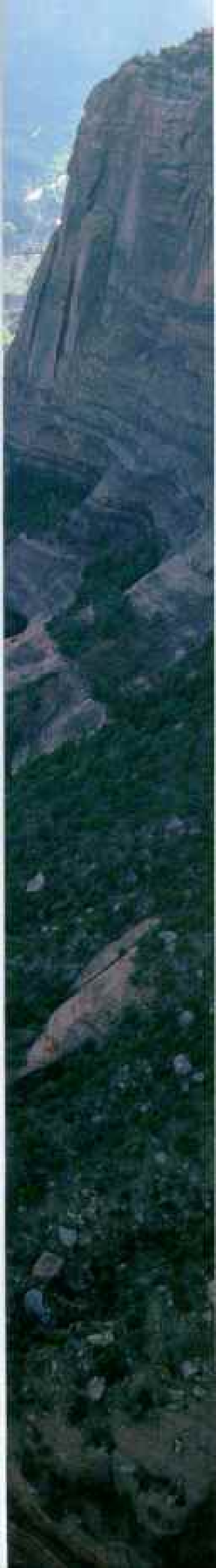
Then, for a sense of where the proper human place might be in the context of such unspeakable power, have a Navajo guide take you into the green-bottomed declivity of Arizona's Canyon de Chelly National Monument, following the twists of its three main canyons along the banks of its spring-fed creeks, the slickrock walls painted with desert varnish and sweeping a thousand feet straight up from the canyon floors on both sides. Here at the bottom are cottonwoods and sage, desert willow and bushy Mormon tea, all coexisting with neat summer fields of beans, squash, and corn, crops that have been cultivated here by the Navajo for generations.

Near the fields are modern-day hogans, smoke curling up from the center of their squat, round architectures, and tucked into many of the walls above are the surviving stone ruins of those who came before the Navajo, the Anasazi, the "ancient enemies," who lived here for their own measure of generations before moving on seven or eight hundred years ago, reasons still uncertain.

The organic strength of Ship Rock and the continuing symbiosis of Canyon de Chelly, like the character of similarly talismanic places in the Four Corners country, remind us that we have forgotten too much of what all people once knew of how to walk in beauty. The most important truth to be found in this landscape, then, is that earth's power and human understanding once built a long history together; maybe if we bring a willingness to embrace what the land has to teach us of limits and possibilities, it can be rediscovered in our own lives, here in a place where earth meets sky in the long dream of life. * * *







CANYON DE CHELLY NATIONAL MONUMENT, ARIZONA (NAVAJO: TSEYI—CANYON), LEFT;
MILE EAR, UTAH (TSE K'AAN—ROCKS STANDING UP)

*A mere trickle of its canyon-cutting power
in the days of melting glaciers, a stream
wends through Canyon de Chelly. Seventy
miles to the north along Chinle Wash,
ancient waters shaped sandstone wedges.*

*Kaibito Plateau shows its western rim
like a curving spine in a body bent by age,
while erosion in Beautiful Valley
reveals graceful concentric patterns
of mudstone and shale.*



ECHO CLIFFS, ARIZONA (NAVAJO: TSE' K'AAN DAHSITANI - ROCKS STANDING UP RIDGE), ABOVE;
BEAUTIFUL VALLEY, ARIZONA (BIB II AH - CLAY MOUNDS STICKING OUT)

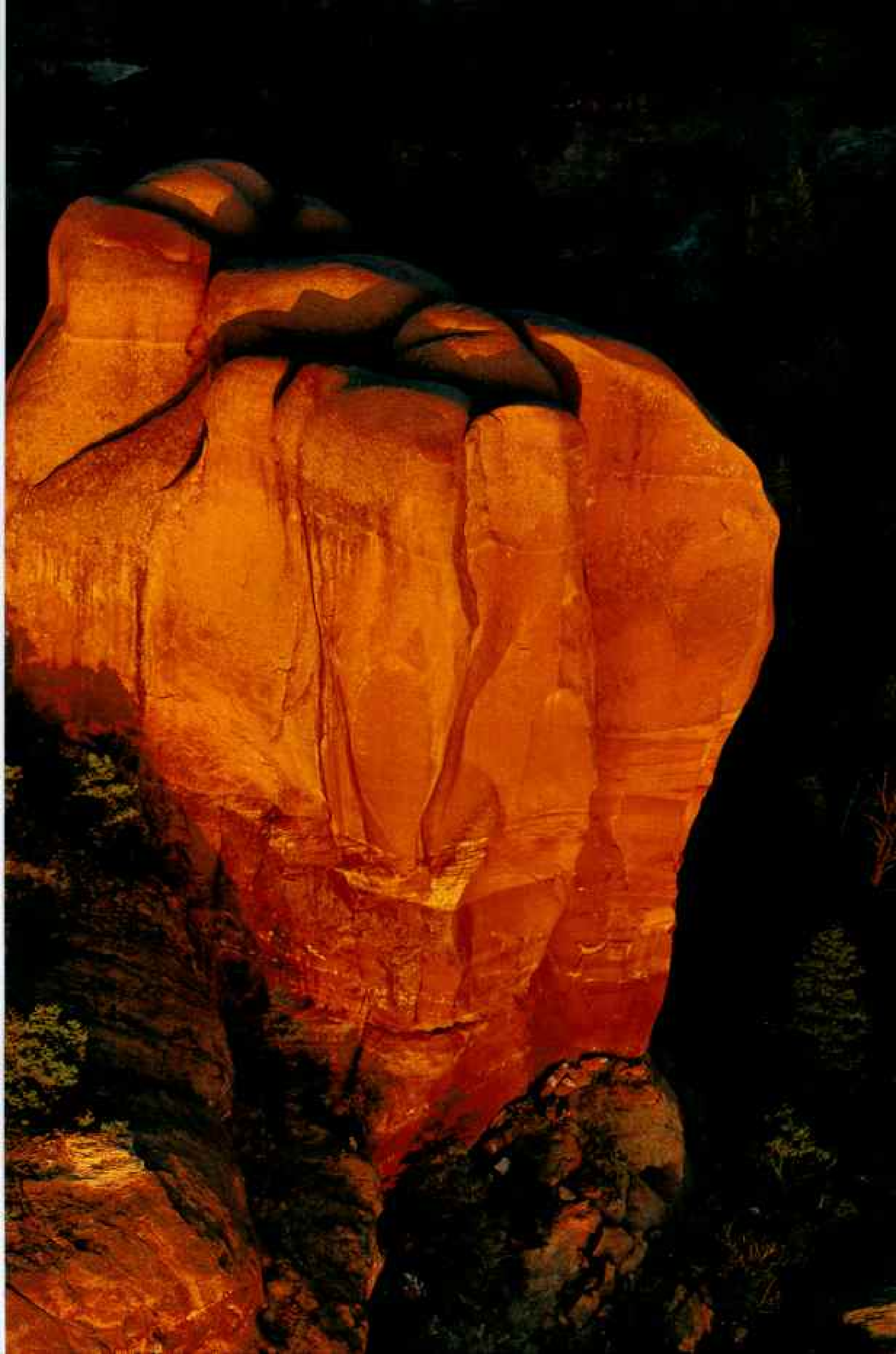




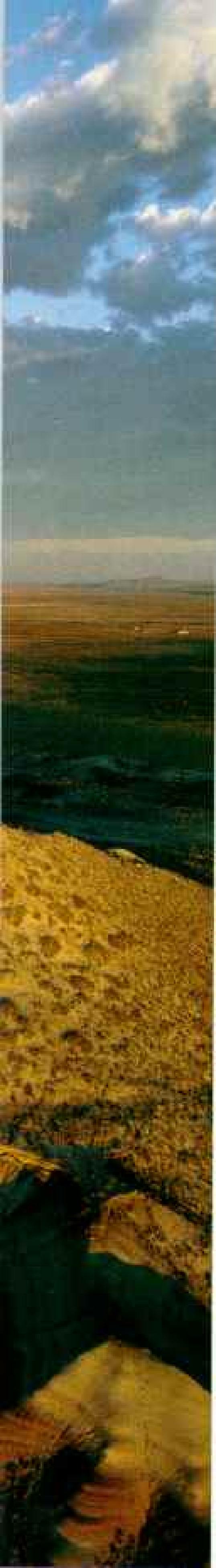
*Nameless formations rise in roadless
country, keeping earth's time under the
wheeling wings of hawks and vultures. The
rare visitor who flies this way can, with
patience, see the land in the best light.*

NEAR NAWAJO, NEW MEXICO







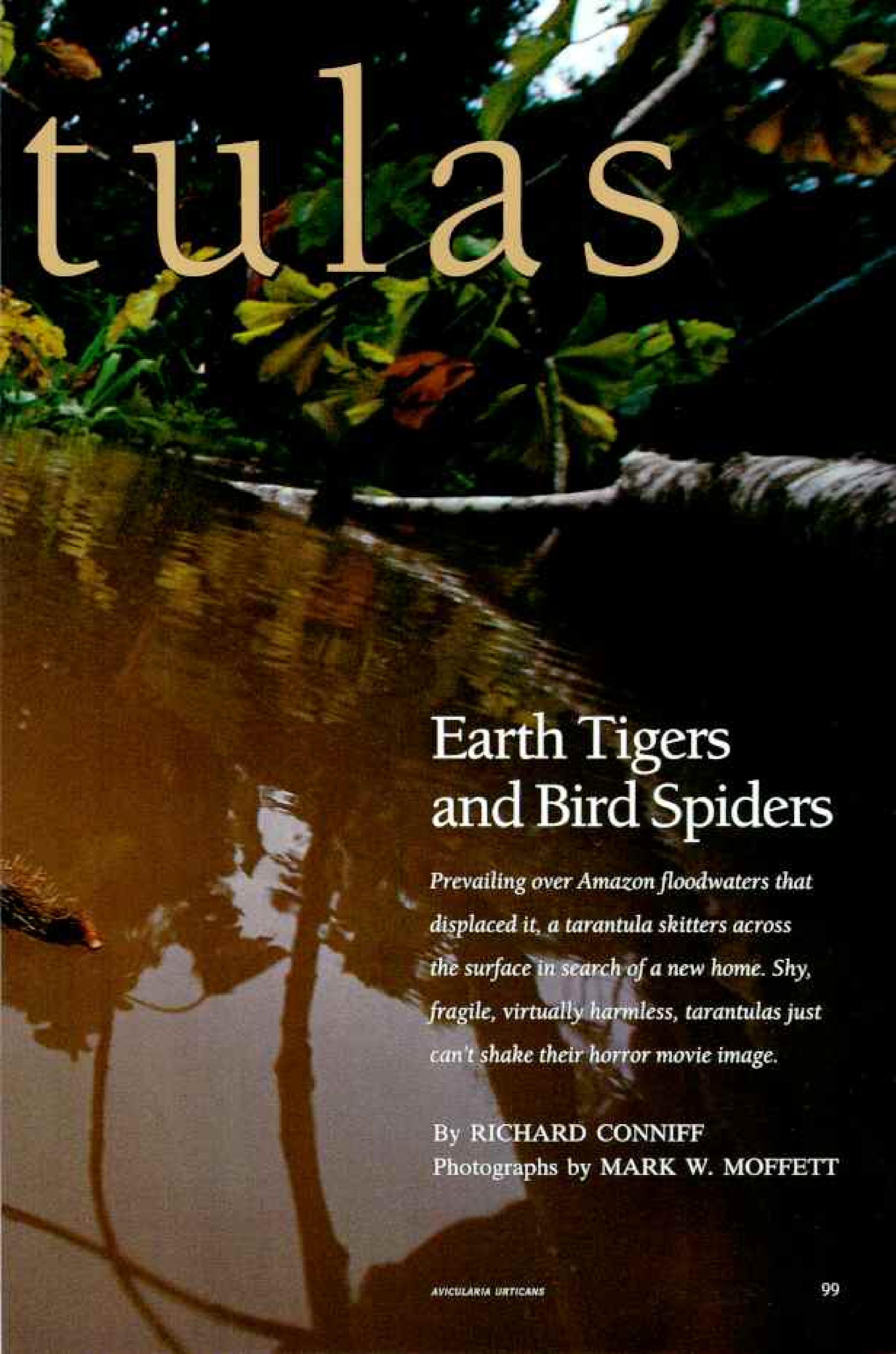


AN-SH-SLE-PAH WASH, NEW MEXICO (NAVAJO: ASH-JH-LYBA—GRAY SALT), LEFT; WHITE CONE PEAK, ARIZONA (SEI-HEETS-OSEI—WHITE SAND CONE)

*Trying on endless variations of hue and form,
the terrain of the Four Corners makes bold
gestures and subtle inflections alike.
Centuries ago the Navajo first moved in from
the north; they have never moved on. □*

Tararan





tulas

Earth Tigers and Bird Spiders

Prevailing over Amazon floodwaters that displaced it, a tarantula skitters across the surface in search of a new home. Shy, fragile, virtually harmless, tarantulas just can't shake their horror movie image.

By RICHARD CONNIFF

Photographs by MARK W. MOFFETT

Somewhere up the Amazon, a big pink river dolphin breaches the surface with a pneumatic venting of its blowhole, then glides off humpy and slow through the placid brown water. A flock of parrots brawls homeward overhead. The setting sun lights up the sheaves of tall grass on the riverbanks, into which we have nosed our boat for the night, and squadrons of mosquitoes wing down to join us for a drink.

Our expedition in search of tarantulas is traveling the upper Amazon on a long, thin bathtub-toy of a riverboat, painted ocher and green. An open-sided white cabin runs the length of the boat, and the ceiling is hung with clear plastic bags holding live snakes, lizards, scorpions, and, above all, large, hairy tarantulas. We make our bunks on the benches below. This is Peru, in the sort of terrain where an early adventurer, P. H. "Exploration" Fawcett, thrilled his readers with reports of a monstrous black tarantula that "lowered itself down at night on the sleeper beneath, and

its bite meant death." As it happened, Fawcett later vanished in the jungle. We somehow live to tell the tale.

Tarantulas are by and large timid creatures. Like almost all spiders they are venomous, but they rarely bite people, and the medical literature does not contain a single reliable report of a death from the venom. The fear of tarantulas is so wildly exaggerated that our guide, a highly regarded tarantula expert named Rick West, interrupts any discussion of his favorite subject with a slightly defensive assertion: "Tarantulas are kind of boring," he says.

We humans, on the other hand, are genuinely scary. Besides West, our gang consists of a writer, me, with an interest in animals humans commonly deem loathsome; a herpetologist

whom we have learned to locate in the jungle at midnight by his habit of belching like a frog (the frog, he says with unabashed precision, would be *Hyla boans*); and an entomologist who aspires through study and personal Zen to achieve the worldview of an insect (walking one night under the green vault formed by a tangle of feathery ten-foot-high ferns, he exults, "I feel like a flea on a bird's back").

By coincidence, all four of us are large. We are bearded. We are hairy. On appearance alone we are capable of frightening strong men, sensible women, and small children. We can empathize with the spiders we have come here to study. When we visit a remote village seeking tarantulas, the effect, West observes, is about what it would be if a Viking horde were to descend on a North American backyard asking to see the earwigs.

But there is method to our madness: The Amazon rain forest is one of the richest habitats in the world for tarantula species, many of

RICHARD CONNIFF'S *Spineless Wonders: Strange Tales from the Invertebrate World* will be published this fall by Henry Holt and Company. Photographer MARK MOFFETT is a biologist at the Harvard Museum of Comparative Zoology.



AVICULARIA PURPUREA

Slipping under a homespun silk sheet, an Ecuadorian purple tarantula prepares to sleep by day. At night the spider, shown life-size, will wait on a branch for breakfast to come blundering by: an insect moving from rain forest floor to tree canopy.

them unknown to science. When we play our flashlight beams up the tree trunks at night, we can spot them camouflaged as lichenous pink star bursts on the mottled bark, poised for some unsuspecting insect or amphibian to come in range. When we tread softly, we can find them waiting at the mouths of burrow holes all over the forest floor.

As a newcomer to the subject, I have a two-fold interest in tarantulas. First is a question I contemplate as I lie in my berth with the spiders just overhead: Since tarantulas pose no plausible threat to humans, why does the merest glimpse of these creatures rile up so many primordial terrors? The question has immediacy because I am meanwhile killing a dozen little vampires every time I toss or turn. How is it that the mosquito can give us malaria and yellow fever and seem like a mere nuisance, while tarantulas give us nothing worse than the wil- lies and yet get typecast, in the words of the 1957 film *The Incredible Shrinking Man*, as

"every unknown terror in the world, every fear fused into one hideous night black horror?" Considering how well we have succeeded as a species, human beings can be plain dumb about recognizing real enemies in the natural world. It would be a question to sleep on, if anyone were getting much sleep.

Instead, we spend the night out in the rain forest pursuing the second question: What, in fact, is a tarantula, and how do these splendid creatures live in the wild? There are about 800 known tarantula species in the world, and they inhabit every continent except Antarctica. In this hemisphere they range from Argentina to Missouri and from remote rain forests to the deserts of the American Southwest.

THE NAME TARANTULA comes from a cult in Taranto, Italy, where the bite of a spider served as pretext for Dionysian revels of frenzied dancing. The cult gave us a good dance, the tarantella, rooted in bad biology: Taranto has a kind of black widow spider, whose bite can be highly toxic. But the cult arose around a much larger wolf spider, which looks dangerous though its bite is harmless. In the popular mind, the term tarantula has since come to mean almost any big, hairy spider.

For researchers it now refers not to wolf



spiders but to a separate family, the Theraphosidae, mostly big, always hairy, and often with grooves on the carapace arranged like spokes around a dimple at the center. They can be formidable spiders, living more than 20 years and growing to the size of a dinner plate.

If size is part of the tarantula's scary image, it may also be a blessing. Tarantulas are too big to stomp underfoot, the common human response to lesser spiders. I started the research for this story mildly disliking spiders. But watching tarantulas in Peru, and later in the American desert and at home, where I acquired a tarantula as a pet, I began to see that spiders can be lovely: the velveteen fur, the plush cat feet, the high, arched legs moving in delicate coordination, the subtle pink and brown and black colorations, the fingerlike weaving of the spinnerets laying silk.

One day I watched two tarantulas mating, and it had all the ferocity and passion of a tango. Gingerly their front legs touched; then she sidestepped, and he followed. With his pedipalps, the leglike appendages at his front end, he beat a tattoo on the ground, a declaration of interest. He began to caress her, drumming his pedipalps on her carapace. Gradually, face-to-face, they twined their front limbs together like the fingers of two hands in velvet gloves.

They pushed one another up in the reared-back position of both love and war. The male hooked his front legs over her fangs, and with his second set of legs bent her backward. Then he reached under to transfer the sperm from his pedipalps to the epigastric furrow at her midsection. The dance ended with the male scrambling safely out of reach. In moments of postcoital *tristesse*, a female will sometimes kill the male, a handy source of protein for her newly fertilized eggs.

No one looks more closely at tarantulas than Rick West, who keeps 2,000 of them alive in the basement of his home, plus another 3,000 preserved specimens. He has been studying them without pay for most of his 44 years. He is a pure enthusiast, earning his living as an inspector with the Society for the Prevention of

Cruelty to Animals in Victoria, British Columbia. He holds no academic degree, but museums and government agencies routinely consult him. Tarantulas are a subject on which informed opinion is quite rare, and sooner or later all roads seem to lead to West.

Except that at the moment, no roads do. West is searching for burrows near the Río Yarapa, ankle deep on a soupy trail through the rain forest. "Pretty wet," he remarks dismally. He is pale and freckled, with close-set blue eyes, a red beard, a mournful manner, and a cracked, comical worldview.

On a high spot he finds a likely hole with a litter of desiccated insect parts nearby and starts to dig. Tarantulas are solitary creatures, and a single featherweight spider has dug this foot-deep burrow using only its mouthparts. West, who weighs 240 pounds, spends ten minutes hacking with his machete into the gluey red earth. He looks up, breathless and glowering. "It's abandoned," he announces. A toucan passes overhead, and the sight fills West with fond longings for civilization. "God," he sobs, "I miss my Froot Loops."



(MEXAPHORENS HELVETODORA COMPOSITE)

Like the smallest house spiders, tarantulas have no internal skeleton. Adults grow out of their rigid skin about once a year (opposite), rolling over and struggling for hours, like a hand trying to wriggle free of a tight-fitting glove. Forlorn as an abandoned building, the lower half of an old skin (above) cradles bits of digestive tissue, surrounded by leg and jaw holes.

In Southeast Asia one tarantula species is known as the earth tiger, for the speed with which it lunges from its burrow. Some tree-dwelling species eat young birds in the nest, according to the imaginative reports of early explorers; hence the name bird spider.

When West says tarantulas are boring, he means in part that they don't use any fancy tricks to get their food. A tarantula cannot leap 25 times its body length to seize its prey, as some spiders do. Nor can it construct elaborate webs or hurl a sticky droplet at the end of a silken thread to lasso a passing insect. Exploration Fawcett to the contrary, tarantulas never lower themselves from the ceiling on strands of silk. "They're sit-and-wait predators," says West. "They don't do much."

Their venomous fangs are located at the front of the carapace, at the ends of two furry, fingerlike mouthparts known as chelicerae. Most spiders bite with a pinching movement, like the grip of human thumb and forefinger. But tarantulas bite straight down, enabling them to take on larger prey. A large ground-dwelling spider can sometimes kill a small rattlesnake or a fer-de-lance, one of the deadliest South American snakes. But crickets, beetles, and other insects are more typical prey.

One rainy night West pointed out a tarantula just inside the mouth of its burrow in the undergrowth, a home that looked as cozy as Mole's House in *The Wind in the Willows*. A giant cockroach, three inches long, entered the tarantula's neatly cleared forecourt, an area West calls the arena, and the spider began almost in slow motion to turn. Tarantulas sometimes stretch out strands of silk like a doormat to amplify any disturbance and announce the arrival of an intruder. Like other spiders they also have extremely fine sensory hairs on their legs. These hairs, called trichobothria, are set in pits with nerve endings on all sides, to locate the source of even the slightest vibration. The tarantula stepped out from its burrow, then lifted two front legs to touch the cockroach gently, almost affectionately.

Range rovers, male Mexican blond tarantulas roam the Arizona desert in search of mates. In early fall so many are on the prowl that roads near Tucson become spotted with arachnid roadkill.

Meanwhile, females—each carrying from 75 to 2,000 unfertilized eggs—stay put in the burrows, some species emitting a pheromone to attract a mate.

"It's as if she tastes it, to determine what it is," West whispered.

Then, in a blur, the spider latched its feet onto the roach's far side, flipped it onto its back, and planted fangs in the relatively soft membrane of the underside, near the head. It dragged its victim into the burrow. The roach twitched briefly, then went still. The spider's fangs continued to rise and fall, pumping in venom. We could hear the spider's fangs and serrated teeth begin to click like lobster picks.

Spiders cannot eat solid food. Instead, they pump digestive fluids into their prey. Then they suck up the liquids. Another night we watched a tarantula gradually open a gaping red hole in the belly of a small bat. West nudged the spider, which was perched on the trunk of a palm tree, into a better viewing position. "They're very single-minded about food," West said, when the spider made no attempt to escape. The spider was supporting its own weight and the bat's on a sheer vertical





APHIS/ROPELMA CVALCODES

patch of glossy green bark. We got close enough to study its plush footpads with a magnifying loupe. Tarantulas can move nimbly on vertical surfaces because each hair on their feet branches out into hundreds of tiny bristles. "If you were to look at this bark under a scanning electron microscope," said West, "it would appear like giant cracks and craters. So it would be easy for those hairs to find a place to hold on." When an insect annoyed it, the tarantula lifted a leg and shook it like a dog, as if oblivious to the normal laws of gravity.

With the bat clutched underneath, the spider began to rotate. Dewy strands of silk emerged from the spinnerets at its hind end and wrapped around the bat's leathery ears and over its eyes, which had started to ooze.

"As the tissues dissolve, the limbs will come apart," West explained, "and the silk holds it in a neat package." The bat carcass lifted and fell with the slow pumping of the fangs. "At the end of the night the only thing left will be

the wings, the bones, and some hair in a big pellet mixed with silk."

THE TARANTULA'S ABILITIES as a predator partly account for its gruesome reputation. In Southeast Asia one tarantula species is known as the earth tiger, for the speed with which it lunges from its burrow. Some tree-dwelling species eat young birds in the nest, according to the imaginative reports of early explorers; hence the name bird spider. In Central America tarantulas are called horse spiders because of the mistaken idea that their bite can cause a horse's hoof to fall off.

But the wildest mythology of the tarantula as archfiend is a product of Hollywood science fiction. In the 1955 film *Tarantula*, for instance, a desert town faces a hundred-foot-tall, cattle-eating, house-crushing tarantula. Clint Eastwood plays an Air Force pilot who saves the town from hairy doom by dropping

Superspider

"There are spiders of marvelous bigness . . . bigger than a man's hand," marveled Spanish explorer Fernández de Oviedo in 1535. He may have been describing the South American goliath birdeater, shown life-size in a cut-away view.

Resting beneath a tropical dry forest, the female tarantula's huge body is sustained by four book lungs (color-coded in blue), named for their slender folds. The lungs add oxygen to the blood, pumped by a long, primitive heart (magenta). The nervous system (yellow) is concentrated primarily in the leggy front segment; the rear is crowded with the digestive tract (green), egg sac (beige), and silk-producing glands (purple).

THE RAPTORA BLOROU PAINTING BY CHRISTOPHER A. BLEEK, NATIONAL GEOGRAPHIC ARTIST

Airborne defenses

With a flick of a hind leg, tarantulas of the Western Hemisphere defend themselves by launching tiny hairs bristling with microscopic barbs. Once imbedded in the attacker's skin or eyes, the barbs cause a maddening itch that can persist for months.

Early warning system

Sensitive to the slightest vibration or wind, pivoting hair follicles on the tarantula's feet and lower legs alert it to approaching danger. The message is vital: Although they have as many as eight eyes, tarantulas have very poor vision.





Venomous message

Hollow fangs deliver venom produced in adjacent tiny bulbs. No human is known to have died of a tarantula bite—burning and swelling generally last a few hours—but a venom dose can kill a small animal. The fluid may have medicinal use in treating blood clots.

Male delivery system

Male tarantulas are equipped with specialized palps, hook-shaped appendages on the short feeding arms near the mouth. When ready to mate, males weave a web and deposit a drop of sperm on it. The sperm is then drawn up into the bulb-shaped tips of the palps, which deposit it into the female.

Little cat's feet

Flanked by protective tufts, needle-sharp retractable claws enable tarantulas to climb walls. Underneath, velvety pads of hair cushion the weight of the spider—and create eight buoyant pontoons that enable some tarantulas to walk on water.

napalm on a spider "more terrifying than any horror known to man."

The sorry truth is that tarantulas are mere animals, vulnerable, like other predators, to the natural order. One afternoon West called us over to see one of the spiders he had collected. She was lying on her back as if dead. Then, with an eerie, trance-like motion, her body began to swell and contract. A tiny split appeared on her flanks, where her eight legs were socketed into the edge of the carapace.

All spiders have an external skeleton, which they must shed as often as four times a year when they are growing. To tear apart its old exterior, the spider forces blood out of its bulbous abdomen and, like Popeye flexing his muscles, pumps it over and over into its extremities and into the area under the carapace.

West pointed to the silken mat she had prepared. "That's to prevent ants and centipedes from attacking her while she's in such a vulnerable position. Normally she would be underground, and the mouth of the burrow would be silked to keep out predators."

The tarantula was almost finished with her molt. Her top and bottom had spread apart like a biscuit rising in the oven. She began to draw out her new limbs, shrugging off the old skin. "See the bend in that new tibia, how soft it is?" said West. "It's just like rubber. There. Everything is loose. She's got her legs out." The spider and her shed skin, on which she now lay, looked like complete duplicates, except that where the old exterior was shabby, she now wore a glossy gray velvet coat.

"It's one of the most energy-consuming things they do," said West, who sat to one side like an intern in a maternity ward, attentive and a little tired, conscious that the patient was doing the real work. "Sometimes if she doesn't get enough nutrients, she won't have the energy to untangle herself, and she'll die, half in, half out, trapped in her own skin."

A TARANTULA can be an irresistibly rich source of protein. Among their known predators are certain species of storks, owls, lizards, and snakes. But the most impressive are huge *Pepsis* wasps called tarantula hawks. Not long after we returned from Peru, I headed out to Arizona to see what tarantulas are up against.

As in the science fiction film, tarantulas roamed the desert. But they were small and gentle enough that I could cradle them in my





Mating means a tangle of 16 legs—and possible death. The ritual begins when a male finds the silk-draped burrow of a female and strums the silk strands (far left). If she emerges agitated, he calms her by stroking her legs (left). The spiders grapple until he secures her fangs and bends her backward, pushing his sperm-filled palps into her reproductive slit. Mission accomplished, the male—in this case *Aphonopelma iodium*—runs for his life. Females, on rare occasion, will devour their mates.

APHONOPELMA spp., MARK W. BEFFERT WITH THOMAS R. PRENTICE





A frog in its throat, a young Peruvian pinktoe shows why tarantulas are a major predator of South American tree frogs: The spiders build nests among tree leaves, then wait for the inevitable leaf-hopping amphibian. The strategy may also yield a bird or bat dinner.

AVICULARIA URTICANS



Queen Mary was, in truth, the perfect pet. . . . She had warm eyes, yes, but eight of them. . . . I began to think, a little smugly, that the relationship of dog and master staring into each other's eyes was just another narcissistic mammal thing.



BRACHYPYLMA SMITHI

palm without risk. Most were males, out wandering at dusk and dawn in a desperate search for a willing mate. Oblivious to the mundane business of eating, they had shriveled away to little more than legs and sex drive. The wasps generally ignored them, preferring to hunt down the more robust female tarantulas in their burrows. The aptly named tarantula hawk is about two inches long, with veiny, rust-colored wings and a metallic blue-black body. Its lanky, articulated legs end in hooked claws, for grappling with the tarantula. The stinger at the end of the female's abdomen can be up to a third of an inch long, and a government entomologist who is a connoisseur of insect stings told me that it is as impressive as it looks. "The *Pepsis* wasp sting," he said, as if savoring the memory, "is kind of. . . profound. It's not like things that make you swear and say bad things about somebody's mother. These things, when you get stung, you might as well lie down and scream. Why not? It takes your attention off the pain."

Patrolling among the saguaro and mesquite, the wasp finds a tarantula burrow and teases the guard silk at the entrance, possibly imitating a male tarantula's opening serenade. If that fails, the wasp will actually enter the burrow to draw out its prey. The first time I saw this happen, the tarantula erupted out of

her burrow and reared back in the classic posture of attack: front legs up for the strike, pedipalps elbowed back, fangs flicked out, a blaze of orange hair visible just underneath like a gaping maw. The spider reminded me of some silent-movie sorcerer, body bent back in a malevolent curve, arms arched high overhead as if to sling forth bolts of evil magic.

The wasp's bold strategy is to slip directly under the venomous fangs and plant its stinger in the tarantula's soft tissue. The effect on the tarantula is immediate paralysis. The wasp then drags it off to bury as a macabre nursery for its offspring, laying a single glistening white egg on the victim before covering it. When the egg hatches, the wasp larva will dine on the living tarantula, avoiding the vital organs at first so its immobilized food supply will remain fresh for a month or more.

THE PATH FROM FEAR of tarantulas to sympathy and even affection may be a peculiar one, but I'd found in my own family that it was surprisingly profound. My children had dubbed our six-inch Chilean rose hair Queen Mary, and my wife, who is generally dismayed by the creatures with whom I associate on the job, cooed over the tarantula from the start. Queen Mary was, in truth, the perfect pet—she ate only crickets and never bit the mailman. These are traits that have begun to make tarantulas increasingly popular as pets—so much so that officials have had to regulate international trade in Mexican redknee tarantulas, a showy spider, caught in the wild. In 1993 a California man was convicted of smuggling 600 of them, with an estimated street value of \$100,000, into the United States.

But Queen Mary's value was far subtler than that. She had warm eyes, yes, but eight of them, in a tufted tubercle at the front of the carapace. I began to think, a little smugly, that



Tarantula breeding is a business with real legs: Every year at the National Reptile Breeders' Expo in Orlando, Florida, collectors pay as much as \$150 for spiderlings (opposite). Buyers are lured by the giant specimens, but the biggest tarantulas, which can live more than 20 years, don't reach full size for a decade.

the relationship of dog and master staring into each other's eyes was just another narcissistic mammal thing. A tarantula's strange and placid life was a way of seeing into another world. Watching Queen Mary bound us to her as if with a silken knot.

I didn't realize how strong the bond had become until it became necessary for my family to pack the spider in a deli container and ship her to me overnight in the field, for purposes of research. When I phoned home the next night, the first words I heard, in an anxious tone I myself seldom elicit even when I am out in some godforsaken corner of the planet, were: "How's Mary?"

She was fine. The search for what makes other people so fearful of tarantulas took Queen Mary and me finally to the Stanford University Medical Center in Palo Alto, California. A psychiatrist named C. Barr Taylor was treating a patient for arachnophobia, the

fear of spiders. It can be a disabling phobia, with symptoms ranging from anxiety to an unwillingness to enter whole areas of one's own house. But Taylor had promised me that the patient would be handling a tarantula, every arachnophobe's nightmare, after just an hour or two of exposure therapy.

The therapy was remarkably simple, a gradual introduction to the reality of spiders. First, Taylor showed the patient a drawing of a gourd shape, roughly corresponding to a spider's body, then a drawing with two legs added, and then all eight legs. "Ugh . . . it gives me a creepy feeling," said the patient, a translator named Tina. She looked away, then back again until her anxiety slowly eased.

Taylor identified the spider's legs, head, and abdomen, and the ritual naming of parts began to demystify spiders. The two of them moved on to a dead household spider, then a live one, and ultimately to Queen Mary, in a clear plastic box.

"Oh, yuck," Tina said. She dropped her head forward to avoid looking. "Oh! That's real science fiction."

"OK," said Taylor. "Let's look at it in the box and identify the body parts."

It was about then that I noticed the wide eyes and trembling hands of a medical-center press person at the far end of the table.

The leading theory about arachnophobia is that most humans have a biological propensity to be alarmed by spiders. At some point in our evolutionary past, spiders presented a serious enough hazard that the star-burst shape or eight-legged walk got coded into our genes as a threat. "The way it moves," said the press person uneasily, after Taylor had eased her into the patient's seat, "it's like there's this place in my brain . . . way back there." She'd already been through the first steps of therapy, but her knees knocked at the sight of a live tarantula in front of her.

What seems to happen with arachnophobics, said Taylor, is that they've never gotten past the alarming image. "They've never paid attention to spiders. And when they pay attention in conditions of safety, they get past the phobia. The brain is looking for the threatening stimulus of the particular spider, and as it goes through the checking process and doesn't find any, the fear goes away."

The press-office woman, a 47-year-old named M. A. Malone, turned out to be a classic tarantula phobic. When she was a child, her two older brothers had tormented her by sending their hands creeping spiderwise across the dinner table. As a treat, when she was about six, the boys took her to the movies. Then, in the dark, they slipped away. The movie was *Tarantula*, and when the hundred-foot-tall monster appeared over the mountain-top, with Clint Eastwood nowhere in sight, the two brothers pounced on Malone from the row behind. Part of her psyche had never quite come back down from the balcony ceiling.

Tentatively, Queen Mary set one foot on her hand, and Malone took a sharp breath. The tarantula climbed up into her cupped hands, which sweated and shook. "I'm amazed," Malone said. "I'm fascinated. I'm waiting for it to bite me." She kept her eyes locked on the spider, which did not bite. Her trembling subsided. "Wow, just incredible," she said. "I wish my brothers were here." After 45 minutes, she was still holding Queen Mary, a little piece of eternity in the palm of her hands.

BUT THE SCARY IMAGE of tarantulas is everywhere, as if, in the heart of our unnatural cities, we still need the thrill of ancient fears. At the end of our time in Peru, Rick West and the rest of our gang of Vikings had piled into a pickup truck to visit a tarantula collector on a dirt road 30

Name your phobia and it probably applies—deep in a cave in Oaxaca, Mexico, home of one of the world's rarest tarantulas. Blind and almost hairless, with long, spindly legs, this Mexican cave tarantula was so startled by human presence that it ran up the arm of an assistant to cover Peter Sprouse and bit him on the hand. Says the photographer, "The poor guy—we kept yelling at him: 'Don't hurt it . . . it's extremely rare!'"



miles outside Iquitos. At about 28 miles, the truck died in a geyser of steam from the radiator. We hiked the rest of the way in, turning off onto a swampy trail. Clouds began to darken the sky, and distant thunder resonated beneath the sonar pinging of a frog, and the high *tu-who* of a rail. We met a woman short several teeth who was carrying a string of small fish and eating wild grapes. It was another 20 minutes, she said, to Nilo, the collector. We heard the roar of rain nearing, and the winds began to blow up among the trees.

Nilo turned out to be a friendly, enterprising man in his mid-20s. He lived with his wife and three children in a thatched hut, next to a small farm plot. He eked out a living by gathering tarantulas for a dealer back in the city, and he led us out into the downpour to demonstrate his technique. In one hand he balanced a machete by the blade. In the other he carried a stick with a sharpened ice pick at one end.

It took him about ten minutes to excavate



©FELICIELMA REDDELLI

the first tarantula burrow, hacking out the clay with angled slices. When the tarantula was finally cornered at the bottom, it made a desperate lunge, and Nilo giggled it through the carapace. He held the tarantula up for display, and it wriggled on the spearpoint, its milky blue blood leaking from the wound. He would sell it in the city for about a dollar, with fifty or a hundred other tarantulas killed in the same way and preserved in alcohol.

Our truck would not start again, and we spent that night in and around it with assorted live tarantulas, which seemed utterly innocuous by now, and a live coral snake in a clear plastic bag, which took some getting used to. All night people woke up from their bad dreams to ask, "*¿Dónde está el naca naca?*" or "Where's the damned coral snake?" We tied the bag to the handle over the passenger door, where the entomologist found the direct eye contact disconcerting, then tucked it into the glove compartment, until someone concluded

that the glove compartment probably had not been designed to be snake-tight. Then we heaved it with considerable relief onto the muddy road outside, until it occurred to us that we might now step on it in the course of our nocturnal wanderings.

Three days later, when we finally got to the airport, entrepreneurs were selling souvenirs to other tourists in line. A man named Lucho came up to offer me tarantulas at ten dollars apiece, pinned out in handsome glass boxes. I thought about buying one. It was the perfect image of the tarantula embedded in our genetic memory, the monster whose bite meant certain death. But the preservative had destroyed the natural colors, and the spiders, tarted up like Halloween knickknacks, all looked greasy and dog-eared. I had seen how lovely they could be in real life.

"Thank you, no," I said, and to a stranger in line, I added, "Tarantulas are kind of boring, don't you think?" □



The Essential Element of

FIRE

**"We are uniquely fire creatures
on a uniquely fire planet."**

STEPHEN PYNE

By MICHAEL PARFIT

**Photographs by
RAYMOND GEHMAN**

In awe and supplication Mescalero Apache dancers honor flames on their New Mexico reservation. "Fire is sacred to us," says one Apache leader. "It provides warmth, food, protection." Most Americans, however, fear fire beyond the hearth and for decades have tried to snuff it out. Today scientific research and practical application have confirmed the ancient lore that fire is vital to the health of both grasslands and forests.

IT WAS HARD TO IMAGINE that anything good had happened on what was left of Drakes View Drive. It was hard to imagine that there was anything natural here, or healthy. Fire had been here and had ruined everything.

Two days before, this northern California community had been a lush, wooded neighborhood with a hint of the sea's shine through the pines to the west across Point Reyes National Seashore. Now, only 48 hours after the start of a 12,000-acre conflagration known as the Vision Fire, the whole landscape was gray and black along this hillside road. The tall bishop pines that had leaned together and whispered in the salty breeze were now



skeletons. Forty-five of the elegant and funky homes that shared the ridgetop were shallow heaps of gray ash.

All that remained in the ash were shattered toilets and heaps of old metal sewer pipes that had tumbled out of disintegrating walls. In a tiny pond now half full of water, dead goldfish floated, parboiled. By what was once a doorway someone wishful had put out a bowl of canned cat food. After hours, nothing had touched it—no cats, no mice, no squirrels, no birds, not even an ant.

A 21-year-old firefighter named Luke Juniper walked through the wreckage, dazed by sleeplessness and awe. He had been chased from here two nights before by flames in the trees overhead. He and his crew had stayed

MICHAEL PARFIT, a frequent contributor, wrote most of the stories in last month's issue on Mexico. RAYMOND GEHMAN photographed Canada's Banff National Park for the July 1995 magazine.

until death roared at them; then they had cut their hoses and fled. Just before the fire took this house, Luke had been inside it, making sure no one was trapped. He had seen family photographs on the piano and a freezer full of gourmet ice cream. Now he couldn't even see remains of the roof.

He looked around. Smoke lazed among the standing skeleton trees, like a ghost of the killer.

"Harsh, man," Luke said.

Fire is harsh. But the devastation on Drakes View Drive was also inevitable. This blaze was a symbol of trouble in North America's relationship to fire.

There's an eerie background to the Vision Fire: In the spring of 1995 a NATIONAL GEOGRAPHIC editor was talking with Chris Collins, fire-prevention specialist at the Marin County Fire Department, which covers the area of the national seashore. They were discussing a concern among ecologists that more than 50 years of effort to protect the American landscape from wildfire has in many cases done exactly the opposite. Collins mentioned past fires

elsewhere in California, then said: "We have the same problem here. Sixty years without a fire. We'll be next." He was right.


AMERICANS have been fighting wildfire full tilt for more than half a century. In those years we've created a powerful system built on brave young firefighters, old bombers, modern trucks, helicopters, and a bear named Smokey. But at the same time foresters and ecologists have been learning that too much fire fighting can be as bad as none. Today many of them agree that if we try to keep fires out of forests completely, dead wood and other fuels build up. Then, instead of low fires that just clear out brush, flames climb into the crowns of monarch trees and kill them. These fires burn so hot they leave total devastation.

The debris left by fire always looks ruinous. That can be. *(Continued on page 124)*



RAVI MIRO PNY

"We need more managed fire in California," says a foam-drenched Gregory Kerstiens (opposite), battling destructive flames near San Francisco. Today both firefighters and foresters know that for most ecosystems fire is a blessing as well as a curse. Though the U.S. spends up to a billion dollars a year fighting fires, too much protection can lead to a buildup of unburned fuel that, when ignited, can cause deadly crown fires.



"That place was *moonscaped*," firefighters say of land like a part of Boise National Forest that burned in 1994. After years of overprotection from fire, trees burn hotter, faster, and more completely. "We don't know when it will recover," says a forester, "or what it will be when it does. Maybe a brush field."



Nature's ancient alliance with fire can be seen in ecosystems all over the U.S. The West's vast ponderosa pine forests are among the most fire dependent. Denied a fire every 5 to 25 years, they become primed for destruction.

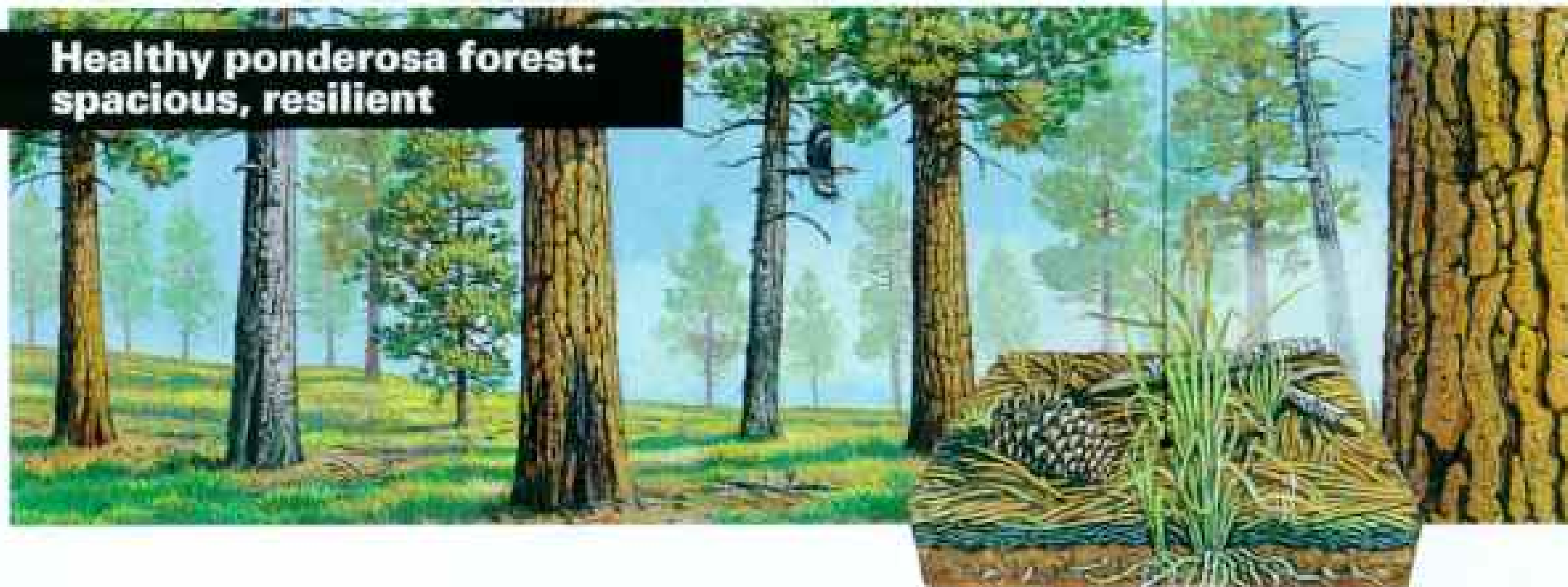
Density and diversity

A healthy ponderosa forest is made of widely spaced, fire-resistant trees. With over-protection (bottom), young trees and competing species make a flammable understory so shaded that ponderosa seedlings can't grow.

Forest floor

If burned often, a forest floor is a shallow layer of duff on soil that accepts ponderosa seeds (inset below). Over-protected, the floor builds deep layers of debris (inset bottom). Seed germination declines; fires burn hotter.

Healthy ponderosa forest: spacious, resilient



Unhealthy ponderosa forest: dense and vulnerable



The gift of fire

Potential natural vegetation

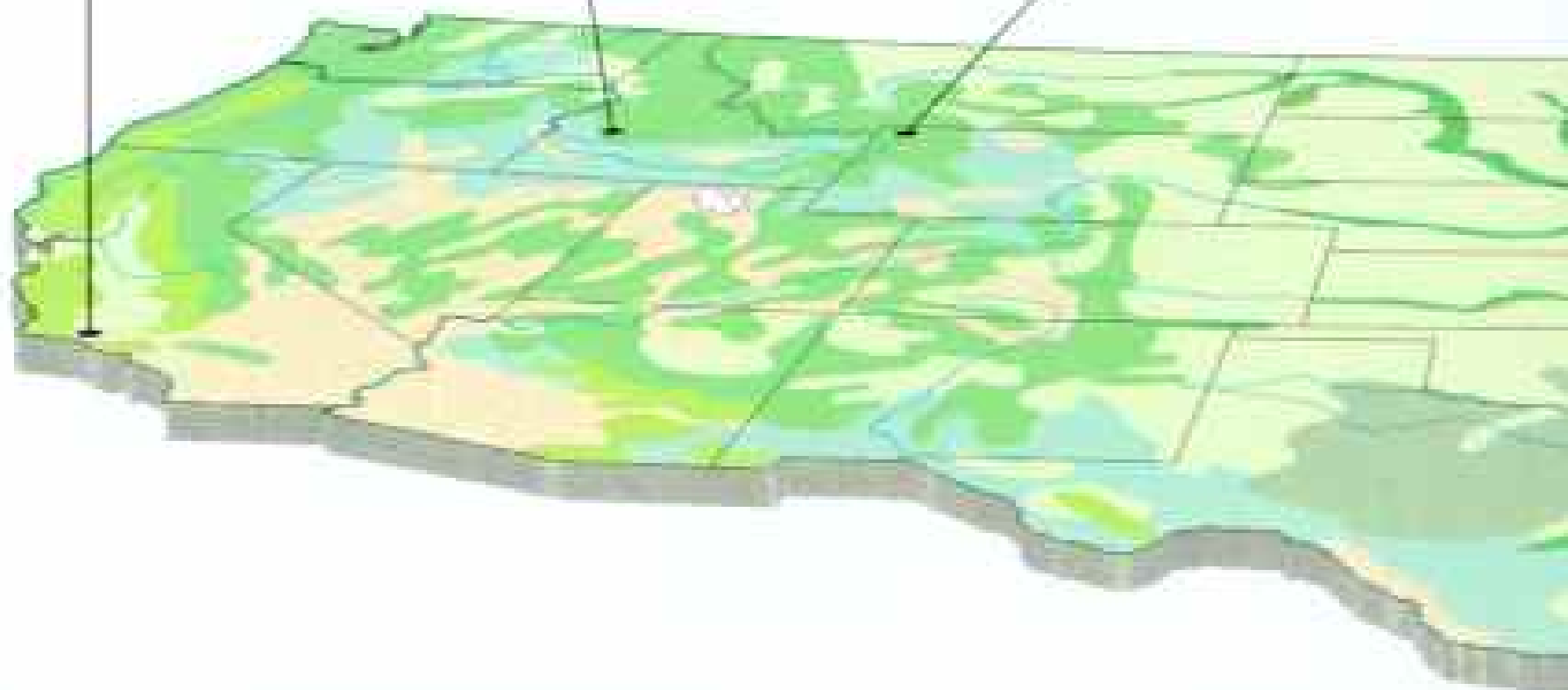
- Broadleaf forest
- Needleleaf forest
- Mixed forest
- Forest and grassland
- Grassland
- Grassland and shrub
- Shrub

Scale varies in this perspective.
NCS CARTOGRAPHIC DIVISION

California chaparral: Densely growing mass of many species of shrubs and low trees. Explosive fires scour hillsides bare every 20 to 50 years.

Ponderosa pine: Spacious forests of trees hundreds of years old. Frequent fires (5 to 25 years) clear ground but seldom kill large trees.

Lodgepole pine: Dominant in Yellowstone National Park; grows in dense stands. Sections burn wholly every 200 to 400 years.



How fires burn

Frequent fires move swiftly across the forest floor, killing few large trees. When fire is rare, accumulated fuels explode into towering crown fires, and the thick floor burns long, hot, and deep, killing roots of grasses and trees.

Frequency of fire

Scientists measure frequency by scars on trees or ash layers in the ground. Fire intervals vary: short in ponderosa forests and grasslands, long in coastal Douglas fir forests. Inevitably, this year or next century, fire returns.

Recovery from fire

A healthy ponderosa forest recovers within three years, its roots intact (inset), its trees barely scarred. In unfit forest, fire kills big trees; soil no longer absorbs rain, and it erodes (insets bottom). Recovery may take centuries.

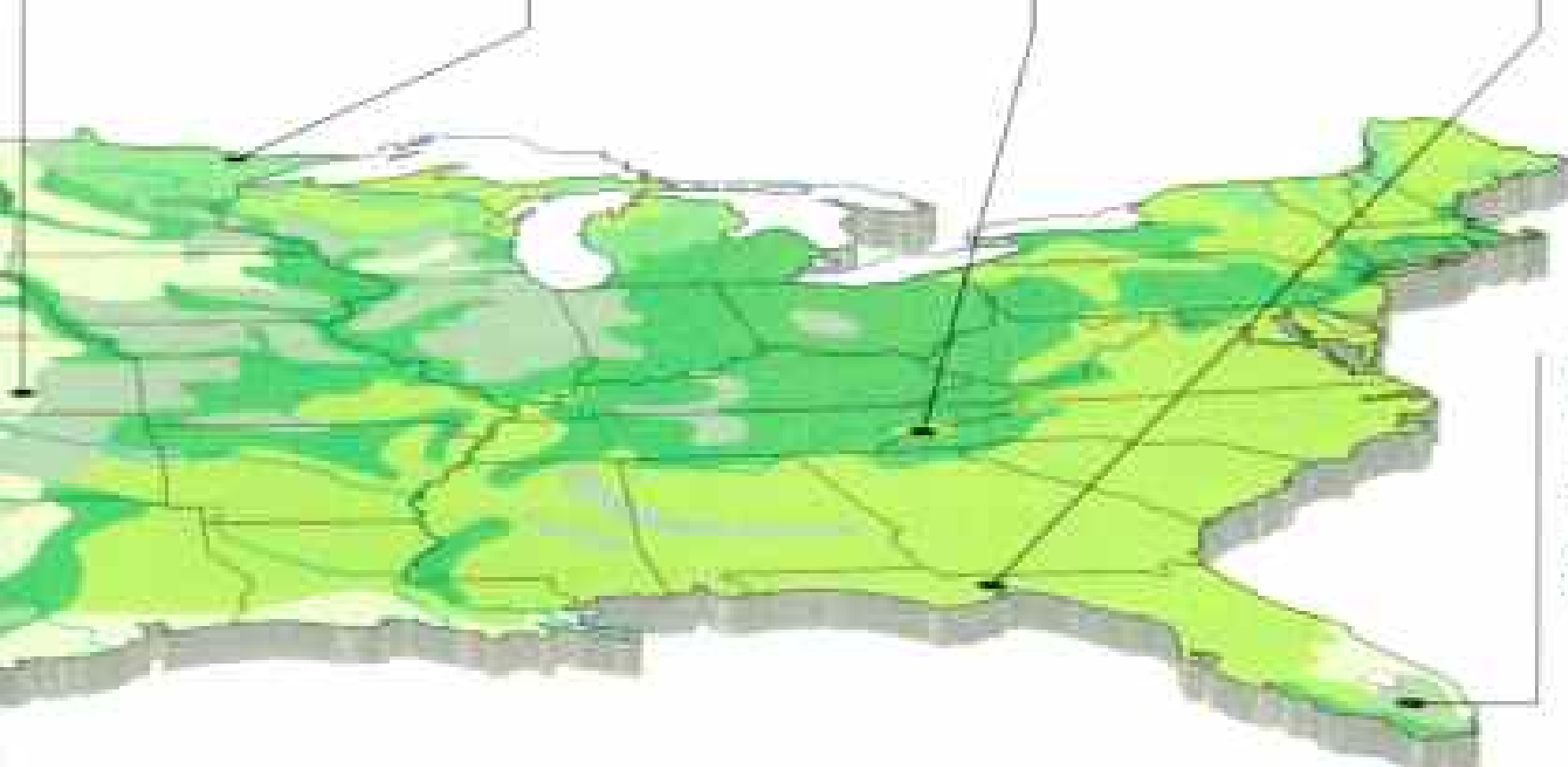


Tallgrass prairie: Survives flames better than does invasive brush. Renewed by frequent large fires that can outrun a horse.

Boreal forest: Spruce, pine, and fir dominate the north to the subarctic tree line. Large, killing fires recur every 25 to 150 years.

Appalachian mixed forests: Conifers and deciduous trees mingle in shifting ratios set by climate and a mosaic of rare fires.

Longleaf and loblolly: Southern pines in grassy, park-like stands. Mild surface fires clear debris every three to five years.



Wetlands: Saw grass needs flames to kill competition. Small patches burn to the waterline every 1 to 25 years.



deceptive. Sometimes fire changes a landscape forever, killing centuries-old trees and allowing rains to erode land no longer protected by living plants. Yet in ecosystems that have become dependent on fire over the millennia, the smoldering ash that looks so disastrous is, in fact, a sign of renewal. As people who manage land in North America learn more about how fire works in nature, they struggle to find balance between the idea of fire as a harsh enemy and the understanding that for many kinds of landscapes it is a vital friend.

"On the one hand there is the growing recognition of the intentional use of fire," said Jerry Williams, the national assistant director of fire operations for the United States Forest Service, "but fire poses air-quality problems, poses risks, and is costly. Maybe more important, at a kind of emotional level, fire challenges some of our most deep-seated fears."

IN A ROAR OF WIND and blowing ash, two logs rose from the green tangle of a forest floor. They were black and massive, and they looked like two monsters rearing up out of the brush in a world of trees gone mad. In the noise and wind a man with a red hat ran madly away from them toward me, as if the logs were about to chase him down.

The running man stopped and looked up.

The helicopter that was working with him to take out trees killed by fire roared away, the logs following, now more like bodies in a sling than monsters. The wind and noise died down as the helicopter moved away. The man looked at me and grinned, his smile a white slash in a face completely smudged by ash.

Magnificent ponderosa pine forests span the interior of the American West, from Arizona to the Canadian border. These loggers were salvaging burned pines in the Boise National Forest of Idaho before the wood rotted and became worthless. The forest fragments I saw were part of 212,017 acres burned in 1994, killed as much by fire protection as by flames.

The ponderosa forest is exhibit A in the story of our confusion over fire. Ponderosas, beautiful and valuable trees that can grow to be hundreds of years old, have developed a particularly friendly relationship to fire—if it comes around often enough.

It is easy for scientists to count the regular recurrence of fires in ponderosa forests by scars left on trunks. The typical natural interval between fires in most of these forests can be as short as five years and is seldom more than 25. Those frequent fires are usually mild: brisk surface fires that clear brush, char trunks, and leave trees alive. But because of the relative success of fire-suppression efforts, much of the ponderosa forest has been protected for 30 to

40 to 50 years, sometimes longer. Over those years dead wood and needles have become heaps of kindling on the forest floor. And groves of young fir trees, which would have been pruned by more frequent fires, have grown up in the spaces between the big old trees. The result is dense, flammable thickets where once trees were so widely spaced that horse carts could be driven among them.

When drought, wind, and lightning come to the forest at the same time, the heaped dead branches kindle, and flames explode into the firs, then leap to the tops of the ponderosas. The fire becomes the most deadly of all, a crown fire. It thunders through the forest, throwing chunks of flame ahead of it like grenades.

These infernos can be as violent as anything on earth. When a fire crowns, firefighters run. "I've seen trees ripped out of the ground and transported into convection columns," one former firefighter told me. "It scares the living bejesus out of you."

When fires burn too hot, the land becomes "like a crab out of its shell," says hydrologist John Thornton (opposite), measuring erosion caused by a 1994 Idaho fire (pages 120-21). Infernos bake tree oils and resins into the soil, and it can no longer absorb water. Mud from the same burn, which silted up a noted trout stream, plasters a hiker's feet.

When a fire crowns in ponderosas, all those great trees, which had survived so many small fires, die.

THE PONDEROSA FOREST is only one example of how fires can work to support and renew life. Though humans tend to think of fire on the loose as dangerous and somehow illicit—a yellow wolf loping across the prairies, snarling among the trees—fire is as natural to the earth as the sea. "We are uniquely fire creatures on a uniquely fire planet," observed Stephen Pyne, an Arizona State University historian who's been called our "fire laureate" for his lifetime study of the subject. Our planet, he says, is primed for ignition—"stuffed with organic fuels, its atmosphere saturated with oxygen, its surface pummeled by lightning."

The link of fire with life is intricate. Over the millennia the yellow wolf has roamed the world, breathing flame everywhere. As a result, virtually every kind of ecosystem coexists with fire. Fire clears out surface debris from the Arctic tundra to the tallgrass prairie to the West's mountain forests to the pine groves of Florida. But life's relationship to fire is not just a matter of rubbish disposal. As the swiftly recovering lands of Yellowstone National Park show, fire can process dead material into nutrients more quickly than decay, feeding the





Bison thrive in part of Yellowstone National Park once described as destroyed. Eight years after fires swept more than a third of the park, forests are reborn and wildlife booms. Many ecologists now regard those fires, though unusually large, as in the normal range for a lodgepole pine ecosystem. "This was not a Bambi situation," says one.

offspring of anything it kills. More important, many plants have a hard time getting through the cycle of life, death, and rebirth without fire. Many pinecones, for instance, require temperatures of 120 degrees or higher—most likely created only by nearby fires—to pop

them open so they can distribute seeds. Prairie grasses grow from buds at or just below the soil surface, where they survive the passing of racehorse fires common to grasslands; the plants burst into green far more quickly after being burned than if the fields are left in stubble that shades and crowds new life. In many climates grasslands exist because of fire; shrubs and trees that might otherwise grow in the same climates simply cannot survive fire as well.

The longleaf pine of the Southeast U.S. has several strategies to use frequent surface fires to its advantage. Its seedlings crouch close to



the ground, shielded from small fires by dense tufts of needles. After developing strong roots, they shoot up abruptly, raising their sensitive buds above the level of those fires while growing bark thick enough to protect inner layers that carry sap. Meanwhile, the tree's competitors die in flames that the longleaf survives.

And despite the terror shown by Bambi and his woodsy friends in the movie that made wildfire evil to generations of children, even wildlife has developed its own relationship to flame. Bison and other grazing animals follow hard upon the tracks of fire, where grass bursts out seemingly moments after the flames die.

Birds like the endangered red-cockaded woodpecker thrive only in areas regularly burned. They require large, old trees to nest in and a relatively open landscape. Quail have similar needs: Without fires the forest gets too overgrown for them.

"GETS ALL JUNGLED UP," said Sonny Stoddard, who with two of his children owns and manages a thousand-acre forest in southern Georgia, a region known for quail hunting. "If you stop fire, by the third year you don't see any quail. By the fourth year you're out of the quail business." Stoddard, 77, is the son of a legendary fire ecologist, Herbert Lee Stoddard. The son has become legendary himself as an advocate of the intentional use of fire in the forest. Educated in zoology, he chooses to look like an old-time Georgia farmer, wearing a car dealership cap sideways and an old pair of glasses held together with a Band-Aid. Maybe that's because he respects how close those people are to the land. "Every country Cracker," he said, "knew you had to have fire."

Stoddard drove me around his forest in a van, a cold pipe in one hand and an unlighted match in the other. We bounced through twilight groves of longleaf, loblolly, and slash pine while he talked about a youth spent eating persimmons, hunting possums for 75 cents a hide, and catching wild hogs. "I ate enough squirrels to sink a boat," he said, waving the match. The young Stoddard also helped his father set fires in the woods.

"Everything you touch is affected by fire," said Sonny.

"Lookit in there," he said, pointing toward a sunlit pine grove. "When I come back from the World War, you couldn't see a deer at 15 feet." Now the grove was open enough to see a quarter mile past 60-year-old trunks.

How often did he burn it? I asked.

"Every year," he replied. "If there's enough fuel for it to burn, *burn it.*"

Stoddard is not a patient man. Years ago he came upon his father setting a smoky little backfire, a cautious blaze set to burn slowly against the wind. Stoddard set a "head fire" with the wind and toasted 20 acres of underbrush in a roar. What he said to his father has become a legend among foresters: "Life's too short to backfire."

Stoddard's easy way with fire is an exception in the U.S. these days, but it fits the past.

Our use of fire was once so extensive that some people believe that the fire stick of early humans, used over tens of thousands of years, made the planet look the way it does today. In North America, Indians used fire to herd deer, chase bison, and keep grasslands grassy by burning young trees. Their fires shaped the landscape as it emerged from the last ice age.

But then along came industrial society, and all that changed. Pioneers built wooden houses and grew afraid of fire. "You have to think back to the frontier," said Neil Sampson, executive vice president of American Forests, a national conservation organization. Sampson grew up in Idaho. "I watched my grandparents and great-grandparents react to fire. The fear was ingrained. The mentality

was geared to elimination of every fire that got out."

That attitude was welded into policy by terrible Rocky Mountain fires in 1910 that killed at least 79 firefighters. Yet even as the fire-suppression machine grew stronger, scientists were learning how to put fire back on the land.

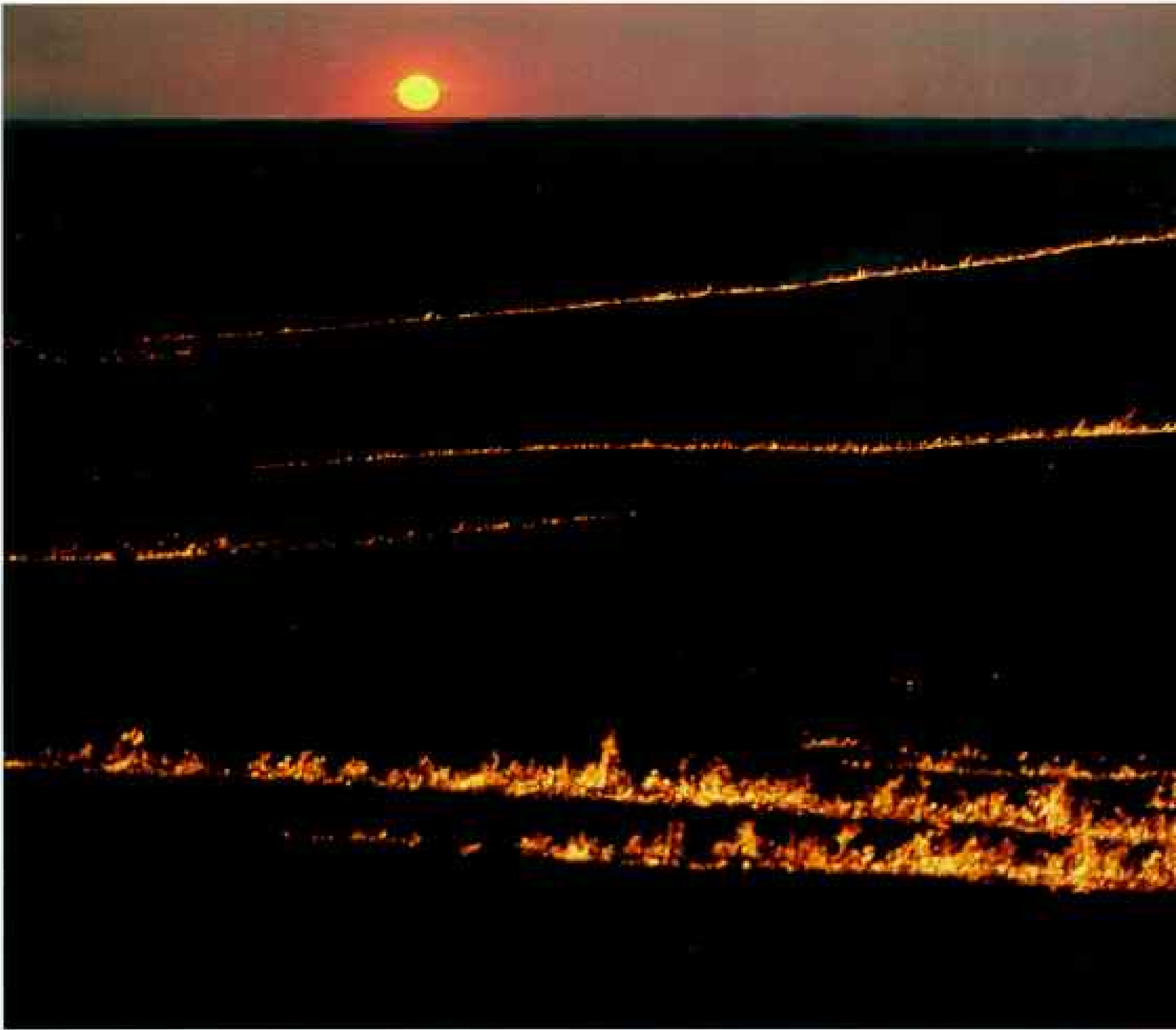
IN A GOLDEN SUNSET Ken Homik walked through golden grass, trailing fire as if on a leash. Flames leaped from under his feet, swirled in the south wind, and blossomed red in the low light. He carried a drip torch—a jug full of diesel fuel and gasoline with a flaming tip—and dropped globs of fire, which caught the dry grass instantly.

By the time Ken was 20 feet down the path,



With a roar of flaming gasoline, forester Jim Carter throws a blaze into desert scrub in southern California. Homes increasingly being built near wildlands are so threatened by fire that "prescribed burns" are sometimes used as prevention. On New Mexico's Mescalero Apache Indian Reservation (right) 10,000 acres are burned each year; residents are so used to fires that midnight flames seem as benign as moonlight.







RICHARD OLSERIGIS, WEE STAFF

Blazes set by lightning and American Indians once stormed across the heartland, helping to create the prairie. Now outfits like the Z Bar/Spring Hill Ranch set fires each spring (above). The fires are swift—sweeping 9,500 Kansas acres in three days. So is recovery. Within a month cattle feast on new grass.

the fire was up and running, a sheet of crackle that reminded me of a writer madly crumpling pages of inadequate words. He came to the end of the strip of fire he had made, snuffed the drip torch with a gloved hand, and watched. The flames turned the tall grass into nets of incandescent lace, which fell swiftly into ash. The fire moved on, and grew. The crackling turned into a roar.

Ken grinned. “Ah,” he said, “the applause of the bluestem.”

I was in central Missouri on the Goodnight-Henry Prairie, owned by the Nature Conservancy. Ken was one of a crew of six people

burning the prairie to keep it alive.

This tallgrass landscape was a 40-acre remnant of the ancient prairie that once covered a million square miles. Between Indians and lightning, this land had been burning year in and year out for thousands of years, until settlers came and plowed much of it up. Now this small crew was trying to restore fire. Since frequent fire, along with little rain and temperature extremes, had been one of the key designers of this kind of prairie, the team reasoned that the only way to keep it original was to burn it—again and again.

The burning process might have made Sonny Stoddard impatient. The crew started with a cautious backfire, which burned out a safety zone. Then team members marched swiftly upwind along the prairie’s edges with their drip torches. At last, just after a full moon rose, they rushed fire across the upwind edge and, as fire boss Doug Ladd said, “tied the golden knot.”

At that point Stoddard would have been delighted. It was now a head fire. Wind, heat, flame, and smoke leaned across the land together and roared. The fire exploded. It drenched moon and sky in red for five thunderous minutes. Then it was over. Forty acres lay black and smoldering and renewed. In the last red glow Ladd looked at the remains of his prairie fire and smiled.

“We have inherited the fire stick from the Native Americans,” Ladd said. “We’re reuniting people and nature.”

This is called prescribed fire. In a landscape in which people, homes, and agriculture are mixed with open land, carefully controlled, or prescribed, fire is one of the ways people are trying to restore fire to the natural systems that most desperately feel its absence.

Prescribed fire is like what the Indians did, but it didn’t really catch on with public land managers until the 1970s, when it became a hot new management technique. It included both the intentional lighting of controlled burns and the policy of allowing fires set by lightning to burn when the weather was cool and damp enough to lower risk.

After the 1988 Yellowstone fires, which were partly blamed on lightning-ignited prescribed fires, the new management tool fell out of public favor. But today concern over the buildup of fuel in western forests has brought prescribed fire back to prominence.

In the West there’s urgency: “We only have a 15- to 30-year window here to recover from

overprotection," one forester said. "Otherwise we'll have killing crown fires over virtually the whole ponderosa forest." He based this estimate on the amount of fuel buildup in forests and the growing intensity of fires over the past several years.

But in the Southeast, where Sonny Stoddard lives and burns, there's a sense of achievement. More than 70 percent of all prescribed burning is done in the southeastern states; in Florida alone 850,000 acres of forest and an estimated 1.2 million acres of rangeland were intentionally burned in 1995.

Not all natural fires are like those frequent but mild blazes in ponderosa or longleaf forests. A natural fire in southern California's chaparral ecosystem, for instance, can be a raging storm of fire that reduces thousands of acres to ash, from which the ecosystem takes years to recover. Here managers seldom use prescribed burns near developments; instead they ask homeowners who increasingly dare to live in chaparral and other flammable ecosystems to clear a brush-free swath, like a moat, around their houses. Sometimes this works: Firefighters can make a more hopeful stand at a home thus buffered. When I walked among the ash heaps of homes at the Vision Fire, an owner outside one of the rare standing houses credited his good luck to a 100-foot-wide cleared zone.

"PRESCRIBED BURNING will have to be part of our management strategy to ensure the long-term health of fire-dependent ecosystems," said the Forest Service's Jerry Williams. Despite such endorsements, there are relatively few prescribed burns. If prescribed burning is such a good idea, why is it not used more?

One reason is liability. Fire is sometimes described as a land manager's tool, but it's not obedient, the way a bulldozer is. It has its own will, and it can multiply itself. It's easy to see how you'd get anxious if every time you started up a bulldozer it might turn into a thousand independent-minded bulldozers and head for your subdivision or a national park. And career foresters don't forget that politicians made scapegoats of park managers after they found out that a few of the huge 1988 Yellowstone fires started as prescribed natural fires.

Another problem is smoke. Someone who starts a fire is likely to smoke up either a region where air is already heavily polluted and heavily monitored, like Los Angeles, or a place where the air is treasured for its clarity, like a national park. If the smoke from a prescribed burn crosses a highway, blocks a driver's vision, and causes a crash, the person with the match may be held responsible. And since tourism can suffer when smoke smothers vistas, nearby businesses complain.





Saving a precious grove, forestry technician Scott Bullene sets flames among California's giant sequoias, which need fire to open cones and clear space for seedlings. "These trees used to have fire every 10 to 20 years," says researcher Steve Sackett (opposite), checking a heat sensor. "Last time they burned naturally was before the turn of the century."

To solve smoke conflicts, people who use fire take various approaches. In some cases they work to get special permits from local air-quality districts. In the Los Angeles Basin, fire managers may soon be able to buy pollution credits from local industry, which allow them to emit specified levels of air pollution.

Another problem is familiar to all: money. Most forest managers say it's easier to get the bucks to fight a fire than to start one. But fighting fire, though nominally included in agency budgets, is also financed through a national system of emergency appropriations that essentially gives fire-fighting agencies a blank check. When land managers are organizing prescribed burns, they face lean budgets and critical scrutiny, but when a wildfire starts, the stops are pulled out. *You need a helicopter? You got a helicopter!*

"Because we don't have a budget," a fire officer told me, "we can afford to spend a million dollars to save a \$50,000 cabin."

But it's far more difficult to get \$50,000 for

a prescribed burn that might prevent that million-dollar fire. And even if some money dribbles through the system, one or two carefully designed prescribed burns seldom come close to matching the way fire used to work.

"Historically what happened was that you had lots and lots of little burns," said Stephen Pyne. "Now you have to get permits, you have to organize a burn, you have to fund it. It's too cumbersome to get the timing right. The acres just don't get burned."

ONLY ONCE did I see fire working the way it may have in centuries past. It was autumn in Yosemite National Park. The fire was part of the park's policy of allowing certain fires to keep burning if weather and fuel conditions seemed favorable. Lightning had started the fire on the 16th of July, and it was now mid-November. In four months the fire had burned about 600 acres.

I hiked to the fire with a fire ecologist and two technicians. When we got there, the flames were about ten inches tall. They flickered in a mat of duff under 300-year-old sugar pine trees six feet in diameter and glowed among dead branches on the ground. They left behind a layer of ash six inches deep.

What was most interesting about this fire was not just the way it munched along in its unspectacular manner, but how we reacted.



Hot enough to burn surface duff so seeds can grow but not so hot that it kills large trees, a 13-acre prescribed fire is just what the doctor ordered. "We're trying to get fire back in the ecosystem," says Steve Sackett, who did research on this blaze among the giants of Sequoia National Park.



Instead of calling 911, instead of digging a fire line, instead of forming a bucket brigade to a stream, we sat down and had lunch. Time seemed to disappear in dusky sunlight and smoke. We sat and watched fire just as we would have watched rain.

But what's natural and what's human may be quite different. Though setting prescribed fires can be dramatic, involving flamethrowers and incendiary plastic balls dropped from helicopters, it will never have the pure human drama of trying to put fire out.

Firefighters are heroes. Pyne has argued that fire fighting has been an answer to William James's call for the moral equivalent of war: People jump out of airplanes or drive big trucks fast on bad roads, face hazard and pain with people they care about, and in the end inevitably triumph, even if rain is the real victor. When I was at the Vision Fire in California, someone had hung pictures from grateful schoolchildren on the command-center walls. "Firefighters: Nicasio School Says Thank You," one read. This is glory. There is little glory in walking around a prairie or a pine forest with a drip torch.

"The first is war and the second is work," said Neil Sampson of American Forests. "And people look at war and work very differently."

WHAT IS THE FUTURE OF FIRE? No one is arguing that the fire-suppression machine should be dismantled. When the land dries out and the hot wind roars, people will always make a stand. Even the most vigorous advocates of increased fire use argue only that suppression should be balanced with more prescribed fires and that more—but not all—naturally ignited fires should be allowed to burn.

"In principle that's been possible for 25 years," Pyne told me. "But in spite of some symbolic successes, we haven't translated policy into practice. The problem is to get the right mix—how much fire to apply, how much to withhold."

Pyne doesn't see much hope that Americans will develop a relationship with fire anytime soon that resembles the balance that existed before industrialization.

If he's right, what will happen?

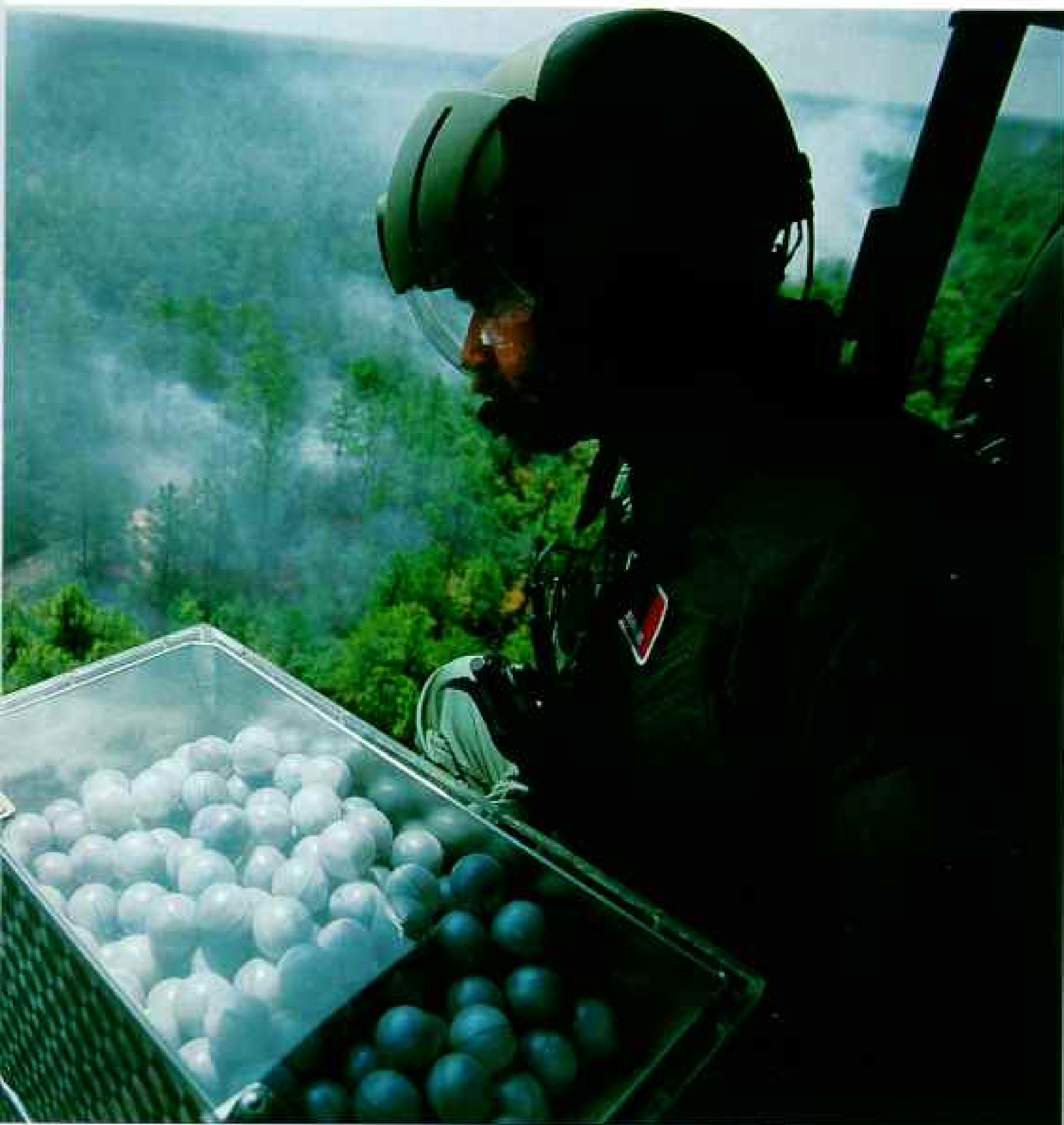
Landscapes dominated by fire-dependent or fire-tolerant species will not die if they're deprived of fire, but they will change. It would be like abruptly changing the official language



Bomblets save bird habitat at Eglin Air Force Base in the Florida Panhandle. Wildland fire specialist Gary Lindsay drops incendiary plastic balls from a helicopter to burn underbrush on the 724-square-mile base in order to prevent young oaks from crowding out essential longleaf and loblolly pine.

of a country. Suddenly a small group of immigrants would flourish, and even the most able people who could not learn the new language would struggle to survive.

Since fire played a large role in most North American ecosystems, the effects of trying to suppress it are widespread. Ponderosa pine



forests dwindle. Other pine species that require fire, like the table-mountain pine in Great Smoky Mountains National Park, which reproduces best on the bare, ashen land fire creates, will continue to decline. Even wetlands change. Saw grass, which dominates the Everglades, sprouts from the base of the plant, where it is protected by the damp soil; trees and shrubs that would compete with saw grass are killed by fire. When fire's excluded, the competition thrives.

Grasslands also change when we suppress fire. Like the saw grass, prairie and desert grasses grow from points at or near the

surface, resistant to the swift fires that keep their competitors at bay. Dry grasslands can turn to scrub when deprived of fire. In the Southwest millions of acres once in grass are now dominated by plants like mesquite and creosote. Overgrazing is part of the reason for this change, but lack of fire is another.

In places where fire still thrives, there is a curious peace, as if flames nourish serenity. One afternoon I walked through such a place in southern Georgia, a 200-acre stand of old-growth longleaf pines that is maintained by regular fires. I went with Sharon Hermann, a fire ecologist at the Tall Timbers Research



“Expansive, airy pine forests,” described by a traveler in 1791, once covered 92 million acres of the Southeast. Prescribed fires help preserve a three-million-acre remnant, habitat for a red-cockaded woodpecker (left) tagged at five days old. This often burned Florida grove (below) is a reminder that much of the serenity we admire in the landscape depends on the violence—and the magic—of fire.



Station in Tallahassee, Florida, who helps manage the stand.

The grove was magnificent: Pines centuries old, tops shaved off by wind, stood widely spaced in grass. It was an elegant contrast to an overgrown, seldom burned woods I had seen near Tallahassee. The day was warm and hazy. I felt like sitting on a log, chewing a stem of grass, closing my eyes, and listening to the breeze in the pine needles and the clatter of red-cockaded woodpeckers.

"This is close to what Hernando de Soto saw when he was wandering around the Southeast in the early 16th century," Hermann said. "I am incredibly fortunate to work here."

Thinking of the Vision Fire, I asked her how

she felt about the destruction that fire at first seems to create. "I'm a Bambi ecologist," she said, admitting a childhood prejudice against fire. "I hate the thought of my prescribed fires harming individual animals, even though that rarely happens. But I know I'm improving the habitat. The right amount of fire is as essential as the right amount of rainfall and sunlight."

I strolled through the grass and looked into a distance of tall columns and openness. Was this the past or the future? I didn't know. I thought of Sonny Stoddard with his match, helping the landscape live and die and live again the way it always has. I wondered if we'd ever again learn to trust fire enough to let it be our friend, and I thought, Why not? Life's too short to backfire. □



FLASHBACK



WILLIAM REID

■ FROM THE GEOGRAPHIC ARCHIVES

Hounded

Highland hunting dogs take a breather above Scotland's Loch Lomond—perhaps exhausted by their appearance in two different issues of the *GEOGRAPHIC*. “Gems from Scotland” (November/December 1917) first featured the dogs, paired in brace chains before a grouse hunt, in a portfolio of photographer William Reid’s work. The same animals—shown with their master—also wagged their way into “The Sagacity and Courage of Dogs: Instances of the Remarkable Intelligence and Unselfish Devotion of Man’s Best Friend Among Dumb Animals” (March 1919), part of an entire issue dedicated to dogs. The photograph above, however, was never published in the magazine.

*The 1997 LeSabre.
The comfort and safety of home...
on the road.*



Its comfort will put you at ease. Its arsenal of safety features will give you a sense of inner peace. Make you feel almost invulnerable. That's why those who want to feel at home on the road drive the 1997 Buick LeSabre. For your peace of mind, drive LeSabre. For more details, visit our Web site at <http://www.buick.com> or call 1-800-4A-BUICK.

Peace of mind
LeSabre  *by Buick*



©1996 GM Corp. All rights reserved. LeSabre is a registered trademark of GM Corp. Buckle up, America!

FORGET RETIREMENT—WE'RE TALKING ABOUT
A SECOND CHILDHOOD. (THIS TIME
MAKE SURE YOU GET A BIG ALLOWANCE.)



How long has it been since anyone asked you what you want to be when you grow up? Well, allow us to ask you now. What do you want to be when you grow up? Before you decide, talk to Aetna Retirement Services. With tools like annuities, 401(k)s, IRAs, mutual funds, and life insurance for your family, you could accumulate the kind of assets that will let you be whatever your cholesterol-free, fully aerobicized, ever-loving heart desires. For your free brochure, call 1-800-AETNA-60 or visit us at <http://www.aetna.com>.

Build for Retirement. Manage for Life.™

Aetna

Aetna Retirement Services



NATIONAL GEOGRAPHIC

SEPTEMBER 1996



2 Scotland *This rugged northern reach of Britain remains a world apart, a land of windswept lochs and heather hills, a people of industriousness and idiosyncrasy.*

BY ANDREW WARD PHOTOGRAPHS BY JIM RICHARDSON

28 Gaza *Palestinians in the 140-square-mile arid strip along the Mediterranean Sea cling to their dream of building a new state.*

ARTICLE AND PHOTOGRAPHS BY ALEXANDRA AVAKIAN

54 Searching for the Scythians *Legendary horsemen who swept across the European steppe in the seventh century B.C. left clues to their culture in finely wrought gold.*

BY MIKE EDWARDS PHOTOGRAPHS BY SISSE BRIMBERG

80 Hawk High Over Four Corners *Where four states meet in the Southwest, nature spreads a splendid panorama.*

BY T. H. WATKINS PHOTOGRAPHS BY ADRIEL HEISEY

98 Tarantulas *Huge, hairy, and voracious, tarantulas are also delicate, timid, and mostly harmless.*

BY RICHARD CONNIF PHOTOGRAPHS BY MARK W. MOFFETT

116 The Essential Element of Fire *More friend than foe to many ecosystems, fire helps keep the planet in balance.*

BY MICHAEL PARFIT PHOTOGRAPHS BY RAYMOND GEHMAN

Departments

Behind the Scenes
Forum
Geographica

Flashback
On Television
Earth Almanac
On Assignment

The Cover

Sandstone pillars cast long shadows in Monument Valley, Arizona.
Photograph by
Adriel Heisey

♻️ Cover printed on recycled-content paper.

For membership please call

1-800-NGS-LINE

Special device for the hearing-impaired
(TDD) 1-800-548-9797

Behind the Scenes



Putting Us on the Map

THE GEOGRAPHIC has made its mark on the world in more ways than one. Places—from mighty glaciers to a suburban Washington subway stop—plants, and animals bear the names of Society staffers: Scientists and geographers, grateful for encouragement, christened many of their discoveries after our first full-time Editor, Gilbert H. Grosvenor. Namesakes include a Greenland mollusk, a small, silvery Peruvian fish, and an herb in China. Society founder Gardiner Greene Hubbard and former Editor John Oliver La Gorce have

also been memorialized. The United States Board on Geographic Names recently approved the name of Mount Bishop, in Antarctica, to honor Barry Bishop, our late chairman of the Committee for Research and Exploration. Freelancers and staff have also made their share of discoveries: Author-photographer Loren McIntyre pinpointed Peru's Laguna McIntyre, while Luis Marden lays claim to a Brazilian orchid and an Atlantic Ocean sand flea. Luis's most famous discovery—a shipwreck—already had a name: H.M.S. *Bounty*.

Great Scot

WHAT MOST IMPRESSED writer Andrew Ward (far right) while researching this issue's Scotland story was its people's "ferocious sense that history, no matter how ancient, just happened the day before yesterday."

When



Andrew mentioned to one Highlander that he was very distantly related to William Wallace, the 13th-century freedom-fighter portrayed in the movie *Braveheart*; he was met with all seriousness.

It was obvious, the Scotsman told him: "I could tell it from the look of you!"

MARY STARR PICTURE LIBRARY; CANADIAN PHOTOGRAPHY



THIS CENTURY WE
MADE HISTORY.
HISTORY IS ABOUT
TO REPEAT ITSELF.

*Nearly 100 years ago, we helped put
America on wheels. And the cars and
trucks we're building today and are
designing for tomorrow maintain the
high standards of quality, value and
innovation set by our founder. Which is
another way of saying the future is
looking brighter all the time.*

FORD • FORD TRUCKS •



• LINCOLN • MERCURY •

Q U A L I T Y I S J O B 1.

For more information, contact us on the Internet at <http://www.ford.com>



© 1995 American Plastics Council



It's true. In the last 20 years, empty milk jugs have lost a lot of weight. In fact, plastics are helping lots of products and packaging slim

product with less packaging. • Even the plastic grocery bag uses 70 percent less plastic than it did in 1976. Big deal? You bet. Now it would

Would You Believe The Jug On The Right Is 45% Lighter?

down. That means using less energy and fewer raw materials to make them. Best of all, the milk jug on the right still holds the same amount of milk, delivering such benefits as shatter-resistance, a tamper-evident seal, a resealable cap and a convenient handle. • Soft drink bottles are slimmer too. That allows trucks to deliver more

take five trucks to deliver as many paper sacks as one truckload of plastic bags. Which also saves fuel. • To learn more, call the American Plastics Council at 1.800.777.9500 for a free booklet. • You'll find that, for a lightweight, the benefits of plastics are still pretty heavy.



American
Plastics
Council

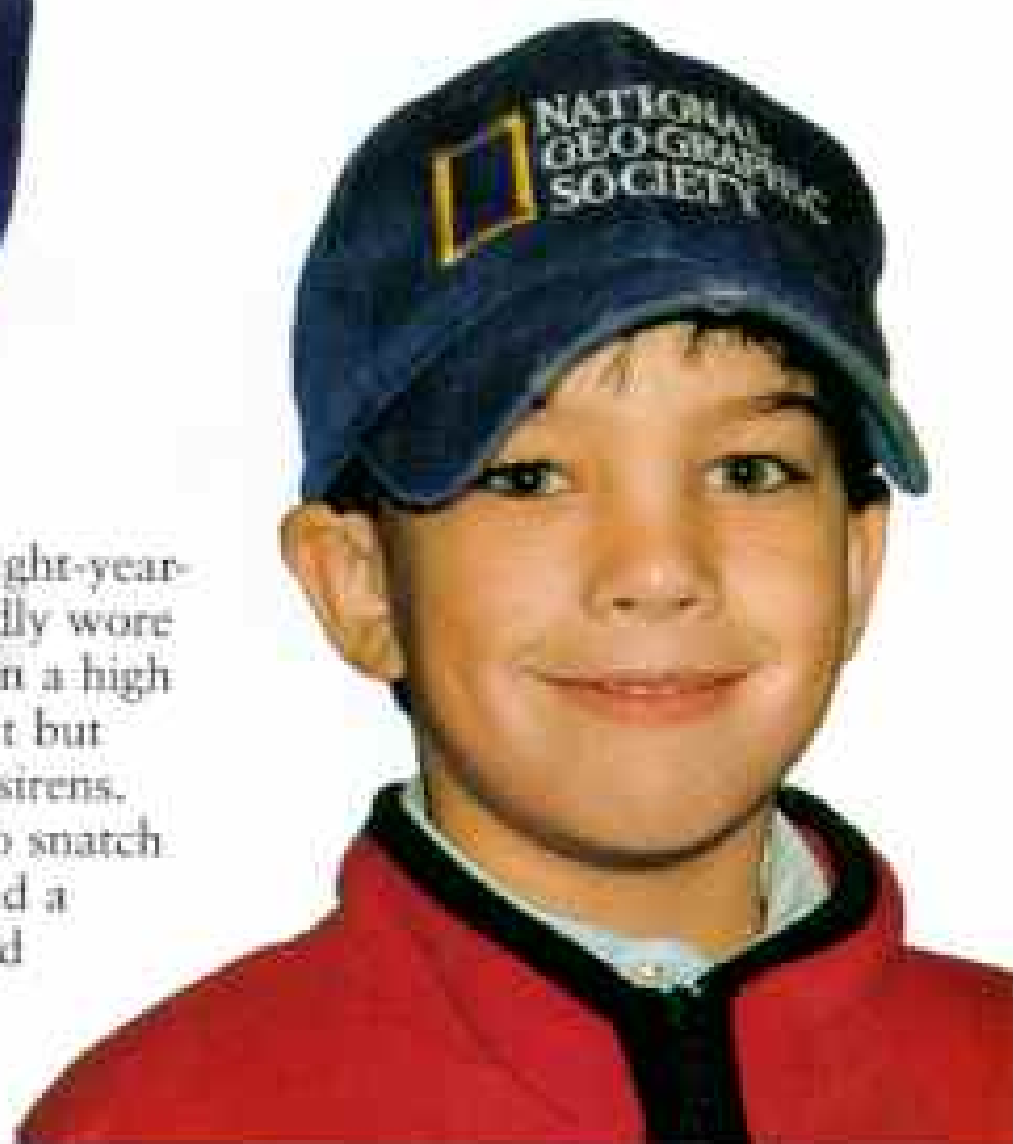
PLASTICS MAKE IT POSSIBLE.™

Visit us at <http://www.plasticsresource.com>



Hat Trick

IT WAS THE PERFECT CAP to their family trip to Boston. Eight-year-old Winston Hughes, of Grosse Pointe, Michigan, proudly wore his NGS baseball hat everywhere. Suddenly it blew off in a high wind during a downtown tour. Winston's uncle chased it but had to stop for an oncoming police car with screaming sirens. The cruiser screeched to a stop, a hand reached down to snatch the cap, and the car sped away. Then the vehicle executed a smart U-turn and pulled to a stop in front of the stunned family. Said the officer who handed the hat back, "National Geographic. Looked important."



DAN HUGHES (TOP); SIVVE BRIMBERG

Go Fish

THE NEAREST FISH may have been tuna salad in the deli down the street, but that didn't stop magazine staffers Cathy Newman and Bob Poole and retiree Luis Marden from practicing their casting atop our ten-story headquarters in Washington, D.C. Fishing rod dealer Joe Garman (above), a friend from Cathy's April 1996 trout story, visited recently and brought along several of his bamboo rods for our fishing aficionados to try.

At one point in the afternoon Bob's line got wrapped around Cathy's throat after a bad cast. "I hope," she told the associate editor, "that I'm a keeper."

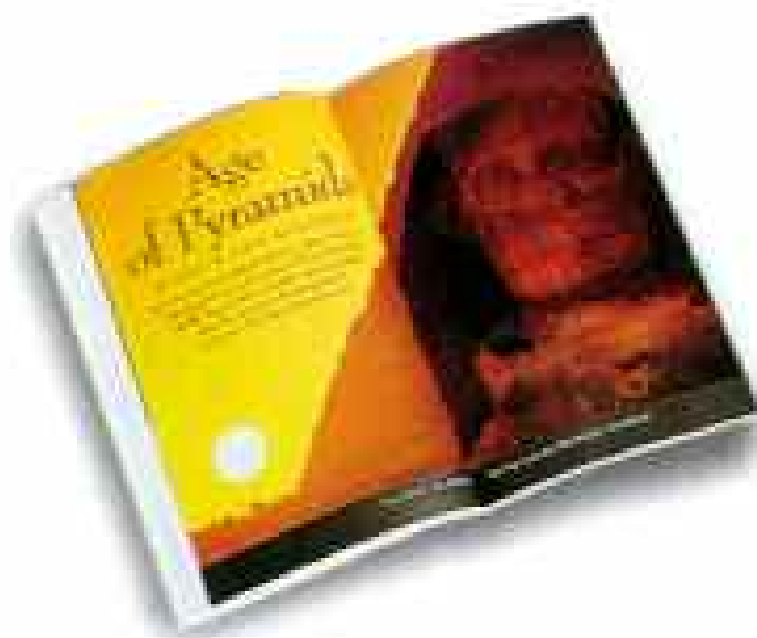
High Hopes

THIS ISSUE'S COVER could have been Adriel Heisey's last photo. Shooting the Four Corners at sunrise, he flew into a torrent of tumbling air. His tiny plane bucking, Adriel cut back on the throttle and, he admits, forgot about photography. When the air was calm again, he resumed speed. "Joy and peril," he says, "are pretty close together in the sky."
—MAGGIE ZACROWITZ

READERS' TOP TEN

Of 68 articles published in 1995, U.S. members' favorites were:

1. Egypt's Old Kingdom—January
2. California Faults—April
3. Brain—June
4. Amazon—February
5. Grand Teton Park—February
6. Cherokee—May
7. Ndoki, Congo—July
8. Oceans—November
9. Hiroshima—August
10. Endangered Species Act—March



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

Online:
World Wide Web:
<http://www.nationalgeographic.com>
CompuServe: GO NATIONAL GEOGRAPHIC

Now Available
For Allergies.



Feel like yourself again. Ask your doctor about Zyrtec.

No other once-daily prescription medicine proven effective for both seasonal and year-round allergies plus chronic itching and hives.

Easy. Just one tablet provides 24-hour relief from sneezing, itchy runny nose, and itchy watery eyes.

Proven. Used in 94 countries worldwide, with 2.9 billion patient-days of experience!

Ask your doctor about a trial of Zyrtec. For a free brochure on allergies and relief of allergy symptoms with Zyrtec, call 1-800-BE MYSELF.

Well accepted. As with all medications, side effects may occur. Always talk to your healthcare provider about any medication you may take. However, when Zyrtec was studied, most side effects were mild to moderate and included dry mouth and fatigue. The most common side effect was drowsiness (14% versus 6% on placebo). Only one out of one-hundred patients stopped taking Zyrtec due to drowsiness.

 **Zyrtec**[™]
(cetirizine HCl) tablets
For Allergies
Feel like yourself again.

Please see following page for information about Zyrtec 5mg and 10mg tablets.

For Allergic Rhinitis and Chronic Idiopathic Urticaria

Once-a-day
Zyrtec™
(cetirizine HCl) tablets

BRIEF SUMMARY

ZYRTEC™ (cetirizine hydrochloride) Tablets For Oral Use (FOR FULL PRESCRIBING INFORMATION, CONSULT PACKAGE INSERT) **CONTRAINDICATIONS** ZYRTEC is contraindicated in those patients with a known hypersensitivity to it or any of its ingredients or hydroxyzine. **PRECAUTIONS** Activities Requiring Mental Alertness: In clinical trials, the occurrence of somnolence has been reported in some patients taking ZYRTEC; due caution should therefore be exercised when driving a car or operating potentially dangerous machinery. Concurrent use of ZYRTEC with alcohol or other CNS depressants should be avoided because additional reductions in alertness and additional impairment of CNS performance may occur. **Drug-Drug Interactions:** No clinically significant drug interactions have been found with theophylline at a low dose, azithromycin, pseudoephedrine, ketoconazole, or erythromycin. There was a small decrease in the clearance of cetirizine caused by a 400 mg dose of theophylline; it is possible that larger theophylline doses could have a greater effect.

Carcinogenesis, Mutagenesis and Impairment of Fertility: No evidence of carcinogenicity was observed in a 2-year carcinogenicity study in rats at dietary doses up to 20 mg/kg/day (15 times the maximum recommended human dose on a mg/m²/day basis). An increased incidence of benign liver tumors was found in a 2-year carcinogenicity study in male mice at a dietary dose of 16 mg/kg/day (6 times the maximum recommended human dose on a mg/m²/day basis). The clinical significance of these findings during long-term use of ZYRTEC is not known. Cetirizine was not mutagenic in the Ames test, and not clastogenic in the human lymphocyte assay, the mouse lymphoma assay, and the *in vivo* micronucleus test in rats. No impairment of fertility was found in a fertility and general reproductive performance study in mice at a dose of 64 mg/kg/day (26 times the maximum recommended human dose on a mg/m²/day basis). **Pregnancy Category B:** Cetirizine was not teratogenic in mice, rats and rabbits at doses up to 96, 225, and 135 mg/kg/day (or 40, 180, and 216 times the maximum recommended human dose on a mg/m²/day basis), respectively.

There are no adequate and well-controlled studies in pregnant women. Because animal studies are not always predictive of human response, ZYRTEC should be used in pregnancy only if clearly needed. **Nursing Mothers:** Retarded pup weight gain was found in mice during lactation when dams were given cetirizine at 96 mg/kg/day (40 times the maximum recommended human dose on a mg/m²/day basis). Studies in beagle dogs indicate that approximately 3% of the dose is excreted in milk. Cetirizine has been reported to be excreted in human breast milk; use of ZYRTEC in nursing mothers is not recommended. **Geriatric Use:** In placebo-controlled trials, 186 patients age 65 to 94 years received doses of 5 to 20 mg of ZYRTEC per day. Adverse events were similar in this group to patients under age 65. Subset analysis of efficacy in this group was not done. **Pediatric Use:** Safety and effectiveness in children under 12 years of age has not been established. **ADVERSE REACTIONS** Controlled and uncontrolled clinical trials conducted in the United States and Canada included more than 6000 patients, with more than 3900 receiving ZYRTEC at doses of 5 to 20 mg per day. The duration of treatment ranged from 1 week to 6 months, with a mean exposure of 30 days. Most adverse reactions reported during therapy with ZYRTEC were mild or moderate. In placebo-controlled trials, the incidence of discontinuations due to adverse reactions in patients receiving ZYRTEC 5 mg or 10 mg was not significantly different from placebo (2.9% vs. 2.4%, respectively). The most common adverse reaction that occurred more frequently on cetirizine than placebo was somnolence. The incidence of somnolence associated with ZYRTEC was dose related, 6% in placebo, 11% at 5 mg and 14% at 10 mg. Discontinuations due to somnolence for ZYRTEC were uncommon (1.0% on ZYRTEC vs. 0.6% on placebo). Fatigue and dry mouth also appeared to be treatment-related adverse reactions. There were no differences by age, race, gender or by body weight with regard to the incidence of adverse reactions. Table 1 lists adverse experiences which were reported for ZYRTEC 5 and 10 mg in controlled clinical trials in the United States and that were more common with ZYRTEC than placebo.

Studies in beagle dogs indicate that approximately 3% of the dose is excreted in milk. Cetirizine has been reported to be excreted in human breast milk; use of ZYRTEC in nursing mothers is not recommended. **Geriatric Use:** In placebo-controlled trials, 186 patients age 65 to 94 years received doses of 5 to 20 mg of ZYRTEC per day. Adverse events were similar in this group to patients under age 65. Subset analysis of efficacy in this group was not done. **Pediatric Use:** Safety and effectiveness in children under 12 years of age has not been established. **ADVERSE REACTIONS** Controlled and uncontrolled clinical trials conducted in the United States and Canada included more than 6000 patients, with more than 3900 receiving ZYRTEC at doses of 5 to 20 mg per day. The duration of treatment ranged from 1 week to 6 months, with a mean exposure of 30 days. Most adverse reactions reported during therapy with ZYRTEC were mild or moderate. In placebo-controlled trials, the incidence of discontinuations due to adverse reactions in patients receiving ZYRTEC 5 mg or 10 mg was not significantly different from placebo (2.9% vs. 2.4%, respectively). The most common adverse reaction that occurred more frequently on cetirizine than placebo was somnolence. The incidence of somnolence associated with ZYRTEC was dose related, 6% in placebo, 11% at 5 mg and 14% at 10 mg. Discontinuations due to somnolence for ZYRTEC were uncommon (1.0% on ZYRTEC vs. 0.6% on placebo). Fatigue and dry mouth also appeared to be treatment-related adverse reactions. There were no differences by age, race, gender or by body weight with regard to the incidence of adverse reactions. Table 1 lists adverse experiences which were reported for ZYRTEC 5 and 10 mg in controlled clinical trials in the United States and that were more common with ZYRTEC than placebo.

Table 1. Adverse Experiences Reported in Placebo-Controlled United States ZYRTEC Trials (Maximum Dose of 10 mg) at Rates of 2% or Greater (Percent Incidence)

Adverse Experience	ZYRTEC (N=2034)	Placebo (N=1612)
Somnolence	13.7	6.3
Fatigue	5.9	2.6
Dry Mouth	5.0	2.3
Pharyngitis	2.0	1.9
Dizziness	2.0	1.2

Due caution should be exercised when driving a car or operating potentially dangerous machinery.

In addition, headache and nausea occurred in more than 2% of the patients, but were more common in placebo patients. The following events were observed infrequently (less than 2%), in 3982 patients who received ZYRTEC in U.S. trials, including an open study of six months duration; a causal relationship with ZYRTEC administration has not been established. **Autonomic Nervous System:** anorexia, urinary retention, flushing, increased salivation. **Cardiovascular:** palpitation, tachycardia, hypertension, cardiac failure. **Central and Peripheral Nervous Systems:** paresthesia, confusion, hyperkinesia, hypertonia, migraine, tremor, vertigo, leg cramps, ataxia, dysphonia, abnormal coordination, hypesthesia, hyperesthesia, myelitis, paralysis, ptosis, twitching, visual field defect. **Gastrointestinal:** increased appetite, dyspepsia, abdominal pain, diarrhea, flatulence, constipation, vomiting, ulcerative stomatitis, aggravated tooth caries, stomatitis, tongue discoloration, tongue edema, gastritis, rectal hemorrhage, hemorrhoids, indigestion, abnormal hepatic function. **Genitourinary:** polyuria, urinary tract infection, cystitis, dysuria, hematuria. **Hearing and Vestibular:** earache, tinnitus, deafness, ototoxicity. **Metabolic/Nutritional:** thirst, dehydration, diabetes mellitus. **Musculoskeletal:** myalgia, arthralgia, arthrosis, arthritis, muscle weakness. **Psychiatric:** insomnia, nervousness, depression, emotional lability, impaired concentration, anxiety, depersonalization, paranoia, abnormal thinking, agitation, amnesia, decreased libido, euphoria. **Respiratory System:** epistaxis, rhinitis, coughing, bronchospasm, dyspnea, upper respiratory tract infection, hyperventilation, sinusitis, increased sputum, bronchitis, pneumonia. **Reproductive:** dysmenorrhea, female breast pain, intermenstrual bleeding, leukorrhea, menorrhagia, vaginitis. **Reticuloendothelial:** lymphadenopathy. **Skin:** pruritus, rash, dry skin, urticaria, acne, dermatitis, erythematous rash, increased sweating, alopecia, angioedema, furunculosis, bullous eruption, eczema, hyperkeratosis, hypertrichosis, photosensitivity reaction, photosensitivity toxic reaction, maculopapular rash, seborrhea, purpura. **Special Senses:** taste perversion, taste loss, parosmia. **Vision:** blindness, loss of accommodation, eye pain, conjunctivitis, serophthalmia, glaucoma, ocular hemorrhage. **Body as a Whole:** increased weight, back pain, malaise, fever, asthenia, generalized edema, periorbital edema, peripheral edema, rigors, leg edema, face edema, hot flashes, enlarged abdomen, nasal polyp. Occasional instances of transient, reversible hepatic transaminase elevations have occurred during cetirizine therapy. A single case of possible drug-induced hepatitis with significant transaminase elevation (500 to 1000 IU/L) and elevated bilirubin has been reported. In foreign marketing experience the following additional rare, but potential severe adverse events have been reported: hemolytic anemia, thrombocytopenia, orofacial dyskinesia, severe hypotension, anaphylaxis, hepatitis, glomerulonephritis, stillbirth, and cholestasis. **DRUG ABUSE AND DEPENDENCE** There is no information to indicate that abuse or dependency occurs with ZYRTEC. **OVERDOSAGE** Overdosage has been reported with ZYRTEC. In one patient who took 150 mg of ZYRTEC, the patient was somnolent but did not display any other clinical signs or abnormal blood chemistry or hematology results. Should overdose occur, treatment should be symptomatic or supportive, taking into account any concomitantly ingested medications. There is no known specific antidote to ZYRTEC. ZYRTEC is not effectively removed by dialysis, and dialysis will be ineffective unless a dialyzable agent has been concomitantly ingested. The minimal lethal oral dose in rodents is approximately 100 times the maximum recommended clinical dose on a mg/m² basis and the liver is the target organ of toxicity. **DOSAGE AND ADMINISTRATION** The recommended initial dose of ZYRTEC is 5 or 10 mg per day in adults and children 12 years and older, depending on symptom severity. Most patients in clinical trials started at 10 mg. ZYRTEC is given as a single daily dose, with or without food. The time of administration may be varied to suit individual patient needs. In patients with decreased renal function (creatinine clearance 11-31 mL/min), patients on hemodialysis (creatinine clearance less than 7 mL/min), and in hepatically impaired patients, a dose of 5 mg once daily is recommended. Cetirizine is licensed from UCB-Pharma, Inc.



Manufactured/Marketed by
Labs • NBD • Pratt • Hoang • Specialty
U.S. Pharmaceuticals Group



© 1995 PFIZER INC
NY, NY 10017

Printed in U.S.A.

CM146A96 DC Issued December 1995



GO

to the North Pole.

In your jammies.

National Geographic is now online on CompuServe. You'll explore and interact with new worlds. Go on virtual assignments. Uncover global mysteries. And visit places you've never dreamed of. Enter GO NATIONAL GEOGRAPHIC if you're a CompuServe member. If you're not, give us a call or visit our website. We'll give you free software and 10 free hours* to discover the planet.

 NATIONAL
GEOGRAPHIC
ONLINE

CompuServe®

www.compuServe.com. Outside the U.S. or Canada: 1-303-854-7338. Inside the U.S. or Canada: **1-800-374-3509**

© 1994 CompuServe is a trademark of CompuServe Incorporated. *Subsequent months 25.25. You'll get 5 free hours each month. Additional bills \$2.95 each. Some additional charges may apply. National Geographic Online is a trademark of the National Geographic Society.

Forum

Peru

As a Peruvian who has lived outside Peru for ten years, I found John McCarry's article (May 1996) to be honest and refreshing. I frequently visit my country, and I am quite aware of the renewal and hope portrayed in your article. There is no doubt that Peru is experiencing a time of new beginnings.

LILLY ESCOBAR-ARTOLA
Broomall, Pennsylvania

In Britain many of our nationalized industries have been sold to the private sector. The result has not enhanced the standard of living of the country. The community I live in is a coal-mining community that has been devastated by the privatization of the coal industry. It is to be hoped that Peru will develop a balanced economy where nationalized and privatized industries work alongside one another for the common good of the nation.

PAUL FOWLER
Cotgrave, England

Is it possible that those Peruvians not "delighted" with President Fujimori's record were not interviewed because they are in prison? Amnesty International estimates that more than 5,000 Peruvians and others have been imprisoned after unfair trials. The most prominent case is that of Lori Berenson, a young American woman who was charged with participating in terrorist activities and sentenced to life in prison by a Peruvian military tribunal presided over by judges concealed from courtroom view.

ARNOLD H. MATLIN
Geneseo, New York

The photograph on page 16 reveals much about Peru. The lovely young women celebrating a traditional 15th birthday are only a few feet from the uniformed maid at the sink, whose profile recalls her Inca forebears. The message is clear: white, Spanish-looking Peruvians enjoy power, wealth, and leisure, while the country's indigenous people find themselves serving the urban elite.

JOSEPH D. O'CONNELL
Gaithersburg, Maryland

Antarctic Ice

Like author Jane Ellen Stevens, I have a great fascination for the strange and unique phenomenon of polar ice. When I was in the Ross Sea in January, the type of ice mass pictured on pages 52-3 was identified not as an iceberg but more precisely as a tabular ice mass or by the popular term "ice island." Ice islands can reach a hundred miles in diameter and drift as far north as 26°30'S.

WILLIAM D. CURRAN
Beecher, Illinois

Preservation of pristine environments should be in the forefront of any explorer's mind, but the author seems to have missed the big picture. On page 50 she explains that they "employ gas-powered machinery as little as possible to keep pollution to a minimum." What difference is a couple hundred gallons of gas going to make compared with the "half a million gallons of diesel" that fueled the ship through the journey?

PAUL NACE
Warren, Arkansas

California Desert

The "wasteland" concept is a sentiment of those living in Los Angeles and other cities who seem to think that if an area does not have a burgeoning population, it must be unoccupied and suitable only for federal prisons, landfills, and low-grade radiation dumps. But there is much of economic and historical value in the Mojave area: cities such as Lancaster and Ridgecrest, historic mining towns such as Randsburg and Calico, and military bases such as Edwards Air Force Base.

PEGGY RICHTER
Inyokern, California

Beautiful land in our country has been destroyed by people who feel they can drive anywhere they want whenever they want.

ART HOCH
McPherson, Kansas

Some of the area's best preserved petroglyphs can be found on the China Lake Naval Air Warfare Center, because access to the site is tightly controlled. Tours can be arranged through Maturango Museum in Ridgecrest.

JOSEPH RIST
Manchester, Michigan

The only time I ever want to see photographs of old naked guys (page 76) is if they have been dead for at least a thousand years.

BARBARA A. ELLISON
Glastonbury, Connecticut

Monaco

A caption identified the House of Grimaldi as "the world's oldest reigning dynasty." The British royal family claims descent from the Saxon kings who ruled England before the Norman Conquest of 1066. However, some historians regard the Japanese imperial family as the world's oldest reigning dynasty. It can be traced back to about A.D. 500. The dynasty is so old that it seems to have no name, a condition unique among the world's monarchies.

ANDREW D. CONNALLY
Ardmore, Pennsylvania

We should have said the "oldest governing dynasty." The British monarch and Japanese emperor "reign," but they do not rule.

Richard Conniff's anecdotes of Mediterranean ribaldry and excess made for one of the best offerings I have ever seen in NATIONAL GEOGRAPHIC. Such wit and a flair for the absurd makes for quite a ride!

MICHELA PASQUALI
Toronto, Ontario

Raphael Bravo, Irving, Texas.

Help so orders can always get through, no matter how many calls for his ceviche come pouring in.

Help so he can stay in the loop even when he's circling over La Guardia.

Help so he can be in six kitchens at once to share his recipe for tamales. (Just like mama used to make.)



From our business solutions, to Airfone® data transmission, to video conferencing, GTE makes technology work for people around the world every day. So, if you think telecommunications have only complicated your life, a reminder: At GTE, we're working to help make your life easier.

GTE

IT'S AMAZING WHAT
WE CAN DO TOGETHER.

I recently attended the Formula 1 race in the principality, which I have visited a dozen times. I had considered it as safe as any place in the world, a belief affirmed by your article. However, the magazine and I may have been mistaken. I had my wallet picked at the entry to the start-finish gate, and the unfortunate event was disregarded by Monaco police. As a deputy attorney general of California for 25 years, I took umbrage when the three gendarmes at the gate and their peers inside refused to take a report or a description of the suspect for the purpose of preventing further thefts. I believe the officers were more interested in the commencement of the race than in public safety.

WILLARD F. JONES
Gold River, California

Dinosaur Eggs

The photographs of the fossilized dinosaur eggs are outstanding. The spherical bodies with concentric layers that were thought to be fossilized egg yolk may in fact be calcified spherules found in the yolk of normal avian eggs. These bodies take up calcium from the eggshell, store it, and release it to the embryo for building bones. In egg yolks of birds, they increase markedly during early development and disappear as hatching nears.

NORMAN F. CHEVILLE
Department of Veterinary Pathology
Iowa State University
Ames, Iowa

Many major paleontological discoveries have been accomplished by amateur collectors giving up their Saturdays hiking and hunting for their own pleasure. It was commendable of you to recognize the value of amateur hobbyists and non-degreed experts in the field of paleontology.

NITA ATWOOD
Yale, Michigan

No credit was given to Albuquerque, New Mexico, sculptor David Thomas for his large-scale *Matisaura* on page 111. Thomas's massive bronze-and-fiberglass dinosaur sculptures are on display at natural history museums nationwide.

ART CHRISTENSEN
Albuquerque, New Mexico

David Thompson

True enough, many North Americans have not heard of Canadian explorer David Thompson. He was forgotten for over 70 years until surveyor Joseph B. Tyrrell found Thompson's maps so extensive and accurate that he had *The Narrative of David Thompson* published in 1916 by the Champlain Society. Ever since, Canadian schoolbooks have included his story. A biography of Thompson titled *The Map-Maker*, by Kerry Wood, was published in 1955.

DAVID R. WEBSTER
Westmount, Quebec

For readers who would like to know more about David Thompson, an excellent book is *Sources of the River* (Sasquatch Books, 1994), by Jack Nisbet, who tracked Thompson across western North America.

MARILYNN J. VAN HISE
Seattle, Washington

Northwest of Verendrye, North Dakota, stands a monument to Thompson. One of my earliest memories is of my father taking me fishing on the river just below the monument and explaining to me why David Thompson was so important among the early mappers of our country.

DOLORES STEVENS
Burlington, North Dakota

Thompson worked very hard to get the International Boundary Commission in the 1820s to adopt an international water boundary line that followed the St. Louis River of Minnesota westward to the headwaters of the Mississippi River near present-day Bemidji, Minnesota. From here the boundary would have stretched straight across the continent to the Pacific. If the British government had been more supportive of Thompson's proposal, the northern U.S. border states would each have been trimmed by approximately a hundred miles.

MERV AHRENS
Devlin, Ontario

I disagree with the author that Canada does not celebrate its heroes. It is true that we have had no Davy Crockett or Lewis and Clark, but we still take pride in the founders of our country. Schools named after our history's finest people, special anniversaries, and famous landmarks all prove that we Canadians recognize our country's heroes.

DEEPAK SETHI
Toronto, Ontario

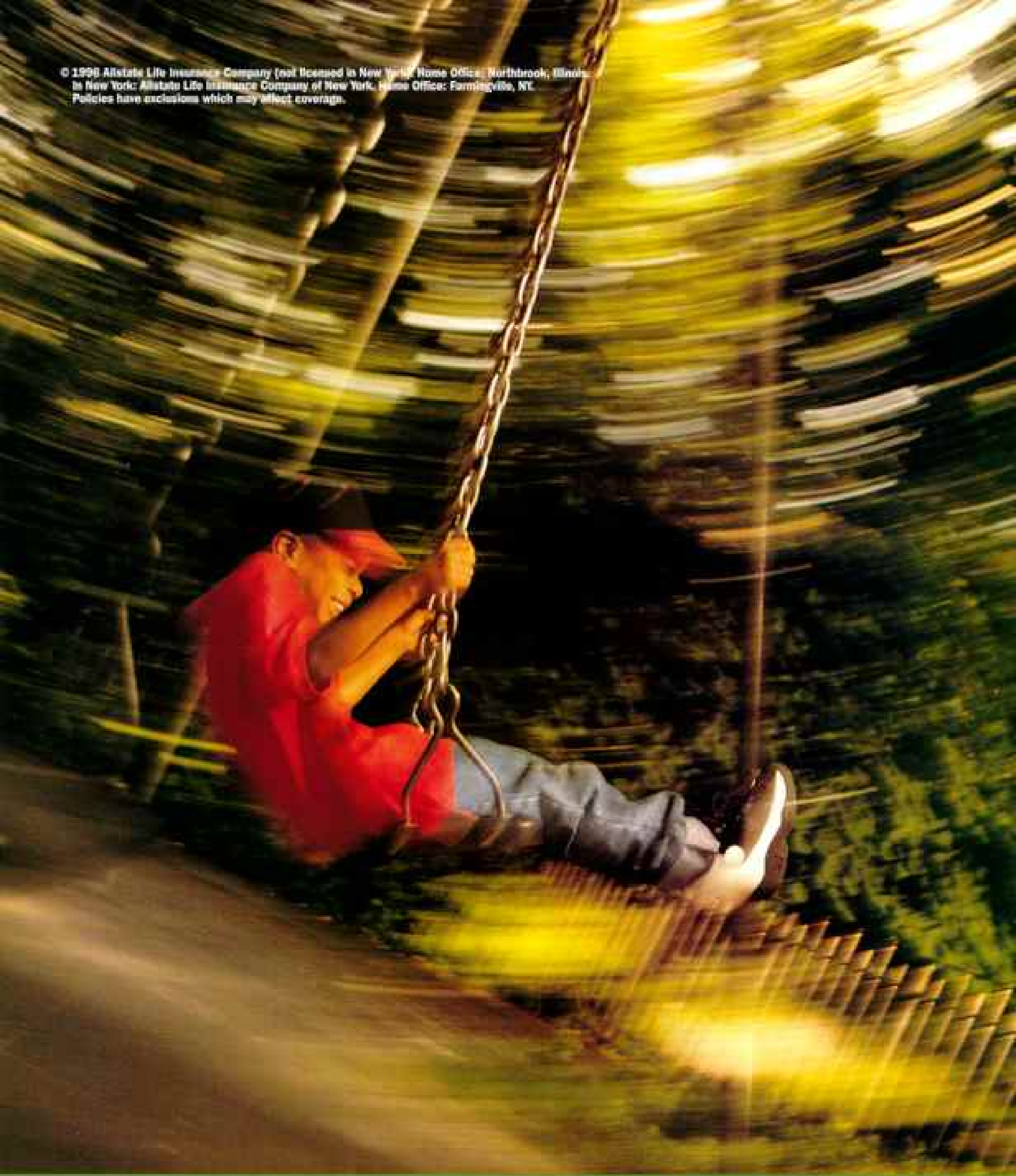
Research and Exploration

In the April 1996 article on the Society's Committee for Research and Exploration, Paul Sereno is shown on page 112 as the discoverer of the primitive dinosaur *Herrerasaurus* in northwestern Argentina. It was actually discovered by teams from the National University of Tucumán, Argentina, and the description of the species was published in 1963. As a paleontologist with the university, I helped excavate an articulated specimen that became the holotype of the species and is now exhibited in the Museum of the Faculty of Natural Sciences in Tucumán. What Sereno found in 1988 were five partial skeletons of *Herrerasaurus*. Ignoring the accomplishments of local scientists is very painful.

JOSÉ F. BONAPARTE
Head, Division of Vertebrate Paleontology
Argentine Museum of Natural Sciences
Buenos Aires, Argentina

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 Internet to ngsforum@nationalgeographic.com. Include name, address, and daytime telephone. Letters may be edited for clarity and space.

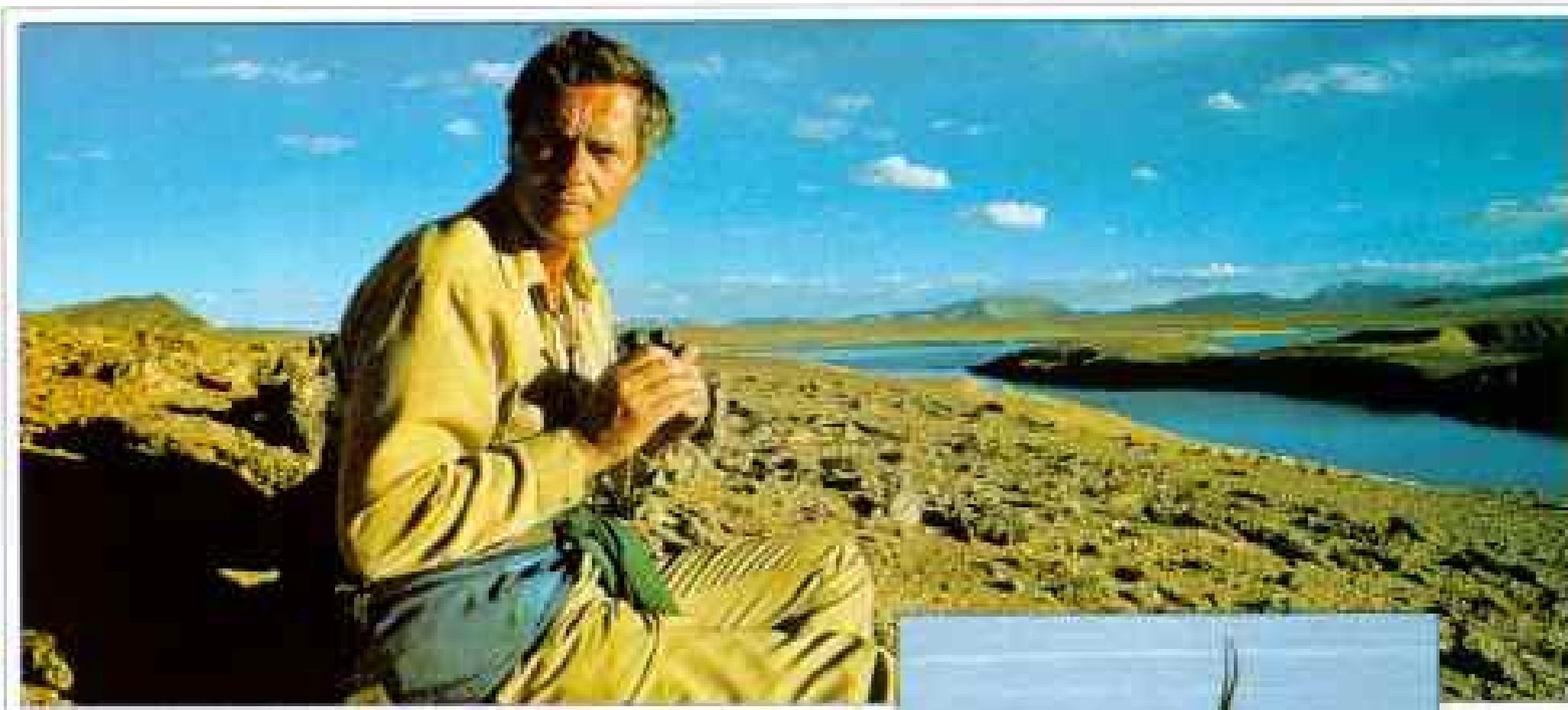
© 1998 Allstate Life Insurance Company (not licensed in New York). Home Office: Northbrook, Illinois.
In New York: Allstate Life Insurance Company of New York. Home Office: Farmingville, NY.
Policies have exclusions which may affect coverage.



Livion's mom is gone, but she's still pushing. Marion Byam made everyone in her family believe they could achieve their dreams. Nothing should stop them. Ever. Now that she's gone, they still feel her strength behind them. Because when Marion and her husband shared their plans for the future with their Allstate Agent, Felix Maisonet, he reminded them that moms need life insurance, too. Good advice. So for Livion and his brothers, there's no limit to how high their dreams can fly. For the Byam family — **Being in good hands is the only place to be.**

"I knew Marion Byam. She was a strong, focused woman. I can see her hand in the way Livion is growing up." — Felix Maisonet. Visit Allstate at www.allstate.com

Allstate
LIFE INSURANCE



Dr. Schaller on the Tibetan plateau at 12000 ft.

Tibetan antelope



Chang Tang—the name means northern plain in Tibetan—is high, austere, and largely unexplored. Rolling away to the horizon, its immensity is broken only by snowcapped ranges. Vegetation is scant, with neither shrubs nor trees to break the expanse. Just a few nomadic herdsman inhabit the fringes.

Wolves still prowl the plains and snow leopards stalk their prey among the crags; wild yaks forage on the hillsides and herds of Tibetan antelopes migrate over unknown paths. This is a landscape untouched by civilization, virtually the same today as it was over a hundred years ago.



Site of the Chang Tang Reserve in the Tibet Autonomous Region.

George Schaller, science director of International Programs for the Wildlife Conservation Society, has spent four

“We have the chance to save one of the last unspoiled ecosystems on our planet.”

George Schaller

decades in wild and rugged places, studying wildlife, and fighting for its survival. And now Schaller and his Chinese and Tibetan colleagues have helped establish a huge reserve the size of Arizona in the Chang Tang. There, Tibet's last great herds can roam free and the nomads can maintain their traditional culture. Schaller explains, “If we don't protect the Chang Tang now, the magnificent species found here could soon vanish forever.”

Under such harsh and remote conditions, the right equipment is not only important, it's imperative. Which is why George Schaller wears a rugged Rolex Oyster Perpetual timepiece.



ROLEX

Rolex Oyster Perpetual Explorer in stainless steel with matching Oyster bracelet.
Write for brochure: Rolex Watch U.S.A., Inc., Dept. 309, Rolex Building, 663 Fifth Avenue, New York, N.Y. 10022-5389.
Rolex, Oyster Perpetual, Explorer and Oyster are trademarks.

Geographica



A New Way to Fly, and Fly, and . . .

WINGING IT under the sun's power but controlled from the ground, NASA's prototype aircraft called Pathfinder soars toward its goal: to prove the feasibility of "eternal flight." Keeping a plane aloft for months could help monitor environmental change.

The all-wing pilotless craft, made of graphite epoxy and foam covered by Mylar, has a 98.6-foot wingspan and weighs a trim 486 pounds. It set an altitude record for a solar-powered flight of 50,500 feet during an 11-hour test conducted last year at Dryden Flight Research Center in Edwards, California. This month it

is to make its first 1996 flights there, then go to Hawaii, where NASA expects it to reach 70,000 feet next summer. The agency hopes to keep a larger craft airborne for two to three months by the year 2001. That goal depends on improving the ability to store the solar energy needed to power motors at night.

"Such a plane could measure solar radiation, monitor flood damage and storm tracks, or signal changes in cloud formation over the Antarctic," says Jennifer Baer-Riedhart, manager of NASA's Environmental Research and Aircraft Sensor Technology Program.

JAMES R. SHANK



FRANS DE WAAL

A Disabled Monkey Wins Affection, Care

AZALEA WAS SLOW and hesitant from birth. She was uncoordinated and a clumsy groomer and would inappropriately pick fights with powerful neighbors.

Yet her mother never rejected her, an older sister gave her extra attention (left), and other rhesus monkeys in her social group at the Wisconsin Regional Primate Research Center showed no hostility toward her.

Tests showed that Azalea carried an extra chromosome,

which in humans can cause mental retardation, says Frans de Waal of Emory University. He believes the mother's advanced age, 22 years at the time of Azalea's birth, played a role in causing the condition.

To de Waal the most striking thing about Azalea's life was that she became part of her group's social structure, even though she behaved awkwardly, "as if they knew she wasn't normal." At 32 months Azalea suffered a seizure, became totally debilitated, and was put to sleep.

As Seen On



Don't miss this and other dramatic stories of the all-new Mercury Tracer on the radio.

THE ALL-NEW 1997 MERCURY TRACER.
THE SMALL CAR THAT THINKS BIG.

On Radio



or dial 1 800 456-3729 or visit our web site @ <http://www.Mercuryvehicles.com>



Mercury 

IMAGINE YOURSELF
IN A MERCURY

Starting At
\$11,560*
Fully Equipped \$12,920*

*MSRP '97 Tracer GS. **MSRP '97 Tracer LS w/PEP 541A. Tax, title costs.



Shark Mother: Sextuplets Times 50!

THE WORLD'S LARGEST FISH, the whale shark (*Rhincodon typus*) rarely reveals its secrets. Even how it is born, marine biologist Eugenie Clark wrote in the December 1992 *GEOGRAPHIC*, is "a mystery that remains unsolved."

No longer. Last year a team of scientists headed by Clark and Che-Tsung Chen of the National Taiwan Ocean University examined a 35-foot-long female (left) harpooned by a Taiwanese fisherman. In twin uteruses they found an astonishing 300 embryos from 16 to 25 inches long (below),

proof that whale shark embryos emerge from egg cases within the body. (Earlier an embryo taken from an egg case in the Gulf of Mexico had suggested that the fish hatched from eggs outside the mother's body.) Fifteen of the embryos were alive and about to be born; one survives in an aquarium in Japan.

The 300 embryos "far exceed the largest number reported for any shark," Clark says. Yet this fish was "not large as female whale sharks go" and probably was young; larger females likely carry even more offspring.



BOTH BY BEN-HUNG CHEN

Lake Yields Redcoats' Guns, Shot, and Rum

THE DISCOVERIES are mementos of a turning point in the American Revolution.

British troops, buoyed by their success in seizing a rebel fort at Mount Independence in Vermont and Fort Ticonderoga in New York, confronted the Americans near Saratoga, New York, in September 1777. Routed, the British retreated north and crossed Lake Champlain on a 1,800-foot-long floating bridge built by the rebels, dumping weaponry and provisions into the lake. They

burned the bridge before high-tailing it to Canada.

Divers from Vermont's Lake Champlain Maritime Museum have recovered more than a thousand items discarded in that retreat. Chief among them: this



ADAM FOXE HEDDER

cannon, cast in 1676 for the English Navy and probably sent to the Colonies for use during the French and Indian War.

The divers also located 21 of 22 caissons the Americans had built for a permanent bridge

span. The British capture of the two forts had cut short that plan.

"We found remnants of the bridge in the early 1980s, but only recently have we been able to bring up items," says Art Cohn, the museum's director. The cannon, ammunition, shovels, and wine and rum bottles are now displayed in a new visitors center in Orwell, Vermont.

—BORIS WEINTRAUB

INTRODUCING
PRESCRIPTION SPORANOX,
THE NEW TREATMENT
THAT COULD...

KICK
TOENAIL FUNGUS.



TOENAIL WITH FUNGUS.

IF YOU THINK YOU HAVE TOENAIL
FUNGUS, ASK YOUR DOCTOR OR
CALL 1-800-595-NAILS.

Take **SPORANOX** treatment orally for just 3 months and you may see a visible difference.

Soon after you stop taking **SPORANOX**, you may notice that the new nail growing in appears normal. Since nails need time to grow, you should expect it to be several months before healthy, new nails grow in.

So, now you can give thick, yellowing, brittle nails the boot and start growing fresh, new nails!

Ask your doctor or other healthcare professional about prescribing **SPORANOX** today.
For more information, call

1-800-595-NAILS ext. 194

What you should know about the safety of **SPORANOX**: **SPORANOX** has been well tolerated in patients. In clinical trials involving patients with thick, hard, yellowish, and/or brittle nails (onychomycosis), the following adverse effects led to either a temporary or a permanent discontinuation of treatment: elevated liver enzymes (4%), gastrointestinal disorders (4%), and rash (3%).

WARNING: **SPORANOX** must not be taken with terfenadine (Seldane®), astemizole (Hismanal®), cisapride (Propulsid®), or oral triazolam (Halcion®).

In rare instances, there were reports of elevated liver enzymes and hepatitis. (If clinical signs and symptoms consistent with liver disease develop, **SPORANOX** should be discontinued.) If you're pregnant or considering pregnancy, you should not take **SPORANOX**. Take **SPORANOX** only as directed by your doctor, and report any adverse effects to your doctor as soon as possible.

world leader in antifungal research
JANSSEN
Titusville, NJ 08847-0300

© Janssen Pharmaceutica Inc. 1996
JPI-SP-104-1, May 1996 Printed in U.S.A.

NOW **sporanox**[®] 100 mg
(itraconazole capsules)

PLEASE SEE IMPORTANT PRECAUTIONARY INFORMATION ON ADJACENT PAGE.

100 mg sporanox® (itraconazole capsules)

Before prescribing, please consult complete prescribing information of which the following is a brief summary.

WARNING: Concomitant administration of itraconazole with tricyclic antidepressants is contraindicated. Serious cardiovascular adverse events, including death, ventricular tachycardia, and torsades de pointes have occurred in patients taking itraconazole concomitantly with tricyclic antidepressants. This is due to elevated itraconazole concentrations caused by tricyclic antidepressants. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

Another oral azole antifungal, voriconazole, inhibits the metabolism of astemizole, resulting in elevated plasma concentrations of astemizole and its active metabolite desmethylastemizole, which may prolong QT intervals. Based on results of an *in vitro* study and the chemical resemblance of itraconazole and voriconazole, concomitant administration of itraconazole and astemizole is contraindicated. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

Concomitant administration of cisapride with itraconazole is contraindicated. Serious cardiovascular adverse events including death, ventricular tachycardia, and torsades de pointes have occurred in patients taking itraconazole concomitantly with cisapride. See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS sections.

INDICATIONS AND USAGE

SPORANOX (itraconazole capsules) is indicated for the treatment of the following fungal infections in immunocompetent and non-immunocompetent patients:

1. Blastomycosis, pulmonary and extrapulmonary.
2. Histoplasmosis, including chronic cutaneous pulmonary disease and disseminated, non meningeal histoplasmosis.
3. Aspergillus, pulmonary and extrapulmonary, in patients who are resistant to or who are intolerant to amphotericin B therapy; and
4. Onychomycosis due to dermatophytes (true onychomycosis) of the toenail with or without fungal involvement.

CONTRAINDICATIONS

Concomitant administration of itraconazole or capsules with SPORANOX (itraconazole capsules) is contraindicated. (See BOX WARNING, WARNINGS, and PRECAUTIONS sections.)

Concomitant administration of SPORANOX with oral miconazole or with oral miconazole is contraindicated. (See PRECAUTIONS section.)

SPORANOX should not be administered for the treatment of onychomycosis in pregnant patients or to women contemplating pregnancy.

SPORANOX is contraindicated in patients who have shown hypersensitivity to the drug or its excipients. There is no information regarding cross-hypersensitivity between itraconazole and other azole antifungal agents. Caution should be used in prescribing SPORANOX to patients with hypersensitivity to other azoles.

WARNINGS

In U.S. clinical trials prior to marketing, there have been three cases of reversible idiosyncratic hepatitis reported among more than 240 patients taking SPORANOX (itraconazole capsules). One patient outside the U.S. developed fulminant hepatitis and died during SPORANOX administration. Since this patient was on multiple medications, the causal association with SPORANOX is uncertain. If clinical signs and symptoms consistent with liver disease develop that may be attributable to itraconazole, SPORANOX should be discontinued.

Prior to U.S. marketing, there have been three cases of life-threatening cardiac dysrhythmias and one death reported in patients receiving itraconazole and itraconazole. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

Concomitant administration of astemizole with SPORANOX is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

Concomitant administration of oral ketoconazole with cisapride has resulted in markedly elevated cisapride plasma concentrations, prolonged QT intervals, and has rarely been associated with ventricular arrhythmias and torsades de pointes. One is noted *in vitro* inhibition of the hepatic enzyme system mainly responsible for the metabolism of cisapride hydrochloride (P450 3A4). Itraconazole is also reported to markedly raise cisapride plasma concentrations; therefore, concomitant use of cisapride with SPORANOX is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and PRECAUTIONS sections.)

PRECAUTIONS

General: Hepatic enzyme test values should be monitored in patients with preexisting hepatic function abnormalities. Hepatic enzyme test values should be monitored periodically in all patients receiving continuous treatment for more than one month or at any time a patient develops signs or symptoms suggestive of liver dysfunction.

SPORANOX (itraconazole capsules) should be administered after a full meal.

Under fasted conditions, itraconazole absorption was decreased in the presence of decreased gastric acidity. The absorption of itraconazole may be decreased with the concomitant administration of antacids or gastric acid secretion suppressants. Studies conducted under fasted conditions demonstrated that administration with 1 capsule of a *in vivo* beverage resulted in increased absorption of itraconazole in AIDS patients with relative or absolute achylia. This increase relative to the effects of a full meal is unknown.

Interactions for adults: Patients should be instructed to take SPORANOX with a full meal.

Patients should be instructed to report any signs and symptoms that may suggest liver dysfunction so that the appropriate laboratory testing can be done. Such signs and symptoms may include unusual fatigue, anorexia, nausea and/or vomiting, weakness, dark urine or pale stool.

Drug interactions: Both itraconazole and its major metabolite, hydroitraconazole, are inhibitors of the cytochrome P450 3A4 enzyme system. Concomitant use of SPORANOX and drugs primarily metabolized by the cytochrome P450 3A4 enzyme system may result in increased plasma concentrations of the drugs that could increase or prolong both therapeutic and adverse effects. Therefore, unless otherwise specified, appropriate dosage adjustments may be necessary.

Concomitant administration of itraconazole with SPORANOX has led to elevated plasma concentrations of itraconazole, resulting in rare instances of life-threatening cardiac dysrhythmias and one death. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Another oral azole antifungal, voriconazole, inhibits the metabolism of astemizole, resulting in elevated plasma concentrations of astemizole and its active metabolite desmethylastemizole which may prolong QT intervals. *In vitro* data suggest that itraconazole, when compared to voriconazole, has a low pronounced effect on the biotransformation system responsible for the metabolism of astemizole. Based on the chemical similarities of itraconazole and voriconazole, concomitant administration of itraconazole with astemizole is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Human pharmacokinetics data indicate that oral ketoconazole merely inhibits the metabolism of cisapride resulting in an eight-fold increase in the mean AUC of cisapride. Data suggest that concomitant use of oral ketoconazole and cisapride can result in prolongation of the QT interval or the ECG. *In vitro* data suggest that itraconazole also markedly inhibits the biotransformation system mainly responsible for the metabolism of cisapride; therefore concomitant administration of SPORANOX with cisapride is contraindicated. (See BOX WARNING, CONTRAINDICATIONS, and WARNINGS sections.)

Concomitant administration of SPORANOX with oral miconazole or miconazole has resulted in elevated plasma concentrations of the latter two drugs. This may potentiate and prolong hypnotic and sedative effects. These agents should not be used in patients treated with SPORANOX. If miconazole is administered parenterally, special precaution is required since the relative effect may be prolonged. (See CONTRAINDICATIONS section.)

Concomitant administration of SPORANOX and cyclosporine, tacrolimus or digoxin has led to increased plasma concentrations of the latter three drugs. Cyclosporine, tacrolimus and digoxin concentrations should be monitored at the initiation of SPORANOX therapy and frequently thereafter, and the dose of these three drug products adjusted appropriately.

There have been rare reports of thrombocytopenia involving renal transplant patients receiving the combination of SPORANOX, cyclosporine, and the HMG-CoA reductase inhibitor lovastatin or simvastatin. Thrombocytopenia has been observed in patients receiving HMG-CoA reductase inhibitors administered alone at recommended dosages or concomitantly with immunosuppressive drugs including cyclosporine.

When SPORANOX was administered with phenytoin, phenylephrine, or 11, analogues, reduced plasma concentrations of itraconazole were reported. The physician is advised to monitor the plasma concentrations of itraconazole when any of these drugs is taken concurrently, and to increase the dose of SPORANOX if necessary. Although no studies have been conducted, concomitant administration of SPORANOX and phenytoin may alter the metabolism of phenytoin; therefore, plasma concentrations of phenytoin should also be monitored when it is given concurrently with SPORANOX.

It has been reported that SPORANOX reduces the anti-coagulant effect of coumarin-like drugs. Therefore, prothrombin time should be carefully monitored in patients receiving SPORANOX and coumarin-like drug simultaneously.

Plasma concentrations of azole antifungal agents are reduced when given concurrently with zidovudine. Itraconazole plasma concentrations should be monitored when SPORANOX and zidovudine are administered.

Severe hypoglycemia has been reported in patients concomitantly receiving azole antifungal agents and oral hypoglycemic agents. Blood glucose concentrations should be carefully monitored when SPORANOX and oral

hypoglycemic agents are administered.

Dizziness and decreased hearing have been reported in patients concomitantly receiving SPORANOX and gentamicin. Edema has been reported in patients concomitantly receiving SPORANOX and 4-thiopyridine calcium channel blockers. Appropriate dosage adjustments may be necessary.

The results from a study in which eight HIV-infected individuals were treated with itraconazole, 2 x 100 mg/kg/day, showed that the pharmacokinetics of itraconazole were not affected during concomitant administration of SPORANOX, 100 mg b.i.d.

Cardiogenic, Myogenic and Dependent Arrhythmias: Itraconazole showed no evidence of cardiogenic potential in mice treated orally for 20 months at dosage levels up to 40 mg/kg/day (approximately 10x the maximum recommended human dose (MRHD)). Male rats treated with 20 mg/kg/day (1x MRHD) had a slightly increased incidence of ventricular arrhythmias. These increases may have been a consequence of hypercholesterolemia, which is a response of rats, but not dogs or humans, to chronic itraconazole administration. Female rats treated with 20 mg/kg/day (1.25x MRHD) had an increased incidence of squamous cell carcinoma of the lung (C/O) as compared to the untreated group. Although the occurrence of squamous cell carcinoma in the lung is extremely uncommon in untreated rats, the increase in this study was not statistically significant.

Itraconazole produced no mutagenic effects when assayed in appropriate bacterial, *in vitro* mammalian and mammalian test systems.

Itraconazole did not affect the fertility of male or female rats treated orally with dosage levels up to 40 mg/kg/day (1x MRHD) even though parental toxicity was present at this dosage level. Male wistar rats of parental toxicity, including death, were present in the next higher dosage level, 80 mg/kg/day (2x MRHD).

Toxicology: Teratogenic Effects, Pregnancy Category C: Itraconazole was found to cause a dose-related increase in maternal toxicity, embryotoxicity and fetotoxicity at oral dosage levels of approximately 40 mg/kg/day (5.25x MRHD) and at oral dosage levels of approximately 80 mg/kg/day (10x MRHD). In rats, the teratogenicity consisted of major skeletal defects in mice (consisted of overpenetration and/or macrophilia).

There are no studies in pregnant women. SPORANOX should be used for the treatment of systemic fungal infections in pregnancy only if the benefit outweighs the potential risk. SPORANOX should not be administered for the treatment of onychomycosis in pregnant patients or to women contemplating pregnancy. SPORANOX should not be administered to women of child-bearing potential for the treatment of onychomycosis unless they are taking effective measures to prevent pregnancy and the patient begins therapy on the second or third day of the next normal menstrual period. Effective contraception should be continued throughout SPORANOX therapy and for 2 months following treatment.

Lactation: Itraconazole is excreted in human milk; therefore, SPORANOX should not be administered to nursing women.

Children: The efficacy and safety of SPORANOX have not been established in pediatric patients. No pharmacokinetic data are available in children. A small number of patients age 7 to 16 years have been treated with 100 mg/day of itraconazole for systemic fungal infections and no serious unexpected adverse effects have been reported.

In three toxicology studies using rats, itraconazole induced bone defects at dosage levels as low as 20 mg/kg/day (2.5x MRHD). The induced defects included reduced bone plate activity, spacing of the main components of the long bones and increased bone fragility. At a dosage level of 40 mg/kg/day (5x MRHD) over one year or 80 mg/kg/day (10x MRHD) for six months, itraconazole induced small tooth pulp with hypoplasia appearance in some rats.

While no such bone toxicity has been reported in adult patients, the long term effect of itraconazole in pediatric patients is unknown.

QT Interval Prolongation: Because hypochloremia has been reported in HIV-infected individuals, the absorption of itraconazole in these patients may be decreased.

The results from a study in which eight HIV-infected individuals were treated with itraconazole, 2 x 100 mg/kg/day, showed that the pharmacokinetics of itraconazole were not affected during concomitant administration of SPORANOX, 100 mg b.i.d.

ADVERSE REACTIONS

In U.S. clinical trials prior to marketing, there have been three cases of reversible idiosyncratic hepatitis reported among more than 200 patients. One patient outside the U.S. developed fulminant hepatitis and died during SPORANOX (itraconazole capsules) administration. Because this patient was on multiple medications, the causal association with SPORANOX is uncertain. (See WARNING section.)

ONCHOMYCOSIS

Adverse events in the following table led to either temporary or permanent discontinuation of treatment:

Body System/Adverse Event	Incidence (%) n=112
Elevated Liver Enzymes 1-5x normal range	41
Gastrointestinal Disorders	43
Fatigue	26
Hypertension	22
Orbital Hypertension	19
Headache	19
Nausea	19
Myalgia	19
Yeastitis	15
Vitigo	15

SYSTEMIC FUNGAL INFECTIONS

Adverse experience data in the following table are derived from 602 patients treated for systemic fungal disease in U.S. clinical trials, who were immunocompetent or receiving multiple concomitant medications. Of these patients, treatment was discontinued in 10.7% of patients due to adverse events. The median duration before discontinuation of therapy was 6 days, with a range of 2-75 days. The table lists adverse events reported by at least 1% of patients.

Body System/Adverse Event	Incidence (%)	Body System/Adverse Event	Incidence (%)
Gastrointestinal Disorders		Psychiatric Disorders	
Nausea	10.6	Likelihood decreased	1.2
Vomiting	5.5	Serum sickness	1.2
Diarrhea	3.3	Cardiovascular Disorders	
Abdominal Pain	1.5	Hypertension	3.2
Anorexia	1.2	Metabolic and Nutritional	
Body as a Whole		Dehydration	
Edema	1.5	Hypokalemia	2.0
Fatigue	2.8	Lymphatic System Disorders	
Fever	2.1	Albuminuria	1.2
Malaise	1.2	Lower and Biliary System	
Skin and Appendages		Diarrhea	
Rash	8.4	Hepatic function abnormal	2.7
Pruritus	2.5	Reproductive Disorders, Male	
Genital and Perineal		Impotence	1.2
Nervous System			
Headache	1.8		
Dizziness	1.7		

*Based on data in our most frequently in immunocompetent patients receiving immunosuppressive medications.

Adverse events infrequently reported in all studies included constipation, gastritis, depression, weakness, tremor, menstrual disorders, adrenal insufficiency, gynecostoma and nasal bridge pain.

In worldwide postmarketing experience with SPORANOX, allergic reactions including rash, pruritus, urticaria, angioedema and in rare instances, anaphylaxis and Stevens-Johnson syndrome, have been reported. Marketing experiences have also included reports of elevated liver enzymes and rare hepatitis. Although the causal association with SPORANOX is uncertain, rare hypereosinophilia and related cases of neuropathy have also been reported.

OVERDOSAGE

Itraconazole is not removed by dialysis. In the event of accidental overdosage, supportive measures, including gastric lavage with sodium bicarbonate, should be employed.

No significant lethality was observed when itraconazole was administered orally to mice and rats at dosage levels of 20 mg/kg or to dogs at 20 mg/kg.

U.S. Patent Nos. 4,822,278

Rev. April 1995, September 1997

World leader in antifungal medicine



TORONTO, ONTARIO M2H 3G2

TAMAN NEGARA

Venture Into The World's
Oldest Rainforest And Discover A
Whole New World



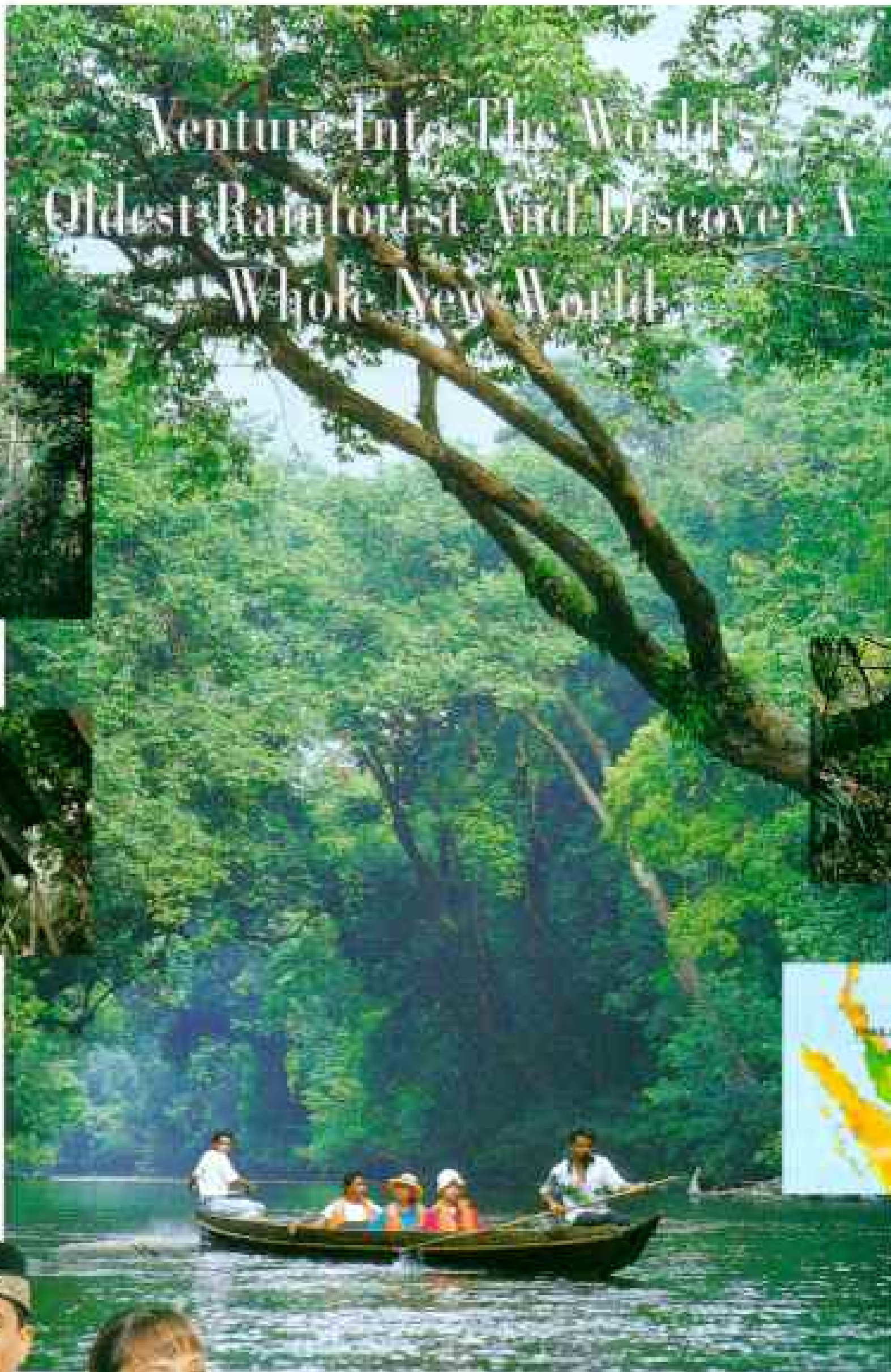
Over 25 metres in the air and
over 400 metres long, it's
up for the best (or not)



Catch a glimpse of the many
species of animals from
observation hides



The road to adventure depends
on the path you choose

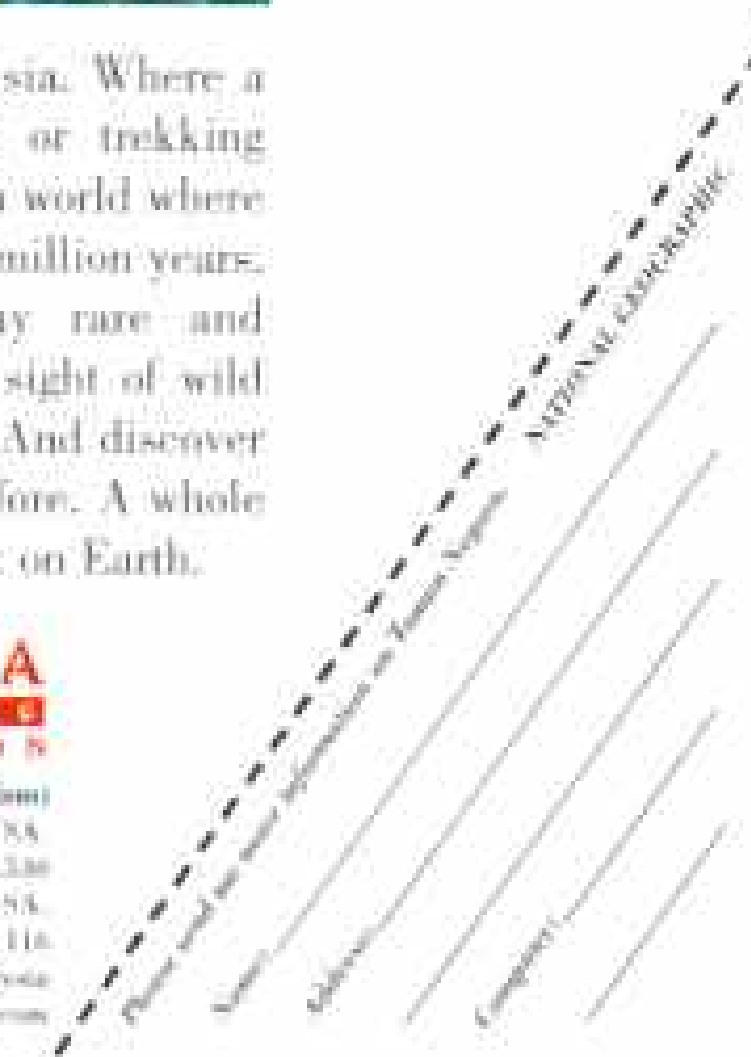


Taman Negara, the National Park of Malaysia. Where a ride upriver, through white water rapids or trekking through the rainforest means stepping into a world where nothing much has changed for the last 130 million years. A protected forest reserve where many rare and endangered species are still found. Catch sight of wild animals from an elevated observation hide. And discover exotic blooms you've never laid eyes on before. A whole new world awaits you in the oldest rainforest on Earth.

TOURISM
MALAYSIA

MALAYSIA
FASCINATING
DESTINATION

Malaysia Tourism Promotion Board (Ministry of Culture, Arts & Tourism)
812, Suite 804, West 7th Street, Los Angeles, CA 90017, USA
Tel: 212-609-9502 Fax: 212-609-1330
201, Madison Avenue, Suite 1800, New York, NY 10022, USA
Tel: 212-754-1119/5, 212-754-1112(DE) Fax: 212-754-1116
Web Site: <http://www.tourknowledge.com/malaysia>
E-Mail: MTT@NYClima.net mtt@ny.com



All their shots

IMMUNIZE EVERY CHILD BY TWO

while they're tots

Join your local Kiwanis Club in seeing that children in your community get "all their shots, while they're tots".



Over eighty years
of community service.

AUTHORS WANTED

A well-known New York subsidy book publisher is searching for manuscripts. Fiction, non-fiction, poetry, juvenile, travel, scientific, specialized and even controversial subjects will be considered. If you have a book-length manuscript ready for publication (or are still working on it), and would like more information and a free 32-page booklet, please write:

VANTAGE PRESS, Dept. NA
516 W 34th St., New York, NY 10001

Hearing or Speech Loss?

these people received help, so can you

To request the free catalog or additional information about The Council for Better Hearing & Speech Month contact:

BH&SM
One Prince Street
Alexandria, VA 22314
1-800-327-9355 (V/TTY)



1996 Child
of the Year,
Sarah Churchill
&
Former
President,
Ronald Reagan



Attention Web Surfers: One Lump or Two?

Come surf the Net, send an e-mail, and take a gulp of National Geographic's fresh-brewed Web site at the Society's CyberCafe. It's a bottomless cup of online adventure—even real National Geographic expeditions—along with expert information on travel and photography, all sweetened with glorious Geographic photographs and maps. Hot coffee and pastries are on the cafe's menu—and the Web tasting is free!

cyber
cafe



<http://www.nationalgeographic.com>

OF GO NATIONAL GEOGRAPHIC on CompuServe®

Explorers Hall, 17th & M Street, N.W., Washington, D.C.

Open 11am to 5pm daily and * til 8 pm on Thursdays through September 8.



STUDIO VOLAND + PARTNER

No problem.

On a Swissair flight you'll find the cabin crew speaks at least three languages. And it doesn't stop there. On journeys to Korea and Japan we even fly with attendants and interpreters who come from the Far East. It provides the novelty of an airline that adapts to our passengers' needs rather than the other way round. Now, have you ever heard that said anywhere else? Call us at 800 221-4750 or ask your travel agent.

swissair  world's most refreshing airline.

Partner in the Delta, Midwest Express, USAir and Air Canada frequent flyer programs.

OMEGA

OMEGA

ELLE MACPHERSON'S CHOICE

★
New Constellation



A stunning example of today's active woman, Elle Macpherson juggles a brilliant career as international super model, actress and business entrepreneur. Success naturally achieved thanks to her luminous personality, wholesome beauty and charismatic charm.

TOURNEAU

NEW YORK - GENEVA - PALM BEACH - BAL HARBOUR - COSTA MESA

SHOP-AT-HOME: 1-800-348-3332

Internet: <http://www.omega.ch>



“Grab life by the beans.”

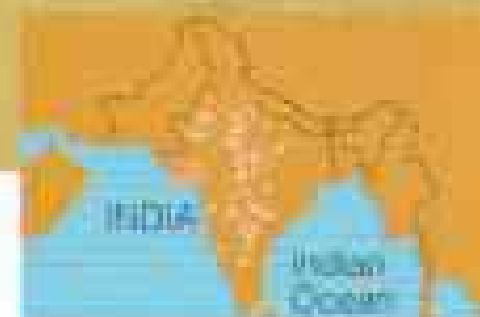
Juan Valdez



The richest coffee in the world.™



Blackbuck (*Antelope cervicapra*) **Size:** Head and body length, 100–150 cm; stands 80 cm **Weight:** Approx. 40 kg **Habitat:** Open plains on the Indian subcontinent **Surviving number:** Estimated at 43,550
Photographed by Gertrud and Helmut Denzau



WILDLIFE AS CANON SEES IT

A herd of blackbuck stands regally amid one of the natural grasslands remaining in India. Living in herds of 20–60, blackbuck depend on keen eyesight and speed to elude predators. When pressed, these graceful animals can bound swiftly through the air at an amazing 80 km an hour. Long spiralled horns and dramatic coloration of the male rank the blackbuck as one of the most elegant of the

world's antelopes. Millions once roamed the Indian subcontinent, but today blackbuck survive only in scattered populations, having suffered drastic decline from hunting and, more recently, habitat loss. As a global corporation committed to social and environmental concerns, we join in worldwide efforts to promote greater awareness of endangered species for the benefit of future generations.

Color Laser Beam Printer
Featuring state-of-the-art 600 dpi resolution and true cantone 256 grayscale/color management, the Canon C LBP 360PS is ideal for multiplatform networking with its capability to interface simultaneously with different computer systems.



Watch "NATURE" on PBS. The project is funded in part by Canon U.S.A., Inc.

Canon

On Television



BOBB KENDRICK

■ EXPLORER, SEPT. 15, 7 P.M. ET

Sumo Cum Laude: The Biggest Champions

ELEPHANTINE DANCE precedes a day's bouts as sumo wrestlers perform the ritual *shiko* exercise, first raising one foot, then stomping it down hard. Sumo, Japan's national sport, is rooted in religious traditions going back some 1,300 years. In "Sumo: Dance of the Gargantuans," T. R. Reid, former *Washington Post* bureau chief in Tokyo, examines the nuances of the martial art. He introduces stars such as U.S.-born Akebono, weighing in at 472 pounds. Viewers also meet Mainoumi, "dancing sea," who at 220 pounds relies on speed and surprise to tip the scales in his favor.



JOHN PORTIER, ANIMALS ANIMALS

■ EXPLORER, SEPT. 1, 7 P.M. ET

Time and Tide Await Exploration

WAVING THEIR "FIDDLES," two male fiddler crabs prepare to do battle at sunset (above). Survival on the shoreline, where twice a day the sea surges and ebbs, is often a matter of digging in and staying put. National Geographic EXPLORER's "Lifestyles of the Wet and Muddy" takes a

close look at the denizens of the Atlantic's barrier islands and salt marshes, animals for whom life really is—a beach.

PROGRAM GUIDE

National Geographic Specials
NBC. See local listings.

National Geographic EXPLORER
TBS. Sundays, 7 p.m. ET.

National Geographic Videos and Kids Videos
Call 1-800-343-6810.



Next time, check The Weather Channel for flood updates.

The Weather Channel® doesn't just have one or two or three meteorologists like most stations. We have 65 meteorologists using some of the most advanced weather-tracking and forecasting technology in existence. Which is why The Weather Channel can tell you more about the weather—around the world and around your neighborhood—than just about anyone else. **No place on Earth has better weather.™**



Find us on the Internet:
<http://www.weather.com>

Earth Almanac



ADRIEL WEINER

New Mine Opposed in Arizona's Copper Country

A SEA OF DISCARDED ROCKS from the Cyprus Miami Mine sprawls beneath Needle Mountain in central Arizona (above). Operating for decades in a sparsely settled area, the copper mine has not caused controversy—unlike a new mine proposed for the nearby Pinto Creek area. That proposal has generated concern among the 500 residents of Top of the World, a community adjacent to the planned 3,000-acre site.

Conservationists say scenic riparian areas and prehistoric Indian sites are at stake and have proposed that Pinto Creek be designated a national wild and scenic river. Although a mining technique would be used that recycles sulfuric acid, residents worry about leakage. Since Pinto Creek would be diverted, they are especially concerned about its maintenance after the mine closes. The project falls within U.S. Forest Service jurisdiction; a decision is pending.

They Don't Waste Beer—They Recycle It

SKIES OUT WEST may benefit from the region's hankering for beer, with a brewery's waste being turned into a gasoline additive intended to reduce winter air pollution.

Like all beermaking operations, the Coors Brewing Company's plant in Golden, Colorado, is often a-slosh with wasted beer—22 million gallons of it a year. "As a precaution, we overfill each can and bottle to get all the air out," says spokesman Jon Goldman. What to do with all that spilled beer?

Coors, an engineering firm called Merrick & Company, and a refiner, Total Petroleum, have teamed up like high-tech moonshiners. Merrick has installed new distillation equipment in the Coors plant to turn waste beer, with about a 6 percent alcohol content, into 100 percent fuel-grade ethanol. It will be used by Total Petroleum as an oxygenated additive for its gasoline to make it burn cleaner. "Colorado mandates that only oxygenated fuel be sold in winter," adds Goldman. Most ethanol used as an additive is produced from corn.



DAVID CLARK

©2005 1000. Breathe Right strips can reduce or eliminate snoring by improving nasal breathing. Breathe Right is a registered trademark of GSN, Inc.



If you really love me, you'd wear one.



You won't even know it's there. But she will. Because Breathe Right® strips can help quiet your snoring by improving your nasal breathing. And once you get used to breathing through your nose again, the less you'll get elbowed. Practice safe sleeping, wear one tonight. Look for them in cough/cold sections everywhere or your favorite sporting goods retailer. And if she doesn't hear improvement within 7-10 days, talk to a doctor.



Now For Snoring, Too.

Dune Buggies and Piping Plovers: Turning Tide

"THE COLOR OF DRY SAND," ornithologist Roger Tory Peterson calls the piping plover. The shy shorebird's camouflage makes



SCOTT HECKER, MASSACHUSETTS AUDUBON SOCIETY

it hard to see for off-road vehicle (ORV) drivers on the beach — where the birds nest. In harm's way, Atlantic coast piping plovers were classified as threatened in 1986.

Since then several states have restricted ORVs from nesting areas, such as one next to Massachusetts' Plymouth Beach (right).

The state's program has raised the number of

breeding pairs from 139 in 1986 to 441 last year; these two hatched on Cape Cod. Officials have responded to protests from ORV owners by lifting restrictions on some Massachusetts beaches. They have issued a permit that gives drivers immunity for inadvertently hitting a piping plover. The Massachusetts Audubon Society and other groups object.



CARY WOLINSKY

Eyes and Claws of a Killer Shrimp

UNDERSEA WEAPONS SYSTEMS, mantis shrimps include this five-inch-long species off Papua New Guinea. Two specialized claws, folded like knife blades, snap out in milliseconds to spear or smash fish, crabs, or rival mantis shrimps. "I had a letter from a South African surgeon who picked one up while diving. His finger was so badly mangled that it had to be amputated," says biologist Roy Caldwell of the University of California at Berkeley.

Caldwell and his colleagues are now focusing on the mantis shrimp's amazing eyes — "the most complex of any organism I know," Caldwell marvels. Its eyes have what he terms "trinocular vision," with visual receptors in separate upper and lower sections, as well as in a central band, that focus on the same point. The shrimp sees in color and can detect polarized light. Each eye can scan independently and rotate 180 degrees to home in on prey, which seldom stand a chance.



STOMATOPODA: JEFFREY SCHELLARD, DAVID BOBBLETT



ALISTAIR B. FRASER

An Eerie Forest Glow — Sylvanshine

ONE DARK SUMMER NIGHT on a British Columbia road in 1984, meteorologist Alistair B. Fraser of Pennsylvania State University was startled. Lit by his headlights, "the forest began to glow as if snow covered," he recalls. He is still studying the phenomenon, which his camera flash reveals in these blue spruce trees. He calls it sylvanshine.

The effect is an example of retroreflection, a term for light reflected directly back from its source. Reflective highway signs work the same way, as do many animals' eyes. Certain plants do too, as Fraser's work shows. The leaves or needles must be waxy and dew covered, and "the observer must look directly along the beam of light." He has seen sylvanshine in juniper, cedar, hemlock, Fraser fir, and spruce.

"Anyone with a spray bottle and a powerful flashlight can see it on rhododendrons in their backyard," he says.

—JOHN L. ELIOT

If you know where you're going,
you're more likely to arrive relaxed.



Let's make things better.

Bernd Wiege, Project Manager Car Systems,
Wetzlar, Germany



For some people, reaching their destination quickly is all that matters. At Philips, we like to go further.

My name is Bernd Wiege, project manager for CARIN navigation systems at Philips Car Systems, Wetzlar.

CARIN is already the most successful car-navigation system in Germany where I work. Our next aim is to make it compatible with cars already on the road, and bring it to other countries.

It will mean drivers arrive quickly, economically, safely as well as by the best possible route. When we achieve that, we'll look for a new destination.



PHILIPS

Your Year-Round Travel Guide



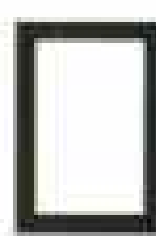
Put more ease and pleasure into your vacations with NATIONAL GEOGRAPHIC TRAVELER! In each bimonthly issue you'll visit fascinating vacation spots in the U.S.A., in Canada, and abroad. Journey to national parks, exciting cities, resorts, historic sites, and little-known places within easy reach of your budget and your home.

TRAVELER also offers you the practical travel information you need to plan the perfect trip. Turn to *TravelWise*, a special section with tips on each TRAVELER getaway, for advice on where to eat and stay, what to see and do, and much more!

Check out *Weekends* for the best ideas for short jaunts. Get advice on shooting great pictures from National Geographic's experts in *Photography*. And consult *Traveling Easy* for ways to make your travels more enjoyable.

CALL: 1-800-NGS-LINE
(1-800-647-5463),
M-F, 8 a.m.-8 p.m. ET.
TDD only: Call 1-800-548-9797.

U.S. and Canada only

 NATIONAL
GEOGRAPHIC
SOCIETY

* To receive TRAVELER magazine for one year (six bimonthly issues), please send your name, address, and remittance of US\$17.95 for the U.S., US\$24.35 for Canada (C\$33.10), or US\$25.50 for all other countries to National Geographic Society, P.O. Box 98034, Washington, D.C. 20099-8180. Add sales tax: DC, 3.75%; MT, 3%. Canadian rates include 7% GST.

To join the National Geographic Society and receive NATIONAL GEOGRAPHIC magazine for one year, please send your name, address, and remittance of US\$25.00 for the U.S., US\$29.00 for Canada (C\$39.00), or US\$37.00 for all other countries to National Geographic Society, P.O. Box 98186, Washington, D.C. 20099-8186. Add 5% sales tax for memberships sent to MD. Canadian rates include 7% GST. While all dues support the Society's mission of expanding geographic knowledge, 80% is designated for the magazine subscription, and no portion should be considered a charitable contribution.

203826



View from Lake Palace Hotel, Udaipur



Campsite overlooking the Himalayas

LEGENDARY ADVENTURES AND UNEXPECTED PLEASURES. From the mountains of the Himalayas to the beaches of the Indian Ocean, you'll discover an extraordinary world of culture and diversity. There's no adventure quite like India and no time like the present to experience it. India, a country that is truly many worlds in one. As Mark Twain once said: "Nothing seems to have been forgotten, nothing overlooked."

India

Everything you'd never expect™

Call 1-800-GO INDIA for your complimentary India Travel Guide, or write to: MSI, 25-15 50th Street, Dept. CP Woodside, NY 11377

MSI 06

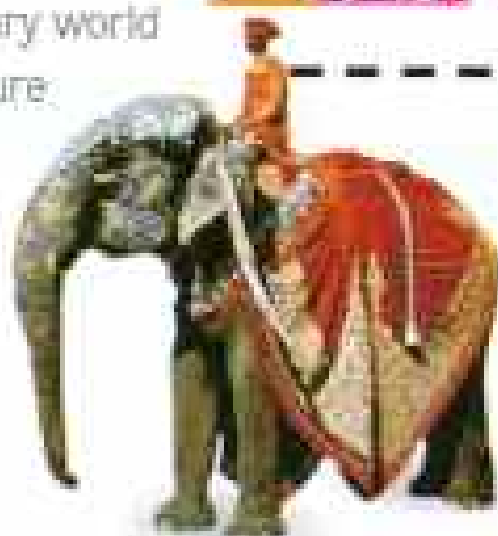
NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____



On Assignment

■ SCYTHIANS

Her Golden Opportunity

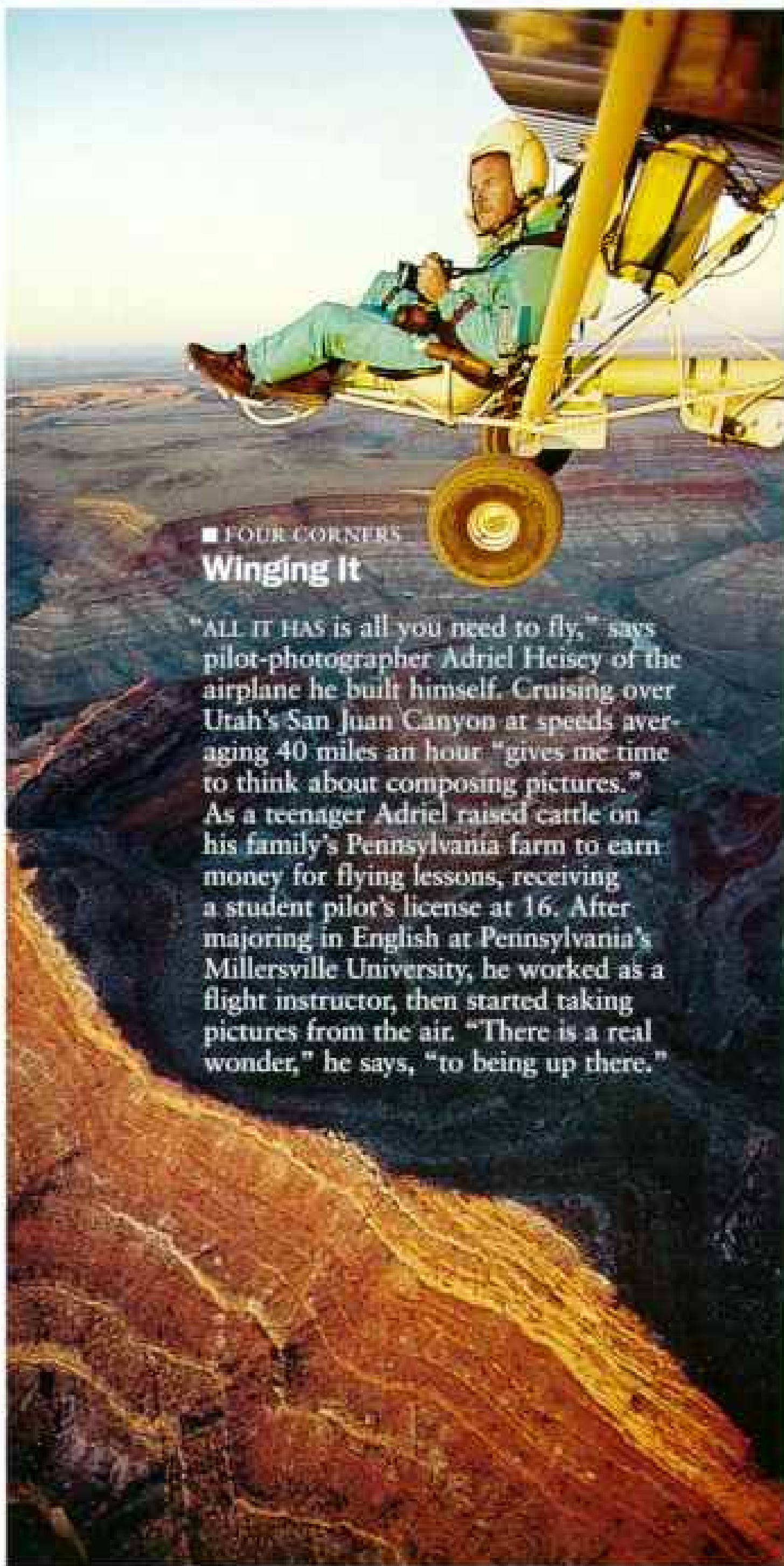
ALL-AROUND ASSISTANT for GEOGRAPHIC staff working in the former Soviet Union, Ludmila Mekertycheva had gotten used to not being followed in recent years . . . until a visit to Kiev's Ukraine Historic Treasures Museum. "Everywhere we went an official kept her eye on us and on all that gold," says Luda, who helped photographers Sisse Brimberg and Chuck O'Rear and writer



CHARLES O'REAR

Mike Edwards on the Scythians story. "When she left the room, I couldn't resist. I held up this necklace—a 3.3-pound gold pectoral from the fourth century B.C.—and begged Chuck to take my picture."

Luda grew up in Oskemen, Kazakstan, then lived in Siberia before moving to Moscow four years ago. She doesn't spend much time at home, though. In the past five years she's worked on ten of our stories. Says Luda, "I'm on the road eight months of the year for the GEOGRAPHIC."



■ FOUR CORNERS

Winging It

"ALL IT HAS is all you need to fly," says pilot-photographer Adriel Heisey of the airplane he built himself. Cruising over Utah's San Juan Canyon at speeds averaging 40 miles an hour "gives me time to think about composing pictures." As a teenager Adriel raised cattle on his family's Pennsylvania farm to earn money for flying lessons, receiving a student pilot's license at 16. After majoring in English at Pennsylvania's Millersville University, he worked as a flight instructor, then started taking pictures from the air. "There is a real wonder," he says, "to being up there."

ADRIEL HEISEY

BUYING
 quality
 PARTS
 is not a
 FOREIGN
 idea to us.

OVER THE last five years, Toyota in America has purchased more than \$20 billion in parts and materials from 510 U.S. suppliers.* Today, more than half the Toyota vehicles sold in America are built at our plants in Kentucky and California. Local investment that contributes to America's place in the global economy - it all makes good sense, in any language.



Toyota Avalon. Built in Georgetown, Kentucky.

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

*Some parts that go into our American built vehicles are purchased overseas. For more information about Toyota in America visit our web site at <http://www.toyota.com/usa/naa/naa.html> or write Toyota Motor Corporate Services, 9 West 52nd Street, Suite 4900-126, New York, NY 10019