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India

Turning Fifty

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

From the Editor

"AT THE STROKE OF THE MIDNIGHT HOUR, when the world sleeps, India will awake to life and freedom."

With these words Jawaharlal Nehru, the first prime minister of independent India, announced the arrival of a new nation, born after more than a century of British rule.

It was August 14, 1947, and NATIONAL GEOGRAPHIC's man in India, Volkmar "Kurt" Wentzel, was roaming the length and breadth of the subcontinent for a series of stories at this crucial point in history. A converted U.S. Army ambulance served as his darkroom and bunkhouse. Emblazoned with a map of India and "National Geographic Society U.S.A." in English, Urdu, and Hindi, the photo-survey vehicle caught Nehru's eye.

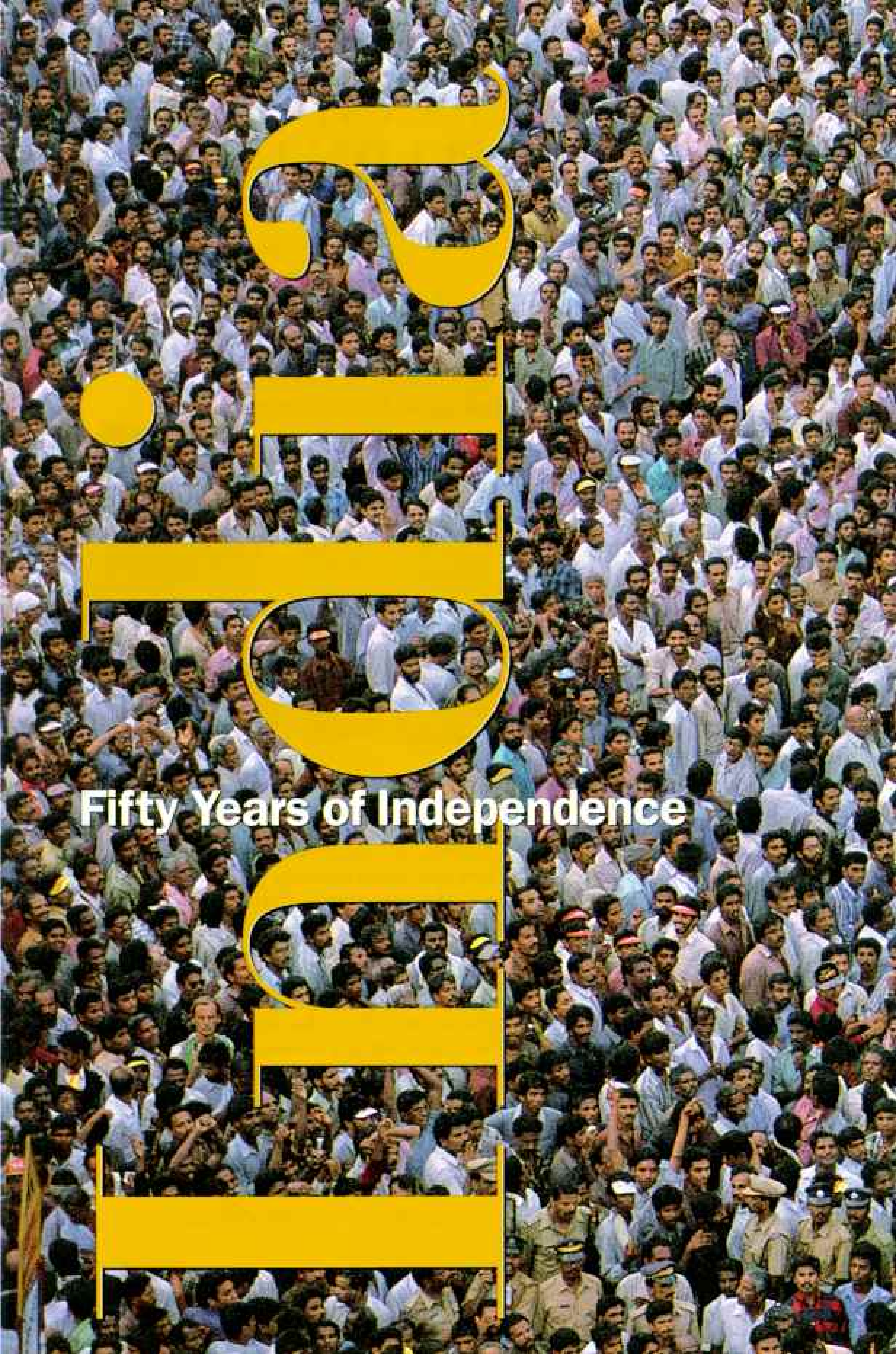
VOLKMAR WENTZEL

The Indian leader invited Wentzel to dinner, the two chatted about possible articles, and Wentzel came home with six ideas. One of those became "Delhi, Capital of a New Dominion," published in November 1947.

We return to India this month to see how this nation of nearly a billion people is getting along 50 years later. Steve McCurry, veteran freelance photographer with a dozen previous Asia assignments, traveled from the Himalaya to the sea to produce his portrait of India at 50. We asked Geoffrey C. Ward to report on New Delhi, the city of his youth, which in many ways reflects India's transformation into a modern state. Ward, a prizewinning historian and biographer of Franklin D. Roosevelt, admits that he cannot resist the pull of India. "The place can be maddening and wonderful at the same time." That keeps Ward going back to what he calls his second home.

NATIONAL GEOGRAPHIC will visit the region again soon to measure how Pakistan is faring since independence. The predominantly Muslim state, born of the British partition that created both India and Pakistan, will be the subject of an article in October.

Bill Allen


India
Fifty Years of Independence

india

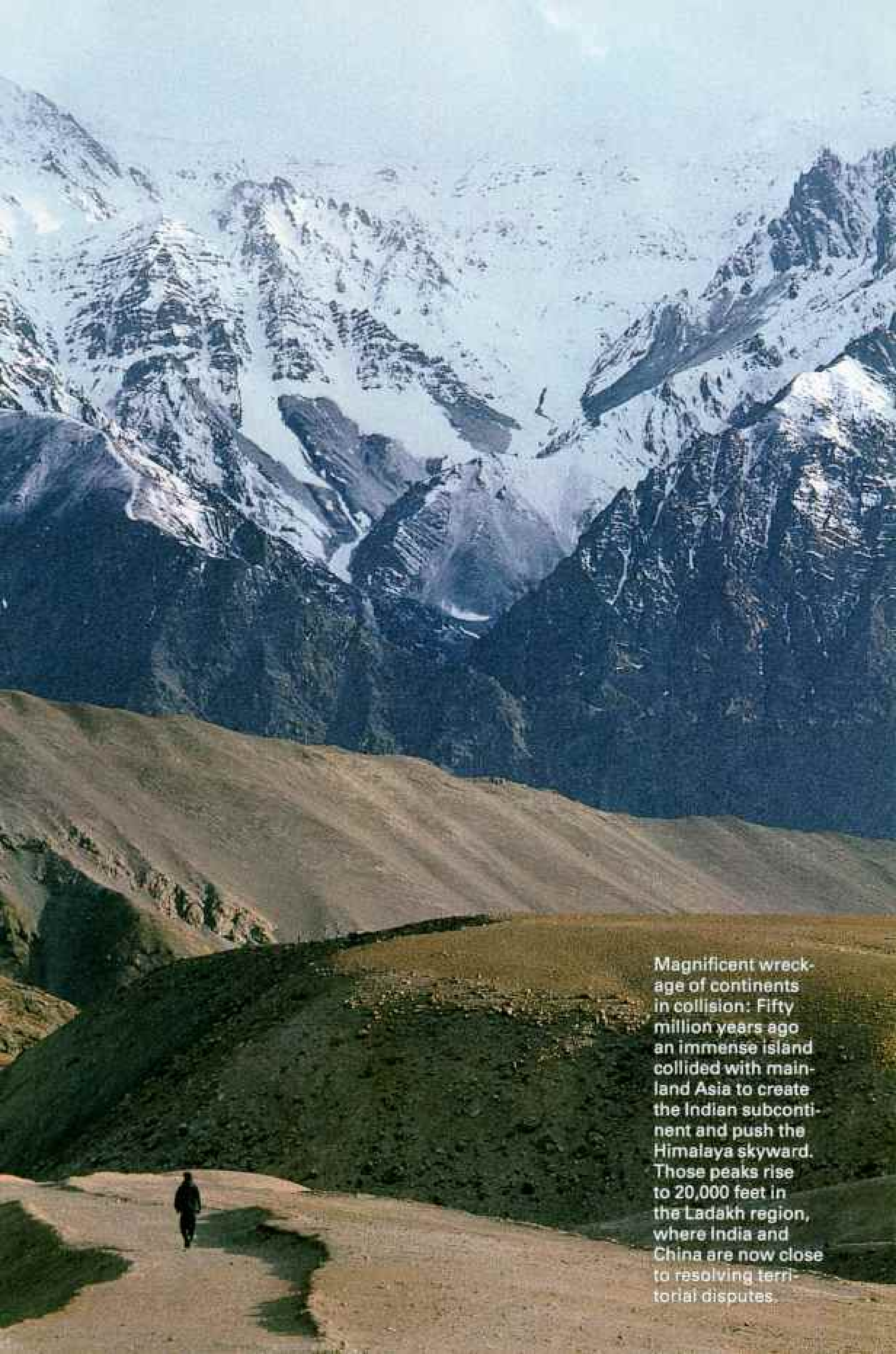
BY **GEOFFREY C. WARD**

PHOTOGRAPHS BY **STEVE McCURRY**

Stare at the underbelly of Asia and behold the Indian behemoth: 950 million people–one-sixth of the world's population–who live in a country one-third the size of the U.S., who speak more than a thousand languages and dialects, and who support more than 20 political parties in the world's biggest and perhaps boldest experiment in democracy. Five decades after gaining its independence from Britain, India still struggles to balance its political ideals with a populace that pulls this union in profoundly different directions.

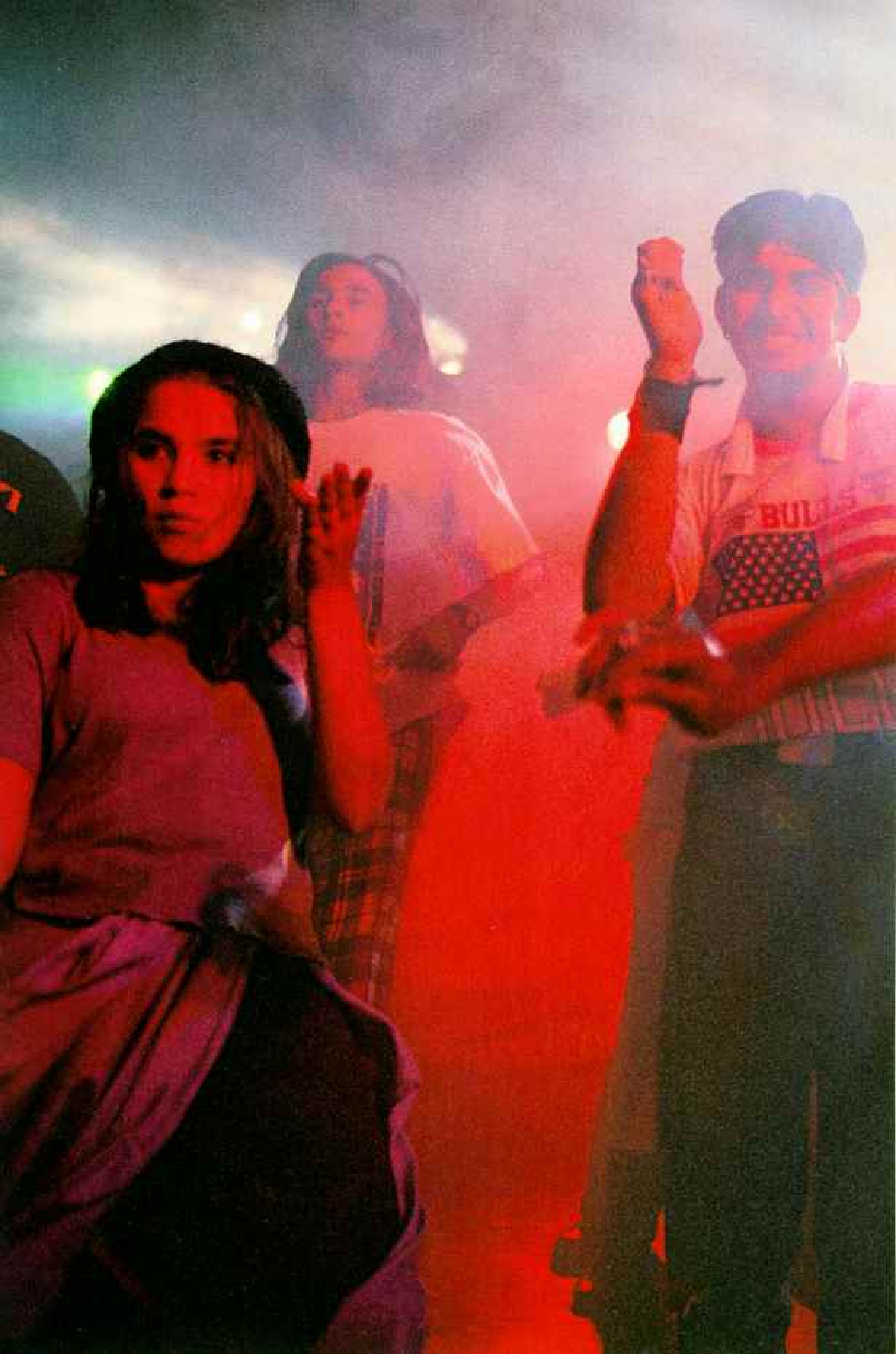
HUNDREDS OF THOUSANDS OF HINDUS CONVERGE FOR TRICHUR POORAM, AN ANNUAL FESTIVAL IN KERALA STATE (OVERLEAF). CELEBRANTS POWDER THEIR FACES FOR THE GANESH CHATURTHI FESTIVAL IN MUMBAI, FORMERLY CALLED BOMBAY.

Reflecting the passions of Mogul Emperor Shah Jahan, the Taj Mahal in Agra was built in the mid-1600s as a tomb for his wife Mumtaz Mahal. Later he was buried beside her. Covering most of India—and known under Shah Jahan's grandfather Akbar for religious tolerance—the Mogul Empire collapsed in the early 1700s.



Magnificent wreckage of continents in collision: Fifty million years ago an immense island collided with mainland Asia to create the Indian subcontinent and push the Himalaya skyward. Those peaks rise to 20,000 feet in the Ladakh region, where India and China are now close to resolving territorial disputes.

A camel convoy patrols the Thar, or Great Indian, Desert near the Pakistani border. Drug and weapons smugglers are a problem, but the biggest worry has been a military clash. India and Pakistan, who have fought three wars in the past 50 years, both claim to have nuclear capability.



What's hip has an American twist on the set of *Club MTV,* a televised dance show geared to a young audience that airs three times a week. Western music and manners, however, offend many Indian traditionalists, both young and old.

I

The Road From Independence

THEY STAND on pink stone pedestals high above a tangled garden on Old Delhi's northern fringe, three British viceroys in white marble flanking a stone version of the king-emperor himself, George V. Wasps buzz around a black nest as big as a football, tucked into the crook of one viceregal elbow. Village dogs skulk through the half-open iron gate, and peacocks rustle within the thicket that has grown up around the bases of the statues.

They were moved here from their places of honor in city parks after India won her independence half a century ago, and locked up within the garden walls for fear patriot mobs might harm them. None ever turned up. Nor did anyone think to bring with the sculptures the plaques that had once identified them, and so Hatar Singh, the gray-haired watchman who has looked after them for two decades now, has never known just whom they are meant to represent. Nostalgic British visitors stop by now and again, he says, but the garden is mostly used by local people who harvest the weeds that have overgrown the brick walkways as fodder for their cattle. Delhi—and India—have long since moved on.

"Delhi is not India"—it's almost the first thing a visitor hears. And in a sense it's true. The overwhelming majority of India's nearly one billion people—three-quarters of them—still live in rural villages, not big cities, just as they always have. The populace of the two Delhis—17th-century Old Delhi, once the capital of the Mogul Empire, and New Delhi, the up-to-date capital of the modern republic—is very largely north Indian and Hindi-speaking, unrepresentative of the millions to whom Hindi is as incomprehensible as, say, Lithuanian. And the heart of New Delhi itself is unlike even other Indian cities, a carefully planned community inaugurated by the British in 1931 as the pomp-and-sandstone symbol of an empire that promptly vanished just 16 years later.

Though no single spot can be said to represent all of India, India's capital remains the seat of centralized power in this turbulent nation of nations. Its busy streets bear witness to much that has happened to the country, both good and bad, in the nearly half a century since I first fell in love with India as a boy. The impact of its spectacularly burgeoning middle class can be seen here, right alongside the

Cars queue for VIPs at the presidential palace in New Delhi on Republic Day, an annual celebration of the signing of India's constitution in 1950. The constitution calls on Indians to "transcend" religious differences while preserving the nation's "composite culture."

GEOFFREY C. WARD is a biographer, historian, and writer of documentaries, who spent part of his boyhood in India and often revisits that country. Photographer STEVE MCCURRY has spent four years in India during his career, which has focused on Asia.

RAGHU RAI

frightening effects of relentless population growth. Tragic evidence of old hatreds coexists in Delhi with unmistakably hopeful signs that India is moving into the modern world at last. India always seems to present stark contrasts of that kind; it alternately maddens and delights, one reason why people like me are unable to resist returning regularly to see how things are going.

I moved to New Delhi from Chicago with my parents and my younger brother and sister seven years after independence; my father was an adviser to the new Indian government, working for the Ford Foundation. We settled into a big house on what was then the capital's southern frontier. Jackals sometimes howled in our garden at night, and gray partridges called from the scrub jungle that stretched beyond its walls, an area already somewhat grandly called the Diplomatic Enclave, earmarked but not yet cleared for the embassies and consulates that were expected soon from everywhere.

Certainly, *that* New Delhi wasn't India. It was a formal, decorous, slow-paced city, more Western than Eastern. Automobiles—there were only some 20,000 of them then in the two Delhis combined—proceeded smoothly along broad, empty avenues lined with trees, past large whitewashed bungalows built for British officials and still only tentatively occupied by the Indians who had recently displaced them. The British were gone, but the imperial presence was still evident: We found relief from the heat in the Lady Willingdon Swimming Bath, did our shopping along the colonnaded sidewalks of Connaught Place, and received sporadic visits from elderly former servants looking for work, each carrying with him tattered letters attesting to his skills and steadfastness from Colonel-this and Collector-that.

Emissaries from a more authentic India arrived in New Delhi each morning from their homes in the crowded old city, a gleaming river of cyclists that swept toward the imposing Central Secretariat and back again each

British rule created the infrastructure for a modern state—including postal, telegraph, rail, and road systems, and a coherent administrative structure. Portugal retained colonial enclaves such as Goa; France, Pondicherry.

After partition, some 15 million Hindus, Sikhs, and Muslims moved to live among their own. At least a million people were massacred on all sides during the migration. Fighting over the region of Kashmir continues to this day.

East Pakistan had a larger population than West Pakistan, yet felt politically and economically short-changed. In 1971, aided by the Indian Army, the Bengalis of East Pakistan declared their independence as Bangladesh.

Cutting a jewel from the crown

FROM HIGH ATOP the Himalaya, snowmelt flows down the Ganges, Brahmaputra, and Indus Rivers, nourishing a fertile plain that has sustained civilizations for more than 4,000 years. Harappans, Aryans, Greeks, Huns, Muslims, Portuguese, and French, among others, all settled and shaped the Indian subcontinent, perhaps none with greater impact than the British.

By the mid-1800s Indians were chafing under Britain's imperial yoke, although their resistance lacked unity and direction. Not until Mohandas Gandhi assumed leadership of the Indian National Congress in 1920 did the drive for independence become a truly mass movement.

What sort of nation should an independent India become? Some Muslims considered life amid the Hindus intolerable and demanded a separate Islamic state (the future Pakistan). The British agreed to partition, but Gandhi warned, "You will have to divide my body before you divide India."

Six months after Prime Minister Jawaharlal Nehru proclaimed independence in August 1947, a Hindu extremist, angry about Gandhi's support of Muslims, shot and killed him. Nehru's daughter, Indira Gandhi, served as prime minister for 16 years; in 1984 she too was assassinated. Her son, former Prime Minister Rajiv Gandhi, was killed by a terrorist in 1991.

TAJ.
Boundary in dispute
Boundary claimed by India
Boundary claimed by India
KASHMIR
LADAKH
CHINA
Srinagar
JAMMU AND KASHMIR
Islamabad
20,600 ft
Boundary claimed by China
Amritsar
Ludhiana
Khanna
PUNJAB
Simla
Source of the Ganges
25,645 ft
Boundary undefined
TIBET
Boundary claimed by China
HARYANA
Mt. Everest 29,028 ft
15,020 ft
Delhi
New Delhi
Gurgaon
Great Indian Desert (Thar Desert)
HIMALAYA
NEPAL
Kathmandu
Thimphu
BHUTAN
Dibrugarh
ASSAM
UTTAR PRADESH
Agra
Lucknow
Jaipur
RAJASTHAN
Jodhpur
Kanpur
Darjiling
Guwahati
Imphal
Jhansi
Varanasi
Patna
BANGLADESH
INDIA
Dungarpur
Dhaka
Ahmadabad
Bhopal
Jabalpur
Calcutta
Vadodara
Indore
MYANMAR (BURMA)
SARDAR SAROVAR DAM UNDER CONSTRUCTION
Surat
Nagpur
Cuttack
DECCAN
Mumbai (Bombay)
Bay of Bengal
EASTERN GHATS
5,250 ft
Vishakhapatnam
Hyderabad
PLATEAU
Vijayawada
Yangon (Rangoon)
GOA
WESTERN GHATS
Chennai (Madras)
Bangalore
PONDICHERRY
Coimbatore
8,841 ft
Cochin (Kochi)
Madurai
KERALA
SRI LANKA
Colombo
MALDIVES
Male
Railroad
0 200
MILES
NATIONAL GEOGRAPHIC MAPS
RELIEF BY TIBOR TÓTH

Jawaharlal Nehru, a rationalist, and Mohandas Gandhi, a man of religion—his title Mahatma means "great soul"—disagreed on what values should shape the new nation.

SUMATI MORARJI COLLECTION, GANDHI SMARAK SANGRAHALAYA

Ready to rumble through New Delhi in the Republic Day parade, the 73rd Armoured Regiment guards its Soviet-made tanks. With 1.3 million soldiers, India has the fourth largest army in the world, after China, the U.S., and Russia.

evening, thousands of clerks and bureaucrats attending to the new nation's business.

Their daily journey took many of them past the grounds of the circular sandstone parliament building where, a few minutes before midnight on August 14, 1947, a vast throng had gathered to hear free India's first prime minister, Jawaharlal Nehru, proclaim independence: "Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially. At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. . . . We end today a period of ill fortune and India discovers herself again. The achievement we celebrate today is but a step, an opening of opportunity, to the greater triumphs and achievements that await us. Are we brave enough and wise enough to grasp this opportunity and accept the challenge of the future?"

Nehru's subdued and cautious tone was understandable. The challenges he was brave enough to accept on behalf of his fellow countrymen looked almost insurmountable. Britain had left behind canals and roads and railways, universities, a dedicated civil service, a disciplined army—and precious little else. India could not feed itself and was virtually without industry; its people were overwhelmingly illiterate, frozen in the grip of the caste system, and at 350 million, already beginning to be dangerously overcrowded.

And at the moment of its birth their country had been torn in two. Nehru had devoted 31 of his 57 years to the freedom struggle, a third of that time spent behind bars in British prisons, but what should have been a glorious triumph had turned out to be a severely qualified one. One-sixth of the people of the world were simultaneously being liberated from colonial rule that night, but at a terrible cost. In Bengal and the Punjab long-smoldering tensions between the Hindu majority and Muslim minority, fanned by unscrupulous politicians,

had exploded into internecine warfare so savage that no one has ever authoritatively assessed the toll it took in human lives.

Mahatma Gandhi, the apostle of nonviolence and leader of the freedom movement, had denounced the proposed partition of the subcontinent into two nations, secular India and Muslim Pakistan, as the "vivisection of the motherland," but even he had been helpless to stop it. What may have been the greatest forced migration in history was about to begin: Some 15 million people were uprooted, displaced Muslims heading toward Pakistan, past long, shuffling columns of homeless Hindus and Sikhs streaming into India.

Progress everywhere exacts a price, but few countries have routinely paid a higher tariff than India has; from the moment it attained its independence, each advance in one area has seemed dogged by retreat somewhere else.

MY BOYHOOD HOME was less than half a mile from the British commander in chief's handsome former residence, which Nehru had made his home, and we often encountered him being driven from home to office or back again, poring over official papers in the backseat of his white Ambassador—the rugged unprepossessing Indian-made automobile that for decades was virtually the only model for sale in the country. And if the prime minister of India was proceeding too slowly to suit our often impatient driver, Peter John, we would simply overtake his car on the broad empty avenue. No one thought anything of it; Nehru did not even look up.

He and his colleagues in the ruling Congress Party were then embarked on a great experiment to see whether, by combining parliamentary democracy with the principles of Fabian socialism, which the future prime minister had absorbed as a student in England, ancient India could be transformed into a modern industrial state.

"Elephants do not gallop," Rudyard Kipling wrote. "They move . . . of varying rates of speed. If an elephant wished to catch an express train he could not gallop, but he could catch the train." In the years since independence, India has been something like that elephant. Ponderous. Often outpaced by faster rivals. But moving forward, nonetheless.

The India I first knew was haunted by the specter of famine, for example; now, thanks in large part to the green revolution of the late 1960s, Indian farmers can feed their nation and export a surplus as well. The percentage of people living below the poverty line has been reduced, at least a little. The social hierarchy of caste still handicaps millions of citizens, but the once powerless are beginning to find their voices, starting to make their numbers felt at the polls; it is no accident that there is only one Brahman in the current Indian cabinet, something that has never happened before in 50 years of freedom. India's industrial growth has been slower than that of some of its Asian neighbors, but it has generally been steady and has accelerated dramatically since the mid-1980s as Nehru's successors have begun to edge away from socialism toward foreign investment and a freer market.

Perhaps most remarkably, India has retained its faith in constitutional democracy in the face of crises of the kind that have sent other developing nations lurching toward military dictatorship—natural disasters, communal and political violence, one war with China and three with Pakistan, and the collapse of its close international ally, the Soviet Union. When Nehru's imperious

Muslim martyrs of the Kashmiri separatist movement fill a graveyard in Srinagar, summer capital of the state of Jammu and Kashmir. Since 1990 perhaps 20,000 people have been killed in Kashmir, a region claimed by both India and Pakistan.

daughter, Prime Minister Indira Gandhi, dared to invoke emergency rule and suspend civil liberties in 1975 rather than accept a High Court judgment that had gone against her, an indignant electorate drove her from office within two years.

INDIA'S POPULATION now grows roughly 2 percent a year, less than half the pace at which it was growing before the Nehru government instituted the first family-planning program among developing nations in 1951. But with more than 18 million new mouths to feed each year—more than half the population of Canada added every 12 months to a country less than one-third Canada's size—sheer numbers still threaten to overwhelm every gain India makes.

Even in the old days Old Delhi seemed a crowded place; it was already becoming difficult then for an automobile to navigate the throngs in Chandni Chowk, the "moonlight bazaar" that was said to have been the richest shopping street in the world. And the air of courtly Mogul refinement that had once characterized life here survived mostly in the memories of its oldest inhabitants.

Saeed Khan has lived in Old Delhi all his life. His ancestors were experts at *zardozi*, delicate gold-and-silver embroidery much prized by wealthy women. The family business died with his grandfather, and Khan now runs a printing press. Many of his Muslim neighbors have moved, either to Pakistan in 1947 or to more spacious quarters elsewhere in the city during the intervening years. But Khan has never lost his love for his hometown, and he cannot contain his sadness at what has happened to it.

A friend of his owns an old house whose rooftop offers the best view in the old city. As he leads me toward it through the labyrinth of alleys and lanes behind the Jama Masjid, the largest mosque in India, things seem much as I remember them. Nearly half the population of this quarter is Muslim. Signs are in Urdu as well as in English and Hindi. Several shops offer garlands woven out of currency notes with which a bridegroom's family can impress the wedding guests. The fragrant smells of

Caught up in a violent debate, Balwinder Singh and family have been attacked for criticizing fellow Sikhs fighting in Punjab state for a nation of their own. Thousands have died in the crossfire since police cracked down on separatists in the late 1980s.

spiced kebabs drift from the interior of a tiny food stall; outside it some 25 men and women in rags squat patiently in rows, waiting for some prosperous worshiper to come along and pay for them to be fed—and thereby earn God's blessing for his charity.

Khan guides me through a bewildering series of inner courtyards, then up several dark flights of stairs, and finally out into the sunlight on the broad roof of his friend's home. Here too everything seems unchanged, at least at first: The massive domes of Jama Masjid and, beyond them, the rhubarb-colored walls of the Emperor Shah Jahan's Red Fort still dominate the skyline. Below us the private rooftop world familiar to anyone who has ever seen a Mogul miniature seems intact. Women gossip from roof to roof. An old man sips tea and gazes out over his city. Shoals of racing pigeons wheel overhead before returning for the night to their rooftop roosts. Gaudy paper kites snap and whistle in the wind, flown by small boys just as they have been for centuries.

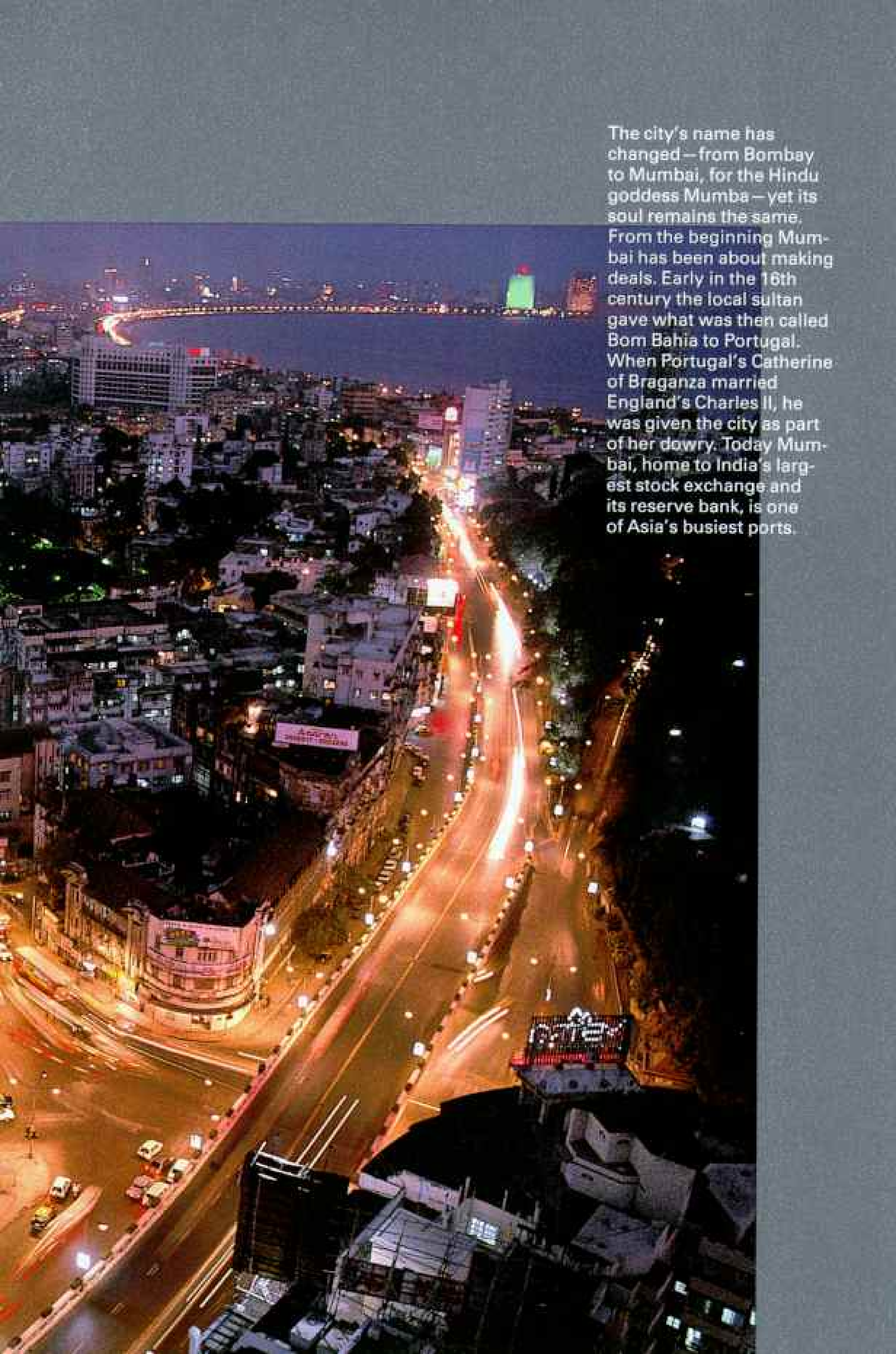
But, Khan says, this apparent timelessness is an illusion. Fifty years ago these roofs rose only two or three stories. Now some teeter five and six. The interiors of the old *havelis*—the exquisitely carved residences that once housed the courtiers and craftsmen of Mogul Delhi—have been carved up into warehouses, shops, factories, tenements.

"The old city—my city—has been buried," says Khan.

And as I look toward the southern horizon, it's clear that *my* city, New Delhi, has changed forever too.

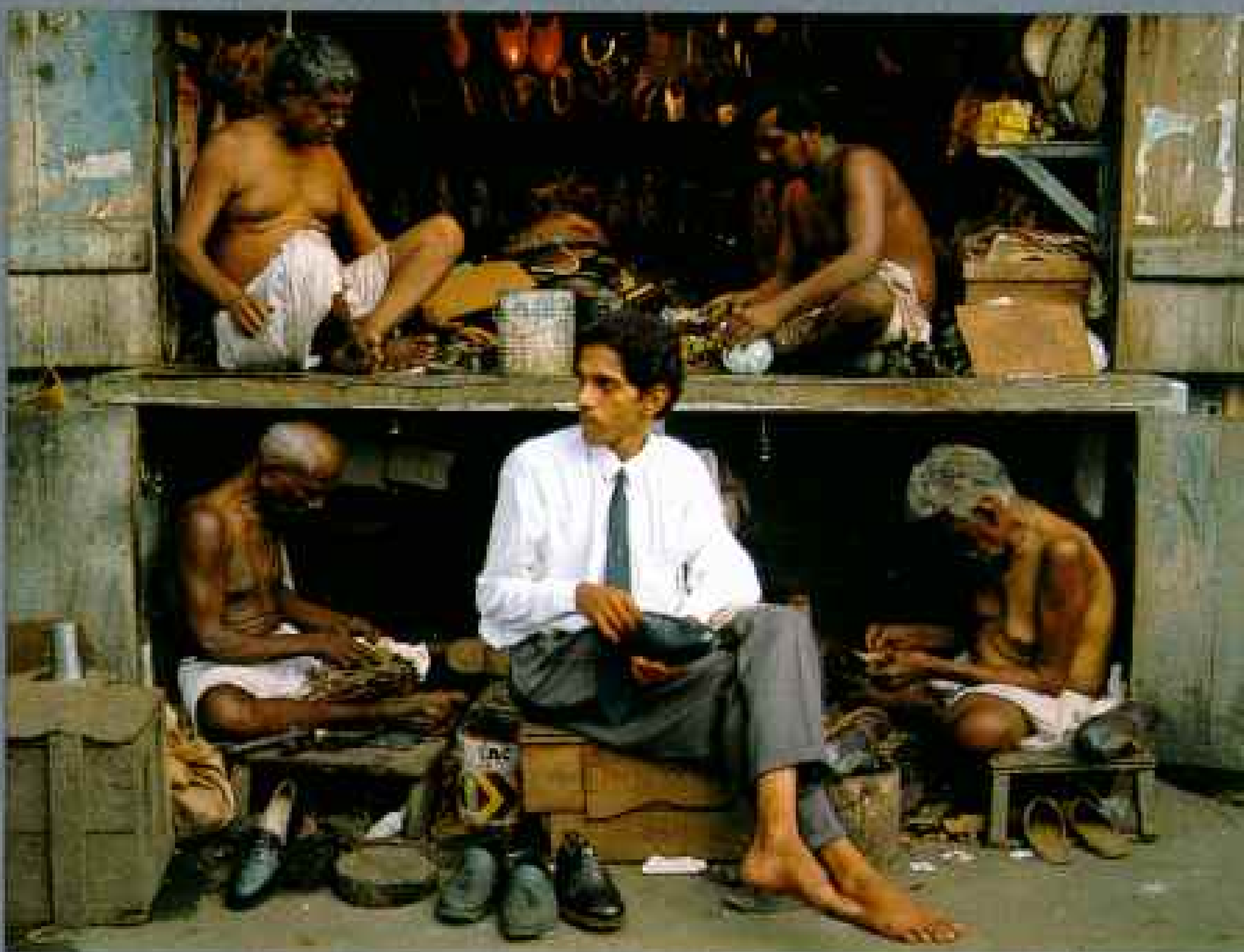
Part of it survives, its wide shaded avenues shielded against change mostly because the men and women who govern India today insist on living in the style set by their colonial forebears. India's most famous architect, Charles Correa, has called this cosseted center of power "the Compound." But those few still tidy streets now represent only one distinctly uncharacteristic neighborhood in a helter-skelter patchwork of brand-new concrete colonies that seem to be spreading almost by the hour in all directions across hundreds of square miles of what I remember as rural countryside.

II Reincarnating India



The city's name has changed—from Bombay to Mumbai, for the Hindu goddess Mumba—yet its soul remains the same. From the beginning Mumbai has been about making deals. Early in the 16th century the local sultan gave what was then called Bom Bahia to Portugal. When Portugal's Catherine of Braganza married England's Charles II, he was given the city as part of her dowry. Today Mumbai, home to India's largest stock exchange and its reserve bank, is one of Asia's busiest ports.

In the rush-hour crush commuters at Mumbai's Churchgate Station join a workforce buffeted by economic winds that shifted in 1991, when Prime Minister P. V. Narasimha Rao introduced reforms intended to reduce the federal deficit, cut inflation, and attract foreign investment. By liberalizing the economy, Rao eased away from four decades of state planning to embrace a free-market approach. In Calcutta (top right) a young man shows entrepreneurial zip by shuttling an abandoned automobile to a workshop to be

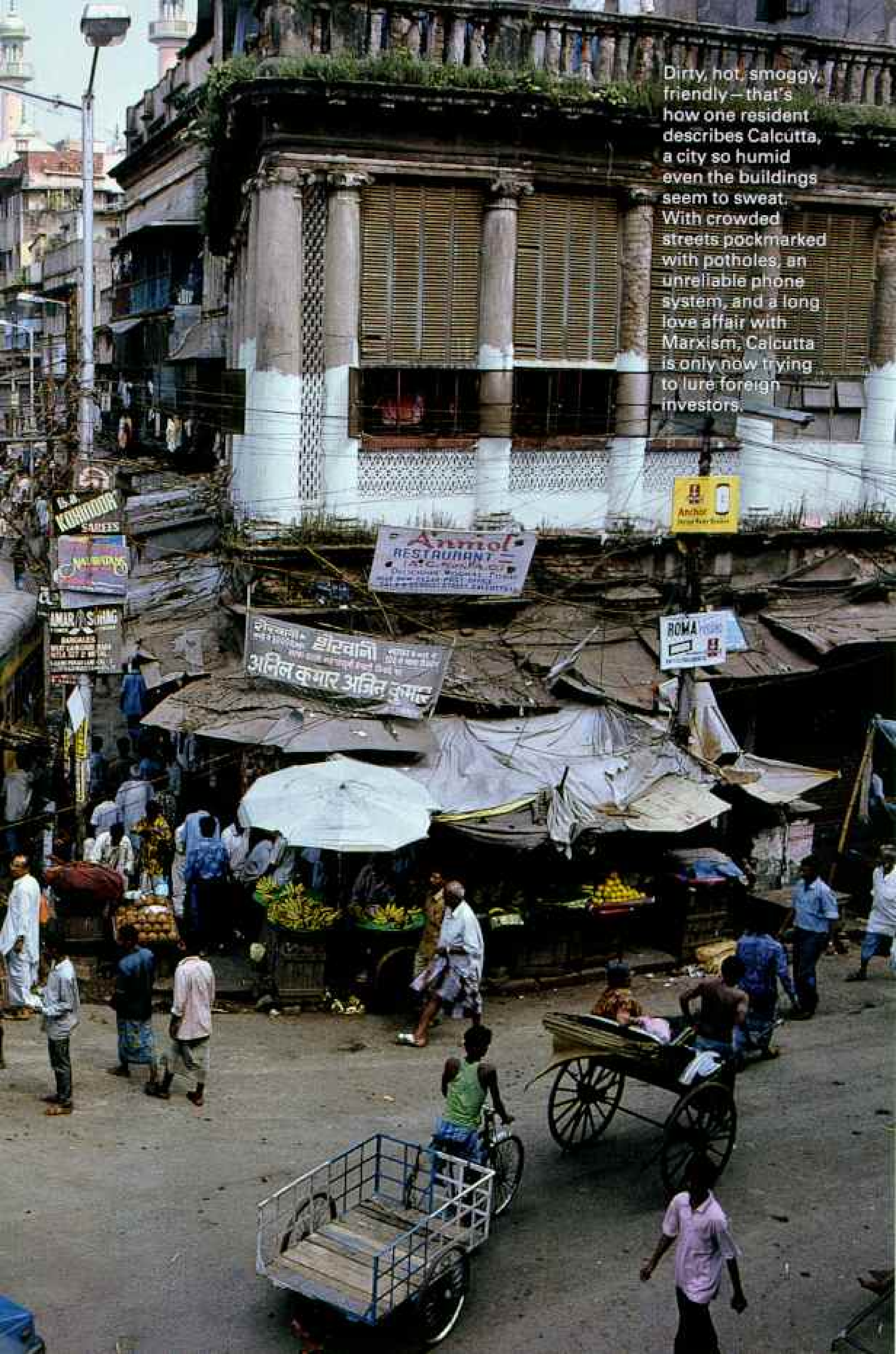


refurbished and sold.

Reforms have led to an annual national growth rate of 6 percent and bolstered the expectations of foreign investors, who like what they see in India: an officially secular state, a free press, and one of the largest middle classes in the world. In addition the nation is rich in minerals, critical for industrial growth, and has 3.5 million professionals trained in medicine or the technical sciences. With all these assets, India ranks as one of the ten largest emerging markets in the world, according to the U.S. Department of Commerce.

Yet prosperity trickles down slowly. Across India many people live on the edge, sometimes literally. In Mumbai on Princess Street four cobblers share a nook in the wall, four feet deep, where they resole shoes (above).

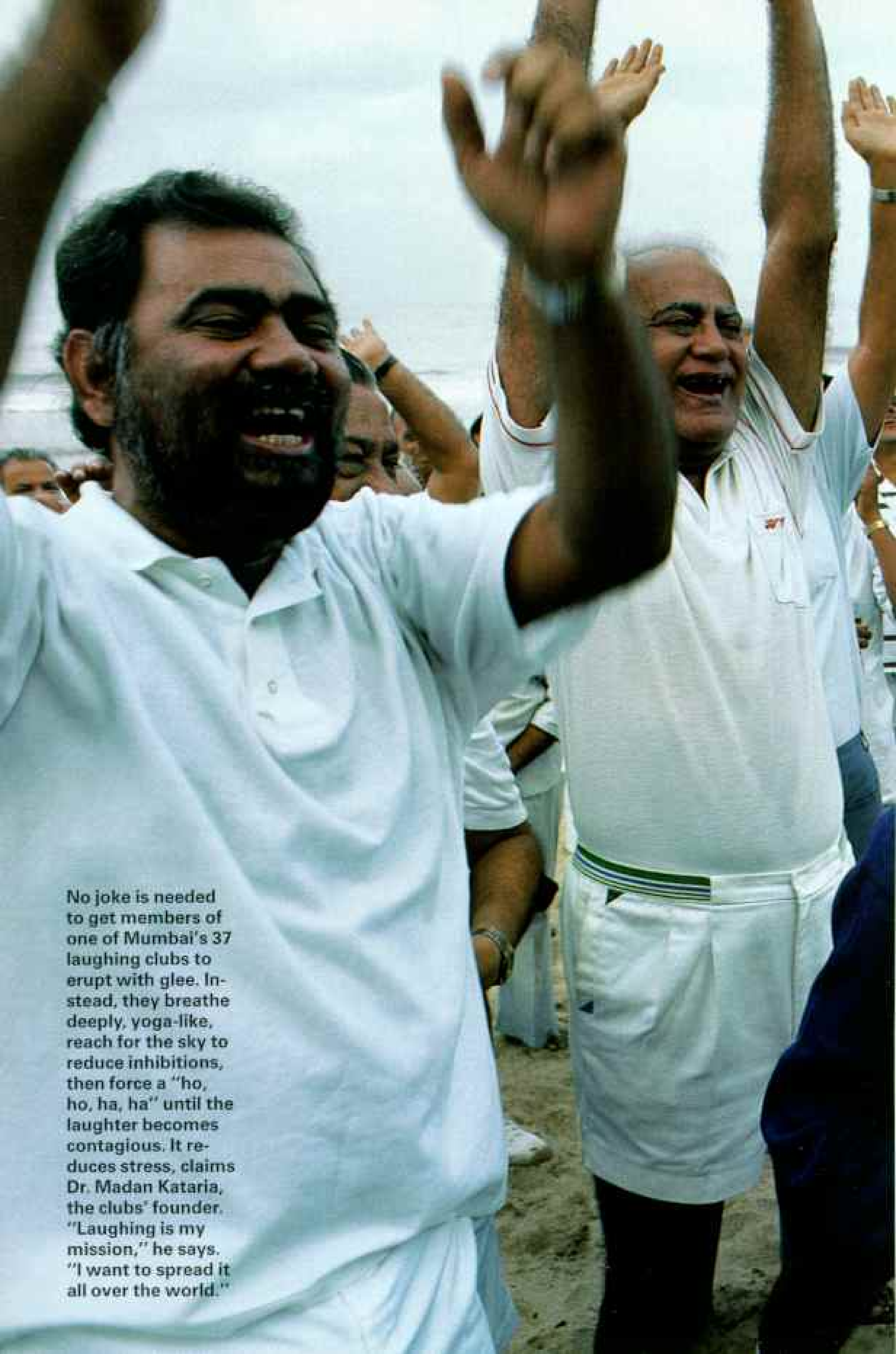
NOVELTY CLOTH STORES
207
Calcutta's Changing to...



Dirty, hot, smoggy, friendly—that's how one resident describes Calcutta, a city so humid even the buildings seem to sweat. With crowded streets pockmarked with potholes, an unreliable phone system, and a long love affair with Marxism, Calcutta is only now trying to lure foreign investors.

Keeping her eye on high fashion (and the bottom line), Jaya Patel primps models wearing the latest Indian designs for a photo shoot in Mumbai. Educated in England and the U.S., Patel is director of Vama Department Store, which once stocked only traditional Indian clothes but now features fashions from Benetton, Reebok, and Levi Strauss. "What you wear does not necessarily change your character and deep-rooted culture," says Patel.

In Bangalore (above) workers assemble televisions for BPL Ltd., one of the many high-tech corporations, including Motorola and Hewlett-Packard, that have turned the city into India's Silicon Valley. New developments like Trinity Acres (top left) are what many middle managers call home.



No joke is needed to get members of one of Mumbai's 37 laughing clubs to erupt with glee. Instead, they breathe deeply, yoga-like, reach for the sky to reduce inhibitions, then force a "ho, ho, ha, ha" until the laughter becomes contagious. It reduces stress, claims Dr. Madan Kataria, the clubs' founder. "Laughing is my mission," he says. "I want to spread it all over the world."

III

New Voices New Visions New Problems

By THE TIME my family and I got to Delhi, more than half a million refugees from the Punjab had already settled there, doubling Delhi's population, commandeering homes and shops abandoned by fleeing Muslims within the old walled city. The newcomers spilled out beyond it into vast tent settlements hastily set up in the countryside. Overnight Delhi had been transformed into a mostly Punjabi city—aggressive, energetic, bursting at the seams—and its growth had just begun.

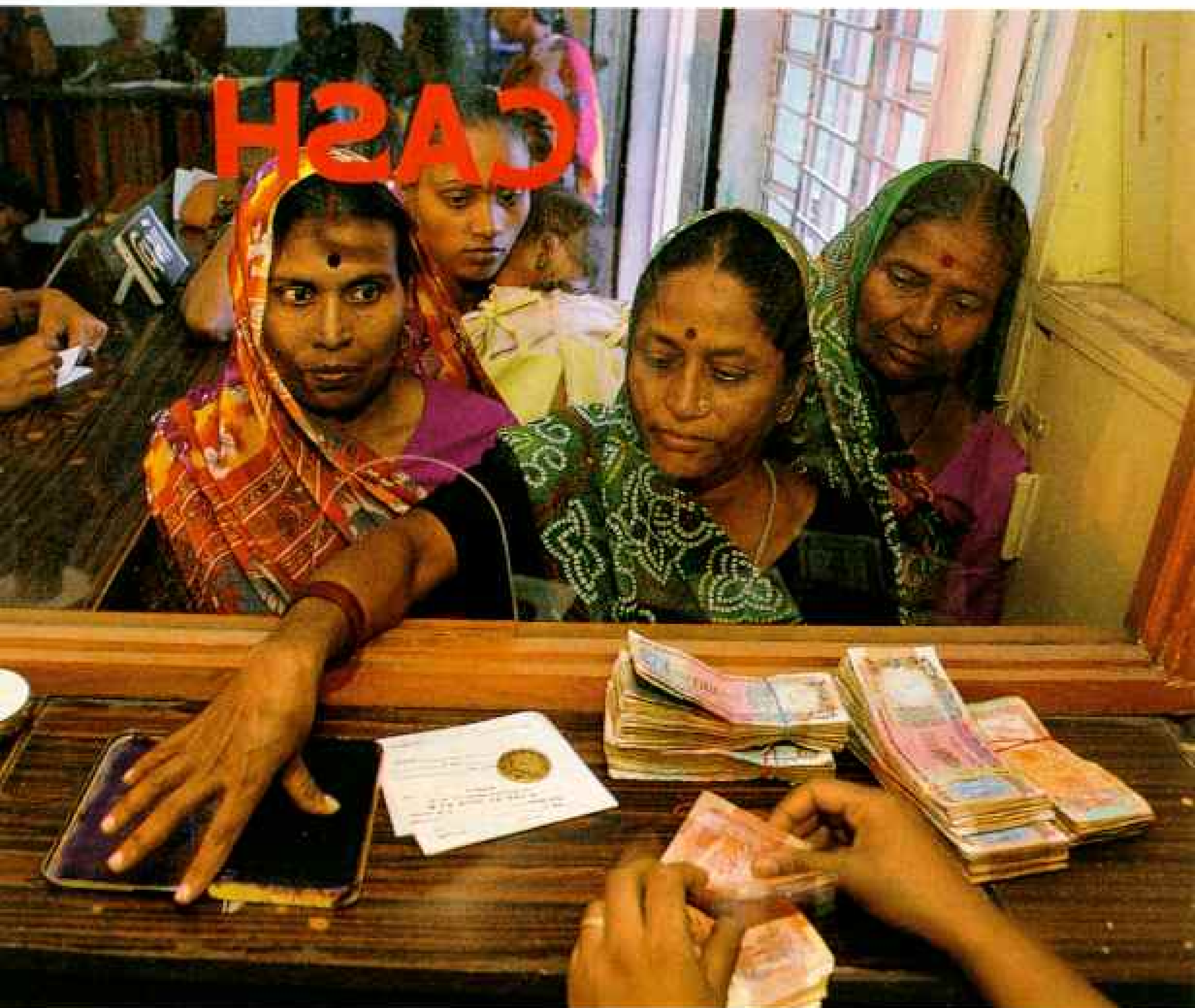
A thumbprint substitutes for a signature when illiterate members of the Self Employed Women's Association in Ahmadabad withdraw rupees from their accounts. Founded in 1972, this trade union provides insurance, shelter, legal aid, child care, job training, and other services to its 220,000 members.

I have been buying books from Balraj Malhotra's crowded New Delhi shop for years. He is 68 now but still a commanding figure with his penetrating gaze and flaring gray mustache, barking orders to his staff while serving customers with elaborate courtesy. He is also representative of the partition refugees who made good and in the process set the go-ahead style for which the city is now known.

"When we came, we had nothing," he remembers. "Just our clothes. By tradition my family had sent its sons to the army or the fields. We had no training for anything else. We had to start all over again. I was just 20."

He and his family moved into a tent in the teeming refugee center called Kingsway Camp, not far from the garden to which the British statuary was later exiled. He and his two brothers made their first money slipping aboard trains in the Old Delhi yards, occupying berths and then—when they reached the station platform—"selling" them to legitimate travelers for five rupees. He hawked fountain pens in Connaught Place too, tried aircraft maintenance until the daily ten-mile predawn walk to training school brought about a collapse, and finally went to work repairing pens for a small-time politician in Old Delhi. His boss eventually helped wangle him a shop in Khan Market, a New Delhi commercial complex newly built to aid refugees. But he still had no money, no expertise: "I knew nothing about books. I had never *seen* a book other than the texts I used in school. What to do? *How* to do?"

Relatives lent him enough money to build shelves, buy a table and chair. A family friend lent him his first stock—one motor-ricksha load of shopworn volumes—and offered some even more valuable advice: "It doesn't matter if you haven't read the books. If the title a customer wants is there, welcome. If not, keep



a pen and pencil on your table, write it down and we'll get it."

"By God's grace we've been doing good business ever since," Malhotra says. He's proud of what he and his fellow refugees have accomplished: "The Punjabi is hardworking, the last to extend his hand for help. These local Delhi shopkeepers were content to sit in their father's chair and wait for the money to come. We couldn't afford to wait."

In today's Delhi no one seems willing to wait. The distinction between the old city and the new has long since blurred in practice if not on paper, and their combined population is now climbing toward 11 million. There is not enough water or electricity or sewers for everyone, nor anywhere near enough housing.

Fully three-quarters of the structures in the city violate building standards in some way, hastily thrown up with the connivance of local officials and without regard to construction codes, often on still undeveloped public land meant to provide fresh air and open space. K. J. Alphons, a commissioner for the Delhi Development Authority, the harried bureaucracy charged with providing shelter, personally has seen to the demolition of 14,000 such illegal structures, but people keep coming anyway, driven by the same forces that drive small towners into big cities all over the world: opportunity and excitement.

But there is a special urgency with which villagers now pull up stakes and take their chances in the city. India is running out of land; its forests are almost gone; family holdings have been divided so many times into such small parcels that in some places they can no longer support a family.

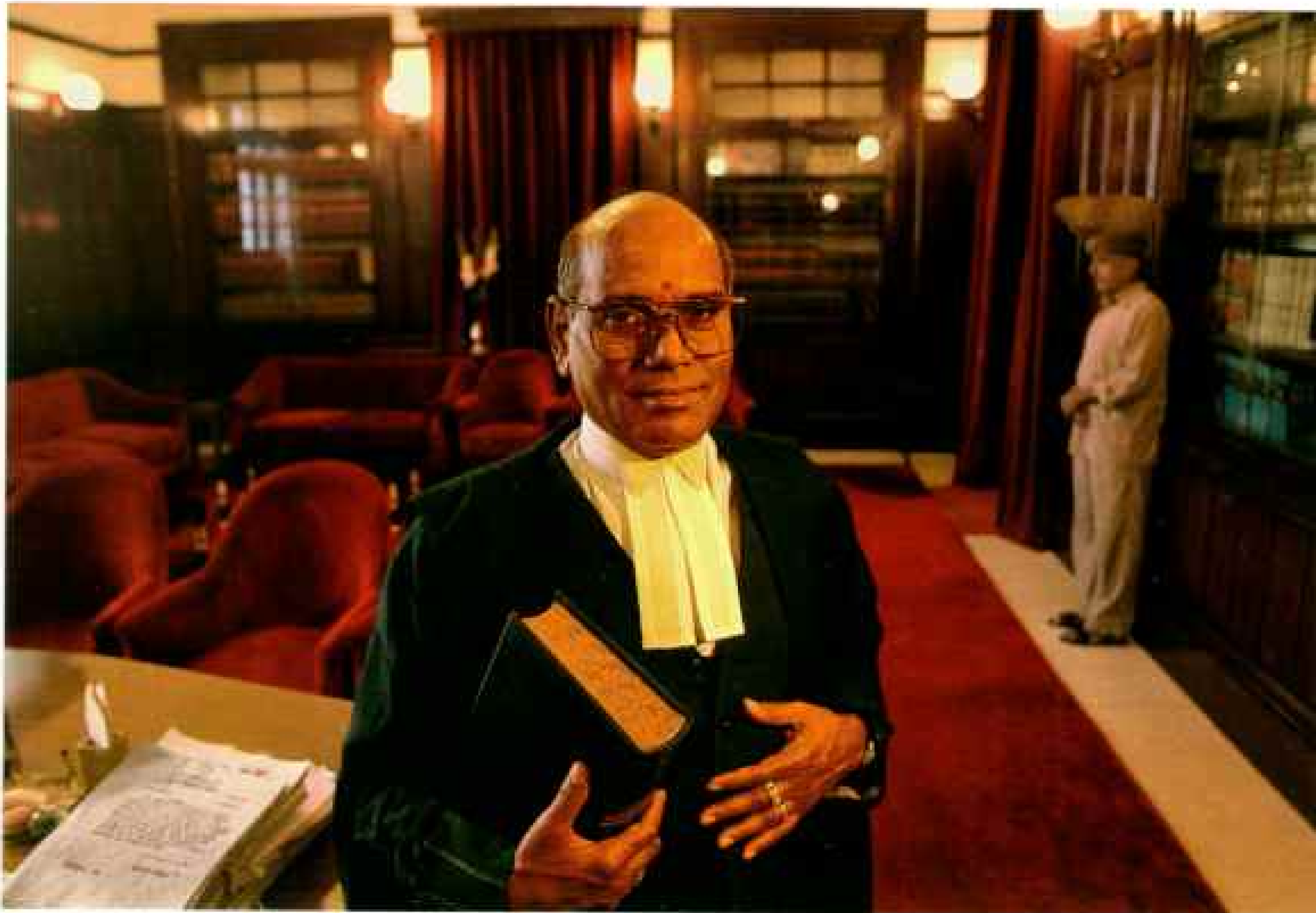
Doing the dirty work like sweeping streets is usually left to those once called untouchables, now known as Dalits, meaning "oppressed." The constitution prohibits discrimination by caste; government-set quotas aid the lower castes.

Most newcomers are drawn from the poorest districts of nearby states—Rajasthan, Haryana, Punjab, Uttar Pradesh. But there is a colony of thousands of Tibetan refugees in Delhi too. And there are large numbers of illegal immigrants from Bangladesh, Afghans in flight from the fighting in their devastated country, and immigrants from each of India's other states and union territories.

"Delhi is a city of refugees," says Rajiv Kapur, deputy chief of mission in the Office of the United Nations High Commissioner for Refugees and himself the son of refugees from the Punjab. "It's become a Wild West boomtown. Everybody's on the make. Anything goes."

Certainly anything goes on Delhi roads. According to the Centre for Science and Environment, almost three million vehicles now choke the streets—taxis, private cars, motorcycles, overladen trucks, and, angrily sputtering from one lane to the next, hundreds of thousands of scooters and motorized rickshas. Five people die in traffic accidents in Delhi every day. The privately owned buses alone account for almost 300 deaths a year. Often with untrained drivers at the wheel, urged on by conductors desperate to sell more seats than their rivals, they race one another through the streets, routinely picking up and discharging passengers in mid-traffic. The Delhi traffic death toll is higher than that of all of India's other major cities combined.

And that's not the worst of it. Thanks mostly to its ungovernable traffic, Delhi has become the world's fourth most polluted metropolis. Vehicles spew 1,430 tons of exhaust fumes into the air every day—enough to ring the inside of your nose with black carbon within moments of leaving the house. One report estimates that the average Delhiite inhales daily the toxic equivalent of the smoke from 20 cigarettes; another report found that 7,500 people die from pollution-related diseases each year; four million more are treated for them at city hospitals.



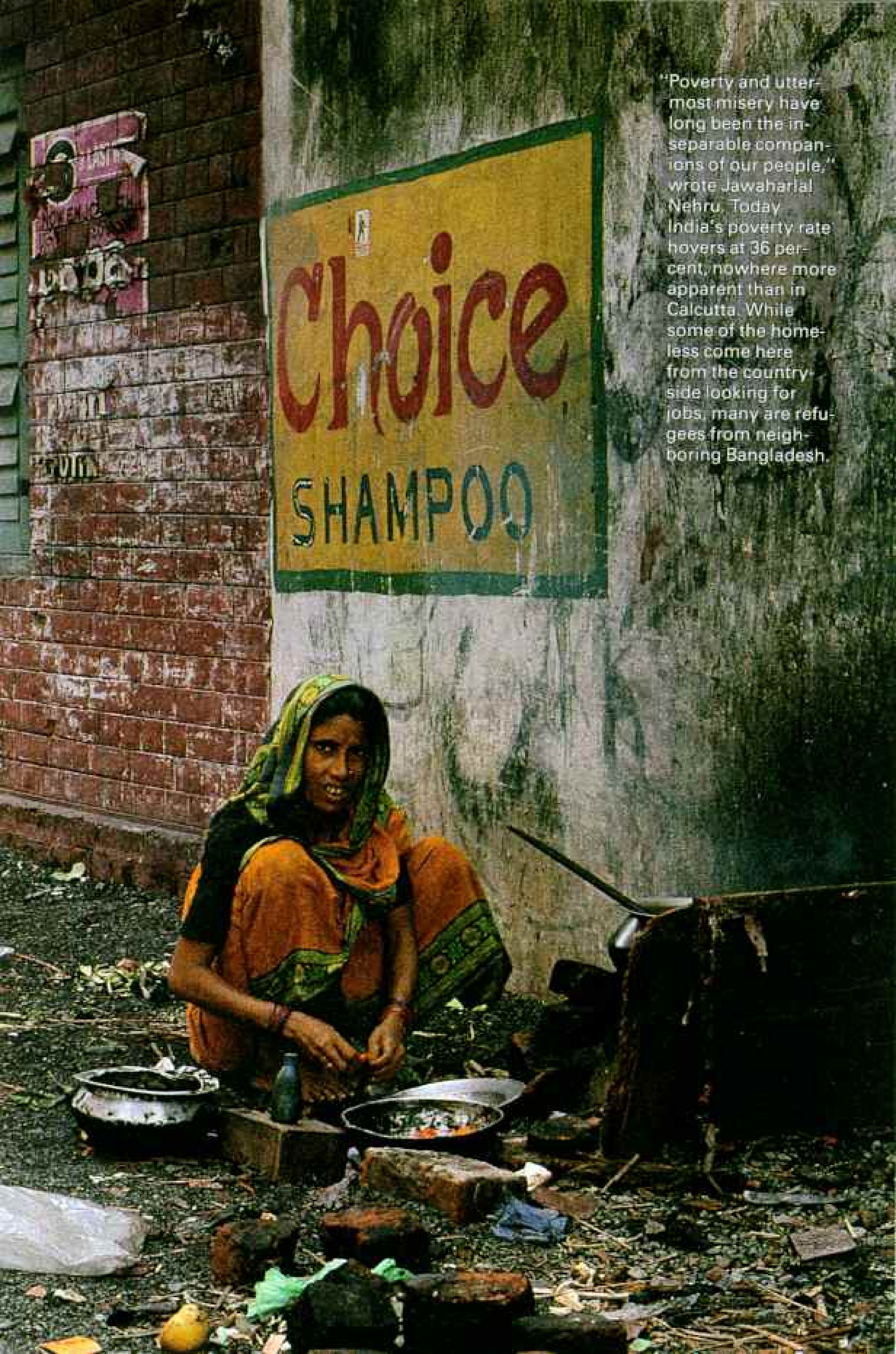
Born an untouchable, K. Ramaswamy grew up on the street. Today he is a justice on India's Supreme Court. "My proudest moment," he says, "is when I wipe away the tears of a man who needs justice by rendering justice."

The Delhi sky was a brilliant blue most of the year when I was a teenager, darkening only during the June-to-September monsoon season and from time to time in the spring when the searing westerly wind turned it red with dust from Rajasthan, which crept inside our house no matter how hard my mother worked to seal the doors and windows against it. Whenever the air conditioner clanked to a stop during summer nights, we would carry string cots to the roof to catch whatever faint before-dawn breeze might blow; even in the worst heat we could count on a night sky hung with stars. Delhi's daytime skies are dingy much of the time now. At night the stars are only dimly seen.

THE INDIAN MIDDLE CLASS was a minuscule segment of the population in 1947. It is now as large by one estimate as the total population of the United States—nearly 250 million people, determined to seize their share of the good life for themselves and for their children. Most do not yet have the comforts enjoyed by their counterparts in the West, but their new and growing numbers represent a revolutionary change in Indian society.

New Delhi is their capital, and much of the new southern section of the city evidences a kind of showy affluence unimaginable in my youth.

Self-sufficiency was the official order of the day then. India was determined to go it alone: Imported goods were viewed as frivolous luxuries and rendered out of reach by exorbitant import duties. Real wealth in Delhi was limited to a few big-time industrialists, who kept their good fortune mostly to themselves, and to members of the old princely families, whose visits to the palatial homes some of them maintained in the heart of the city were marked by an uncharacteristic lack of display, perhaps for fear the sight of too many royal baubles might tempt the government to curtail their wealth as well as their power. (The



"Poverty and uttermost misery have long been the inseparable companions of our people," wrote Jawaharlal Nehru. Today India's poverty rate hovers at 36 percent, nowhere more apparent than in Calcutta. While some of the homeless come here from the countryside looking for jobs, many are refugees from neighboring Bangladesh.

Point: At Sardar Sarovar Dam in Gujarat state – one of a series of controversial dams planned for the Narmada River basin – Deputy General Manager Paresh Shah, at left, says the dam's benefits will include irrigation and hydropower.

government did just that in 1972, canceling the annual privy purses that had allowed the princes to live at least a semblance of their once opulent lives.)

Now, it seems, the more display the better. Winter is the wedding season in Delhi, and marriages have always been opportunities for families to impress one another with their prosperity. But today's weddings among New Delhi's richest citizens are something else again. Sometimes whole streets are closed, then covered over with red-and-green cloth *shamianas* big enough to house an old-fashioned circus. Trees and shrubs and houses blaze with electric lights. Hundreds, sometimes thousands, of guests roll up in chauffeured cars, the women dazzling in silk shot through with gold and hung with jewels so valuable they have to be locked in bank vaults between grand occasions.

It is difficult for even a frequent visitor to keep up with the pace of change. Just seven years ago television in most of India was limited to one determinedly staid government-controlled channel. Now cable and satellite dishes seem to be everywhere. The BBC and CNN bring unfiltered news of the outside world. MTV offers Indian-made videos that blend rock with Indian film music. Star Plus presents American programs – including the soap opera *The Bold and the Beautiful* dubbed in Hindi. And nearly all these channels feature commercials for every kind of product imaginable.

Almost overnight India has plunged into the world economy.

Virtually anything – from French perfume to American basketball sneakers – is now available at the glass-fronted department stores of the vast new South Extension Market, and six days a week its sidewalks are practically impassable with customers eager to get at it all. And every afternoon after school hundreds of young men and women in jeans haunt the shopping center in Vasant Vihar, one of South Delhi's most posh colonies.

Counterpoint: "Sardar Sarovar will destroy everyone," says Baliben Tadvi. One of 20,000 displaced by the project – the total could reach hundreds of thousands – she leads a rally demanding that all "oustees" be compensated and the dam stopped.

Arnold Schwarzenegger was playing at the movie theater during my visit, the sounds of canned explosions poured out the open door of a packed video game parlor called Future Zone, and India's first McDonald's was offering a Maharaja Mac—mutton, not beef—for 41 rupees ($1.22 U.S.). The only visible reminder that this was still India was the big oblivious bull nosing through a rubbish bin.

THE NEW INDIA is beginning to edge out into the old India as well. The already rich and those still moving up are on the move, away from the crowds and traffic and bad air. The countryside around Delhi is experiencing an old-fashioned land rush.

At the juncture of two dusty village tracks near the industrial town of Gurgaon, nearly 20 miles southwest of the center of New Delhi and just over the border in the state of Haryana, a small boy with a long stick prods his family's herd of water buffalo homeward, past signboards tacked to trees and slogans splashed across the walls of a long-abandoned mosque: *Prince Properties, Prerna Properties, Sri Prem Properties, Deep Properties, Rishi Properties, S. Paul Associates Properties, Premee Properties.*

Across what have been fields of wheat and mustard and cauliflower for countless generations, some of Delhi's richest families (and some of India's most powerful politicians) are building themselves massive villas surrounded by carefully tended lawns and flower beds, often shielded from the gaze of ordinary citizens by armed guards and ten-foot walls topped with shards of glass. Their owners euphemistically call them "farmhouses" to get around a law that requires the acreage upon which they are built be reserved for agriculture, and they are often paid for entirely with cash to avoid tipping off the tax man.

But some middle-class citizens too are

Sweeping clean, workers prepare unmilled rice for sale at Punjab's Khanna grain market, one of the largest in Asia. Self-sufficient in grain production by 1980, India is the world's second largest exporter of rice, after Thailand.

moving to Delhi's outskirts and beyond—improving their lives in ways that would have been unimaginable for most of their counterparts in my day.

R. V. Sharma, his wife, son, and daughter recently moved into a colony called New Palam Vihar, which has developed so fast that a comprehensive city atlas published just a year ago makes no mention of it. He works in a crowded, clamorous office in the Punjab National Bank on Parliament Street, about 20 miles away in the heart of the chaos that Connaught Place has become. Until last year he and his family lived in Ghonda on the east side of Delhi's Yamuna River on a tiny remnant of the land his father had once farmed. The family's fields had been appropriated by the Delhi Development Authority in 1965 to accommodate refugees, and a chaotic slum had grown up around their old village.

"The congestion was too much," Sharma says over a cup of sticky-sweet tea. The streets were unpaved and strewn with litter; the air foul with the reek of raw sewage and smoke from the nearby electrical power stations that work overtime struggling to keep up with the city's unchecked growth.

"My children can breathe here," he says. "Their mother doesn't worry about their safety walking back and forth to school."

Outside his parlor window, in the soft evening light, a procession of peacocks makes its stately way through a nearby field. An eager puppy, half German shepherd, half village pariah, clambers up onto the sofa next to Sharma to have its ears scratched. "We can even have a pet."

Sharma owns a television set, a refrigerator, a shiny new motor scooter—unremarkable elsewhere in the world perhaps, but here they are signs of such good fortune that he can hardly believe it. "None of this could have happened in my father's time."

He has no illusions about how long his surroundings will remain idyllic. "Delhi will follow us here," he says. "In four or five years we

will be surrounded and have to move again." But when he does, he should do very well. As the city sprawls southward, the prices of farmland can barely keep pace; a year and a half before my visit, Sharma took out a loan to buy his plot for Rs. 800 ($22 U.S.) per square yard. By the time I spoke with him its value had almost tripled.

In recent months nearly 20 colleagues from the bank have joined him here, just as willing as he is to undergo an hour commute by charter bus each way for the new lives the new India allows them to lead.

THE SUDDEN GROWTH of the market economy is changing things with remarkable speed, but the poor have yet to see many of its benefits. Some 350 million Indians still live below the poverty line—as many as those living in India at Independence. Some of them, too, are citizens of Delhi.

To get anywhere from Maharani Bagh, the comfortable, mostly Punjabi colony in South Delhi where I stay with friends whenever I'm in town, one must brave the perpetual traffic jam at the corner of Mathura Road and Ring Road, built 35 years ago to girdle the city but now merely one more strangled artery within it. I've spent hours there over the past 14 years, deafened by car and truck horns, engulfed in exhaust, importuned by the melodramatic beggars who work this congested intersection in shifts.

Eventually, of course, the light turns green, traffic belches into life again, and my car inches away.

For others, there is no escape. Twelve extended families, nearly a hundred men, women, and children, have made this corner their home. They are itinerant blacksmiths from Rajasthan called Gaduliya Lohars, members of a clan that believes itself descended from royal armorers who have been roaming the subcontinent ever since Mogul Emperor Akbar invaded their homeland 400 years ago. This particular band has huddled here, along a narrow, hundred-foot stretch of pavement, in crude shelters fashioned from straw and mud brick and sheets of black plastic for 17 years. They have no running water or electricity and are forced to use the banks of a nearby sewage canal as their toilet. Their smallest children toddle in and out of traffic; they have no other place to play.

Their spokesman is Musadhi, a tall, lean, turbaned man with an intense gaze and blunt brown teeth worn down by ceaseless smoking of the hookah he keeps beside him as he hammers a battered cooking pot back into shape. He is not sure of his age—"somewhere in my 40s," he says—and he ekes out his living forging tools for local carpenters and repairing the cooking utensils brought to his tent from some of the city's wealthiest kitchens just across the road.

"Our people used to raise livestock and sell them in the villages as we traveled," he explains. "But now, everywhere, there are too many cattle, too many buffalo. The only hope for us now is in towns and cities where we can find a little work to do."

But rising numbers have begun to tell against his people here, just as they once did in the countryside. There are more than a thousand families from his clan in Delhi, Musadhi says. "For ten years politicians have promised us a colony of our own, but if we get it, what will we do? Even in Delhi there isn't enough blacksmith business to keep us all occupied. We need to learn new trades."

His son, a younger, unlined version of his father, tends the coal fire. "I sent my boy to school for six years," Musadhi says. "We had high hopes for him, but then his mother died, and I needed him to help me here. Now his children are going to school. Our hope now is that *they* will do better."

More than a million people are said to live on Delhi's grim margins, more or less as Musadhi and his clan do. In exchange for their votes politicians see to it that city authorities look the other way as these squatters construct their haphazard colonies, called *jhuggi bastis*. The men find employment as construction workers, ricksha pedalers, street hawkers, servants; their wives often become lady's maids. They endure dysentery, cholera, dengue fever; one out of ten babies born to them dies in infancy.

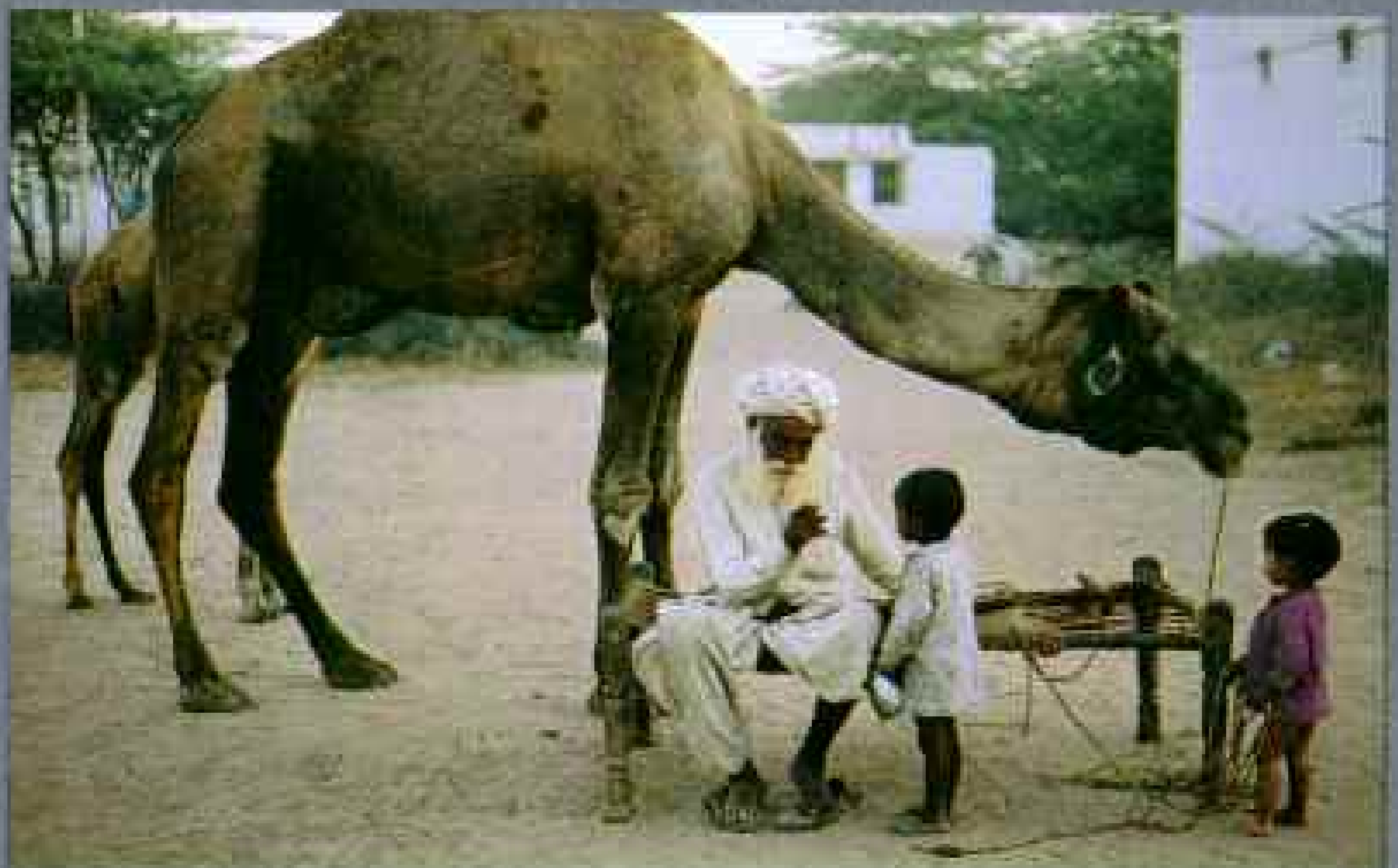
They hang on anyway, determined to make new lives for themselves in this strange new urban world. Some manage to tap into the electric lines hanging overhead, and in the evenings the darkness is punctured here and there by the blue glow of TV sets. Like their better-off neighbors, Delhi's jhuggi dwellers have become part of the larger world, seeing for themselves for the first time how a better life might be.

IV

The Pace of the Past

In history's shadow, students unwind hand-spun yarn at Gujarat Vidyapith, a coeducational school founded by Gandhi in 1920. One key component of the school's program is weaving *khadi,* a coarse fabric that became a symbol of self-reliance during the struggle for independence. If Indians would spin and wear their own cloth, Gandhi reasoned, they could get rid of the textiles imported from big British mills — and get rid of the British too.

Memories of maharajas past loom large in Jodhpur, where, on its outskirts, green chilies spice dinner (left) and a grandson gets orders to fetch water (bottom). Jodhpur's Mehrangarh Fort (bottom left), a walled city built in the 15th century, evokes the days when India was divided into hundreds of princely states, each with its own laws and taxes, and some with their own currency. After independence princes relinquished their power but were allowed to retain their personal property. Harshvardhan Singh (below), son of the present Maharawal of Dungarpur, still lives in the family palace, half of which is now a hotel. "We lost direct involvement with the people, in solving their problems," says Singh, "and we feel sad for it."



Life and death on the Ganges

Once in every lifetime an observant Hindu hopes to make a pilgrimage to the holy city of Varanasi. Some come to wash away sickness and sin in the Ganges River. Others bring their dead to be burned (left and above). Still others come to live their last days here, for to die and be cremated in Varanasi guarantees eternal release from the cycle of birth and death. Small children, by tradition, are not cremated here, nor are the very poor, whose families cannot afford the wood. Instead their corpses are often dumped into the river.

Yet this is a minor element in the Ganges' serious pollution problem, caused mainly by sewage and industrial waste. The Ganges Action Plan, launched in the mid-1980s, has attempted to clean up the river with a variety of schemes. For funerals, electric crematories, more efficient than wood pyres, have been built. Turtles that feed on decaying matter were also released, but poachers have killed most of them for meat.

Floating offerings of flowers and candles are sold in Varanasi to light the way for pious rituals. But locals also use the river in ordinary ways, doing laundry or washing hair. Devout Hindus are reluctant to believe that a river as holy as the Ganges is "polluted." Some environmentalists now use softer language to suggest that Mother Ganges is "suffering."

V

Devotion and Division

OVERTAKING a prime minister's automobile on Delhi streets as we used to do in Nehru's time would be unthinkable today. Before the current incumbent, H. D. Deve Gowda, dares stir from his barricaded home, the streets are lined with armed policemen and closed to other traffic while he moves inside a bulletproof sedan, escorted by a shrill, careering convoy of vehicles filled with black-uniformed security men armed with automatic weapons. Such attention to security is understandable: Indira Gandhi was assassinated here in 1984, and continuing terrorist threats keep authorities on the alert. There are armed separatist groups in Jammu and Kashmir, Assam, Punjab, and other states as well. But even some small-time politicians now insist they be escorted by gunmen wherever they go.

"It's a status symbol, evidence that they are important personages," says Patwant Singh. "Who do these politicians think they are?"

He is a Sikh, an author who writes about architecture and urban affairs, born in New Delhi in 1925 and not hesitant about criticizing much that has happened since. "There are signs of progress everywhere," he says. "I remember when my father's friends shot the occasional panther on the edge of town. Now the roads leading away from the city in all directions are lined with industries. We're producing everything for ourselves—cars, aircraft, fertilizer—you name it, we make it. We have everything a nation needs to be a great, independent power—natural resources, self-sufficiency in food, talented people, strong defense, a large measure of political unity. It is the self-centered, corrupt, and unprincipled among our politicians who hold us back, their class that keeps India on her knees."

Revered enough by Hindus to roam the streets of Jodhpur, a bull is still not as sacred as a cow, which is surrounded by a great mythic aura. An ancient Hindu verse says that he who kills, eats, or permits the slaughter of a cow will "rot in hell for as many years as there are hairs on the body of the cow so slain."

Outside the window of his book-lined second-floor study the wind stirs the branches of trees planted by the British. "The British did not come here for the climate," he continues. "They robbed us blind. But they did have a sense of public propriety. So did Nehru and most of his colleagues from the freedom movement. I'm afraid we've lost that. Corruption has become a way of life."

Such talk was heard in Delhi even when I was a boy: Delhiites, like New Yorkers, enjoy telling visitors just how bad things are. But the evidence now seems to be everywhere. Traffic cops openly solicit tribute from truck and

ricksha drivers on the street. One friend of mine pays 200 rupees a month just to keep her telephone working; another acquaintance, grossly overcharged for electric power, had to pay a bribe simply to have a look at the ledger book in which her bills were recorded. Driver's licenses are said to be for sale.

"Petty corruption like that is bad enough," says Singh. "Our problem is that it now runs right up to the top." The newspapers seem to bear him out. Last fall former Prime Minister P. V. Narasimha Rao and several members of his cabinet were formally charged with financial wrongdoing. "If our most important politicians see public office only as a means of acquiring wealth whilst the going is good," Singh continues, "how can one expect minor officials—or ordinary citizens—to walk the straight and narrow?"

INDIAN CIVILIZATION has an astonishingly long history, and Delhi has witnessed a good deal of it. There have been at least eight cities here in the past 3,000 years, beginning with Indraprastha, the capital mentioned in the Hindu epic, the *Mahabharata*. Some scholars believe that if all the smaller settlements and fortifications and military outposts whose remnants are scattered across the landscape were taken into account, the actual number would be closer to 15. Monuments and ruins and relics of the rich past are everywhere. The high-rise office buildings that have gone up near Connaught Place in recent years cast their reflections into the green waters of a 14th-century step well. Traffic on one of New Delhi's busiest thoroughfares has to swerve around the masonry slab that marks a Muslim saint's grave. Even on the fairways

The Golden Temple in Amritsar serves as the spiritual center for the world's 20 million Sikhs. "From Hindus and Muslims have I broken free," said Arjan Dev Ji, the fifth Sikh guru, in the 1590s. The faith holds all people equal in the eyes of God.

of the Delhi Golf Club, where my father used to play a quick nine holes before the sun got too high on summer mornings, royal tombs offer unique hazards.

The historic site to which I find myself returning at least once a visit is not a ruin at all but the flower-filled garden in which Mahatma Gandhi was assassinated on January 30, 1948. Few bother to visit it nowadays. The old man is still revered as the Father of the Nation, but even before his death many of his most powerful political supporters had declared impractical his vision of an agrarian, nonviolent India, free of Western influence.

The only sound in the garden is the raucous calling of crows from the branches of the old trees that shade the empty lawn. Footprints carved from red sandstone mark out the path Gandhi followed toward the platform where he meant to hold his daily prayer meeting shortly before sundown, and a pillar garlanded with marigolds stands at the spot at which he fell. It is inscribed with his last words, *"He Ram*—O God."

Gandhi was murdered by a fanatic fellow Hindu for urging fair treatment for Muslims, a martyr to the ideal of a secular India in which all faiths would be treated equally.

FOR ALL ITS NEWFOUND MODERNISM India remains steeped in religion. The pious cacophony I hear from my window each dawn attests to that. First comes chanting from a Sikh gurdwara, which is soon partly drowned out by the sound of temple bells and the voice of a priest offering prayers from a Hindu temple dedicated to Siva. Then, louder than the rest, comes the wobbly tenor of a Muslim muezzin, proclaiming the greatness of Allah from a mosque.

The overwhelming majority of India's 950 million people are Hindus, but the country is also home to over a hundred million Muslims (only Indonesia and Pakistan have more), 20 million Christians (more than the population of many European countries), 18 million Sikhs, 7.5 million Buddhists, 4 million Jains, and countless adherents of other faiths.

RAGHU RAI

Segregated during services, men and women pray in New Delhi at the tomb of Hazrat Nizamuddin, a Muslim holy man. A pacifist, he taught his followers that helping the poor and feeding the hungry brings greater reward than prayer.

Indian nationalists charged that the British held onto their power by a deliberate policy of "divide and rule"—the cynical playing off of one religious group against another. If so, that lesson was clearly not lost on their successors.

In village India, where people still know one another as individuals, Hindus, Muslims, and Sikhs coexist peacefully enough. But in crowded, anonymous cities like Delhi, religious resentments seethe beneath the surface, ripe for exploitation by heedless politicians willing to sacrifice communal peace for short-term gains.

In November 1984 India's capital witnessed some of the worst religious violence since the country's birth. For three terrible days following Indira Gandhi's death on October 31 at the hands of Sikh bodyguards, murderous Hindu mobs chanting "blood for blood" controlled the city's streets, and neither the city nor the central government moved against them.

The eminent Indian historian Romila Thapar lives in the colony of Maharani Bagh. She climbed to the roof of her house shortly after news of the assassination reached her. Black columns of smoke had already begun to rise here and there along the horizon as Sikh taxis and trucks, homes and houses of worship were set ablaze. "I saw Sikh drivers being pulled from their buses on Ring Road and set afire," she remembers, "and the ghastly thing was that I could do nothing."

With some of her neighbors she patrolled the colony by car at night, but a mob eventually managed to get in anyway. With the son of a local political boss coolly directing the action, the mob looted and burned seven houses owned by Sikhs—and left untouched an eighth, the home of a man who was known to support the boss's party. It also torched the gurdwara whose prayers sometimes interrupt my sleep; worshipers have since repaired it.

Maharani Bagh got off easy.

At least 2,700 and perhaps as many as 5,000 Sikh men and boys were butchered elsewhere in the city before the riot ended. Whole neighborhoods were razed. Only a handful of the

alleged killers were ever brought to trial; still fewer have been convicted.

Many of the widows and children of the murdered men still huddle together in colonies like the one I visited in the North Delhi neighborhood of Tilak Nagar. Nine hundred families are crowded into apartment blocks, sometimes seven and eight people to a room. Another 300 families, for whom there is no permanent shelter, live in a noisome roadside camp.

The survivors were eager to talk, and a crowd of children and young men fell in behind me as I picked my way around three pigs rooting through the garbage littering the narrow lane. We stopped in front of a tiny stall from which an elderly woman named Jumna Kaur sells flour, cooking oil, and other staples to her fellow victims. She explained that she lost four sons, four brothers-in-law, and four nephews in the carnage. Tears filled her eyes.

An old, white-bearded Sikh pushed his way through the crowd and handed me his identity card. It officially identified him as a "freedom fighter," a veteran of the nonviolent struggle against Britain. His name was Santa Singh. "What kind of freedom did I fight for?" he asked, gesturing toward Jumna Kaur. "For this?"

I've sometimes wondered why, as an American, I am drawn back again and again to the garden where the Mahatma fell. I suppose it is that our country, like his, remains a collection of minorities, ethnic and cultural as well as religious. Our survival, like India's, finally depends on the kind of tolerance and mutual respect for which Gandhi gave his life.

MANI SHANKAR AIYAR was six years old in 1947 when his mother took him to the grounds of the parliament building to hear Nehru proclaim India free. His memories of that historic night are dim, he admits over lunch at the India International Centre, a quiet gathering place for scholars and intellectuals on the edge of the serene tomb-filled park known as Lodi Gardens, but he is intensely proud "to have been there at the creation." Until recently he was a member of parliament, and he wears the white homespun clothing of the freedom movement that is still the quasi-official uniform of the Indian politician. But he also writes an outspoken column for one of India's leading news magazines and is frank to admit that corruption is a curse even within his own Congress Party. "It really should be India's chief export," he says, grinning ruefully. "We could give seminars to less advanced countries in how it's done."

He supports the new policy of economic liberalization, though he sees it as a vindication of Nehru's socialist principles, not a refutation of them. "Indian socialism made Indian capitalism possible," he says. "In 1947 barely 10 percent of our population was in the marketplace. Our problem was to pull the remaining 90 percent into it. Now, thanks to the success of Nehru's policies, 30 percent of us are involved and in a far better position to help the remaining 70 percent."

He worries, though, what will happen if that help is not forthcoming. The middle class, he says, remains preoccupied with getting ahead. When the electricity fails in the most comfortable colonies in South Delhi, residents simply switch on their generators; when the trickle of city water dries up, they switch over to tube wells.

"The poor of East Delhi have no such options," Aiyar says as we end our lunch. "Neither do the people in the villages. And resentment is growing. It is the man who can effect a merger between South Delhi and East Delhi, between city and countryside, who will lead India into the future. If such a person doesn't emerge, I'm afraid the tumbrels may roll."

DIWALI, the five-day Festival of Lights, was my family's favorite among all the religious observances that crowd the Indian calendar. Its climax comes on the night of the new moon in the Hindu month known variously as Kartik or Asvina, which falls in late October and early November. It commemorates to the Hindus of the north the return to India of Lord Ram and his wife, Sita, after their victory over the demon-king of Sri Lanka. Tiny earthen oil lamps are lit to outline every house and hut to guide them on their journey home.

Sikhs also celebrate on this night of Diwali. Even Muslim families sometimes join in. For me, my brother, and sister, it was a chance to clamber over our bungalow, helping the servants set out and light the scores of lamps that made our whole house seem to float in the darkness. Then we and the servants' children stood together on the lawn and watched as

Young Buddhist students at a monastery near Darjiling play the English game of cricket before a wall of Tibetan script. An infinite interplay of cultures, histories, and dreams propels a young nation as old as time.

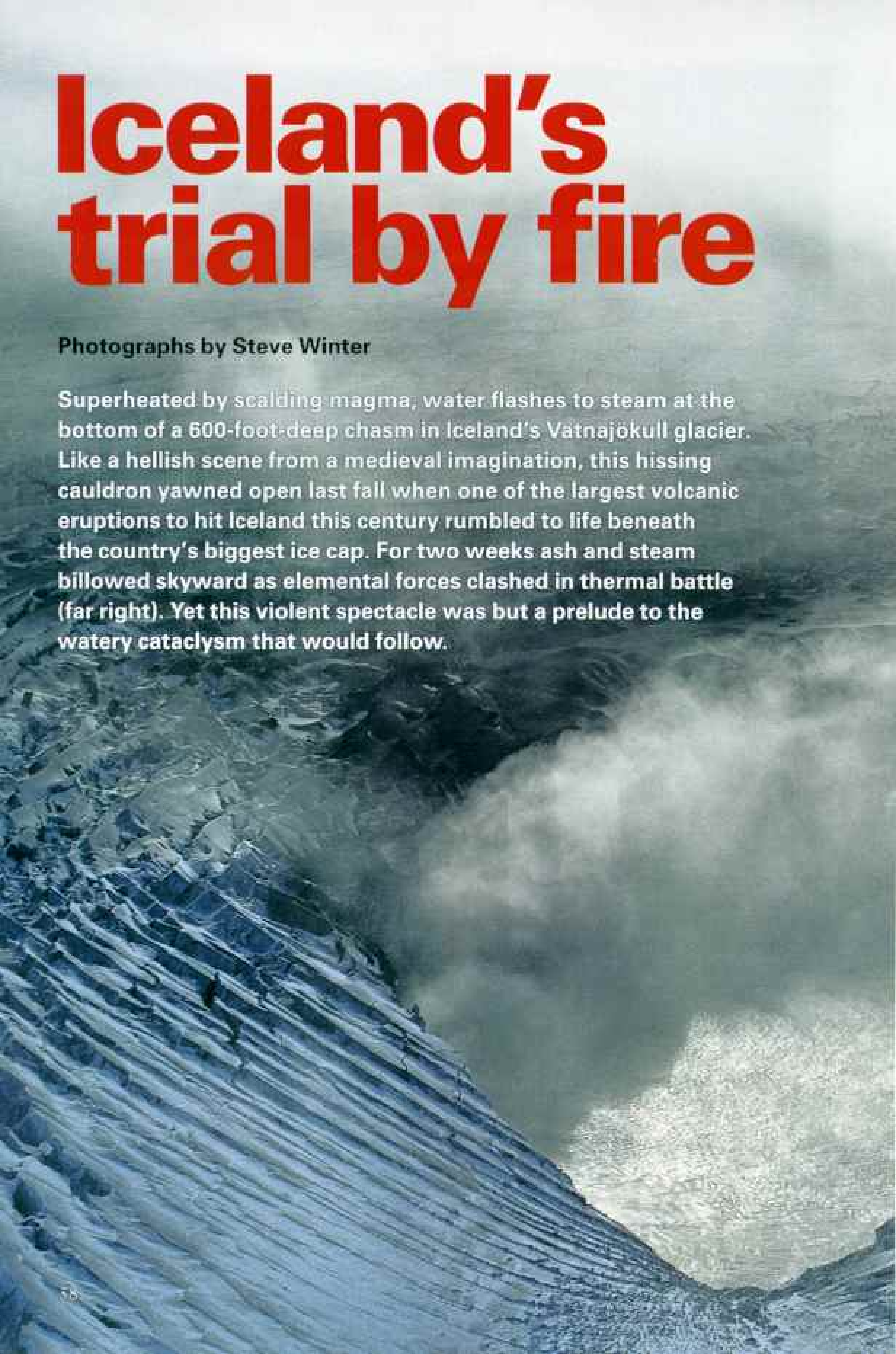
rockets were sent hissing into the night sky.

Diwali fell toward the end of my last visit to Delhi. Every market in the city was hung with tinsel. Poor women from nearby villages brought baskets of handmade lamps into town for housewives to buy. Confectioners struggled to keep up with the demand for gift boxes filled with sweets, some of them topped with microscopically thin sheets of edible silver. Open-fronted stalls sold effigies of the gods in pink and green and blue next to gleaming arsenals of fireworks—sparklers, crackers, rockets, Roman candles, and more, all wrapped in gold.

The family with whom I stayed celebrated in the traditional way. There was a party on the lawn with close friends and relatives. Flickering lights outlined the staircase and windowsills and compound walls, just as they had in the old days, and the servants set off fireworks to delight us as well as their wide-eyed children.

I took a drive before the evening ended. Strings of electric bulbs had replaced oil lamps on some of the houses in Maharani Bagh, and there were so many fireworks blazing overhead, ripping along the road in front of the car, echoing and re-echoing from colony to colony, that the whole city seemed at war.

At the corner of Ring and Mathura Roads, amid smoke that now swirled even more thickly than usual, the Gaduliya Lohars were celebrating too. They'd managed to buy a handful of lamps to light up the curb in front of their makeshift dwellings; their children stood together in the dark, watching in wonder as the rockets rose. I remembered my talk with Mani Shankar Aiyar. If the next generation of Indian leaders can somehow wed the needs of these children and their parents with the ambitions of those more fortunate people living just a few hundred yards away, the dream of a prosperous and united India that was first deferred by partition and then dimmed by the long litany of ills that followed may one day be fulfilled—not just "substantially," as Jawaharlal Nehru said 50 years ago, but "wholly" and "in full measure." ☐



Iceland's trial by fire

Photographs by Steve Winter

Superheated by scalding magma, water flashes to steam at the bottom of a 600-foot-deep chasm in Iceland's Vatnajökull glacier. Like a hellish scene from a medieval imagination, this hissing cauldron yawned open last fall when one of the largest volcanic eruptions to hit Iceland this century rumbled to life beneath the country's biggest ice cap. For two weeks ash and steam billowed skyward as elemental forces clashed in thermal battle (far right). Yet this violent spectacle was but a prelude to the watery cataclysm that would follow.

Glacial gash

Cut and bleeding, Vatnajökull's frozen hide was lacerated as ash-laden runoff rushed from the eruption site, carving an ice canyon 500 feet deep and more than two miles long. Magma welling up through a fissure in the bedrock melted the deeper levels of the glacier, causing the surface to collapse and shatter like plate glass.

Torrents of meltwater sluiced through the chasm, then tunneled below the glacier to create a river roofed by ice (foldout). This drained into a geothermally warmed lake hidden in an ice-capped crater known as Grímsvötn caldera.

During the first days of October, when the eruption peaked, billions of gallons of meltwater filled the lake to bursting, prompting officials to warn that an explosive glacial flood, or *jökulhlaup,* was imminent. But as journalists and scientists from around the globe gathered to witness the predicted deluge, Vatnajökull made a dramatic pause. Anticipation waned as days turned into weeks. Then, shortly after dawn on November 5, the pent-up waters spewed forth with startling speed in Iceland's most powerful flood in almost 60 years.

Gone with the water

Built to withstand floods of 317,000 cubic feet a second, Iceland's longest bridge was no match for the 1.6-million-cfs gusher unleashed by Vatnajökull. For a few hours the volume of water rivaled the flow of the world's second largest river, the Congo. No lives were lost, but damage to roads and utility lines is estimated at one billion Icelandic kronur ($15,000,000 U.S.)—a sizable bill for the nation's 265,000 citizens.

"I saw huge masses of ice being swept down the rivers," recalls Einar Haflidason, a transportation official who witnessed the flood from a helicopter—then had to deal with the aftermath on the ground. Slabs of gritty ice turned the country's principal highway into a boulder field (right).

Though the bane of road engineers, such natural disasters may benefit Iceland's fishermen: Nutrients washed into coastal waters could bolster future cod stocks.

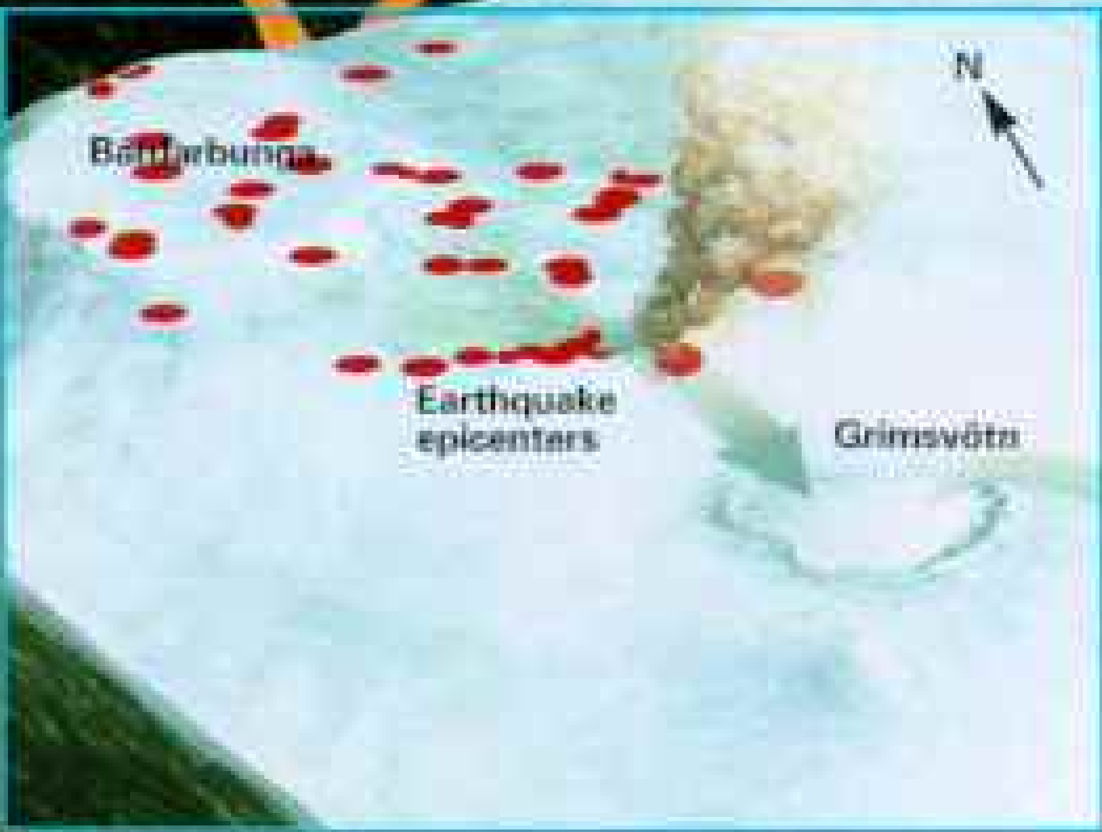
Subarctic hot spot

Iceland sits athwart the volatile Mid-Atlantic Ridge, a seafloor mountain range where two of the colossal slabs of rock that make up earth's crust—the North American plate and the Eurasian plate—part company. The island is also above a hot spot, a kind of subterranean stovepipe deeply rooted in earth's mantle. As the plates pull apart, magma rises between them along an active volcanic zone that encompasses about a third of Iceland, including the western half of Vatnajökull.

Bárđarbunga

Subglacial
water flow

Magma



AREA ENLARGED AT RIGHT

Subglacial
water flow

Glacier edge

Glacier edge

Magma

Anatomy of a meltdown

Located between two major volcanoes—Grímsvötn and Bárðarbunga—the fissure that erupted last autumn, following a telltale series of earthquakes (red dots), tore open the rocky rind that separates Vatnajökull's frozen underbelly from Iceland's fiery underworld. Intense melting fueled by the eruption produced vast volumes of water, which amassed in Grímsvötn's ice-capped lake.

Under normal conditions geothermal heat rising beneath the glacier melts enough ice to fill the lake and trigger a small flood every few years. But an eruption fast-forwards the process.

"The lake ordinarily rises 60 feet a year," says Magnús Tumi Guðmundsson, a geophysicist at the University of Iceland. "But during the first days of the eruption it was rising 60 feet a day."

The ascending water, in turn, lifted the 800-foot-thick lid of ice covering the caldera. When at last the swelling lake floated the overlying ice off its footing, nearly a cubic mile of water burst from Grímsvötn and surged beneath the ice some 30 miles to the glacier's edge. Such was the power of the jökulhlaup that blocks of ice 30 feet high and judged to weigh a thousand tons were torn from the glacier and deposited three miles away.

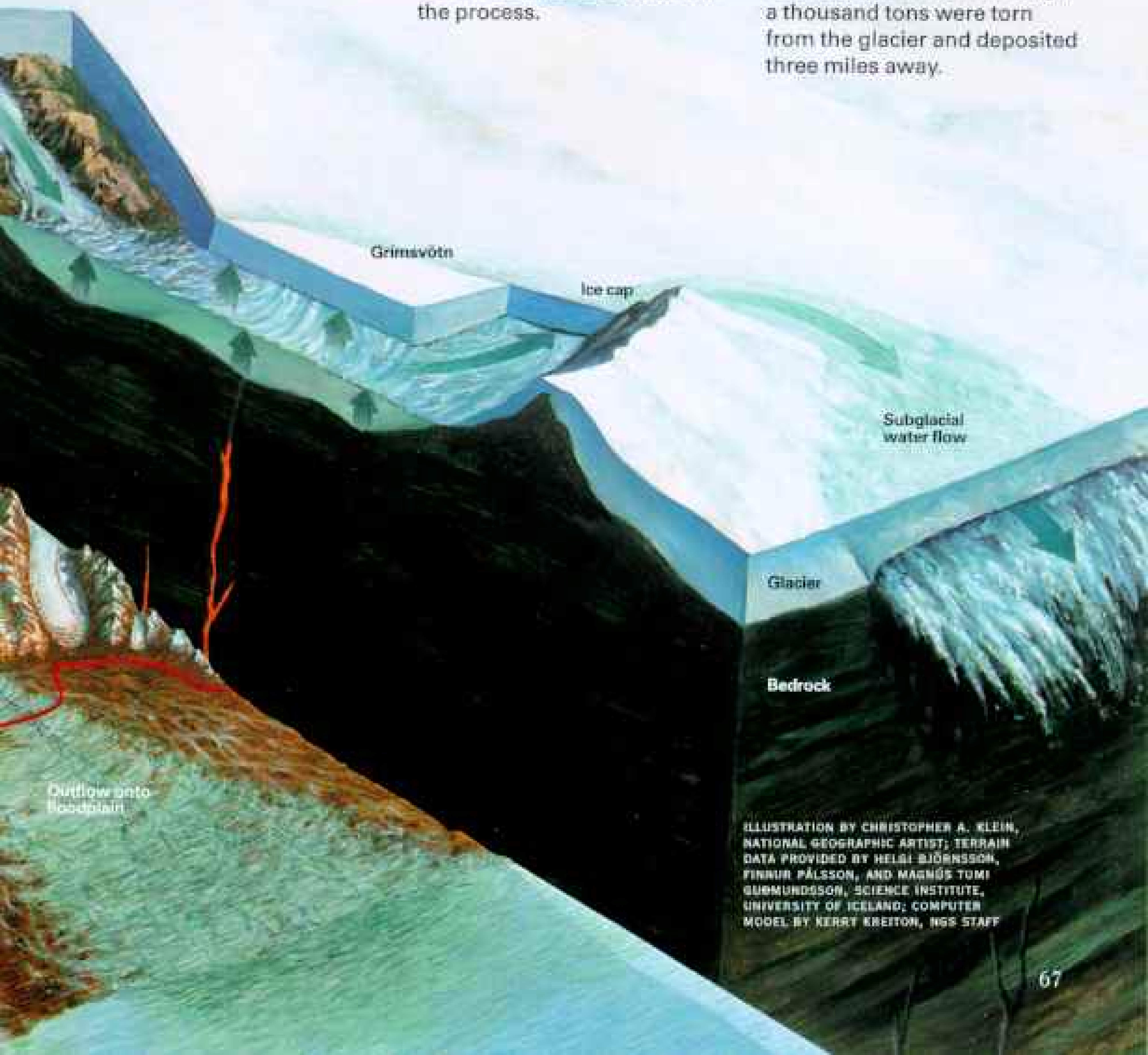


ILLUSTRATION BY CHRISTOPHER A. KLEIN, NATIONAL GEOGRAPHIC ARTIST; TERRAIN DATA PROVIDED BY HELGI BJÖRNSSON, FINNUR PÁLSSON, AND MAGNÚS TUMI GUÐMUNDSSON, SCIENCE INSTITUTE, UNIVERSITY OF ICELAND; COMPUTER MODEL BY KERRY KREITON, NGS STAFF

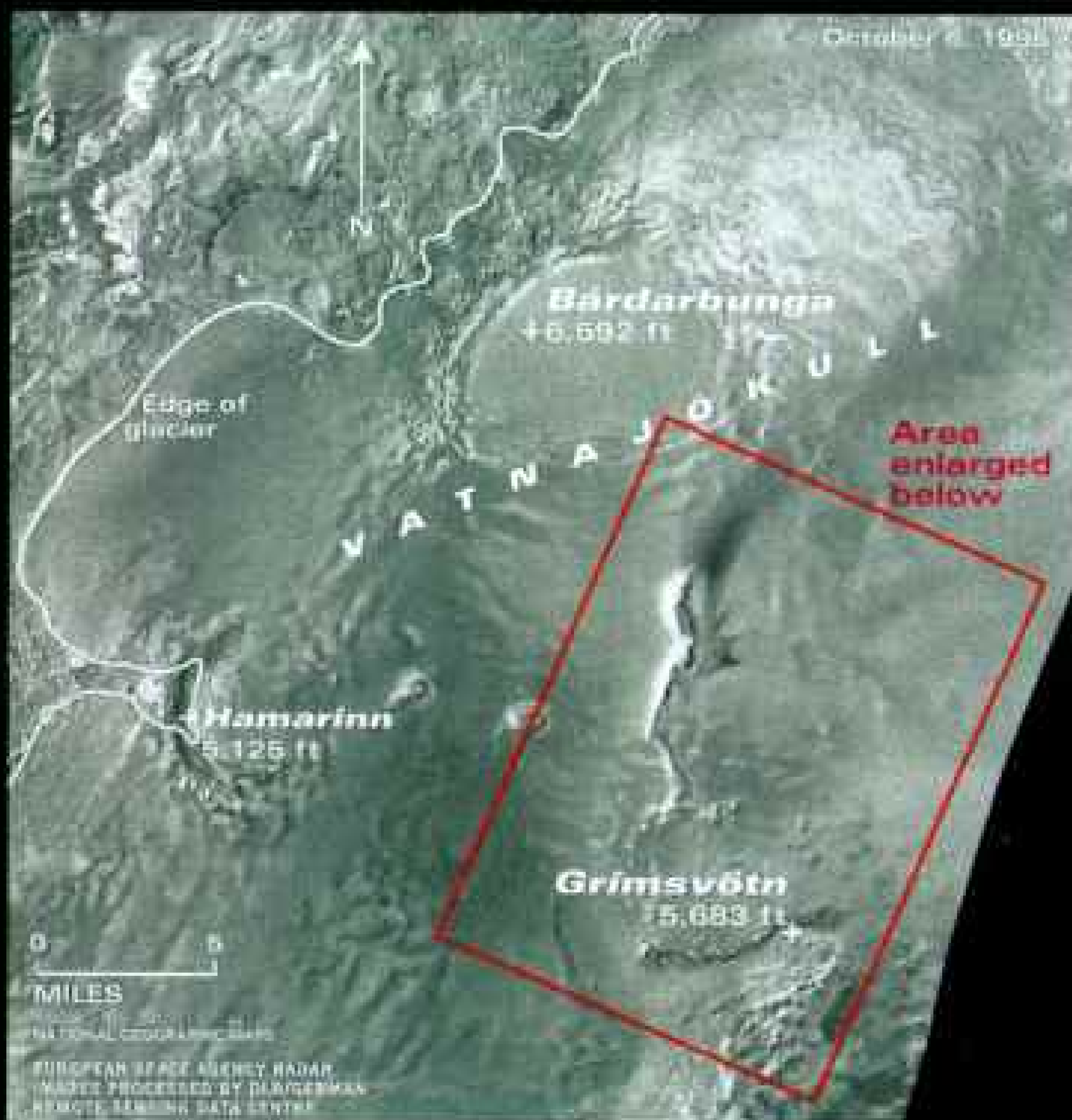
Space-age look at an ice-age event

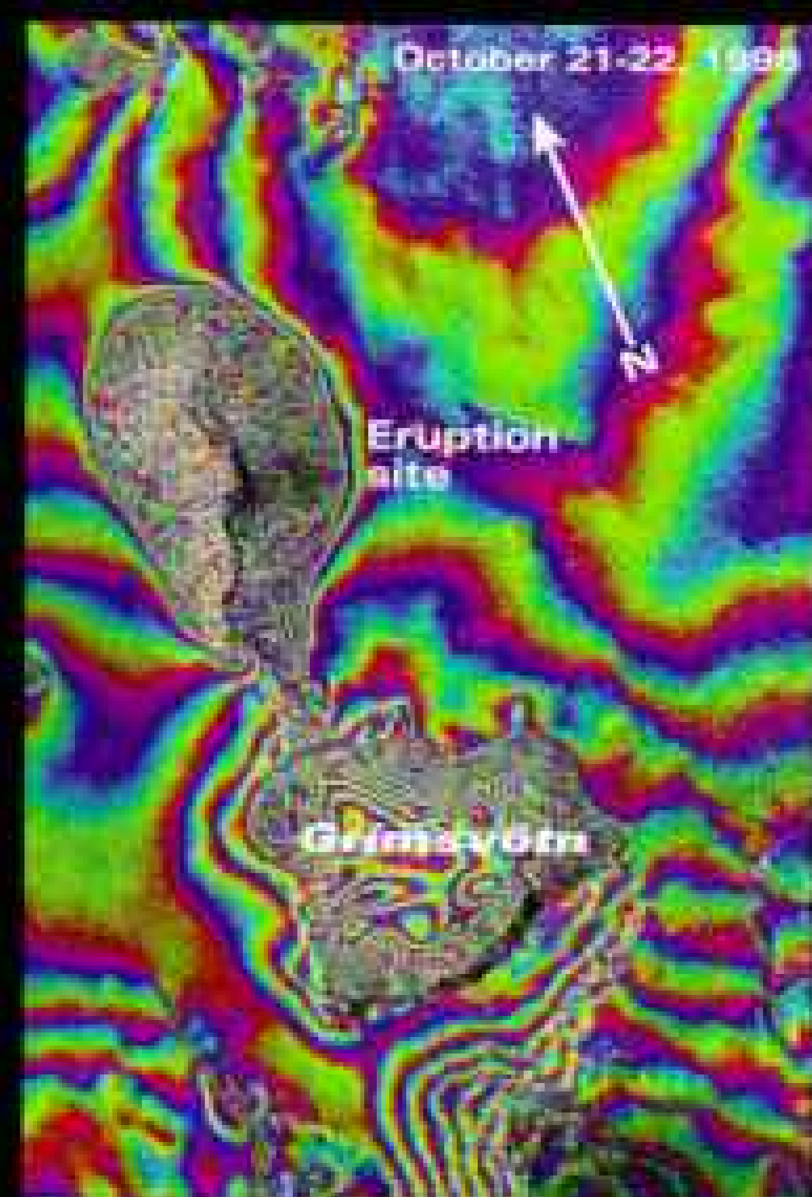
Eyeing the eruption from above (facing page), scientists gained new insights into the ancient upheavals that forged Iceland's dramatic landscape. "Subglacial venting probably shaped the land in this region more than anything else," says Guðmundsson. "Yet this was the first time we've been able to observe such an eruption from beginning to end."

To study each phase, he spent many hours in an airplane, wheeling like a hawk above the ice. Earth-orbiting satellites, meanwhile, provided even loftier views.

On a satellite radar image made during day seven of the eruption (right), the volcanic fissure resembles a jagged knife wound. Images taken two weeks later by a pair of satellites, one orbiting a day behind the other, were melded by computer to show changes in the glacier's surface over the 24-hour period (below right). Mottled colors indicate the ice sheet subsiding around the eruption site, while tight swirls at the bottom of the image record the ominous rise of the ice atop Grímsvötn lake.

To aid in forecasting when the jökulhlaup would hit, hydrologist Árni Snorrason (below) took daily water samples at the foot of the glacier, where a sharp increase in waterborne sediments would signal the onset of the flood. A rainbow that arced above the bridge where he was stationed proved portentous: When the long-anticipated jökulhlaup finally came, it swept the bridge away like a divine judgment.





Of ice and men

Recalibrating his sense of scale, Árni Snorrason sizes up mammoth blocks of ice blown from the glacier as floodwaters broke through the surface. Icelandic history records about 60 such cataclysms since Vikings arrived in the ninth century, but scientists were skeptical of the near-apocalyptic descriptions of monstrous floods. "Now we realize the stories are probably quite true," Snorrason says.

The gods of volcanism beneath Vatnajökull have been relatively quiet for the past 60 years. But that respite is likely finished. Even if they sink back into slumber, the thermal effects of last year's outburst will endure for as long as 20 years, triggering more floods in coming decades.

"This event is not over," says Gudmundsson. "Even now ice continues to melt, and Grímsvötn lake is again rising." Just when the gathering jökulhlaup will burst forth, and with what degree of ferocity, is impossible to know. This much is certain: Such hazards will remain part of the challenge—and wonder—of life on this island of fire and ice. □

TEXT BY GLENN OELAND
EDITORIAL STAFF

RAGNAR AXELSSON, *MORGUNBLAÐIÐ*

La Salle's

Rigid and imposing as the man it portrays, a statue of French explorer La Salle faces the dawn over Matagorda Bay in Texas. In 1686 this bay claimed La Salle's last ship and last hope of reaching the Mississippi by sea. The wreck's recent recovery spotlights his failed dream.

Last Voyage

By LISA MOORE LaROE
NATIONAL GEOGRAPHIC EDITORIAL STAFF
Photographs by ROBERT CLARK

On July 24, 1684, Robert Cavelier, Sieur de La Salle, sailed between the 14th-century towers flanking the French port of La Rochelle (below) with four ships, 300 men and women, outward bravado, and inner doubt about his quest. He hoped to reach the mouth of the Mississippi River, there to establish a colony and port

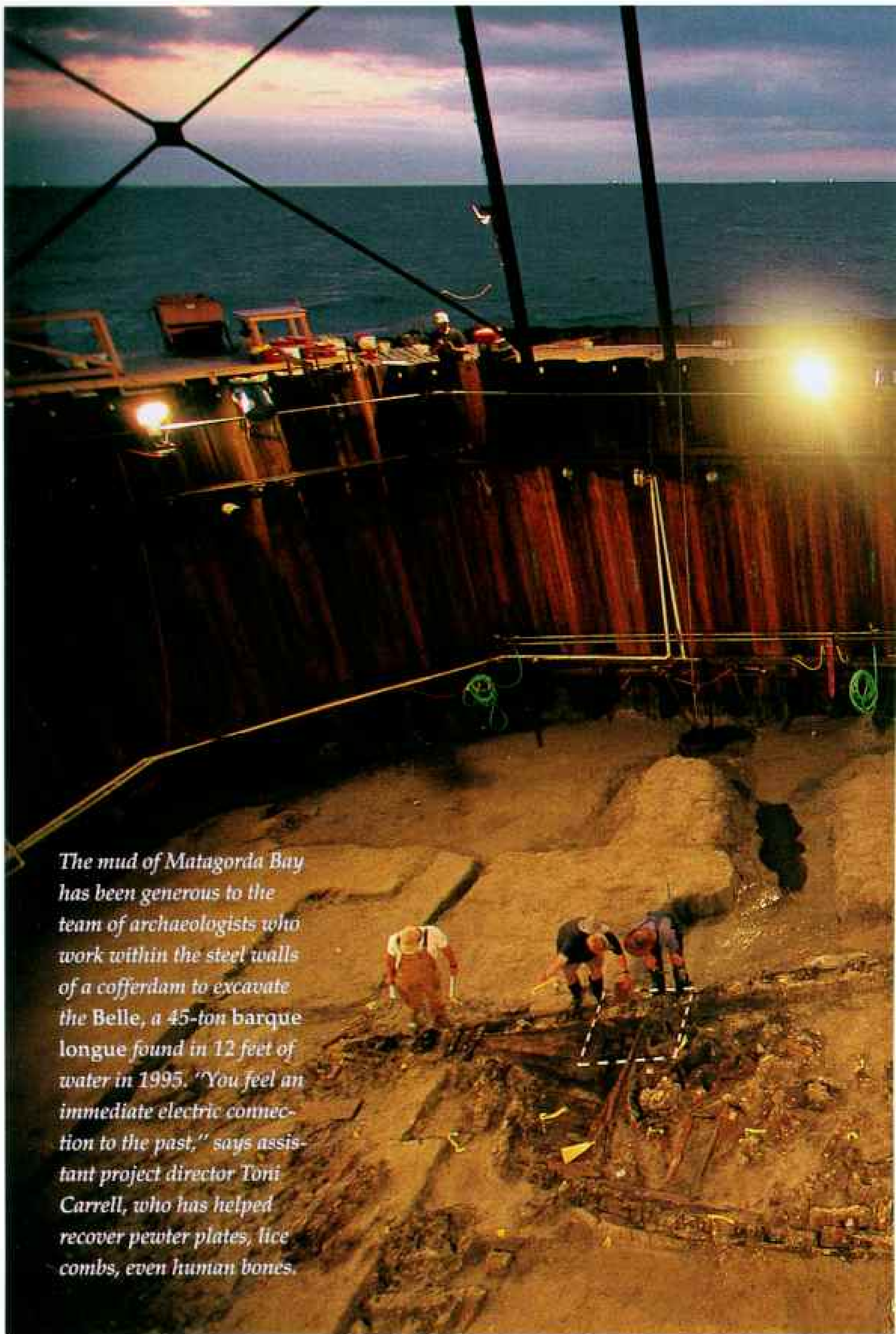
for the glory and enrichment of France.

King Louis XIV backed La Salle, who had been the first European to travel the length of the Mississippi from the Great Lakes to the Gulf of Mexico, claiming the entire drainage area for France and naming it Louisiana.

But La Salle's vision far exceeded his ability. He overshot his mark by 400 miles. His ship, the *Belle,* foundered in a storm (right), and his fledgling settlement perished. This sad history is recorded in the journal of Henri Joutel, faithful witness to La Salle's search for "that fatal river." Wrote Joutel, "Heaven refused him that success."

Discovered in Matagorda's murky waters after more than 300 years, the wreck of the *Belle* reveals much about La Salle's ill-fated mission.

DRAWING BY HERBERT TAUSS



The mud of Matagorda Bay has been generous to the team of archaeologists who work within the steel walls of a cofferdam to excavate the Belle, *a 45-ton* barque longue *found in 12 feet of water in 1995. "You feel an immediate electric connection to the past," says assistant project director Toni Carrell, who has helped recover pewter plates, lice combs, even human bones.*

"It was archaeology by braille," says Chuck Meide, who groped through Matagorda's muddy waters to find the first of three ornate bronze cannon recovered from the *Belle*—proof of her identity. Each bears the name Le Comte de Vermandois (right), illegitimate son of Louis XIV. In 1669 the king appointed him admiral of France—at age two.

Meide was part of a team led by marine archaeologist Barto Arnold, who found the *Belle* by scanning the bay for magnetic anomalies caused by iron in the wreckage. Arnold knew roughly where to look. In 1687 a Spaniard wrote of a wreck with "three fleurs-de-lis on her poop" near what is now Matagorda Peninsula. Shrimpers had snagged nets there for decades.

To simplify excavation in the silty bay, the Texas Historical Commission—in charge of the wreck's recovery—had a cofferdam built around the *Belle* (below) and had the water pumped out. "It is the first dry-land excavation of an offshore wreck in this hemisphere," says project director Jim Bruseth.

For *Belle*'s archaeologists it is a 15-mile boat trip from their warehouse-dorm in Palacios to the wreck. Inside "the pit" *Belle*'s oak ribs peeked through gray mud, her planking sloped to starboard. Wood casks lay in a jumble, and everywhere was a sense of human hands—in the nested cook pots, the coiled ropes, the numbers carved into *Belle*'s timbers by a shipwright.

She was surprisingly small—only 51 by 14 feet, according to records discovered last year by historical archaeologist John de Bry. Yet her loss was incalculable to La Salle's colonists: It left them adrift in a hostile land.

ILLUSTRATION BY GREG HARLIN (OPPOSITE), GRADY ALLEN (ABOVE)

La Salle believed that a port at the mouth of the Mississippi would link French holdings from Canada to the Gulf, making the French "masters of the whole of this continent." It would also give France a base from which to attack Spain's lucrative silver mines in Mexico. His plan never realized, La Salle died a failure to his countrymen.

March 1687: La Salle is murdered by his own men near the Trinity River.

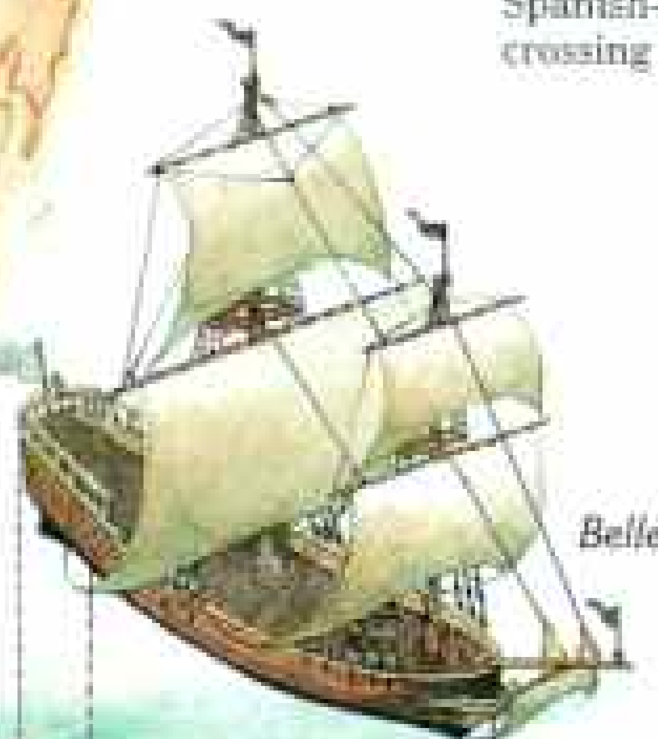
January 1686: Blown across the bay by a north wind, *Belle* runs aground stern first near Matagorda Peninsula.

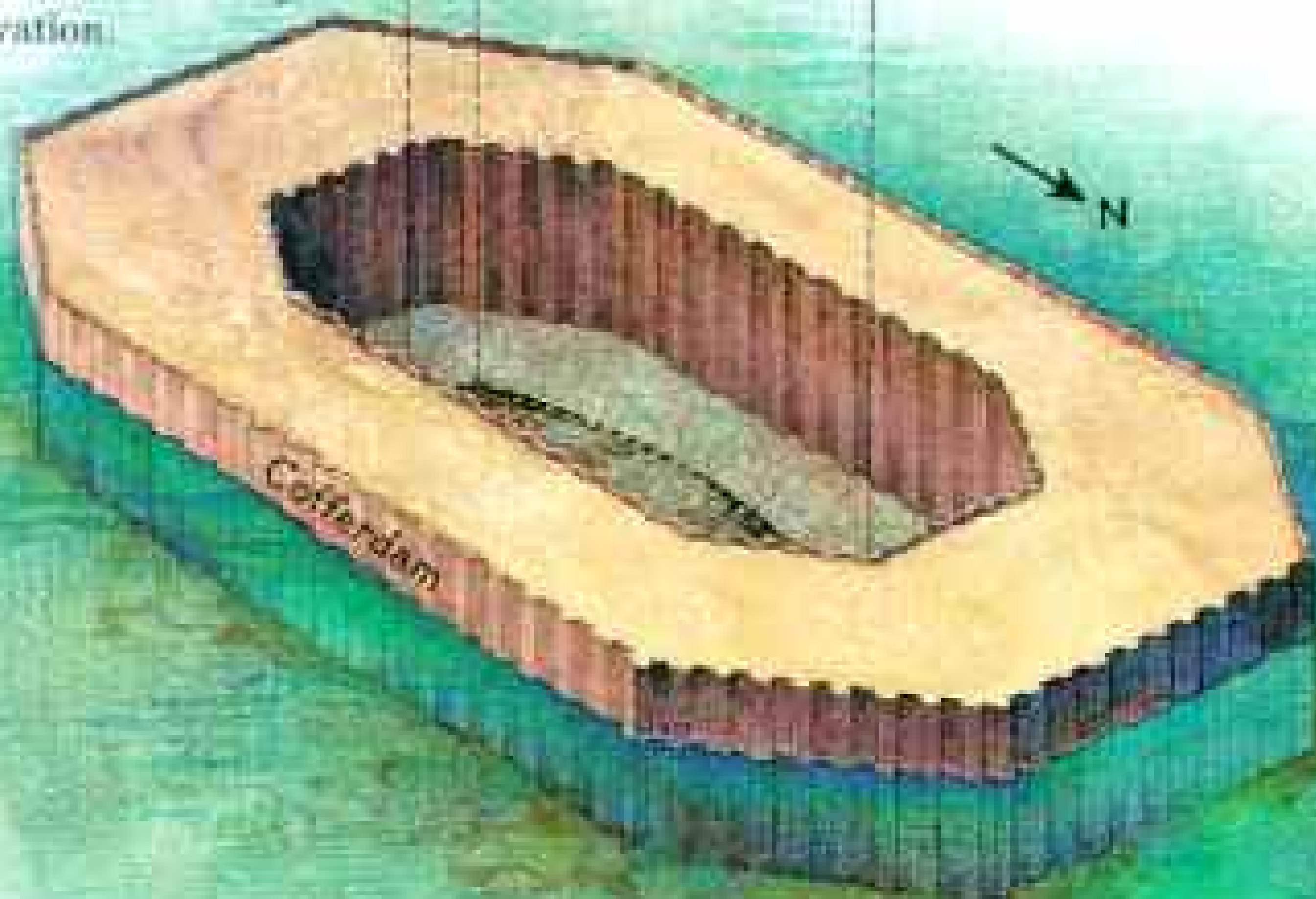
January 1685: After five months La Salle lands just west of the Mississippi. Uncertain of his location, he sails on to Matagorda Bay, mistaking it for a western arm of the river. Joutel describes a land alive with bison, fish, and fowl.

The voyage, 1684: During a two-month stay in Saint-Domingue (now Haiti) La Salle suffers a fevered delirium. He sets sail in November, passing Spanish-held Cuba before crossing the Gulf.

Belle's *Elaborate Steel Crypt*

The 1.4-million-dollar cofferdam surrounding the *Belle* is as impressive as the ship is diminutive. It consists of two concentric octagonal walls of interlocking steel plates sunk 40 feet below the bay floor and rising about 6 feet above sea level. Sand-and-gravel fill between the walls serves as a work platform for the archaeologists—"*Belle*'s second crew"—who arrive daily for excavation.





"We all have good hope of a happy success," wrote La Salle to his mother just before his final voyage. Seldom have a son's words of comfort been so unfounded.

The trip was doomed from the start. Rivalry seethed between La Salle and Captain de Beaujeu, with whom he was forced to share command. One ship, the ketch *St. François*, was seized by pirates. La Salle "rendered himself privately odious" to the crew through rigid discipline, wrote Joutel. Many deserted during a stop on Saint-Domingue; others contracted disease through debauchery.

La Salle was flying blind, with no accurate way to gauge the longitude of the Mississippi. When he arrived at Matagorda Bay in late January 1685, he convinced himself he had found a western arm of the great river.

The group found little joy in this land of brackish water and endless plain. Their supply ship, the *Aimable*, ran aground while entering the bay. With it sank nearly all their food, medicine, and tools. Soon after, the *Joly* sailed back to France with colonists who longed for home, leaving only the *Belle*.

La Salle ordered the building of Fort St. Louis on Garcitas Creek for the 180 settlers who remained. Many died from dysentery, smallpox, poisonous fruit, snakebites, or native arrows. La Salle left for months at a time to search for the main branch of the Mississippi. Addressing the dwindling group upon his return (above), he did little to alleviate his followers' bitterness and rising despair.

Belle's loss was the cruelest blow. She had been anchored offshore with supplies and about 20 people. When she ran out of drinking water, her desperate—

and drunk—pilot tried to sail to Fort St. Louis. But a fierce norther blew the ship across the bay and she ran aground. Only six people reached the fort to tell the tale. Jean Cavelier, La Salle's brother, wrote that the settlers felt "cast away in a savage country." The land had become "a perpetual prison."

In January 1687 La Salle set out to seek help. He took about 17 men. Only 20 settlers remained behind. Having aroused what Joutel called "an implacable hatred," La Salle was ambushed in March by five of his men and shot through the head before the eyes of Anastase Douay, a friar (below). The assassins stripped and cursed the corpse, dragged it into a thicket near the Trinity River, and left it as carrion. La Salle was 43.

Joutel, Douay, and three others made it to Canada and then sailed home to France, but Louis XIV refused to help the colonists. Some died of disease. Others were killed by Indians, who spared the children. Yet the fort had its legacy. Spain began settling its northern territories, having vowed to "pluck out the thorn which has been thrust into the heart of America."

DRAWINGS BY HERBERT TAUSS

"You can see the tragedy that befell the ship," says Layne Hedrick, who discovered and then helped remove (right) the complete skeleton of a man (below) found in the bow atop sodden rope. Before the *Belle* ran aground, several aboard had died of thirst. Perhaps this fellow's last drink came from the liquor cask still encircled by split-willow hoops. Near him lay a leather shoe (top right) and pewter porringer (bottom right) inscribed "C. Barange."

Wood, bone, leather, hair—these organic artifacts, remarkably preserved in anaerobic muck, are *Belle*'s real treasure. Heartier objects such as lead shot (center) and glass trade beads look new after cleaning. Such artifacts, along with eight iron cannon found at the Fort St. Louis site, await conservation at Texas A&M University.

A decorative candlestick, a lady's ring, a crucifix, each recalls the hopes of La Salle's lost colonists, forgotten by king and country. With *Belle*'s recovery, they seem to live again. □

THE DAWN OF HUMANS

Expanding

So near yet so far, the Indonesian island of Lombok looms beyond a deep strait that must have stymied *Homo erectus*. Smarter and faster than its predecessors in Africa, this new hominid species spread across the Old World beginning almost two million years ago. Remains that include a fossilized skull from Java provoke countless questions on the origin and fate of these beings and the identity of those who dared each new frontier.

Worlds

By RICK GORE SENIOR ASSISTANT EDITOR
Photographs by KENNETH GARRETT
Art by JOHN SIBBICK

IN THE SMALL PORT of Padangbai on the island of Bali a ferryboat called the *Nusa Penida* sits low in the water, loading passengers for a 40-mile trip to the neighboring island of Lombok. Scabs of rust stain the boat's white hull, and workers yelling in languages I don't understand toss buckets of slop from the squalid decks. No pleasure boat, the *Nusa Penida* conjures up those one-paragraph stories I recall reading in newspapers back home: "Indonesian Ferry Sinks; 400 Eaten by Sharks."

Fuming cars and trucks, surrounded by walk-on passengers, honk impatiently as they inch toward the boarding ramp. Vendors hawking everything from T-shirts to incense wander through the crowd. A woman selling trinkets and postcards approaches me and holds up a string of beads.

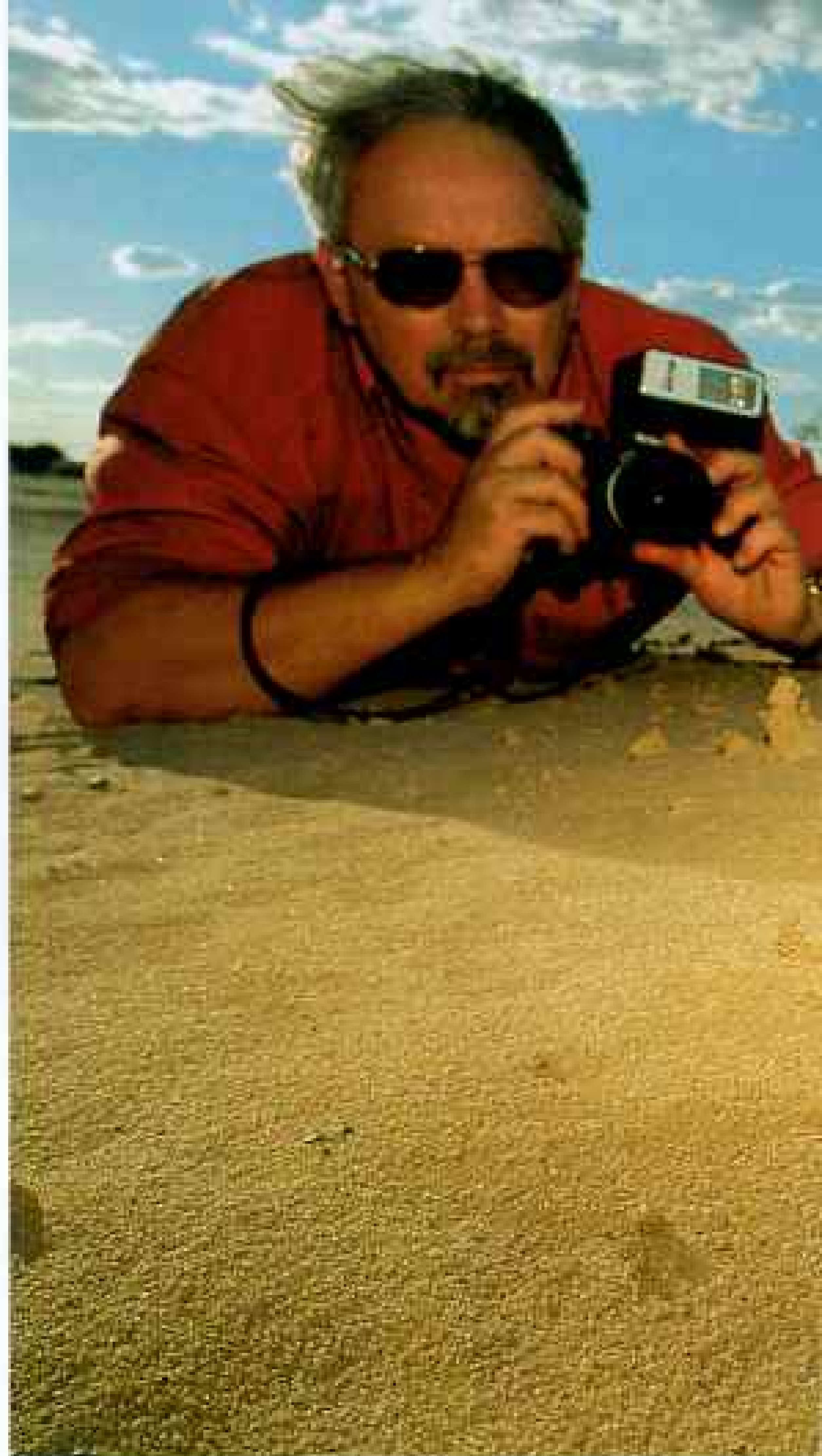
"No, thanks," I tell her, but she persists, trying to slip the beads around my neck. "No want money," she says, pointing toward the *Nusa Penida*. "Gift. For not drowning."

I glance at the boat again. A moment later I am wearing the beads and giving her a few coins for some postcards.

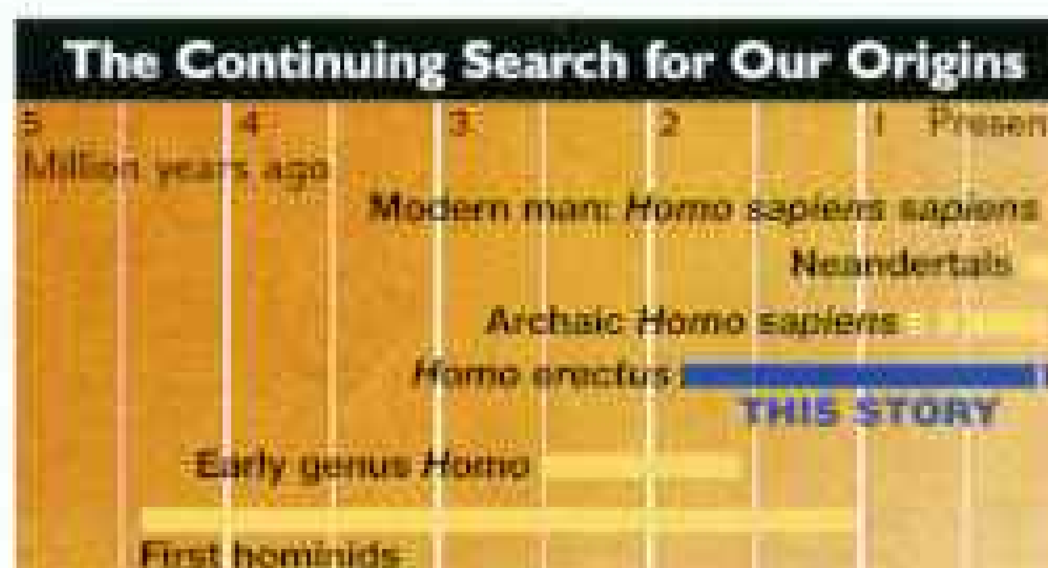
"Why am I doing this?" I ask myself as I board the *Nusa Penida* and it chugs out of the harbor. But I know the answer. This crossing completes a journey. For months now I have been exploring the controversial terrain of human evolution, retracing the steps early members of the genus *Homo* made as they spread throughout Africa, Europe, and Asia.

Homo, the second of the two major genera, or groups, of hominids, probably evolved in Africa from its more apelike predecessor, *Australopithecus*, around 2.5 million years ago. With longer, more modern body proportions than the short and stocky australopithecines, *Homo* was a new kind of hominid. And with a bigger brain it was well equipped to extend its range beyond its home continent.

By a million years ago—perhaps much earlier—at least one species of *Homo*, *Homo erectus*, had made it as far as Indonesia. But Bali was apparently the end of the line for *erectus*,



Australia's oldest known human fossils lie in the Willandra Lakes area, where anthropologist Alan Thorne surveys a 37,000-year-old femur. Thorne believes that the first hominids to leave Africa were archaic *Homo sapiens* who then evolved into modern humans in many regions. Others think *sapiens* replaced *erectus* throughout its wide range by about 100,000 years ago.



Articles in this series focus on early members of our own genus and the hominids that preceded them. Much of this research was supported by your Society.

who could never do what in five skittish hours I will do on the *Nusa Penida* today. I will cross Wallace's Line, an invisible biological barrier described in the 1860s by the British naturalist Alfred Russel Wallace.

Wallace noted that this strait between Bali and Lombok separated two great faunas—one that had originated in Asia and another that had begun in Australia. Today scientists know that a deep trench has always kept a waterway between these islands, even when low sea levels created land bridges between Asia and other Indonesian islands. Thus tigers could never prowl beyond Bali, and kangaroos could not make the leap into Asia. Nor could any human cross until someone, presumably a member of the most advanced of all *Homo* species, *Homo sapiens,* invented the rudiments of seafaring.

As the *Nusa Penida* rolls through the waves, I reflect on what I have learned of the long passage our early ancestors made toward Indonesia. How strange to recall that this far-flung archipelago was for decades considered the birthplace of humanity. That's because fossils of these ancestors were first found on the island of Java.

In 1887 a young military doctor from Holland, Eugène Dubois, sailed into Java with the sole purpose of finding the hypothetical missing link between apes and humans. By 1891 Dubois had organized a large excavation in Java along a bend in the Solo River near the village of Trinil. Using East Indian prisoners as laborers, he pulled off one of the greatest success stories in the history of science: In his first two years he found what he was looking for—a skullcap, a femur, and a molar that came to be known as Java man. He labeled his discovery *Pithecanthropus erectus,* meaning "upright ape man."

The Original Frontier

The fertile ground of Africa produced the first hominids, most experts agree. Largely herbivores, early species didn't stray far from familiar plants, which had limited ranges. Then, some two million years ago, a different kind of hominid appeared: a carnivore born to roam. "Meat is meat," explains Alan Walker, a paleoanthropologist at Pennsylvania State University. "Once you start eating it, you can take advantage of other animals' adaptations to the various plants and spread over enormous distances."

A widely held theory says that *Homo erectus* was the first hominid to venture out of Africa, leaving a trail of its own bones as well as stone tools (right). Finely worked hand axes are the signature of *erectus* at many sites. "Experiments and common sense suggest they were heavy-duty butchery tools, but we can't prove it," says Indiana University lithic specialist Nick Toth.

Yet *Homo erectus* may not have been the first explorer after all. Controversial new evidence with extraordinarily early dates has convinced some scientists that an older *Homo* species appeared in Asia just as *erectus* was emerging in Africa.

From Africa?

Did *Homo erectus* first appear in Africa, spread across that continent, then move to Asia and Europe over many hundreds of millennia?

Crudely chipped, the chopper (top left) shows an early toolmaking technique of the Stone Age. More advanced skills created the oval biface. Masterly hand axes—called Acheulean after a French site—were crafted later in Africa and the Middle East. Sharp flakes were common in the Far East.

NATIONAL GEOGRAPHIC MAPS

Many Eastern sites such as Zhoukoudian yield numerous choppers and flakes but no hand axes. Were hominids here making their big tools from bamboo?

From Asia?

Did an earlier hominid reach Asia and there evolve into *Homo erectus*? Did erectus then spread to Europe and back to Africa?

Ubeidiya
Hand ax
1.4 million years old

Nihewan
Flakes
one million years old

Yunxian
Crude biface
600,000 years old

Bose
Hand ax?
780,000 years old

Jinmium
Core tool
116,000 years old

Large stone hand axes litter Western sites such as Olorgesailie. Were they used like butcher knives to dismember and deflesh large animals such as elephants?

● SELECTED SITE 90,000 TO 1.8 MILLION YEARS OLD

EUROPEAN SITES ARE ATTRIBUTED BY DIFFERENT RESEARCHERS TO HOMO ERECTUS OR ARCHAIC HOMO SAPIENS. (WATCH FOR THE AUTHOR'S ARTICLE ON THE FIRST EUROPEANS IN THE JULY 1997 ISSUE.)

A man with a mission, Dutch anatomist Eugène Dubois sailed to Indonesia in 1887 seeking evidence of human evolution. By the Solo River he unearthed a skullcap, a molar, a femur—Java man (right). Measuring cranial capacities with mustard seeds poured from the skulls into a cylinder, he realized that this hominid was an ape-man not a man-ape and changed the Latin in his notes, spotlit at right. Technology today is changing long-accepted dates for fossil sites such as Sangiran in Java, where geologist Carl Swisher orients a rock sample for paleomagnetic dating.

THE STUDY of early humans has come a long way since Dubois's discovery. In the 1920s and '30s an international expedition uncovered an assortment of fossils known as Peking man at a site near Beijing. By the 1950s scientists were lumping both Java man and Peking man into the same genus as people today and calling it *Homo*, Latin for "human."

Scientists also learned that the renamed *Homo erectus* was not the earliest member of the human family tree. The australopithecines, discovered first in South Africa in 1924, were thriving in Africa's Great Rift Valley by 4.1 million years ago. Although australopithecines walked on two legs, they had retained apelike features such as long arms, thick waistlines, and chimpanzee-like faces. Eventually, one species of australopithecines—and paleoanthropologists feud over which one it was—evolved into the first *Homo*.

Most scientists agree that the earliest species of *Homo* emerged about 2.5 million years ago, perhaps in response to climatic changes. Africa was experiencing great swings in climate, becoming on average cooler and drier. Eventually a species arose—*Homo erectus*—that was superbly adapted to the more arid, open grasslands and less stable environments that had spread across tropical Africa.

Until the mid-1980s no one realized this, because all but a few *erectus* fossils found by then were skull fragments. But in 1984 a team led by Richard Leakey began unearthing the nearly complete skeleton of a 12-year-old *erectus* boy who died 1.54 million years ago near Lake Turkana in northern Kenya.*

KENNETH GARRETT frequently covers stories on early humans for the magazine. He photographed "The First Steps," also by RICK GORE, for the February 1997 issue. Artist JOHN SIBBICK lives in Bath, England, where he specializes in "reconstructing anything that's extinct."

*See "*Homo Erectus* Unearthed: A Fossil Skeleton 1,600,000 Years Old," by Richard Leakey and Alan Walker, November 1985.

The skeleton, named the Turkana boy, is stored in boxes in a dark, air-conditioned room sometimes called the Chapel at the National Museums of Kenya in Nairobi. When I visited most recently, an aura of reverence filled the quiet room, a soothing contrast to the din of Nairobi's chaotic streets. Emma Mbua, who has served as keeper of the fossils for many years, took several boxes containing the boy's bones from one of the metal cabinets that line the Chapel's walls.

The first box held the boy's skull. His teeth and jaws are smaller than the crushing molars and strong mandibles of the australopithecines. A meat-eater, *erectus* did not need the powerful jaws his predecessors used for grinding coarse vegetation and cracking nuts. The rear of the skull, which contains the part of the brain that processes sight, is larger than in australopithecines, suggesting that *erectus*'s vision was keen. But the rest of the *erectus* brain was still evolving, as is evident from the boy's lack of a forehead. His brain's frontal lobes, where complex thinking occurs in modern humans, were relatively small.

"An adult *Homo erectus* had a brain the size of a one-year-old modern human's," says Alan Walker, one of the paleoanthropologists who excavated the skeleton. "Still his brain was twice as large as a chimp's, so he must have been devastatingly clever for his time."

Walker, a jovial English expatriate, has studied the boy for much of the past 12 years. He had met me at the museum on an earlier visit to explain the boy's anatomy.

The real novelty of the Turkana boy, according to Walker, lies below the neck. The length of his thighbone suggests that he would have stood five feet three inches tall when he died and probably would have grown to six feet or more by adulthood, making *erectus* by far the tallest hominid species to have evolved by that time.

The boy's pelvis was narrow, which made him more efficient on two legs than even we are. "*Homo erectus* was tall and slim-hipped

Australopithecus afarensis
Larger browridge
Protruding face
Brain: 400-500 cubic centimeters

3.9 to 3 million years ago

Homo erectus
Browridge
Brain: 800-1,000 cc

1.8 million to 100,000 years ago

100,000 years ago to present

Homo sapiens
No browridge
Enlarged forehead for larger frontal cortex
Brain: 1,100-1,400 cc

Almost Like Us

From the neck down *Homo erectus* looks more like *Homo sapiens* than *Australopithecus*. Yet the hole in a vertebra (above, at left) smaller than one today carried a spinal cord probably too limited for speech. The brain, replicated in the white cast, was nowhere near modern either. A full-grown *erectus* female (reconstruction, facing page) would likely not have been capable of reasoning or imagining, the essence of our species.

Homo erectus

Australopithecus afarensis

Homo sapiens

"These creatures had a brain the size of a one-year-old modern human's," notes Alan Walker, a member of the team that found the skull pictured above along with a remarkably complete skeleton—the "Turkana boy."

The rib cage is virtually identical to that of *Homo sapiens*.

Hips narrower than those of other hominids helped give *erectus* great speed.

Robust bones carried *erectus* through a physically demanding life.

As tall as six feet and slender, *erectus* had ample surface area for sweating, an advantage in the tropics.

RECONSTRUCTION BY JOHN GURCHE; PHOTOGRAPH BY RICK WICKER

and built to run around catching prey in the heat of the day on the Equator," says Walker, who teaches at Pennsylvania State University.

Examining the limb bones of the Turkana boy, I could envision him racing across the savanna, but the vacant eye sockets made me wonder whether we could have connected as fellow humans. Could we have communicated? Some scientists believe that *erectus* had rudimentary language, since their increasingly complex social organization would probably not have been possible with mere grunts.

But Walker argues that the boy lacked speech as we know it. His evidence lies in another box Emma Mbua opens for me in the Chapel. It contains the boy's spine. I hold up a small bone known as T7, the lowest vertebra of the thorax. The hole in the middle is the canal through which the spinal cord passes. Nerves in the T7 area of the spinal cord allow fine control of the rib-cage muscles used in exhaling. Mbua brings me the same bone from a modern human so I can compare the two. The hole is noticeably smaller in the boy's bone. Therefore, Walker argues, his spinal cord could not have carried enough nerve tissue for him to control his breathing as well as modern humans. Linking words into long sentences would have been impossible.

"That doesn't mean he couldn't have made meaningful utterances," says Ann MacLarnon, an anthropologist at Roehampton Institute London, who first connected the small hole in the boy's vertebra with his ability to control breathing. "With simple grunts and sounds you can communicate a lot," she says. "But he couldn't have produced anything like modern human speech."

ONE REASON some scientists believe *Homo erectus* could communicate verbally was that, by the time of the Turkana boy, the species was evolving a superior tool kit for butchering animals. While earlier hominids had relied on crude cobbles and flakes, *Homo erectus* invented the hand ax, a teardrop-shaped stone that fit snugly into the palm and, depending on how it was held, could cut, crush, or batter. Hand axes were the Swiss army knives of their day, and passing on the technology to make them, some scientists argue, required more than physical gestures.

At the National Museum in Addis Ababa in what once was a small library, three Ethiopian scientists, Yonas Beyene, Yohannes Zeleke, and Berhane Asfaw, along with their colleague Gen Suwa from the University of Tokyo, show me tables covered with hand axes and other tools they had collected at a new site called Konso-Gardula, or KGA. Each is identified by a white flag designating which of 12 different site locations it came from, and, thus, its age. The locations are dated between 1.37 and 1.7 million years ago, making KGA the oldest known hand ax site in the world.

KGA lies hidden in a remote stretch of the Great Rift Valley near Ethiopia's border with Kenya. The team discovered it by scouring satellite images in the hope of finding isolated areas where erosion is stripping away ancient sediments, thereby uncovering artifacts and bones. After the location was pinpointed, Asfaw and Suwa made the slow, arduous drive to survey it.

"We were staggered when we saw all the stones and bones," recalls Suwa. The team returned two years later and collected hundreds of hand axes. "We had to carry them on

the hour-and-a-half walk back to our vehicles," says Zeleke.

Beyene picks up a ten-pound, eight-inch-long hand ax from the oldest of the tool-bearing locales, KGA 4, which is dated between 1.5 and 1.7 million years ago. "You don't see much refinement here," he says. "They've only knapped away a few flakes to make the edge sharp."

He then displays a beautifully knapped hand ax from KGA 8, made tens of thousands of years later. "See how refined and straight the cutting edge has become."

"It was an artwork for them," Asfaw adds. "It wasn't just for cutting. Making these is time-consuming work."

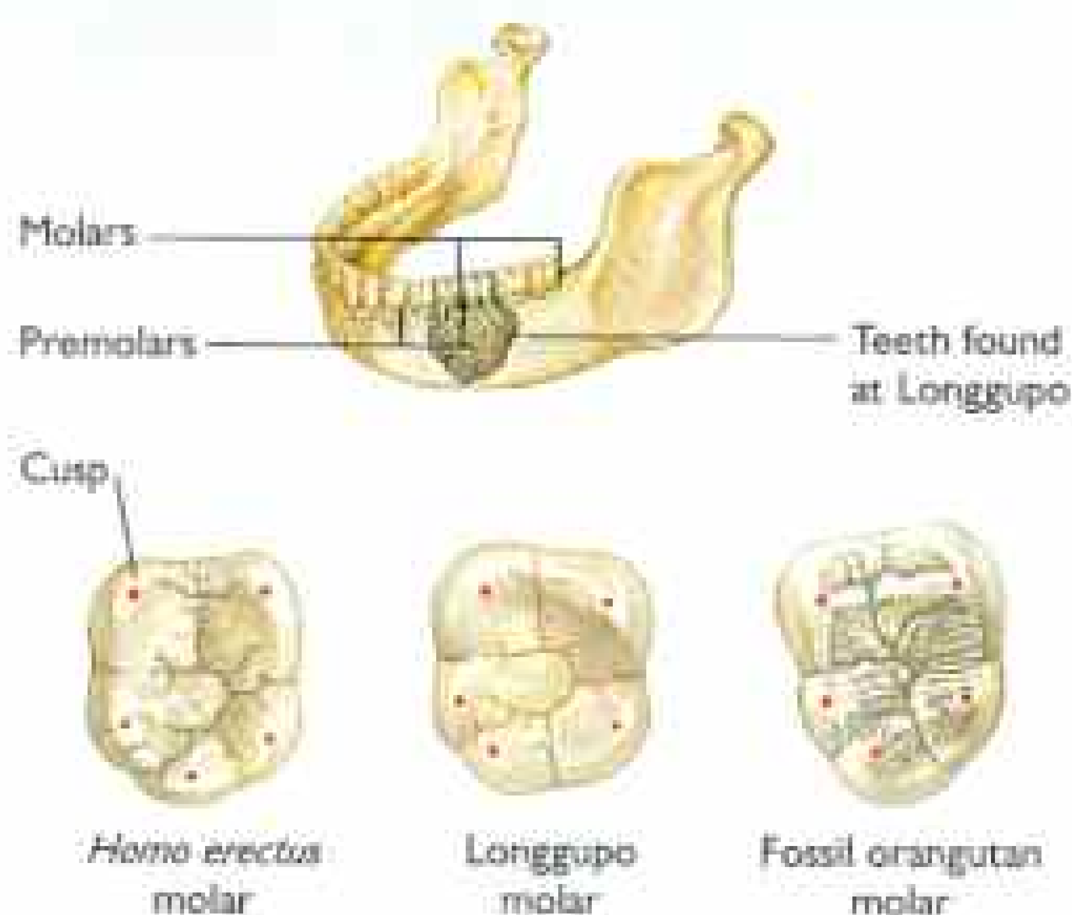
Early humans were evolving a sense of craftsmanship. Not only did they knap stone elegantly, but by the time of the Turkana boy they were probably also working with wood and bone.

Armed with such tools, *erectus* learned to intimidate other mammals, a skill that became necessary as the grasslands of Africa expanded and antelope, buffalo, and other large grazers began to thrive. Along with hand axes they used sharp cleavers and finger-size scrapers to cut through tough hides and slice off chewable chunks left over from lion or leopard kills. They would then smash the animal bones and suck out the nutritious marrow.

"Tools gave them access to elephants, wildebeests—bonanzas so big they couldn't eat it all," says Nick Toth, an archaeologist at Indiana University. "Meat gave them a new way to survive when the climate changed and their staple vegetation disappeared." Meat and bone marrow also gave them the extra energy to grow larger brains. Thus early *Homo* became an ever more clever omnivore, following the big cats that followed the game.

EVIDENCE of *erectus*'s growing impact on the local fauna litters the dry and dusty ground at the site of Olorgesailie, about an hour's drive from Nairobi in the Great Rift Valley. Dug extensively by Louis and Mary Leakey in the 1940s and '50s, Olorgesailie has more recently been worked by teams led by Rick Potts, a trim-bearded young paleoanthropologist from the Smithsonian Institution. On a sunny afternoon he walks me through a desert landscape that until 180,000 years ago was the shoreline of a lake. That lake attracted abundant wildlife.

Teeth from the Longgupo cave are tearing at the prehistory of China. Their discoverers call them *Homo erectus*. Other scientists say they could be from an earlier hominid, the first in Asia. Still others, comparing features such as cusps—marked below by red dots—argue that they belonged to an ape. The Chinese fossil record has suffered losses as bones have been ground up for traditional medicines (opposite).



CONSULTANT: RUSSELL L. CIOCHON

We approach the site of a prehistoric marsh where in 1987-88 his team excavated the remains of an elephant that died about 990,000 years ago. They found more than 400 flaked stone tools alongside the fossil carcass, which had obvious cut marks; most of the meaty limb bones were missing.

"Humans cut the limbs off and dragged them away," says Potts. *Erectus* would have

When fossils of great antiquity surprised archaeologists excavating the medieval Georgian village of Dmanisi, specialists like paleogeographer David Lordkipanidze (above) joined the effort. Amid many other remains, a saber-toothed cat skull came to light. Antje Justus recalls feeling something just under the skull: "I thought, Oh God, another bone. I will never finish." Her discovery? A jaw full of teeth that may establish *erectus* in Asia much earlier than anyone had imagined.

been drawn to the area by circling vultures, but there is no evidence of scavenging by other predators. This is because, according to Potts, humans and other carnivores were avoiding each other by this time.

Armed with hand axes, *Homo erectus* also began ranging farther from the lowland rivers and lakes to which earlier hominids were tied, says Potts. "This hints at something special to come—the increasing global adaptability of human beings." As Africa's dry grasslands and distinctive fauna shifted north and east, some humans may have migrated with them, leaving Africa before hand axes were invented. That may explain why, despite the presence of human fossils, hand axes older than 700,000 years have rarely been found outside Africa.

THE SCARCITY of hand axes outside Africa is one reason most scientists have long doubted that humans left the continent before about a million years ago. But in 1994 Carl Swisher and Garniss Curtis from the Berkeley Geochronology Center shocked their colleagues by dating volcanic deposits in Java containing the fossil skull of an *erectus* child at 1.8 million

years ago, at least 800,000 years earlier than *erectus* was thought to have been in that part of the world.

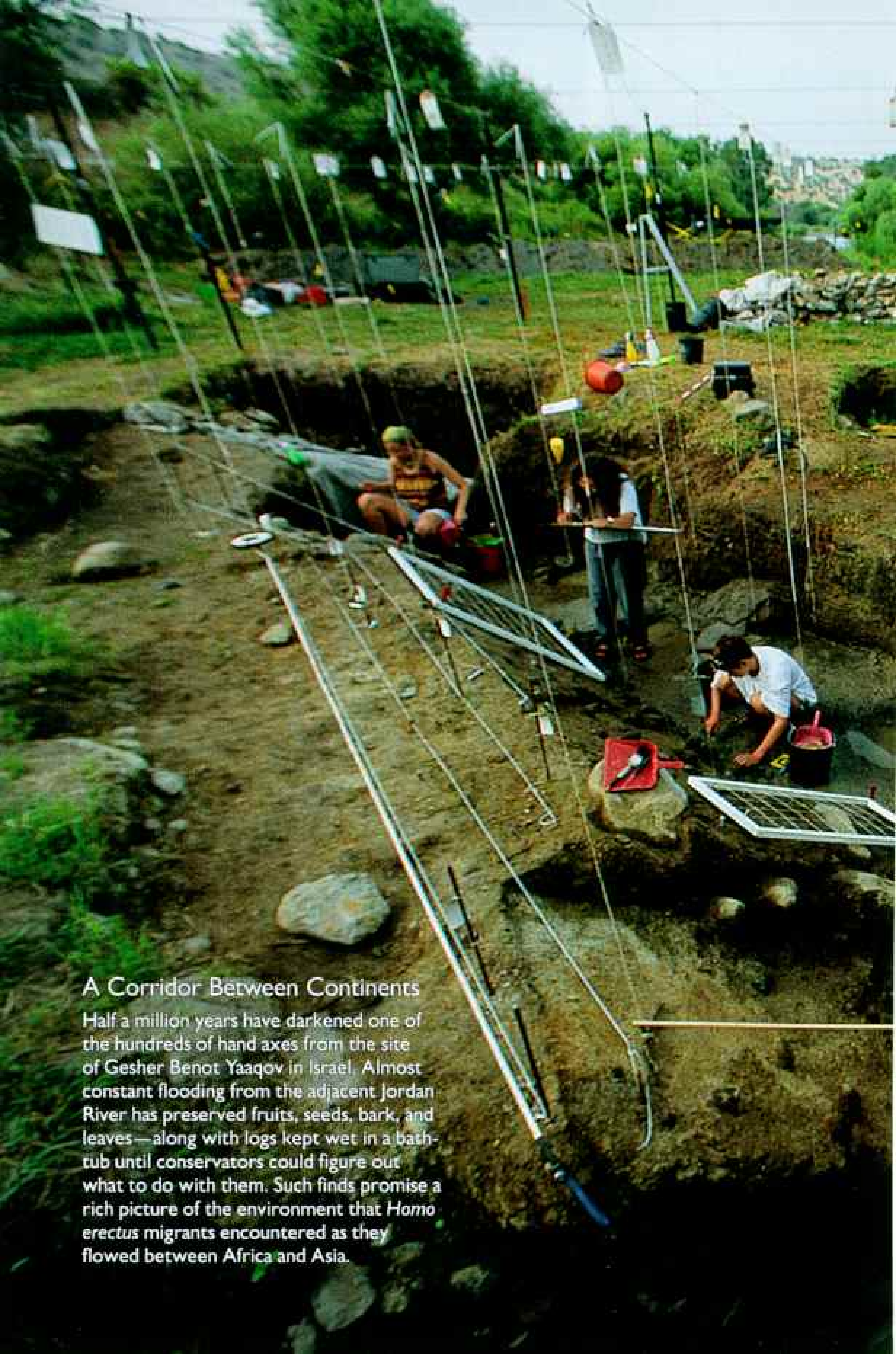
If *erectus* originated in Africa, as most scientists believe, this early date suggests that the species lunged out of its homeland and made it all the way to Java shortly after it evolved. But some scientists suspect that an unknown predecessor of *erectus* left Africa much earlier than previously believed. If this is true, *erectus* might have evolved elsewhere and later migrated to both Java and Africa. (Some scientists argue that the *erectus* fossils found in Africa vary enough from those found in Asia to merit a different name. They use the name *Homo ergaster*, or "working man," for all the African *erectus* specimens.)

At Gadjah Mada University in Yogyakarta, Teuku Jacob, Indonesia's leading authority on human fossils, lifts a delicate dark brown skullcap from a safe. The fossil was found in 1936 near the town of Mojokerto, not far from the site where Dubois discovered Java man. "She was the youngest of our fossils—about six years old," Jacob says.

"She's also the oldest," says Carl Swisher, taking the skull from Jacob and turning it over to expose the underside, which had been painted black years ago for unknown reasons. "We noticed there was an odd bump in this painted area that we knew wasn't part of the anatomy. So we scraped a little of it away and realized that the underside of the skull was coated with pumice."

Volcanic material can be dated reliably to within a few thousand years with the potassium-argon method, a technique that measures accumulated argon from the radioactive decay of potassium through time. Swisher took a sample back to Berkeley, where he found that it was 1.8 million years old. He also dated to 1.6 million years ago a sample from an area called Sangiran, where nearly 50 other *erectus* fossils have been found since the 1930s.

Swisher's astoundingly early dates were



A Corridor Between Continents

Half a million years have darkened one of the hundreds of hand axes from the site of Gesher Benot Yaaqov in Israel. Almost constant flooding from the adjacent Jordan River has preserved fruits, seeds, bark, and leaves—along with logs kept wet in a bathtub until conservators could figure out what to do with them. Such finds promise a rich picture of the environment that *Homo erectus* migrants encountered as they flowed between Africa and Asia.

One of the last people alive who witnessed the discovery of the Peking man fossils at the Zhoukoudian caves, 88-year-old archaeologist Jia Lanpo revisits the site with his son. "Not much is left here now. We'd better leave it for future generations," he says. Among the remains of some 40 individuals, no complete skulls were found. Skulls from Yunxian, unearthed recently, offer the first look at the face of what may be *Homo erectus* in China.

immediately challenged. Perhaps, other paleontologists argued, pumice older than the skull had eroded from the slopes of nearby volcanoes and buried it. Or perhaps the skull itself had washed down into older deposits. Maybe the local fossil collectors who had found the specimens had reported their locations inaccurately.

To quell the chorus of doubters, Swisher has returned repeatedly to the Sangiran basin, where most of the earlier fossils of Javanese *erectus* were found. He has determined that the layer of sediment that bears those human fossils is sandwiched between two layers of volcanic deposits, one laid down 1.5 million years ago and the other 1.7 million years ago.

The land is a sultry patchwork of terraced rice fields, bamboo groves, and scattered palm trees. At dawn we stand on a bluff near the village of Pucung and look down into a small gorge. Below us two girls laugh as they wash clothes in a creek that is swiftly eroding the rich volcanic sediment, bringing the prospect of more fossil discoveries with every heavy rain. Swisher had taken some of his samples from the hillside on the other side of the gorge.

"The *erectus*-bearing layers in this little gorge would be almost the exact age as those at Olduvai Gorge in Africa," he says, comparing this Java site to the oldest human fossil beds in Africa's most famous paleoanthropological site. Although doubters remain and technical questions must still be answered, other sites in Eurasia are forcing scientists to reconsider how quickly *Homo* left home. Controversial evidence has been emerging from China.

HORNS BLARE and a pall of smoke from burning coal and auto exhaust obscures the landscape as I head out of Beijing on a new superhighway with Jia Lanpo, one of China's most respected archaeologists. We drive southwest for about an hour until we reach the caves at Zhoukoudian, where in the 1920s excavators began

turning up pieces of five skullcaps and other remains of more than 40 *erectus* individuals—collectively known as Peking man.

"I saw the first Peking man skullcap," says Jia, 88, his eyes sparkling with the memory. That celebrated fossil fragment ended doubts about Dubois's discovery four decades earlier. A primitive human ancestor had indeed been afoot in Asia.

Jia himself identified one of the Peking man fossils in 1936 after he noticed a worker, Zhang Haiquan, looking at a walnut-size piece of bone he had just pulled from the earth. "I asked him what it was," recalls Jia. "He said 'Just a piece of rotten leek.' I looked again and said 'Get away! That's a human bone.' "

Today China has only casts made from the fossils. The originals disappeared in 1941 when, during the Japanese occupation of the region, the fossils were hurriedly packed up and sent away with American soldiers for safe-keeping. "For a long time I felt my spirit was lost also," he says, looking suddenly sad. "My head was muddled, and when people asked me a question, I would answer something they had not asked."

With help from his ever present son, Jia Yuzhang, Jia leads me down a steep path into the 165-foot-deep excavation site where he worked for more than half a century. He holds up one of the casts made in the 1930s. "This skull has some characteristics of modern Chinese people," he says. "For instance, the nose bone of Peking man was low and the cheeks were flat, as in Asians today."

Peking man lived more than 400,000 years ago, and scientists argue about whether any of his genes have survived. Jia thinks they have. Along with a few other scholars, Jia believes that the roots of humanity sprouted in Asia rather than Africa. Not all Western scholars discount that notion. "The idea that all hominids originated in Africa is a myth created by people working in Africa," one primatologist told me. "Sure they've found a lot there, but if

2 million years ago — Present

Bilzingsleben 400,000 to 300,000

It takes two hands for archaeologist Dietrich Mania to show how a stone chopper could have smashed the pelvis of a now extinct elephant found at Neumark Nord, an old German coal mine. Mania brought this tool from nearby Bilzingsleben, where he has uncovered many pieces of elephant bone as well as skull fragments he thinks are *Homo erectus*. Other scientists argue that *erectus* never made it to Europe.

Mania compares the Bilzingsleben skull fragments, positioned above by Emanuel Vlček, with a complete *Homo erectus* skullcap from Olduvai Gorge in Africa, shown below.

we'd invested that much time and money in Asia we would find fossil hominids just as old there too."

BUT IN CHINA, proving how old fossils are can pose problems. Unlike Africa and Indonesia, China lacks volcanic deposits associated with hominid remains. Such deposits, with their radioactive minerals, provide the kind of hard dates most scientists demand.

Chinese scientists have had to rely instead on a variety of other techniques. One analyzes evidence of the occasional reversals that occur in earth's magnetic field. For instance, 780,000 years ago the magnetic pole that is now north was south. For unknown reasons the planet's magnetic field reversed. Such reversals have been well dated, and by studying the magnetic characteristics of minerals in the soil, geologists can assign fossil-bearing sediments to a particular paleomagnetic era. Unfortunately, since those eras can last hundreds of thousands of years, precision is impossible.

Using a combination of paleomagnetic dating techniques and a new method called electron spin resonance, an international team of scientists has recently dated a jaw fragment with two intriguing teeth found in a cave called Longgupo, located in a highland valley near the Yangtze River in Sichuan Province. They believe the fossil represents early *Homo* and is from 1.8 to 2 million years old.

Many paleoanthropologists think that the teeth are those of an ape. Others are skeptical about the dates. But in the Chinese province of Yunnan human teeth and tools once believed to be about 700,000 years old have recently been redated through paleomagnetic analysis to 1.8 million years old. And, far to the west of

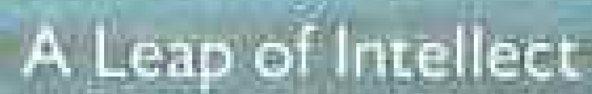
China, more new clues bolster the idea that *Homo* was spreading throughout the world surprisingly early. In the Republic of Georgia archaeologists have found a lower jaw they believe belonged to a *Homo erectus* that lived more than 1.6 million years ago, before the Turkana boy was born.

In the Georgian capital of Tbilisi, I examine the jawbone with David Lordkipanidze, a young paleogeographer, and Leo Gabunia, the paleontologist who first analyzed it. Shaped like a narrow horseshoe, the mandible is as thick and strong as an *erectus* bone, but it also has a more vertical chin than any other *erectus* specimen. Chins, distinctive features of *Homo sapiens*, developed at the same time that human jaws were growing smaller and faces were retracting beneath prominent foreheads. Such an advanced feature, along with teeth that are more modern than *erectus's*, raises questions about the mandible's age.

The fossil was discovered in 1991 by Antje Justus, a German archaeologist, beneath the ruins of Dmanisi, a Georgian village built in the ninth century that grew rich by taxing the caravans traveling to Byzantium, Armenia, and Persia. Justus saw it glinting through sediments lying about eight inches above a hardened layer of lava that scientists have since determined to be 1.8 million years old. But no one is sure how much time the sediments lying between the jawbone and the lava represent. The excavators believe as little as 100,000 years, but others think about 800,000 years.

"If it is a million years old or less," argues Günter Bräuer, a physical anthropologist at the University of Hamburg, "its features would fit much better with other fossils of that age."

But if the Dmanisi mandible, with its



A Leap of Intellect

A makeshift raft rolls down an Indonesian river to Jakarta, where the bamboo logs will be made into everything from furniture to scaffolding. Alan Thorne believes that early humans could have reached Australia on similar vessels. "Bamboo makes sea travel wonderful," he says. "You don't have any waves breaking over you—you just sort of flex over them." Such a voyage would have required a level of ingenuity thought to be inherent only in *Homo sapiens*.

modern-looking features, turns out to be as old as the Georgians contend, scientists may have to rethink their beliefs on the evolution and migration of *Homo*.

And at yet another continental crossroads scientists have discovered more than 10,000 stone tools, including dozens of hand axes, at a site called Ubeidiya near the Sea of Galilee in Israel. Animal fossils indicate that the site is 1.4 million years old. "It's definitely one of the oldest stations for *Homo erectus* outside Africa," says archaeologist Ofer Bar-Yosef of Harvard University.

MIGRATION PATTERNS are not the only remaining mystery in the study of early humans. With evidence of great diversification among *erectus* specimens, evolution is starting to look more like a complex mosaic than a straight line from one clearly defined species to the next.

Two human skulls unearthed near Yunxian in the Chinese province of Hubei in 1989-1990 add to the complexity. At the Institute of Cultural Relics and Archaeology in Wuhan, Li Tianyuan shows me the fossils, which he calls *Homo erectus* and which are at least 600,000 years old.

Grotesquely distorted from millennia beneath the earth, the faces of the Yunxian fossils would make good Halloween masks. Their browridges look like those found on *Homo erectus* specimens from Java, and their cheekbones resemble those of skulls from China, while the facial dimensions are similar to those of somewhat younger skulls found in Europe. "This mix of characteristics tells us that there was more diversity within *Homo erectus* than we had thought," says Dennis Etler, a paleoanthropologist at the University of California at Berkeley. He thinks that the diversity reflects racial differences within *erectus*.

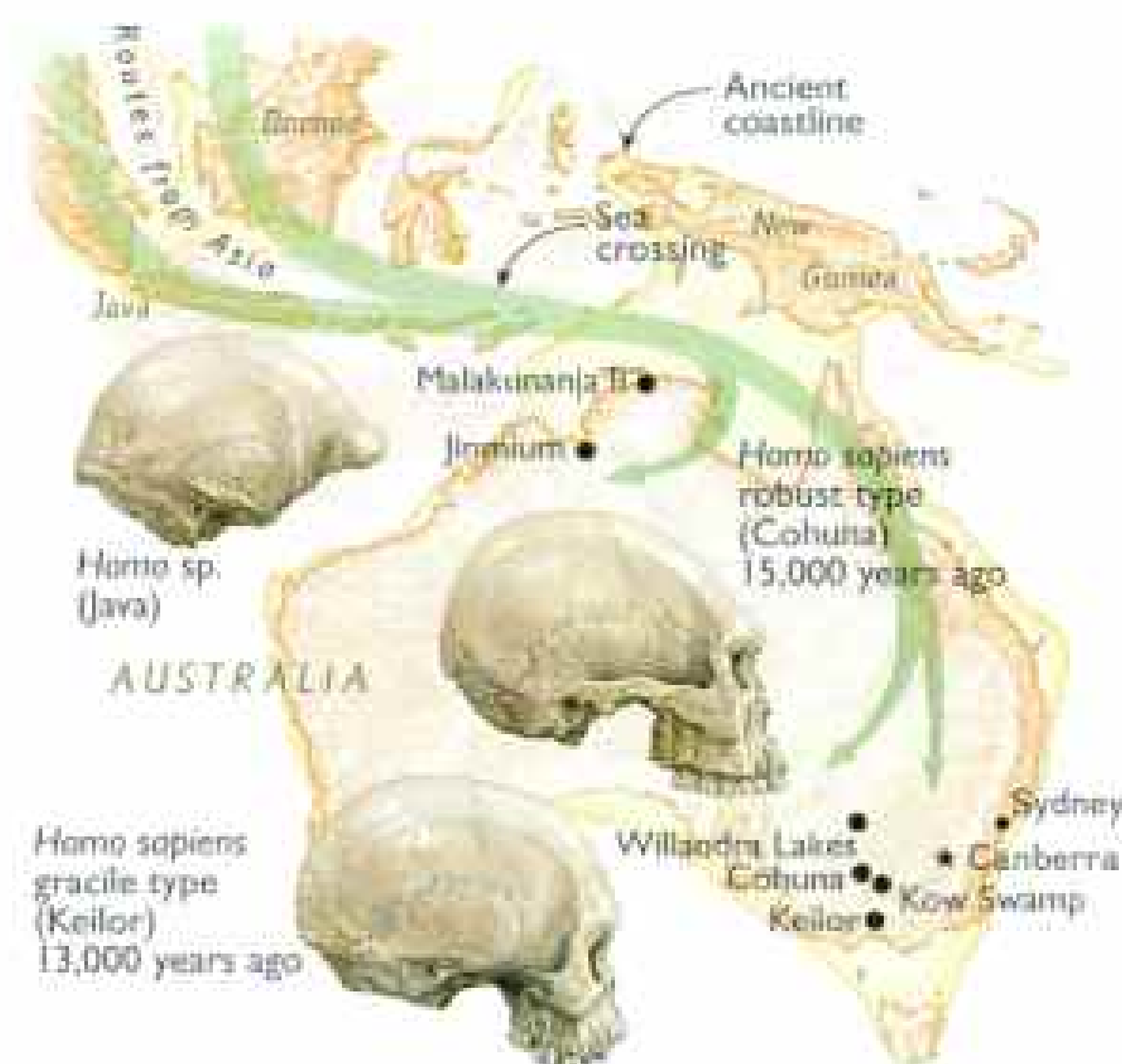
But some scientists doubt that the Yunxian discoveries should be called *erectus* at all. They argue that these fossils might represent another species that lived in China at the same time as *erectus*. That species, called *Homo heidelbergensis*, would have given rise to both modern *Homo sapiens* and the Neandertals, the stocky, cold-hardy humans who inhabited Europe from about 230,000 to 30,000 years ago.* (Other researchers consider the Neandertals a subspecies of *Homo sapiens*.)

*See "Neandertals," by the author, in the January 1996 issue.

No one knows exactly when *erectus* ceased to exist and *Homo sapiens* began to thrive. Last December a team led by Carl Swisher announced new ages for a collection of *erectus* fossils found beginning in the 1930s at a site called Ngandong in Indonesia. Previously thought to be between 100,000 and 300,000 years old, the fossils may in fact be less than 50,000 years old. If further study confirms these surprisingly late dates, *erectus* must have coexisted with modern *Homo sapiens* in Indonesia. Probably originating in Africa between 100,000 and 200,000 years ago, modern *Homo sapiens* had, by at least 60,000 years ago, reached Indonesia and taken the unprecedented step across Wallace's Line.

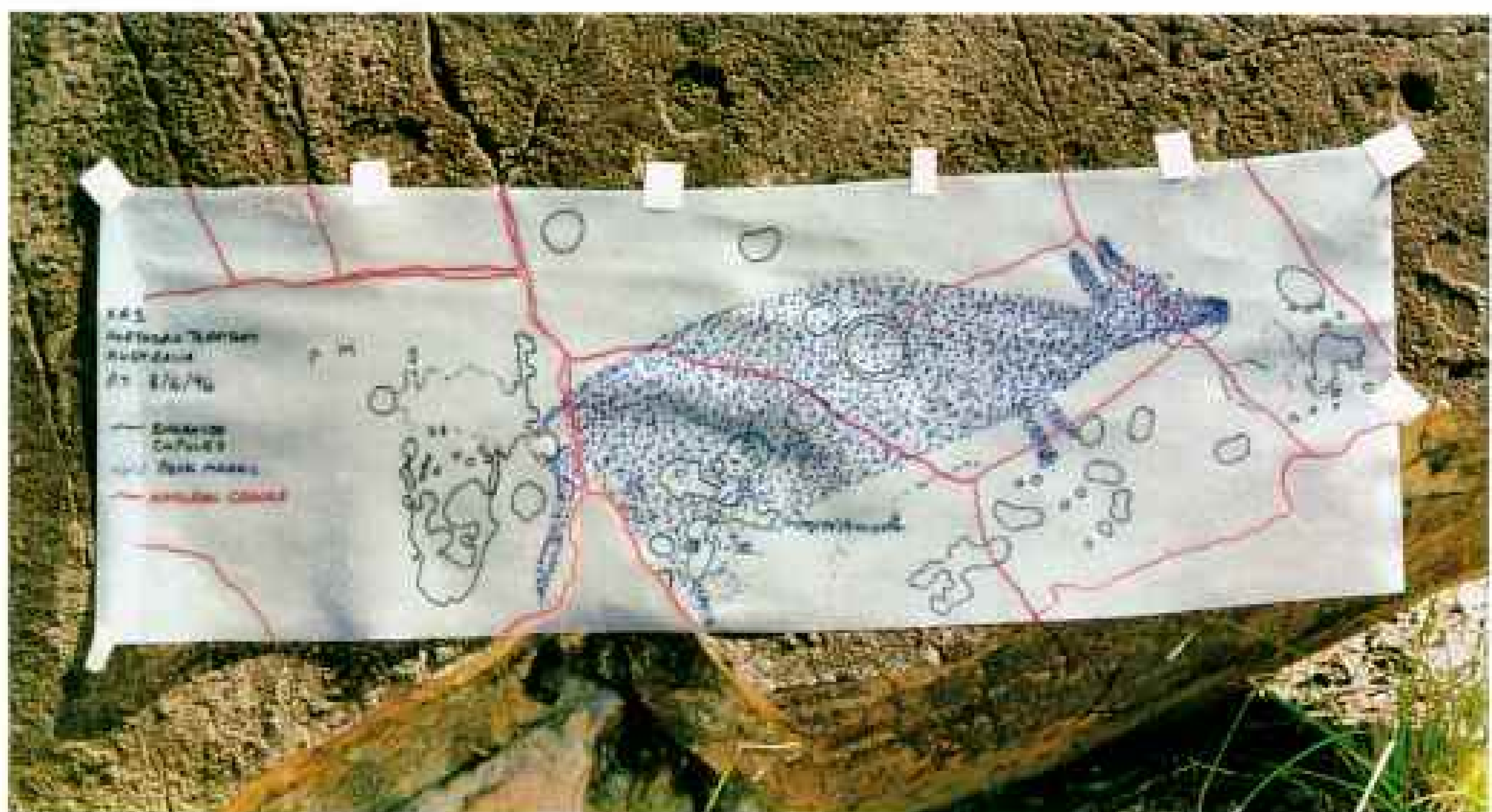
EVENTUALLY *Homo*'s tracks would lead into Australia. Researchers Rhys Jones, Mike Smith, and Richard Roberts have found evidence on that continent of modern behavior dating back 60,000 years. In a lab at the Australian National University in Canberra Smith hands me a thumb-size piece of rust-colored stone. "It's high-grade hematite," he says. "Ancient people ground it to get red ocher powder. That means they had an interest in either coloring their bodies for ceremonies, painting clan designs on themselves, or putting art on walls or designs on their boomerangs."

The hematite crayons came from Aboriginal rock-shelter sites discovered in northern Australia. Using a new dating technique called optically stimulated luminescence, which determines when sediments containing buried artifacts last saw sunlight, Roberts



PAUL S.C. TACON, AUSTRALIAN MUSEUM (BOTH)

Mysterious cuplike designs engraved on the stones of northern Australia are among the world's oldest art. Tracings made at Jinmium (above) include a section where a kangaroo-like figure was pecked over some of the old circles (below, in black). "This art shows that people were putting their cultural stamp on the landscape," explains rock-art expert Paul Tacon. Though these people clearly had developed beyond *Homo erectus*, not much is known about them. Arriving in one of many waves of migrants from Asia, they may be the ancestors of either of two distinct populations whose remains—robust and gracile (below left)—have turned up farther south.



2 million years ago — Present
Malakunanja II 61,000 to 52,000

Handing down Aboriginal traditions, "Big Bill" Neidjie brings his son and granddaughter to a rock-shelter in northern Australia where he left a stencil of his hand as a child. His people's myths say the continent's original settlers came over the sea from the north and west, which archaeology confirms. That same cultural memory may also reach back to art. More than 50,000 years ago someone scraped this piece of hematite at Malakunanja II, likely making red ocher powder to share abstract ideas with others of our highly cerebral species.

estimates that the crayons were covered between 53,000 and 60,000 years ago.

In September of last year the discovery of even earlier "modern" art—thousands of circular pits pecked into rock walls and boulders in northwestern Australia perhaps as early as 75,000 years ago—was announced by Richard Fullagar, an archaeologist at the Australian Museum in Sydney. That date is twice the age of the earliest known cave paintings in France, and stone tools and ocher buried at the base of the Australian circles may be much older still. The ocher may date back to 116,000 years ago and the tools to 176,000. Scientists have long assumed that *Homo sapiens* lacked the seafaring technology to have reached Australia before about 50,000 years ago. With this discovery they have to consider whether modern humans were on the move much earlier.

Even more startling are what may be stone tools found on the Indonesian island of Flores near the bones of an extinct species of elephant in a rock layer around 700,000 years old. The find implies such an early crossing of Wallace's Line that most scientists stress the need for caution.

BUT REGARDLESS of who first sailed for Australia or when they left from Bali, a crucial landfall was likely Lombok. Five hours after leaving Bali, the *Nusa Penida* docks at that steamy volcanic island. I disembark and pick my way through the chaos of hawkers, honking cars, and whining motorbikes. A taxicab driver takes me north to a beach where I watch windsurfers sail among the traditional boats, or *jukung*. I wonder what the first humans to come here would have found.

"A big feast," Tim Flannery, an Australian

Museum mammalogist, had suggested when I met him in Sydney. "How would you respond if you came from Bali, where you couldn't go out at night because of tigers and had to compete with skillful fruit gatherers like macaques?" he asked. "What if the first hunk of meat you came across—maybe a pygmy elephant—didn't run away?"

"The golden age of Lombok" is how Flannery describes the century or more that followed the arrival of the first humans in this untouched land, where the seas hadn't been fished and the mudflats were strewn with crustaceans and mollusks that had never been harvested. "All the challenges and opportunities this new world opened for humans would have encouraged innovations in technology and thought," he says. "But eventually a great crunch had to come—when the last of the pygmy elephants was eaten."

The desire to move on to the next island, and the next, eventually reaching Australia, would have been irresistible, encouraging the Lombok people and their descendants to build ever more seaworthy craft. Flannery believes seafaring was in fact invented in this archipelago and then transported, along with other technological and cultural innovations, back to Africa and the rest of Asia.

No evidence of a golden age remains on Lombok. Like much of Indonesia, it is crowded and poor. Over the past two million years, as members of our family tree have spread to the ends of the earth, *Homo*—a voracious omnivore with a brain so much larger than its predecessors—has become a difficult animal for the planet to sustain. As I gaze back over the water we have crossed, I wonder if that advanced brain will prove smart enough to cope with all it has created. □

Wrapped in a suffocating embrace, Sambo, a member of the Gbaya ethnic group in Cameroon, wrestles an 11-foot African rock python before calling for another hunter to help free him from its coils. Armed with cleverness and courage, hunters crawl into the lairs of serpents up to 20 feet long, grab them barehanded, and pull them out by their heads.

Hunting the

Photographs by GILLES NICOLET

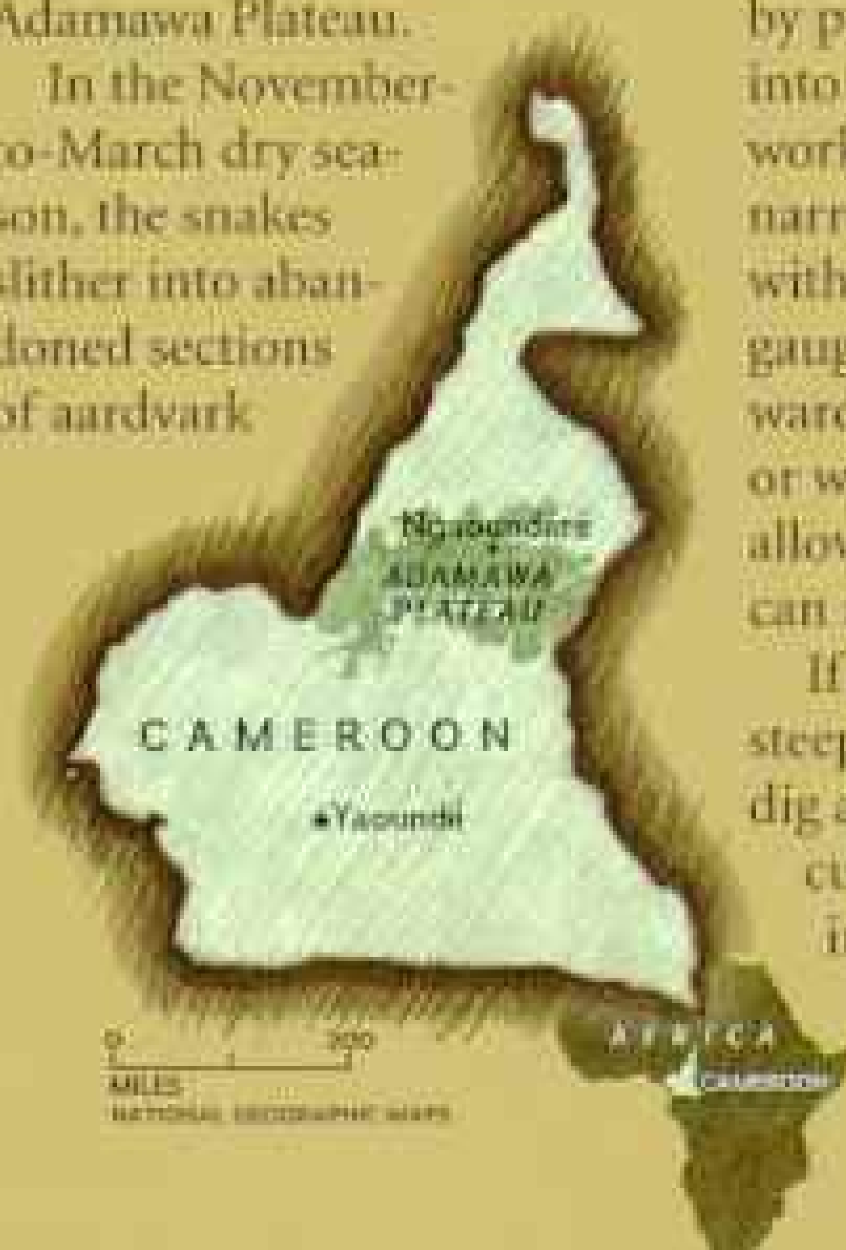
Mighty Python

Crouched over the darkness of an aardvark burrow (right), Sambo watches his friend Adamou David disappear headfirst in pursuit of a python. On his first trip to hunt the *gbagok*—"great snake"—Sambo, then 15, turned from a hole like this in terror. His father forced him into the burrow, blocking the exit until he brought back a snake.

In the past 40 years Sambo has mastered his fear, but he starts each hunt by killing a chicken and sprinkling its blood on his knife and spear as an offering to his ancestors for success. As a boy undergoing the traditional Gbaya initiation into adulthood, Sambo learned this lesson: "Death is not something to play with."

According to Gbaya folktales, trickery and guile are the best ways to defeat the python, king of the snakes, which was hatched from a dragon at the world's start. Famed hunters, Gbaya men have long stalked pythons for meat and skins, tracking the snakes in the tree-studded savanna and forest-lined stream valleys of their sparsely populated homeland, the Adamawa Plateau.

In the November-to-March dry season, the snakes slither into abandoned sections of aardvark burrows to lie dormant or to lay their eggs.



Since few pythons are found near the hunters' roadside villages, Sambo, Adamou, 45, and Sambo's 22-year-old son, Abou, trek days into the bush, where they ignite fires to burn the undergrowth covering burrow entrances.

Following trails left in ash by pythons, the hunters crawl into burrows with torches, working their bodies along narrow corridors greased with their sweat. They must gauge if they can move forward without becoming stuck or whether, if the tunnel allows no space to turn, they can make it back in reverse.

If a tunnel is too narrow or steep or winding, the hunters dig a series of holes (above), cutting as deep as 15 feet into hard soil to find the chamber where a snake lies coiled.

Lunging at an intruder, a brooding female protects her eggs. The snakes have no venom, but their back-curved teeth, which grip prey during constriction, can also tear into flesh "like saw blades," says Adamou.

Pulling himself forward in a burrow, Adamou lights his way with burning straw (top right): "In the hole we are like soldiers going after an enemy; we always feel in control."

Face-to-face with a python, Adamou holds out a flame, which he believes keeps the snake from striking. He positions his left hand, shielded with antelope skin, to cover the snake's eyes while he grabs just behind its head. Most pythons encountered in burrows are relatively unaggressive. Scientists do not agree on why.

After Adamou has taken hold of the snake, he drags it very slowly out with both hands, moving gradually backward, so the python remains calm and does not resist.

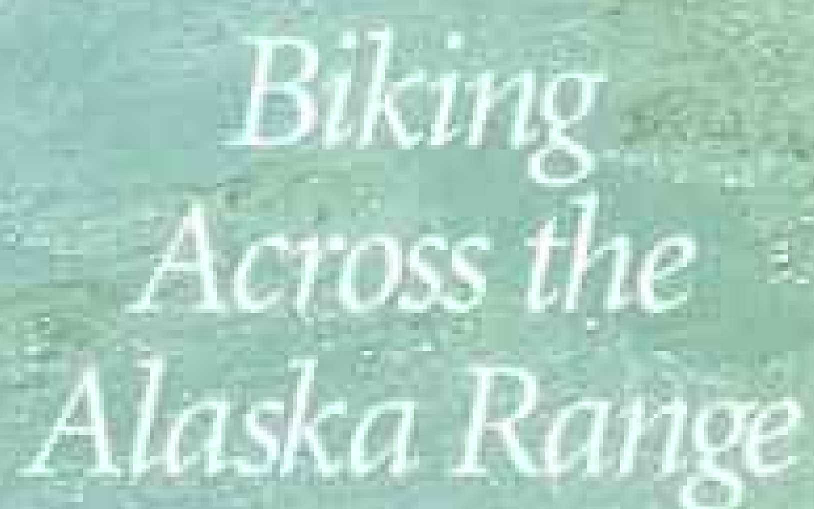
Once unearthed, pythons writhe into action, straining to draw themselves back into their holes or wrap hunters in coils that can asphyxiate. To subdue a snake dug from its lair, Adamou pins its head with a forked stick, while a friend pulls on the tail (above).

Torn from its hole, an 18-foot, 150-pound python twists to escape Sambo's grip on its head (above right). The struggle will end with a slit to the throat that leaves the snakeskin undamaged.

Sambo and Adamou stake out skins to dry in their camp, near hearths where they boil python eggs to eat and smoke the snake's flesh to carry to villages. "If you were to bring this meat to an elder, he would hold your hands and spit in them as a blessing," Adamou says. Traders offer up to $60 for the meat and skin of a large python.

Commercial hunting has led to international restrictions on trade in python skins. But the Gbaya tradition of crawling into burrows may dwindle before the snakes' numbers do. None of Sambo's or Adamou's sons will do it. Adamou, who learned from his grandfather, says he can teach another, but first "He'd have to prove he was a man and had no fear." ◻

TEXT BY KAREN LANGE
EDITORIAL STAFF



A Wild Ride

Forced to dismount on soft ice and slog up a 6,000-foot-high pass, three adventurers press on in their effort to traverse the rugged Alaska Range by mountain bike. On their seven-week, 775-mile expedition the trio rode on glaciers, game trails, and gravel bars. They also rafted rivers and climbed icy mountains—anything to complete their daring, high-country journey.

SHIMANO

BY **ROMAN DIAL** PHOTOGRAPHS BY **BILL HATCHER**

EVERY YEAR after breakup in Alaska's russet red Delta Mountains, floods of glacial meltwater shift the course of the Gakona River across a five-mile-wide bed of crushed granite, pushing gravel and sediment like a prospector's incessant bulldozer. For nearly an hour Carl Tobin, Paul Adkins, and I stand on the pedals of our mountain bikes and crank over fist-size rocks in this gravel bed as we search for a place to cross the icy mocha river, whose waters conceal quicksand, driftwood snags, and powerful currents.

We're 11 days into a seven-week bike trip from one end of the Alaska Range to the other, a journey no one has ever made before. Stretching more than 700 miles from the Yukon border in the east to the base of the Aleutian Range in the west, the mountains span a wilderness of boulders, brush, and belly-deep bogs that would be a chore to traverse by foot or mountain bike were it not for the game trails, gravel bars, and glaciers that crisscross the landscape. Using this network also enabled us to minimize our impact on the land.

Not far from here at the turn of the century, stampeders rushed north to seek fortunes in gold—scores of them bringing bicycles. Following dogsled trails in winter and staying in roadhouses, these dreamers rode "safeties," as they called them, with the same size wheel in front and back, hand brakes, and pneumatic tires, occasionally stuffing flat tires

ROMAN DIAL teaches environmental science at Alaska Pacific University in Anchorage. BILL HATCHER photographed rock climbers on Pakistan's Trango Tower for our April 1996 issue.

Traveling light means heavy going for Carl Tobin, who lugs his titanium bike up a slope above the Delta River. The team of Tobin, Paul Adkins, and author Roman Dial saved weight by sleeping in a floorless tent and using bike tools as silverware.

with grass. Many of the stampeders abandoned their bikes after a few miles.

Unlike those simple but cumbersome bikes, ours have oil-damped front suspensions, 16 gears, and frames made of titanium, featherlight but stronger than steel. Instead of shovels and gold pans we're carrying less than 20 pounds each in food, clothing, and gear. Our aim is to travel light, freeze at night, lose weight, and go hungry in a style Carl half jokingly calls "hell biking." Truth is, we can't afford an extra ounce if we hope to make it across the steep sub-ranges ahead: the Delta, Hayes, Kichatna, Denali, Teocalli, Terra Cotta, Revelation, and Neacola.

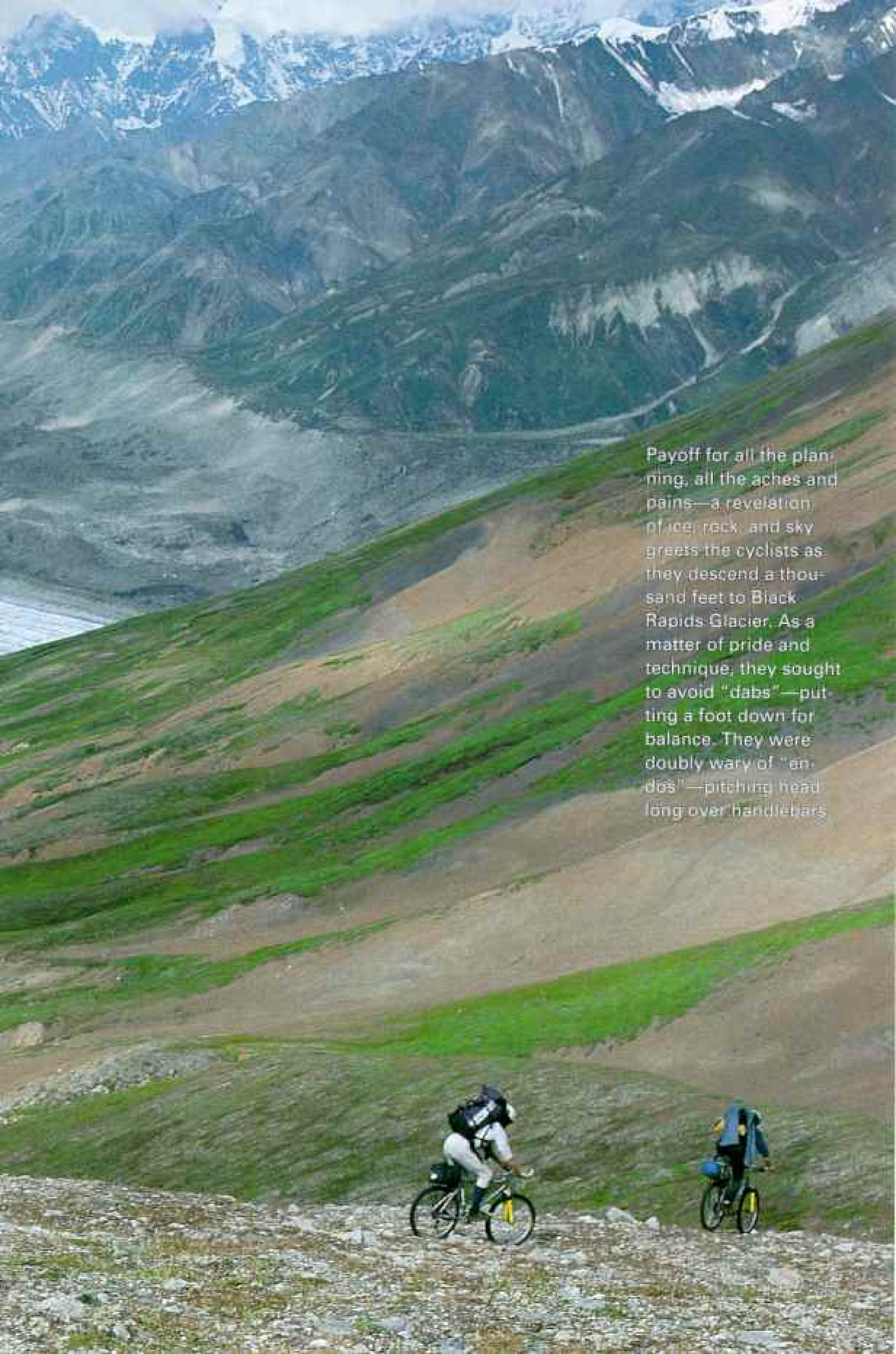
Avoiding the few paved or gravel roads that penetrate the backcountry, we study topographical maps for obvious routes, never knowing exactly what we'll find. Paul, who makes a living guiding mountain-bike trips in West Virginia, sniffs out the best game trail. When luck rides with us, our path rolls across a silky smooth valley bottom, following a caribou trail incised into the tundra by cloven hoofs, then merges with bear trails as we muscle up a ridge of polished granite slabs. When our luck runs out, we stumble through alder brush as thick as an arm that snags our handlebars, seats, pedals, and, if we're not careful, an eye or two. Except for chance encounters with grizzlies, though, river crossings are by far the most hazardous moments of our trip.

Stopped now beside the Gakona River, we choose a spot where the icy water splits into three braids. The first two reach only up to our thighs, but the third looks far deeper and faster, rushing by in whirlpools and haystacks. Drownings are far too common among Alaska outdoorsmen, many of whom succumb to hypothermia or fear halfway through a crossing. Hoisting my bike up over my head, I swing it horizontally across my shoulders and pack, ready to drop it should the current knock me down and force me to swim the white-water rapids below. With Carl and Paul looking on apprehensively, I plunge in. Instantly the water piles against my chest, shoving me like a playground bully. Digging my boots into the gravel, I turn my body to use the current to my advantage. With long strides, I push across in half a minute.

Carl comes next, his face tight with anxiety. A science professor at Alaska Pacific University in Anchorage, Carl has been my climbing partner for nearly two decades. Twelve years ago, on an obscure mountain west of here, an avalanche swept him 1,500 feet down the mountainside, breaking his legs and wrenching his right knee, which sometimes locks up on him. As a result, every rocky river crossing is a fearful and daunting act. Twice I've watched a big glacial stream suck Carl under, bloodying his face as he fought to hold onto his bike and his life.

"I'm always a hair's breadth away from swimming," he once told me.

But not this time. Carl crosses easily, with Paul close behind. Shedding our waterproof shell clothing, we climb back on our bike saddles and pedal off toward the Delta Mountains, the unnamed peaks draped in the fresh snow of a mid-July storm. With nearly 600 miles to go, we have no time to congratulate ourselves on having survived thus far.



Payoff for all the planning, all the aches and pains—a revelation of ice, rock, and sky greets the cyclists as they descend a thousand feet to Black Rapids Glacier. As a matter of pride and technique, they sought to avoid "dabs"—putting a foot down for balance. They were doubly wary of "endos"—pitching headlong over handlebars.

Going the length of the Alaska Range

WEEK 5

Because heavy bike traffic can damage land, the Denali Wilderness—like all U.S. wilderness areas—prohibits any "mechanized" travel. The trio hiked 60 miles to the western border, where their bikes had been airlifted.

WEEK 6

Tired and sore after 700 miles, the riders rafted the Stony River. At a hunting lodge they caught up with backpackers who had left on a similar route six weeks before the bikers started.

WEEK 7

The bikers sped to the finish on caribou and bear trails in Lake Clark National Park. After weeks of surviving on freeze-dried meals and high-energy bars, they celebrated with a meal of pasta and garden-fresh peas and tomatoes.

WEEK 3

The bikers unpacked crampons and ice axes to help them cross the perilous Hayes Range glaciers. When able to ride, they used studded tires to grip the ice.

WEEK 4

A curious blood grizzly bear followed the trio for half an hour, causing them to double their pace along Healy Creek. It was one of nine grizzlies encountered.

WEEK 2

After picking up a cache of food and equipment, the bikers rode on sheep trails and old mining roads through the Mentasta and Delta Mountains. They used inflatable pack rafts to cross the swollen Nabesna River.

WRANGELL-ST. ELIAS NAT. PARK AND PRESERVE

WEEK 1

A bush plane dropped off the men and their bikes in early July. Without camping gear at first, they slept fully clothed and ate raw bacon and bagels.

Alaska obstacle course: Making tracks proved a muscular undertaking for the bikers as they pushed into raw wilderness. For two days they wrestled through alder thickets (center, top), removing bike pedals to make bushwhacking easier. Faced with fast-running rivers, they struggled across on foot (above) or strapped their bikes to rafts and ran the white water (far left). On foot in the Denali Wilderness, the original core of the national park where bikes are banned, they had to hike four days (left). Back in the saddle, they followed bone-jarring river bars (center, middle). "We didn't come to camp in comfort," says the author, and mosquitoes made sure he couldn't (center, bottom).

Giro

ROMAN DIAL (ABOVE, LEFT, AND RIGHT)

Cold sweat

New ground rules came into play once the bikers entered the fields of ice. Rule 1: Watch your step. Hiking on Black Rapids Glacier during one of his stints with the adventurers, photographer Bill Hatcher nearly disappeared into a crevasse (above). Only his bike broke his fall. Thereafter, the group roped itself together, the better to skirt even bigger holes (right). Rule 2: Be afraid of the weather. Having descended the glacier, the bikers saw the sky darken with storm clouds. Without gear to withstand severe conditions, the tired group embarked on a forced climb to reach Icy Pass, six miles distant. Engulfed in mist, the team located the pass by compass, barely avoiding another crevasse. On the steep descent Adkins used his bike as an ice ax (left). Finally, after 25 hours of travel, the men made camp and collapsed, staking the tent down with bikes. Next morning they roped up again (bottom) and heeded Rule 3: Get to lower ground.

A passing player on nature's grand stage, Tobin rides the rough ice of Black Rapids Glacier. With windblown grit giving traction, the cyclists pedaled up to ten hours straight on the ice. All told, the group covered 70 percent of the journey upright on bikes.

Happy trails

A mounted remote-controlled camera captures a biker's-eye view of terrain sweeping past in Lake Clark National Park. Two days from the finish the group experienced some of its best riding as it followed flattened caribou trails.

"I was so tired at this point though," says Tobin, "that only a bear could have speeded me up."

A foot injury slowed Adkins to the point that the author had to piggyback him across the park's swift Chilikadrotna River (left).

A half dozen flat tires, just as many hard spills, sore legs, sprained wrists, and aching backs all came with the territory. But so did memories of sublime wilderness—of the glacier-hung mountains still free of names; of misty valleys dotted with caribou; and of braided rivers like the Swift Fork of the Kuskokwim River in Denali Park (far left). "You get into a special zone when you ride a bike here," says Adkins. "You smile, look around, and say, 'This is it!'" □

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MAY 1997

2 **India** *Home to nearly a billion people, Asia's giant democracy struggles to fulfill the dream born with its freedom from Britain 50 years ago.*

BY GEOFFREY C. WARD PHOTOGRAPHS BY STEVE McCURRY

■ *Double Map Supplement: India*

58 **Iceland's Trial by Fire** *A volcanic eruption ripped open the island-nation's largest glacier, unleashing the worst flood in 60 years.*

PHOTOGRAPHS BY STEVE WINTER

72 **La Salle's Last Voyage** *In 1686 the* Belle *ran aground off Texas, ending a French explorer's quest to reach the Mississippi by sea. Now the wreck surrenders its secrets.*

BY LISA MOORE LaROE PHOTOGRAPHS BY ROBERT CLARK

84 **The Dawn of Humans** *Fleet-footed and skilled at tool-making,* Homo erectus *was probably the first member of our human family to venture out of Africa.*

BY RICK GORE PHOTOGRAPHS BY KENNETH GARRETT
ART BY JOHN SIBBICK

110 **Hunting the Mighty Python** *Gbaya men in central Cameroon stalk the huge snakes for meat and skin by crawling into their burrows and hauling them out bare-handed.*

PHOTOGRAPHS BY GILLES NICOLET

118 **Biking Across the Alaska Range** *After 775 bone-rattling miles of glaciers and gravel bars, a trio looks back at an awesome mountain-biking adventure.*

BY ROMAN DIAL PHOTOGRAPHS BY BILL HATCHER

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On Television
Earth Almanac
Interactive
On Assignment

The Cover

Dusted with red powder, a young Indian boy joins in the traditional Hindu festival of Ganesh Chaturthi in Mumbai (Bombay). Photograph by Steve McCurry

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Behind the Scenes

Gearing Up With the Photo Engineers

Who makes the equipment that makes it possible for our photographers to make many of their pictures? Our nine-man photo-engineering division builds and modifies gear in a tool-filled basement workshop at headquarters. Keith Moorehead helped fit cameras on this remotely operated mini-submarine for underwater shots; Kenji Yamaguchi lofts a flying camera housing called the Albatross, used for aerial pictures. Photo engineers sometimes travel on assignment with our photographers to keep equipment in top shape. "Breakage is a real problem," says Keith. "If something can go wrong out there, it usually will."

Joe Stancampiano hoped that would not be true when he accompanied photographer David Doubilet to Australia last year to capture saltwater crocodiles on film. After a croc was lured close with bloody bait, Joe swiftly substituted a camera while David composed the image through a remote viewfinder. One crunched camera later, David had his pictures (June 1996). And Joe still had his hands. "For a fraction of a second," Joe says, "I was the bait."

MARK THIESSEN, NGS

Get the Big Picture

A limited-edition print of Annie Griffiths Belt's Yellowstone fly-fishing photograph (April 1997, pages 56-58) is available for $29.95, postage paid. The number of 24-by-36-inch posters printed will be determined by orders received by June 15. Each will be hand-numbered and embossed with the NGS seal. To reserve your poster:

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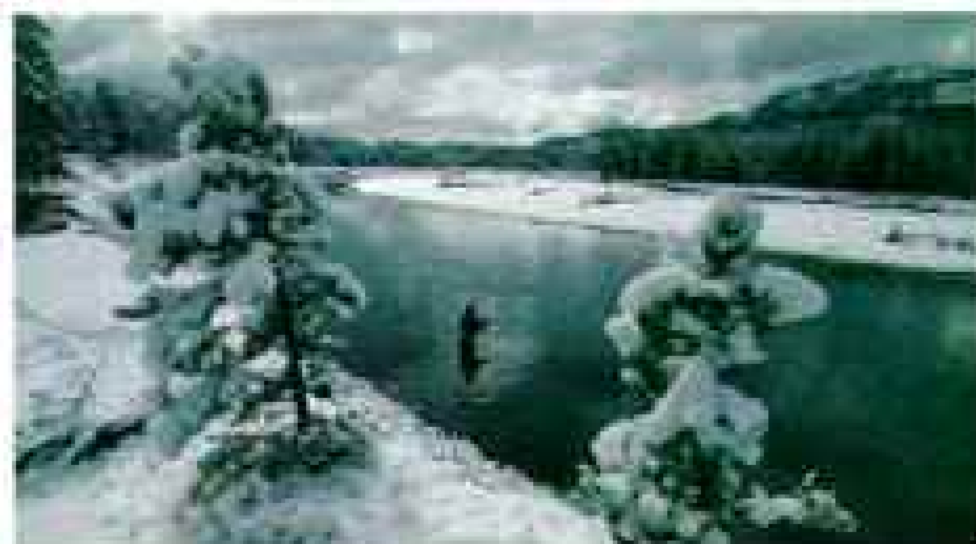

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Going Deep: JASON Project 1997

This month nearly half a million young people around the world will take part in a journey from the center of the earth—using satellite and fiber-optic technology. Since 1989 scientist and explorer Robert Ballard's annual JASON Project has introduced students to science. This year they will explore geothermal features in Yellowstone National Park and in Iceland. Students will transmit their findings to huge video screens and computer centers in a network of schools and auditoriums. You can check out the project online at: www.jasonproject.org.

STEVEN FULLER (TOP LEFT); BROOKS WALKER (TOP RIGHT); ART BY DON FOLEY

Gifts Odd and Odorous

Letters, we get letters—and the occasional package with startling contents. Recently senior writer John Eliot, our natural history specialist, received a parcel from Scotland that contained a preserved cephalopod . . . and fudge that smelled suspiciously of squid. After his article on the Kuril Islands ran last October, writer Charlie Cobb was given one man's solution to strife there: a new language called "Espro." Included were loose-leaf dictionaries—Espro to English and English to Espro—and a mission statement, pronunciation guide, and tape of Espro folk songs. Then there was the member who sent what she thought was fossilized dinosaur dung and asked, "How old is it?" The answer: Not quite old enough. —MAGGIE ZACKOWITZ

Online, On the Road

Before the online debut of our kids' site in January, Editor Mark Holmes, at left, met with students in two Michigan schools to get their input. The young consultants posted comments to a computer bulletin board, including a request for girl pirates in the "Pirates!" feature.

PETER ESSICK (MIDDLE); MICHELLE ANDONIAN (ABOVE)

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Forum

In the January 1997 issue many writers focused on a subject from our Society's past—roving China correspondent Joseph Rock. Some asked for a TV Special or extensive online coverage; one compared his photos to "the best of today's." A reader in Hawaii remembered Rock at 78 at a botanical garden, putting seeds in his pocket to take home and plant as if "there was always going to be a tomorrow."

Imperiled Nile Delta

On the time line of ancient Egypt (pages 13-15), the Middle Kingdom should be placed in the blank column between the First and Second Intermediate Periods. The New Kingdom (incorrectly labeled as the Middle Kingdom) comes between the Second and Third Intermediate Periods.

DEBORAH BAGLEY
Auckland, New Zealand

You are correct. The mistake, which occurred in the final stage of our production process, was not noticed until all magazine copies were mailed.

Peter Theroux's article on the problems facing the people of the Nile Delta brought to light the health problem of schistosomiasis. There are two species of trematode endemic to the Nile, both entering the skin as people bathe or swim in contaminated waters. The incidence of schistosomiasis has increased since the building of the Aswan High Dam. It appears that as we take one step forward in our progress we take two steps back. Fortunately the disease, although debilitating, is treatable.

DAVID A. CALDERWOOD
Orem, Utah

It is quite evident that the Egyptians created more problems than they solved when they erected the Aswan Dam more than 20 years ago. Has anyone examined the problem of buildup of silt in Lake Nasser? Will it threaten the dam itself in the future? One way to alleviate the problem would be to dredge the lake on a massive scale, obtaining huge amounts of rich soil for the farmers, if it could be efficiently transported and distributed.

PAUL A. FREITAG
Cheverly, Maryland

Silt poses no threat for the foreseeable future. At its current depth dredging is impractical.

There was no mention of the modern wastewater treatment facility at Alexandria. Expansion of the original plant is under way; the next phase will include the disposal of effluent away from Lake

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Maryut. Three cities along the Suez Canal also have treatment plants under design, and work is ongoing in Cairo.

MILTON M. CAMERON
Newton, Massachusetts

I enjoyed Theroux's reporting on past events in the past tense, which to me as a British English speaker seems the natural way. So many of your writers use the present tense indiscriminately, confusing the reader as to what was personal experience in the field and what are the regular facts pertaining to the part of the world in question.

MARTIN SHEFFIELD
Grenoble, France

Tree Giants of North America

A good article was ruined by the implication that the logging community is responsible for vandalism and threats to canopy researchers (page 60). It is a fact that fanatics are always a threat to anyone involved in a controversial profession. Fanatical acts, especially violent ones, are never condoned by the community of citizens who make their living harvesting timber. The remark does nothing to help this country's citizens resolve their differences of opinion over how our forests should be managed.

LINDA SLAGHT
Petersburg, Alaska

The comment about the occasional live limb of the coast redwood breaking off, striking the ground, and taking root is presented as a newly discovered means of reproduction. Back in the 1950s we grew redwoods from seed obtained at Muir Woods. As the seedlings grew, we pruned them and raised trees from the resulting slips. The slips seemed more frost resistant than the seedlings. We assumed that everyone knew that they would slip successfully.

ROBERT P. FARISS
Portland, Oregon

What surprised researchers was that 20-to-30-foot branches would slip without human intervention.

I particularly enjoyed seeing the photo of Nalini Nadkarni, whom I met while studying temperate rain forests under her husband, Jack Longino. Last October I visited the Wind River Canopy Crane with Longino's class, though acrophobia unfortunately prevented my joining others in ascending the tower. Your article made no mention of the International Canopy Network (ICAN), founded by Nadkarni and headquartered in her laboratory at Evergreen State College. Canopy scientists all over the world use ICAN to exchange information on study sites, current and upcoming projects, and other issues.

JASON HERNANDEZ
Shelton, Washington

Our Man in China

The article was interesting to me since "Doctor" Rock was a frequent, though not always congenial, visitor in my parents' home while he was living in Jone ("Life Among the Lamas of Choni,"

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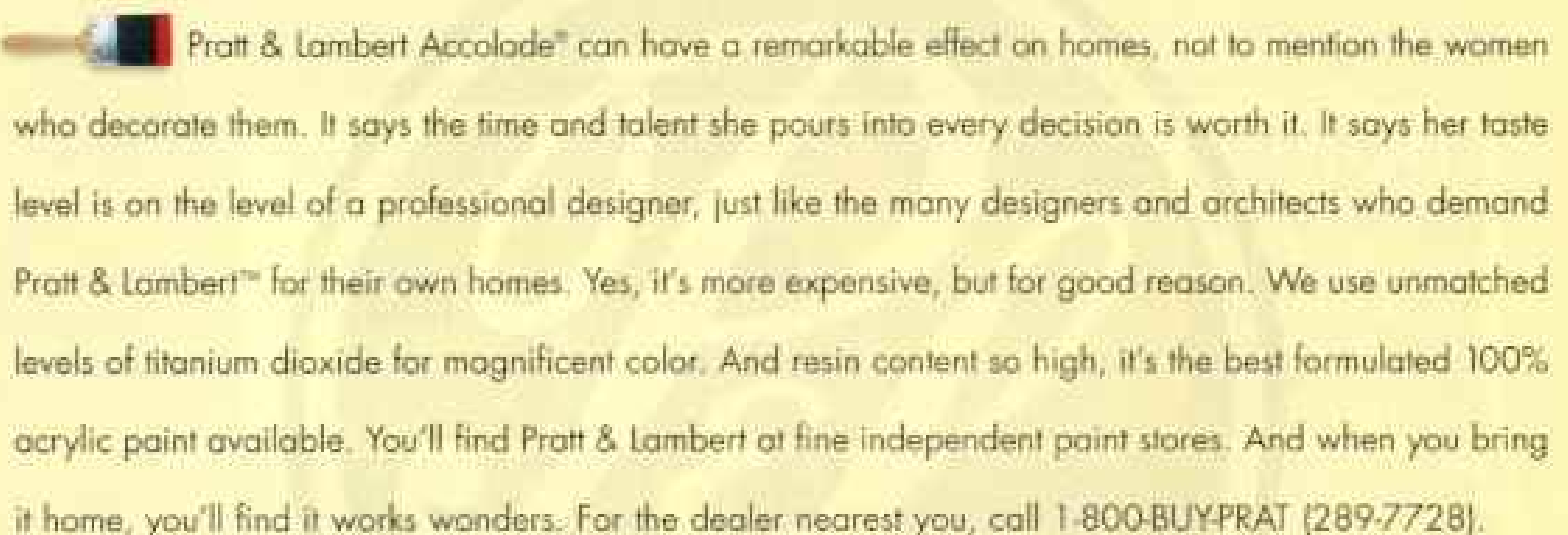

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November 1928). He never mentioned that missionaries had been living in Jone for 20 years before he arrived. But he at least got there. In 1990 I tried to visit Jone but was firmly denied permission by the authorities in Lanzhou, capital of the province.

ROBERT D. CARLSON
Wheaton, Illinois

I was about to cancel my subscription after many years, but the article by Mike Edwards on Joseph Rock made me change my mind. My earliest memories are of the photographs of strange people in strange lands. In 1927 I was not yet able to read, but my grandfather told me about the people in other places in the world. NATIONAL GEOGRAPHIC's arrival was always an event. Those beginnings of curiosity and wonder have never left me. Can we have more articles of this sort? The format was great.

SARAH E. REYNOLDS
Winter Park, Florida

Field Notes

I was honored and pleased to have my ongoing shipwreck project at Tantura Lagoon, Israel, profiled in your article about the science supported by the Society's Research and Exploration Committee. However, an error crept into the caption on page 105. The two pieces of Napoleon's artillery mentioned were recovered not by us but by Kurt Raveh in the early 1980s, during surveys in the lagoon carried out for the Israel Department of Antiquities and Museums, now the Israel Antiquities Authority.

SHELLEY WACHSMANN
Institute of Nautical Archaeology
College Station, Texas

Sri Lanka

The article by senior writer Priit J. Vesilind is one of the best I have read so far in an international magazine, fair and balanced in its analysis and reportage. However, the caption on page 112 misrepresents the situation by saying the conflict is between minority Hindu Tamils and majority Buddhist Sinhalese. The article itself correctly reports that the guerrillas, or Tigers, are a minority group of Tamil rebels at war with the democratically elected government. Thousands of Tamils continue to live and work in areas outside the claimed Tamil homeland. The government has offered a peace package short of a separate state, which the Tigers have rejected, and sadly the war for a separate state for Tamils continues.

UPALI RANASINGHE
Darwin, Australia

As you report, foreign journalists were not allowed to visit the north. Why? The ravages by the army would come to light if reporters went there.

FRED V. BALASINGHAM
Thornhill, Ontario

Mr. Vesilind seems to wonder why such an outwardly pious and just society as the Buddhist Sinhalese kill each other in recurring JVP (Peoples

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"The only action more outrageous than creating a Prowler show car is building copies for sale to the public. Proving that this is not your average car company, Chrysler Corporation intends to do just that."– Motor Trend, February 1996

January 10, 1996:
Wearing shades à la Jake and Elwood, Chrysler Chairman Bob Eaton and Bob Lutz wheel Prowler prototype into the North American International Auto Show to announce that it will become a limited production 1997 Plymouth.

What's the point of building an outrageously cool concept car if the closest anyone can get to it is behind a velvet rope at some auto show? That's what we thought too. At Chrysler Corporation, concept vehicles aren't just exercises in corporate vanity. They're laboratories for testing new ideas. When people respond to those ideas, we pay attention. Sometimes we incorporate them into

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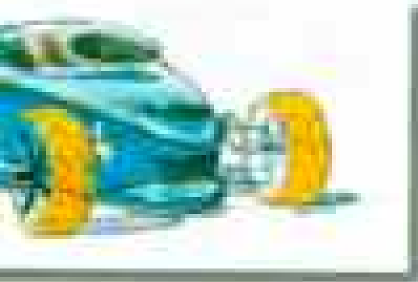
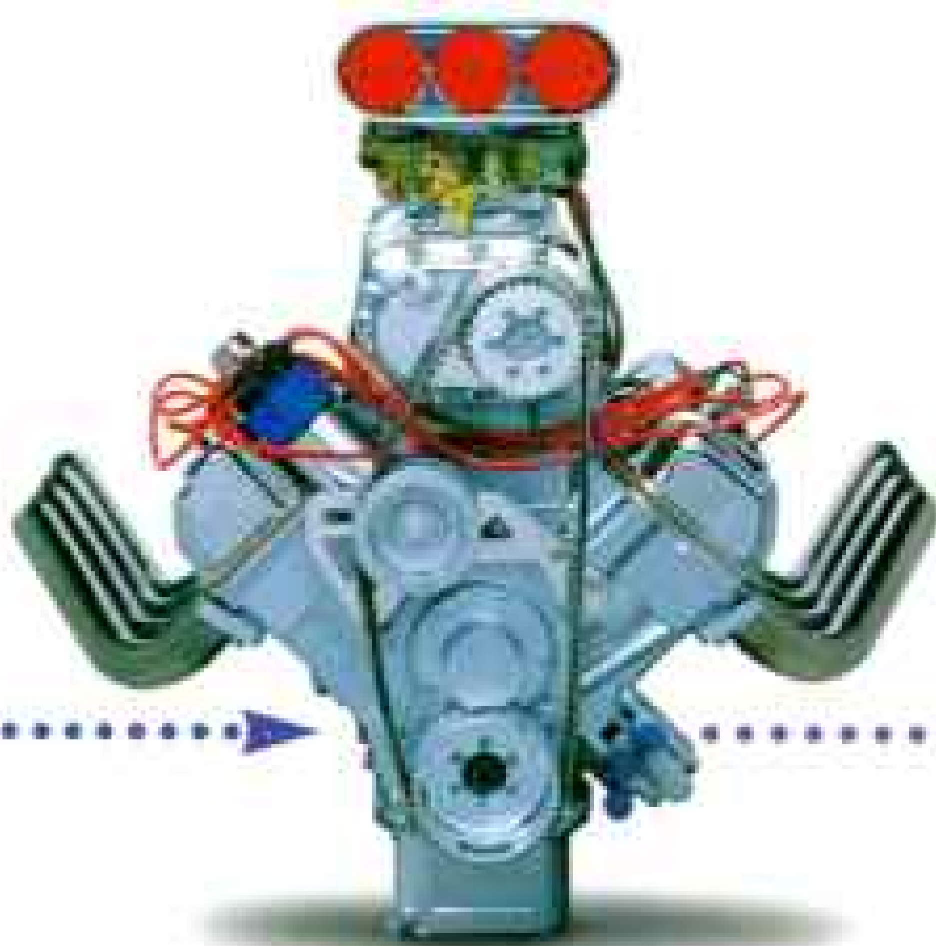
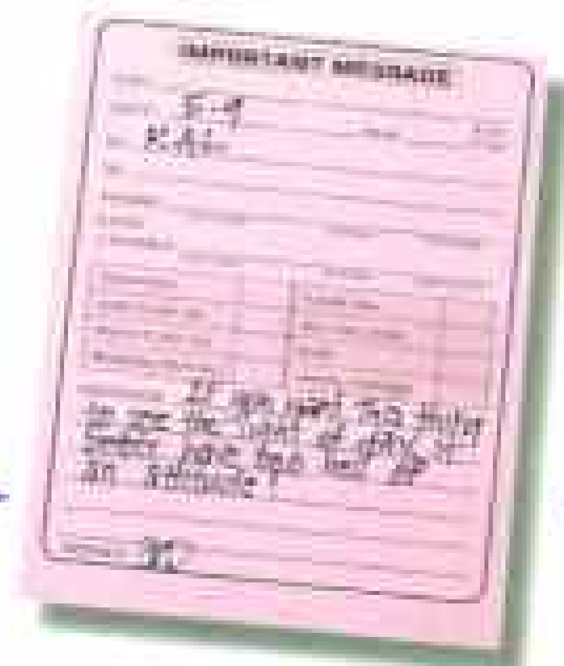


August 13, 1990: Designer walks into colleague's office with loose sketch of 21st century open-wheel roadster. That evening, a group gathers to discuss how it could be built.



September 18, 1990: Chrysler Design Chief Tom Gale starts work on his own custom street rod.



May 9, 1991: Chrysler top management gets wind of project. Message from President Bob Lutz: "If you want this to see the light of day, it better have one hell of an attitude."

May 20, 1991: Lutz is shown scale model of concept car. Grinning, he agrees with recommendation to build full-size version. Project is named "Prowler."

May 10, 1992: Chrysler team travels to the NSRA Street Rod Nationals for research, inspiration, and rousing performance by Peter Noone and Herman's Hermits.

January 7, 1993: Prowler show car draws huge crowds at the North American International Auto Show in Detroit, followed by impassioned pleas to put it into production.

April 15, 1995: First prototype body parts, fabricated entirely from aluminum, are delivered.

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Liberation Front) insurrections and brutal government countermeasures. It is a replay of centuries-old enmity over political power and economic opportunities. Most JVP members hail from coastal areas where the predominant caste groups are Karave, Durave, and Salagama, who—although they speak Sinhalese today—are of southern Indian origin. They are considered lower castes by the so-called true Sinhalese, who control the government, military, and economy; thus their economic opportunities are minimized. As long as the economic pie is divided along ethnic and caste lines by the government, Sri Lanka will never see light at the end of the tunnel. I came to know these facts from books only after coming to the U.S.; back home such talk is considered sacrilegious.

RAVEEN SATKURUNATHAN
Henderson, Nevada

As an ethnic Tamil from southern India, I was especially interested in and commend your writer for his portrayal of the turmoil with unbiased candor. I take exception to the oft-expressed notion that the 50 million Tamils in southern India, along with their brethren in Sri Lanka, threaten to create a greater Tamil state. While local Indian politicians have, from time to time, aroused Tamil sentiment against the "Sinhalese oppressors," most Tamils in India do not support the Tigers and truly believe in a peaceful resolution to the conflict. In fact, strong anti-Tiger fervor has set in since the assassination of former Prime Minister Rajiv Gandhi.

RAGUPATHY KANNAN
Fort Smith, Arkansas

Beneath the Tasman Sea

David Doubilet's pictures are at the highest level of expertise and initiative—perfectly stunning—and the prose reminds me of the great days of Luis Marden. Beat the bushes for some more of his caliber.

STANTON A. WATERMAN
Lawrenceville, New Jersey

I can't believe that I live only a couple of kilometers from these places. Once again, not only has the NATIONAL GEOGRAPHIC opened my eyes to the world but it has also opened my eyes to the beauty of my own home.

CHRIS HERBERT
Hobart, Tasmania

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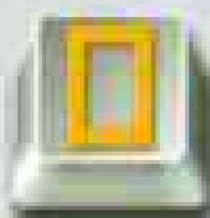

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CONTRAINDICATIONS ZYRTEC is contraindicated in those patients with a known hypersensitivity to it or any of its ingredients or hydroxyzine. **PRECAUTIONS** Activities Requiring Mental Alertness: In clinical trials, the occurrence of somnolence has 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 (approximately 10 times the maximum recommended human daily oral dose on a mg/m² 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 (approximately 4 times the maximum recommended human daily oral dose on a mg/m² 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 in vivo micronucleus test in rats. No impairment of fertility was found in a fertility and general reproductive performance study in mice at an oral dose of 64 mg/kg/day (approximately 25 times the maximum recommended adult human daily oral dose on a mg/m² basis). **Pregnancy Category B:** Cetirizine was not teratogenic in mice, rats and rabbits at oral doses up to 96, 225, and 135 mg/kg/day (or approximately 40, 180, and 215 times the maximum recommended adult human daily oral dose on a mg/m² 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 (approximately 40 times the maximum recommended adult human daily oral dose on a mg/m² 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. Because many drugs are excreted in human milk, use of ZYRTEC in nursing mothers is not recommended. **Geriatric Use:** In placebo-controlled trials, 186 patients aged 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:** The safety of ZYRTEC, at daily doses of 5 or 10 mg, has been demonstrated in 376 pediatric patients 6–11 years of age in placebo-controlled trials lasting up to four weeks and in 254 patients in a non-placebo-controlled 12 week trial. The effectiveness of ZYRTEC for the treatment of seasonal and perennial allergic rhinitis and chronic idiopathic urticaria in this pediatric age group is based on an extrapolation of the demonstrated efficacy of ZYRTEC in adults in these conditions and the likelihood that the disease course, pathophysiology and the drug's effect are substantially similar between these two populations. The recommended doses for the pediatric population are based on a cross-study comparison of the pharmacokinetics and pharmacodynamics of cetirizine in adults and pediatric subjects and on the safety profile of cetirizine in both adults and pediatric patients at doses equal to or higher than the recommended doses. The cetirizine AUC and C_{max} in pediatric subjects 6–11 years of age who received a single dose of 10 mg of cetirizine syrup was estimated to be intermediate between that observed in adults who received a single dose of 10 mg of cetirizine tablets and those who received a single dose of 20 mg of cetirizine tablets. **ADVERSE REACTIONS** Controlled and uncontrolled clinical trials conducted in the United States and Canada included more than 6000 patients aged 12 years and older 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 in patients aged 12 years and older that occurred more frequently on ZYRTEC 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 in patients aged 12 years and older 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 Patients aged 12 years and older in Placebo-Controlled United States ZYRTEC Trials (Maximum Dose of 10 mg) at Rates of 2% or Greater (Percent Incidence), ZYRTEC (N=2034) vs Placebo (N=1612) respectively:** Somnolence (13.7% vs 6.3%); Fatigue (5.9% vs 2.6%); Dry Mouth (5.0% vs 2.3%); Pharyngitis (2.0% vs 1.9%); Dizziness (2.0% vs 1.2%). In addition, headache and nausea occurred in more than 2% of the patients, but were more common in placebo patients. Pediatric studies were also conducted with ZYRTEC. More than 1300 pediatric patients (6 to 11 years) with more than 900 treated with ZYRTEC at doses of 1.25 to 10 mg per day were included in controlled and uncontrolled clinical trials conducted in the United States. The duration of treatment ranged from 2 to 12 weeks. The majority of reported adverse reactions reported in pediatric patients (6 to 11 years) with ZYRTEC were mild or moderate. In placebo-controlled trials, the incidence of discontinuations due to adverse reactions in pediatric patients receiving up to ZYRTEC 10 mg was uncommon (0.4% on ZYRTEC vs 1.0% on placebo). Table 2 lists adverse experiences which were reported for ZYRTEC 5 and 10 mg in pediatric patients (6 to 11 years) in placebo-controlled clinical trials in the United States and were more common with ZYRTEC than placebo. Of these, abdominal pain was considered treatment-related and somnolence appeared to be dose related, 1.3% in placebo, 1.9% at 5 mg and 4.2% at 10 mg. **Table 2. Adverse Experiences Reported in Pediatric Patients (6 to 11 years) in Placebo-Controlled United States ZYRTEC Trials (5 or 10 mg dose) Which Occurred at a Frequency of ≥ 2% in Either the 5 mg or the 10 mg ZYRTEC Group, and More Frequently Than in the Placebo Group. ZYRTEC 5 mg (N=161), 10 mg (N=215) vs Placebo (N=309):** Headache (11.0%, 5 mg; 14.0%, 10 mg; 12.3%, placebo); Pharyngitis (6.2%, 5 mg; 2.8%, 10 mg; 2.9%, placebo); Abdominal pain (4.4%, 5 mg; 5.6%, 10 mg; 1.9%, placebo); Coughing (4.4%, 5 mg; 2.8%, 10 mg; 3.9%, placebo); Somnolence (1.9%, 5 mg; 4.2%, 10 mg; 1.3%, placebo); Diarrhea (3.1%, 5 mg; 1.9%, 10 mg; 1.3%, placebo); Epistaxis (3.7%, 5 mg; 1.9%, 10 mg; 2.9%, placebo); Bronchospasm (3.1%, 5 mg; 1.9%, 10 mg; 1.9%, placebo); Nausea (1.9%, 5 mg; 2.8%, 10 mg; 1.9%, placebo); Vomiting (2.5%, 5 mg; 2.3%, 10 mg; 1.0%, placebo). The following events were observed infrequently (less than 2%), in either 3982 adults and children 12 years and older or in 659 pediatric (6 to 11 years) patients who received ZYRTEC in U.S. trials, including an open adult study of six months duration; a causal relationship with ZYRTEC administration has not been established. **Autonomic Nervous System:** anorexia, urinary retention, flushing, increased salivation, dry mouth. **Cardiovascular:** palpitation, tachycardia, hypertension, cardiac failure. **Central and Peripheral Nervous Systems:** paresthesia, confusion, hyperkinesia, hypertonia, migraine, tremor, vertigo, leg cramps, ataxia, dysphonia, abnormal coordination, hyperesthesia, hypoesthesia, myelitis, paralysis, ptosis, twitching, visual field defect, syncope, dizziness. **Gastrointestinal:** increased appetite, dyspepsia, abdominal pain, diarrhea, flatulence, constipation, vomiting, ulcerative stomatitis, aggravated tooth caries, stomatitis, tongue discoloration, tongue edema, gastritis, rectal hemorrhage, hemorrhoids, melena, abnormal hepatic function, eructation. **Genitourinary:** polyuria, urinary tract infection, cystitis, dysuria, hematuria, micturition frequency, urinary incontinence. **Hearing and Vestibular:** earache, tinnitus, deafness, ototoxicity. **Metabolic/Nutritional:** thirst, dehydration, diabetes mellitus. **Musculoskeletal:** myalgia, arthralgia, arthrosis, arthritis, muscle weakness. **Psychiatric:** insomnia, sleep disorder, nervousness, depression, emotional lability, impaired concentration, anxiety, depersonalization, paroniria, abnormal thinking, agitation, amnesia, decreased libido, euphoria. **Respiratory System:** epistaxis, rhinitis, coughing, bronchospasm, dyspnea, upper respiratory tract infection, hyperventilation, sinusitis, increased sputum, bronchitis, pneumonia, respiratory disorder. **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, skin disorder, skin nodule. **Special Senses:** taste perversion, taste loss, parosmia. **Vision:** blindness, loss of accommodation, eye pain, conjunctivitis, xerophthalmia, 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, pain, pallor, chest pain, accidental injury. 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 adult 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. In an 18-month-old pediatric patient who took an overdose of ZYRTEC (approximately 180 mg), restlessness and irritability were observed initially; this was followed by drowsiness. 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 acute minimal lethal oral doses in mice and rats were 237 and 562 mg/kg, respectively (approximately 55 and 265 times the maximum recommended human daily oral dose on a mg/m² basis). In rodents, the target of acute toxicity was the central nervous system, and the target of multiple-dose toxicity was the liver. **DOSAGE AND ADMINISTRATION** **Adults and Children 12 years and older:** 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. **Children 6 to 11 years:** The recommended initial dose of ZYRTEC in children aged 6 to 11 years is 5 or 10 mg (1 or 2 teaspoons) once daily depending on symptom severity. The time of administration may be varied to suit individual patient needs. Cetirizine is licensed from UCB Pharma, Inc.

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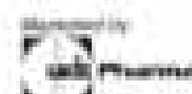

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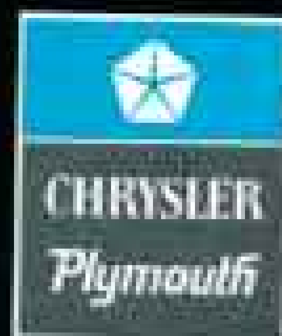

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A Double Blessing: Koala Twins

Presenting a pair of shy faces to the world, Euca and Lyptus make a bold statement: They are one of only two sets of koala twins known to survive in captivity.

Named for eucalyptus leaves, the favored food of Australia's arboreal ambassador (GEOGRAPHIC, April 1995), Euca and Lyptus are the first twins born at Yanchep National Park in Western Australia, among the few koala homes in the western half of the nation. The pair, born in April 1996, snuggled in the pouch of their mother, Inky, before emerging in August. Koala mothers usually give birth to a single joey once a year.

In the wild, koalas live about 10 to 15 years, but in large open preserves such as Yanchep they can survive up to 20 years. Ranger John Wheeler says, "We bring in leaves and cut the stress factor. They don't have to fight man, vehicles, or any other predators in here."

R. IAN LLOYD

A Hairy Way to Repair an English Castle

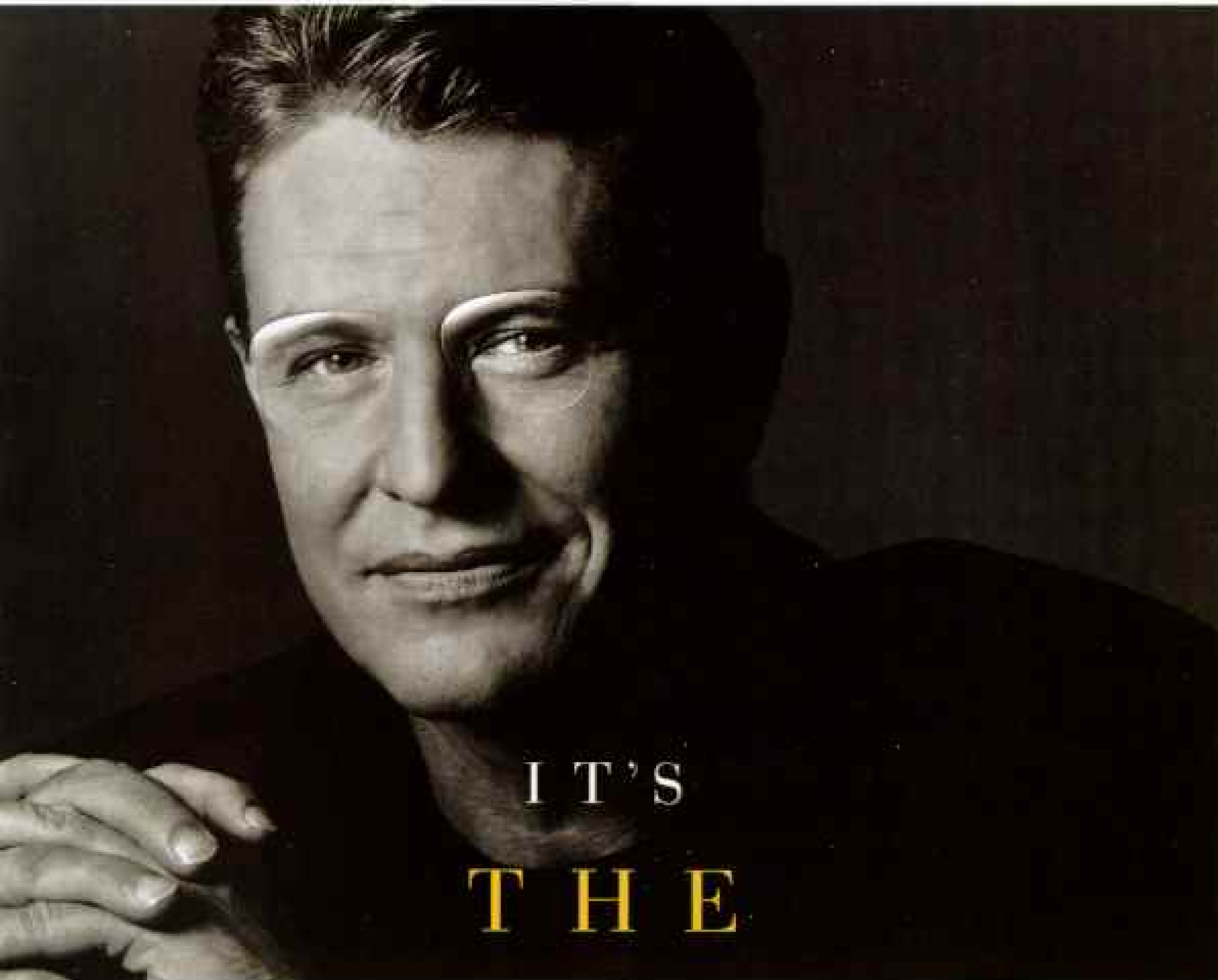
English craftsman Tim Meek repairs old buildings using old methods. When the stone walls of Lindisfarne, a century-old castle on Holy Island off the northeast English coast, began to leak, its owner, Britain's National Trust (GEOGRAPHIC, October 1995), turned to Meek for help. The trust sought his aid because the castle's builders had employed a traditional technique of caulking—galleting and harling.

Galleting consists of mixing a mortar of lime, sand, and animal hair and then applying it in globs—along with bits of broken tile—to large joints. Next comes harling: Masons stir up thinned mortar and hurl—"harl"—it at a wall "with as much force as you can muster," says Raymond Rourke, the trust's regional building manager.

Goat or horse hair, which likely held the original mortar, was in short supply. So Meek purchased 22 pounds of Tibetan yak hair, "stronger than goat hair," from a London firm. The north face was restored last year; work will resume in 1998.

WILL WALKER, NORTH NEWS AND PICTURES

V A R I L U X



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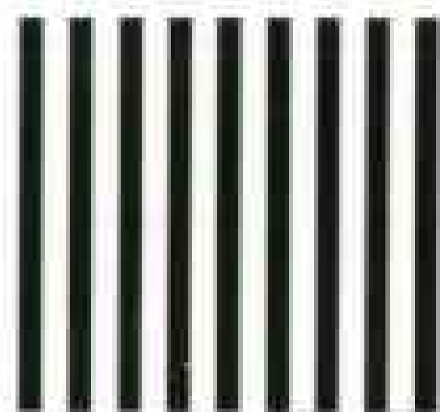

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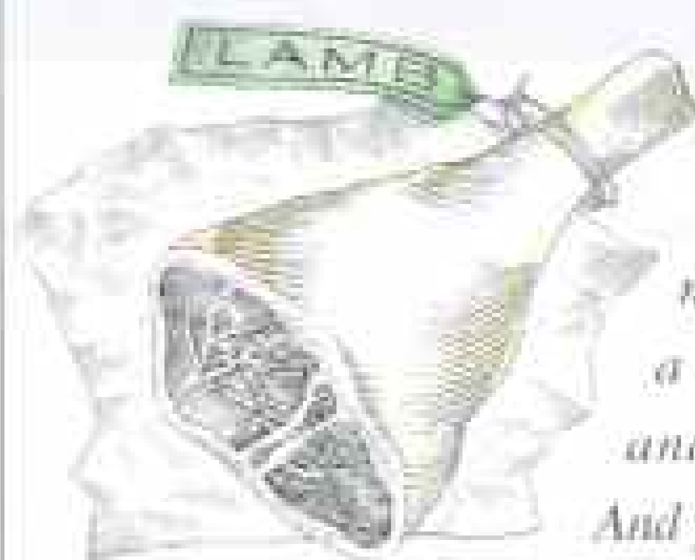

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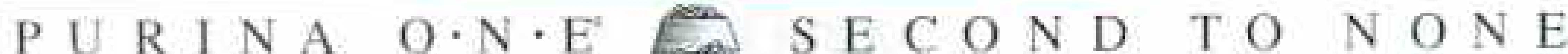

NGm

Aerobatics and a Good Tune Pay Off for Males

A female long-tailed manakin—a sparrow-size bird found in Mexico and Central America—knows what she wants: a pair of males that can carry a tune and dance up a storm.

"While males compete like crazy, they also cooperate," says David B. McDonald of the University of Wyoming, who has studied manakins in Costa Rica with Society support. And cooperation is key: Two high-ranking males, at right, sing a song—it sounds like *to-le-do*—until they attract a female, below, then leap backward over each other. The more they sing in tune, the better their odds of catching a female's ear; the better they dance, the more likely she is to mate—but only with the higher ranking of the two. The other one bides his time; someday he'll move up in status and mate with 50 to 60 females a year.

MARIE READ

Shrimp Give Up a Lot to Find a Decent Home

Space is tight for snapping shrimp that live inside sponges on coral reefs off Belize. So they've worked out an unusual solution: Each colony of the tiny crustaceans contains just one female, which breeds with no more than a few males. Others in the colony, all of them male, never mate; they simply defend the home territory against invaders.

This is the first time such insect-like cooperation has been observed in marine life, says J. Emmett Duffy of the College of William and Mary. It's known on land mainly among bees, ants, termites, and naked mole rats.

By studying shrimp proteins, Duffy established that virtually all the members of a colony of up to 300 are genetically related. Like humans who live with relatives when housing is scarce, the snapping shrimp may find this the only way to survive, says Duffy. In his laboratory tests male shrimp attacked and killed shrimp intruders that were not members of their species but left their own kind alone.

J. EMMETT DUFFY

Happy Trails: the Case of the Walking Bees

It was a mystery: Why do insects that can fly clear a trail on the ground? Because everything they need for their nest is there, say University of Arkansas biologists studying bumblebees in the Peruvian rain forest.

"No other bee species has been known to do this," says Sydney Cameron, who with her husband, James B. Whitfield, spotted the trails.

The Amazonian bumblebee builds its cone-shaped nest on the forest floor out of roots, leaves, and sticks. As worker bees collect these materials on the ground, they clear a path a few inches wide and more than six feet long. Toting the loads, they fly back to the nest. The bees are fastidious about trail maintenance. When Cameron dropped twigs on the path, they brushed them away in seconds.

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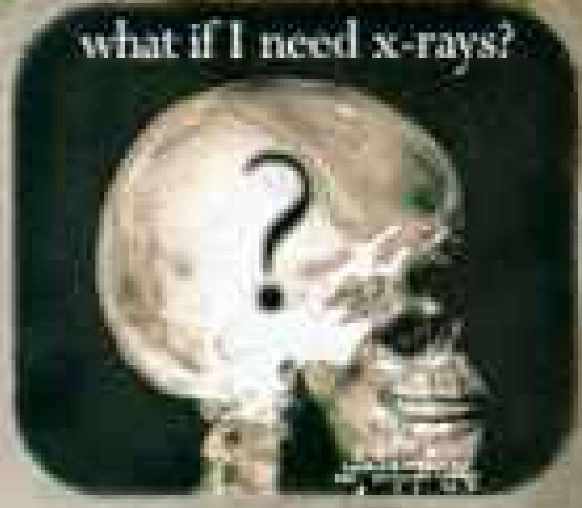

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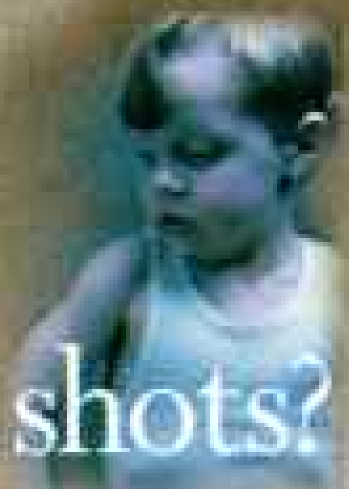

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New Spin on Fast Food

The phalarope, a wading shorebird, has a unique way of dining on creatures too deep for it to reach. It draws them up by spinning in the water at breakneck speed. Scientists led by William M. Hamner, a UCLA biologist, have learned how fast—a full spin every second. The bird eats fast too: It kicks seven to eight times per spin and moves its head in separate snaps to peck at food. "Phalaropes detect prey, thrust, seize, transport, and swallow in less than half a second, at a rate of 180 pecks per minute," the team reports.

The scientists placed brine shrimp in a dish of seawater stained with green dye at the bottom of a three-foot-deep aquarium. Retired GEOGRAPHIC photographer Bates Littlehales used high-speed photography to record this red-necked phalarope in full spin, pumping up shrimp in the vortex it has created.

BATES LITTLEHALES

Tiny Frog With a Sizable Name

On a scouting trip to the humid slopes of eastern Cuba, herpetologist Alberto Estrada heard an unfamiliar chirp one night. Poking around in the leaf litter and ferns, he discovered an unknown frog that is the smallest in the Northern Hemisphere. It measures 3/8 of an inch long, 1/32 of an inch shorter than another Cuban frog and 1/32 of an inch longer than a Brazilian species.

"You have to put your face on the ground to see it hop," says S. Blair Hedges of Pennsylvania State University. He and Estrada named the frog *Eleutherodactylus iberia*. Extremes of size occur in many island animals, Hedges says. The frog was photographed atop a nickel-size ten-centavo Cuban coin bearing the likeness of the world's smallest bird, the bee hummingbird, that also lives in Cuba (GEOGRAPHIC, June 1990).

African Rituals in Colonial America

They are items you might find anywhere: beads and pins, buttons, this coin with a hole in it. Unearthed beneath the northeast corners of ground-floor rooms in an Annapolis, Maryland, house, these humble objects probably were placed by slaves practicing rituals that originated in Africa.

Built in 1774, Slayton House, now owned by the Historic Annapolis Foundation, commands a grand view of the waterfront from its upper stories. In the rooms below, University of Maryland archaeologist Mark Leone, at right, found the hidden artifacts. Guiding him was English professor and folklorist Gladys-Marie Fry, at left. Familiar with the West African practice of burying items, Fry noted references to stones, beads, shells, and other everyday objects when reading slave narratives. "I think the slaves hoped these caches would aid in healing, confer protection against a master, and help divine the future," she says.

—BORIS WEINTRAUB

MARTJAN LAMMERTINK (CENTER); STEVE RUBIN

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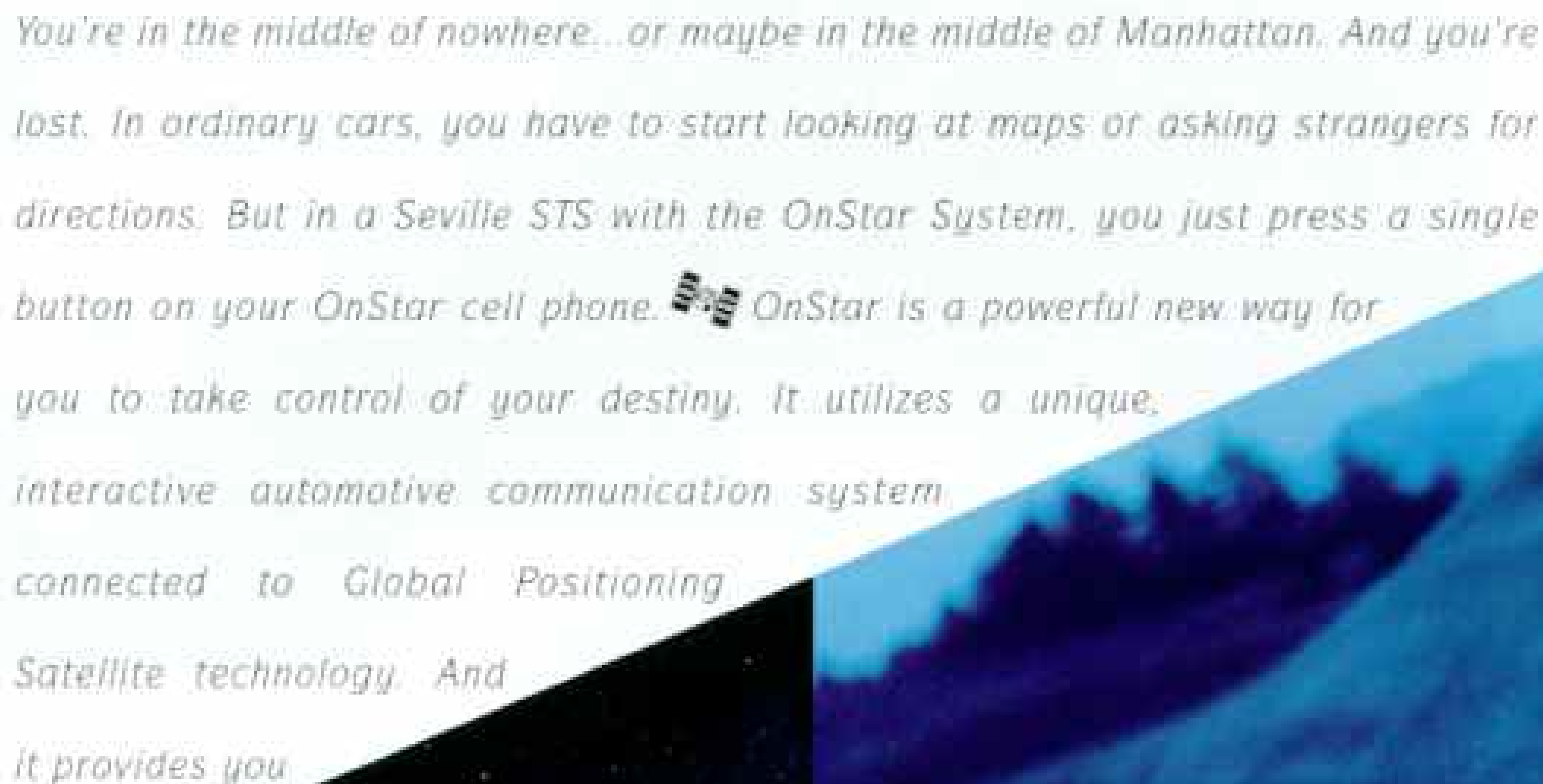

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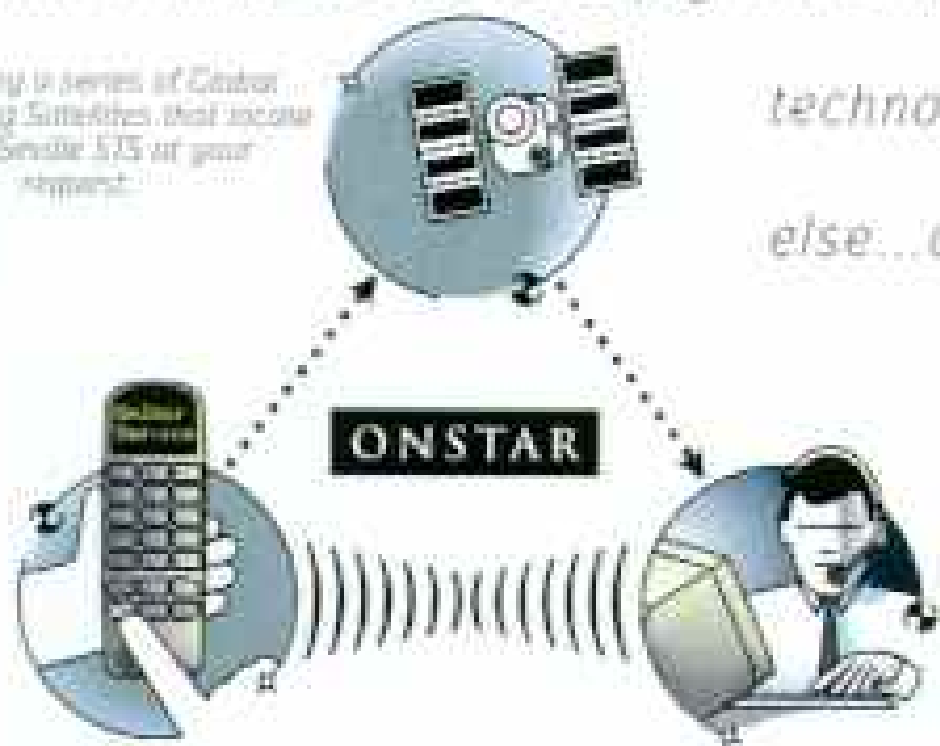

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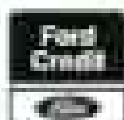

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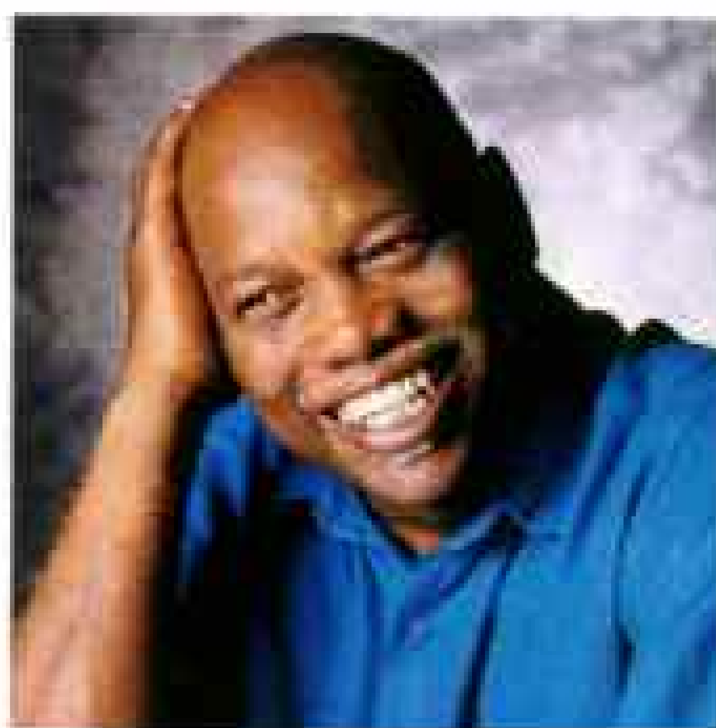

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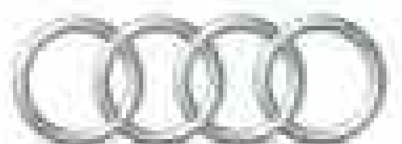
Finally, a car with standards as high as the Andes. The A4 1.8 Turbo. The first car in the world with 5 valve technology. Fifth generation ABS. Four Link suspension with Formula 1 technology. Intelligent air conditioning. And its exclusive quattro four-wheel drive, which maintains torque and perfect stability even in the most imperfect conditions. The Audi A4 with quattro four-wheel drive. It will bring comfortable stability to your life, especially in the curves.

with quattro four-wheel drive.

Audi



Vorsprung durch Technik

It's surprising how deep

You're snorkelling. You take a deep breath and dive. How deep will you go? Three metres? Four? Five?

Or you could try your hand at scuba-diving. But don't expect your instructor to take you past 18 metres.

Even for the most accomplished recreational divers, 50 metres is regarded as the limit.

Yet every single Rolex Oyster, including the elegant Lady Datejust, is guaranteed waterproof down to 100 metres/330 feet.

While very few Rolex wearers indeed will ever venture this deep, for some professional divers depths of 100 metres may be routine.

Which is why Rolex developed the Submariner.

Like every Rolex Oyster, the seamless case of a Submariner is carved from a solid ingot of metal.

Its winding crown actually screws down on to the Oyster case to close as securely as the hatch of a submarine.

The result is a watch that is watertight to a depth that very few divers – and, for that matter, very few submarines – are ever likely to encounter: 300 metres/1,000 feet.

Lady Datejust

Submariner

an Oyster

Yet there are some for whom even the Submariner's superlative waterproof qualities are not enough.

Hence the Rolex Sea-Dweller. This unique timepiece is guaranteed waterproof to a depth of no less than four thousand feet.

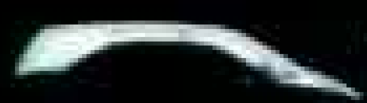
Sea-Dweller

can go.

Wherever your next dive takes you – the deep end of the pool or the deep end of the ocean – you can be certain of one thing.

You can trust an Oyster to feel at home.

More leg room. More elbow room. More relaxing. The Galaxy is now available with a smoother.



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more powerful 2.3l 16v engine. So whenever you're flying around, be sure you get an upgrade.

SPAIN *by* HEIGHTS

A VISIT TO GRANADA ACCOMMODATES A PASSION FOR ALL KINDS OF HIGH LIFE

The incomparable Alhambra. And the exhilaration of skiing in the white peaks of the Sierra Nevada. Two very different reasons for visiting Granada. But both within easy reach of the other.

Cruise Down The Rendezvous Of Prosperous Merchants And Warriors Of Old

Even as you step onto the boat, eager to begin your trip down this famous waterway, you will be embraced by the mystique of the past. As you watch boats of different sizes bobbing gently at the harbour, you can almost picture a quaintly dressed Chinese merchant, sailing in on his barge, ready to trade fine raw silk, brocade and silver coffers, for wares from traders coming from all over the world. You will begin to wonder about the languages, smiles and traditions shared at this meeting point of East and West.

And as the boat takes a corner you will notice the riverbanks. Imagine, the beautiful Chinese princess, Hang Li Po, who was promised in marriage to one of Malacca's Sultans magnificently stepping on shore, accompanied by her grand troupe of servants.

As your guide tells you more, you'll find yourself turning into more than just a curious bystander, watching this amazing Straits of Malacca port flourish and prosper under Portuguese, Dutch and English rule.

Once you return to reality, you'll have lots of other fascinating historic, food, shopping, cultural and recreational attractions awaiting you in various parts of Malacca.

Come. Marvel at the magic.
Only here. Malacca.

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MALACCA

Malaysia's historic City

NEGOTIATING THE ROAD WAS EASY. THE PUBLICAN HOWEVER, TOOK A LITTLE LONGER.

I HADN'T THOUGHT ABOUT BURKE AND WILLS SINCE I WAS IN PRIMARY SCHOOL. IT'S FUNNY THE THINGS YOU THINK ABOUT WHEN YOU'RE OFF THE BEATEN TRACK.

Not that I thought I was lost. I knew exactly where I was. Behind the wheel of the world's finest on-and-off-road vehicle.

We'd set off before first light. We weren't sure about where we were going. But the only certainty was there was nowhere we couldn't go.

The Range Rover's powerful 4.6 litre V8 engine had us rising up The Great Dividing Range faster than the sun was rising over the Pacific Ocean.

The day got better as the roads got worse. We absorbed the changing scenery and the Range Rover's electronic air suspension absorbed all the rough spots.

The interior displayed all the sophistication and comfort of any luxury car, but the comparison finished there. In fact it had finished a hundred kilometres ago.

We'd been on the road for five hours. And off it for two. The creek turned to sand. And the sand turned to boulders.

That's when my thoughts turned to Messrs. Burke and Wills. They ate their four wheel drive transport. Our four wheel drive ate the boulders instead. The ride was as smooth as the ancient river stones beneath us.

An hour later, we found a pub and ventured out of the Range Rover to a warm welcome. Thirty-nine degrees.

The publican gave us and the Range Rover the once-over. "No problem parking it here?" I asked. "Reckon you'd have no problems parking it anywhere," he answered.

And we thought the creek was dry.

Features refer to the 4.6 HSE priced at $114,300, 4.0 SE available from $99,300 (now including leather upholstery and electrically adjustable front seats as standard).

Inside, we sipped our home-made ginger beer amidst a collection of stuffed birds and animals.

We took in the black and white photos of a once-colourful town. That's when I saw it.

Penfolds Bin 4a. "That'd be well and truly on the nose by now," advised Mine Host. He'd had the case for forty five years.

A case? My nose couldn't wait.

I explained that this was Max Schubert's forerunner to the legendary Grange.

Over a couple more gingers (and an hour of persuasion) he finally agreed to sell.

Range Rover's self-levelling air suspension.

We converted four pounds, seven and six into decimal currency. He doubled that. It was a deal.

We had a rare find and the only vehicle in the world that was capable of transporting it safely home.

The Range Rover's climate control kept the case at the perfect temperature. And the self-levelling suspension kept the contents as undisturbed as it had been for almost half a century.

And now might just be the time to disturb a bottle. Here's to Mr. Burke and Mr. Wills and more successful expeditions.

RANGE ROVER
BEYOND THE LUXURY CAR

Limited edition 4.6 Autobiography available from $148,750. Prices include sales tax but exclude statutory and on-road costs.

The measure of a leading global telecom company must surely be in its being the preferred choice. As 74,320* new subscribers daily prove a distinct preference for Ericsson systems.

Of the world's 140 million cellular subscribers, more than 50 million make their calls via an Ericsson wireless system. In the fiercely competitive North American market, Ericsson's systems support 13 million people, that's 30% of all mobile subscribers. And 2.2 million Japanese subscribers depend on Ericsson systems to make their calls.

And the accolades keep coming! From The Network Product Quality Award 1995 from British Telecom, to the 1996 Australian Quality Award, to the 1996 New Media Grand Prix in Korea.

Here in Asia, Ericsson has spent the last 100 years establishing a solid market presence. Special emphasis has always been placed on the transfer of knowledge through local development and training centres, on manufacturing and the development of software. And through joint ventures with local interests and co-operation with universities and colleges.

Telefonaktiebolaget LM Ericsson, S-126 25 Stockholm, Sweden. http://www.ericsson.com
Local companies in China, India, Indonesia, Japan, Korea, Malaysia, Pakistan, The Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam.

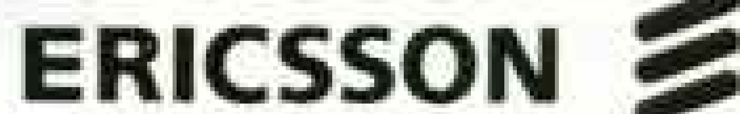
Small wonder then that in Asia, Ericsson is considered to be the right business partner.

Ericsson has 18,000 engineers in 44 research centres concentrating on the development of new products, systems, hardware, software and technology. We engineer infrastructure capable of that inevitable leap into the future. And provide total flexibility in fixed and mobile systems. Clearly we give good reason to be the preferred telecom choice.

Need we say more? We'll just let the facts speak for themselves...

*average daily figure 1996-01-01 to 1996-06-30 for Ericsson fixed and mobile systems.

Telecom solutions for business to build on.



A shockwave over 5.5 can DAMAGE underground water pipes. The ground can become wet and unstable. Wide tyres spread the weight of your car more evenly.

Smoke from fires and dust clouds mean you cannot keep car windows open. Air conditioning is ESSENTIAL. An aftershock can disrupt power lines. Supplementary front driving lights may be necessary.

"JUST POPPING UP THE ROAD FOR SOME MILK, HONEY."

CAR FEATURED FRONTERA SAN DIEGO

QUAKES measuring above 6.1 on the Richter scale can cause asphalt to buckle and fracture. Side steps are needed to protect the underside of doors.

For more information on the Special Edition Frontera San Diego or the 3-door Frontera Niagara, call 0345 400 400.

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But, since our point of view is admittedly biased, perhaps you'd appreciate someone else's.

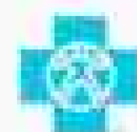
Like, say more than a million Californians.

After all, in the past four years, more people have joined the CaliforniaCare® HMO from Blue Cross of California than any other health plan. Some, because it delivers quality coverage at an affordable price. Others, because Blue Cross has been a trusted name for nearly 60 years.

But, as it turns out, most people like CaliforniaCare because so many of California's finest doctors do – 24,000 in total – all of whom you'll find in our HMO provider network.

So if you're looking for a good health plan, we think you've found it. And there are plenty of Californians out there who agree.

For more on California's fastest growing HMO, call your broker or local Blue Cross sales office.



Blue Cross of California

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THE Psion Series 3c may fit into the palm of your hand, but when you need it, it delivers. Big time. You need the world's best organiser. The Series 3c is it. You need to exchange information with your PC. The Series 3c makes it easy to link to desktop applications, including those in Microsoft Office, using PsiWin. You need extra software. There are hundreds of titles to choose from, and with Series 3c's new backlight, you'll never be working in the dark on any of them. You need a hard copy of your data. With a Series 3c you can connect to virtually any printer and print straight from it – even via infrared. And, you can send faxes, do your email, or browse the web directly from the screen, using Psifax or PsiMail Internet software, and Psion's Travel Modem. All this in a machine the size of a spectacles case that weighs just 275g. You were expecting more? You can, with a Psion Series 3c.

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SERIES 3c

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Would you consider a Jaguar a safe choice of car? The Department of Transport would. The safest on British roads* no less.

For the fourth time in succession, the Protection Value of Jaguar saloons has been shown to be significantly higher than that of other cars.

(This is based on 1994 police accident statistics and real life situations – not simply crash tests using dummies.)

The safety features that many other manufacturers tend to make a lot of noise about have always been there on the Jaguar XJ Series.

Jaguar information: 0800 70 80 60. Internet: www.jaguarcars.com *Source: the 1996 edition of HMSO's "Choosing Safety".

Like an impact-resistant steel cage, reinforced floor and roof, anti-intrusion door beams, front and rear crumple zones, drive-away door locking.

It may come as something of a surprise that the first luxury car to offer the UK motorist dual airbags as standard, was Jaguar.

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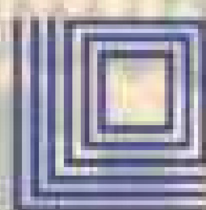

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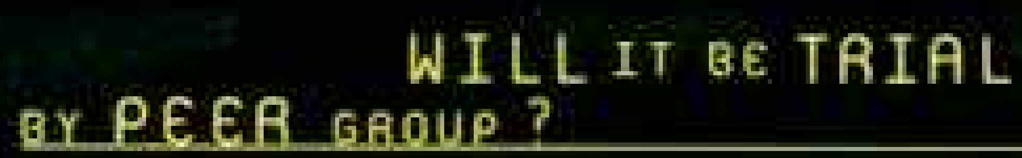

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In 1998 The Rolex Watch Company of Geneva, Switzerland will be rewarding five people with exceptional enterprise.

IF YOU THINK YOU COULD BE ONE OF THEM, SEND FOR FURTHER INFORMATION.

The Rolex Awards for Enterprise were created in 1976 to support outstanding personal initiatives in important areas of endeavour. Once again, Rolex is calling for entries.

An international panel of distinguished judges from a variety of disciplines will be assessing applicants for the originality, feasibility and potential impact of their work.

Areas of recognition include science and medicine, technology and innovation, exploration and discovery, the environment, or cultural heritage.

Projects must expand our knowledge of the world, improve the quality of life on the planet or result in the betterment of humankind.

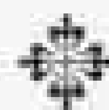
But, above all, the judges will be looking for an exceptional spirit of enterprise.

Each of the five winners will receive US$50,000, a gold Rolex Chronometer and international publicity. As many as ten other entrants will each receive US$10,000 and a steel and gold Chronometer.

For more information or an application form, write to:
The Secretariat, The Rolex Awards for Enterprise, PO Box 1311, 1211 Geneva 26, Switzerland.
Completed applications must be returned to the Secretariat by December 31st, 1997.

Begin your *own* tradition.

Whatever innovations Patek Philippe introduces, every watch is still crafted by hand. The men's Annual Calendar ref. 5035 is the first self-winding calendar watch in the world to require resetting only once a year. And because of the exceptional workmanship, each one is a unique object. Which is perhaps why some people feel that you never actually own a Patek Philippe. You merely take care of it for the next generation.



PATEK PHILIPPE
GENEVE

For information: Patek Philippe S.A., P.O. Box 2654, 1211 Geneva 2, Switzerland. Tel.: (41 22) 884 20 20

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Powerful and petite, the μ[mju:]-II features a bright, high-resolution 35mm F2.8 lens, multi-beam autofocusing, and an auto colour-balancing flash that ensures natural colours even under artificial lighting conditions. So if you want a camera of compact beauty and intelligence, you'll prefer Olympus.

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May 28, he'll pick on people half his size.

Watch the **National Geography Bee** on your PBS station, moderated by Alex Trebek, host of "Jeopardy!" Check local listings or http://geobee.nationalgeographic.com for exact day and time.

Millions of America's best and brightest kids have already competed in local school geography bees. On Wednesday, May 28, the state-level winners will meet to determine this year's national champion. A $25,000 college scholarship is the grand prize.

• Sylvan Learning Centers are proud to sponsor this National Geographic Society program.

The National Geography Bee is produced by Maryland Public Television.

Heavy Isn't Healthy.

Excess weight can be associated with certain health conditions

RESPIRATORY PROBLEMS

HEART PROBLEMS

GASTROINTESTINAL DISORDERS

SKELETAL STRESS

BLOOD SUGAR LEVELS

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Purina® Fit & Trim® is one of the leading weight management foods for dogs, with 15% fewer calories, 33% less fat and 33% less salt than the leading dry dog food — plus a taste dogs love. Veterinarians recommend Fit & Trim to help dogs lose weight. And you'll find it's ideal for weight maintenance once your dog has trimmed down.

Monitor your dog's weight monthly by giving him the Purina® Fit & Trim® Rib Check® test. Put your thumbs on his backbone, with both hands on his rib cage. If you can't easily feel his ribs, your dog probably needs to lose a few pounds. Before you start your dog on any weight management program, consult your veterinarian.

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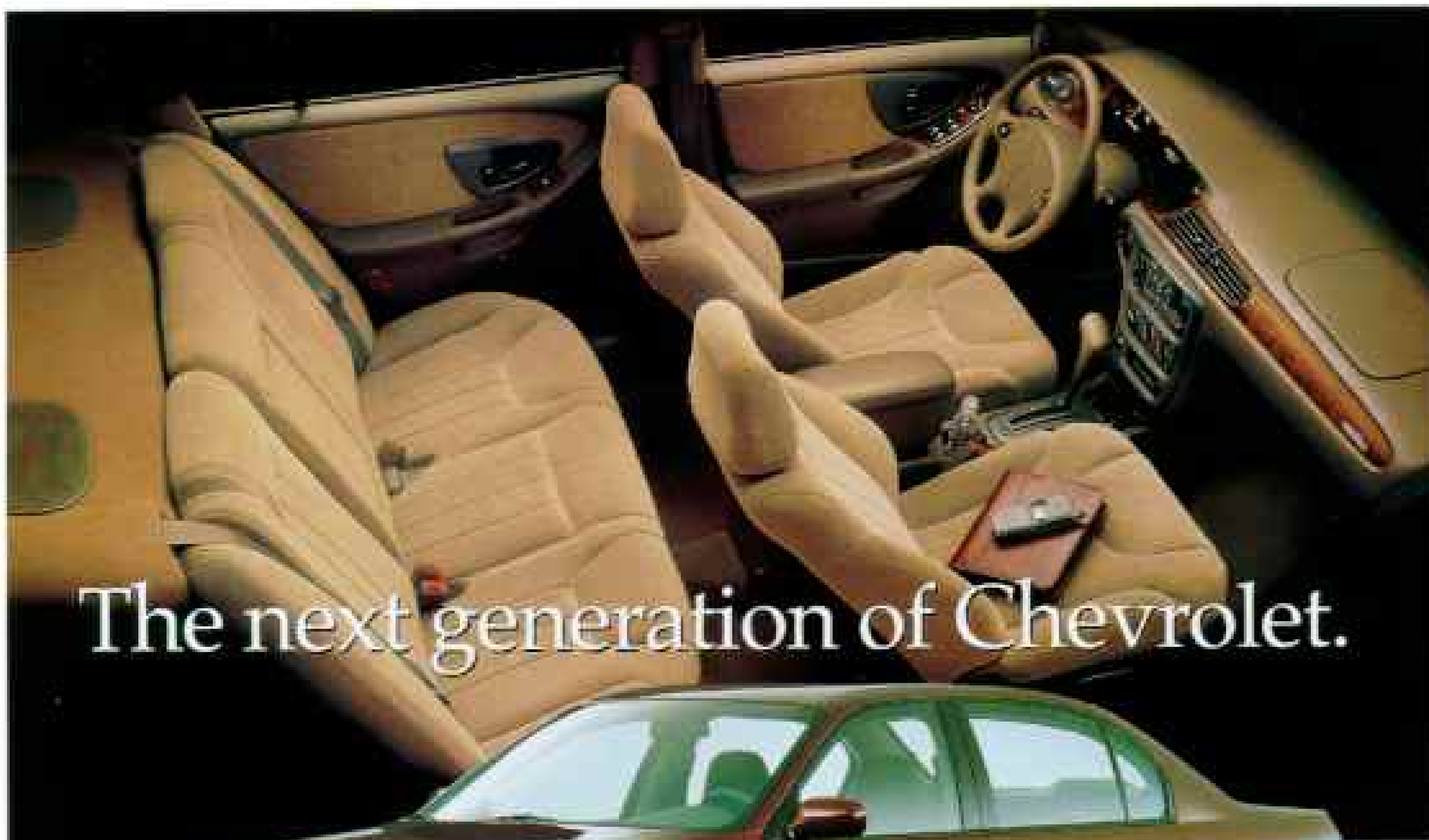

VERSION LS

With the new Chevrolet Malibu, you can now enjoy driving pleasure at its best, with a carefully crafted balance of design, power, safety and subtle luxury.

The new Chevrolet Malibu, Motor Trend 1997 Car of the year, puts together the best of space and comfort. Ample room for five passengers and a big trunk. Driver and front-passenger air bags, as well as 4-wheel ABS brakes are standard safety features. The new Malibu includes power windows and lock doors. The LS, in addition to many other features, has power driver's seat and a stereo with both CD and cassette players.

Visit your General Motors dealer and see it for yourself. You and your family belong in the new Chevrolet Malibu. And don't forget that it comes with the Roadside Assistance program which now covers the Mexican Republic, the United States and Canada.

NEW CHEVROLET

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■ FROM THE GEOGRAPHIC ARCHIVES

Points of Interest

This "native state executioner" wore ceremonial armor to the Delhi Darbar, a British celebration in India honoring the coronation of King Edward VII. The picture was probably purchased by Mrs. Oliver Bainbridge while traveling with her husband, an author and lecturer, who wrote our October 1907 article "The Chinese Jews." For his speaking tours, Bainbridge promoted himself as a "citizen of the world" with a five-page brochure, now in our archives. In it he quoted 106 commendations, from "You will seldom or never get the opportunity of hearing anybody quite his equal" to "Your lectures are all too short."

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ONE DRIVE WILL SURPRISE YOU.

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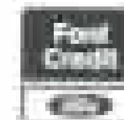

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Heath Fritillary *(Mellicta athalia)* **Size:** Wingspan, 39-47 mm **Habitat:** Woodland clearings and flower-rich grasslands in Europe **Surviving number:** Unknown, declining in most areas

Photographed by Martin Warren

WILDLIFE AS CANON SEES IT

The heath fritillary used to be a common sight throughout Europe, flitting across sunny glades and flower-rich meadows. But ever since traditional farming and forestry methods have given way to intensive modern practices, this sun-loving butterfly has been declining across its range. A poor flier, the heath fritillary needs woodland clearings and grasslands nearby for it to complete its brief week-long lifespan. This little checkered butterfly has been rescued from imminent extinction in Britain, and efforts to save some other known colonies in Europe are under way. 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 contone 256 grayscale/color management, the Canon CLBP 360PS is ideal for multiplatform networking with its capability to interface simultaneously with different computer systems.

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

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NATIONAL GEOGRAPHIC

On Television

MAURICE AND KATIA KRAFFT

■ SPECIAL, MAY 19, 8 P.M. ET

From Violent Fires, New Lands Are Born

Some 10 percent of the world's population—500 million people—lives within reach of active volcanoes. For the residents of Vestmannaeyjar, the only town on the island of Heimaey, Iceland, a 1973 eruption meant losing one-third of their village even as it created one square mile of new land (left).

The dual nature of one of earth's most destructive yet creative forces is captured in this month's National Geographic Television Special "Volcano!"

ANUP AND MANOJ SHAH, ANIMALS ANIMALS

FRANS LANTING, MINDEN PICTURES

■ REALLY WILD ANIMALS

A Disney Base Camp for World Traveler Spin

Setting out from his new home on the Disney Channel, Spin, National Geographic's globe-on-the-go, features wet and wild wildebeests, ring-tailed lemurs, and frilled lizards trying to look scary. "Amazing Journeys," "Island Magic," and "Secret Weapons" present animal worlds in a fast-paced, lighthearted way. "We're thrilled to be working with the Disney Channel, with their tremendous outreach," says Andrew Wilk, executive producer of the Emmy award-winning series, which is also available on home video from the Society or in stores.

Image not available

■ PROGRAM GUIDE

National Geographic Specials
"Volcano!" NBC. Monday, May 19, 8 p.m. ET.

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

National Geography Bee
PBS. May 28. See local listings.

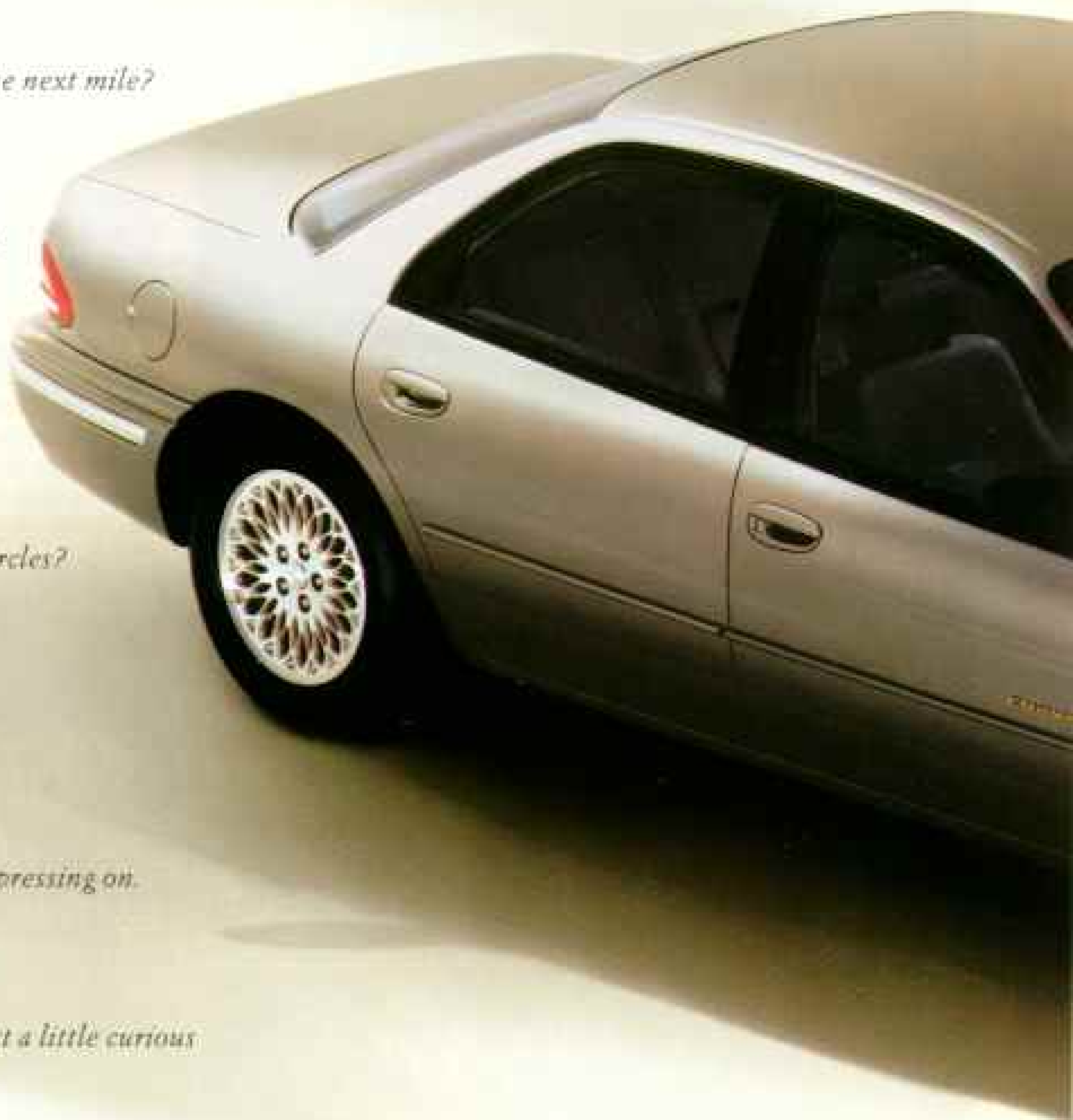
Children's Programming
Really Wild Animals
The Disney Channel. Weekends.

National Geographic Videos and Kids Videos Call 1-800-627-5162.

WILL YOU turn the corner?

Or keep heading down the same road?

Will you go the next mile?



Or be content

to travel

in the same circles?

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technology is pressing on.

Aren't you just a little curious

what's over the next hill?

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CAB-FORWARD DESIGN. 3.5 LITER 24-VALVE V6. DRIVER-ADAPTIVE TRANSMISSION. SPEED-SENSITIVE STEERING. INDEPENDENT TOURING SUSPENSION.

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NATIONAL GEOGRAPHIC

*Earth*Almanac

For a Gull, Happiness Is a Face Full of Food

Rarely do gulls bite off more than they can chew; thus this large gull on the central California coast easily wolfs down a sea star.

Scavengers of sea and land, growing as long as 30 inches, gulls will eat almost anything. Worms, crustaceans, clams, other gulls' eggs and chicks, ducklings, insects, blueberry and grain crops, even dead seals—all are fair game. On an 1829 Arctic expedition naturalists collected a glaucous gull. When they clubbed it, it disgorged an auk—a seabird nearly a foot long—and an autopsy showed a second auk in its stomach.

JOE SALKOWSKI

KENTARO ARIKAWA

Shedding Light on Butterfly Mating

Light signals are essential to butterfly mating, scientists now know. Males and females have photoreceptors on their sex organs. When light to the male's receptors is completely blocked, the pair's genitalia are exactly aligned and they can mate. If the light "leaks," it's no go. Kentaro Arikawa and his colleagues at Yokohama City University discovered this in Japanese yellow swallowtail butterflies like these.

Bears Win Stamp of Approval

Maryland's 300 or so black bears represent a population increase of 50 percent since 1991, thanks mainly to habitat restoration. But farmers' complaints about crop damage have also risen, to some 50 a year.

Solution? Maryland's Department of Natural Resources issued a five-dollar souvenir stamp by artist Francis E. Sweet. The state hopes to raise $20,000 to compensate landowners for bear damage—a boon to both bears and farmers.

Which animal has more neck bones... a human or a giraffe?

Even though their necks can stretch several feet, giraffes have the same number of neck vertebrae as humans, seven.

Because we care for the largest animal collection in the world, Sea World and Busch Gardens receive a lot of questions. And some of the answers require a real commitment.

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With nearly 60,000 animals including 60 endangered species, Sea World and Busch Gardens play a vital role as a modern-day ark. But to properly care for these animals, our conservation programs must reach far beyond our park boundaries. To encourage grassroots conservation efforts, we fund outstanding school groups through the *"A Pledge and A Promise Environmental Awards."* Worldwide, we work with key conservation partners such as the National Fish and Wildlife Foundation and The Nature Conservancy to support wildlife and habitat protection efforts from the African plains to the Arctic tundra. And we support the world's largest volunteer beach cleanup event, the Center for Marine Conservation's International Coastal Cleanup, which takes place in more than 90 countries.

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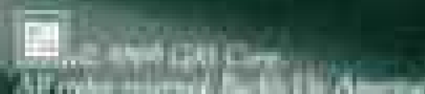

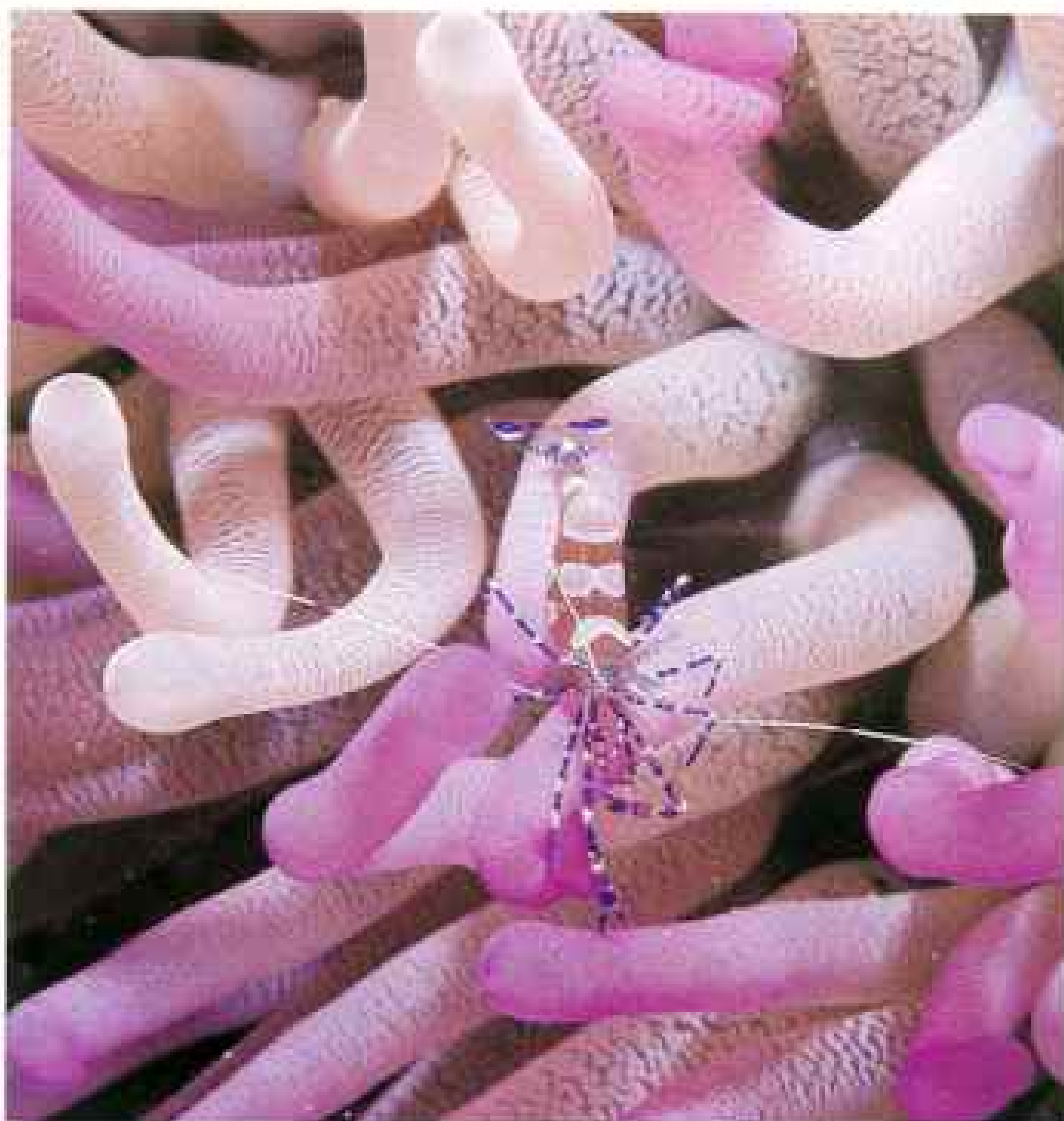

PETER WIRTZ

Symbiotic Duo Share Food and Fertilizer

Unaffected by potentially debilitating stings, an inch-long spotted anemone shrimp creeps among a giant sea anemone's tentacles. Shrimp and anemone live symbiotically in the West Indies. The shrimp may feed on mucus from the anemone's tentacles and perhaps also gains protection from hungry fish. But what is the anemone's benefit? Stephen Spotte of the University of Connecticut's Marine Sciences and Technology Center recently found an answer.

Anemones get energy from single-celled plants within their tissues called zooxanthellae. The plants themselves need nitrogen, which is often scarce in tropical waters. Not all anemones have a resident shrimp, but those that do are lucky, because they get nitrogen from ammonia in the shrimp's excretions.

Tiny Tract Nurtures Myriad Species

A small but mighty kingdom of trees has been identified in Malaysia's Lambir Hills National Park, where Rhett Harrison of Japan's Kyoto University inspects these giants. Within a 129-acre plot an international team of researchers has found 1,175 tree species, one of the most diverse forests in the world. Many of the trees are tall Asian hardwoods called dipterocarps, prized as timber. The unique site has survived despite intense farming and logging pressure on the park's boundaries.

MARK MOFFETT

ROGER SEYMOUR, UNIVERSITY OF ADELAIDE

Golden Moles: Deep Breathing in the Sand

Tiny blind burrowers, Namib Desert golden moles have nifty survival tricks. After hunting termites on the surface, they dig a foot or so into the African sand and remain torpid there for 19 hours or more as their bodies cool, reducing their energy needs. "They essentially become lizards in this respect," says zoologist Roger Seymour, a Society grantee, who adds that the desert sand has uniform grains that permit the passage of air.

—JOHN L. ELIOT

*Inter*active

WILLIAM FITZER, FITZGRAPHICS (HUBBLE TELESCOPE); NASA

■ ONLINE

On Our Website: the World and Beyond

The National Geographic website is a passport to virtual adventures. Highlights will be previewed each month on this new Interactive page. In May:

■ Travel on an interactive intergalactic journey aboard the Hubble Space Telescope (above). Manipulating this 3-D computer model on the screen, a viewer can tour Hubble itself, one of the largest and most complex satellites ever built. Click on components, such as solar panels, instrument packs, mirrors, and radio antennas, to see how they work together collecting data about black holes and distant galaxies.

■ See what Hubble sees as it orbits 370 miles above the earth, free from atmospheric distortion. Find your way on our map of "The Heavens" overlaid with a grid that divides space into locators, or tiles. Click on a tile to call up enlarged Hubble images and detailed descriptions of special features, such as this nebula, a mass of starlit dust and gas within the Large Magellanic Cloud.

■ Test your geographic knowledge of planet Earth in the GeoBee Quiz. Answer daily questions, win weekly prizes, and qualify to win a Toshiba computer—to be awarded in late May.

■ CD-ROM

Coming Soon

Every issue of the magazine, from 1888 onward, is being digitized on CD-ROM. Look for *The Complete National Geographic: 108 Years of National Geographic Magazine* this fall.

■ FOR INFORMATION

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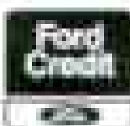

NATIONAL GEOGRAPHIC

*On*Assignment

DAVID COVENTRY

■ LA SALLE'S LAST VOYAGE

Bare Bones Assignment

"I only paid attention in art class," admits Kansas-born photographer Robert Clark, but he boned up on history before shooting the excavation of French explorer La Salle's ship *Belle* in Matagorda Bay, Texas (above). This crew member's skeleton—sprawled in the rope rigging where he died—was found on Halloween. "That ship went down 300 years ago," says Robert. "But look at that poor guy lying there today, and you know just how he felt."

■ INDIA

His Indian Summer

"It's the fastest way to get down those narrow alleys," says photographer Steve McCurry of Calcutta ricksha rides. "The best pictures are often in the hardest-to-reach places." To cover India after 50 years of independence, Steve spent four months and made some 40 airplane flights, visiting nearly all the country's 25 states and 7 union territories. "India is my favorite place in the world to work," says Steve. Naturally. He began his freelance career there in 1978 and lived in the country for two years. He has visited at least 30 times since moving back to the United States. "It's so beautiful in India, so culturally diverse. There's always something you've never seen before. That's the greatest thing for a photographer."

When not on assignment, Steve makes his home in New York City.

KISHOR ROY CHOWDHURY

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