NATIONAL GEOGRAPHIC

From the Editor

LAST WINTER I JUMPED AT THE CHANCE to pilot *DeepWorker* (above right), a single-passenger submarine the Society is using as part of its five-year, multimillion-dollar Sustainable Seas Expeditions research initiative. Peering through the submersible's clear dome 40 feet down in California's Monterey Bay, I watched sea lions swimming playfully around me and felt completely at ease in the idyllic undersea environment.

Taking turns with me on these shakedown cruises were, clockwise from top left, Gil Grosvenor, the National Geographic Society's Chairman of the Board; John Francis of the Committee for Research and Exploration; Margaret Sears, the Society's director of development; Sylvia Earle, our host and explorer-in-residence; and Susan Reeve of our Expeditions Council.

During his dive Gil made a less than idyllic observation: "I could follow the trail of beer cans all the way out to the bay." That speaks to the importance of finding ways to preserve and protect our marine sanctuaries. The Society-wide crew on that Monterey dock illustrates National Geographic's commitment to making Sustainable Seas a success.

Betty Alden

"Home is where the heartbreak is," reads a headline in a Kashmiri newspaper. Wedged between two enemies —India with its Hindu majority and Muslim Pakistan—Kashmir has been caught in the cross fire for a half century. Kashmiri Muslims struggle violently against India's rule and in the process turn Hindu Kashmiris, like anguished Sartha Devi, into refugees.

KASHMIR

By **LEWIS M. SIMONS**

Photographs by **STEVE McCURRY**

Trapped in Conflict

and volley has erupted into all-out war three times since British colonial rule ended in 1947. Risks are growing: Both nations have tested nuclear weapons.

A 16th-century fortress looms over the dawn-burnished waters of Dal Lake in the Vale of Kashmir. India controls this densely populated, predominantly

Muslim area. Pakistan depends on rivers flowing out of Kashmir—the Jhelum, the Chenab, and the Indus—to irrigate fields and generate electricity.

From each crocus flower patient hands will pluck three vivid garnet strands of saffron. An acre yields only a few pounds of the world's most costly spice.

Lush fields and placid lakes once drew more than half a million visitors a year, but civil unrest has shattered Kashmir's calm and left tourism in shambles.

Dodging bomb blasts and gun battles, engineer Maqbool Andrabi kept public water flowing for years in Srinagar, Kashmir's summer capital. "Nights were sleepless," he recalls, "and days full of fear."

Kashmir calls back, its pull stronger than ever, it whispers its fairy magic to the ears, and its memory disturbs the mind.
—Jawaharlal Nehru, first prime minister of India, 1940.

Where World Ends and Paradise Begins
—roadside sign in 1998 on the Indian side of the cease-fire line separating Indian-held Kashmir from Pakistani-held Kashmir.

KASHMIR IS NO LONGER a magical place. On a day like many others, against a backdrop of green mountains sliced through by the glittering Jhelum River in Azad Kashmir, a ragged little cavalcade comes into focus. Men and women and their children trundle down narrow, rocky trails, staring into the middle distance, idly poking a stick at a cow here, a goat there, sandaled feet stirring puffs of red dust. Some carry small bundles wrapped in blankets; some have bloody bandages tied around heads, arms, and legs.

Muzaffar Shah, a bulky man in his mid-30s, says he doesn't know or care where he's going, just that he get far away from where he'd set out the day before. That place was his village, Tafarabad, near the Pakistani Army outpost at Chakothi. For three days Indian Army artillery had been shelling Tafarabad across the cease-fire line, or line of control (LOC), as it has been known since 1972, which divides the disputed territory of Kashmir. Muzaffar Shah doesn't know how many of his relatives and neighbors have been killed or injured by the Indians, but he guesses about seven.

Along an unpaved road nearby, Pakistani Army trucks, buses, taxis, and pony carts jouncing in a haphazard convoy spill over with refugees fleeing other villages near the LOC. Mothers in loose, flowing robes and shoulder-length head scarves somehow retain an innate grace as they cradle eerily quiet babies. Bearded men in baggy tunics and pants clutch string beds, rolled carpets, and cooking pots.

Just a few days before, I'd been on the Indian side, above the dust-blown town of Uri at the spit-and-polish command post of the Indian Army's 12th Infantry Brigade, and had seen the mirror image of what was happening now: shells from the Pakistani side screaming in, killing and maiming villagers.

"Firing across the LOC is so ordinary that you can't digest your breakfast until you've fired off a few rounds," an Indian *jawan*, or trooper, to whom I'd given a lift, had told me with a cocky grin.

Indeed the cease-fire line, which was drawn up by the United Nations in 1949 and snakes erratically for about 500 miles through some of the roughest terrain on Earth, has been breached far more often than honored. India and Pakistan each maintain several dozen military outposts along the line of control. Almost daily, duels such as the one I was witnessing are waged between heavy weapons set no more than eight or nine miles apart from muzzle to muzzle. Since it's illegal to cross the line, a journalist must travel hundreds of miles by road and air to get from one army to the other.

On both sides I heard the same protestations about the bloodshed. Officers would tell me, straight-faced, that the enemy was zeroing in on helpless victims while *they* were firing only at military targets. I never did learn who fired first on that occasion, but a day after I'd arrived in Uri, according to newspaper accounts, 16 people had been killed nearby on the Indian side. They had been taken from their houses and shot, reportedly by Muslim guerrillas. It was the third such act in just over a month. All the victims were Hindus.

The neighborhood fight over Kashmir has been going on since 1947, when the British partitioned predominantly Hindu India to create Pakistan as a homeland for South Asia's Muslims. Jammu and Kashmir—a princely

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LEWIS M. SIMONS, a Pulitzer Prize-winning journalist, first reported on Kashmir in 1972 as the New Delhi correspondent for the *Washington Post*. STEVE MCCURRY has won numerous awards for his photographs of people caught up in conflicts as far afield as Sri Lanka and Yugoslavia.

state with a primarily Muslim population ruled by a Hindu maharaja, Hari Singh—floundered. The maharaja wanted independence for the state, but he didn't know how to get it. At the 11th hour he signed an agreement of accession to India, but by that time Pakistani-backed tribal fighters had invaded Kashmir.

The leaders of India and Pakistan were desperate to acquire Kashmir to bolster their respective visions of nationhood. India's Jawaharlal Nehru, the secularist, wanted to demonstrate that an Islamic population could coexist with the Hindu majority; Mohammed Ali Jinnah, the Muslim nationalist, insisted that Pakistan would be incomplete without the Muslim enclave. Almost immediately the two countries went to war, tearing Kashmir apart. Ebbing and flowing, that war has, in essence, never ended. Today there are some 400,000 Indian troops in Kashmir and about half as many Pakistani soldiers.

Beneath the surface of this South Asian geopolitical game board are the aspirations of a people who consider themselves Kashmiris—neither Indian nor Pakistani—but who live divided by an artificial line. Hardly a day goes by without local newspapers in both countries reporting new violence—from artillery shelling across the LOC, from cross-border incursions of Muslim guerrillas backed by Pakistan, from indigenous Kashmiri Muslim militants who have been fighting Indian security forces for independence since 1989. These confrontations have blended together in a single cauldron of blood.

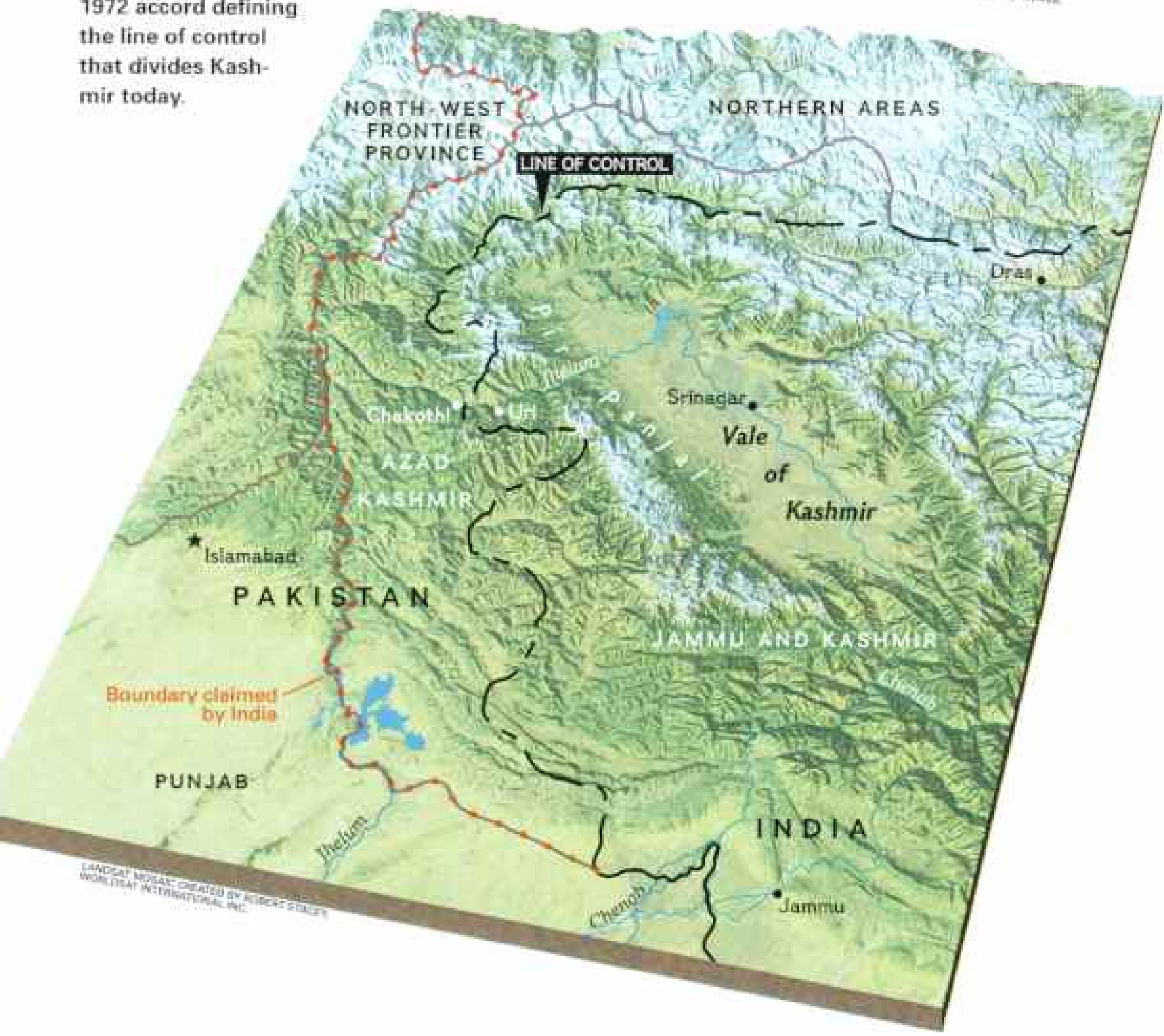
Casualty figures from fighting in and over Kashmir since 1947 are notoriously unreliable. In the past ten years—the period of the Kashmiri Muslim militancy—an estimated 30,000 to 40,000 Kashmiri civilians and militants and Indian and Pakistani soldiers have died. Indian police place the toll at 24,000; Kashmiri Muslims say it's more like 80,000. Both India and Pakistan now have nuclear weapons, and because Kashmir is the flint against which either could strike a nuclear spark, fatalities of this magnitude could become mere footnotes.

Why these two countries would remain at each other's throat for so long, at such cost in life and fortune, over a remote patch of land comes down to the great truism of real estate:

Grandfather supervises the October rice harvest, drawing slowly on a water pipe, while a teenager prepares tea for their weary kin near Srinagar. Family farms and orchards support some 80 percent of Kashmir's population.

KASHMIR
Himalayan Battleground

Politics tangle boundaries. Territory claimed by India was part of the princely state of Jammu and Kashmir before 1947. After a war in which Pakistan held the Northern Areas and Azad Kashmir, U.N. peacekeepers drew a cease-fire line between the rivals in 1949. China won Aksai Chin in a 1962 war with India, carving off another piece of the state of Jammu and Kashmir but magnifying India's resolve to hold adjacent territory, where a Buddhist majority has strong ties to Tibet. India again fought Pakistan over Kashmir in 1965; a third Indo-Pakistani war led to a 1972 accord defining the line of control that divides Kashmir today.



Scores of *shikaras* laden with fruits and vegetables jostle for space on Dal Lake as farmers transact the early morning business of Srinagar's wholesale

produce market. Some farmers tend floating gardens: They weave stalks of water plants into a living offshore raft, cover it with soil, and put in crops.

location. Kashmir perches like a raja's jeweled turban in the Himalaya at the very top of the great subcontinental landmass. There it is a gateway—or a barrier—between the two protagonists as well as between them and China and Afghanistan. Kashmir also sits astride Pakistan's major rivers: the Indus, the Jhelum, and the Chenab.

THIS LAND EXERTS a powerful emotional pull as well. Millions of sweltering, plains-dwelling Indians and Pakistanis dream of its green mountains, its blue rivers and lakes, its fertile farmlands and cool, dry climate. Kashmir is their Maui, Aspen, and Palm Springs all rolled into one. Hindi-language musicals from Mumbai's (Bombay's) "Bollywood" movie studios still court success at the box office with scenes of lovers romping through flower-strewn Kashmiri meadows and snowy hillsides.

When Kashmiris speak of Kashmir, more often than not they're thinking of "the valley," the Vale of Kashmir, which lies wholly under Indian control. Only a fraction of what India rules as Jammu and Kashmir state, the valley is ringed by the high peaks of the Himalaya and the ridges of the Pir Panjal. It is a lush green heartland of thick pine and fir forests, with fields of rare saffron crocuses and terraces of rice bordering mulberry groves and orchards heavy with apples, pears, plums, and walnuts. Centered on the city of Srinagar, the valley is the prize.

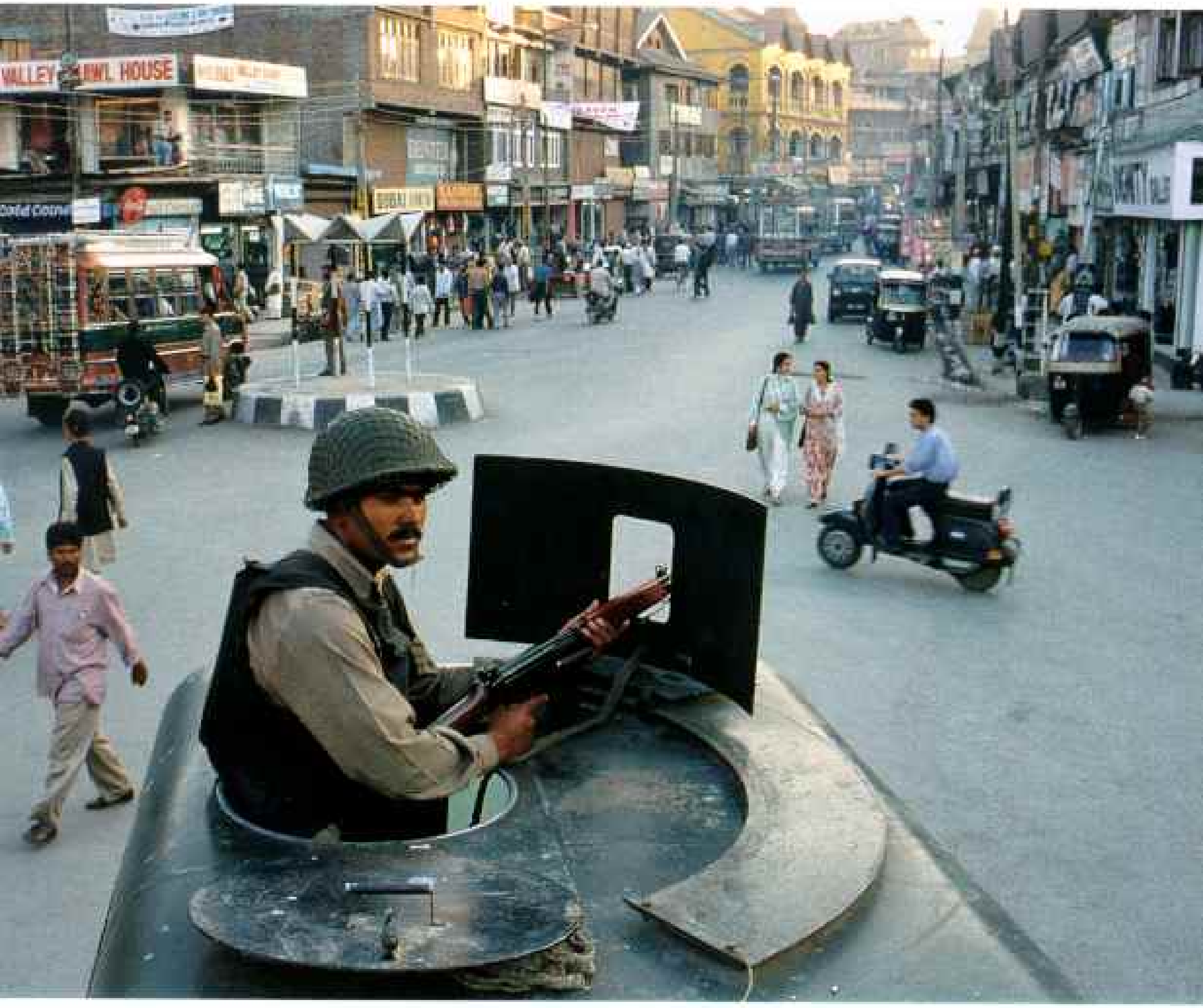
Atop an armored truck, a flak-jacketed member of India's Border Security Force stands watch over Srinagar's busiest intersection. Since separatist fury exploded in 1989, New Delhi has committed as many as 400,000 army and paramilitary troops to the region. "In the valley," says Kashmiri journalist Surinder Oberoi, "violence poisons everyday life." Death toll estimates for the decade range from 24,000 to 80,000.

In the 1970s when I was a foreign correspondent based in India, I would take my family up to Kashmir in summer to escape the New Delhi furnace. On Dal Lake in Srinagar, then, as now, Kashmir's summer capital, we'd rent a houseboat of polished wood, carved with the fanciful patterns of an Oriental carpet. Like latter-day colonials, my wife and I would sip gin-and-tonic sundowners on the rear deck while our two little girls paddled around in a dainty *shikara*, a kind of gondola, with a boatman who'd be delivering groceries.

We'd stroll through twisting medieval streets, among half-timber and plaster structures, more like old Europe than old India. We'd be accosted by honey-tongued souvenir wallahs, offering sets of walnut stacking tables, papier-mâché boxes, magnificent hand-knotted wool and silk rugs, and feathery shawls of wool harvested from the Kashmir goat. Kashmir was, if not quite paradise, certainly a delight.

All that is no more. In the summer of 1995 Muslim insurgents from the Indian side seized six Westerners. One, an American, managed to escape. A Norwegian was later found beheaded, and the remaining four are assumed dead. The next summer another local Muslim group killed six Indian tourists on Dal Lake.

Returning to Srinagar for the first time in more than 20 years, one of my first stops was Butts Clermont Houseboats, at Nasim Bagh, on the shore of Dal Lake. The lake hadn't been very clean even back then, but now it gave off the smell of raw sewage. Illegal squatters have moved onto the marshy shore, where they tend vegetable gardens and sell their huge rosy turnips, green squashes, and fat cabbages from



wooden boats at a floating market held early each morning. Everywhere, the state government had posted green-and-white signs reading, "Save Dal Lake."

Old Mr. Butt, whom I remember as the most genial of hosts, with his flowing white beard and crocheted white skullcap, died some years ago, and his son, Gulam Butt, greeted me with a warm "*salaam aleikum*—peace be with you" and a formal embrace. He led me from his tree-shaded office, hung with fading photographs of past guests, such as Nelson Rockefeller, Joan Fontaine, and George Harrison, through a well-tended rose garden onto an immaculate houseboat. In a moment tea and biscuits materialized.

We talked about old times and old friends, and then I asked him how business was. His face fell, and he sent for a stack of guest books. More than half a million tourists, Indian and foreign, visited Kashmir annually during the 1980s, and the signatures of guests who stayed with the Butts during that time filled four fat ledgers. But in the past decade, as the Muslim insurrection intensified, all the signatures combined covered less than a single page, and nearly all of those were journalists. Gulam Butt shut down four of his eight boats.

I was surprised he'd had any bookings at all. From where we sat, I could see Indian soldiers patrolling the streets in pairs, wearing body armor over camouflage fatigues and hefting automatic rifles chained for security to their web belts. Major intersections were dominated by sandbagged bunkers, their entrances draped in stout netting to keep grenades out. Armed militiamen halted cars and sputtering trishaw taxis, shoving the drivers around and

Slumped in grief, a Muslim cleric leads funeral prayers for his son—militant leader Shariq Bakshi—killed by Indian security troops. Some call Kashmir's

insurgents *mujahidin,* holy warriors for Islam. Others call them criminals,
whose victims—of kidnapping, extortion, and rape—are often other Kashmiris.

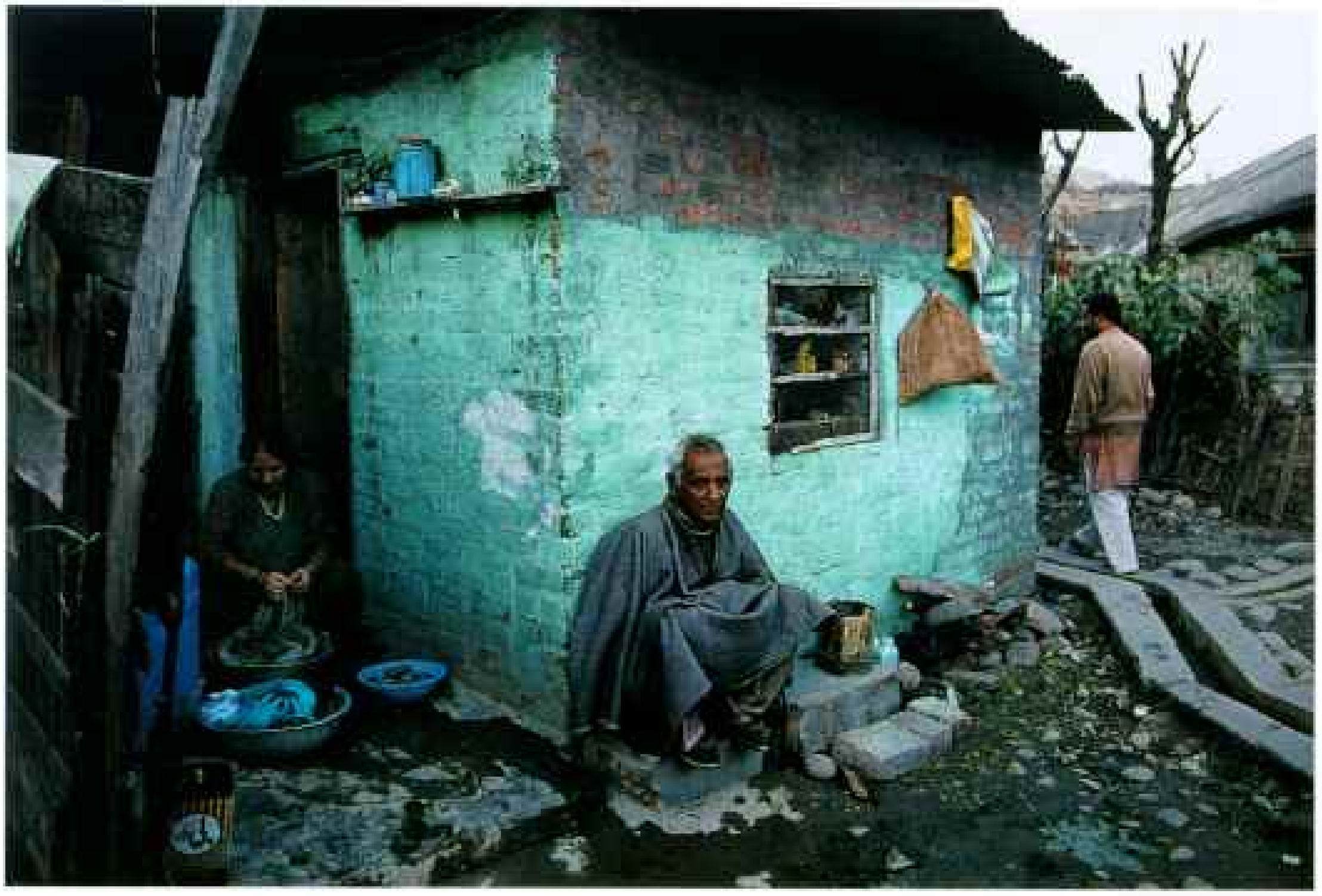
Their houses and temple torched, 23 Hindu men, women, and children were killed in January 1998 in Wandhama, where security forces patrol the ruins (above). Survivors fled, joining more than 150,000 other Hindus driven from their homes by ethnic hatred since 1989. Some resettled in other parts of India, but many remain in squalid refugee camps like the one at Nagrota (right), outside Jammu.

rooting beneath seats in search of bombs. Burning glances from passersby made plain that Kashmiris regard the soldiers as a foreign army of occupation—much like the British Army in Northern Ireland—not a gendarmerie there to protect them.

Despite so much ugliness, most of Kashmir's legendary beauty remains unscarred. Even in the heart of Srinagar, where concrete box-style buildings are spreading like inkblots, enough of the old remains intact to whisk the visitor's imagination back to what the city must have been in its glory. Said to have been founded by the Buddhist Emperor Ashoka during the third century B.C., Srinagar focuses on water—Dal Lake, the Jhelum River, and a looping canal that joins the two, effectively making an island of the city's busiest section. Some two dozen bridges, many of them stone relics, arch over the river and the canal, vantage points for glimpses of boatmen poling small wooden vessels past antique houses.

The city's water reaches it from sources high in the mountains, and because of the purity of the swift Himalayan streams, travelers in the highlands love to pause where road and stream meet. I often did so myself—to drink and wash, to gaze up into the hills at little log houses with sun-sparkled metal roofs, and to chat with other visitors. Once I met a small, wizened, weather-tanned herdsman leading a pony and two goats on rope halters. As we gulped from our cupped hands, a khaki-shrouded army truck rumbled past, gears gnashing, fouling the sweet air. The old man and I glanced at the truck, then at the piney hills, and finally at each other. Almost as one we shrugged and smiled sadly.

THE MILITARY OVERLAY is thick in Kashmir, and inescapable in the valley. One day I drove eastward to the little hill town of Pahalgam. There, in a deep mountain cave, stands an immense pillar of ice, worshiped by devout Hindus as a lingam representing the god Siva. The annual



pilgrimage to this site had for several years been disrupted by the insurrection. Indian authorities, determined to demonstrate that normalcy had been restored, dispatched thousands of troops in a cordon around the devotees, who numbered perhaps 200,000. But Muslim shopkeepers hadn't hung out signs welcoming the Hindus, as in years past. The only banners strung across the road were put there by army units: "We will protect you from the militants—Indian Army Victor Force."

Another precaution taken to avoid potential outbursts was to supply the pilgrims with all the food they would need during their stay. The Hindus, many wearing the saffron-colored robes and elaborate forehead painting of the devout, stayed within their sprawling campground and away from the town's shops. Muslim merchants I talked with were infuriated as they watched buses, trucks, vans, and cars speed by, rooftops piled with bundles of food and equipment. "You see how India cares only for the Hindus," the owner of a tiny general store hissed as I sat alongside him drinking a bottle of lime-flavored Limca.

On the way back to Srinagar I stopped at a small indoor-outdoor workshop in the village of Sangam, where half a dozen men and boys were handcrafting blocks of seasoned willow cut from adjacent groves into polished cricket bats. Cricket, for which Kashmiris share the obsession left wherever the British trod, is said to be the truest measure of loyalties. When India and Pakistan play each other, Kashmiri Muslims cheer for the Pakistani side.

While admiring the workmanship of the bats, I asked the owner about his relations with the Indian troops and the Muslim fighters here in the heart of Kashmir and away from the line of control. He showed me pocks in the pale blue stucco of his shop front. "You've got to take care of both army and militants. Both come to you and demand money and food. If you refuse, they shoot the place up. That's if you're lucky." He said that he and other members of his family had been beaten in the past for refusing to comply. "So, now we give to anyone who asks."

His experience is widely shared. People all over the valley told me that everyone knew at least one family with members killed, wounded, tortured, kidnapped, or arrested by soldiers, insurgents, even next-door neighbors.

The Muslim insurgency traces back to 1987, when Indian officials rigged local elections to install their choice as chief minister, inflaming widespread resentment. In 1989 dissent exploded into a full-blown separatist

movement, as some young Kashmiri Muslims, traditionally docile, took up the gun and began killing Indian soldiers and members of a Kashmiri Hindu community known as Pandits. The Muslim rebels imposed harsh Islamic regulations throughout Kashmir, which included burning down government schools, banning women from going out of their homes with their faces or hair uncovered, and closing movie halls and wineshops, many owned by Pandits.

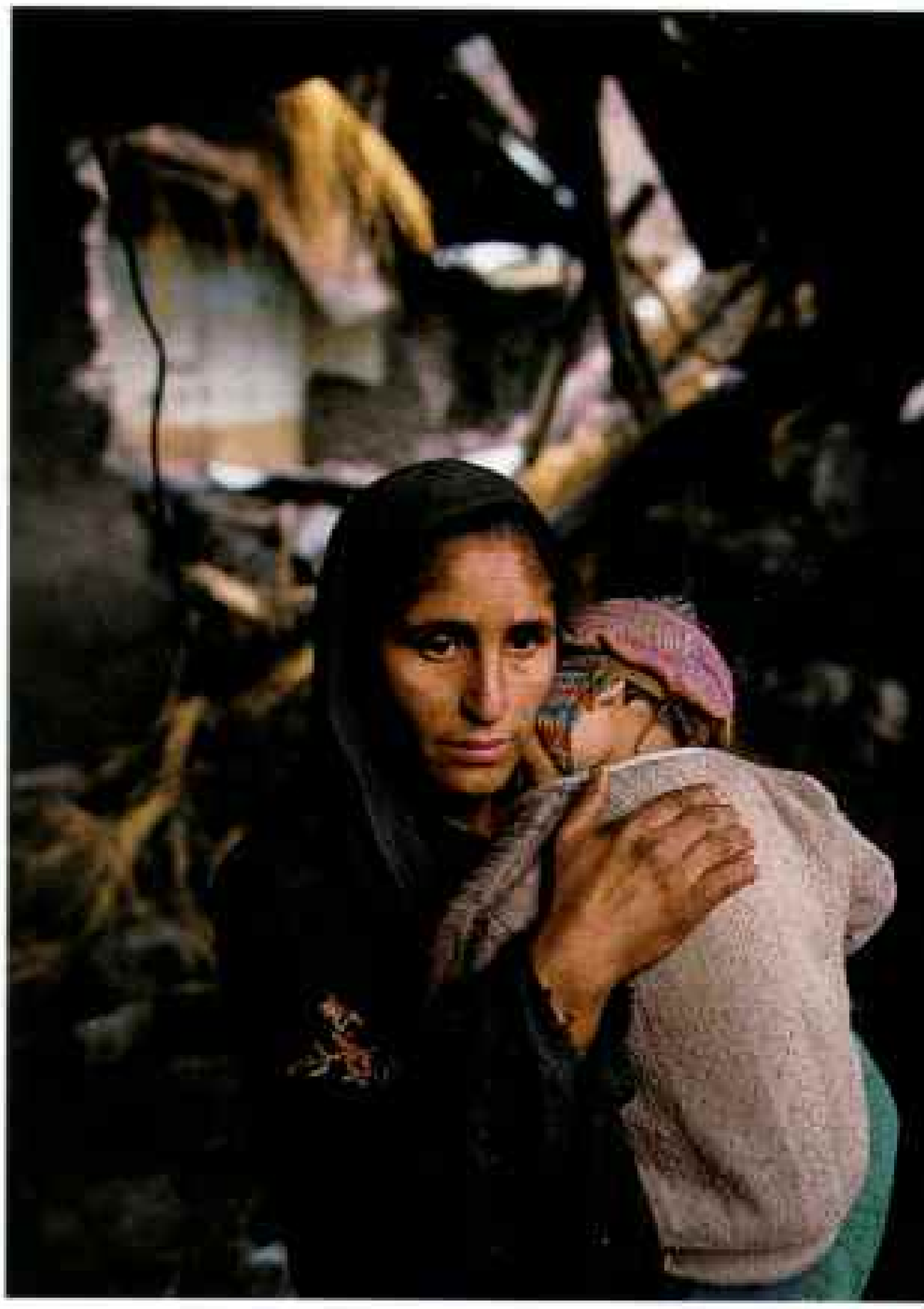
Estimates vary, but a decade ago Pandits numbered from 150,000 to 300,000 out of the eight million inhabitants of the state of Jammu and Kashmir, a small but disproportionately well-educated and successful minority. They have since been persecuted so ferociously by some of their Muslim neighbors and by infiltrating guerrillas that as few as 5,000 remain in their homes. I visited a Pandit refugee camp on the outskirts of Jammu, the capital of Jammu and Kashmir in winter, when Srinagar is cold and snowy. Jammu's Hindu residents tolerate the more than 150,000 refugees, but only just, fearing their competition for scarce government jobs. Other displaced Pandits have moved into the Indian heartland and to other countries all over the world.

ASHOK KUMAR, once a farmer, now unemployed, was a willing Pandit spokesman. I sat with him on the packed-earth floor of his allotted 14-by-9-foot room, which he shares with his wife and two children, in a long row of roughly made, single-story brick tenements. He said he had been in despair since 1990, when he fled his home northwest of Srinagar near the border with Pakistan.

"One day my Muslim neighbors came to our houses and began screaming: 'Indian dogs, leave here or die.' A few days later they raped a woman. Then they set fire to my house, and we ran for our lives. I had owned my own orchard; now I'm a beggar. The Muslims are determined to eradicate the last of this microscopic community. Why is the world deaf?"

The answer, said a young Pandit newspaper reporter who was interpreting the interview, is that for nearly all Kashmiris—Hindu and Muslim, on both the Indian and Pakistani sides—life is so filled with atrocities that the "ethnic cleansing" the Pandits feel is being waged against them is a barely audible subtext. "My entire family were burned out of our homes," the reporter told me. "My cousin was murdered. All of us, all Kashmiris, are victims." Kumar, the Hindu Pandit, like Muzaffar Shah, the Muslim I'd met fleeing his village of Tafarabad on the Pakistani side, was just one more victim of the struggle for Kashmir.

Many of those who die in the turmoil are buried in "martyr cemeteries," rows of white marble slabs, often festooned with gold and silver tinsel, dotting cow pastures and soccer fields, country roadsides and city traffic



A mother comforts her child in what was once their home. India and Pakistan deny targeting civilians, but shell-struck towns litter the border. Raising their children in Pakistan's refugee camps, Kashmiri parents rely on makeshift schools (opposite) to help preserve a Muslim heritage that faces growing hostility in India.

Dras huddles on India's side of the line of control beneath Himalayan heights where guerrillas infiltrating from Pakistan became a target of Indian air strikes

in May. Villagers fled as fighting intensified and Pakistan, in sympathy with the "indigenous freedom fighters," retaliated with artillery bombardment.

The devout gather under the carved wood windows of Srinagar's largest mosque, Jamia Masjid (above). Since the 14th century the city's Muslim faithful have come here to pray. Asiya Andrabi (opposite, standing) exhorts the Dukhtarani-Millat—Daughters of Faith—to press for Kashmir's union with Pakistan. She continues despite a year and a half spent in an Indian prison for such secessionist agitation.

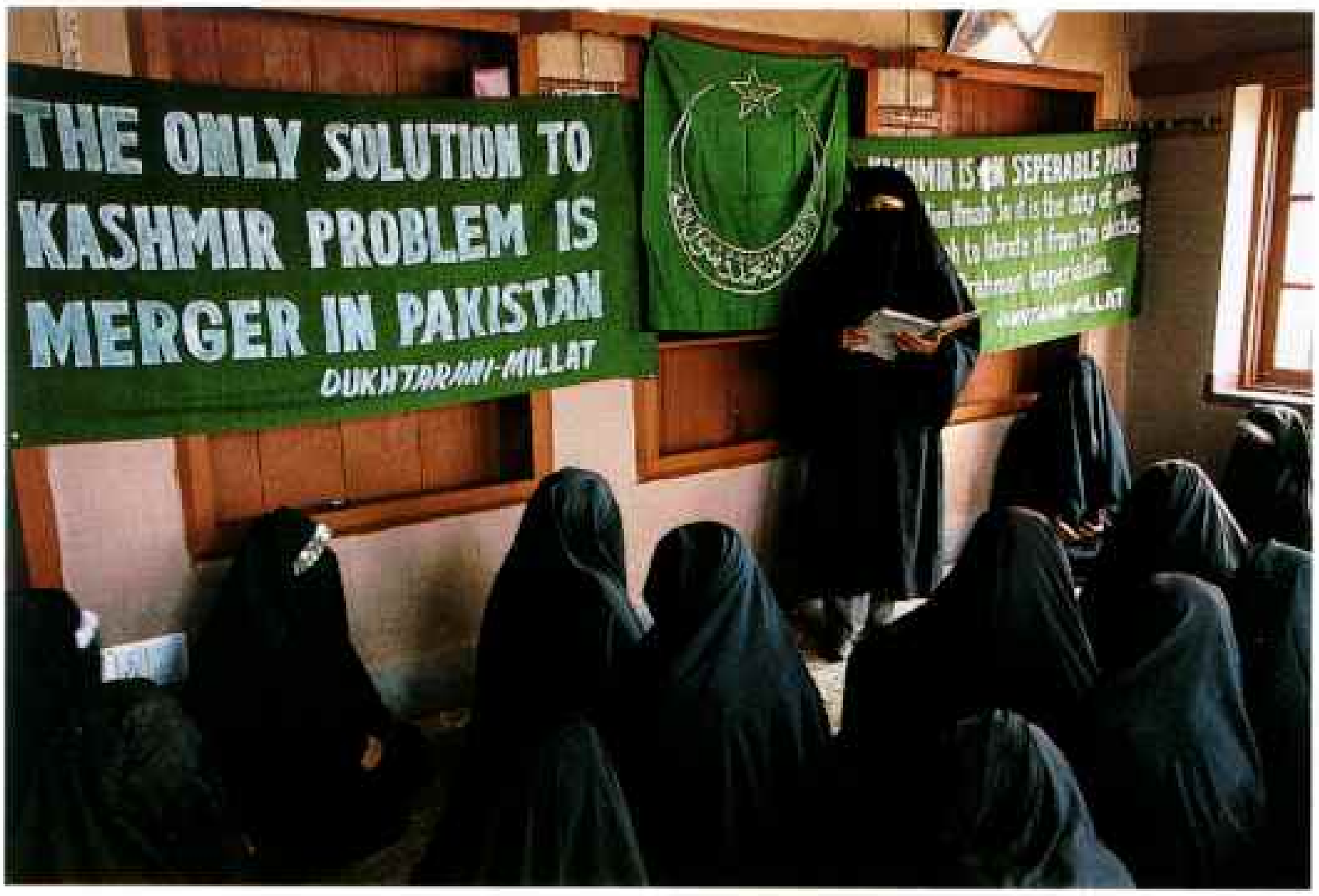
islands. At noon one day in Srinagar I found a 23-year-old Muslim man, a slim, sad-eyed tailor, strolling barefoot among the markers in a graveyard. He was paying respects to a slain religious leader. "The government of India is responsible for this," he said.

While Muslim Kashmiris share this condemnation of India, they have begun to distance themselves from Pakistan. They gladly accept money, arms, and guerrilla fighters from Pakistani extremist groups, but few say any longer that they want Kashmir to become a part of Pakistan.

Pakistan's leaders deny giving the rebellion material aid, but a Muslim leader I spoke with in Rawalpindi confirmed that money originating in Saudi Arabia and Iran is funneled through Pakistan to the militants in Kashmir. The money is also used to pay Islamic fighters —among them Pakistanis, out-of-work Taliban zealots from Afghanistan, and other soldiers of fortune from as far away as Libya and Chechnya—who infiltrate the Indian-held side on the pretext of waging jihad, holy war.

Yaseen Malik, 32, a prominent Kashmiri militant who says he's cut his ties to Pakistan, is famed among his followers for killing four Indian air force personnel and an official of the government-run television network in the early days of the uprising. He suffered a stroke that left the right side of his bearded, boyish-looking face partly paralyzed. After spending four years in a New Delhi jail, he was released but remains under close surveillance.

Malik has about him an almost beatific air. He neither boasts about, nor apologizes for, his past. Rather, he discusses what Kashmiris term "the militancy" in even, direct tones. When he spoke to me in downtown Srinagar in the sparse second-story office of his Jammu and Kashmir Liberation Front—one of a dozen or so competing militant groups—he was dressed in simple white cotton trousers and tunic. Aides, bearded men his own age, stood around the brightly lit, pea green room, glancing out an open window onto the sputter



and jangle of city traffic. Malik kept a cigarette burning much of the time, clenched near the knuckles of index and middle fingers, sucking the smoke from the top of the fist, in the manner of many Kashmiri men.

We sat opposite each other, barefoot and cross-legged on a red carpet. His voice was at times barely audible, and he seemed exhausted. But, he insisted, despite government claims of restored normalcy in Kashmir, the relative calm of the moment masked "only our time of hibernation, of rebuilding our strength. It's true that Kashmir is bleeding, but so is India. If they don't take our independence struggle seriously, full-fledged violence will return."

Not surprisingly, given their recent history, Kashmiri Muslims yearn for independence. Even without the turmoil of recent decades their desire would be understandable, for they were once a self-contained people, evolved mainly from Central Asia and Persia, with characteristically fair skin, light eyes and hair, their own interpretation of Islam, a distinct language, architecture, and style of dressing.

The few Indians who take Kashmiri separatism seriously are those who know the most about the place and its people. A senior Indian administrator in Srinagar, who spoke candidly only when I agreed not to use his name, put it this way: "The truth is that the Kashmiri does have a case. He says, 'Give me my rightful place in the sun, give me my dignity, my religious sensibilities, my cultural identity. Don't impose yourselves on me.' That's legitimate. But the militants are chasing up a blind alley when they go in search of *azadi* [independence]. We will never grant them independence. Never. India is a hard state."

India feels obliged to show Pakistan its intention to bend Kashmir to its will. After years of street battles Indian troops had weakened the separatist militants to the extent that touches of daily life had recovered. Schools were open. Lal Chowk market in central Srinagar was packed with jostling women, some hidden inside voluminous *burkas* in deference to the militants, others having reverted to the more liberating Kashmiri-style robes and headdresses. Butchers casually waved flies from hanging mutton joints, and most goods were in ample supply. At a fruit stall a woman accepted an apple slice proffered by the vendor and gave it to her small son. Averting her luminous green eyes as I asked her how life was these days, she replied without hesitation, "Oh, there's

no question that things are better. We're able to walk about without worry and to shop for our daily needs."

On Sundays families arrive by the busload at the splendid Mogul gardens near Dal Lake to indulge their fondness for picnics. Photographers encourage couples to pose in richly colored period costumes, and vendors entice children with balloons and ears of roasted corn. A young couple, she in a loose, pumpkin-color robe, he in a sky blue safari suit, were sitting near a trickling stream, eating ice-cream cones. "This is the first time we've come to the gardens in some years," said the man, licking at his droopy mustache. "But just because you can go out for a few hours hardly means that life is normal, which is what the government says." Then, showing me a pale scar running from his left ear to the corner of his mouth, he said, "This is what the soldiers did to me." He'd been caught in the cross fire between Indian troops and some militants, but he blamed only the soldiers.

As if to illustrate his point, plainclothes security men appeared shortly before dusk and, casually swinging machine guns, began ushering stragglers out of the gardens. Movie theaters in the city were still closed, banned by the militants, as were liquor shops and bars. Most tourist hotels, and a good many abandoned Pandit-owned houses, were being used as troop billets, their balconies hung with laundered uniforms, their entrances sandbagged. There was little call for hotel space. At the Palace Hotel overlooking Dal Lake, once the maharaja's residence and now under reconstruction, I was the only guest most nights. Rebuilding the palace was an act of faith. "*Inshallah*—God willing—tourists will begin coming back to Kashmir, perhaps next year," a lonely clerk at the front desk said one evening. Then, hesitantly, "Don't you think so?"

It seemed unlikely. It has taken India nearly a decade to limit the revolt, and in doing so soldiers raped, tortured, illegally detained, and robbed thousands of Kashmiris, according to international human rights organizations. The Indian Army has weakened the militants, but people are by no means ready to forgive, nor to forget the dream of independence. And so Kashmir remains an armed camp, in which not even the simplest farmer is free to come and go.

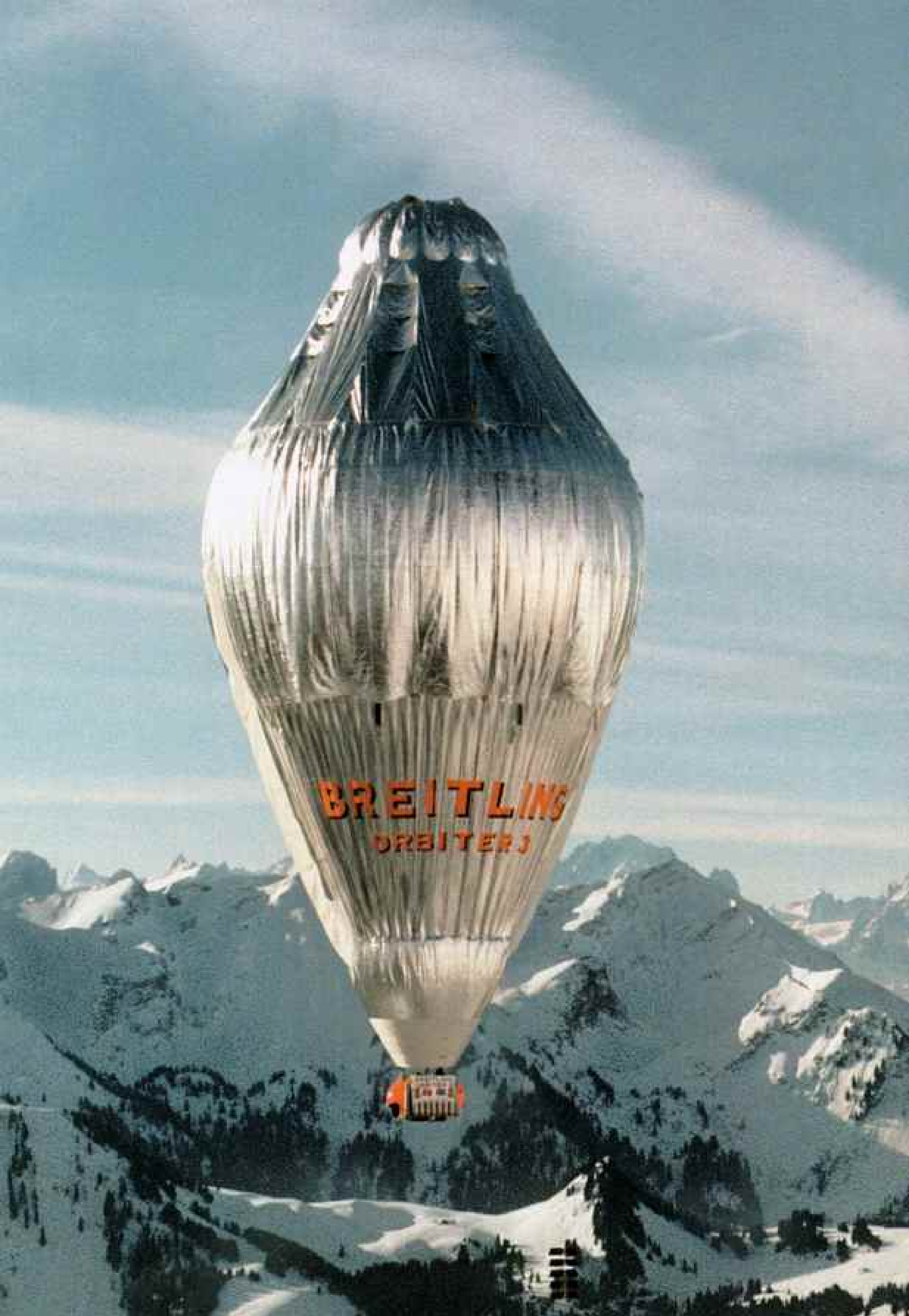
HARVEST SEASON in the valley, and roads are clogged with tiny pony carts heaped high with wooden apple crates. Troops halt the drivers and search for explosives. At the dingy public hospital in Uri, Aijaz Iqbal Beigh, a tall, thin man with a scraggly brown beard, says the 40-mile bus ride from his village, Lalpor, has taken six hours. "The soldiers checked us every 200 meters," he says. "Ladies, gents, even children are checked."

Early any morning I'd run into a logjam of armored vehicles loaded with troops, their heads swathed in black scarves, adding to their already sinister appearance, and an anxious-looking soldier with his finger on the trigger of a heavy machine gun. Slowing their progress would be a sapper unit, men on foot sweeping with electronic devices, accompanied by Alsatian dogs sniffing for buried mines. "You just don't know when a sniper might squeeze off a round or two at you or when you might find a mine," a muscular lieutenant wearing the starched olive drab turban of a Sikh told me, leaning from the cab of his truck.

Although India and Pakistan seem incapable of coming to a resolution, it's not for want of talking. As I was witnessing the shelling across the LOC near Uri, political leaders were attending a South Asia regional conference in Sri Lanka—discussing Kashmir. The outcome: There would be another round of talks.

In much the way that Tibetans have been forcibly surrounded by the dominant Han culture of China, Kashmiris are being subsumed by India and used by Pakistan. In both places, as in other parts of the world where larger powers determine the fate of smaller ones, the land matters more than the people. With no other country willing to intervene on behalf of the Kashmiris, it is evident that they have no way out. □

A flower seller paddles through Dal Lake's quiet waters. Few observers expect diplomacy to restore equal serenity to his homeland. Buffeted from within and without by waves of seemingly intractable strife, Kashmir faces a stormy future.


BREITLING
OREITER

On March 1, 1999, *Breitling Orbiter 3* lifted off from a village in the Swiss Alps in a daring attempt to become the first piloted balloon to fly nonstop around the world. Twenty days later it landed in the Egyptian desert, having triumphed in ballooning's greatest challenge. **BERTRAND PICCARD**, one of the two pilots, tells NATIONAL GEOGRAPHIC the story of this historic flight.

At Last! Around

During its first minutes aloft, the balloon skimmed the Alps as it drifted toward Africa. Until this flight no one had come close to circling the globe in a balloon.

High above the red vastness of the Sahara, the silver bubble of the *Breitling Orbiter 3* balloon feels absolutely motionless. Only our instruments tell us we are moving: 85 miles an hour. Yesterday Brian and I climbed out the hatch. As he fixed a problem with the burners, I used a fire ax to break off ten-foot-long icicles that had formed on both sides of the capsule, watching them tumble and turn as they fell toward the impossibly empty sands of Mali below. After closing the hatch, we repressurized the capsule, fired our burners, and climbed back to our cruising altitude of 23,000 feet. Now, sitting in the cockpit in front of our navigation instruments, we smile at each other. After flying southwest for three days, we have reached the 25th parallel and entered the jet stream at last. For the first time since March 1, when we took off from Switzerland, my home country, we are heading east. We can finally say that our trip around the world has started.

For me this flight is a unique opportunity to establish a friendlier relationship with our planet. Human beings always want to control nature, but to fly around the world by balloon, even using our most advanced technology, we must harmonize with nature, following the rhythm of the wind. Unlike my previous two attempts to circle the globe, this time I feel that my dream is within reach. Our Rozière balloon, a combination hot-air and helium design, is flying well and is using less propane fuel than expected. The engineers at Cameron Balloons, who built the envelope and capsule, have done an excellent job. And Brian Jones is the best partner I could have chosen. With a calm and flexible personality, he is also a fine technician and a very good pilot. But as I look down at the arid surface, images flash before my eyes of all the problems, all the failures, and all the tears we have gone through to reach this point.

In January 1997, when Wim Verstraeten and I made our first round-the-world attempt, our balloon had barely taken off before a massive fuel leak covered the floor of our pressurized cabin with kerosene, making us sick with vapors and forcing us to ditch in the Mediterranean Sea. On our second flight, in January 1998, Wim, Andy Elson, and I managed to reach Myanmar (Burma), but an

Grinning through three-week-old whiskers, Piccard, far right, and copilot Brian Jones rejoice after being picked up in the Egyptian desert. "We took off as friends and landed as brothers," the author said of Jones. In recognition of the flight, the pair will be awarded the Hubbard Medal, the Society's highest honor.


BREITLING
AP/WORLD WIDE PHOTOS

A family tradition: Like grandfather,

KEYSTONE UNDERWOOD

BRETLING SA

Speaking to the press in Zürich on August 18, 1932, the author's grandfather Auguste Piccard explains the scientific mission of his second balloon flight into the stratosphere, studying cosmic rays. The author, waving from his capsule before the launch, sounds more like the psychiatrist that he is. He describes his own flight as "a fabulous metaphor for life—finding new resources to face the unknown."

unexplained loss of fuel during the first night and a lack of permission to fly over China put an end to that attempt. We stayed aloft longer than anyone had before, 9 days and 18 hours, but still we failed.

That flight had proved, above all, how important China was to our plans. Without permission to cross the Middle Kingdom, which stretches across so much of Asia, our chances would be slim. So in August 1998 I flew to Beijing with three other members of the team to persuade Chinese officials and obtained an overflight permission two months later.

By the end of November the balloon was ready to fly. But then the global weather patterns turned bad, Iraq was being bombed again, and a British balloon drifted over forbidden areas of China, prompting the Chinese to withdraw permission for our flight as well. The season for round-the-world ballooning, which takes advantage of winter's more constant jet streams, was almost over by the time Swiss diplomats obtained a new approval for us to fly over China—but south of the 26th parallel to avoid sensitive or unsafe areas. That promised to be a difficult feat, since no weather pattern could guarantee such a trajectory. Nevertheless, on March 1 our meteorologists, Pierre Eckert and Luc Trullemans, gave us a green light to launch.

THAT MORNING at the Swiss village of Château-d'Oex, when Brian and I climbed into the capsule, the wind began to buffet the balloon and rattle our 32 propane fuel tanks. Brian looked a bit pale, but I was fatalistic: There was no going back. The uproar of the thousands of spectators drowned out the voices on our radio, and a burst of wind shot us upward. The last line tethering us to the ground had been cut.

We knew the first 24 hours would be crucial. In many previous round-the-world attempts problems had appeared quickly. I could also not forget the story of my grandfather Auguste Piccard, when he took off on his first flight into the stratosphere in 1931. A whistling noise showed him there was an air leak in the wall of the cabin. He finally managed to plug the leak with hemp and Vaseline, but later he found

like grandson

that he was unable to descend because of a release-valve cord that had become tangled. He had to wait for the night to cool his balloon in order to get back to Earth.

For Brian and me, crossing the Alps was slow but wonderful. We had a spectacular view of the Matterhorn and Mont Blanc. That evening, with the sun setting over the Côte d'Azur, we enjoyed a meal of emu steaks, rice, and vegetables, reheated in plastic bags in the kettle.

The following afternoon we passed Almería, Spain, where Colin Prescot and Andy Elson had launched *Cable & Wireless* two weeks before on their own round-the-world attempt. We had no hope of catching up with them though, since they were already over Myanmar 6,000 miles away.

Now, on the fifth day of our flight, my face is glued to the porthole as we soar over Libya. I have begun to like this desert, which 70 years ago was crossed by Antoine de Saint-Exupéry, Jean Mermoz, Henri Guillaumet, and the other pilots of the French Aéropostale whose works I read when I was a child. Suddenly the satellite fax light blinks, and a message from our control center in Geneva appears on the computer's screen.

"Our current speed of 85 miles an hour is too fast. The stream is going to take us north of the Himalaya. Let's descend to slow down and take a more southern route." Our friends in the control center have such team spirit that their messages are often written in the first person. They are all flying with us, from Alan Noble, the flight director, on down. Even though we are still four days from China, Alan is already worried. He knows we must cross the border into China at exactly the right place.

Thanks to our new altitude, we drift toward southern Egypt, over Sudan, Saudi Arabia, Yemen, Oman, then India and Bangladesh, assisted from afar by Swiss air traffic controllers, who help us gain access to forbidden areas. Not all the countries we fly over understand our goal, as shown by this radio exchange between Brian and the Burmese authorities:

"This is Rangoon control. What are your departure and landing points?"

"HB-BRA, departed from Switzerland, intention to land somewhere in Africa."

"If you're going from Switzerland to Africa, what in the hell are you doing in Burma?"

Each day Brian and I take eight-hour shifts in the pilot's seat. While one of us flies the balloon, the other crawls beneath the covers in the bunk to sleep. We spend the rest of the time together, plotting our

JEAN-FRANCOIS LUY, BREITLING SA

In a sheltered valley in the Swiss Alps the 180-foot-tall balloon lifts off from the snow-covered ground in the village of Château-d'Oex at 9:05 a.m. local time on March 1, 1999. Weeks earlier the launch had been delayed until Swiss diplomats could obtain permission for the balloon to cross China.

JULIET ERMANUEL, 1998

Their lifeline to the surface, a laptop computer allows the pilots to trade messages with mission control in Geneva. Piccard adjusts a tiny camera for sending pictures as well.

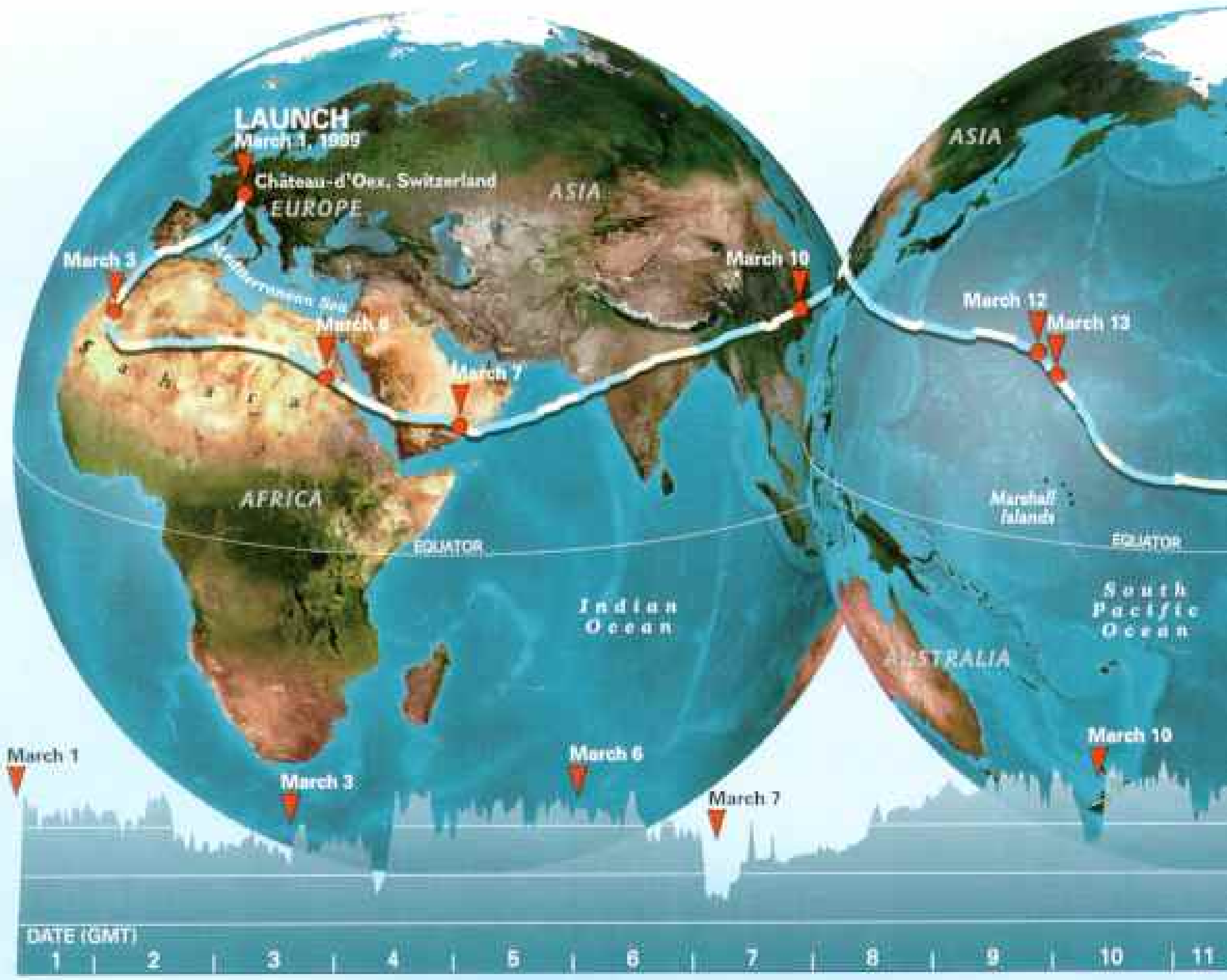
route on maps, discussing flight strategies, making repairs, preparing food in the tiny kitchen area.

After nine days in the air, we are ideally positioned to enter southern China. Crossing the border in the middle of the night, we cannot see the high mountains of Yunnan Province, but we feel their effect: Huge waves of wind make the balloon difficult to stabilize. The first words of the Chinese air traffic controller leave us no doubt.

"HB-BRA, remember, it is forbidden to fly north of 26 degrees."

Back at the control center in Geneva the atmosphere is electric as they follow our progress. At one point, when we drift as close as 25 miles to the restricted area, the Chinese authorities ask us to prepare for an emergency landing. But as if by a miracle the wind brings us back on track. The next morning when the sky brightens, we see a China that is almost completely covered by a thick layer of clouds. During the rest of our 15-hour crossing we keep our eyes fixed on the magic numbers of our instruments: 85 miles an hour, heading

Breitling Orbiter 3 Route



March 1, 1999
Balloon launches from Château-d'Oex, Switzerland, at 8:05 a.m. Greenwich mean time (GMT).

March 3
Having drifted southwest from the start, Piccard and Jones finally begin to turn toward the east.

March 6
After zooming over Libya at almost 90 mph, the balloonists must avoid no-fly zones over Egypt and Yemen.

March 7
Piccard and Jones learn that rival British balloonists Andy Elson and Colin Prescot have ditched off Japan.

March 10
Honoring an agreement with China to stay south of the 26th parallel, the team crosses that nation in 15 hours.

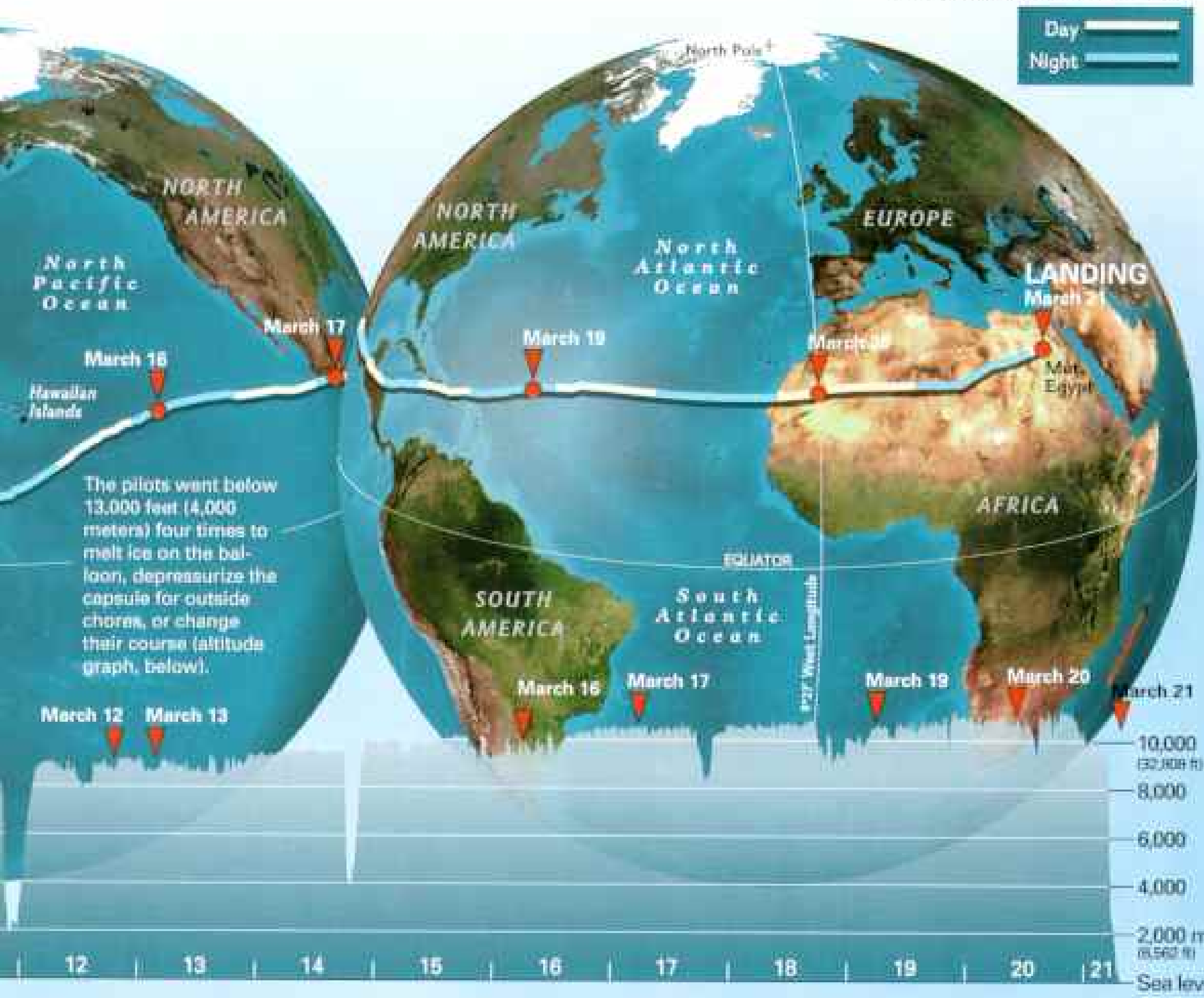
March 12
Wary of towering nimbus clouds, the pilots continue their six-day journey across the Pacific Ocean.

In Pursuit of the Dream

Below are ten of the most notable round-the-world attempts in ballooning's history.

NATIONAL GEOGRAPHIC MAPS
SOURCES: CAMERON BALLOONS; BREITLING SA; NOAA SATELLITE MOSAIC PREPARED FOR NATIONAL GEOGRAPHIC BY JPL AND RENDERED BY NASA'S LABORATORY FOR ATMOSPHERES; WMO; FÉDÉ FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE (CHART AREAS)

Varying wind speeds account for unequal periods of day and night on the route map.



The pilots went below 13,000 feet (4,000 meters) four times to melt ice on the balloon, depressurize the capsule for outside chores, or change their course (altitude graph, below).

March 13
The balloon passes the halfway mark near the Marshall Islands.

March 16
The pilots surpass American Steve Fossett's distance record of 14,236 miles.

March 17
The balloon is ejected from the jet stream over Mexico.

March 19
Piccard and Jones break the duration record of 17 days, 17 hours, and 41 minutes aloft.

March 20
The balloonists cross the finish line at 9°27′ west longitude, becoming the first to circle the globe nonstop.

March 21
Piccard and Jones land safely in Egypt at 5:52 a.m. GMT.

BRIAN JONES AND BERTRAND PICCARD

The first bear to circle the globe in a balloon was a gift to Jones from an airline flight crew, who suggested that the high-flying teddy be auctioned later for charity. Beaming at his own contraption, the author demonstrates a window-cleaning tool he fashioned during the flight from sponges, a radio antenna, and a boat hook. Later he chips ice that formed on the fuel valves from the condensation of moisture in the cabin air.

90 degrees. For 1,300 miles we have followed a straight line.

As soon as we leave China, the crew in the control center opens the first bottles of champagne. To them we have achieved the most difficult challenge of the trip. Yet we still have two oceans to cross, as well as North America.

The decision to cross the Pacific Ocean is irreversible. Ahead lies 10,000 miles of water, and the team in Geneva does not seem certain where to send us. Three days earlier we had all been shocked to hear that Colin Prescot and Andy Elson had been forced by bad weather to ditch their balloon in the Pacific off Japan. We were greatly relieved to learn that they were safely rescued—and to realize that we were now the only round-the-world balloon in the air. But the same storm that downed their balloon is still threatening.

Finally we receive a message advising us to give up on the northern route and to let ourselves be pushed south toward the Equator, where the computer models predict a jet stream will form in three or four days.

We don't know what to expect. No one has ever flown a balloon so far south across the Pacific.

"We have no choice," I say to Brian.

THAT AFTERNOON, as we fly past the Mariana Trench, the deepest spot on the planet, I think of my father, Jacques, who 39 years ago rode his bathyscaph to a depth of 35,800 feet. Considering my grandfather's exploration of the stratosphere and my father's journeys into the ocean abysses, I have begun to dream that my own flight around the world might fulfill our family's destiny—if there is such a destiny. Thinking about such things only increases my fear of failure. And yet I realize that I must learn to let go of my anxiety, to have confidence in life as I have tried to have in the wind.

All around us the clouds seem alive. Every morning small cumulus clouds appear next to the balloon, growing little by little until they become fearsome cumulonimbus storms, able to tear the fragile skin of our balloon in their turbulence. As if guided by an invisible hand, we weave *(Continued on page 43)*

BRIAN JONES (LEFT AND ABOVE)

1. Titanium load frame
2. Burners
3. Heat-shield tray and fire-resistant foam
4. Heat shield
5. Fuel-control plate
6. Hatch
7. Kitchen
8. Survival equipment
9. Food supplies
10. Lithium hydroxide filters
11. Liquid nitrogen and oxygen tanks
12. Propane fuel tanks
13. Cockpit
14. Keel
15. Mylar outer skin
16. Solar panels

ART BY DOM FOLEY

BERTRAND PICCARD

Life in the Capsule

About the size of a minivan, the 18-foot-long *Breitling Orbiter 3* capsule was designed to keep two pilots comfortable for four weeks. Jones (left) and Piccard took turns sleeping in one bunk, using the other for storage. The cabin, pressurized to fly as high as 40,000 feet, had an air recycling system that added oxygen and removed excess carbon dioxide with lithium hydroxide filters. Using the fuel controls, the pilots could operate the burners, switch tanks, and jettison empty tanks from inside. Keels gave the capsule a flat base and would aid flotation in case of a water landing. Solar panels recharged batteries under the cockpit floor, powering equipment, lights, and a kettle in the kitchen.

These are

the longest hours of my life.

Hours after crossing the finish line at 9°27′ west longitude above West Africa, the balloonists descend toward Egypt's Western Desert, looking for a safe place to land.

BRIAN JONES AND BERTRAND PICCARD

Back to Earth after 20 days:

With less than a tank of fuel, the pilots make a two-bounce landing on a sandy plateau near the Egyptian oasis town of Mut. A seven-hour wait to be picked up by a military helicopter gave them time to wash their hair and consider their historic flight. "When Neil Armstrong stepped on the moon, he was happy to be so far away," the author says. "When we stepped onto the desert, we were happy to put our footprints back on Earth."

AP/WORLD WIDE PHOTOS (TOP); BRIAN JONES AND BERTRAND PICCARD (RIGHT); GAMMA-LIAISON (LOWER RIGHT); BERTRAND PICCARD

The *Eagle* has landed.

among the thunderclouds, which dissolve every night in the coolness of glorious sunsets.

When our speed drops to 25 miles an hour, we become very concerned, since we have covered less than 3,000 miles of ocean. We are flying so close to the Equator that the aluminum coating of the balloon over our heads blocks communication between the antenna on our capsule and the satellite directly above. We lose our fax and telephone links with our team.

"Brian, I have to tell you I'm a little frightened," I say.

"I'm really pleased to hear you say that," Brian replies, "because I'm really scared."

This immense expanse of ocean has become a mirror in front of which it is impossible to fool myself. I feel naked with my emotions, my fears, and my hopes. We'd like to be farther on in our flight, but all we can do is accept being where we are, drifting in a lazy wind over the biggest ocean on the globe.

AFTER SIX DAYS of flight over the Pacific, the optimism of our meteorologists is proved right and we enter a powerful jet stream. Now, at 33,000 feet, we are delighted to race toward Mexico at 115 miles an hour. The typical cirrus clouds of the jet streams accompany us, their ice crystals glistening in the bright sunlight. But the euphoria lasts only 24 hours. At this altitude the outside temperature is minus 58°F, our burners use a lot more propane, and our cabin heater becomes less efficient. The water reserves inside the capsule have turned to ice.

Cold and exhausted, Brian and I begin to pant in the overdry air of the cabin. Worse, we watch, powerless, as our speed drops: Somehow we have been ejected out of the jet stream over Mexico and are flying the wrong way, southeast toward Venezuela.

Wearing oxygen masks, Brian and I take turns sleeping as much as we can to regain strength. Completely out of breath, I phone my father and my wife with tears in my voice. My dream is falling apart, I tell them. So close to our goal! I decide to risk everything. We will fly as high as the balloon can take us, no matter how much propane it takes, to try to get into a jet stream that Luc and Pierre have managed to locate. According to them, the whole flight depends on it. At 35,000 feet my eyes are fixed on the instruments, and I can barely believe what

An invisible hand guided us.

ARTWORK: WIDE PHOTO

Back in the embrace of their families, the pilots celebrate their return to Switzerland, where they are hailed as conquering heroes. Yet the secret of their success was not to conquer but to harmonize with the winds, Jones says, recalling a balloonists' prayer. All they had to do was "let Mother Nature take us in her arms, carry us around the world, and set us gently back down again."

I see: Degree by degree, our flight curves northeast. A bit later Brian notices that our speed is dramatically increasing. After flying over Jamaica, we are back on track.

On March 18 we have only four fuel tanks left out of 32, barely enough to cross the Atlantic. But there is no way we are going to stop our flight in the Caribbean. I remind Brian of what Dick Rutan, who flew nonstop around the world in an airplane, once wrote me: "The only way to fail is to quit." By the next day we are halfway across the ocean, flying at 105 miles an hour in the middle of a jet stream.

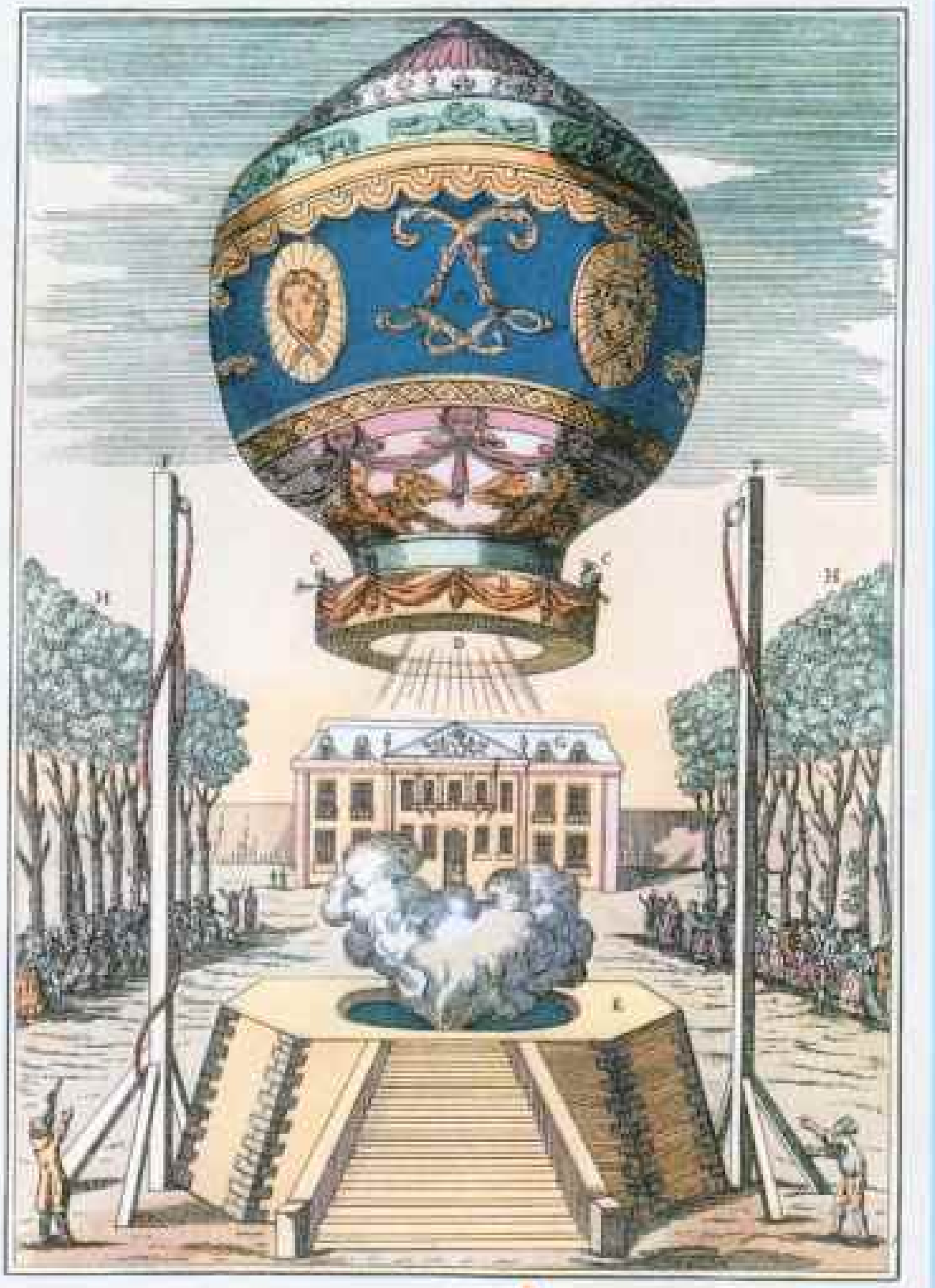
We cross the coast of Africa during the night, and when the sun rises on March 20, we are just a few hours away from Mauritania. These are the longest hours of my life. Western Sahara stretches in front of my eyes. I am happy to see the red sand desert again.

AT 9:54 A.M. GREENWICH MEAN TIME Brian and I look at our maps incredulously: After having flown 26,050 miles, we have reached the finish line at 9°27′ west longitude, where we first headed east. We clasp hands and give each other a hug. We have achieved the craziest of our crazy dreams, the first nonstop flight around the world in a balloon. In Geneva our control center team is flooded in champagne in front of cameras from all over the world. But for us nothing has changed. We are above the same desert we left from, and we have yet to find a suitable place to land. The fuel has held out, so, for the thrill of it as much as for a less remote landing, we fly another 2,380 miles, at speeds exceeding 130 miles an hour, reaching Egypt.

During the last night, I savor once more the intimate relationship we have established with our planet. Shivering in the pilot's seat, I have the feeling I have left the capsule to fly under the stars that have swallowed our balloon. I feel so privileged that I want to enjoy every second of this air world. During our three weeks of flight, protected by our high-tech cocoon, we have flown over millions of people suffering on this Earth, which we were looking at with such admiration. Why are we so lucky? At this moment it occurs to me that we could use the largest portion of the Budweiser Cup million-dollar prize to create a humanitarian foundation, the Winds of Hope, to promote respect for man and nature.

Very shortly after daybreak on March 21, after 19 days, 21 hours, and 47 minutes in the air, *Breitling Orbiter 3* will land in the Egyptian sand. Brian and I will be lifted away from the desert by helicopter, and we will immediately need to find words to satisfy the public's curiosity. But right now, muffled in my down jacket, I let the cold bite of the night remind me that I have not yet landed, that I am still living one of the most beautiful moments of my life. The only way I can make this instant last will be to share it with others. We have succeeded thanks to the winds of providence. May the winds of hope keep blowing around the world.

200 Years of Ballooning



A History

More than two centuries ago balloonists became the first human beings to turn the dream of flight into reality. Yet this oldest form of flight is still in the experimental stage when it comes to long-distance adventures, many of which have been chronicled in the pages of National Geographic. *A review of ballooning breakthroughs is presented in the following pages.*

1783
Nov. 21: *First manned free flight*

To the delight of a crowd in a Paris garden, Jean-François Pilâtre de Rozier and François Laurent, Marquis d'Arlandes, become the first to fly an untethered balloon. Reaching a height of 3,000 feet, they soar over the city for about 25 minutes.

André-Jacques Garnerin, Napoleon's balloonist, tested the first

1784

June 4: *First flight by a woman*

Marie Elisabeth Thible, a French opera singer, becomes the first female aeronaut when she ascends in a Montgolfier balloon in Lyon, France. Posing as Minerva, goddess of wisdom, for this illustration, she points to a balloon in the clouds, while holding an image of King Gustav III of Sweden, who witnessed her flight.

1793

Jan. 9: *First free flight in America*

Gathered near what is now Independence Square in Philadelphia, spectators—including President George Washington—pay five dollars a ticket to watch the first manned balloon launch in North America. French balloonist Jean-Pierre-François Blanchard sips wine and snacks on a biscuit as he sails over the Delaware River to land in a field in New Jersey.

1861

Sept. 24: *Balloons used in Civil War*

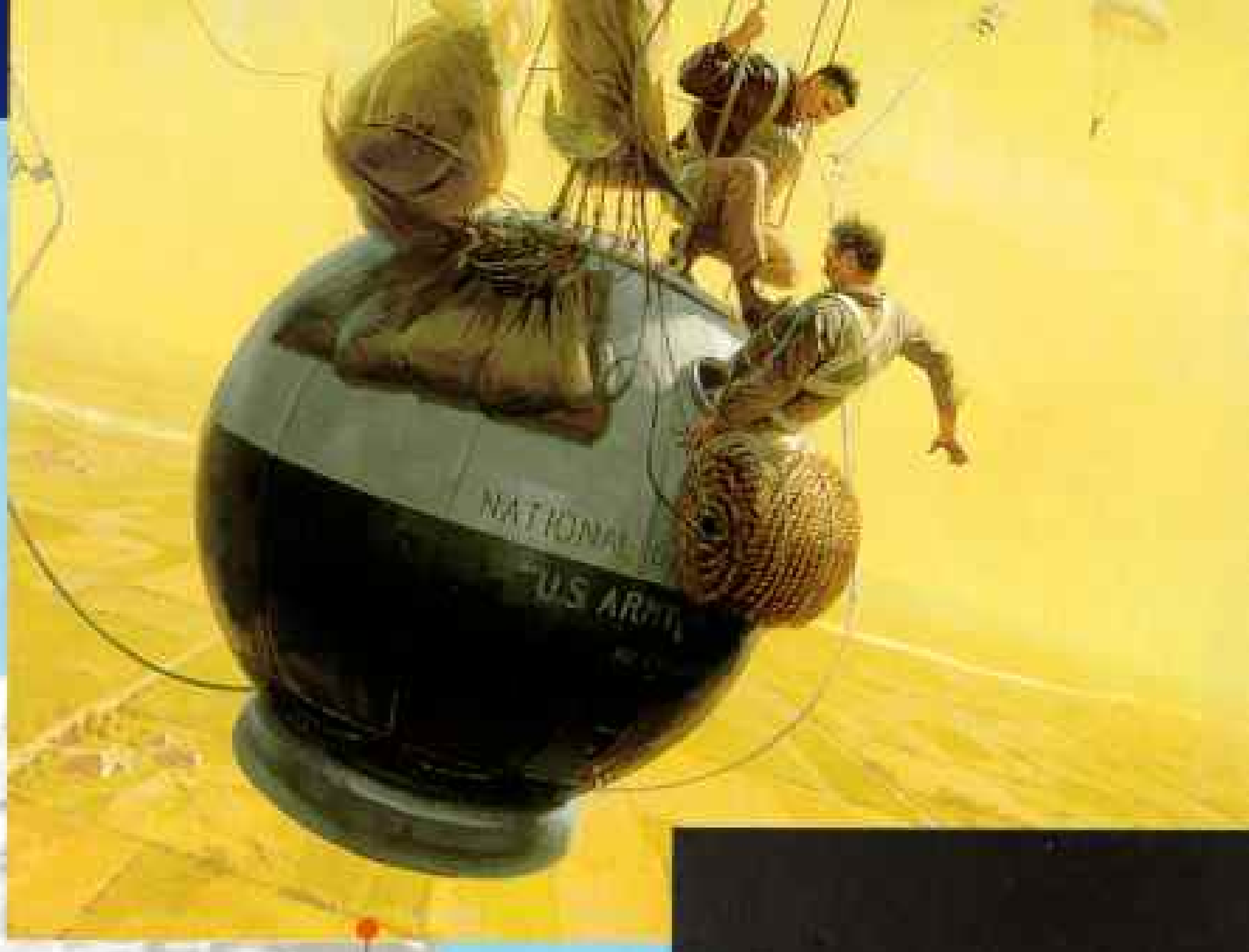
Balloonist Thaddeus Lowe proves the worth of the recently created civilian Balloon Corps when he rises a thousand feet above Arlington, Virginia, spots Confederate troops in Falls Church three miles away, and telegraphs their position to Union troops.

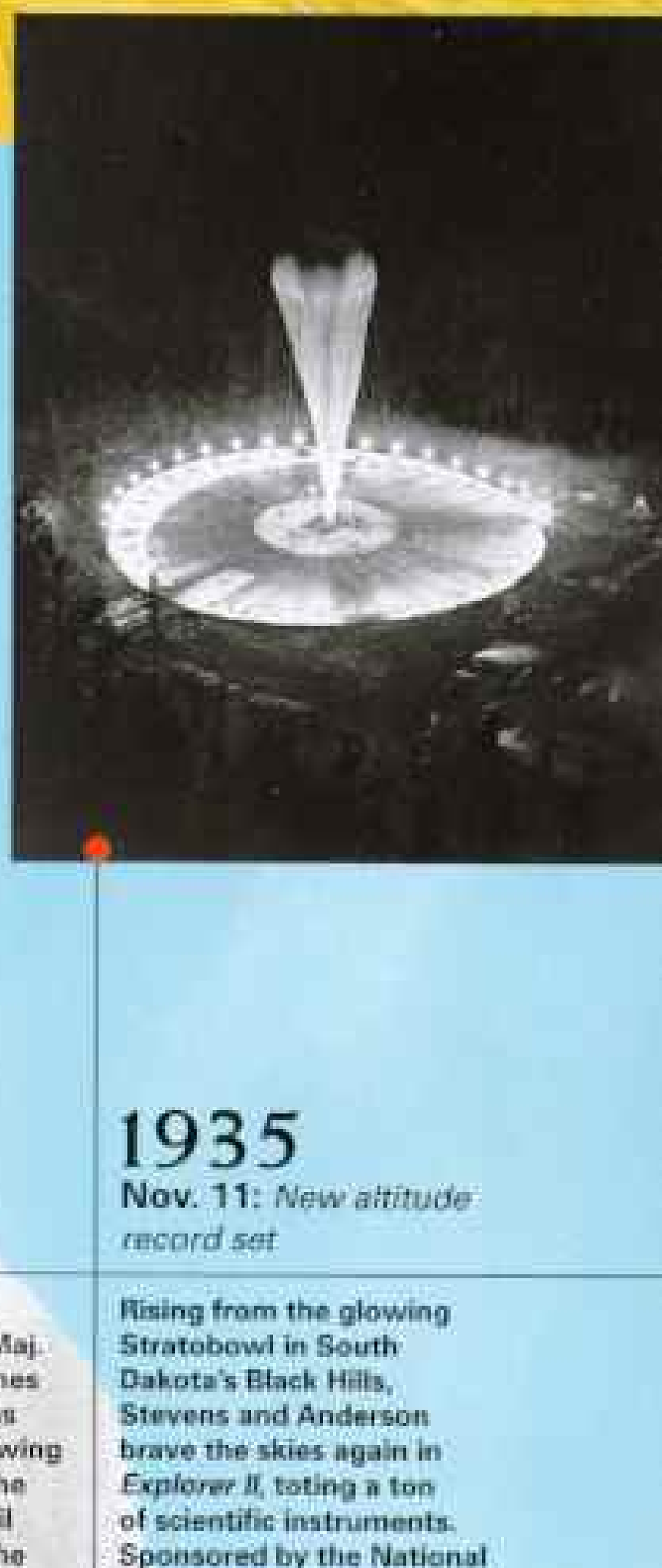
1897

July 11: *First aerial Arctic expedition*

Swedish scientist Salomon August Andrée and two companions set out from Spitsbergen for the North Pole. The balloonists' fate is a mystery until 1930, when seal hunters find the expedition's diaries, logs, and film.

parachute in 1797.





1931

May 27: *First successful flight into the stratosphere*

Protected by basket crash helmets that doubled as seats, Paul Kipfer, left, and Auguste Piccard become the first to reach the stratosphere in a pressurized cabin. On the morning of their launch from Augsburg, Germany, as they wait for workmen to release their balloon's ropes, Piccard and Kipfer are surprised to realize they are already aloft. "They had let us loose and forgotten to tell us anything about it," Piccard reports in the March 1933 National Geographic. The two rise almost ten miles during their flight. "The sky is beautiful up there—almost black," Piccard writes. "It is bluish purple—a deep violet shade—ten times darker than on earth, but it still is not quite dark enough to see the stars."

1934

July 28: *Close call on Explorer I*

As the gondola of *Explorer I* plummets, Maj. William E. Kepner pushes Capt. Albert W. Stevens clear of the hatch, allowing both to parachute to the ground with Capt. Orvil A. Anderson, seen in the background of this painting for National Geographic. Their balloon had ripped after reaching 60,613 feet, or 11 miles.

1935

Nov. 11: *New altitude record set*

Rising from the glowing Stratobowl in South Dakota's Black Hills, Stevens and Anderson brave the skies again in *Explorer II*, toting a ton of scientific instruments. Sponsored by the National Geographic Society and the U.S. Army Air Corps, the balloon rises to 72,395 feet, an altitude record held for 21 years.

CLOCKWISE FROM HAA LEFT: THE ROMANCE OF BALLOONING, GIBBS-BETTMANN; © ALBERT BONNIER AND HEARST ENTERPRISES; ART BY TOM LOVELL; RICHARD H. STEWART, AP/WORLD WIDE PHOTOS

France's *Le Géant* ushered in an era of massive hot-air balloons in

1956

Nov. 8: Strato-Lab I *sets new altitude record*

Lt. Comdrs. Malcolm D. Ross and M. Lee Lewis ascend to 76,000 feet in the U.S. Navy's *Strato-Lab I,* unofficially breaking *Explorer II*'s record. Today the unheralded balloonists of projects like *Strato-Lab,* which pioneered flight on the edge of space, are remembered as "pre-astronauts."

1960

Aug. 16: *Highest altitude parachute jump flight*

Capt. Joe W. Kittinger rides a balloon to 102,800 feet before jumping from an open gondola to test a new kind of parachute. Rocketing downward for 13 minutes, he falls at more than 600 miles an hour, almost breaking the sound barrier with his body. He described his free fall for NATIONAL GEOGRAPHIC readers: "The big drop is the only way home. . . . At zero count I step into space. No wind whistles or billows my clothing. I have absolutely no sensation of the increasing speed with which I fall. I drop facing the clouds. Then I roll over on my back and find an eerie sight. The white balloon contrasts starkly with a sky as black as night."

1961

May 4: *Absolute altitude record*

Launching from a U.S. Navy ship in the Gulf of Mexico, Comdr. Malcolm Ross and Lt. Comdr. Victor Prather ascend to 113,740 feet in *Strato-Lab V,* setting a record that has stood for nearly four decades. After landing in the Gulf, Prather drowns when his pressure suit fills with water.

1863. Nearly 200 feet high, it had a two-story gondola with a balcony.

1978
Aug. 12-17: *First transatlantic flight*

Maxie Anderson, Ben Abruzzo, and Larry Newman (from left) become the first balloonists to cross the Atlantic Ocean. Their flight from Presque Isle, Maine, to Miserey, France, is smooth until a day before landing, when *Double Eagle II* suddenly drops 19,500 feet. Since Larry Newman had been in a balloon only once before, he fears the worst. A National Geographic December 1978 story describes this moment of panic: "I was really upset, especially since we had been doing so well and seemed so close to success. I said to Ben and Maxie, 'You know, guys, I don't think we're going back up.'

'Yeah, we are,' they said.

I said, 'No, we're not. Tell you what. I'll bet you a hundred dollars we won't go back above 12,500.'

'Make it ten dollars,' said Maxie.

'Ten dollars—you're crazy! Let's make it a hundred.'

Sure enough, the balloon finally bottomed out . . . and about thirty minutes later we passed 12,500 feet. I couldn't have been happier. I just threw the hundred dollars at them."

1980
May 8-12: *First transcontinental flight*

Maxie Anderson and his 23-year-old son, Kristian, become the first to cross any continent by balloon. In *Kitty Hawk* (top) they begin their four-day flight from Fort Baker, California, enduring stiff winds and low temperatures to land safely in Quebec Province.

NOAA IMAGE COLLECTION (OPPOSITE); MAXIE ANDERSON (TOP); MARC RIBOUD, AFP/GETTY IMAGES

A joint Soviet-French mission in 1985 dropped two unmanned

1981

Nov. 10-12: *First transpacific flight*

Halfway through the first balloon flight across the Pacific Ocean, Rocky Aoki, owner of Benihana restaurants, cooks a banquet on a propane stove for the rest of the crew of *Double Eagle V*—Ben Abruzzo, Larry Newman, and Ron Clark. The flight from Nagashima, Japan, to Covelo, California, lasts 84 hours and 31 minutes.

1984

Sept. 14-18: *First solo transatlantic flight*

Setting a record for the longest solo flight, Joe W. Kittinger crosses the Atlantic Ocean in *Rosie O'Grady*. Launching from Caribou, Maine, he flies to Savona, Italy, where he breaks his ankle in a crash landing.

1991

Jan. 15-17: *First hot air Pacific crossing*

Richard Branson and Per Lindstrand set out across the Pacific Ocean in the 220-foot-high *Pacific Flyer*, the largest hot-air balloon ever flown. Their 46-hour flight breaks previous duration and distance records and proves that hot-air balloons can travel safely at speeds as high as 245 miles an hour. In 1987 the pair were the first to navigate a hot-air balloon across the Atlantic.

1997

Jan. 14-20: *New endurance record*

Alone in his small capsule, Steve Fossett flies *Solo Spirit* from St. Louis, Missouri, to Sultanpur, India. Fossett also becomes the first to cross Africa by balloon, setting a distance record of 10,361 miles and a duration record of six days, two hours, 44 minutes.

helium balloons into the atmosphere of Venus to measure winds.

1998
Aug. 7-16: *New absolute distance record*

1999
Feb. 17-Mar. 7: *New endurance record*

1999
Mar. 1-21: *New non-stop*

After a nearly flawless ten-day flight, having traveled 14,236 miles from Mendoza, Argentina, Steve Fossett's balloon *Solo Spirit 3* ruptures in a thunderstorm 500 miles off the east coast of Australia.

"I'm going to die," he says out loud as he falls nearly 29,000 feet to the Coral Sea—flames from the burners melting the fabric of his deflating balloon (top). Knocked unconscious by the impact with the ocean, Fossett comes to in an upside-down capsule that is partly filled with water and partly on fire. As he pulls his life raft away from the capsule, propane fuel tanks explode. An emergency beacon helps rescuers find him the next day.

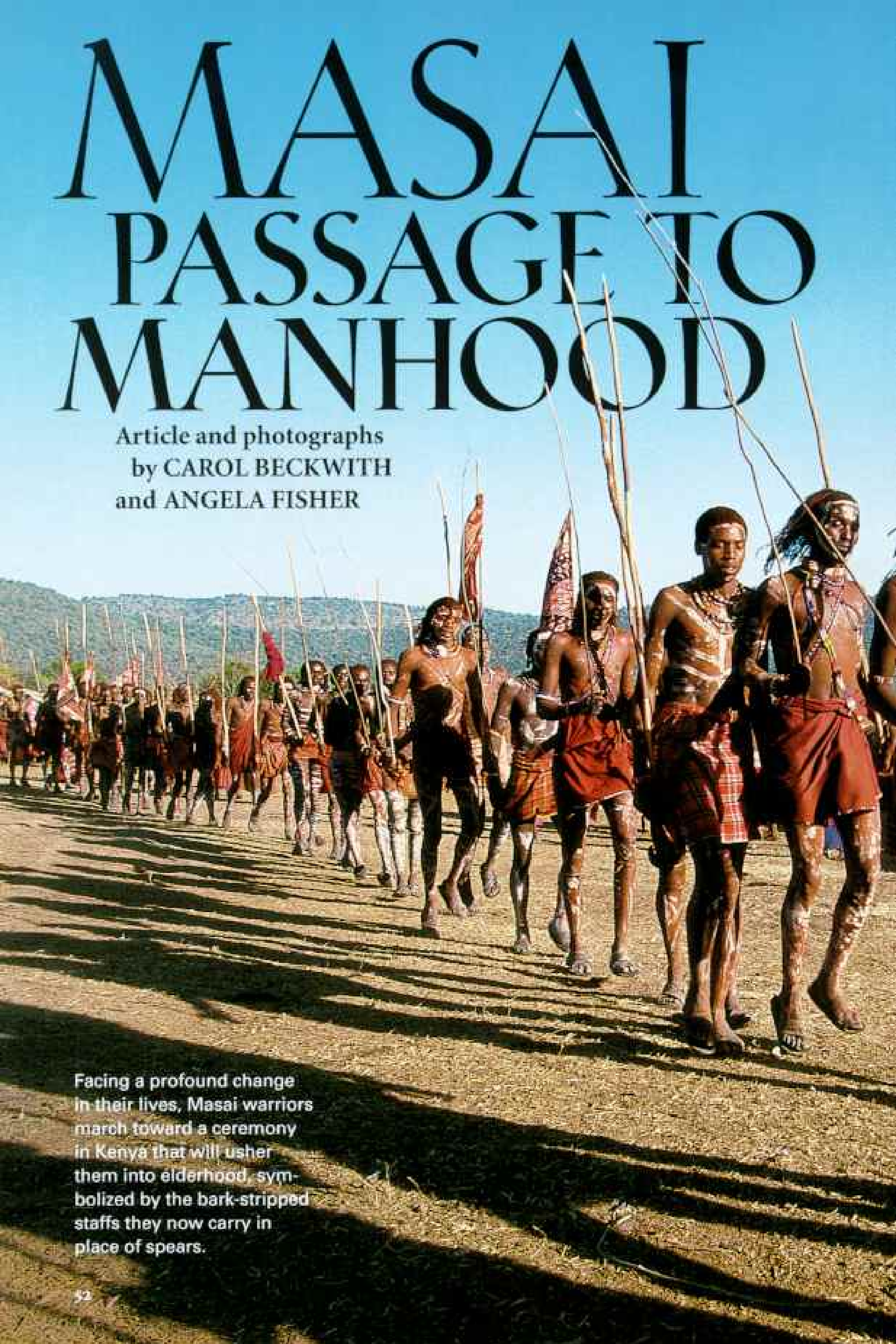
Colin Prescot and Andy Elson grin from the hatch of their *Cable & Wireless* balloon before liftoff in southern Spain on February 17, 1999. Aloft for nearly 18 days, the two men set an endurance record but are forced by bad weather to ditch off the coast of Japan.

Having surpassed all records for duration and distance on their 20-day flight around the world, Piccard and Jones accept the Budweiser Cup and a million-dollar prize, most of which will go to a charitable foundation. □

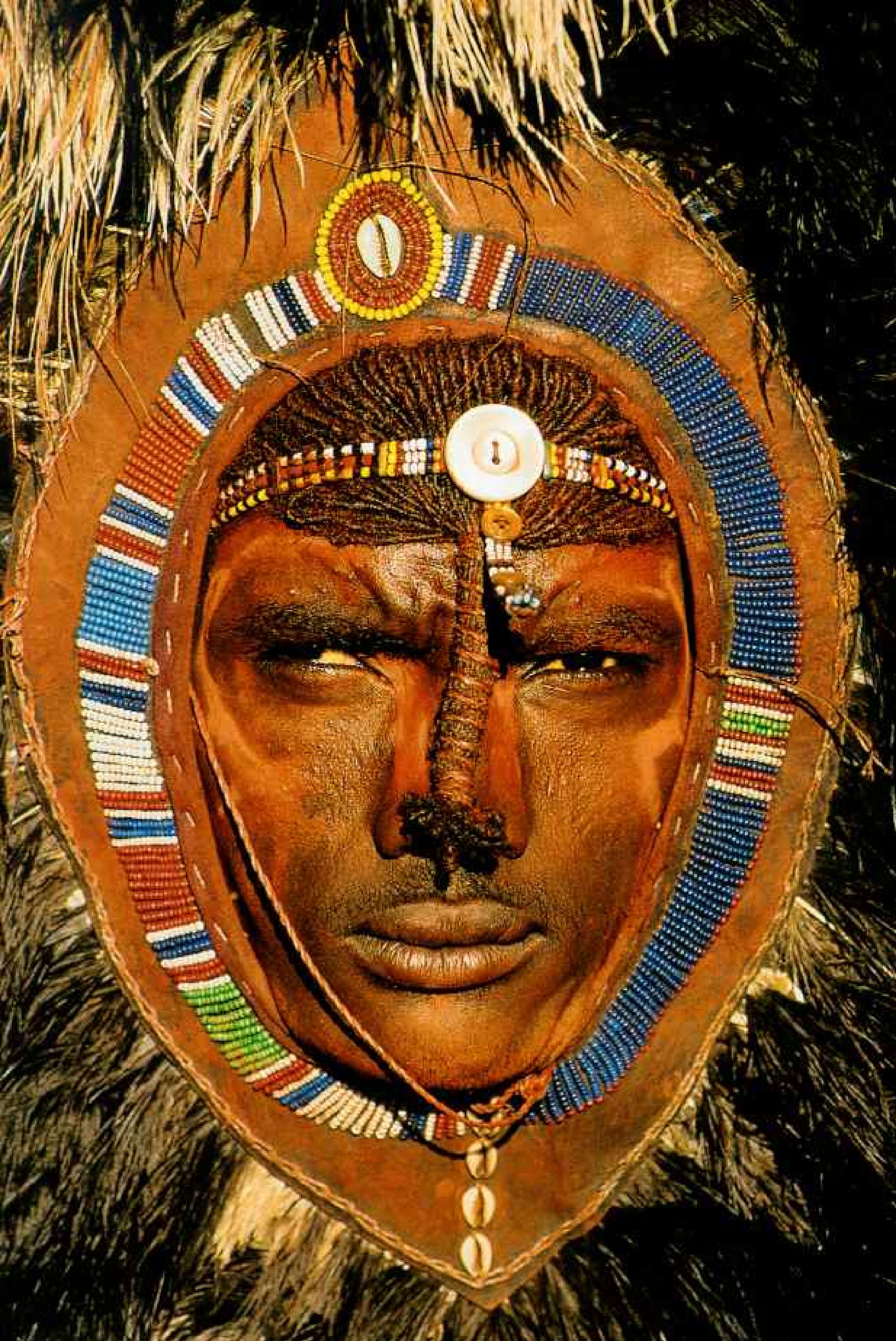
CLOCKWISE FROM FAR LEFT: IAN ARMSTRONG; ART BY JIM BATZ; MARK THIESSEN, NGS; CRAIG PERRYN; ALLSPORT; PETER TURNLEY

MASAI PASSAGE TO MANHOOD

Article and photographs
by CAROL BECKWITH
and ANGELA FISHER



Facing a profound change in their lives, Masai warriors march toward a ceremony in Kenya that will usher them into elderhood, symbolized by the bark-stripped staffs they now carry in place of spears.



Stern visage of a painted warrior is framed by a splendid headdress of ostrich feathers (left). A headdress made of a lion's mane (right) signifies that the wearer slew the lion using only a spear.

The dozen or so Masai groups, united by a common language, are mainly occupied with tending cattle. They occasionally raid stock from each other and from neighboring tribes, but such warring is increasingly seen as theft—and is being prosecuted in government courts.

A warrior's fiery nature is symbolized by the red

ocher body paint worn during the four-day initiation ceremony called Eunoto. Eunoto ends the period of Masai warriorhood that begins after a circumcision ceremony for male youths, usually in their late teens.

On a sacred site near the Kenya-Tanzania border, warriors' mothers build the *manyatta,* a circle of huts made of cow dung and branches (below). More than a hundred men from three Masai groups walked for days to reach the site. When they return home, they will face the responsibilities of elderhood: marriage, raising children, and acquiring cattle.

THE EUNOTO CEREMONY HONORS THE HERITAGE OF THE MASAI AND REAFFIRMS THEIR SOLIDARITY AS A GREAT WARRIOR TRIBE.

Following tradition, women cut the hide of an unblemished black bull into a continuous spiral (left) that will determine the size of the *osingira,* the ritual's most important building. On the second day initiates travel to a sacred chalk bank (below), where they paint their bodies with designs that may speak of their achievements, such as killing a lion or an enemy.

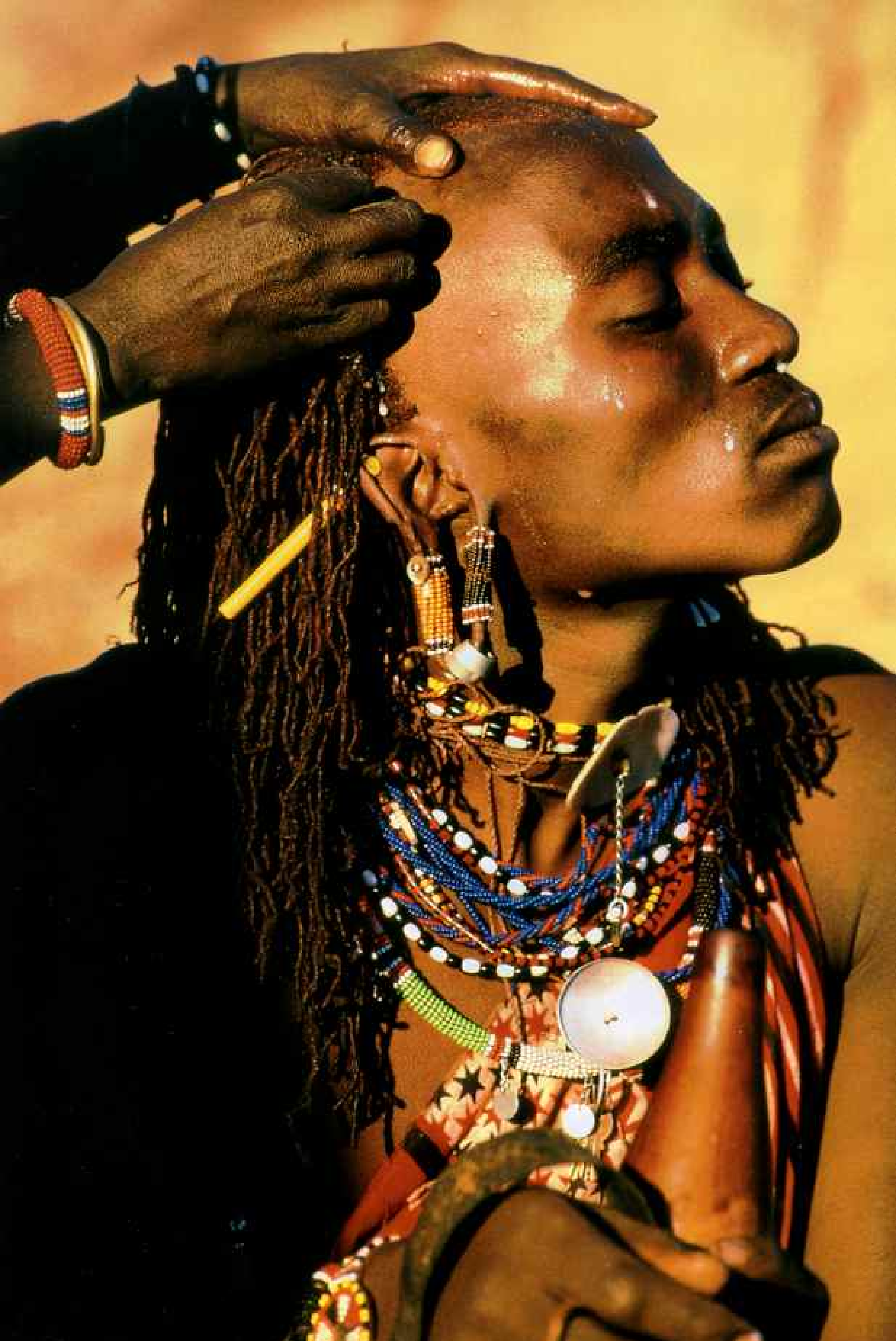
Young Masai girls (right) wear ornaments designed to sway as they dance. Before their Eunoto, warriors may have sex with these girls, who are prepubertal and uncircumcised. After initiation these relationships must end. As an elder, a man may marry a mature woman, circumcised at puberty, and may take more than one wife.

The Masai are a semi-nomadic people of about 300,000, whose land straddles the Kenya-Tanzania border. The future of such large-scale ceremonies is in doubt, as more Masai send their sons to school, and into another world.

Filling an honored role, mothers build the osingira within the manyatta. Warriors who have refrained from sexual relations with married women are permitted to enter the sacred building. Inside, they will be blessed by senior elders who will invoke Enkai, the Masai deity, to protect them.

Sounding their horns and carrying shields made of Cape buffalo hide, warriors make the ritual run around the osingira accompanied by junior warriors, girlfriends, and mothers.

As the initiates circle the grounds with increasing speed, the import and emotion of the occasion sometimes lead to a contagious hysteria called *emboshona*. A warrior in a trance is helped along by the mothers (right). In an extreme case, another warrior is wrestled to the ground to keep him from injuring himself (left). Led to a quiet place and calmed, both rejoined the ceremony.

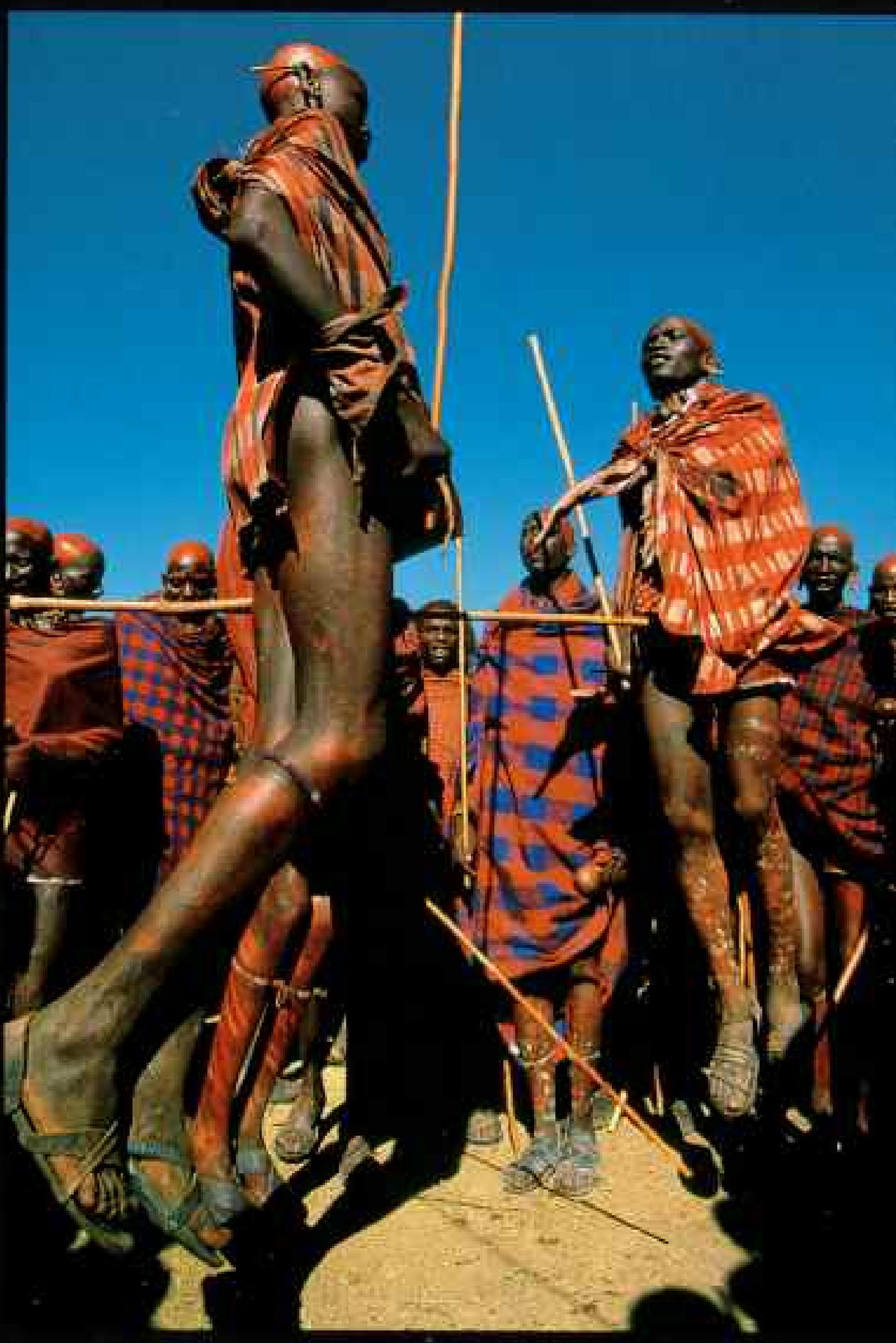


A MOTHER'S CEREMONIAL SHAVING OF HER SON'S HAIR IS A WATERSHED EVENT, MARKING THE END OF THE MATERNAL BOND THAT BEGAN AT HIS BIRTH.

The end of warriorhood is symbolized by the shaving of hair in the ceremony's most poignant moment. Using a balm of milk and water, each mother scrapes off the plaited locks of her son at sunrise on the final day of Eunoto.

The newly shaved men burst into an energetic dance to a song called *empatia,* demonstrating that though they've lost their warrior hair, they've not lost their vigor. At the height of each leap, the men shimmy their shoulders to the accompaniment of the rhythmic chanting of their fellow initiates.

CAROL BECKWITH and ANGELA FISHER include the Eunoto in their book *African Ceremonies,* to be published in October by Harry N. Abrams, Inc.



Graduation day finds the new elders and a scattering of junior warriors gathered for final blessings. Senior elders walk among the initiates spraying them with mouthfuls of honey beer and milk for health and prosperity. Their words of advice: "Now that you are an elder, drop your weapons and use your head and wisdom instead." □

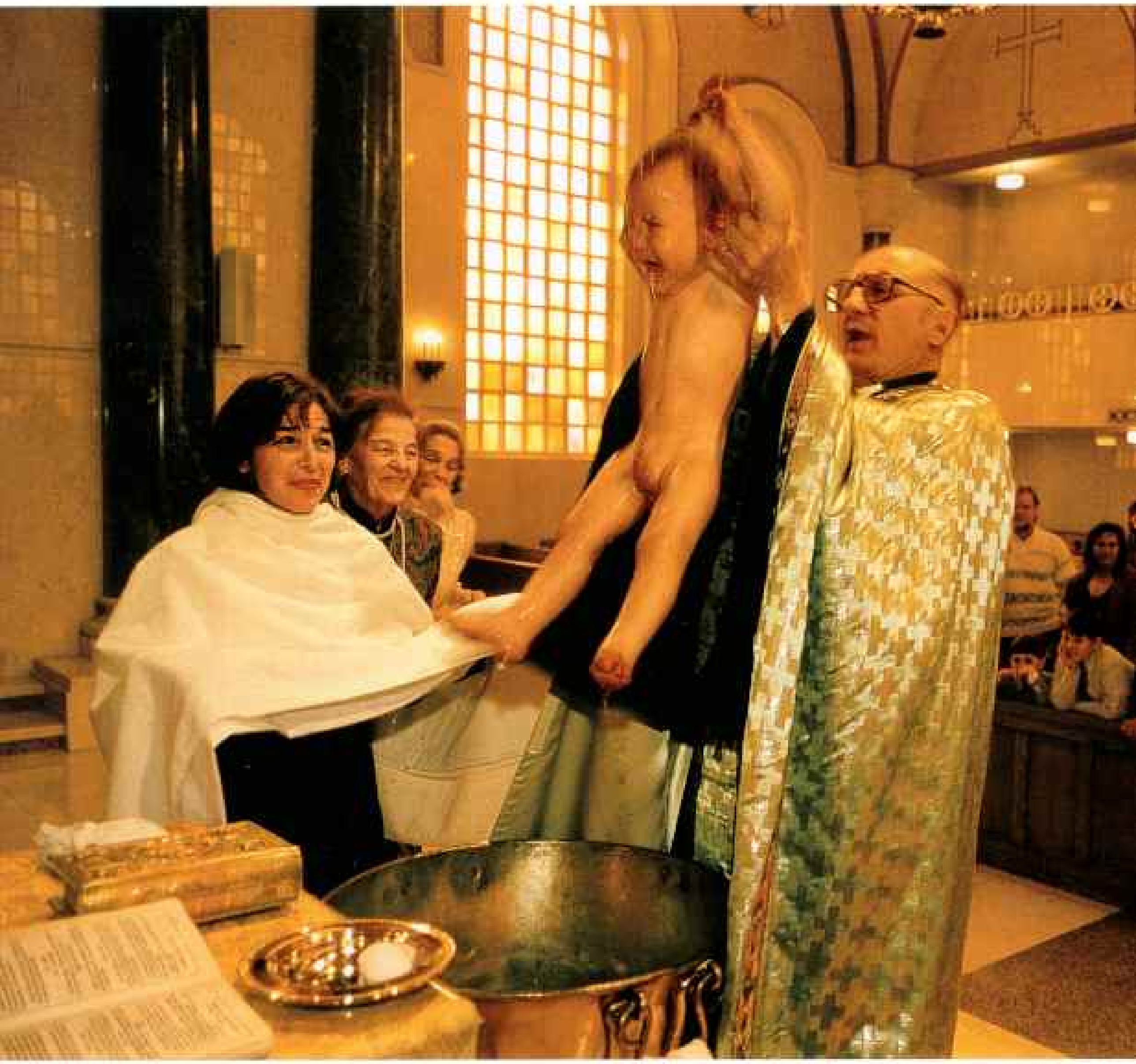
Century-old ceramic urns store Italian olive oil, made at this Tuscan estate for nearly 1,200 years. Valued through the ages for food, fuel, salve, and sacrament, the olive's liquid gold remains unsurpassed among oils.

Olive Oil

ELIXIR OF THE GODS

BY ERLA ZWINGLE PHOTOGRAPHS BY IRA BLOCK

THIS SHALL BE AN HOLY ANOINTING OIL UNTO



White linen and a godmother's warm embrace await ten-month-old Nicholas File at St. Sophia Greek Orthodox Cathedral in Washington, D.C., where anointing with olive oil and baptism in water signify salvation. "Oil enables the baby to slip away from the grasp of evil," says Father John Tavlarides. As for his own grasp? "I haven't lost one yet."

ME THROUGHOUT YOUR GENERATIONS.

—EXODUS 30:33

YOU CAN BURN IT, wash with it, lubricate squeaky hinges with it. Cosmetics are based on it, diamonds polished with it. Kings, babies, and the dying are anointed with it. It's loaded with vitamin E. It has no cholesterol. It's an amazing preservative, keeping fish, cheese, and even wine good for years. Boiled, it's one of the more ingenious weapons of war and torture. And, of course, you can eat it. For 4,000 years it has served the Mediterranean cultures as everything from money to medicine. Now the rest of the world is discovering olive oil, the most versatile fruit juice ever squeezed.

Until recently, for people beyond the Mediterranean olive oil retained an aura of the exotic; it was something eaten in odd ethnic dishes or lost on the specialty shelf in the grocery store somewhere between the kumquats and the saffron. Olive oil was usually first encountered in restaurants, where it unjustly acquired a reputation for being heavy, as it was often low quality and sometimes adulterated with anything from animal fat to glycerine.

But olive oil began gaining new respect after a study published in 1970 revealed that Mediterranean peoples have the lowest rate of heart disease among Western nations, a condition partly attributed to their liberal use of olive oil (it is rich in monounsaturated fat—the "good" fat—and also in antioxidants, which help prevent plaque buildup in the arteries). By the end of the eighties, olive oil had experienced an unprecedented boom in Western countries. This was apparently the result of a convergence of happy circumstances: Consumers were more interested in nutrition, more eager to choose natural products, and more willing to pay a higher price for a high-quality product. And as people discovered the appeal of numerous foreign foods, from shiitake mushrooms to Sumatran coffee, olive oil was bound to benefit. For the 1982-83 season the U.S. imported nearly ten million gallons of olive oil. In the 1997-98 season it imported almost five times that amount.

One frosty November morning I was balanced atop a ladder leaning against an olive tree in the Italian region of Tuscany. Sunlight slanted over the steep grassy hillside and folded itself among the olive trees and Chianti grapevines, gradually melting the shards of frost. A cloth was spread on the ground beneath me, and I was clawing at the branches with a yellow rakelike tool with seven curved tines. Olives were flying everywhere. Giuseppe Giotti, an olive farmer with ruddy cheeks and a massive black mustache, hovered anxiously below.

How you harvest olives depends on many factors—including the number of trees, the amount of money and time available, and the type of olive. Although the techniques vary, they're almost all strenuous, from stripping the olives by hand to beating the branches with long

ERLA ZWINGLE, a frequent contributor, became an olive oil devotee while working on this story. IRA BLOCK's most recent assignment for us was photographing a 67-million-year-old *Tyrannosaurus rex* fossil ("A Dinosaur Named Sue," June 1999).

sticks. Giuseppe, like many olive farmers, doesn't own enough property to make it profitable to buy machinery (he has only 600 trees), and he doesn't make enough money from the oil to pay extra workers. His two sons have jobs, so the only people helping him today were Maria, his 73-year-old mother, and, temporarily, me. I was starting to sweat. The branches were springy and loaded with leaves, and the hard purple-green olives all seemed to be clustered inside. Behind every bottle of olive oil, I soon learned, is a troupe of tired people in old clothes.

After about 45 minutes I had removed all the olives I could find, plus a few that only Giuseppe could see. I climbed down the ladder, and we slowly gathered up the drop cloth, bouncing all the olives toward the center. We poured them clumsily into a large bucket. Olives fell into the grass and stuck to the soles of Giuseppe's boots.

Giuseppe's farm has been in the family for at least a hundred years. "I was in the Navy for 30 years," he said, "but when my father died, I came back." Now the future of the farm depends entirely on him.

With about half the harvest already done, he hoped to finish in another month or so. "If the rains don't start," he said. "The important thing is that it doesn't rain." Wet olives ferment faster inside their hundred-pound bags, and fermentation can ruin the oil's flavor. But he's looking forward to a substantial harvest. This year he'll pick more than two tons of olives, which should give him about a hundred gallons of oil.

Crowning a hillside 40 miles to the south is the abbey of the aptly

In uniform splendor legions of young olive trees swarm the hills of Andalusia in Spain, world leader in olive production. Thriving on heat and sun, gray-green olive groves have long inspired artistic souls. Wrote Renoir: "... the sky that plays across them is enough to drive you mad."

Olive pits dug from Levantine soils suggest that olive cultivation began in the eastern Mediterranean some 6,000 years ago. As it spread westward, olive oil became the ancient world's most valued commodity. Today 99 percent of all olive oil still spills from the rim of the Mediterranean.

LEADING OLIVE OIL PRODUCERS
(in millions of gallons annually)

Present-day extent

Origin of olive cultivation

(4000 B.C.) Estimated beginning of olive cultivation

0 mi 500
0 km 500

NATIONAL GEOGRAPHIC MAPS

named Monte Oliveto Maggiore, Mount of the Olive Grove. Here Don Celso Bidin, one of 37 Benedictine brothers, oversees the monastery's olive mill, one of the few in Tuscany that still use traditional methods. Though milling techniques have been modernized, the simple process remains the same everywhere: Crush the whole olive, pit and all, separate the liquid from the solids, then separate the water from the oil.

Don Celso was a trim, robust figure in blue coveralls, with serious eyes but a cheerful expression. He showed me around the mill. Olives tumbled into a huge basin under two ponderous grindstones. (Animals once provided the power; now it's motors.) A roar filled the room as the stones crushed the olives, drowning the crooning of the doves in the cypresses outside. Workers spread the resulting dark brown paste on round, woven nylon mats and stacked them on a spindle. A metal plate was added, then the whole column of mats was squeezed by a hydraulic press at 400 atmospheres—the famous "pressing" of the oil. Water and oil slowly dripped from the mats and passed into a settling tank, where the oil rose to the top. Every week Don Celso bottled it by hand.

The work is painstaking and not as productive as more modern methods, such as using metal hammers to crush the olives and centrifuges to separate the oil. Still, no matter how many times I saw it, or with what technique, the process retained a miraculous aspect: at one end, trillions of bitter little nubbins and, at the other, elixir of the gods.

Don Celso cut thick slices of rough white bread and toasted them on a small electric grill. A rub of garlic, a sprinkle of salt, and a generous baptism of new oil. The flavor was rich, fruity, with a powerful afterbite of pepper, a prized quality of classic Tuscan oil. Bread with oil is the olive

A drizzle of peppery Tuscan oil and a sprig of olive leaves transform sheep cheese into savory art at a banquet in Siena. From sharp Tuscans to sweet Liguvians, Italy's olive oils are prized worldwide. "Italians treat oil as they would a valuable wine," says waiter Roberto Lachi. "To waste it feels like a sin."

"Greek olives and olive oil are the best," says Konstantinos Kokkalis of Athens, whose unabashed bias typifies rival growers in the Mediterranean. Since its fabled birth as a gift from Athena, the olive tree has been revered by Greeks, who have the world's highest per capita use of olive oil. "The olive," says Kokkalis, "is blessed by God."

farmer's immemorial breakfast, and plenty of people still start the day this way. Some even skip the bread and drink a teaspoon straight.

"We also harvest in the traditional way," Don Celso told me in his warm baritone, "by hand or with combs. It would be less expensive to do it with machines, but it's more a social thing. Twenty people come to help with the harvest, and we pay them in oil."

I asked which was more important, oil or wine. "Certainly the greater awareness has been toward wine," he replied. "But in terms of history and sacredness oil has a deeper meaning." Oil is still used to consecrate altars and for baptism; the word "Christ" means "the anointed one."

The Mediterranean world has regarded the olive as sacred for thousands of years. The ancient Egyptians credited the goddess Isis with teaching mankind its cultivation and uses. The Greeks believed that Athena, goddess of wisdom, bestowed the olive on mankind, thereby winning a contest among the gods for presenting the most useful gift. The Bible is brimming with references to olive oil, from the parable of the wise and foolish virgins (oil as lamp fuel) to the story of the Good Samaritan (oil as unguent) to the Prophet Elisha's rescue of the destitute widow (oil as item of trade).

Farmers on the eastern shores of the Mediterranean domesticated the wild olive tree some 6,000 years ago and began extracting its oil about 2,000 years later. Phoenician voyagers spread olive cultivation to Greece and Spain, and the Greeks took it to Italy. Today 74 percent of the world's supply of olive oil comes from those three nations.

The Tuscan olive groves are romantic, woven into scenery from a Renaissance tapestry: velvety green hills clad with vines and topped

Capped by a veil of morning fog, Spain's Baena valley is a sea of olive trees that sway below the village of Zuheros and its crumbling ninth-century castle. Deep rooted and tenacious, olive trees can survive for centuries. Spain's groves may harbor trees born of ancient stocks first imported by Phoenicians.

OLIVE OIL IS LIKE A HUMAN BEING. ITS QUALITY IS

The practiced hands of Paco Núñez de Prado lay out freshly washed mats of esparto grass at his oil mill in Baena, Spain. He crushes his organically grown olives right after picking, then spreads the paste on mats, which are stacked and pressed to extract oil. Says the seventh-generation grower, "We're mixing culture and agriculture to make something perfect."

SUBJECTIVE AND LIES IN THE SHADOWS.

—OLIVE GROWER PACO NÚÑEZ DE PRADO

by castles, all softened by a golden haze. The landscape lacks only a knight on horseback and a desperate damsel. But in Spain, particularly the southernmost region of Andalusia, oil is big business. Andalusia alone produces 192 million gallons a year, nearly 90 percent of Spain's output. In two years, one expert predicts, Spain will produce half the world total of olive oil, and you can see why: Sturdy, squat trees march off to the horizon, endless ranks of silvery-green plants corrugating the soil. Although most landowners have relatively small holdings because of the subdivision of property over the generations, the aggregate tracts are vast. It doesn't come as a complete surprise that the International Olive Oil Council is based in Madrid.

Once again there was the roar of machinery, but now it was from the production lines at Aceites del Sur outside Seville, one of Spain's foremost oil bottlers. Juan Ramón Guillén, the president, was giving me a tour of his empire. Every day tanker trucks filled with olive oil roll up to the huge storage tanks outside; inside, bottles and cans of all sizes race down conveyor belts. Graying and dapper, Guillén has a metabolism calibrated to the rate of production—we fairly galloped through the plant, bounding from topic to topic.

In one room Guillén showed me shelves full of the company's products, in all brands, sizes, colors, and scripts. Aceites del Sur exports to 60 countries, blending and marketing the oils according to cultural preferences. The can of La Española for Spain showed a young lady seated demurely in a bucolic olive grove; on the can of La Española destined for the United Arab Emirates, the young lady had been tactfully removed. Al-Amir oil was in a simple, small green tin. "The king of Saudi Arabia gives this as a traditional gift to pilgrims to Mecca," Guillén explained. "In the Arab countries they eat oil and also use it as a hair tonic. In India they put it on their hair but don't eat it."

Into a small laboratory reeking of solvents. "This is where we analyze the oil," he said. "Everyone thinks that all olive oil is the same. But some is sweet, some is bitter." Oil is analyzed not only to establish acidity but also for blending purposes. "In America they like an oil very, very light that doesn't taste of anything," Guillén said. "In Mexico they like darker and spicier. In the Arab countries they want oil that's green and sweet. They eat a lot of bread, and they like to 'paint' the bread."

He offered me a series of small glasses of oil to taste. I took about a teaspoon's worth of each into my mouth and gave a quick series of short, sharp slurps; not very attractive, but this way the flavors suffuse the nose and palate. A professional taster can distinguish a hundred different flavors, from straw to apple, artichoke to wood, almond to flowers. I could only manage one or two. The Manzanilla was fruity and smooth. The Moroccan Picholine was soft and sweet. I wanted to try the Picual, but Guillén quickly said it was "only for blending a little bit for the Arabs." He kept trying to dissuade me from sampling it. I insisted. And I liked it—it was strong and a little bitter, with a powerful aroma of olive.

Checking the taste of his family's extra-virgin oil was a labor of love for the late Andrés Núñez de Prado of Baena, at right. To qualify as extra virgin, oils must meet exacting standards for pressing, acidity, and flavor. Natural hints of fruit, herbs, even bitterness can transform oil into nectar worthy of a toast.

The best olive oil is extra virgin. To merit the term, which conveys that it has not been altered, the oil must result only from mechanical extraction without being heated, have less than one percent acidity, and meet a series of exacting standards for flavor and aroma—a judgment rendered by panels of professional tasters. The oils that fall short in either category are acceptable, though less interesting and slightly less nutritious than extra-virgin oil. They are marketed in several ways. There is "virgin olive oil," "refined olive oil," or simply "olive oil." These are essentially bland oils that may have been refined by a chemical process, with some amount of extra-virgin oil added to enhance the flavor and color.

Most big olive oil brands achieve a standard flavor that their customers like, then have to replicate it every year. The customer keen on extra-virgin oil knows there could be variations. But the typical shopper isn't looking for surprises. The only way the large companies can consistently produce an oil that matches their customers' expectations is to blend various oils according to their own recipe. However, not every country produces enough to satisfy both local and export demand—Italy foremost of all. Therefore that bottle of Italian oil may very well contain Greek or Spanish olive oil too, though recent changes in international trade standards now require exact labeling of the contents.

Still, the Greeks and Spanish are not entirely happy with this situation. Their oil deserves to be better known, they believe, but it is hidden in the shadow of the image of Italian oil. The Italians were first to capture the foreign market—73 percent of the European olive oil the U.S. imports comes from Italy—and they continue to dominate at least with

To your health! At Casa Benigna in Madrid, Rafael and Maria Alcalá make liberal use of olive oil. Its monounsaturated fats and antioxidants benefit the body—a welcome but secondary perk for Maria. "A meal without olive oil," she says, "would be a bore."

their reputation for high-quality oil. The others chafe. "You know what we say?" a Greek asked me. "Italian oil is like water." Said a Spaniard, "They import our oil to make theirs better." An Italian snorted, "The Spanish know nothing about olive oil."

Until recently Spain was content to sell in bulk to foreign blenders. But in Greece, which is awash in first-class oil, the many small producers accuse the Greek bureaucracy and a sort of mafia of middlemen of preventing them from bottling and marketing their oil as their own.

"So," one Greek farmer asked me, a little aggressively, "where do you think the best oil comes from?" I knew what I was supposed to answer, but I couldn't do it. "That's easy," I replied. "The best oil comes from the country with the most beautiful women."

But that was just a dodge. By that point I'd become a sort of olive oil junkie. Any oil I was eating was suddenly the best I'd ever had. I loved the peppery jolt of Italian oil from the Leccino or Correggiolo olives (great for frying foods). In Spain the Picual, Arbequina, or Hojiblanca varieties were full of character, yet also delicately aromatic (perfect on grilled fish). In Greece, the ubiquitous Koroneiki rendered an oil that was fruity and full of body (celestial on salad). I poured olive oil on everything: meat, vegetables, even cheese.

And I never tired of hearing what wonders olive oil could work. I read a study that demonstrated that foods fried in olive oil retain more nutritional value than those fried in other kinds of oil. Another study showed that women who eat olive oil more than once a day have a 45 percent reduced risk of developing breast cancer. It may have therapeutic effects on peptic ulcers and prevent the formation of gallstones. A Greek

housewife said it makes the perfect hair conditioner (equal parts vinegar and oil) as well as the ideal burn treatment (mixed with lime and water). "My wife suffered from back pain," said a Cretan farmer. "Somebody told her to take two tablespoons of olive oil every morning on an empty stomach. She did this for ten days, and she was cured."

What could account for these amazing properties? Gerónimo Díaz, a Spanish chemist, oil taster, and technical adviser in Málaga, was eager to tell me. My newfound enthusiasm was as nothing compared with the adoration he feels for olive oil. "The olive oil world is so beautiful you could be captured by it," he declared. Dark-haired, of average build, with a crisp white shirt and tailored suit, Díaz could be any sort of businessman. But olive oil is his vocation as much as his livelihood, and he has traveled to Tokyo, Sydney, and Taipei to promote the benefits of this seemingly simple fluid.

We sat by the beach in Málaga while fishermen grilled the fish we were about to eat. He filled pages with chemical formulas, excitedly explaining the arcana of the oil's composition. Up to 80 percent of olive oil is made up of monounsaturated fatty acids, which resist oxidation better than polyunsaturates and help keep HDL—"good" cholesterol—levels up and bad cholesterol (LDL) down. Only 4 to 12 percent of the fat content of olive oil is polyunsaturated fat, which when oxidized can lead to arterial lesions.

"But you know," Díaz said, "it's not only important to have low cholesterol thanks to monounsaturated fat. Two other components in olive oil are also very important—vitamin E and the polyphenols, which are synergistic. They prevent oxidation of fatty acids, which reduces the risk of arteriosclerosis and some forms of cancer."

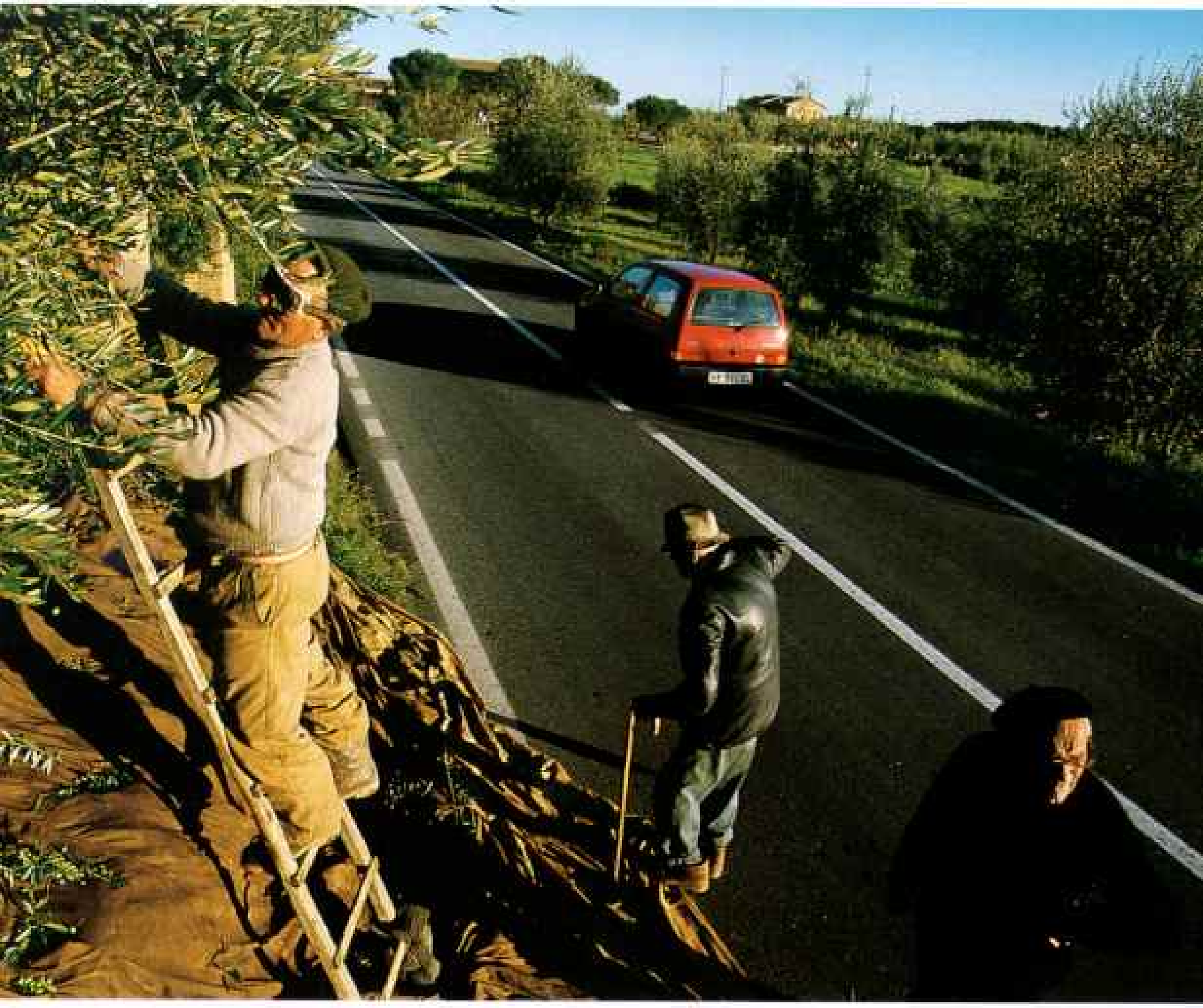
He paused while I studied his impromptu diagrams. To me, they were runic scribbles. To him, they were practically poetry. "My wife tells me I'm the most uncultured man in the world," he said without apology, "because I don't talk about anything else. I don't read anything else because I think it's a waste of time. I'm a pessimist in my private life, but where olive oil is concerned, I'm an optimist. It's a passion."

IN THE GREEK CITY of Kalamata—best known for its briny black table olives but home to delectable extra-virgin oil too—Panayiotis Sardelas consumes his oil in another form. He is founder, manager, and, I suspect, also foreman, truck driver, and accountant of one of the few soap factories in the Peloponnese using olive oil. His workshop and warehouse are in a big cluttered shed on the airport road.

"I started 40 years ago," he said. "I had an olive mill, and people asked me to make soap, so I took the risk. There was an old woman working for me, and she taught me how to make it. I started with a hundred pounds, and after three or four years it was four tons."

He buys the sediment that settles from new oil and mixes it with caustic soda and soapstone. He boils it all for 12 hours in a tank with a conical bottom. When it begins to solidify, he removes the caustic soda, which has sunk to the bottom, and washes the mixture with salt water to remove any remaining traces.

"The old people know that this soap is better than chemical ones," he said. "It lasts longer than other soaps, and you can use it for everything. Cut it in chips and put it in your washing machine. Some doctors prefer this soap for washing their hands."



Fall lures Tuscans outdoors to begin the olive harvest—a ritual as old as Mediterranean myth. Olive oil has massaged Olympians, anointed kings, perfumed pharaohs, and enriched ancient coffers. Its taste will remain forever infused with history.

I took a small but heavy chunk of the muddy beige soap. It had a mulchy, sensible-shoes sort of odor. I asked if he ever thought of adding perfume. "No, no." He looked perplexed. "If you want something pure, you wouldn't mix something in it." That night I tried it. It didn't lather much, but afterward my skin felt startlingly smooth.

The soap factory was an OSHA nightmare, full of detritus and bits of things held together by other things. The rusty three-ton tank was empty; Sardelas had already made his batch. But atop the cluttered worktable a clear, bright little flame was burning. A plain glass full of olive oil. A floating wick. He noticed my glance. "Oh," he said simply. "We pray here every morning for a good day."

Beyond the city, the stony, austere hills stretched to the sea. Small splotches of color—a flowering pink almond tree, a golden mimosa—softened the land's bony outlines. Dark clouds were spreading veils of rain across the mountains; no harvest tomorrow. The evening moved slowly up the hillsides. The darkness rose, filling the hollows. But the olive trees held out to the end. They tossed eagerly in the wind, full of brightness, full of oil, full of life. □

On an island of stone in the wind-tossed Sahara,
a pair of monumental giraffes exalt the unknown artist
who carved them thousands of years ago.
Under a fierce desert sun, a research team works to
copy this ancient masterpiece—and protect such
treasures from the ravages of time and man.

PRESERVING THE SAHARA'S PREHISTORIC ART

ARTICLE AND PHOTOGRAPHS BY
DAVID COULSON

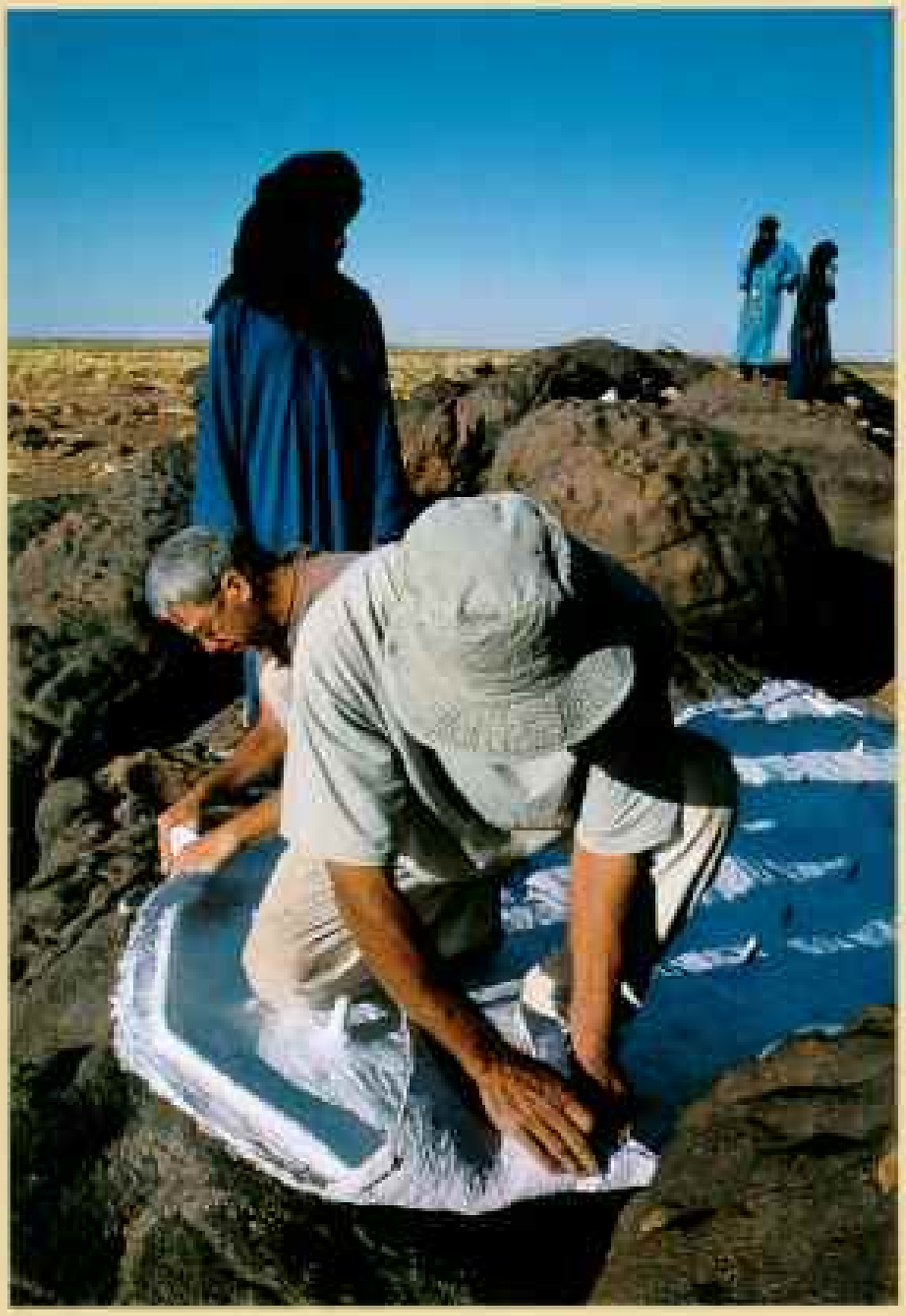
KENJI YAMASAKI, NGS STAFF

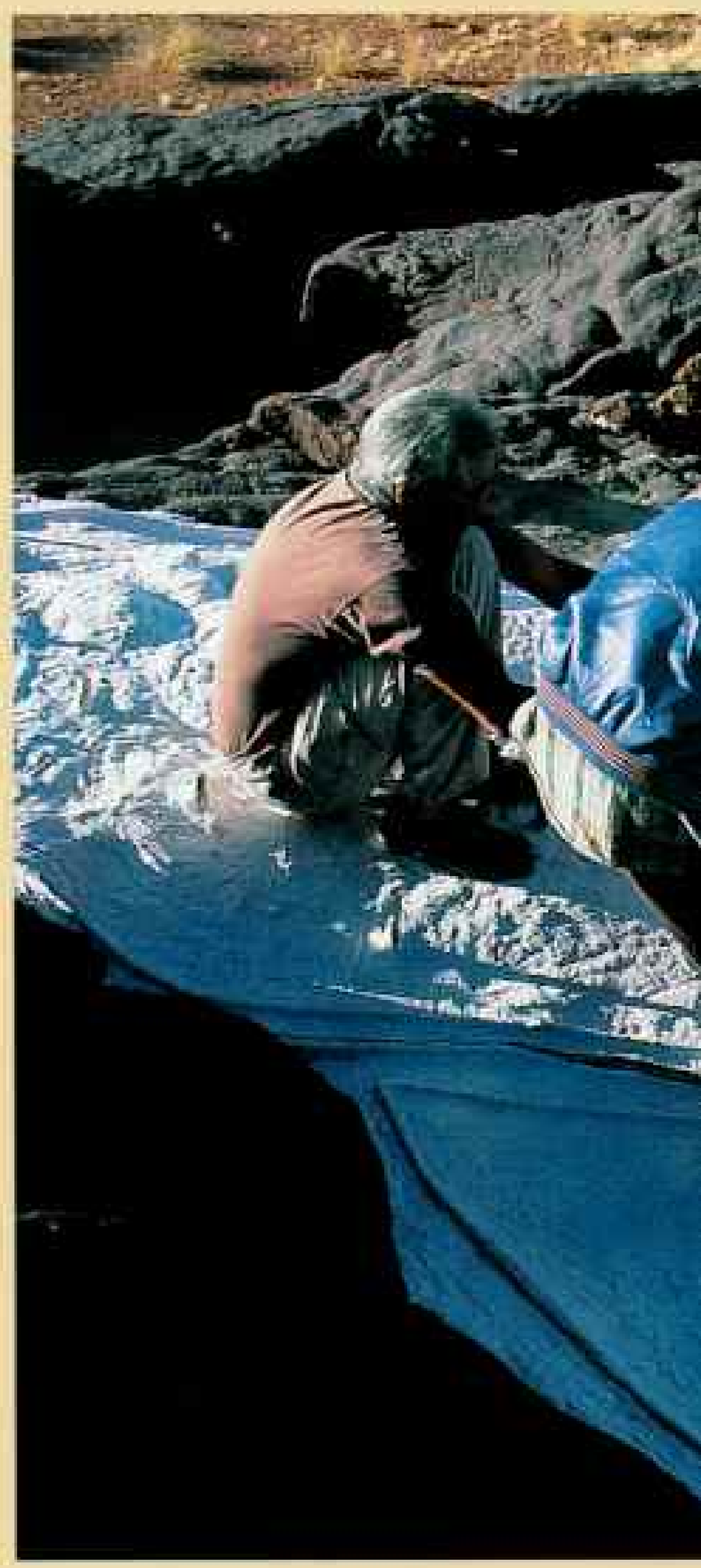
MAKING THE IMPRESSION

Carved by human hands some 7,000 years ago, the rock giraffes of Niger were unknown to the outside world until recently—and are at greater risk today than at any time in the past. Despite their remote location (above), they are near a road and vulnerable to vandals and looters. With help from the Bradshaw Foundation, our team set out with my colleague Alec Campbell and art restorers from Ateliers Mérindol to copy this masterpiece before it was too late. After cleaning and sealing the stone to prevent damage, we applied layers of silicone paste (left), which molded to every detail of the art. Then we assembled a metal frame over the silicone and poured a layer of nonbinding plaster of paris (right) to make a stiff protective backing for the image.

RESEARCH PROJECT

Supported in part by your Society





Lifting the Image

After the plaster dried, we cut it into sections and lowered them to the desert floor, where they were reassembled upside down as a platform (right); the silicone mold remained on top of the giraffes. Then came the moment of truth. Inch by inch we carefully peeled back the image from the stone (above), folding the rubbery silicone like a carpet as each of three panels was taken up (above right) and moved to the plaster platform. When the panels were unfurled, we broke into whoops of joy and relief. For there, molded in silicone, was what one team member, rock art authority Jean Clottes, calls a "world-class masterpiece" that deserves a place in the Louvre. The mold and its plaster base were shipped to France, where Mérindol craftsmen are making the first copies. One will be presented to the Niger government, and National Geographic plans to exhibit another at its headquarters in Washington, D.C.

With this first step behind us, we can turn to the larger task ahead: taking steps to protect the giraffes and other prehistoric African artworks—we recorded some 450 engravings on this rock outcrop alone—for future generations. A key, I believe, will be involving not only governments but also local communities in the effort.

David Coulson, chairman of the Trust for African Rock Art, covered Sahara art in the June 1999 issue.

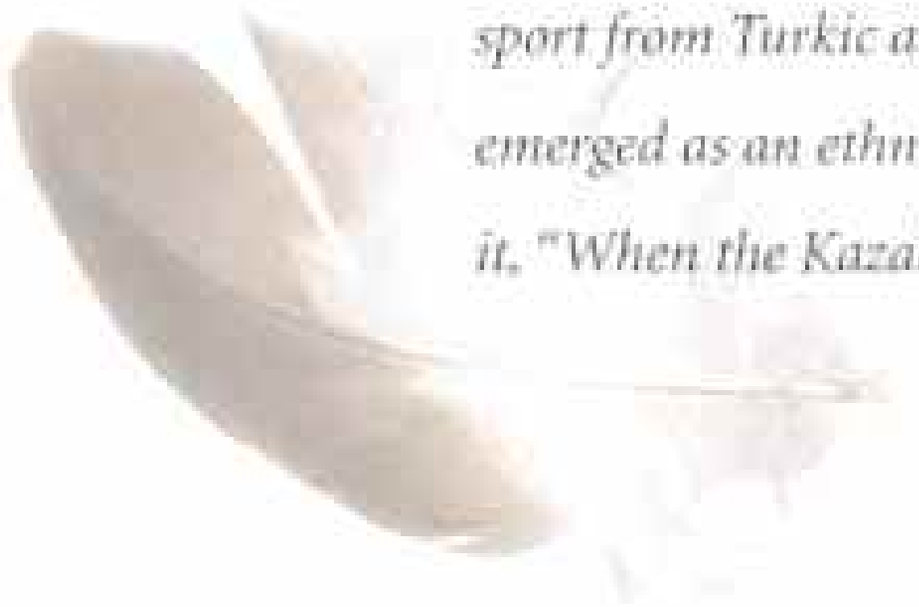
Freshly joined, our silicone copy reveals exquisite details, such as a line leading from the muzzle of each giraffe to a tiny human figure. Thus we glimpse the world the artist lived in: not a desert but a greener place, where rain sometimes fell and the giraffe, roaming gracefully with his head in the clouds, might share his power with man. □

KENJI YAMAGUCHI

IN THE
MOUNTAINS OF
MONGOLIA

HUNTING WITH EAGLES

The hunter returns. Hackles up, she sits alert on a falconer's arm, torn meat caught in her beak. The falconer, like this young apprentice, is one of a group of Kazakhs in Mongolia who hunt with golden eagles, a tradition more than a thousand years old. Kazakhs inherited the sport from Turkic ancestors and were already practicing it when they emerged as an ethnic group in the 15th century. As one falconer puts it, "When the Kazakhs came into the world, they were eagle hunters."



By CANDICE S. MILLARD • *Photographs by* DAVID EDWARDS
NATIONAL GEOGRAPHIC EDITORIAL STAFF

CLEARED FOR TAKEOFF

In a winter wind a veteran hunter named Kosan strains to support his eagle as she flattens her wings, seven feet from tip to tip. He often hunts from this promontory, and when his eagle pursues prey in the valley below, Kosan, in corduroy coat and fox-fur hat, jumps on his horse and races down the mountain, hoping to reach her before she damages the precious fur—or, in fighting for its life, the animal injures her.

Fleeing tribal warfare in the late 1600s, a small group of Kazakhs settled in Bayan-Olgiy, Mongolia's westernmost province. A century later, after a Manchu emperor's genocidal raids had wiped out the region's Mongols, the Kazakhs took control of this dry, harsh land. Rainfall rarely exceeds ten inches a year, and the rocky soil makes farming almost impossible. No paved roads lead into Bayan-Olgiy, which is separated from the rest of Mongolia by the Hovd River and from China by the Altay Mountains. Thus isolated, these Muslim pastoralists have been able to keep their language, cultural traditions, and identity as Kazakhs. After the Soviet Union broke up in 1991, many Kazakhs left Bayan-Olgiy for a homeland they'd never known. By some estimates fewer than half the roughly 70,000 Kazakhs in the region at that time remain today.

Photographer David Edwards is a co-founder of New Land Bridge, a program promoting cultural exchange between the U.S. and Mongolia.

PORTRAIT OF A PREDATOR

"I've always thought of them as feathered velociraptors," says photographer David Edwards, whose proximity to a resting eagle provokes a startling lunge. In Mongolia, Kazakhs hunt only with female golden eagles, which they believe to be more aggressive. These females, which defend the nest, weigh as much as 15 pounds, nearly a third heavier than males. One of the eagle's best assets is its vision, perhaps eight times more acute than that of humans.

TO CATCH A THIEF

In his home a hunter prepares a trap: a handwoven net, seven sticks, three frozen hares, and one angry raven. Outside, he strings the net between the upright sticks, forming a precarious circle around his bait. When an eagle dives in to scare away the raven and steal the carcasses, the trap collapses, netting her like a butterfly (top right). Taming her will be more difficult. Her ankles are bound in leather straps and tied to a wooden block on a

rawhide line (middle). Each time she tries to fly away, she flips upside down. She'll stay here, struggling with this tightrope, for up to two days. When she's exhausted, she's tame, and the falconer can teach her to return (right), bloody knuckled after a hunt.

SWIFT LESSON IN DEATH

Slamming on the brakes with her wings and tail—a diving bird can reach a hundred miles an hour—an eagle in training seizes a tethered fox. Securing its hind legs in her relentless grip, she attacks the fox's head, paralyzing her prey with talon tips exerting thousands of pounds of pressure per square inch. In the wild, golden eagles usually hunt small prey; but captive birds can be trained to successfully attack wolves or lynx that are five times their size.

RICH LIFE IN A LEAN LAND

A young man gives thanks to Allah before slaughtering a sheep (left). He ends the prayer by wiping both hands down his face, affirming the blessing. Mosque attendance is not possible for these nomads, so religious traditions are taught within the family, as are customs that ensure survival. After the first freeze relatives gather (below) to slaughter enough sheep and goats to endure a winter that can brutalize with minus 50°F temperatures. They work for three days, killing as many as 150 animals. In the summer families move with their herds, living in felt tents called gers, but from September through April they hunker down in wood-and-adobe homes like this one.

HEIR TO A TRADITION

A falconer gallops home after a hunt, his hooded eagle gripping one arm. Once the sport of the elite throughout Central Asia, hunting with eagles in much of the region has become little more than a tourist attraction—a "cultural relic," according to ethnologists. But in Mongolia the tradition lives on among the Kazakhs, who proudly practice the sport they learned from their fathers and teach to their sons.

Moments from pain, bull rider Brian Smotherman holds on for a last instant before the chute gate opens. In less than eight seconds he'll be down hard on Tucson dirt with a separated shoulder, a casualty of the roughest event in the rough sport of rodeo. Professional rodeos—about a thousand a year—thrive today on romance, nostalgia, and the utter devotion of their hard-driving cowboy stars.

ROD

By MICHAEL PARFIT

Photographs by WILLIAM ALBERT ALLARD
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Behind the Chutes

E O S

"She's got lots of juice," says champion bareback rider Eric Mouton of bronc Skoal's Molly Bee, who bears him to victory in Tucson. "It's a weird feeling," says Mouton, "to sit there and beat the beast."

In the medical room far behind the chutes, cowboys were talking about the day a bull's hoof cut off Charlie Sampson's ear.

"Rob Smets found it in the dirt," one of them said. "He was holding it in his hand, and Leon saw it and he was puking, and Charlie was crying because he thought his career was over, but how could your career be over as a bull rider just because you lost your ear?"

Meanwhile, out by the chutes cowboys were praying for victory and their lives, and then all the hats came off because the flag rode in. Another rodeo was under way.

Crude, rude, and socially unacceptable. That's rodeo. Patriotic, honorable, moral, all-American. That's rodeo too. But after a season behind the chutes, watching rodeo from the intimate place where cowboys go to work, I was no longer startled by rodeo's contradictions. The world of rodeo is violent but sweet, harsh but full of affection, profane but religious, obscure to most of the American public but central to our roots.

"This is where we came from," Bob Tallman, an announcer at many rodeos, once boomed to the crowd during a celebration of rodeo's history. Tallman, with his rough eloquence, always sounds as if he was born in a Southern Baptist pulpit and raised on syrup and sleet. "This is where we are," he said, "and this is how we hope to lead the world."

On a stormy June day in Belt, Montana, I climb a fence, walk through mud and manure, then climb another fence and find myself on a platform just behind the chutes, the stalls where horses or bulls are penned before they're turned loose to try to shed cowboys. Like every other place behind the chutes, it smells of manure and is stained by tobacco juice. And it is oddly private. Not many spectators watch what goes on back here, because out front of the chutes is where the action is.

But the place behind the chutes is the center of rodeo. This is where cowboys go to ride and older rodeo hands go to help the cowboys or work with the animals. This is where the big names of rodeo go, even when they're not riding—people like Ty Murray, seven-time champion all-around cowboy, or Charlie Sampson, the legendary retired bull rider with one false ear—because here they feel most at home. Back here tough men dance to keep loose, a lot of men seek their Maker, and a few men say their last words. Old men of 30 pass hard-won wisdom about the length of a rein or the nature of courage to young men of 19, and

Rodeo may be "bulls and blood" in a Garth Brooks song, but clown Frank Newsom's job is to prevent bloodshed. That often means getting thumped himself. "The bull has that guy in his sights," says Newsom, "so you dang sure got to let him get a piece of you."

MICHAEL PARFIT, a frequent contributor, lives in Montana, a state noted for producing some of the best saddle bronc riders in America.

everyone learns the meaning of the noun "try."

Behind one of the chutes a stocky, good-natured, 28-year-old Montana cowboy named Jess Martin is getting ready to get on. Rodeo cowboys don't say they are going to ride; they say they are going to *get on*, because for a cowboy the act of decision—and courage—is to climb aboard whatever animal awaits. What happens after that may be long enough to be called a ride, or it may not be.

Jess measures the length of his rein with his palm. Too short and the horse will yank him forward; too long and he'll be flung back. As he prepares, men by the gate watch his face, waiting for him to nod his head that he's ready.

Jess once told me that he likes this sport better than any other. He was good at a lot of them; he got a football scholarship to college. But football ended when he tried rodeo.

"I got on," he told me, "and I nodded, and he bucked me off. Right then I knew that's what I wanted to do and do it good."

As Jess settles carefully down on the saddle, I look around the arena. Belt has a population of 600, but thousands come to its annual rodeo. Beyond the full stands, hills roll out into the big wheat-striped landscape east of the Rockies. This is the kind of place rodeo came from. The legend is that it began in the mid-1800s when men driving cattle up the trail from Texas to the northern plains started to compete in the activities they did on the trail: roping steers, breaking colts, enduring pain.

The horse Jess is getting on, named Footloose, shifts his position. There's a moment of tension behind the chutes and out in the arena. This happens at every rodeo. The crowd noise seems to fade, *(Continued on page 114)*

Rodeo outfits come fancy and plain. "I wear a lot of sparkle-type stuff," says Danyelle Rideout (above), geared up for a ceremonial ride in Pecos as Miss Rodeo Texas. True grit covers clown Rob Smets, who's been saving cowboys from bulls for 22 years and doesn't flinch at the autograph table.

Cowboys stretch, adjust equipment, think a lot—but don't talk much—before the rodeo at Pecos. Some rodeo cowboys are Indians, and the Pendleton Round-Up in Oregon celebrates them with a tepee village, where Acosia Red Elk, American Indian Beauty Pageant winner, waits for a parade.

First job in a Montana "wild horse race": Saddle an unbroken animal. Then try to ride it. This is harder on cowboys than on horses, though rodeo critics argue that animals can't choose to sit out an event.

(Continued from page 109) as if a collective breath is held. Everyone waits for Jess to nod.

Several places claim to have put on the first official rodeo—Pecos, Texas, and Prescott, Arizona, among them. After the century turned, the Wild West shows turned rodeo into two very different things: a rough sport for young men with horses on their minds and a romantic symbol of a favorite fable of America's roots—the cowboy.

"The rush is so high because you know you're going to cross the line, and death awaits you over there. You cross the line, and then you get back."

In the latter role, rodeo has sold a lot of jeans, compact discs by Garth Brooks and Chris LeDoux, chewing tobacco, and beer. But one of the contradictions of modern rodeo is that many of those urban customers have only a faint idea of the young man's sport itself.

There are about a thousand professional rodeos every year in the United States and Canada, and countless other amateur events. But rodeo has only about 25 million spectators a year. This is just a single grain in the feed bucket compared with auto racing or baseball. The reality of rodeo is hidden in small western towns—or in annual events in big cities that are attended mostly by people from small western towns.

Rodeo evolved from displays of the skills developed to trail cattle, to catch them for branding, and to break and ride horses. At events sanctioned by the Professional Rodeo Cowboys Association (PRCA), like Belt's, the contests of these skills have been refined into seven main events for men—saddle bronc riding, bareback riding, bull riding, calf roping, steer roping, team roping, and steer wrestling—and one event for women, barrel racing. The show is held together by continuous patter from an announcer who conducts a raunchy repartee with a clown who tells jokes like this:

Clown: "I got beat up by my wife last night."

Announcer: "I thought your wife was out of town last night."

Clown: "So did I."

At Belt right now the clown is silent. Across the hushed arena a voice echoes out: "Bear down, Jess!" At last the brim of his hat dips. The gate opens, and Footloose erupts.

Out in the arena the horse looks like a classic bronc, rearing and kicking. From behind the chutes he looks like a berserk freight locomotive, flinging hoof-loads of mud that hit people in the face at long range. Jess grips the rein with his left hand and holds his right arm high, where it whips around. Eight seconds later the whistle blows. He has made it. He jumps to the dirt and walks slowly back to the chutes.

Rodeo is seen as a simple and honorable sport, but the scoring of the roughstock events—saddle bronc, bareback, and bull riding—is complicated and subjective. A score is based on style and difficulty, much the way it is in gymnastics. Out of 100 possible points half are for the cowboy and half are for the animal. So a lot of a cowboy's score depends on how good an animal he gets in a random drawing. And judges' decisions are, well, debatable.

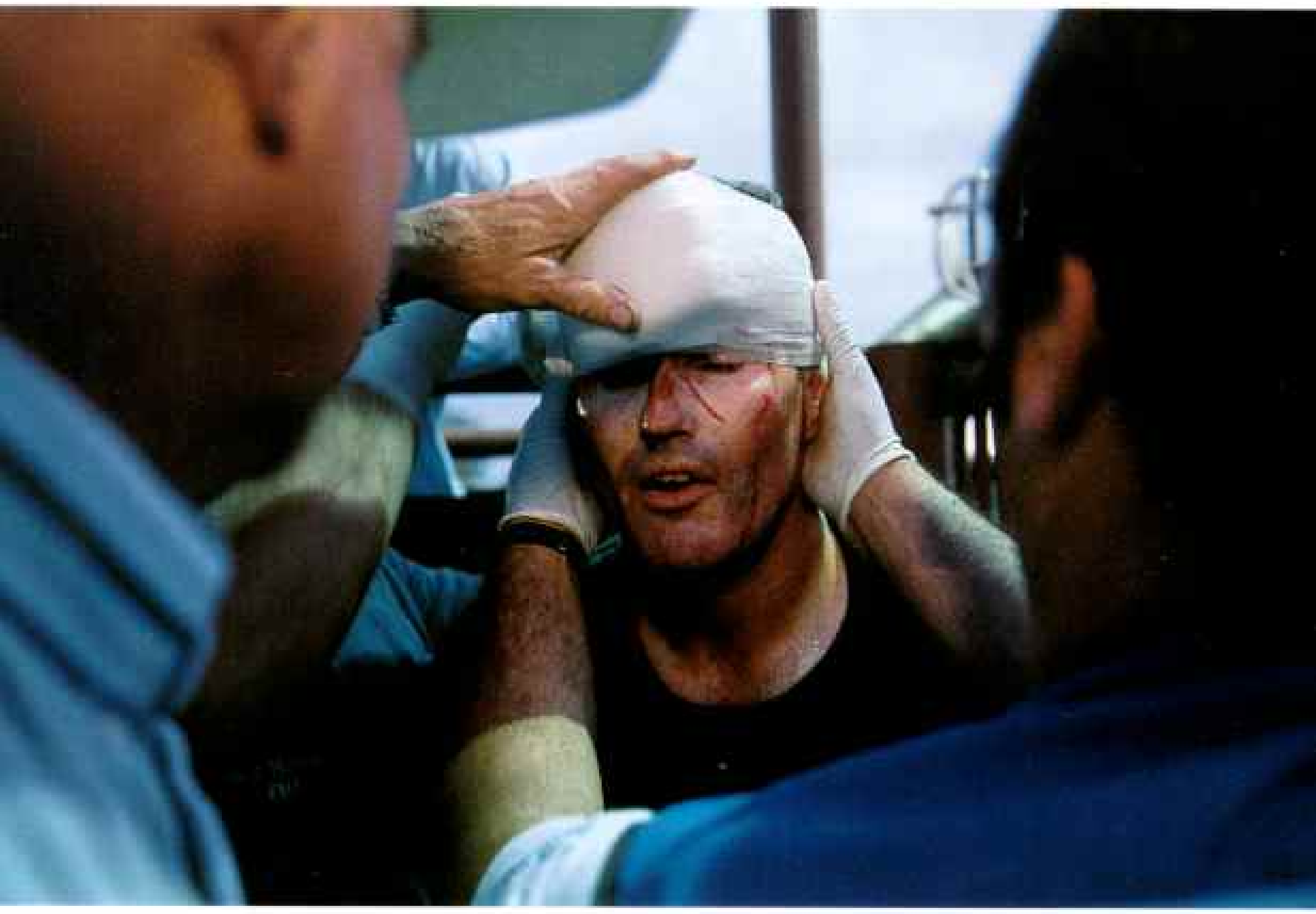
Jess's ride gets 74 points. That's good for a tie for first place and a check for $312. But like most modern cowboys, Jess is not off to buy his friends a few rounds. Instead he'll be on the road in his diesel pickup truck, starting on the thousand-mile run to Reno, where tomorrow he'll get on a horse named Ram Power.

Today's professional cowboy has one goal: to reach the National Finals Rodeo (NFR), which is held in Las Vegas every December. Qualifying is straightforward. There are no championship brackets or polls. The NFR just takes the year's top 15 money winners in each event.

To get on that list, Jess, like most pro cowboys, will enter more than a hundred rodeos this year. And since most cowboys gross far less than $50,000 a year, these guys are not getting around in jets. Most traveling is done in cars or trucks, like Jess's club cab. On big weekends like the Fourth of July, during which cowboys sometimes enter three rodeos each day, the most successful riders may charter a small plane.

All for the chance to get on, again and again and again.

"I loved playing football," Jess told me, "but it's nothing like this. When you are on a great bucking horse and you're sticking it on him, it is—unexplainable. You're pretty much addicted to the adrenaline."



"Everything was vague," says Roger Nygaard, kicked by a horse in Montana. Pain is as common as chewing tobacco, but, says Tuff Hedeman, a famously battered star, "I never think about it."

"This is a brutal sport," says Lyle Sankey. "Not many of you are going to pursue it for any length of time." Chutes and fence are all there is of this arena out on the flats of West Texas, near Lubbock. I'm behind the chutes on precarious planks, watching students at Lyle's roughstock riding school get flung off one after another onto the dirt.

It's a varied group. There's a young anthropologist from Virginia, a 47-year-old man with a big mustache who wants to ride for charity, three Australian men living out of a $300 car they call the Green Snot, and a woman named Fiona from Newcastle upon Tyne, England, who went wing walking a few weeks ago and now wants to ride a bull.

Sankey, once a rodeo star, is big, energetic, and full of advice. Like all rodeo rhetoric, his wanders from the practical to slogans for life.

"If you don't trust your rope, don't ever put it on a bull."

"There's no sellout point. You can't fold your tent, or they'll do it for you."

By the time the school is over, the 47-year-old has lost half his mustache to a swift, sharp hoof, Fiona will spend the rest of her vacation on crutches, kicked in the knee, and I've found a good slogan for myself. It's about being on a bull, but I think it applies to everything.

"Your perception is 'I'm toast,' " Sankey says. "But you're OK."

CODY CUSTER squats on the concrete behind the chutes at the famous Calgary Stampede, hat in his hands, praying. Many bull riders pray openly, and there's good reason for it. Bull riding is the most dramatic event of rodeo, partly because it is so dangerous.

"Every year kids die riding bulls," John Growney told me. John is a lean, energetic stock contractor, which means he supplies the

"Bear down!" cowboys shout to a rider in Belt, Montana, while the bull's owner yanks a flank strap around its belly. The strap encourages bucking, but cowboys insist that it inflicts no pain.

animals. "Bull riding is one of those things for a modern man who understands that death is wrong but who still gets excited about seeing that guy die or almost die."

But when that hush breathes across the arena before the first ride, everyone wonders: Why do these boys do it?

"Bull riding is just a rush," said Growney, who has done it. "I believe the rush is so high because you know you're going to cross the line, and death awaits you over there. You cross the line, and then you get back."

Cody Custer's eyes are almost black. As he prepares, they seem to become darker. "When I'm getting ready," he told me once, "I get real quiet. I don't pal around with my buds. I do a lot of stretching, and I pray for a clear mind."

That's not necessarily what bull riders get.

Once I saw Cody bucked off onto his back. He got up, looked up in the stands, and fell over as if he'd been shot. He got up again, and fell over again. When the medics got to him, he was saying over and over: "Mom and Dad are up there. Mom and Dad are up there."

All he had was a mild concussion. Nothing at all to a rodeo star. "If you haven't had a concussion yet," said Lyle Sankey at his school, "you haven't rodeoed much."

Another day, another busted-up cowboy. This time it's John Johnson, and he has just broken his collarbone during a summer rodeo in Santa Barbara, California.

"You son of a bitch!" John says to his friend Michael Stewart. "You turned out for me. You shouldn't have done that!"

John is faking anger because Michael, a bareback rider, has just "turned out"—canceled his ride at another rodeo—so he can take John to the hospital. "I'm not going to go off and leave him here," Michael tells me.

Rodeo is violent but tender. Because of their low incomes, cowboys team up to travel. The

friendships this creates seem sweet and gentle, for all the profane banter. Behind the chutes you see these bonds at work as traveling partners help each other with their rigging or by pulling a bull rope. And when someone gets hurt, it's typical for a guy like Michael Stewart to give up the chance to get on, to give up the rush, in order to help his friend.

"Rodeo people are like family," a young bronc rider once told me. He thought about it, then said, "They're *better* than family."

Behind the chutes in Santa Barbara the first few rows of the stands seem full of young blondes. They ask for pieces of paper from my notebook so they can write down cowboys' phone numbers. The term for them is buckle bunnies.

They all watch eagerly when it's time for the bulls. But two cowboys, Brock Mortensen and his brother Judd, aren't here yet.

This is typical of cowboys' fast-paced lives. As their event begins, the Mortensens are racing up the highway from another rodeo. About five minutes before they lose the chance to get on, they come barreling in, pulling on their flak jacket vests, a recent rodeo innovation that has saved a lot of ribs—and lives.

Brock is first and gets 73 points. But his brother has drawn a good bull and has a romping ride, greeted by cheers.

And suddenly in the sweet, dusty California air, for just one moment, rodeo is perfect for one thin young man from Idaho. The great fast drive across the desert, the great blondes waiting in the stands, the great bull, the fine ride. The whistle blows, he gets 86 points, and he throws his hat into the sky.

"Rodeo is just an old Chris LeDoux song," another bull rider told me, and Judd's joy reminds me of what LeDoux, a former bareback champion, wrote about this boyish life:

Chewin' snoose and spittin' in a bottle
With country music blasting off the radio
Talking girls and broncs and gold belt buckles
Rollin' south to a California rodeo

Just rollin' down that great American highway
With the morning sky lit up like a flame
Chasin' dreams and following a rainbow
Like children runnin' through the rain

"People talk about the romance of rodeo," LeDoux told me one day, just before he taped a satellite network show. "That word threw me for years. I'd think dust and flies and heat and wind—romantic? But I think they're talking about having your freedom. It's just living life as free as you possibly can." Like many young cowboys, that was all he had ever wanted.

"I used to have this fantasy," he said, "how I wanted it to end. I'd be at the height of my glory—maybe I could be riding Cheyenne—and a horse would throw me off and kill me."

IT SEEMS TOO DARK behind the chutes in the covered stadium called the San Francisco Cow Palace. The dark ceiling, the dark stands, and the dark earth of the arena eat light. I stand on steel grating in a crowded space crossed by greasy poles on which chute gates hang, jammed between the arena and the announcer's stand, where Bob Tallman weaves sugary braids of eloquence:

"The Cow Palace is old, dingy, and dark," a PRCA official told me of this place, "but there is so much tension there."

"People talk about the romance of rodeo. . . . I'd think dust and flies and heat . . . romantic? But I think they're talking about having your freedom."

It's November. It's the last weekend of the PRCA season before the finals, and if you're anywhere close to the cutoff point in the rankings—which the cowboys, like other athletes, call "being on the bubble"—you have to win money at the Cow Palace.

"There are a lot of heartbreak stories here," says Todd Fike, a bronc rider. The Cow Palace is all about heartbreak, pain, and "try."

"Try" is the cowboy's bottom line. It's the most important noun in the unique language spoken back of the chutes. It is effort, energy, and that familiar sporting term, heart. The best thing you can say about a cowboy is that he has "a lot of try."

"Try" means many good things, like persistence and courage, but there's a shadow in it from one of the darker sides of rodeo: the abundance of pain. *(Continued on page 122)*

Outside the arena, rodeo sparkles on, whether in romance at a bar after the Pendleton Round-Up or in Wolf Point, Montana, where the belt buckles of self-described "old cowboys" Jim Gibbs, at left, and William Lang compete with fireworks to light up the night.

Father and cowgirl head for a dance after the Pecos Rodeo. During the National Finals Rodeo in Las Vegas (below) kids go to the arcades and cowboys go to the casinos, where you can let it ride at the table for a lot longer than the eight seconds you have to stay on a bull to score.

As he lands hard, silver spurs on steer wrestler Coty Battles glint through the dirt of Cheyenne. The effects can linger, says his stepmother, Donna: "The cleaners are always excited to get his pants."

(Continued from page 117) In San Francisco I spend a lot of time in a stark room full of padded tables and tape. This is the home of a group of doctors and trainers called the Justin Sportsmedicine team.

Here a trainer named Rick Foster is helping bull rider Josh O'Byrne put on his knee braces. Josh is 33, old for this sport. A bald spot is growing under his hat, and there isn't much left of his knees. One of them dislocates frequently. "It ain't no fun when it comes out," he says with a shrug. Josh is close to the bubble and is determined to get on. "It's just an unreal feeling to be at the finals," he says.

"Try" is the cowboy's bottom line. It's the most important noun in the unique language spoken back of the chutes. It is effort, energy, and . . . heart.

From behind the chutes I often see how quickly a strong young man can be reduced to a dazed, staggering, bloody victim. A bareback rider named Alex Meroshnekoff, of Penngrove, California, goes romping off on a horse and comes back on a board, his back broken. Later, Toby Adams, a young bronc rider, is kicked square in the side of the head.

"Believers, I know what you're doing right now," Bob Tallman intones while Toby lies still. It looks as if someone had mopped his face with blood.

Back in Rick Foster's room, Toby is soon sitting up on a table, head bandaged, looking embarrassed that he can't remember much. Larry Sandvick, an irrepressible cowboy, sticks his head in the door: "Hey, Toby, you want me to sew you up?"

Toby can't remember the day of the week right now, but he knows Larry Sandvick, a top ten bareback rider who also runs a leather shop in Kaycee, Wyoming. A hideous image appears in Toby's mind: Larry approaching with a needle.

"No, Lar," Toby says.

"Bull riders are stupid," Larry once told me, then added, "bareback riders are stupid too, but they're more goofy."

Larry spends much of his time trying to prove at least the goofy part. Once, when he sliced a finger to the bone in his shop, he tried to sew himself up. One of his traveling partners, bareback rider Mark Garrett, was watching, and he got green quicker than Larry.

"Mark don't do blood too good," Larry said when he told me about it.

Mark Garrett is entered at the Cow Palace, but he isn't there. Later I hear the reason.

He and three other cowboys were flying in a single-engine plane from Bozeman, Montana, to the Cow Palace, when the engine quit, possibly out of gas. They crash-landed into trees.

Mark Garrett was sitting in the back of the six-seat plane. He was bruised and cut up but not broken. Everyone else was seriously injured. There was blood. Then there was fire.

Mark saw flames starting under the instrument panel, so the young man who didn't do blood too good scrambled out a door and started pulling out the others. With the help of another passenger, Scott Johnston, who had two broken vertebrae, Mark managed to get everyone out. The plane burned to ash.

The pilot died two weeks later, but the rest survived. It seemed to me that what Mark Garrett did could be called "try."

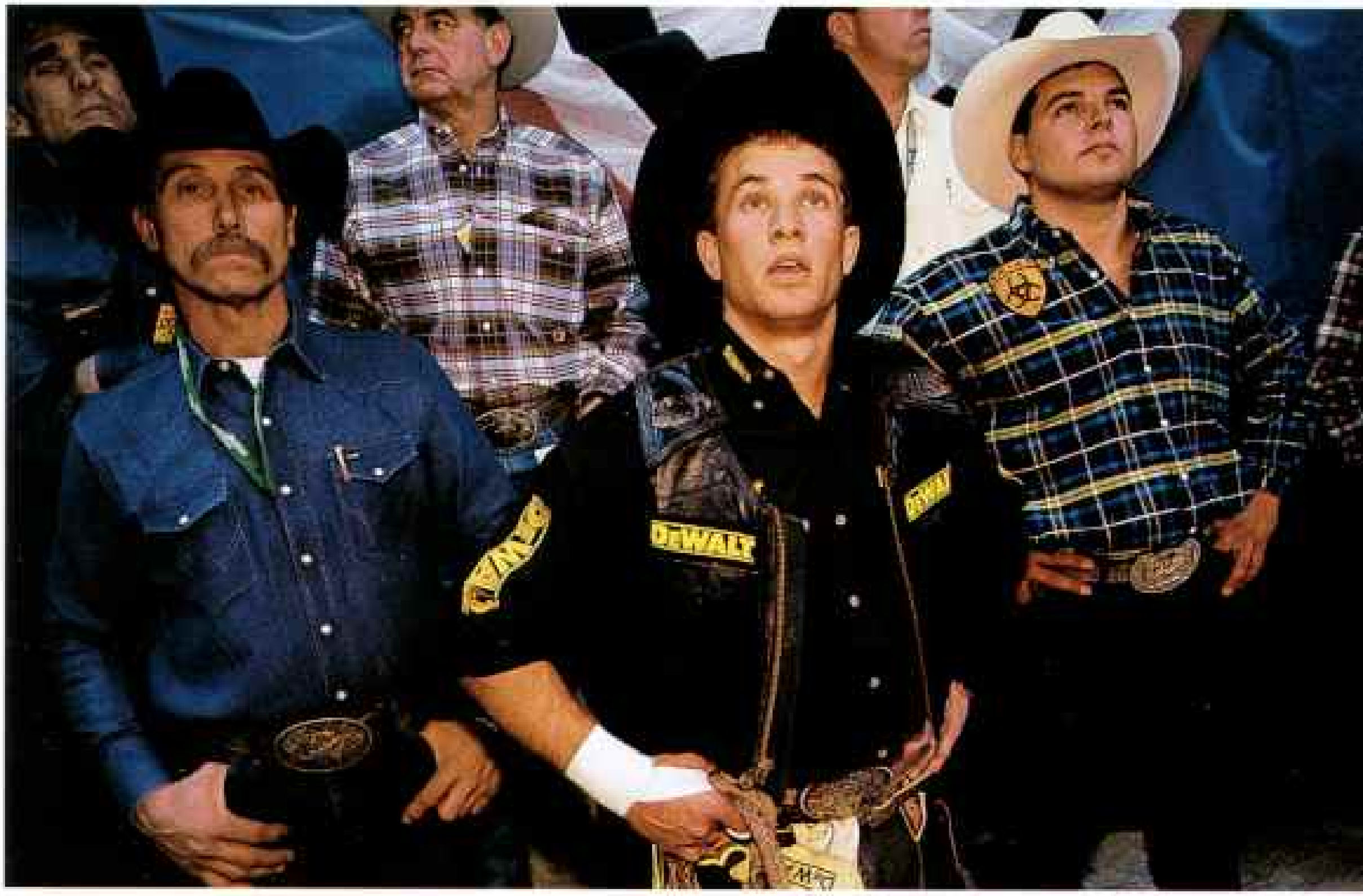
THERE IS ANOTHER SHADOW on rodeo. It is also the shadow of pain, but it's the pain of the one group of participants that cannot choose to avoid it—the animals.

"If people educated themselves about rodeo, they'd be horrified," says Peggy Larson, a veterinarian and former rodeo contestant.

Larson and others, including the Humane Society of the United States, oppose several rodeo practices. Among them are the use of the flank strap, a sheepskin-covered belt that is cinched around the lower abdomen of a horse or bull to encourage bucking. The flank strap does its job either because of a mild irritation like tickling, as rodeo people say, or, as some opponents say, because it causes "torment."

Rodeo opponents focus attacks on calf roping, in which a mounted cowboy chases a calf, ropes it, then ties it. "Calf roping is hell on wheels," says Larson. "What's making them run? Their tails are twisted, they're shocked with electric cattle prods, they're terrorized." When they're roped, she said, calves can have whiplash injuries or even broken necks.

Rodeo's Super Bowl, the National Finals packs 'em in at Las Vegas. The event sells out 17,000 seats for ten straight nights. Behind the chutes former champ Bobby Brown (below, at left), bull rider Mike White, center, and calf roper Cody Ohl watch a big-screen replay.



It glorifies youth and vigor, but it shatters them both. It is sentimental about its link with nature, its animals, but it's rough on them. Is that America?

The PRCA counters that its rules prevent most injuries and that things such as the flank strap just encourage animals to do what comes naturally—buck. Cowboys like to point out that the typical bucking bronc or bull is used in 20 to 30 rodeos a year and spends most of the rest of its life in pastures, making babies. This looks like a good life compared with that of many animals, including the millions of beef cattle that feed most of us.

From behind the chutes there seems no chance that this debate can be reconciled. I have seen animals (and a few rookie cowboys) that look desperate to escape the chutes, but I've also seen how sentimental both the cowboys and the owners are toward what they describe as the animal athletes they compete with and against; there were tears at the National Finals Rodeo when a famous bucking bull, Wolfman, was formally retired.

The question is simple: Is it civilized to make sport of animals' fear? Maybe not. But rodeo is not very civilized in general. As a throwback to the frontier, it's close to the moral equivalent of war in a negative as well as a positive way: All the drama and try of it depends on an inevitable—and unfair—cost to both the humans and the animals. There is no way to untie that knot.

In artificial mist at the finals, singer Shane McAnally lofts "The Star-Spangled Banner" into a patriotic hush. A horse pricks up its ears and awaits a cowboy's challenge. Though critics contend that rodeo is cruel, millions of fans are drawn to its simple drama of animal strength and human bravery.

BEHIND THE CHUTES Cody Custer squats on blue painted plywood, praying into his hat. This time he's not asking for a clear mind. He's praying for Josh O'Byrne, who's lying on the dirt on his back with his arms outstretched, not moving, while clowns dart in front of the bull.

"All you believers," says the booming voice of Bob Tallman on the loudspeakers, "I know what you're doing now."

Josh's fiancée climbs down the ladder from the stands onto the stage behind the chutes. "It's his wife, boys," somebody says, inaccurately. The crowd of men parts to let her get out to Josh.

It is the sixth day of the National Finals Rodeo. It has only been a few weeks since Josh told me how great it was to go to the finals. Now here he is, lying in the dirt.

Here in the glitter of Las Vegas, surrounded by the flags of sponsors that make the big prizes possible—Copenhagen Skoal, Crown Royal whisky, Coors ("The last real beer for the last real sport")—I'm suddenly angry at rodeo. I've seen one cowboy too many get hurt.

Is it as Tallman says? Does rodeo represent where we came from and what we are? Well, maybe. But if so, maybe that's not so great. This sport is a heap of contradictions. It claims to be moral, religious, conservative, but many of its boys run around cursing, picking up and discarding girls, getting drunk. It values freedom, but it's tied to the apron strings of sponsors like alcohol and tobacco. It glorifies youth and vigor, but it shatters them both. It is sentimental

about its link with nature, its animals, but it's rough on them. Is that America?

As Josh is strapped to a board, I stand behind the chutes and wonder: If rodeo represents a national core of values, then what you find out here is that there is no excuse, no gentleness, no easy way out, and no escape from the rough edges of our past and the hard contradictions of our present.

But now they've got Josh off the dirt, and he sits up. Drops run off his nose—sweat or tears. His heart is broken because the concussion has ended his finals. But he'll be OK, and he'll get on again someday. My anger ebbs.

Back of the chutes there is one great moment left. It's Saturday night, and Sunday is the last performance. The tightest contest is in the bareback competition. Larry Sandvick, the goofy leather man, is in a virtual tie with a serious young rider named Mark Gomes. As I leave the chutes after the rodeo, Larry and Mark come booming out of the dressing room, arms on each other's shoulders, laughing.

"We're gonna fix it right now," Larry shouts. "We're gonna wrestle for it."

"When I win that belt buckle, Lar," Mark says, "I'll let you wear it."

This is the moment I will remember about rodeo: Two young superstars kidding each other in the echoing concrete hall back of the chutes, knowing that what they share matters more than what they're fighting over.

Larry and Mark lope off down the hall together, still laughing, like a couple of kids just running through the rain. □

Cowboy romance or animal exploitation—what's your opinion of rodeo? Share your thoughts online at www.nationalgeographic.com/ngm/9909.

IN THE

COURT OF KING JUPITER

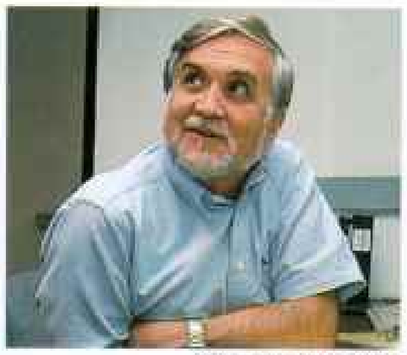
LIT FROM BEHIND BY THE SUN, JUPITER'S RING SYSTEM WAS DISCOVERED IN 1979 DURING THE VOYAGER FLYBYS. NASA'S GALILEO ARRIVED 16 YEARS LATER TO LINGER WITH THE KING OF PLANETS AND SCOUT ITS LARGEST MOONS, SHOWN HERE IN A COLOR-ENHANCED COMPOSITE: IO, EUROPA, GANYMEDE, AND CALLISTO.

BY WILLIAM R. NEWCOTT
NATIONAL GEOGRAPHIC SENIOR STAFF

CORNELL UNIVERSITY AND NASA; MOONS BY DEUTSCHES ZENTRUM FÜR LUFT-UND RAUMFAHRT (DLR) AND NASA

TORRENCE JOHNSON'S CAMERA was halfway to Jupiter when he discovered that, in effect, he'd be getting back only one roll of film. The Galileo spacecraft, launched a decade ago this October by NASA's Jet Propulsion Laboratory (JPL), was supposed to take more than 50,000 images during its voyage to Jupiter and its moons. But Galileo's umbrella-like high-gain antenna failed to open en route, and without it the craft would have to transmit those images back to Earth, 470 million miles away, through an antenna the size of a coffee can. "It appeared," said Johnson (below, top), the Galileo project scientist, "that instead of the 134,000 bits per second in telemetry we'd expected to receive from Galileo, we'd end up with ten. We'd be lucky to get a handful of images." At a cost of 1.4 billion dollars, those pictures had better be good.

Galileo's problem most likely arose as it awaited the beginning of its mission. The craft was supposed to be launched from a space shuttle in 1982, but shuttle-design troubles and the *Challenger* accident pushed the date back to October 1989. "It's possible that during storage and transport the lubricant on the high-gain antenna was rubbed off," said Johnson. "When we finally tried to open it, it got stuck."



BOTH BY PENNY DE LOS SANTOS

With only the smaller antenna operating, JPL scientists were faced with a problem akin to funneling a Niagara Falls of data through a garden hose. The spacecraft's 18 computers had less memory than a cheap laptop today. So for two years, while Galileo completed its cruise to Jupiter, JPL engineers created data-compression programs and transmitted them to the craft.

"Galileo's computers may have been old, but they were also flexible—designed so they could be reprogrammed from Earth. That's what saved us," says Ronald Greeley (left), a planetary geologist and imaging-team member from Arizona State University. "But until those images started coming back, it was nail-biting time."

By the time Galileo arrived in 1995 and began its gravity-driven tour of Jupiter's moons, "we were getting about 1,000 bits of data per second," Johnson says. "It's not 134,000, but it's decent." So far, Galileo has provided more than 2,000 images from the Jupiter system—"a fantastic success in the opinion of the whole scientific community," says Johnson. As a bonus, Galileo's ancient computers are immune to the infamous Y2K bug, which threatens to shut down many computers on January 1, 2000. Why? "Our computers," Johnson says, "don't use dates. They use a simple counter."

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JUPITER

SKIRTING THE FACE OF THE GIANT GAS PLANET, GALILEO FOUND A STRATIFIED KALEIDOSCOPE OF SWIRLING, COLORFUL CLOUD FORMATIONS, TOWERING THUNDERSTORMS, AND SHIMMERING AURORAS.

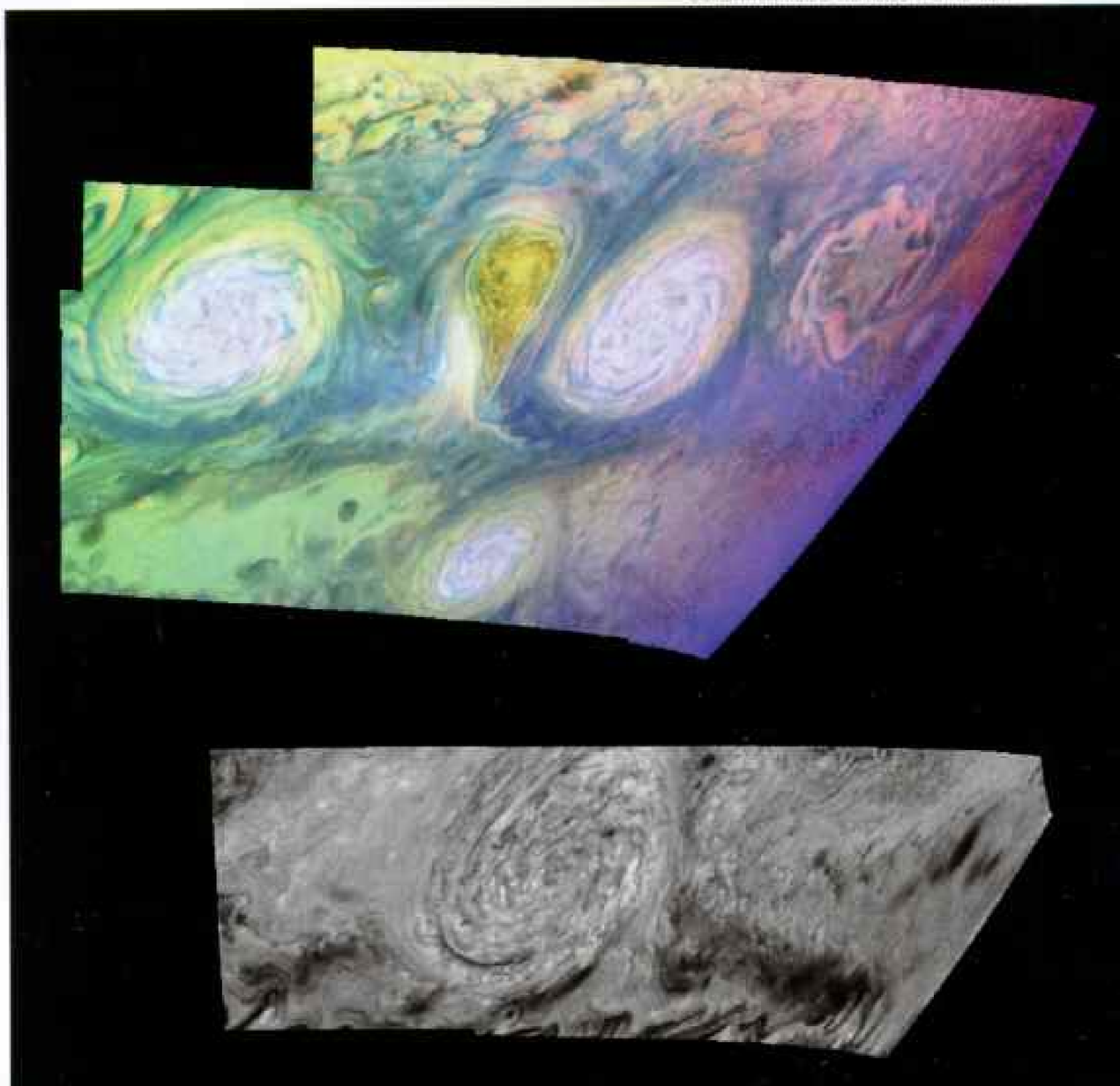
A night-sky standout, Jupiter became the first planet beyond our own to be explored through a telescope when it was observed in 1610 by Galileo Galilei. For more than 300 years scientists have studied Jupiter's enormous Great Red Spot, a churning storm that still shows no sign of letting up.

Smaller anticyclones, identified as Jupiter's White Ovals, have been seen since the 1930s—and after its arrival Galileo sent back an image of two of them drifting tantalizingly close to each other (upper image below).

"It became clear they would merge," said Johnson. "And when we imaged them again in September 1998 (lower), the two White Ovals had become one. We caught one of the first major changes in Jupiter's atmosphere in more than 60 years."

Near Jupiter's north pole Galileo detected the thin arc of an aurora (top right) glowing in the night. Jovian auroras have the same causes as those on Earth: Electrically charged

CALIFORNIA INSTITUTE OF TECHNOLOGY AND NASA (BELOW)



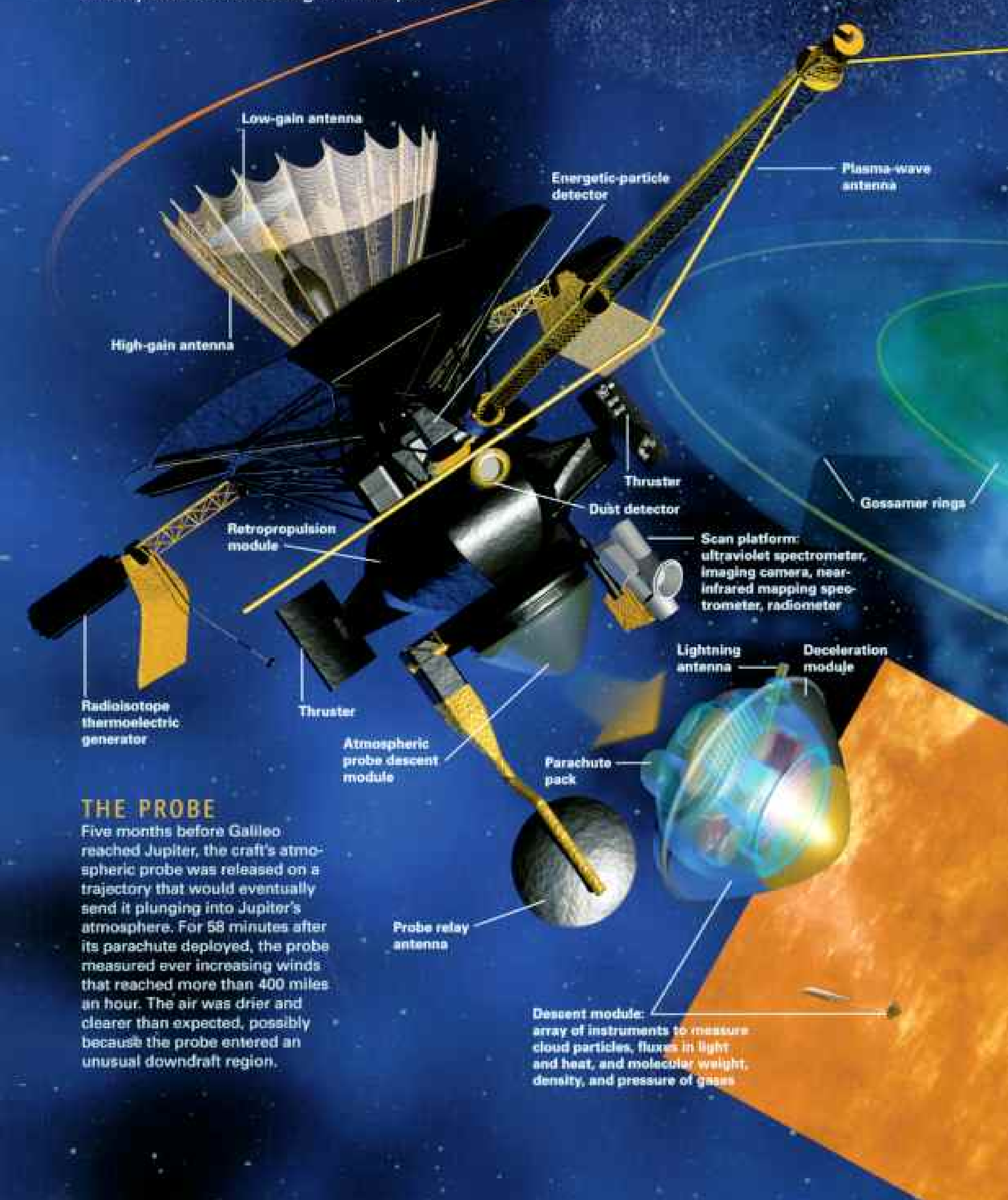
CORNELL UNIVERSITY, CALIFORNIA INSTITUTE OF TECHNOLOGY, AND NASA (MIDDLE); CALIFORNIA INSTITUTE OF TECHNOLOGY AND NASA

particles traveling along the planet's magnetic field lines strike the upper atmosphere and make hydrogen gas glow some 155 miles above Jupiter's cloud tops.

Computer imaging creates a false-color glimpse between two cloud layers (below) just north of Jupiter's equator. Dark blue indicates an area largely clear of clouds, where dry air descends deeper into the atmosphere. Ammonia ice crystals form the upper haze; its distance above the lower clouds is exaggerated in the image. Galileo also captured a convective thunderstorm (right) northwest of the Great Red Spot.

DESTINATION: JUPITER

Announced in 1977, built by 1983, and launched in 1989, Project Galileo is the most ambitious interplanetary mission to date. Twelve scientific experiments bristle from the orbiter; seven more were conducted by the atmospheric probe, which detached from the orbiter and plunged on a suicide mission into Jupiter's atmosphere. With its high-gain antenna only partly opened and totally useless, Galileo was able to return but a small fraction of the expected data to Earth. Yet the craft completed more than 70 percent of its original goals and is now finishing a two-year secondary mission focusing on Europa.



THE PROBE

Five months before Galileo reached Jupiter, the craft's atmospheric probe was released on a trajectory that would eventually send it plunging into Jupiter's atmosphere. For 58 minutes after its parachute deployed, the probe measured ever increasing winds that reached more than 400 miles an hour. The air was drier and clearer than expected, possibly because the probe entered an unusual downdraft region.

GETTING THERE

To save fuel, Galileo took the long way to Jupiter, getting gravity assists from Earth and Venus to slingshot it to the outer solar system. The craft flew past Earth and through the asteroid belt twice before reaching Jupiter.

Launch
October 18, 1989

JUPITER'S RINGS

Virtually invisible from Earth, the rings of Jupiter are made of dust kicked off the planet's inner moons by meteoroids. The closest of the rings is a doughnut-shaped halo; beyond that are a bright, flattened main ring and two diffuse rings.

Halo

Molecular hydrogen

Liquid metallic hydrogen

93,600 miles (70,000 km)

Possible core

Adrastea

Amalthea

Main ring

Metis

ANATOMY OF A GIANT

Like the sun, Jupiter is mostly hydrogen and helium. Surrounding Jupiter's core, most likely molten rock, is a deep layer of liquid metallic hydrogen, created by intense pressure. It is covered by a layer of mainly hydrogen gas, an inner cloud layer of water, clouds of ammonium hydrosulfide, and finally a haze of ammonia ice.

Thebe

Probe descends 150 km into atmosphere.

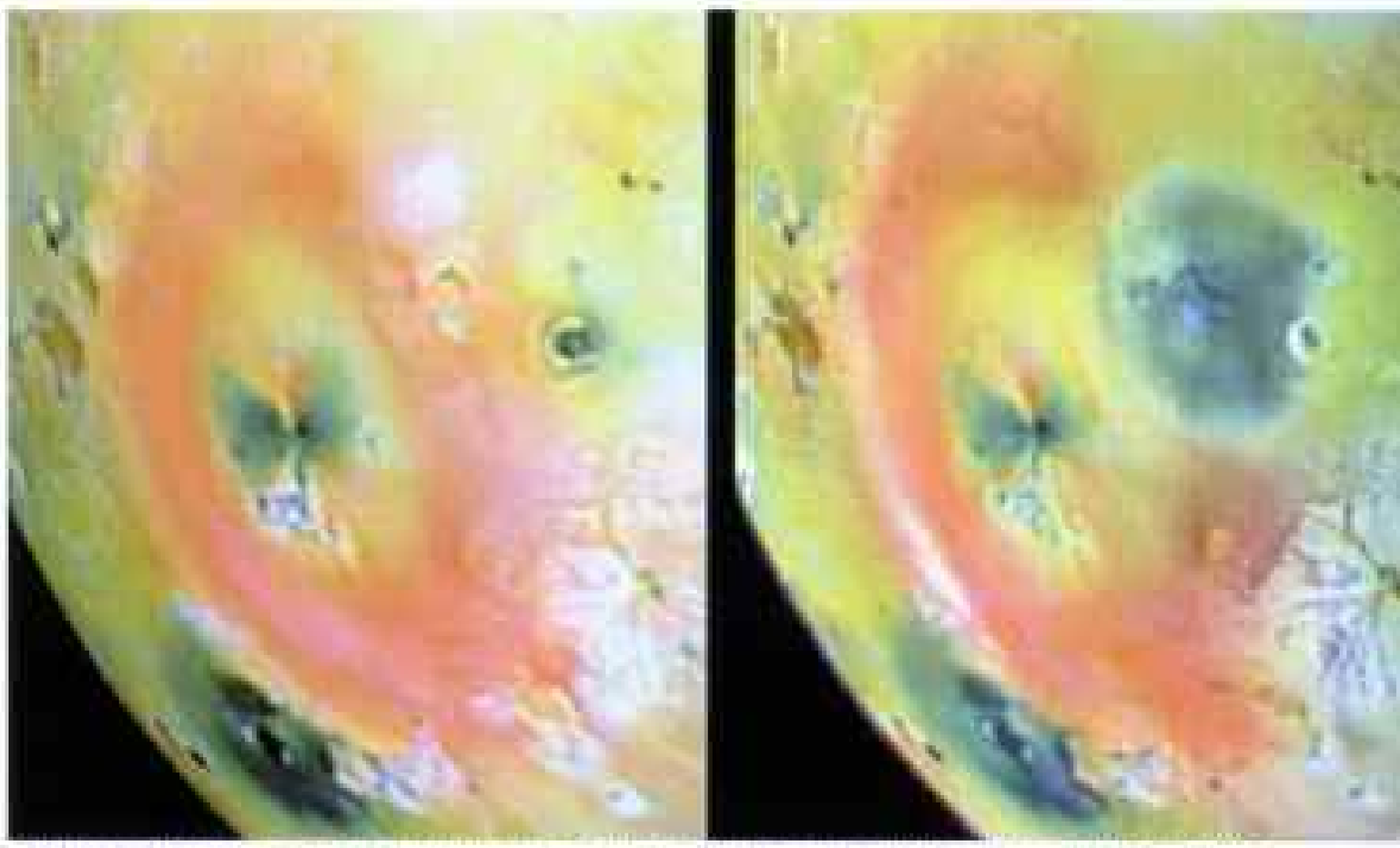
Protective shell falls away.

Probe vaporizes in atmosphere.

ART BY PETER BOLLINGER

IO

THE MOST VOLCANIC BODY IN THE SOLAR SYSTEM, ROCKY IO IS TORTURED BY JUPITER'S MIGHTY GRAVITATIONAL PULL. WITH A SOLID SURFACE THAT RISES AND FALLS IN 300-FOOT TIDES, IO CHANGES ITS FACE DAILY WITH NEW ERUPTIONS OF GAS AND SUPERHEATED LAVA.



AMES RESEARCH CENTER AND NASA (BELOW RIGHT); JPL AND NASA (FACING PAGE); UNIVERSITY OF ARIZONA AND NASA

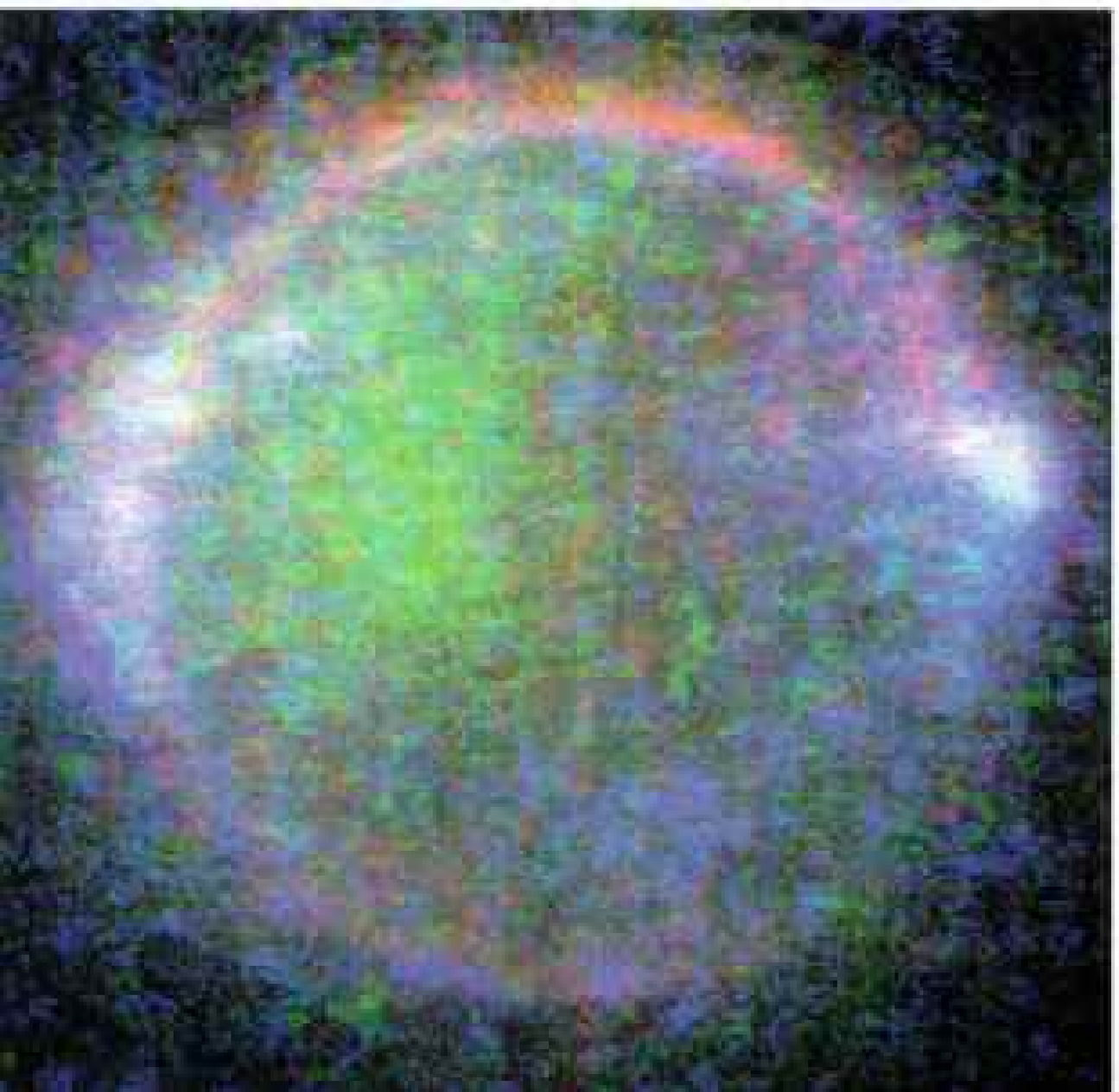
Between April 4, 1997 (near right), and September 19, 1997 (far right), an area on Io roughly the size of Arizona was buried beneath a dark smudge of volcanic debris. A volcano called Pillan Patera had exploded, throwing hot sulfur and rock ash in an 87-mile-high plume, seen on Io's edge in another view (facing page). This view also shows a plume rising from a volcano called Prometheus, visible at Io's equator near the moon's nightside. Prometheus remains as active as it was 20 years ago, when Voyager I sent back the first images of an active volcano beyond Earth. The dark shape extending to Prometheus's right is the shadow of the plume cast by the sun.

Like a blast furnace at night, Io (below left) glows with gases released by volcanic activity. Charged particles from Jupiter's magnetic field collide with the gases, causing them to glow in colors that identify their composition: Sulfur dioxide shines white, oxygen red. Green areas may be oxygen and sodium.

"Some of the lavas erupting on Io are extremely hot, as high as 3140°F," says planetary geologist Alfred McEwen. "That's much hotter than present-day eruptions on Earth but similar to lava that commonly erupted on Earth in the early Precambrian period. The tidal forces of Jupiter melt Io's interior, creating a very high heat flow."

Adds Johnson: "So when we look at Io, we're looking at a place that is in some ways a lot like Earth was long ago."

Passing across the face of Jupiter (below right), rocky Io floats in sharp contrast to its gassy parent.



EUROPA

TAKE EARTH'S MOON AND COVER IT WITH A HUNDRED-MILE-THICK SHELL OF WATER—SOME OR ALL OF IT FROZEN. THAT'S EUROPA, A CRACKED ICY CUE BALL THAT IS ABOUT TO BECOME A FOCUS OF THE SEARCH FOR LIFE BEYOND EARTH.

UNIVERSITY OF ARIZONA AND NASA (ABOVE); DLR AND NASA (BELOW); ARIZONA STATE UNIVERSITY AND NASA

To understand scientists' fascination with Europa, you need to know just one fact: Europa holds more water—possibly liquid water—than all the oceans on Earth.

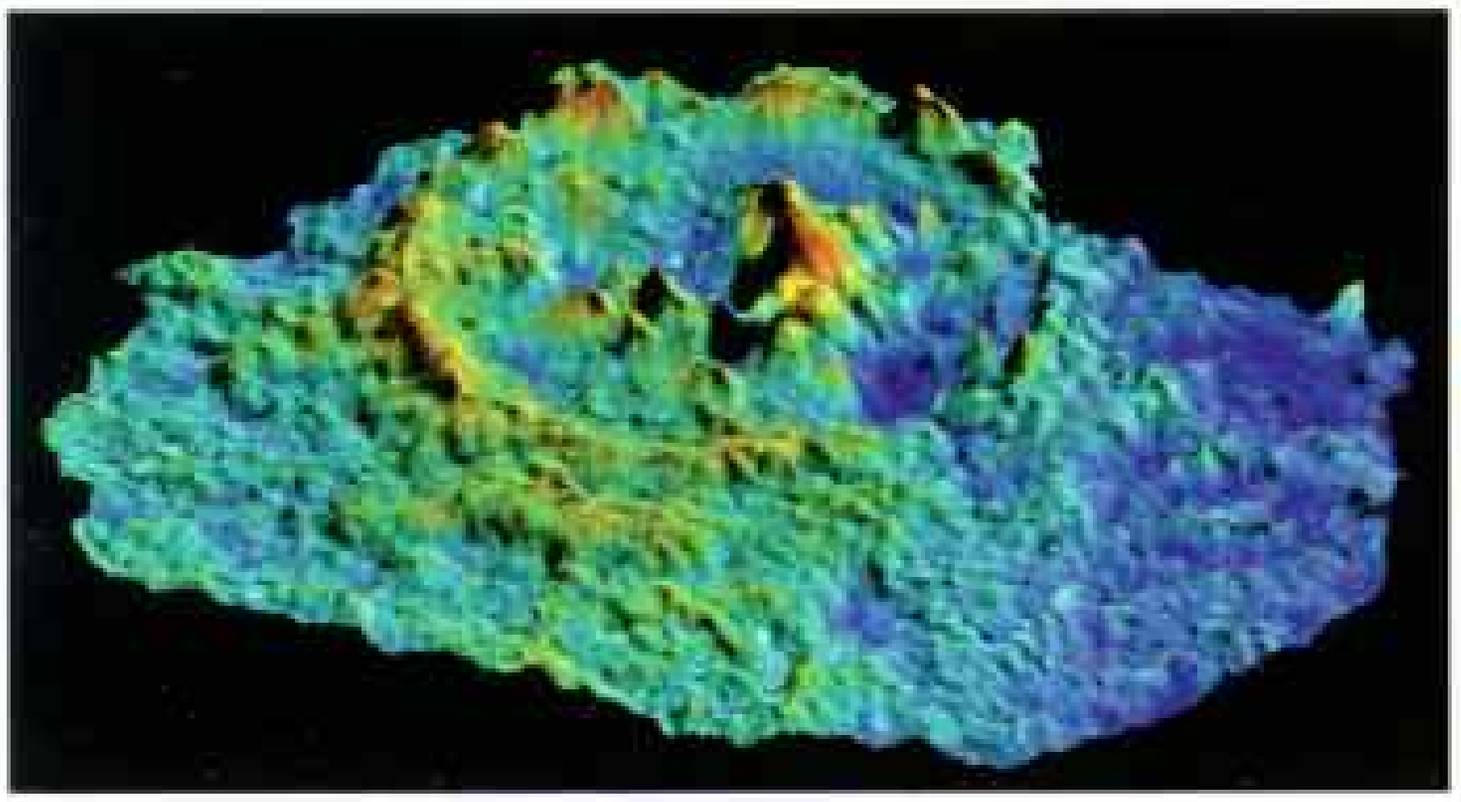
"Water is very common in the outer solar system," says Greeley. "That's just the way elements are distributed."

But on Europa the tidal forces of Jupiter's gravity generate heat that may keep water beneath its icy crust from freezing. The heat drives subcrustal convection, which fractures the surface of the moon, creating intricate patterns of ridged ice "rafts" (above). The brown color indicates the presence of mineral contaminants spread by water vapor released from below. To the left, white and blue ice crystals have been scattered across the surface, probably from the impact that created the crater Pwyll, 620 miles to the south. Such impacts may have delivered organic compounds to Europa.

A computer-generated image of Pwyll (below) shows a typical impact crater, but the crater floor is at the same level as the surrounding terrain—suggesting that it was filled from below with water seeking its own level.

Despite its fractured features (facing page), from afar Europa appears remarkably smooth. No surface features measure more than a few hundred feet high, evidence that the ice sheet is in fact reshaping itself.

"Life as we know it requires heat, liquid water, and organic compounds," says Greeley. "Europa appears to have all three." And that is why NASA's next Jupiter mission will head straight for Europa and stay there.



GANYMEDE

THE SOLAR SYSTEM'S LARGEST MOON IS BIGGER THAN MERCURY, PULSATES WITH ITS OWN MAGNETIC FIELD, AND MAY HAVE ONCE ERUPTED WITH VOLCANOES OF ICE OR WATER.

BROWN UNIVERSITY AND NASA (ABOVE AND BELOW)

Swooping within 519 miles of the largest moon of the largest planet, the Galileo spacecraft made an unexpected discovery: Ganymede has its own magnetosphere. Nowhere else in the solar system had scientists found a moon with a stable, internally generated magnetic field.

"So what we have is this little magnetosphere operating inside Jupiter's much larger magnetosphere," says Johnson. Most scientists thought Ganymede would be too cold to have a molten iron core capable of generating such a field. But the moon's orbit may have been altered in the recent past, subjecting it to stronger tidal forces that liquefied and stirred up its iron core. "It is likely," says Johnson, "that a molten core is generating the magnetic field today."

Ganymede has two types of terrain: older, dark, crater-beaten areas and newer, bright, ice-rich areas that have torn apart and replaced the older surface. A region containing both types is slashed by a diagonal chain of 13 craters (above), caused by the low-angle impacts of pieces from a comet.

In its warmer past Ganymede's surface may have surged with volcanoes not of rocky lava but of ice or water. Such eruptions could have sculpted channels (below) into the terrain.

CALLISTO

SOMETHING IS EATING AWAY AT THE SURFACE OF JUPITER'S MOST DISTANT MAJOR MOON, BUT EVEN MORE MYSTERIOUS IS WHAT MAY LIE BENEATH ITS CRATERED FACE: AN OCEAN OF SALTY WATER.

Judging from Voyager images, scientists expected to find craters of every size on shell-shocked Callisto, from giant bull's-eyes to tiny pockmarks. "But what we saw," says Greeley, "was an eroded surface with very few craters smaller than a half mile. The surface is being eaten away and blanketed by soft, fluffy stuff."

At the upper rim of an impact crater (right) a section has given way in a landslide. The distance traveled by the debris—nearly two miles—suggests a loose, fine-grained surface. An older, eroded crater called Har (left) has a large, rounded mound on its floor that was probably caused by upwelling ice. Ice may play a key role in smoothing Callisto's surface. A highly detailed view taken in the moon's largest impact structure, Valhalla (below)—marked by a shadow from a fault scarp—shows a blanket of fine debris.

ALL BY ARIZONA STATE UNIVERSITY AND NASA

"As the ice sublimates and is lost, all that is left is the dirt," says Greeley. "It's like after your snowman melts, and all that's left is that little pile of soil."

But why here on Callisto and not on heavily cratered Ganymede? "Who knows?" Greeley says. Another question for another mission. □

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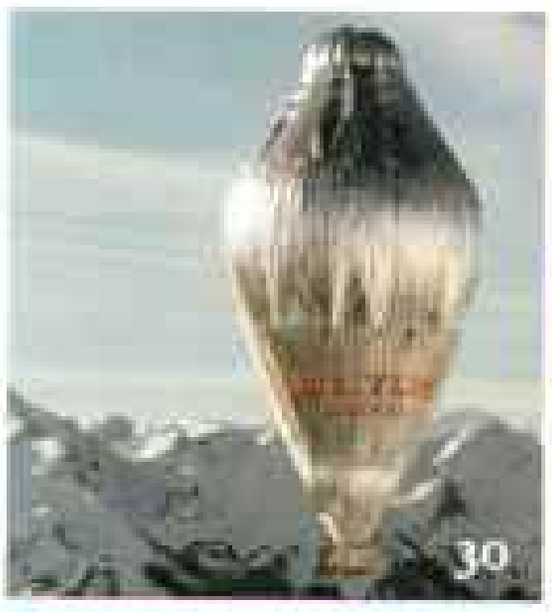
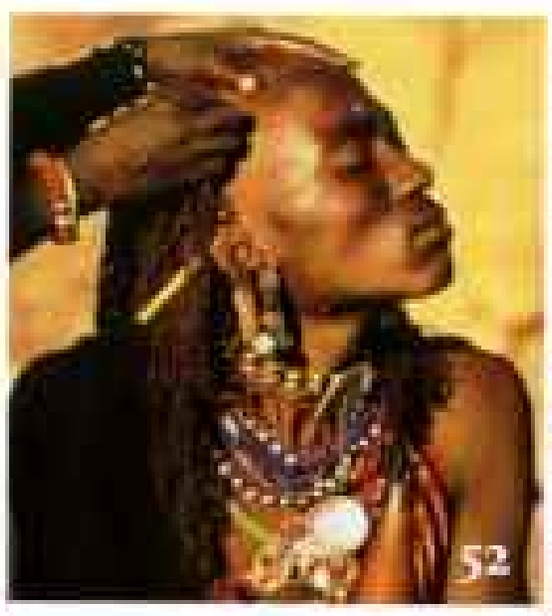
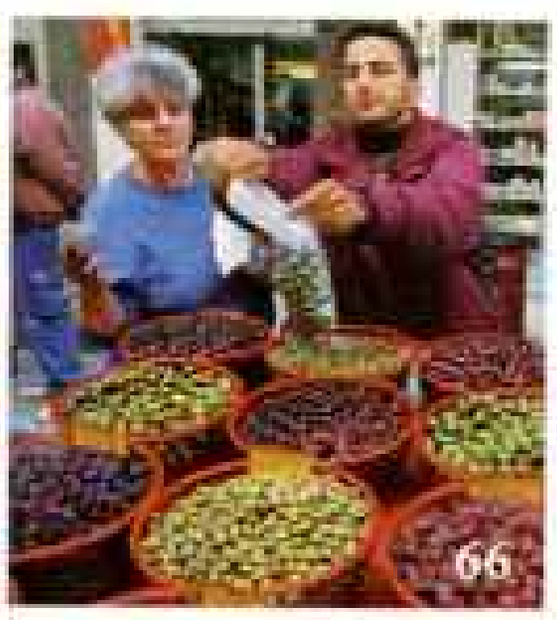
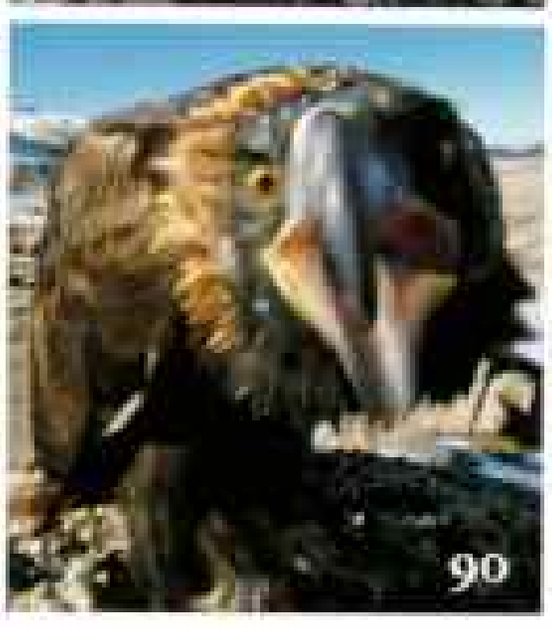
NATIONAL GEOGRAPHIC

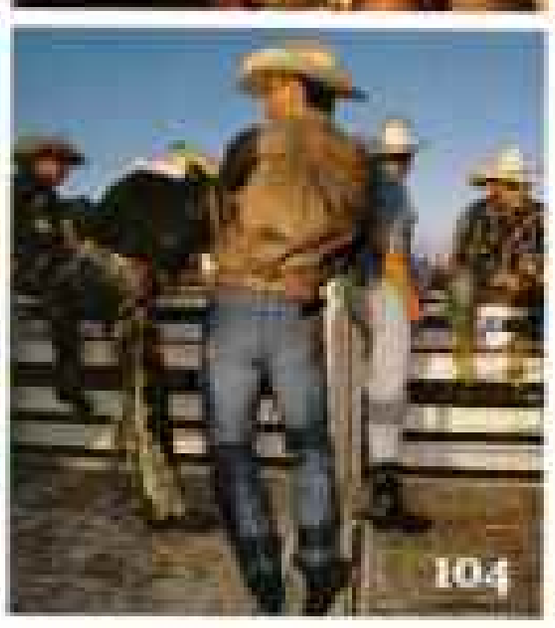
SEPTEMBER 1999

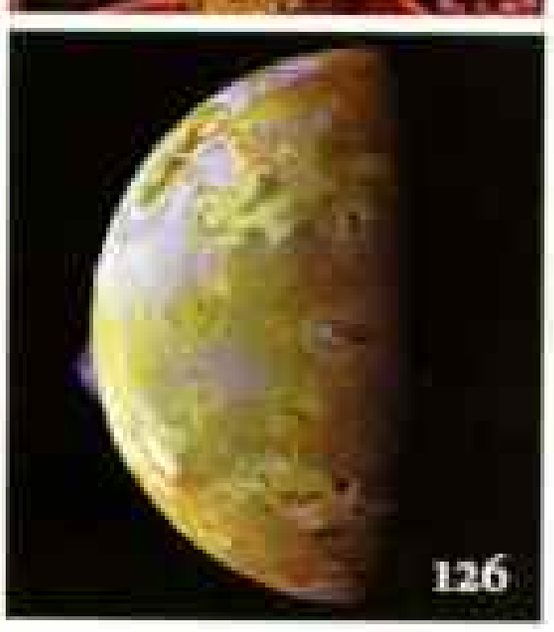












The Cover

Breitling Orbiter 3 *soars above the Swiss Alps shortly after liftoff, as Bertrand Piccard and Brian Jones begin their historic three-week circumnavigation of the Earth. Photograph by Breitling SA*

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On Assignment

STEVE MCCURRY

■ KASHMIR

In the Danger Zone

Though Pakistani artillery frequently traded fire with Indian troops across the Siachen Glacier, "I was really only worried about altitude sickness," says photographer Steve McCurry, at right, with a Pakistani soldier at a mountain army base. Their white parkas serve as camouflage in the snowy surroundings. "Since I wasn't acclimated to the 15,000-foot altitude, they were only going to leave me at this base for an hour. Then the weather got bad, and the helicopter came back two days later!" says Steve, who escaped with just a headache.

■ MONGOLIAN EAGLE HUNTERS

Feathers in His Cap

"Where I live in Arizona," says David Edwards, at left, "cowboys call an out-of-the-way spot 'behind God's back.'" Bayannuur, Mongolia, where he photographed eagle handler Suleyman, surely qualifies. David attended the London Film School after graduating from the University of North Carolina, then switched to still photography. When not shooting, he leads adventure tours—via horseback and river raft—to out-of-the-way places all over the world.

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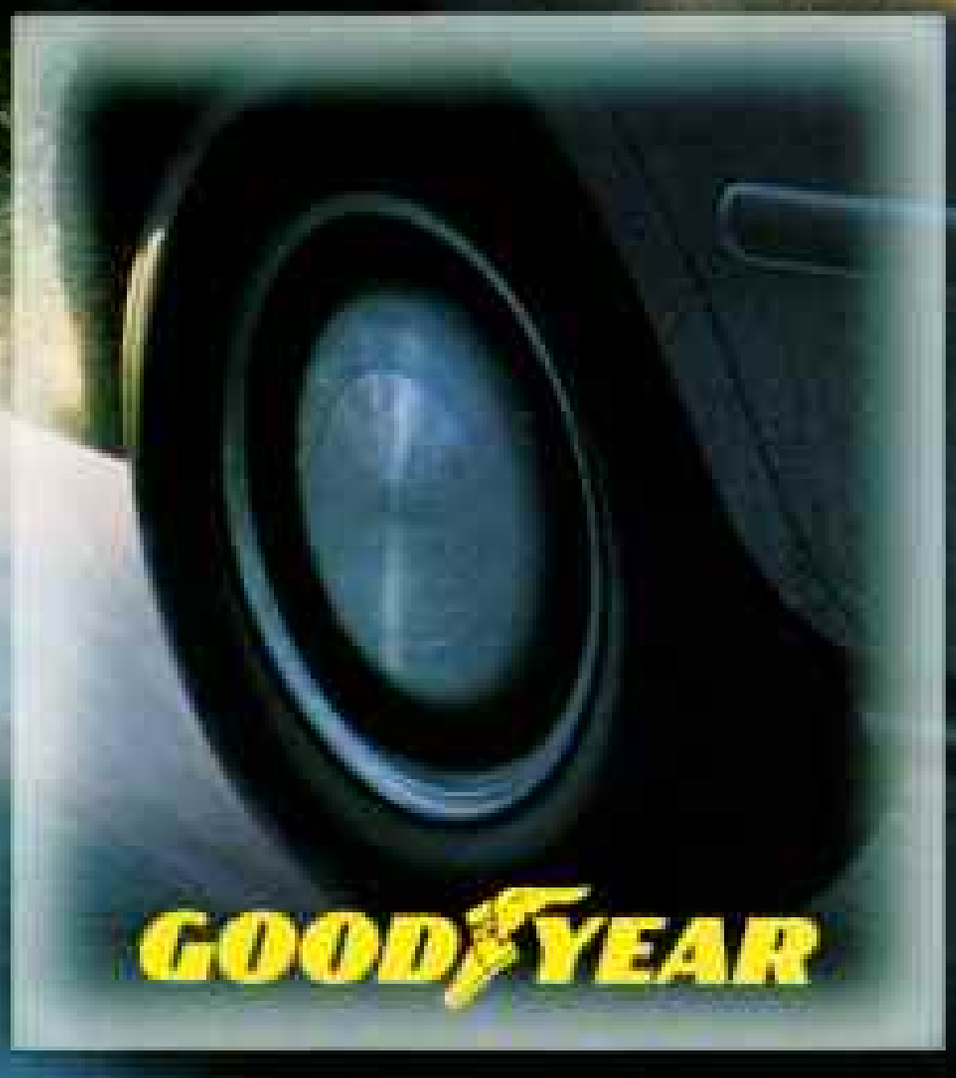

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Geographica

Undoing Damage to a Monastery's Murals

Perched on scaffolding, conservators from the California-based Kham Aid Foundation gently tend to 270-year-old Buddhist murals (above) at the Baiya Monastery on the Tibetan Plateau in China's Sichuan Province. The workers took down the murals—which include portraits, like this one of religious teacher Sachen Kunga Nyingpo (right), and scenes of Buddha's life—and removed years of grime and water damage. After replacing the monastery's leaking roof and rebuilding crumbling wattle-and-daub walls with wood, they rehung the murals. The program, started by China explorer Wong How-Man, also shows young Tibetans the value of conservation and trains them for similar work in other monasteries, says Kham Aid's president, Pamela Logan.

BOTH BY PAMELA LOGAN

Sponging Off the Past: Dig Yields Fossils

As a hole was being dug for storage tanks at his family's Interlaken, New York, gas station, Michael Potts spied light-colored rocks amid dark shale from 15 feet down. He broke one open and saw pieces of glassy material shaped like hands. At nearby Cornell University, paleontologist John Chiment and graduate student Sande Burr identified the objects as rare fossilized branched glass sponges 375 million years old, from a time when a vast inland sea covered the northeastern U.S. Living glass sponges of this kind are now known only in the waters off the Philippines.

CHARLES HARRINGTON, CORNELL UNIVERSITY

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Barbara Gonci's class for exceptional students is always doing something exceptional. Through food, art, music, crafts, and stories, she brings an exciting world to life for students whose horizons might otherwise seem limited.

As part of last year's Native American theme, Ms. Gonci dressed as an American Indian storyteller, with her necklace serving as a clue to where her tribe lived. During the year her class also grew corn, prepared Indian foods, learned sign language, drew pictographs, strung beads, and made pottery. Ingeniously woven throughout this theme were math, science, social studies, reading and language arts.

Ms. Gonci has taken this same in-depth approach to subjects as wide-ranging as the oceans and rain forests. And she's done it with a sense of fun, adventure, and infectious enthusiasm that inspires her students to academic achievements they may never have thought possible.

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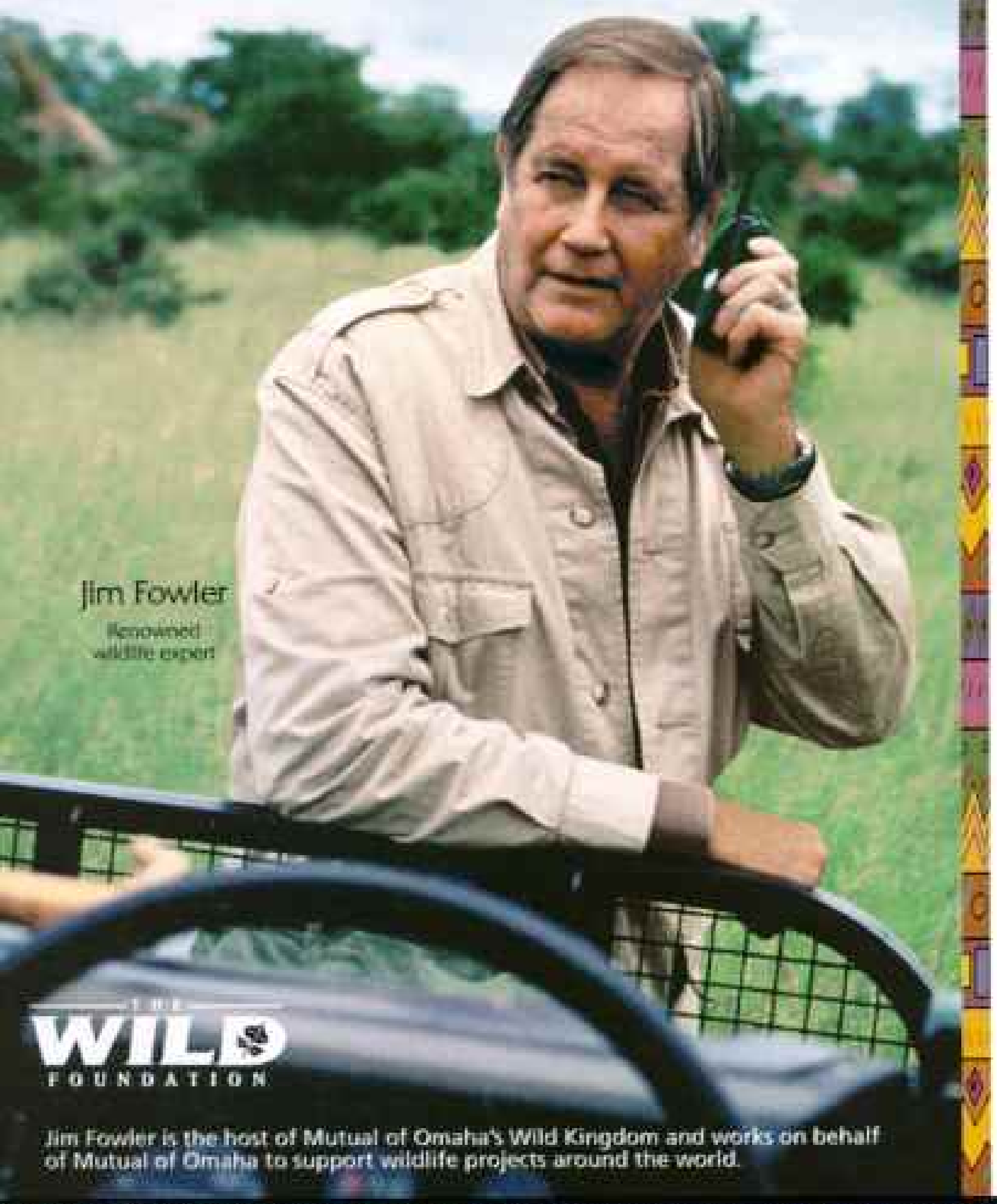

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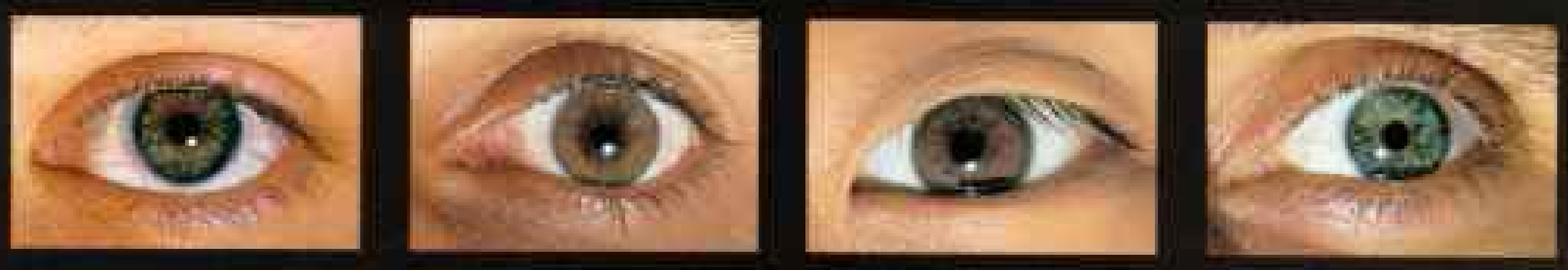
Jim Fowler is the host of Mutual of Omaha's Wild Kingdom and works on behalf of Mutual of Omaha to support wildlife projects around the world.



For Identification, the Eyes Have It

Think of the iris—the colored tissue around the eye's pupil—as a unique bar code: No two people have the same iris tissue patterns, the left iris differs from the right one, and iris patterns remain stable throughout life. Based on this principle, Cambridge University professor and computer scientist John Daugman devised a highly reliable system that can analyze an iris's image, encode its pattern, and match it instantly with patterns in a database.

Now, using iris identification, a Pennsylvania jail identifies visitors and prisoners, a Missouri nuclear power plant controls access to sensitive areas, and U.S. and European banks are testing a system to replace the use of PINs at automatic teller machines.

NGS PHOTOGRAPHER MARK THIESSEN

Arthur, Meet Arthur

JONATHAN BAILEY, ENGLISH HERITAGE PHOTO LIBRARY

For centuries legend and literature have connected the ruined English castle at Tintagel (below) on Cornwall's north coast with the romantic hero King Arthur, though scholars debate the link. Last year University of Glasgow archaeologists, commissioned to excavate the site by English Heritage, a conservation group, found a piece of slate (right) inscribed in the sixth century to read: "*Pater coliavificit Artognov*—Arthnou, father of a descendant of Coll, has had this built." Seeing a name similar to "Arthur," many took it as proof.

Well, maybe. The slate may refer to a sixth-century chieftain named Arthur, who was "a real person, all right," says archaeologist Geoffrey Wainwright. Records kept by Welsh monks say this Arthur was a warlord whose domain included what is now Cornwall. He won 12 battles against invaders, then died in a 13th.

Legends about Arthur of the Round Table emerged later. A 12th-century Welsh writer, Geoffrey of Monmouth, first made the king a heroic figure and associated him with Tintagel. The tale was embellished in the 15th century by Sir Thomas Malory in *Le Morte Darthur*, and other versions followed.

The excavators, who have worked at Tintagel since 1990, have unearthed elaborate stone buildings, as well as Mediterranean pottery and glass. The finds indicate that the site was a high-status castle, perhaps the home of the warlord. "We know that a person called Arthnou was living at Tintagel in the right time in the right context," says Wainwright.

If Arthnou was Arthur the chieftain, is he also Arthur of the Round Table? That remains a mystery.

SKYSCAN BALLOON PHOTOGRAPHY, ENGLISH HERITAGE PHOTO LIBRARY

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VALUE AWARDS:

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1998 SmartMoney "A Bu
1997 Kiplinger's "Best R
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1987 J.D. Power and Associates "Number One Minivan in Customer Satisfaction"1*

VALUE AWARDS	**20**
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Design and Engineering Awards	**30**

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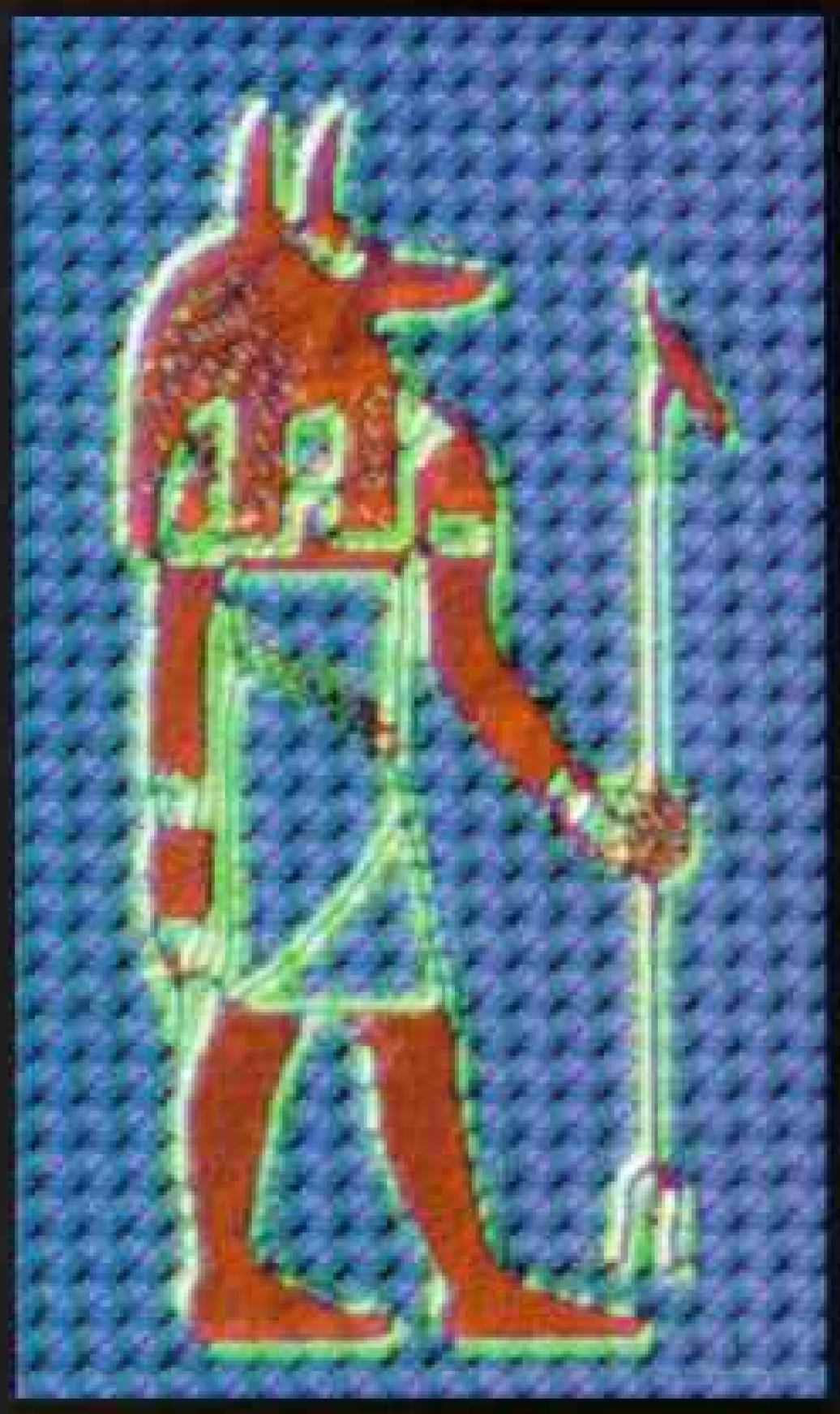
Art for Art's Sake—on a Chip

Cheetahs and Egyptian gods, license plates and wedding photographs, birds and dogs and college mascots, Groucho Marx, and dozens more—all on the tiny microprocessors that run computers? After Michael Davidson, who makes photo images through high-powered microscopes, spied an image etched onto a chip's metal circuitry —an elusive Waldo character so small that "three of him would fit on a human hair"—he sought others. A website, Silicon Zoo, displays his finds. Why would chip designers add such creations? "Why does any artist sign his work?" asks Dan Zuras, who crafted a tiny roadrunner. "We did it because it was hard work we were proud of. But mostly we did it because we *could*."



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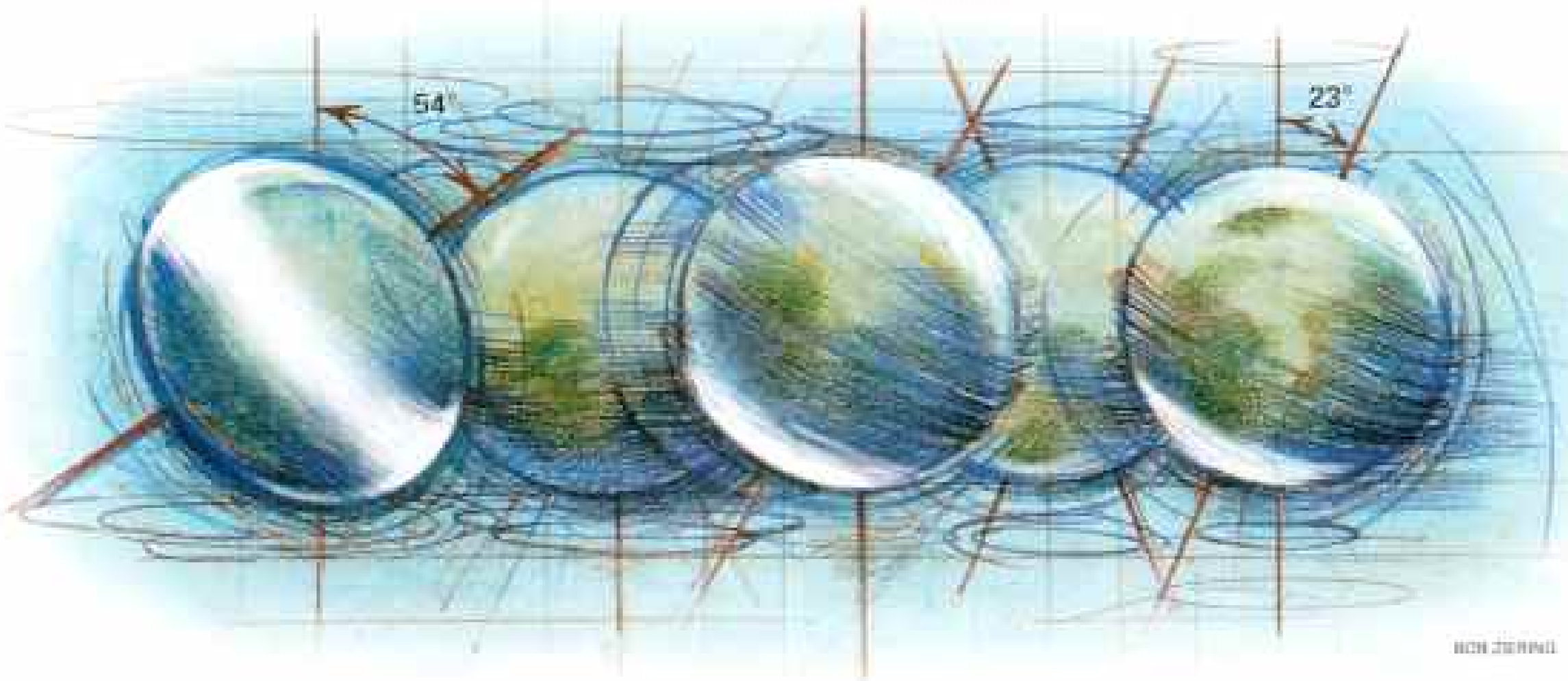


BOB ZUCKER

As the World Turns —and, Maybe, Tilts

How is it that ice blanketed the Equator 600 to 800 million years ago, yet marine plants requiring the sun's rays for photosynthesis survived—wouldn't the whole globe have been under ice?

Not necessarily, say Pennsylvania State University scientists who propose a novel hypothesis: At that time the Earth's axis tilted at an angle much greater than the present 23 degrees. They suggest the tilt exceeded 54 degrees, so the Poles received more sunshine than the Equator, and glaciers could form in the tropics while the Poles remained ice free.

During the next 150 million years the tilt was reduced to 23 degrees by changes in the Earth's shape resulting from colossal ice sheets that cyclically formed and melted in a time of intense glaciation. This process could occur only if the climate was colder than it is today, most continents were clustered near the South Pole, and the ice sheets were at high latitudes.

"It would have taken very special circumstances, but it could have happened," says lead scientist Darren Williams.

■ NGS RESEARCH GRANT

Valuable Cargo but Few Defenses

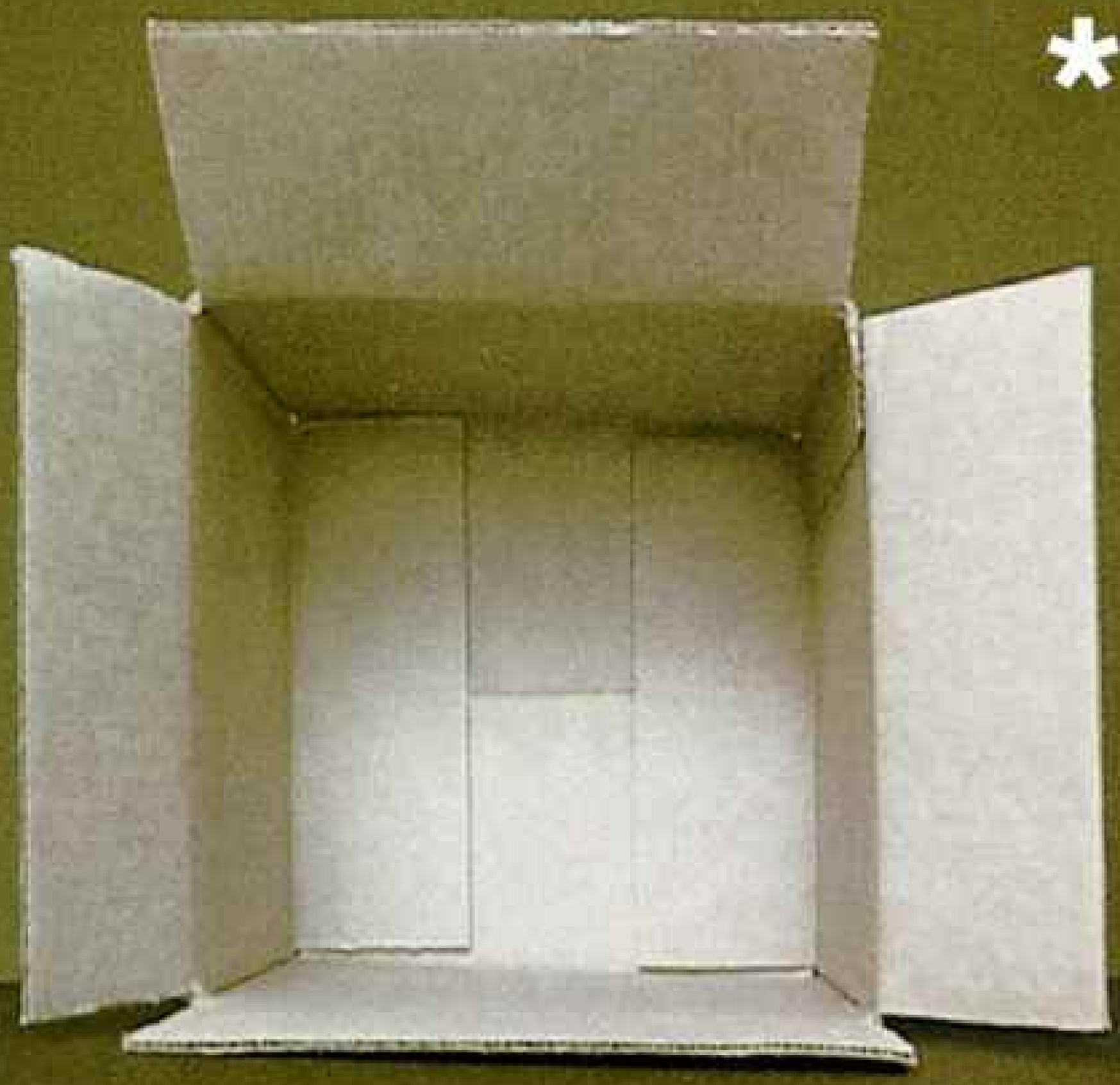
The 18th-century ship was more than 160 feet long, and its cargo was large and varied: at least 2,500 clay jars used to cool drinking water (right), thousands of porcelain cups, piles of wood, bags of coffee, hundreds of pounds of resin, and stores of grapes, figs, olives, and hazelnuts. But to the archaeologists who spent three years excavating the vessel (bottom), which sank near Sadana (Sadan) Island off Egypt's Red Sea coast, it was what *wasn't* there that caught their attention—no heavy weaponry.

BOTH BY MEREDITH KATZ

"We found a few musket balls, but there were no cannon and no shot on the ship," says Cheryl Ward of Texas A&M University at Galveston, who led the excavation. "That makes us sure it was operating only in the Red Sea, away from pirates on the Indian Ocean."

Ward thinks the ship called at ports like Mocha in Yemen and Jeddah in Saudi Arabia. Its Muslim crew may have been led by a captain named Mahmoud Musa —identified by an inscription on a copper cooking basin.

TEXT BY BORIS WEINTRAUB



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Forum

Several readers of the May 1999 issue responded to the Editor's column on the debate surrounding the Whydah *exhibit. While one said that she "found it interesting that 18th-century looters are now being looted by 20th-century looters," another wrote, "Shame on the jealous sinecures who censored the displays. Discoveries are made digging dirt, not throwing it."*

The Caspian Sea

On the door of the remote cabin shown on page 26, surrounded by the relics and photographs of a past U.S.S.R., is a small poster. On closer inspection with a magnifying glass my suspicion was confirmed. It's Jimi Hendrix, playing his guitar on an American flag. If I remember correctly, he was at the 1967 Monterey Pop Festival. The Azerbaijani fisherman must have thought Jimi was a comrade!

ROB SPRINGETT
San Rafael, California

The caption for the photograph on page 26 states, "a former phone company technician in Azerbaijan can gaze at portraits of Stalin and Brezhnev and remember better days." The photograph on the wall is not Stalin. It shows a hairless upper lip. Stalin was never photographed for public consumption un-mustachioed.

JOHN GLAUS
Rumford, Maine

A computer enlargement by our photo lab reveals the mustache, as well as the portrait's Cyrillic caption. Transliterated into English, it reads: "Joseph Vissarionovich," which was Stalin's patronymic name.

As I leafed through your article depicting the economic effects of oil drilling near the Caspian Sea, I was extremely moved by the picture on pages 20-21. There, amid industrial debris, stood a tattered refugee tending a horrifyingly oil-polluted and barren garden. Although her head is shrouded by her scarf, her hands aptly express her despair and frustration. It should be every human's right to grow food. Countries may topple; economies may crumble; only the Earth remains our constant. If ever there was a poster child for oil pollution, this Azerbaijani woman says it all.

MELANIE GAENSSLEN
Jupiter, Florida

Africa's Wild Dogs

A few years ago I saw wild dogs disembowel a large kudu in the Moremi preserve. Within a half hour all that remained of the animal was a circlet of bare ribs and other bones, while outside the nearby den those dogs that had gorged were regurgitating for their pups. Your amazing photographs and cover story tell of the dogs' lives with great sensitivity.

KATHRYN COKE RIENHOFF
Baltimore, Maryland

My husband and I just returned from a trip to Mala-Mala, a private game reserve in the northeastern-most part of South Africa, next to Kruger National Park. One of the highlights of our trip was coming upon a pack of 19 African wild dogs. They were waking from their afternoon nap, and we had the opportunity to watch them hunt a jackal, then a wildebeest (both unsuccessfully) later that afternoon. They headed in the direction of a group of lionesses, but the two groups never met. After reading your article, I wondered what would have happened if they had!

COLLEEN WALSH BERG
Cary, North Carolina

Readers who want to know more about the African wild dog and its conservation status can find that information on the Web page of the Canid Specialist Group of the International Union for the Conservation of Nature. The 1997 African Wild Dog Status Survey and Action Plan, the most comprehensive report on the species now available, can be found at *http://users.ox.ac.uk/~wcruinfo/csgweb/*.

JIM SCARFF
Berkeley, California

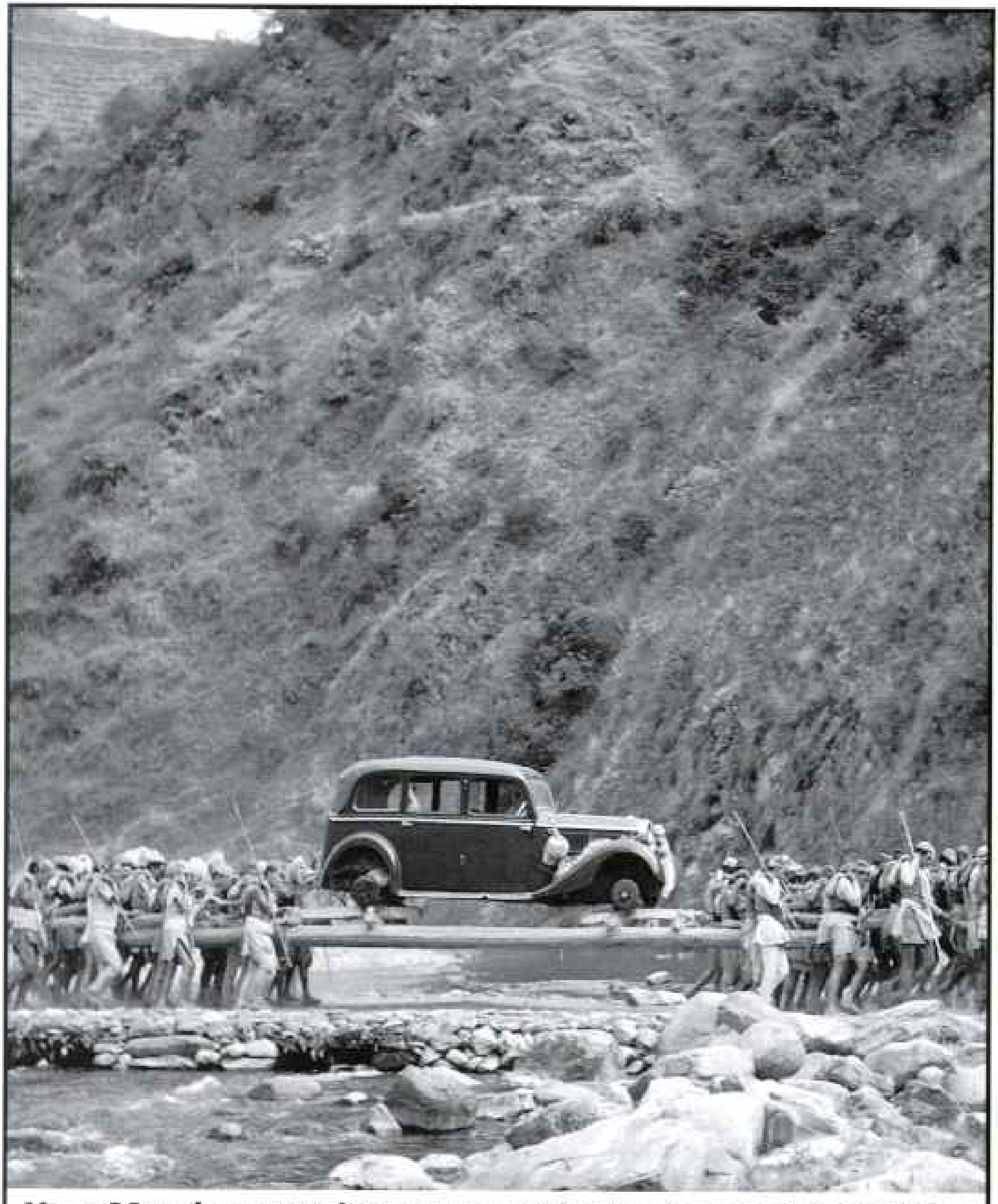
I believe the excellent article by Richard Conniff on Africa's wild dogs will raise the public image of these much maligned creatures. This year at Crufts, Britain's most prestigious dog show, we at the David Shepherd Conservation Foundation launched a campaign to help save the last remaining wild dogs. I encourage those who would like to support wild dog conservation to contact us at 61 Smithbrook Kilns, Cranleigh, Surrey GU6 8JJ.

HELEN MEEKING
Cranleigh, England

Pirates of the *Whydah*

I was at first delighted and then flabbergasted at the article and editorial comment regarding the *Whydah* galley pirate ship. I discover that my children and I are now among a fortunate few who have been lucky enough to visit the *Whydah* exhibit, this when it visited Edinburgh, Scotland. As well as pirate hats, pirate eye patches, pirate pencils, and pirate erasers, my children left the exhibit with history vivid and alive in their minds. They were shocked by the conditions for slaves on a slave galley, thrilled by the pirates' story, and fascinated with the discovery and restoration of the artifacts from the *Whydah*. The Edinburgh exhibit did no disservice to history or academic research. I guarantee it sowed seeds of interest in young minds, which can only be of benefit to all disciplines involved.

JAMES T. PAXTON
Ayrshire, Scotland



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Missouri Breaks

In the summer of 1977 my parents sent me to visit my cousins in Jordan, Montana. At that time it was pointed out to me, as your article has over 20 years later, that Garfield County was about the size and shape of the state of Connecticut but with only 1,500 citizens. At the end of the summer I went home to a medium-size town and attended a medium-size high school of about 1,800 students. It is so nice to see your article independently state what all my friends thought I was exaggerating.

HANK McDONALD
Kent, Washington

Your article brings back memories of hitchhiking out West 30 years ago. Broke, tired, and in need of a good meal, I spent a week on the Lipke Ranch just outside of Hilger. I still think of the bunkhouse, the stringing of fences (and the blisters they put on my "eastern" hands), and the people who worked so hard to make a life in those wide open spaces.

SID AMSTER
Cherry Hill, New Jersey

The article on the Missouri Breaks captivated me from start to finish. I can identify with the author's friend Boone and his wish to move back to the middle of nowhere. I live in the cramped suburbs of Kuala Lumpur, with every modern convenience just a ten-minute walk, and long for a home on an isolated hill or on the fringe of the jungle.

VERONICA ALBELA
Kuala Lumpur, Malaysia

No wonder the land featured in the Missouri Breaks article is so thinly settled—judging from the photographs, the population is exclusively male. The few children also appear to be boys, so obviously this group propagates by budding. Deep within the article a waitress and a wife are quoted, but the overall impression is unpleasantly similar to 1950s textbooks filled with heroic pioneers toiling for passive wives and children.

DEBBIE LEVEY
Brookline, Massachusetts

Ants and Plants—Friends and Foes

Because of an incident I experienced in the spring of 1998, I got quite a chuckle out of Mark Moffett's article. A carpenter ant colony decided to construct its nest in a drawer containing my tax documents, which were made of paper, a plant material. Ants processed most of these documents into "mulched plant material called carton" (page 104). Now if the tax man comes calling for an audit, I'll have quite a story to tell—and I'll use your article to back it up!

NUNZY GAREFFA
Lunenburg, Ontario

From the Editor

I applaud Editor Bill Allen's sensible recognition that commercial salvagers and professional archaeologists can and should work together to ensure that shipwrecks are recovered in an appropriate manner for the public good. The technology now exists to find and recover any object lost in the deep ocean; the only hindrance is cost. Entrepreneurs have the financial resources to conduct recovery operations, but they often lack the scientific expertise to do so in an archaeologically sound manner. Archaeologists have the scientific expertise, but they often lack the funds. Nevertheless, the two sides generally refuse to work together. I hope Mr. Allen's remarks will help the process of reconciliation.

DAVID G. CONCANNON
St. Davids, Pennsylvania

Your May editorial states that the missions of archaeologists and treasure hunters are not irreconcilable, and that the National Geographic Society exhibits artifacts from a treasure hunt because they "provide an important glimpse into early 18th-century pirate life."

Artifacts from looted tombs "provide an important glimpse into early" Egyptian or Maya life, so my students ask if archaeologists should cooperate with tomb robbers, whom National Geographic condemns. What do I tell them? You accept the treasure hunters' claim that sites won't be excavated by archaeologists because they are "perpetually underfunded," yet you have published nearly a dozen articles on the excavations of unique wrecks my colleagues and I have conducted in the Mediterranean over the past four decades.

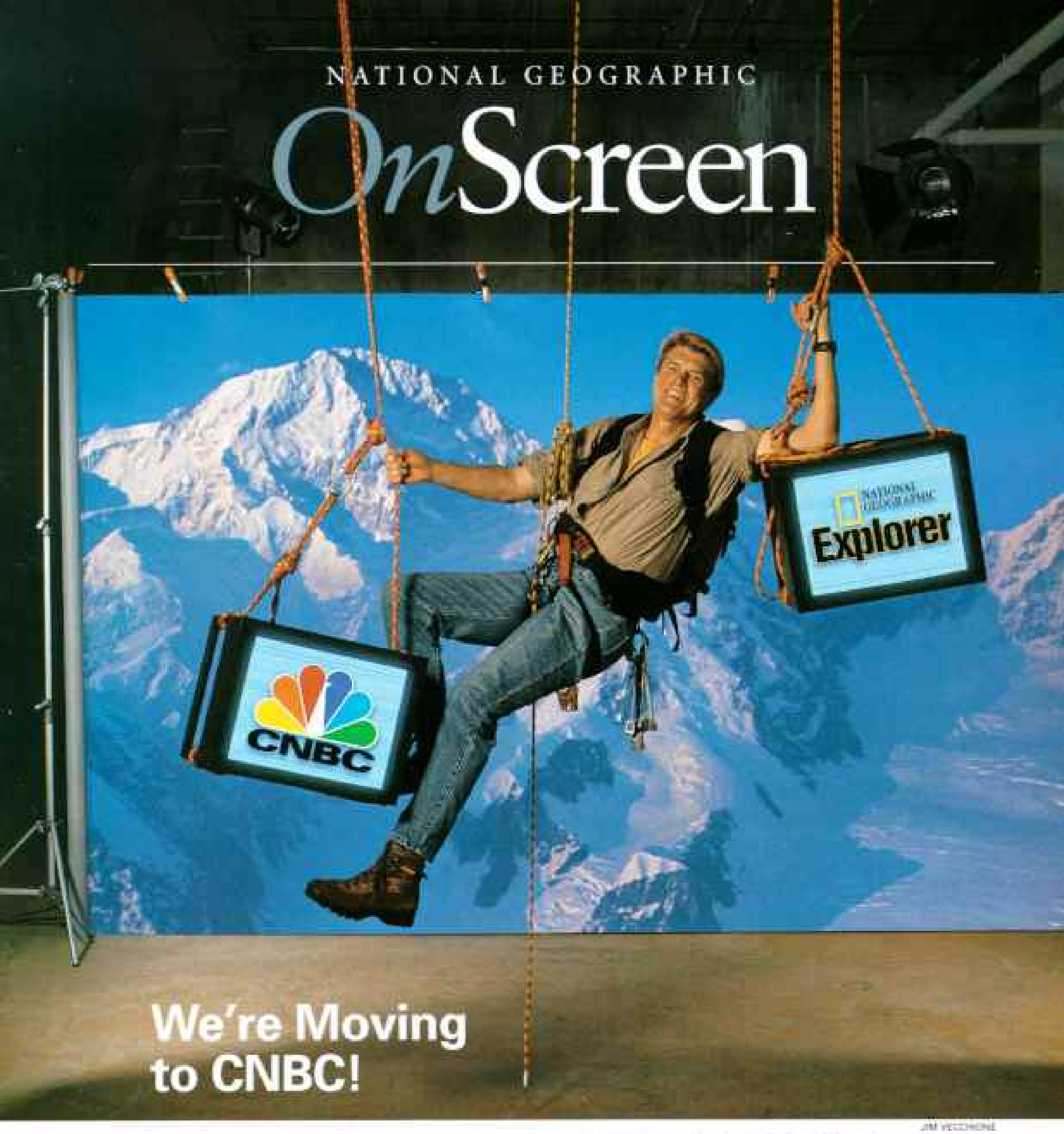
Well-funded ship excavations in Australia, Sweden, Denmark, France, Turkey, Israel, Cyprus, Great Britain, the Turks and Caicos Islands, and the United States have profited the peoples of those countries both financially and culturally, through museum displays, far more than any treasure hunts.

GEORGE F. BASS
Abell/Yamani Professor, Nautical Archaeology Program
Texas A&M University
College Station, Texas

Nautical archaeologists and treasure hunters must learn to work together if the public is to benefit fully from the knowledge and fascination of discovery.

DONALD G. GEDDES III
Board Member Emeritus
Institute of Nautical Archaeology
New Orleans, Louisiana

Letters for FORUM should be sent to National Geographic Magazine, PO Box 98198, Washington, DC 20090-8198, or by fax to 202-828-5460, or via the Internet to ngsforum@nationalgeographic.com. Include name, address, and daytime telephone. Letters may be edited for clarity and space.



JIM WEDEKIND

Gear up for adventure as National Geographic EXPLORER premieres on CNBC in a season launch filled with eye-popping footage of venomous snakes, giant crocs, ancient mummies, and mountaineering feats. This move is a homecoming of sorts for host Boyd Matson (above), who served as an NBC correspondent before signing on to his "dream job" with EXPLORER in 1994. Not usually found hanging around a studio, Matson was a good sport for the three-hour shoot that suspended him against a backdrop of snowy Alaska peaks. "I must admit it was a nice change from the hypothermia, altitude sickness, broken bones, and animal bites that can happen in the field," he noted.

EXPLORER makes its CNBC debut September 5, airing weekend nights at 8 p.m. ET/PT with a lineup that will take viewers to the ends of the Earth and the edge of their seats.

■ PROGRAM GUIDE

National Geographic EXPLORER
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Allison Wignall helped raise more than $350,000 to fight AIDS

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Allison Wignall
1999 Prudential Spirit of Community Award Honoree

Allison Wignall, 18, of Newton, Iowa, has been volunteering her time – and talent – to promote AIDS awareness and prevention since the age of 12. She's performed in benefits, recorded an album featuring a song about AIDS, distributed red ribbons and served as chairperson of a major fund-raising campaign. Allison's hard work and dedication has helped raise more than $350,000 for her cause – and earned her a 1999 Prudential Spirit of Community Award.

Do you know a young person who deserves recognition? Prudential created the Spirit of Community Awards in partnership with the National Association of Secondary School Principals to honor young people like Allison in grades 5-12 for outstanding community service. And right now, we're looking for award candidates for the year 2000. If you know a young person who's made a difference in the community, we want to hear about it.

Awards are given at the local, state and national levels. Applications will be available in September through middle schools, high schools, Girl Scout councils and county 4-H organizations. Local honorees are selected in November and become candidates for statewide honors, a $1,000 prize and a trip to Washington, D.C. At a special ceremony in the nation's capital, ten national honorees will each receive a $5,000 award, a gold medallion and a crystal trophy.

Help us find next year's honorees! If you know any volunteer-minded students, encourage them to apply. The application deadline is October 29, 1999. For more information, call **1-800-THE-ROCK, ext. 1143.**

Prudential

This program is supported by the American Association of School Administrators, the Council of the Great City Schools, the National Middle School Association, the National School Boards Association, the National School Public Relations Association, Girl Scouts of the U.S.A. and the National 4-H Council. The Prudential Insurance Company of America, 751 Broad Street, Newark, NJ 07102-3777.

NATIONAL GEOGRAPHIC

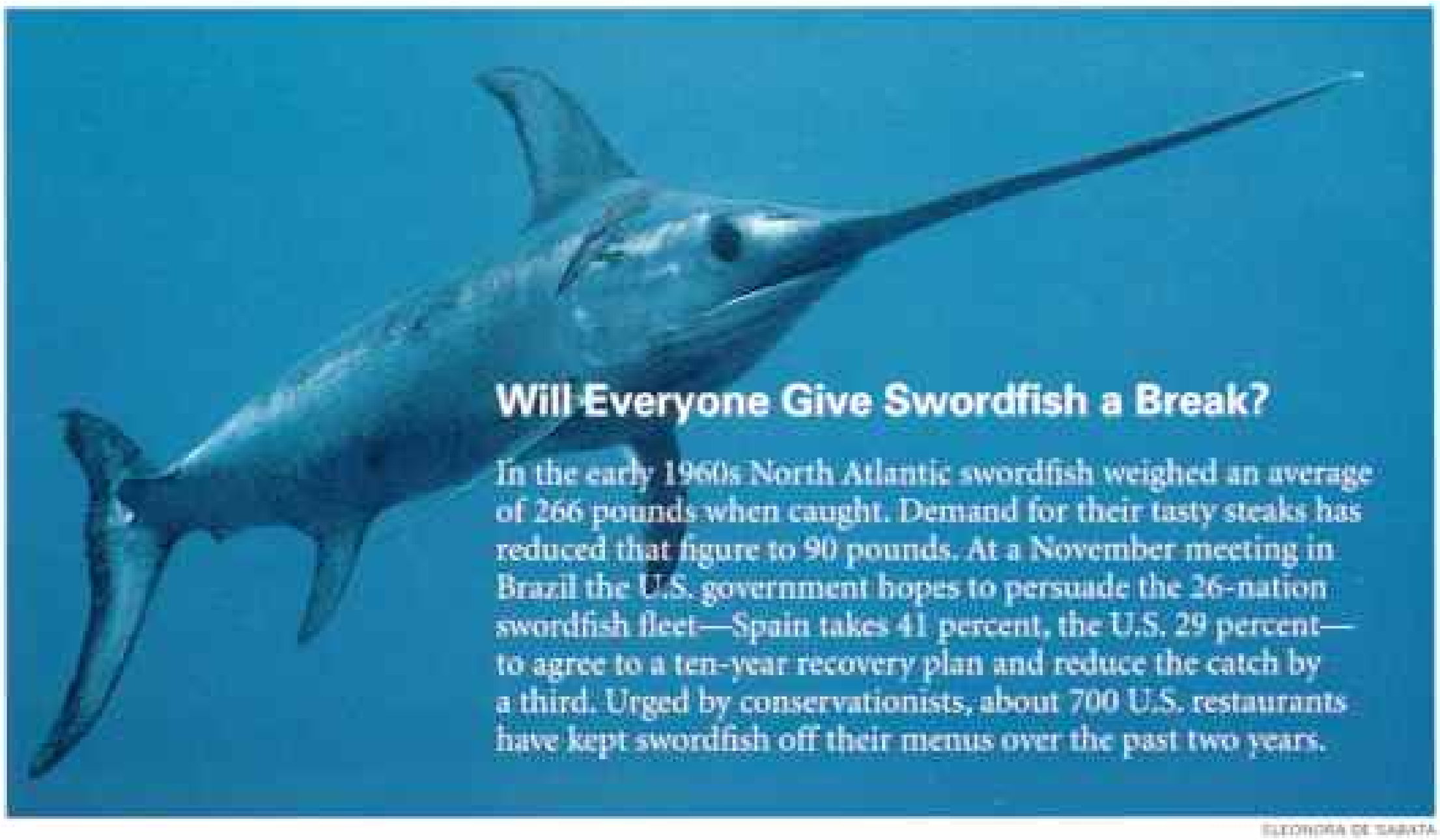
EarthAlmanac

Bad Chemistry for Britain's Predators

Carrying a rodent for a midnight snack, a barn owl wings past a village church in Sussex, England. But the meal in its beak may be harmful. Britain's rats and mice are becoming increasingly resistant to pesticides designed to kill them. Anticoagulant poisons, including rodenticides, were introduced in the 1950s. Some rodents can tolerate both the early chemicals and newer, more powerful ones. When the rodents are eaten by foxes, weasels, and birds of prey such as rare red kites, the toxics they've accumulated are passed on to those animals.

For years Ian Newton and his colleagues at the Institute of Terrestrial Ecology have tested barn owl carcasses for toxics. Thirty-eight percent of those tested in 1996 contained toxics, compared with only 5 percent in 1983.

STEPHEN DALTON, NHPA



ELEONORA DE SABATA

Will Everyone Give Swordfish a Break?

In the early 1960s North Atlantic swordfish weighed an average of 266 pounds when caught. Demand for their tasty steaks has reduced that figure to 90 pounds. At a November meeting in Brazil the U.S. government hopes to persuade the 26-nation swordfish fleet—Spain takes 41 percent, the U.S. 29 percent—to agree to a ten-year recovery plan and reduce the catch by a third. Urged by conservationists, about 700 U.S. restaurants have kept swordfish off their menus over the past two years.

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Seals Are Stars With "Seal Cam"

Observation is crucial to science, but keeping an eye on an animal that can dive a thousand feet below Antarctic sea ice is no easy job. To study the underwater behavior of Weddell seals, a team led by Randall Davis of Texas A&M University attached a miniature video camera to one of the deep divers. Retrieved when the seal returned to a breathing hole, the camera recorded a new hunting technique: The seal blew bubbles into the underside of the sea ice to flush fish from crevices.

RICHARD STONE

Rain Forest Ruler: the King Vulture

With a crown of many colors, a king vulture perches 80 feet high in the Peruvian Amazon. When it dives on six-foot-wide wings toward a carcass, the wind roars through its feathers. On the ground other vulture species scatter. Royalty is arriving.

Little is known of the kings. During courtship display both sexes stoop, arch their necks, and dance, says Marsha Schlee of the Natural History Museum of Paris. Deforestation threatens the birds in Central and South America, she adds.

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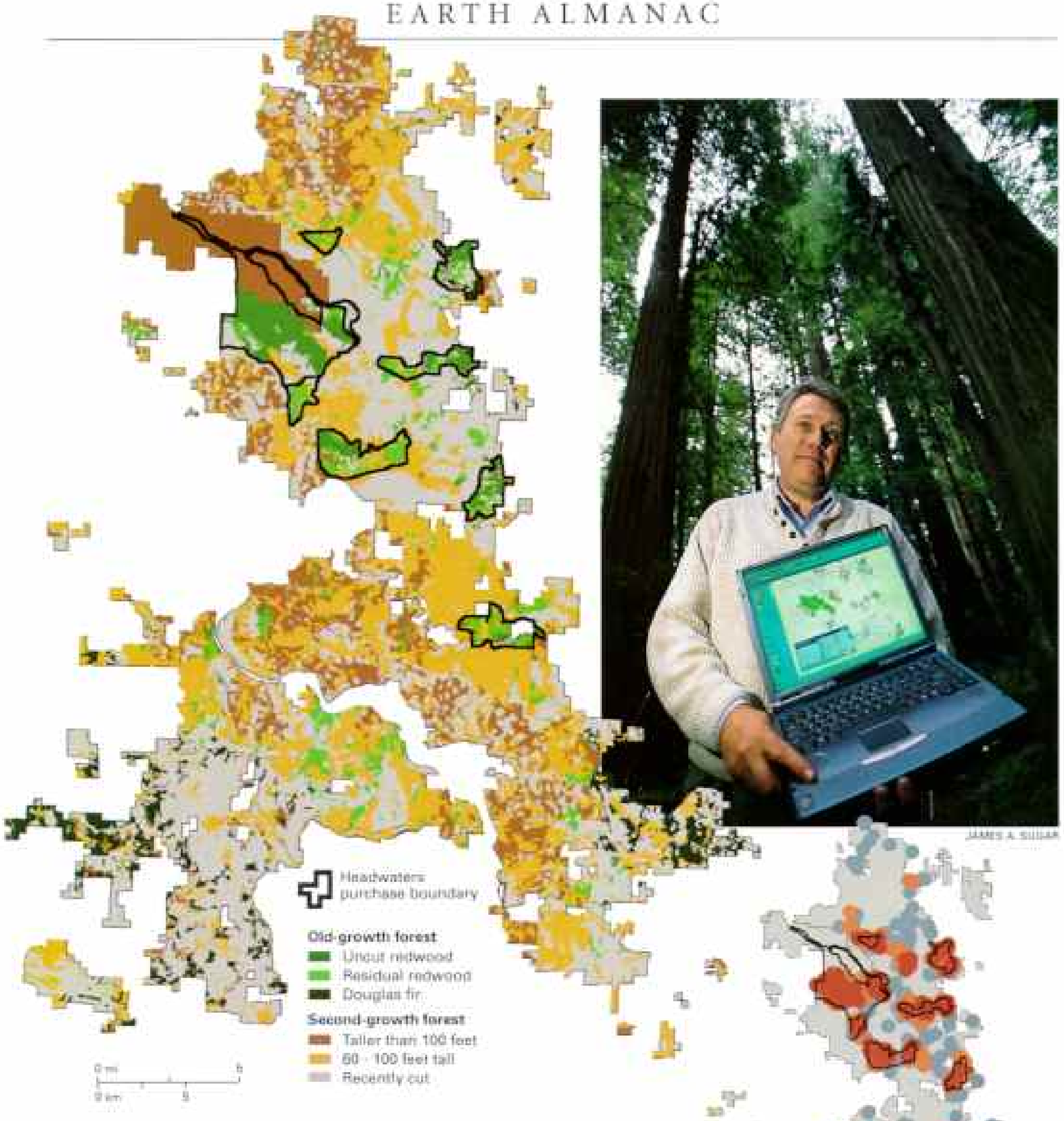
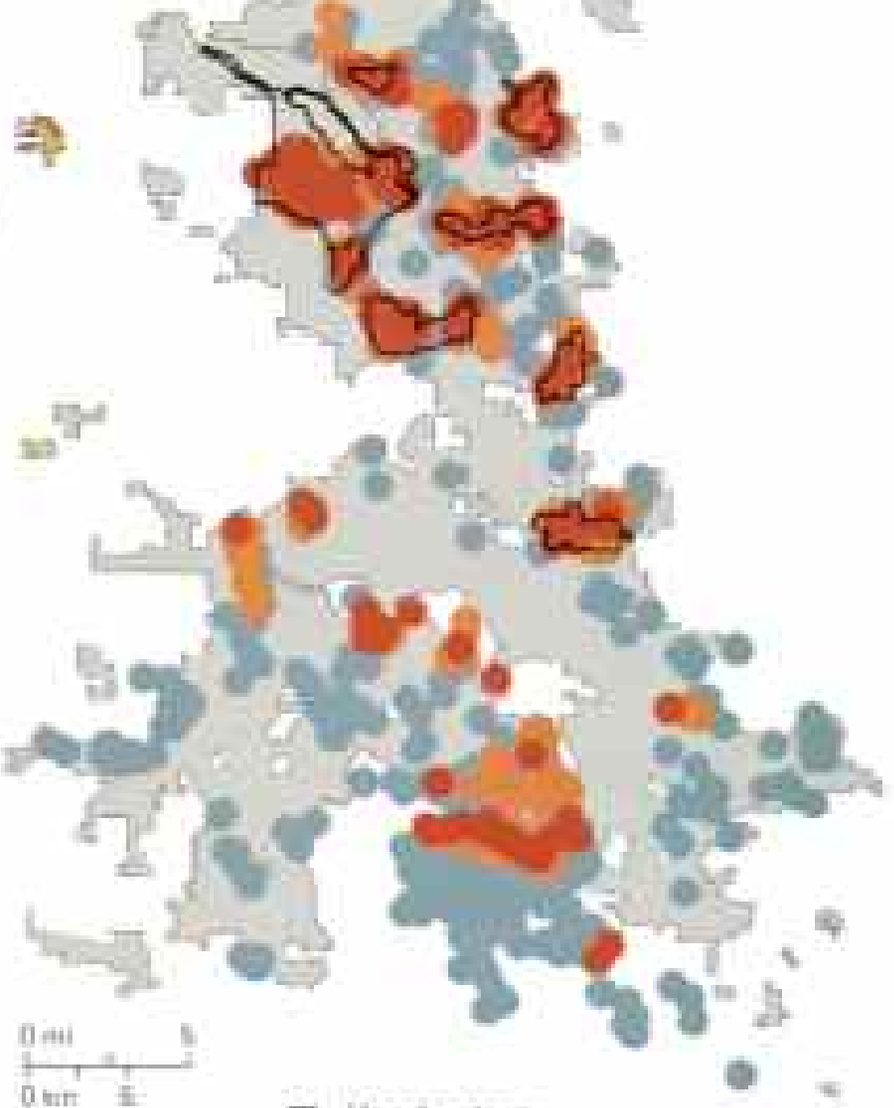


JAMES A. SUGAR



Mapping a Pact to Save Ancient Redwoods

After a decade of protest and negotiation, a deal was hammered out last March to preserve northern California's Headwaters Forest, the largest stand of old-growth redwoods still in private hands. Amid the acrimony Thomas S. Reid (above right) and his colleagues "listened hard to figure out where people were hung up." To help negotiators weigh the trade-offs of various proposals, Reid's consulting firm used computerized maps showing timber stands (above), endangered seabird nesting areas (right), and other information. In the end the federal and state government agreed to pay Pacific Lumber Company close to a half billion dollars for the 7,500-acre Headwaters grove and nearby tracts. Pacific Lumber, in turn, signed on to a plan that bans logging for at least 50 years in a dozen other old-growth groves.

TEXT BY JOHN L. ELIOT

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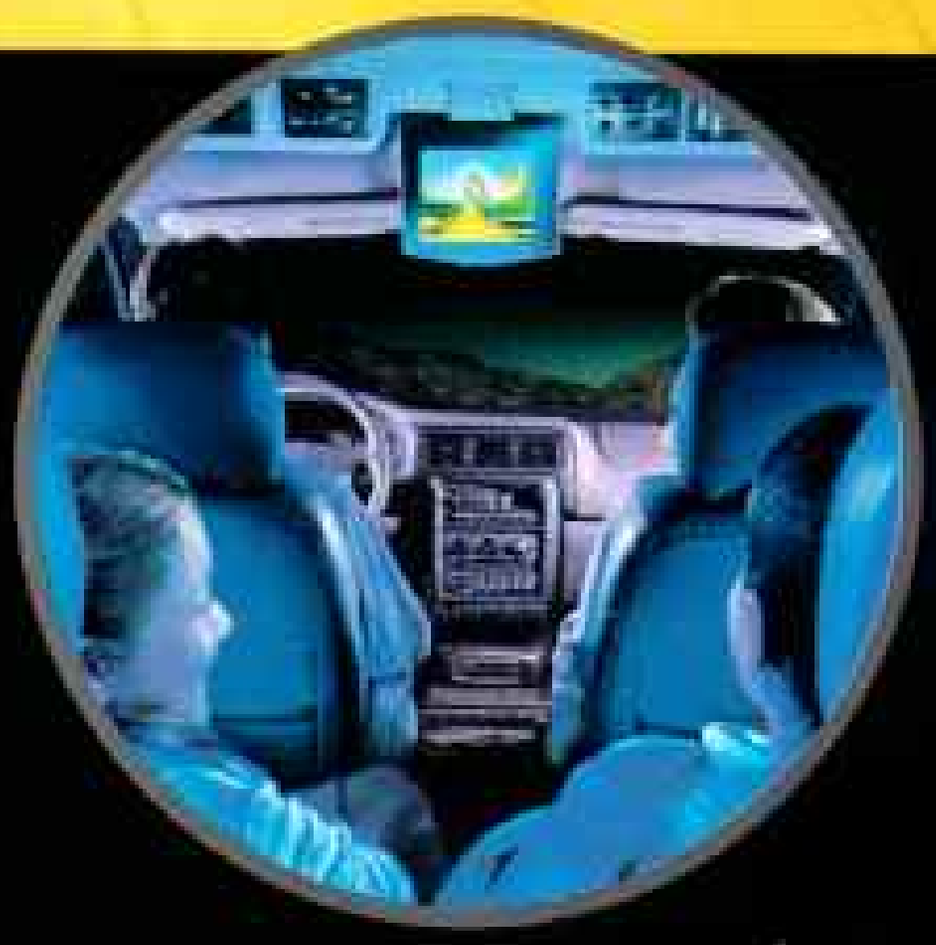

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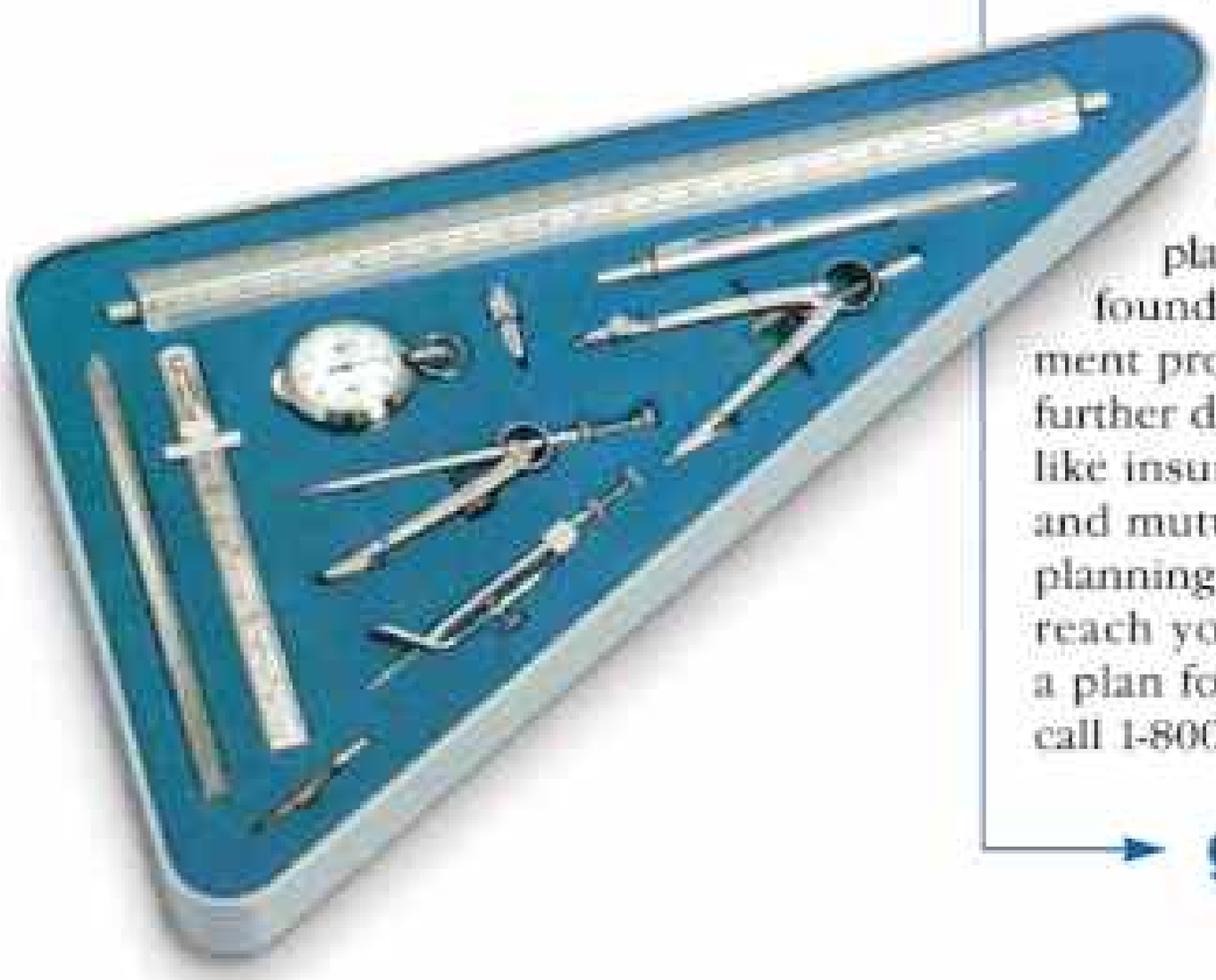

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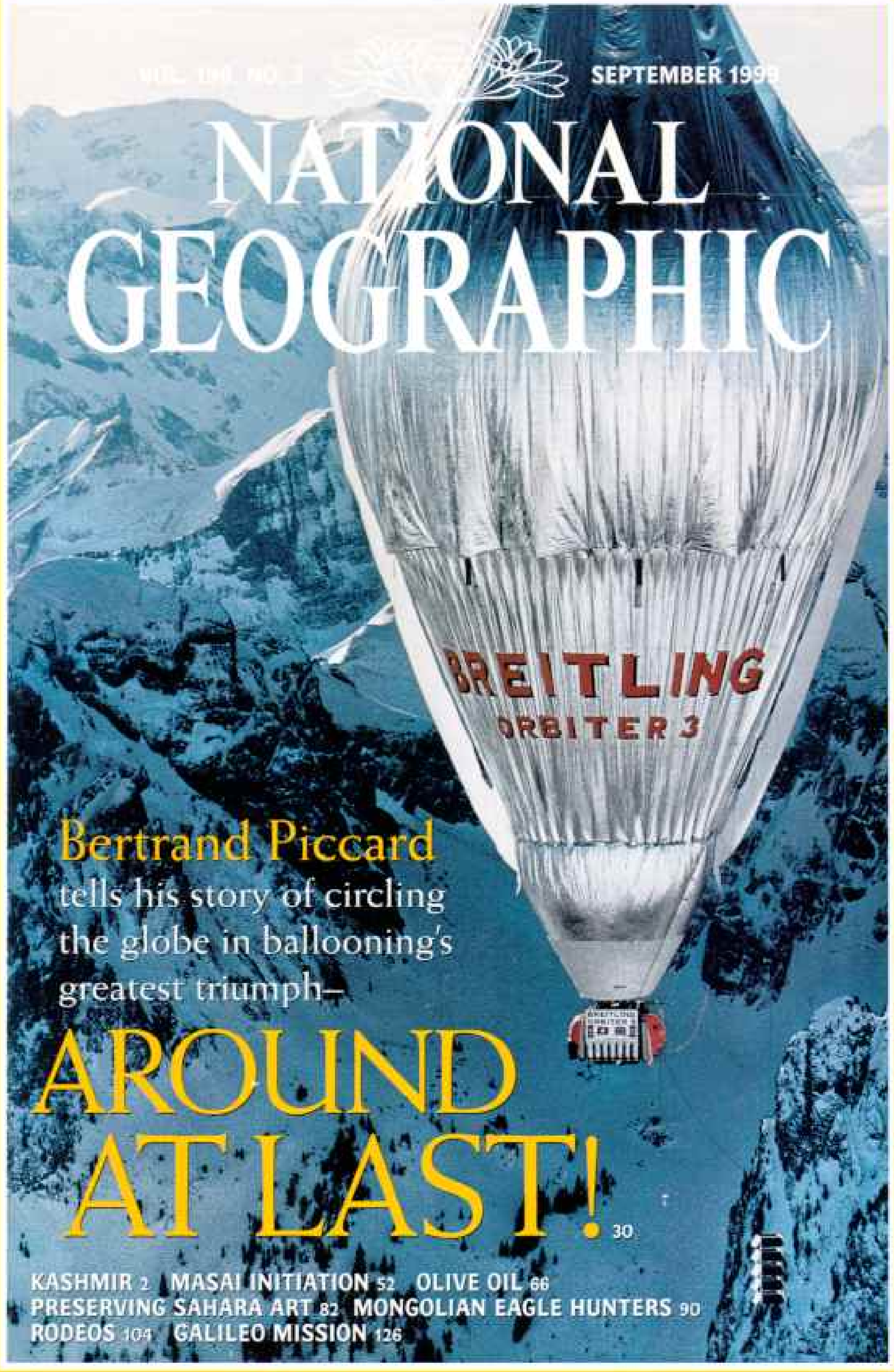
VOL. 194 NO. 3

SEPTEMBER 1998

NATIONAL GEOGRAPHIC



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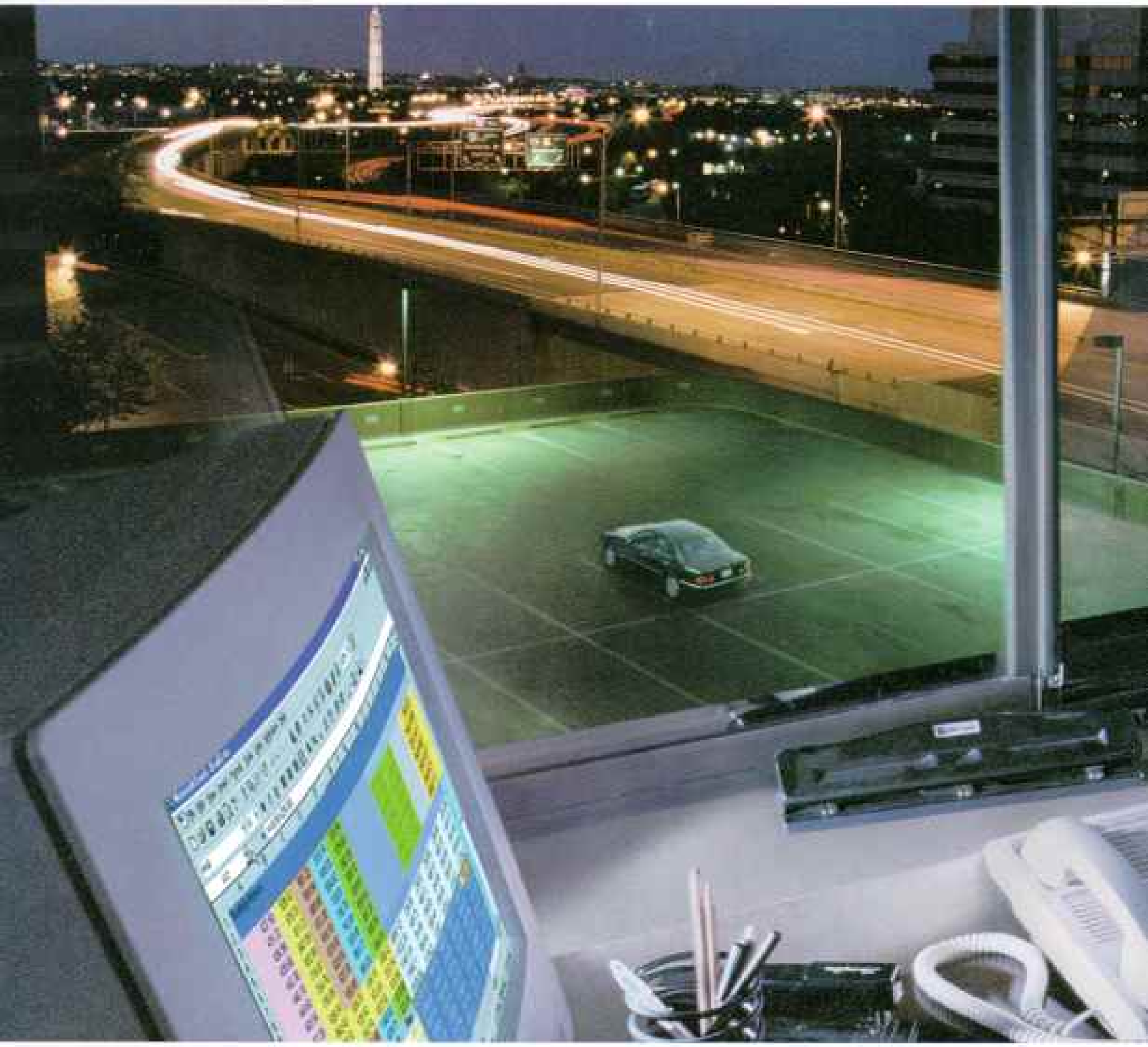

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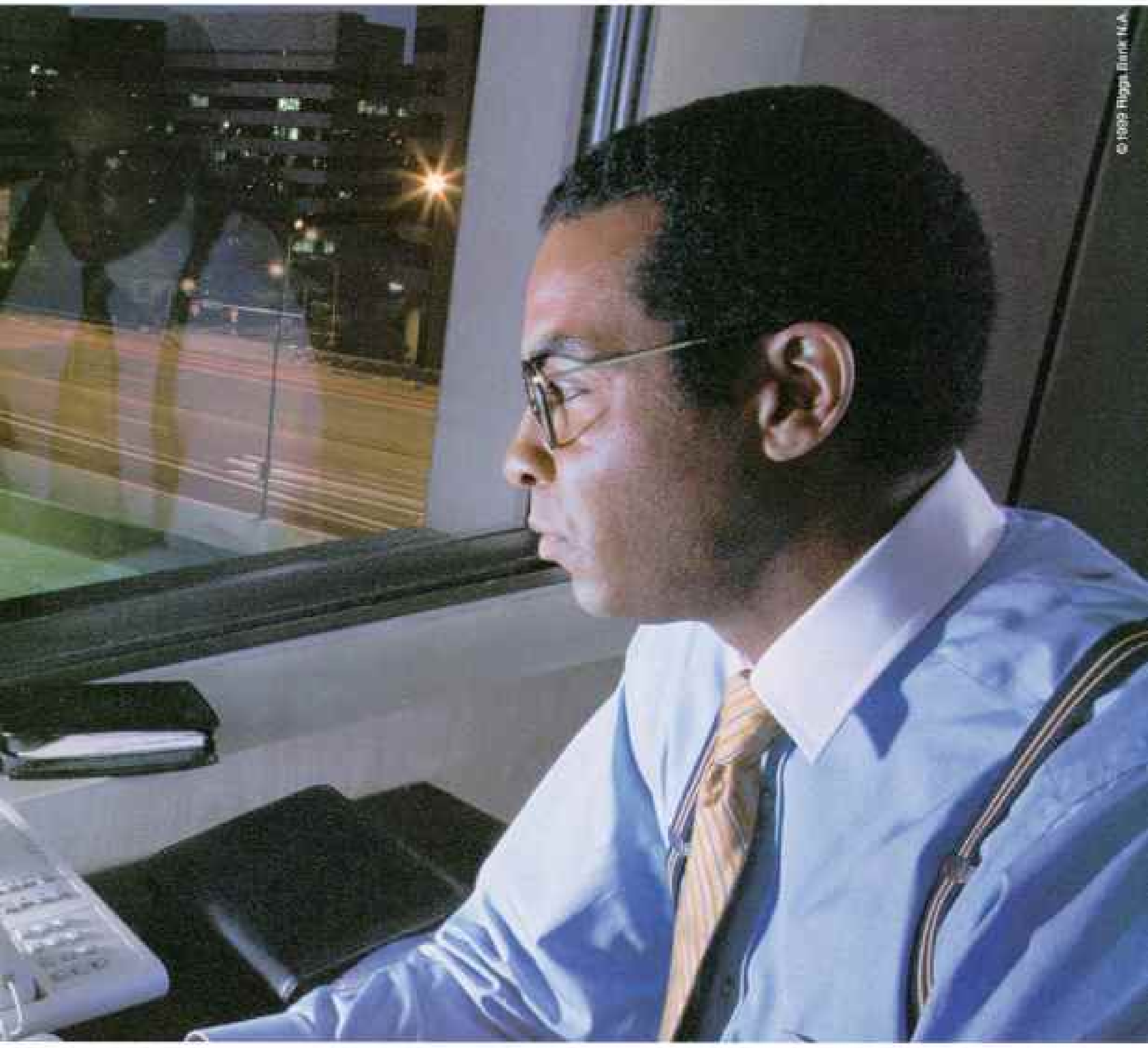

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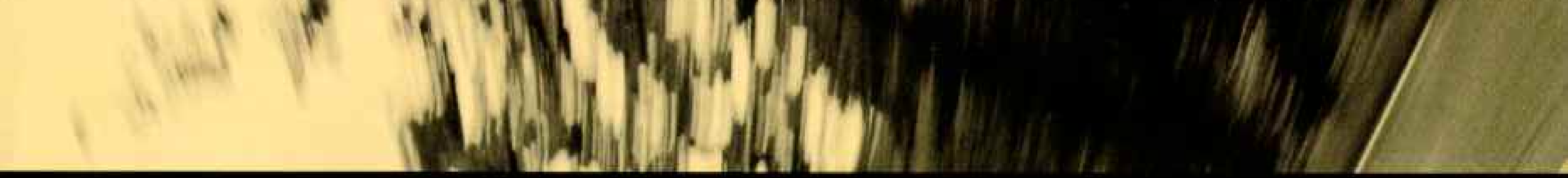

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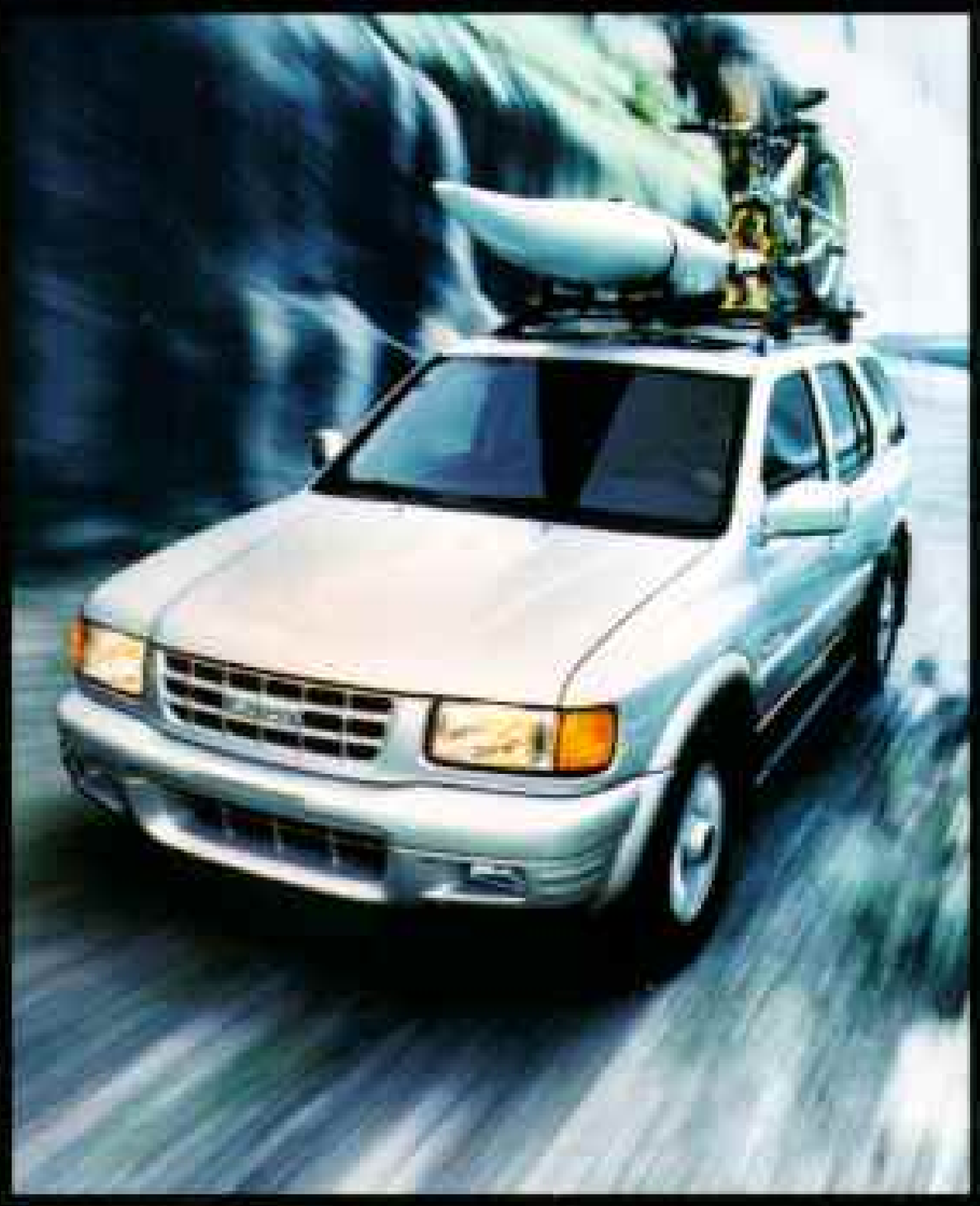

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VITTORIO SELLA

■ FROM THE GEOGRAPHIC ARCHIVES

Kashmir's Floating Assets

"A large part of the population of Srinagar lives afloat," wrote Florence H. Morden in our October 1929 article "House-Boat Days in the Vale of Kashmir," for which this photograph—never before published in the magazine—may have been purchased. "The best are comfortable and well-furnished houseboats, such as one might see upon the River Thames."

For this article Morden spent a summer on a craft called the *Melisande*, but she seemed more interested in shopping opportunities than geography. "The native industries of Kashmir, alas, have cheapened and some have almost died out entirely," she wrote. "No longer, for instance, can one procure the very finest shawls, such as made the name of Kashmir famed throughout the world. One can get good shawls, soft and fine, but the exquisite, old-time shawls are hardly to be found outside of museums."

The sky keeps

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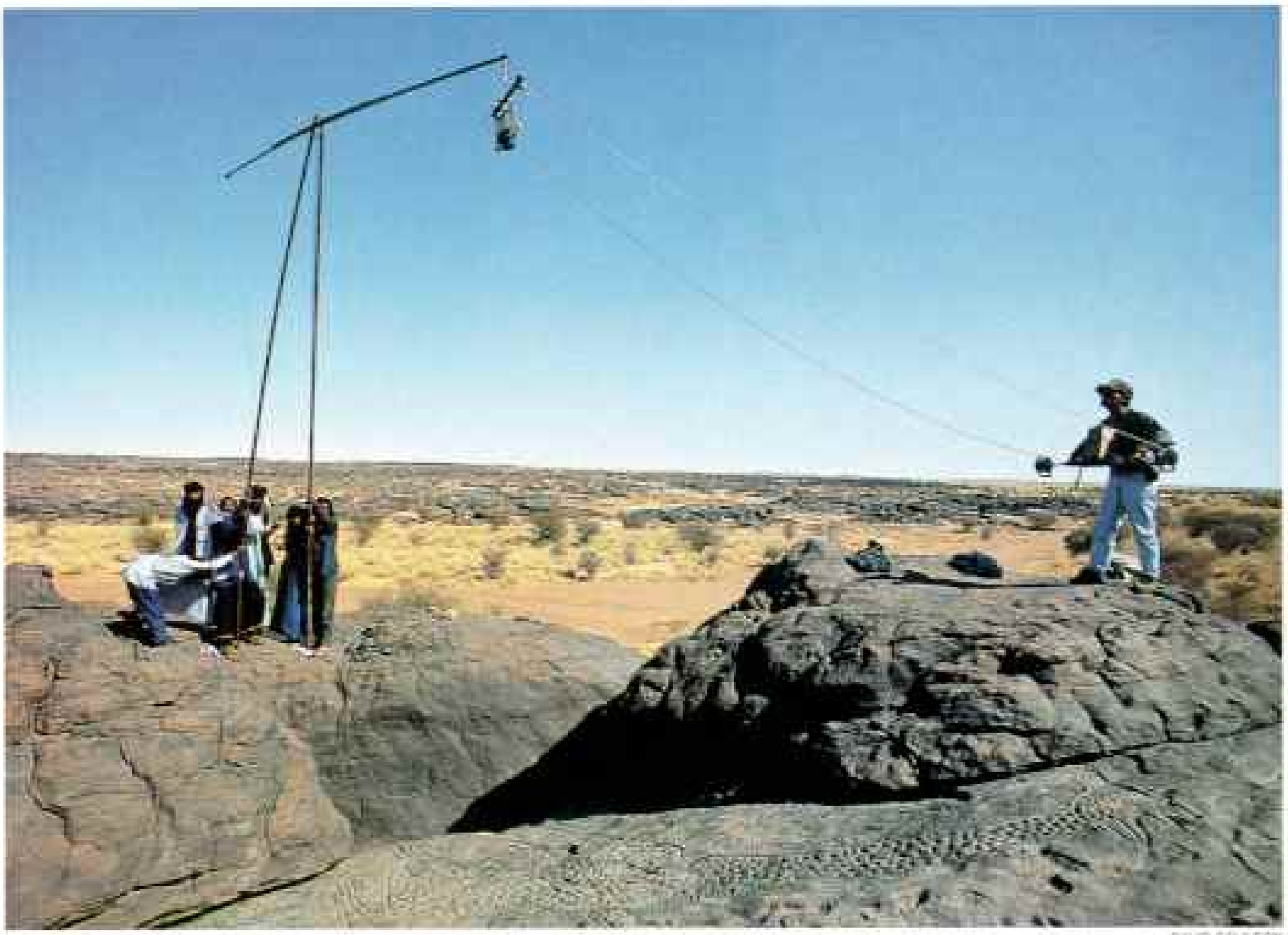

DAVID COULSON

Improvising in the Sahara

In the 16 years I've worked as a photographic technician at National Geographic, I have engineered numerous remote-controlled shots. In Greenwich, England, and Machu Picchu, Peru, I rigged cameras from small, tethered helium balloons without any problems. But when I went to Niger to make aerial photographs of 7,000-year-old rock art in the Sahara, my luck ran out: The tether broke—fortunately, before I installed the camera. As a substitute I rigged a tripod of 26-foot-long steel rods. Local Tuareg assistants held the swaying contraption in place (above). As I viewed the scene through a hand-held video monitor, author-photographer David Coulson (right) helped position the camera from below. To change the lens or exposure, we had to take down the tripod and then set it up again—dozens of times in 110° heat. It was my hardest assignment, but the result was the photograph that appears on pages 88-9.

—KENJI YAMAGUCHI

KENJI YAMAGUCHI, NGS STAFF

Japanese Murrelet (*Synthliboramphus wumizusume*) **Size:** Length, 24 cm **Weight:** Average, 364 g **Habitat:** Breeds on small islands off the coasts of Japan and South Korea; winters offshore of breeding sites and in waters north to the Kuril Islands **Surviving number:** Estimated at 5,000-6,000

Photographed by Koji Ono

WILDLIFE AS CANON SEES IT

Long black crown feathers form the distinctive crest of a Japanese murrelet in summer plumage. Nesting in cracks and holes in rocks, the little seabird lays two eggs, usually a week apart, and for a month the murrelet pair shares two-day incubation shifts. The newly hatched, down-covered chicks remain in the nest for only a day or two, without being fed, before the parents lead their tiny fledglings out to sea after dark.

Japanese murrelet colonies are small, and most vulnerable during breeding season. Introduced species such as rats and rabbits have degraded murrelet populations, and crow predation poses a growing threat. 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.

NATIONAL GEOGRAPHIC

Behind the Scenes

Writing & Writing

A Man of Letters

Last month's GEOGRAPHIC story on writing needed a little something extra—more writing! We called on Julian Waters, master calligrapher. A longtime freelance contributor—his work has embellished subjects from Lewis Carroll to Native Americans for this magazine—Julian has also designed lettering for children's books, for stamps for the U.S. Postal Service, and for the Women in Military Service for America Memorial in Arlington, Virginia.

Before deciding on the lettering for a magazine article, Julian looks over the entire package of the text and photographic layout. "Calligraphy can make or break a page's graphic design," he says. He then crafts his own style of hand lettering to suit the needs of the page; some of his "roughs" for the writing story title appear above.

Though he specializes in adding the human touch of calligraphy to graphic design, Julian is just as comfortable in the digital arena as he is with his traditional pens and brushes. He created a popular computer typeface family, Waters Titling MM, which was also used in the design of last month's story. It's almost as beautiful as if he had written it himself.

NATIONAL GEOGRAPHIC PHOTOGRAPHER MARK THIESSEN

The Will to Surprise

He worked as a maintenance man, lived in a ramshackle house, and dressed from thrift stores. He loved collies, watercolor painting, ballroom dancing—and the NATIONAL GEOGRAPHIC. When Karl H. Hagen, an 89-year-old native of Suitland, Maryland, died in March, he bequeathed a million dollars to the Society.

Robert S. Herman, 84, of Melbourne, Florida, had the same idea. When he asked neighbor Don Paterson to help him make a will, they bought a kit. "What are your total assets?" Don asked. "Five million dollars," Bob replied. A lawyer was enlisted. Bob died in February; his million-dollar gift will endow a fund for the Committee for Research and Exploration. Bob Herman—a lifelong traveler—would have liked that.

Look Him Up; He's in the Book

WILBUR E. GARRETT

Call them Luis Marden's defining moments: The GEOGRAPHIC veteran—who spent 43 years as a staff writer and photographer and contributed his latest magazine piece in 1998, some 22 years after retirement—is quoted six times in *Webster's Third New International Dictionary*. His citations appear in the definitions of the following words: foot (right); snick, a clicking noise; tot, a small amount of an alcoholic beverage; unstep, to remove a ship's mast; warp, to haul a ship with a rope; and sevillana, a Spanish dance.

foot \"u̇t\ *vb* -ED/-ING/-S [ME *foten*, fr. *fot, foot*] *n* **1 :** to tread to music : DANCE, TRIP — often used with *it* (~ it featly here and there —Shak.) **2 :** to go on foot : WALK, RUN — contrasted with *ride*, often used with *it* (~ it softly across the limbing fields —Roland Mathias) (a couple of men tearing up the path as fast as they could ~ it —Mark Twain) **3** of a falcon : to seize prey with the talons **4** *of a sailboat* **:** to make speed or distance forward — contrasted with *point* (under all sail . . . she ~s along in a light breeze —Luis Marden) ~ *vt* **1 a :** to perform the movements of (a dance) (~ the sarabande or some other intricate forgotten dance —Dixon Wecter) **b :** to run, or dance on, over, or through (~ the greenward) (~ the treetops —C.E.S. Wood) (~ his way ... ~ to kick with the foot

Objects of Our Affection

They don't move much, but they work here; just check their ID badges. Staff member Thog (right, at top) started his career in an exhibit on early humans in Explorers Hall. He then did a stint in the President's office as the Society's unofficial mascot, occasionally modeling seasonal garb and proffering mail in his outstretched hand. Today Thog operates out of Associate Editor Bob Poole's office. Eddie Too, a 380-million-year-old tetrapod, at bottom, was commissioned by photographer Jonathan Blair for our May 1999 story "The Rise of Life on Earth." Now a contract employee, Eddie makes his home next to Editor Bill Allen's desk.

MARK THIESSEN (ABOVE); ART BY DANIEL ADEL

The Tie That Binds Him

"Ties cut off air to my brain," says photographer Nick Nichols. "I only wear one when I feel it's absolutely necessary." Nick has spoken before presidents in appropriate neckwear but was turned away—in a designer T-shirt and jacket—from his own presentation at London's posh Royal Automobile Club recently. Staffer Eddie Dormack rushed to buy him a collared shirt and tie.

"I made sure they were nice," says Eddie. "I knew I'd get to keep them when it was over."

TEXT BY MAGGIE ZACKOWITZ

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LEFT TO RIGHT: NASA; GEORGE F. MOBLEY; CHRIS JOHNS; NGS (LION AND VOLCANO)

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