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NATIONAL GEOGRAPHIC MAGAZINE

silk road

By THOMAS B. ALLEN

Photographs by REZA

新疆

شينجاڭ

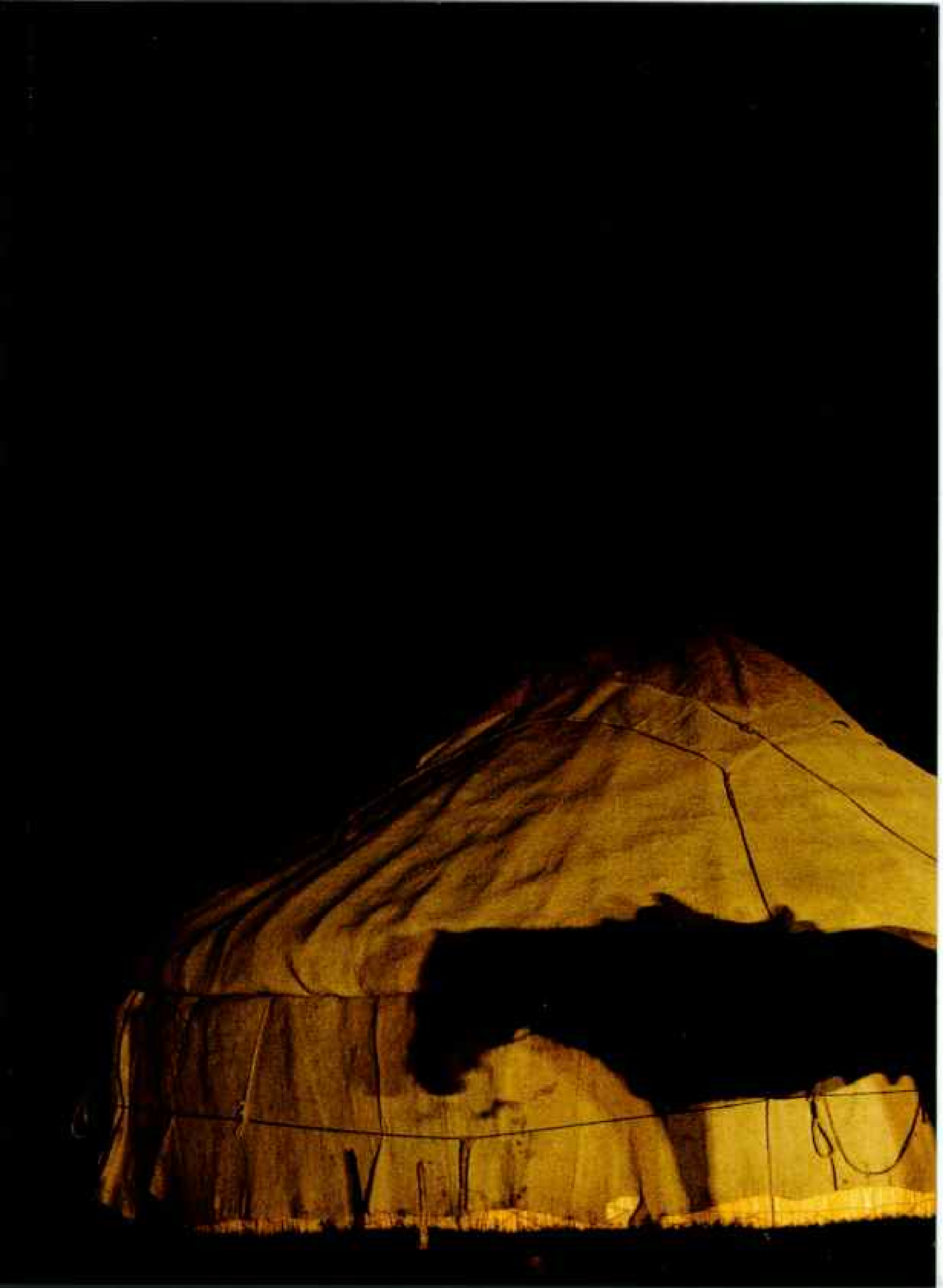
Tinted by an oil well's gas flare, the night sands of the Taklimakan Desert ripple like fine silk—a commodity once carried across these dunes in camel caravans. Xinjiang, China's Wild West, has long been a remote crossroads of cultures—as reflected in the Chinese and Arabic script for its name (above). Today China's little-visited Islamic outback is again opening to the world.

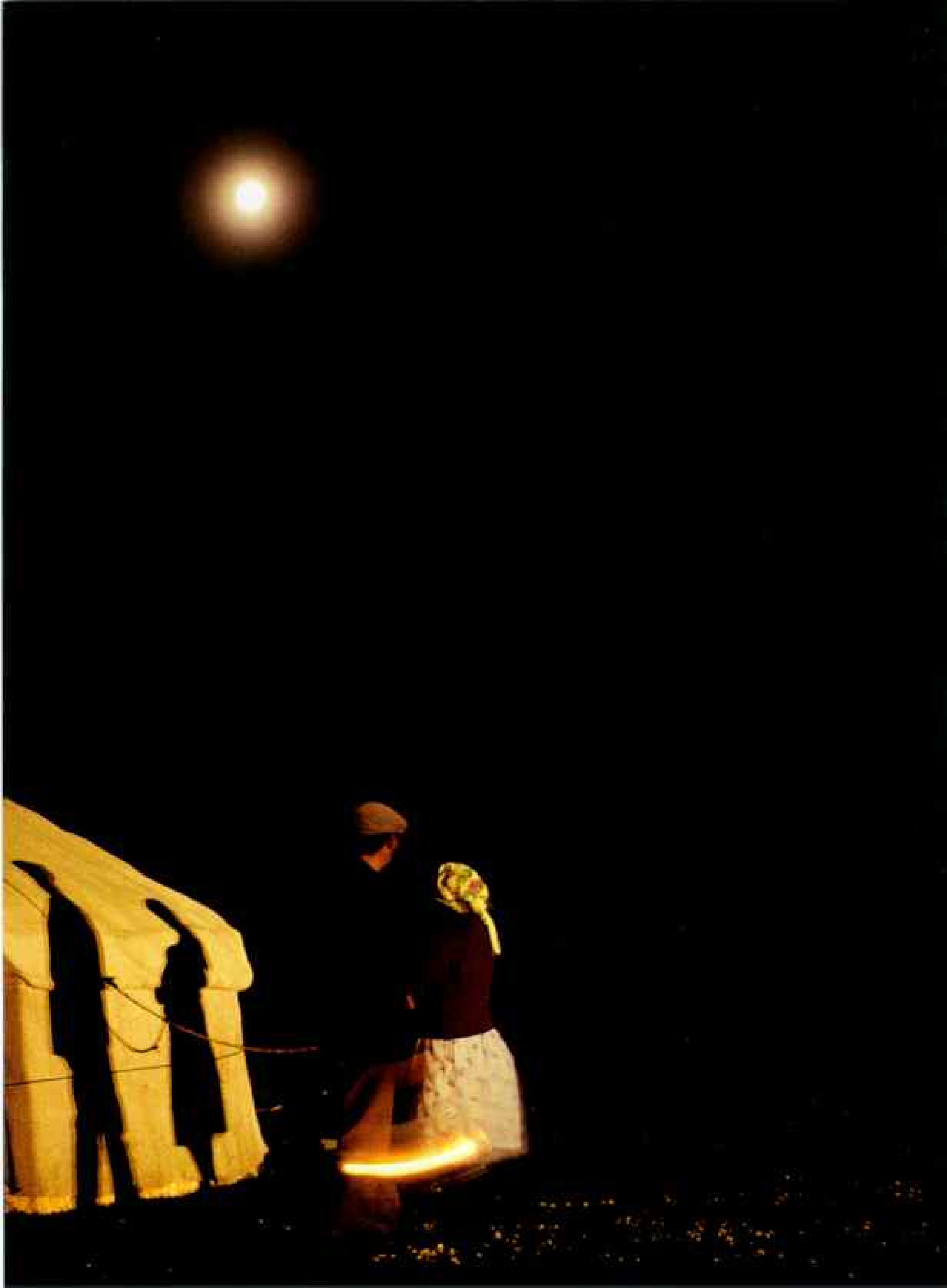
A chill March wind scatters the morning mist across the high plateau, revealing three camels, two riders on horseback, a dog, and a string of sheep. I hail the riders and they turn their little caravan toward me, bringing color to the drab brown land in this northwest corner of China. Lashed on the camels' backs are orange wooden stools, woolen rugs woven in mazes of red and blue, the poles and felt pieces of their tent home. On one black-maned horse sits a man in a blue cap. On the other horse is a woman in a red coat, clutching a small boy wearing a cap striped in blue and white.

For days, far off on the plateau, I had been seeing families like this one, moving to the new grass of spring and summer. Now paths had crossed. The smiling, broad-shouldered man says his name is Tarik. While his wife and their youngest child watch silently, he talks, his eyes on his sheep. Many of the 120 animals will soon drop lambs at the birthing place near here. His five other children are in school, he says, his eyes briefly turning in the direction of Altay, a city a dozen miles away. The family will be reunited in the summer pastureland.

A paved road, two jeeps, and a row of utility poles are the only visible symbols of modern life here. Tarik's family and his people live in the past. He waves good-bye and rides back *(Continued on page 12)*

Graceful in the grass, a dancer performs at a circumcision ceremony in the Altay Mountains, summer home to bands of Kazak herders. A crucible of Eastern and Western cultures, Xinjiang harbors peoples whose roots span Eurasia—Mongols, Turkic Uygurs, Persian-speaking Tajiks, and Han Chinese. Kazaks, superb horsemen, still hew to nomadic ways.





新疆

Shadows make lonely company in a Kazak sheep camp in the Altay Mountains, where felt yurts dot immense, nearly roadless pasturelands. Even in more settled winter communities Kazaks like elbowroom; neighbors can be miles away.


奋进振兴

新疆

Aiming for prosperity on China's frontier, Xibe archers — whose ancestors guarded Xinjiang against the Mongols — spearhead a trade-fair parade in the city of Gulja. Banking on its central Asian location, Xinjiang has sprouted free-market zones.

新疆

into the mist, returning to a life without roads or brightly lit night, a life paced by the seasons and the needs of sheep and camels and horses.

To talk with Tarik, I first had to speak to an interpreter who translated my English into Chinese. Then a second interpreter rendered the Chinese into Tarik's language, a Turkic tongue spoken by his people, the Kazaks. Neither he, his language, his people, nor his culture is Chinese. He lives in Xinjiang, a vast province of China, where most people are Turkic-speaking Muslims. Only here and in Tibet are Chinese in a minority.

The name of the province acknowledges its double identity. Xinjiang (pronounced SHEEN-jee-ahng) is Chinese for "new frontier." China long sought this vast swath of central Asia, a corridor between East and West even before the Silk Road passed this way as early as the second century B.C. But not until the 18th century did China gain an uneasy control, and not until 1955 did the People's Republic of China establish the Xinjiang Uygur Autonomous Region, a province bigger than Alaska and home to eight million Uygurs (WEE-gurs), the most populous of Xinjiang's many ethnic groups.

Chinese leaders opened their nation to the outside world in the 1980s. But much of Xinjiang remained off-limits, primarily because the Chinese-Soviet border bristled with arms. The Soviet breakup in

1991 unlocked the border gates, travel restrictions gradually eased, and once more in its long history Xinjiang awaited discovery. Photographer Reza and I were given unprecedented access to the long-forbidden province. For months, sometimes traveling together and sometimes separately, we explored Xinjiang, from the northern mountains to the southern deserts, seeing bazaars and discos, ancient cities and new oil wells, Islamic festivals and deserted Buddhist shrines.

Beijing calls this distant western province China's California, for here is oil and here is potential wealth from industry and international trade. Xinjiang gained three new neighbors and prospective trade partners when the former Soviet republics of Kazakstan, Kyrgyzstan, and Tajikistan became independent nations. Officials proudly showed off new marketing enterprises along the border and pointed to new factories built as joint ventures with several countries.

Reza and I were barred from some places, such as desolate areas where China tests nuclear weapons or runs prison camps. But we saw much of this rapidly changing frontier, meeting people who had never seen Westerners and visiting people whose way of life still resembles

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THOMAS B. ALLEN, a regular contributor to NATIONAL GEOGRAPHIC, reported on the changing life of nomads in "Time Catches Up With Mongolia" (February 1985). REZA, an Iranian photographer based in Paris, recently joined Tom Allen in covering Turkey (May 1994).

what Marco Polo saw in the 13th century. And we met Xinjiang's people of the future: Former nomads who would rather live in apartments than in tents. Desert workers who call themselves China's soldiers of oil. Entrepreneurs with little more than a mobile phone and a faith in venture capitalism. Uygurs hungry for a bigger stake in Xinjiang's booming economy.

Although there had been talk in the early 1900s of a Uygur-led separatist movement that would make Xinjiang an independent nation named Eastern Turkistan, republics arising in parts of Xinjiang in the 1930s and '40s were short-lived. China strengthened its control in the '50s and was rarely challenged until the '80s, when hundreds died in what China called "racial incidents" in Kashgar (Kashi in Chinese), Xinjiang's Islamic citadel, and Aksu, northeast of Kashgar. In 1990 about 50 Uygurs and Kyrgyz were killed in what China labeled a "counter-revolutionary rebellion." Bombs allegedly set by separatists exploded in Urumqi in 1992 and in Kashgar in 1993. Muslims rioted in Hotan in 1995, when Chinese authorities removed a popular Islamic imam suspected of fomenting dissent.

The Chinese in Xinjiang are known by their old name, the Han. The rest of the population consists of national minorities: the Uygurs and other Turkic-speaking Muslim groups—the nomadic Kazaks and the more settled Kyrgyz. There are Mongols, who trace their lineage to Genghis Khan; Islamic Tajiks, who speak a Persian language; and the

Circling the center of a continent, inhabitants of Baojachaozi village pose for a 360-degree photograph near their homes—a remote spot that Chinese experts pinpoint as the geographic heart of Asia. "Whether it's the center or not, it was a strange, emotional moment," says photographer Reza. "Everybody put on their Sunday best. Asia stretched away forever."

Xibe, Manchu-speaking descendants of warriors dispatched here from northeast China 200 years ago. Even some Han Chinese, because they are Muslims, are considered a distinct nationality, the Hui.

Xinjiang's geography once was destiny. How people lived depended on where they lived—nomadic in the mountains, settled in the oases that fringed the deserts. Today change is destiny. In government-run boarding schools the children of nomads like Tarik are learning about a world beyond the old sheep paths. In one such school I talked with two 17-year-old Kazak girls. They had just passed Chinese-language examinations, a gateway to higher education. They said they wanted to become doctors and help their people. Many sons and daughters of nomads are choosing what government officials call the settled life.

After Tarik's camels plodded off toward the Altay Mountains, Abdul, the leader of a nearby small town, began educating me in the old and new ways of the Kazaks. Beijing, Abdul said, had decreed nomadic life to be inefficient and is trying to discourage it. (Beijing seems to carry about as much weight in Xinjiang as Washington does in Alaska.) Surprised at Abdul's acceptance of Han ideas and wondering about his Kazak allegiance, I sneaked a look at his watch. China has one time zone; all time is Beijing time. But Xinjiang stubbornly goes by its own time, two hours *(Continued on page 18)*

Xinjiang

"Merchants from this country travel to all parts of the world," wrote 13th-century adventurer Marco Polo, one of the first Europeans to reach the fabled oasis cities of what is today the Xinjiang Uygur Autonomous Region. "Everything necessary for human life is here in the greatest plenty. . . cotton, flax, hemp, grain, wine, and other articles." The powerful khanates that flourished along the Silk Road beginning in the second century B.C. have faded into myth or obscurity, but their cosmopolitan legacy lives on. Greek Hellenism, Indian Buddhism, and, later, Middle Eastern Islam all trickled through the deserts and wind-chiseled mountains of Xinjiang, spread by wandering armies, pilgrims, and caravans. Today a mosaic of ethnic groups – the largest of them the Uygurs – composes the bulk of the population. Han Chinese immigration is growing, however, and with it local Muslim resentment. Anti-Chinese riots occasionally erupt in some cities, where Han Chinese reap the most benefit from economic development – oil exploration, coal mining, and tourism.

RUSSIA

新疆

NEW FRONTIER

The Chinese characters for Xinjiang tell the story of the region in miniature. "Bow" and "land" imply Han conquest of the province. "Field" and "border" describe the frontier terrain itself.

Bow
Land
Field
Border

Limited-access areas are used by the Chinese for military purposes and labor camps.

Burqin
Altay
Fuyun
Tacheng
Karamay
Dzungarian Gate
Bole (Bortala)
Junggar Pendi
MONGOLIA
Usu
Shihezi
Manas
Changji
Qitai
17,864 ft
Borohoro Shan
Urumqi
Baojiachaozi
Bogda Shan
13,996 ft
Hami
Turpan
Flaming Mountains
Turpan Depression -505 ft
Wubao
14,938 ft
Kuqa
Yanqi
Korla
Luntai
Lop Nur test site
China continues nuclear testing at Lop Nur but may join a global nuclear test ban.
GANSU
Anxi
SILK ROAD
Dunhuang
J I A N G
Loulan (Kiruran)
C H I N A
B A S I N
D e s e r t
Miran
Ruoqiang
Niya (Old Niya)
Qiemo (Qargan)
A l t u n S h a n
20,212 ft
Minfeng (New Niya)
Aktag 22,034 ft
K U N L U N M O U N T A I N S
25,338 ft
22,507 ft
A desert fearsome even in name. Taklimakan means "go in and you won't come out."
QINGHAI
XIZANG (TIBET)

The Silk Road thrived until sea routes, opened during the 17th century, slowly diverted trade between Europe and Asia.

Kashi Official Chinese name
(Kashgar) Local or variant name
Arable land
Archaeological site
Limited-access area
Oil basin
Oil field
Pipeline

Glossary

Hu	lake
Nur	lake, salt lake
Pendi	basin
Shan	mountain, range

0 100 MILES

NGS CARTOGRAPHIC DIVISION

新疆

The People's Army gets a pint-size salute at a cultural ceremony in Artux, a city near Xinjiang's border with Kyrgyzstan. Han rulers began settling soldier-farmers on China's unruly western frontier 2,000 years ago—a practice revived by Mao Zedong.

behind Beijing's. It is a subtle sign of local loyalty to live on Xinjiang time, and that was what Abdul's watch was set to.

Abandoning the road, my driver bounded over the rumpled plateau in pursuit of Abdul's jeep. Behind a rocky hill was a yurt, a circular white felt tent with a conical roof. Next to the yurt was a birthing place, a three-sided shelter and low fence, all made of flat rocks. I counted eight lambs and could hear more bleating in the shelter. Sheep wandered about, munching on scant grass as dry as straw. Tethered nearby were three of the eight horses the family owned.

A smiling man warmly greeted Abdul and motioned us inside the yurt. His wife was already heating water over a stove whose smoke rose to an open roof flap. A daughter brought in sticks to feed the small fire. In a few moments, seated on a red four-legged stool, I was drinking tea tinged with sheep milk. Around me, in low chests set on a floor of rugs, were the possessions of a mother, a father, and six children.

Like the other families drifting onto the plateau, they had come from the south, trekking 50 to 70 miles from the river valley where they had spent the winter. There, through fall into early spring, they shelter themselves and their animals in mud-brick structures. The animals find sparse grass or are given fodder. The wintering family lives on the traditional year-round Kazak diet of mutton and bread.

In spring, as the lower pastureland is turning green, the families take the sheep to the plateau. They spend the birthing time here and, when the mountain snows begin to melt, head for the high summer pastures. As the white slopes change to green, the herds climb higher. "There is a saying," Abdul relates, "that the snow leads the sheep." High in the Altay, the families gather in clans, race their horses, and mark timeless rites—wedding, circumcision, death. At the end of summer they descend in the chill air to begin the rhythm of another year.

Other Kazaks live by another rhythm. Beijing is trying to turn nomads into farmers by helping them build substantial homes wired for electricity. On another jolting trip across the plateau, I was taken to one of these houses. It belonged to Makin, a bronzed, stocky man who would stay here with his wife, Kerzira, while some of their seven children and other kinfolk took herds up to summer pastureland.

I asked them how they felt about settling down. Makin smiled. "The traveling life. Yes, most herdsmen miss that." But he lives in a house snug as a yurt, richly decorated with embroidered wall hangings and complete with television set. He and Kerzira are not housebound. They still tend flocks and walk upon the land. Makin still slaughters sheep with his own knife.

Even monkeys learn to hustle in Urumqi, the booming capital of Xinjiang. Though still a raw outpost by eastern Chinese standards, oil and manufacturing have brought shopping malls, discos, and a Holiday Inn to a city whose Mongol name recalls humbler origins—"beautiful pastureland." Says one resident, "Every day the trains are packed with easterners. All come looking for work."

FOR MANY YOUNG KAZAKS, however, the future is not on the land. They are seeking jobs in Altay, a city spread along a high river valley. Here, as in other Xinjiang cities I visited, industry is on the rise, but Han Chinese seem to have most of the jobs. At a leather factory, for instance, nearly all the workers were Han women. When I mentioned this to the Han factory manager, he pointed to one Kazak woman who was supervising Han leather cutters. The factory was producing stylish jackets for export to Sweden. They are made from sheepskins brought in by Kazak herdsmen on bicycles and donkeys. The Han women in the factory typically earn more money in two months than a herdsman can expect to make in a year.

Uygurs in Xinjiang do not talk to foreigners about Chinese policy.

新疆

Taking his cue from capitalism, a Uygur entrepreneur wheels his mobile pool table through the backstreets of Bortala, inviting all comers at 20 cents a game. Pool has replaced Ping-Pong as the latest rage in Xinjiang; almost every village has a table.

The sun-coppered face of a 12-year-old Tajik girl reflects the Indo-European heritage in Xinjiang. One of the region's smallest and poorest minorities, 27,000 Tajiks share Iranian cultural roots with clansmen in Tajikistan and Afghanistan. The glaciated peaks of their Pamir mountains

But Uygurs in self-exile in the U. S. say that the Chinese government is pouring migrants into the province to make Han Chinese the majority. In 1949 only 200,000 Han lived here. In 1993, by Chinese count, there were 6 million Han out of a population of 16 million. A Western scholar estimates that 250,000 to 300,000 Han enter Xinjiang each year and that in 1993 there were nearly as many Han as Uygurs in Xinjiang.

Whatever resentments Xinjiang's varied peoples may harbor, they usually get along among themselves. One day, seated at a long table in a Mongol farmhouse, I found myself facing a Kazak, a Uygur, and my Mongol host, all friends, all toasting me and one another. At this meal, as at most meals I ate in people's homes, the menu was boiled mutton and a flat, crusty bread called nan. The women and girls served the meals and did not sit with the men. Usually, though, everyone joined in post-dinner singing and solo dancing.

After the meal Kenza, my host, led Reza and me out to show us two newborn foals. Since we had arrived about the same time, he said, he decided to name the foals Reza and Tom. Suddenly, one of the guests,

homeland have sheltered Tajiks from the outside world. Until recently staples such as sheep and barley were bartered. But now a cash resource—pristine alpine wilderness—is attracting adventure-tourism dollars.

a husky moonfaced man named Bimbai, leaped onto his horse. He scooped up a toddler and galloped off, both he and his passenger laughing wildly and sitting ramrod straight in the saddle.

Even Mongols like Bimbai are settling down. In his Mongol ancestral region, centered on the city of Bortala, many Mongol families live year-round on widely separated farms, where they raise crops but also keep a string of horses. Others still spend part of the year in the mountains with their herds of sheep and cattle.

"The state gives herdsmen money to help make them into farmers. Now those herdsmen don't have to worry about the weather," said Ulide, a burly Mongol government official who had a swan tattooed on the back of his right hand. "And many who changed have become rich. In the past there was no industry. Now we have a textile factory and a plant for making quick food. We have many roads. Ninety-seven percent of the children go to school."

SOUTHWEST OF BORTALA is the Horgas Pass, a trading outpost since the days of the Silk Road. Fortified and closed against Soviet Kazakstan in 1971, the pass was reopened when relations warmed in 1983. The village at the pass, whose people had no electricity and depended on snowmelt for water, became a boomtown. Some 25,000 tons of goods crossed the border in 1984; in 1993 trade topped 422,000 tons. Joint venture deals flourish. A Hong Kong investor is building a luxurious shopping mall and hotel complex.

Small-time traders do their business at the Market for Both Sides of the Border, an arena of primitive capitalism. The market has two gates. Through one come the buyers of Kazakstan, who arrive in buses accompanied by empty trucks. Through the other gate come the sellers of Xinjiang. Each buyer pays $1.50 in U. S. currency for admission and then changes a fistful of American dollars into Chinese yuan at the day's bank rate.

The buyers run a gantlet between lines of shouting merchants offering watches, cigarettes, and currency deals. Behind the merchants, under vaulting roofs, are bazaars crammed with rows of counters where Han, Uygurs, and Kazaks sell candy, beer, clothing, toys, sewing machines, irons, hand tools, and what looks like enough shoes for every man, woman, and child in Kazakstan.

Abdu Salam, a Uygur, was selling sugar, wholesale. I asked him how much he sells a day. "One hundred fifty kilos," he said. The crowd that had gathered around me—I was the first American ever to enter the market—laughed at his fib. "He cannot be exact," my interpreter explained. "Taxes. Understand?"

The day's buyers from Kazakstan included many women weighed down with shopping bags. I spoke to one wearing an American running suit and sneakers and a Chinese leather jacket. This was her fifth trip to buy goods for her father's shop back home. Like most buyers and sellers, she was secretive about transactions.

Porters pulling and pushing carts suddenly wheeled into the loading area, banging into one another to get to a row of empty trucks. Buyers shouted orders. Security police yelled and shoved. The porters piled hundreds of bags of sugar and hundreds of cartons of vodka into the trucks. "The vodka's as good as Russian," a buyer assured me. "The Chinese did it to our taste, not theirs."

Ili, a growing city near the pass, spreads along a verdant river valley

of farms and forests. Pastureland here belongs to farmers, not nomads. In one small area, known as milk country, live about 20,000 Xibe (pronounced SHEE-ba), descendants of an army transplanted from Manchuria in the late 1700s to help guard and colonize the western frontier. Traveling with their wives and children, the soldiers arrived with 350 babies born on the yearlong trek.

The Xibe still speak and write in their old language and keep up their prowess as archers. When a girl is born, the family hangs a red banner at the door. When a boy is born, neighbors see an archer's bow. At a sports field in Xibe country, I watched a coach scowling when arrows hit merely near the bull's-eye. He said he was working his archers—boys and girls—eight hours a day, six days a week, taking aim at the next Olympics.

IN THE 20TH CENTURY, as in the 18th, China used the army to colonize Xinjiang. The soldiers, organized into the Production and Construction Corps in the 1950s, built an economic stronghold in Xinjiang, then largely uninhabited. The corps, through its farms, factories, and other enterprises, now runs an empire of 2.2 million people, nearly all of them Han Chinese who answer to Beijing.

I met some of the veterans at State Farm No. 128 of the No. 7 Division. The farm, about 85 miles northwest of Urumqi, lies like a green carpet on the bleak earth of the Junggar Basin. To get into the farm, I had to pass through a military-style checkpoint. Along the paved road stretched rows of cotton and groves of fruit trees, all flanked by irrigation ditches. Such rich, watered farmland is as rare as a paved road in the rugged terrain of northwestern Xinjiang.

"When I came here," Zhang Pei Ji remembered, "this was a desert. The regiment lived in holes." We talked in his home, where two or

Grief-stricken parents memorialized the 312 schoolchildren killed in a theater blaze in the town of Karamay. Sensitive to criticism, authorities quickly tore down the makeshift shrine. China's construction frenzy has spawned a rash of fire-trap disasters.

Kazak schoolchildren, meanwhile, learn in an outdoor classroom in the Altay Mountains (right). The texts use the local language; the teacher arrives by steed.

Waiting out the dying winter in a mud-brick hut, a Kazak family keeps the newest clan member warm—a newborn lamb. Though Chinese programs to settle Xinjiang's nomads have reduced the Kazaks' meanderings, the government officially supports their cultural survival. Minorities can

three other veterans come every day to pass the time with board games. They are in their 70s and 80s. One nodded at Zhang's recollection and said, "We came here in March, walking from Urumqi. Nine days. We shot wild pigs and wild sheep for food."

Most of the soldiers found wives among the trainloads of Han women sent here to tame the wilderness. But Zhang fell in love with Yu Sui Qi, whom he saw begging on the streets of Urumqi. They married and had eight children. A family portrait, showing some of their ten grandchildren, hangs on the wall of their home.

I asked Yu Sui Qi what she remembered. "After giving birth to my first son," she said, "I still had to keep working, making shoes for the soldiers. Twenty shoes every day for the soldiers. I kept my son in the corner and had to keep working." She turned her head away, speaking no more of those days.

The state farm is far more than a farm. It has its own foreign affairs office, television station, oil refinery, and enterprises for marketing crops and forestry products. Each of the 17,000 people who live here is

publish newspapers in their own languages, and China's strict "one couple, one child" law is bent to allow rural families three children. Xinjiang's pastoralists often go further—parceling out additional children among relatives.

assigned to a company, a word that, like "corps" and "division," comes from a military vocabulary.

Workers sign contracts, agreeing to meet quotas set by the corps. Their children are likely to get jobs in a farm enterprise. Of the 1,020 students at a middle school I visited, about 60 will go to college.

Accompanied by a large entourage of officials, I was taken to No. 17 Company. Whitewashed, single-story brick houses stood in rows along a dirt road. Awaiting me in one was a retired worker named Mau. He handed me an apple, showed off his vegetable garden, his newly planted fruit trees, and the two rooms of his immaculately clean home. He had built the house himself and had even installed radiators, which he proudly stroked.

Outside, as we all walked past a brick wall, I asked for a translation of something I had seen written in many places on the state farm: "Don't Sell. Give to the Unit." The Production and Construction Corps obviously was bracing itself against the wave of capitalism sweeping through China and, now, Xinjiang. In every other place I had been, people were trying to make money. Even in the smallest mud-brick village people squatted behind their wares—fruit, shoes, a few yards of cloth, whatever could be bought at one price and sold at a higher. And nowhere has the market mania hit harder than in Urumqi.

SEEN FROM THE AIR, Urumqi sprawls like a huge oasis that has flowed down from the Tian Shan. Urumqi is Mongol for "beautiful pastureland," and upon the ancient earth are etched the old roads and faint trails that once led to that precious grass. Cutting across the old is the new: the highways and railways linking Xinjiang's capital to the rest of the world. So vital has the city become to China's economy that in 1992 Urumqi was decreed a port, giving the city the same capital-luring tax incentives enjoyed by Shanghai and other seaside cities. Urumqi is an odd port; 1,400 miles from the nearest sea, it is one of the world's most landlocked cities.

On city streets clogged with wary pedestrians, cars, buses, and donkey-drawn carts, I saw dealmakers wobbling along on bicycles and shouting over the traffic into cellular phones. At a street market, amid the brisk selling of cats, kittens, birds, goldfish, and dogs, a poster urged, "Raise Dogs. Get Rich."

Well over a million of Urumqi's 1.4 million people are Han Chinese, who run the city and dispense most of the jobs. Every employee I saw in my Western-style hotel was a Han. All the police officers I saw were Han. Even unskilled laborers were Han, lured from other provinces to work on the dozens of high-rises sprouting in Urumqi.

Governor Ablat Abdulreshit had a cryptic explanation for this. "Construction has changed," he said. "We have enrolled the laborers from the inland cities of the other provinces because they have a lot of technology. And we import equipment. And so the Chinese population has increased also."

Reza and I had an audience with the governor in his spacious office near Urumqi's huge main square. By law the governor of Xinjiang must be a Uygur. Even so, Abdulreshit spoke to us in Chinese, the official language here. He presides over a bewildering structure of prefectures, towns, cities, and counties, each with sets of political and Communist Party officials. Many are from minority groups, but all are under Han superiors.

When I asked the governor what the word "autonomous" meant in Xinjiang's official name, he gave two examples. While Chinese is the national language, Uygurs and other non-Han peoples can use their own languages in newspapers and on radio and television. And, although China limits Han couples to one child, Xinjiang's non-Han couples who live in cities can have two children and those who live in the country can have three. But, because of the business boom in Xinjiang, he said, "People's personalities are changing. The family does not want more children."

While there are a few prosperous Uygurs in Urumqi—including some who are trying to increase the Uygurs' share of the city's prosperity by making loans, teaching English, and encouraging Uygurs to launch enterprises of their own—I was never able to meet them. I was, however, introduced to many new Han capitalists, such as Feng Dong Min.

Feng graduated from Xinjiang Teachers College with a degree in art and got a job on a government payroll as a designer and interior decorator. With the economic boom in 1993, he set up a joint venture company with Taiwanese investors and started a small furniture factory in Urumqi. He became rich almost immediately. He drives a Cadillac and has a thriving overseas trade. "Urumqi is like a seaside city," he said, taking me around his showrooms. All of the furniture is marked for export. About 80 percent of his tables, chairs, cabinets, and bedroom suites go to the United States. His wife runs the Los Angeles office.

As a businessman he can go to Taiwan, which most ordinary Chinese cannot do. Sitting in his office at one of his own glass-topped tables, he leaned back and talked about his plans. "I want to build an apartment house for my workers," he said, ironically preserving as a capitalist the Chinese communist notion of a single job-and-home work unit. He also expects to relocate in a new economic zone in Xinjiang,

More Arabic in flavor than Chinese, the sprawling bazaar at Kashgar, a major Silk Road city, offers everything from boom boxes to camels to haircuts—one stubbled style only (above). In Hotan, another storied caravan stop, a curbside dentist fits a patient for dentures. Other market doctors arrange themselves by specialty and administer homegrown remedies such as horse oil for broken bones.


WORLD CUP

where he will pay lower taxes and be near a railroad. "I work all the time," he complained. "I do not have enough time for anything but work." As for being a capitalist in a communist nation, he shrugged and said, "I am in the confused generation."

Reza and I attended the murder trial of another member of that generation. As the story was told in an almost empty Urumqi courtroom, Sun Hong Jun was a 25-year-old Han peasant who had come to the city from a distant province to seek his fortune. He got a job as a busboy in a restaurant and a room to share in a boarding house. One night, in a drunken brawl, he fatally stabbed another roomer in the neck.

Now Sun Hong Jun stood before three judges and tried to explain that the killing was an accident. The judges wore military-style uniforms bearing the balanced-scales symbol of justice. After Sun told his story, an assistant judge held up a knife and flicked it open. It gleamed as she asked, "How did you hold it?" If he had begun the fight with an open knife, she said, the killing was no accident. If Sun was found guilty of deliberate murder, he could be executed. The judges, I later learned, were merciful, sentencing him to 15 years in prison.

During a break in the trial I glanced out a courthouse window and saw banners and balloons waving on a building across the street. It had been a theater for the military police. Now it was the Marco Polo Club, a disco that would have its grand opening that night.

The club, its dance floor and balcony jammed, opened to a blare of music and a spectacular barrage of laser beams. The club's owners cut a red ribbon on the stage, which filled with shy-looking models in skimpy bathing suits. The mayor was supposed to have cut the ribbon, but he had sent his regrets because China had just decreed a new anti-corruption law prohibiting even an appearance of impropriety.

The club's principal owner, a former army truck driver, had parlayed a used-car business into a host of enterprises, the disco being the latest. Harvey Hsia, a tall, fast-talking entrepreneur from Taiwan and Los Angeles, had designed the club and brought in the Taiwanese technicians who wired it. In a central control room, flicking switches with white-gloved hands, they ran the complex system that transmitted music videos to monitors in plush private rooms. A night of fun and videos in the Marco Polo could cost a patron about what a typical worker in Urumqi earned in a month.

Over the rim of his champagne glass Harvey looked at the laser-lit bedlam and said, "A guy named Marco Polo came here and then went back to Venice and wrote a book telling all about the gold and silk around here. And everybody in Europe wanted to go to Asia. And that's what we want. So we named it after him."

Rolling up the bleachers, Tajik workers tidy up after a game of buz kashi—a bruising form of polo played with a calf carcass. The stadium: a 10,000-foot-high plateau in the Pamirs. Life is lived in the open in Xinjiang. Some 16 million people dot a region almost three times the size of France.

MARCO POLO'S TRAVELS took him to the sun-scorched southern half of Xinjiang, where the Silk Road, a web of caravan routes, shifted like the sands of the Taklimakan Desert. The two main routes looped around the desert, converging at Kashgar.

Through Kashgar's gates passed the peoples, the riches, and the ideas of East and West. Buddhist monks took the roads eastward, carrying images that artists later painted on the walls of caves near Turpan and elsewhere. Still later, Islam traveled along with the caravans, and fervent converts defaced the Buddhist images in the caves, believing that they obeyed the will of Allah.

Reza and I often followed those old caravan routes, covered now

Emptiness hushes the land. "Everything is sunk in peace. But from the distance comes the scarcely audible sound of bells," wrote a Swedish explorer. "Gradually the clang . . . dies away and silence spreads its wings over the earth again."

with highways or, more often, dirt roads. This land's barriers—the mountains of eternal snows, the endless deserts—defy road builders. Even a highway is no guarantee of a smooth ride. One day, as we were driving along a cliffside highway, snowmelt cascaded from a mountain and washed out the road a few yards before us. Long lines of cars and trucks built up until the torrent eased and we could all make our way across the watery trench.

Countryside families who live close to a highway can sample modern life. Wires carry electricity, giving light and television to mud-brick houses scattered along the roadside. People can take buses to village markets, schools, jobs. But people who live deeper in the countryside live in the past. I learned this one day when we gave a lift to a Kyrgyz family—a mother and father with their nine-month-old baby boy—who had been waiting for a bus until we appeared.

About 12 miles down the highway the mother gestured for us to turn onto a dirt road that went past a school, police compound, and a few other buildings. The curving road went on for another two miles across

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Sorrow shadows the faces of Mongol Buddhist villagers attending the wake of a neighbor. Survivors are comforted with gifts of whiskey and sweets. "Posts support a yurt"—says one Mongol proverb—"friends support a man in difficulties."

barren, rocky ground and ended at a meadow dotted with grazing yaks. We had entered a vast valley edged by a massive mountain, more shoulder than peak, its flank half-buried in sand. The meadow had been touched by spring, and at that seam of whitish sand and faint new green was a village. The low houses, strung along the base of the mountain, looked as if they had been there since the beginning of time.

Children ran toward us, astounded at what they saw. The village elder, in a long brown coat and fur hat, gravely welcomed us, speaking Kyrgyz to our Uygur interpreter, who understood because Xinjiang's Turkic languages are so similar. Women disappeared into their homes and quickly reappeared in formal clothes, white headdresses and flowery skirts. This was Sonobashi, a village of about 40 families, some of them living several miles away on a patch of grassland.

In the gray darkness of a house, warmed by a dung fire, the elder told us about the rhythm of the year. In June the families will live in pastures farther up the valley. In September they will return to Sonobashi, and the elder hoped that there would be electricity next winter.

The trip to Sonobashi was a detour on a journey to the lofty homeland of the Tajiks, who live in high valleys of the Pamir mountains. Descendants of subjects of Alexander the Great, they speak a Persian tongue and belong to an Islamic sect led by the Aga Khan.

The Pamirs, say the Chinese, form the roof of the world, a domain where the air is lean and people rare. At Karakol Lake, a young shepherd politely asked Reza where he was from. When Reza replied Paris, the boy asked how many sheep he owned.

THE HIGHWAY CLIMBED FARTHER, then dipped. We turned off and bounced along a rock-strewn dirt track that clung to a ridge high above a swift-flowing river.

After a few miles the track pitched down to the floor of a narrow valley. A camel loped by, carrying long-grass fodder that would be bartered in one of the villages strung along the valley.

The road vanished on the rocky valley floor before reappearing to climb another ridge. Our ride abruptly ended at a half-built bridge. When we walked across it, dozens of people materialized from a village. A horseman rode off to find a donkey for our gear, and soon, with an ever growing convoy, we hiked along a canyon about 8,200 feet above sea level. The white wall of the Pamirs filled the V ahead.

Two miles down the canyon Jafargul, our Tajik host, greeted us. A tall fur hat topped his bushy red eyebrows and freckled face. Shy but warmly gracious, he led us to one of his family's houses, which spilled down a hill near a stream. They were made of the usual mud bricks, but slathered with finer mud to make smooth walls. I stepped inside the house nearest the stream. Carpets—mostly red and black in geometric designs—hung from the walls. As in Kazak, Kyrgyz, and Uygur homes I had been in, this one had a *kang*, a raised platform covered with rugs. This Tajik version ran around two walls. Here we would eat and, under piles of colorful quilts, sleep.

Through an archway I could see the kitchen. Jafargul's wife, daughter, and daughter-in-law worked at an adobe stove formed from corner walls. Kettles, filled with water from the stream, sat before a fire blazing at the bottom. A large pan covered the opening at the top. The women wore pillbox-shaped brocaded hats draped with white veils that framed their faces. Children, from toddlers to a teenage boy,

A holy day of remembrance, Qurban draws Uygur families to a Muslim cemetery in Kashgar. The 17th-century tomb of Uygur ruler Apa Hoja (background) has become a symbol of Muslim identity tolerated by the Chinese. Always simmering, Uygur nationalism has boiled over since the

demise of the Soviet Union and the independence of neighboring central Asian states. Anti-Chinese violence flared in Kashgar as recently as 1993. "Our biggest fear is that we will be wiped out by their numbers," says one exiled Uygur.

darted in and out, sometimes helping with chores, sometimes ogling us.

Men drifted in from other farms, and we talked about life in this secluded valley, where for generations they have grown wheat, raised sheep, and ridden horses. The fathers and grandfathers around me said they knew that their children and grandchildren did not want to stay here, but stay they would. "People's life is close to the land and the animals," one of them said. "If the children go, there is no one to take care of it. If someday the social system finds a way to give security to the old, then the children will feel free to go."

On another night, at a restaurant under the trees a few miles outside of Kashgar, I talked to a group of Uygurs. There were no tables and chairs. We sat cross-legged on the board-covered springs of an old brass bedstead, an imitation of the kang. We dined on strong tea and hand-pulled noodles mixed with bits of lamb and vegetables. The talk was cautious. No one spoke of the future. No one wanted to answer my questions.

Out of the shadows came the soft, slow-paced sound of a Uygur

A silk worker near Hotan uses age-tested methods to starch his product. No longer destined for the elite of imperial Rome, Xinjiang's silks are woven today mainly for domestic consumption.

In Kashgar bagel-like round bread, another Xinjiang product locals claim to have introduced to the world, sells for pennies, beneath a priceless—and illegal—pelt of the highly endangered snow leopard.

singing and strumming his long-necked *rawap*. It was a love song, I was told. A Uygur interpreter tried to translate—"He is sad. He is waiting. . . ." The interpreter shook his head. I should just listen and not worry about understanding the words.

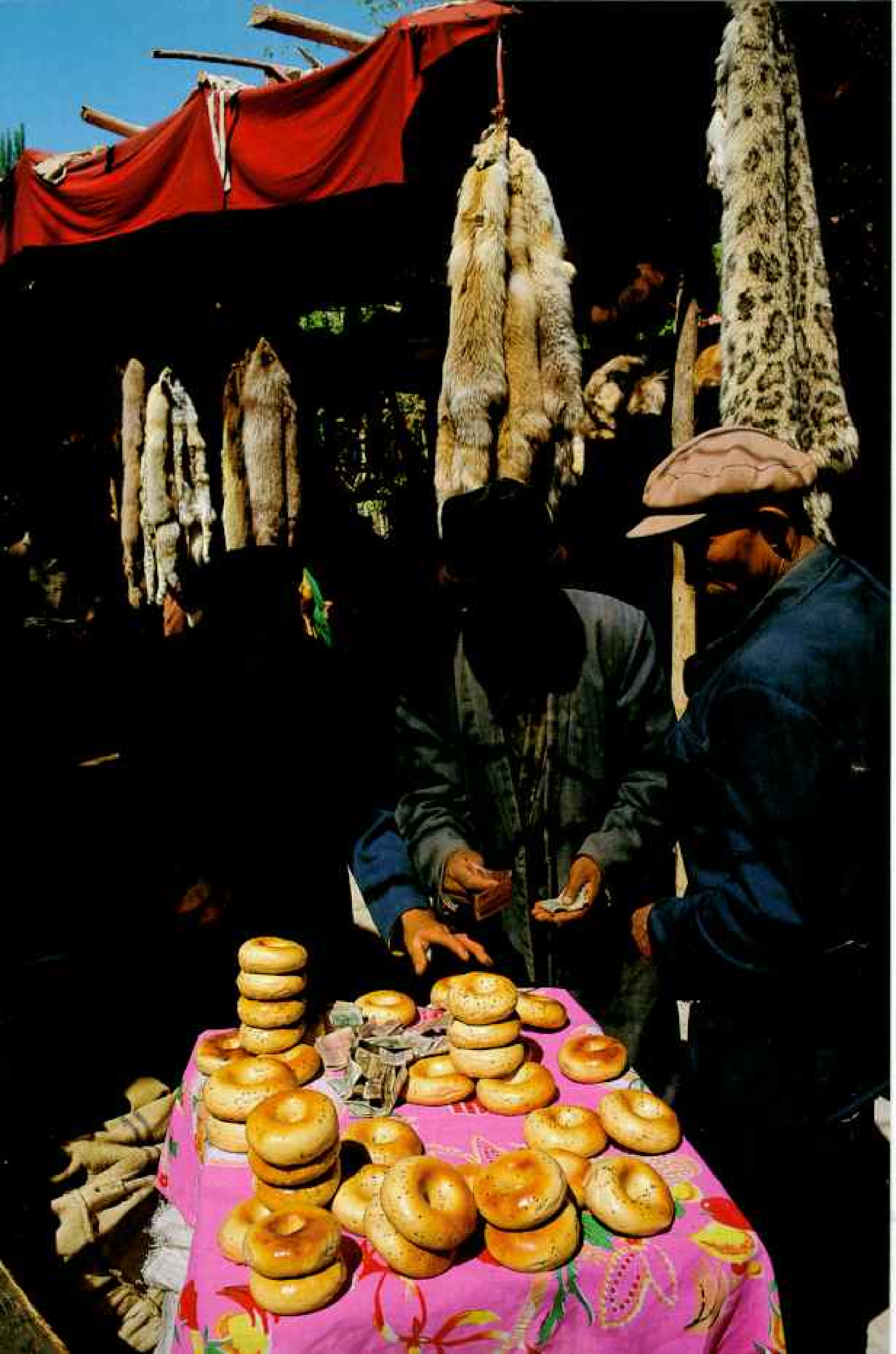
We soon were back on the road to Kashgar. In the headlights we could see dozens of donkey carts piled high with spindly firewood for Uygur ovens.

Next morning I saw the carts again, caught in the frenzy of Kashgar's Sunday bazaar, touted as the largest market in central Asia, a square mile of tent arcades and open-air stalls. At least 100,000 people jostled with one another to buy live chickens and caged songbirds, spices and shrieking stereos, red silk dresses and jeweled knives, firewood and bleating sheep, horses and camels.

I stopped by a baker who was kneeling on a platform next to an open-topped oven. He formed dough into round shapes and sprinkled sesame seeds and water on them. Then his upper half disappeared as he dipped into the oven to slap the circles of dough onto the inside wall. In minutes he dipped into the oven again and removed . . . bagels! At least that was what they looked and tasted like. Uygurs call them *girde nan*, round bread. I bought them frequently, and each bite increased my admiration for Uygur civilization.

The Sunday bazaar, a tradition perhaps as old as the Kashgar oasis, is shrinking. Banks and office buildings are crowding out the stalls. The economic boom has not spared Kashgar. At a factory full of Uygur women sewing and embroidering tourist souvenirs, I saw a sign: TIME IS MONEY. EFFICIENCY IS LIFE. The sign jarred me because, as I walked Kashgar's alleys, I often fell under the spell of the ancient place.

The Islamic feast of Qurban was one of those times. It commemorates the story of Abraham: the divine dispatch of a celestial sheep as a substitute when Abraham was about to sacrifice his son. In every home



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Crossing a sea of sand to plumb a sea of oil, a petroleum-exploration convoy grinds through the Taklimakan Desert. Huge finds have lured foreign companies to one of the most remote oil fields on earth. Deposits could dwarf U. S. reserves.

a man killed a sheep, and the women laid out an array of special breads and sweets. It was a day of families keening at brown-earth tombs, of men and boys praying and later dancing around the great Id Kah Mosque, of people gently tugging strangers like me off the street to share festive foods in homes humble and grand.

Islam has its own style in Kashgar. I saw more veiled women on the streets than I had seen in the north. Here, though, women nonchalantly flip back their thick brown veils when they want to examine prospective purchases. Some veiled young women walk about the markets in high heels and knee-length skirts. Most of Xinjiang's Muslims are Sunni, whose religious practices differ from those of the more militant Shiite Muslims of Iraq and Iran. But there is a new militancy in the alleys of Kashgar and other Uygur cities along the fringes of the Taklimakan Desert.

Because I was always escorted by Chinese officials and could use only official translators, I could not talk to just any Uygur in Xinjiang. But, back in the U. S., Uygur exiles said that three issues had fueled desires for independence there: the massive migration of Han into Xinjiang, the use of the province for testing nuclear weapons, and the exploitation of Xinjiang oil, which local residents view as their property.

Since 1964 China has been exploding nuclear weapons in Lop Nur, a wasteland where an Indo-European civilization flourished 2,000 years ago. Chinese archaeologists who dug at Lop Nur in 1979 found the mummified corpse of a woman with dark blond hair (page 44).

Reza and I had hoped to go to Lop Nur, but Chinese officials, without mentioning the nuclear test grounds, ruled out a trip to the site, where the mysterious city of Loulan vanished more than 1,600 years ago. Although wide swaths of Xinjiang remain closed, we were allowed to visit Turpan, where the spectacular Flaming Mountains rise over the lowest place in China, and the Tarim Basin, where scorching

Thousands of workers, miles of sand-stabilizing plastic, and countless tons of gravel were marshaled last year to push an oil road where caravans feared to tread—the heart of the Taklimakan. Conditions for road crews (right) were brutal. Taklimakan sandstorms hurl pebbles like buckshot. Sand temperatures of 150°F can broil skin.

sands enshroud ancient cities and a modern treasure: an enormous underground pool of oil.

Along the highway to Turpan the land was flat and lifeless. Seen through a scrim of shimmering heat waves, the bloodred mountains did seem afire. Nearing Turpan I asked my reluctant guide to detour through the choking dust of a rutted road. It led to a bowl of dry, cracked earth where once there had been a lake nearly 25 miles long. Here, 505 feet below sea level, is a spot where water vanishes under a relentless sun.

We made a spine-pounding return to the highway and resumed the trip to Turpan. A hazy line of green appeared in the distance, just as it must have appeared when travelers neared this junction of the silk caravans more than 2,000 years ago.

Turpan, a major center for grapes, melons, and other fruits, is greened by water from *karez* wells, shafts sunk along a mountain slope and connected to form a subterranean canal. The hidden water, shielded from evaporating sun for much of its journey, flows into irrigation

Rhapsody in red, a Uygur woman takes a travel break at Karakol Lake, a rest stop on the China-Pakistan highway. Muztagata, "Ice Mountain Father," shimmers in the distance. Though the modern world intrudes as never before in China's central Asian frontier, its otherworldliness still

grips the popular imagination. Haunted by lost empires, pregnant with waiting, its people and landscape remain unknowable, exotic. "Xinjiang is a mystery," concedes a government official, "even to the Chinese."

ditches that serve Turpan's bountiful fields. Local Uygurs call the ingenious irrigation system their underground Great Wall.

SOUTH OF TURPAN and the Tian Shan is Xinjiang's most forbidding realm, the Tarim Basin. The heart of this vast depression is the Taklimakan Desert, a place that can kill with heat or with cold. But there are treasures here, and so the seekers come. China, thirsting for oil, is tapping the Taklimakan, which, by Chinese estimates, holds 74 billion barrels of oil—three times the proven U. S. oil reserves. Archaeologists venture into the Taklimakan in hopes of finding lost civilizations that lie beneath the sands.

To reach Tarim No. 4 Field, a major production center, we took the Oil Road, which tamed the Taklimakan. The journey began at the northern fringe, south of Korla, where desert poplars struggled out of the stony soil. The Chinese call the poplars the trees that never die, for even in death they may stand for a century. Soon the roadside thicket thinned out, giving way to clumps of spiky tamarisk and camel thorn. In pure desert now, the highway coursed straight through the sea of sand. To keep nearby dunes from burying the road, workers had planted a wide net of hardy reeds along the roadside. The net clamps down the sand when winds whip through the dunes.

We passed under an arch that said "Fighting the Sea of Death" and, 136 miles down the highway, reached Tarim No. 4 Field, site of many of the 360 successful wells thus far drilled in the great Taklimakan oil quest. Spread across hundreds of square yards of desert were trucks, oil drums, and a jumble of trailer-like boxes that house some of the 5,000 workers enlisted in this branch of China's oil army.

Xu Fu Chen, the tall, briskly confident manager of the No. 4 command post, hurried us into one of the faded green boxes and closed a hatch against the whirling sand. On the hottest day he recorded here, the temperature was 104°F; on the coldest, minus 22°F. "My men worked on both of those days," he said. "There are sandstorms. You can't see farther than a meter. Then the cars stop, and the exploration stops. But the drilling always goes on."

That night the wind came up, and for most of the next two days we ate and breathed sand. At an outlying well the men who call themselves oil soldiers worked as if the sand whipping around them was not there. They are fighting a vital battle. If the oil is as plentiful as geologists say it is, China will have enough oil to fuel its soaring economy. If not, China will continue to be an oil-importing nation.

Xu, who came out of retirement to take charge at Tarim, talked patriotically about his job. So did other workers. Unlike so many people I met in Xinjiang, they did not talk about money. Near a small greenhouse, a gardener pointed to what looked like brittle desert weeds. "I want to grow flowers," he said, looking at his patch of sand as if it were a garden in bloom.

The 324-mile Oil Road ends at the southern edge of the desert, near an old oasis that the Chinese call Minfeng and local Uygurs call New Niya. Old Niya lies under distant sands. There often are two names for places in Xinjiang, where so much history is buried. The Chinese translate Taklimakan as "go in and you won't come out." Uygurs say that it means "homeland of the past," a lament for a lost civilization whose cities included Old Niya, where Reza and I went searching the Xinjiang desert for that homeland of the past. □

The Silk Road's Lost World

By THOMAS B. ALLEN
Photographs by REZA

A skeletal house, its roofline traced by a flashlight in a time exposure (above), thrusts from China's Taklimakan Desert where the city of Niya flourished for 500 years before collapsing at the end of the third century A.D. About a hundred mummified human remains have been dug from the sands of the Taklimakan, including many with Indo-European features, like most Xinjiang residents today.

In Zaghunluq, a village 150 miles east of Niya, near Qarqan, Dolkun Kamberi, a Uygur archaeologist, found the tomb of a man (right) who added clues about the early inhabitants of the region. Painted on his temple was a sunray symbol, a possible link to the worship of Mithra, an Indo-Iranian god. Dr. Kamberi believes that a later Tarim Basin civilization produced kingdoms like Niya along the network of caravan routes known as the Silk Road.

Niya residents built houses with fireplaces and elaborately carved furniture that showed Greek and Roman influence. They painted stuccoed walls with floral designs. Ababekri, a local guide, felt at home, for it was like his own village of Qapaq Asqan—the last village before the desert. His house is also built of reeds and posts; its layout is like those of Niya's skeletal homes. And his Uygur village is full of people who resemble those who lived here long ago, centuries before the Han Chinese ruled the land.

PHOTOGRAPHED AT THE XINJIANG MUSEUM, URUMQI

The man from Zaghunluq (below) was about 55 years old when he was put in a grave around 1000 B.C. A red woolen bracelet circled his right wrist, and his hands were bound, probably to keep them folded. He wore deerskin boots remarkably similar to those of a modern horseman (facing page) near Taxkorgan.

Discovery of agricultural tools and woven bags of grain suggests that these early desert dwellers were farmers as well as herders. Some of the mummies date back to 2000 B.C. Others may be much older.

A mummified infant boy (right) was also found at Zaghunluq, swaddled in woolen cloth and placed in a small coffin pit lined with white felt. A smooth stone covered each eye. Dr. Kamberi relates this to a traditional Uygur saying: In the desert, eyes must be strong as stone. Interred with the infant was a kind of baby bottle—a bag fashioned from a sheep's nipple breast.

Three women were buried with the man, and nearby were a horse's skull and leg, hollowed and stuffed with reeds for some forgotten rite. Buried food was similar to items on Xinjiang menus today: the flat leavened bread called nan and kebab, chunks of roasted mutton on skewers.

PHOTOGRAPHED AT THE XINJIANG MUSEUM (ABOVE AND BELOW)

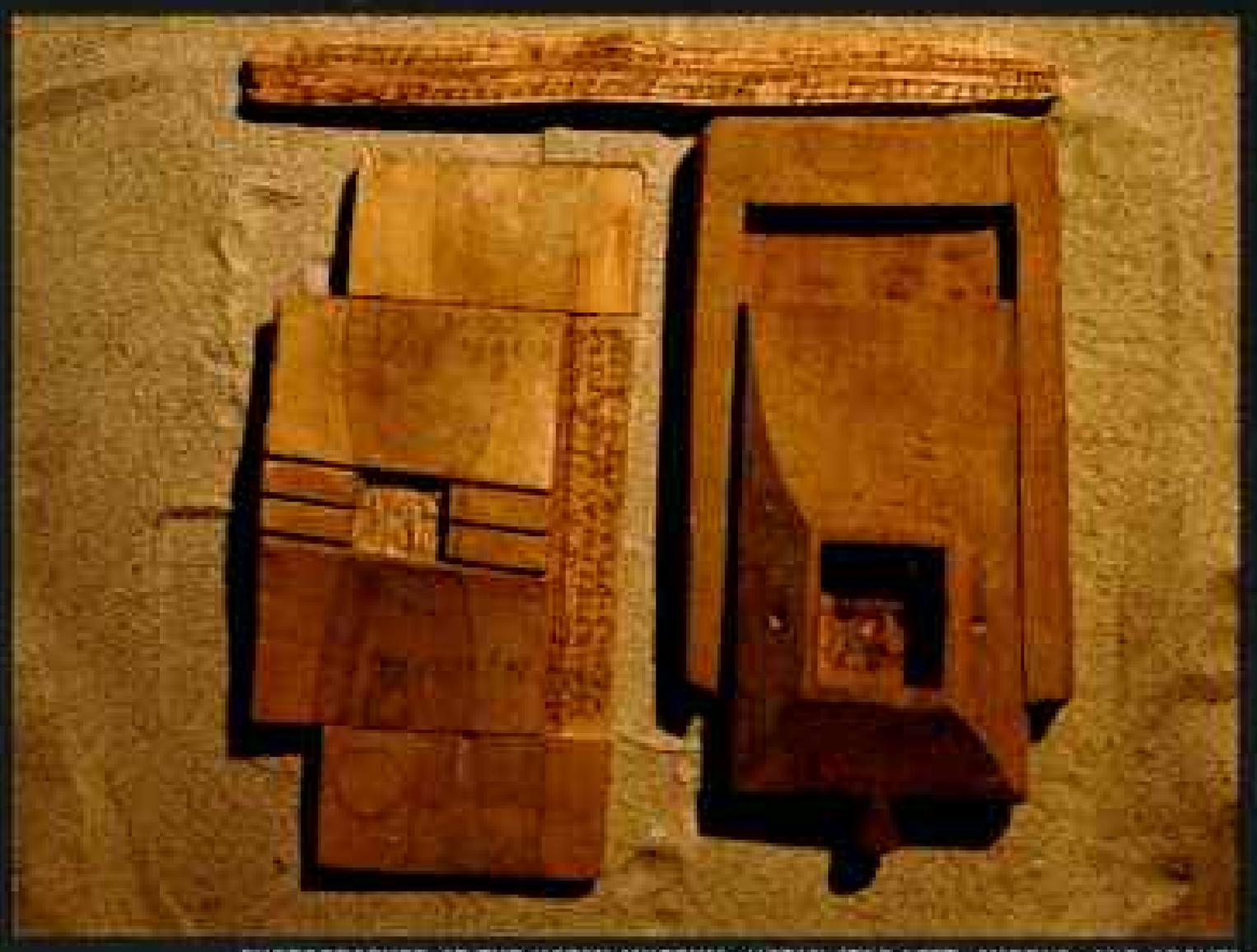
Wealthy kingdoms spread across much of what is now Xinjiang, trading along the Silk Road and, like China, embracing Buddhism. Niya carvings on a small wooden door (above) reflect a society aware of Indian elephants and mythical beasts of other cultures. A Niya bowl (right) bears a symbol of a moving sun, perhaps a sign of Mithraic worship. Some art has clear precedents in Hellenistic culture.

At Niya I found a sherd of pottery bearing the fingerprint of the potter (below). Excited, I showed it to Wang Binghua, Xinjiang's leading archaeologist and an authority on Niya, who was traveling with us. I asked for permission to bring it back to the United States, where, I told him, a forensic anthropologist might be able to extract information about the potter by studying the fingerprint. Wang Binghua, a Han Chinese, held the pottery for a moment, then asked: "Would he be able to tell if the potter was a white

man?" I said I didn't know. He nodded and put the sherd in his pocket. I never saw it again.

In the early 1900s British archaeologist Sir Aurel Stein meticulously mapped a stretch of Niya (above right) covering an area of about 20 square miles. Among his finds were "hundreds of wooden documents" in Kharoshthi script, an Indian alphabet of Aramaic origin dating back to the fifth century B.C. and often used for Silk Road transactions. Two types of wooden documents were found (right). Narrow strips carried routine messages. Confidential letters were put into tamper-proof wooden envelopes secured with string and sealed with wax.

Not until the late 1970s did Chinese archaeologists begin to rediscover the Tarim Basin, following the trails both of Stein and Sven Hedin, a Swedish explorer who found the lost city of Loulan. Once the capital of a kingdom that may have



PHOTOGRAPHED AT THE HOTAN MUSEUM, HOTAN (TOP LEFT, MIDDLE, AND ABOVE)

included Niya, Loulan was well known to travelers along the silk routes of the second century B.C. and lay along Lop Nur (Lop Lake).

Cities like Loulan and Niya rose along the rivers then lacing the Tarim Basin. As more people settled on upriver land, however, water sources dried up, forcing migrations and leaving cities to the sands. Lop Nur shifted as its river sought new channels. By the fourth century A.D. Loulan, deserted by its lake, was a ghost town.

On an expedition to Loulan in 1980 Mu Shun Ying, a Chinese archaeologist, found preserved in the sunbaked desert sands the extraordinary mummy of a woman whose long, brown-blond hair framed a face somehow beautiful even in death (left).

A goatskin wrap and a woolen cape, pinned with a sharpened twig, covered her. A felt hat on her head was trimmed with a goose feather. Leather shoes graced her feet. She was nearly five feet tall and probably in her mid-40s when she died. Until the expedition left Loulan, archaeologist Mu shared her tent with what she called the "Loulan beauty."

Carbon dating indicates that the Loulan beauty is 3,800 years old. Chinese archaeologists found another mummy nearby; carbon-14 testing on wood from that mummy's tomb suggests that the mummy could be 6,000 years old.

The finding that the mummies significantly predate Han Chinese presence in the area is affecting modern politics and has caused cultural and political consternation in some quarters.

When the Loulan beauty was put on exhibition, Uygurs took her to their hearts and claimed her as "the mother of our nation." Her face, re-created by an artist, adorns a poster (below) advertising a cassette in tribute to her. In a song on the cassette she is called Kiruran Guzali, "the beauty of Kiruran." That phrase makes her a citizen of Kiruran, the Uygur name for Loulan. Photographs of vocalist Zahir Burkhan also decorate the poster.

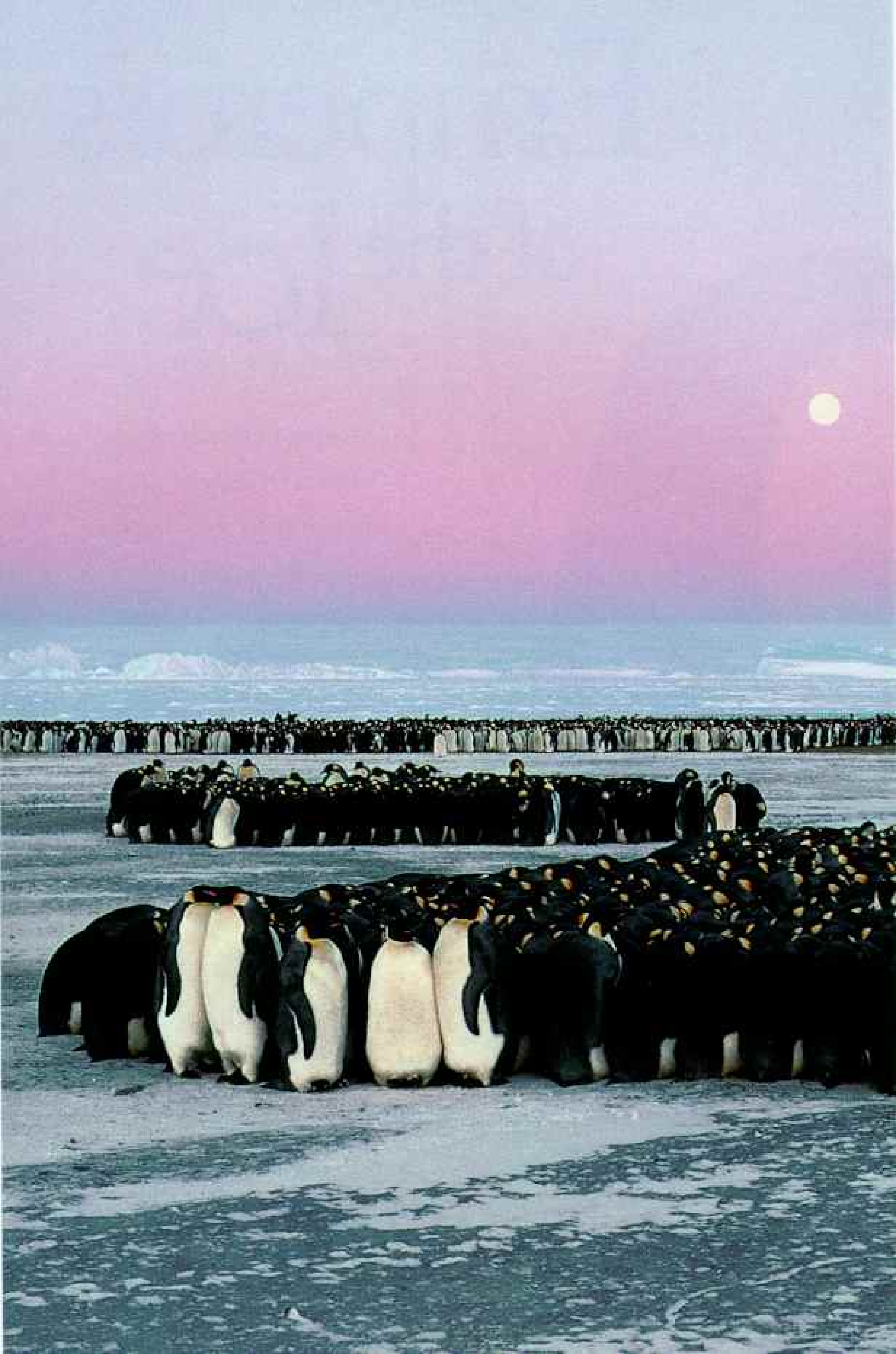
I saw Kiruran Guzali in the Xinjiang Museum, where she seems to sleep in a distant, tranquil past. Lop Nur, the wandering lake where she once walked, is now the name of China's nearby nuclear-weapons testing ground. □

Emperors of the Ice

Greeted with courtly bows, an emperor penguin chick about four months old basks at the center of attention. In the dead of the Antarctic winter, these regal birds nurture their young through relentless blizzards, oppressive darkness, and months of killing cold. Largest of 17 penguin species, they are the undisputed rulers of earth's coldest realm.

By GLENN OELAND
NATIONAL GEOGRAPHIC EDITORIAL STAFF

Photographs by
FRANS LANTING



Brittle moon of the winter solstice offers cold comfort to emperors huddling on a wind-raked plain of ice along the Mawson Coast. By clumping together in tightly packed huddles—slowly shuffling so each bird gets time out of the wind—emperors cut their heat loss and metabolism by half and double their odds of outlasting winter's siege.

GRAHAM ROBERTSON, AUSCAPE

Hatching an Egg...at Forty Below

ANTARCTICA IN MARCH IS LIKE AN ISLAND panicked by a looming hurricane. Prodded by some innate evacuation order, nearly every creature flees the onslaught of the austral winter. Only the emperor penguin overwinters on the open ice.

As snow petrels, skuas, Adélie penguins, and leopard seals cut and run northward to warmer latitudes, 400,000 emperors make their way resolutely south—into the teeth of one of the most forbidding environments on the planet. To add to the challenge, they have mating on their minds.

A single egg laid in early winter marks the start of a prolonged ordeal for the male emperor, who incubates the egg through nine weeks of bitter weather. Puffs of gray down, six-week-old chicks nestle atop their parents' feet (facing page).

"Compared with other marine birds, emperor penguins have everything backwards," says Ann Bowles of the Hubbs–Sea World Research Institute in San Diego. "They breed in winter, the females compete for the males, and they're notoriously unfaithful. They're the most bizarre birds I've ever met."

Bowles's sentiments are echoed by Graham Robertson of the Australian Antarctic Division. A bearded, windburned ecologist, Robertson once spent nine "demon cold" months bivouacked on the shore-fast sea ice where emperors gather to rear their young. Observing a colony from the sidelines, he was both awed and baffled by the birds' eccentric sex life. "Standing there in that intense cold," he says, "you can't help asking, 'Why would penguins breed in this bloody place?'"

The reasons are complex, arising out of the birds' long evolutionary odyssey, biologists explain. The simple fact that they succeed is a source of wonderment. After a weeks-long courtship during which partners learn to recognize each other's signature song (how else to distinguish one's mate from mobs of look-alike penguins?), each female lays a single, softball-size egg. She then strikes out on a two-month oceanic feeding spree, leaving her partner to incubate the egg through the worst of the polar winter—with only his body fat to sustain him. Through shrieking storms and weeks of virtually round-the-clock darkness, the male carefully balances the embryonic emperor on the tops of his feet, where an apron of densely feathered flesh seals out the deadly cold.

"The emperor's blood temperature is about the same as yours and mine," observes Robertson. "The difference is that I had to wear ten kilograms [22 pounds] of clothing through the winter, whereas the emperor is outfitted by nature to cope with the cold."

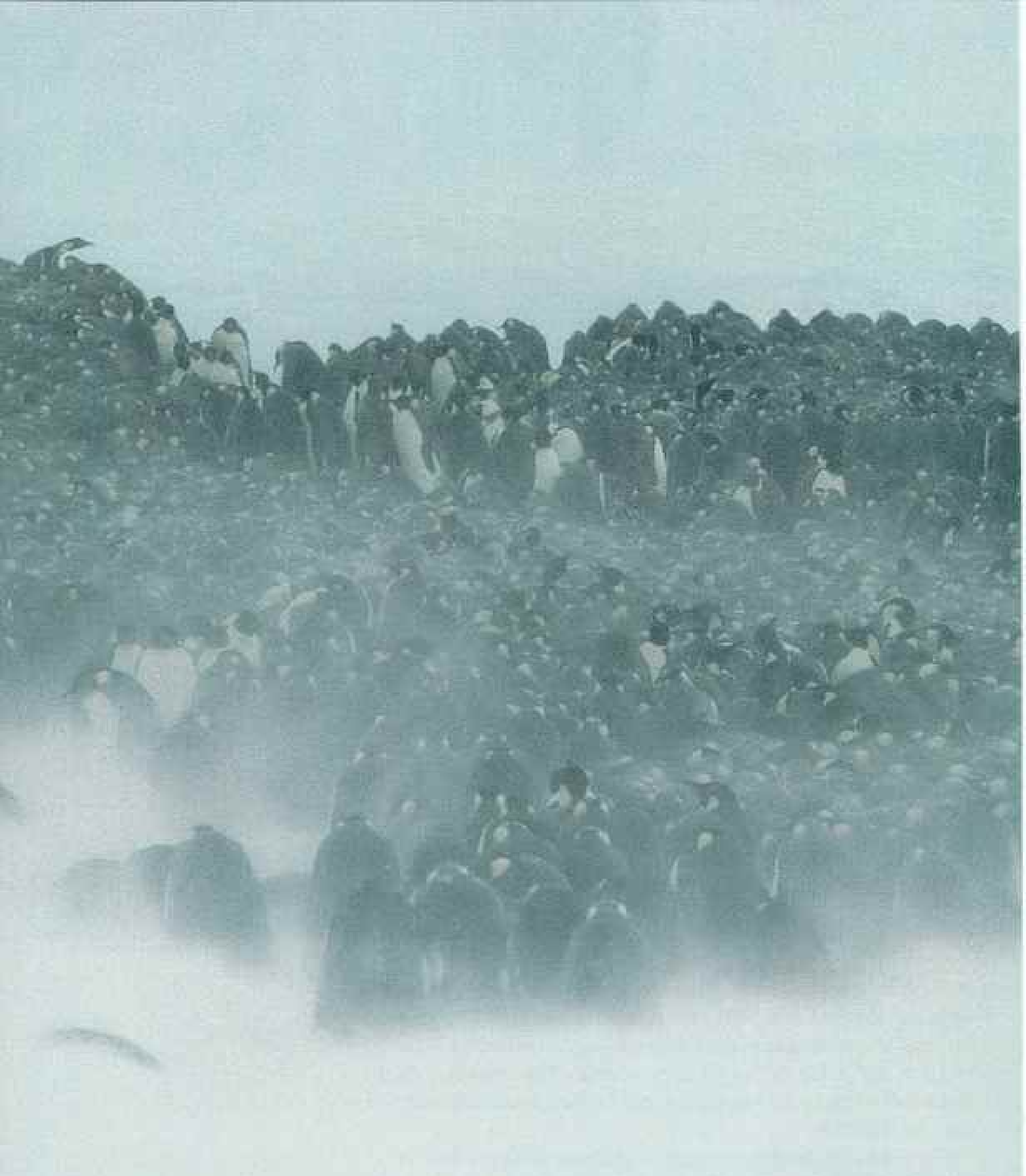
If all goes well, more than 90 percent of the eggs hatch, and the

GRAHAM ROBERTSON

well-fed females trek back into the colony just as the chicks begin whistling for their first meal of regurgitated seafood. When his mate arrives, "the male goes berserk trumpeting," says Bowles. "He's had that egg on his feet for 65 days, and he's lost between a third and a half of his body weight. You can bet he's good and ready for mom to take over."

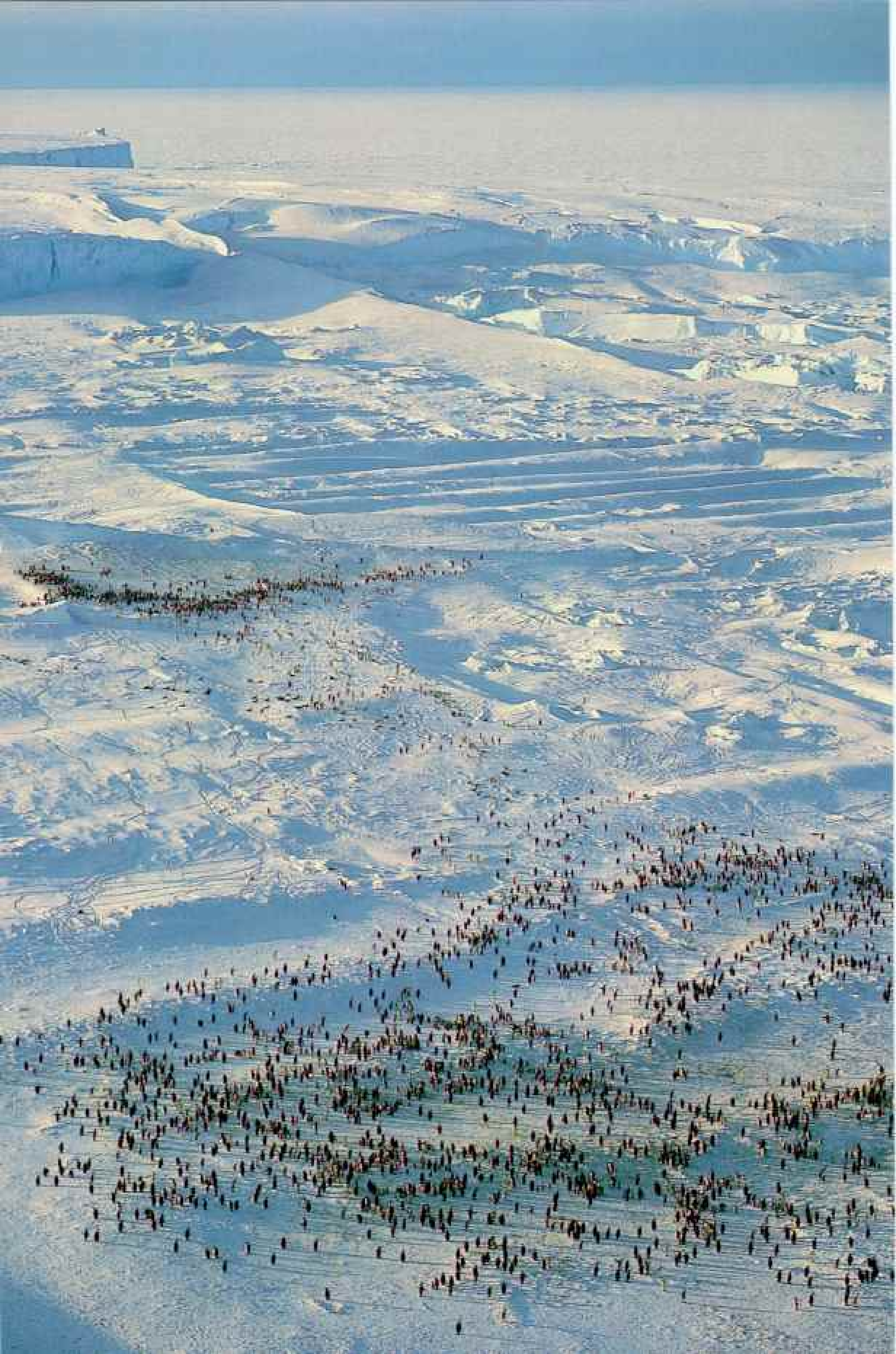
The method behind the emperor's madness comes to light in December, high summer in the Southern Hemisphere. As the ice on which they've been standing starts to splinter, the fledging chicks—now just old enough to fend for themselves—take to sea during the brief period when food is most abundant and the climate is kindest.

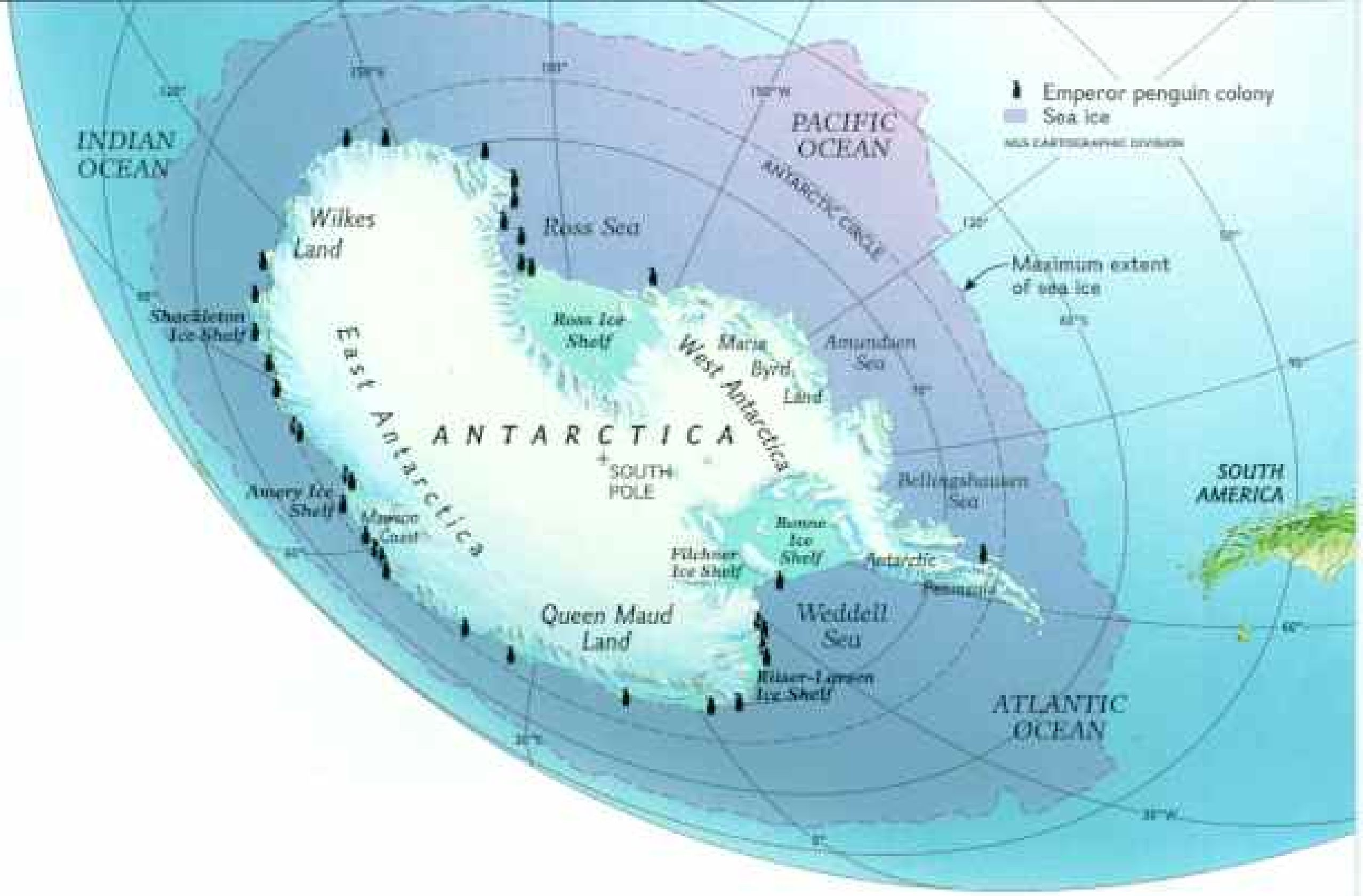
If the emperors' arrangement for getting their genes into the next generation strikes us at first as a bit, well, birdbrained, their astonishing ability to pull it off appeals to our sense of the heroic. Theirs is the unupholstered life of the pioneer at the limit of the habitable world. As Graham Robertson puts it, "Emperors live on the cutting edge of life itself."



Assailed by the elements, 11,000 emperors coalesce into a single mass to fend off a blizzard on the Mawson Coast. Unlike most penguins, emperors don't defend a territory. "They're like people in a crisis," says seabird ecologist Graham Robertson. "They forget their differences and rally together."

GRAHAM ROBERTSON

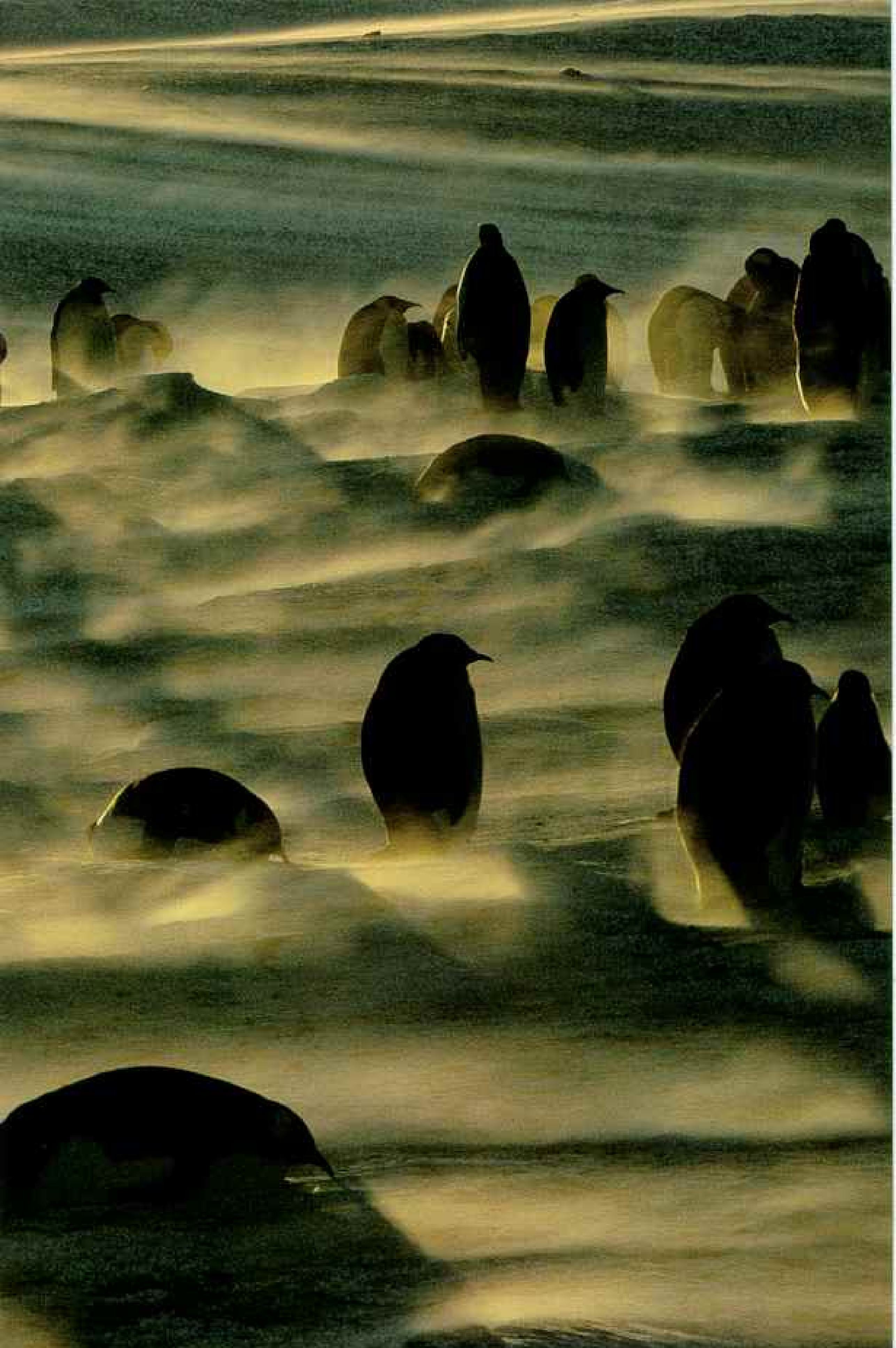




Colonizing the swells of the continent's frozen seas, the emperor penguin, *Aptenodytes forsteri*, ranges with the growth and retreat of Antarctica's sea ice. Courtship begins with the onset of winter and hardening of the ice in March as breeding-age birds—those four years and older—congregate at colonies numbering from a few hundred to 60,000 members (map). Except for the few scientists sequestered at year-round research stations and Weddell seals feeding beneath the ice, emperors are the only warm-blooded beings to winter through. "It's a biological desert except for the emperors," says a seasoned polar researcher. "Nothing else can possibly cope with the conditions."

After hatching in July during the dark of the polar winter, an emperor chick spends its first two months snugged in a parent's brood pouch (right), where the temperature is a constant 96.8°F. A young chick accidentally tipped from its haven can freeze to death in two minutes.

Cocooned inside dense plumage—about 80 feathers per square inch—emperors shrug off a spring snowstorm. A downy undercoat topped by long feathers that overlap like roof tiles provides a barrier even gale-force winds cannot breach. Both males and females grow to nearly four feet; males can reach 70 pounds, females slightly less.

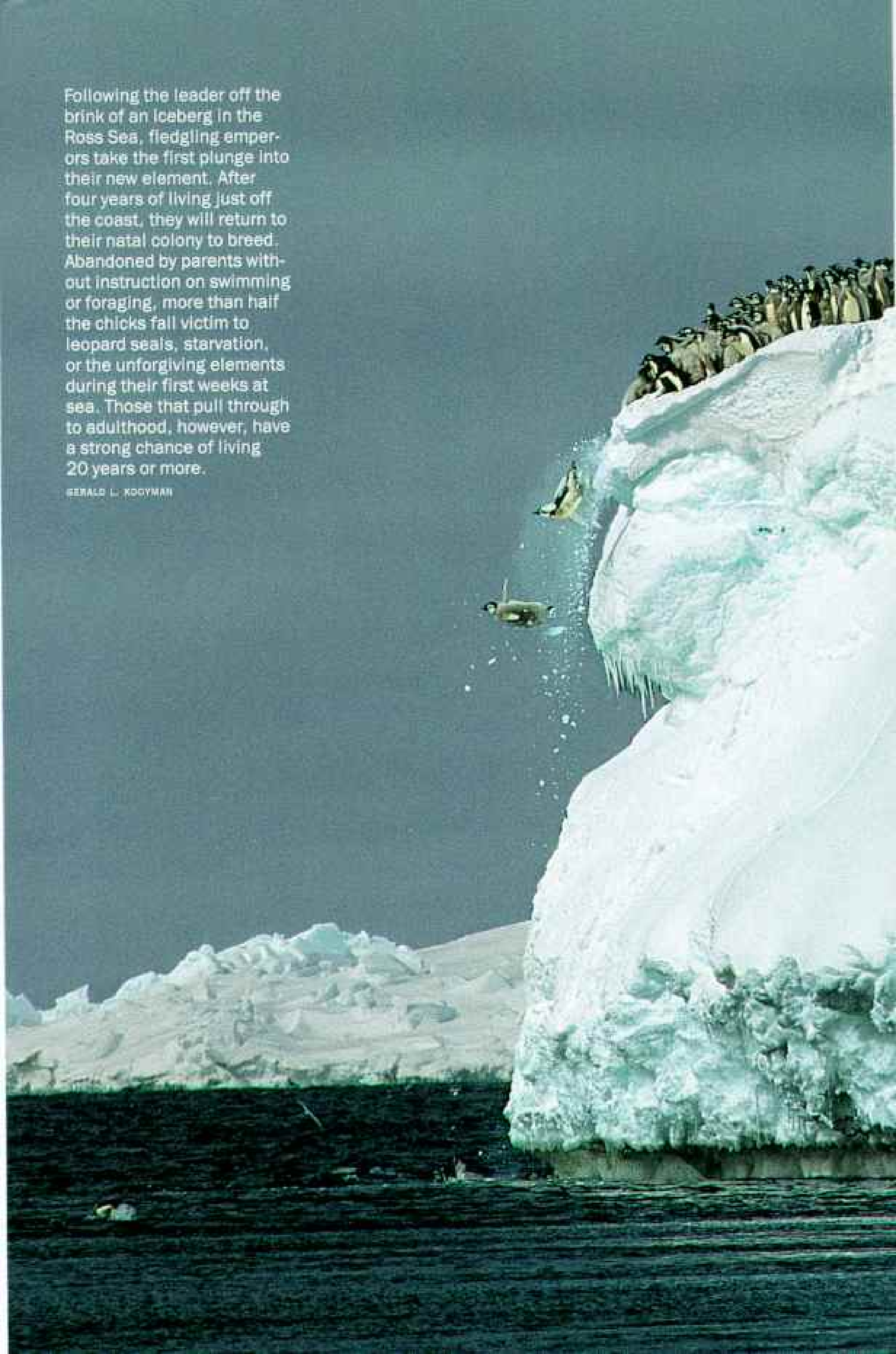


To pick its chick from the crowd, an emperor relies on sound instead of sight. While parents go to sea to hunt for food, young emperors pile into penguin day-care centers called crèches. The returning parents walk from crèche to crèche, trumpeting at the top of their voices. "Each bird's call is distinctive," says Ann Bowles, an expert on emperor communication. "When a chick recognizes its parent's voice, it comes barreling out to meet it."

Propelled by crampon-like feet, emperors toboggan toward the Weddell Sea to feed on krill, squid, and fish. The distance to a patch of open water in the vast expanse of sea ice varies with the season; in midwinter birds may have to cross 50 miles of ice—at an average cruising speed of half a mile an hour.

Following the leader off the brink of an iceberg in the Ross Sea, fledgling emperors take the first plunge into their new element. After four years of living just off the coast, they will return to their natal colony to breed. Abandoned by parents without instruction on swimming or foraging, more than half the chicks fall victim to leopard seals, starvation, or the unforgiving elements during their first weeks at sea. Those that pull through to adulthood, however, have a strong chance of living 20 years or more.

GERALD L. KOOYMAN



Exploding through a hole in the ice, an emperor rockets from the sea. Graceless on land, emperors are Olympian swimmers, capable of diving to 1,750 feet to hunt fish. To elude leopard seals that lurk at ice's edge, they accelerate as they near the surface, leaving contrails of air bubbles in their wakes and catapulting as high as seven feet out of the water.

Though emperors have been the subject of scientific inquiry for nearly a century, much remains to be learned.

"Antarctica is so remote that new emperor colonies are still being discovered," says Ann Bowles. "The latest was

GERALD L. KOOYMAN; HANS REINHARD (RIGHT)

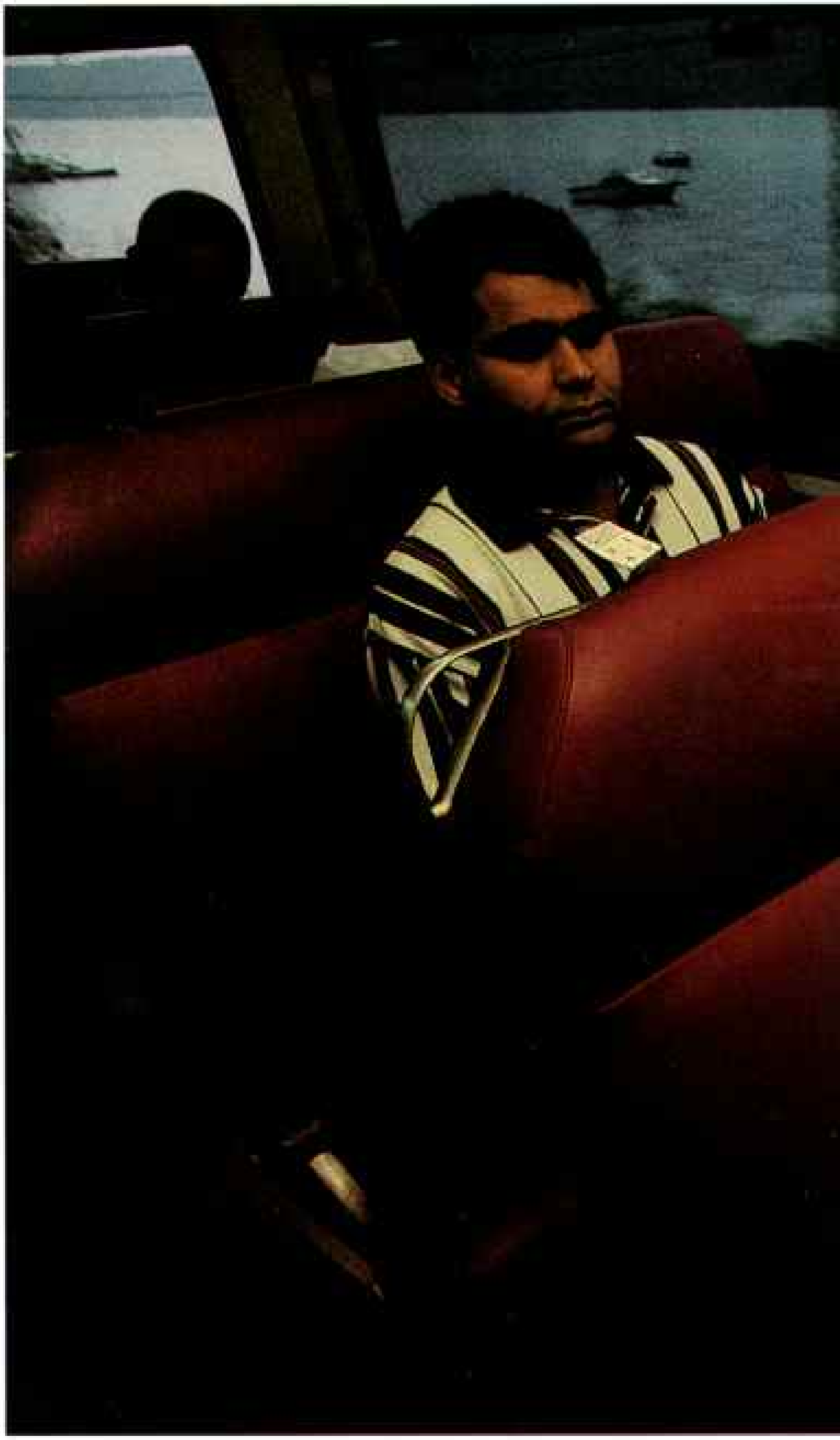
in 1994, which is very recent history to be finding something as big as an emperor colony."

Despite the difficulty of studying one of the world's most inaccessible animals, scientists are drawn to these seabirds. "The more you learn about them, the more it heightens your respect," says Graham Robertson. "Of all the types of wildlife I've worked with, emperors are the peak." □

Commuting along the Hudson, Carolyn Rossi Copeland takes a morning train to Manhattan to show her twins where she works. Many Hudson Valley transplants hold to city careers; others open local businesses to pick up the slack left by declining factories and farms.

By PATRICK SMITH

Photographs by MELISSA FARLOW



Heart of

the Hudson

"The mists were resting on the vale of the Hudson like drifted snow," wrote 19th-century landscape artist Thomas Cole. The fog-draped river, sweeping past groves and farms such as these near Saugerties, captivated painters of the Hudson River school, inspiring distinctly American works of art.

STEVERETT NACK NOSED his skiff into RamsHorn Creek, south of Catskill, a few minutes before the autumn dusk. As we made the first bend of the snakelike estuary, the brush drew close and the twinkling lights along the river disappeared. RamsHorn is primeval, a northern version of the bayou. Decaying tree trunks, beaver dams, and wild rice line its banks. Of all the footprints in the mud, none is the shape of a shoe.

Nack, a burly fisherman of 67, knows the Hudson River as well as most of us know our kitchen tables. As I leaned against a bait bin in the bow, he described the duck and muskrat along the creek and the way the swampy banks changed shape over the years. When the sky had darkened to a faint violet, we turned. We'd gone as far as the tide let us.

"It's a world apart," Nack called above the quickened groan of his outboard as we eased back into the wide river. "There's no place along the Hudson really like it."

During the time I explored the Hudson's 315 miles, from its source in the Adirondacks to New York Harbor, RamsHorn's silent wilderness was one of the few places I saw that wasn't a collaboration between man and nature. The long human partnership with the Hudson has ebbed and flowed just as the tide does as far as Troy. Yet to travel this river is to discover how one-sided the partnership has been, how much a great waterway has been ignored—or abused.

But a remarkable transformation is taking place. People are starting to think of the Hudson Valley as a region again, something shared. They're realizing that Yonkers, Mechanicville, and Saratoga Springs have something—call it public space, call it community—in common. And they're rediscovering places like RamsHorn Creek, whose

Contract photographer MELISSA FARLOW and her husband, Randy Olson, covered our national parks for the October 1994 issue. PATRICK SMITH's article on inner Japan appeared in the September 1994 GEOGRAPHIC. While writing this story, he lived in the gate cottage of an old Hudson River estate.

A wedding fit for royalty—complete with Rolls-Royce touring car—matches the elegance of the Lyndhurst estate in Tarrytown. Built in 1838 for a New York City mayor, the home came to reflect the 1860s lavishness of dry-goods merchant George Merritt, who later lived there. Lyndhurst is among 24 restored mansions in the Hudson Valley open to the public, who enjoy craft fairs and sunset symphonies on the grounds.

preservation is the valley's greatest challenge. It's a change that has come none too soon.

"The Hudson, for natural magnificence, is unsurpassed." I found this to be as true as when the painter Thomas Cole wrote it in 1841. The sheer cliffs of the Highlands south of West Point or the grassy meadows rolling up to the riverbank in Greene County are natural scenes as worthy of the Hudson River school as anything Cole and his colleagues painted.

Along the Hudson history persists into the present like the layers of sandstone and shale beneath the Palisades cliffs just north of New York Harbor. Every rotting ferry slip has a story to tell, every hydroelectric sluice and hard-bitten, redbrick river town. What drew me to the river was a simple proposition: We will leave our own mark on the Hudson. What will it be made of? Maybe the Hudson River Valley Greenway, a vast project that will eventually link open spaces along the river from New York to Albany.

A few things are certain. The future won't include the passenger boats that used to ply the river up to Albany: They're all gone, and tug-and-barge traffic is a fraction of what it used to be. The old foundries and mills are gone too, leaving the river towns—lively communities in their day—suspended between decay and quixotic hope.

Fruit and dairy farmers are giving up, letting go of the way of life that has given this river valley its placid agrarian character. "I'm one of the last farmers in East Fishkill," Lewis Knapp told me at the Dutchess County Fair in Rhinebeck. "Everyone else has quit, sold out, or moved their operation."

You can still see how well the old industries and farmers like Knapp once bound the valley together. But when its once robust economy lost its way, communities began to fragment. It's a story repeated endlessly across America; so is the search for something new, to hold the Hudson River Valley together.

No one knows right now just what that will be—so far new industries are usually more rumor than reality. Or, as a man I met along the old wharves in Albany said, "Everyone knows, everyone has a different answer."

In each town I visited, the valley was on everyone's mind. The Hudson's people are a diverse assortment of farmers, merchants, factory hands, townspeople, commuters, and lingering lords of the manor. In one way or another they all ask, What shall we do with our land? How they answer that will determine within a few years whether the natural magnificence of the Hudson will survive—or whether, in a while, we'll have to be happy reading about it.

At ease at last, graduating cadets of the United States Military Academy at West Point break formation and into smiles after four grueling years.

Built in 1778 to block upriver movement of British ships, West Point is the country's oldest continuously occupied Army post. Gen. Benedict Arnold commanded it in 1779, when he plotted to surrender the garrison to the British. When the treasonable plan was foiled, he fled to the enemy.

Founded 23 years later, the academy trained Army officers and engineers to protect the young nation and build its roads, canals, and railroads.

Thirty years ago it seemed that the river itself wouldn't survive our century. Raw sewage, spilled oil, polychlorinated biphenyls (PCBs)—a potent mix of waste and the leavings of industry—had turned the Hudson into a virtual cesspool. General Electric's discharge of PCBs, which are used to insulate electrical equipment, prompted one of the most famous environmental battles of the 1970s. That effort and continuing vigilance have rejuvenated the Hudson.

Now the threats are on land. Along the old roads up the Hudson—Route 9 on the eastern bank, 9W on the west—the woodlands and

orchards are salted with places in need of the same cleanup the river once required.

FRANK BULICH KNOWS the value of good stewardship. He benefits from centuries of it every day.

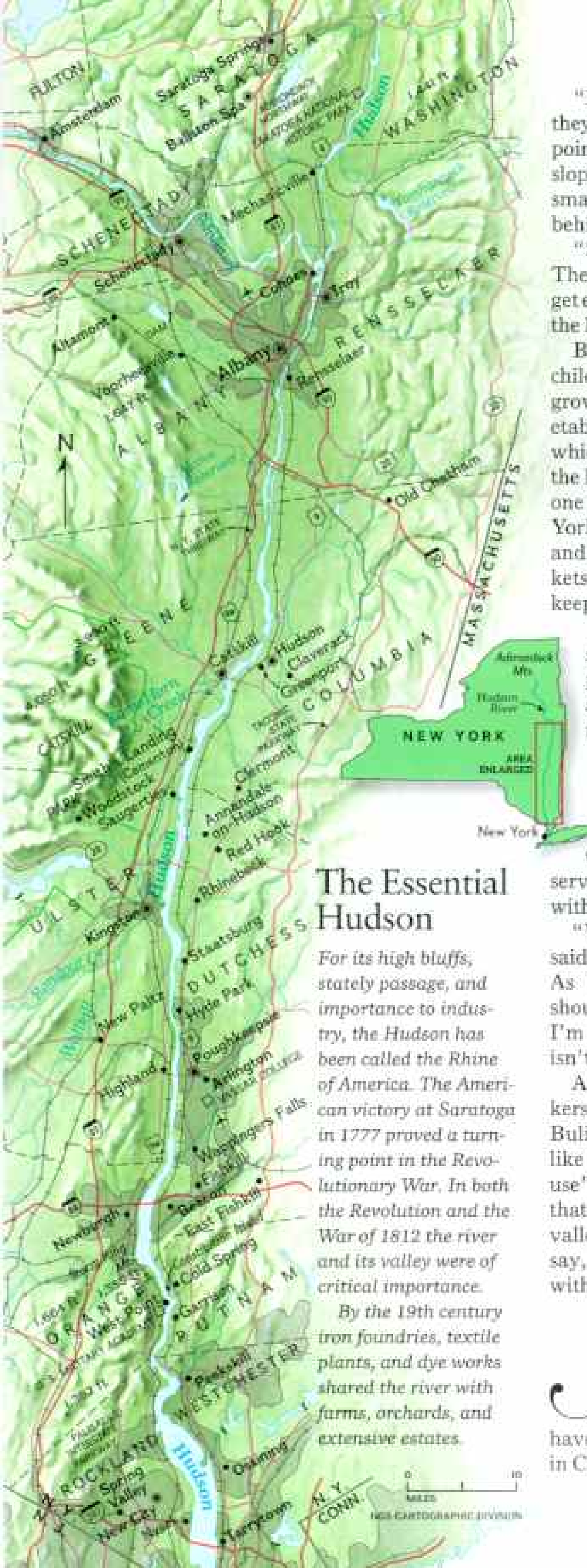
On a bluff in the center of his 670-acre farm a half dozen gravestones huddle against the elements and the indifference of his grazing cattle. Here lie descendants of the Van Orden family, Dutch patroons, as the first settlers were called, who arrived in the late 1600s. Before the Van Ordens, the bluff was a hunting ground for Mahican Indians. Bulich keeps boxes full of the arrowheads, axes, and simple flint tools he's found there.

Graying and tanned, Bulich has been a farmer in the Hudson Valley the past 50 of his 65 years. He loves the land, but he's far from sentimental about it. We drove around his property in his pickup, finally pausing atop a rise along his half mile of riverfront.

Below us the Hudson spread wide through its basin south of Catskill. In the late afternoon sun we could see several miles southward to the old river estates along the eastern shore near Red Hook. It was still a scene worthy of the painter's brush.

Bulich let our conversation lapse a minute or two while I took it in. Then he asked, "See those cement silos?"

You couldn't miss the things, towering tanks on a spit of earth that poked into the current maybe a mile downriver. A huge conveyor belt, used for moving cement into barges, tethered them to the shore. The silos marked a hardscrabble hamlet once called Cementon and renamed Smith's Landing.



The Essential Hudson

For its high bluffs, stately passage, and importance to industry, the Hudson has been called the Rhine of America. The American victory at Saratoga in 1777 proved a turning point in the Revolutionary War. In both the Revolution and the War of 1812 the river and its valley were of critical importance.

By the 19th century iron foundries, textile plants, and dye works shared the river with farms, orchards, and extensive estates.

"I love those silos," Bulich said. "To me they're beautiful. Look down below." He pointed over his steering wheel to the land sloping toward the river. Off to one side a small farmhouse and a few outbuildings hid behind trees.

"See the poles, the wires? I love those too. They mean progress to me. Our farm didn't get electricity until 1946. I read schoolbooks by the light of an oil lamp."

Bulich and his wife, Ann, brought up nine children. Seven of them now work the farm, growing mushrooms, hay, flowers, fruit, vegetables, and raising three head of beef cattle, which are essentially pets because no one has the heart to slaughter them. Five days a week one of the kids departs before dawn for New York—and the high retail prices that flowers and Portobello mushrooms fetch in city markets. Bulich only advises now, and his wife keeps the books.

Like other farmers, Bulich complains of steep taxes, rising costs, and produce prices that never seem to move. But he's also got a quarrel with progress, for that is no longer as simple to define as electricity.

Out where the Van Ordens are buried is a fine place to build, and Bulich has pondered selling that patch to provide for his later years. But the town of Catskill's planning board, eager to preserve the shoreline, has blocked new building within a hundred feet of it.

"We're still arguing about it," Bulich said. "The thing is, our land is our retirement. As long as I'm not hurting anybody, I shouldn't have restrictions on my property. I'm not polluting the river—that's the issue, isn't it?"

A lot of people—developers, real estate brokers, political conservatives—agree with Bulich. But a lot of others believe that farmers like him, along with developers and "wise-use" conservatives, need to rethink the idea that progress always equals growth. As the valley becomes aware of itself as a region, they say, it's time to recognize that what you do with your land affects others too.

SINCE 1960 the population of the Hudson Valley, from Troy to Yonkers, has expanded by a third, to 2.5 million. The New York suburbs have crept steadily northward: A hunter I met in Cold Spring, complaining about how much

National Geographic, March 1996

"There was a time I wouldn't have gone near this river," says Cold Spring windsurfer Steve Garfinkle. Thirty years ago environmentalists declared legal war on industries releasing harmful chemicals. Though the river is cleaner today, says Garfinkle, "I still won't eat the fish."

less land he can hunt on each autumn, reckoned that "the city's up as far as Peekskill now."

Elsewhere, sprawl threatens to turn a valley dense with character into Anywhere U.S.A. Malls have multiplied so fast that the first generation of them is already emptying. "Crudscape," a man in Saratoga Springs called it.

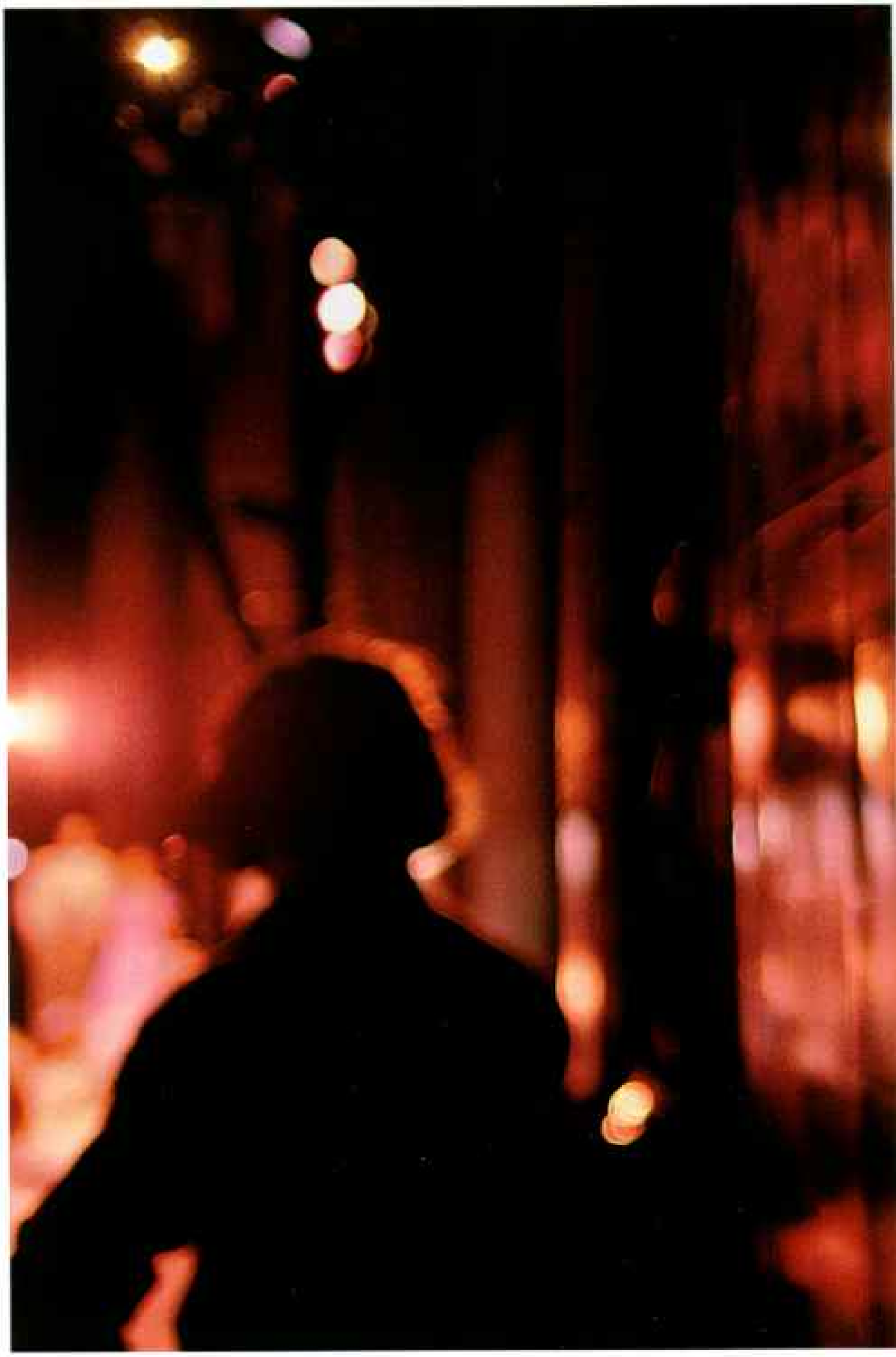
Now the environmental groups that sprang up during the antipollution fights of the 1960s and '70s are focusing on such issues as land use and property rights. When I attended town meetings along the Hudson, I usually found a planner from one of these groups offering advice and help in mapping out the future, whether that involved a sign ordinance, preserving open space, or understanding the negative impact of past decisions.

One such group is Scenic Hudson, Inc. Among the techniques it's bringing to the valley is one that might interest a farmer like Frank Bulich. Scenic Hudson would step in between Bulich and the town planners by purchasing what is called a conservation easement on Bulich's land. Bulich would keep the farm, selling only the development rights to the property, and Scenic Hudson would preserve the land as it is.

Not limited to farmland, this approach is also taking hold on the east bank near Red Hook, where a 25-mile stretch of private estates and historic museums dates back to the 1600s. The owners of two estates there have sold conservation easements to Scenic Hudson, which will preserve the land as a public park running to the river's edge.

Overbuild, says executive director Klara B. Sauer, and the valley will attract neither tourists nor new industries. Sauer, who runs Scenic Hudson from a redbrick Victorian building in Poughkeepsie's tattered downtown, still has the passion of a newcomer. She attended Vassar College in Poughkeepsie and thought she would spend a few years afterward at Scenic Hudson. That was 15 years ago. With groups like Scenic Hudson gaining influence, Sauer is the face of the future in the valley. She sees only irony in the fact that farmers blame groups like hers for their woes, for they both want the same thing: to preserve open space and farmland.

"Sprawl is the biggest problem we have," says Sauer. "Along with commercial-strip development, it will kill this valley if we don't do something about it."



In a glow of anticipation Carolyn DuPuis waits to take the stage in the Catskill Ballet Theatre's production of The Nutcracker *in Kingston. The lower valley harbors many venues for the arts, enriched by well-heeled residents, proximity to New York City, and top-flight universities.*

Recipes for success often start at the Culinary Institute of America in Hyde Park, where rookie chefs crowd around for instruction. Students learn their courses by running four restaurants ranging from ordinary fare to four-star cuisine. In Annandale-on-Hudson wicker chairs beckon on the north porch of Montgomery Place. Built in 1805, the estate was acquired and restored by Historic Hudson Valley and opened to the public in 1988.

THE STRUGGLE to survive has been going on for 30 years. As I got to know the towns that once prospered as ports and manufacturing centers, they began to seem like idled workers wondering what to do. As they ponder, the tiles fall off the mansard roofs, and the plywood shop fronts multiply on Main Street.

Kingston made bricks and textiles, shipped bluestone for New York City sidewalks, and directed traffic in and out of the Delaware and Hudson Canal. Saugerties was famous for its fine paper. In Poughkeepsie the Vassar family brewed the beer quaffed by immigrants who worked the town's foundries. The city of Hudson, a hundred miles upriver, was a raucous whaling town, with bars and brothels remaining infamous in the valley until the 1950s. Hudson had industry too: textiles, purses, drainpipes, furniture. There were two newspapers, several hotels, even a Greek Revival opera house. There's a movement to rehabilitate the opera house, and there's a row of antique shops on Warren Street—meager signs of future promise.

But Hudson today, like other river towns, makes decisions out of something close to desperation. A few months before I arrived a Wal-Mart had opened, after much controversy, just outside of town. As I walked up Warren Street, past the hardware store and the five-and-dime, it seemed to me that Hudson may have shot Warren Street in the foot.

"I wanted the Wal-Mart," George Super told me as we sat at his dining-room table. "Working in retail doesn't compare with your old job. But there's so little work in the area."

Super surprised me. He seemed to represent so much of what the valley had once been. He had been a union man all his life. He could

recite the names of companies that once powered the Hudson economy as if they were his children: Atlas Cement, Mohawk Novelty, Textile Byproducts, V & O Press. They were all manufacturers, all unionized—and all gone. Some made products that became obsolete; others never quite recovered after shifting to military production during World War II. But most simply lost out to lower-wage areas of the country or to low-cost producers abroad.

"When I was in high school, in the forties, I could get work at the mill whenever I needed it," Super said. "There was a dyeing house, a weaving shed—even company houses. Then they sold it all and moved south."

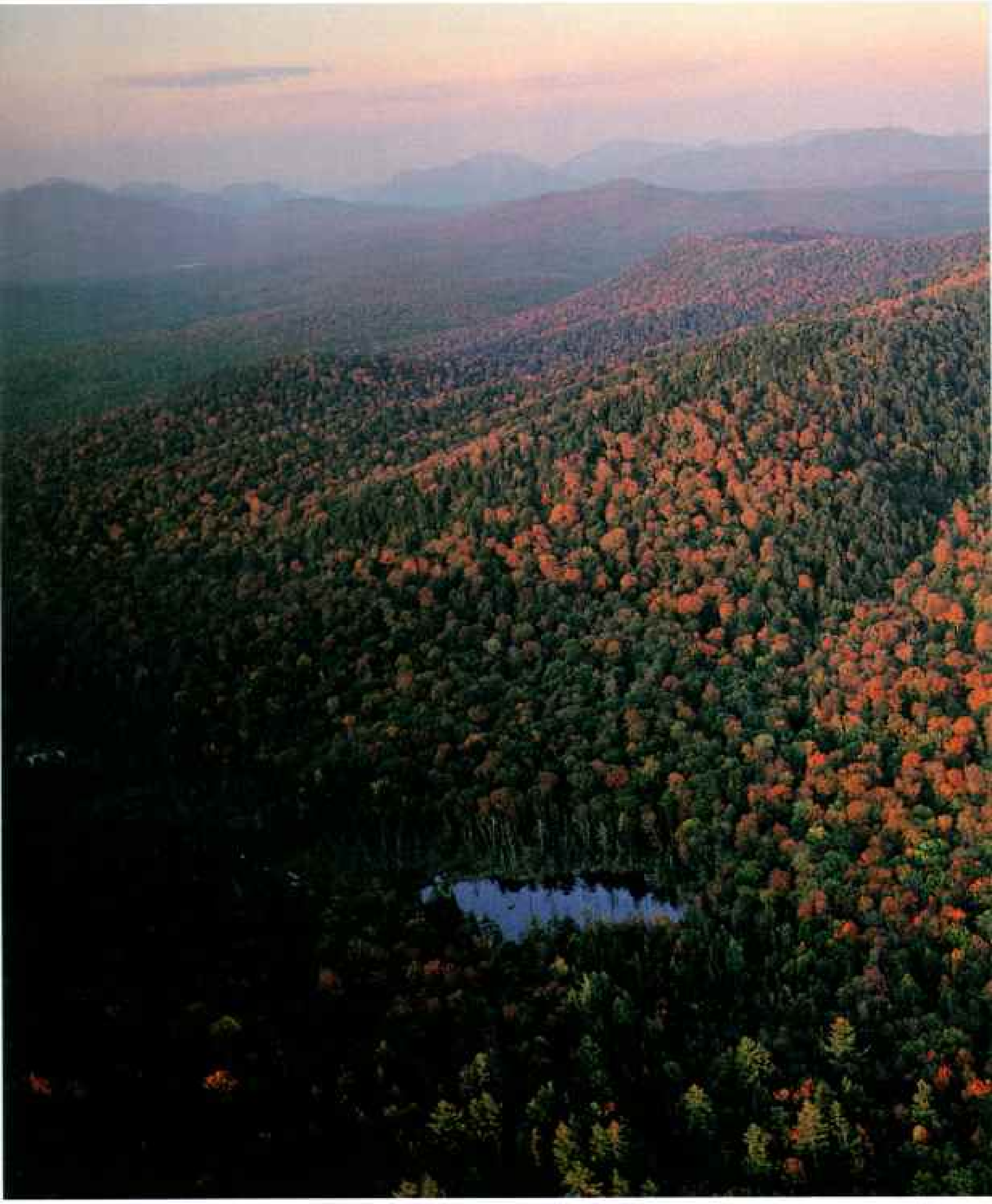
Super smiles easily as he recalls the past. At 63 he's happily retired. With his wife, Madelyn, he lives in a tidy brick house in Greenport, which surrounds Hudson like a half-moon. Down the road is a long, low factory of brick and concrete that housed the Universal Match Corporation, where Super worked in the print shop for 34 years. As union president he helped turn out the lights when the company closed in 1988. Weeds now crawl up the chain-link fence; missing windows look like black eyes.

"Match paid the best wage in Columbia County," Super said with pride. "Now the only high-wage jobs left are with the government—the correctional facilities and social services. My son works down at the correctional facility—he's doing fine. The good thing about the state is it can't move."

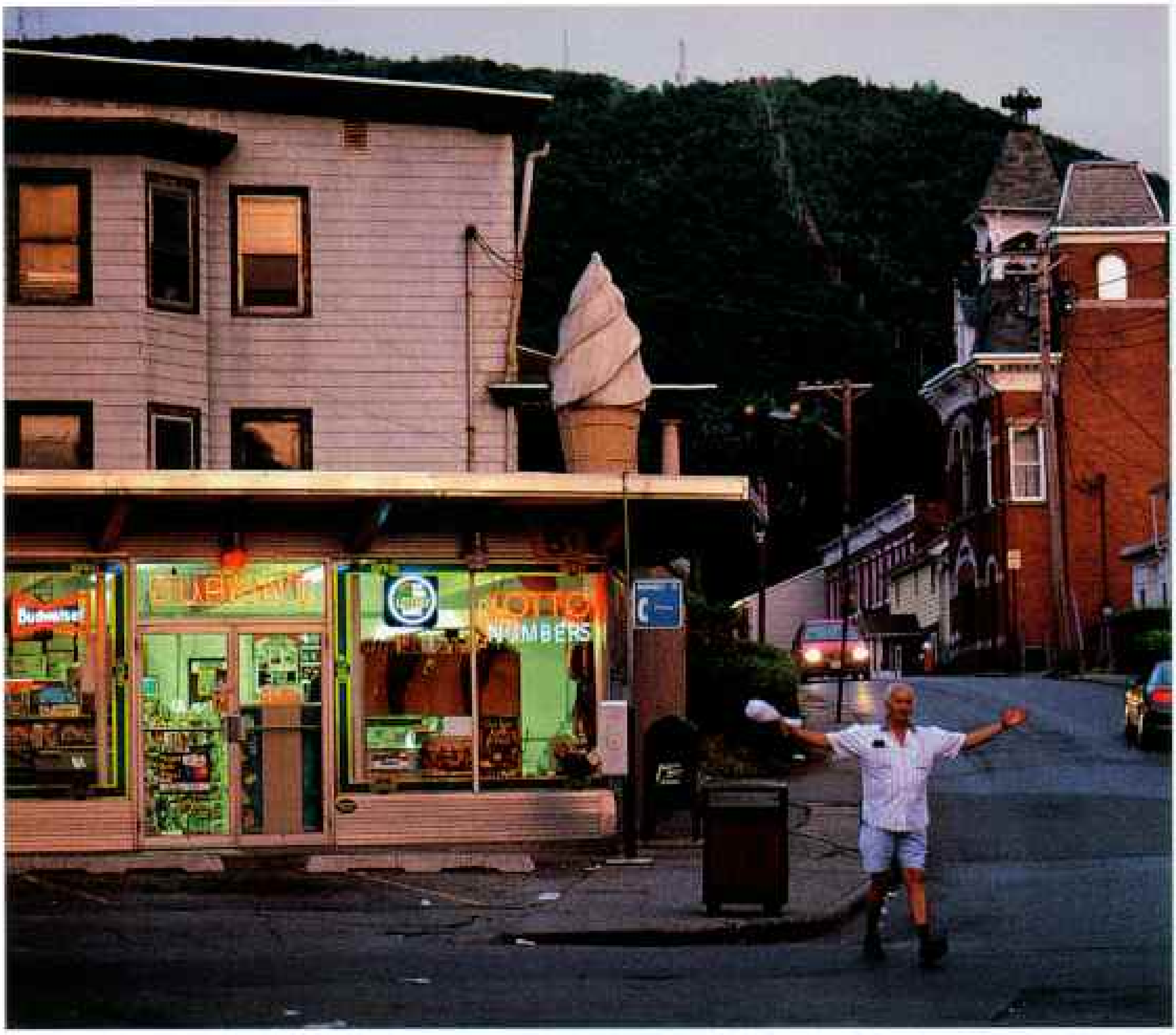
Madelyn Super leaned over to refill my coffee cup. "We're used to things closing," she said. "They've even closed our church."

But nobody in the valley ever thought IBM would close.

International Business Machines was a giant among the area's industries. Suburban



Autumn's earth tones reverberate over the Adirondacks, site of the Hudson's source. In 1609 explorer Henry Hudson sailed the river in his futile search for a route to the Orient. Instead, the Hudson became a great highway to the North American interior by way of canals and the Great Lakes.



and high-tech, it gave the valley a new idea of itself. Big Blue's presence goes back to 1941. Fifty years later it employed 24,400 at plants in East Fishkill, Poughkeepsie, and Kingston. These became company towns, where IBM put up vast complexes on what had once been farmland. New highways got "beemers" to work; road signs read, IBM NEXT RIGHT.

Then came the announcements that were never supposed to come. Buffeted by change in its core computer business, IBM has, since 1991, cut nearly 14,000 employees and vacated seven million square feet of office and factory space. The exercise has helped IBM recover, but the ripple effects of the company's shrinkage will go on for years.

Visiting the towns where beemers lived, I took to counting the lawns with For Sale signs on them. Then I considered the dry cleaners, plumbers, and butchers who depended on IBM employees. They have closed too: a Volvo dealer, a wine merchant, a stationery store. Ulster and Dutchess Counties, the mid-valley industrial centers where IBM was king, lost 40 percent of their manufacturing base.

No longer willing to entrust their fate to one big corporation, valley citizens are working to diversify their economy. To that end, Linda Dickerson, a fourth-generation resident of Wappingers Falls, runs Mid-Hudson Pattern for Progress. "My people came to this valley to find opportunity," she told me. "I don't want my kids leaving to find theirs."

THE HUDSON VALLEY is still full of people who have found opportunity in it—wood craftsmen, metalworkers, bakers of fine French bread. They are entrepreneurs and risktakers who saw a market in the valley and

Open-armed greeter hails a friend across the street in Beacon (left), among the cities hit hard when industries moved away. But Beacon—setting for the Paul Newman movie Nobody's Fool*—aggressively sought new firms, netting 18 in 1995 alone, when the population actually grew by 250. In Saratoga Springs, listeners at the Final Stretch Music Festival fuss over a piggyback rider. The event marks the end of horse racing season, during which the city doubles to 50,000 people.*

beyond, even as traditional businesses folded. My favorite among them is Nat Collins, the only man who has ever offered me a glass of porter at seven o'clock in the morning.

Collins is stocky, longhaired, and perpetually on the go. He drifted into the valley as a kid to hear the music at Woodstock in 1969, and he never left. He raised a family, started a construction company, and brewed beer in his basement.

Five years ago Collins bailed out of construction and leased an old foundry in Kingston; there Hudson Lager was born. He later added Big Indian Porter and other brews and now sells beer throughout the valley and as far away as Manhattan. In 1995 he bought a bottling machine and hired four people to handle his expanding business.

"These are the same recipes I used at home," Collins told me while hosing down one vat and heating malt in another. "I made 4,500 kegs last year."

It would be misleading to say that Collins makes the best beer in the valley; he makes the only native beer distributed in the valley. There were dozens of breweries between Albany and Manhattan before Prohibition, but few came back afterward, and none survived the arrival of refrigerated trucks and the postwar rise of the big national brands.

"People are finally figuring out that beer is supposed to taste like something," he said.

People are figuring out that towns are supposed to be distinctive too. Kingston's brickyards, quarries, and shirt factories are gone. The Delaware and Hudson Canal hasn't been used in decades. But newcomers are teaching longtime Kingstonians that the city's historic character—its arcaded shops, its 17th-century Senate House, its stone cottages, and broad

"As I walk the land, I hear footsteps of my ancestors," says John Snyder. Seven generations have farmed his 55-acre plot near Saugerties. Today so many small farms have disappeared that the American Farmland Trust ranks the valley among the nation's ten most threatened farming regions.

Indigo hues deepen near Albany as daylight wanes over hills and fields ideal for riding to hounds. At the Old Chatham Hunt Club, Rhoda Hopkins uses conditioning to train puppies. Comfort, Candid, and Cheerful associate the horn with food as they chow on milk, cottage cheese, and Rice Krispies. "Very Pavlovian," she says. "And it works."

sidewalks—are irreplaceable. Rondout, the waterfront district where the old canal meets the river, has already been restored and is home to a swarm of galleries, antique dealers, restaurants, and clothing shops. If the rest of the city rebounds, Kingstonians say, it'll be partly because of the energy of people like Collins.

"Kingston's at this funny point where things could really happen," Collins said matter-of-factly. "It's not so decayed that it can't come back. With the right moves it can take off. But if we're not careful, it could go the other way.

"We don't need more malls or another restaurant. We have to be connected to the world beyond the valley. That means making things we can sell outside the area. We need money—and people paying attention."

I met few people who paid closer attention to what's going on in the valley than Norman Greig. It was harvesttime when I met him, and his family farm was at its busiest. Greig farms 500 acres of gently rolling land in Red Hook. Lying just north of Rhinebeck, which has been fashionable among wealthy weekenders since Edith Wharton's day, Red Hook has seen swift change recently. New houses jumped from ten or so a year in the early 1980s to a hundred during the property frenzy that gripped the country later in the decade.

"That change did one thing well," Greig said. "It made people realize what was happening to their town."

Rising costs and taxes have been hurting the valley's farmers for years. This is inevitable in the lower valley, as the suburbs push northward. If high-speed rail service is installed along the eastern bank, as Albany and Washington promise, the whole valley could become a commuter belt.

The front line right now falls somewhere in Dutchess County, traditionally rich dairy and apple country. Greig tells me there were 275 dairy farms there in 1972, and only 42 remain.

Greig drove me through his acreage in a dusty Saab that doubles as a farm vehicle. From a small rise near his house he showed

me his berry and vegetable crops, his apple orchards, the hay and corn that feed his cows, and the 65-acre pasture. Later we passed a long, narrow plot of flowers.

Slim, reserved, Cornell-educated, Greig took over the dairy farm 20 years ago, which his father had started in 1942. But with his neighbors already selling out, he could no longer measure his yields against anybody else's. His main competitor was housing; as new houses drove land values and taxes up, he had to find crops that grossed thousands of dollars an acre, not hundreds.

"Dairying is an extensive use of land," Greig explained. "Land costs are too high for it. I've had to find a way to rotate crops that require less land than hay and corn so I can subsidize the dairy."

I realized that he was showing me a mosaic he had assembled piece by piece. We stopped at a huge patch of autumn raspberry bushes—late bloomers just then ripening. The best berries fell onto my fingers when I touched them.

"When I took over, we were 90 percent wholesale, 10 percent retail," Greig told me as we foraged. "I decided that if I could reverse those figures in ten years, I might be able to stay in business."

Today 85 percent of Greig's harvest is retail. This is partly a result of his setting aside 140 acres for people to pick their own fruits, vegetables, and flowers. He also runs a nursery and a market selling produce and baked goods, all on the farm.

His latest additions are "crop art"—designs in the earth made of vegetables and flowers—and a day camp for local children. Both are intended to draw people to the farm, Greig told me, but they are less about profit than community relations, which he is intent on rebuilding. "Twenty or thirty years ago there was an inherent link between producers and consumers," Greig said. "But we've lost it. If we don't educate people, we won't be able to farm."

There's an irony to what is happening to people like Greig. Red Hook homeowners get back $1.11 in services for every dollar they pay in property tax; for farmers the return is 22 cents. In other words, farmers subsidize the very development that is pushing them off their land.

"We've got to stop taxing farmland and open space," Greig said with uncharacteristic vehemence. "Michigan and Vermont have taken significant steps. It can happen. It will happen."

Purple loosestrife and white water parsnips spangle a peninsula near Saugerties. The land is owned by a conservancy that fought to save the Saugerties lighthouse, built in 1867 to aid oceangoing ships and local craft. The lighthouse is now federally protected, and the adjacent property is frequented by birders who delight in spotting herons, egrets, and swans.

Despite modern pressures, Hudson Valley charms remain. "When a field in the valley is my office," says Red Hook farmer Norman Greig, "there is no corner office in the world that can compete either for setting or scenery."

FOR ALL THE ANXIETY the Hudson stirs, it still delights you with the people and places you never expect to find. In Saugerties there's a book publisher who offers you a worn leather chair and pours out an encyclopedic knowledge of his town. Amid Hudson's decay a fine restaurant survives. Down a narrow dirt track in Greenport, hard by an egregious strip of malls, a green-shuttered clapboard mansion has surrendered not an iota of its dignity. And one day I discovered Bob Boyle.

Boyle, silver-haired and sixtysomething, makes his living as a newsman, but the river has long been the center of his life. With help from Everett Nack and a few others, Boyle

started the Hudson River Fishermen's Association in 1966, and it quickly became a prime mover in cleaning up the pollution.

Today he lives on a ridge high above Cold Spring, surrounded by the Hudson Highlands. Storm King Mountain stands across the river to the northwest, West Point to the south. Below his perch are the dense, dark green treetops of Constitution Island. It's the most expansive view I saw in my travels, and much of what's good in it is due to Boyle's forceful defense.

I visited Boyle with a single question. The book he published in 1969, *The Hudson River: A Natural and Unnatural History*, is a classic account that ends with two visions of the future. The first posits a clean, productive river of great worth to the communities along its banks. The other predicts a dead stream in a valley "jammed with senseless sprawl."

Which were we headed for?

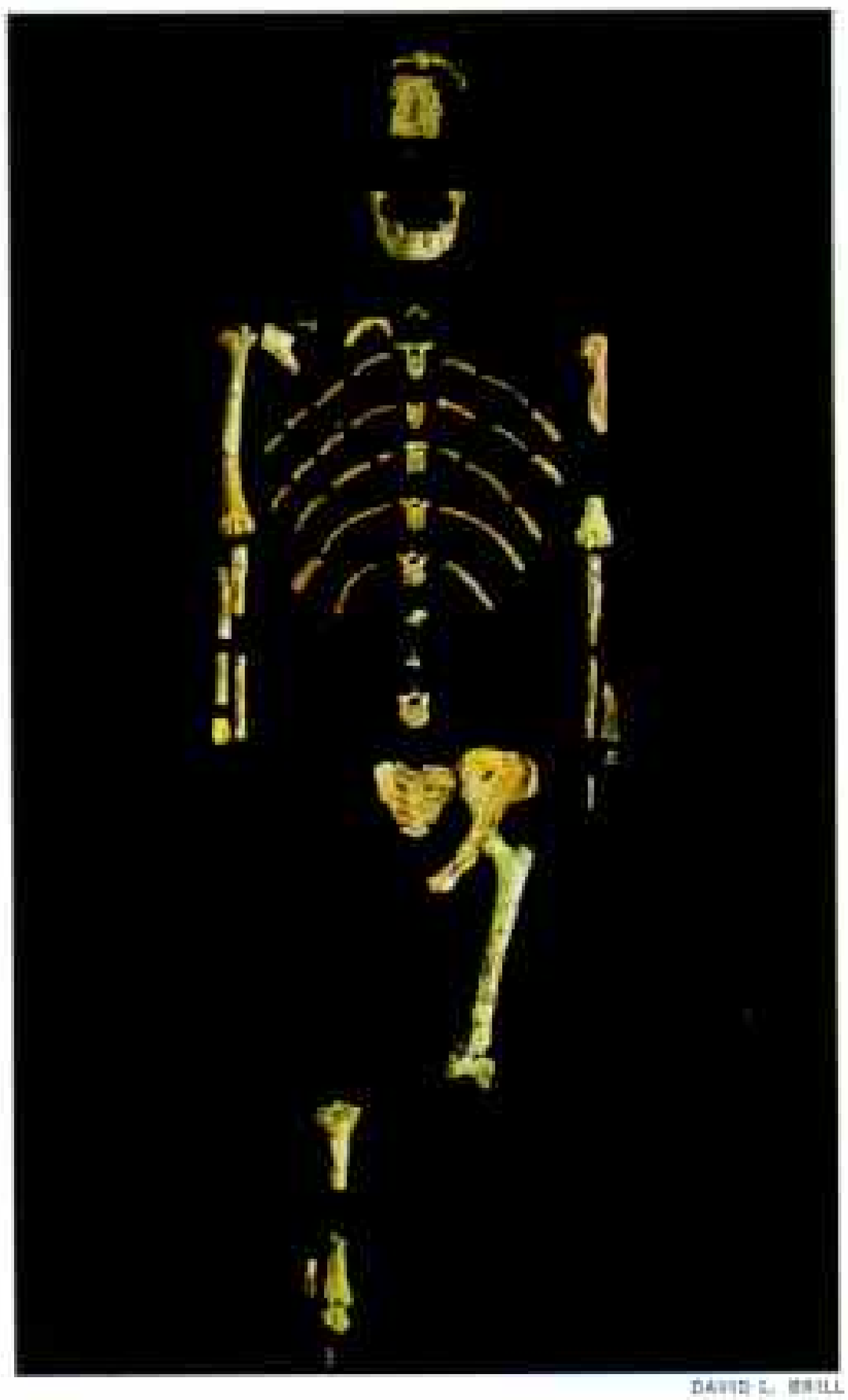
"We're two-thirds of the way toward the better picture," Boyle replied crisply. "There's a constituency for the river now. We've found a wonderful sense of place—we're almost an independent republic. Anything anyone wants to build now comes under tremendous scrutiny."

Boyle paused. We began to talk about all that was at stake in the valley—its economic well-being, its natural beauty, its rich past. He worried as much about these things as he once did about sturgeon and striped bass, he told me, but he was confident that the valley's people would rise to the challenge.

"We've got every problem there is," Boyle said, "and if we can't solve them here, we won't solve them anywhere." □

Face-to-Face with Lucy's Family

By DONALD C. JOHANSON
Photographs by ENRICO FERORELLI
Art by JOHN GURCHE



DAVID L. BRILL

Walking the parched earth of Hadar, Ethiopia, in 1974, paleoanthropologist Donald Johanson unearthed a set of fossilized bones (left). Known as Lucy, she's the most complete hominid skeleton of her age and the most famous specimen of *Australopithecus afarensis*—believed to be the common ancestor of all later hominids, including modern humans. Though her bones proved that she walked upright, Lucy's remains lacked a skull, the most revealing of all anatomical clues. In 1992 Johanson's team found what it sought: an *afarensis* skull. With jutting jaw, heavy brow, flaring cheeks, and strong muscles, the apelike male head—re-created (right) by artist John Gurche—held a brain one-third the size of a modern human's. When compared with older *afarensis* fossils, the author says, the three-million-year-old skull supports the proposition that the species survived relatively unchanged for 900,000 years.

Haunted hills

A fractured mosaic of loose sands, silts, and volcanic ash millions of years old, the blistering badlands of Hadar bear some of the world's richest fossil beds—and provide tricky footing for Ethiopian fossil hunters. They use sticks for balance and to poke at bits of stone and animal bone, hoping

to find elusive hominid remains. Most of the team that scours Hadar are Afar tribesmen from the village of Elowaha to the north. So skilled are they with the terrain and the task, writes Johanson, that "an Afar can spot a hominid tooth from standing height with the sun in his eyes."

Hard data

Like a litter of bony reference books, casts of hominid fossils and chimp skulls help Johanson, seated at center, team co-leader Bill Kimbel, at right, and their colleagues identify the day's find—a partial *afarensis* jaw. Since the early 1970s the team has gathered more than 320 *afarensis* fossils at Hadar, ranging from 3 million to 3.4 million years in age. "Every find is an exciting event," says Yoel Rak, at left, the Israeli paleoanthropologist who found the male skull.

"WE NEED A SKULL. We really must have a complete cranium." That goal, which I underscored in my journal one night shortly after we arrived at Hadar, was on everyone's mind as we set up camp in the baking wilderness of Ethiopia's Afar region.

This was our second expedition back to Hadar after a ten-year interruption. There had been a government-imposed moratorium on fieldwork in Ethiopia during the 1980s. But in 1990 officials of the Ministry of Culture and Sports Affairs invited our team from the Institute for Human Origins (IHO) in Berkeley, California, to return. It was now January 1992, and I was delighted to be back on this ground, gazing out over Hadar's seemingly endless badlands, with their multicolored layers of sands, silts, lava, and volcanic ash. We had pitched our tents, as we always did, high on a bluff above the Awash River, where we would sit at the end of the day and watch the setting sun bathe the hills and valleys in shades of orange and purple.

It was out there, on a scorching day in 1974, that we'd found Lucy. At first glance all we saw was her elbow protruding from the sediments. But we quickly identified the bone as that of a hominid—a member of the human family tree. We roared back into camp in our Land Rover, horn blaring. We soon realized we had found more than an elbow. Lucy, whom we named after a Beatles song popular in camp—"Lucy in the Sky With Diamonds"—belonged to a new species of human predecessors, which in 1978 we named *Australopithecus afarensis*.

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

DONALD JOHANSON's search for human origins in Africa spans 25 years. Freelance photographer ENRICO FERORELLI documented Chile's Chinchorro mummies in the March 1995 issue. JOHN GURCHE's paintings and reconstructions have appeared in several GEOGRAPHIC articles, including "The Iceman" in June 1993.

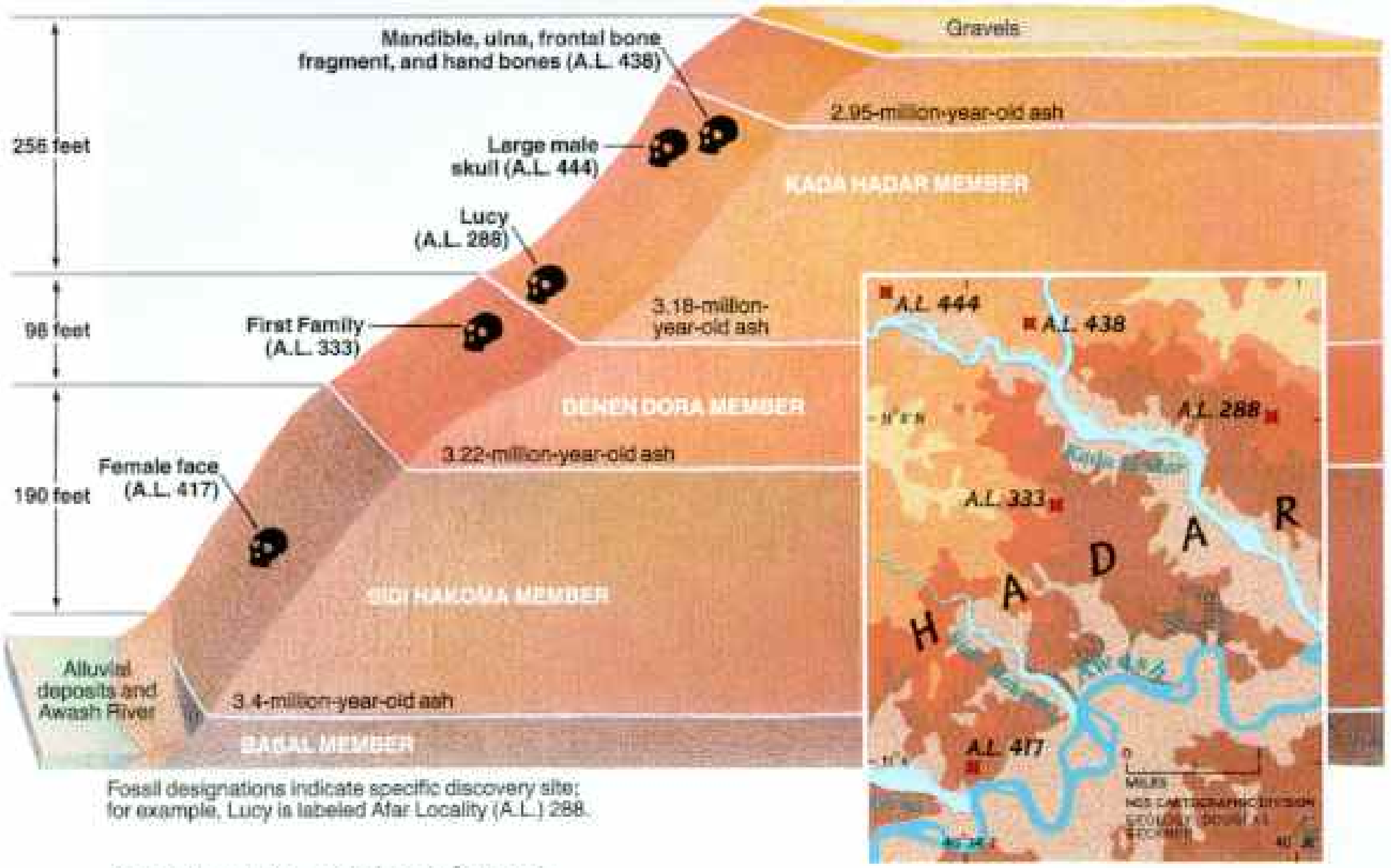
Dating back more than three million years, Lucy was the oldest, most complete hominid fossil ever found. She stood a mere three and a half feet tall, with a mixture of ape and human features. Her long arms dangled apelike by her side. Yet her leg and pelvic bones showed that she walked upright on two legs. I and my colleagues at IHO have long believed that Lucy's species is the common ancestor of all later hominids, including our own genus, *Homo*. We see her, in a sense, as the mother of all humankind.

Not everyone has agreed. The disagreement goes back to the late 1970s when we said that Lucy and the 250 other hominid specimens we had collected at Hadar belong to a single species—*A. afarensis*. Lucy was not our only spectacular find at Hadar. The year after we found her, we discovered the fossils of at least 13 more individuals—the so-called First Family—at a nearby site.*

Many of the bones we had came from hominids of very different sizes, and some critics argued that the variations were so great at least two species of hominids must have roamed Hadar. They contended that one of those other creatures, not Lucy, might be our last common ancestor.

We believed, however, that *afarensis* was simply a species in which the males were much larger than the females. This trait, called sexual dimorphism, is seen in apes, our closest evolutionary cousins. Male gorillas, for instance, are much taller and twice as heavy as females. But their bones, although different in size, are otherwise nearly identical. What was the

*See "Ethiopia Yields First 'Family' of Early Man," by Donald C. Johanson, December 1976.



Fossil designations indicate specific discovery site; for example, Lucy is labeled Afar Locality (A.L.) 288.

Probing the vaults of time

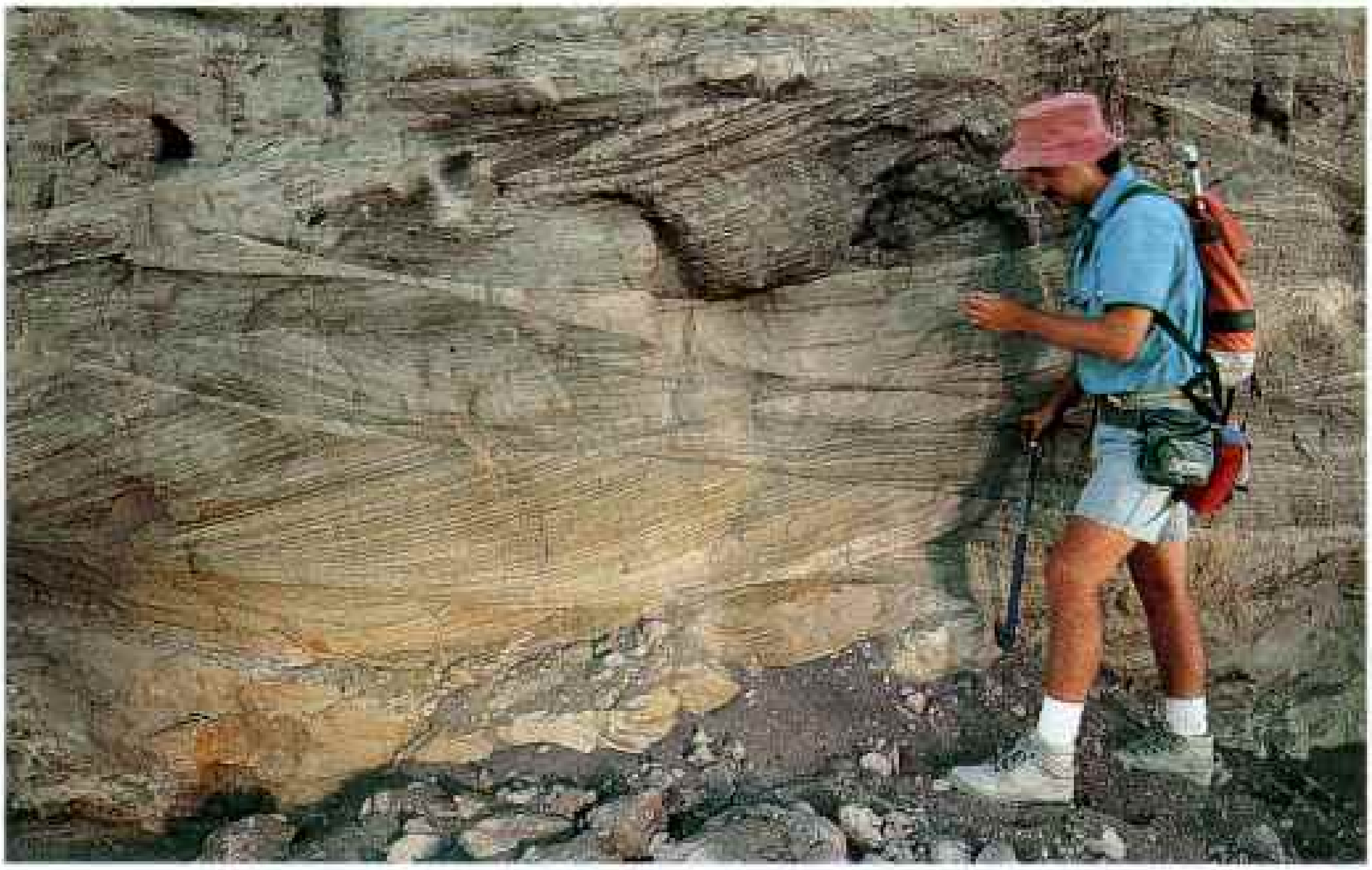
Sheared by powerful currents, a sandstone wall at Hadar (facing page) shows geologist Bob Walter how the meandering waters of a river shifted course 3.18 million years ago—when Lucy might have roamed the banks. Using new technology (page 113), Walter has been able to date the various strata, or members, that make up the Hadar formation.

His task was aided by the region's turbulent geology. Hadar sits in the Afar Triangle at the head of the Great Rift Valley, where the African, Somali, and Arabian tectonic plates meet. "As these hominids were evolving, volcanoes were erupting all over the place," says Walter. A slice of the Hadar formation (above) reveals the four most extensive layers of volcanic ash, whose precise dates provide an age framework for fossils found between them.

pattern of sexual dimorphism in *afarensis*? To answer that question, we needed to find more bones, large and small, and compare them.

Most important, we needed a complete skull. Lucy and all those other individuals lacked faces, and we had only bits and pieces of their skulls—the most diagnostic part of the anatomy. The differences between hominid species show up distinctly there—in the slope of their foreheads, the shape of their brow-ridges, and the degree to which their faces jut forward. Seeing a complete skull is like looking at a person. The constellation of features comes together in a unique way. Without a skull, how could we know what Lucy and her family looked like? Or observe the details of their cranial anatomy that made them distinct from other hominids?

During the 1980s two of my colleagues, Bill Kimbel of IHO and Tim White of the University of California at Berkeley, had pieced together a partial male skull from fragments of several different individuals found at Hadar. But too many pieces were missing; there was no way to be certain we had all the details of the distinctive *afarensis* skull. So when our hunt resumed at Hadar in 1990, our most urgent goal was to find a complete cranium.



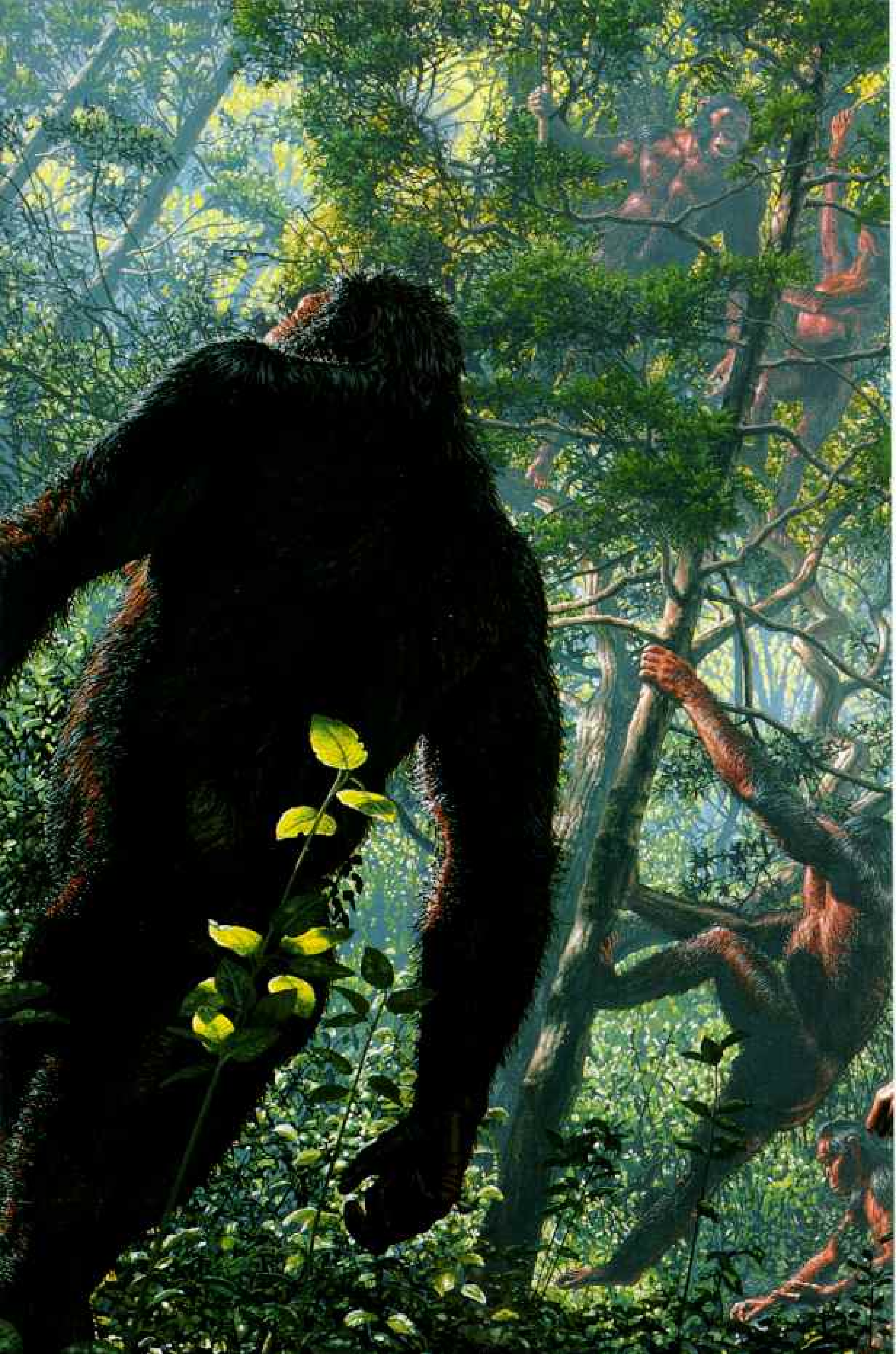
OUR FIRST SEASON back at Hadar, which was primarily one of reacquaintance and reconnaissance of the terrain, tantalized us. One day midway through that season a young Afar tribesman named Dato Adan appeared in camp. Lean and extremely fit, he was typical of the Afar people who today live where Lucy once wandered. Their bodies bear almost no fat. They eat little, surviving mostly on the goats they keep. The Afar get everywhere by walking—just as Lucy and her kin did. We have always relied on the Afar as our guides and guards. With their keen eyes and their seemingly endless patience, they have also proved to be skillful fossil hunters.

Dato Adan, hearing we had returned, had walked a long distance in hopes of working for us. He presented us with a piece of a lower jaw, which he had found during his walk. One member of our project, Yoel Rak, a hominid specialist from Tel Aviv University, immediately recognized the jaw as hominid. Dato led us back to the place where he had found the jaw. It fit perfectly into the concave depression from which he had lifted it a day earlier. We hired Dato on the spot. That season was too short to excavate for more fragments, and so we had to leave further exploration for the second year.

Our second season began with a series of new discoveries. On our arrival, one of our former Afar guides, whose name was also Dato—Dato Ahmedu—led us to a hominid mandible that he had spotted in our absence while herding his goats. This lower jaw excited us because it came from a section of Hadar we had not yet scoured for fossils. But the geology had been studied in detail, and we knew that the new jaw came from sediments just below a layer of volcanic ash dated at 2.95 million years. We did not yet know exactly how old Lucy was, and determining the age of the deposits in which she was found was a high priority for this season. Nevertheless we suspected this jaw was significantly younger. It might belong to one of Lucy's descendants—a hunch that later proved correct.

Then, one morning while one of our team's co-leaders, Bob Walter, chief geologist at IHO, and his Ethiopian colleague Mike Tesfaye were mapping this new section, I broke off to climb a steep slope to investigate a large fossil we could see eroding out of the sediment. It turned out to be an elephant jaw. I decided to look around more carefully. I began walking toward a shallow gully, and a wrench-shaped bone caught my eye. It looked like a large ulna, one of the bones of the forearm. It was enormous—twice the size of Lucy's.

I rushed back down the hill to tell Yoel and Bill Kimbel, our team's third co-leader. At first Bill said *(Continued on page 110)*



Between two worlds

Signaling with waves and calls, an *afarensis* group warily moves on after foraging for food. Pollen evidence proves that these hominids lived in forests of juniper and olive trees. Their hips, knees, and ankles enabled a humanlike walk. But long, powerful forearms, curved fingers and toes, and upward-tilting shoulders all indicate that *afarensis* also climbed trees, probably to search for fruits and nuts, possibly to escape predators or to sleep. Thickly muscled, males appear to have averaged five feet and a hundred pounds—at least a foot taller and two-thirds heavier than females.

Quest for a face

This story of a skull is a journey spanning three years and three continents. It began in 1992 with the discovery at Hadar of scores of bone fragments encrusted with sedimentary stone. The pieces went to Ethiopia's National Museum in Addis Ababa, where paleoanthropologist Bill Kimbel (left) and others spent a month gazing through a binocular microscope to carefully chip stone from bone using dental tools and a tiny drill. The resulting skull of an *afarensis* male, made of nearly 60 fragments that fit snugly together, thrilled those who saw it take shape. "I was surprised at its large size," says Kimbel of the apelike skull—at 5.3 inches across the largest of any ancient hominid species yet discovered.

Yoel Rak took a plaster cast of the skull (above, at far left) to the University of Zurich in Switzerland. There he worked with Christoph Zollikofer and Marcia Ponce de León, scientists who helped create a more complete plastic model (second from left) using computerized mirror imaging and stereolithography, in which a computer-guided laser shapes a three-dimensional model from a vat of plastic resin.

Next stop: Denver. In his studio, artist John Gurche—an expert in primate facial anatomy—applied plasticine muscles (center) to the model, following its structural clues. Bone markings indicated massive chewing and neck muscles; a flat, wide nose; flaring cheeks; a muzzle-like mouth; and ears set far back on the head. Gurche then added layers of fat and skin (second from right). "It's rewarding to think that this is a face that would look very like the original," he says.

For the final touches (above) Gurche embarked on educated conjecture. He had to guess about skin coloring and hair pattern. Using bear hair, he punched in each strand with a needle. For the eyes he poured several layers of acrylic plastic, painting irises and corneas on different layers. "It's a gazillion-stage process," says the artist, who spent some 700 hours crafting Lucy's male counterpart. "I wanted to get a human soul into this apelike face, to indicate something about where he was headed."

(Continued from page 103) the bone was too big to be hominid, but Yoel convinced him I was right. Within minutes we found a hand bone. Then Zelalem Assefa, one of our Ethiopian government colleagues, spotted another. Soon we had also located a part of an *afarensis* skull we had never found before—the cranial region above the bridge of the nose.

Back in camp, I compared the ulna with a cast of Lucy's. They were identical, except in size. It must be a male of the same species. *Afarensis* hominids, as we had proposed earlier, were almost as sexually dimorphic in body size as gorillas. Had this male and Lucy lived at the same time, they could have been mates. That night I fell asleep dreaming that an entire male skeleton—a discovery as exciting as Lucy—might be waiting in the ground. We never did find that skeleton, but the season had something else in store.

On February 26 Bob Walter and I visited colleagues working in another section of Hadar. When we returned, Bill Kimbel greeted us near the dining tent.

"Well, the hits keep coming," he said.

Yoel, sitting at a table, smiled broadly.

"I found a skull," he said simply. As he listed the various parts of the skull he had recovered, I could feel my heart racing. He had the occipital bone, a major chunk of palate with teeth, many fragments of the cranial vault, a canine tooth—and the face. He had most of a very large, rugged-looking skull—no doubt a male *afarensis!*

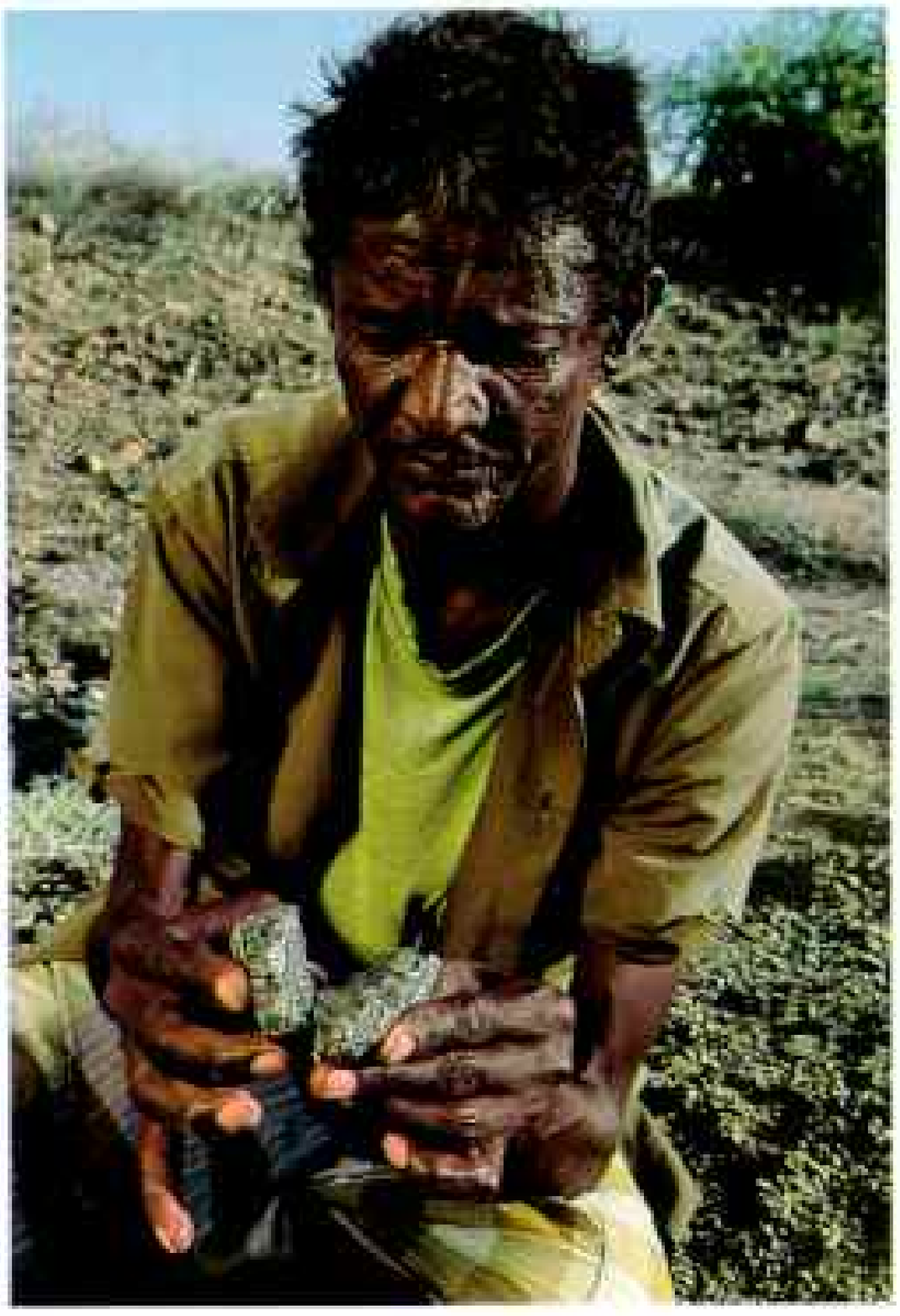
The next morning we all drove to inspect the site, where Yoel had erected a pile of stones as markers. Now known as Afar Locality 444, the site overlooked a dry wadi called Kada Hadar. We began to mark the locations of the bone fragments by planting nails with strips of colored tape in the ground next to each of them. Yoel was ecstatic to find an enormous cheekbone eroding out of the soft sediments.

It was quite a scene on that hill, everyone tiptoeing around for a closer look at the cheekbone while making certain not to step on any other bones.

The Afar had been moving slowly up the hill, as if picking their way through a minefield. They formed a semicircle around Yoel, whom they called Doctor because he treated their illnesses in the camp. They peered into his hands and smiled, saying: "*Mehe, kada mehe,*" meaning "Good, very good."

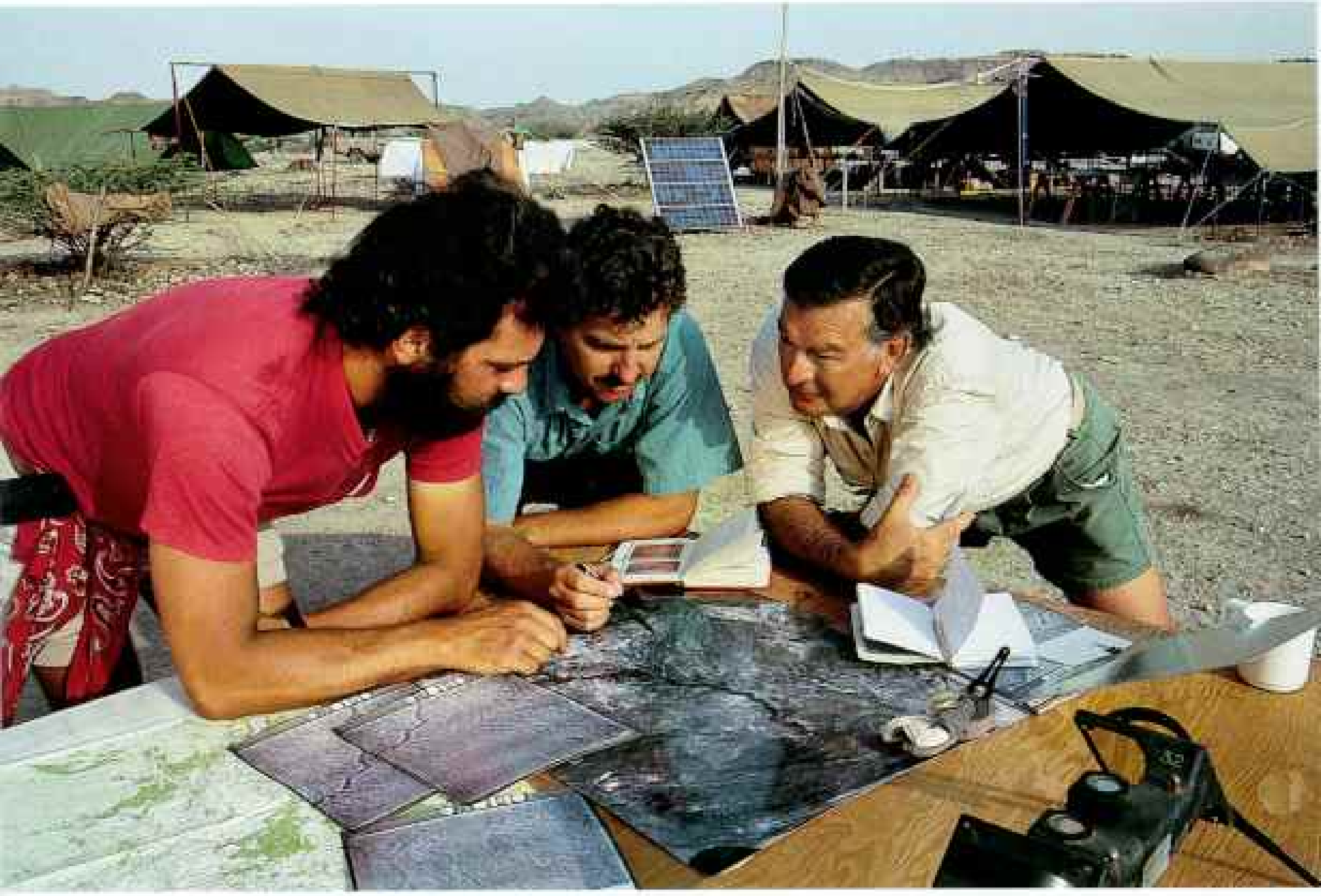
That night as we sat around the campfire, the Afar joined us again. One of them, Omar, began performing good-natured imitations of each of us. Then, in celebration, they began chanting, singing, and dancing around us, holding their Kalashnikov rifles high in the air. I asked Dato Adan what they were singing. He said they were thanking Allah for letting us find something we really wanted.

AS THE SEASON ENDED, we returned to Addis Ababa with some 200 fragments of the new skull, many of them still encrusted in stone. They went into safe storage at the National Museum of Ethiopia until we could begin the slow and



Hot on the trail

Lying as if gnawed and casually dropped by yesterday's predator, half a hominid jaw rests on an arid floodplain where seasonal rains have left it. Meles Kassa (above), who died after an illness in 1994, was a master at finding such unburied treasures, easily missed in this vast terrain. Shown with jaw fragments he found during his last season, Kassa—fluent in Amharic and Afar—had joined Johanson in 1973 and led his excavation teams.



arduous task of preparing them and assembling them into a skull.

Bill, Yoel, and I arranged a special trip back to Ethiopia early in 1993 to work solely on the reconstruction of the skull for a month. We spent long days examining the fragments in a tiny interior lab at the museum. We peered through microscopes and with sharpened needles picked away the grains of sediment that time had cemented to the skull fragments. Bill and Yoel then put the pieces together, and finally we could stare into the eyes of this magnificent face.

We could immediately draw some important conclusions. We could tell, for instance, that by *A. afarensis* standards this male was an old man, because his teeth were severely worn down. It's hard to estimate how old, because we don't know the rate at which these hominids matured. If their pattern was apelike, they might have reached adulthood in their early teens.

Also, this individual's canine teeth retained the large roots typical of great ape males, but the crowns—the parts that protrude from the gums—were significantly smaller, closer in size to female *afarensis* canines. That implies that our male didn't need those teeth as much as his great ape cousins do. Male gorillas keep harems and use their canines in combat with other males to establish dominance or to compete for females in estrus. Perhaps *afarensis* had evolved a different mating strategy. Owen Lovejoy, a paleoanthropologist at Kent State University, suggests that smaller canines mean that there was much less competition for females among *afarensis*—an indication that monogamy may have been evolving more than three million years ago.

Nevertheless, this male was powerfully built; his strong jaw muscles had left pronounced rough areas where they attached to his skull—indications of their size and power. His face projected outward beneath his forehead like an ape's.

We still need to determine exactly how big his brain was. It probably exceeded 500 cubic centimeters. By comparison, the brain of *Homo habilis*, one of the earliest members of our own genus, averaged about 630,

A stopwatch in stone

Against the stark backdrop of their camp—primitive but for solar panels that power computer batteries—Kimbel, Walter, and Johanson study a high-altitude photograph of the Afar region. The area of Hadar where they are permitted to dig is bordered on the south by the Awash River, visible as a dark furrow across Afar's pitted face. Photographs help the team pinpoint potential fossil sites in ancient river channels and floodplains.

To help date fossil-bearing strata, geologist Mulugeta Feseha (right) carves a nipple of rock, covers it with glass, seals it, and records its north-south orientation. He then removes the sample to analyze it for evidence of geomagnetic shifts, which occurred at known intervals over time.

The relatively new process of single-crystal laser-fusion dating (below right) yields more accurate ages. A laser beam melts a potassium feldspar crystal, releasing argon gas, which is measured in a gas mass spectrometer. Since the argon in the crystal has accumulated at a known rate, the amount released reveals the age of the rock and thus of fossils found nearby. The margin of error is less than one percent.

and the modern human brain is about 1,300.

The new skull also helps clarify Lucy's place on the human family tree. For one thing, it dispels a long-standing contention that *afarensis* was just an East African version of another ancient hominid, *Australopithecus africanus*, which lived in the southern part of the continent between 2.5 and 3 million years ago. Placed next to each other, skulls of the two species show clear differences, making it difficult to argue any longer that *afarensis* is not a distinct species.

PERHAPS MOST SIGNIFICANT, the new male skull—along with the enormous male ulna I found—supported the idea that *afarensis* males were indeed much larger than the females. We estimate that the average male would stand five feet tall and weigh about 100 pounds, compared with a female, who would be a foot shorter and weigh around 60 pounds. We can now argue more strongly than ever that sexual dimorphism creates the variation in size we see in the Hadar fossils. We are confident that *afarensis* was the

sole hominid species at Hadar and the best candidate for the last common ancestor of all later hominids, including humans.

Our seasons back at Hadar yielded other important fossils. Over three years we managed to collect additional facial fragments from the site where the young Afar, Dato Adan, found the jawbone in 1990. Eventually we realized we had most of a female *afarensis* face. Using advanced computer-imaging techniques, we have assembled these fragments into a composite head. In a sense we have finally put a face on Lucy.

She looks much as we would have predicted. She had small canine teeth. Her mid-face jutted out moderately—less than an ape's, but more so than a human's. She would have made a good match for the male from Afar Locality 444.

Except that she would have been too old! She lived 180,000 years—at least 9,000 generations—before he did. We can say that because we have at last determined exactly how old Lucy is. Estimates of her age had ranged from 2.8 to 3.6 million years. We had been uncertain because at Hadar the minerals in some of the volcanic ash layers we normally use to date fossil-bearing formations had been altered or contaminated by later geologic processes. Some layers, such as the one that lay just below Lucy, contained insufficient datable minerals.

During the 1980s new dating technology using lasers, developed by Derek York of the University of Toronto, made it possible to get an accurate date from a single microscopic crystal of volcanic mineral. Bob Walter could now determine the ages of most of the fossils at Hadar. Getting good dates is important if we want to know the tempo at which human evolution occurs. Lucy, we can now confidently say, lived 3.18 million years ago, plus or minus 10,000 years. The new male roamed Hadar about three million years ago, making him among the most recent individuals at Hadar.

The First Family assemblage turned out to be slightly older than Lucy—about 3.2 million years old. Still older individuals go back to 3.4 million years ago, which indicates that *afarensis* persisted relatively unchanged a long time at Hadar—at least 400,000 years. Another skull fragment found in 1981 at a 3.9-million-year-old site about 40 miles south of Hadar may also be *afarensis*. If so, Lucy's species would have survived almost unchanged for 900,000 years. These hominids appear to have been highly adaptable—or perhaps they were changing in ways we cannot detect in the fossils.

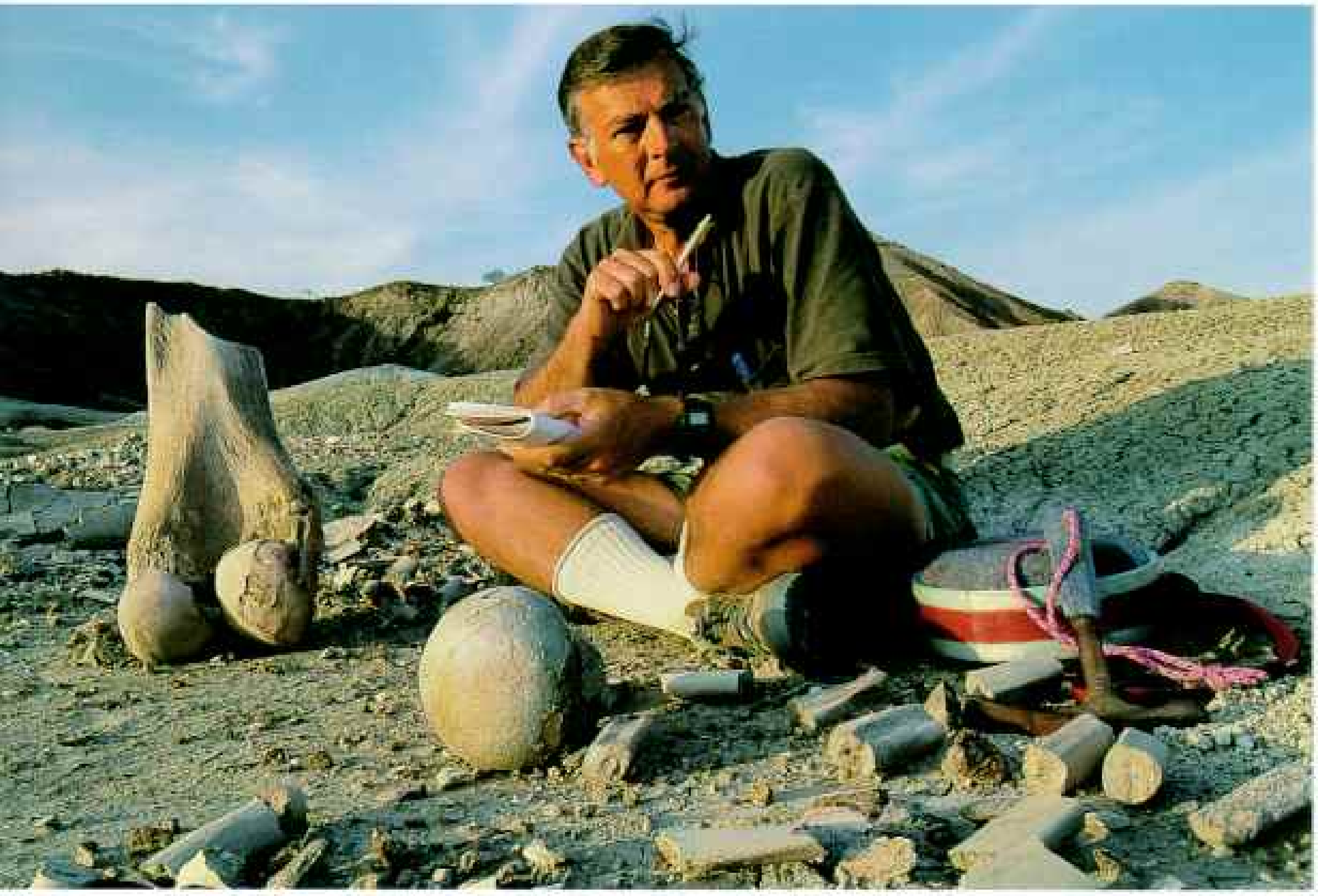
After that long interval the African climate apparently became cooler and drier. It was then, I believe, that *afarensis* gave rise to several new branches of hominids, one of which eventually evolved into *Homo*. However, the origin of our genus, which probably occurred about half a million years after Lucy lived, continues to inspire fiery debate.

DID LUCY WALK LIKE US? Footprints left by at least two *afarensis* individuals walking through the volcanic ash from an eruption 3.5 million years ago at Laetoli in Tanzania clearly show a humanlike stride—a strong strike with the heel, followed by a push-off with the big toe to propel the body forward.* Their big toes do not splay out from the rest of the foot like the divergent big toes all other primates have, which they use to grab branches in the trees. Moreover, according to Owen Lovejoy and Bruce Latimer of the Cleveland Museum of Natural History, Lucy's hips and the muscular arrangement of her pelvis would have made it as hard for her to climb trees as it is for modern humans.

On the other hand, Randall Susman, Jack Stern, and William Jungers of the State University of New York at Stony Brook see a curvature in Lucy's finger and toe bones resembling that found in tree-dwelling apes. Her longer arms certainly would have helped her climb between branches. The Stony Brook specialists also see evidence in Lucy's ankle and pelvis that suggests she would have walked with slightly bent legs. They reckon she spent considerable time in trees and may well have slept among the branches. I do not accept their interpretation of her gait. If Lucy saw an attractive fruiting tree, she would have climbed it; most of the time, however, she walked on two legs like us.

No matter how Lucy walked, she probably traveled with a group. If *afarensis* had any edge over other animals, it was the social groups—maybe 25 to 30 strong—they lived in. There is no evidence that they had leaped onto any new cultural plateau. That would come

*See "Footprints in the Ashes of Time," by Mary D. Leakey, April 1979.



Remains of the day

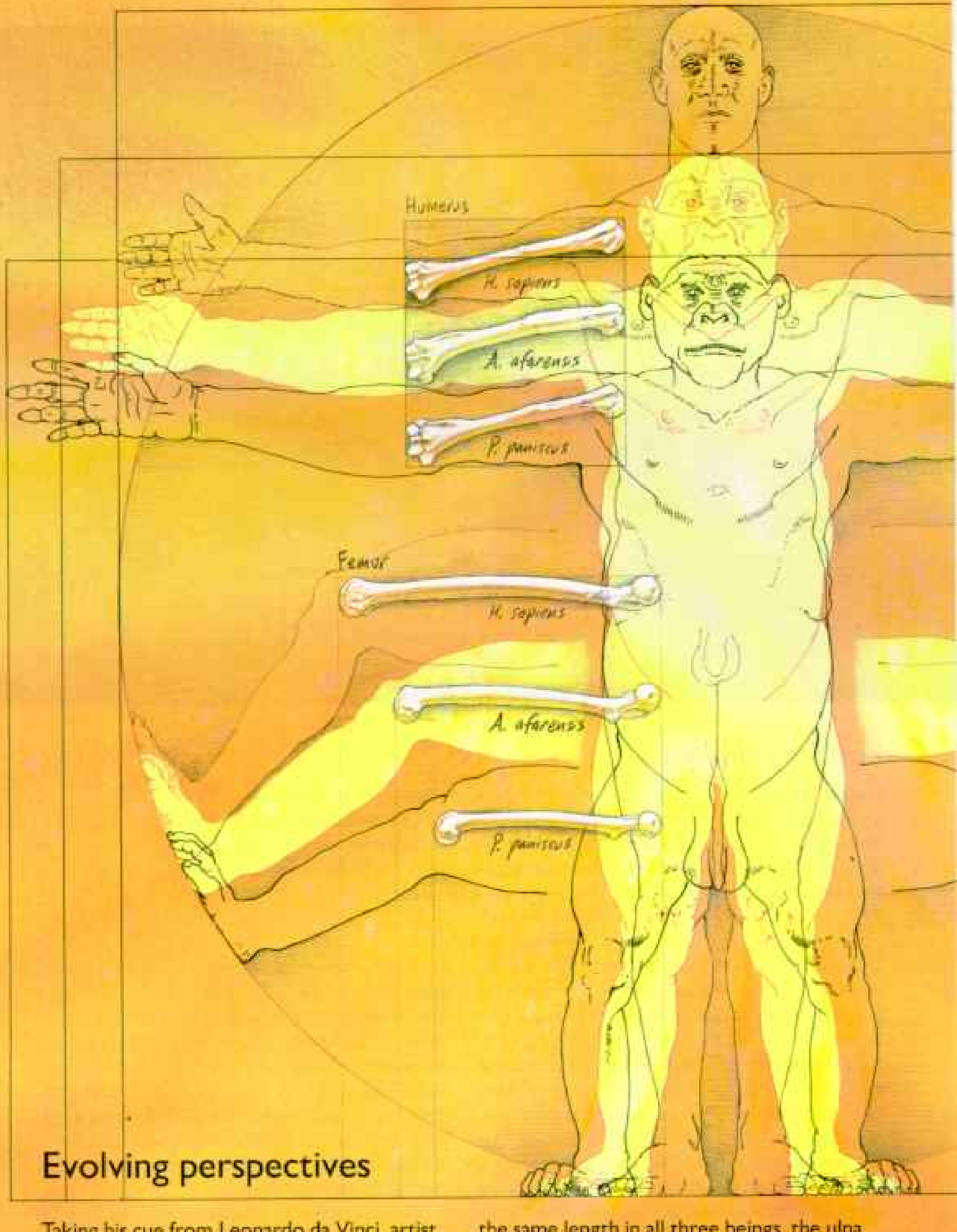
Tossed like prehistoric toys, the femur head, lower thighbone, and snapped ribs of an elephant crumble in Africa's unforgiving sun. Each season Johanson notes the condition of these fossilized bones, first found in 1972. His team has documented thousands of animal fossils—including baboons, pigs, rodents, and leaf-eating monkeys—to learn what creatures roamed, or competed, with *aforensis*.

half a million years after Lucy, with the invention of stone tools, which let hominids butcher large carcasses and cut the meat into edible pieces.

Afarensis was still more likely to be preyed on than to prey, and the group would have offered common defense against carnivores, especially at night without protection of fire. I can imagine a group of howling *afarensis* parents throwing rocks at a threatening saber-toothed cat. Carnivores could get more meat for much less trouble by running down a gazelle.

The fossils of Hadar tell us a lot about what *afarensis* ate. Their teeth are not the ripping teeth of a carnivore. Under a microscope their front teeth show grooves and scratches made by fibrous material, suggesting that they were used to strip food off some kind of rough vegetation. Moreover, enamel has often flaked off their canine teeth. We conclude that they must have been biting down on hard foods—perhaps the shells of nuts or fruits. *Afarensis* evolved out of a vegetarian past, and although they may have occasionally eaten termites, lizards, or other small creatures, they relied primarily on vegetation.

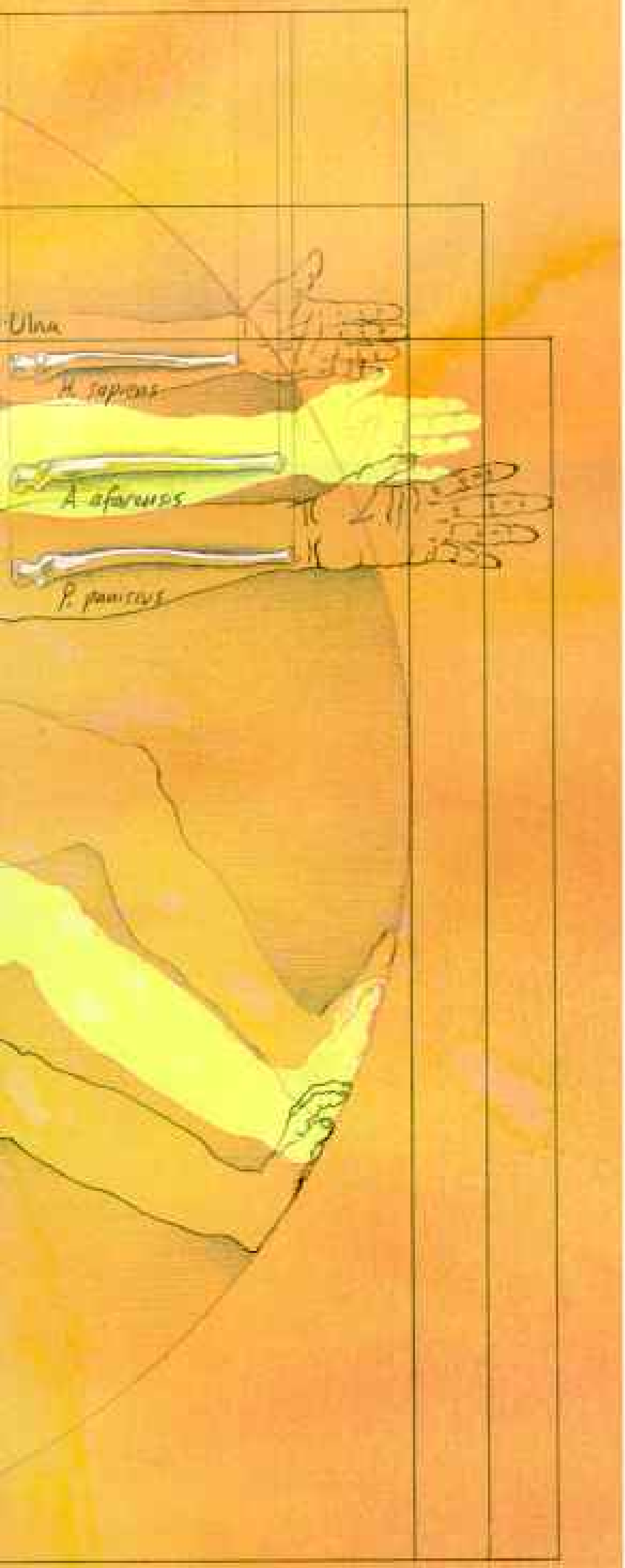
The landscape at Hadar three million years ago was far more lush than today's. Studies of fossil vegetation and ancient fauna tell us that the Afar region was once forested with evergreen conifers and olive trees. Still, Lucy had to survive in a diverse assortment of habitats, ranging from open grassland to woodland.



Evolving perspectives

Taking his cue from Leonardo da Vinci, artist Gurche compares the physical proportions of a bonobo chimp, *Pan paniscus* (foreground), an *afarensis* male (highlighted), and a modern man. The discovery in 1992 of a whole male *afarensis* ulna, or forearm bone, helped Gurche complete the picture.

Though the upper arm bone remains about the same length in all three beings, the ulna gets progressively shorter from bonobo to human, while the thighbone gets longer—evidence of our move from trees to terra firma. Though the amount of time *afarensis* spent climbing or walking is hotly debated, some scientists believe it was a transitional creature at home in both worlds.



It is, however, no longer the oldest hominid known. In the past two years teams working at Kanapoi in Kenya and Aramis in Ethiopia have discovered remains of two hominid species that predate *afarensis*. Further finds will help widen the circle of understanding of our human origins.

Afarensis clearly evolved great adaptability, a trait that undoubtedly contributed to the endurance of the species.

EVEN TODAY *A. afarensis*—and those of us who study them—must adapt. Lucy has recently been dethroned. Last year Meave Leakey of the National Museums of Kenya announced that she and her team had found a human ancestor older than Lucy.

Working at a site called Kanapoi near Lake Turkana, they found pieces of a new, 4.1-million-year-old bipedal species she named *Australopithecus anamensis*.* The new species has many features in common with Lucy, but it is significantly more primitive and apelike in its teeth. *Anamensis*, I suspect, is the species that gave rise to *afarensis*.

Also, in late 1994 an international team led by Tim White announced that it had found bones of an even earlier hominid at a site in Ethiopia called Aramis. Tim and his Ethiopian colleagues have since unearthed a nearly complete skeleton of the same creature, which dates back to 4.4 million years ago. Its position on the human family tree is in question. It has many chimplike features—enough that Tim decided to create an entirely new genus for it, naming the animal *Ardipithecus ramidus*. Over the next year or two, as the new skeleton is studied, this hominid's lineage will become more clear.

In the meantime Lucy and her family still have much to tell us. Our work at Hadar is far from finished. We have reopened excavations at the First Family site. During the 1994 season we realized that the geologic layer that contained the hominid fossils extends much farther than we had thought and may contain many more specimens. The site surely represents some unknown catastrophe that killed a hapless group of hominids, sealing them in a geologic instant. Their misfortune will be our luck: They will give us a much better understanding of how much individuals varied within one group of Lucy's species.

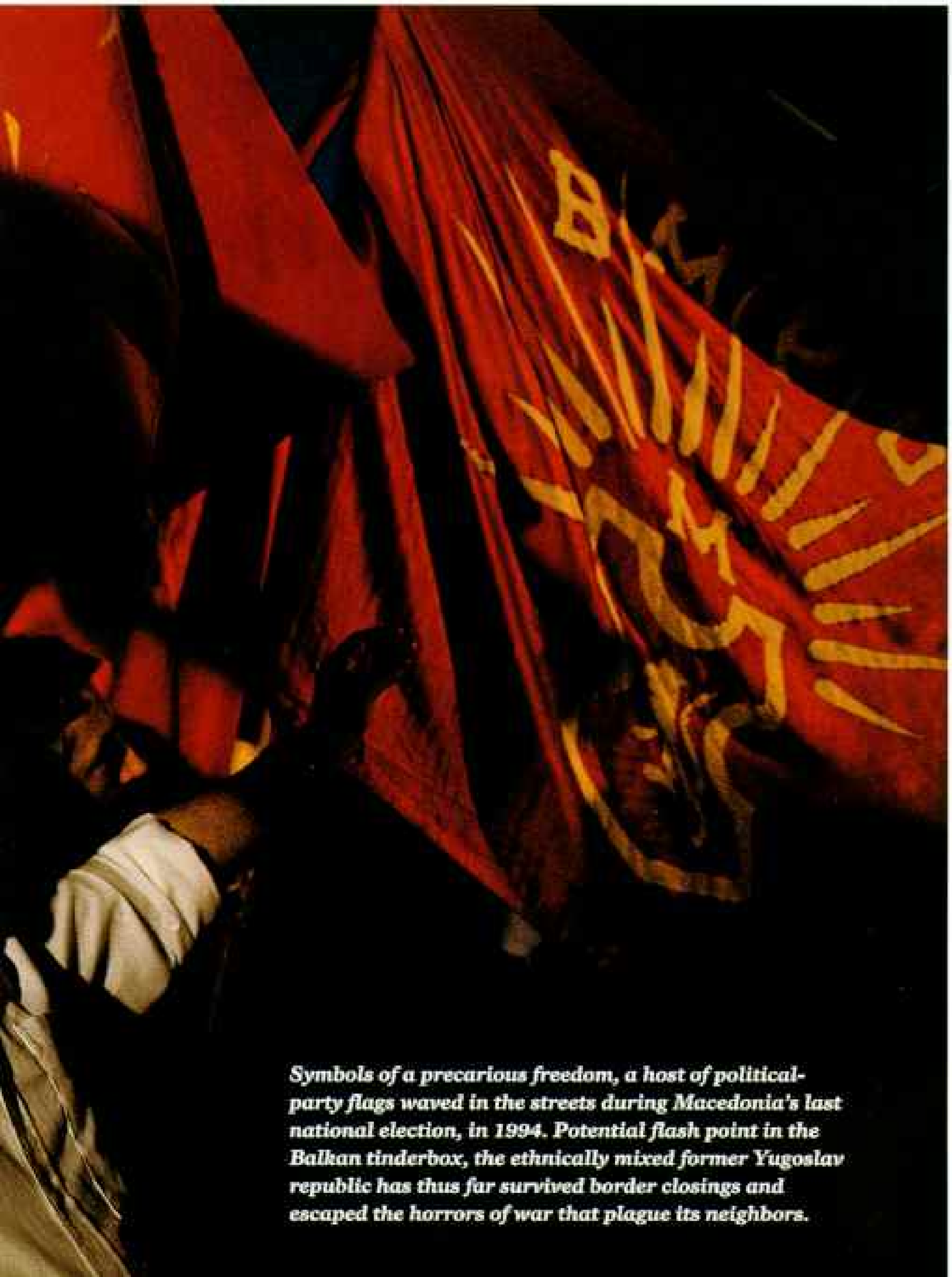
Last November we celebrated the 21st anniversary of our discovery of Lucy. She may no longer be our oldest ancestor, but she remains the best known. Our return to Hadar has taught us much about how she lived. At 21, Lucy has indeed come of age. □

*See "The Farthest Horizon," by Meave Leakey, September 1995.

CAUGHT IN MICE

DONIA

THE MIDDLE



Symbols of a precarious freedom, a host of political-party flags waved in the streets during Macedonia's last national election, in 1994. Potential flash point in the Balkan tinderbox, the ethnically mixed former Yugoslav republic has thus far survived border closings and escaped the horrors of war that plague its neighbors.

By Priit J. Vesilind
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by Sarah Leen

Disaster strikes Skopje with some regularity, for the capital city of Macedonia straddles a tectonic fault. A clock in the preserved ruins of the old railway station remains frozen on 5:17, the moment that a predawn earthquake turned Skopje into landfill in 1963.

Macedonia was then one of the six republics of Yugoslavia, and a team of engineers rebuilt the city mainly out of concrete slab, clamping it to the Vardar River floodplain almost as a

From the rubble of its third great earthquake, Skopje has reemerged as a modern city of 541,000. So devastating was the 1963 quake that some advised moving Macedonia's capital to another site. As seismic changes of a different nature transform the Balkans, Skopje watches in a state of nervous expectancy.

modular unit, in case the earth attempts to shake it loose again.

Nearly two million people live in Macedonia, a landlocked nation the size of Vermont in the mountainous heart of the Balkan Peninsula, furrowed and compact like a walnut. Only two republics—Serbia and Montenegro—are left of the old Yugoslavia. Macedonia is now an independent state, a member of the United Nations, and the only republic to secede in 1991 without armed conflict.

But new disasters loom: Albanian extremists agitate for autonomy, neighbors on all four borders challenge Macedonia's legitimacy, and Kiro Gligorov, the President of Macedonia, barely survived a car-bomb assassination attempt blamed on Bulgarian mobsters. Only 140 miles to the north in Bosnia the blood feud of the Balkans flames on.

When I arrive here in the hot Mediterranean summer of 1995, Macedonia itself seems like dry tinder. On its northwestern border, the volatile Serbian province of Kosovo, whose population is 95 percent Albanian, seethes under Serbian rule. Macedonians worry that violence in Kosovo would quickly flare into their own restless Albanian community. Albania would be drawn in, and Greece and Turkey, both members of NATO but adversaries, would react to protect their interests, touching off a southern Balkan war that could ignite all Europe.

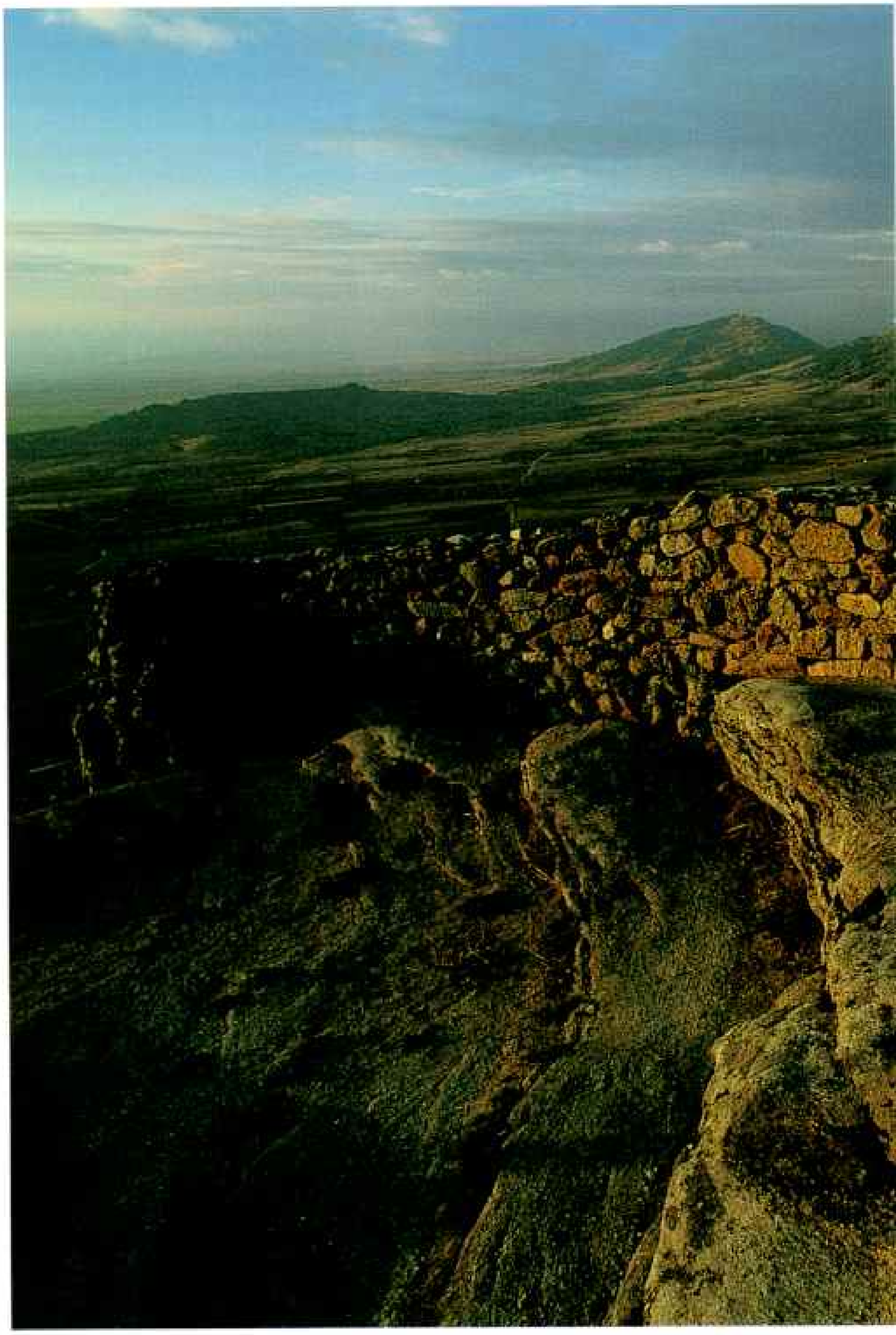
Two battalions of United Nations peacekeepers, some 500 soldiers from Scandinavian countries and 540 from the United States, patrol Macedonia's Serbian and Albanian borders against that possibility, the first such preventive deployment in UN history.

Tension thrives like a virus in Skopje (SKO-pyeh), where nearly a third of Macedonians live. The future here seems hostage to forces beyond their control, and the rewards of free enterprise and democracy still seem distant. My questions often bring angry lectures about some historical injustice or regret.

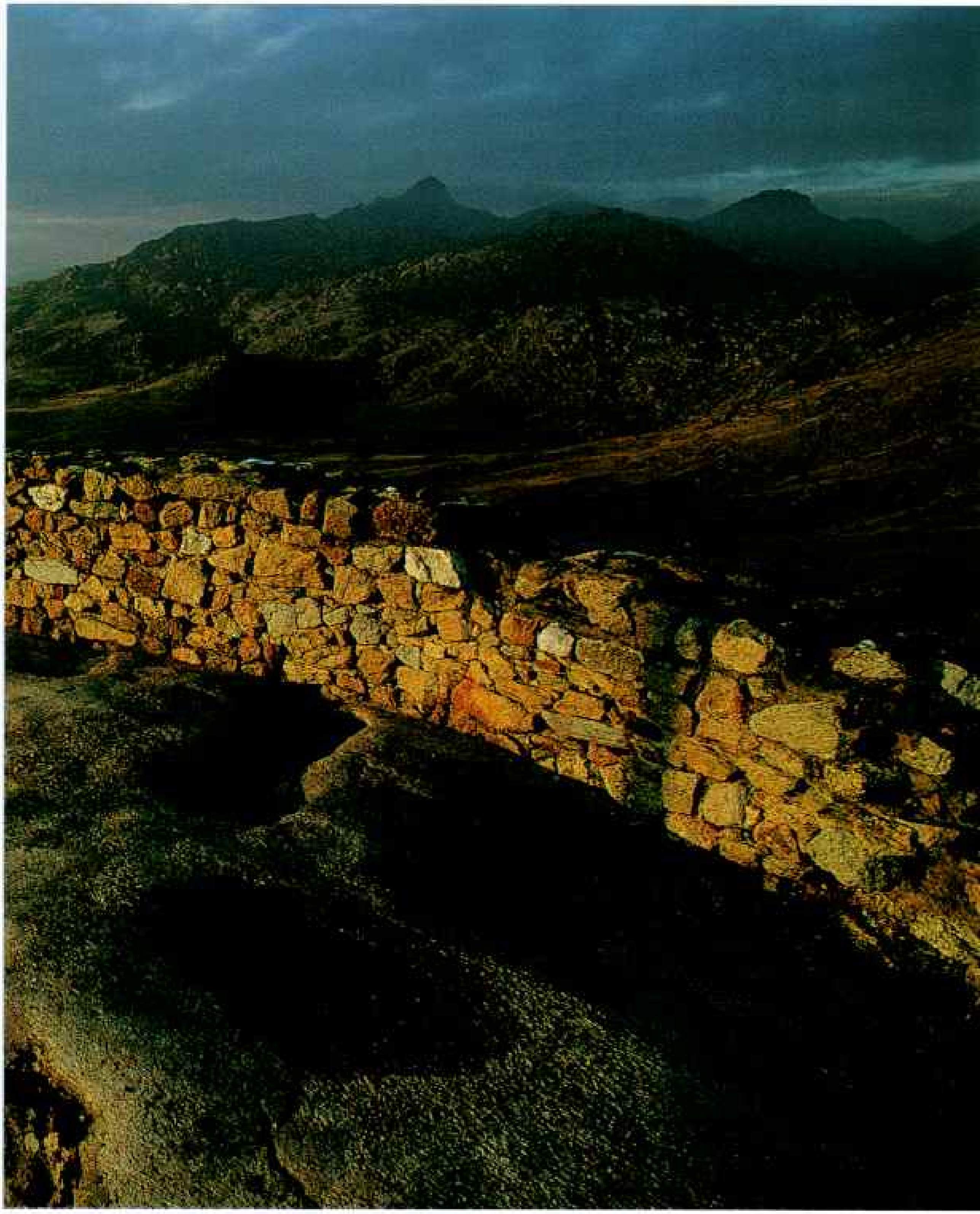
"Whatever you write," says Nade Proeva, a history professor at the university in Skopje, "understand that every nation here has its own truth. In the Balkans we only speak through myths. We can't have an intellectual discussion when one nation's war hero is another nation's war criminal."

Conspiracy theories abound. I hear that Yugoslavia was destroyed by Germany, that the U. S. and Iraq are in league to undermine Macedonia, that the war in Bosnia was imposed by world powers. These conspiracies are all "obvious" and "well-known."

The gut fear among Macedonians is this: If Serbs and Bosnians and Croats are truly fighting out of stubbornness and simple ethnic hatred, they could be next.



Storied field of Balkan history, the great plain of Pelagonija is steeped in the blood of warring tribes and invading armies. Near Prilep, the ruins of a 14th-century fortress recall a time of Serbian rule, just before Macedonia and most of the Balkans fell to the Ottoman Turks.



Legend holds that its builder, Marko Kraljevic, a Serbian prince of great strength and chivalry, carried a hundred-pound mace made of iron, silver, and gold. On killing Albanian rebel Moosa Arbanassa, he wept, proclaiming, "I killed a far better knight than I am."

AREA: 9,928 sq mi. **POP.:** 1.9 million. **CAPITAL:** Skopje. **RELIGION:** Eastern Orthodox, Muslim, Roman Catholic. **LANGUAGE:** Macedonian 67%, Albanian 23%, other 10%. **ECONOMY:** Industry, mining, trade, agriculture, and fishing.

Whose Macedonia?

With the defeat of the Ottoman Turks in 1913, the homeland of Alexander the Great was divided among Greece, Bulgaria, and Serbia. Macedonia declared independence in 1991; Greece—angry over the use of this historic name—closed its border in 1994. Though Greece ended its embargo last fall, negotiations continue over the name.

TODAY'S MACEDONIANS KNOW who they are. They trace their name to the empire of Alexander the Great in the fourth century B.C. They trace their ethnicity to the Slavs who migrated into the southern Balkans a thousand years later and their faith to the Byzantine Empire that brought them into the Eastern Orthodox Church.

But it is hard to be a Macedonian. The wash of invasions and conversions over the millennia has created an ethnic mix here so notorious that it inspired a French word for mixed salad: *macédoine*. It is hard when detractors say there is no such nationality, that Macedonians are simply those people—Bulgarians, Serbs, Greeks, Turks—who happened to fall into the ancient region of Macedonia when Josip Broz Tito cobbled the Yugoslav federation together after World War II. Macedonia was for 46 years of socialism considered a sort of buffer state intended to ward off the expansionist temptations of Greece and Bulgaria.

I have my own confusions about Macedonians. This is the Balkans, after all, where chauvinism often passes for history and facts are obscured in ethnic and religious murk. But I know how closely Macedonians identify with their church, so early in my four-week stay I drive into the hills north of Skopje with my guide, Elena Damjanoska, a cheerfully argumentative college student, to visit the monastery of Gorni Sveti Ilija.

The isolated monastery was built in the 12th century, when Macedonia was part of the

In her work for the GEOGRAPHIC, photographer SARAH LEEN has covered other regions undergoing change, including Russia's Kamchatka, which appeared in the April 1994 issue.

Refreshments are given to a member of the United Nations Preventive Deployment Force on duty near the border with Serbia, which was under a UN trade embargo for much of the Bosnian war. Mindful that two Balkan Wars were fought over Macedonia early in this century, world leaders sent the small force of American and Scandinavian peacekeepers here in 1993. Many fear that a new round of ethnic violence could ignite along Macedonia's frontier with the Serbian province Kosovo, where the Albanian majority chafes under Serbian rule.

Byzantine Empire, and it has survived Tito's communists as well as the Ottoman Turks, whose 500-year rule of the Balkan Peninsula ended only in 1913.

Its caretaker is Tome Bonevski, a retired machinist bent like a question mark from rheumatism. He gives us the key to the church and, later, as we sample wine and yogurt beneath a beech tree, shuffles over and unfolds himself onto a bench beside us. He wants to talk about his family.

"Nine of them are in Sweden as guest workers," he says, "but when war broke out, my grandson came down from Sweden to do his duty in the Yugoslav Army. He ended up in Croatia, in Vukovar, where the worst fighting was. He shook for a month after we got him out of there."

The old man dabs his eyes.

"Macedonians have always been the victims in war," he says. "My grandfather died fighting the Turks, and my father was left an orphan when he was only three. I joined the Partisans during World War II and got our nation back, thanks to Tito."

The tears now stream down his stubble-covered cheeks. "We fought for Macedonia for 500 years," Bonevski says, voice cracking, "and it should be known: This piece of land is Macedonia and will always be Macedonia!"

BUT IT IS HISTORY'S IRONY that nearly every patriotic touchstone of Macedonia is challenged by some other nation's conflicting version of the same events. In this complex and fractious bottleneck on the edge of Europe, each nation dreams that it will someday regain the borders of its empire at its

apex. Those borders have often lapped across one another and across Macedonia, and those dreams still fuel today's animosities.

Macedonia seems surrounded by ill will. To the south the Greeks are incensed over the very name Macedonia. They claim the new nation has usurped Greek history and symbols, that it covets the Macedonian territory that Greece gained in 1913. For 18 months a petulant Greece closed its border to Macedonian traffic, reopening it only last fall.

On the east the Bulgarians tend to patronize Macedonians, claiming they are merely western Bulgarians with nationalist delusions. To the west tens of thousands of Albanians who have lived in western Macedonia for generations hope to tear off a chunk of the new nation as an autonomous republic for themselves. To the north militant Serbs consider Macedonians misguided country cousins who belong in a Greater Serbia.

The United Nations placed a trade embargo on Serbia in 1992 to punish it for fomenting war in Bosnia, which punished Macedonia as well. With both southern and northern borders closed, Macedonia lost its major trade artery from the Greek port of Thessaloniki to Belgrade and beyond. Its commerce was forced to the east and west, down dusty Third World roads in Albania and Bulgaria.

Macedonians dreamed of capitalist glitter when their socialism collapsed, but reform was undercut by the Bosnian war and the skepticism of other nations. Investment and new construction have been deferred. Unemployment stands at nearly 30 percent, and many workers have not received wages for four or five months.

Skopje exists in a post-communist torpor that could pass for innocence. Hard times are not obvious on the street. Tourists are rare, souvenirs difficult to find. Police are tough and conspicuous, and the crime wave that has buried other emerging nations is but a ripple.

The city is part modern shopping mall with Benetton stores and stylish women, part Gypsy ghetto and the jingle of horse carts. It's part Turkish quarter, where idle men in skullcaps play backgammon, wrapped in the small comforts of their male-dominated culture, and the open marketplace stews in tomatoes, paprika, vats of *kaimak* cream, and mounds of green peppers long and crooked as a witch's nose.

I squirm through its labyrinth one morning to buy fresh apricots, dodging pickpockets and watermelon carts, and finally settle into an outdoor bistro to drink thick coffee and read away the sweltering afternoon. As the sun arcs overhead, the waiters shift umbrellas and move tables to keep them in the shade; we inch across the hot stones of the ancient courtyard like a migration of tortoises.

Solid Turkish inns and mosques with pointed minarets survive in the quarter, as well as St. Dimitri, a dim, cramped Eastern Orthodox church where Christians worshiped almost furtively throughout the Turkish occupation. In one of the wall frescoes from the 14th century, the silver halos of the saints surrounding a dying Mary shine like coins strewn across dark sand.

"It is a land made for the exhibition of mysteries, this Macedonia," wrote an enchanted British author, Rebecca West, in 1941.

After a hard day in the Mediterranean heat of his family's vineyard near Kavadarci, young Dragan Boskov downs a manly draft of Macedonian wine. Prices for the family's grapes fell drastically when the international trade embargo corked the Serbian market for Macedonian wine. Trade sanctions delivered a blow not just to the country's farmers but also to Macedonia's economy as a whole. Besides losing Serbs as customers, the struggling new country lost its northern trade route through Serbia to other markets.

The ancestors of today's Macedonians were the pagans who sacked and assimilated the early Christian communities founded by Roman colonists converted by St. Paul. They became Christians themselves through the efforts of two Byzantine missionaries, St. Cyril and St. Methodius. Their followers, St. Kliment and St. Naum, created a Slavic alphabet, later called Cyrillic, and in 886 established the first seat of Slavic higher learning, in Ohrid.

This epoch underlies Macedonian nationality; these missionaries were the founding fathers. Thus the reestablishment of an independent Macedonian church in 1967 was not only a religious benchmark but also an emotional reaffirmation of identity.

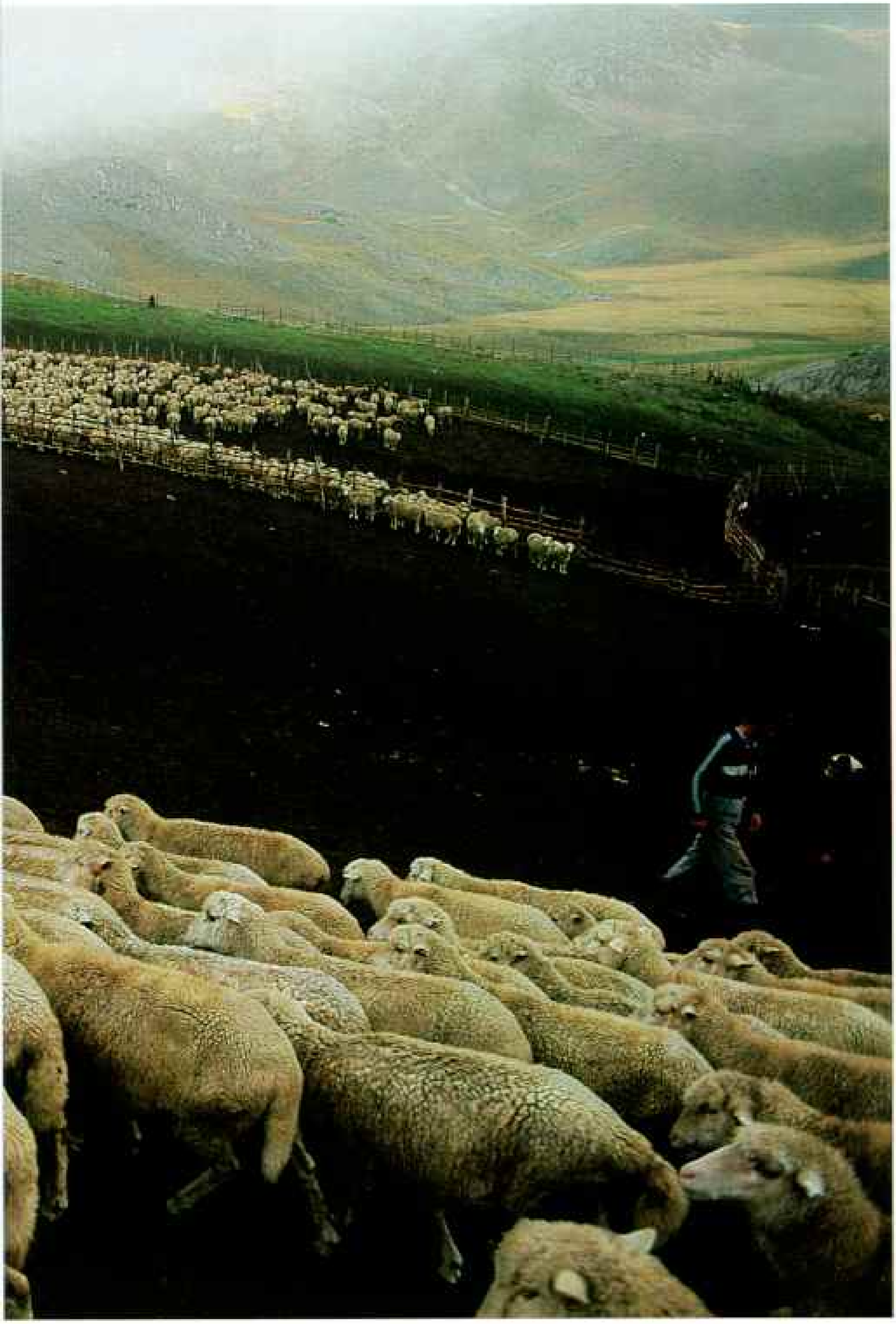
"When the Macedonian people had no state," says Petar, Bishop of Bitola, a city in the Macedonian south, "the church protected them from being assimilated into another culture. That's why Macedonians love their church, even though they are not really very religious.

"Go to Ohrid," the bishop advises, "for the pilgrimage to the monastery where St. Naum is buried. There will be 50,000 people there."

OHRID LIES ON THE SHORE of Lake Ohrid, one of two large lakes, the other Lake Prespa, that sink into the southwest corner of Macedonia. The town presses gently to a small harbor of clear water, then dances up a hillside with terraces and narrow stone walkways, hiding more than 20 old churches.

Dark mountains cup Lake Ohrid and curve into the haze of the Albanian shore, nine miles

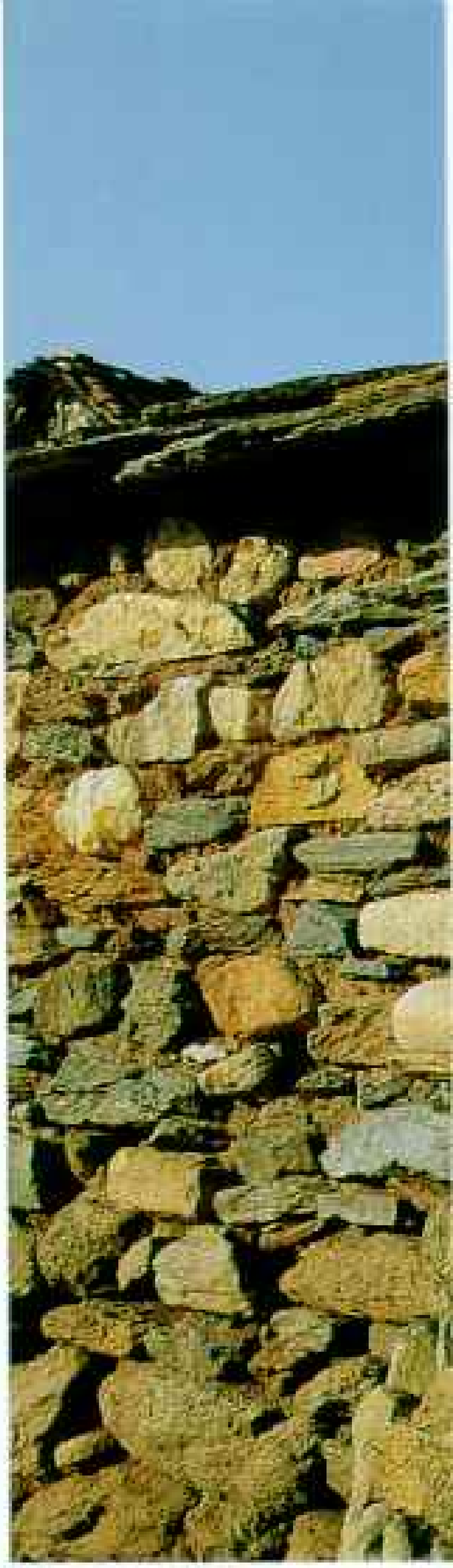
Shepherds muster their sheep in high communal pastures of the windswept Bistra mountains in western Macedonia. More numerous than the country's people, some 2.5 million sheep provide an important source of income for rural Macedonians. During the two trade embargoes



that tested their nation's new independence, farmers were unable to export their lamb and mutton. "Why slaughter our sheep," one asked, "if we can't sell the meat?" With the embargoes ended, shipments have resumed—especially to Italy, the largest customer.

Farmhands are increasingly Albanian in rapidly urbanizing Macedonia, where agricultural production—like this strawberry harvest outside Skopje—is shifting quietly to the minority side of the country's Slavic-Albanian divide. Despite a tendency toward ethnic polarization, the rift between Slavs and predominantly Muslim Albanians is far less volatile here than in neighboring Serbia.

Meanwhile, as the Slavic majority continues to abandon the countryside for the cities, many small towns have turned into old folks' homes. Barely 50 people remain in Stavica, a village near Prilep that was a site for the award-winning 1994 film Before the Rain. *Removing bread from her medieval-style stone oven, Zora Gulevska complains: "Nobody stays here anymore."*



away. The lake is fed by cold springs filtered through limestone, water that flows from the higher Lake Prespa, and is one of the oldest and deepest in the world, full of living fossils—trout and other species found nowhere else. The United Nations has placed both lake and town under environmental protection.

We head out for St. Naum early the next morning in an old motorboat, guided by Dragan Petroski, an engineer in a struggling local textile plant. Dragan scoops a cupful of lake water and drinks freely. He squints against the sunrise, pleased to be away from the factory.

"When I was a child, we'd take a pan of eel stew, get on a boat in the evening, and spend all night at St. Naum," he says above the put-put of the outboard. "Just give me a tent. I could live right here. I'd be perfectly happy. I could plant a few vegetables. My cousin in California calls me a Balkan peasant for staying here. But I love it."

St. Naum monastery lies on the southern tip of the lake, surrounded by a green meadow eternally soaked in springwater. Families once brought their mentally retarded and disturbed to be purged in this place of purity.

We reach the church after plowing through a gantlet of vendors hawking everything from icons to plastic machine guns. A Gypsy woman carries a sheep three times around the church in symbolic sacrifice. Her husband records the ritual with a video camera. Inside, the tomb of the saint is smothered in gifts of food and clothing, and I crowd with the faithful around the altar as a choir chants the Old Slavonic liturgy. We are bathed in ritual smoke and soothed by the incantations of gilded priests, conquering the darkness with our small candles.

THOUGH GREECE AND MACEDONIA are spiritually united within the Eastern Orthodox Church, that bond has eroded in acrimony. Under the Ottomans the region called Macedonia encompassed much of today's northern Greece, including Thessaloniki on the Aegean Sea. In the savage Balkan Wars of 1912-13, the Turks were finally expelled from the peninsula, and Macedonia was partitioned into three sectors. Vardar Macedonia, including Skopje, became part of the Kingdom of Serbs, Croats, and Slovenes, formed in 1918 and renamed Yugoslavia in 1929. Pirin Macedonia went to Bulgaria. Aegean Macedonia is now in northern Greece.

The Greeks set out to expunge Macedonian loyalties in its new territory. They shipped in ethnic Greeks from Asia Minor, which diluted the Slavic population and forced out thousands of Macedonians and Turks. Macedonians who left could not return to their villages, and visas were denied their relatives.

Hristo Melovski, a professor of history at the university in Skopje, was born in Greek Macedonia. "They told us our name was now Mellios," he says, "and it was forbidden to speak our language—for every Macedonian word, you would be fined 30 to 40 drachmas [40 cents U. S.]. One man I knew fought it. He would see a policeman and go right up to him, pronounce a Macedonian word, and hand him the money."

Greece bristled anew when an independent Macedonia emerged on its northern border. The question is one of prestige, of which people would inherit the historic glory of Alexander the Great. The Greeks maintained that only their northern province had the right to

use the name Macedonia. They were outraged by the Macedonian flag—a bloodred field with a 16-point yellow sun, a symbol that they consider purely Greek because it was found on the grave of Philip II, Alexander's father.

"Even if we wanted to invade and occupy them," says Saso Ordanoski, director of Macedonian television, "how would we do it? We have almost no army, for God's sake. The Greeks are a fine people with a great history, but why should we pay for their complexes and stupidities?"

The Macedonian government had already amended its constitution once, at the request of the European Union, to clarify that Macedonia has no territorial ambitions. Pressured by Greece and its powerful Washington lobby, Macedonia has been forced to operate internationally under the awkward name Former Yugoslav Republic of Macedonia, or FYROM.

Last September U. S. diplomats brokered an agreement to end the logjam. Greece lifted its embargo, and Macedonia changed the shape of the sun on its flag, but politicians are still bickering over the name Macedonia. In the Balkans wounds do not heal overnight.

MACEDONIA's internal wound remains the Albanian question. Slavic Macedonians are 67 percent of the population, and ethnic Albanians are 23 percent (although they claim higher), with smaller groups of Serbs, Turks, Gypsies, and Vlachs. The new constitution specifies generous minority rights but declares Macedonian, with its Cyrillic alphabet, to be the official tongue. Albanians continue to speak their own language and use the Roman alphabet. They resent being treated as a minority and feel like tenants in their own house.

The government has managed slowly to increase opportunities for Albanians. Ten percent of university admissions, for example, are set aside for minority students, and four government ministers are Albanian. Still, Macedonia is no multiethnic Switzerland; it is more of an Israel, an independent state for a damaged people, and it will not easily grant its minorities equal status.

Even many educated Macedonians, if scratched, reveal blood animosities. "We all pay taxes, and we have to support these Albanians with their 12 children each?" scoffs history professor Nade Proeva. "They tell us, 'We will beat you in the beds.' But we don't have another mother state, like the Albanians. We have only this little piece of land, and they want to divide it again. Enough is enough! There is nothing left to divide!"

In the city of Tetovo, near the Kosovo border in western Macedonia, Albanian activists attempted to open an Albanian-language university last year, but the government labeled it a political provocation. Police closed down classes. A large crowd gathered; rocks were thrown. An Albanian man was shot and killed. The government blamed the unrest on radical Albanian politicians such as Menduh Thaci, a former activist in Kosovo.

Fine roads connect Macedonian cities, and I drive to Tetovo one afternoon along the valley of the Vardar to see Thaci himself.

A certain peace comes with such a drive. The countryside looks mature, as if it had considered all its options over centuries—as if it had fine-tuned wheat fields, vineyards, poplars, and farmhouses into harmony in the finite space between mountains.

Tetovo is wedged into the foothills of the Sar Planina. Higher up, villages hang like glacial debris almost to the tree line. Herds of sheep crop the summer grass in the high reaches, guarded by Sarplaninec dogs, bred as gladiators, big and courageous enough to turn back the occasional wolf or bear.

Menduh Thaci, vice president of the Albanian splinter party called PDPA, looks at me with the eyes of an angry hawk. He is 30 and says that the Albanian leaders who have joined the Skopje government are simply collaborators.

I ask if he is as radical as his reputation.

Thaci gives me a tight smile. "We haven't thrown a single stone," he says. "But there comes a moment in politics when you don't have success, when nobody listens to you. And then extremists appear, those who will use kidnapping or terrorism. We fight this tendency every day, every moment. . . ."

IN THE VILLAGE OF VEVCANI, one of the few to remain predominantly Slavic in western Macedonia, ethnic tension is razor-edged.

"This is a village where most men have emigrated as craftsmen," says Gavril Bebekoski, director of a construction firm. "They work in Kuwait. In Germany. We have workers in Moscow. They are talented workers with walls, ceilings, floors, terraces."

Over the past several decades, Albanian

Who owns the water on a frontier? For millennia, Macedonian fishermen on Lake Doiran used cormorants to drive fish into reed weirs along the shore. Today fishing huts stand high and dry above a receding lake bed, while unhappy fishermen settle for shrinking catches. The problem: Farmers on the Greek side are siphoning off the lake's water for irrigation. "We can do nothing," says one local. "This is political." That's true enough, since landlocked Macedonia depends on Greek goodwill for access to the sea.

The mosaic of cultures that is modern Macedonia is best seen in its largest cities. In ethnically vibrant Skopje, Gypsy women take to the streets in a scarf-burning ritual used to quell family disputes. In Tetovo, home to nearly a third of Macedonia's Albanians, a Muslim cleanses himself before entering the city's famed Painted Mosque. A legacy of the Ottoman Turks—Macedonia's masters for more than 500 years—the country's many mosques are now used primarily by Albanians, along with some 75,000 ethnic Turks.

settlers have moved into such villages, abandoned by Macedonians who could no longer make a decent living from the land.

"Around here three villages have been converted to Islam," says Gavril's brother Goce, director of the agricultural co-op. "It's unnatural multiplying! The Albanians live here, and they will not acknowledge our system of values. When our national anthem is played, they will not listen; some even whistle."

"The Macedonian greed for a better life made us sell our land and move to the cities," says Gavril. "We blame ourselves."

In the gritty Albanian village of Velesta, only a mile or so away, I talk to Muca Xheladin, a soft-spoken unemployed schoolteacher who has been clerking in a grocery.

"Not many of us socialize with the Macedonians," says Xheladin, "but those Albanians who do are very careful not to let their communities know what they're doing. Now even the most common people are politicized. After that Albanian was killed in Tetovo, we would not talk to a Macedonian who passed through this village. Even if you had a Macedonian friend, you couldn't bear to look at him."

A young Albanian man who had been listening carefully offered: "The Macedonians have a police force and army organized against us."

"Not against outside enemies?" I ask.

"No. Against us."

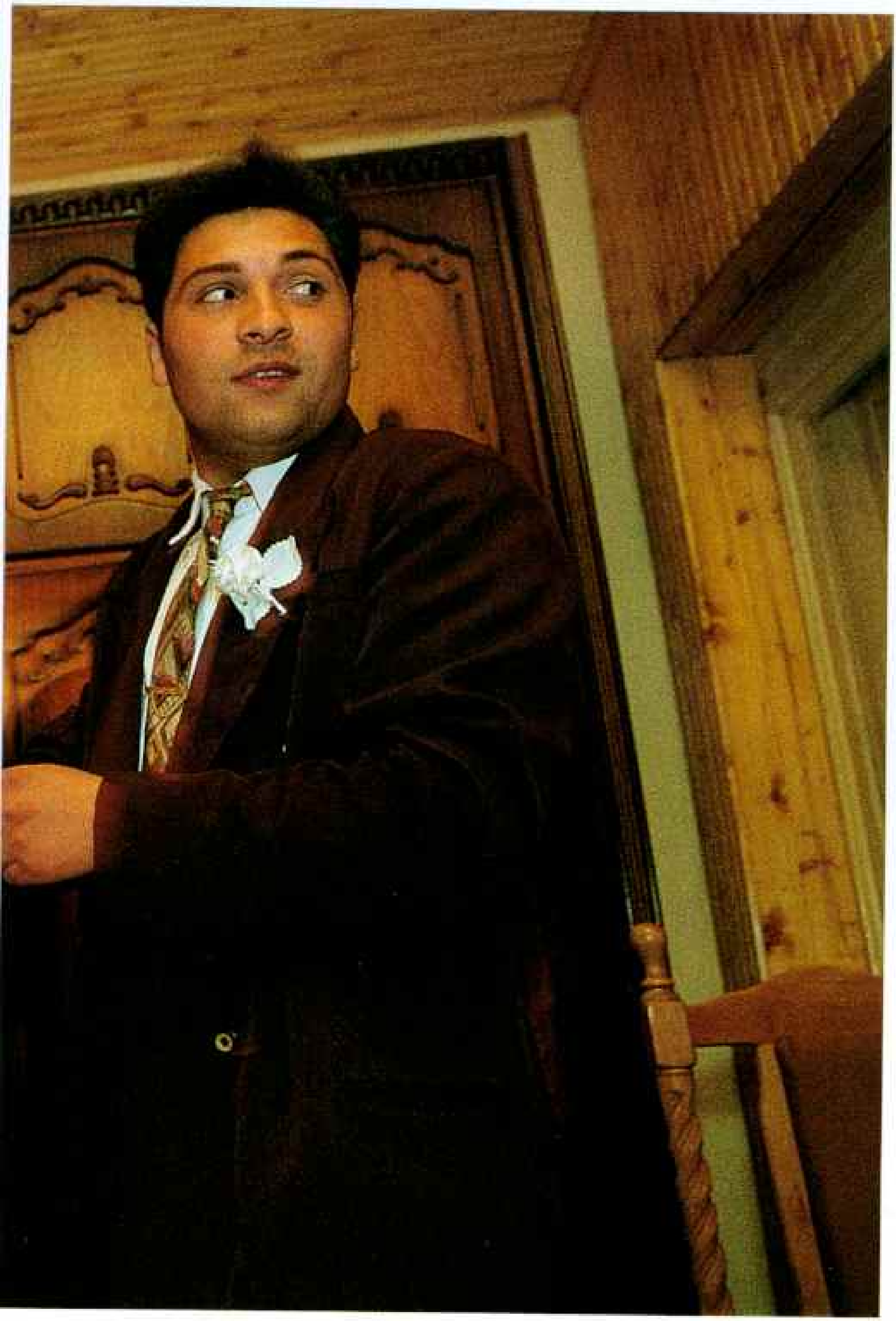
"You can ask 200 Albanians," adds Xheladin, "and if a single one disagrees with that, I will buy you dinner."

"What about the war?" I ask. "Will it come?"

"You can smell the powder even here."

THE SISTER REPUBLICS of Yugoslavia once accounted for 70 percent of Macedonian trade, and Serbia is still Macedonia's most likely ally. Macedonians fought alongside the Serbs as Partisans in the antifascist forces of World War II, and Tito

At a Gypsy wedding, Ramiz Bajramov leads his bride, Meri Ali Mirvet, by his belt, touching her head to the four walls of her new home. The flour sifter on her head and bread under her arms are to ensure a fertile union. According to custom, the couple met only two weeks before



the family-arranged wedding in Sutka, on the north end of Skopje. About half Macedonia's 45,000 Gypsies reside in the capital. Part of Balkan society since medieval times, they are more integrated and prosperous in Macedonia than elsewhere on the warring peninsula.

encouraged development of the Macedonian language and culture. Tito's portrait appears behind desks throughout Macedonia; nostalgia for the security of the old federation remains.

Viktor Korošec is half Slovenian and still sees himself as a Yugoslav. "Once I was part of a nation of 24 million," he muses. "Now we're only two million. I feel stifled. In a cage."

"I still can't understand that the war's so close to me," says Petar Bogoevski, a lighting technician for films. "A few years ago we were making a movie in Croatia near Vukovar, and 30 miles away people were killing each other. My mind doesn't want to accept that this is my former country. I want to wake up and think it was a bad dream."

Macedonia avoided conflict in 1991 by convincing the large Yugoslav Army stationed here to take its weapons and go home; the new republic would not claim its share of the arms, as other republics had. The decision left the nation in peace but virtually defenseless until the United Nations stepped in.

In truth, Macedonia is not a nation of warriors but of survivors. Some would even welcome Serbian administration as an answer to their small-nation problems.

"Who is going to fight?" asks a former journalist who requests that her name not be used. "Against whom? If the Serbs come, some

Inner sanctum of the Macedonian soul, the church of St. Naum dates from the ninth century, when its patron saint co-founded the southern Slavic Orthodox Church here at Lake Ohrid. A museum during communist days, the church is once again open for matters of the spirit—at a time when Macedonians may need it the most.

people will resist, but the majority will say, 'Thank God!' "

On the Serbian border near the town of Kumanovo, 18 U. S. soldiers man observation post U-52 of the United Nations Preventive Deployment Force, a compound of white huts surrounded by concertina wire. Their mission is to prevent incursions, not to interrupt trade. They keep tabs on the number of donkeys carrying smuggled goods through the hills.

The Americans also patrol nearby villages, "just to be seen," says Lt. Chip Krotee, the platoon leader. "This is not a combat unit. If 25,000 Serbs appeared on the border, we would protect ourselves, but otherwise we keep our weapons down."

We go on village patrol that sunny afternoon, the troopers in full gear, with extra socks, flashlights, and enough rations to stay for days. In Slaniste a 59-year-old Macedonian emerges from his house to greet us. "I have no place else to go," he says, laughing, "I am married to a Serb."

And then he and Sgt. Albert Ochoa, a Mexican American from Los Angeles, engage in a sort of semiverbal conversation that can only happen when both parties are willing. They are soon laughing, shaking hands vigorously, and calling each other *drugar*, a special friend for whom you would give your life.

Petar Bogoevski had tried to explain this drugar relationship to me: "Maybe people outside cannot understand that I would die for my friends. And this is what I'm afraid of most in Macedonia. People here will not forget. There is a code. No one has forgotten what happened 50 years ago. All these people live together, and they know . . . which family killed which person."

THESE POWERFUL MEMORIES have both impassioned and protected a nation that wears its history like armor—necessary but almost too heavy to bear. Throughout the past century poverty has driven hundreds of thousands of men from their villages to work abroad; a third of Macedonians still live in this diaspora—in the United States, Canada, Australia, or Western Europe.

Before they leave Macedonia the men traditionally perform a stately dance called *Teskoto*, the hard dance. They form a circle, holding upraised hands, and slowly move to the rhythm of a bass drum and *zurli*, reed horns played with the eerie, keening ferocity of bagpipes on the battlefield.

They dance to show strength and agility as the music quickens, and, in the final sequence, the oldest man jumps up on the drum and kneels on one leg as the drummer slowly beats the knell in this ritual of separation.

Teskoto. It is hard to be a Macedonian. □

OWEN LATTIMORE

■ FROM THE GEOGRAPHIC ARCHIVES

Between a Yak and a Hard Place

Rockier roads awaited writer-photographer Owen Lattimore, who crossed Xinjiang's Sanju Pass (above) with his bride, Eleanor, on their honeymoon in 1926. "The Desert Road to Turkestan" (June 1929), an account of their trek, was the first of his four GEOGRAPHIC articles on China. In 1950 Lattimore, by then a respected Far Eastern scholar at Johns Hopkins University, was targeted by Senator Joseph McCarthy as "the top Russian espionage agent in this country." Lattimore battled the groundless charges until Justice Department indictments were dropped five years later.

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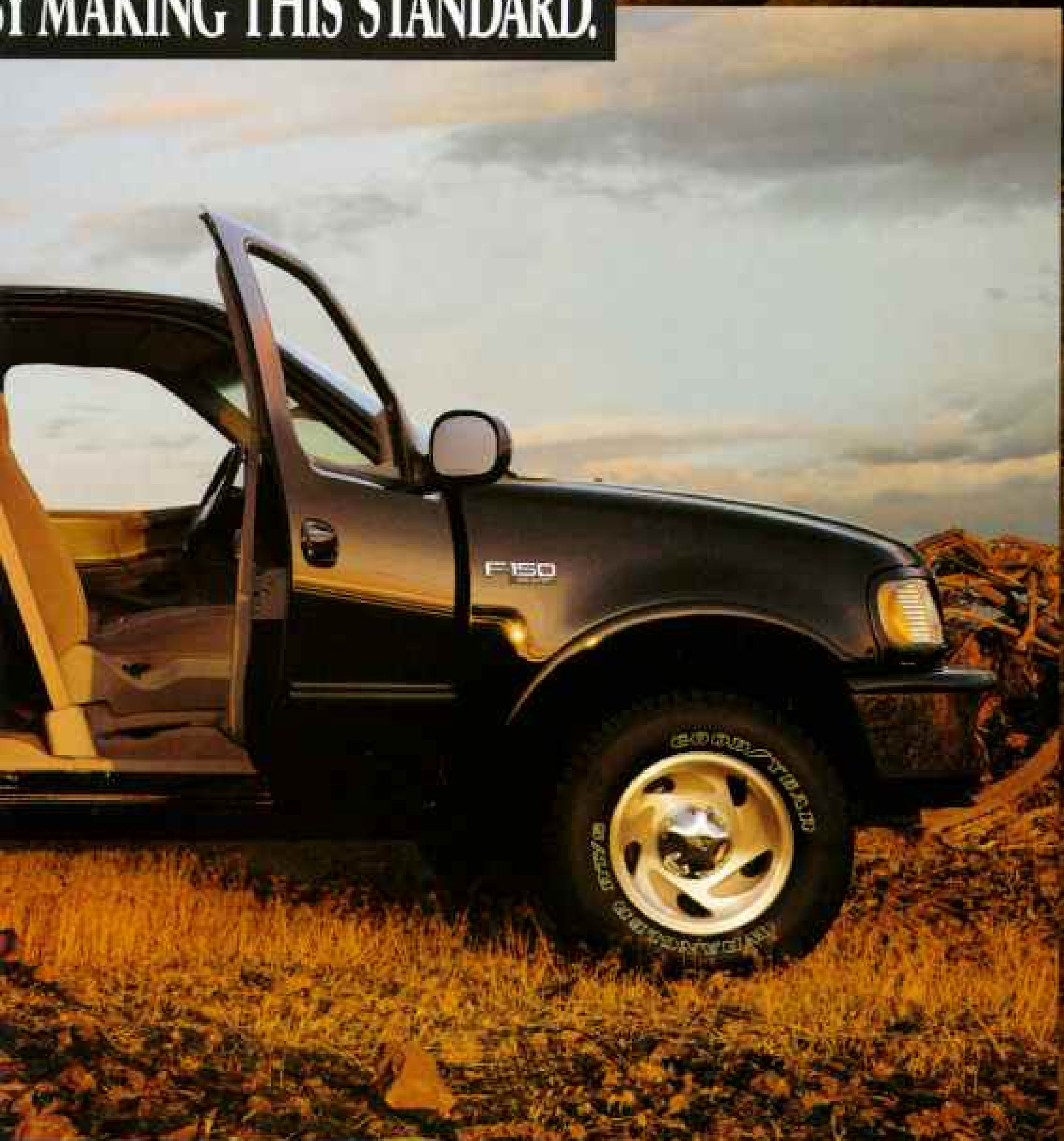

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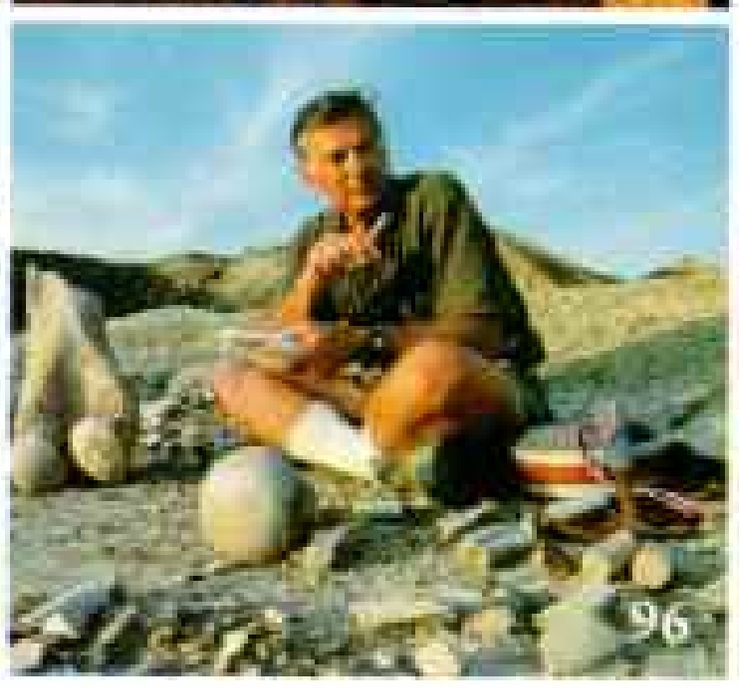
NATIONAL GEOGRAPHIC

MARCH 1996



2 **Xinjiang** *Horsemen become farmers and deserts sprout oil wells as China resettles and develops its wild west.*
BY THOMAS B. ALLEN PHOTOGRAPHS BY REZA

44 **The Silk Road's Lost World** *Mummies with Caucasian features recall a culture that thrived in Xinjiang 3,000 years ago.*
BY THOMAS B. ALLEN PHOTOGRAPHS BY REZA

52 **Emperor Penguins** *Embracing the coldest climate on earth, these avian royals reproduce during the Antarctic winter.*
BY GLENN OELAND PHOTOGRAPHS BY FRANS LANTING

72 **Heart of the Hudson** *A spirited sense of community is reinvigorating New York's historic river valley region.*
BY PATRICK SMITH PHOTOGRAPHS BY MELISSA FARLOW

96 **Face-to-Face With Lucy's Family** *New fossils from Ethiopia help flesh out the oldest skeleton in our ancestral closet.*
BY DONALD C. JOHANSON PHOTOGRAPHS BY ENRICO FERORELLI
ART BY JOHN GURCHE

118 **Macedonia** *Independence came in 1991 to the onetime Yugoslav republic, but national unity remains elusive.*
BY PRIIT VESILIND PHOTOGRAPHS BY SARAH LEEN

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The Cover

An emperor penguin chick gets close inspection on Antarctica's frozen Weddell Sea. Photograph by Frans Lanting

SCRATCHING ONLY MAKES IT WORSE.

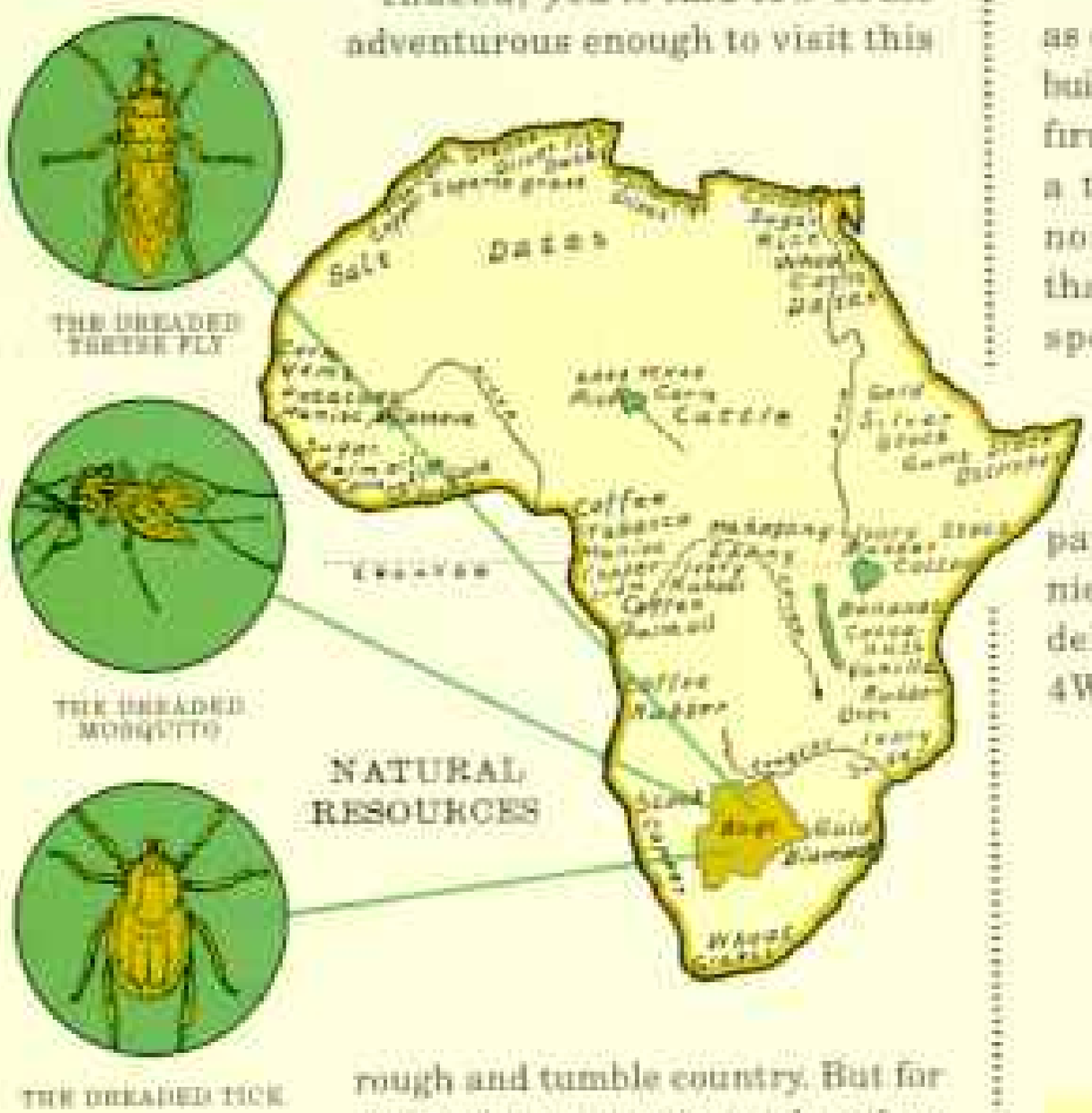
(A JOURNEY THROUGH BOTSWANA'S OKAVANGO DELTA.)

Recently we subjected the new Nissan Pathfinder to one of the toughest test drives imaginable: a 5,000-mile safari across Africa. Our journey treated us to incredible wildlife, breathtaking landscapes and some of the poorest excuses for roads you can imagine. Over the next few months, we'll share highlights, lowlights, our favorite destinations and survival tips. We may even mention a word or two about the vehicle that took us there and back in one piece. Today's story, as the saying goes, begins in Botswana.

BOTSWANA

WITH OVER 85% of his country covered in sand, scorching temperatures that routinely soar over 115° F, and roads that have never seen an ounce of asphalt, Botswana's Minister of Tourism would seem to have his work cut out for him. Add the ubiquitous mosquitoes and voracious tsetse flies and you'd think he'd quit and find a new job.

Indeed, you'll find few souls adventurous enough to visit this rough and tumble country. But for us, Botswana was the perfect place to prove the mettle of the new Nissan Pathfinder.



We arrived in Botswana on September 30th, which was, auspiciously, "Botswana Day." Our intended destination was the northwest corner of the country, where Angola's Okavango River spills into Botswana's sands and forms the Okavango Delta: the largest inland delta in the world. Here, we were told, temperatures only reached 105° and any discomfort would be recompensed by the hundreds of different animal species that inhabit this wildlife oasis. (And, of course, the fact we could set our automatic temperature control on a more humane 72°F.)

Our jumping-off point for the Okavango Delta was a small frontier town called Maun where, as our Pathfinder's built-in compass confirmed, we caught a two-lane road north. It took us only a few minutes to surmise that Botswana's Minister of Transportation must spend most of his time consoling the country's Minister of Tourism, for just two miles out of Maun the tarred road abruptly ends and turns to sand. Indeed, since there is no pavement or gas station or traffic sign or convenience mart for the long, slow 75-mile drive into the delta, we recommend keeping the Pathfinder in 4WD and bringing along a good collection of CD's.

BOTSWANA TRAVEL TIPS:

1. Beware of bull elephants.
2. Beware of crocodiles.
3. Beware of deep sand.
4. Beware of deep mud.
5. Beware of everything else.

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LOCAL BOTSWANAN SNACK.

A common local treat is the Mopani worm. To prepare, cook in hot ash for 15 minutes, boil in salt water, then place in the sun until dry. (Note: Chefs pressed for time can simply serve small pieces of cardboard.)

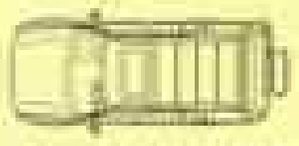
Any curse words uttered in the direction of Botswana's transportation department, however, were quickly retracted as we entered the primordial delta. The terrain, although challenging to man, machine and antiperspirant, is home to an incredible array of wildlife. On our first day alone, we saw elephants, giraffe, hippos, zebra, buffalo, wildebeest, gazelle and warthogs—the latter of which (DRIVING ALERT) burrow dens into the ground that put New York potholes to shame.

The following days were spent four-wheeling through the thick sand and soggy marshes that pass for roads in Botswana, and observing the area's elephant herds. We're pleased to report that the Pathfinder's increased horsepower and torque handled the terrain with ease, the newly improved suspension system made mincemeat of the bumps, and, aesthetically speaking, our vehicle looked quite sharp covered in Okavango mud. We should also add, immodestly, that we learned enough trivia about the Family Elephantidae to ensure us a spot on the final round of Jeopardy. (Did you know African elephants eat 16 hours a day? That's a lot of peanuts!)

Leaving the Okavango Delta sweatier, itchier and wiser, we have only the kindest of words for Botswana. Sure, the roads are lousy and the tsetse flies bite hard. But as a break from vacation crowds, few places compare.

SAFARI SAFETY BULLETIN

Refrain from using the Pathfinder's horn whilst driving through an elephant herd. The sound is like that of an elephant in distress, and may cause the herd to stampede in your direction. Even though the Pathfinder features chip-resistant paint, this would not be a good thing.



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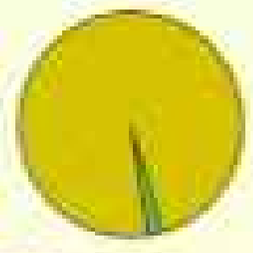

Percentage of Dirt Roads

Percentage of Paved Roads

Pathfinder drivers desiring to visit the Okavango can call their local travel agent or, if phone bills are no object, Botswana's Department of Tourism at 011-267-353024. We're sure the Minister of Tourism would love to hear from you.

NEXT STOP: KENYA!

New ideas should be judged for what they are, not where they come from.

Let's make things better.

Yolanda Bustamante, National Sales Secretary
Mexico City, Mexico

When secretaries suggest improvements, I take it as a compliment. I'm Yolanda Bustamante Mejia, responsible for secretary training at Philips National Sales, Mexico.

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Behind the Scenes

MARK THIESSEN

Reach Out and Type to Someone

TRAVEL CAN BE the best part of working for the GEOGRAPHIC—and the worst. "You get lonely," admits photographer Maria Stenzel. But while cruising the Ross Sea to shoot a forthcoming story on Antarctic ice, Maria regularly logged onto the Internet from a shipboard computer to keep up with a friend, staff writer Cathy Newman, on assignment in Australia's Cape York Peninsula. Separated by 4,500 miles—and 100°F—the pair discussed their work, mutual friends, and vacation plans, just as if back at the office.

Moved by the GEOGRAPHIC

FRESH OUT of the Marines in 1945—and tired of the flatlands—Texas native J. O. Reed happened on the August GEOGRAPHIC for that year. Our feature on Wyoming inspired him to move to the mountainous state with his bride, Lou. There he taught school, and they raised four children. "It's taken us 50 years to ask for that copy of GEOGRAPHIC," he wrote us. "Can you help?"

Yes. Copies of issues back to 1915 that are still in print, as well as indexes back to 1888, are available for purchase by calling 1-800-NGS-LINE.

■ IF THE SHOE FITS

The Society's archives hold souvenirs from a century of exploration, including a few mysteries. The provenance of this 9.5-inch-diameter bamboo wheel was unknown, but a list of items from Robert Scott's ill-fated Antarctic trek of 1911-12 included a reference to a "pony snowshoe." Cambridge University's Scott Polar Research Institute confirms that this is the shoe—which often didn't work in the snow!

ROBIN SIEGEL, NGS

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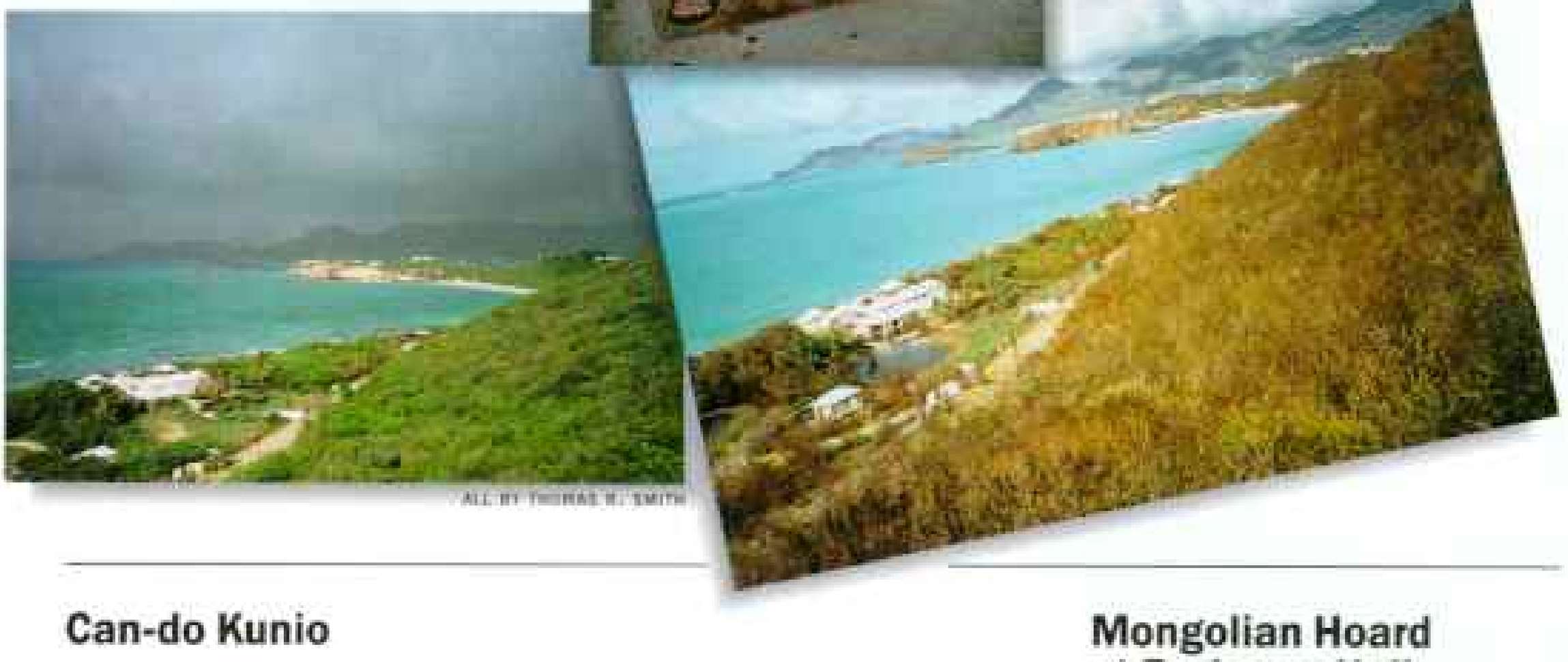
Retiring Into . . . a Hurricane

THE STORM huffed and puffed but didn't blow their house down. In September 1995, just weeks after longtime editors Tom and Mary Smith sailed off into the Caribbean sunset to retire on St. Martin (below), Hurricane Luis blew through with 140-mile-an-hour winds. As the saltwater drenching browned the normally green island (below), the Smiths waited in darkness for 33 hours in a basement utility room with 19-year-old cat Holli. "She's deaf—didn't hear a thing," Mary reported. "The island was mashed flat, but we and our house are fine." And while rebuilding continues, St. Martin's green and charm have returned.



ALL BY THOMAS R. SMITH

Can-do Kunio

A BELL RINGS in Kunio Kadowaki's van when it is driven over 60 miles an hour. "That bell rings continuously," says illustrations editor Susan Welchman, one of many GEOGRAPHIC staffers who have ridden with the interpreter as he speedily smoothed the way through his native Japan. He has researched, found contacts, secured permissions, and even posed—by a 53-foot-high Buddha to show scale (June 1976, page 843)—for 36 articles since 1969. "I attended 36 colleges," he corrects. "Without tuition." Sailing in the Sea of Japan (below), Kunio plies the tools of his trade: address book and phone.

MICHAEL K. YAMASHITA

Mongolian Hoard at Explorers Hall

WHEN MONGOLIA embraced democracy in 1990, its traditions, religion, and national hero, Chinggis Khan (this spelling reflects the Mongolian better than "Genghis Khan"), were freed from communist suppression. Now 115 little-known artworks have been collected by the Asian Art Museum of San Francisco. Bronze Buddhas, golden robes, silver saddles, and more will be on display in Explorers Hall at Society headquarters in Washington, D. C., April 3 through July 7. —MAGGIE ZACKOWITZ

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Diminishing Returns

New Englanders are particularly sensitive to the depletion of world fisheries (November 1995), the consequent inability to meet escalating demands for seafood, and the resulting economic hardship for our fishermen. Recognizing all this, our marine science community is engaged in aquaculture research leading to new sources of seafood through fish farming. Aquaculture is predicted to produce one-half the global market supply of fish and seafood by the year 2025.

RICHARD A. COOPER
Director, Marine Sciences & Technology Center
University of Connecticut at Avery Point
Groton, Connecticut

Great story. Beautiful pictures. However, it's old news to me and fisherpeople worldwide. We should have faced these problems 15 years ago. But because of governments' indifference and scientists' inability to listen, we now face empty nets, empty pockets, and empty plates. In Newfoundland it is illegal for me to catch a codfish to eat. As one old fisherman said, "She's gone, boys, she's gone."

GARRY J. TROAKE
Durrell, Newfoundland

People are trying to make a difference. Here in Washington State we are trying to pass laws limiting fishing, and the Native Americans, who have rights to 50 percent of the salmon harvest, have voluntarily curbed their own fishing.

SARA LEWIS
Seattle, Washington

Ten years ago I visited a Milwaukee slaughterhouse, and from then on I quit eating meat. After reading your splendid but shocking article, I decided not to eat fish anymore.

ACHIM GORSCH
Erftstadt, Germany

Alaska fishermen have been blamed for declining stocks on the British Columbia salmon run. On some Canadian rivers there simply aren't enough fish making it through the wall of boats offshore. In some cases salmon numbers have dropped to 10 percent of expected levels. Canada has introduced tighter regulations and quotas, but Alaska has not agreed to the numbers. In the meantime I wish they'd stop stealing our fish!

PETER McCLURE
Edmonton, Alberta

In my country we treat encroachment of foreign fishing vessels as a serious offense. In November last year two Thai fishermen were shot dead for illegal fishing, refusing to stop for inspections, and endangering enforcement officers. It is every maritime country's responsibility to protect its fisheries and harvest them sustainably.

V. GANESAN
Kuala Lumpur, Malaysia

The fishery crisis is no different from most other resource shortages. The root problem is the world's annual population growth of 90 million people.

ALEX CAMERON
Sacramento, California

Tokyo Fish Market

For my brother and me the Tsukiji wholesale fish market is all the excitement and blur portrayed by T. R. Reid and photographer James L. Stanfield—and more. It was our first stop on a one-day visit to Tokyo. We arose early to ride the Hibiya subway line to Tsukiji station. After experiencing the frenzied pace of the market, we decided on a whim to walk to the Imperial Palace instead of reboarding the subway. While we mixed in the hubbub of motorcycles, knife sellers, and boot shops around the market, terrorists released sarin gas into the subways below us. The date was March 20, 1995.

FRED ROWLEY
Santa Clara, Utah

The article misses the big picture. The signs are everywhere that the insatiable appetite and demand for such novelties as shark fins, sea cucumbers, whale meat (funny, that wasn't mentioned), and sea lion teeth have caused worldwide depletion and commercial extinction of many marine species.

PETER J. WALTON
Houston, Texas

As any sushi lover worth his wasabi will tell you, it is tetrodotoxin that kills, not enzymes, from eating *fugu*, or blowfish.

VICTOR WONG
Singapore

Sperm Whales

As a student in Amsterdam I attended a gripping yearlong course by whale specialist and whaler Evert Slijper. When I went back to my books of some decades ago, I realized how little was then known about the social lives of the sperms. Hal Whitehead, his team, and photographer Flip Nicklin did a great job by revealing the female-centered society with cows visited only once a year by the bull, thus rejecting the harem theory.

MACHTELD ROEDE
Maastricht, Netherlands

The picture on pages 70-71 of a sperm whale's tail in profile is almost an exact match of the famous picture of the Loch Ness monster. All this time we've been led to believe Nessie was a prehistoric dinosaur, and it's really a freshwater sperm whale!

PAUL T. MYERS, JR.
Rancho Cucamonga, California

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I disagree that the words "great ferocity, cunning, and malice" on page 62 represent Herman Melville's description of the species. They were excerpted from the second paragraph of chapter 41, also titled "Moby Dick." They are used by Ishmael to describe the exceptional behavior of a single, extraordinary whale.

PETER WILLIAMS
Dinosaur, Colorado

The Basques

I read your article with the interest of a person who looks at his own portrait. It reflects quite well our idiosyncrasies. But it should have included our universities, art, and literature; Basque country is not only a land of shepherds, fishermen, and sailors. Vitoria-Gasteiz, my birthplace, deserved one photograph; it was given an award by the European Council for being a model of a well-organized city.

JOSÉ IGNACIO LÓPEZ
Bilbao, Spain

The author said that over 500 Basques are held as "political prisoners" in Spanish jails. You neglected to mention that they have been convicted of participating or collaborating in the killing of over 800 people, including scores of women and children. Several months ago ETA terrorists attempted to kill the popular leader of Spain's opposition party with a car bomb in the middle of Madrid. As I write this, a fellow Basque businessman languishes somewhere in an ETA cell for not having paid the so-called revolutionary tax to the Marxist-oriented organization. To call these terrorists and the people who aid them political prisoners is akin to labeling the Oklahoma bombers liberation fighters.

ORLANDO GONZÁLEZ-ARIAS
Madrid, Spain

Navarra cannot be considered part of Basque country. After its first king was crowned in 800, the kingdom remained independent until it joined other kingdoms under King Ferdinand in the 15th century. Navarros have their own history and deeply rooted sense of identity. It is very difficult to find someone in Navarra who can speak Basque.

PATRICK GANDARIAS
Madrid, Spain

Squirrels

As a fellow squirrel lover, I was excited to see Diane Ackerman's article listed on the cover. I could only imagine the editors' meeting when the subject came up—the group looking at one another wondering how a story on an animal considered as common and as much a nuisance as the pigeon would play to your audience. Well, thank you for taking a chance!

RICK OBERG
Melrose, Massachusetts

The anthropocentric approach does not change the fact that squirrels cause untold damage by ripping up insulation and vapor barriers in attics, digging holes in lawns, and wrecking gardens. Squirrels are not compatible with humans in city habitats and belong in a forest environment. To feed and care for them in human surroundings could be considered cruel because they become dependent on handouts.

S. R. LOSCHIAVO
Winnipeg, Manitoba

A band of grays gnawed away at and through two-by-four redwood planks supporting our deck and did such a thorough job that the whole deck had to be replaced. The contractor said he had known similar damage on a smaller scale, but never had he seen such devastation.

HAROLD OREL
Lawrence, Kansas

Feeding raw peanuts to squirrels can have serious or even fatal consequences. Peanuts are a legume, not a nut, and when raw contain a trypsin inhibitor that interferes with the absorption of protein. Roasting hulled raw peanuts for 20 minutes at 300°F destroys the trypsin inhibitor, making the peanuts suitable for feed.

JAMES K. KIESWETTER
Medical Lake, Washington

Oxford

From a writer-historian living in a cabin in the High Sierra, thanks for the wonderful photo of Oxford (pages 117-19), which will hang in my office to remind me of some of the most wonderful days of my life. Americans who wish to taste the Oxford experience should investigate the Oxford/Berkeley Program, which offers two summer sessions at Worcester College—living there, eating in hall, studying with Oxford tutors, and working in Oxford's many libraries. But beware, Oxford can be habit forming. Each winter when the catalog arrives, my eyes glaze and my credit cards tingle.

MARTHA L. VOGHT
Bishop, California

Showing Oxford's elite inhaling helium (pages 128-9) does a disservice to the efforts of the compressed-gas industry to make the public aware of the risks. We see more cases every year of people, mostly children, with serious health damage due to this seemingly innocuous practice.

ABEL HAURI
President, Liquid Carbonic Inc.
Markham, Ontario

Behind the Scenes

Giving totals for U. S. Society members, you show North Dakota with the fewest, California the most. Yet doing a little calculating, I find 3 percent of North Dakotans are members, while total U. S. membership is only 2.9 percent. Hats off to California with a beautiful 3.2 percent membership.

PHIL LARSON
Fargo, North Dakota

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

Mandrill (*Mandrillus sphinx*) **Size:** Head and body length of males, 65-95 cm; females, 50-60 cm; tail, 7-12 cm. **Weight:** Males, up to 30 kg; females, 10-15 kg. **Habitat:** Forests in Cameroon, Rio Muni, Gabon and Congo. **Surviving number:** No estimates, but generally rare and declining. Photographed by Marc Ancrenaz

WILDLIFE AS CANON SEES IT

The mandrill's startling blue and red face distinguishes this primate as one of the most strikingly colorful of all mammals. Though well known in zoos, mandrills are difficult to study in the wild due to their enormous home range and elusive nature. Traveling in groups by day, these forest baboons cover a wide range through the lush vegetation of equatorial west Africa as they forage for favored fruit and also a diversity of leaves, roots, seeds and insects. Social group sizes vary from 15 to 50, and often several groups unite to form larger aggregations. Unprotected throughout much of their range, mandrills live under continuous pressure from hunting and habitat disturbance. 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.

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Ford Safety Engineers Karen H. Petrella, Steve Pangione, Mike Fenton

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NATIONAL GEOGRAPHIC
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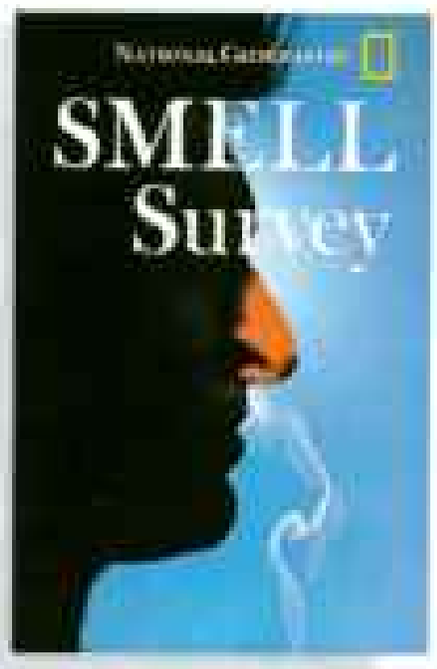
THE SMELL SURVEY

Sniffing Out the Sense of Smell

BOB SACHA

IT'S NOT ALWAYS PLEASANT, but someone has to take sniff tests for science. Leigh Anne Dorsey (above) reacts to the odor of acetic acid at Philadelphia's Monell Chemical Senses Center, under the watchful nose of Dr. Charles J. Wysocki.

The neuroscientist helped create the first-ever international smell survey; it was included in the September 1986 GEOGRAPHIC with an article on the sense of smell. An astonishing 1.5 million readers, including 200,000 outside the U. S., responded. Their reactions have fueled nearly a dozen scientific papers on the sense of smell.



The survey asked readers to scratch and sniff six odors, then answer questions: Could they smell androstenone (sweat), Galaxolide (musk), isoamyl acetate (banana/pear), mercaptans (natural gas), eugenol (cloves), or rose? Was the smell intense? Pleasant? Would they eat something that smelled like it? Results from a sample of 26,200 replies were published in the October 1987 GEOGRAPHIC.

Analyzing the 1.42 million usable surveys gave researchers a better handle on specific issues:

• Women, on average, outperformed men in detecting and identifying smells.

• Aging does not bring a uniform decline in "smellability." We can usually detect the scent of rose much longer than we can the odor of the mercaptans added to odorless natural gas, for example.

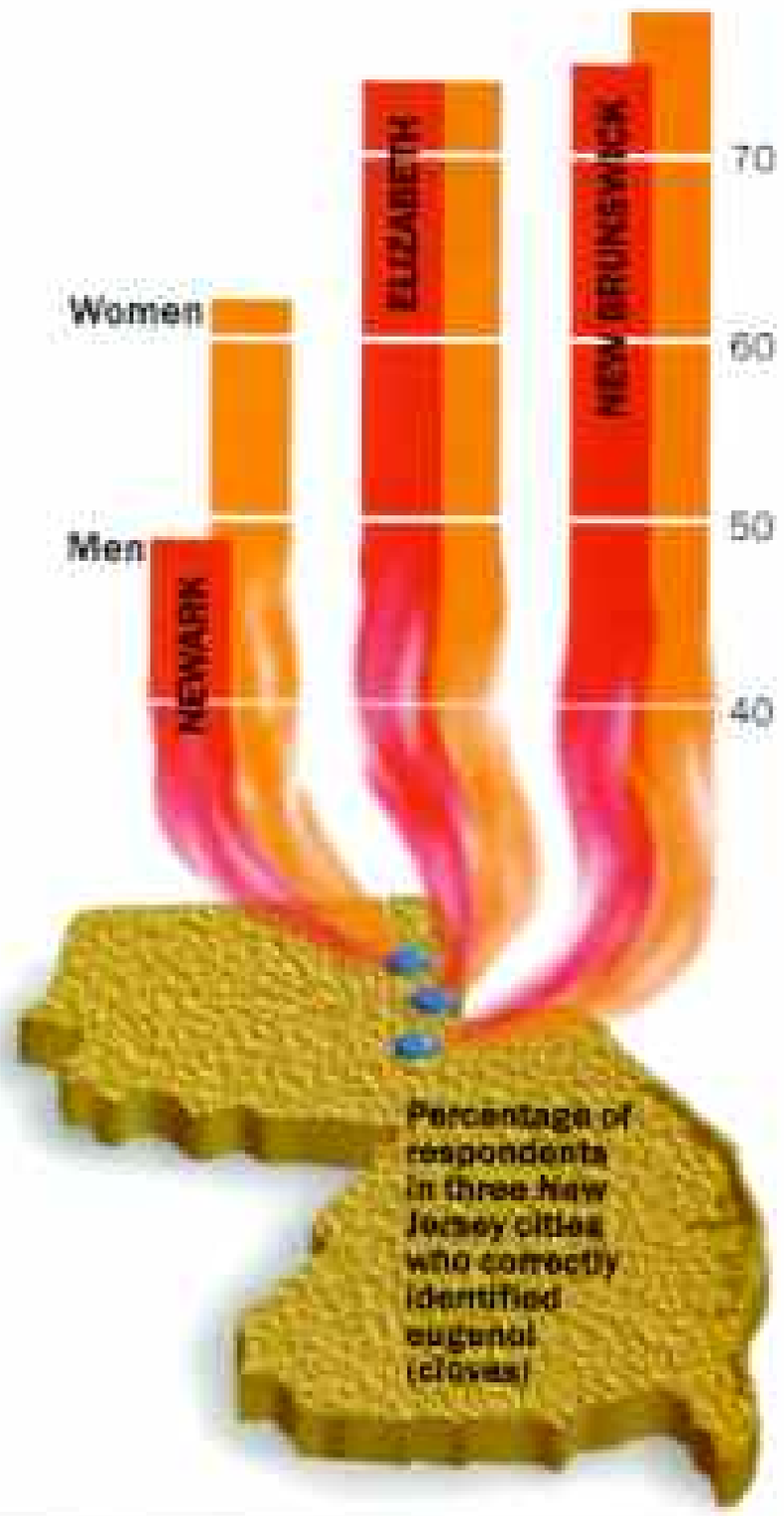
• Smoking does not necessarily blunt the sense of smell. There were few differences between American and French smokers and nonsmokers in detecting the smell of sweat and musk.

• Cultural differences influence how we react to an odor. Respondents from India found rose more appetizing than Americans did; rose water is often used in Indian cuisine.

• Pregnant women found eugenol less pleasant than did other women; older readers disliked it more than younger ones, perhaps recalling its past use as a dental anesthetic.

• Even people who live near one another, such as residents of three New Jersey cities (chart), can vary in their ability to detect a scent.

The main impact of the survey has been to help increase public awareness of smell disorders, says Wysocki.



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(more room, in fact, than Honda Accord and Toyota Camry) and its interior amenities. On the other hand, why imagine any of those things when you can see, hear and feel them firsthand instead? With a test drive in the all-new Mercury Sable. For more information call 1 800 446-8888, or enter *http://www.Mercuryvehicles.com* to connect with the World Wide Web.

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IMAGINE YOURSELF IN A MERCURY

MARK THIESSEN; BACKGROUND BY EMORY KRISTOF

Harpoon Blades Point to Long-Lived Whales

ENGAGED in their annual subsistence whale hunt, Captain Ben Ahmaogak's crew out of Wainwright, Alaska, hauled in a bowhead taken with a steel-and-brass harpoon. But as the Eskimo whalers butchered it, they came upon a surprise: two stone harpoon blades embedded in the blubber.

The discovery, reported to Alaska biologist Craig George, may fix the lifespan of bowheads (GEOGRAPHIC, August 1995) at more than a hundred years, far older than previously thought. Use of stone harpoons ended after commercial fleets brought machine-made metal tools to the Arctic a century ago. The whale was only a few years old when it cheated death.

"This point [above] would have to be at least 100, maybe 130 years old, based on our collections," says Stephen Loring, an Arctic specialist at the Smithsonian Institution.

Chinese Ware, Red Sea Wreck: Indian Ship?

A CONVOY of Land Rovers flanked by police cars carried artifacts from a Red Sea shipwreck across Egypt's Eastern Desert past the Pyramids at Giza to the National Maritime Museum in Alexandria.

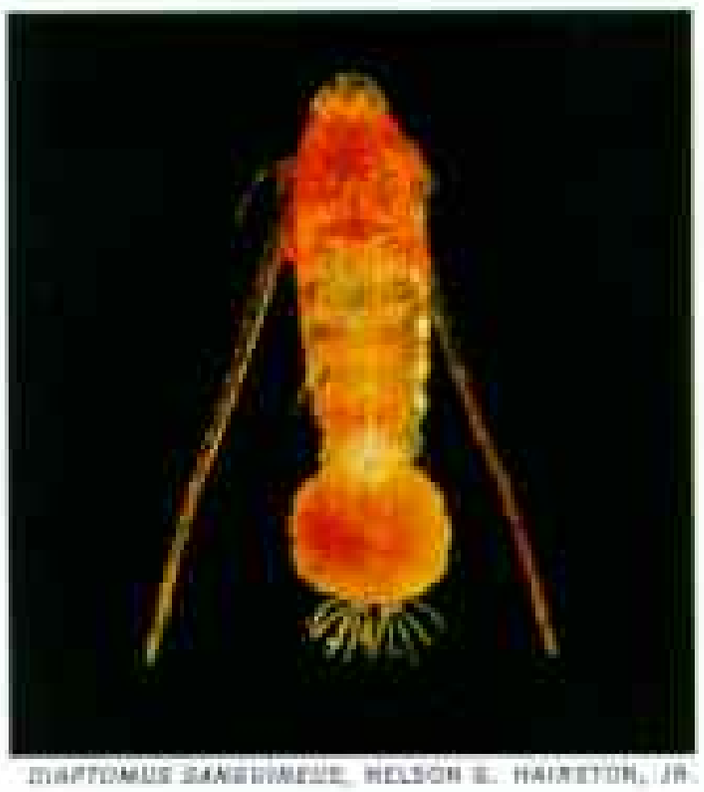
"Not the route the 300-year-old cargo was originally intended to take," says Cheryl Haldane (left), co-director with her husband, Douglas, of the Egyptian program at Texas A&M's Institute of Nautical Archaeology.

In 1994 they located the cargo ship more than 90 feet down off a coral reef near Sadan Island. It was massive: 160 feet long and 50 feet wide, with eight huge iron anchors. End-to-end hull timbers reflect a construction style never seen before, perhaps from India. Much of the cargo was Chinese, like the blue porcelain dish at Haldane's side. "From early documents we know of a trade route used by Chinese ships to carry goods to the tip of India. There cargoes were reloaded on Indian ships bound for Egypt," she says. Local chronicles bear this out, speaking of 18th-century Indian ships anchored at Suez.

ALAN T. FLANIGAN

Eggs on Hold Finally Hatch

LONG, LONG AGO, a female copepod like this one (below), no larger than a comma on this page, deposited eggs in a lake in Rhode Island.

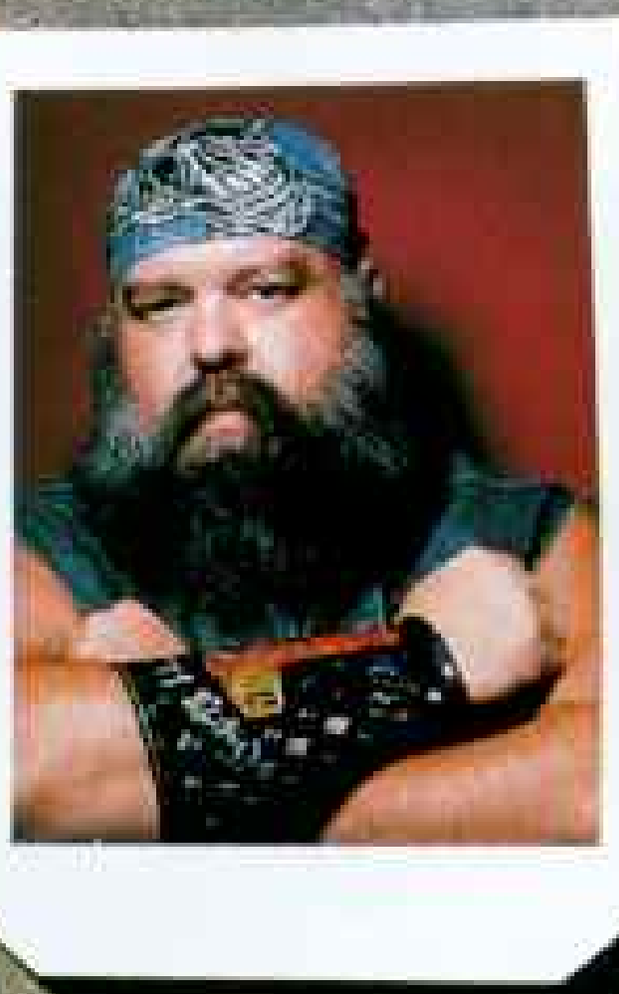


MARTOMUS SAMUELSEN, NELSON G. HAIRSTON, JR.

There the sleeping beauties lay, buried in mud, until Prince Charming, in the form of ecologist Nelson G. Hairston, Jr., "kissed" them with light and oxygen inside his Cornell University laboratory. Amazingly, the eggs began to hatch—as many as 50 percent of them. Lead-isotope dating showed them to be as old as 330 years, a record for the time between laying and hatching for these minute crustaceans.

Ordinarily, eggs laid in the spring will hatch in the fall, because it's advantageous to delay hatching until cold weather, when predatory fish stop feeding, says Hairston. But many eggs become stuck in the mud while still retaining their viability.

—BORIS WEINTRAUB



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In Tennessee, Brittanny Johnson and her mother, Kathy, attend classes together through Families for Learning, a program sponsored by Toyota.

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NATIONAL GEOGRAPHIC

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TIM DAVIS, DAVIS/LYNN PHOTOGRAPHY

■ EXPLORER, MARCH 17, 9 P.M. ET

Violence on the Veld: Paths That Cross

"THE MOST ASTONISHING OBJECT ever to disgrace nature," as it was once described, the dumpy warthog (above) makes its home in the realm of a powerful adversary—the sleek, lethal leopard.

EXPLORER's "Beauty and the Beasts: A Leopard's Story" follows a growing generation of warthog piglets and leopard cubs. Through play, the piglets learn self-protection, while the cubs learn to attack.

In youth, warthogs and leopards lead separate lives, but their destinies converge as they mature toward their roles as hunted and hunter.

The neighborhood they share is the grassland embracing the Sand River as it meanders through Mala Mala Game Reserve in South Africa. Where wildlife flourishes, deadly encounters are daily occurrences.

A young leopard, now on her own and scanning for prey from a tree limb, must fend for herself. Soon she zeros in on a warthog her own age, and the chase is on. When threatened, warthogs can reach speeds of 35 miles an hour. As the leopard accelerates in pursuit, a panicked, fully grown male impala leaps into the air in front of her. The impact of the midair collision stuns both animals, but the leopard sinks her teeth. Taking her first major kill to a tree, she has come of age—and the warthog has escaped for another day.

■ PROGRAM GUIDE

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MANOJ SHAH, TONY STONE IMAGES

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[1]We calculated resale using avg. trade-in values of '94 full-size models vs. MSRPs, published in Jan.-Sept. '95 *N.A.D.A. Official Used Car Guide*® monthly editions.

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NATIONAL GEOGRAPHIC

EarthAlmanac

Down the Burrow Holes, a Snoopy MOLE Goes

JIM STOOTS, LAWRENCE LIVERMORE NATIONAL LABORATORY

JIM WOOLLETT, LAWRENCE LIVERMORE NATIONAL LABORATORY

HIGH EXPLOSIVES and wildlife don't mix. So before scientists at Lawrence Livermore National Laboratory test conventional weapons at a 7,000-acre site in California, they talk to the lab's wildlife biologist, Jim Woollett.

Beneath the earth lie hundreds of burrows seasonally occupied by three vulnerable species: burrowing owls, San Joaquin kit foxes, and American badgers. To avoid harming or disrupting them, Woollett and engineer John Christensen have invented a Miniature Optical Lair Explorer—a MOLE. With a tiny video camera and some parts from a toy store, the battery-powered, five-inch-long vehicle is sent by an operator with a control cable down a burrow hole to see if it is occupied. "If it is, I tell the weapons personnel to pull back and move the tests away from that burrow," says Woollett. Still experimenting last summer, he took the MOLE to Idaho habitat where burrowing owls are plentiful, including this nesting pair (above).

Wildlife in the Fast Lane

MORBID CURIOSITY of the young may lead to a conservation career for some of the 3,000 students taking part in the Roadkill Project, sponsored by the National Science Foundation. Each spring grade school and high school students from around the world identify animals flattened by speeding tires. They count everything from squirrels (primary victims) and birds (a surprising number two) to deer and moose—about 30 different animals all told. The kids e-mail their data to Dr. Splatt, aka Brewster Bartlett, a science teacher at New Hampshire's Pinkerton Academy. He compiles the data—some 3,000 to 6,000 fatalities a year. Bartlett says if a victim's remains are too far gone to be recognized, "We call it a U.R.P.—an unidentified road pizza."

PAINTING BY RICHARD THOMPSON

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IMPORTANT NEWS IN PAIN RELIEF

New Study Shows 55% Of People Are Not Fully Satisfied With Their Current Pain Reliever:[1]

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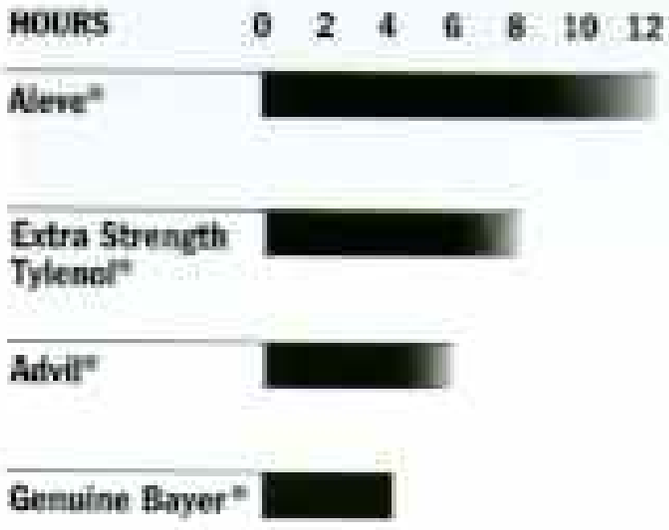
Is your pain reliever working for you?

Not all pain is the same and neither are all pain relievers. Remember your last headache – did it come and go quickly, or did it last for hours? Did a backache plague you for a week? Have you ever had a toothache that kept you up all night? Do you suffer from the minor pain of arthritis? How about the discomfort of menstrual cramps? If you think about the kinds of pain that make you reach for a non-prescription pain reliever, you may realize that the long-lasting relief of Aleve is right for you.

There are so many pain relievers to choose from, finding the right product that works for your pain might seem confusing. But when you understand the product differences, your choice becomes clearer. Aleve is the only pain reliever to contain a non-prescription strength of the medicine in Anaprox,® a fast-acting form of Naprosyn,® the #1 selling prescription brand in its class for many years. That's probably why so many doctors recommend Aleve for their patients.

RECOMMENDED DOSING



Are you too busy to be stopped by pain?

Most pain relievers are labeled to be taken up to four or six times a day, which could be a burden if you are trying to work all day or sleep through the night. However, looking at the chart above, you will notice the Aleve dosing advantage. Aleve is labeled to be taken every 8 to 12 hours instead of every 4 to 6 hours like Advil, or 6 to 8 hours like Extra Strength Tylenol. Many Americans are too busy to keep watching the clock and reminding themselves to take more medication. Taking medication every few hours lets pain control your life rather than letting you control your pain.

Are you confused about what to take?

Many people have a medicine cabinet overloaded with pain remedies. That can be both confusing and expensive. Once you have Aleve on hand, a single container could hold the answer to many of your aches and pains.

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(Based on Maximum Daily Dose)

BRAND	COST
Aleve (3 pills)	$0.31
Advil (6 pills)	$0.62
Extra Strength Tylenol (8 pills)	$0.79
Genuine Bayer (12 pills)	$1.13

Based on IRI drug outlet pricing data on 50 count caplet bottles (2/1/95–10/29/95).

How can you find the best value?

These days, it's important to get the most for your money. Aleve makes economical sense because it can be used to alleviate many kinds of pain and provides the best value per dose. The table above illustrates that the cost for a whole day's relief varies greatly between Aleve and other non-prescription products. Consider the cost of relief. Dose for dose, Aleve is an excellent choice for the value-conscious consumer.

How safe are non-prescription pain relievers?

Although you can buy them almost everywhere, remember OTC pain relievers are serious medicine. It's important to read the product labels and directions carefully. When used properly, OTC pain relievers can provide safe and effective relief from most common aches and pains. If you are in doubt about what to take, ask your doctor or pharmacist. Chances are, he or she may recommend Aleve.

Unfortunately, we all suffer from aches and pains at some time. Fortunately, you can be prepared by having Aleve on hand–before the pain begins. Nothing has been proven to be faster, stronger, or longer-lasting.

[1] Data on file at P&G.
[2] Based on a single, 2-pill dose pain relief comparison at 11 and 12 hours.
[3] Do not take this product if you have either been in a severe allergic reaction after taking any pain reliever.

ALEVE®

MARK W. MOFFETT

In China, a Walk on the High, Wild Side

"WE NEED TO MAKE tropical rain forests too valuable to be destroyed," says Illar Muul, whose company, Integrated Conservation Research, erected this 125-foot-high walkway in China's southern Yunnan Province, aided by a National Geographic Society research grant. Since 1989 the 1,000-foot-long treetop path has drawn visitors to Mengla Protected Nature Reserve, an 86-acre pocket of their dwindling natural heritage—a dipterocarp forest.

Dipterocarps are huge Asian trees relentlessly felled for timber; with them vanishes a fascinating ecology. Here in Mengla, part of the larger Xishuangbanna Protected Reserve, the keen of sight may spy mouse deer, slow lorises, gibbons, and hornbills, all severely depleted by hunters in neighboring areas.

The small fees collected from visitors go a long way to help preserve such islands of diversity. Muul's company has also built walkways in Malaysia, Ghana, Peru, and Costa Rica.

Living Fossil in Peril

ONCE THOUGHT EXTINCT for 60 million years, the coelacanth has returned just in time to join today's endangered species list. When a specimen was discovered in 1938 off the coast of South Africa, scientists were overjoyed. Some believe its strange fins link it to the first vertebrates that walked on land.

But the main population, off the Comoro Islands, is only about 200 strong. Comoran fishermen sometimes accidentally snag coelacanths along with commercial species. Hans Fricke, a marine biologist with the Max Planck Institute, wants the World Bank to help fund fish-attracting devices that will lure commercial species to shallow water, keeping fishing hooks far above coelacanths' 500-foot-deep caves.

FRICKE & SCHAUER, M.P.I.V.

"Bugging" Plants to Sting Poachers

AMONG THE RAREST PLANTS in the world, this South African cycad, *Encephalartos woodii*, was grown from the stem of a plant discovered in 1895. Several dozen offshoots have been produced from the original specimen's suckers. *E. woodii* and other cycads are in demand worldwide by botanical gardens eager to borrow them as temporary exhibits. But on such journeys, the cycads may fall prey to plant poachers, who can sell them to collectors for thousands of dollars.

To protect the ancient plants, dating back to 300 million years ago, South African conservationists tag them electronically. Scientists insert microchips into the stems and track the plants by satellite; if one disappears, authorities are notified.

JOHN E. BRACKENRIDGE, PLANET EARTH

Wild cycads also are fitted with chips. "That's really why the system has been implemented," says John Donaldson of the National Botanical Institute, home to several offshoots of *E. woodii*, which no longer grows in the wild. Two-thirds of all cycad species face extinction from collecting and loss of habitat. Recently a contractor took some 300 wild cycads worth hundreds of thousands of dollars to landscape casino grounds, Donaldson says.

—JOHN L. ELIOT

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NATIONAL GEOGRAPHIC

On Assignment

■ XINJIANG

Taking Their Best Shot in China

"WE PLAYED POOL all over Xinjiang," says freelance writer THOMAS B. ALLEN, right on cue in a town west of Urumqi. "The balls might be cracked, the cues might be bent, the pockets might have holes, but the game has replaced Ping-Pong in popularity there. I never won once."

Tom learned pool—and writing—at his Jesuit school in Fairfield, Connecticut. While in college, he reported for Bridgeport's *Sunday Herald*. After graduation and a stint in the Navy, he wrote for the *New York Daily News*. A career in book publishing followed; Tom was associate director of National Geographic's Book Service before turning freelance in 1982.

Xinjiang marks Tom's second story with Paris-based freelance photographer REZA, who uses his first name professionally; they also covered Turkey for the May 1994 issue. Since Reza speaks Turkish, he understood Xinjiang's Uygur language, which is similar.

"Some of my favorite times came between official visits, when I was able to relax with people," recalls Reza. At a Kashgar café (below) he shares breakfast with the owner's son.

Born in Iran, Reza had exhibited photographs in Teheran but was earning a living as an architect when he realized he had the wrong job. "I heard students demonstrating outside—unusual in 1978 under the shah. Soldiers soon arrived and gunned them down in the street. One student had a camera and kept shooting photos through the bullets. I knew then I had to be a photographer. I told my associates I wouldn't be in the next day."

REZA (BOTH)

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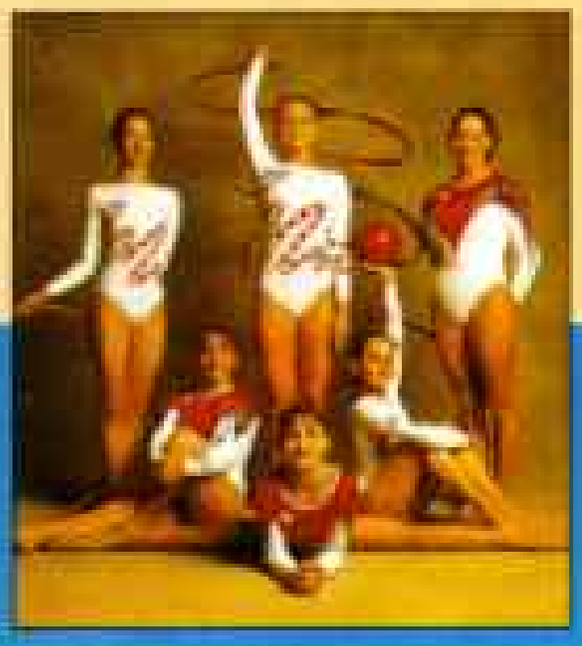

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