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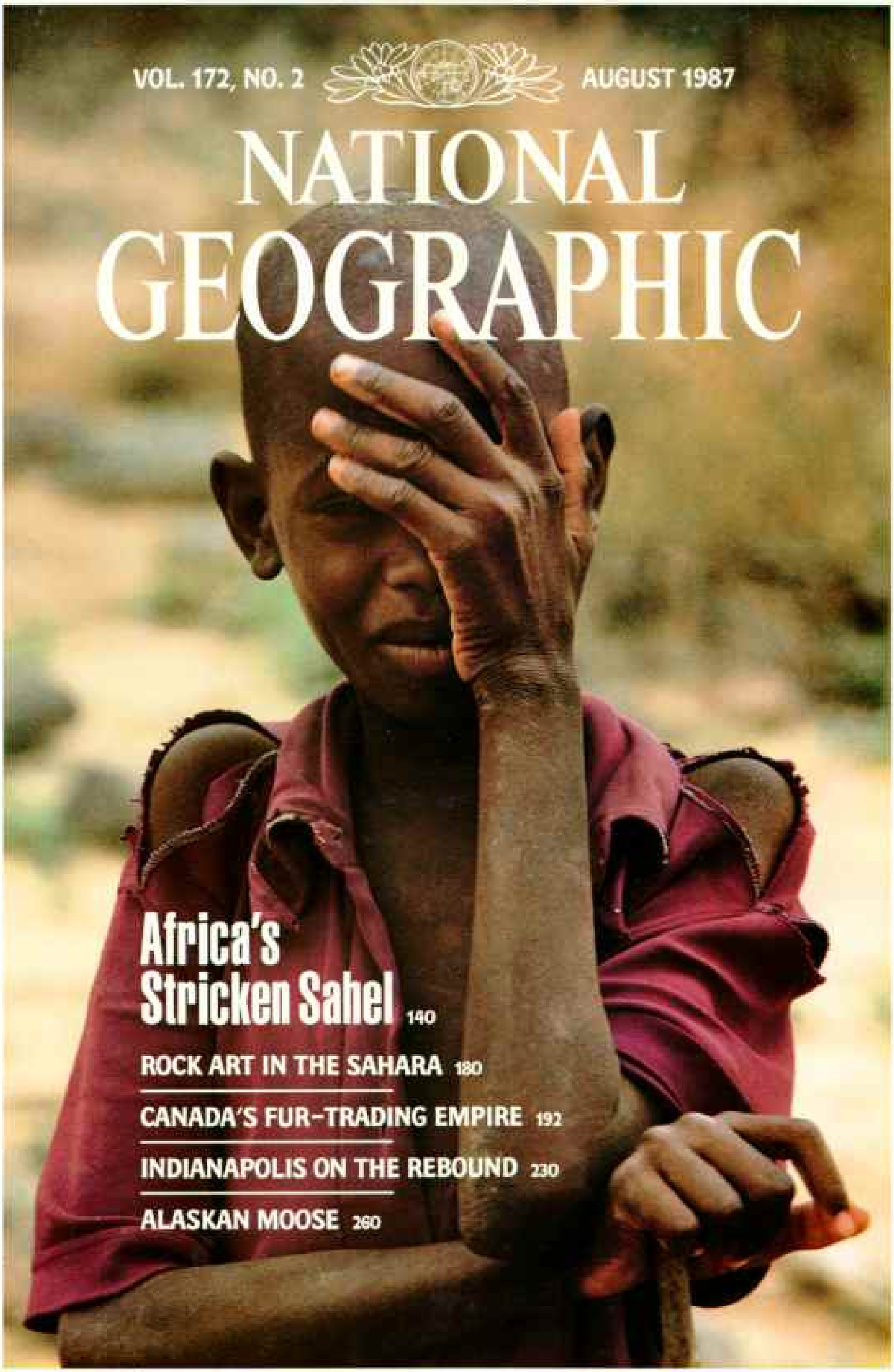
NATIONAL GEOGRAPHIC



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

AT THE RISK of spraining an arm patting ourselves on the back, I want to brag about the major awards received this year by the magazine, its staff, and its contributors (see On Assignment in this issue). More than 30 awards for photography, writing, design, and cartography indicate that just because we've entered our hundredth year doesn't mean we're getting old. Among these awards are:

- The National Magazine Award for photography, given by the American Society of Magazine Editors. NATIONAL GEOGRAPHIC was also a finalist in the categories of general excellence and design.
- The Overseas Press Club of America's Olivier Rebbot Award for 1987, to photographer Steve McCurry for his coverage of the Philippines.
- First place for "Best Use of Pictures by a Magazine" in the Pictures of the Year Competition, sponsored by the National Press Photographers Association, the University of Missouri School of Journalism, and Canon U.S.A., Inc. Eight other awards went to photographers for work that appeared in our pages.
- A first-place award from the White House News Photographers Association to Steve Raymer for "Child of War, Witness to Famine."
- The Aviation/Space Writers Association's Robert S. Ball Award to science editor Thomas Y. Canby for "Are the Soviets Ahead in Space?" Canby's article also received a National Space Society award.
- Our Cartographic Division received three awards for map design from the American Cartographic Association—for the U. S. Pacific Trust, Oregon Trail, and History of the Philippines maps.
- A Special Autometric Award from the American Society for Photogrammetry and Remote Sensing for the *Atlas of North America*, as "a milestone in the field of imagery interpretation." The atlas previously received the Outstanding Achievement Award from the American Congress on Surveying and Mapping and the Elliott Montroll Special Award of the New York Academy of Sciences.
- Three paintings in the magazine—"Titanic on the Seafloor" by Pierre Mion, "Tide Pool" by Karel Havlicek, and "Evolution of a Meteorite" by Davis Meltzer—won places in the New York Art Directors Club exhibition from 15,000 submissions.
- One Society of Publication Designers Award of Distinctive Merit went to "The Serengeti" in our May 1986 issue, another for the entire year's issues.

Awards from our peers are always treasured, but the recognition that is most important and virtually unique in magazine publishing is that—despite death and taxes—85 percent of you renewed your membership in the Society this year. Satisfying a demanding readership is the toughest test of any magazine staff.

Wilbur E. Garrett

EDITOR

NATIONAL GEOGRAPHIC

AUGUST 1987

COVER: *Overwhelmed by despair, a boy in Mali reflects the hopelessness of life in Africa's Sahel, where land abuse helps bankrupt the environment. Despite massive economic aid and relief efforts, its people balance at the edge of survival. Photograph by Steve McCurry.*

THE NATIONAL GEOGRAPHIC MAGAZINE
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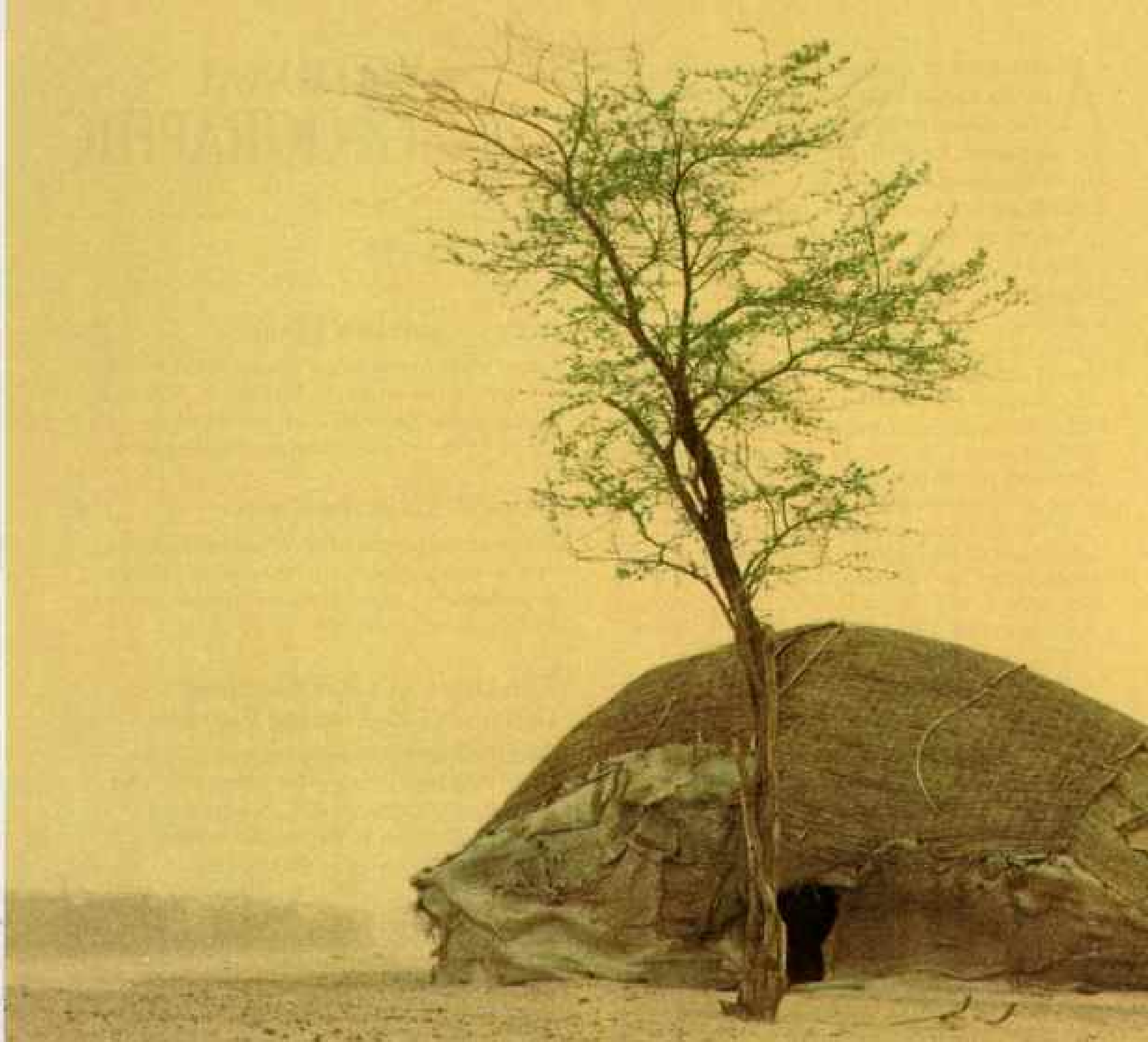
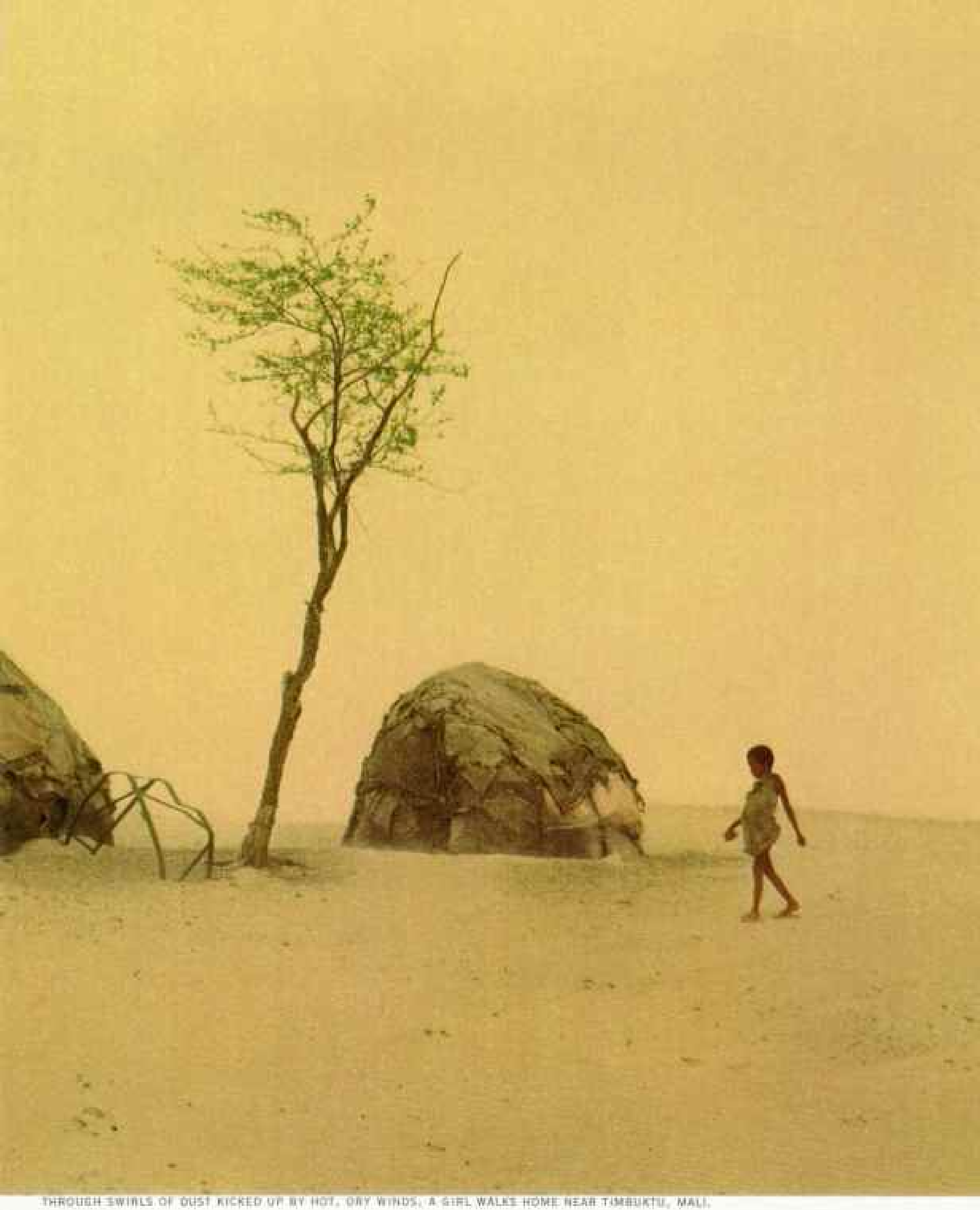


AFRICA'S SAHEL

The Stricken Land



THROUGH SWIRLS OF DUST KICKED UP BY HOT, DRY WINDS, A GIRL WALKS HOME NEAR TIMBUKTU, MALI.

By WILLIAM S. ELLIS
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by STEVE McCURRY
MAGNUM

Man has punished this barren realm, stripping it of trees and bankrupting the soil. Abetted, the desert advances and the region edges toward catastrophe.

Drowning in sand, *a house and its surrounding four-foot-high walls were suffocated by dunes in Mauritania. The family moved a hundred miles to the capital city of*

Nouakchott three years ago, adding their numbers to the ten million people across Africa forced from their homes by drought to search out food, water, and shelter.

Africa's Sahel: The Stricken Land

The sterilization of the Sahel

A SEMI-ARID BELT *of poor soils, 200 to 700 miles wide, the Sahel stretches across the African continent. Average rainfall ranges from 4 to 24 inches a year. When—and if—it rains, up to 90 percent of the moisture evaporates. Drought is natural to the Sahel; what is not is the overgrazing and deforestation that have helped the desert overrun an area roughly the size of France and Austria in 50 years.*

*The Sahel can support only a limited pastoral population. Traditionally nomads lived in balance on marginal resources (**diagram at top right**). Before the 1940s, herdsmen and livestock followed rains north during the rainy season and retreated to greener range in the south during dry spells. Crops were planted, but fields were allowed fallow spells to regenerate the soil. During those periods, stock fed off stubble; their wastes fertilized the soil.*

*The balance shifted in the 1950s and '60s. The political policies of new African nations constricted nomads. Independence also brought foreign aid. And economic aid brought new strains of crops like cotton and peanuts that could tolerate a short growing season. Expanding agriculture and population (**bottom diagram**) usurped grazing land. Aid also dug wells. Thousands of new wells penetrate the aquifer each year. Livestock strips vegetation around wells, topsoil blows away, and bare patches fuse into desert.*

The intricate process of desertification is not unique to the Sahel. Each year man's misuse denudes 25,000 square miles of our planet's surface.

Does desertification perpetuate drought? One theory says that if the potential for rain exists, a vegetated area is more likely to receive it. Vegetation blankets the soil—retaining solar heat at night, releasing it during the day. With the normal seasonal monsoon, air containing moisture from plant transpiration rises during the day and condenses to form clouds. With denuded land and a short, erratic monsoon, no cycle occurs, no clouds form, because solar energy is immediately reflected back into space.

Rain clouds
Wind
Village
Thermal lift
Agricultural field
EGYPT
Wind
Town
Sand dune
Refugee camp
Agricultural field
Dust storm
CHAD
Khartoum
Well
Khuwei
El Obeid
SUDAN
Ethiopian Highlands
CENTRAL AFRICAN REPUBLIC
ETHIOPIA
SOMALIA
UGANDA
KENYA
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A wave of sand *laps a shore of grass where dune meets pasture in Niger. Inevitably, goats will devour the remaining bushes; the dune will advance. And more pastoralists will give up their life, seeking refuge in the cities.*

*Choked by dust, hemmed in by refugee camps of rickety slums, Nouakchott (****foldout, following pages****) has grown from a town of fewer than 20,000 in 1960 to today's city of 350,000. More than half the population are refugees.*

Dunes besiege the city, and residents spend each morning sweeping sand from doors and streets to keep them passable. The influx of nomads to cities has inverted Mauritania's population. In 1965 less than half its citizens lived in cities. By 1986 the figure had risen to 85 percent.

In the Sahel, problems outrun solutions. Though billions of dollars in aid funnel in, mismanagement dilutes good intentions. Vaccines are delivered, but without needles to administer them. Pumps are sent, but no fuel to run them. In Mali a million-dollar solar-energy plant deteriorates, a white elephant of misguided effort. It worked for a month—but no better than two $6,000 diesel pumps might have done.

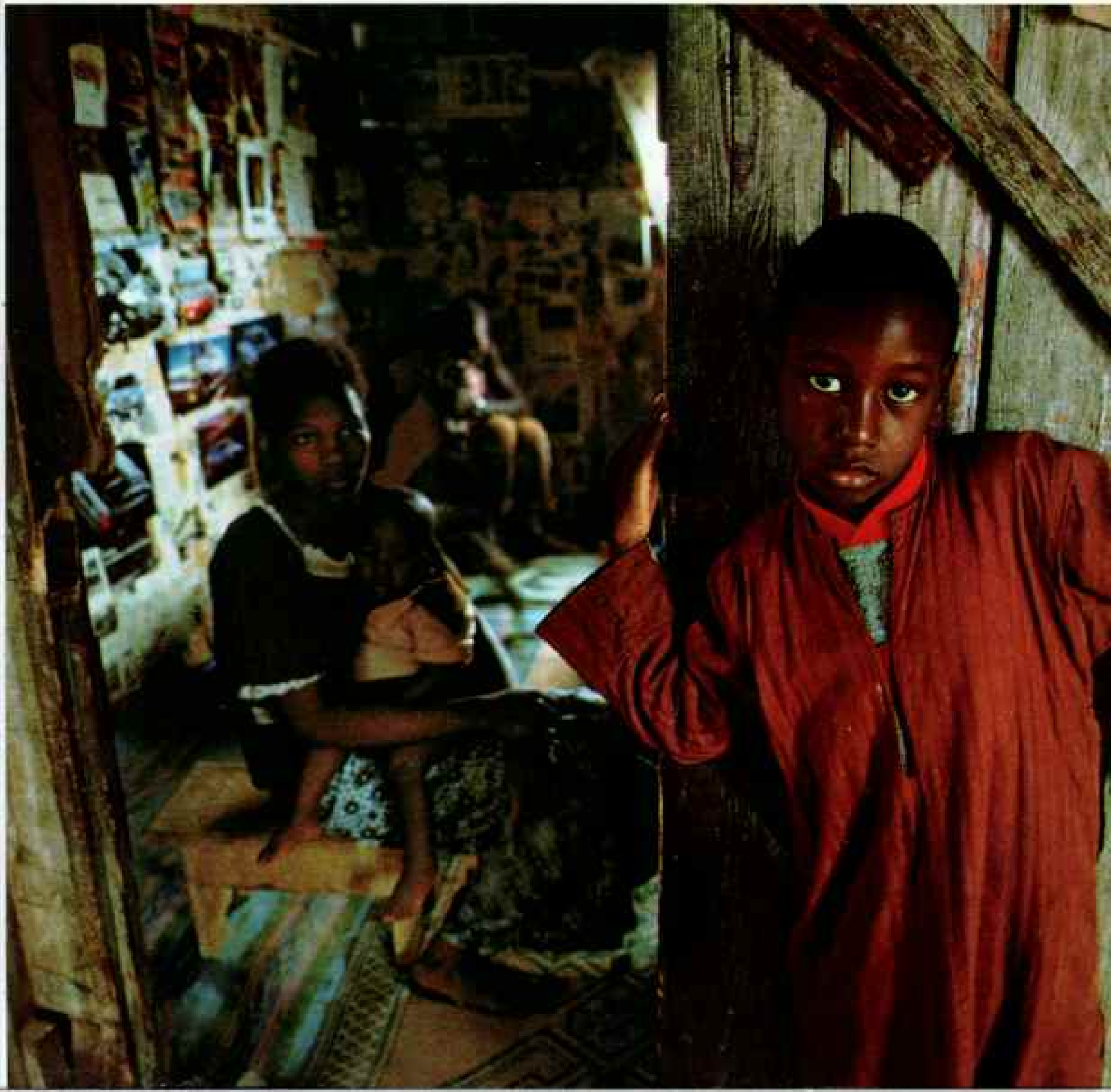
FOR MOST OF HIS LIFE he was a herdsman, a pastoralist who drove his cattle to distant places in search of grass and water. But when the rains failed and the desert sands swept in, he went home. With death by starvation snapping at his heels, Omar Mahmoud went home to stay.

In the Republic of Chad, in central Africa, near a settlement called Chèddra, there is a wadi—one of many dry watercourses in the region—and it is there, in the place where he was born, that Mahmoud now tends a small garden, growing tomatoes, onions, and okra. He finds little joy in scraping a hoe over the dirt left gray and powdery after 19 years of drought.

"I don't know much about this work," he said. "My life is being with my animals, but now they are all gone. Forty head of cattle, forty sheep. Sixty goats."

Throughout the African Sahel one of the most disruptive storms of social and environmental upheaval of all times is now occurring. At its worst there is famine when tens of thousands of persons die, but always there is erosion of the family structure and a severance of the bonds of tribal traditions. As for the land, much of that is dying and being put to rest in shrouds of sand.

As an Arabic word meaning "shore," Sahel is the name given to the southern rim of the Sahara, and it is land meant to carry seasonal grasses. In its 3,000-mile-long span from Senegal in the west to Chad and portions of Ethiopia, Kenya, and Sudan in



the east, the Sahel encompasses about 20 percent of the 11,700,000-square-mile African landmass. For the most part, it overlays the reach of French colonialism on the continent.

Omar Mahmoud stoops low when he works in his garden, for the crude, hand-fashioned tools he uses have short handles. He is there at sundown, half hidden in swirls of yellow dust, pulling at weeds and raising water for irrigation from a nearby well. When darkness falls, it is then that he misses most the life that he knew, and that his father knew, and his father's father.

Yes, the best times of all were the nights, when the air cooled, and there was goat's milk to drink, camel meat to feed on before a man made prideful with the ownership of cattle put himself down on the ground for good sleep.

The first long siege of the current drought lasted from 1968 to 1973. Estimates of drought-related deaths during that time range as high as 250,000. The toll in cattle is believed to have reached 3.5 million head. At the same time, desiccation was overtaking the Sahel's landscape, not in uniform waves, but in patchy, acne-like outbreaks, a process known as desertification. Rivers dried and lakes pulled back from their shores, and the specter of famine touched millions of lives in villages in Mali and Mauritania, and all the other Sahelian countries.

They were not yet 15 years into independence before their survival was being called into question. Today the slide toward final

Trying to lengthen the odds, *a Swiss midwife teaches a mother to care for her newborn at a maternity clinic in a Nouakchott slum* ***(above)****. Here malnourishment plagues one in three youngsters. The average life expectancy is 46. Each day new refugees arrive and add to already swollen statistics. A boy stands outside a shack* ***(left)*** *shared by his family of eight.*

destruction as viable nations continues in the Sahel. Severe drought and hunger flared anew in 1984 and 1985, and now the response of a usually caring world has become shaded with indifference. Call it compassion fatigue.

There are boundaries and flags and anthems, but the nations of the Sahel are one in their shared misery. In Mali a Dogon man, no longer able to provide for his family, takes his life by hanging; in Mauritania a Moor is prevented from planting crops at a time of good rain because he ate the seeds the previous year.

And in Senegal, other Mauritanians wait for the ferry that will take them across the river and back to their country. Some are returning with large stocks of rubber sandals to sell in the marketplaces of Nouakchott, Mauritania's capital. Others carry the rewards of scavenging in the streets of Dakar, Senegal's capital. In less than 30 minutes the ferry is on the other side, and the passengers set out to make their way north into the heart of this vast and strange country where howling, burning winds scour the land.

THE SENEGAL RIVER is wide at the ferry crossing, a natural choice for a border by the colonialists who in the past drew lines on a map and arbitrarily reduced scores of tribal territories to a handful of nations on the fringe of the largest desert on earth. In addition to Senegal and Mauritania, the hardest-hit countries include Mali, Burkina Faso (formerly Upper Volta), Niger, Chad, and Sudan. The Cape Verde Islands, off Senegal, and the Republic of the Gambia are sometimes included in the Sahelian grouping, together with Somalia, Ethiopia, Kenya, and Nigeria.

None of these Sahelian nations is more stricken than Mauritania. In a land where only 20 years ago one out of two children was born in the desert, nomadism is vanishing. Sand is taking over most of the country, burying villages and compressing more and more of the population into the seaside capital and surrounding shantytowns. Nouakchott today is more than just a city; with a population of 350,000 it has been called the largest refugee camp in the world.

In its expanse of some 400,000 square miles, Mauritania is almost as large as Spain and France combined, and yet there are fewer miles of paved road there than in the city of Minneapolis. The main route is called the Road of Hope, and it will take you to where birdsongs are never heard.

In early morning, before the bulldozers start to work, many sections of the 700-mile-long road are covered with sand. Where it is packed tight, the sand is so smooth that each

To tack the desert down, *a grid of branches is implanted in sand* ***(above)****. The project aims to anchor the dune field surrounding Nouakchott. A main route into the Sahel, the 700-mile-long Road of Hope, upper right corner, must be cleared daily. A road of despair is traveled by women and children who trudge from village to village in search of food* ***(right)****.*

grain seems to have been fitted by a master mason. Elsewhere, caught in small winds, the sand rises as devils that dance along the road in whirlish steps. Here and there where dunes rise high along the shoulders, the Road of Hope is squeezed to half its normal width and makes its way through the passages like a shadow-darkened col.

A HUNDRED MILES from Nouakchott there is a settlement beside the road. It is called Tignarg Oasis, but there are no palm trees, no pools of fresh water. And there are few, if any, adult males, for they have all left to seek work in the towns. Some have been gone a long time, having abandoned their wives and children.

At noontime the children of Tignarg Oasis are gathered in the small store, where bottles of warm soda sit in a refrigerator with a motor long silenced. A few packages of biscuits covered with dust are on the shelf, along with some soap and cartons of dried milk. Nothing more than that. A boy with curly hair and pale eyes is there, leaning against the counter. When asked his name, he smiles and says "Abdullah."

His father went off some time ago to the town of Boutilimit, ten miles down the road. "I go to school some days, but mostly I take the donkey to the well to bring back water," he said. I walked the mile or so with him the next time he went to the well to fill the two large cowhide bags that hung suspended

Hope takes root *in the arms of a young girl* ***(above)*** *holding trees to be planted as part of a CARE project in Niger's Majia Valley. Some 230 miles of windbreaks now shelter fields. Erosion has decreased and crop yields have risen as much as 20 percent. Such successes are rare. Tree planting proceeds 50 times slower than needed. At a former oasis in Mauritania camels snack on a lonely surviving shrub* ***(right)****.*

from the donkey's back. He carried a stick in his hand, which he used to tap rather than strike the animal when it slowed.

"When I was six, I started to tend the goats and chickens we had," he said, "and when I reached ten, my father let me move the cattle." With a grand gesture he lifted his arm, and a large, flowing fold of his blue robe fell over his shoulder. There was about him a dual aura—that of the Arab and of the African. He was one to say his prayers, I knew, and so would he observe the rituals that tradition had taught him.

The animals had trampled and overgrazed the ground in a wide circle around the 90-foot-deep well until no grass remained. Such have been the mixed blessings of wells and 1,000-foot-deep boreholes sunk in the Sahel. The attraction of the water to the herdsmen and their cattle is strong, but the damage to the land is devastating and, for the most part, irreversible.

Looking out in all directions from the well, there are not more than two or three trees in sight, and yet the boy tells me that he has heard it said that once the wildlife and greenery were plentiful here. With the water bags filled, we started on the walk back to the village, and as we came closer, I could see that a bulldozer was there, pushing the sand off the Road of Hope.

Bushes and trees have been planted as windbreaks at some points along the road in an attempt to stabilize the dunes, but it

seems little more than a token effort to arrest the advance. It would take vast sums to make such a project truly effective.

"One of the most important things we have to do is to change the attitudes of the people so that they come to understand that trees are essential to their survival," said Henrik Olesen, resident representative of the United Nations Development Programme in Mauritania.

In some of the cities of the Sahel there are boulevards lined with stately trees, and those are the legacy of the French, the ministers and colonels who created their own little Champs Élysées in the distant outposts of empire. But for the average native Sahelian, the interest in trees is related not so much to the aesthetics of landscape as it is to the need for firewood. Between 80 and 90 percent of all the energy consumed in the countries of the Sahel is derived from the burning of wood.

THE ESSENCE of firewood is all pervasive. In Niamey, the capital of Niger, camels cross the Kennedy Bridge (named after the late U. S. President) leading into the city one after the other in late evening and on into the night. Each of the animals carries two huge bundles of wood that ride like scows at sea on their bloated flanks. The sound of the hooves on pavement is a dirge for the death of forested areas in Niger, which have decreased 30 percent over the past 20 years.

Rehabilitation projects initiated in the Sahel by international agencies and donor nations have been, for the most part, ill-conceived and, in the long run, of little benefit. Among the more successful efforts have been those of reforestation, such as the one started by CARE in Niger's Majia Valley. Since 1974 some 230 miles of windbreaks, consisting of double rows of trees, have been planted over an area of nearly 5,000 acres.

"The breaks have been successful in stopping wind erosion of the soil during the dry season," said Dr. Steven Dennison of CARE in Niger. "During the rainy season when the winds shift, they have prevented the winds that come from the opposite direction from damaging crops."

Finally, with prudent harvesting of the trees, the breaks provide a new and valuable resource of firewood (the neem tree planted

Unwitting accomplices *of desertification, wells—such as the one operated by hand pump* ***(above)*** *in Mali—contribute to the demise of pasture when too many cattle collect around the water, trample soils, denude vegetation, and create the nucleus of a patch of desert. In areas where boreholes have been drilled, animal waste washes in and pollutes water. In Niger women dig pits by a riverbed* ***(below)*** *in the belief that the water that percolates up is partly filtered by sediment.*

there can be cut off at ground level and still come back for second growth).

Initially, full funding for the project was provided by CARE, and the agency continues to supply financial backing, seedlings, and technical assistance. But it is the people in 30 villages of the valley who do the planting and maintenance of the windbreaks. They have come to understand the importance of the trees to their survival, and that is the standard, above all others, by which the project is judged one of the most successful in all the Sahel.

To have trees growing within sight of the village is to be blessed in this 2.5 million square miles of wrathful sub-Saharan land. It is the women then who give thanks, for they are the ones with the responsibility of collecting the firewood, and if that means difficult walks of five, or even ten, miles each day, so be it. Women also do much of the farming, grind the millet, cook the food, and tend to the children. Indeed, the village women are the stage managers as well as the starring players in this fight-for-survival Sahelian drama.

Sometime, somewhere, it occurred to someone that the traditional "stove" used in African villages is responsible in no small part for the critical condition of the land in the Sahel. Consisting of nothing more than an open fire surrounded by three stones on which a pot sits, it consumes an abundance of wood in a short time. Eventually there appeared in some of the villages representatives of various agencies—the United States Peace Corps, the United Nations, CARE, and others—to demonstrate the benefits of using a stove with a high enclosure.

"The results have been astonishing," said Hilary Whittaker, director of the staff of 80 Peace Corps volunteers in Mali. "The stove we have developed consumes one stick of wood in the same time that the traditional stove burns five."

That has resulted in a new way of life for women like Coumba Diop, who lives in the village called Diobène Batar, in Senegal. "The new stove is good," she said. "It doesn't put out the smoke that used to fill our huts. Before, when I went to the deep country for wood, what I brought back lasted only one day. So I went out every morning, walking a long, long time out and back. Five hours I was gone every day. Now I just go once every four days."

Coumba Diop said it was time to go for the firewood. She strapped her youngest child, an 18-month-old boy, to her back and started out across the sand, walking with the grace of a fawn. I asked her husband how she would manage to carry the wood back. "On her head," he replied. "She'll bundle it and carry it on her head."

THE SIMPLE THINGS are the ones that work best in the Sahel—an improved stove, fencing, planting trees in a row as windbreaks. In the past the advice and actions of aid donors, as well as the policies of Sahelian governments, were heavy with contradiction, poor planning, and mismanagement. As in the days of colonialism, the people were driven to increase production of cash crops, such as cotton and peanuts. That resulted in utilization of land that, traditionally, had been allowed to lie fallow for years at a time in order to replenish the nutrients.

Outsiders brought in equipment requiring maintenance far beyond the skills of the native Sahelians. Pumps on wells broke down and were never repaired. Trucks and other vehicles sat abandoned for lack of repairs to fuel pumps and generators. Up until several years ago, there was only one elevator in all Mauritania, and the men who kept it running were in the front ranks of mechanical geniuses in the country.

Most damaging of all was the failure of well-meaning benefactors to understand where the fundamental strength and wisdom of sub-Saharan Africa lies. It is in the villages and rural areas, invested with the small farmer and the nomad and all the others who long ago fine-tuned their survival to the vagaries of the land. No use was made of

Tucking loaves *of French bread under-arm, a boy accompanies his mother and aunt in Tiguent, Mauritania. European food preferences supplant those based on millet and sorghum. The Sahel produces only 4 percent of the wheat it consumes, so grain for this bread is probably foreign food aid. Imports drive the local grain price lower, discouraging farmers and perpetuating dependency on aid.*

*"I will not plant again," a Fulani farmer in Niger told the photographer after a rainstorm flattened millet planted for the seventh time (**left**). Rats destroyed six previous crops. The man had lost his cattle to drought and was given a farm plot. In the desert a farm is where you stake one out. Near Tiguent, Mauritania, a woman waters her precious garden (**above**). A cloth fence discourages animals from trampling the vines.*

this knowledge in planning strategies to prevent the permanent collapse of the Sahel.

At the same time, the post-colonial governments, often led by former army leaders of little vision other than that focused on staying in power, played for the favor of the urban populations in such ways as placing strict controls on food prices.

"These governments recognize that if the people in the cities go hungry, they rise up in revolt," an official of the World Bank told me. "But if the farmers go hungry, they just die of starvation."

Of course, that is not to say that villagers and herdsmen are not without blame for what has happened to bring about the crisis. They have overgrazed the land, felled trees, and served as the major contributor to a smothering population growth of 2.7 percent annually (food-production increases, by comparison, reach only 1.5 percent).

"I think the people of the Sahel have contributed to the degradation of their ecosystems and their economies, and I also think they have to change their own policies," Kenneth King, director of the technical advisory division of the United Nations Development Programme, said. "But they can't do it alone. There has to be a combination of effort from outside and inside."

So far, since 1968, the amount of outside effort has exceeded ten billion dollars. That includes money to free the Sahel from the grip of famine in the early 1970s, and again in the mid-1980s, two of the most noble rescue efforts of all times.

AS FOR STOPPING desertification, however, the effort, by general admission, has been a spectacular failure. Indeed, in more than two months of traveling the Sahel I did not find a single major success story. Only reforestation in the Majia Valley comes close. Dr. Mostafa K. Tolba, head of the United Nations Environment Programme (UNEP) confirmed that there are none; rather, he described what has happened as "a harvest of dust."

"If the present rate of desertification continues, by the end of this century they may not be able to get firewood closer than 900 miles from some major cities, such as Khartoum in Sudan," Dr. Tolba told me. "It is a worldwide problem, and to stop it throughout the world would take 20 years of concerted effort at a cost of 4.5 billion dollars a year. The poor countries, such as those in the Sahel, would require an additional 2.4 billion dollars. A lot of money, yes, but what we are losing today as a result of desertification amounts to 26 billion dollars a year."

Dr. Tolba, an Egyptian who lives in Nairobi, Kenya, where the agency is based, said that what the Sahel does not need is another

"grand plan," such as the one drawn up in 1977 by representatives of 94 nations attending a UN conference on desertification. They agreed on a wide-sweeping attack against the problem, to be conducted for the most part on a level beyond involvement of the rural Sahelian people themselves. For example, it was recommended that each national government in the Sahel establish machinery to monitor and combat the spread of desertification in its own country. Ten years have passed, and this effort is still without any meaningful results.

ADOPTING a more modest, more workable approach, UNEP will now concentrate its work in 150 villages in the Sahel and other parts of Africa. "We will get these villages self-sufficient in food and energy within five years," Dr. Tolba said. "We will do it on a local level, involving the local people."

So too have other agencies taken this direction of bypassing bureaucracy and going directly to the people. At the same time, they are putting heavy pressure on the governments of Sahelian countries to institute reforms. The United States Agency for International Development, the World Bank, and others are threatening, in effect, to plug the flow of money if changes are not made. They want more liberal policies toward free enterprise in the countries, more favorable pricing policies for the farmers, reductions in the number of government employees, devaluation of the currencies, and other such reforms aimed at deflating the gassy bloat of the nations' economies.

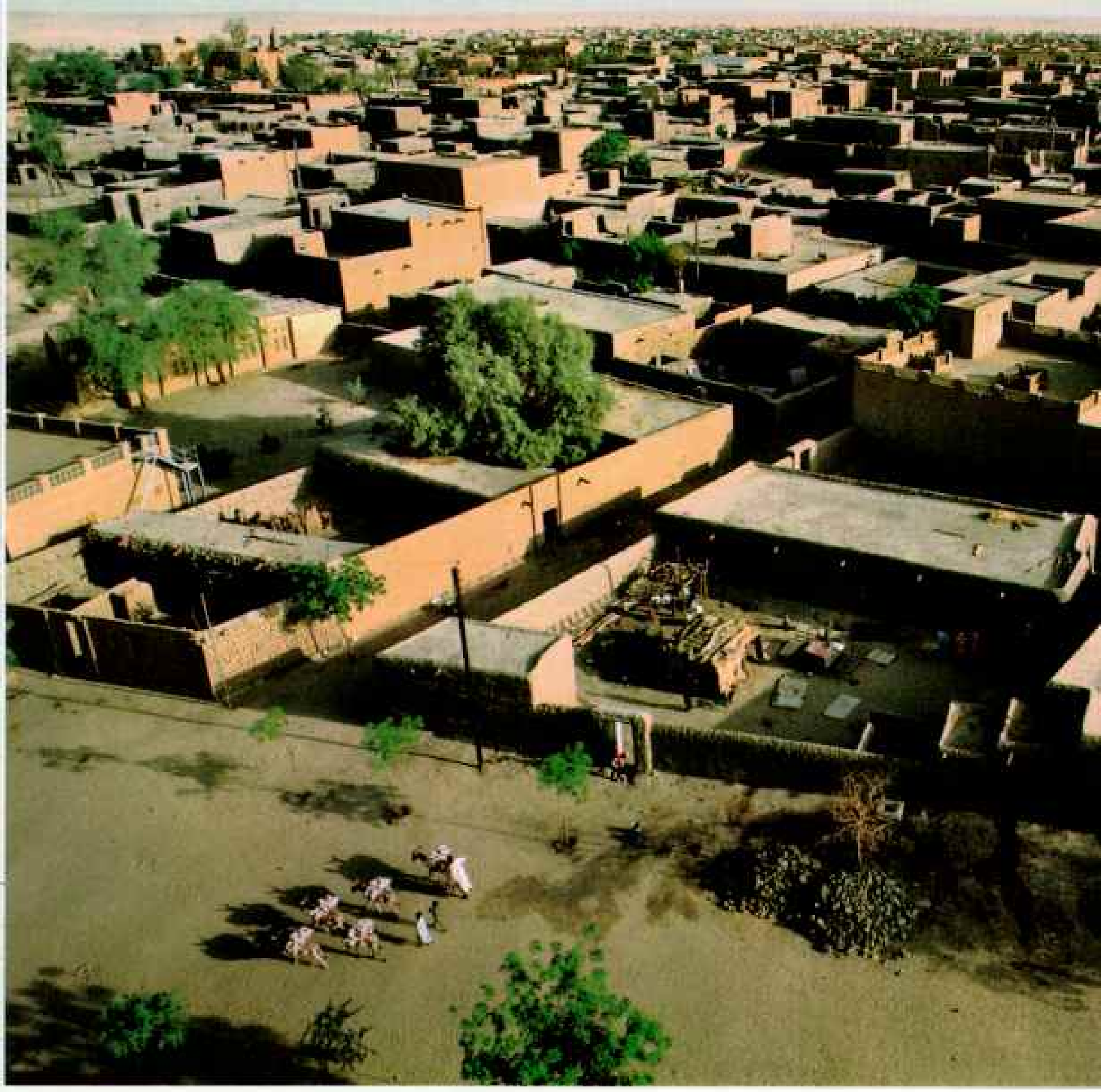
Khuwei, in the Sahelian region of western Sudan, is not among the 150 villages selected by the United Nations for its program. It is just as well because conditions there may be beyond reversal. Then too Khuwei is not an easy place to reach.

From the nearest large town, El Obeid, the 65-mile drive by four-wheel vehicle takes six hours. There is deep sand along most of the route, and it sucks at the tires until the vehicle lists, as if to topple over. "Not to worry," the driver said as he struggled mightily with the wheel to keep control. At times we drove through clumps of tough, thorny bushes, and the branches struck out at us like snapping whips.

At one point a dozen trees stand together along the route. They are tall and twisted and grotesque, bare of foliage and seemingly dead. The trunks are massive, anchored to the ground by a delta of roots. They are baobab trees, a symbol of Africa if ever there was one. They show best at sunset, silhouetted against the sky like some black calligraphy on a scroll of fiery light.

Dr. Fouad Ibrahim, geography professor

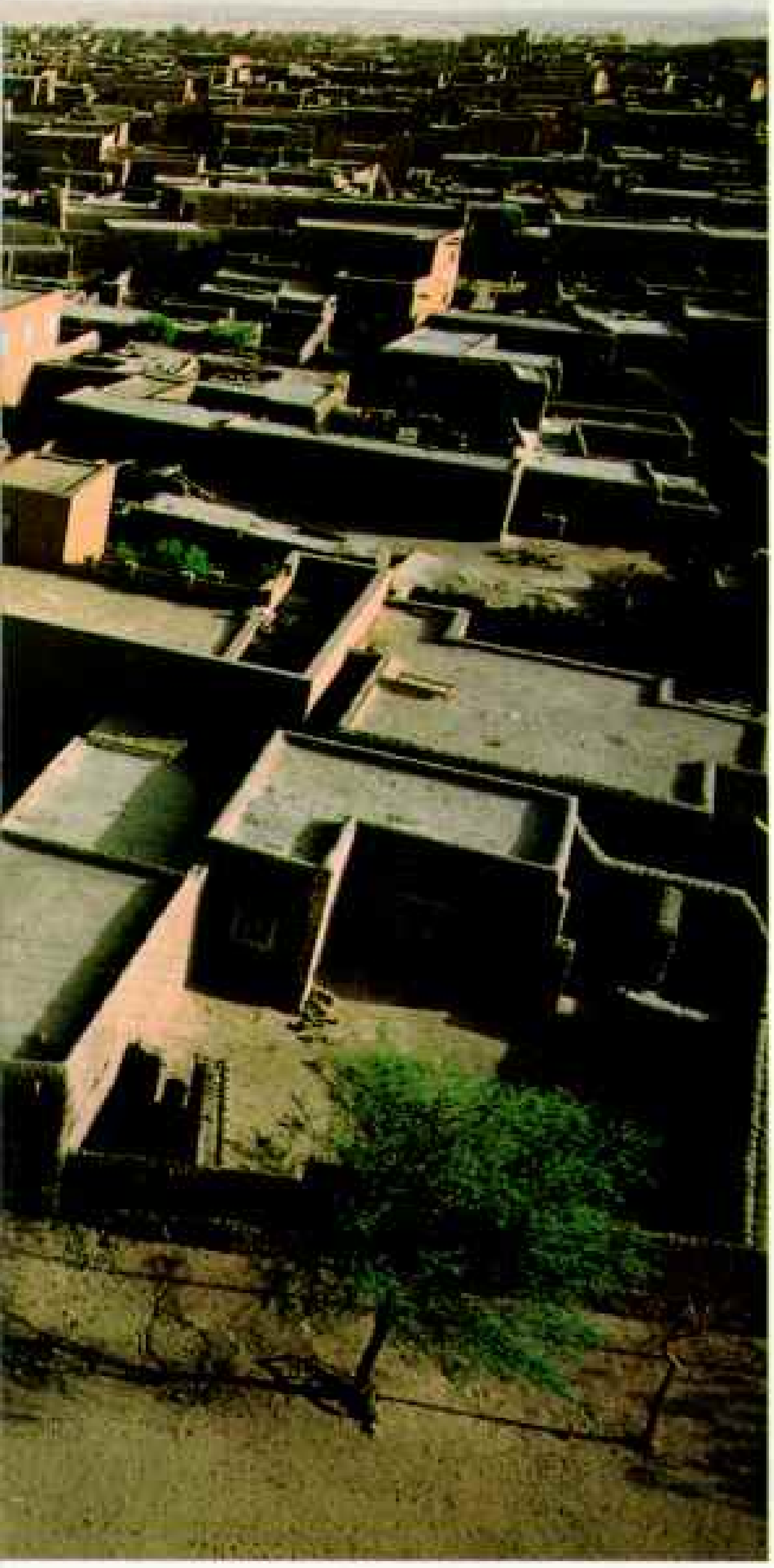
***The perversity of water**—too much, too little—torments the Sahel. Sudden, hard rains washed out this road in Niger (**top**). The short rainy season in summer is highly erratic in frequency and distribution. Drought has shriveled Lake Chad in recent years. These boats rest high and dry 32 miles from shore (**right**).*

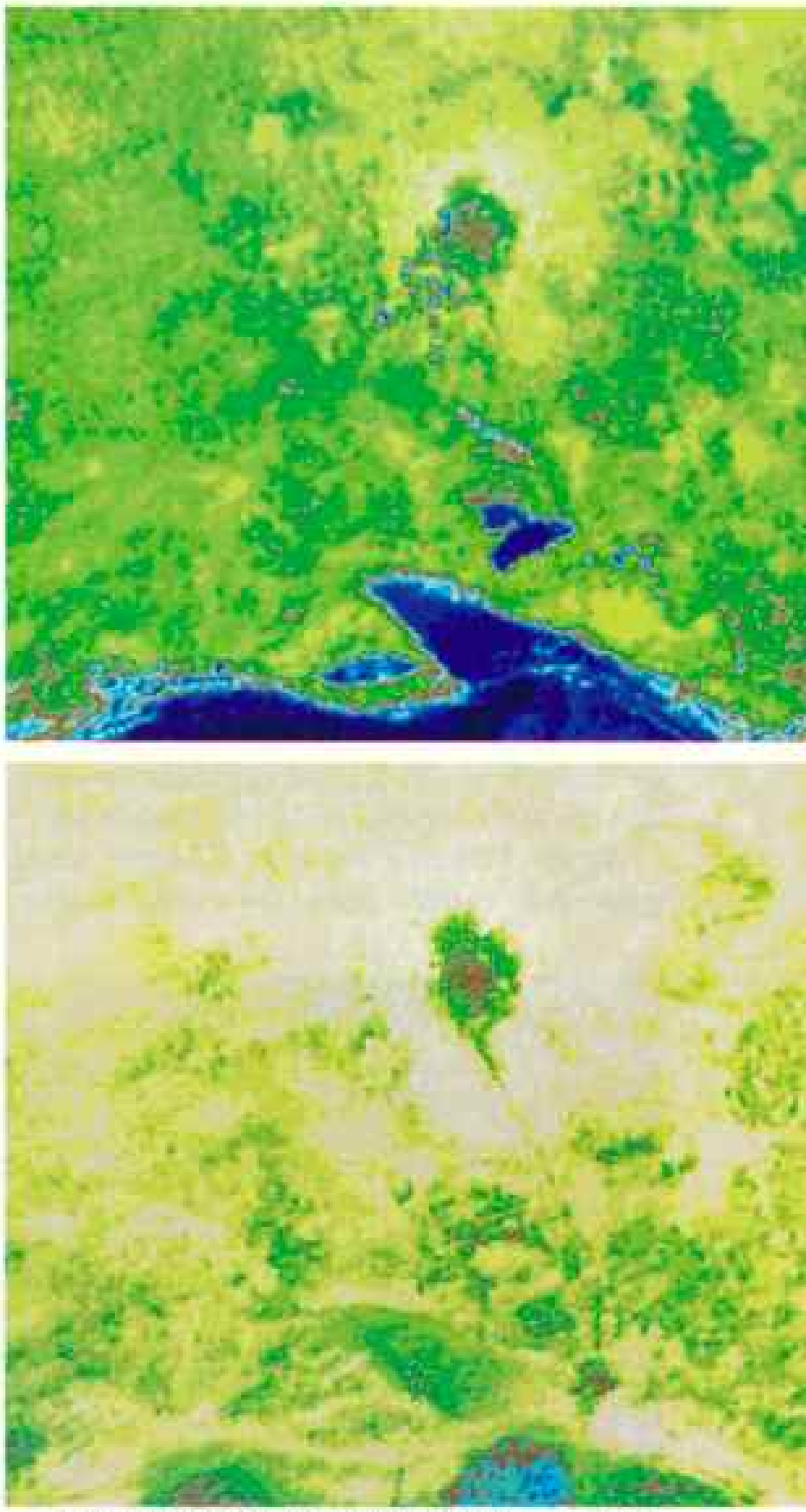


at the University of Bayreuth in West Germany and an expert on the ecology of Sudan, pointed to the holes high up in the trunks of some trees. "Those trees are used in a water-storage system going back hundreds of years," he said. "When rains are abundant, water is taken from the ground and put into the tree trunk through the hole. During the dry season the owner of the tree sells the water, taking it out by a bucket on a rope. If you read the 14th-century writings of Ibn Battuta, an Arab geographer, you will find a description of this storage system."

The dunes increased in size and number as we neared Khuwei. They had not simply rolled down across 125 intervening miles from the Sahara, Dr. Ibrahim explained, but because of drought and overuse of the land, winds had blown the sandy topsoil of the area into piles, or dunes. In the village itself the sand rose against some of the structures to roof level.

"Once there was a green belt around this place, but the sand began accumulating about five years ago, and it hasn't stopped," said Abd El Monem Hassan, a schoolteacher in Khuwei. Other villagers gathered around, and some said it was the drought, the awful drought, that allowed the sand to take over. "My son did not see rain for the





CENTER FOR EARTH AND PLANETARY STUDIES, SMITHSONIAN INSTITUTION

first six years of his life," a woman told me. Almost all the trees that once rimmed the village are gone now, consumed in the fires that cooked the food and gave warmth on the cold nights.

A man who said he was born in the village 80 years ago confirmed that Khuwei was once a pleasant place in which to live. "It was green, and there were lots of trees," he said. "I was a herdsman, but when my sheep died I became a cultivator. Now I'm hungry all the time." Saying his name was Atiyat-allah, meaning "gift of God," he walked to the shade of the one large tree remaining in the village. And there, in the process of

Losing ground: *A widening noose of desertification is seen around Timbuktu, Mali, in Landsat images. In February 1976 (**top**) the city is a brown patch at center. Blue marks the Niger River floodplain and waterways; unstable sand (yellow) surrounds the city. Nine years later (**above**) dunes blanket the region, and the floodplain and waterways have dried out.*

*Timbuktu (**left**)—weathered, worn, crowded with some 80,000 people—was once the golden city of interior Africa. "Here are . . . doctors, judges, priests and other learned men . . . bountifully maintained at the king's cost," a 16th-century traveler wrote.*

hunkering down, he lost his balance and rolled down a small hill.

Khuwei is one of the places that did not share in the good rains of 1985-86. Millet and sorghum crops were not enough to meet villagers' needs, so they had to buy grain. It is like that throughout the Sahel. There are no government-run systems for distribution from areas of abundance to those of shortage. What is needed, many experts say, are farmers' cooperatives, but the people of Khuwei do not know about such things.

So they sold many of their animals in order to get money for the grain. Some camels remain, along with the ubiquitous goats. To water the goats, the villagers give them watermelon. The people themselves do not like to eat watermelon, just as they do not like some of the vegetables they have been encouraged to grow. It is the eggplant they dislike the most. Some call it "the purple one."

On the morning I was in Khuwei, there passed on the outskirts of the village a camel caravan. The animals were in the distance, far enough away in the shimmering glaze of heat to appear to be skating on the sand. Later, while talking to the leader of the camel drivers, a young man gifted with the road smarts of a teamster, I learned that the animals were being taken to Khartoum, where they would be sold. "How much will you ask for the camel you're riding?" I asked. "Two thousand pounds [$800]," he replied. "But that's my opening price."

IT COULD WELL BE that the camel market in the Sahel is destined for a boom. More and more the surly animal that adapted to the desert long before the swallows found Capistrano is gaining new respect in the stricken regions of central and western Africa. In grazing, they tend to prune rather than get down to ground level and tear at roots. Unlike cattle, which bunch around a well, camels wander miles in search of food. More important, the dromedary, or

one-humped camel, is a valuable source of food when crops fail.

Nomadic tribesmen have long known that the dromedary's milk is highly nutritious. Moreover, its freshness staying power is longer than that of cow's milk. In a paper presented in 1985 to an international conference on arid lands, Dr. Reuven Yagil and Zippy Etzion of the health-sciences faculty at Ben-Gurion University of the Negev, in Israel, wrote that even when drinking water is brackish and scarce, camels continue to produce vitamin-filled milk. According to Dr. Yagil, camel farming is one of the ways by which villagers in the Sahel can become self-sufficient in times of drought.

It is in its traditional role of ship of the desert, however, that the camel is now sailing to new ports of possibilities. The time will come, for example, when solar-powered refrigerators (small ones) containing vaccines will be strapped to the backs of camels for transport to outlying villages. And that is far more important than a St. Bernard carrying brandy to someone stranded in Alpine snow.

More than camels are needed to solve the health problems in the Sahel. Diarrheal diseases take a heavy toll of life among infants and children. Malaria is widespread, and AIDS is increasing. The tsetse fly leaves its trail of sleeping sickness in more humid areas.* Long since overcome in developed nations, measles remains a major killer of youngsters in the Sahel.

The hardships wrought by the drought and desertification have served to intensify the health problems. The movement of people to urban areas has placed heavy demands on hospitals that, even in normal times, are understaffed and burdened with a crippling lack of supplies and equipment. As with almost everything else with a long history of use in the Sahel, natural medicines drawn from the pharmacopoeia of the earth worked well in the scheme of medical care in the villages, or at least they worked better than an injection with a dirty needle in a hospital ward where the floor is stained with dried blood. Under the French such practices were deemed primitive, but now new thought is being given to the possible wisdom of, say, treating a rash with the sap of a certain tree.

In the town of Fana, in Mali, there is a Dutch woman, a volunteer who works in primary health care. Her name is Emmeke Uyphozen, and she lives in a small house with a large and colorful flower garden in the front yard. "It is important to come home to something different, something of color," she said. "Out there, beyond the town, it's all the same."

During her three years of service in Mali she has encountered many frustrations. "It seems that the government here has little concern for health care," she told me. "They spend only 2 to 5 percent of the national income for health services. I'm working with

*See "Tsetse—Fly of the Deadly Sleep," by Georg Gerster, in the December 1986 GEOGRAPHIC.

Misery's child, *a boy endures a cluster of flies. One in three infants in the Sahel will not reach the age of five. Survivors often bear signs of malnutrition: slow growth and reflexes, missing teeth, dry skin.*

people employed by the Mali government, and some of them haven't been paid for seven months. As for the donor organizations, they come with their bags full of money and give it out without bothering to learn anything about the people's needs."

And the people, she added, do not know enough to appreciate the importance of health care. So they continue to believe that diarrhea is a normal condition. They continue to drink water from the wells where they take their cattle, even after it rains and the animals' waste matter has been washed into the water supply.

The zeal of a volunteer in the Sahel can erode quickly. The sense of urgency with which they arrive slows and stalls and is finally overtaken by the infinite patience and trust-in-God resignation of the villagers.

MALI'S DOGON PEOPLE are fighting hard to maintain their identity and culture. "It is characteristic of the Dogon that they want to keep their traditions," said Boua Diabate, *chef secteur élevage* (chief of matters involving livestock) in the town of Bandiagara, southwest of where the River Niger makes its great bend in eastern Mali. "But because of the drought, some have had to move away to the south, to a place near the border with the Ivory Coast. They are young, and when they come back, they bring motorcycles and bicycles and radios, things they buy just for themselves. In Dogon culture, things are acquired for use by the whole family."

Many do not return at all. Before the famine of 1984, the combined population of the 57 villages in the Dogon-dominated *arrondissement* was in excess of 150,000. It is believed that the number now stands at close to 100,000. There were even reports of suicide among members of the tribe in 1985 because of the inability of husbands and fathers to feed their families.

Dogon culture is closer to death now than at any time since these people sought refuge in the high, steep cliffs of the Bandiagara Escarpment in the 15th century. There is only a thin thread that binds them to their traditional worship of spirits and the life they divine in the presence of water and rocks. Their fierce independence is flagging; they are reaching out for help.

Grasshoppers threatened *Sahelian crops in 1986 when spring rains hatched a bumper crop of eggs. A 35-million-dollar spraying program averted disaster. The insect (**below**) can consume its weight in grain in a day. Irrigated rice grows near the Niger River (**right**), but the grain is still cheaper to import.*

Still, the Dogon continue to transport rich soil from riverbanks to the rocks on which they live. What they do, in effect, is mine dirt. They further enrich the soil before placing it in crevices in the rocks and sowing the seeds. "It is a very difficult way to farm, to go a long way to find good earth and then bring it back to plant," Diabate said. "It can be very successful, however."

Among other things, the Dogon have a proud tradition in art. The best known of their wood carvings are masks and figures with arms raised, no doubt in supplication for rain. The best of the Dogon artworks are now in museums and private collections, but in the town of Sanga there are men who will beckon a visitor to a darkened room, there to produce an old carving of top quality. Sold in New York City, the piece might

fetch enough money to feed the people of a village like Sincanmo for months, considering that the annual per capita income in Mali is less than $150.

Sincanmo is a small Dogon village where the chief, Anéi Wõlõguéme, spends most of the day sitting under a tree sewing a bag out of leather. He is an old man with such a chiefly presence that even the flies leave him alone. "It's been seven years since we've had enough rain here to cultivate millet," he said. "So we just grow onions now. We sell the onions and use the money to buy millet."

Most of the cattle owned by the people of Sincanmo died during the worst times of the drought, and almost all those that survived were drowned when a nearby gully flooded at a time of brief but violent rain. "Now we have only a few cattle here," the chief said, pushing a spike through the leather with the palm of a hand as tough as rawhide.

I asked him if many young people had left the village. "It is our tradition that if the family is a big one, they can send three or four of their young people away to earn money and help the family," he replied. "If it is a small family, they can send one. They always have a meeting of the family before the decision is made. Some go away for three years, others just during the dry season. Some of those who go away for three years stop sending money home after a time."

GRASSHOPPERS covered the ground where I sat talking with Wõlõguéme. In other parts of the Sahel, locusts were grouping to move about in swarms of cloudlike density. On top of all else, the Sahel was under attack by what was potentially the most severe locust-grasshopper infestation in half a century.

But this time the warnings had been issued early enough for effective action to be taken. Certainly there was no equivocating in the dire predictions of what could happen

if billions of hungry insects were allowed to munch their way across the Sahel. The U. S. Agency for International Development called it an "astonishing, sudden assault." To other agencies, newspapers, and magazines, it was a "plague of Biblical proportions," and "God's worst punishment."

In Dakar, Senegal, a group of Americans sat in the coffee shop of a hotel, eating breakfast and talking about the day's work before them. Within an hour they would be flying four old DC-7 aircraft over Senegal, spraying pesticide over the first segment of the nearly one million acres they would cover in a week. It wouldn't stop with that. It wouldn't even stop when one of the planes crashed, claiming the lives of three Americans. They would continue until another million acres in Senegal and other parts of the Sahel had been sprayed.

That was but one of the efforts that led to an announcement in October of last year that the locusts and grasshoppers had been stopped. Coordinated by the United Nations Food and Agriculture Organization, the campaign, with donations that totaled some 35 million dollars, was a triumph of technology and cooperation, with perhaps a stabbing awareness that the insects would take the Sahel down to a point from which it could never rise again.

Still, the danger has not passed. Eggs are sitting on the ground, waiting for this year's rains, waiting for the second chance in two years to bring to life the spectacle written of in the Book of Exodus, in the Old

Hauling firewood, *a vendor heads for market in Senegal. Nine of ten rural Sahelians use wood for fuel. The search is a consuming one; a woman may spend half her day scavenging twigs. As trees vanish, dung, used to fertilize crops, is burned, further impoverishing the soil. Due to overcutting, the region has lost more than half its forest since 1950.*

Testament: "For they covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees . . . and there remained not any green thing. . . ."

LOCUSTS OR NOT, the Sahel, experts agree, will never be green again. "There will be no green revolution here," said Dr. Charles Renard, an agronomist with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

If there is to be a savior for agriculture in the Sahel, I nominate ICRISAT. The institute is supported by donations from the governments and agencies of 17 countries, in addition to 12 international and private organizations, ranging from the European Economic Community to the Rockefeller Foundation. Among its mandates is one to "serve as a world center for improvement of grain yield and quality of sorghum, millet, chick-pea, pigeon pea, and groundnut, and to act as a world repository for the genetic resources of these crops."

Nothing covers the need for agriculture in the Sahel quite as well as that. The climate is too hot and dry for vegetables and most grains; millet and sorghum remain the mainstay of life. To increase the yields and improve the strains would be of immeasurable importance to the struggle of the Sahelians for, first, survival and then self-sufficiency.

ICRISAT's Sahelian Center is located in Sadoré, Niger. It is a short drive from the capital city of Niamey, taking the road on which the "Oh, Don't Worry" bus-company driver picks up passengers. Sadoré announces itself with its green experimental fields of millet and other crops.

"The Sahel has unique problems with agriculture," Dr. M.V.K. Sivakumar, principal agroclimatologist at the center, said. "For example, the average consumption of fertilizer used in Africa is 18 kilos [40 pounds] per hectare [2.5 acres]. But in Niger, where the land is over-cropped, it's only one kilo per hectare. Fifty percent of the fertilizer used in Africa is consumed by Egypt and South Africa. As a result, the soil here is poor, deficient in phosphorus, nitrogen, and humus. So we are working to make the most efficient use of what is here."

What Niger does have to put to use is a lot of phosphate rock, and that, Dr. Sivakumar said, can be processed for use as fertilizer. "Just by applying this phosphate, we have increased yields of millet from 400 kilos [882 pounds] per hectare to 1,200 [2,645]."

Millet grows to as much as eight or nine feet tall, with the grain-yielding stalk resembling a cattail. To ensure the sprouting of at least three plants, a farmer will open a pocket in the wet ground and throw in as many as 350 seeds. The growing season coincides with the rainy season, usually between 90 and 100 days. In all that time, the rain may not total ten inches. Millet does not require much water—nothing in the Sahel requires *much* water—but the margin is too thin for a miracle. It needs what it needs.

The preparation of millet is confined to crushing, boiling, mixing with some kind of sauce, and eating as a paste or patty. It lacks the tang of pâté, but, then, to the Sahelian, goose liver ranks fairly close to eggplant.

Also working to improve agricultural production in the Sahel is the regional weather and hydrology center, where weather data from locations throughout the Sahel are collected and analyzed. It is on the basis of the findings that farmers are advised when to plant and harvest their crops. It is a computerized operation, established in Niamey by the Permanent Inter-State Committee for Drought Control in the Sahel. Recognized as a project of high potential, it will become more effective as agricultural officials in the field acquire radio transmitters with which to disperse the information to the farmers who put it to use.

The question of possible changes in the climate as a result of desertification in the Sahel is one that is often discussed by scientists. As of now, there is nothing to substantiate speculations that the drought may be largely man-made. It is true that land stripped of its vegetation may cause an upset of the balance between the solar energy absorbed on the surface and that reflected back to the skies, thereby altering the rainfall pattern. But evidence points to droughts occurring in cycles. Certainly, the rains have failed for long periods of time before in the Sahel.

There are some scientists who strongly believe that lack of rain is the sole cause of the muscle-flexing of deserts. Humans can

ruin an environment only in limited fringe areas where natural balances are fragile, they say. In supporting this view, Dr. Farouk El-Baz, a geologist at Boston University, has written that 20,000 years ago the borders of the Sahara were 300 miles farther south than they are now. In other words, deserts are going to expand and recede according to long-range climate patterns, and there is little anyone can do about it.

That may or may not be, but if it is, the Sahara would do well by the Sahel if it shifted into reverse pretty soon. Otherwise, the warriors in Chad are going to hurt themselves.

"More precious than gold," *a Senegalese herdsman said of wood. A young boy in Niger heads home with his gleaning. Without remedial action, Niger's forests may vanish in 25 years. Most Sahelian countries forbid the cutting of live trees, but the law is often ignored.*

THERE WERE 15 of them, and they were walking in late evening along a road, each carrying a spear. But the dust was heavy in the air—gritty, stinging dust—and, nearly blinded, they were bumping into one another.

I asked the Chadian with whom I was traveling why the men were armed.

"Tomorrow is market day," he said, "and they are walking to market. They may walk all night to get there, if they don't kill themselves bumping into one another with those spears. They carry them because it is a tradition that wars break out on market day. They want to be ready."

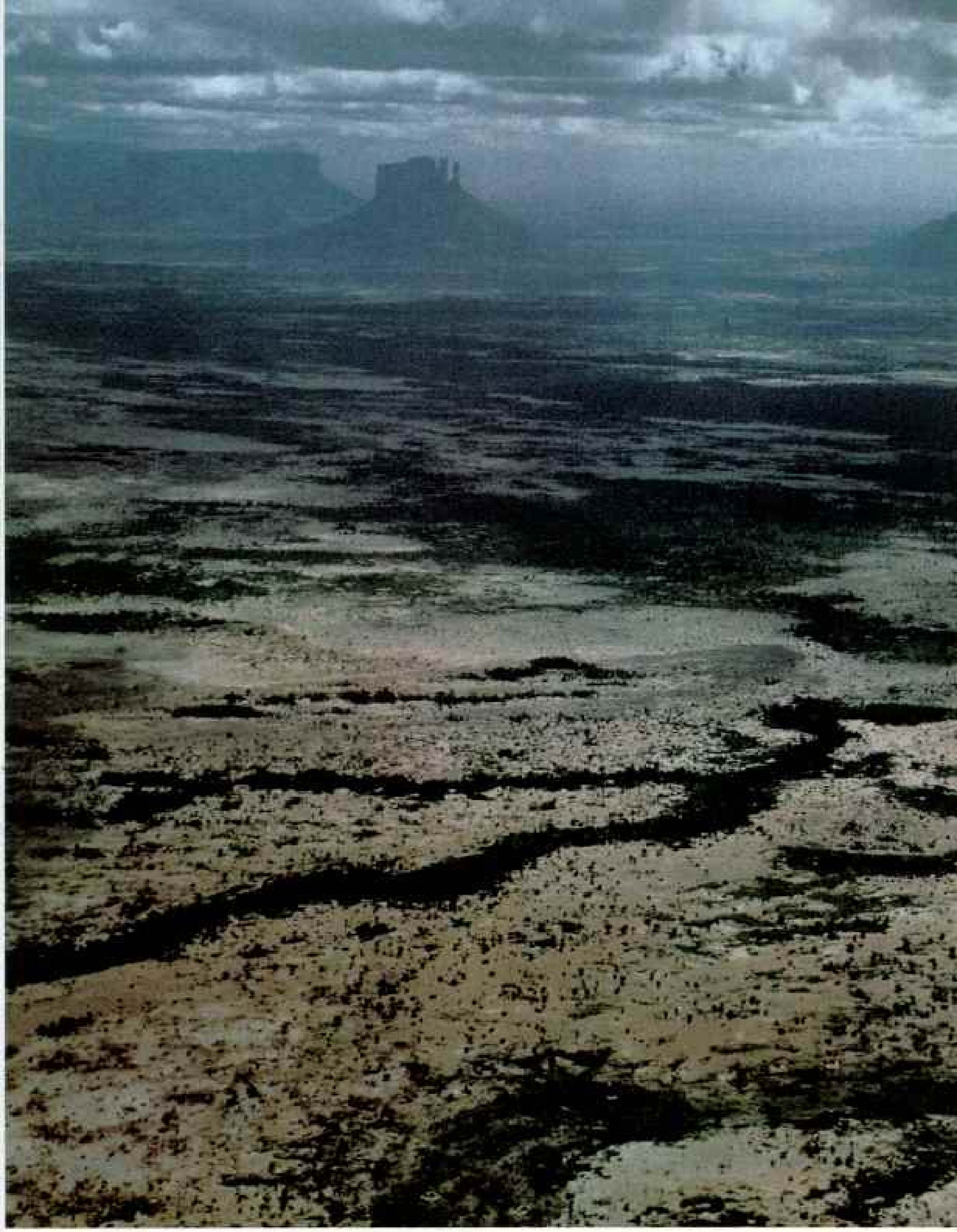
Chad is one of the poorest nations in the world. Once it profited by exporting cotton, but that market collapsed. Now its chief revenue is customs fees on imports. It is a republic without a solid economic base, other than outright gifts such as the seven million dollars advanced by the United States in 1986 for "budgetary support."

In addition to all else, Chad has been torn by invasion by Libya and two decades of civil war. N'Djamena, the capital, is heavily scarred by gunfire. "If you think it looks bad now, you should have seen it before they made some repairs," said Allan Turnbull, who heads CARE's programs in Chad.

Turnbull has been with CARE for more than 30 years. He talks now of retirement, of a house in a green place in England. He has been forced to dismiss several dozen people on his staff because, with the famine at an end and with newspapers and magazines no longer running pictures of babies with distended bellies, the emergency contributions to his agency have plunged. He has been through it many times before, this remission of a crisis mistaken for recovery.

There is no post of greater hardship in all the world—for CARE, the League of Red Cross and Red Crescent Societies (also forced in 1986 to slash outlays in the Sahel), and all the heavy-duty agencies of Western donor governments—than in Chad. And yet it is a place that worms its way into the soul, torturing with its void of livability while tantalizing with the mystery of its existence.

Make no mistake: Chad is a huge country, hugging both sides of the 16th parallel, in a land spread the size of Kansas, Texas, and Virginia combined. There are at least 200



Land of little compromise, *the Sahel in Mali stretches over skeletal ridges and spiny bush. Gullies are the last to relinquish their green. Throughout the Sahel, wind and water have swept topsoil away. Regeneration might take 20,000 years. Remaining subsoils shrug off water, and even if rainfall increased, the land is*

unable to absorb moisture. Each year the slippage accelerates. For each acre brought under cultivation, another deteriorates for lack of upkeep. Population rises 2.7 percent a year, but grain production only 1.5 percent. "The challenge in Africa today isn't even really to develop," says one African relief worker, "it's to hold on to what we have."

ethnic groups living there, and their members are poor, each with an average yearly income of $90.

No wonder, then, that when we take a case of empty soda bottles back to a food shop in the village, a father is there with his five-year-old son, waiting for us to leave before he lets the boy drain whatever cola remains in the bottles.

I had gone into the interior of the country with Patrick Sayer, an Englishman under contract to CARE to teach Chadian villagers how to grow vegetables in the fairly rich soil of the wadis. "In 1984 hungry people were walking toward the capital from all parts of Chad," Sayer said. "The government became concerned and set up feeding centers along the route. This place, where we are, Chĕddra, was one of those centers."

Long ago the waters of Lake Chad covered this place, but, like all major bodies of water in the Sahel, it receded. It left depressions with shallow pools of water and some three inches of topsoil. Vegetables would grow well there, Sayer knew, and he set out to enlist the people in the project.

Each family has been given a plot of land. They grow tomatoes and onions, cucumbers, sweet potatoes, and, on an experimental basis, some turnips. I asked Sayer if the project has been successful, and with the mix of resignation and surviving hope that is the hallmark of many outside workers in the Sahel, he replied, "In my heart of hearts, I'm reluctant to give up on this. Going from an emergency feeding program, like the one we

once operated here, to a development program is a very large step."

The people tend the gardens, all right, but watching them, I could sense that their thoughts and interests were elsewhere. It was as if the whole of this 500,000-square-mile country was their house, and now they were confined to a closet. Growing onions!

"Having been plunked down and fed for a while, and then having someone like myself come along and say, 'Look, fellows, we've got to start doing something else here'—well, they can't understand that," Sayer told me. "But having said that, I find it encouraging that we no longer have to have monthly distribution of food."

Then, too, they were stopped and settled before they could reach the capital on their walk of hunger in 1984. Many others made it, and now N'Djamena is a seething stewpot of a city. There are also French soldiers in support of the government in its fight against the rebels in the north. In the evenings they gather in the bar of the hotel La Tchadienne, by the swimming pool that is now filled with something (not water) both brown and sinister. The fathers of some of these young Frenchmen no doubt sat in this same bar, at the time when Chad was a territory of French Equatorial Africa and N'Djamena was called Fort-Lamy.

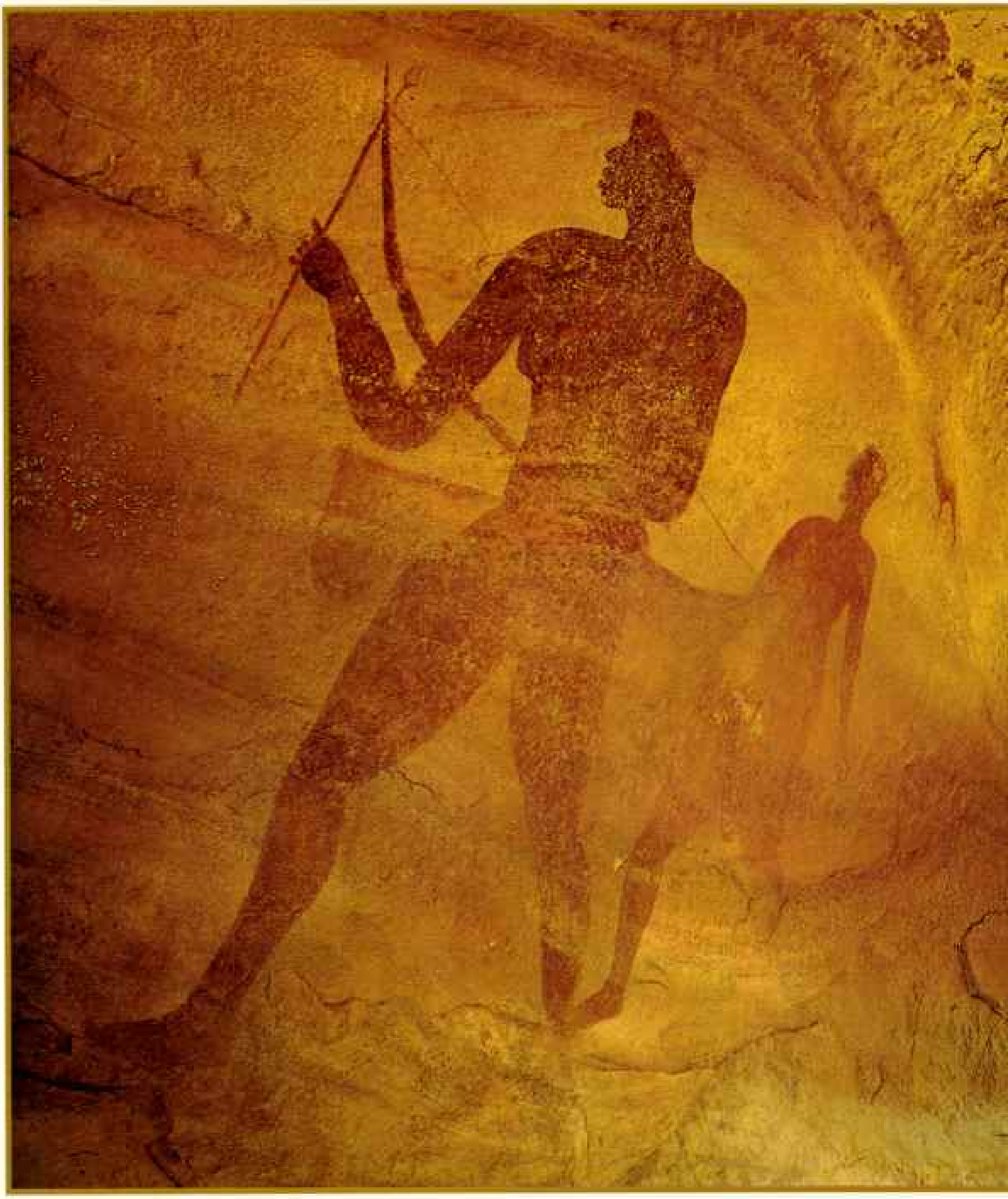
FOR ALL THEIR PROBLEMS, the Chadian people are sweet of nature. One in five infants in that country does not reach the age of one, but those who do, live their average 40 years as if in joyful thanks for being spared. Once, stopping for the night far out in the country, Patrick Sayer and I were brought food by some of the people in a nearby village, people who only three years ago were rooting in anthills for pieces of grain.

I saved Chad for the last of my travels in the Sahel. I arrived with the despair of Mauritania and the fragile hope of Niger fresh in my mind. Research had told me what I would likely find in the country, and it wasn't far wrong.

What I didn't expect, however, was the touch of blessing on this otherwise cursed land. I came across it in the early afternoon in the savanna north of Chēddra. The rains had been good and the grass was high, but dying then. Soon it would again be all sand there, and the good smell of the grass and the leaves on the low-lying brush would be lost.

It was in the crevice of some rocks. There, unseen from the road but for the brilliant colors, sat a pond full of wild water lilies. Patrick Sayer said there are a lot of water lilies in Chad. □

Lives of quiet desolation *are led by the desert's disenfranchised. The family of this Tuareg woman once roamed the Sahel with hundreds of cattle. Drought ended their nomadic life, condemning them to a stingy plot of soil. The nightmare continues. The solution, if one exists, recedes with the unraveling of each thread of a tortured land.*

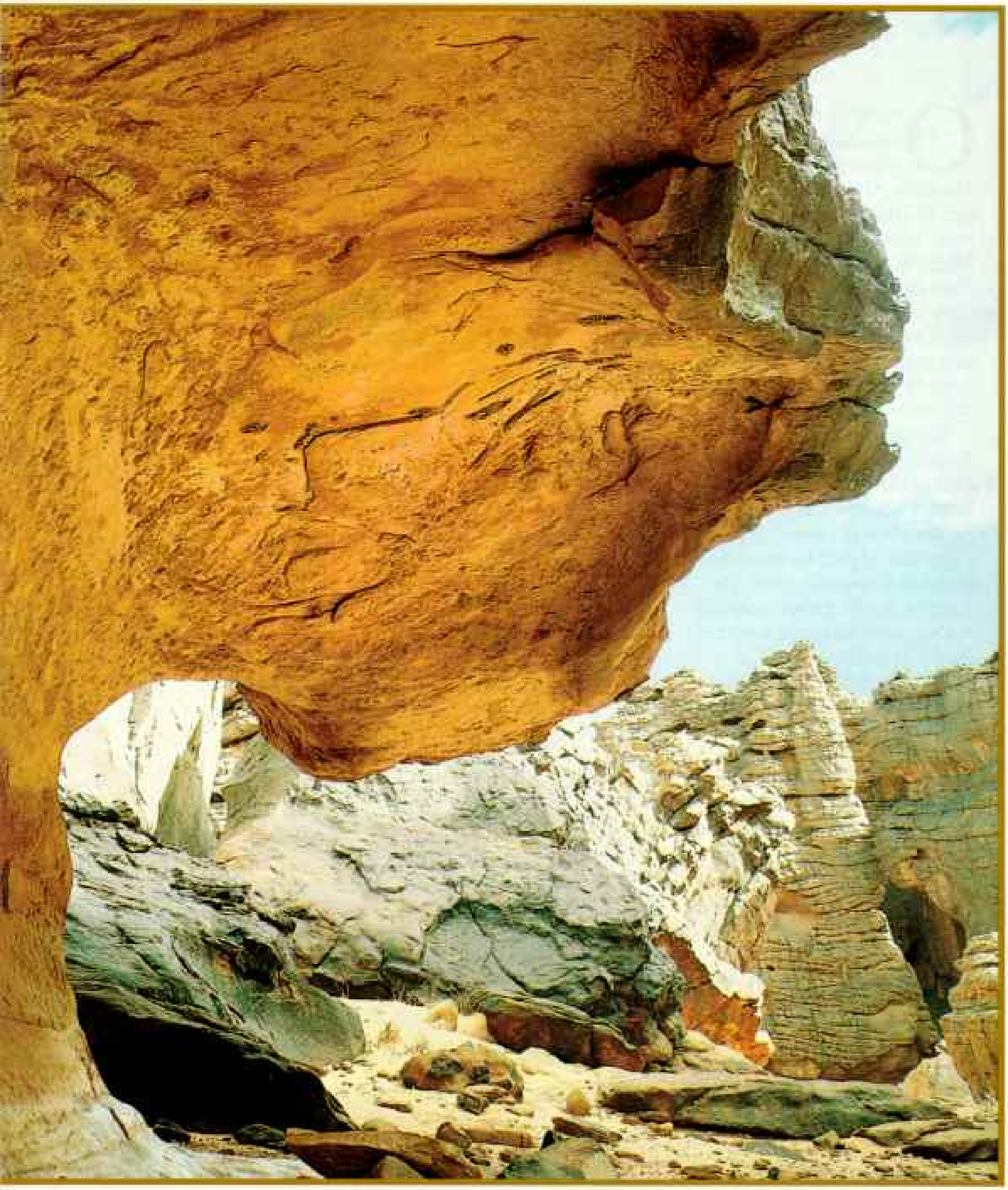


Oasis of

By HENRI LHOTE

Photographs by KAZUYOSHI NOMACHI

PACIFIC PRESS SERVICE



Art in the Sahara

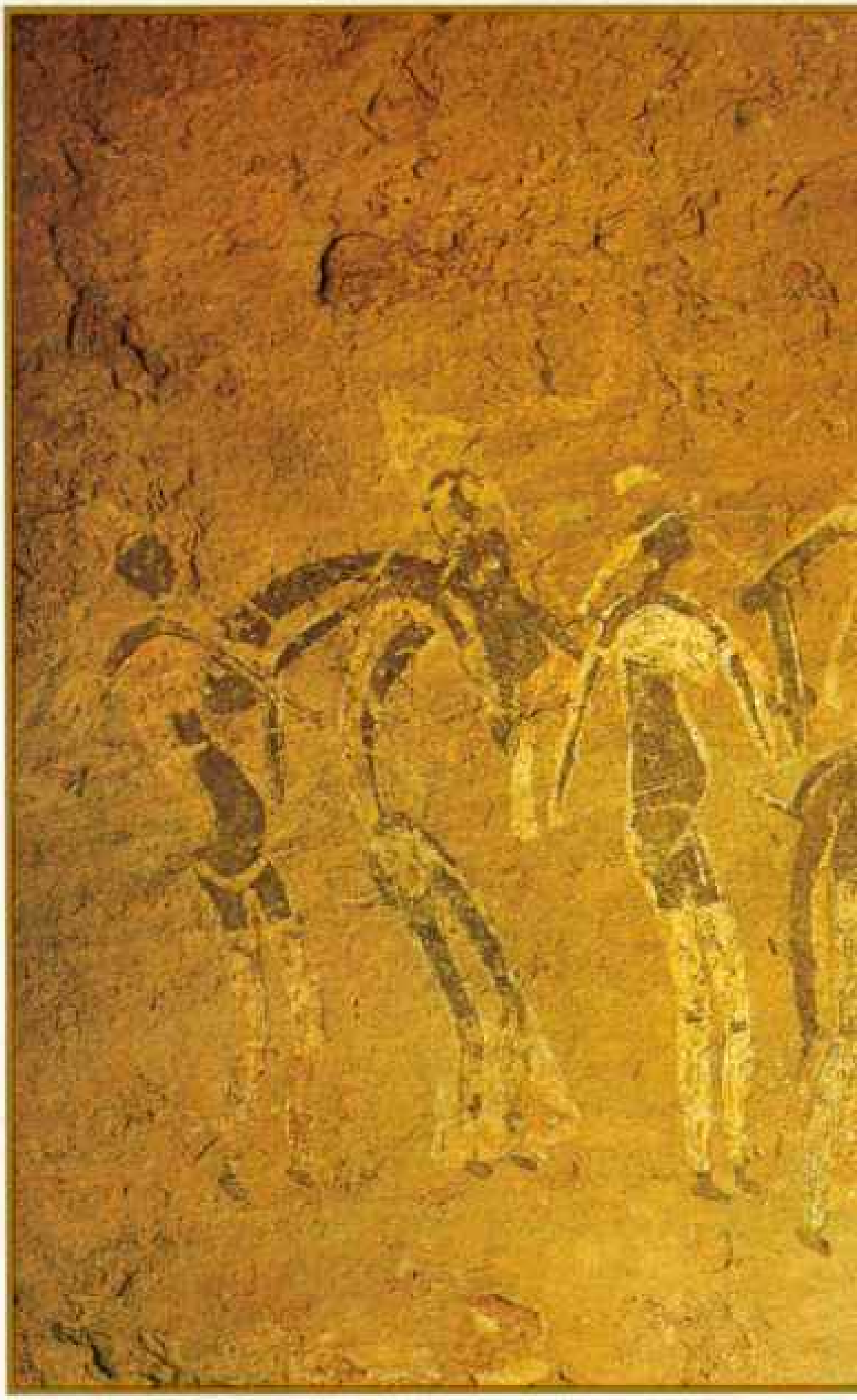
When the Sahara was green, millennia ago, man hunted buffalo and drove cattle over grasslands where giraffes browsed and hippos wallowed in lakes. Among a multitude of rock artworks of that era, an archer stands poised in sandstone at Tassili-n-Ajjer.

ONE COULD hardly imagine a more desolate place than Tassili-n-Ajjer, a devil's garden of grotesquely shaped rock, heat, wind, and sand. Night brings biting cold to an eerie moonscape. Yet this remote massif in Algeria is enlivened by some 4,000 paintings and many more engravings. I consider it the world's greatest collection of prehistoric art.

The very name Tassili-n-Ajjer, "plateau of the rivers," evokes the time when the Sahara blossomed with life. As the Ice Age waned 12,000 years ago, a shift in weather patterns brought a moist climate to North Africa, making it a far more hospitable place than it is today.

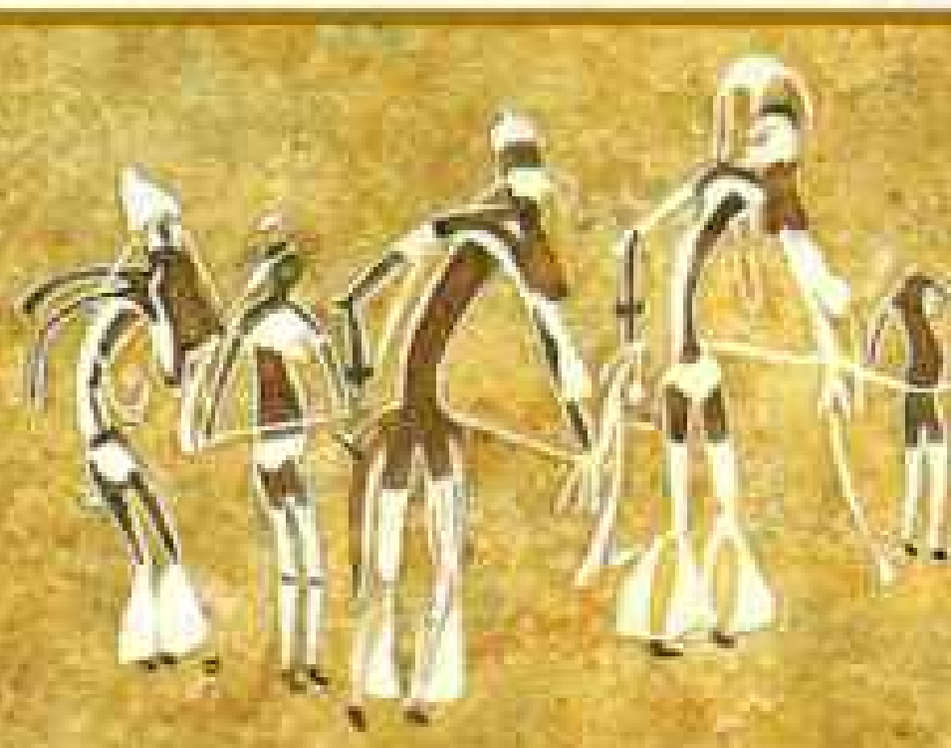
Here an artist, or artists, created what I call the elephant dance (***right***). The figures, connected by a rope or cord, move in a mysterious ceremony. The men wear flared leggings that remind me of grass costumes still worn by tribes in the Ivory Coast. I use the term Round Head for the style of this painting, produced during the decline of an age when man hunted giant, now extinct, buffalo. The features of the archer (preceding pages), painted during the later Pastoral period, suggest to me the presence of black peoples. The figures in this chronology (***right***) are based on copies made by artists who labored with me to preserve Tassili's priceless works.

A specialist in Saharan prehistory, ethno-archaeologist ***Henri Lhote*** is director emeritus of the French National Scientific Research Center in Paris. Tokyo-based photographer ***Kazuyoshi Nomachi*** has published two books on the Sahara.



Tassili time line

Four major styles—often overlapping—dominate the numerous artistic traditions of successive cultures.



ROUND HEAD, BEGINS BEFORE 6000 B.C.

Featureless faces and rounded heads characterize a period of stylized painting that may have lasted some 2,000 years. Figures vary in size, some reaching more than 15 feet in height.

PASTORAL, BEGINS CA 5000 B.C.

Herders of unknown origin developed a naturalistic style depicting scenes from everyday life. Compared with the Round Head, these works show greater concern for detail and composition.

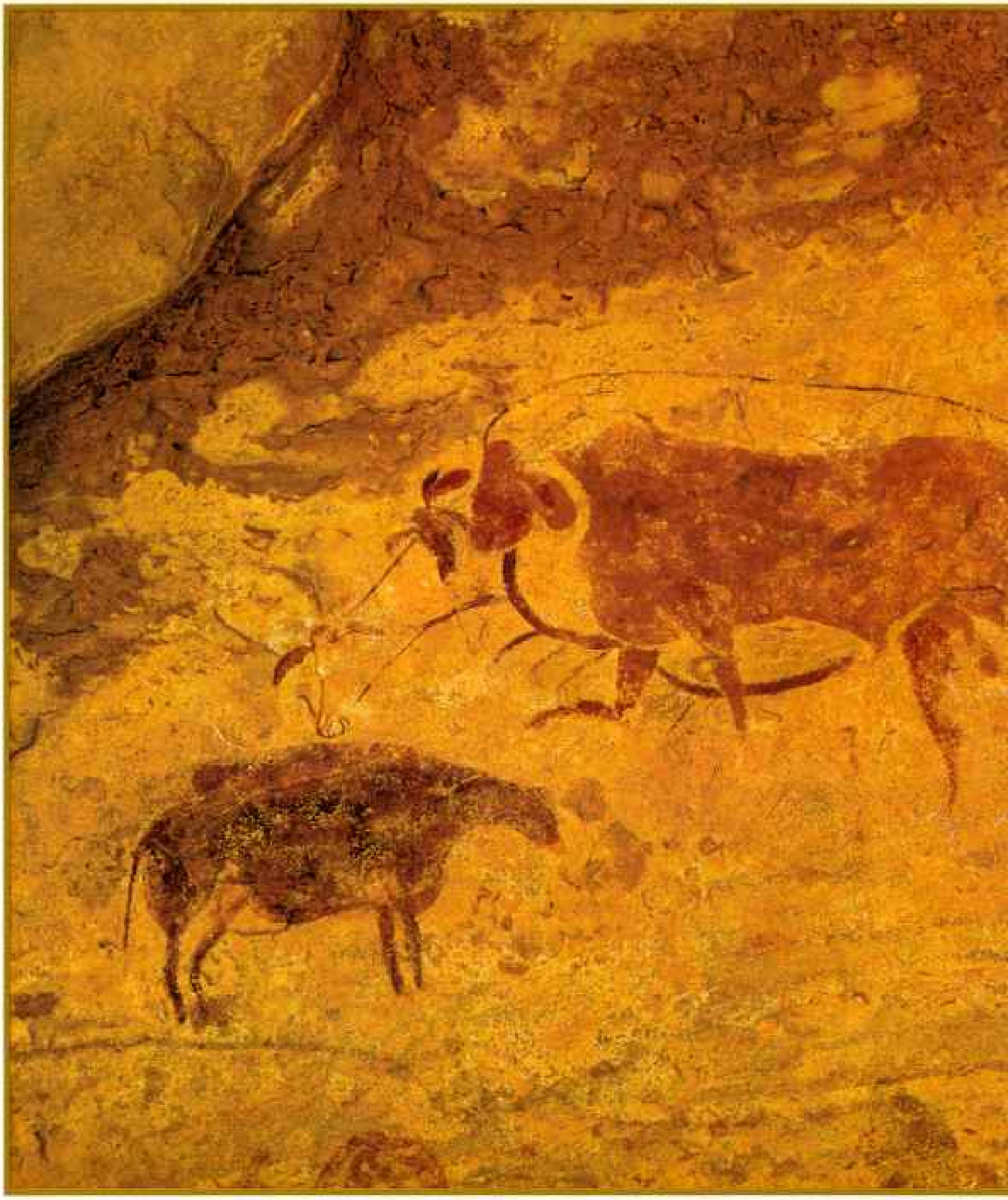
HORSE, BEGINS CA 1200 B.C.

Horse-drawn chariots reflect contact with cultures from the eastern Mediterranean.

CAMEL, BEGINS CA 100 B.C.

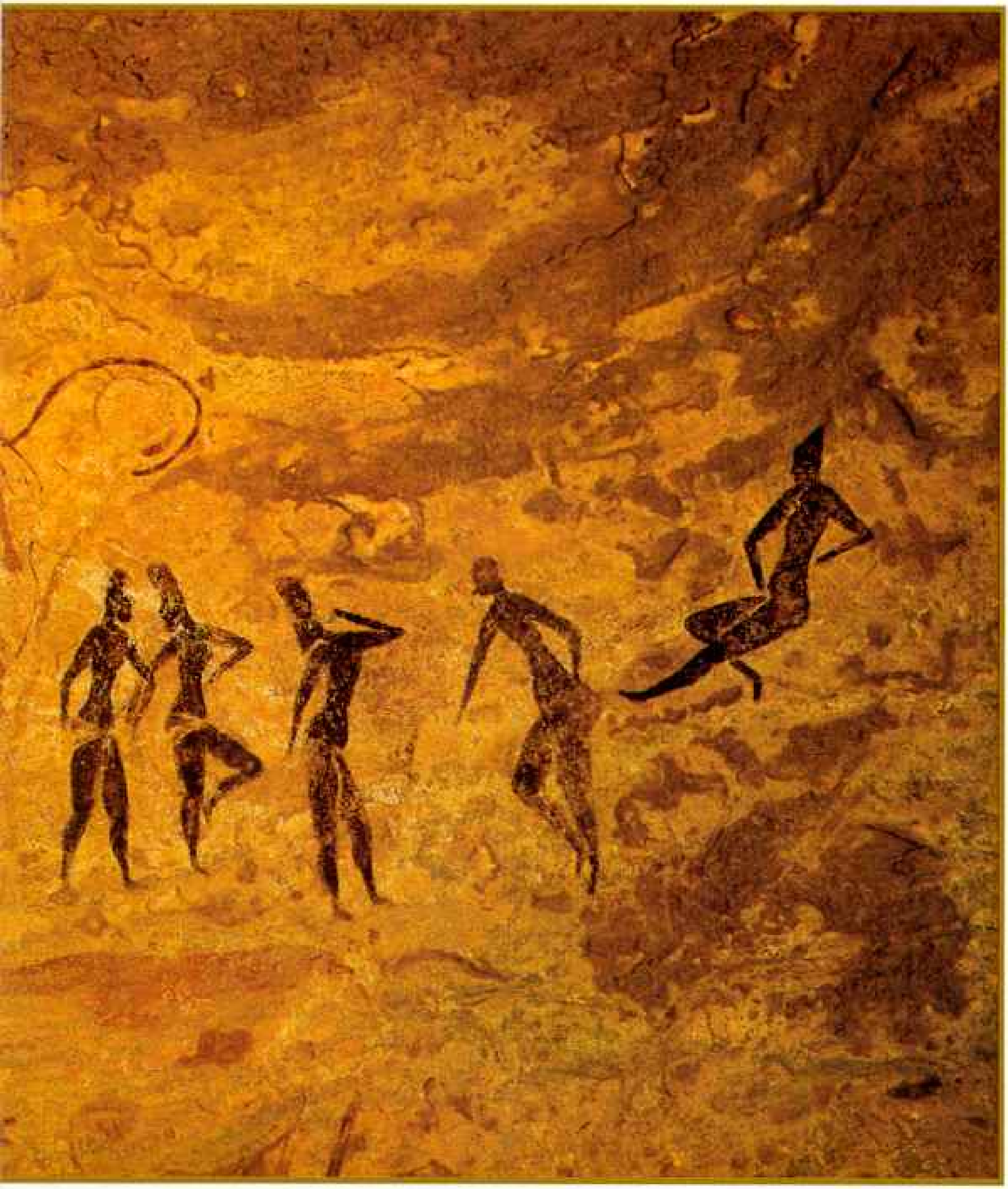
As the Sahara became more arid, the camel—more suited to the climate—replaced the horse.

ART BY MAUREEN TIERNEY AFTER HENRI LHOTE



ANIMAL MAGIC invokes help from the spirit world in this Pastoral period work that resembles a ceremony still performed by members of the Fulani tribe of the Sahel, the southern fringe of the Sahara.

As interpreted to me by the son of a tribal chief, the spirit of the earth assumes the shape of the snake goddess, Tyanaba, protector of cattle. Curved lines represent the serpent as she encircles a sacred bull. A man, second from right, joins four women whose hairstyles resemble those of the Fulani of today. At far right, the "mistress of milk" reclines to chant to the earth. She implores that the goddess lift the bull's bewitchment—perhaps an illness—and ensure propagation of the herd. The woman third from left listens for the earth's response.



Tassili's mysterious paintings have intrigued me since I first saw them in 1934. I knew they should be shared with the world, but two decades passed before I could mount an expedition to study them.

Traveling from the oasis village of Djanet with a 30-camel caravan, I led a team of artists on an arduous two-week trek to Tassili. As we washed the dust-covered rocks—a practice now forbidden—we were stunned by the vivid colors. The Tassili painters favored shades of yellow, red, and brown, made by mixing ocher with a liquid, and applied with feathers or animal-hair brushes. To make our reproductions, we fought the wind to tape transparent paper over the paintings for tracing. From these, team members made watercolor copies of 800 major works.

A COLOSSAL BEAST looms over a Tuareg guide (***below***). Though the creature's head is indistinct, the shape of the legs and hindquarters convinces me that this is a hippopotamus rather than an elephant.

Such large figures on curved walls presented an enormous challenge to the expedition artists, who strained in cramped positions on ladders and for much of the year endured stifling heat to make their tracings.

Yet by December we drew our water from ice-encrusted ponds. Fighting head colds and numbed fingers, the artists pressed on.

I have been pleased to see increased interest in the artworks, not only among scholars but also among the Tuareg. Their curiosity has grown with the knowledge that these creatures lived here before leaving the desert thousands of years ago.

Figures clearly representing an adult and baby hippo at another site (***right***) were painted during the Pastoral period and may date from 5000 B.C.

Proof that these animals inhabited the area was found south of Tassili. Our expedition discovered hippo bones in the dry riverbed of the Tafassasset, which once flowed south across the Sahel in Niger to Lake Chad, then five times its present size.

One of our most important discoveries occurred by chance during a search for water. With our supply nearly exhausted from cleaning the walls, we once went 40 days without bathing or shaving. I dispatched a guide who returned to report water standing in rock pools.

After filling several goatskin bags, I stood up to discover this figure wearing a mask (***below right***) in a deep recess

that may have been a sanctuary. Dating from the Round Head period, the figure covers the white image of a woman whose legs are still seen. Measuring about five feet high, the masked figure sprouts plants from its arms and thighs.

Created about 7,000 years ago, this Tassili painting is perhaps the oldest record of the cult of the mask, still practiced in the ceremonies of sub-Saharan tribes. Only 12 years ago I bought a recently made mask in Ouagadougou, Upper Volta (now Burkina Faso), that bears a marked resemblance to this ancient image.

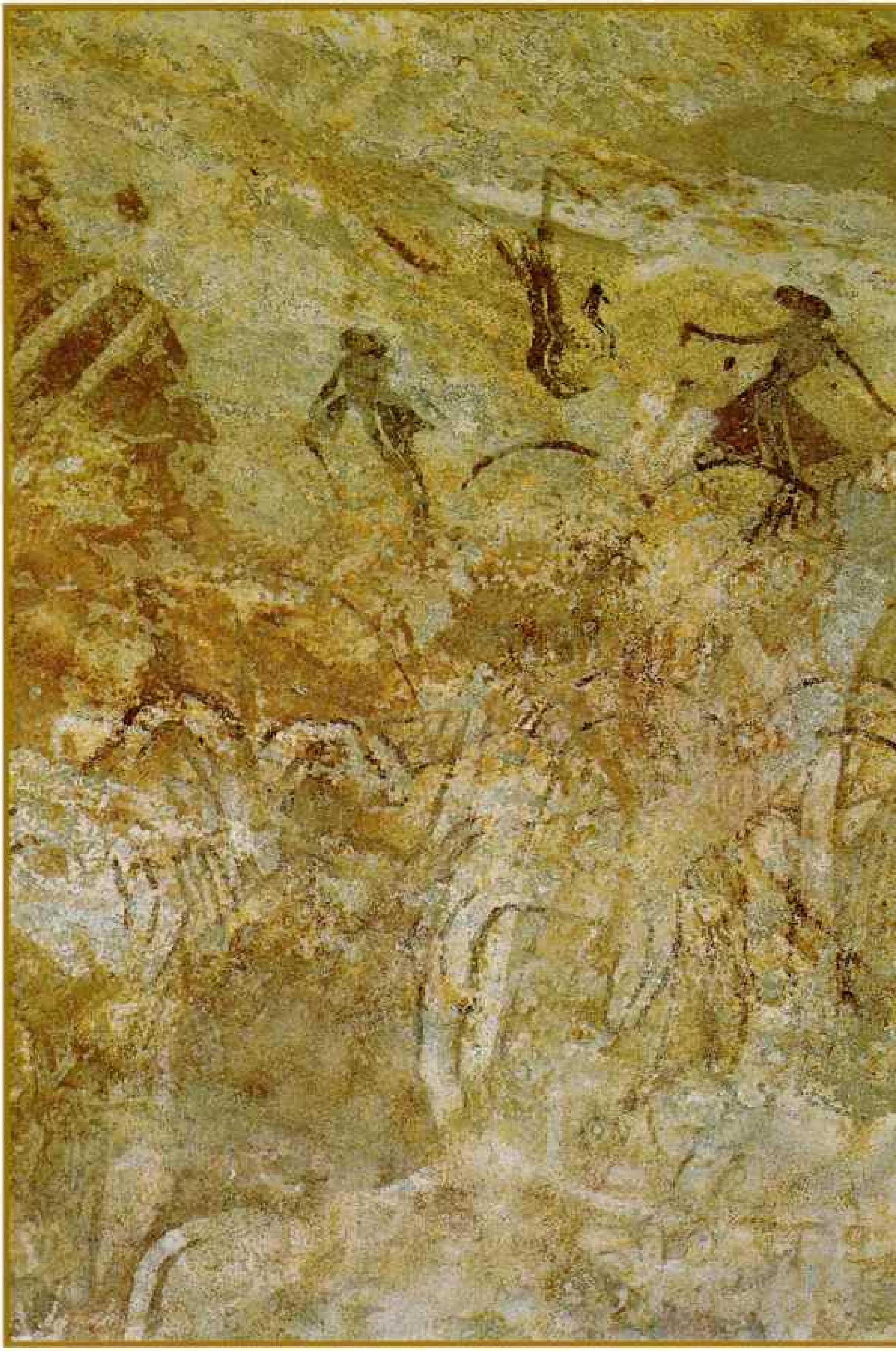
HORSE-POWERED chariot carries two hunters (**bottom**), one holding the reins, the other a weapon in his left hand. A woman in a gathered skirt stands near the vehicle's eroded wheel as a loping dog keeps pace.

Such horse scenes may signal the presence, about 1200 B.C., of descendants of a mysterious group from the Mediterranean called the People of the Sea. Wearing armor and wielding bronze weapons, these mercenaries had staged an ill-fated invasion of Egypt. Retiring to the desert, the Sea People were assimilated by the indigenous Garamantes, later described by the Greek historian Herodotus as "very powerful people" who rode four-horse chariots as they pursued black cave dwellers whose language sounded "like the screeching of bats."

Drawn in the linear, child-like style of the Camel period, two figures perch on their mounts (**right**). One rider sits on an exaggerated saddle equipped with a *basour*, a framework covered with linen for protection from the sun.

Crowned by horns and flexing bulging biceps, a "god" figure from the Round Head period stands more than ten feet tall (**right**) behind the figure of an antelope, painted later. Close by the figure's side, a woman raises her arms in supplication. The god's phallus may reflect a fertility cult. The paddle-shaped tail is commonly worn by animist tribesmen in Africa.

Working with the United Nations Educational, Scientific and Cultural Organization (UNESCO), preservationists attempted to protect the paintings from further erosion by applying a varnish-like sealant, which left a dark area at the center of the figure. The practice was abandoned, however, when it was feared that moisture trapped beneath would hasten deterioration.



LIKE A SENTINEL, a giraffe's head pokes from the beautiful chaos of a wall teeming with the curved horns of wild sheep and other figures. Using infrared light, our expedition detected 12 superimposed layers painted during a period of perhaps 2,000 years.

It is not known why different artists used the same locations. Some sites may have offered a better painting surface than others or held special religious importance. Perhaps the act of painting filled a ceremonial function more important than the artwork itself.

Upon first seeing the paintings from the Pastoral period, I was reminded of the famous cave art of northern Spain and southern France. For decades scholars believed in an artistic unity between prehistoric Europe and North Africa. Now it appears that Tassili belongs to an independent African tradition.

Whatever the case, these works deserve to be preserved. Tassili-n-Ajjer has been placed on UNESCO's World Heritage List and is part of the Algerian national park system. Sightseers now roam the rocks on guided tours.

During a recent trip to Algeria, I was distressed to learn that vandals have marred several paintings, some using chain saws to remove entire figures. I pray that this destruction will be halted and that the works of the Tassili painters will survive to further enlighten us about the age of their creation. □

Three Centuries of the

HUDSON'S BAY COMPANY

Canada's Fur-Trading Empire

By PETER C. NEWMAN

Photographs by KEVIN FLEMING

In a tradition far older than the Canadian Confederation, trappers such as Philip "Pi" Kennedy have sold their wild harvest to the Hudson's Bay Company since it was founded by English royal charter in 1670. "The Bay" pursued the fur trade across a vast sweep of North America, establishing a corporate presence imprinted deeply in Canada's history and character. The tradition ended this year with the sale of stores in the north in a financial chess move that leaves the Company of Adventurers, Canada's biggest retailer, with severed ties to its historic trading grounds.

WHEN SIR GEORGE SIMPSON, the overseas governor of the Hudson's Bay Company from 1826 to 1860, attended a state dinner at Christiania (now Oslo) during an 1838 European tour, he was toasted as "head of the most extended Dominions in the known world—the Emperor of Russia, the Queen of England and the President of the United States excepted."

It was a fitting, if astonishing, tribute. The realm of the Hudson's Bay Company encompassed nearly three million square miles—ten times the size of the Holy Roman Empire at its height.

Rooted in the beaver swamps of North America, the company's trading posts once reached from the Arctic Ocean to Hawaii, and its influence far beyond that. The largest corporate landowner in history, its self-proclaimed gentlemen-adventurers tamed a wilderness and built a nation: Canada.

The oldest continuous commercial enterprise still in existence, the company has weathered 317 years of war, rebellion, ambush, siege, bumbling bureaucracy, and coupon-clipping neglect. Despite financial losses in recent years, it remains a major economic force as Canada's biggest department store chain, and as a significant international player in real estate, stuffing nearly six billion Canadian dollars into its coffers in 1986. It has survived the centuries by turning nearly every necessity into an opportunity, and by not moving too fast. The motto of the Bay men who bent their efforts to producing maximum profits should have been "Wait and Seize."

Even if the real glory days are long gone, it still means a lot to be a Bay man in Canada. Nobody can define the intangibles that add up to high morale, but everyone seems to agree that once the idea of being part of the Company of Adventurers takes hold, most people perform far beyond their imagined capacities, and it won't let them go. The paternalism, poor pay, and frustration of being a cog in a large bureaucracy are tempered by the spirit of being part of an enterprise as grand as the Royal Navy and as methodical as a religious order.

Even the weather does not faze these hard cases. Capt. E. J. "Scotty" Gall, who spent 44 years in the Arctic fur trade running stores, driving dog teams, setting up posts, and later serving as captain of a supply ship, told me about the *Baychimo*, a freighter that got stuck in the ice off Point Barrow in the autumn of 1931. The vessel was abandoned during a blizzard and its crew eventually flown out. When the storm lifted, the vessel had vanished. The *Baychimo* became a ghost ship, drifting among the western Arctic ice packs. Gall's reaction was typical of the good company man. "Pity," he said. "She still had 20 bales of fur on her."

Another northerner touched by the Hudson's Bay Company was the late Adam Dick, chief of the War Lake Indian band, whom I met at Ilford in the northeastern

Outlet *for the outside world,* *the northern stores remain intact as a separate company, continuing the close association with the native peoples on which the Bay's trade was founded. Cree Indians purchase appliances* (**above**) *from the Norway House store in Manitoba. The Waasagomach store* (**facing page**) *supplies several reserves from its island site, reached in winter by snowmobile.*

corner of the province of Manitoba. Born in a tepee at Split Lake in 1897, he started trapping beaver and rabbit at the age of eight.

"My dad gave me one dog to go and hunt with," Adam once told me. "The dog ran four miles ahead of me. Then my dad made me a bow and arrow and snowshoes, and my mum made me a bag. When I began hunting by myself, I caught one rabbit and four chickens. Later I worked for the Hudson's Bay from 1920 to 1943 as a cribber, freighting supplies by dog team or canoe to 12 trappers' camps. They paid me $65 a month. I never got a raise, and I never got a pension. I brought them lots of furs, but I didn't get anything from them."

The chief, who was 87 when I saw him and had yet to acquire his first gray hair, had one kind thought about the company. "There was never any room in the sled for me because they piled all the space up with supplies. So I had to run behind it. I guess that's why I'm so healthy."

In the latest of its reincarnations, the Hudson's Bay Company in the past year sold the bulk of its fur auction business (then the free world's largest) and the 178 retail stores it owned in the Canadian north. In selling off these assets, the company's canny managers were prompted by the short-term need to reduce the heavy burden of corporate debts, but in the long run they were just exercising—possibly for the last time—the Hudson's Bay Company's determination to survive. No wonder that in the Canadian north its initials, HBC, are still thought to mean "Here Before Christ."

IF THE HUDSON'S BAY COMPANY prospered by shrewdness and guile, it was born out of a sort of romance—the passionate union of *Castor canadensis*, the New World beaver, and European fashion. Before the popularization of the umbrella, beaver-felt hats provided an elegant way to keep dry, but there was much more to the fashion than mere practicality. It was more mania than swank. Men and women in the 18th and early 19th centuries could instantly be placed within the social structure according to their hats: The precise technique used in doffing a beaver expressed minute shadings of deference; meticulous etiquette prevailed about how the headpieces were worn and the sweeping gesture with which they were removed.

So valuable did the beaver headpieces become that they were willed by fathers to eldest sons. By 1854, when the fashion in beaver hats had already passed its height, 509,000 pelts had been auctioned off in London alone, and Hudson's Bay Company accountants calculated that from 1853 to 1877 they had sold three million skins.

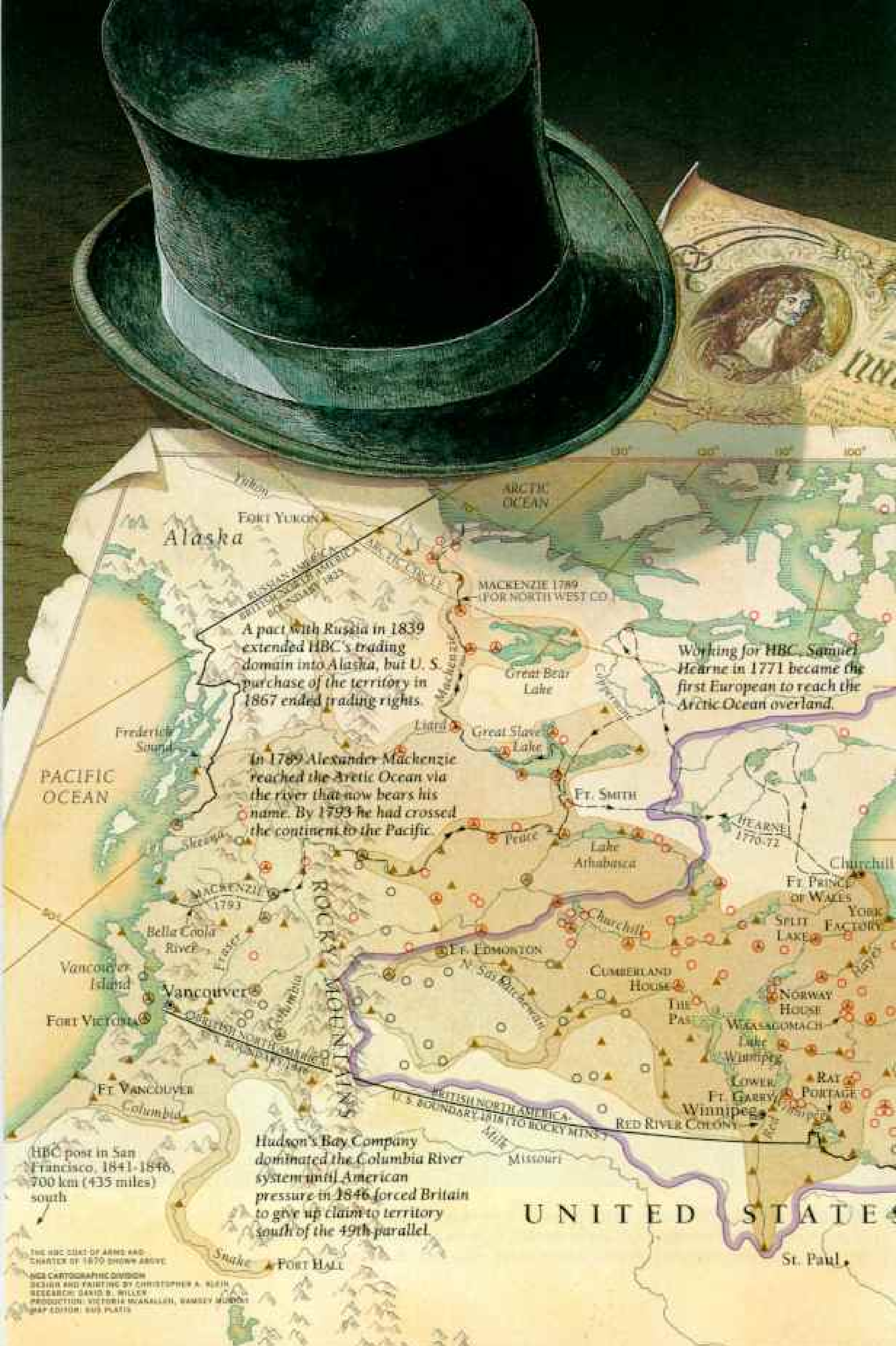
The beaver had once colonized nearly every waterway from the Rio Grande to the Arctic Ocean. Robert J. Naiman, an ecologist at the University of Minnesota, believes that in 1670 there were at least ten million beaver in present-day Canada, living in a drainage system *(Continued on page 205)*

Peter C. Newman, a former editor of Canada's *Maclean's* magazine, is the author of *Company of Adventurers* and *Caesars of the Wilderness*—a two-volume history of the Hudson's Bay Company. Photographer **Kevin Fleming** is a frequent contributor to NATIONAL GEOGRAPHIC.

Master mover *of the Hudson's Bay Company (HBC) fortunes, Canadian billionaire and majority shareholder Kenneth Thomson (***above***) has overseen divestitures of most of the company's fur division, northern stores, and other holdings to reduce crippling debts incurred in an expansion period that was brought up short by nationwide recession in 1981. The Toronto headquarters (***left***) now administers department and discount stores and real estate holdings. Critics lament the rending of HBC's historic ties with the Canadian north. Corporate Secretary Rolph Huband replies: "The sale hasn't taken away the past." At restored Lower Fort Garry near Winnipeg, home city for the new northern-stores company, President Marvin Tiller (***facing page,*** at left) stands with Ian Sutherland of the Mutual Trust Company, the firm that put together the friendly takeover of the stores. "Our mission is unchanged," says Tiller. "We'll continue to operate in the north as in the past."*

Prefab pillar of the community, *the store at Pond Inlet on Baffin Island plays a central role in the life of Inuit villagers, who customarily visit several times a day to shop for immediate needs and local news—often riding snowmobiles bought*

through the store. "We tend to be universal providers of everyday needs," says Marvin Tiller. Perishables are flown in weekly; bulk items come from Montreal on a company freighter that serves eastern Arctic communities in summer.


Yukon
Fort Yukon
Alaska
ARCTIC OCEAN
MACKENZIE 1789
(FOR NORTH WEST CO)
A pact with Russia in 1839 extended HBC's trading domain into Alaska, but U. S. purchase of the territory in 1867 ended trading rights.
Great Bear Lake
Working for HBC, Samuel Hearne in 1771 became the first European to reach the Arctic Ocean overland.
Frederick Sound
PACIFIC OCEAN
In 1789 Alexander Mackenzie reached the Arctic Ocean via the river that now bears his name. By 1793 he had crossed the continent to the Pacific.
Great Slave Lake
Ft. Smith
HEARNE 1770-72
Peace
Lake Athabasca
MACKENZIE 1793
Churchill
Ft Prince of Wales
Bella Coola River
Fraser
Vancouver Island
Vancouver
Ft. Edmonton
Saskatchewan
Cumberland House
York Factory
Split Lake
Fort Victoria
Norway House
Lake Winnipeg
Ft. Vancouver
Columbia
Lower Ft. Garry
Rat Portage
Winnipeg
Red River Colony
(HBC post in San Francisco, 1841-1846, 700 km (435 miles) south
Hudson's Bay Company dominated the Columbia River system until American pressure in 1846 forced Britain to give up claim to territory south of the 49th parallel.
Missouri
Snake
Fort Hall
UNITED STATES
St. Paul

From continental power to Canada's storekeeper

A KINGLY GIFT from Charles II, Hudson Bay and its vast drainage basin were awarded to his cousin Prince Rupert and associates as "true and absolute Lordes and Proprietors" of an unexplored region rich in furs. A 200-year-long rage for beaver hats fueled success. York Factory, HBC's main outpost on the bay, held a 1,500-mile advantage in proximity to the trapping grounds over North West Company competitors based in Montreal. HBC absorbed its rival in 1821, but not before explorers from both concerns had made trail-blazing journeys in a rough-and-tumble fight for furs. The company's resulting dominion extended to the west coast, an apogee of empire that ended with the 1870 "deed of surrender" of Rupert's Land to government jurisdiction. Today HBC's outlets and the northern stores cover the vast reach of Canada.

CHROMOLITHOGRAPH FROM "EXPLORATIONS IN THE INTERIOR OF THE LABRADOR PENINSULA," 1863

Meandering highway *of the Hayes River (***above***) was the company's earliest arterial route between Hudson Bay and the west. In early decades all trading took place at York Factory, with goods from beyond the Hayes's drainage arriving via Cree middlemen, who appeared in flashing flotillas paddling downriver. Eventually inland posts were built, the first established at Cumberland House in 1774 by Samuel Hearne, who also was first to reach the Arctic Ocean by land. Half a century later the HBC was trading along the Arctic and Pacific coasts.*

*Coast to coast the watery northern landscape bred mosquitoes and biting flies in clouds such as those reported by a government survey on Mosquito Lake on the Labrador peninsula (***left***): "All the men were compelled to wear veils . . . and as they paddled mournfully across these little lakes, they looked from a distance like veiled sufferers from snowblindness."*

Linchpin of a bygone empire, *York Factory* ***(right)*** *stands abandoned on Hudson Bay's roadless shore. It closed in 1957 after a century as a backwater, made obsolete by railroads.*

Annual reports were sent to the company's governing board in London. After headquarters moved to Canada in 1970, tons of documents were ensconced in provincial archives ***(below)*** *in Winnipeg.*

An inside view of life at York Factory, painted by an unknown artist perhaps using fish-oil tinctures, was found on the underside of boards used as shelves. It is thought to portray a factor, as post managers were called, and his wife at an amply supplied table, supplemented with geese from the plenitude of the eastern flyway.

(Continued from page 196) of rivers and streams containing a quarter of the world's fresh surface water.

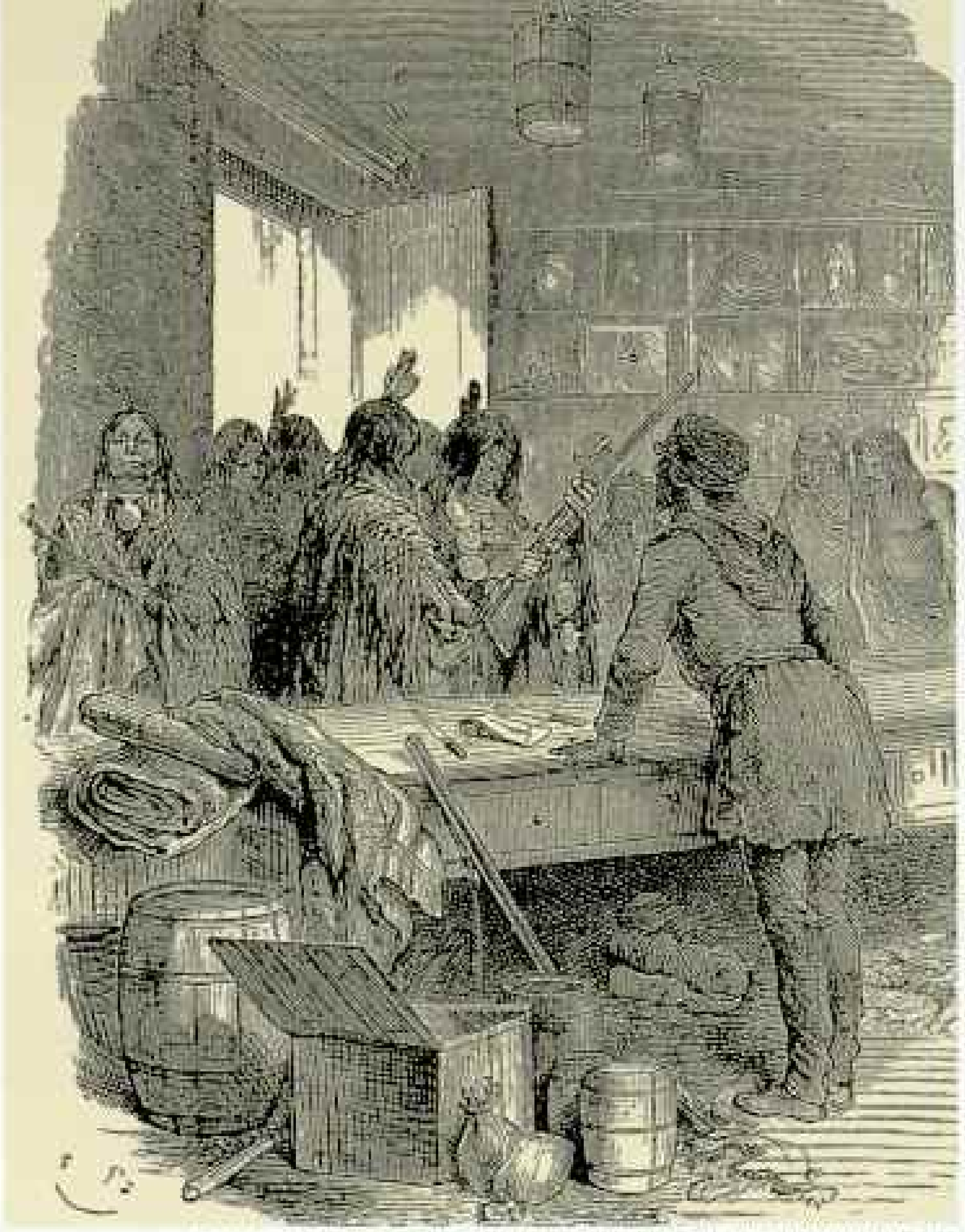
Seldom has an animal exercised such a profound influence on the history of a continent. From the early 1650s to the late 1850s the beaver became the breathing equivalent of gold. There was nothing genteel about the hunt. Men risked their lives and reputations, caught up in a feverish trade that transformed this pug-nosed rodent with its lustrous fur into a cause for war.

The beaver is a nonmigratory animal that needs relatively large spaces to thrive, so that once a creek was "beavered out," the hunters had to move farther into the new land. Just as the stalking of elephants for their ivory tusks lured white hunters into the heart of Africa, so the beaver pelt drew traders from both Hudson Bay and the St. Lawrence River toward the snowcapped Rocky Mountains and, eventually, to the shores of the jade green Pacific. Without anyone being particularly aware of it, the hunt for beaver became the quest for a nation.

THE INDIVIDUAL who first transformed distant tales of these furry rodents into a corporate infrastructure to harvest them was Prince Rupert, Count Palatine of the Rhine and Duke of Bavaria, a 17th-century Renaissance man. An incongruous pastiche of Sir Galahad and Cyrano de Bergerac, Rupert drew his sword to defend the divine right of his uncle Charles I, yet devoted

Two cultures met *in peaceful commerce across the counter of a typical HBC post in the mid-1800s* ***(right)****. Trade goods, such as those arrayed atop furs in the museum at Lower Fort Garry* ***(facing page)****, were mostly practical items: musket, shot, gunpowder, clay pipes, knife blades, snare wire, copper kettles, leghold traps, and Hudson's Bay blankets, still renowned for stoutness.*

The standard of trade was in portions or multiples of "made beaver," or prime pelts, as listed in a company document from 1715 ***(below)****. Wooden tokens were used to aid factors in explaining mathematics, while brass tokens represented beaver. Company-issued pound notes were legal tender in the Red River settlement.*



ENGRAVING FROM "HUDSON BAY; OR, EVERYDAY LIFE IN THE WILDS OF NORTH AMERICA," 1859


CAPITOL

Fabled beasts *attributed with human industry and engineering skills, beavers were portrayed in Europe as living in apartment-like dwellings in a 1777 engraving (**facing page**). Hunting methods —and subtropical setting—are also in error. Beavers were usually clubbed, minimizing damage to the pelts, before the advent of wire snares and leghold devices still used by trappers (**below**).*

GLENBOW MUSEUM, CALGARY (FACING PAGE)

himself equally to preservation of the populist rights of Parliament under Charles II.

During the last decade and a half of his life, while actively pursuing the business of the Hudson's Bay Company, Rupert set up a laboratory and metal forge in his lodgings at Windsor Castle. He is credited, among many other inventions, with fashioning a primitive torpedo, the forerunners of the modern revolver and machine gun, tear-shaped glass globules known as Rupert's drops that led to the making of tempered safety glass, a naval quadrant that made it possible to take observations at sea in rough weather, and a "diving engine" said to have successfully retrieved sunken treasure.

Pierre-Esprit Radisson and Médard Chouart, Sieur des Groseilliers, the two French adventurers who originated the idea of trading furs through Hudson Bay to bypass the French posts on the St. Lawrence River, ignited Rupert's imagination with reports of gold and copper. Rupert was excited by the prospect that the backcountry beyond Hudson Bay might yield not only fur but also as much mineral wealth to the Stuart dynasty as the mines of Mexico and Peru had produced for the kings of Spain.

Following an exploratory 1668-69 voyage to Hudson Bay by Groseilliers aboard the former Royal Navy ketch *Nonsuch*, during which the ship's company overwintered, Rupert and his fellow adventurers obtained from Charles II, on May 2, 1670, a charter as "true and absolute Lordes and Proprietors" of all the seas and lands of Hudson Bay and its entire drainage system. By setting the geographic limits of the territory at the sources of the streams that drain into Hudson Bay, the grant enclosed a subcontinent, its eastern boundary extending back to the height of land in unexplored Labrador, its southern extremities stretching along a huge territory just above the headwaters of the St. Lawrence River's many tributaries. Then it swept into the Red River Valley, south past the 49th parallel, and west to the Rocky Mountain divide. Only the lands around the great northward-flowing streams (today's Coppermine and Mackenzie), those flowing west to the Pacific (the Columbia, Fraser, Skeena, Yukon), and the Milk River basin draining to the Missouri were excluded.

THE CHARTER for "the Governor and Company of Adventurers of England tradeing into Hudson's Bay," in effect, granted a monopoly over trade originating anywhere west of Hudson Bay, so that if the Northwest Passage had actually existed where navigators of that day thought it did, the Hudson's Bay Company could have claimed control of trade rights, based on discovery, all the way to the shores of China.

The newborn Hudson's Bay Company rapidly developed into a profitable operation. Cash surpluses were reinvested in

Engraved for
Middleton's Complete
System of Geography.

BEAVER HUNTING in CANADA.

Driving a nail *at 40° below zero, a babysitting grandmother at Pond Inlet tacks up a caribou hide for eventual use in clothes or sleeping robes. More valuable furs are sold: Demand for arctic fox led the HBC to establish its most northern posts in the 1920s.*

expanding the arc of posts around Hudson Bay. Most of the "courts," or annual meetings, were held at Rupert's London lodgings in Spring Gardens, where it was decided to lease rather than own ships. Then it was decided that instead of using colored beads, silk ribbons, and tinkling trinkets, the trade with the native peoples would be based on utilitarian goods such as knives, axes, muskets, flannel and wool, and copper kettles. (And despite such early admonitions from London as "Trade as little brandy as possible to the Indians, wee being informed it has destroyed several of them," enough liquor was being introduced into the native economy by French traders operating out of Montreal that by the early 19th century little fur could be traded with the abstinence requested by the HBC's absentee landlords. "English brandy"—almost raw London gin colored with tinctures or molasses to resemble true brandy—became a standard HBC trade item.)

The sale of furs, the court decided, would be split into two annual auctions at Garraway's Coffee House. Bidding was by candle, in which one of two procedures was used to determine the buyer. A one-inch candle was lit, a bottom price of seven shillings was called, and bids were made on separate lots of furs; the highest bidder at the point when the candle guttered out got the goods. Alternatively, a pin was stuck into the tallow, and the last bidder before it fell out was declared the purchaser.

AS IT MATURED, the company came more and more under Scottish influence. Sparse of speech but swift in action, the Scots had persistence and self-sufficiency, traits ideally suited to the fur trade. They became part of the new land, marrying into the Indian families with whom they traded. When the Scottish Marquess of Lorne, who was then governor general of Canada, made his first national tour in 1881 and found himself at Rat Portage in northwestern Ontario, he asked the manager to introduce him to a "typical" Indian. The Bay man motioned for the fiercest-looking brave to come forward, saying, "Would ye come here for a minute, Macdonald?"

Although furs were the Hudson's Bay Company's chief trading staple, the firm also exported buffalo wool and pickled buffalo tongues, eiderdown, narwhal tusks, smoked, dried, and salted salmon, and turpentine distilled from coniferous trees.

A curious sideline was selling ice to Californians. In 1853 the HBC leased the ice fields under the company's jurisdiction to a former U. S. Navy captain named W. A. Howard for $14,000 a year. A ship, the *Fanny Major*, put into Frederick Sound in what is now Alaska, where Captain Howard hired 500 Stikine Indians to cut and load chunks of the blue glacier. The first shipment of 300 tons sold so quickly that Howard and his backers rushed to buy six more ice ships, and decided to share their profitable mode of natural air-conditioning and food preservation with Honolulu and Hong Kong. That was their mistake. The ice melted on the way across the Pacific, and the ships arrived with wet, nearly empty holds. The business collapsed in 1856.

A far more serious and very much more profitable venture was a scheme organized during the stormy stewardship of the British financier Sir Robert Molesworth Kindersley, the Hudson's Bay Company's 27th governor, to supply France, Russia, and Romania with food and munitions during World War I.

Through a maze of subsidiaries and overseas agencies, the Hudson's Bay Company


HEAV

In the solitude of fur country, *Pi Kennedy crosses a frozen lake* ***(above)*** *on his trapline route through the Northwest Territories' taiga, where mixed woodland meets tundra. Today most trappers use snowmobiles rather than dogs, and few trappers are as self-sufficient as Kennedy, who feeds the team fish he nets beneath the ice near his cabin, a day-and-a-half ride from Fort Smith.*

Bathing is a sporadic comfort ***(left)****. "When he lights the stove, the cabin warms up fast," photographer Kevin Fleming reports, "but the walls are still minus 20 degrees Fahrenheit."*

A snare ***(right)*** *could yield a wolf, coyote, fox, or lynx. Kennedy sells his pelts to the former HBC store in Fort Smith. Light, easy to carry in the woods, and effective, snares are one of the most commonly used trapping devices in the north. Opponents of snares and leghold traps decry the suffering imposed on trapped animals. Trappers counter that more humane devices now available are too bulky and impractical for use in the wilderness.*

with a fleet of nearly 300 merchant ships became a massive mover of edibles, fuel, lumber, ammunition, and troops. More than 13 million tons of supplies were delivered to France alone. By the spring of 1918 the private armada was discharging 11,000 tons of freight daily at French ports, and more than a hundred vessels flying the company's flag had been sunk. The Hudson's Bay Company applied its northern shipping experience to delivering similar cargoes to tsarist Russia, and, at Winston Churchill's request, supplied the White Russian armies following the Bolshevik Revolution. It was in the Barents Sea near the port of Archangel that the deck gun of the Hudson's Bay Company ship *Nascopie* sank a German submarine in 1917.

Ready for auction, *racks of lynx pelts* ***(facing page)*** *fill a Montreal warehouse, formerly used for winter sales. This facility, along with auction houses in Toronto and London, was sold to a private concern by HBC. In Toronto, polar bear skins* ***(below)*** *taken by natives under strictly controlled licenses may cost $5,000 (Canadian) each, with grizzly worth half that and black bear fetching $500.*

APART from these and many other attempts to diversify, the Hudson's Bay Company has always devoted inordinate energy to trimming costs. Salaries were kept at a minimum. David Thompson, whose pioneering maps of western Canada were standard reference works for three-quarters of a century, was allowed to resign after 13 years' service because the London committeemen thought he was spending too much time shooting the sun with his sextant instead of trading pelts. Sir George Simpson reprimanded James Hargrave at York Factory on March 3, 1843, for spending too much on condiments.

"I consider it quite unnecessary," scolded the governor, "to indent [requisition] for Sauces & Pickles on public account. . . . I never used fish sauce in the country, and never saw anyone use it or pickles either. From the quantity of Mustard indented for, one would suppose it is now issued as an article of trade with the Indians."

It was not until the 1960s that the company finally began to heat its northern stores; before then, it had allowed them to get so cold that indoor walls and nailheads would be coated with ice. "They didn't want anybody hanging around—they wanted everybody out trapping," recalls Stuart Hodgson, who served 12 years as commissioner of the Northwest Territories.

The HBC maintained its 178 stores in the Canadian north until their sale earlier this year, its managers often acting as father confessors, mayors, doctors, dentists—and if there wasn't a resident Mountie, as law-enforcement officers as well.

WHEN I WAS RESEARCHING the history of the company, particularly the early days of its royal charter, I kept hearing rumors that the British royal family still owned a proportion of its shares. I finally managed to obtain an interview in London with Lord Adeane, then chief financial adviser to Queen Elizabeth. "It is true," he told me, when I asked him about it, but discreetly said no more.

When I returned to Canada, I tackled Donald McGiverin, the company's current governor, with my query and was told that all he knew for certain was that there was no mention of the royal family in his lists of stockholders. "But I'll let you in on a little secret," he said. "Last time there was a royal visit, I happened to be standing near Prince Philip at a reception in Toronto, and at one point he sidled up to me and whispered: 'How are we doing?'"

The Hudson's Bay Company had not been doing that well in recent years, with losses amounting to more than 250 million dollars since 1981. A decade and a half into its fourth century of business, the Hudson's Bay Company was bleeding, its bond ratings cut to shameful levels, its balance sheet adrift in red ink, its management on edge. But its prospects have improved mainly because its current proprietors have put in some very tough cost-cutting measures.

THE RECENT SALE of its fur auction houses in London and Toronto to private interests and of its northern stores to a group under the auspices of Mutual Trust of Canada is the latest and most dramatic of its self-generated rescue efforts. By jettisoning these history-laden divisions, the company shocked some of its most loyal veterans. "I'm saddened and angry," declared Bob Chesshire, who once headed its northern division. "A priceless heritage is gone forever."

Dick Murray, the company's managing director in its glory years, laments the notion of abandoning the profitable northern stores to save the money losers in the south: "Only an unpardonable combination of commercial incompetence and callous disregard for its unique history and current responsibilities could have led the Hudson's Bay Company owners to cast aside the jewels in their crown. The company now abandons the vast Canadian north, it severs generations of a trusting and respectful relationship between native peoples and traders—and it discards the heart of its historic name: the Company of Adventurers. One might just as well take the Royal Canadian Mounted Police and sell it to Pinkerton's!"

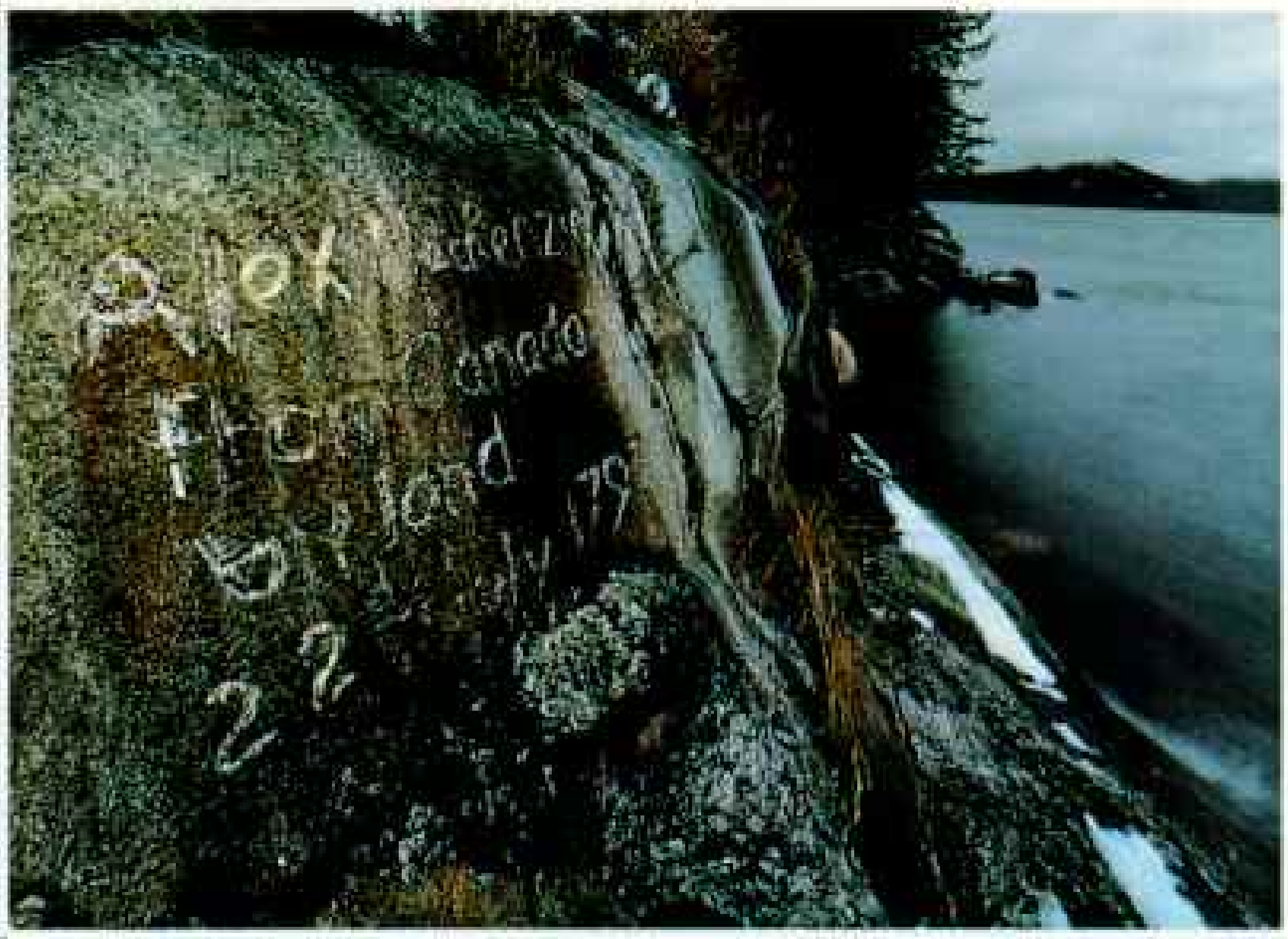
Kenneth Thomson, the publicity-shy billionaire who purchased control of the HBC in 1979 for 640 million dollars cash, defends the decision, explaining, "It was one we were reluctant to make because of the historical significance of the northern stores. However, in the interests of ensuring that the Hudson's Bay Company will be alive and well another 300 years from now, we felt it was essential that our management and financial resources be concentrated on what are today the company's core businesses of

Once a strategic post *at the head of Lake Superior, Fort William in 1857* ***(above)*** *had waned as a gathering place for trappers, traders, and Indians—giving way to York Factory after the 1821 HBC-North West Company merger. Holiday revels at the factory mixed Orkney Islanders and other Scots with Indians and métis at the "Christmas Ball in Bachelors' Hall"* ***(right)****.*

WATERCOLOUR BY W. H. E. NAPIER, PUBLIC ARCHIVES OF CANADA

ENGRAVING FROM "HUDSON BAY; OR, EVERYDAY LIFE IN THE WILDS OF NORTH AMERICA," 1878

First crossing *of the full width of North America was recorded by North West Company explorer Alexander Mackenzie in 1793 beside the Bella Coola River* (**below**) *in present-day British Columbia. Birchbark canoes were the workhorse craft of Nor'Westers. A canoe builder* (**facing page**) *at re-created Old Fort William sews the multilayered craft with spruce roots sealed with hot spruce pitch.*



department store retailing and real estate."

Indeed, despite its setbacks, the company still employs 41,000 people and owns 404 retail stores across Canada with combined floor space of more than 28 million square feet. It also owns Markborough Properties, one of the country's largest real estate firms, which has built a total of 32 shopping centers, 23 warehouses and factories, 11 office buildings, one hotel, and two apartment towers in Canada, the United States, and the United Kingdom.

Donald McGiverin, the gregarious Scot who has headed the company in its best and its worst years, remains philosophical in the face of adversity, blaming the company's shortfall on the recession of the early 1980s that hit every Canadian merchandiser and on the fact that too much debt (a peak of 2.5 billion dollars in 1985) was acquired for expanding the business.

By the winter of 1984-85 McGiverin was having private as well as public troubles. His weekend hideaway at Palgrave, Ontario, was being overrun by beavers. The governor of an empire built on beaver pelts saw no poetry in this. "The little buggers keep eating away at my only apple tree," he complained. He has defended his domain with every available weapon, including dynamite to bust the dams and steel plates around gnawed trunks. But the beavers will not leave the governor in peace. Sometimes, late at night while reading in bed, trying to find solace from the brutal competition of the marketplace, McGiverin thinks he hears a tree falling.

AT YORK FACTORY, the company's great tidewater headquarters on Hudson Bay, history and reality come together. There is no memory of the great events that took place here because there is no one left to remember them. Every so often native trappers wander by, faces purpled by the juice of wild blueberries. They circle *kichewaskahikun*, York Factory's empty "big house" on the shore of the Hayes River, singing loudly as they walk by because they believe the depot is the home of evil spirits.

This was once the greatest of the trading posts. The building's hundred vacant windows still yawn in the silver afternoon, recalling that here was a center of North American commerce, the overseas headquarters of the Company of Adventurers.

The first white man to winter near this spot, halfway up Hudson Bay's west coast, was Sir Thomas Button, who searched in 1612 for the doomed explorer Henry Hudson and for a navigable Northwest Passage. Seven decades elapsed before an expedition headed by Pierre-Esprit Radisson, traveling under the French flag, returned to the site; two years later the Hudson's Bay Company built a permanent trading station, naming it York Factory after the company's governor, the Duke of York. (It was called a factory not

Long road to the far north *stretches through Manitoba wilderness when lakes and muskeg freeze sufficiently to support supply trucks. Communities on the Mackenzie River are supplied in summer by barges. Throughout the year fresh foods and special orders arrive by air.*

The Trappers' Festival in The Pas, Manitoba, celebrates the portages of historic cross-country journeys with a flour-packing contest that loads champion Jimmy "Sugar" Custer with 930 pounds for a short stagger ***(facing page)***.

because anything was manufactured there, but because this was where the factor, as the company's agent was called, lived.)

York Factory became a pawn in the tangled wars between the British and the French for control of Hudson Bay, changing hands five times in 14 years. During the early 1690s it was the only post not held by the French. Then Pierre Le Moyne, Sieur d'Iberville, the greatest military genius Canada has produced, captured the fort for New France in an epic sea battle.

Returned to British possession by the 1713 Treaty of Utrecht, York Factory was sacked nearly 70 years later by French marines who had dashed north from the West Indies in 1782. Joseph Colen, in charge of rebuilding the post (and its first resident intellectual—he moved in with a library of 1,400 books), decided to shift operations upriver to the present site. He gave the refurbished factory the only name that seemed to fit: New York.

THE STORIED RIVALRY between the Hudson's Bay men and the fur traders of the North West Company of Montreal had begun to heat up by that time. Founded in the late 1770s, the NWC was not so much a financial vehicle as a loose confederation of common interests—but it had two major advantages: manpower and the ability to make decisions on the spot, rather than awaiting stratagems from overseas. The Nor'Westers, using their birchbark canoes, pushed inland to collect furs directly from Indian trappers. The HBC began experiencing a dwindling supply of pelts as the Indians refused to make the long river voyages to posts on the bay, and was itself forced to establish inland posts and a transportation network to counter the leapfrogging Nor'Westers. But the HBC had to rely on far fewer men. As late as 1799 the company still had only 498 employees posted in North America, 180 of them on the bay; the NWC had 1,276 men engaged in the fur trade.

Most of the Nor'Westers, though, were bellicose risk takers who based much of their commerce on an explosive mixture of rum and violence, indiscriminately exploiting Indian trappers and their women. This behavior precluded *(Continued on page 225)*


ROBIN HOOD
FLOUR
PACKING

DETAIL OF WATERCOLOUR BY PETER RINDISBACHER, PUBLIC ARCHIVES OF CANADA

Signs of their times, *red ocher paintings adorn rock faces alongside a stream near Norway House, a still active post established as a strategic inland depot in the early 1800s. They were painted by Indians perhaps 500 years ago; recent graffiti deface the rock. Interpretations of the large image vary. It may be a boat paddled by totemic animals, including beavers. There is general agreement that the smaller image beyond depicts three human figures in a high-prowed canoe.*

Beginning in the 1790s, most company cargo traveled by York boats, so called because of their final destination. An artist-settler en route to the Red River Colony in 1821 painted what is probably his party (**left**) *in a flotilla of the distinctive craft struggling up a shallow river between lakes.*

stable business patterns, since, fearing reprisals, few Nor'Westers dared winter in the same locality twice. Their severest economic disadvantage was the length of their supply line for trade goods: from London to Montreal, then by cart and barge and 35-times-portaged freight canoes to the far shore of Lake Superior for transfer to smaller "north" canoes, and finally on to the fur country a thousand miles west, where they wintered. A single transaction took two years.

The fierce rivalry between the competing companies finally ended when the two merged in 1821 under the charter, and name, of the Hudson's Bay Company. The amalgamated firm's exclusive license to trade was not renewed by the crown when it expired in 1859. A decade later, after the confederation of the British colonies in North America, HBC transferred all but seven million acres of its land empire to Canada for £300,000.

***Frozen sentinel** of empire, the stone bastion of Fort Prince of Wales was built over a 40-year span to guard the mouth of the Churchill River from French incursion. But the HBC men surrendered the fort to a large French force in 1782 without a shot being fired. Isolation and disease were far worse enemies, even at busy York Factory, where some of the old inhabitants still rest (**below**).*

IN THE HEYDAY of the HBC, virtually all the trade goods going into and the fur harvest going out of the company's western holdings moved through York Factory. By the mid-1800s the factory had become a township of 50 buildings—the main depot, guesthouses, doctor's house, Anglican church, hospital, library, cooperage, smithy, bakehouse, fur stores, provisions houses, and officers' and servants' quarters. "I was much surprised at the 'great swell' the Factory is—it looks beautiful," commented vivacious Letitia Hargrave, wife of a chief factor, who created a sensation in 1840 by importing a Viennese piano of six and a half octaves.

From the hexagonal cupola of the depot-building vantage point, clerks sighted the arrival in late summer of the annual supply ship from England, heavy with trade goods and apprehensive recruits. The majestic vessel would ride gently on its anchor chains at Five Fathom Hole, the sandy-bottomed holding ground seven miles from the depot, while scurrying sloops exchanged the mother ship's cargo of guns, brandy, textiles, axes, knives, and other supplies for the bundles of furs collected from the inland posts.

Down the roaring North Saskatchewan, the fast-flowing Winnipeg River, and the sluggish Red, from Norway House and Cumberland House and from Fort Edmonton 1,500 miles away came the summer fleets of York boats bearing the winter's harvest. York's foreshore was ablaze with campfires as the wild uplanders sang, wrestled, drank, and gambled the night away.

During the long week between Christmas Eve and New Year's Day, the wilderness post exploded in a kind of madness. The Reverend J. P. Gardiner counted the flasks emptied during the 1861 celebrations and came up with the astonishing total of nearly 105 gallons of liquor, mostly brandy and rum, that had been consumed by York Factory's yuletide population of 50.

James Knight at York Factory recorded that during three days of feasting at Christmas 1715, he allocated to each mess hall of four men a helping of four geese, a large slice of beef, four hares, seven pounds of fresh pork, two pounds of drippings, a pound of butter, three and a half pounds of fruit preserves, four pounds of flour, and a hogshead of strong beer.

Great fires burned in the hearths through the winter but made little difference in a climate where the quicksilver in thermometers froze so solid that it could be shot out of muskets and still retain its shape. Company clerk Robert Ballantyne described how the breath of the revelers at the 1843 Christmas ball transformed the room: "In consequence of the breathing of so many people in so small a room for such a length of time, the walls had become quite damp. During the night, this moisture was frozen, and [the room] was converted into a palace of crystal. The walls and ceiling were thickly coated with beautiful minute crystalline flowers."

Few places on earth experience such extreme weather fluctuations as the bay. Out of reach of moderating ocean currents, its shores are more frigid than the iceberg-packed Arctic Ocean or the North Pole itself. Temperatures of minus 82°F have been recorded. For half the year the sun hugs the horizon; the fierce winds snarl across the beaches and eskers, and on overcast days drifting snow creates a disorienting white void that obliterates all points of reference.

The brief summers bring little respite. Temperatures can rise above 80°F, but the numbing agony of the winter's cold is replaced by intolerable plagues of "musketos" and "sand flyes." While he was at Churchill, James Knight gave way to near hysteria in his August 11, 1717, journal entry describing the insects: "Here is now such swarms of a small sand flyes that wee can hardly see the sun through them, and where they light is just as if a spark of fire fell and raises a little

WATERCOLOR BY FRANCES ANNE HOPKINS, ROYAL ONTARIO MUSEUM (LEFT)

Musical reprise *at Old Fort William's Great Rendezvous Pageant* ***(above)*** *recalls the freewheeling spirit of the North West Company's annual gathering of fur traders. The boisterous era ended after the 1821 merger, during the reign of Sir George Simpson as overseas governor. This energetic Scotsman regularized affairs throughout the company's immense domain and traveled indefatigably, often with private secretary Edward Martin Hopkins, whose wife, Frances, recorded this scene* ***(left)****.*

lump which smarts and burns so that wee cannot forbear rubbing of them as causes such scabbs that our hands and faces is nothing but scabbs. They flye into our ears, nose, eyes, mouth and down our throats as wee be most sorely plagued with them."

FOR 249 YEARS the Hudson's Bay Company sent supply ships to the Five Fathom Hole anchorage from its docks in London, but in 1931 traffic to York Factory stopped, though the decline really dated from the early 1870s, when railway construction reached the Red River from St. Paul, providing a new and cheaper method of supplying the company's western network. Only the great white depot building remains, its door barricaded in a useless gesture against animal and human intruders. For decades the building has withstood wind, frost, and the occasional marauders who rolled old cannonballs along its polished floors at beer-bottle tenpins, smashed mickeys of whiskey against its satiny spruce walls, and tore off its siding to burn as fuel.

The best of the Bay men at York Factory and the other forts that sprang up in the northern wilderness displayed an esprit de corps comparable to that of the Royal Navy. The wilderness was their ocean, the outposts their ships. Seniority, sobriety, and the ability to keep neat journals brought command in the service of the company as in the navy. Social stratification was strengthened by the strict rule that all "commissioned gentlemen" had to be addressed as mister both by subordinates and superiors.

The arrival and departure of a post's commanding officer warranted cannon salutes. Changes in shifts, meals, and bedtimes were signaled by the sounding of ship's bells. The company recognized spontaneous valor or oncoming senility by awarding its own medals, and everything depended on seniority. The choice of thwarts in a canoe,

Kernel that sprouted *into Canada's fifth largest city, HBC's 19th-century Fort Edmonton was re-created outside a downtown that swallowed the original site. The North Saskatchewan River, frozen in December, once bore the fur-laden boats of the Bay—a vast commercial empire that helped give birth to a nation.*

entitlement to a segregated campfire, even the location of pews at the occasional Sunday worship all signaled one's position in the Hudson's Bay Company hierarchy.

The main reason this unlikely enterprise prospered was that it was based on mutual exploitation: The company eagerly harvested ever more furs for profitable sale in England, and the Indians were anxious to supply pelts in return for goods that transported them instantaneously from the Stone Age. Trade meant that meals could be cooked in copper kettles over fires instead of in birch-bark caldrons containing red-hot rocks, and that fish could be caught on strong metal hooks instead of with carved beaver teeth or bird bones.

Describing the effect of one such item—the ax—on his people, Chief Dan George, the late Indian activist and actor, explained: "Imagine its impact on a people whose main implement was still a sharpened stone. Five strokes of an ax, and a sapling is down; one day, and a stockade is built—the Iron Age attached to a wooden handle!"

In this transatlantic trade, which was deliberately maintained at a fairly even level by the company regardless of prices on the London fur market, an ice chisel was worth one beaver pelt; a blanket, seven. The price of cloth was one yard for every three pelts. The most sought after item in the white man's inventory, trading for 13 beaver skins, was the gun.

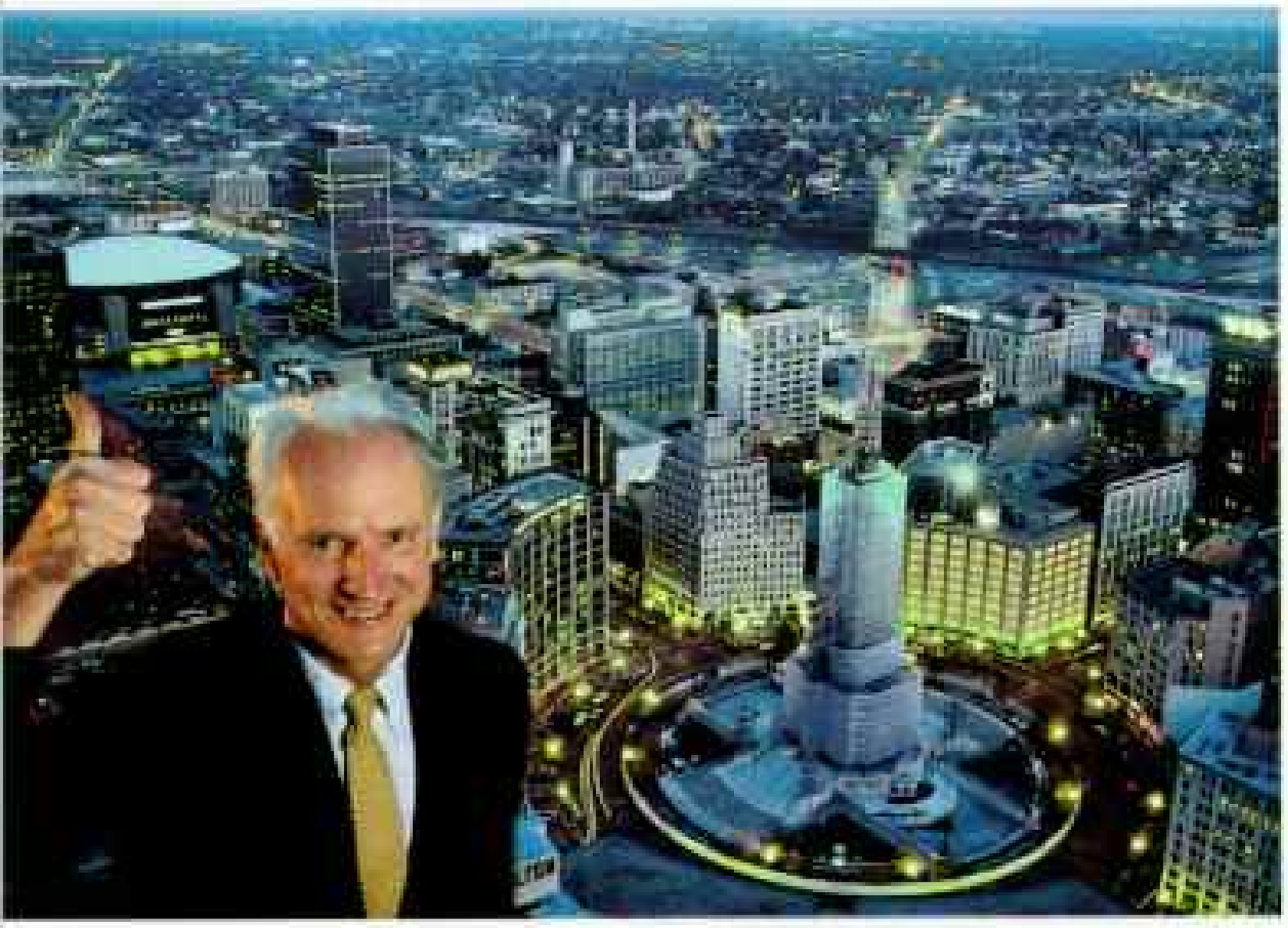
A persistent tale about the gun trade—which every Indian swears is true and every Bay man swears is not—claims that early flintlocks were bartered for an equivalently high pile of pelts. According to legend, the company kept making longer and longer gun barrels to take in more furs. HBC archives, however, show that from the beginning of the company's trading history, Indians were offered several choices of barrel lengths. From 1700 until the late 1800s trade guns with barrels of 36, 42, or 48 inches were available. To make up the five-foot pile of furs reaching the total height of the longest gun would have required nearly 300 beaver skins, but the going rate at the time was about a dozen pelts per gun. Hugh Ross, former post manager at Temagami in central Ontario, experimented on the basis of the legend. He told me that it took 170 skins to reach the muzzle of a $60 rifle, "and at that point they kept slipping all over the place, so I couldn't make a pile much more than halfway up the longest gun."

IN THE FINAL ANALYSIS, perhaps the Hudson's Bay Company has survived because its proprietors were clever—or indolent—enough to allow the fur traders on the spot to manage its affairs. They were the ultimate absentee landlords. No governor visited Hudson Bay, for example, until 264 years after the company's incorporation, when Sir Patrick Ashley Cooper, the 29th man to hold the office, made a brief ceremonial procession through its posts in 1934.

In its newly trimmed anatomy, the Hudson's Bay Company may appear to be winding down its incredible extended historic run. But to those of us who are students of its remarkable history, the currently diminished state seems like only a new incarnation in the continuing evolution of an institution that refuses to die. The pioneering traders who sat out their lives in the bleak forts around Hudson Bay may have been largely ordinary men, castaways in a tight-fisted land, yet they achieved something truly magnificent. They—and their beloved company—endured.

Perhaps the secret of this ultimate example of corporate Darwinism is that the kings, dukes, earls, knights, and accountants who have spent more than three centuries guiding the destiny of the Company of Adventurers have always applied the philosophy contained in a stern pronouncement by Prime Minister Lord Palmerston in 1848: "We have no eternal allies and we have no perpetual enemies. Our interests are eternal and perpetual." □

Indianapolis: City on



Once a Rustbelt city on the skids, Indianapolis was laid low by cutbacks in federal aid and by an overdependence on the automobile industry. But those dark days are over, say residents, thanks to an aggressive partnership of government, business, and philanthropy that has practically re-invented America's 14th largest city—complete with an upbeat new sports image and a taste for shopping malls, conventions, tourists, and entrepreneurs.

Overlooking Indiana's capital from the city's tallest skyscraper, Mayor William Hudnut III never tires of promoting his "can-do city."

NO ONE IN BALTIMORE believed it. The Colts had gone:

"To *where?*" said Rosie Apicella, a waitress in a South High Street eatery. "*Indian-naa-polis?*"

On a stormy March night in 1984, the football team had snuck out of town, as one sportswriter noted, "with all the grace of a snake-oil salesman backing out of a prairie tank town."

As the moving vans pulled out of the team's headquarters with Johnny Unitas's uniform, the Colts' Super Bowl trophies, and a little bit of Baltimore's soul, a crowd gathered at the gate. The light rain had turned to snow. There were a few tears, a few carelessly chosen words. And litigation initiated by bitter Baltimore took two years to settle.

"We didn't steal the Colts—Baltimore lost them," said Indianapolis Mayor William H. Hudnut III. "Cities don't automatically grow and prosper. You've got to work at it."

In the game of urban renewal, acquiring a professional sports franchise is the big prize. The mayor offered the Colts a new domed stadium and unprecedented financial incentives, and, with their arrival, exuberantly declared that Indianapolis had finally joined the major leagues. It is estimated that the team, despite its losing record, generates some 25 million dollars a year for the city.

The wooing of the Colts was part of Indianapolis's long-term strategy to use sports as a tool for economic redevelopment. A smokestack branch town of the automotive industry, Indianapolis was known primarily as the home of the 500-mile car race. A city that was long on name and short on appeal, with no mountains or seashore. Cold, blustery winters and worse summers. Chosen in

the Rebound

By LOUISE E. LEVATHES
NATIONAL GEOGRAPHIC STAFF

Photographs by
SANDY FELSENTHAL

1821 as the state capital because of its central location in Indiana, it became more of a place to go through to get someplace else. A sleepy crossroads city nicknamed "Naptown" and "India-no-place."

"We knew we had to create our own excitement," said David Frick, a former deputy mayor. "It seemed logical to build on our strengths, which were sports, health, and our central geographic location."

Deliberately and aggressively Indianapolis set out to become a sports and physical-fitness center and a destination city that would attract conventions and tourists. With generous support from the locally based Lilly Endowment, one of the country's wealthiest foundations, the city poured more than 180 million dollars into world-class sports facilities, including a natatorium with three swimming and diving pools, a 12,800-seat track-and-field stadium and state-of-the-art bicycle-racing track, and a 60,000-seat domed stadium.

The new sports facilities were complemented by a host of downtown renovation projects. The city market was refurbished, landmark Monument Circle bricked. Two old movie palaces were renovated as new homes for the Indianapolis Symphony and the Indiana Repertory Theatre. And Indianapolis's Union Station, a derelict 19th-century depot that had been a refuge for dope addicts and drunks, was painstakingly restored and transformed into a "festival marketplace" of shops, restaurants, and disco bars.

"Once we were successful with one project, a momentum was created—it was like a barn raising," said Theodore Boehm, president of the Indiana Sports Corporation, which has been successful in bringing many amateur sports events to the city, including the upcoming Pan American Games.

The games have been held in the United States only once before, and this month Indianapolis will play host to 4,500 athletes from 38 countries.

Indianapolis did not do its barn raising quietly. A vigorous PR campaign has resulted in a flurry of national publicity. The Rodney Dangerfield of cities suddenly found itself called the "Cinderella of the Rustbelt," "U. S. sports mecca," and "the Cornbelt city with Sunbelt sizzle."

Although since 1969 Indianapolis and surrounding Marion County have lost 35,000 manufacturing jobs, the sizzle has produced some solid economic gains. Unemployment, which peaked in February 1983 at 11 percent, is now below 5 percent. In recent years downtown jobs have been created at the rate of 1,450 annually. Some 40 office, hotel, and housing projects have been completed, and, since 1984, convention business to the city has tripled.

There are, however, some disturbing gaps in this picture of progress. Recent plant closings continue to jolt the city's economy and displace thousands of workers. Cutbacks in city services and programs have exacerbated the serious housing problem. And, with little or no increase in property taxes since 1973, public-school education has fallen far below the national average.

JOHN AND MARGARET THOMAS were sitting on the veranda of their house at 621 Lockerbie Street. It was a fine summer day, and the downtown neighborhood, the oldest in the city, was raising money to replace its sidewalks. Country bands played on the shady streets, and women in turn-of-the-century costumes sold freshly baked cookies and cakes. Beloved Hoosier poet James Whitcomb Riley, author of "Little Orphant Annie," once lived in a handsome brick Victorian house here, now open to the public. The character of Lockerbie Square, however, is shaped by the dozens of wood-frame workmen's cottages dating from the Civil War. They have been renovated and painted in bright colors.

The Thomases' one-and-a-half-story clapboard house once belonged to a railroad

***Restored centerpiece** of downtown revival, 99-year-old Union Station reopened in 1986 with a 75,000-balloon flourish (**left**). The once derelict railroad station is now a "festival marketplace" with some 40 restaurants, 70 retail shops, and a hotel where visitors can stay in antique Pullman cars (**facing page**). The statue recalls the station's busy life during World War II.*

*Nearly 15 million people visited the renovated station in its first year—a turnout that thrilled developers Bob and Sandra Borns (**below**), the only bidders on the risky 60-million-dollar project that city leaders hope will anchor downtown business. "This city is made up of people who make things happen," says Bob Borns. "We're well on our way to becoming the urban Disneyland."*

blacksmith. The couple moved to Indianapolis in 1984 when the Hudson Institute, a think tank for public policy, relocated with the encouragement of a 1.5-million-dollar Lilly grant. Mr. Thomas is a research fellow with the institute.

"We laughed when Hudson's president first talked about moving here from New York," said Mrs. Thomas. "Now we like Indianapolis very much. The pace is slower, and the people are lovely."

"And it's very easy," added her husband. "You can get anywhere in 20 minutes."

"EASY" IS A WORD often used to describe Indianapolis. It is an easy place to buy a home, because housing costs are low. It is an easy place to start a new business and to raise a family. And with ten highways radiating from the city like spokes on a bicycle wheel, it is an easy place to get around.

Convenience was certainly on the minds of the state commissioners when they decided in 1820 to move the capital from Corydon in southern Indiana to a site farther north on the banks of the White River. Unfortunately the meandering White River proved too shallow to be very useful for commercial traffic.

Alexander Ralston, who worked with Pierre L'Enfant in designing Washington, D. C., laid out this *polis* (city) of Indiana with a central circle and four diagonal streets radiating from it. Like Washington, much of the mile-square city was built on swampy land, and the young capital was plagued with malaria. The first settlers were a mixture of Northerners and Southerners, establishing from the beginning what writer Kurt Vonnegut, who is from Indianapolis, calls "the schizophrenic nature of the city." During the Civil War, the Union Army was fearful of recruiting south of the city line because of strong Rebel sympathies.

Population growth came with the opening of the National Road, now U. S. Route 40, in the 1830s and later with expansion of the railroads in the 1850s. Indianapolis soon became an important agricultural processing and distribution center with flour mills, slaughterhouses, and farm-machine shops. The city still has several granaries and a soy processing plant, and when the wind blows in the right direction the downtown streets smell like buttered popcorn.

In the 1880s, discovery of a large natural gas field in northern Indiana and easy access to extensive coal deposits precipitated a tremendous industrial expansion. Before Detroit, Indianapolis became America's original "motor city," producing 50 makes of cars, including the Duesenberg, the Marmon, and the Stutz. The Indianapolis Motor Speedway was built in 1909 as a proving ground for new cars. Races were held in May, between corn planting and haying, so farmers could attend.

In the 19th century Indianapolis had large and influential immigrant populations, particularly Germans and the Irish. Their numbers, however, failed to grow with the city.

Why this happened is not entirely clear. There was some backlash against the German community during World War I, and Detroit and Chicago were certainly bigger magnets to attract immigrants. Indianapolis also became a profoundly conservative city, not especially receptive to foreigners. The John Birch Society was established here, as well as the headquarters of the American Legion, and the city's strong Ku Klux Klan helped keep public schools sharply segregated until the 1950s. Today, foreign born compose just 1.6 percent of the metropolitan population, and only vestiges of ethnic communities remain, such as Shapiro's, a south-side delicatessen once part of a large Jewish neighborhood.

In 1969 manufacturing peaked in Indianapolis, making up more than 30 percent of the jobs in the metropolitan area. There were some 800 plants producing 1,200 different commodities including automobile and aircraft parts, electrical goods, farm implements, and chemical and agricultural products. Today manufacturing jobs are down to 18 percent, and service jobs in the hotel business, retail trade, and health field have rushed in to fill the gap, as they have in other troubled Rustbelt cities.

"As long as the auto industry was doing well, we had our day in the sun," said Indianapolis economist Robert Kirk. "In the late '70s, when things went badly, we became vulnerable because we were a branch town. We didn't control our destiny."

Office buildings are the factories of the

1980s, and they are going up at an amazing rate downtown amid the parking garages, convenience stores, and vacant lots. Walking down Washington Street at noon, the people seem wholesome and homogenized. The melting pot has simmered down. Young men tend to look neat and clean-cut like David Letterman; the women like Jane Pauley, all smiles. Both television personalities are, in fact, from Indianapolis.

I HAD BEEN FOLLOWING Mayor Hudnut around all day. No mean feat. The six-foot-five-inch mayor, 55, a Presbyterian minister, walks faster than most people, and with each public appearance he seems to be recharged. He succeeded in abolishing a law limiting the mayoralty to two terms and is now running for his fourth.

It's 10:30 p.m. The mayor quickly finishes his wine and rises from the dinner table to address the annual meeting of the Marion County Medical Society at the Holiday Inn at Union Station.

"We're glad to be breaking bread with you in this 60-million-dollar project," the mayor began. "It is a symbol of the resurgence of Indianapolis. Ten years ago this place was empty. This place was forlorn. Moss was growing through the tile floor. Trains weren't going through the way they used to. Now we have this magnificent festival marketplace. [Applause.]

"It illustrates what you can do if you take public dollars—and there's about 17 million in this project—and use them to leverage private sector investment. . . . We're not Naptown any more! Newspapers say Indianapolis is awake year-round now—not just during the 500. That's quite a compliment. [Laughter.] Why, even in Baltimore someone wrote that it's a lot easier to hate Indianapolis from a distance. . . ."

The mayor continued for 40 minutes; his enthusiasm was infectious.

When I talked with him afterward, he described his role as mayor as being three jobs: a coach who develops strategy, a player in the game, and a cheerleader, which he said he was tonight.

"As coach," I asked him, "what's your strategy?"

"We've suffered from being a branch town," he said. "We're making a conscious effort to get one national headquarters here a year."

High on their city, *shopping mall magnates Mel Simon, center, and brother Herb, right, relax in their office lounge, decorated with an Andy Warhol portrait. They plan a 500-million-dollar downtown complex, about one-fifth of it financed by the city. "We could never build a project this size without help," says Mel. Adds Mayor Hudnut: "We're not an automatic-growth city. We have to create our success through incentives, or it's just not going to happen."*

WHILE HUDNUT is generally credited with rebuilding the city, his predecessor as mayor, Richard Lugar, now U. S. senator, created a new structure for the city government and strengthened the critical partnerships with the business community and the Lilly Endowment. Both men are Republicans.

Lugar, a reserved businessman, was elected mayor *(Continued on page 240)*

Dancing under the stars *goes indoors at the Indiana Roof Ballroom, a 1920s vintage night spot recently reopened downtown after a six-million-dollar*

facelift. A computerized display dazzles dancers with special effects, from passing clouds, fog, and lightning to snowfall on demand.

A 65-million-dollar welcome mat *built with taxpayer and philanthropic dollars, the Hoosier Dome paid off in 1984. The new stadium, along with financial enticements worked out over weeks of intense negotiations, lured owner Robert Irsay to move pro football's Colts from Baltimore—despite death threats by city fans. Fearing a Maryland injunction against moving the team, Mayor Hudnut called on neighbor John B. Smith,*

chairman of the Mayflower Corporation, who dispatched 11 vans to transport the Colts' equipment in the dead of night. The fabric-roofed dome—held in place by air pressure—together with the adjacent convention center, has boosted tourism and helped keep downtown restaurants opening at the rate of one a month. But, according to Mayor Hudnut, its most important contribution is "galvanizing the optimistic spirit in this city."

in 1967 at the age of 35. He used the unusual coincidence of simultaneous Republican control of the Indiana state legislature and the governorship to, as he put it, "unstick the gears of an archaic, expensive, and overlapping Model T form of government."

In 1969 the state legislature passed an act partly consolidating the fragmented governments of Indianapolis and most of surrounding Marion County. Although there have been city-county mergers, Indianapolis's UNIGOV was the only consolidation to occur in the U. S. without a popular referendum

***High note** of the year for jazz lovers, the Indiana Avenue Jazz Festival is held at the old Madame Walker Theatre building, now restored as an urban life center. The city's "Naptown sound" was born in nightclubs that once lined the historic avenue.*

since the creation of Greater New York City in 1898. Indianapolis's population immediately jumped from 485,000 to 745,000, its size from 82 square miles to 369. Although zoning, planning, health, parks, and capital improvements are all handled countywide, the original townships maintain separate school systems and their own ambulance and fire departments. Democrats, who had a majority in the old city, now hold just six of 29 seats on the consolidated city-county council.

"UNIGOV gave the Republicans complete domination over the county," said Elton H. Geshwiler, Democratic mayor of Beech Grove, one of four Marion County municipalities that did not become part of Indianapolis. "It also cut the voting strength of blacks—who now make up about 20 percent of the population—in half."

Control over the county is one thing. But the Republicans stretched the perimeters of their power. They began conducting city-county business in private party caucuses, excluding Democrats and the press, and local reporters balked. Indianapolis Newspapers, Inc., filed a lawsuit last November and obtained a court order to get public business back into public forums.

Whether UNIGOV is a more efficient form of government is an open question. The 56 tax districts in Indianapolis send out 101 combinations of tax bills. But opponents and proponents of UNIGOV agree that the reform has acted as a catalyst for the city's development.

"In the past, the business community had little confidence in elected officials and didn't invest in the city," said Michael Carroll, the former director of metropolitan development, now with the Lilly Endowment. "But Lugar was a businessman. They liked him. Things began to happen."

At the same time, the Lilly Endowment, established 50 years ago by the family of Col. Eli Lilly, founder of the pharmaceutical giant, was reevaluating its grant programs. The 1969 tax act had mandated that foundations had to give away a certain percentage of their assets each year.

"When the law took effect in the early '70s, we had to increase our yearly grants from five or six million dollars to more than 20 million dollars," said Thomas H. Lake, chairman of the Lilly Endowment. "Mr. Eli [Colonel Lilly's grandson] was concerned about where the city was going and wanted to do something about it."

Indianapolis was where the Lilly family had made its fortune. Eli Lilly, a Civil War veteran, founded a small pharmaceutical

plant on the city's south side in 1876. It was the day of the traveling pitchmen and miracle cure-alls, and the colonel, wisely, decided to manufacture only products used by physicians. The company, which was carried on by the colonel's sons and grandsons, became one of the first pharmaceutical firms to mass-produce insulin and penicillin and, in the 1950s, supplied over half the Salk polio vaccine. Today Lilly is Indianapolis's only Fortune 500 company, with profits last year of more than half a billion dollars and 29,000 employees worldwide.

The endowment, with assets of 1.9 billion dollars, thus became a partner with the city in redevelopment. It took risks that neither the public nor the private sector had been willing to take. Although support for capital projects is viewed critically in the foundation world, Tom Lake and endowment president James Morris embraced the idea of creating a sports image for the city and provided the vital seed money for the new facilities, including 25 million dollars for the Hoosier Dome and 11 million dollars for the Indiana University natatorium.

PEOPLE ARE BEGINNING TO CALL the east side of Indianapolis along Shadeland Avenue "Memory Lane." Western Electric, the mainstay of the east-side economy that once employed 8,000 people, closed in 1985, a victim of the AT&T divestiture. Chrysler and RCA-Ariola have both announced that they will be shutting down operations here.

"People say they don't care if a plant closes, but when it does close, they care," said Frank Harris, 46, a forklift operator who has worked for Chrysler for 24 years. Most of the plant's remaining 850 employees manufacture parts for rear-drive cars whose production has been cut back by Chrysler.

Although Harris has a diploma, he is taking a high-school-equivalency course to brush up on his math in case Chrysler can't place him in another plant and he has to change fields. When the plant folds, he will receive almost full pay, $28,000, for two years.

"It's alarming to think about having to scratch at this point in my life," he said, "but I know I'll find something."

His wife, Evelyn, 37, a warehouser for RCA, received her notice just a few weeks before her husband. She has loaded record jackets for most of her 20 years with the company and will get only 20 weeks' pay at half salary. Knowing that vinyl-record sales were down and the plant, which employs about 1,000, was in trouble, she began studying to become a real estate agent last fall.

"I help him when he gets down," she said, "and he helps me when I'm down. We just don't let ourselves get depressed."

On the other side of town the 5,600 employees at General Motors' Detroit Diesel Allison plant are also worried. Although the plant, the world's largest manufacturer of heavy-duty transmissions for trucks and buses, had a very good year, its future is uncertain. GM has decided to build its new transmissions elsewhere, because unions here would not agree to changing the plant's job classification system and cutting 1,700 jobs. In 1982 GM laid off 2,000 workers from the plant.

Visiting the enormous Tenth Street facility, I stopped by a rest station in the machine shop. Men in overalls, hands blackened with grease, were sitting at plastic tables drinking coffee.

Joe Miller, a 32-year-old machinist, spends two nights a week studying engineering. "At least I have something to go to . . . afterward," he said.

"I don't know what I'll do," said Tim Fout, 33. "The only thing I know is I don't want my son working here."

To many workers the downtown development is like a mirage in the desert.

"Who are they bringing the city back for? Not us," said Ted French, 42, a job setter. "I pay a tax on restaurant food and beverages in the city to help finance the Hoosier Dome, but I've never been in it."

WHILE DOWNTOWN INDIANAPOLIS is humming with new construction on practically every corner, there are pockets north and east of Monument Circle that look like ghost towns. Boarded-up cottages with overgrown front yards. Wrecks of homes condemned by the city, some with families still living in them, too poor to fix them up.

"We have spent a lot of money on the Hoosier Dome *(Continued on page 250)*

W. 10TH ST.

Indiana University Medical Center

Wishard Memorial Hospital

J. W. Riley Hospital for Children

INDIANA AVE.

MICHIGAN ST.

Indiana University-Purdue University at Indianapolis

NEW YORK ST.

PA

I.U. Natatorium

Track & Field Stadium

White River

Indianapolis Zoo (under construction)

White River State Park (future)

Indiana State Museum (future)

Building Use

Present / Future

- Sports facilities
- Government/public
- University/education
- Health/medical
- Major commercial site

PA Pan Am Games site

0 1200 ft.
0 400 m

NGS CARTOGRAPHIC DIVISION
DESIGN: DAVID E. CHANDLER, RESEARCH: MICHAEL A. NICOLAS
PRODUCTION: BARBARA CARRIGAN, RAMSEY MURRAY; MAP EDITOR: SUE PLATTE

BOONE CO.

HAMILTON CO.

URBAN

Eagle Creek Park

Indianapolis Motor Speedway

Speedway

Fort Benjamin Harrison Military Reservation

Geist Reservoir

Lawrence

Shadeland Ave.

Indianapolis-Marion County

Enlarged Above

Beech Grove

Indianapolis International Airport

Southport

FARMLAND

HENDRICKS CO.

HANCOCK COUNTY

SHELBY CO.

White R.

MORGAN CO.

JOHNSON CO.

0 4 km
0 4 mi

Indianapolis INDIANA

THE GUNG HO LEADERS of Indianapolis have much in common with the city's founding fathers, who staked out the mile-square down-

town in 1821 to give Indiana a centralized capital, with hopes of profiting from the great westward migration. The plan succeeded in 1825, when boosters persuaded Congress to run the National Road (now U. S. Route 40) through the city, instead of 15 miles to the south. Later, railroads enhanced Indy's role as a regional transportation hub, which drew automakers and other factories in the early 20th century.

Another key move came in 1970, when the city expanded to include most of Marion County (inset), giving Indianapolis a broader tax base and spur for development. Since then the city of 721,000 has embarked on a spree of building and renovation, creating new landmarks such as the Hoosier Dome and Market Square Arena downtown and the expanding university medical and athletic facilities to the west.

"We're the ones getting left behind," *says Dee Jones, at far left, decrying the city's neglect of its poorer sections. On the streets of her east-side neighborhood "drugs are up, guns are up, runaways are up," and indoors things are just as bad. "That place was a firetrap," Ms. Jones says of the duplex at left, which she recently*

vacated. "I saw sparks when the cat walked behind the dryer, and I got my kids out of there!" Experts estimate that there are 33,000 substandard housing units in Indianapolis neighborhoods, many unfit to live in and too costly to repair. "You can't bring out the best in people when they're living in the pits," says Jones.

Give a Hoosier kid a ball and something to shoot at—even a milk box nailed to a telephone pole—and you'll see one of Indiana's most popular pastimes. Homegrown basketball talents perfect their moves in places like the south-side Indianapolis neighborhood where Michael Clark, 12 (in Pacers T-shirt), and his friends dream of the big time.

Movers and shakers *cross paths often at the Columbia Club* ***(right)****, organized by city Republicans in 1888 to help boost Indiana lawyer Benjamin Harrison into the White House. "Anything of importance in this town starts right here," boasts a member. "It's almost a law."*

It practically became one in 1970, when the consolidation of Indianapolis and most of Marion County brought into the city the heavily Republican suburbs and adjacent farms ***(above)****, giving the GOP a majority and a powerful consensus for civic action. "Things get done quickly and smoothly around here because there's no dissent," complains a local columnist. "The rest of us kind of feel like spectators."*

(Continued from page 241) and downtown commercial development," said Judge David Jester. "Now it's time we did something about our housing problem."

Judge Jester sits on the city's environmental court, which handles housing violations of the health code. He estimates that there are 6,000 houses in Indianapolis with such major structural defects that they are health hazards to the people living in them. They would require an average of $11,000 each to be brought up to code. The city currently has no housing rehabilitation programs.

Putting a damper *on taxes, former city fireman Carl Moldthan became a populist hero in 1985 by soundly defeating, through a petition drive, the mayor's plan to raise 40 million dollars for projects related to the Pan Am Games—18 million of it to subsidize construction of privately owned apartments to house the athletes. "A lot of people are fed up with paying welfare for big developers," says Moldthan, an independent candidate for mayor in November's election.*

"I have 40 cases on my desk right now that I'm not processing," said Judge Jester, tossing up his hands. "How can I order people to do something they are not able to do?"

Frustrated by the lack of community resources to ease his caseload, Jester decided to do something about it himself. He formed a committee to fix up five badly run-down houses. Building supply firms, contractors, and trade unions responded generously. In Indianapolis it seems unpatriotic not to be civic-minded. But it was clear to Jester that charity alone would not solve the problem.

"We have got to build more low-income housing," said Sam Jones, head of the Urban League, "as we must retrain workers displaced in our changing economy. Unfortunately, when it comes to the human side, our Cinderella City image doesn't shine so brightly."

The city's education system, which is heavily dependent on state financing, is also troubled. For 18 years the state legislature vigorously pursued a policy of cutting and freezing taxes, and public schools in Indianapolis and throughout the state continually came up with the short end of the stick, slipping below national norms in one standard after another.

Indiana now ranks 33rd in the nation in terms of educational expenditure per student. Students' average Scholastic Aptitude Test scores are low (47th in the U. S.), and as many as a third of the freshmen entering Indiana colleges need to take remedial courses.

"Education has never been highly regarded here because, even if you didn't finish high school, you could get a good job on an automobile assembly line," said Carlyn Johnson, a professor at IU's School of Public and Environmental Affairs. "The economy of the Rustbelt has changed, and manufacturing jobs are no longer available. Attitudes about education are slow to change."

In the past it has been hard to get public approval to raise taxes to improve public education. But last April the Indiana General Assembly passed a hotly debated 454-million-dollar education reform package proposed by Governor Robert D. Orr. It includes provisions to lengthen the school year and require students to pass a new standardized test before being promoted.

The Lilly Endowment has also announced new initiatives in education to mark its 50th anniversary. It has set up a 50-million-dollar scholarship program to aid Indiana college students and earmarked another 24 million dollars in grants to private Indiana colleges and traditionally black U. S. institutions.

LESTER THUROW, an economist at the Massachusetts Institute of Technology and the author of *The Zero Sum Solution*, is not a great believer in the trickle-down theory of economic development. "I'm not sure," he said, "that in a city like Indianapolis average citizens will ever get back more than what they have paid in local taxes to build these expensive sports and entertainment facilities."

Whether or not manufacturing returns to the city or it succeeds as a sports mecca, Thurow believes Indianapolis has a strong economic base in its booming medical-service center—source of a 40-million-dollar boost to the city's economy each year.

The Indiana University Medical Center complex in downtown Indianapolis, which includes six hospitals, 90 clinics, and schools of nursing, dentistry, and medicine, is, in fact, one of the country's largest medical complexes. It has a cancer-research center that has pioneered a cure for testicular cancer and the James Whitcomb Riley Hospital for Children, which specializes in family-oriented care for critically ill children.

I visited Riley's special Parent Care Pavilion one afternoon and found nurse Lorna Girod looking over the chart of a six-week-old boy with a birth defect called Pierre Robin syndrome. A small jaw and cleft palate made it difficult for him to swallow, and he was in constant danger of choking on his tongue. Ten years ago the prognosis for such children was bleak, but now mothers like Melissa Dodd of Russiaville, Indiana, come to Riley to learn how to care for their babies.

"Mrs. Dodd hasn't been with us very long," said the nurse. "She is just 21—and she has a learning disability. It's about feeding time. I'm going to see how she's doing."

We found Mrs. Dodd standing by the crib in her room, fastening tiny hand restraints on her baby in preparation for the feeding.

"You're just a little monkey, aren't you?" she said, as the baby squirmed. "This isn't going to take very long, Joey."

Carefully and gently she placed a narrow, plastic feeding tube down the baby's nose and throat and connected it to a container with formula.

"Did you check the placement of the tube?" asked the nurse.

"It's OK," Mrs. Dodd said matter-of-factly. "If it had gone down the trachea, he'd be turning blue. . . ."

"Are you going to teach your mother how to do this so she can help you with the feedings?" asked the nurse.

"I know I learn . . . slowly," she said, "but I'll manage."

At that point, seeing that Mrs. Dodd was doing fine, Lorna Girod left the room. It was 6 p. m., and she was off duty. The baby's records were sent down to the emergency room, where help was available, but Mrs. Dodd and the other parents in the unit were left alone at night to care for their children.

"I was pretty nervous yesterday when I did this for the first time," she told me when we were alone. "He threw up everything, poor baby. I think I gave him too much formula. Three ounces. Tonight, I'm trying two and a half ounces."

Suddenly a monitor the baby was wearing on his chest sounded an alarm. He had stopped breathing.

"My God!" I gasped. I felt my pulse racing. Where was the nurse?

Calmly, Mrs. Dodd shook her tiny baby, waking him up. She knew how to resuscitate him, if necessary, but the baby started breathing normally again.

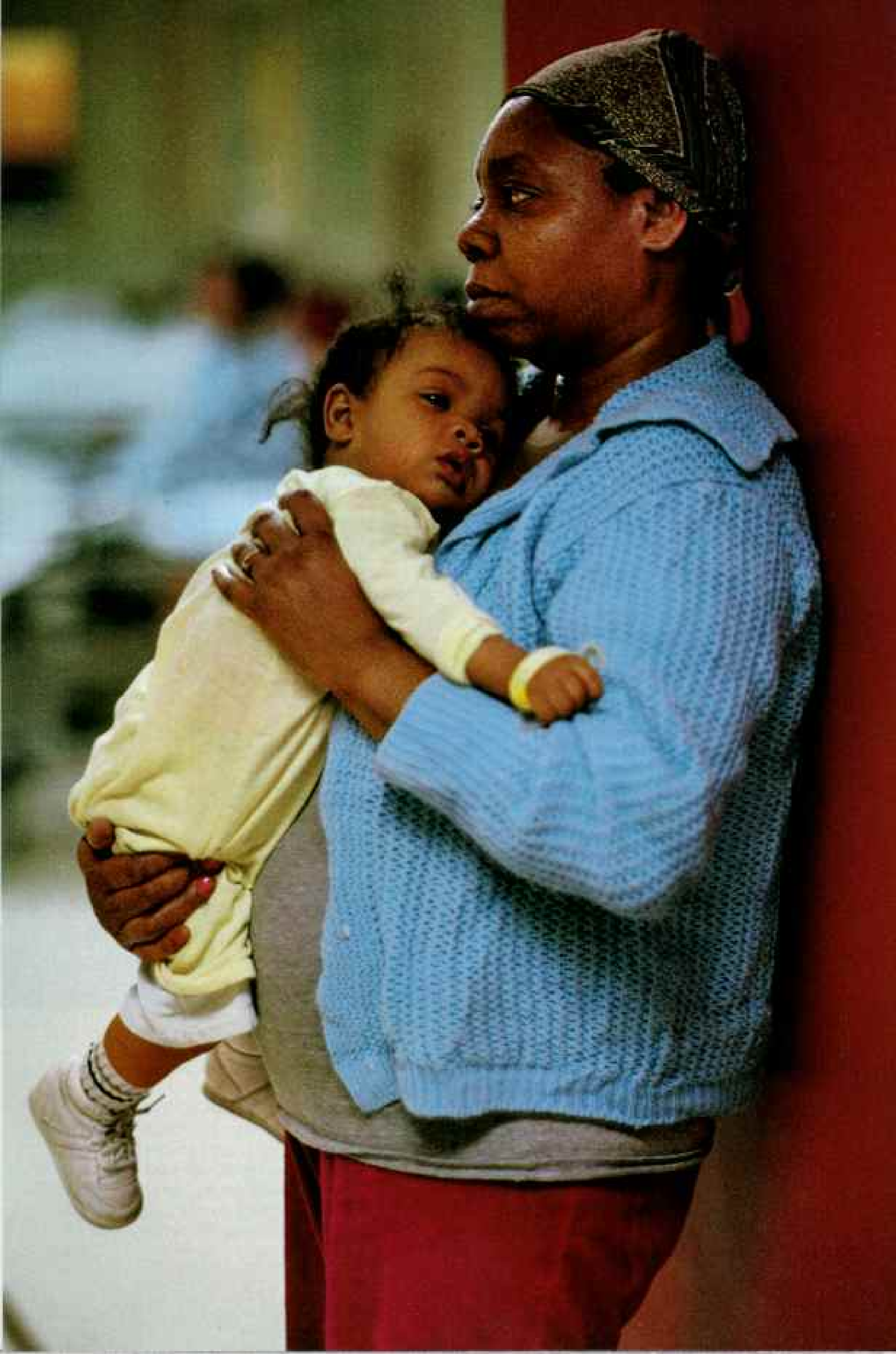
"Now, now," she said, "I'm sorry to wake you . . . if you'd keep breathing, that wouldn't happen. What am I going to do with you, little monkey?"

The baby fell asleep again, closing his fist around his mother's finger. It seemed as if he was reaching out *(Continued on page 258)*

"**Soul of the enterprise**" *to descendants of founder Eli Lilly, research is also big business to the giant pharmaceutical firm that bears his name. The company, based in downtown Indianapolis, spends more than a million dollars a day researching new formulas for the marketplace; only one in 8,000 ever makes it as far as the synthetic insulin rolling off the sterilized assembly line (***right***). Of Lilly's 29,000 employees, one in seven works in research.*

*Across town the Indiana University Medical Center (IUMC) complex includes the university's medical school, six hospitals, and 90 clinics. Nurses at the James Whitcomb Riley Hospital for Children (***below***), a leader in innovative pediatric surgery, undergo special training in bedside manner for kids. Another of the medical center's facilities, Wishard Memorial Hospital, provides emergency room service to the community (***facing page***). Despite the care available at IUMC, Indianapolis suffers the highest rate of black infant mortality of any major city in the nation—a statistic professionals blame on a combination of poor prenatal treatment and a lack of education in infant care, particularly among teenage mothers.*

On the economic front, city leaders hope the presence of Lilly and the sophisticated IUMC facilities will act as a magnet for growth in medical technology and related fields.



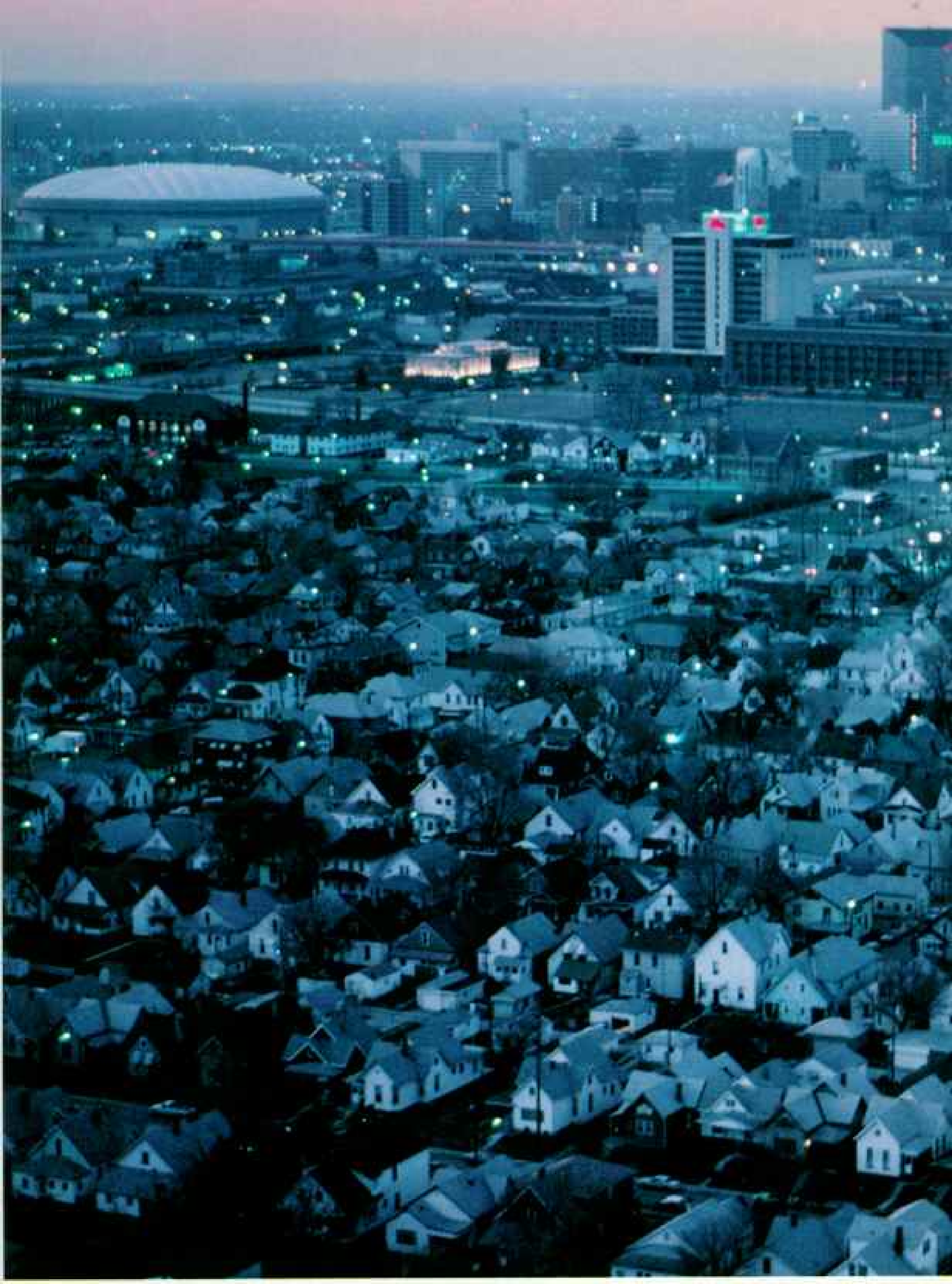
"**The Greatest Race Course** *in the World," the Indianapolis Motor Speedway proudly calls itself. This helicopter view of the 71st running of the Indianapolis 500 encompasses the two-and-a-half-mile track and the stands and infield packed with 400,000 spectators—one of the world's best attended sports events every year. The 1987 classic was marred by the death of a spectator—the first since 1960—who was struck in the head by a wheel that flew off a race car.*

*Infield revelers at both the time trials in early May (***right***) and at the Memorial Day weekend race keep police busy in a city noted for its low crime rate; this young man was restrained after a fight. On race day some 70 were arrested for*

JOSE AZEL (ABOVE)

public intoxication or disorderly conduct.

The winner of the 200-lap classic—for the fourth time—was veteran Al Unser, Sr. His average speed was 162.175 mph, considerably slower than the 170.722 record of Bobby Rahal in 1986. Twenty-five accidents during the month of practices and time trials may account for the reduced speed at this year's contest.



Indianapolis rising *forms a glittering backdrop for working-class neighborhoods south of the city's heart. One returning Hoosier exclaimed, "My God, they moved a whole city in here while I was gone!" Will Indianapolis be able to replace lost factory*

jobs with solid economic gains? Indiana University economist Morton J. Marcus is cautiously optimistic. "I don't see a program for sustained growth in Indianapolis, but I do see lots of good things, lots of potential. I'd say we're getting there."

(Continued from page 251)

for some of her enormous strength and courage.

Mrs. Dodd napped through the night between feedings. After a few days the hospital let her take the baby home for the first time.

IN THE 1960s the area around Indiana University Medical Center near the White River was a ghetto of tenements and dirt-floor cottages. Historically the malaria-infested riverbank was the least desirable neighborhood in the city. Desegregation had enabled many of the black families to move, but some were forced out of the blighted area to make room for an expanded university complex. Indiana University-Purdue University at Indianapolis, or IUPUI, opened in 1969 and today has 23,000 students.

Fortunately for jazz lovers, the frenzied urban renewal stopped just short of Indiana Avenue, which has been called the Bourbon Street of the Midwest. Nightclubs like the Cotton Club and George's Bar lined the street from the 1930s to the early '50s, featuring such musicians as Duke Ellington, Count Basie, Lionel Hampton, Cab Calloway, and Hoagy Carmichael. The avenue produced the great jazz guitarist Wes Montgomery, who created the "Naptown sound," Indianapolis's own style of jazz.

"When I first met Wes, he was just a kid who'd never picked up a guitar," said Erroll Grandy, a blind piano player who's called the godfather of Indianapolis jazz. He has helped many young musicians.

"Wes developed this way of playing the melody in octaves, plucking the string with his thumb. All solo jazz

"World class" *is a term used frequently as the city prepares to host 4,500 athletes from 38 countries competing in the Pan American Games. It certainly applies to the Natatorium, billed as the world's fastest swimming facility because of its unique wave-reduction system. Since 1971 the city has spent some 180 million dollars on state-of-the-art sports facilities, 50 million coming from the Lilly Endowment, a strong supporter of the city's emphasis on sports as a key to the economic future.*

guitarists use the technique now. *That's* Naptown sound."

We were sitting in The Place to Start on the city's north side with guitarist John Fish and saxophonists Jimmy Coe and Pookie Johnson. Here, you can get a meal of ribs or fried catfish for four dollars and listen to jazz late into the night.

"Jazz is coming back here," said Pookie. "No doubt. There's the Chatterbox, the City Tap Room, Rick's Café, and jazz Friday nights at the ballroom of the old Walker building on Indiana Avenue."

The renovation of the Madame C. J. Walker Center, thanks in part to five million dollars in Lilly grants, was an important symbol to the black community that they were not being left out of the new Indianapolis. The large six-story brick building had been the headquarters of a multimillion-dollar beauty business, founded here in 1910 by the enterprising Madame Walker.

An orphaned child, born in a slave cabin in Louisiana, Madame Walker made her fortune selling special hair ointments and a pressing comb that straightened black women's hair. In the 1930s the building was the focal point for the black community in Indianapolis, and Kenneth Morgan, the center's current director, hopes it can be again.

"We'd like to see the boarded-up buildings around us restored to bring Indiana Avenue back to life," he said.

YOU ARE NEVER FAR from the country in Indianapolis. From red barns anchored in green waves of new corn and the smell of turned earth. Like a youngster growing into a new pair of shoes, the city doesn't quite fit into its larger boundaries.

It is not unusual to see a rabbit downtown scampering up the bank of the White River. Eagle Creek, one of the country's largest municipal parks, where many of the Pan Am events will be held, has a deer problem. Two herds, about 140 deer, have been eating the yew trees in the new housing developments bordering the park. Thirty percent of the city's 236,000 acres are still tillable.

"We're late getting the beans in . . . *never* seen a May with this much rain," muttered Murray Mills, a lean, red-faced man in his 50s. "Still, plenty to do 'round here."

Mills and his three brothers farm 3,000 acres in southwest Indianapolis and Hendricks County. They harvest corn, wheat, and soybeans. They also have 4,500 hogs, 250 milking cows, a dairy, and a bakery.

When I visited them one Saturday, the fields were too muddy to work. Murray's sons and nephews were repairing machinery. His father, Howard S. Mills, 88, a tall, strong man in well-worn overalls, was feeding the calves. Every year Indianapolis farmers sell off land, and neat rows of split-level homes are sprouting all around the Millses' properties.

"We're just seven miles from downtown Indianapolis," said Murray, "which means we don't have to keep an inventory of parts, and we're near the big grain terminals. . . .

"The problem now is that some of my new neighbors complain about the odors from the hog barns. And, recently, a friend of mine lost nine cows. They just went wanderin' off down Highway 67, messin' up traffic. It took him three days to get 'em in."

ON THE BANK of the White River, bulldozers are working furiously. They are leveling land for one of the entrepreneurial city's ambitious development schemes—a 200-million-dollar state park that will include a zoo, a museum, and an amusement center. The focal point of the park will be a 750-foot tower that will dwarf Indiana's tallest buildings.

Architect Cesar Pelli, who designed the tower, calls it a "marker for the plains" and believes it will become an international tourist attraction like Paris's Eiffel Tower. A 1.75-mile-long walkway will spiral to the top, where visitors will have a 40-mile panoramic view of the surrounding countryside.

The 25-million-dollar tower has gotten a mixed reception in Indianapolis. Some people, conscious of their rural roots, say it would be an embarrassment: To them, it looks like a great big corncob.

From a distance now, the skyline of Indianapolis rises up dramatically from the farmland. The high-rise office buildings peer over the smokestacks, and the domed stadium reflects the sun like a giant mushroom. A new city is replacing an old. There is already a marker for the plains. Indianapolis. □

Giants of the Wilderness:

By VICTOR VAN BALLENBERGHE Photographs by MICHIO HOSHINO

Alaskan Moose

Majestic in early morning mist, a bull moose in Alaska's Denali National Park approaches a possible mate after catching her scent. Late September and early October mark the peak of the breeding season.

Mother Moose *and her twin calves enjoy a meal beneath massive Mount McKinley. Voracious eaters, adult moose can dispose of some 40 to 60 pounds of forage daily—*

preferably willow shoots—with the aid of their four-chambered stomachs. Moose often feed in ponds, ducking to the bottom for sodium-rich plants.

As autumn comes to south-central Alaska, frost-filled mornings turn the tundra red and sandhill cranes form wide V's as they ride the winds south. Mount McKinley, loftiest peak in North America, raises its glistening head and snow-draped shoulders in the crisp, clean air to survey a vast realm of glacier, ridge, forest, lake, and valley—9,000 square miles of this wilderness in Denali National Park and Preserve at its foot.

At timberline on a hillside a bull moose with majestic antlers strides among his dozen cows. He sniffs for chemical signs of estrus that signal readiness to breed.

Four hundred yards below, another bull approaches, attracted by the wavering moans of cows. He listens, watches intently, and tries to gauge the size of his opponent.

At two hundred yards the resident bull sees the intruder, studies him briefly, then moves downhill to challenge him.

Each bull slowly walks forward, not directly toward the other but at a slight angle, tipping his head from side to side to display antlers. At ten yards, with eyes bulging and ears back, each pauses to rake a willow bush with his antlers.

Suddenly the resident bull lunges forward. The two clash antlers, each trying to push the other back. But they are evenly matched, and that round quickly ends. For ten minutes the bulls repeatedly brandish their antlers, thrash the bushes, and clash. Finally the intruder, pushed back, whirls and runs off. Stalking from the arena of scarred earth and broken spruce limbs, the victorious bull returns to his cows.

An awesome beast, a bull moose may weigh 1,600 pounds, stand seven feet tall at the grotesquely muscular shoulders and neck, and raise 70-pound antlers that spread seven feet—among the most impressive structures grown by mammals. Little wonder that "the sight of moose among the spruces" inspired in pioneer naturalist Charles Sheldon, who explored here in the early 1900s, "the consciousness of the presence of a noble form of wild life." He also experienced a primitive aura of mystery about the moose, "evoking a sense of creatures of the long past."

When Sheldon wrote, he didn't know what later scientists would discover: that moose are the archetypal Ice Age mammal whose ancestors evolved toward being giants adorned with large, complex weapons for combat. For animals faced with the harshest of winter climates, massive bodies made sense to store the large amounts of energy necessary to survive winter and conserve heat. And food resources made gigantism possible. Shrubs that flourished in the rich, moist soils left by glacial retreat provided the protein-rich plant tissue that accelerated body growth. Feeding on willows growing unshaded by trees in the long subarctic summer days, moose became the world's largest, most powerful deer.

Four subspecies of North American moose today roam the forests of spruce, fir, birch, and aspen extending from northern

Homing in on his subject *in Denali National Park, author Victor Van Ballenberghe, a biologist with the United States Forest Service, uses a tracking antenna to locate a radio-collared moose, one of many studied during his 20 years of research.*

Alaskan moose
(*Alces alces gigas*)

LARGEST MEMBERS of the deer family, moose—known as elk in the Old World—first arrived in Alaska from Asia during the Ice Age. Alaskan moose are the biggest subspecies, weighing as much as 1,600 pounds and standing seven feet at the shoulder. Widely distributed in Alaska, they are also found in northwest Canada. Their preferred habitat is second-growth birch forests, timberline plateaus, and areas along major rivers of south-central and interior Alaska. They most commonly live at densities of one to two moose per square mile. Alaska boasts a healthy population of 144,000 to 160,000, amid controversies over hunting regulations and heavy predation by wolves and bears.

Utah toward the Arctic Ocean, from Newfoundland to western Alaska. The largest of these, *Alces alces gigas*—commonly called the Alaskan moose—grows antlers nearly twice as massive as those of the Shiras moose, a smaller-bodied race living in the southern Rockies.

In Alaska's glory days of hunting, in the 1950s and '60s, abundant Alaskan moose met the demands of resident sportsmen and out-of-state trophy hunters as well as the native Indians and wilderness predators that fed on them. Today wolves, bears, and humans of strongly opposed convictions compete for fewer numbers, placing the Alaskan moose at the center of bitter controversy in the legislature, courts, press, and on the street corner.

THE SEASONAL NATURE of their environment dominates the lives of moose. Predictable patterns vary little from year to year. From early June, when shrub foliage springs forth, feeding engrosses them. Still lean from winter (a bull of 1,500 pounds in September may lose 300 pounds by April), with incomplete antlers and shedding coats, they devote themselves to three activities: feeding, resting, and traveling between feeding sites. Rarely do they engage in social behavior. To interact with other moose is a waste of valuable feeding time—10 to 12 hours a day in which a large bull may eat as much as 60 pounds of leaves and twigs.

Bull moose go through "puberty" not once like humans but annually like all species of deer. For most of the year their reproductive systems are turned off, making them incapable of mating. Indeed, mature bulls in winter seek the company of other mature bulls, far removed from younger bulls, cows, and calves. Each winter, after the rut, bulls shed their antlers. In spring, antler growth begins in response to lengthening daylight. This signals increased activity in a bull's endocrine system, which controls his cycle of weight gain, reproductive physiology, and antler development. As a young bull ages, he grows progressively larger antlers.

Victor Van Ballenberghe moved to Alaska in 1974 to further his research on moose and wolves. **Michio Hoshino** has traveled yearly from his native Japan since 1978 to photograph Alaskan wildlife.

September marks the high point of the annual cycle. Early frosts have killed the hordes of mosquitoes and flies that plague the north in summer. Deep snow has yet to arrive—moose still have freedom to travel from spruce bogs and river floodplains to mountaintops. For three months lush green forage has abounded. Fat has been stored, protein replenished, hair coats have been replaced, new antlers grown, and calves weaned. In September, bulls shed their antler velvet and start showing keen interest in cows, which they attract with a series of low grunts. During one brief period each year, gathering in groups of 10 to 30, moose engage in complex social behavior for the sole purpose of reproduction.

DURING MY SEVEN YEARS of moose research in Denali National Park I have seen many spectacles of nature, but few as exciting as a fight between two bull moose. Such battles determine which bulls breed. Losers not only fail to spread their genes but also may be killed outright or die slowly from their wounds.

Moose antlers are well designed for fighting. Their wide palms and brow tines serve as shields to catch an opponent's antlers. The geometry of antler design aims the longest, strongest tines forward as a bull lowers his head. Antlers are bone but are not inflexible. Fights subject them to enormous stress, absorbed in part by a spongy honeycombed core inside a dense, compact outer layer of bone. Some antlers have narrower palms, shorter points, less developed brow tines. Other bulls grow large but weak antlers that break during fights. That was bull number 55's problem, and his fight with a bull known as Scarface gave me new understanding of why moose go about their yearlong activities with such seriousness.

Head-on combat *erupts during the fall rutting season as bulls vie for dominance and the right to breed with a particular group of cows. Such violent clashes follow lengthy posturing and maneuvering for position. The weaker bull usually retreats before being gored, ceding his mating rights to the victor. The cows typically pay no attention to these aggressive displays.*

In 1981 number 55, named for the frequency of the radio collar we had fastened on him the previous year, became large and aggressive enough to challenge dominant bulls. My assistant Dale Miquelle watched 55 defeat two rivals in mid-September prior to the peak of rutting. Each time 55 broke portions of his left antler. One night he challenged Scarface, a young but experienced fighter, and broke his left antler completely.

"There's a lot of 55's blood in the snow, and Scarface's antlers are stained from the goring," Dale told me next morning. A week later 55 lay dead. He had gambled his reproductive future and lost.

It struck me that calcium and phosphorus might be the key. Perhaps 55 had been less efficient than other bulls in finding and utilizing the great amounts of these elements that build strong antlers. Thus the outcome of the serious business of rutting depends as much on what happens in summer when body and antler growth occur as in September when bulls fight and court and breed.

IN DENALI NATIONAL PARK, unlike much of Alaska, moose are protected from sport hunters. September is traditionally the month to hunt moose, and Alaskans take this seriously. With only 500,000 people Alaska surely has proportionately more moose hunters than any other state—one in 80 Alaskans reported legally taking a moose in 1985-86. That figure represents a lot of moose meat—more than 3.5 million pounds of it—in freezers and on tables throughout the state. And good meat it is, without the strong gaminess of caribou or the too sweet richness of Dall sheep or the fat of beef.

Moose are seldom found in high densities. Few places support more than two moose per square mile; some have only one in five square miles. So, to get where the animals are, moose hunters go in by airplane, boat, and all-terrain vehicle, as well as on horseback or by foot. Despite Alaska's vastness and its limited road system, few places are inaccessible.

A moose hunt is a mixture of adventure, wilderness appreciation, satisfaction of primal instincts, and plain hard work. September's weather in the north can range from radiant fall days to cold drenching rain. In the northern spruce forest, hunters commonly encounter caribou, grizzlies, wolves, beavers, ravens, and countless smaller creatures. They also gain memories of quivering yellow aspen leaves, moose and grizzly

Biding his time, *a patient bull keeps watch over a herd of cows (**left**), waiting for them to come into estrus and accept his advances. Normally solitary in summer, cows band together during the rut. They rebuff premature attempts at mating, though the occasional nuzzle (**above left**) is permitted. They resist being herded and move about as they please, closely followed by their attendant bull.*

Crowned with velvet, *a mature bull moose's antlers* ***(right)*** *will shed their protective skin by summer's end. Ribbons of velvet hang bloodily from the tines* ***(top)*** *until the antlers are stripped bare; these bulls spar as a warm-up to breeding battles. Tinged red with residual blood after the shedding* ***(above)****, the antlers will soon darken to a rich brown. Each winter the antlers are shed; new growth begins in the spring as part of the annual reproductive cycle and is completed by midsummer. The rack on a trophy bull may span seven feet and weigh 70 pounds.*

Giants of the Wilderness: Alaskan Moose

Irritable and edgy before breeding, cows periodically lash out at each other, reacting aggressively

tracks on river bars, the howl of wolves, glistening new ice on lake margins.

Twenty or thirty years ago moose numbered many more than now. Caribou too. In the Nelchina basin, a 20,000-square-mile tract within easy driving distance of Anchorage—home to about half of the state's people—the resident caribou herd peaked above 80,000 in 1964. The moose numbered about 30,000. To increase the take, wildlife managers alerted hunters by radio when migrating caribou neared roads.

But high populations seldom endure. Within eight years the caribou declined by 90 percent, the moose by half. Recovery has been slow. The area now supports about 29,000 of each. Meanwhile, hunters have increased faster than either animal. Today a hunter in the Nelchina basin has only about one chance in four of shooting a moose.

Hunters who remember the halcyon days wonder why they did not persist. Was it the severe winters of the mid-1960s and early '70s? Did the moose reach such high levels

to the social tensions of being in a group. Fights between females are brief and usually victimless.

that they depleted their food supply? Did hunters take too many moose? Was it the wolves? Or the bears?

THROUGHOUT much of the north, moose share their range with grizzly bears. In Denali grizzlies are plentiful, though they are smaller than their coastal cousins, who feed on migrating salmon. Roots, soapberries, blueberries, and ground squirrels cannot compensate for the fat- and protein-rich salmon, and the bears of the interior do not eat enough during their six months each year out of the den to exceed 550 pounds.

But a 550-pound bear is big enough to kill even the largest bull moose. A moose named Whitey taught me that in 1982. We collared Whitey, the largest bull we could find, because my colleague, wildlife biologist Dr. James Peek from the University of Idaho, was trying to determine if dominant bulls select better foraging habitats in winter than their subordinates. Some travel 20 to 40

***Storming to the rescue,** a cow rushes to confront a hungry grizzly **(below)** that barreled out of the bush in pursuit of her calf **(left)** as she was browsing nearby. Without her intervention **(right)** the four-week-old calf would have joined grim statistics: Of a hundred calves born each spring in eastern Denali National Park, 85 to 90 die by autumn. Many succumb to bears, the rest to wolves or natural accidents. While a mature moose can outrun a bear or occasionally repel one with antlers, a calf has no defenses, though it can swim from birth and will take to water when in danger. Staying close to mother—preferably right underneath her—offers the best chance for survival.*

Split-second timing *by Athapaskan Indian Don Stevens* ***(left)*** *ensures that his hefty thousand-pound prey will fall on land* ***(below)****. Strictly a subsistence hunter, Stevens is favored over urban sportsmen by a controversial hunting statute enacted in the interest of Alaska's rural residents. Opponents of the law continue to wage battle in court.*

miles between summer and winter ranges.

Whitey was young but large, with magnificent antlers, and in his prime in mid-September. So was a large dark male grizzly that roamed the upper Savage River, where Whitey liked to spend the rut. A photographer who had seen the bear there over the years told me: "Old Joe likes to hunt bull moose each September before he dens."

When Whitey's radio signal didn't move for several days, Jim Peek and his assistant and I hiked in through three miles of dense birch to see why. "I hope Whitey is alive," I remarked, without much conviction.

I have homed in on radio collars thousands of times since I collared my first moose in 1968, but I still have trouble estimating distance by signal strengths. As we trudged through a willow bottom, I thought we had another 300 or 400 yards to go when I looked to my right and saw a set of moose antlers under a large mound—topped by a large dark grizzly bear. Old Joe had gone hunting.

Joe easily could have added three human carcasses. Instead, he huffed as frightened bears often do and ran off. "Let's give Old Joe a few days to finish eating," I said to Jim. He was easy to convince.

Actually we know little about how bears kill adult moose. Despite their size and armament, bull moose fear bears and depend on their senses to stay far away. We have seen enough encounters to know that moose almost invariably run from bears—unlike their defensive stands against wolf packs. A grizzly must get very close to make a quick rush. Few moose survive such contact.

Bears are also efficient scavengers and often find dead moose. Perhaps only half the moose meat eaten by bears results from direct killing. Indeed, we have only circumstantial evidence that Old Joe killed Whitey.

When we revisited Whitey to collect our radio collar and some biological specimens, there wasn't much left except skull and antlers, hide, some bones, and the stench typical of bear kills. Bears rake up ground debris and vegetation to cover their kills, to minimize loss to ravens and other scavengers. Bears generally rest on or near the kill, covering and uncovering it to feed over a five- or six-day period. The mound of debris and bones remains for years.

While Old Joe and his brethren like to hunt adult moose in autumn, most moose they kill are calves, from birth in mid-May to the age of six weeks. Bears sometimes chase cows with calves through park campgrounds in full sight of busloads of tourists who have never before seen a moose or a grizzly, let alone the death of a baby moose.

Of every hundred calves born in eastern Denali in spring only 10 or 15 survive to fall. Such low survival prevents the moose

population from increasing. At best, it is now stable or declining slowly. Grizzlies also affect the proportion of bulls. Our studies indicate that bulls are more vulnerable than cows, and bears kill them at higher rates. Bulls in rut are less wary and in poorer physical condition. Cows feed throughout the rut; bulls do not, and lose 10 to 15 percent of their body weight. As a result, cows outnumber bulls about three to one. Cows also live about five years longer than bulls—20 years or more, if wolves do not get them.

IN ALASKA, as elsewhere in North America, when Europeans arrived, one of the first things they did was poison wolves. Gold-rush miners of the 1890s set out strychnine to kill wolves and trapped them in winter. Rabies and other diseases likely introduced by sled dogs also took their toll. Add to this a statewide bounty, long open seasons, and public fear and loathing of wolves. Only the country's remoteness kept them from being wiped out.

During World War II, pressure on wolves relaxed, and they increased. After the war the federal government systematically shot and poisoned wolves. In the Nelchina basin fewer than 20 survived—one wolf per thousand square miles. Some biologists cite simple cause and effect in the moose and caribou eruptions that followed.

And so in the mid-1970s, after the poisoning had stopped and wolves rebounded, many thought that wolf control was again needed to revive depressed moose populations. Biologists shot wolves from helicopters between 1976 and 1979 on the Tanana Flats, south of Fairbanks in central Alaska. A 40 percent reduction of wolves resulted in a tripling of moose by 1986. The moose hunters of Fairbanks were pleased.

Between 1975 and 1983 wolf-control programs to increase moose spread to include areas totaling some 14,000 square miles. More than 1,300 wolves were taken at a cost of $824,000. Their pelts were auctioned for as much as $500 each—recovering much of the $600 it cost to take each animal.

None of this made Wayne Hall very happy. An impassioned Anchorage resident, Hall heads the Alaska Wildlife Alliance, which persistently criticizes wolf-control programs and those who promote them. "Given continuation of current wolf control, the hysteria of the wolf haters, and the methods available to kill wolves, we are convinced wolves will soon become endangered in Alaska," Hall told the Alaska Board of Game, which regulates hunting, trapping, and predator control.

Hall speaks of "moose factories," lack of biological justification, the mistake of managing wildlife only for a "minority group" of hunters. He also alleges "subterfuge" in holding hearings on short notice and sees "hidden" wolf-control programs in liberalized wolf-trapping regulations.

"Diarrhea of emotion and constipation of fact," comments an official of the Alaska Department of Fish and Game. Nor is Hall's stand popular with Jim Rearden, biologist and former Board of Game member, a grizzled veteran of wolf controversies. "The irrefutable fact is that wolves can and will destroy herbivore prey populations to their own detriment: Wolves then face starvation," Rearden wrote. He characterizes sympathetic portrayals like Farley Mowat's *Never Cry Wolf* as fairy tales and says the balance of nature doesn't exist unless people intervene to correct wide swings in moose numbers caused, in part, by wolves.

The important battles between these opposing views, however, take place not in the press or at public hearings, but in courtrooms. The state has successfully defended all but one lawsuit brought against wolf control; that case was settled out of court.

Is Wayne Hall discouraged? "We're going to keep fighting for as long as it takes."

DESPITE WIDESPREAD trapping and hunting of wolves, moose are still failing to increase in interior Alaska. Bears are part of the problem. But bears are more difficult to control than wolves. They're one notch higher on the scale of public perception that allows aerial shooting of wolves but abhors it for bears. Control must come through letting up on hunting regulations.

More volatile than the issues of wolf and bear control is the competition of humans for the available moose. As game populations declined in the 1970s, subsistence hunters lobbied for regulations—and prevailed. A 1978 statute gave subsistence

Waste not, want not: *Don Stevens saves every scrap of his kill, preserving the freshly butchered meat in his smokehouse. Inedible moose parts have traditionally yielded clothing, bone tools, and even sewing thread from the sinews.*

hunting and fishing preference over recreational and commercial exploitation. And in 1980, when the U. S. Congress acted to preserve vast areas of Alaska as national parks, wildlife refuges, and wilderness areas, it granted a similar subsistence preference on federal lands. Former Governor Jay Hammond labeled the resultant battles as one of the most divisive issues facing the state.

"Subsistence preference is imperative for the survival of Alaska's Indians and Eskimos," one person will tell you. "It will conserve resources to sustain future nutritional and cultural needs."

"A plot to punish sport hunters," snorts another. "A conspiracy by environmentalists and indigenous residents to lock up wilderness." Public demonstrations, the state legislature, the courts, and the ballot box have all served as forums for this debate.

"The only possible thing this state can do is tell the federal government to go to hell with subsistence because it's gonna fail," sport-hunting activist Dale Bondurant told the boards of fisheries and game after passage of the 1980 Alaska Lands Act. A group called Alaskans for Equal Fishing and Hunting Rights tried to do just that, seeking repeal of the subsistence preference in the 1978 state law. But Alaska's voters defeated the initiative by a significant margin.

Further court cases addressed the issue of whether to base subsistence preference on need rather than rural residency and traditional patterns of hunting or fishing for food.

"What is traditional about expensive snow machines, sophisticated bush aircraft, and fast-moving riverboats?" asked Jim Greiner, a Fairbanks hunter and columnist. The hunting industry supports some urban

Ever on the alert *for sounds of danger, a cow nurses one of her four-week-old twins amid protective trees and brush. A calf will remain close to its mother until she gives birth again, when the youngster will be ousted to fend for itself.*

residents too. Tested four times in nine years by the legislature or voters, the issue has been decided consistently: Urban residents do not qualify for subsistence preference.

In the only state where entire communities still exist largely on nature's bounty, the furor and fray will continue as long as demand for wild resources exceeds supply. Money, power, emotional pleas, threats of resource depletion, and subtle racism fuel the controversy. But after the angry debates are over, Alaskans have a good record of ultimately doing what is right.

MOOSE POPULATIONS may rise and fall in response to wolves, bears, and hunters, but Alaskans know that without suitable habitat moose cannot survive. Near Anchorage, subdivisions have encroached on feeding grounds. Several hundred moose are killed each year by cars and trains. Heavy snowfall in 1984-85 drove moose onto the Alaska Railroad tracks between Anchorage and Fairbanks where they found easier walking. Trains killed 384 moose that winter; 24 fell to a single train making the 712-mile round-trip. Trains carrying tons of freight at 40 miles an hour need more than a mile to stop, and few do. Striking a moose does little damage to a locomotive armed with a steel cowcatcher.

Automobiles do not fare as well. About 200 such collisions occur each year on the Kenai Peninsula, most with serious damage to vehicle, driver, and moose. Signs of the times: Barbed-wire fences and moose patrols to keep the animals from straying onto runways at Anchorage International Airport and a projected 1.5-million-dollar "moose underpass" to funnel moose traffic under a four-lane highway near the city.

Hydroelectric projects, mining, and oil exploration threaten the moose's wilderness. But overall the future looks bright. North America's mightiest deer will thrive wherever it finds adequate habitat. So will the bears, wolves, and people that have shared its environment since the Ice Age. □

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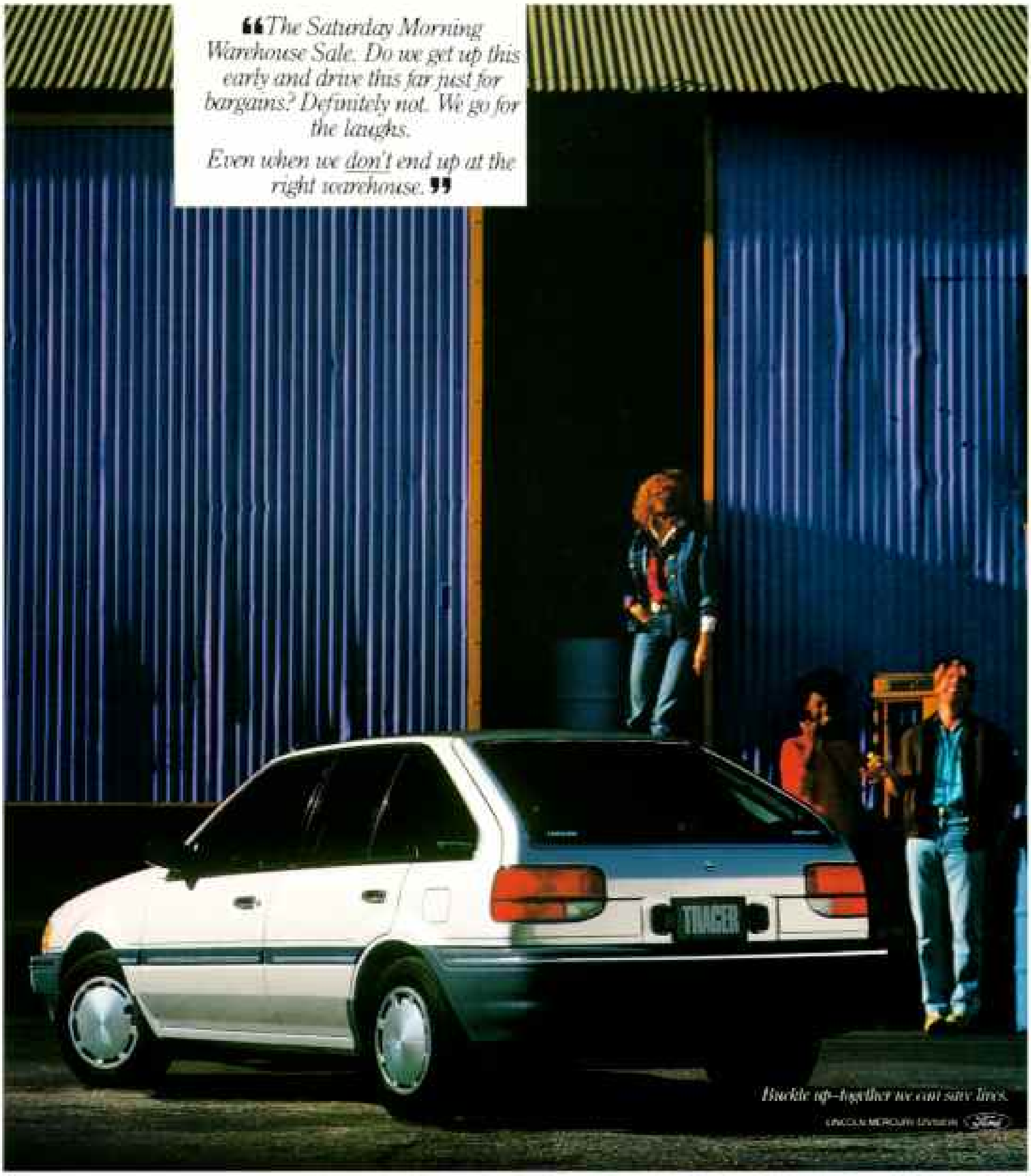

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A dangerous rise in oil imports

America imported four million barrels of oil a day in 1985. In 1986, that figure jumped to over five million barrels a day. By 1990, we will most likely rely on imports for nearly half our needs. Some say as much as 75%. Compare that to 35% in 1973.

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Information about energy America can count on

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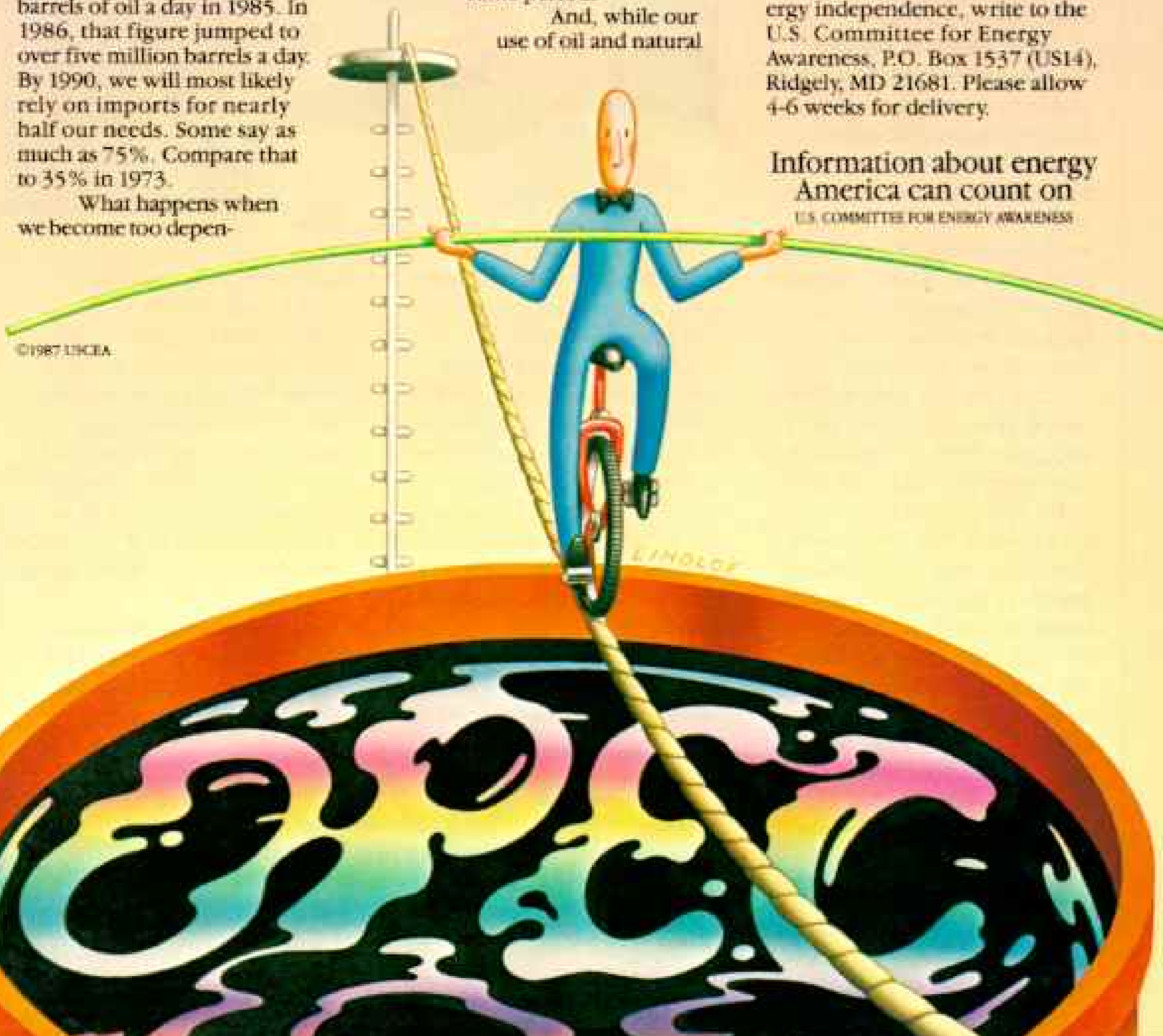


Member Relations: planning and service

YOU WERE INVITED by mail last month to participate in the Society's Summer Remittance Plan. By paying early, you help ensure that you won't have to pay more later.

More than half our members choose to remit under the plan, and of the others who do not, a few question the reasons for the policy, implying that we just wish to use their money. At today's interest rates on $18.00 for three months, that 30 cents pales in comparison to our increased costs if we had to process everyone's renewal at once.

Think about it. Society memberships expire on December 31 each year. If we had to process millions of renewals all at once, we would be forced to hire a large seasonal work force. Not only would expenses increase dramatically, but almost certainly our service would worsen because of mistakes born of inexperience and haste.

Adopting any system that would generate higher costs and poor service—leading to a dues increase—is a bad idea.

We have maintained our own Society-run fulfillment service for nearly 100 years and have turned aside every suggestion that we contract out that important function. We believe that our members deserve our direct attention, and, although we are not flawless, we strive to provide superior service.

Our Membership Center personnel handle hundreds of thousands of communications daily. Most of the mail consists of orders and can be processed quickly and efficiently by electronic scanners. But most is not all; some 3,000 to 4,000 letters a day—850,000 a year—require personal attention. Furthermore, that doesn't count the 250,000 telephone calls a year from members—calls we encourage.

PAUL TYLOR AND THE MEMBER RELATIONS DIVISION. PHOTOGRAPH BY JOSEPH H. BAILEY, NGS

Out of that landslide of communications, the ones Paul Tylor likes to handle are complaints where he can "address a problem, improve relations, or eat crow." Paul and his 107 colleagues make up our Member Relations Division, the critical link in our quest for excellence.

Paul and his staff will go to any reasonable length to help solve a member's problem with his or her membership, order, or related matter.

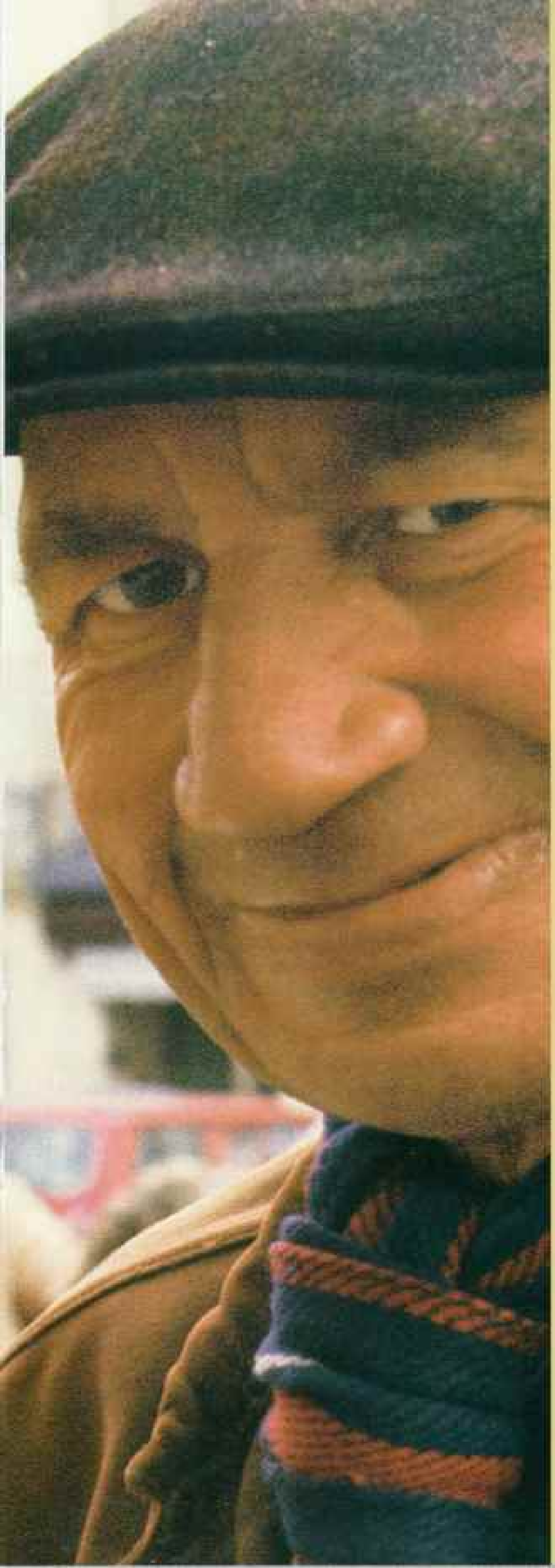
Member Relations also acts as an early-warning system. If, for instance, hundreds of calls start coming in from Chicago complaining that NATIONAL GEOGRAPHIC is late, we know that we have a problem to attack—right now.

Regrettably, pride in service, like many rare animals, seems headed for extinction. The Society deplores but cannot itself prevent animal extinctions. We also deplore—and make every effort to prevent—anything that threatens to violate superb service to you our members.

Paul Tylor and his people are 108 who won't stand for anything else—nor will our other 2,400 employees.

Gilbert M. Grosvenor

PRESIDENT, NATIONAL GEOGRAPHIC SOCIETY



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Members Forum

Antarctica

Many thanks for your Antarctic article and the photographs of the Amundsen-Scott South Pole Station (April 1987). My brother is one of the "rodents" wintering over this year. You helped bring his life down there into better perspective; he'd be more accessible in a spaceship orbiting the planet.

KATHLEEN LITTIN-BELMONT
Poughkeepsie, New York

The article should have been entitled "In the Footsteps of Shackleton," who was the actual trailblazer of Scott's route, and from whose mistakes Scott refused to learn.

ALAN H. COCKRELL
Clinton, Mississippi

Mr. Swan's article twists the facts of history. To recall what happened in Antarctica 75 years ago is to remember that Amundsen utilized the best technology available—sledge dogs—which Scott stubbornly eschewed in favor of emasculating manhauling. Thus, the "tragedy" was a consequence of pigheadedness not "vision." Where, finally, is an article on Amundsen?

TERRENCE NEAL BROWN
Memphis, Tennessee

Amundsen's only shortcoming was that he failed to dramatize his spectacular success at the South Pole. Had Scott not died, chiefly as a result of his own negligence and lack of foresight, I doubt that his name would be synonymous with those of the great heroic explorers.

DEBORAH KEEGAN
North Babylon, New York

We British should start printing top and bottom on our flag. The Union Jack on page 555 is upside down. That used to be a distress signal. Could the ghost of Scott still be asking for help?

GILBERT BRAITHWAITE
Vienna, Virginia

Congratulations on the excellence of your new map of Antarctica. In one unfortunate error, the Soviet summer station Soyuz is shown on George VI Sound. In fact it is on Amery Ice Shelf, Mac. Robertson Land, at 68° 47' east, not west, longitude.

G. HATTERSLEY-SMITH
Antarctic Place-names Committee,
Foreign and Commonwealth Office,
London, England

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High Andes

Oscars to NATIONAL GEOGRAPHIC and Loren McIntyre for his lyrical description of the Andes (April 1987). I am lucky to have seen much of this chain, thanks to an interest generated by your magazine. My foreign agent told me his first job was in these highlands, selling men's clothes. His firm in New York thought he had erred on his first order for men's shirts with neck sizes 17 to 20 inches. They failed to realize that men at these heights had developed huge chests and necks.

RICHARD K. PATRICK
Duxbury, Massachusetts

Because March was Women's History Month, I would like to add an addendum to "The High Andes." In 1908 the American mountain climber Annie Smith Peck was the first person to climb Huascarán. Peru honored her with a gold medal and named the north peak Cumbre Aña Peck. Citizens of Yungay helped her gather the food, clothing, and equipment for her relentless efforts—six in all—on Huascarán.

DOROTHY L. BRISTOL
Santa Rosa, California

Kayaking the Amazon

I found Piotr Chmielinski's article (April 1987) a soul-stirring yarn of gripping proportions. Along with the incredible photographs, he accurately

The sequel w

Introducing the new Grand Caravan.

From the company that wrote the book on minivans comes another surefire success story. Introducing Dodge Grand Caravan.

Like Caravan, the new Grand Caravan has some unique advantages over imitators, Aerostar and Astro. Such as a shorter step up for easy ins and outs. A lower lift-over height for easy loading and unloading.

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Yet, Grand Caravan extends itself even further.

It offers 170% more total knee room in the back seats, and 100% more cargo space than an original Caravan with 7-passenger seating.

And, with the seats out, Grand Caravan goes to even greater lengths to accommodate. Offering enough floor space for a full 4x8 sheet of plywood. And a generous 150 cubic feet of cargo room.

*See 7/70 powertrain & 7/100 outer body rust-through limited warranty at dealer. Restrictions apply.

conveyed a sense of wonder at the unknown. I've one gripe; the article stopped 3,600 miles short.

GREG NIELSEN
Rochester, Minnesota

This story told me nothing about the geography, geology, biology, sociology, or ecology of the upper Amazon watershed. It told only of a contrived adventure. The most disturbing aspect was the author's description of the residents along the route. He did not write about them; he wrote about their reaction to him.

DON MCMANMAN
Bellingham, Washington

It seems unfair for the author to have implied that all previous expeditions to the upper Apurimac ended in defeat, retreat, or death. In fact, the five-man 1975 Apurimac Kayak Expedition, led by J. Cal Giddings of Salt Lake City, Utah, (and supported by the Society) successfully traversed the deepest, most dangerous 240-mile section from Pillpinto to the head of navigation for freight canoes at Luisiana in 33 backbreaking days without loss or injury.

JIM SINDELAR
Concord, New Hampshire

I don't think it is in Society policy to tell the natives from "uncivilized countries" that "they would be better off with more tourists who brought money." I believe it's the opposite. I

ith no equal.

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enjoy articles about these places and will support expeditions that do not violate people's privacy.

PAVEL MACEK
Limoges, France

Air Pollution

The article (April 1987) is very disturbing, although none too surprising. It is time that each of us look at our everyday lives and make the correlation between the products we use in our work, homes, and gardens and the toxic chemical plants. Cars are major polluters, and we must seek alternatives: carpooling, walking, bicycling, public transportation. We do not accept responsibility for our own part of the problem.

CAROL MAUREEN MCCORMICK
Criders, Virginia

I criticized "Acid Rain" (November 1981) for failing to mention nuclear power as a partial solution. Again a writer has vividly detailed air contamination without acknowledging nuclear's potential role. Of the 25 pollutants listed on pages 510-11 (what happened to CO_2?), 16 derive from coal burning. The causes of air pollution are not fully understood, but fossil fuel furnaces and vehicle emissions seem accepted as major contributors. Rather than expensive approaches to *reduce* power plant emissions, why don't we *eliminate* them through nuclear energy?

COL. JOHN C. BELL (RET.)
Nashville, Tennessee

Noel Grove deserves special congratulations for his clear exposition of the complex problem of air pollution, perhaps the greatest threat facing the world today.

E. GARNAUD
Geneva, Switzerland

The article did a disservice to the Japanese, American, and European scientists who have already developed ways to remove nitrogen oxides from boiler exhaust gases. Most processes rely on a catalyst and the addition of low-cost ammonia to convert nitrogen oxides to harmless nitrogen and water. The processes have been employed in Japan for a decade and are being used in Europe.

K. J. MILLS
Cuyahoga Falls, Ohio

Your picture of Denver's smog (pages 520-21) probably was taken on one of our good days. Sometimes it is so dense that only the tops of high rises are visible. Our once beautiful small city has become a dirty metropolis that may sprawl down the entire fragile Front Range. Some years ago trash burning was banned. Now we have occasional wood-burning bans and voluntary no-drive days; neither has solved anything. How can one solve the smog enemy when our congressional delegation, governor, mayors, councilmen and women, and all officials in between give lip service to iffy controls on one hand and beat the bushes all over the world with the other to promote more growth and more people here?

REBA B. RANSOM
Denver, Colorado

Researchers don't need to test any more animals to learn the symptoms of petrochemical sensitivities. Humans with such sensitivities can speak to anyone interested. The few physicians who are also clinical ecologists dealing with problems of environmental illnesses can enlighten anyone. Write (with stamped, self-addressed envelope and $2): American Academy of Environmental Medicine, Box 16106, Denver, Colorado 80216.

BEVERLY G. ANDERSON
Oklee, Minnesota

I read with dismay the statement that carpets give off formaldehyde. Recent testing of carpets representing more than 80 percent of the nation's output showed no formaldehyde in carpet leaving the production line. However, carpet and other materials having a high surface-area-to-mass ratio can absorb small quantities of formaldehyde from contaminated atmosphere.

CAREY R. MITCHELL
Dalton, Georgia

Seals

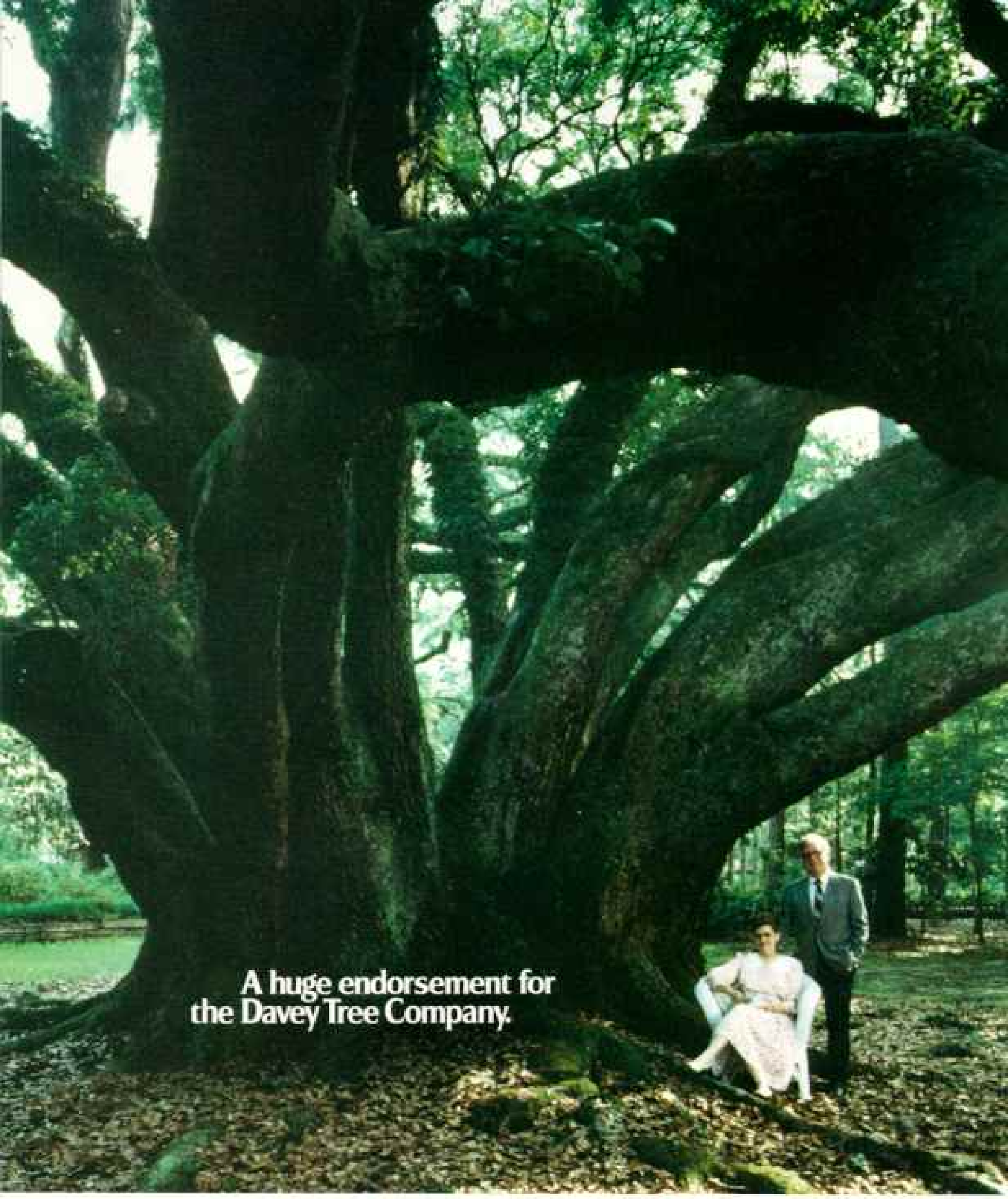
In "Seals and Their Kin" (April 1987) author Gentry suggests that seals and sea lions do not have an effect on salmon populations. Every fall many salmon are torn to bits and eaten on the surface by seals. Also the seals and sea lions have eliminated the starry flounder as a viable species in Oregon estuaries, are seriously depleting the surf perch and herring, and have ruined the chances for any worthwhile shore-based ocean fishing. I wouldn't want to eliminate the pinnipeds, but we need a balance.

ALAN D. REID
Springfield, Oregon

Norwegian fishermen were, until recently, allowed a yearly quota of seals. This has ended, and the seal population has expanded—to such an extent that there are no longer sufficient fish in their natural habitat. This has caused a seal invasion into prime fishing grounds along the Norwegian coast, reducing the fish haul by about 60 percent and causing the industry, the major income source, to deteriorate.

HELGA KATHERINE GRIMSRUD
Oslo, Norway

Letters should be addressed to ***Members Forum,*** *National Geographic Magazine, Box 37448, Washington, D.C. 20013, and should include sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.*



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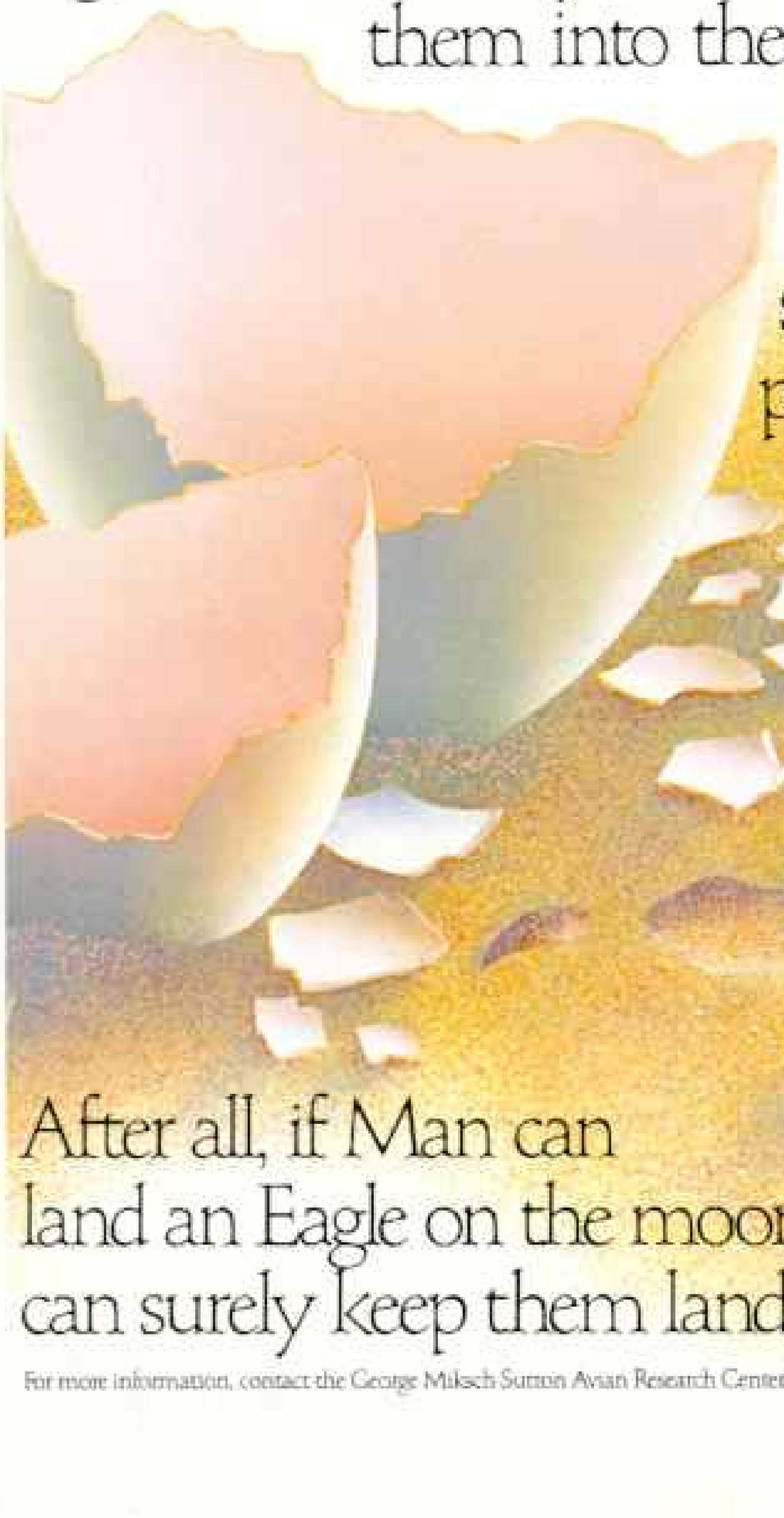

After all, if Man can land an Eagle on the moon, he can surely keep them landing on the earth.

PHILLIPS 66

For more information, contact the George Miksch Sutton Avian Research Center Inc., P.O. Box 2007, Bartlesville, OK 74005; (918) 336-7778.

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Pink Pigeon **Genus:** Nesoenas **Species:** mayeri **Adult size:** Length, 35cm **Adult weight:** 250-350g **Habitat:** Upland indigenous forest and scrubland surrounding the Black River Gorges on Mauritius **Surviving number:** Estimated at 25 in the wild; over 150 in captivity

Photographed by Stanley A. Temple

Wildlife as Canon sees it

One of the greatest roles of photography is to record and preserve images of the world around us worthy to be handed down as a heritage for all generations. A photograph of the pink pigeon has a unique power to capture the delicate pastel hues of this last surviving indigenous pigeon of Mauritius.

Found in a small forest area on Mauritius, the home of the now extinct dodo, the pink pigeon feeds on native flowers, fruits and seeds. While other Mauritius pigeons were hunted to extinction, it survived because its flesh is rendered inedible by this specific diet. Though captive breeding has been successful, the future of the pink pigeon in the wild remains uncertain. Within its dwindling range, nest predation by introduced mammals is a serious threat.

An invaluable research tool, photography can help save the pink pigeon from going the way of the dodo by enhancing our understanding of this and other endangered birds that are part of the natural heritage of Mauritius.

And understanding is perhaps the single most important factor in saving the pink pigeon and all of wildlife.

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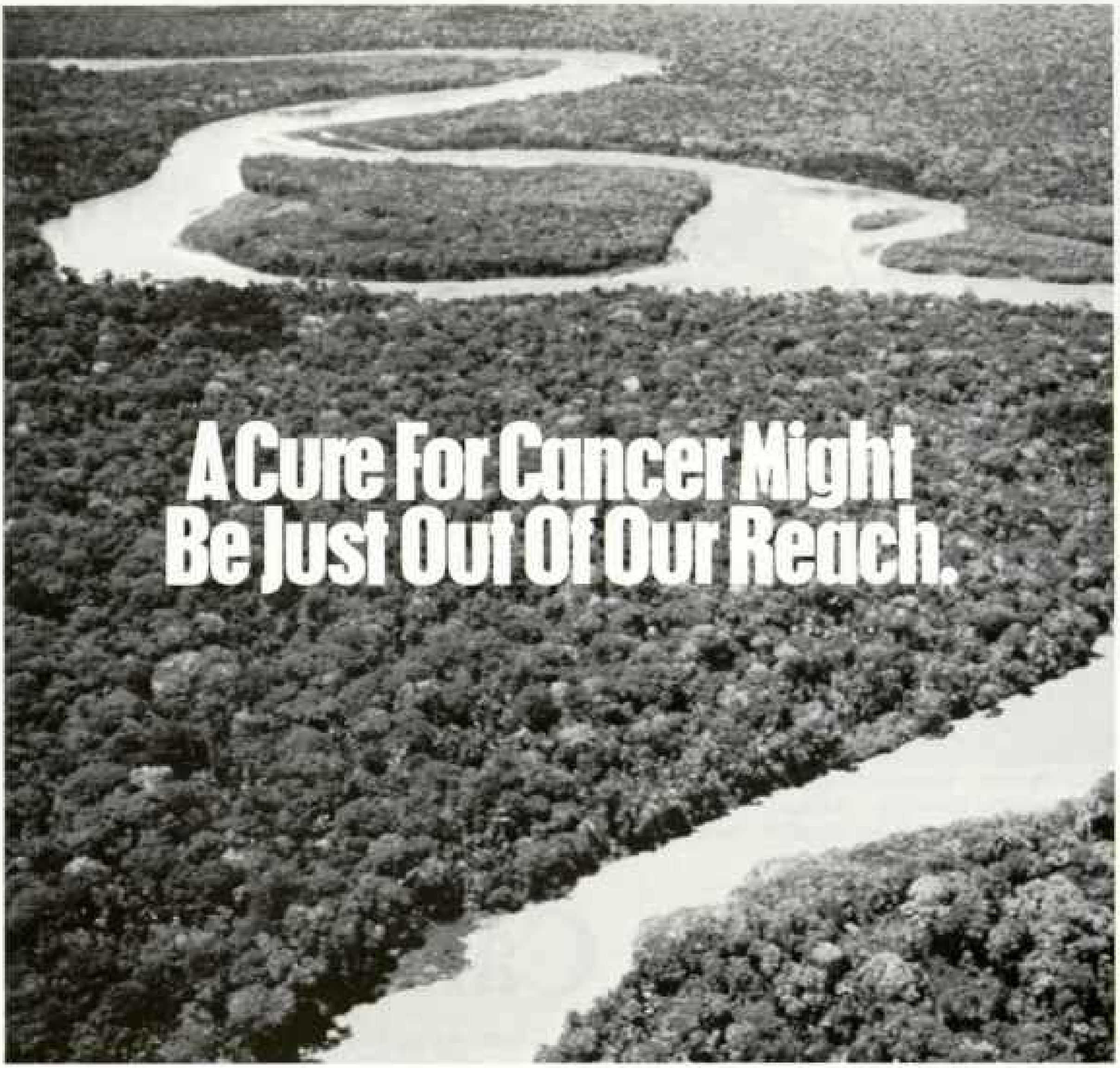


It's not surprising that one out of four pharmaceuticals comes from tropical forests. Or that an estimated 1,400 tropical plants, like the rosy periwinkle, have promising anti-cancer properties. After all, as home to half of the world's plant and animal species, these forests are a vast biochemical warehouse.

What is surprising is that the human race is destroying this living resource at an alarming pace.

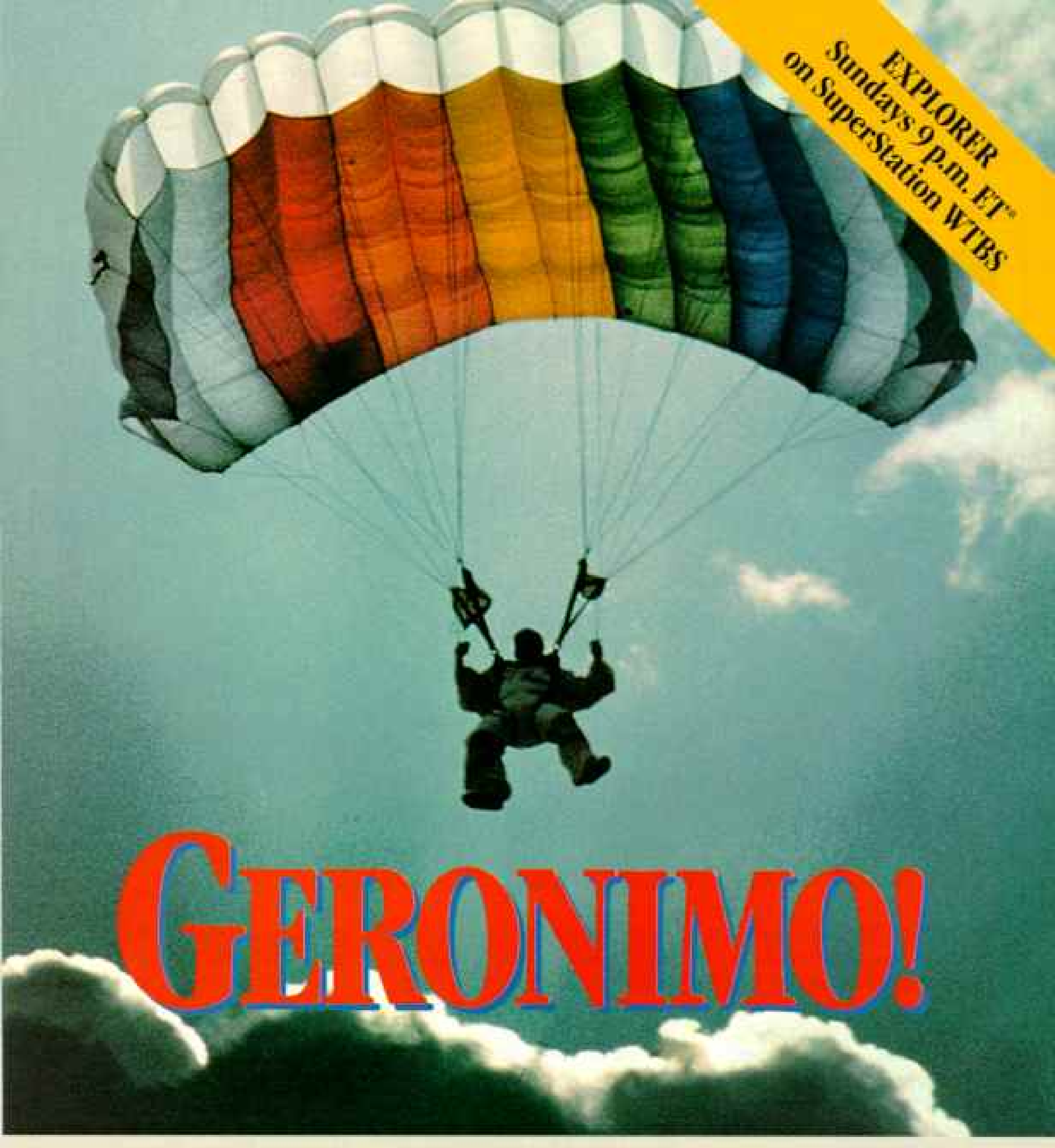
Each day, 74,000 forested acres are cleared, pushing untold numbers of species toward extinction.

The future of medicine and agriculture, the existence of thousands of wildlife species, and the survival of hundreds of millions of people in developing countries depend on what we do now to keep the tropical forests alive.

The means of solving this problem are within our reach. Write in order to find out how you can help keep the tropical forests alive, before the reasons disappear.

Keep Tropical Forests Alive.

Tropical Forest Project, World Resources Institute, 1735 New York Avenue, N.W. Washington, D.C. 20006 / Prepared by Richardson, Myers & Donofrio, Inc.



GERONIMO!

Catch the action **August 30** when a team of amateur divers drops from the sky over China. Follow the rugged preparation of the U. S. National Skydiving Champions for a "friendship competition" with their Chinese counterparts.

And on other Sundays . . .

August 2—Search for man's origins with Australian anatomist Raymond Dart.

August 9—Board an aged steam engine for its final journey in Zambia, Africa.

August 16—Relive the awesome finish of the 1865 race to the Matterhorn's peak.

August 23—Sample life with the Amish.

NATIONAL GEOGRAPHIC **EXPLORER**

EVERY SUNDAY 9:00 PM ET*

SuperStation WTBS

*Also Mondays at midnight ET/9:00 p.m. PT and Saturdays at 9:00 a.m. ET

On Assignment

FROM LEFT, SEATED OR KNEELING: HOWARD E. PAINE, GERARD A. VALERIO, ALLEN CARROLL AND JAN ADKINS ON ROCK SCULPTURE; ROBERT W. MADDEN; STANDING FROM LEFT: JOHN F. DORR, SALLY SUDNIKER-SUMMERALL, JON SCHNEEBERGER, HAROLD E. ARCA, JR., W. ALLAN ROYCE, THOMAS R. KENNEDY, RICHARD A. ROGERS, JOHN B. GARVER, JR., STEVE MCCURRY, JOHN F. SHUPE, THOMAS Y. CANBY. PHOTOGRAPHS BY BIBBE BRIMBERG (ABOVE) AND VICTOR R. BOSWELL, JR., NGS

IN MAGAZINE PUBLISHING there's no such thing as a one-man show any more, so when staff members (like these gathered in the courtyard at headquarters, ***above***) or their divisions win awards for publishing excellence, all 350 members of our staff share in the satisfaction and the pride.

Take the "Soviets in Space" article of October 1986, for instance. It won the Aviation/Space Writers Association's top award for space writing for science editor Tom Canby, as well as a National Space Society award for 1986. The article was "a great collaborative effort," says Tom. "It distilled the expertise of more than a dozen staffers and consultants. Many of us have worked on space articles for years—developing the background to know what questions to ask." Our thoroughness and accuracy on a subject long cloaked in secrecy won even the Soviets' admiration.

Contract photographer Steve McCurry, winner of a coveted Overseas Press Club award for the best photographic reporting from abroad for his Philippines coverage (July 1986), praised staff support, saying, "I was in touch often with headquarters to brainstorm ideas." Steve may generously credit the team effort, but the award is rightfully his. It was an assignment that required great personal courage and instinctive talent.

The American Society of Magazine Editors National Magazine Award for photography—symbolized by an Alexander Calder "Elephant" stabile (***left***)—is a team award, as was the University of Missouri-National Press Photographers "Best Use of Pictures" award for 1986. Both honor the combined efforts of photographers, picture editors, layout designers, engravers, printers, and the many others who contribute to the photographic presentations in NATIONAL GEOGRAPHIC.

Pull for the Team.

Whenever you buy Visa Travelers Cheques, we'll contribute to the 1988 U.S. Olympic Team.

This year, there are a number of ways you can support the 1988 U.S. Olympic Team. You can spur the athletes on as they try out for the Team. You can follow them to Calgary to cheer and wave the flag. Or you can buy Visa Travelers Cheques.

Every time you buy Visa Travelers Cheques between now and December 31, we'll make a donation to the 1988 U.S. Olympic Team. And it won't cost you a cent extra.

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