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ALL OF US live with clichés and trite sayings; we don't always live *by* them.

"One picture is worth 1,000 words." That journalistic aphorism depends for its very existence on words—as do we. The elephant photographs in this issue by Oria and Iain Douglas-Hamilton tell a powerful story, but with Oria's sensitive, often angry text, the whole is indeed greater than the sum of its parts.

"The camera never lies." True enough, but liars can use cameras. The work of the GEOGRAPHIC's talented photographers, illustrations editors, and caption writers rests solidly on professional integrity. None of us would knowingly deceive, and we guard constantly against being deceived by others.

"Truth is where you find it." Our research staff challenges and checks every word and picture the magazine publishes. Every detail is reviewed and approved or corrected.

"Don't look back—something might be gaining on you." With all due respect to that ageless baseball pitcher Satchel Paige, we often reject his classic advice. We find both direction and inspiration in looking back across the 92-year history of the magazine. The first issue, in October 1888, established the course we still follow. The Society was organized "to increase and diffuse geographic knowledge," and the magazine's "pages will be open to all persons interested in Geography, in the hope that it may become a channel of intercommunication, stimulate geographic investigation and prove an acceptable medium for the publication of results."

"Hold as 'twere the mirror up to Nature." In Hamlet's advice to the players, William Shakespeare, that most quotable of bards, coined a phrase that we do live by.

In December our editorial mirror will reflect in words, pictures, and art the amazing Aztec culture of Mexico. We'll lead off 1981 with a gripping account and exclusive photographs of the Mount St. Helens disaster—some retrieved from the camera of a photographer killed in the volcano's fiery blast.

As Gilbert M. Grosvenor takes up his duties as the Society's new President and I move into the Editor's chair, you may be sure your magazine will continue to hold the mirror up to nature.

Wilbur E. Garrett
EDITOR

NATIONAL GEOGRAPHIC

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November 1980

Africa's Elephants—
Can They Survive? 568

Wildlife consultants Oria and Iain Douglas-Hamilton tally the continent's embattled giants, documenting the havoc wreaked by ivory hunters and human population pressure.

The Grandeur of Windsor 604

Symbol in stone of Britain's majesty and stability, the 900-year-old fortress begun by William the Conqueror is portrayed today by Anthony Holden and James L. Stanfield.

Royal House for Dolls 632

At an inch to the foot, a miniature palace crafted in the 1920s for Queen Mary delights visitors to Windsor Castle. Text by David Jeffery, photographs by James L. Stanfield.

Arnhem Land Aboriginals
Cling to Dreamtime 644

Natives of northern Australia's bush defend their age-old culture against 20th-century incursions. By Clive Scollay and Penny Tweedie.

Tale of Twin Cities 665

Thomas J. Abercrombie returns to his hometowns, Minneapolis and St. Paul, to rediscover why Minnesota's urban giant has won acclaim as the most livable metropolis in the United States. With photographs by Annie Griffiths.

Baja's Mysterious Murals 692

Caves and canyon walls in Baja California hold a treasury of rock art left by unknown Indians. Harry Crosby and Charles O'Rear report.

COVER: *A snow shower dusts Windsor Castle as Prince Philip drives a four-in-hand toward the Long Walk. Photo by James L. Stanfield.*

Like a great gray whirlwind, a matriarch charges to protect her kin. But each year thousands of elephants fall to ivory poachers, and civilization claims more of their habitat. How many remain? The Douglas-Hamiltons crisscrossed Africa to find out.

AFRICA'S ELEPHANTS

Can They Survive?

By ORIA DOUGLAS-HAMILTON

Photographs by ORIA and IAIN DOUGLAS-HAMILTON

LEE LYON (PRECEDING PAGES)

IN THE IMMENSE SILENCE of dawn, before the sun rose and burned the skies, I watched through the opening of our tent the morning beauty of an untouched place, and dreamed how lucky we were to be here in one of the strongholds of the elephant in Africa.

Then, across the hills of Tanzania's Selous Game Reserve, a gunshot echoed and broke all dreams. A terrible stillness followed; then two, three, four shots blasted out and set my heart pounding. I could see an elephant limping away from a line of tents. People were running.

I fell into some clothes and ran down the green slope. The elephant was limping badly, his right side stained red. I joined some half-dressed game scouts. One, draped in a towel, held an empty gun. He was going back to his tent to get more cartridges.

The elephant kept walking away, and we, 15 of us, followed. He had such a sad look on his face—no anger or violence. His head was bobbing from side to side to keep watch on us, his trunk testing the ground ahead. The scout returned, fired, and missed; fired again and hit in the shoulder, and the blood ran through the crackly skin.

My husband, Iain, took the gun from the scout. He did not want to shoot the elephant, he hated shooting elephants, but there was no choice. Iain aimed and fired.

The elephant screamed and thrashed the bushes with his trunk, tottering on three legs. The bullet had not dispatched him. "There are no more cartridges," the scout said. "There is only a small gun in the lodge," and he walked away to get it. We waited in the thick wet bush as the blood-soaked elephant moved step by painful step to a little river.

He was standing looking at the water, waiting with us for death, when the gun arrived. Iain walked up to him, lifted the gun to his heart, said, "Sorry, old chap," and pulled the trigger. Instantly, his legs folded and he collapsed (**left**). No one moved, the birds were still, there was no sound now except the trickling stream. It was the saddest sight I ever saw.

The scout was standing nearby. "Why did you shoot?" I whispered.

"Because he was touching the ropes of my tent," he answered.

This tragic scene symbolized for me a story as old as the history of elephants and man. Recently man has been killing a higher proportion of Africa's elephants than ever before. Comparatively few people struggle to conserve them. For nearly 15 years Iain has fought for the elephant, a battle I have shared wholeheartedly with him.

It is a losing battle. The elephant's range is steadily diminished by expanding civilization and its need for more farms and ranchlands, and man continues to slaughter him for his ivory—by poisoned arrows in Kenya, by fires in Sudan, by pitfalls in Zaire, by Pygmies' spear traps in the forest, by horsemen's spears in Chad. A new technique is to place poisoned fruit along his pathways.

But the greater slaughter in the past decade has been by guns—from muzzle-loaders with poisoned spears to the high-powered rifles and automatic weapons used by poachers, soldiers, guerrillas, even rangers.

Elephants by the tens of thousands are slain every few years. Mountains of ivory leave Africa and are being used for currency, jewelry, and objets d'art. It is man who is digging the elephant graveyards.

Iain's work with the elephant began in 1966 with studies in Tanzania's Lake Manyara National Park. Later I joined him there, and together we have succeeded in following the life histories of individual elephants and families.

A decade after this work began, we were on our way back to the park in our old Cessna 185, flying down the Great Rift Valley as red dust coiled into the sky. Lake Manyara came up like a silver spot, while all around the bare earth was blowing away. The lake was smaller than before, surrounded with salt. Manyara was in the grip of a drought—the third dry year in a row. We knew the elephants would be having difficulty finding food. Ten years before, the problem had been to cope with their destructive feeding habits—pushing over trees and stripping the bark (page 574). Now, with drought, the problem could be worse unless poaching had reduced their numbers.

On the lakeshore was a gray mass of at least 200 elephants gathered in the soft evening light, sunning themselves. Each family formed a distinct little group, all walking slowly in the same direction.

***Dinner is a doubleheader** as Valeria suckles twins. Born in 1976, during the drought that parched Tanzania's Lake Manyara National Park, Straight Tail, at left, died before greening rains fell. Females give birth about every four*

years after a 22-month gestation period. A family unit consists of related females; males, tolerated until adolescence, are driven off to associate with other males or to roam alone, returning to the family only occasionally.

We touched down nearby on the sandy beach just as a battered Land-Rover approached. Out jumped Mhoja Burengo, the Tanzanian park ranger who has worked with Iain since 1966, welcoming us back with his wonderful smile. Because of difficulties in getting research clearance, our visits to Manyara had become only occasional since 1973, and Mhoja was doing most of the job of keeping an eye on births, deaths, and disappearances within the elephant community. He can still recognize many of the 400 individuals identified from 1966 on. He told us that poaching had killed many of the elephants, and drought had turned thousands of acres of the park's lush foliage into a barren windswept land of skeletal trees.

IAIN AND I were particularly interested to find what had happened to the family of a one-tusker, Jezebel, who had died a year before. Elephant families are not led by bulls, who at puberty, about 13 years of age, are pushed out by the matriarchs, returning periodically to mate beginning around the age of 20. The family leaders are the experienced matriarchs, and so Jezebel's successor was Curie, who was probably her sister, and not Valeria, her daughter. As her assistant leader, Curie had another matriarch named Hera, who once had a reputation for being extremely fierce.

On a visit two months before, in August, Iain discovered, to his amazement, that Valeria had given birth to twins, the first we had ever seen (pages 572-3). They must have been about ten days old, both males. One had a straight tail and the other a crooked tail. The dominant twin was Crooked Tail; though slightly smaller, he pushed ahead of Straight Tail, establishing his position to walk right behind his mother.

The leading matriarch, Curie, had a four-month-old daughter named Pili, and Curie and Valeria were the only nursing mothers in the family. When the twins tried to get some milk from Curie, who had an agitated nature, she slapped them with her trunk, kicked and toppled them, and made them squeal. Only Yusta, the adolescent daughter of Hera, tried to comfort them, pushing them under her belly. Adolescent females often help in elephant families, giving the calves a better chance of survival and learning themselves how to act when they later become mothers (page 593).

A month after the birth of the twins, Mhoja, patrolling in the woods, heard loud elephant screams. Curie came crashing out with her family close behind. Mhoja saw that Hera had been speared in the side, blood pouring out. Yusta was helping her mother, allowing Hera to lean against her, putting earth in the wound, and pinching the wound together with the two tips of her trunk, as if *(Continued on page 581)*

With elephant mug shots, *Iain Douglas-Hamilton studies families in Manyara* **(left)**, *accompanied by a pet mongoose. The bent steering wheel recalls a matriarch's charge, but elephant destructiveness is usually directed at the park's acacia trees, a favorite food* **(facing page)**.

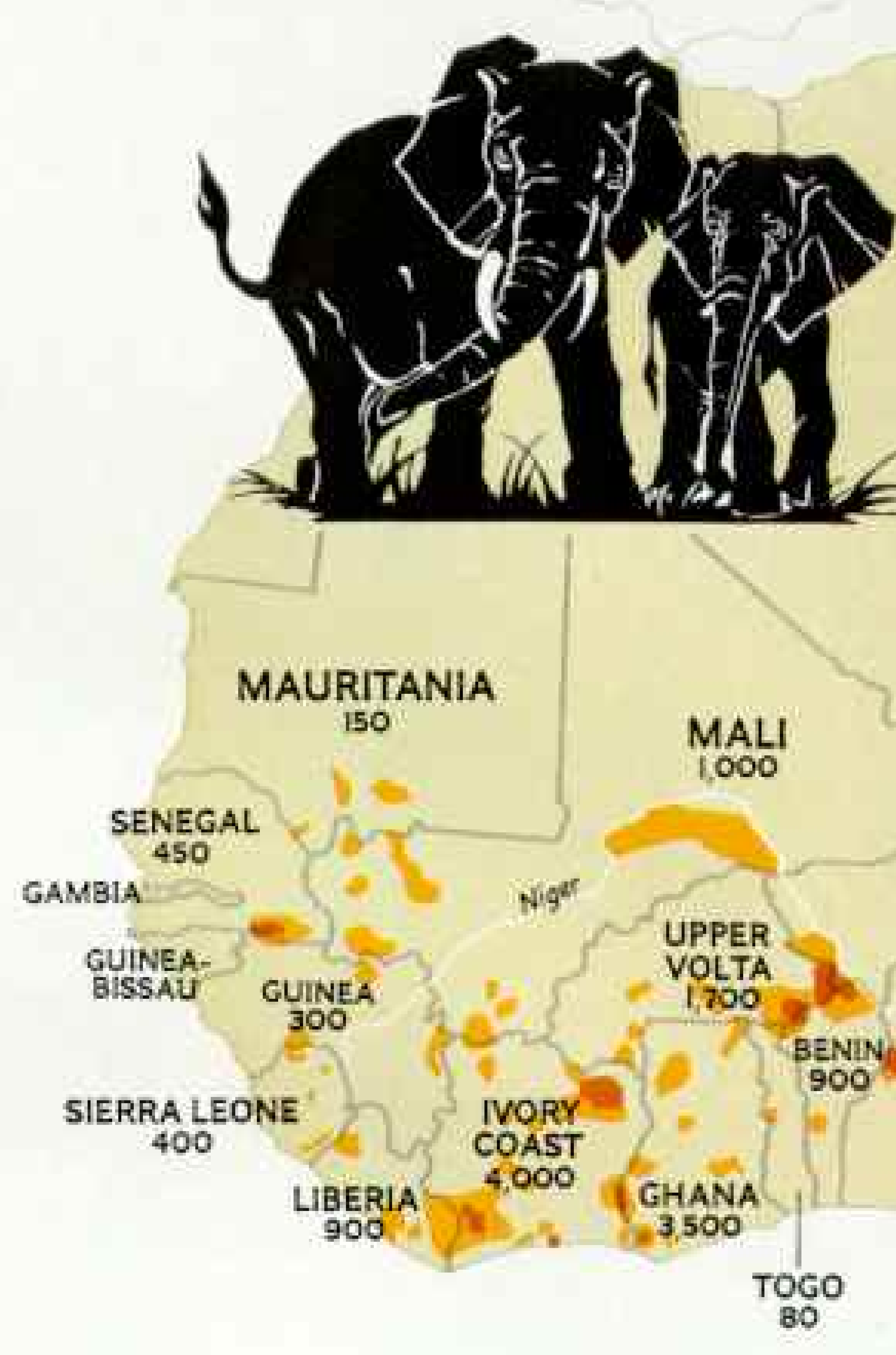
Pattern of decline: *Elephants bunch on a shrub-speckled savanna in Zaire* **(following pages)**, *where entire families have reportedly been killed by poachers using poisoned fruit.*

THE ARITHMETIC of African elephants adds up to dismaying news. On much of the continent the animals are being killed faster than they can reproduce. In a 35-country study from 1976 to 1979, Iain Douglas-Hamilton compiled the first continental census, using aerial survey techniques and a network of scientist informants. He concluded that only about 1.3 million elephants then existed in Africa.

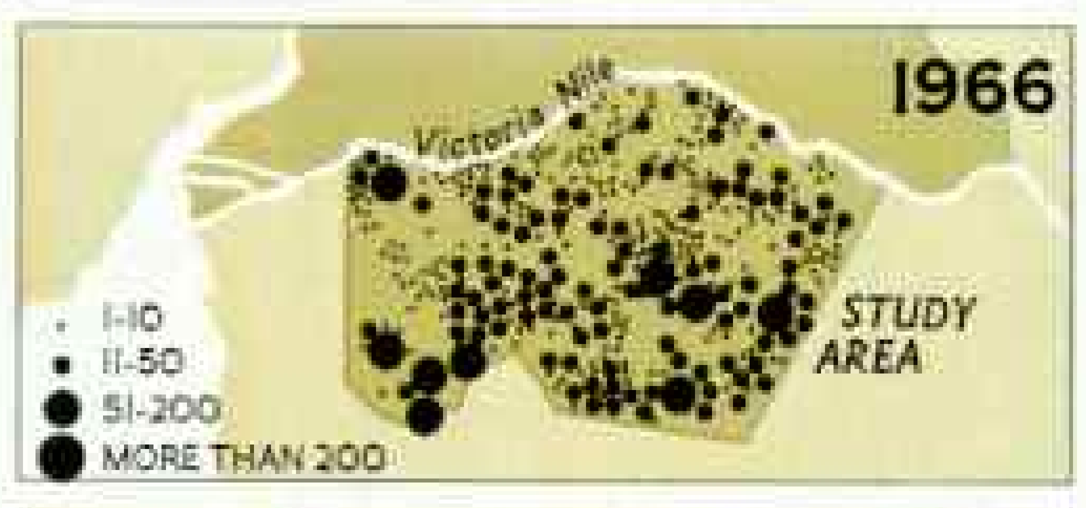
Poaching claims thousands each year. But shrinking range poses the gravest long-term threat, as Africa's growing human population, in need of food, cultivates more and more elephant territory and crowds the animals out. Consequently, elephants—once widespread south of the Sahara—have been nearly annihilated in western and extreme southern Africa.

A few countries—Zimbabwe, Malawi, Senegal, and South Africa, for example—try to enforce strict conservation laws. But in Uganda, Chad, Zaire, Angola, and elsewhere, political upheaval or indifference has fed the slaughter.

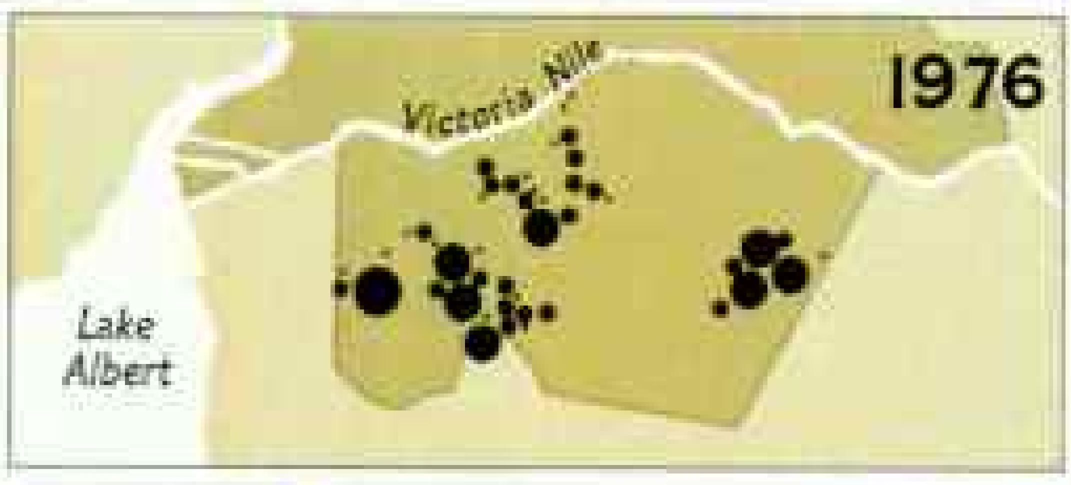
Dr. Douglas-Hamilton's survey was financed by the World Wildlife Fund, the New York Zoological Society, and the International Union for Conservation of Nature. The World Wildlife Fund, 1601 Connecticut Avenue, N.W., Washington, D.C. 20009, has announced an urgent campaign to raise 1.1 million dollars to save the elephant.



Uganda's 14-year countdown in Kabalega Falls National Park

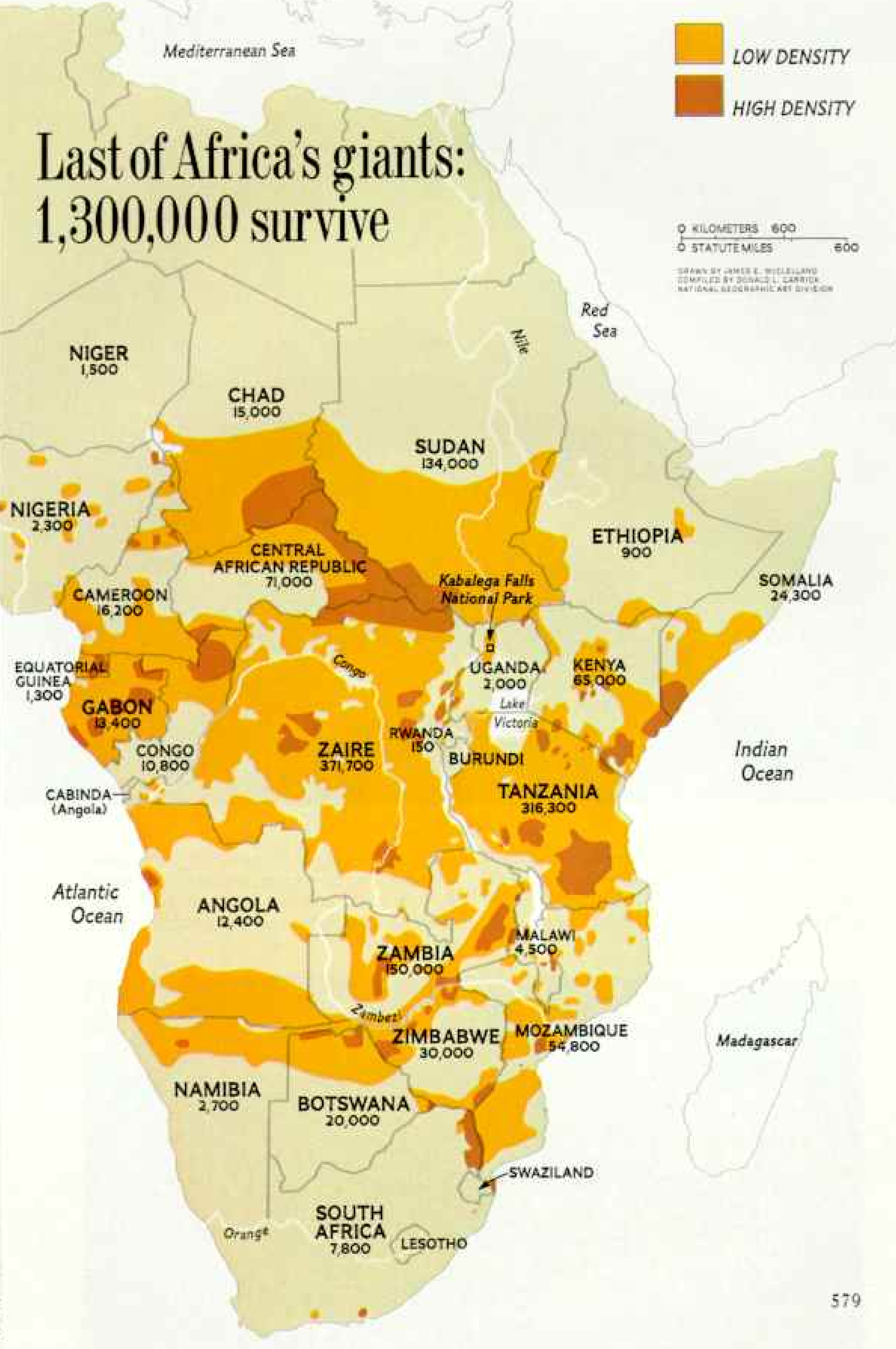


Decades of expanding human population had pushed 8,000 elephants into Kabalega's 810-square-mile southern section by 1966. Park officials attempted to ease pressure on the crowded parkland by culling.



Sharply rising prices for ivory and rampant poaching had severely reduced the population to fewer than 1,700 elephants by 1976. A new warden was transferred to the park two years later, and he contained the poaching . . . but only temporarily.

In the chaotic aftermath of the fall of Idi Amin, his routed troops and poachers armed with captured automatic weapons slashed the population to a terrified 160 elephants. "They will not survive the year unless we can reinforce the national park system," says Iain Douglas-Hamilton.


Last of Africa's giants:
1,300,000 survive
LOW DENSITY
HIGH DENSITY
0 KILOMETERS 600
0 STATUTE MILES 600
Mediterranean Sea
Red Sea
Nile
NIGER
1,500
CHAD
15,000
SUDAN
134,000
NIGERIA
2,300
ETHIOPIA
900
CENTRAL AFRICAN REPUBLIC
71,000
Kabalega Falls National Park
SOMALIA
24,300
CAMEROON
16,200
EQUATORIAL GUINEA
1,300
GABON
13,400
Congo
UGANDA
2,000
KENYA
65,000
Lake Victoria
CONGO
10,800
RWANDA
150
ZAIRE
371,700
BURUNDI
Indian Ocean
CABINDA (Angola)
TANZANIA
316,300
Atlantic Ocean
ANGOLA
12,400
MALAWI
4,500
ZAMBIA
150,000
Zambezi
ZIMBABWE
30,000
MOZAMBIQUE
54,800
Madagascar
NAMIBIA
2,700
BOTSWANA
20,000
SWAZILAND
Orange
SOUTH AFRICA
7,800
LESOTHO

Politics took its toll *of Uganda's elephants when the guns of fleeing government troops fell into the hands of poachers who killed entire families, hacked out tusks, and left the carcasses, stained with vulture droppings, to rot* (**above**). *Without vehicles a ragtag but dedicated ranger force* (**below**) *had little effect. A new aid program offers hope for the surviving elephants.*

BOTH BY RICK WEYERHAEUSER

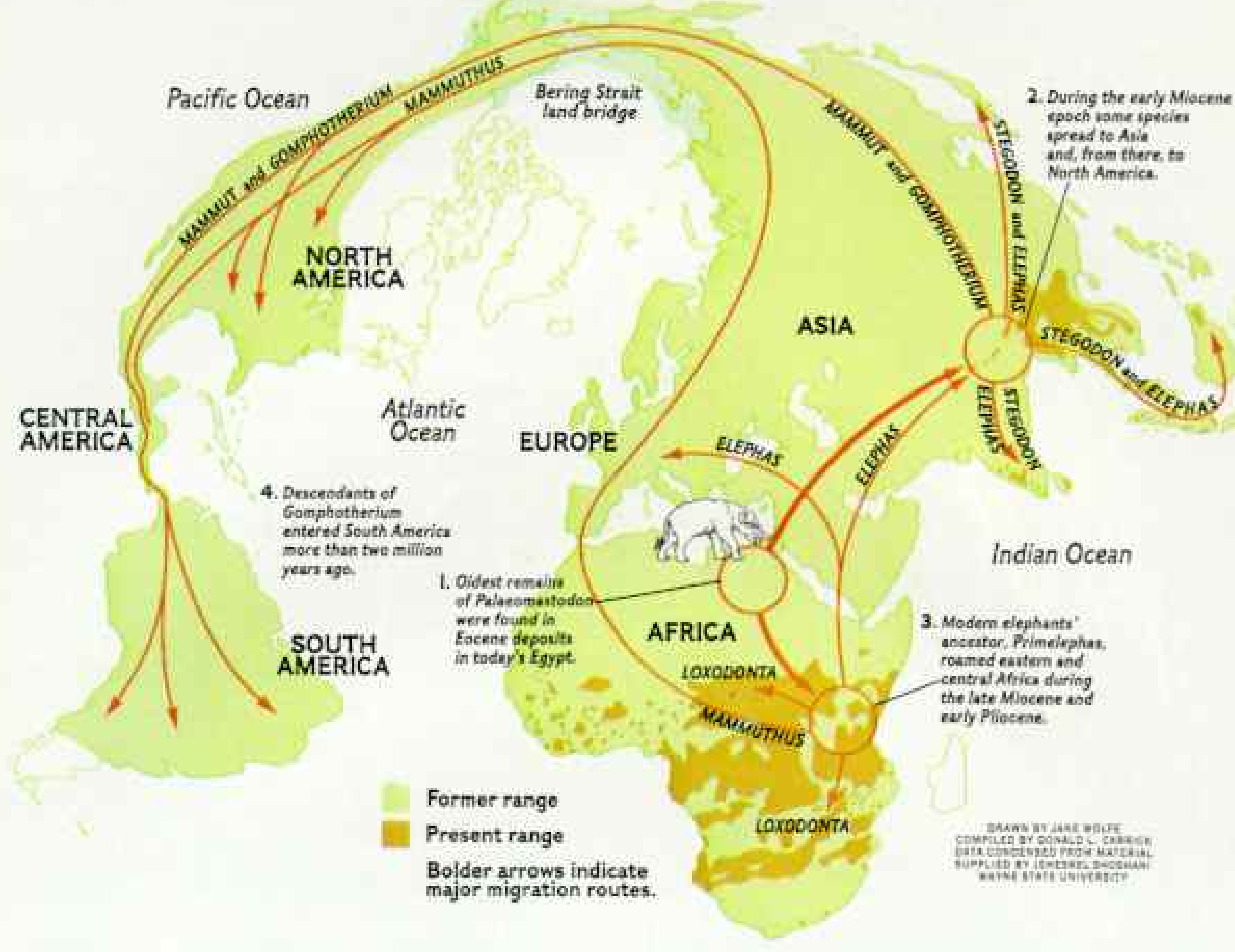
(Continued from page 575) they were fingers. She had blood all over her face.

Curie quickly moved the family on toward thickets in the south, and for a month they could not be found. Then one day they returned, Hera's wound healed and all the family alive, though the twins were a lot thinner.

By this time the heat and drought were intense. Vegetation shriveled, and the hungry elephants ate even the shrubs down to raw wood. Parched, Valeria and her twins went to drink where the river was shallow. Like all baby elephants, the twins were still to learn the art of siphoning water with their trunks. Now they could drink only with their mouths, wading in till they were practically submerged. Straight Tail seemed the better organized; he kept the tip of his trunk out of water so that he could drink and breathe at the same time. Crooked Tail constantly got his trunk stuck in the riverbed and had to come up for air.

Surprisingly, because she was not in estrus, Valeria was joined for a week by a young bull. We scanned our photographs of the family and discovered that he was in fact Valeria's older brother. He had left the family many years before when Jezebel was matriarch. This was only the second time we had witnessed such a long reunion of a bull with a member of his family after the mature females had forced him to leave.

By December the ground was barren, boiling hot, with nothing tender for young elephants to nibble on. The twins looked



A pig-size animal, *Palaeomastodon lived 40 million years ago. This first known proboscidean—or "long nosed" animal—probably evolved in a swampy, subtropical part of Africa. By the Miocene epoch its descendants had spread to Eurasia, where species*

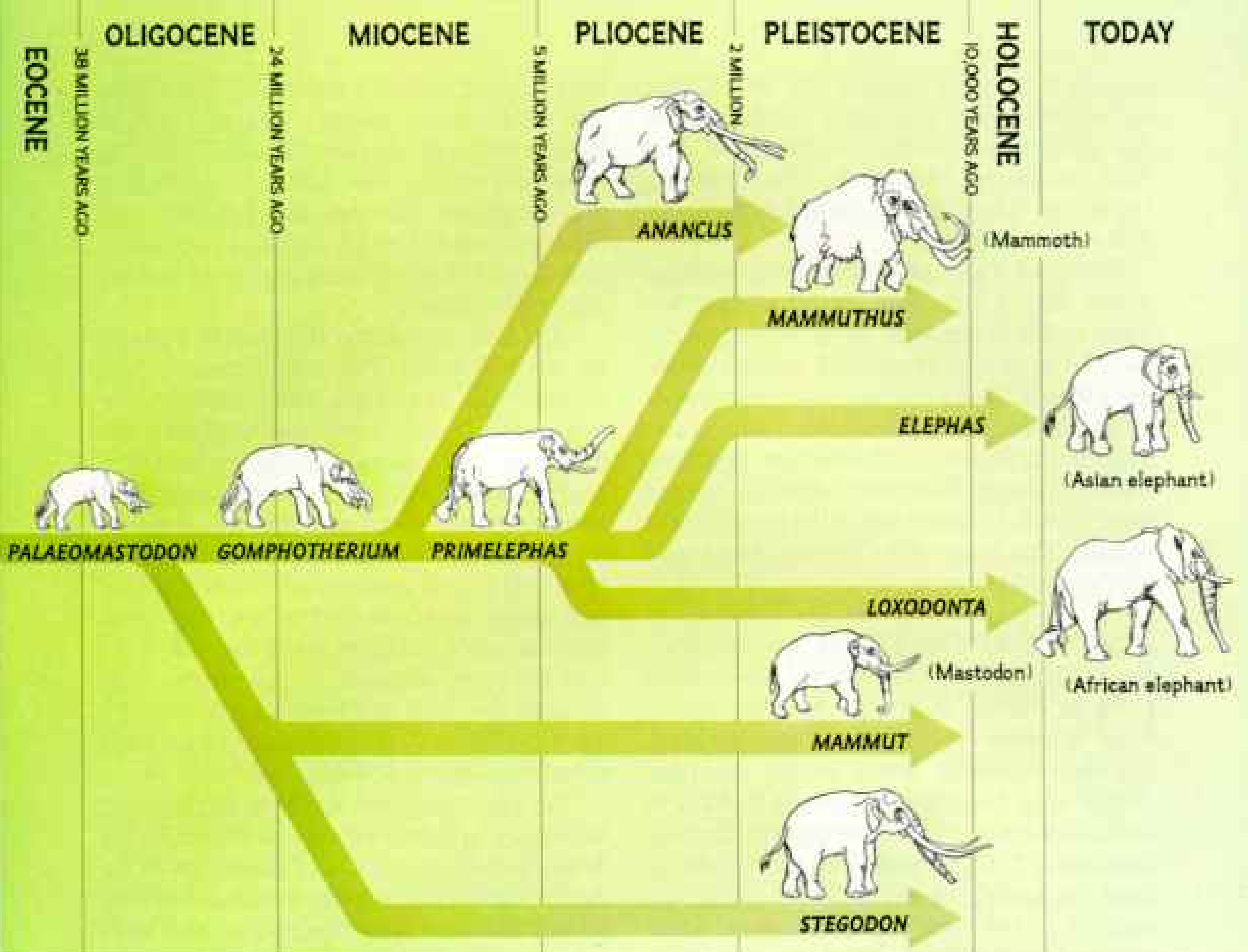
like skeletons, stumbling behind Valeria. Straight Tail, his little face pinched, was so weak he could hardly keep up. Crooked Tail became more aggressive toward his brother, pushing him away to nurse, fighting for his own survival.

On December 19, Straight Tail died, only two weeks before the rains broke. Crooked Tail, now with that extra portion of milk, lived on to welcome the cool rain and the new tender grass. He grew into a big fat round elephant.

Though the rain finally came with a vengeance, perhaps a hundred of Manyara's elephants did not live to enjoy it; following hard on the drought, a lethal pneumonic disease cut them down. Curie may have been a victim; at any rate she disappeared, leaving little Pili to the care of Valeria and Yusta. The leadership passed to Hera, who once again displayed her sudden threat charges, which, however, were never as frightening as Boadicea's.

THAT HUGE TUSKER, named after a fierce ancient British queen, had been chief matriarch of the largest group of Manyara elephants, which included the family of Jezebel and Curie. How she died we never learned.

I remember clearly the first time I met Boadicea, in 1969. I was driving with Iain through the dark silent Manyara forest when a great gray mass wheeled and moved gracefully but with elephantine power toward us (pages 568-9). As if floating on air, ears flapping like wings in slow motion, she seemed to grow taller and taller, and then she stopped in front of us. She did this not suddenly, but with a flowing movement of



emerged that migrated over land bridges and eventually covered every continent except Antarctica and Australia. Inability to adapt to changes in climate and food supply may have caused mass extinctions, and today only the African and Asian elephants survive.

the body. Eyes fixed on us like bright disks, she barred our way, and then, with a trumpet burst through her trunk, she shattered all silence and displayed her power.

I sat there frozen to my seat, pale and insignificant, unable even to think, faced by this magnificent creation of the wilderness. She did not attempt to hurt us. She was merely warning us away from her family. Iain, knowing what she was doing, remained motionless, respecting her presence. She moved on then, taking some of her family with her, while the others stood nearby, watching us.

A little farther on Iain opened the door of the Land-Rover and slipped out, moving cautiously toward an elephant with one tusk. When he was about two paces from her, she turned on him, lifting her head, ears outstretched, only needing to fling her trunk to hammer his chest. He spread out his arms in a similar human gesture and stood his ground. They looked at each other, and slowly they lowered ears and arms. Iain stretched out a hand. Hesitatingly, she touched it with her trunk. It was a fleeting moment of contact between man and beast, in which ancient enmities between alien intelligences were forgotten.

"This is Virgo," Iain told me. "It has taken me nearly four years to get this close. In a few months I will be able to stroke her."

That relatively peaceful life of the Lake Manyara elephants suddenly changed in the early 1970s, when the price of ivory soared. A poacher who in the '50s and '60s could get only 45 cents or so a pound by 1976 was extracting almost six dollars a pound from middlemen. Many of the great Manyara matriarchs fell to the swelling ranks of the poachers. It felt as if our own family were

having their teeth hacked out by axes for money. Boadicea was one of the few of her age still alive, always standing tall and ready to charge, with all the others rallying round her. Then, in late 1974, Mhoja found Boadicea's skeleton.

We asked Tanzania's director of national parks, Derek Bryceson, to let us buy her tusks and take her skull to our home in Kenya, a favor he readily granted. But in the few days it took to get our government permissions, the tusks, we were told, had already departed to Japan's ivory market. Iain flew home with only Boadicea's skull in the rear seat. That is all that is left of the magnificent creature that roamed the forests, plains, and hillsides of Manyara.

SINCE AT THAT TIME we could only guess at how many elephants were left in Africa, it was impossible to say whether the ivory rush was threatening their survival. Some people regarded Africa as a bottomless store of tusks and claimed there were millions upon millions of elephants. If there was to be any action to limit the trade, we needed facts. With the support of the New York Zoological Society, the World Wildlife Fund, and the International Union for Conservation of Nature, we began a survey of African elephants in 1976. Uganda, Tanzania, and Kenya were among the countries from which, we had heard, poachers and traders were feeding the ivory warehouses of the world, and we made them our priorities.

In March 1976 Iain with two of his colleagues flew west from our Nairobi headquarters to Ruwenzori National Park in Uganda. Their eyes were caught by many elephant skeletons littering the landscape. Never had they seen so many skeletons; in just 15 minutes they counted 78 carcasses and only 58 live elephants.

Then in Uganda's Kabalega Falls National Park they discovered more than 900 elephants lying dead in the huge stretch of parkland south of the Nile. The park staff told them that the poachers were army men who came in with their automatic weapons, and that the trade was in the hands of close associates of President Idi Amin.

In 1979, with the overthrow of Amin in the Uganda-Tanzania war, the situation in the two parks actually worsened. The frontline Tanzanian troops passed through Ruwenzori in good order, but those who followed reportedly shot hundreds of hippos and elephants. Thousands of Amin's soldiers retreated through Kabalega, gunning down elephants and other game and looting park equipment.

This past spring Iain returned to Uganda for another look. The whole country was awash with automatic rifles captured or looted from Amin's army, and with them the poachers were taking tusks. In the northern part of Kabalega some 1,200 elephants had survived; in the south they had been reduced from 8,000 in 1966 to a mere 160, almost all clustered in one terrified herd, moving day and night, unable to find refuge, and shedding corpses like leaves along the trail. Iain and his team counted 374 carcasses. The tusks of the dead had been hacked out and the meat left untouched, food for hundreds of vultures (pages 580-81).

"We have only one working vehicle and no money to patrol against poachers," said Alfred Labongo, warden of Kabalega. "Our rangers earn 450 Ugandan shillings a month [about $6 in real spending power] and have not been paid for three months. What is my ministry doing, except turning all these rangers into poachers?"

We realized with horror that we were witnessing the extermination of the elephants, and no one seemed to care. But our hopes soared several months later as Uganda's new government stepped in, aided by international conservation organizations: Kabalega soon would have new vehicles and spare parts, landing strips, and desperately needed money for staff salaries and training.

Formerly much of the ivory from the elephant slaughter ended up in the curio shops of Nairobi, Kenya's capital. One morning in 1977 I walked into one of the largest in town. A young Indian clerk, all smiles and very polite, greeted me, slowly walking backward, pulling out piece after piece of enticing ivory from shelves packed with statues, jewelry, and small tusks. There must have been at least 200 tusks of every imaginable size in the shop.

The Indian took me to a back room where two African carvers sat under a glaring bulb. One squatted on a stool with a dentist's

drill in his hand, carving identical figures and faces on chopped-off pieces of tusk.

A pile of ivory chippings and dust fell on the ground. "What does the owner do with this tooth dust?" I asked.

"I put it in a bag every evening, and he takes it home to put on his road," the carver said. "You know, to make the road pretty into his house."

When I told the clerk I would like to take pictures in the shop, he warned that the owner would have me arrested.

The most profitable way to take legal ivory out of Zaire, Uganda, and Tanzania in those days was to trade it through Kenya. Poachers also had their big-shot contacts there to smuggle ivory out by trucks, camels, cars, and major airlines. So Nairobi became one of Africa's ivory capitals, and in 1976 exported more than 400 tons.

In Kenya itself, poachers were killing elephants by the thousands despite a hunting ban. Tsavo National Park, biggest in Kenya, with one-third of the country's elephants, had already been hit hard by drought, and the unprecedented wave of poaching caused a further decline among the remaining elephants. In 1975 the warden sent eight truckloads of ivory, weighing more than 66,000 pounds, to the ivory room in Mombasa to be auctioned off, a large part of it confiscated from poachers (pages 598-9). Tsavo was littered with mounds of "eleskeles," white bones draped with a dark skin like a blanket covering the dead.

The poachers then were mainly Kamba people using bows and poisoned arrows. "Working for rich people in Nairobi," they confessed when caught in anti-poaching raids. Later, fierce nomadic Somalis from the north took a heavy toll with firearms.

We landed in Tsavo at a small tourist camp on the edge of the Athi River, where a family of eight elephants had lived. The manager, a young blond German, told us that one by one they had fallen to the Kamba arrows, leaving only one cow with her two calves. Just a couple of months before, the cow had staggered toward the camp with four poisoned arrowheads in her side, collapsed, and had to be shot. The poison is concocted from the wood of *Acocanthera* trees. It is usually effective immediately, but a poorly placed arrowhead can sometimes take as long as a month to kill an elephant.

Today the poachers have been cleaned out, the park has revived, and one rarely sees a dead elephant. The big change began at the end of 1977, when elephant killing in Kenya had reached its peak. President Kenyatta announced on December 12, Independence Day, that a total ban on private trade in wildlife trophies, skins, and ivory would be enforced in Kenya in three months' time.

That announcement coincided with another step forward. It came as the United States Congress was holding hearings on the threatened status of the African elephant. The result of the hearings, at which Iain testified, was that the U. S. would limit its ivory imports to countries that had signed the Convention on International Trade in Endangered Species, and would fund a study on the international ivory trade.

New Year of 1978 in Kenya found posters pasted on the windows of the curio shops, announcing reduced prices on all stocks. Prices dropped further as the March deadline approached, but the stocks seemed to be growing. Business was flourishing.

People crammed the shops and crowded the sidewalks, waiting their turn to get in, to buy hideous skin bags and wallets and badly finished ivory statues. Iain and I stood in one shop watching. The Minister of Wildlife and Tourism, Mr. Matthews Ogutu, was there beside me, talking with the owner.

"Why don't you buy anything?" the minister said to me. "It's the last day." I couldn't. Not after seeing the elephants in Tsavo dragging their poisoned bodies, waiting in agony for death.

FROM the Nairobi curio stampede we flew into Rhodesia (now Zimbabwe), which, in spite of its then tense, war-strained atmosphere, had retained a substantial elephant population and a highly efficient wildlife department. We were invited there to a symposium celebrating the 50th anniversary of Wankie National Park.

Civil war was in progress, and we entered Wankie in a convoy, escorted by armored cars. Their underbodies were V-shaped to minimize damage from land-mine blasts, and they had zigzag sides to deflect rockets.

Every year a culling team inside the park kills elephants. The wildlife-management

Nose, hose, and hand, *an elephant's trunk is long on versatility. An elephant in Kenya's Tsavo National Park has learned how to turn on a water tap (**left**). To drink, elephants siphon as much as a gallon and a half of water up their trunks before spraying it into their mouths. In drier months the trunk may be used to dig to water level (**above**).*

*During a midday snooze an elephant curls its trunk neatly in its tusks (**right**). Equipped with thousands of muscles, the trunk can deftly pluck a leaf or uproot a tree. Covered with sensory hairs, it also feels the shape, texture, and temperature of things.*

***Last rites** for a bull shot for crop raiding were observed by the Douglas-Hamiltons in Manyara. As an experiment Iain set the skeleton by a well-used trail. A passing kinship group closed in.*

department maintains that their numbers must be kept below certain limits to preserve the habitat and ensure adequate food for the other animals. A team of three or four riflemen drop the matriarchs first, then shoot the other adults of the family as they mill around leaderless. The youngsters, up to the age of four, are tranquilized and transported to pens next to park headquarters.

I saw about 40 youngsters huddled together in the "baby pens" (page 597). They would be sold to a contractor for about $1,000 each, and then to zoos and circuses in the United States and other countries. Two very tiny ones were kept in big boxes. One seemed lonely and immediately ran to me, hoping to get some milk. I gave it my thumb to suck, and it held on with a soft pink tongue. These tiny ones are bottle-fed, and lacking the antibodies in mother's milk, they tend to die from intestinal infections.

The other babies under three were herded into a paddock together, some eating oranges, branches, and green stuff, others just standing in corners sucking their trunks. Every now and then one would come out and charge at the ranger looking after them.

In the stables with smaller paddocks lived

The tusks were mouthed and passed about, the bones lifted, carried, and dropped a hundred yards away. "It was an uncanny sight," he says. Though recorded before, such behavior is unexplained.

the juveniles, three to four years old, who were much more nervous and frightened and charged instantly. Any young elephants over 60 inches at the shoulder were too big and too aggressive; the riflemen with an experienced eye for age could easily pick them out. Perhaps they had the better fate. The survivors, from now onward, would spend their lives in little enclosures to amuse man, with almost nothing to do but eat.

Culling takes place between May and August in Wankie, for only then is the climate cool enough for processing the elephant meat. In the 1978 season, 398 elephants were shot, skinned, cut up, and dried.

We arrived in time to see the meat of at least 15 elephants being cut into strips and laid on long, low tables made of metal rods and chicken wire (pages 596-7). The carcasses were now the property of contractors, who had paid the government $240 for each animal, regardless of size.

The dried meat from a single carcass brings about $100 and goes for 55 cents a pound in the local market. The skin is more valuable, bringing up to $1,200. The tanned hide is used for leather goods. Briefcases fetch $400; scraps are used in shoes, bags,

purses. The feet become wastepaper baskets, umbrella stands, or in the case of baby elephants, pencil holders. The fat is melted down and sold in 44-gallon drums for cooking. The tusks go to the ivory auction in Salisbury, where a matched pair brought $50 a pound in 1978.

Culling, when properly done, far from harming the elephant herds, guarantees more plentiful food for the survivors. The alternative can be, in extreme cases, overpopulation and starvation. Iain believes that culling should be done for ecological management when necessary, though neither of us thinks it should replace a laissez-faire policy in every instance.

To see the elephants shot in masses, especially a whole family, is a most horrific experience. It is easy for armchair ecologists to recommend shooting programs when they have never participated in the shooting. But hearing the guns mixed with the screams and bellowing of the terrified elephants as they all collapse needs a strong stomach and a cold nerve.

In Rhodesia, during the guerrilla warfare, the elephants had to face the risk of land mines as well as guns. A few miles from the majestic beauty of Victoria Falls, Dave Scammell, warden of Zambesi National Park, had spotted an elephant that had crossed over from nearby Zambia. He invited us along to chase it away from the minefields set by the Rhodesians along the border. His Land-Rover had thick steel protection underneath and steel bars over the roof. "I'm sorry I have to take you in this cage," apologized Dave. "Occasionally on the road one does hit mines that have been slipped in by the terrorists. But in here we're probably pretty safe."

Tightly strapped into our seats, we were driven along a lonely road through the bush until we came to a big fence. We found some elephant tracks that followed the road, but we were too late. The fence was broken down, and the tracks went into the mines. Where they came out they had blood on them. "Damn, he's been hit," Dave said. "Let's follow the tracks and see what's become of him."

He had come out of the minefields, then gone deep into them again, this time almost certainly blown up for good. Dave told us that scores of such dismembered animals lay along Rhodesia's borders with Mozambique and Zambia. Frequently the hyenas or vultures that descended on the carcasses also got blown up.

But not all our Rhodesian experiences were so gory. On a hill covered in orange and yellow mopane trees, where the Sengwa River runs under sienna-colored cliffs, stands the Hostes Nicolle research station. Here a young scientist, Rowan Martin, was working on an elephant-tracking program.

He had developed a new type of radio collar that used little power, and that could continue transmitting for more than 12 months and be received at a range of ten miles. Tracking was done from tall, rotatable antennas atop sheer hills. He had trained rangers to record the bearings of each of his 20 or so collared elephants every three hours, day and night.

Locating his elephants from his stations, on foot, and by air, Rowan has built up the most detailed data ever compiled on continuous elephant movements. His most exciting result is apparent proof of a new level of elephant society, the "clan," which is beyond the family units and the kinship groups that Iain has found.

Rowan has clear evidence that as many as a hundred individuals sharing a common home range freely associate with each other, but not with individuals of a neighboring clan. He also discovered, as Iain did at Manyara, that large strung-out assemblages of elephants show extraordinary coordination of movement. They rumble to each other, and at times their communication seems almost telepathic.

LEAVING the elephant clans of Rhodesia, we flew to South Africa, where the fate of most elephants was sealed a century ago by ivory and meat hunters. Today the only substantial elephant population, about 7,500, lives in the rigidly managed Kruger National Park, where excess animals are processed scientifically and hygienically in a huge abbatoir.

Two tiny herds also exist on the country's southern shore. One is in the dense Knysna forest, which grows on steep V-shaped slopes. Here, on rare occasions, an elephant emerges from his hiding place and stands in

a clear patch facing the sea, watching waves crash on pink rocks. These elephants, roaming a 100,000-acre forest reserve, are seldom seen. But from time to time, when they raid private farmland, they are shot and wounded or killed. The existence of this little group of elephants—probably no more than five today—hangs by the merest thread.

Another elephant enclave survives in the Addo Elephant National Park. Here separation of man from beast has allowed the elephants to recover. In 1954 a massive steel fence was completed to enclose the last 10 or 20 elephants. Since then they have increased rapidly, and they total more than 100 today. The historic conflict with man is over. Man and the elephant are mutually tolerant, separated from each other by steel barriers. From slaughter to strict preservation of a tiny fragment—this South African example may foreshadow the fate of most of Africa's elephants.

PERHAPS THE SAFEST REFUGE is still the dense equatorial forest. There below our plane stood the towering trees, wrapped in shifting mists of rain, a forest floored in thick red sludge, through which it is almost impossible to move. A stronghold where elephants and other species can get away from man.

We were at the start of another long journey to look at the effects of the ivory trade on the elephant population. It would take us to the forest elephants of central Africa, then across thousands of miles to the most westerly elephants, in Senegal, and north to the desert elephants of Mauritania and Mali.

Little is known about the forest subspecies, *Loxodonta africana cyclotis*. Far from communication, they have been undisturbed by man, except for the Pygmies. But now the ivory hunters, working on behalf of rich men, follow the forest elephants' tracks for days on end, inspired by the high price of ivory. Today the elephants are pursued through the great forests that stretch from Cameroon, in a wide D shape, over the Central African Republic, Zaire, Angola, the Congo, Gabon, and Equatorial Guinea.

It was in Gabon in May 1979 that we first sighted wild forest elephants, strolling in patches of long golden grass between islands of forest. We were at Petit Bam-Bam in the Wonga Wongué Reserve, private hunting ground of President Albert-Bernard Bongo. It was virtually impossible to observe these elephants at close quarters because hunters and the recent explosions for oil exploration had made all the animals wary. Sensing our disappointment, the guide remarked, "Don't worry, the oil is nearly finished in Gabon, and there are plenty of elephants farther on."

We flew southward along the Atlantic coast, and met Pierre Guizard by chance at Iguéla. He had been in Gabon for 34 years as a forester and later as a prospector for gold and diamonds. "I have also been a hunter and have shot many, many elephants," he told me with a half smile.

He offered us a boat to track these forest elephants, with his son René as guide, his tracker Makita, and Joseph the boatman. "Tomorrow you will see the elephants strolling out of the forest and walking next to the sea," he said, "family after family, like clumps of rocks in the sand, but be careful, for they become extremely fierce."

We traveled up a crocodile-filled lagoon in our dinghy, and on reaching a grove of trees, Iain had a hunch he should get up one of the trees and have a look at the beach. Knee-deep in green wax-leaved bushes, fifty yards away, stood a dozen forest elephants, the open blue sea and long white waves breaking behind them. It was as if Iain had seen a vision, so surprised was he to have found them that easily, after dreaming for years of seeing such elephants on a beach.

Iain went up another tree, closer to the elephants, and René stayed with me as I crawled on the sand behind some bushes. Makita and Joseph were terrified. They had never seen two people so eager to be killed by an elephant, and they were under Guizard's strict orders not to shoot. We were all excited and nervous, as Iain and I click-clicked our cameras and watched those elusive elephants. There was a bull with spread-out tusks, females with calves picking fruit from the waxy plants, and several half-grown youngsters playing in the sea. They were certainly smaller than the elephants we knew, and with rounded, smaller ears blown out by the wind.

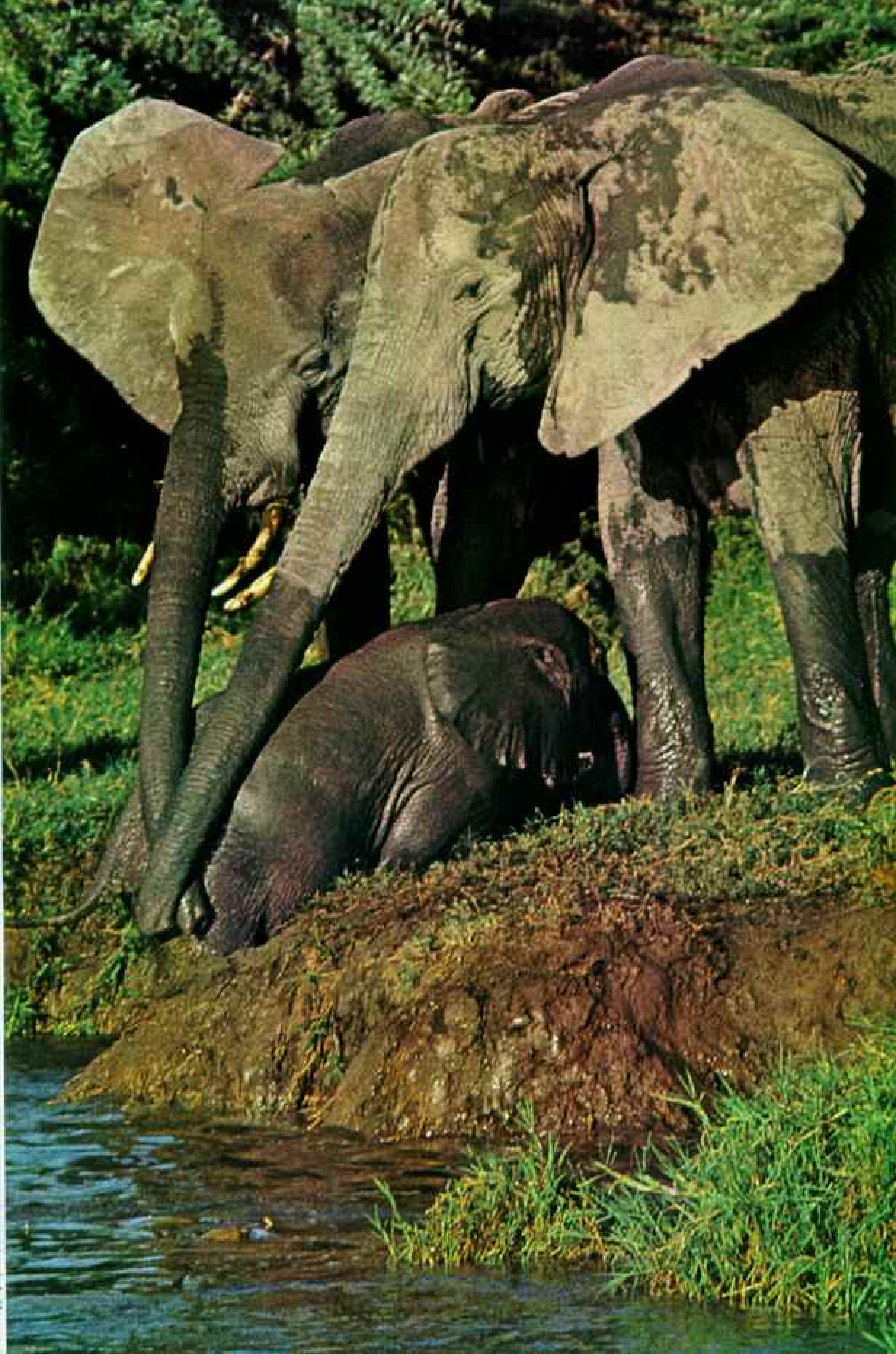
Suddenly there was panic, and our three guards were running in all directions

***To lend a helping trunk** is natural in elephant family life. A mother and oldest daughter rescue a calf on a slippery mudbank (**right**). All females in the kin group, even teenagers, share in tending infants. The young are well protected, and may nurse as long as eight years—or until their tusks become too long for mother's comfort.*

*Two juveniles (**below**) assist one another in a mud bath. The mud pack protects against heat and insects.*

*Iain and his assistant Mhoja Burengo took an unexpected bath (**left**) when they unsuccessfully tried to navigate a swollen river while tracking an elephant. A towline rescued their Land-Rover.*

RICK WEYERHAEUSER (ABOVE AND RIGHT)



as an elephant came up behind and walked straight past us. Iain and I found ourselves alone, with the reputedly fierce *assala*, as they are known locally, heading slowly toward us, their thin little tusks pointing slightly inward. But the wind carried our scent away, and we escaped detection.

THE GABON ELEPHANTS, although hunted for ivory, meat, and pleasure, seem to be in balance with their environment. But in Zaire we were less optimistic. Though by our estimates it had more than 370,000 elephants in 1977, it had now become the hub of the corrupt ivory trade.

During the early 1970s, reports of poaching and the complicity of high officials in evading ivory-trading laws were widespread. Issuing of trading permits got out of hand, and in 1978 one of the greatest massacres of Zaire's elephants took place. Wardens and acquaintances reported to us that military personnel were machine-gunning elephants, and that whole families had been killed by the use of fruit poisoned with battery acid or insecticide and placed on well-used elephant trails and at water holes. For the local people this was big and easy money, to buy food, medicine, radios, vehicles, or wives. For the traders in Europe, the Far East, the U. S., it was just more money.

In August 1978, after tens of thousands of elephants were killed, President Mobutu Sese Seko declared a moratorium on all further ivory exports. But illegal ivory trading continued to cross the borders into Uganda, Burundi, the Congo, and the Central African Republic. And, in spite of the ban, Zaire itself remained one of the leading producers of ivory on the continent, with major airlines involved in carrying large ivory consignments to markets around the world.

The wildlife consultant charged by Iain with investigating the international ivory trade for the U. S. Fish and Wildlife Service was Ian Parker. A former Kenya game warden and elephant cropper, he was recently back from a trip to Hong Kong, where he had inspected more than 20,000 tusks. When we talked to him in June 1979, he concluded that more than half came from the forest elephants of West and central Africa.

Powerful officials in Zaire were alleged by members of the legislature to be behind the illegal ivory traffic: four members of the Political Bureau, who had immunity from prosecution, and a relative of the president himself. One Western military attaché told Iain he had seen fresh tusks being loaded into a Zaire military plane to be conveyed to Kinshasa for export.

Iain and I had been talking to people for months, listening not only to facts and informed opinion about elephants but also, too often, to lies, indifference, and excuses. Many times I was overwhelmed by discouragement as I took the same notes about smart traders and smugglers, corrupt ministers, disillusioned conservationists, paid-off officials, and wildlife directors who had not been in their offices for weeks.

In such hands were the lives of the great elephants. They were so vulnerable. Man, the self-appointed decision maker, says, "Eradicate the elephants," and they are eradicated with guns and helicopters, as they were in part of Rwanda. "Cull the elephants, for they are destroying the trees and the crops," and whole families are shot and eaten. I began to wonder whether man could or really wanted to save the elephants.

I remember when Iain returned from a 1976 trip to Tanzania, where he had been flying for six weeks, and announced with jubilation, "There are 110,000 elephants alive and well in the Selous!" Realizing that only we and the crew knew, my first reaction was to keep this a secret. Those elephants are going to be killed, I thought. But the Selous count had been financed by Danish aid to the Tanzanian government, and it had to go in, exact "to the last elephant," so to speak.

In country after country we made our counts from our airplane, flying in straight lines 300 feet above the ground, each run

"A latticework of wrinkles": *The Roman scholar Pliny the Elder so described the elephant's sagging skin. The inch-thick hide lacks sweat glands, and the animals rely on their well-veined ears as a cooling system. When severely overheated, they may withdraw water from their throats or stomachs to spray their ears.*

three to six miles apart. Stopwatch in hand, Iain would call out, "Stand by for transect one," and two observers in the backseat would tape-record their sightings: "Eles six—skele one—skele one—eles three. . . ." Minutes later, "Transect two—huts 10—shoats [for sheep and goats] 40—skele one." In the seat beside Iain, the habitat observer took pictures and marked his map.

The numbers kept coming in, though the magnitude of the task was daunting, since the elephants of Africa still occupy a range of nearly three million square miles. Within this area lie 35 countries and some 90 national parks and reserves. Extrapolating likely densities for the total range, Iain concluded that a minimum of 1.3 million elephants survived at the time of our survey. This figure was based on the work of other scientists, as well as our own, but I believe it is by now a great overestimate, considering the amount of ivory still flowing out of the continent.

One of the big ivory drains was through La Couronne, a company in the Central African Republic managed by a Belgian woman and a young Spaniard. In 1976 it obtained a virtual monopoly to trade in ivory from President Bokassa, reportedly a shareholder in the enterprise. Here some of the last big tuskers carrying ivory of more than 100 pounds could and still can be found. In 1977 the official record of elephants killed suddenly jumped to 4,065, from the 1976 figure of 1,420.

One contributor to our elephant survey reported that military trucks were used to transport this ivory to Bangui, the capital and company headquarters, for export to China, Japan, and Hong Kong on major airlines, with the ivory transiting Paris and Antwerp. But as one of the airline officials said: "It's only cargo."

After Bokassa was overthrown in September 1979, La Couronne's ivory business was closed down; so, alas, was wildlife law enforcement. By the end of the year 4,000 elephants were reported killed, with ivory weighing 85 tons. In reality, our contact in

Red meat stripes *the fields of Zimbabwe's Wankie National Park, where an average of 500 elephants are culled each year in an effort to keep their population in balance. The meat is cut, placed on low chicken-wire tables for drying* (**above**), *then marketed as a cheap source of protein.*

Orphaned youngsters of those killed are kept in stout pens (**below**) *until sold to contractors for zoos and circuses.*

Africa's white gold: *Elephant tusks gleam alongside rhino horns at Tsavo in 1975. Although Kenya banned private ivory sales two years later, tusks confiscated from*

DAPHNE SHELDRICK

poachers and those harvested from animals that die naturally may be sold by the government for export. But tons of ivory each year are still shipped out illegally.

Bangui said, these figures could be doubled.

In the spring of 1980 the new government forbade all elephant hunting and stopped all trade in ivory. It still needs to convince the people of the value of this new policy, however, since many profited from the perhaps 28,000 elephants killed during the three-year ascendancy of La Couronne. But this is the first good news this year, giving us hope that such treaties as the Convention on International Trade in Endangered Species might work.

WHEREVER MAN has penetrated and settled, the elephant range has disintegrated, especially in West Africa. In 30 years nearly 24 million acres of primary forest have been destroyed by man in the Ivory Coast. Across the remaining forests of Africa the timber companies are cutting the trees, hundreds of years old, opening roads for the primitive agriculture of the slashers and burners. Squatter families move into these forests to grow their patches of millet and maize. The elephants must find their lives elsewhere.

The Tai forest in the west of the Ivory Coast bordering Liberia is one of West Africa's largest remaining primary forests. For hours we drove on traffic-filled roads, passing trucks carrying three to four gigantic logs each. All day this procession proceeded to the logging ports, so crammed we could hardly see the water for the floating logs.

Few are interested in the salvation of that forest. Only presidential action can keep the timber raiders out. With that forest go the elephants, and all the rare species of plants and birds that have been protected from man, till now, by the trees. While the mighty international industrial overlords, totally uncontrolled, continue to make their fortunes, the elephants and the great trees, the giants of Africa, are going hand in hand to their graves.

From the decimated forests of the Ivory Coast, a thousand miles as the crow flies, we dropped into Cameroon with its largely unspoiled forests. Along the eastward track to Lomié is a series of Pygmy villages, where the people live by hunting and gathering. They still exploit the forest, and elephant hunting remains very important—a source of food, festivity, and prestige. Fat, which is plentiful in elephant meat and lacking in most of their other game, is a special bonus in their diet.

Their traditional method of hunting is exceedingly dangerous. On sighting an elephant, the chief hunter and a learner, usually his son or son-in-law, leave the hunting party and follow the prey. The hunter alone creeps up and cuts the elephant's hamstrings with an ax or machete and attacks the soft underbelly with a large spear. The hunter and learner then retreat and wait for the elephant to die.

Till recently Pygmies would kill an elephant only for its meat. They gave the tusks to the Bantu village chief in exchange for protection and small gifts. But the availability of big-game guns in the past few years has pushed the Pygmies' motives toward ivory. Gun owners lend them weapons on condition that the Pygmies may keep the meat and they the ivory, in return for such gifts as clothes, liquor, and cash.

Down in the southeast tip of Cameroon, the Pygmies are more sophisticated. They own plantations, pay taxes; many even speak French. The gifts they demand from gun owners, besides large cash payments, include transistor radios and 12-bore cartridges. In some places in the forest they are reported to kill more than a hundred elephants a year, often just for the ivory, leaving the carcasses to rot.

In the Cameroon capital of Yaoundé we visited the offices of the Wildlife and Forest Environment Service, where we were shown three and a half tons of ivory that had been seized from a Frenchman and northern tribesmen. The only safe place to keep these tusks was in one of the lavatories. The little room was stuffed to the ceiling, and it was impossible for anyone to enter. A court case

Elephants feasted *when forgiving nature carpeted Tsavo with flowers after a prolonged drought. An adult elephant in the wild consumes between 300 and 350 pounds of food a day. Herds straying into crops and rangeland can leave devastation—and gun-wielding farmers—in their wake.*

had been filed, but the director, Victor Sunday Balinga, told us he thought the defendants would probably get their tusks back in the end.

Mr. Balinga was alarmed by the speed at which the elephants are disappearing in the south. "Enormous amounts of ivory leave Cameroon each year," he said. And every year the price of ivory goes up.

In the ivory markets and galleries of Yaoundé, a Greek dealer offered us a 110-pound tusk for $3,250. "The price is going up, yes, but there is money to be made in ivory," he said. He has ten carvers working for him, each producing a statue a day worth about $100. "Plenty of orders," he said. "I have a special order from France to produce ivory porno all year round."

DESPITE the lively business in Cameroon, the ivory trade there and all through western and central Africa seems to be in the hands of merchants from Senegal. In Dakar, the capital, a wonderfully flavored place of multicolored people in multicolored markets, one trader pulled tusk after tusk out of a bag, admitting it was all illegal. "I can send these anywhere for you," he said. "I know the right way; it's just a matter of some money here and there.

"I have to earn a living somehow," he said. "I have never killed an elephant. Anyway, there aren't many elephants left here. I once went to Niokolo Koba National Park; it was quite nice, but when I saw all those elephants moving away in the bush, I said to myself, 'Look at all that ivory'; but then I thought life is worth more than money."

Senegal has about 450 elephants left because Léopold Senghor, the poet-president, stepped in at the last hour and saved them from extinction. He appointed a young Frenchman, André Dupuy, a former French Foreign Legion officer, to create a national park system. Dupuy runs it today with a Senegalese deputy and 300 militarily trained men, making Niokolo Koba one of the best protected parks in Africa.

We went on north to Mauritania, to look for some elephants last seen by scientists ten years ago. If they were still alive, they would be the last survivors in this northern part of Africa where the Sahara begins.

We reached Sélibaby, a flat spread-out village shimmering in a mirage. There the governor pronounced: "You cannot go on to Assâba. You are not desert people. It is too hot this time of year, and you will probably die. There are very few elephants left. After the big drought they either died or left for another country." He paused. "But you might be able to find some near Harr, a village not far from here. I can give you my driver."

The arrival of *toubab*—foreigners—in Harr was a great event. The whole village crowded round as we talked to the 77-year-old chief, who was dressed in a yellow robe.

"We do not kill elephants here," the chief said. "When the elephants come, we burn bits of cloth. When they smell it, they go away, and we beat on the tom-toms. If an elephant dies, we do not eat it, as it has not been *bismelah*"—a Muslim blessing uttered at the ritual slaughter of an animal. "One elephant killed a girl here in 1919. It was our only accident.

"The elephants were here in December. When the water is finished, they cross into Senegal. It would be nice to have tame elephants here, if a reserve could be made."

We returned to say good-bye to the governor, who told us: "We too would like to have national parks and a place for wild animals to live in peace, but how can we when we ourselves are struggling to live? Maybe if some of your big organizations helped, something could be done, but, you understand, it is the last hour for these animals."

In neighboring Mali the elephants' thread of survival is also perilously thin. By 1920 French colonizers had killed most of them for the ivory trade. About 550 survive there in the Gourma area, which spreads from Mali into Upper Volta and Niger. There they coexist harmoniously with the Pheul and Tuareg pastoralists. The water holes are shared, with the tribesmen's cattle drinking by day and the elephants at night.

Landing in the Gourma in April, we walked in search of tracks. The ground was like concrete at that time of the year. Not a blade of grass. The elephants were eating bark from stunted trees. We were told they move in herds of 50 to 100 and stand out like huge monuments on the dry pink earth. We saw not one, though we did find some tracks and dung only a day old.

Mali's Gourma elephants represent the

ultimate capacity of the African elephant to adapt to the harshest conditions. If the fragile harmony between the elephants and the nomads is allowed to thrive, then perhaps these desert elephants will continue to survive. As with all Africa's elephants, their future depends on man's *allowing* them to live, even through his own political upheavals.

But I can see only guns and more guns, and man wrapped in snakes of bullets as he sets forth emptying the forests and the plains, leaving carcasses and empty cartridges on his trail. I see only a few people working in the field and behind desks who are protecting the elephants, compared with the multitudes who are indifferent or whose focus is a quick way of making money. What happened to Uganda's elephants has taken place before and is happening now in Chad and Zambia. It will happen again in other lands already plagued by tribal power struggles, a breakdown of law and order, war, and famine.

The story of the African elephant could have a happy ending, but the ultimate choice is ours. Are we going to sit back and accept that the age of giants has passed without a whimper? Shall we simply allow the great elephant to be pushed into the refuges we carve out for him? Or are we going to take a stand and make this giant a living symbol of our freedom? That powerful yet gentle wanderer who can cross the boundaries of the great African plains and forests must, to survive, be freed from the political and financial burdens of man. □

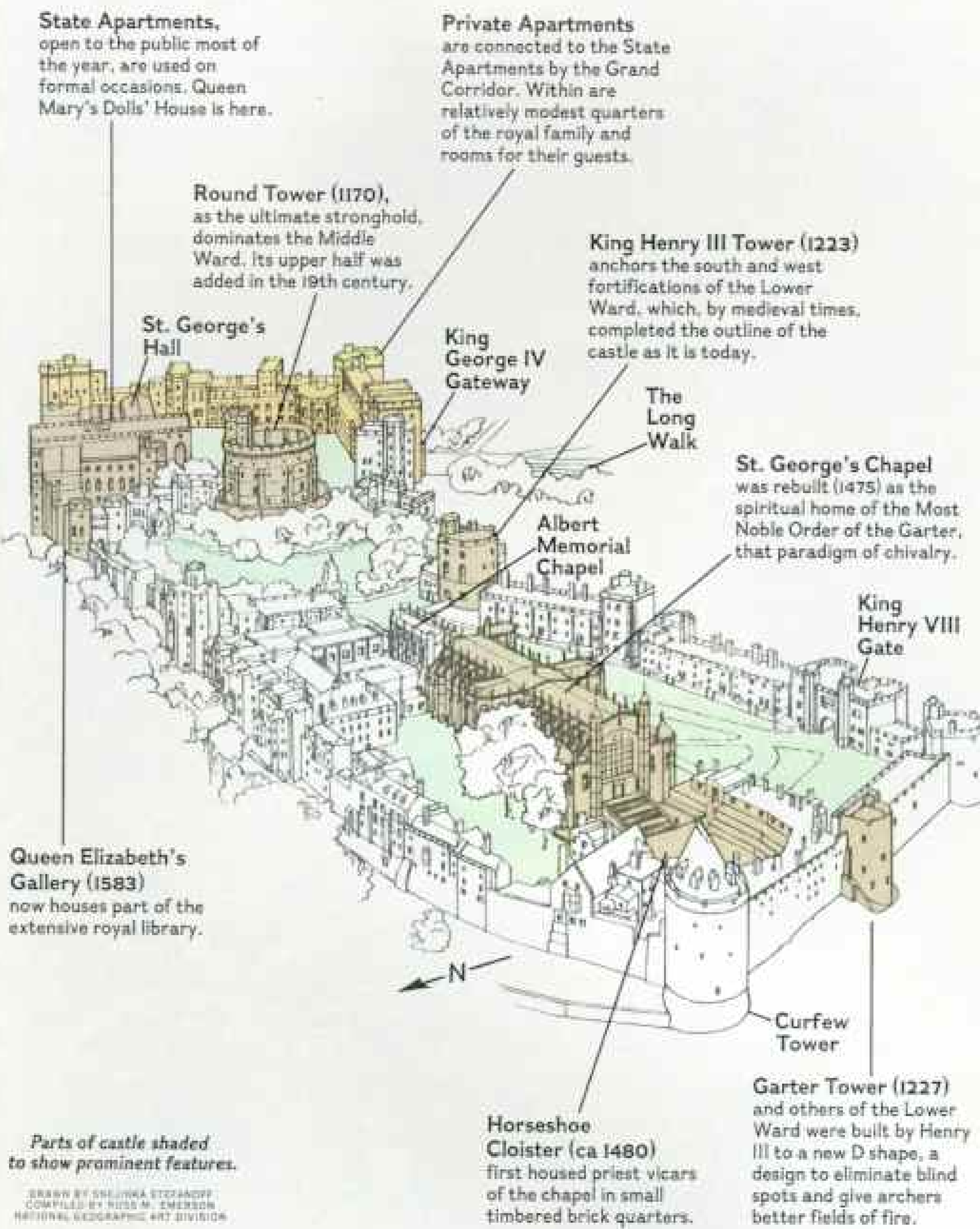
***Seeing eye to eye** with an elephant, Iain and daughter Saba reach out to touch Virgo, a special, trusting friend. But the human touch has historically spelled tragedy for elephants, and their future cannot be foretold.*

WINDSOR CASTLE

By ANTHONY HOLDEN

Photographs by JAMES L. STANFIELD

NATIONAL GEOGRAPHIC PHOTOGRAPHER

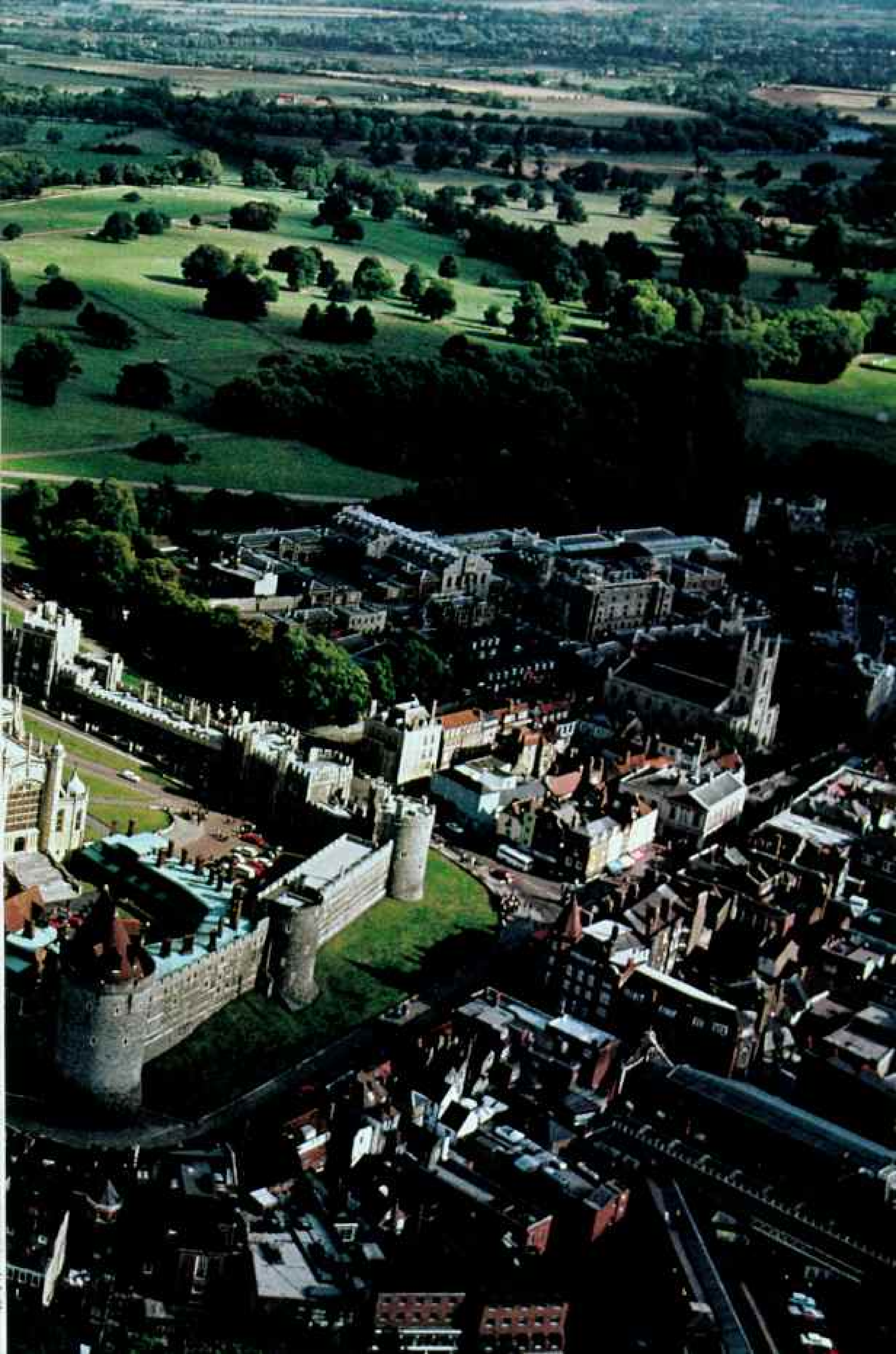


Parts of castle shaded to show prominent features.

RUMBLE OF ARTILLERY closes the Royal Windsor Horse Show. Beyond stands the castle, a residence of British monarchs since the Norman Conquest and stone witness to changing fortunes of the crown. The castle overflows, sometimes with pomp and daily with tourists. Itself a mélange of architecture, Windsor houses collections beyond assessment. While a massive symbol of sovereignty, the place is first a home, where Elizabeth II can gather with her family in brief recess from rounds of public duty.

Built about 1070, William the Conqueror's castle was a Norman motte and bailey, a timber stockade atop a dirt mound. A century later Henry II raised the Round Tower and stone walls. They served John well; in 1216, after he repudiated the Magna Charta, Windsor was besieged but held.

Down the dynasties, monarchs built and rebuilt. The last major changes were in the 1820s, when Windsor was encrusted with all the Gothic detail of a Walter Scott novel. Yet castle and environs seem much as Alexander Pope wrote: "Not chaos-like together crushed and bruised, But, as the world, harmoniously confused" ***(overleaf)****.*



IN THE SHADOW of Windsor Castle one recent summer Sunday, I joined a large and good-humored holiday crowd to watch one of England's traditional upper-class rituals: a hard-fought game of polo. Few of the spectators had a clue about the rules—it was hard to find anyone who even knew which team was winning—but for once, perhaps, ignorance was bliss. All eyes were contentedly fixed on a stocky figure in blue, galloping around the field as if his life depended on it, instantly recognizable despite his somewhat battered white helmet.

The captain of the Blues—leading them, as it happened, to overwhelming defeat—was His Royal Highness Charles Philip Arthur George Mountbatten-Windsor, 21st Prince of Wales, Earl of Chester, Duke of Cornwall, Duke of Rothesay, Earl of Carrick and Baron of Renfrew, Lord of the Isles and Prince and Great Steward of Scotland—and heir to the throne of the United Kingdom of Great Britain and Northern Ireland.

For the holiday crowd it was a rare chance to glimpse Prince Charles in the flesh. For me it was an opportunity to see another side of the man on whose biography I had been working for nearly two years. I had traveled to Windsor that weekend to watch the royal family at play in its favorite setting, the oldest inhabited royal residence in the world.

The present Queen's father, King George VI, preferred Sandringham, the family's more comfortable and more private country

Waiting to captain, *Charles, Prince of Wales, scans the polo ground at Windsor Great Park. His career follows from the princely motto:* Ich Dien *(I Serve).*

house in Norfolk. Queen Victoria spent much more time at Balmoral, that other fairy-tale castle amid the Scottish heather, although it was at Windsor that she had met her beloved Albert.

But Queen Elizabeth II's first love has always been Windsor. She spent much of her childhood here, playing happily with her sister, Margaret, despite the gathering clouds of World War II. In an ideal world, she has said privately, she would like to make Windsor her first home, but the demands of public life have forced her to abandon the idea.

Now another royal generation has come to love this familiar landmark, a symbol of stability and reassurance to British subjects the world over. It was here that Prince Philip of Greece wooed the young Princess Elizabeth. It was here that their children later knew their happiest family moments, living life as naturally as is possible for royal siblings, tucked away from public gaze.

Back on the polo field Charles was riding to the touchline for a much-needed mug of beer. He had just missed an open goal, then fallen off his horse before the delighted crowd. A right royal loss of dignity, rewarded by a highly unprincely ticking-off from his polo coach, the only man (apart from his father) who may swear at the Prince of Wales.

Charles looked ruefully over to me, his expression growing more pained as he saw me recording his embarrassments in my notebook. Then his face broke into the broadest of grins. In the heat of that unmajestic moment, I could see that he was thoroughly enjoying himself. Things don't often go wrong for princes. And at Windsor he, like the rest of his family, revels in a rare chance to be utterly informal and relaxed.

Watching Charles against the backdrop of Windsor's famous Round Tower, I was reminded that he provides a direct blood link with William the Conqueror, the first monarch to build defenses on this site, about four years after subjugating the troublesome English in 1066. A thousand years of British history merge in this fortress overlooking the River Thames, atop a lofty mound said by legend to have been the site of King Arthur's Round Table.

William the Norman, the foreign invader, was hated and feared by his new Saxon subjects. There were constant threats of insurrections—and it was primarily to protect himself from his own people that he built a chain of fortresses around London, also guarding trade along the Thames. Another still standing today is the Tower of London, the main defense to the east of the capital.

To the west the nearest suitable site was a chalk outcrop rising a hundred feet above the riverbed, commanding distant views. Nearby was an Anglo-Saxon settlement called Windlesora—from which, a thousand years later, the British royal family derives its dynastic name of Windsor.

Where Windlesora was, Old Windsor now stands, one and a half miles from the sleepy town whose life revolves around the castle. Windsor's citizens, who have Prince Charles as their high steward, are long accustomed to royal comings and goings. But one periodic ritual always sends a frisson of excitement through the town.

Several times a year, in particular before Christmas, Easter, and Ascot Week in June, a parade of small vans discreetly embellished with the royal crest approaches the castle. The court is coming here from London—and with it all the finery needed for royal entertaining, and a large flotilla of liveried footmen and household servants.

The day before Charles's polo game, I had watched with all Windsor for the signal that their community was once again complete. At a radio message from the Queen's chauffeur, informing the castle staff that the royal limousine is about to enter the grounds, the royal standard is raised on the flagpole above the Round Tower. The monarch is in residence.

For much of the year the flag is the only clue to the Queen's presence at Windsor. She likes to weekend here, and to do so with little fuss. The British sovereign lives in a small suite of rooms above the East Terrace, overlooking the sunken garden, her family gathered around her in equally modest accommodation. During these weekends the State Apartments remain open to the public, who tramp through in the remote hope that they might turn a corner and bump into their Queen.

Each April Her Majesty holds a series of dinners at Windsor for some of her more prominent subjects. These are popularly

known as the "dine and sleep" visitors: top Britons from many walks of life—politicians, diplomats, and leaders of business and industry. They enjoy a brief overnight chance to mingle with their monarch and her friends. For aristocrats and commoners alike, an invitation to Windsor is Britain's most cherished hallmark of social status.

Christmas and Easter are times for family and friends. But the week of the race meeting at Ascot, a few miles away, sees foreign dignitaries and British nobility travel to Windsor as Her Majesty's houseguests.

THE CASTLE is not far from London's Heathrow Airport, which has been something of a mixed blessing. For visiting heads of state it means a short journey after a long one. For Windsor it means a great deal of aircraft noise. The standard flight path takes the big international jets, notably the Concorde, directly overhead. In after-dinner conversation, the Queen has proved herself an expert on the effect of winds on Heathrow flight patterns.

Heads of state on official visits are taken by limousine from the airport to the outskirts of Windsor, where they transfer to a horse-drawn carriage for the final approach to the castle's King George IV Gateway.

The state visitors will then be conducted by the master of the household to the Private Apartments, considerably grander than those occupied by the royal family. Those hoping for the King's State Bedchamber will be disappointed. It was last occupied in 1909, by King Manuel of Portugal, and is now a museum piece.

The dine-and-sleep guests will not see their hostess until they forgather in the Green Drawing Room for aperitifs. The master of the household will have briefed those unfamiliar with royal etiquette. Do not shake a royal hand unless it is extended in your direction. Address the Queen as "Ma'am," and do not call the Prince of Wales "Wales" (as some do, to his annoyance). "Your Royal Highness" or "Sir" are equally correct, though he will agree with you that the first is a bit of a mouthful.

At 8:30 sharp the guests file in for dinner. In June—on or close to the anniversary of the defeat of Napoleon in 1815—dinner will be held in the magnificent Waterloo

Prince Philip drives the

Queen's four-in-hand in international-level competitions of coachmen's skill.

Chamber. It was in this room that the young Princesses Elizabeth and Margaret performed in the annual Christmas pantomime, watched by their father, George VI, pale from the strains of war. Their last, "Old Mother Red Riding Boots" in 1944, kept alive the castle's strong theatrical tradition; 350 years earlier, at the request of Elizabeth I, Master Shakespeare of Stratford wrote *The Merry Wives of Windsor* for a royal performance here.

Beneath the guests' feet in the Waterloo Chamber is one of the largest seamless carpets in the world, woven for Victoria by Indian prisoners in Agra (pages 620-21). On the walls hang portraits of monarchs, statesmen, and warriors who shared in Napoleon's defeat, commissioned by King George IV (1820-30). The most magnificent, over the fireplace, is of the "mad monarch" himself, George III, though he had little to do with Wellington's victory.

Dinner menus are chosen by the Queen herself, though her guests are occasionally surprised to find her served more modest fare. She does not care for some of the richer foods that are often on the royal table. Nor will she drink much, perhaps just one glass of champagne, but her guests may be as self-indulgent as propriety permits.

When the meal is finished, the party will return to the drawing room (properly called the Withdrawing Room) for brandy and talk. Prince Philip is likely to do most of the talking; he has a practiced way of drawing out visitors. The Queen is adept at listening intently, making inward notes on the proceedings, while revealing little of herself.

At some point before midnight she will rise from her chair, a signal to all present that the time has come to retire. If the guests are one-night visitors, usually British politicians or other prominent figures, they will bid their hostess farewell. Breakfast will be served in their rooms in the morning, but they will not see her again before they leave.

Longer-staying guests will not see the Queen until lunchtime next day. At Windsor as anywhere else, even during holiday periods, the business of monarchy goes on. Those vans scuttle back and forth from London with "the boxes," the battered leather attaché cases containing documents of state for Her Majesty's attention: summaries of Parliamentary proceedings, cabinet papers, legislation requiring her signature.

In the afternoon, during Ascot Week, guests will join Her Majesty in the royal enclosure at the nearby racecourse. At other times of the year she may take them riding around the 5,000 royal acres of Windsor Great Park, the hunting preserve of former monarchs. (The less hardy are permitted to try to keep up with her by Land-Rover.)

One particular source of pride she will show off to houseguests is the royal herd of Jersey cattle, which graze in the park. From these cows, she will tell them, comes the pat of butter served with their breakfast, neatly embossed with the royal crown.

ON A SUMMER EVENING, after dinner, the Queen enjoys nothing more than taking visitors through the State Apartments, to whose priceless art treasures she is an expert guide.

At the top of the Grand Staircase, where she played as a child, stands one of the biggest suits of armor ever made—designed for that portly monarch Henry VIII (1509-47), who lived at Windsor with his succession of wives, and is buried here.

The King Charles II Dining Room has a late 17th-century Verrio ceiling depicting, appropriately enough, a feast of the gods. Until the reign of George V (1910-36), it served as an antechamber to a six-room suite for state visitors, centering around the adjoining King's Drawing Room. They would sleep in the King's State Bedchamber, formerly the king's council chamber (page 623).

The bedroom was lavishly redecorated by Victoria for the visit of France's Emperor Louis Napoleon and the Empress Eugénie in 1855. Its sumptuous hangings, embroidered with their initials, remain to this day—despite Eugénie's comment on returning to the castle some 50 years later, a lonely widow who had seen her husband's empire fall: "Still the same frightful curtains!"

Then into the King's Closet and King's Dressing Room, which house a remarkable collection of paintings by Holbein, Rubens, Rembrandt, and Canaletto, and, after that, into the formal Queen's Drawing Room, where hang portraits of the Queen's ancestors by old masters.

Most splendid of the State Apartments is the Grand Reception Room, still used as a guests' gathering place before larger dinners (pages 617-18). This was part of the most grandiose scheme of George IV, who with his architect Jeffry Wyatville and a million pounds (an immense sum in the early 19th century, the equivalent of 40 million dollars today) remodeled the entire castle, inside and out, on the grand scale we now see.

It was George who added the Grand Corridor, a long, drafty passage where Queen Victoria's guests had to await her forbidding presence. The older ones dreaded it, as they invariably came away with a cold. The great Prime Minister Disraeli, summoned along this passage as many as five times in one day, complained: "That was exercise, with blasts from every opening in my progress—that was air!"

One story has it that early in this century, in the reign of Edward VII, the many royal busts along this corridor were removed and scrubbed, to be returned to their original pristine white condition. I was examining them one day when one of the castle staff told me the rest of the story. "The art curator," he said, "thought they then made the rest of the decorations look shabby, so the busts had to be made to look old again. The answer was to wash them in weak tea."

Through the Queen's Tower you reach Prince Philip's private study, once called the Blue Room. This is where George IV and his brother William IV (1830-37) both died. Prince Albert also died here in 1861, and Queen Victoria in her overwhelming grief decreed that not one item be disturbed. Every evening fresh clothing was laid out on his bed and hot water poured into his basin.

Forty years later, on Victoria's own death, their son became King Edward VII. He immediately ordered that these apartments be totally refurbished for his own private use, and equipped with such unheard-of luxuries as bathrooms. Elsewhere in the castle, his mother's stubborn aversion to change had left many of the rich furnishings to fade and decay.

Edward began a program of restoration, finished after his death by Queen Mary, wife of his son George V. Many of the creature comforts in the castle today, though hardly luxurious by contemporary standards, were then the best that money could buy.

Guests dazzled by Windsor's splendors can also find treasures that bring history's dry memories to life. I was particularly hypnotized by the musket ball that killed Nelson at Trafalgar. Here, too, is the samurai sword received by the late Lord Louis Mountbatten in the Japanese surrender at Singapore in September 1945.

Most dazzling of all, perhaps, is the 16th-century shield of King Henry VIII. It possibly was a gift from Francis I of France at the spectacular tournament of the Field of the Cloth of Gold in 1520.

Tourists wandering through the State Apartments can glimpse the royal family's private rooms when they reach St. George's Hall (page 622) and the Queen's Guard Chamber. Look out of the south windows, and you will see them in front of you and to your left: Prince Philip's study overlooking the gardens, the oak-paneled private dining room, the sitting *(Continued on page 626)*

THE GRANDEUR OF WINDSOR

*THE OPULENCE OF WINDSOR'S interiors owes much to George IV (reigned 1820-30). Indifferent as a statesman, his tastes were catholic and eccentric. He bought this flamboyant gilded clock about 1820 for the Royal Pavilion at Brighton, a showplace that celebrated the fashion for Chinese motifs. The clock has come back to the Grand Reception Room (***below***), much as an odd family heirloom, after much debate, finds a place on the mantel instead of in the attic.*

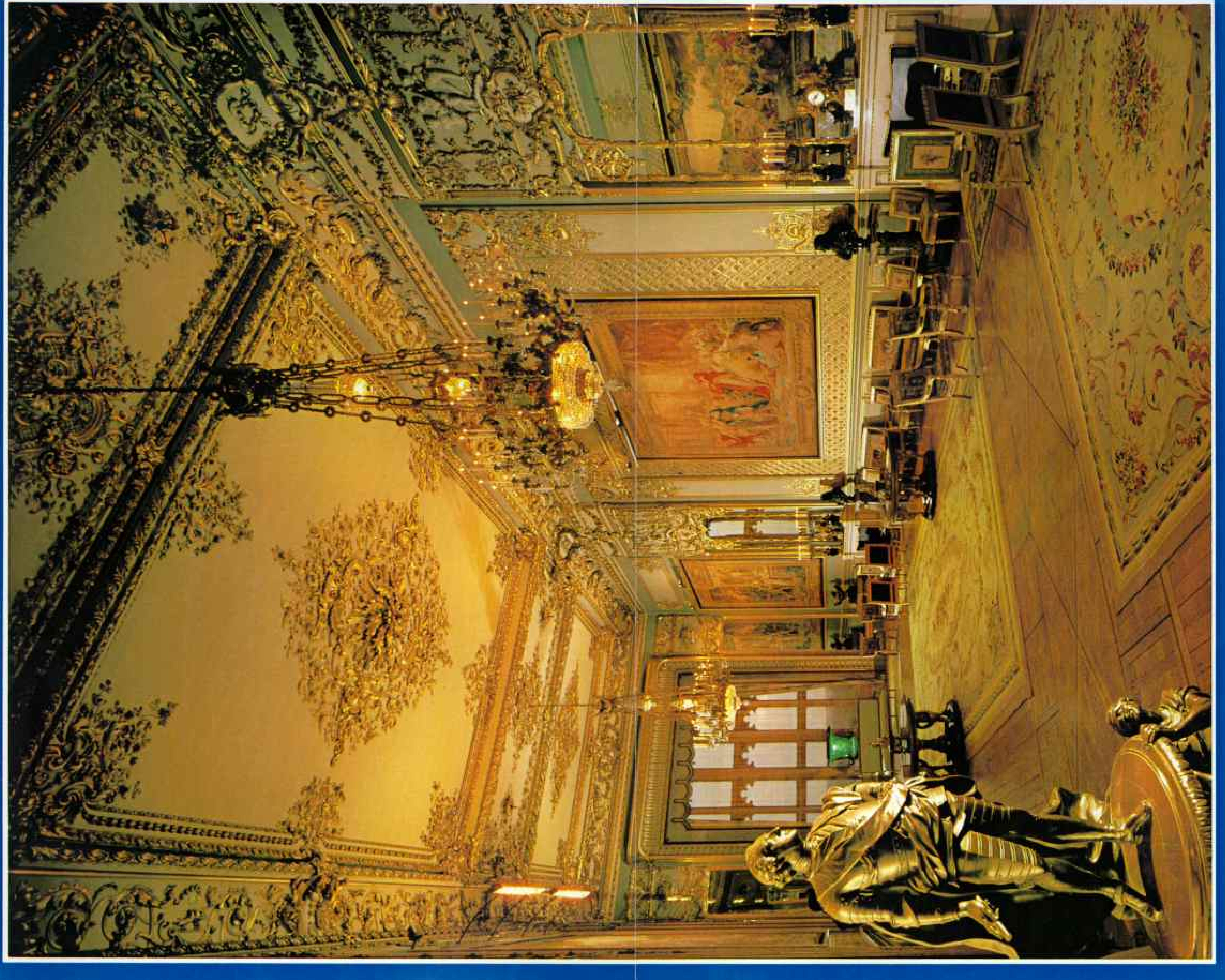
The royal collector was, according to the Duke of Wellington, "a medley of the most opposing qualities." George IV was obese, vain (he painted his face), self-indulgent, dissipated. He was also kind, sensitive, witty, and sentimental. And he was shrewd enough to buy fine pieces when French aristocrats were forced by the revolution to sell them. As both agent and architect to create settings for his collections, the king chose Jeffry Wyatville, who had redecorated his own surname, having been born into a family of Wyatts that had produced 11 other architects.

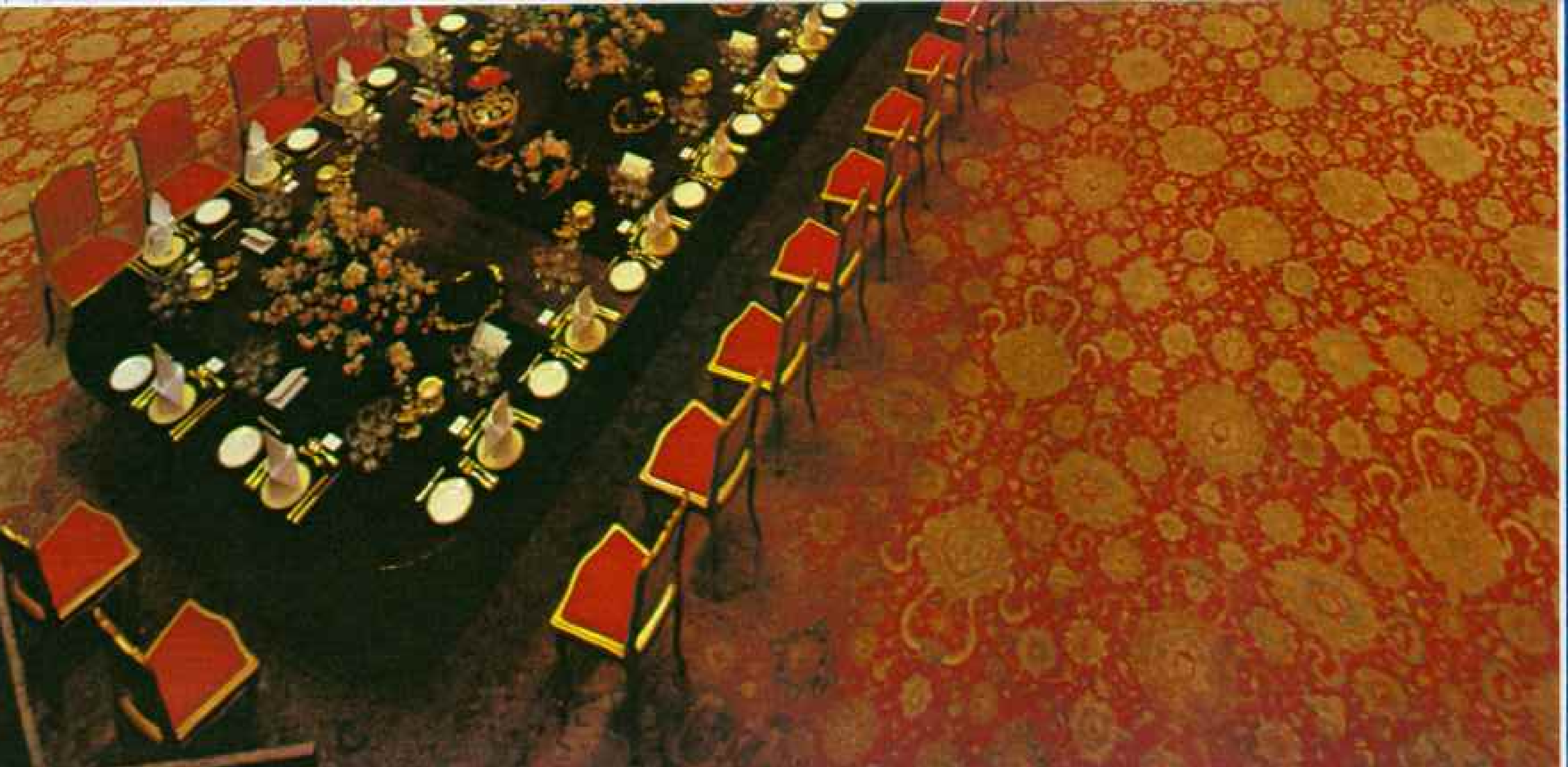
The collaboration of king and architect had splendid result in the Grand Reception Room with its overwhelmingly 18th-century French decor. A series highlighting the adventures of Jason in quest of the Golden Fleece, the wall tapestries were made by the Gobelins factory, first established in France during the 15th century. Chairs in the Louis XV style are covered with designs woven in Beauvais.

Extravagant gilded plasterwork along the walls depicts musical instruments and cherubs performing and dancing. Bronze busts of Cardinal Richelieu and two French generals of Louis XIV grace the room. Britain is represented only by the unfortunate Charles I, victim of regicide. In the foreground stands a model, never cast full size, of Louis XV.

Like others of the State Apartments, the Grand Reception Room is open to public view during most of the year. Each June the Queen's privileged guests assemble here before going in to the banquet in honor of the Waterloo victory. When George IV's clock shows 8:30, they pass from the ambience of royal France into a room that celebrates the defeat of imperial France—without so much as a threshold reminder of the intervening republic.

VICTOR R. BOSWELL, JR., NELSON BROWN, AND JAMES L. STANFIELD (BELOW); ALL INTERIORS COPYRIGHT RESERVED





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***Fine adjustment** is made to the Queen's chair in the Waterloo Chamber before the annual luncheon on Garter Day. Most of the portraits are of British principals in the final victory over Napoleon and were painted by Thomas Lawrence on the commission of George IV. Wyatville made the room from an open courtyard and added clerestory windows that admit midsummer's evening light. For the visit of Napoleon III the room was tactfully renamed the Picture Gallery.*

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That very formidable monarch *and very small woman, Victoria, performed one of her last official acts in St. George's Hall* **(above)**. *Here at 81 she inspected colonial soldiers wounded in the Boer War. The room was once two, a private chapel and a hall where the Knights of the Garter feasted with their sovereign. Wyatville had the partitioning wall removed and made alterations, including placement on the ceiling of coats of arms bearing the Garter Knights' devices.*

The King's State Bedchamber **(left)** *was a gathering place for state and private business in the reign of Charles II. His many and various evening callers entered the adjacent Dressing Room with their gowns swishing, admitted by William Chaffinch, who held the only key but the king's.*

The room was redecorated for the 1855 stay at Windsor of Napoleon III and his empress. New carpets and silks were assembled, and the furniture was regilded. But in the plasterwork above the chandelier the initials, and perhaps the spirit, of Charles II still look down.

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***Chivalry and piety** have had joint expression in St. George's Chapel since Edward III founded the Most Noble Order of the Garter in 1348.*

*The choir of the present chapel, begun in 1475 (**above**), is flanked by the stalls of the Knights of the Garter and caparisoned with their banners and helmets. The stalls are garlanded with whimsical, biblical, and historical wood carvings, among them a scene of patron and dragon (**left**). The memorial plaque in the checkered floor marks the unlikely joint tomb of Henry VIII (and his third queen, Jane Seymour) and Charles I—the monarch beheader and beheaded monarch.*

TEXT BY DAVID JEFFERY
NATIONAL GEOGRAPHIC STAFF

(Continued from page 615) room cluttered with family photographs.

Out of sight, behind the apartments, is the family's private garden, where stands the wooden practice "polo pony" passed on by Prince Philip to Prince Charles. If you see a helicopter landing here, as well you might, it will be one of them flying himself home from an official engagement.

Those houseguests privileged to visit the royal family's private rooms will find quite a contrast to the splendor of the State Apartments. The furnishings are comfortable, though not unduly rich. From the record albums lying around, you can tell that family favorites include Ella Fitzgerald and the Beatles. Along the passageways you may trip over toys left underfoot by the ever expanding youngest generation of royals.

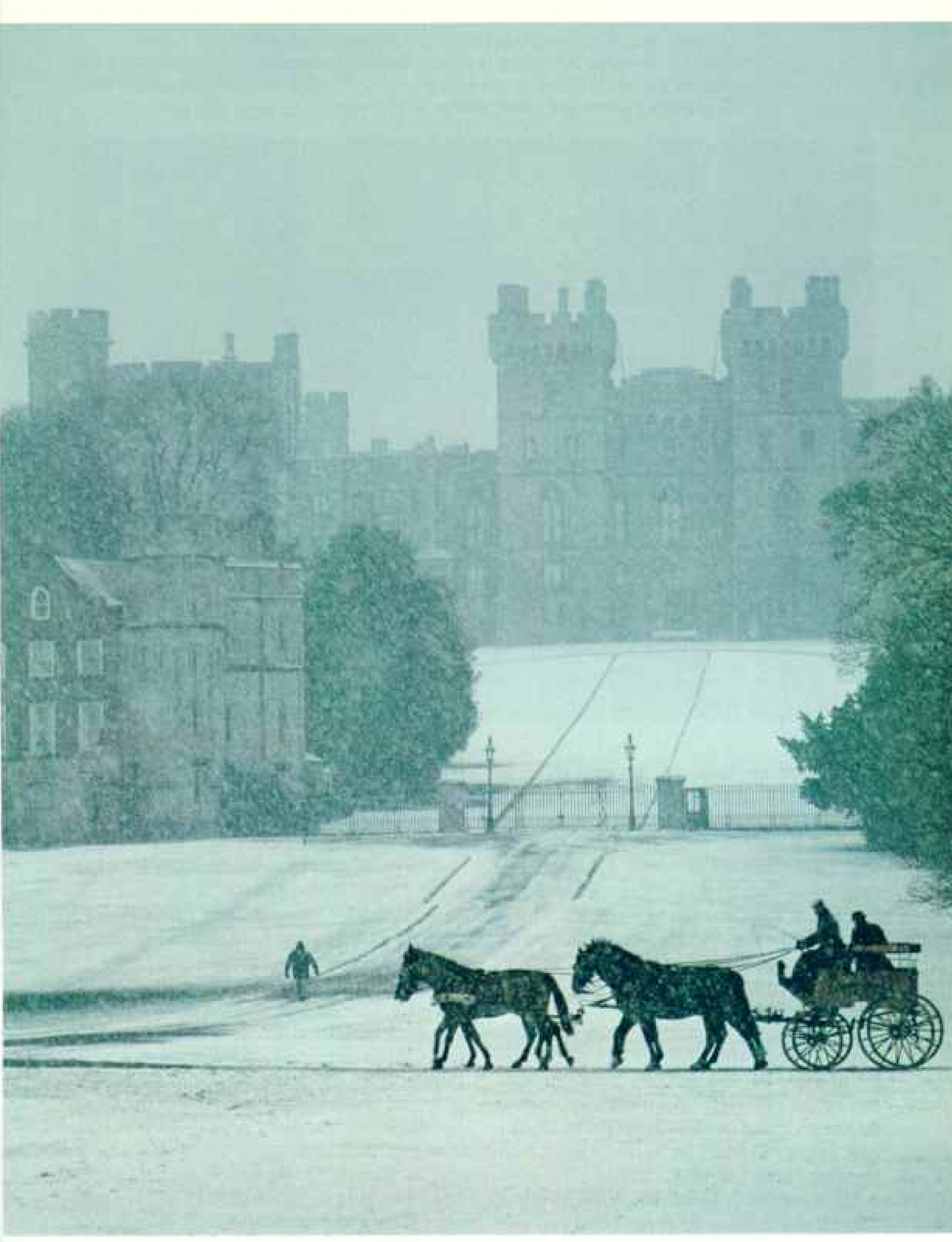
IT WAS because of a sudden population explosion in the family that Elizabeth II, in the early 1960s, happily transferred its Christmas festivities from Sandringham to Windsor. There just wasn't room in Norfolk for all those royal cousins, nephews, and nieces.

A few days before Christmas, the Queen herself rides out into the conifer forests of Windsor Great Park to choose a Christmas tree. She will supervise its decoration by her daughter and sons, then sit back contentedly to await arrivals from all over the island. Her current favorite among royal babies is her own first grandchild, Princess Anne's three-year-old son—as yet still known as plain Master Peter Phillips.

The royal children will play in the White, Green, and Crimson Drawing Rooms, the largest chambers in the Private Apartments, where at other times of year the carpets are rolled back for royal balls. Christmas lunch is a noisy affair in the State Dining Room, finished in time for the family to watch Her Majesty's annual Christmas broadcast to the nation on midafternoon television.

For some members of the royal family, Christmas Day and every Sunday bring another welcome relief. Every other day of the year the royal morning is greeted by what must be the world's most unusual alarm clock—a bagpiper on the terrace beneath the Private Apartments sounding a raucous skirl at nine o'clock sharp. It was a tradition

Impartial snow turns both crowds



and time away as Prince Philip drives the four-in-hand toward the Long Walk.

Trained as a driver and mechanic *in wartime service, the Queen (former Second-Lieutenant Elizabeth Windsor) makes her Sunday rush to chapel a brisk routine. Elizabeth II has reigned for 28 years; Windsor Castle has stood for 900. They share a name and more: change with integrity and duty with grace.*

introduced by Victoria, which her great-great-granddaughter rather likes. Others of Victoria's descendants are not so sure.

Most Sundays, year round, the Queen will drive herself down the Long Walk (above) to morning worship at the Royal Chapel in Windsor Great Park. At Christmas, however, the whole family motorcades to St. George's Chapel, another of Windsor's glories, spiritual home of Europe's oldest order of chivalry, the Garter.

Above the choir stalls hang the standards of the Knights of the Garter, whose number is limited to 24, and who are personally chosen by the sovereign. Among those recently so honored was Sir Harold Wilson, the former prime minister, on his retirement from Downing Street in 1976.

Once a year, in June, the people of Windsor watch the splendid parade that precedes the Garter service. In the procession to St. George's Chapel (pages 630-31), dressed in their magnificent midnight blue, ermine-trimmed robes and accompanied by the Queen herself, have walked such great Britons as Churchill, Mountbatten, Alexander, and Montgomery.

The order was founded by King Edward III in 1348. Legend has it that Edward was dancing with Countess Joan of Salisbury, alias the Fair Maid of Kent, when her garter fell to the floor and he stooped to retrieve it.

The king protested his courtiers' lack of chivalry. One day, he told them, this simple piece of female attire would be honored throughout the world. "Shame on him who thinks ill of it," cried the king. Thus the motto of the Most Noble Order of the Garter: *Honi soit qui mal y pense*—Evil to him who evil thinks.

The present St. George's Chapel (pages 624-5) was begun by Edward IV in 1475 and completed some 50 years later, in the reign of Henry VIII. King Henry is buried here, as have been many British monarchs since then, right up to George VI (1936-52). One

snowy night in 1649, the beheaded remains of Charles I were buried here with little ceremony; now Charles rests in the same tomb as Henry VIII.

In their marble images, the tombs in St. George's help bring back to life the procession of British monarchs who have made Windsor their home. As I walked out that summer weekend, back across the castle's Lower Ward, I shared the sense of living history inspired in so many by Windsor and its treasures.

It was from here, in 1215, that King John rode forth to the nearby meadow of Runnymede to meet his rebellious barons and sign the Magna Charta. Here Charles II dallied with Nell Gwyn, and here Victoria began her long retreat from society after Prince Albert's death.

NEXT DAY I traveled a few miles across Windsor Great Park to look at a more modern relic, a fortress-like home that bears painful recent memories for the royal family. It was here, within sight of Windsor Castle at Fort Belvedere, that King Edward VIII wooed Mrs. Wallis Simpson of Baltimore, Maryland, here that the great drama of the abdication was played out in 1936.

Edward's final decision to abandon his throne for "the woman I love" fundamentally altered the lives of those who today live in Windsor Castle. Had he chosen to put his royal duty before the dictates of his heart—as the present Queen Mother, Queen Elizabeth, to this day believes he should have—King George VI would have remained the Duke of York, and Elizabeth II might not now be Queen.

In studying the life of Prince Charles, I knew how closely *he* had studied the life of his great-uncle Edward, and how sympathetic an attitude he developed. Charles's character as a future king has, in many ways, been forged by a decision to learn from Edward's mistakes and put public duty before private pleasure.

Again it was here, at Windsor, that Edward chose to make that dramatic farewell radio broadcast to his people, from a small room in which he had played as a child. He left the castle, and his kingdom, that night, but chose to carry the name of this favorite royal home around the world with him by bearing the title of Duke of Windsor.

He seldom returned to England, wandering with his duchess in lonely exile before coming home in 1972 for the last time, in death—home, of course, being Windsor. He lay in state here in St. George's Chapel and was buried nearby at Frogmore, where the Duchess of Windsor will eventually rest beside him.

Since 1917 Windsor has also been the name of the British royal house—chosen, as it happens, in something of an emergency. It was at the height of the First World War that Lloyd George, the prime minister, decided that the British royal family needed a new name. Saxe-Coburg and Gotha, the surname bequeathed by Prince Albert to his and Victoria's heirs, was a painful reminder of the family's close blood ties to Kaiser Wilhelm. The two countries were at war, and the kaiser was the king's cousin. It did not help the monarchy's role as a symbol of national unity against the Germans.

King George V consulted members of his far-flung family, genealogists, historians, heraldic experts. Some favored historical names like Plantagenet, York, or Lancaster, the grandeur of plain England, or the European ring of D'Este.

Others liked Fitzroy. The name itself, in a hybrid old French-English form, originally meant "king's son." But it was pointed out that this was the name bestowed by several British monarchs, notably Henry VIII and Charles II, on their bastards. That certainly would not do.

It was George V's private secretary, Lord Stamfordham, who suggested the name of the ancestral family castle where they all spent such happy weekends. Elizabeth II, on becoming Queen, issued a special edict that the royal family continue to use the name of Windsor. A later edict stated that her direct descendants would also bear her husband's family name of Mountbatten (anglicized from the German Battenberg during World War I).

Such heady constitutional goings-on seemed a far cry last Christmas, when the Mountbatten in question could be seen driving his four-in-hand expertly around the Great Park and the castle grounds (pages 626-7). This unusual sport, in which he has

*"**By command of the Sovereign**" procession to the installation service (**right**) for two new Knights and a Lady of the Garter winds in solemnity, then exits (**below**) to smiles in a stiff breeze.*

become a respected competitor, was Philip's consolation when synovitis in the right wrist forced him to give up polo in 1971.

Princess Anne and her husband, Capt. Mark Phillips, both former Olympic equestrians, also relish Windsor's opportunities for a gallop out of sight of press photographers. They have been known to sweep the board at Windsor's annual horse show, where a proud mother has presented the princess with her trophy.

One of Prince Charles's favorite Windsor haunts is the castle's magnificent library, storehouse for centuries of royal archives—an Aladdin's cave of material for royal biographers and scholars. The typed manuscript of my own book, annotated by Charles in the margin, is stored there for use after his death by an official biographer.

Prince Charles, who studied history at Cambridge, is better informed about his ancestors than any member of his family for generations. Browsing in the library on one occasion, he met the historian John Brooke, then working on a biography of George III.

The "mad monarch" (1760-1820) is one of Charles's pet subjects. He maintains that George was a cultured and democratic monarch, not the mere lunatic portrayed by popular history, best remembered for losing Britain's American colonies.

Prince and historian argued about George, whose final, unhappy days were spent, apparently insane, wandering these

Windsor corridors. They agreed to differ, but Charles volunteered to set out his views in a foreword to Brooke's biography, as he has since done in other volumes.

IN TIME this next Windsor monarch will reign in his own right over this venerable castle and all its glories. But it may not be for many years. Charles, like Victoria's son Edward VII, may be a grandfather before he finally ascends the throne.

"I don't mind praying to the eternal Father," Edward told the archbishop who conducted Victoria's diamond-jubilee service, "but I must be the only man in the country afflicted with an eternal mother."

Elizabeth II, a kinder and shrewder mother than Victoria, understands the daunting prospect ahead for her son, a long wait in the wings with no clearly defined role. She knows full well the duties of constitutional monarchy and will not abdicate, but in later years she may leave more social duties to Charles while she leads the life of a country lady at Sandringham and Windsor.

One day she too, and Charles after her, may be laid to rest here in the vault of St. George's, leaving a 21st-century monarchy that may well have changed with the times. No such alteration, however, is ever likely to overtake this tranquil and majestic fortress beside the Thames—dubbed by the diarist Samuel Pepys "surely the most romantique castle that is in the world." □

ROYAL HOUSE FOR DOLLS

Text by DAVID JEFFERY

Photographs by

JAMES L. STANFIELD

BOTH NATIONAL GEOGRAPHIC STAFF

NO DOLLS live here. They do not walk these palatial halls and chambers, nor do they read. A shame, for the Queen's Dolls' House, built in the 1920s as a gift for Queen Mary (1867-1953), has an excellent library. The leather-bound books are, like everything else, on the scale of an inch to a foot. Rudyard Kipling contributed by choosing from among his verses, then writing and illustrating them himself.

Arthur Conan Doyle had Dr. Watson trying to best Sherlock Holmes at deductive reasoning. Max Beerbohm, imagining himself shrunk to the house's scale, wrote: "How good it is to be here!—working in this perfectly delightful library, and writing in this perfectly delightful book!"

The minute paintings, fixtures, statuary, vases, paneling, machinery, furniture—all were created by an army of craftsmen. Their work, with its uncanny delicacy, is on display at Windsor Castle. Proceeds from admission (some 650,000 visitors a year) are, as Queen Mary wished, given to charity.

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RADIO TIMES HULTON PICTURE LIBRARY (ABOVE)

***A royal visitor** such as Golbasto Momaren Evlame Gurdilo Shefin Mully Ully Gue, most mighty Emperor of Lilliput, would enter by the ceremonial hall (**left**). Of imposing stature, well above six inches, he would cross the marble and lapis lazuli floor and ascend the grand staircase beneath the mural of "The Expulsion of Adam and Eve from Paradise."*

*The Gullivers who assembled the Dolls' House (**above**) followed the plans of Edwin Lutyens, an architect who also designed the 80 square miles of New Delhi, India.*

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***The merest touch** of a Quinbus Flestrin, as the Lilliputians called Gulliver, is enough to send the kitchen scale nearly to its limits (**facing page**). This heart of the house, with its floor of 2,500 wooden blocks, has every convenience of the day, except that the range is coal burning.*

*The cellar (**above**) has a fine collection of spirits, beer, and wines in inch-high bottles, among them Margaux '99, Romanée '04, Yquem '74, and an 1854 brandy. It lacks only "glimigrim," a fine wine of Lilliput.*

*A working vacuum cleaner (**left**) eases the servants' tasks. They can ride to their upstairs-downstairs duties on an elevator suspended by fishline cables.*

The slide-out garden *with its pop-up trees invites a stroll on velvet turf* (**below**). *Yet this is not the time for rusticating idleness. A formal dinner is about to be served. The walnut dining table* (**below right**) *is set with the silver service, rather than the simpler white china bearing the queen's cipher crowned. This is, after all, if not a model of any real palace, a royal residence.*

After the meal, guests may retire to the withdrawing room (**right**), *with its portraits of George V and Queen Mary. Entertainment, perhaps the "Minute Waltz," may be played on the fully operational piano.*

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With its facade raised, *the house invites ever closer inspection by the stream of visitors (**above**). The nearer they approach, the more total the illusion becomes, to the point that they might see, as did Gulliver, ". . . a young girl threading an invisible needle with invisible silk."*

*Nowhere is the illusion more perfect than the queen's bedroom (**left**), with the walls and bed hung in silk damask, the delicate wardrobe, and the walnut writing table with faultless drawer handles.*

The princess royal's room is simpler, and under the mattress, as in the fairy tale, is a discomforting pea, this one grown to proper minute size under a microscope.

Rudge

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No four-in-hand here, *no buggies or stables, for the Dolls' House is a town residence, thoroughly up-to-date. A 1920s mansion that has hot and cold running water issuing from working taps and that is fully wired for electricity, right down to the chandeliers, must have motorcars.*

A Rolls-Royce, two Daimlers, a Lanchester, a Vauxhall, and a Sunbeam make up the fleet, with a 6¼-inch-long motorcycle, exact to its gasoline engine that runs, and a bicycle for messengers. An inspection pit, petrol pumps, and everything required to keep the cars in working order are also provided. As is a fire engine, for safety.

Should that fail, a recourse is prudently tucked away in the library, a householder's comprehensive insurance policy.

The town palace in this 900-year-old castle of the island realm is secure. □

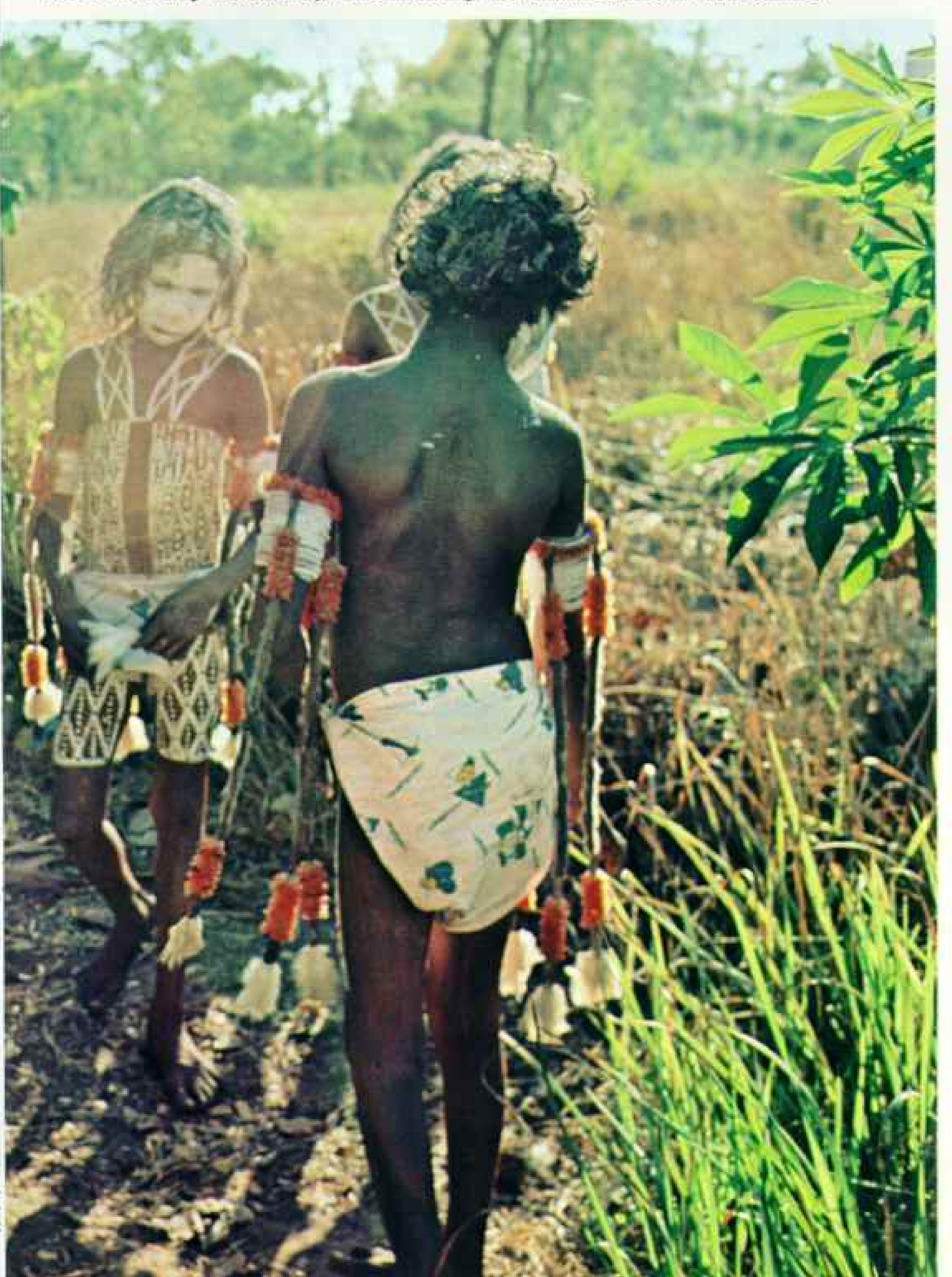
Arnhem Land Aboriginals

Walking works of art, boys wear clan designs during their ten-day circumcision

Cling to Dreamtime

By CLIVE SCOLLAY Photographs by PENNY TWEEDIE

rites. Soon they will share full membership in Arnhem Land's ancient culture.



"YOU KNOW that time before the sun comes up, when the moon is a fish again, swimming in the ocean?" Softly spoken by Aboriginal lips in the cool mauve of dawn, the question seeks no reply.

"That is the time, our ancestors tell us, when Barnambirr, the Morning Star, is released from her dilly bag on the faraway island of Baralku."

We are sitting cross-legged on a remote beach in central Arnhem Land, the far northeast frontier of Australia's Northern Territory. Old Bininuwuy, a respected Aboriginal painter and clan elder, continues.

"Behind that Morning Star trails a feathered string, tying her to her home, holding Barnambirr low in the sky."

The place is Dipirringur, a cluster of tin sheds and bough shades at the mouth of the Glyde River. Darwin is 350 miles west, the Gove Peninsula 125 miles east.

We had come to this wild country—Penny, myself, and our two-year-old son, Ben—to spend eight months with the Aboriginal painters, to photograph them and study their culture. Their artistry on bark increasingly makes its way onto urban walls, to hang like stained-glass windows between two different worlds.

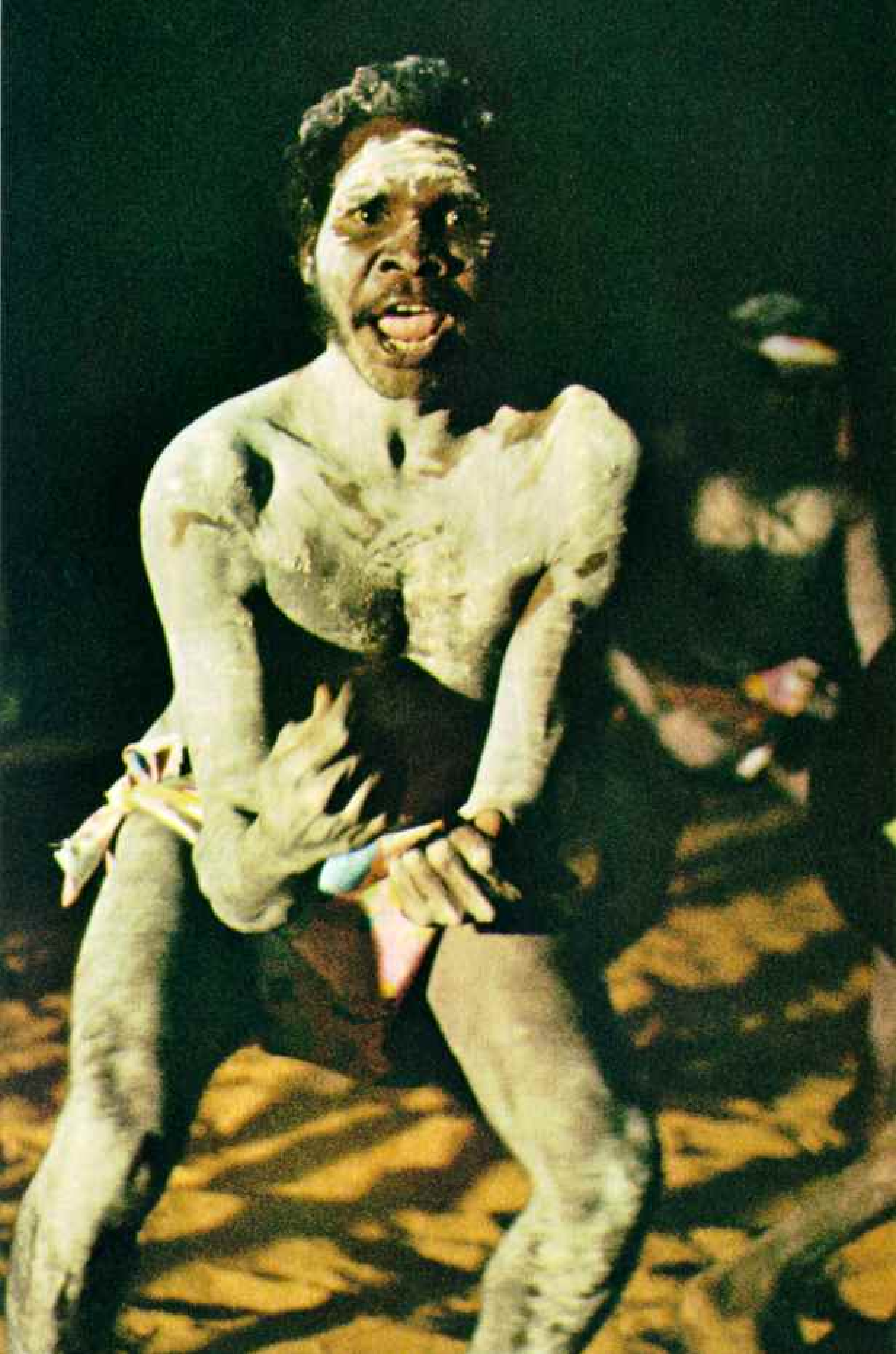
For more than 20,000 years the Aboriginals have been hunters and gatherers in this tropical region of swamp, dense bushland, and spectacular escarpments. They regard this land with the greatest respect, for it is the very root of their religion and sacred law. In Arnhem Land today, as in centuries past, this spiritual connection with the land is celebrated and passed on.

From the dense bush fringing the shore, insects and birds chorus first light. Bininuwuy picks up his long wooden pipe, primed with tobacco. Gazing out across a silver shimmering sea, he continues: "See, here comes the sun. Barnambirr must come down now to rest in her dilly bag for the day, just as it was in the Dreamtime."

For the Arnhem Land Aboriginals, the Dreamtime was long ago before time itself, when mythological ancestors and supernatural creatures traveled across a featureless land from sunrise to sunset. They came, some say, from mythical Baralku Island, known to no living man. As the mythical beings traveled, they had many strange adventures. Wherever they stopped, to dig for yams, hunt a kangaroo, spear a goose, or throw away the bones of a fish, the

Mythical Dreamings *come to life on Aboriginal bark paintings. In the tradition of ancient rock and cave art, they tell the stories of supernatural beings who shaped the landscape and created living creatures before time began. This painting* ***(above)*** *by David Malangi, reproduced on the Australian dollar bill, depicts funeral rites for a legendary hunter who was killed by a snake at a sacred water hole.*

Another artist ***(above left)*** *completes a design on flattened eucalyptus bark with paints of ground ocher, charcoal, and clay. His radio was paid for by earlier sales to an arts-and-crafts dealer, who ships works to Melbourne, Sydney, and abroad.*



landscape changed; a rock formation grew, a water hole appeared, or a sandy shore rose from the sea, and each became a sacred site.

In these places too, the many clans of Arnhem Land were born, each with its own language and owning a part of the stories of creation. In Arnhem Land now there are 7,500 Aboriginals, comprising several hundred clans and speaking 70 or so languages and dialects. In all Australia the Aboriginal people number about 160,000.

Bininuwuy signals that we are ready for the cup of early morning tea his wife has been brewing over a low fire. Smiling, she brings us a loving cup, sweet with sugar, and unleavened bread, baked in hot coals. Later Bininuwuy will complete a magnificent three- by two-foot bark painting of the Barnambirr story, to be sold through the subsidized arts-and-crafts center 15 miles away at Milingimbi settlement. But for now, he prepares for the heat of the day by spreading a blanket to sit on beneath the welcoming shade of a spreading acacia tree.

Church Settlements Lure Bush Dwellers

This idyllic setting is one of many small outstations scattered along Arnhem Land's northern and eastern coastline and farther inland on its 37,000 square miles of dense bush, grassy plains, and vast river flats.*

"Before the white man," explains Johnny Bungawuy, a distinguished elder recognized as senior man in this region (next page), "people always lived in bush camps—just small clans on land shown us by our ancestors. But then the missionaries came."

He is speaking of the eight church missions set up throughout Arnhem Land since the 1920s. In 1931 the government declared the area an Aboriginal reserve "for the use and benefit of the native people."

Johnny Bungawuy's own father, a much feared warrior from Buckingham Bay, some 80 miles east, arrived at the mission on Milingimbi Island in its earliest days. He had agreed to travel toward the setting sun after troubles with his relatives, and Milingimbi offered regular food supplies and medical services.

But settlement life created tensions, and after he died his sons split into two factions. One group stayed on the island. Two of the brothers used marriage connections on the mainland to establish the other clan at Nangalala, a cluster of tin shacks, four houses, and a store six miles up the Glyde River. There Bungawuy lives today with 11 wives and 52 children.

For Johnny Bungawuy and his people, life in Arnhem Land continues to revolve around hunting, gathering, and ceremony. In recent years shotguns have superseded spears for some types of hunting, and four-wheel-drive vehicles and two-way radios make it possible to travel and communicate more frequently over greater distances.

In the settlements, houses, electricity, and the store provide material benefits. But

*NATIONAL GEOGRAPHIC has documented Arnhem Land exploration since the pioneering scientific expeditions of Charles P. Mountford, which he described in the January 1946 and December 1949 issues. Donald F. Thomson also wrote of Arnhem Land in March 1948, and Howell Walker in September 1949 and January 1953. Most recently Kenneth MacLeish reported on "The Top End of Down Under" and Kay and Stanley Breeden photographed Aboriginal rock paintings for the February 1973 GEOGRAPHIC.

Surging energy *grips a dancer during a 1978 festival at which 700 men shared in rites designed to slow their culture's erosion.*

In another revival of old ways, about half of Arnhem Land's 7,500 Aboriginals have left the settlements established by the white man for outstations of bark huts and bough shelters. Several hundred clans inhabit the 37,000 square miles of bush, plains, and river flats that became a reserve in 1931.

to a society geared to a complex system of sharing and caring, problems of ownership, maintenance, and responsibility also arise. Over the past few years, in response to the white man's pressures, there has been a strong move toward self-determination.

In 1972 new federal policy enabled elected Aboriginal councils to run the settlements. Many missionaries and administrators left the area or stayed on as employees—community advisers, craft buyers, or building managers. The government also provided economic aid that enabled about half the Aboriginal population to set up their own smaller encampments, called outstations or homeland centers, like those at Dipirringur and Nangalala.

There are now some 95 officially recognized outstations receiving federal funding. And, as Barry Lamshed, senior area administrator for the Federal Department of Aboriginal Affairs, himself a European, told me: "Without the opportunities these centers offer for the people to consolidate their culture, there can be little hope for them."

The white man's pressures stem from mining and economic development and from the threat of tourism. The discovery of bauxite and uranium on Arnhem Land's eastern and western borders respectively

has turned this formerly isolated region into Australia's potentially most valuable asset.

The new towns of Nhulunbuy, where 1,200 white miners are extracting and processing bauxite, and Jabiru, with more than 3,000 whites engaged in uranium mining, have created difficulties for the Aboriginals. At Oenpelli in the uranium province, and at Yirrkala, close to Nhulunbuy, mining brings the native people wealth from royalties. It also aggravates the extensive alcoholism among them.

A federal parliamentary report named alcohol abuse the single biggest problem facing the Australian Aboriginals generally,

Marriages of diplomacy *cemented the powerful clan position of Johnny Bungawuy. Seven of his 11 wives and a handful of his 52 children accompanied him when he bagged this pelican.*

Staying within their own clan territories, families move to where food is plentiful. Men hunt game, such as geese, lizards, and kangaroos, discuss clan politics, and paint, while women gather nuts, yams, shellfish, and other foods, weave bags of pandanus leaves, and tend children.

but it is especially prevalent among the people closest to these developments. Alcohol is close at hand, and the temptation increases as they sit and watch their sacred lands being cut and opened.

In 1978 Australia's parliament transferred ownership of the Arnhem Land reserve to the Aboriginals, but mineral rights remained the property of the government.

Wesley Lanhupuy, 26, from eastern Arnhem Land, is manager of the council that represents the Aboriginal people in land questions. He speaks bluntly: "We are under threat. The government wants our land for mining. They say uranium will make us rich. But what's the point of money if we lose our culture and our land?"

At Nabarlek, 25 miles inside Arnhem Land's western border, Queensland Mines was then digging one of Australia's richest deposits of uranium. So the push is on for exploration, mining, roads, and, ultimately, tourism. Development seems to be the objective of federal and state governments.

Partly because of fears that these pressures will spread farther into central Arnhem Land, and in some cases in response to alcohol-related problems, the outstation movement has become a linchpin of continued tribal existence.

"Every Man Got Dreaming"

Old Mandarg, a respected healer and well-known bark painter, typifies those who have left settlements to take up outstation life. He was one of the first to return to his ancestors' land beside the Cadell River, 50 miles south of Maningrida settlement and 70 miles southwest of Milingimbi.

Here in Rembarnga country, close to a high sandstone escarpment, a dozen bark huts have been cut from surrounding stringybarks, which have been further thinned for firewood. Wild bush "tucker"—food—is plentiful.

Mandarg speaks little English, and he has shunned settlement life for more than a decade. About 70, he encourages his family to be self-sufficient and to adhere closely to ancestral law. The 40 or so in his encampment include his four wives, some of his 20 children, and other dependent relatives.

The camp, named Mangallod, is approached by a winding track that terminates abruptly at a four-wheel-drive vehicle, which is under repair. Footpaths made by bare feet on red sandy soil radiate into the surrounding bush. We find old Mandarg painting in the shade of his bark hut.

Close by, his sons and grandsons sit playing the traditional instruments of Arnhem Land: a six-foot hollowed branch called a didgeridoo, which produces a low, vibrating drone when blown by practiced lips, and ironbark clapsticks, foot-long pieces of solid wood rhythmically struck together to produce a sharp ringing sound. While playing, they sing the appropriate Dreaming songs to accompany the old man's painting.

His 20-year-old son Jackie told us: "Mandarg, he is barramunda [a large salmon-like fish]. His Dreaming makes him protector for that fish." He was referring to the taboos associated with certain species, depending on one's ancestors, which place restrictions on what may be eaten.

"Every man got Dreaming. Sometimes he might be fish, or kangaroo, or emu man.

***Blazing bushfire** set by this fleeing boy's father clears undergrowth from hunting areas (**above**), protects campsites from wildfires, and drives out game.*

*Heads of several clans (**below**) create a different sort of heat as they block the reserve's only bush track to protest trespassing by a government mining survey crew.*

***An appetite for learning** distinguishes artist David Malangi's eight-year-old daughter, Muykul, right, who was selected from the settlement school at Ramangining to attend Dhupuma boarding school near Nhulunbuy. At 18 she may return, as have other educated Aboriginals, as a health worker or teacher. Marriages of young women traditionally have been prearranged by parents, sometimes before a child's birth. But many young people now insist on choosing their own partners.*

That way he can't kill his own Dreaming."

Practically speaking, these totemic restrictions act as protectors of the environment, maintaining a unique ecological balance in Arnhem Land.

During our stay we spent many happy days with the women and children learning bushcrafts and gathering bush tucker—turtles, freshwater prawns, lily corms, yams, snails, and wild honey, called sugar bag, found high in the hollow branches of gum trees. Endless varieties of berries, nuts, roots, and leaves are also part of the basic Aboriginal diet.

Penny and I would sometimes accompany the men on hunting expeditions for emu, kangaroo, and goanna (a large lizard similar to the iguana). The men would use shotguns until they ran out of shells and then a variety of spears, depending upon the prey.

Mandarg's son-in-law, Jimmy Singleton, was chairman of the Outstation Resource Association, which represented and serviced all the outstations. Front-line defense against the outside world, he preferred to use the name given him years earlier by the missionaries.

Jimmy arrived the day we did, on the truck sent fortnightly during the rainless months from March to October, bringing supplies, mail, and pension checks to Maningrida's 20 or so outstations. (During the rainy season supplies travel by boat or by chartered plane to airstrips built by local

labor at many of these isolated centers.) Twenty minutes before the truck's arrival, the children heard it coming and the whole camp poured out to meet it.

From the back of the truck Jimmy witnessed the X's of the old women and Mandarg himself as they claimed their old-age pensions, and of the younger wives as they collected their child-endowment payments.

The cash was quickly redistributed throughout the camp. The women bought flour, tea, sugar, tins of food, and perhaps a new dress or blanket. The kids dived into the throng for fruit, fishing lines, and anything that took their fancies, while the men bought bullets, tobacco, and bush knives.

Then everyone gathered to catch up on the latest gossip. Jimmy set up the two-way radio and in minutes was on the air, calling from one outstation to another. "Hello, Maningrida, hello. This is Jimmy at Mangallod. Please tell that Mormega mob we'll be there tomorrow morning early. Roger, roger. Over and out." World War II flight jargon in the remote Australian bush.

Jimmy sat down in the shade and passed around his cigarettes. "Our job is to help the outstations to be self-sufficient," he said, "to make decisions. We are a sort of filter between the white administration in Darwin and the people here."

Jimmy sees the movement to the bush as an important period of stabilization. "In the bush we are closest to things we know. If we are to maintain the important parts of the old culture, and choose from the new, then we must do so from a position of strength. From here we can move forward with ease."

Ancient Paintings Grace a Sacred Place

Some days after Jimmy's visit, Mandarg arranged for us to explore Rembarnga country, to visit the caves, to see the ancient rock paintings and the crystal-clear creeks and rock pools. In the cool stillness of a magnificent rock gallery, his son Jackie explained the significance of the paintings and place.

"These paintings made long ago on this rock," Jackie said. "Some made from blood of the ancestors. Some more here, like that giant white snake, that was painted by the Mimi people: spirits that live in this rock country and look after it."

As he spoke, his brother picked up two sticks and softly accompanied the stories with the rhythm until, overcome with enthusiasm, he broke into song, the traditional way of explanation, and we were back with the Mimi spirits in the timeless past.

Apart from the galleries of rock art, Aboriginal culture in Arnhem Land has created few material markers. No written form of the ancestral law exists, nor man-made monuments to past ceremonies and glorious victories. The traditions and sacred law are transferred by word of mouth, principally through chants or song-poems with highly expressive illustrations in dance.

Bark paintings are a relatively recent rendering of mysteries previously hidden within the realm of the old men's Dreamings.

David Malangi is a painter whose work achieves wide recognition—one of his bark paintings is reproduced on the Australian dollar bill (page 647). He lives near Ramangining, a settlement of 300 Aboriginals and 15 whites.

Malangi sits cross-legged, majestic, under spreading canvas and corrugated iron, attended by his four wives (two inherited from dead brothers) while he pores over his latest bark painting.

Like all senior men, he relishes his role in this patriarchal society. He is important because of marriage connections and very much involved in the day-to-day men's business of clan organization, painting, and preparation for ceremony.

Malangi is grinding raw red ocher into powder on a large stone slab, mixing it with water and a traditional fixative, the juice of a chewed orchid. He turns the quarter-inch-thick bark, cut earlier from a stringybark tree, replaces it on the blanket in front of him, and, with a brush made from his daughter's hair, painstakingly continues the fine-line cross-hatching on his painting.

His wives sit behind him weaving circular mats and dilly bags from pandanus leaves, peeled and dyed with natural root pigments. Much of this work now brings good prices, but some of the dilly bags in hand here are being set aside for a forthcoming ceremony.

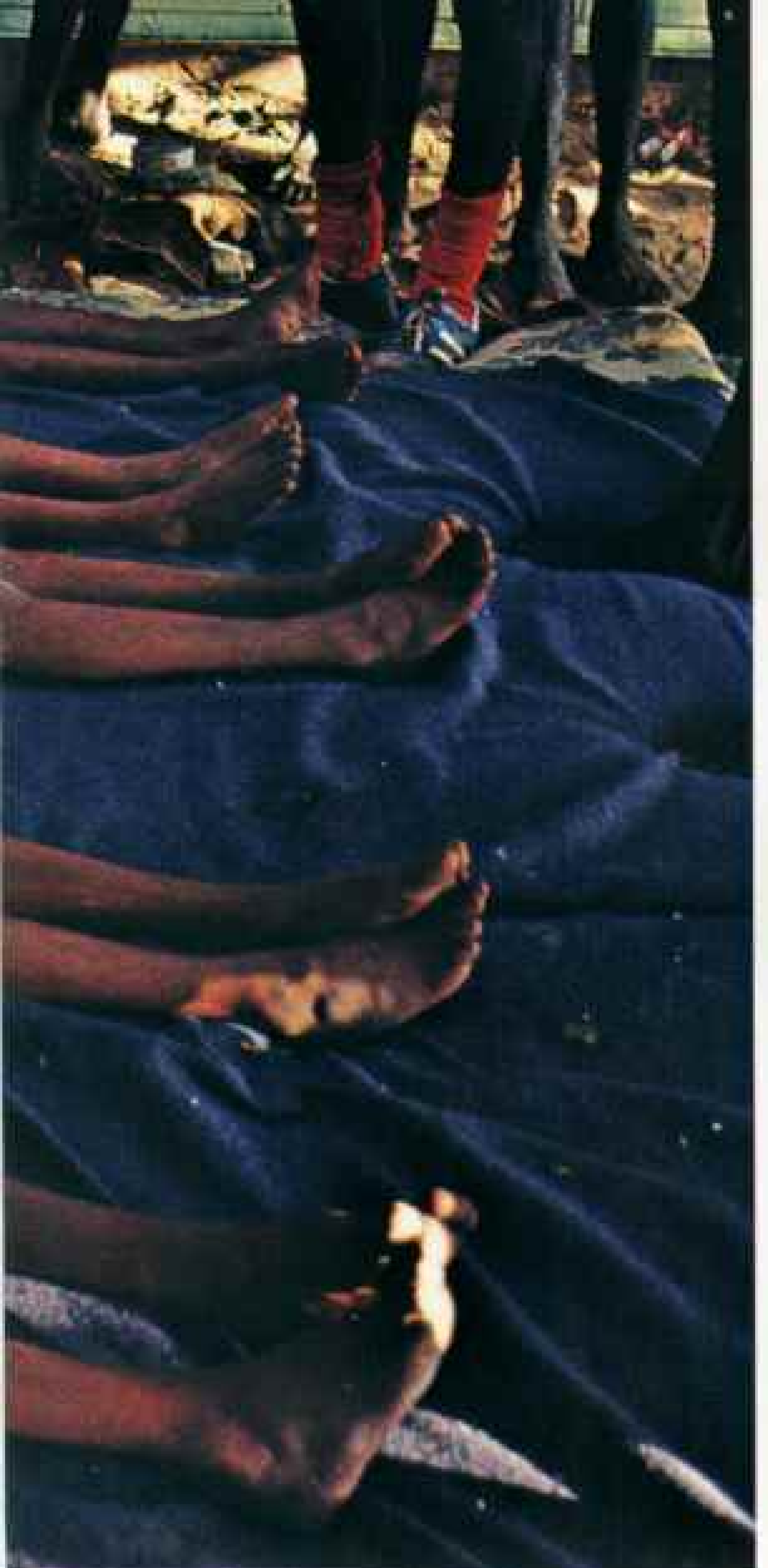
The rhythmic movement of Malangi's brush from palette to bark, accompanied by the continuous squeak of the weaving, mesmerizes me. Malangi speaks: "This painting is of Milmildjark, my country. And this"

—he points to the black circle in the center—"is my water hole. Very sacred place."

The special significance of water holes, or billabongs as they are known, stems from the Aboriginal belief in the cycle of human life from birth to death. "From the clan water hole comes the soul of a child," Malangi tells us. "And to the water hole it returns at death." Such water holes often lie at the center of clan land and are said to be protected by spirits who may manifest themselves to errant people as huge pythons.

Malangi's dollar-note painting depicts a story related to this water hole. "The story," he says, "tell about Gurrumirringu, first great hunter in our clan. He was camped by the water hole preparing some kangaroo meat. He did not look out for that evil spirit snake, which was in a tree near the water. So it came out and bit the hunter." Malangi is proud that this story will pass through most Australian hands.

Fire as an implement, water as a shrine. These are the Aboriginal uses of the primary elements. In Arnhem Land, where the dry season stretches for months without rain,



Boys summon courage *during the final hours of their circumcision ceremony as clansmen surround them with songs of their ancestors* (**left**). *Earlier, a man* (**below**) *touches up his nephew's face, whose white color evokes male potency, death, and rebirth. After the rites the boys will be led into the bush by their uncles for weeks of instruction in the sacred law. Then they will live until marriage in a camp for single men.*

burning off the thick undergrowth is an absolute necessity against unexpected bushfire. No expedition goes to the bush without setting acres of land on fire. Children toss matches into clumps of grass, laughing as flames leap and crackle. Hunters set scrub ablaze to chase out game.

We were invited to many a big burn—once with almost disastrous consequence. Our host on this occasion was Milpurrur, respected leader of the Ganalbingu, the renowned onetime tree dwellers of the Arafura swamp around the outstations of Nangalala and Ramangining. He was anxious to show us how savage a blaze could be.

"We better go and make that country clean," he suggested. "We can hunt kangaroo better that way." He and his four sons set off in a line ahead of a gentle wind, leaving instructions with his wife, Nancy, to take us to a large water hole two miles downwind.

The men covered a huge arc away from us, dipping burning firebrands to the tinder grass as they ran. Twenty minutes later we sat dangling fishing lines in the billabong as the sky grew heavy with smoke. A shower of

gray-white ash descended on dark water, and a consuming roar grew near. Out of the smoke appeared Milpurrur's sons, running ahead of the inferno. A wall of fire about 12 feet high raced to the opposite bank, consuming pandanus with an earsplitting crackle. The heat was intense (pages 652-3).

Penny was so busy photographing the fire lighters that she found herself nearly encircled by flames, her back to the water hole. She could only retreat into the dark waters, where she watched wide-eyed as the fire approached, fizzled, and died.

A few moments later Milpurrur reappeared with a huge grin on his face and a fair-size wallaby over his shoulder. "Everything all right?" he inquired. "Look like it's time for some tucker. Hey, Penny, look like you have been swimming with all your clothes." And he burst into laughter.

Handyman Hunter Is Gracious Host

We camped with Milpurrur for weeks, finding him a remarkable—and powerful—host. On the day we arrived, he immediately set about building us a bough shade near his own, swinging his ax tirelessly in the broiling sun and dragging branches to lean against crossbars resting on forked uprights buried firmly in the earth. As he worked, his children joined him with whoops of delight, raking away fallen leaves, pausing to make friends with young Ben.

Milpurrur was never idle, painting bold ocher figures on flattened bark in his own unique style, shaping a spear-thrower or carving wooden totemic creatures. Always he worked with silent intensity. Like so many of the men in Arnhem Land, he stayed close to his family, cajoling and endlessly playing with his children or helping his wife prepare food.

Milpurrur's rough bough shelter underwent constant subtle modification during our stay, preparations being made toward the end of the dry season for the coming rains. But when he found time, he would take us all goose hunting in the swamps of

Leaping in tribute, *dancers celebrate a mythical fish in a public phase of the boys' initiation. Without written texts, they pass on legends through dances and songs.*

his ancestors, never failing to bag enough to fill the hungry mouths of family and guests.

Hunter, painter, gentle family man, Milpurrur also is revered for his magic, an intrinsic part of the rich web of life and death in Arnhem Land, almost exclusively in the men's domain. The women engage in nurturing and fostering the family, work considered by the old custom important but subordinate.

Marriages in the past often were long prearranged, sometimes even before a child's birth, according to the law that provides an intricate system of correct partnerships. Today, however, with mixed schooling for boys and girls in many of the settlements, and the introduction of the white man's example, the system is under some strain.

Many of the young men want partners of their own choice and are willing to forgo the ancient practice of multiple wives. Women, too, are objecting to their teenage daughters' being sent off as fourth or fifth wife to an elderly man for reasons of clan diplomacy.

Rites Reach Deep Into the Past

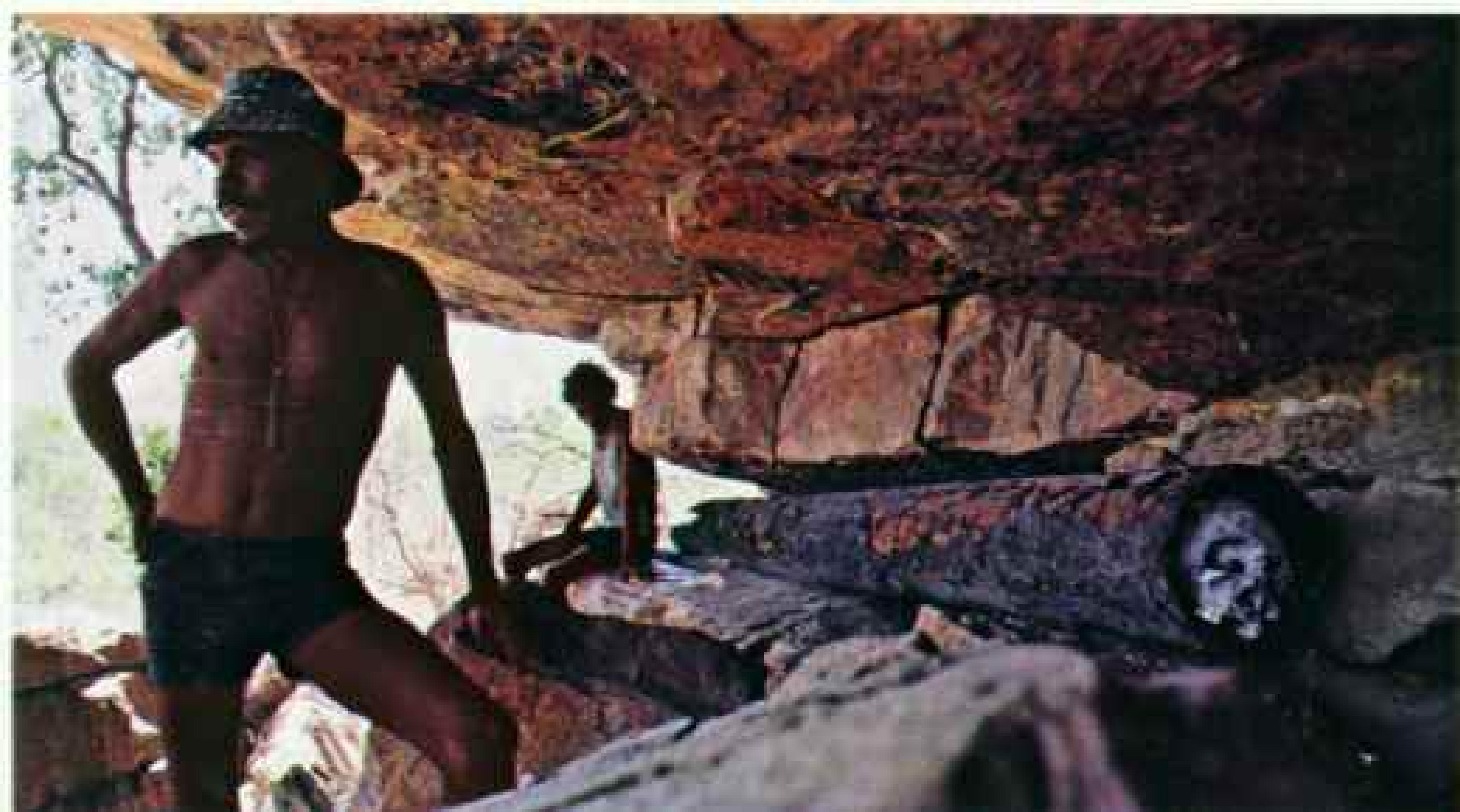
Although birth and marriage, strangely, are attended by no special ritual, ceremonies lie at the core of Aboriginal culture. "We live for our ceremonies," says Nandjiwarra Amagula, chairman of the Aboriginal Cultural Foundation. "Through them we maintain contact with our ancestors who made the land before us. We have ceremonies to make men and ceremonies for death."

Both are mostly public, that is, open to women and children to attend all but the most sacred stages. Visitors sometimes come from far away to share ten days of acknowledgment of attained manhood or passage of a relative from this world.

But the most important gatherings, which are the religious basis for Aboriginal society, remain secret. Mainly, they are the preserve of men, though there are some women's ceremonials that are also closed.

These rites pay homage to the Mardayin—the sacred law—which governs the way people shall behave. Penalties for breaking the law, such as revealing the contents of ceremonies to the uninitiated, women and children, can be harsh. In the past, death was almost certain. Even today, trial by spear sometimes is held—a procedure by

***Forbidden ground** to most outsiders, this sandstone overhang **(above)** in central Arnhem Land is both workshop and spiritual sanctuary for the family of Mandarg, a formidable medicine man and painter. Beneath a kangaroo drawing by forebears, clansmen show how spearheads are chipped from rock and used for ceremonial scarring. Beneath another ledge **(right)** brothers explain emblems and designs on a burial log that identify the bones inside—and the skull protruding outside—as those of their grandfather.*



Rinso
Rinso

which a wrongdoer stands inside a circle of spear-throwing clansmen, who aim to wound him in the thigh.

We were invited to an initiation ceremony at Nangalala toward the end of our stay in Arnhem Land. It climaxed our eight-month visit with these hospitable people.

Five boys were to be circumcised according to old custom—nephews and grandsons of our friends Bininuwuy, Bungawuy, and Malangi, all related through their mothers to Milpurrur.

Beneath the vast shade of a banyan tree, the people of Ramangining and Nangalala gathered to watch as painted bodies twisted and whirled, leaped and stamped on this opening occasion. Men clapped to the songs and the rhythm of didgeridoo and sticks. Bodies red ochered or white with clay were paintings come alive.

The dancing lasted well into the night. Next day fresh new dancers, relatives on the boys' maternal side, began the ten-day cycle of chants and clan dances that would reshape their world for the five boys about to become young men.

Each morning the boys would be led to these relatives where they sat beneath spreading stringybarks while songs were chanted by the older men. As each day advanced, the dancers would dip their hands into buckets of liquid clay and cover their bodies with it. Then they stood stiffly in the warm sun as the fluid dried powderlike on their black skin.

One day, well into the week, the old men began to paint their clan designs on the initiates' chests and thighs. By late afternoon the boys were decorated with the images that recur in the bark paintings (pages 644-5). It was the last evening of boyhood.

Dawn on the last day broke as clear and cool as every other in this land of endless summer. The dancing began once again. Bunched together in protective male oneness against the waiting sorties of the women, the men lifted the boys to their shoulders.

The procession, stringing and bunching like the contractions of a giant worm, crossed open ground. At the ceremonial site a huge crowd waited to witness the final moment, to judge how bravely the boys would bear the pain: Good fortune would come to the families of the silent ones, and dishonor for screams. The chanting throng joined now in the chorus of several hundred voices. The women were wailing at full pitch.

The noise reached a crescendo as the boys were laid on grass pallets and swiftly dealt that moment of pain. Then it was over, and the crowd gave a collective sigh of relief that all had gone well with these young men.

The last we saw of the boys—how young they now seemed—was as they were rushed silently in the arms of their mothers' brothers into the bush. There leaves and ancient medicines would salve the wounds. Soon they would be given their first lessons in the sacred law. Men now among men.

Will the Dreamtime Be Passed On?

A hundred miles away Jimmy Singleton faced a crisis. A team of geologists had trespassed on sacred ground, disturbing ancestral spirits. One old man had become ill with grief. Telegrams and radio messages winged out of Arnhem Land to Darwin. Jimmy and a group of landowners blockaded the road, demanding an inquiry, withdrawal of the survey team, and an apology (page 653).

Back at Nangalala night brings exhausted sleep to the young initiates. Men now, they will not mix with women and children until their wounds have healed and they have been instructed in the laws and behavior befitting their new status.

As night ends, blanketed figures complete their ceremonial songs and let out a collective "Yo!" as if to greet the tropical dawn. Overhead a ghostly goose solos, and flying foxes chatter and clap as Barnambirr—the Morning Star—slowly climbs above the trees and tugs at her feathered string.

Will her light, I wonder, be enough to guide these people forward to a future Dreamtime? □

Soda, soap, and spears *in the arms of a father and daughter demonstrate their coexistence with white society. Aboriginals pick and choose among modern conveniences when a truck, bringing items from batteries to bullets, arrives from the settlement. But for necessities they rely upon millennia of experience in the bush.*

A Tale of Twin Cities

Minneapolis and St. Paul

HEAD and shoulders above its neighbors, Minneapolis's 57-story Investors Diversified Services (IDS) building (left) commands the high-rise heart of a city growing out as well as up. Nine miles to the east, the Roman Catholic cathedral (right, background) crowns St. Paul, Minnesota's capital, where long-established neighborhoods help preserve a more intimate sense of community. Proud of their individuality, the cities fit together into a double-headed metropolis that is prouder still of its reputation as an urban success story.

RAYMOND GEHMAN (LEFT)

By THOMAS J. ABERCROMBIE

NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by ANNIE GRIFFITHS

BACK HOME. Few thoughts can faster soothe the brow of a tired traveler, or stir his heart to bittersweet anticipation.

It had been a long time since I last looked the Twin Cities squarely in the eye; only two brief glimpses in nearly 30 years. For more than two decades I had roamed across Arabia, the Soviet steppes, Cambodia, Venezuela—some 50 countries in all—a jet-age nomad writer, at home in many lands but beginning now to feel estranged from his own. It *was* time to go back home.

I was to find the Minneapolis and St. Paul I had left nearly a generation earlier quite changed, yet blessedly unspoiled. Nearly doubled in size, both cities remain uncrowded; though more industrialized, they still breathe clean air; more successful, they cultivate humility; more worldly than ever, they still talk to strangers. And each, I found, still stubbornly maintains its own identity. Hailing from the Twin Cities is more fun than having just one hometown, twice as much. Between the two there is something for everybody.

Pumpernickel and Wonder Bread

From the air the Twin Cities appear as one, a lake-dotted, tree-lined urban grid rolling from Lake Elmo west to Lake Minnetonka and beyond, from Coon Rapids in the north all the way south to Apple Valley. Home for two million Minnesotans, half the state's population, the two cities reign jointly as the commercial and cultural capital of the upper Midwest. Each downtown soars optimistically in blocks of glass and concrete above greening riverbanks. Except for the blue Mississippi River coiling between them, it would be hard to tell where Minneapolis ends and St. Paul begins. Yet more than the Mississippi sets these cities apart.

St. Paul proffers first-name friendliness, while Minneapolis—innovative, competitive, businesslike—is more big city. St. Paul is heavily Roman Catholic, spiced by ethnic parishes and a large blue-collar population. Minneapolis, heavily Lutheran, is more homogeneous. St. Paul is a government town, steeped in politics; its State Capitol dome vies with St. Paul's Cathedral as skyline centerpiece. In Minneapolis the 57-story Investors Diversified Services (IDS) Tower, tallest monument to commerce between Chicago and the Pacific, dominates all.

As local disc jockey-philosopher Garrison Keillor put it, "The difference between St. Paul and Minneapolis is the difference between pumpernickel and Wonder Bread."

But if each of the Twin Cities hums to a different tune, they harmonize on the main themes: There is still hope for the American city; an urban landscape can still nurture the human species.

"Promise me you won't go back and write another one of those stories about 'the good life' in the Twin Cities," asked my host earnestly, over a backyard barbecue along Minnehaha Creek in the heart of Minneapolis. "The whole country will be migrating here in droves."

Larry Lee knows his cities. Originally from Wyoming, he now is an urban planner for Bloomington, a Minneapolis suburb.

"When I decided to settle down," Larry said, "I looked around at America's bright spots—Boston, Cincinnati, Seattle—and, well, the Twin Cities won, hands down."

Statistics back him up. Always near the top of a city planner's poll, the Twin Cities were ranked number one by the Urban Institute of Washington, D. C., for overall quality of life. Indicators include housing, income, education, government, health care, environment, recreation.

Why? Some note that many of the area's founding fathers came from northern Europe, bringing traditional demands for good government with them. Others theorize that the harsh climate compels citizen cooperation against the elements. Serious minority problems are few. Population density is still low, and single-family homes predominate. Also the Twin Cities are the political focus of a farm region where common sense is still fashionable and the voice of the church still widely heard.

Once I even heard it in the backseat of a taxi. I climbed into Bob Lumley's Yellow Cab at the IDS Tower, and we inched out Hennepin Avenue past a couple of adult bookstores and an X-rated theater. As we waited at a stoplight, driver Lumley picked up a well-thumbed Bible and began reading from Revelations:

"Babylon the great is fallen . . . become the habitation of devils, and the hold of

every foul spirit, and a cage of every unclean and hateful bird."

We eased forward another block. "And the merchants of the earth shall weep and mourn . . . ," he intoned, and at each stoplight he added another verse of doom.

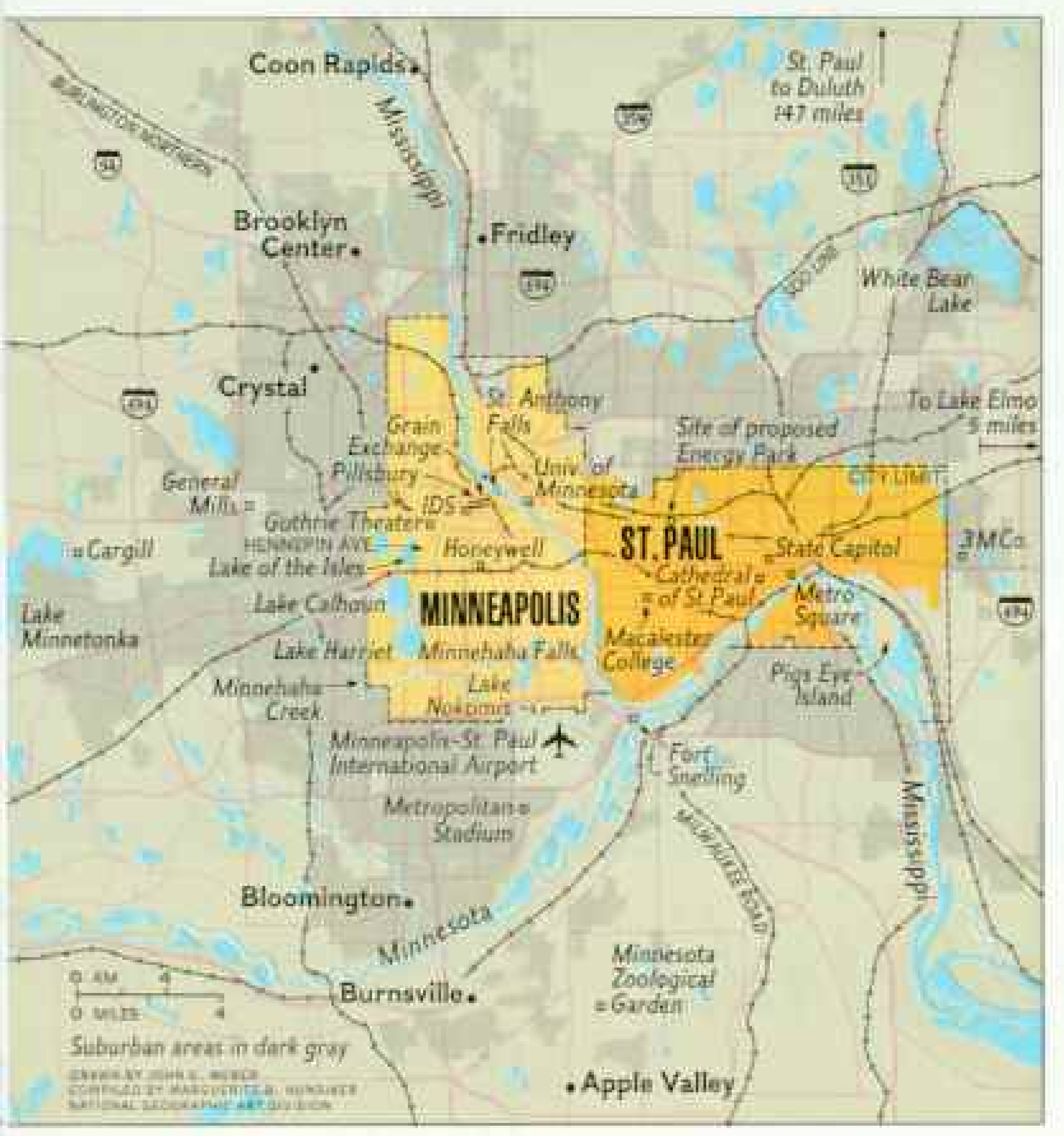
"Wait, there's more," the preacher-driver insisted as I paid the fare. I admired his fervor but felt strongly that taxi drivers should deal with addresses of the moment, never the final destination.

In 1820 U. S. Army Col. Josiah Snelling planted the seeds that would grow into the Twin Cities, building a stone fort on high bluffs where the Minnesota River meets the mighty Mississippi. Snelling's frontier regiment mingled with fur traders, explorers, and Indian agents, and later with lumberjacks and missionaries.

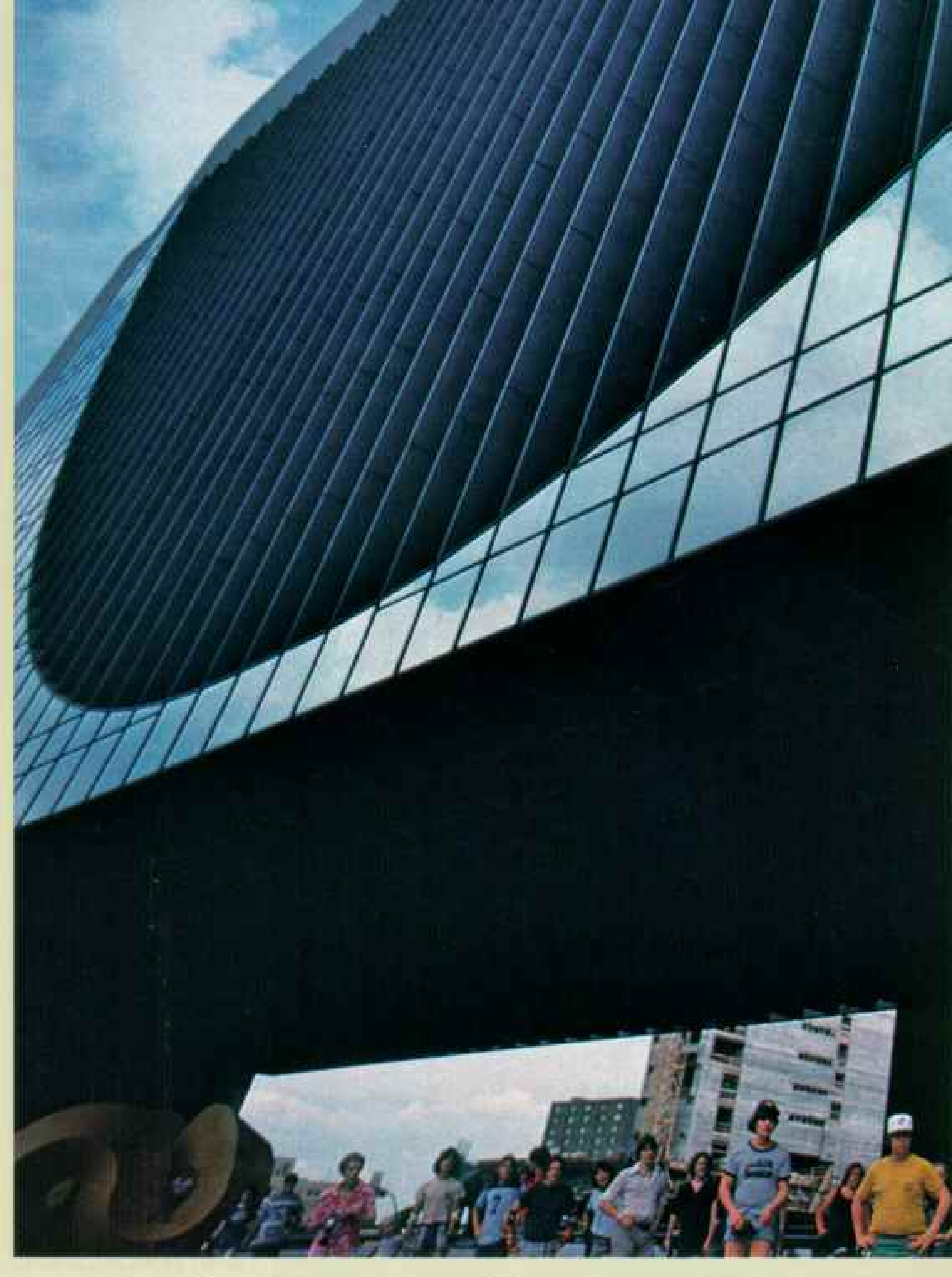
In 1823 the first steamboat arrived from St. Louis. About the same time, the soldiers completed a gristmill and sawmill, the area's first industry, ten miles up the Mississippi beside St. Anthony Falls. By 1856 the small town of St. Anthony on the east bank had a west-bank rival called Minneapolis (from the Sioux *minne,* water, and the Greek *polis,* city). Flour mills began to compete with the lumbermen around the roaring falls (now tamed), at that time the largest source of waterpower west of Niagara.

Among the squatters booted off the Fort Snelling Reservation in 1839, a flamboyant whiskey peddler named "Pigs Eye" Parrant opened a saloon on the Mississippi banks, five miles downstream. During its first decade the shanties and board streets above the steamboat landing were known as Pigs Eye, and even today a nearby spit of land is called Pigs Eye Island. Not until midcentury did local businessmen, polishing their image, rename the town after its small log Chapel of St. Paul.

As former Indian land opened for settlement under the Homestead Act, waves of emigrants from Sweden, Norway, Germany, and Ireland pressed past Fort Snelling to the *(Continued on page 674)*



***FATHERED BY** the Mississippi River, the twins grew up on its banks in the 1840s and '50s. St. Paul sprouted around a riverboat landing at the head of river navigation. Minneapolis began upstream where St. Anthony Falls powered saw- and gristmills. The spread of railroads in the 1870s bolstered the cities' joint role as gateway to the northern Great Plains, a part they still play as the 15th most populous United States metropolis, with two million residents.*



Minneapolis

Big sister of the two looks to her own future

THOMAS J. ABERCROMBIE

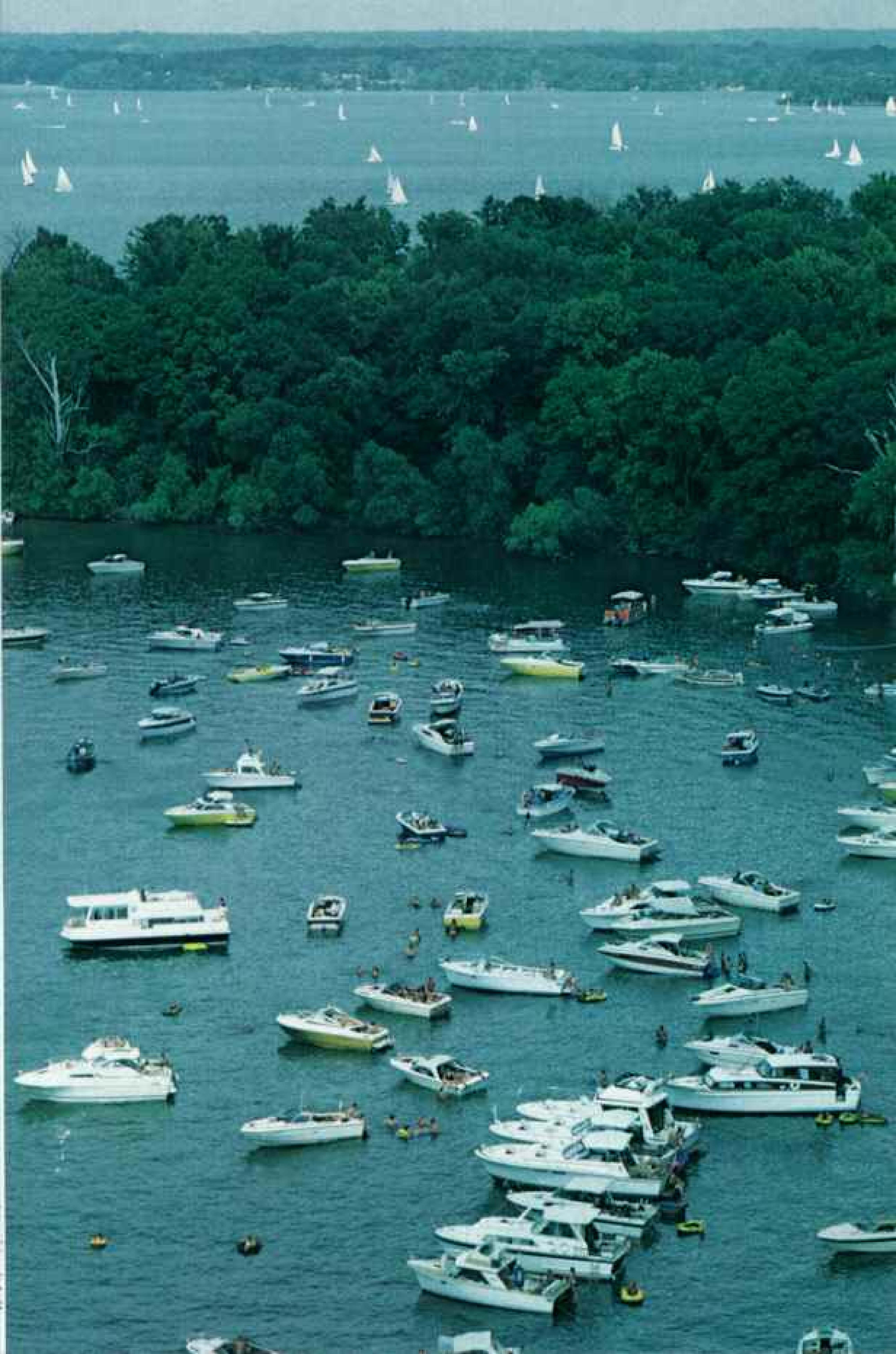
with a midwestern mix of optimism and practicality

GRAVITY WINS in a skateboard contest beside the Federal Reserve Bank. The site was once a notorious skid row; it was razed in the 1960s as part of foresighted renewal efforts to keep the inner city in the mainstream of growth.

RAYMOND GEHMAN (ABOVE)

LAKE OF 10,000 BOATS, Minnetonka draws weekend navies (right) along 111 miles of shoreline. Do-it-yourself sports are a passion rivaled only by devotion to professional football, baseball, hockey, and soccer. Minnesota Vikings football fans have made a ritual of elaborate parking-lot picnics (above), but a new domed stadium with no parking lot threatens to end the tradition in 1982.

Change is outlawed at Fort Snelling, where guides act out the daily lives of soldiers (left) and other 1827 residents of the region's first permanent white settlement.



OPENHANDED GIVING by a corporate community noted for its generosity helped build the Minnesota Orchestra's new hall in downtown Minneapolis in 1974. Ceiling and wall cubes (above) aid acoustics for the 77-year-old orchestra, acclaimed as one of the nation's finest. A few blocks away, Plexiglas skylights roof the IDS building's Crystal Court (top right), nerve center for a second-story skyway system that gives shoppers weatherproof access to a 14-block

RAYMOND GEHMAN (LEFT)

area of shops, banks, and offices.

An acute observer of Twin Cities foibles and strengths, cartoonist Richard Guindon (above) explores life's everyday ironies in the "Minneapolis Tribune" and 43 other newspapers across the nation. Here hanging out with a few good friends, he says, "My characters are a set of attitudes, midwestern profiles. It's not as flamboyant here as New York . . . I mean, a lot of people in these cities are still upset because the speed limit was raised to 55 miles an hour."

(Continued from page 667) prairies beyond. Primarily wheat farmers, they soon transformed the Twin Cities region into one of the world's premier grain and flour centers. (Today, as home to the grain-trading giant, Cargill, Inc., and headquarters for Pillsbury and General Mills, it still holds that distinction.) In the three decades after 1860, Minneapolis and St. Paul grew more than 20-fold to some 300,000 people.

As elsewhere in the white man's westward surge, great Indian nations were doomed. Many Dakotas and Ojibwas were slaughtered; survivors found themselves refugees in their own land, their habitat spoiled forever by ax and plow. Today the Twin Cities number close to 20,000 Indian residents. Many are transients, however, lured in from Red Lake or Leech Lake Reservations for a year or so of big-city wages. Despite programs designed to integrate these native Americans, some still suffer from cultural upheaval, and can be seen staggering along Franklin Avenue in Minneapolis. Of course there are encouraging exceptions.

I talked to Jim Howe, washing his Porsche sports car outside his First Street Station, one of the city's most fashionable restaurants.

"I decided early in life, if you can't lick 'em, join 'em," Jim said. "If I've made it in the business world, it's because I learned to

ESCORTED by parks and jogging paths, Minnehaha Creek (left) rambles through Minneapolis neighborhoods en route to Minnehaha Falls (below). True to its name, the City of Waters protects 11 recreational lakes in a 5,500-acre park system begun a century ago.

BOTH BY RAYMOND GEHMAN

operate that way. But my heritage and culture are still very important to me."

Most natives find the switch painful. Some are still very bitter. At the American Indian Movement (AIM) office in St. Paul, Pat Bellanger, a proud Ojibwa, lashed out at the injustices still borne by her people. I could hear children beating a drum in the nursery school upstairs. Medicine men as well as modern doctors treat patients in AIM's clinic next door.

"My grandfather fought the white man at Sugar Point in 1898," she said. "Officially it's called the last Indian battle—but our fight still goes on.

"When President Carter declared war on the energy shortage, he was in fact declaring war on us," she said. Indians, collectively, are the largest private owners of coal and uranium in the U. S. "Now they'll want to take that from us."

Mike Oker, a métis, or mixed-blood, runs the art department at the Minneapolis American Indian Center on Franklin Avenue. Besides showings of Indian arts and crafts, the center sponsors language courses and recreation programs. Regular powwows, organized by Indian elders there, draw crowds by the thousands.

"The white man was too busy with his industrial revolution to understand native Americans or appreciate their ways," Mike

GRAIN IS DOUGH at the Minneapolis Grain Exchange (below), largest cash market in the nation. At a farmers' cooperative in St. Paul, a single hydraulic lift (above) empties 30,000 truckloads a year—one drop in the river of grain that funnels through the Twin Cities from as far away as eastern Montana.

BOTH BY RAYMOND GEHMAN

said. "Only now, in the age of ecology consciousness, do we see the first glimmers of respect for a race that lived in perfect harmony with its environment."

A vestige of the Indian's primeval forest survives around Minnehaha Falls, immortalized by Longfellow's *Song of Hiawatha*. But visiting Minnehaha Park, I found the woods peopled by tribes of Dahlgrens and Swansons gathered for the annual Svenskarnas Dag, or Swedes' Day. They had come to enjoy the folk dancers and bell ringers, to browse among the Scandinavian embroidery and wood-carving booths, and to munch *vorm korv med mos*—hot dog and mashed potatoes.

"How Swede It Is"

Even though there are 27 pages of Johnsons in the Minneapolis phone book, and 19 of Andersons, "Scandinavians actually make up only about 12 percent of the population here," Iner Johnson told me. "But we continue to celebrate our heritage. Folk dancing and music clubs help keep us in touch with the old country."

A T-shirt stretched across one blond picnicker spelled it out: How Swede It Is!

From the park I pedaled west along Minnehaha Parkway aboard a borrowed ten-speed bike to explore some of the 55 miles of sylvan paths that curve along shaded creek banks from lake to lake through the heart of Minneapolis (pages 674-5). At Lake Nokomis—one of 11 recreational lakes within the city limits—I dodged swarms of joggers, then circumnavigated Lake Harriet to pause at its yacht club. There Jim Martin invited me aboard *White Tornado*, a 20-foot C Scow-class sailboat, one of 50 that race under the club's flag every Sunday morning. On a brisk, fair wind these blunt-bowed, shallow-draft racers can step up to 20 knots, but today it was a lazy breeze that wheeled us around the shimmering lake past the parkways and fine homes that line its shore.

"I guess I would never want to live anyplace but Minneapolis," said Jim at the tiller. "In this city a man's domain might be just a 40-foot lot, but he's never more than ten minutes from a swim, golf, tennis, fishing, skiing, or—most important—his boat."

Jim could have added "a concert." That evening I joined the popcorn and ice-cream crowd at the Lake Harriet band shell to syncopate with the Hall Brothers Jazz Band. Later, for a change of pace, I relaxed over wine, cheese, and Shostakovich at one of the Concerts in the Park given by the Minnesota Orchestra, formerly the Minneapolis Symphony, at nearby Lake of the Isles.

As patrons of the performing arts the Twin Cities rank high. Practically all professional theater in the United States was still in New York City when Irish director Sir Tyrone Guthrie arrived in Minneapolis in 1959, looking for an alternative to a Broadway more concerned with box office than serious theater. Civic leaders pledged earnest money, land was donated, and a corps of 1,200 volunteers fanned out to raise two million dollars to build the facilities.

In the two decades since, the Guthrie Theater has rewarded the cities with masterful productions of the major classics and with regular excursions into the experimental as well.

The Twin Cities, their appetite for the stage whetted by the Guthrie, today feast on a smorgasbord. For dessert I recommend the Dudley Riggs show.

"When I first came to town, there was only one professional theater group in the area," said Riggs, creator of Brave New Workshop on South Hennepin Avenue, zany specialists in social and political satire. "Now we have 20—plus 56 smaller companies and 12 dance groups. The Children's Theater is the finest of its kind in the country. This is a helluva theater town—more dynamic, I think, than New York City."

Riggs, a third-generation trapeze artist in a Barnum and Bailey family, met and married a Minneapolis girl, then settled here. ("I'm a case of a boy running away from the circus to join a family," he says.) He opened his workshop in 1958, and has since produced such madcap attractions as "Atheism Means Never Having to Say You're Lutheran," "Son of Miss America," and "How Much Does This Holocaust?"

Fans' Cheers Blot Out Agony

For many Twin Citians the best show in town is still Minnesota Vikings football. Some 47,000 fans filled Metropolitan Stadium to the brim that Sunday I climbed to the bleachers, with six-pack and transistor,

to watch the Vikes kick off to the Green Bay Packers—usually the game of the year. This was no exception.

Tied at 21 to 21, the game went to sudden-death overtime. Third down, Vikings' ball. From midfield, quarterback Tommy Kramer fired a long pass, high. As wide receiver Ahmad Rashad leaped to a one-handed catch, the fans around me shouted themselves hoarse; as Rashad stiff-armed his way through the Packers' defensive backfield to the winning touchdown, they went right off the Richter scale.

Afterward in the Vikings' dressing room, roaring with well-wishers and strewn with sweaty jerseys and bandages, Rashad iced down his knee. "These Twin Cities crowds make it all worthwhile," he told me. The former All-American running back from Oregon—Bobby Moore was his name before he embraced Islam—has traveled the pro circuit for eight years (pages 690-91).

"They cheer you even if you're having a bad day. And when you're hot—wow! It's the best town I've ever played in."

Outside I joined my old friends Kitty and Bill Sault at their 20-foot motor home, one of many lingering around the stadium for a little "tailgating." This delicious rite began as a modest picnic off the back of a station wagon while waiting for traffic to thin. Today it is a pre- and post-game bacchanal as important as the game itself. Nearby, one clan had set a long folding table with linen, silver, and tall candelabrum (page 670). Loudspeakers blared on the parking lot, now polkas, now disco tunes, as dancers took to the tarmac. Over by gate 26 a group prepared to launch a hot-air balloon.

"We've been tailgating on this parking lot for 13 years—even when there was six inches of snow on the ground. But, sad to say, the new domed stadium downtown means the end of these cookouts," Bill said as he speared our steaks off the charcoal.

For nearly a decade controversy plagued the domed stadium. Some called it the "doomed" stadium, a white elephant of future energy shortages. Others foresaw a purgatorial rush hour when 65,000 sports fans battle 90,000 regular commuters. Some St. Paulites felt that Minneapolis was stealing the ball game. A suit to halt construction went all the way to the Minnesota Supreme Court. But last winter work on the Hubert H. Humphrey Stadium began.

Years ago, to help steer the cities and suburbs through such controversies—and to draft regional plans—the Twin Cities Area Metropolitan Council was formed.

"Minnesotans have historically demanded good government," said Charles Weaver, present council chairman. "It's no accident that a high percentage of our politicians graduated to the national scene—Hubert Humphrey, Walter Mondale, Eugene McCarthy, Chief Justice Warren Burger."

A lawyer, Mr. Weaver had served eight years in the Minnesota Legislature. We talked one morning in his office on St. Paul's Metro Square.

"As you can imagine, it is an awesome task to frame the needs and aspirations of this 3,000-square-mile patchwork quilt, which includes two major cities, seven counties, 189 municipalities, and 49 school districts. But we know growth is inevitable. Best we all grow together," he added.

The council had just vetoed location of a new 12-million-dollar hospital complex in suburban Burnsville, recommending instead the enlargement of existing facilities in downtown Minneapolis.

"Some suburban politicians complain the cities get more than their share," Mr. Weaver said. "But most will concede the importance of recycling the inner city. They realize that as the core goes, so goes the apple."

Contrasting Styles in City Hall

Calling on the Twin Cities' mayors, I found them dedicated and experienced—and as different as their constituencies. In the red-granite Minneapolis City Hall, Donald M. Fraser struck me as a quiet, orderly man of liberal politics and conservative tailoring. He brings his considerable experience, 16 years as a U. S. Representative, to an already well-ordered city. Business booms, optimism pervades. The flagging downtown district I remember from the '50s, and the mile-long Washington Avenue skid row, once famous throughout the upper Midwest, have long been plowed under.

"I admit many of the problems plaguing other United States mayors have been solved here by my predecessors," Mayor Fraser said. "We're just putting on finishing

FRIEND OR FOE? A toddler eyes a puppet held by Mrs. Muriel B. Humphrey at the Fraser School, a facility for children mentally retarded or developmentally delayed. Teams begin work with six-week-old infants at their homes, while the school serves two- to twelve-year-olds. A leading supporter of the school, Mrs. Humphrey is familiarly known as "Grandma" here and in Fraser residences for retarded adults.

touches. We have 600 million dollars' worth of private construction going up—corporate headquarters for Pillsbury, another for Lutheran Brotherhood Insurance, and the City Center office and shopping complex. While many cities look to federal funding, Minneapolis counts its corporate blessings.

"If I were to sum up the key to our success in three words, they would have to be: 'the private sector.'

"Of course no city emerges problem free. We still have work to do with our sizable native American minority. And housing: Two-thirds of the houses in Minneapolis are pre-World War II or older. We have more than a dozen programs to promote neighborhood restoration.

"And it's paying off," Mayor Fraser said. "In the early 1970s Minneapolis was losing 10,000 people a year to the suburbs. Now we have stemmed the tide. For the eighties we predict a stable population."

St. Paul's bearded mayor, George Latimer (page 687), is a man of boundless humanity and wit, with a twinkle of optimism in his eye and a penchant for wild cards.

"He's one of us" one St. Paulite told me. Once, at a University of Minnesota musical production, they needed a bearded baritone in a hurry when one of their cast fell sick. Mayor Latimer, in brocaded robes and carrying a large scroll, belted out the solo to a standing ovation.

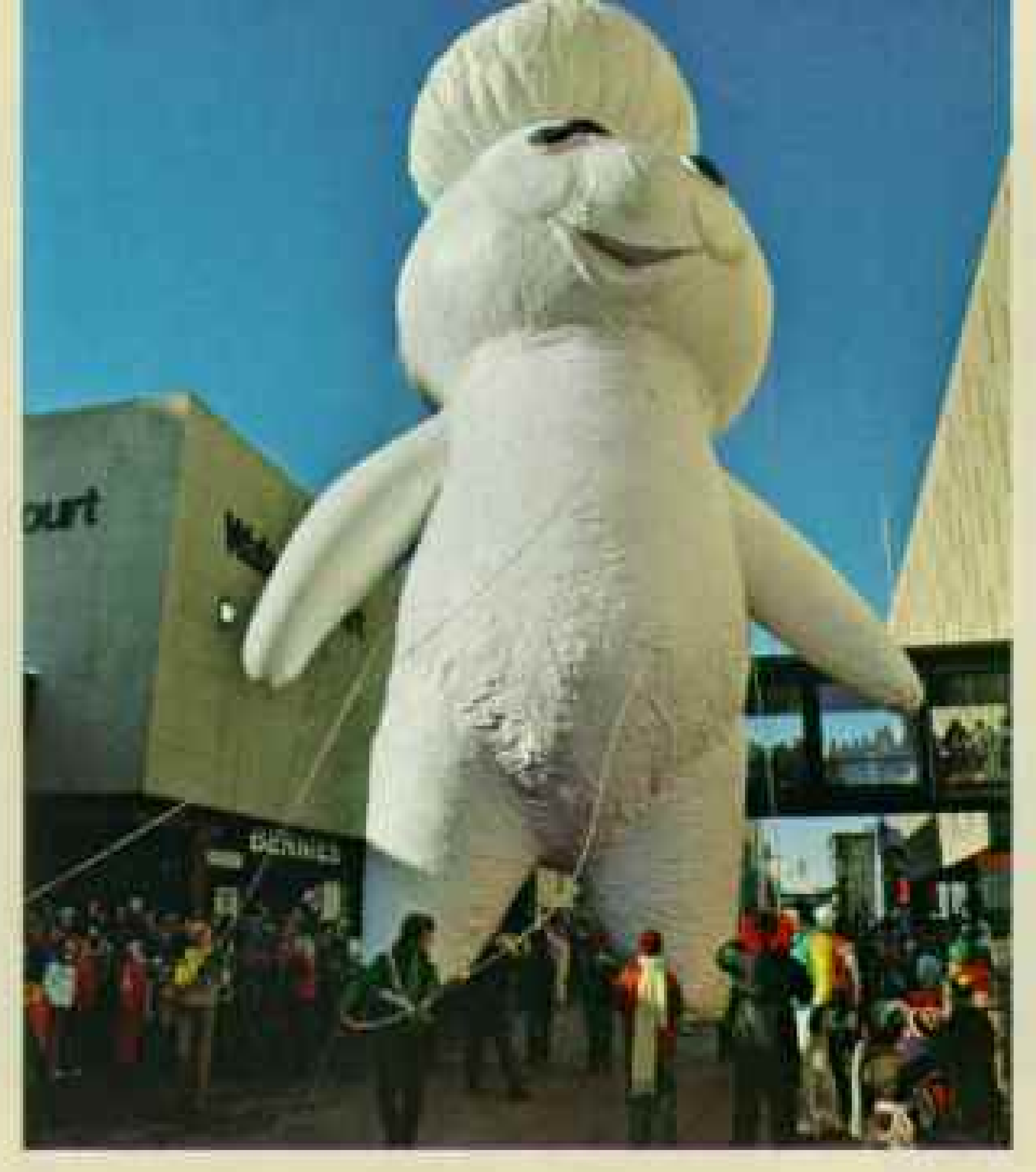
Last February, to stress the importance of energy conservation, he mailed out questionnaires on energy use to every household and business in St. Paul. Two weeks later he followed up by closing City Hall for three days while city employees and neighborhood and business volunteers canvassed the recipients. Computerized results of the census will shape the St. Paul Energy Mobilization Program.

A former labor lawyer, Mayor Latimer has succeeded in uniting the unions and businesses in this workingman's town. His bold planning has generated funds, government and private, that helped revitalize the city while actually lowering public debt. Last spring he won a landslide election for an unprecedented third term.

Learning to Be Energy Efficient

At the wheel of his official Ford, Mayor Latimer drove me around St. Paul, past the rehabilitated apartments in once decaying Lowertown to Ramsey Hill, with its gingerbread mansions, then on to Cherokee Heights for a panorama of the downtown skyline that is now cluttered by cranes and scaffolds.

"We have seven new buildings going up, ten others being completely renovated," Mayor Latimer pointed out. "The two-towered, 27-story, 75-million-dollar Town Square will house offices, a department



UNDAUNTED by the elements, inner tubers adapt to the season while skiers and skaters crisscross Lake Calhoun (below) in Minneapolis's Winterfest. St. Paul's Winter Carnival, begun in 1886 as the city's answer to an Easterner's description of St. Paul as "another Siberia," parades a five-story Pillsbury Doughboy balloon (left). A gift for taking winter in stride is essential to survival here, for the northland's cold often locks the cities in bitter chains (right).

store, 55 shops, a glassed-in park, with underground parking for 500 cars."

Over dinner at a favorite family restaurant at Grand and Lexington, Mayor Latimer talked of the threat that rising fuel costs pose for these cold northern cities.

"To remain competitive with the Sunbelt, we must make St. Paul a model of energy efficiency," he said. "We are studying a plan to recycle heated wastewater from the power company's nearby plant into downtown St. Paul. This fall we break ground on Energy Park—light industries, offices, and nearly a thousand housing units, all using the latest in energy conservation."

It Started With Thermostats

One world-renowned Minneapolis company has been in the energy-conservation business since 1885, when inventor A. M. Butz began selling thermostats for furnace dampers. His firm grew into Honeywell, a multibillion-dollar controls- and computer-oriented corporation with branches and subsidiaries in 77 countries. It is now involved in everything from torpedo controls to fiber optics and the designing of computerized bowling alleys.

From atop Honeywell's corporate headquarters at 28th Street and Fourth Avenue South gleams a huge battery of high-temperature solar collectors. The system heats the entire eight-story building and powers the air conditioning in summer.

Twin Cities firms prosper by attracting—and holding—some of America's top technological talent. Unemployment here is significantly less than the national average. Honeywell, UNIVAC, and Control Data grew exponentially, then spawned dozens of smaller computer companies, causing a Boston newspaper recently to complain: "The boys from Main Street . . . are after Massachusetts' high-tech industry."

St. Paul's Minnesota Mining and Manufacturing Company, better known to the world as 3M, is as pleasant a place to work as any in the land. I know: My first job was as a tape cutter there. Employees enjoy first-class working conditions, good salaries, and stock options. Tartan Park, a 483-acre complex for 3M workers, offers an 18-hole golf course, tennis, skiing, and a luxury dining room *(Continued on page 688)*

St. Paul

"Last of the eastern cities," as she is called, remembers her beginnings in staking out her future

CAMEO GLIMPSE of an old house's new owners catches Diane Follmer and husband, Gary Hietala, in a window of the Victorian-era home they are restoring. Renovation is widespread in St. Paul's older, inner neighborhoods. "They're being seen as good places to raise a family," says Diane. "St. Paul has been supportive, and now it's reaping the rewards."

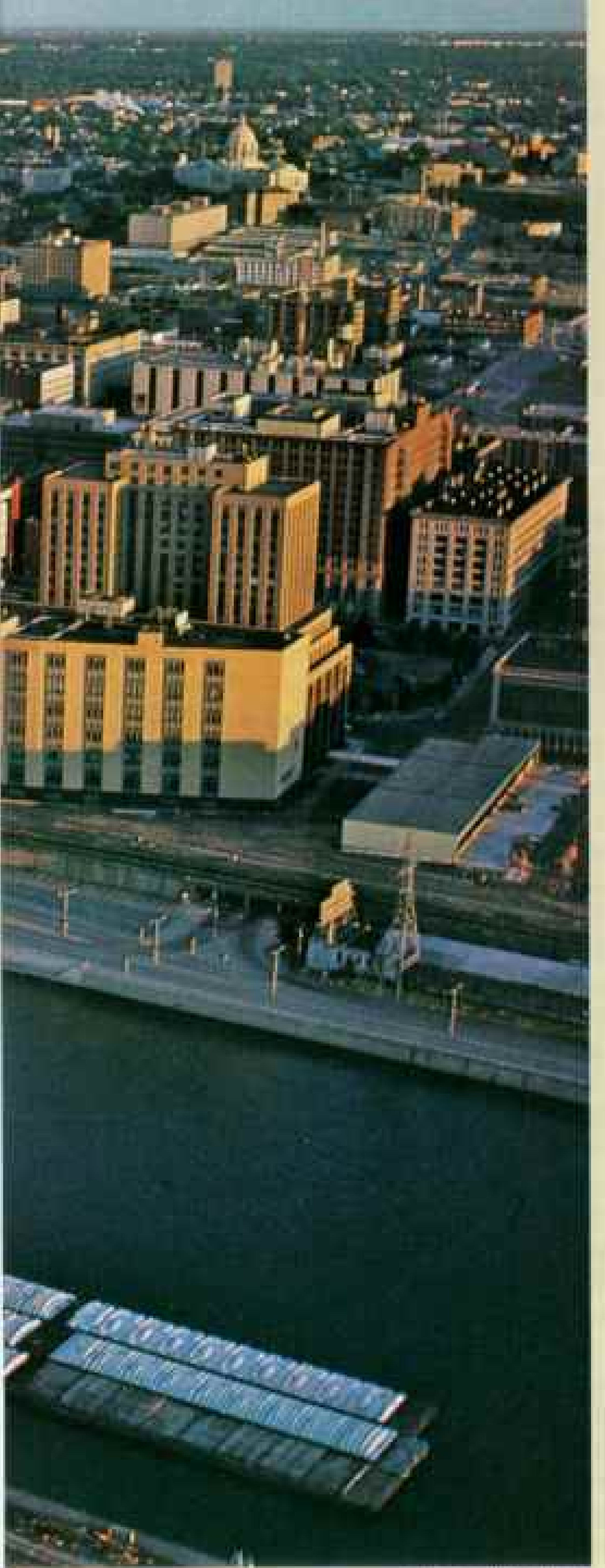
MARK BRETHEIM

CHANGE for change's sake has never loomed large in St. Paulites' philosophy. "I liked the barber-supply business 58 years ago when I started, and I like it still," says 70-year-old Bill Marvy (facing page), sole maker of barber poles in North America. At Mickey's Diner (below), downtown's only round-the-clock eatery, citizens of every stripe have rubbed elbows since 1937.

The Minnesota State Fair, first held in 1859, drew one and a half million visitors in 1980—and young livestock owners who watch over their animals day and night (above).

RAYMOND GEHMAN

PEAKS OF THE MIDWEST line the river bluffs in St. Paul's business center (above). On the opposite bank, foreground, warehouses and factories profit from easy access to river shipping. The financial and retail headquarters for a vast slice of the upper Midwest, the twins also prosper as the hub of rail and highway webs and enjoy a diverse mix of agricultural and light industries. At 3M—Minnesota Mining and Manufacturing Company—one of



several native-born high-technology giants, an employee assembles color-coded wires into a roll of flat cable (lower right). Pioneered by the company, the product simplifies the rats' nests of wires and connectors in electronic components.

Whether rooting for the Vikings or his city, St. Paul's Mayor George Latimer (top right) is a fan. "The city's largely middle class," he says, "solid, unpretentious, wholesome . . . and earthy. She's the kind of girl you settle down with and marry."

(Continued from page 682) rivaling that of any country club. Dues: Three dollars a year. At 3M's sprawling, tree-shaded "main campus" on St. Paul's eastern outskirts, a relaxed atmosphere belies a hard-driving, successful company.

Incorporated in 1902 to mine corundum in northern Minnesota, 3M lost money on an inferior lode, then began making sandpaper in Duluth. In those dark early days, so the story goes, 3M stock was selling two shares for one shot of cheap whiskey. Not until 1916, after moving to St. Paul and perfecting quality control, did 3M's sandpaper finally pay a dividend. Having mastered the art of paper coating, the firm began to apply adhesive to paper and cellophane. The result: Scotch brand tape.

It was a logical step to magnetic tapes and cassettes. Today 3M sells floor tiles, bandages, brass polish, fishing line, copying machines, stethoscopes, scouring pads—thousands of different products. Its 88,000 people in 200 plants in the U. S. and abroad turn out six billion dollars' worth a year.

The core of 3M is its staff of 6,000 scientists and engineers. And they are given plenty of elbowroom. "We have an average of one day a week to work on our own ideas," said Arthur Fry, product development specialist in the Commercial Tape Laboratory. "Often the wild ones pay off."

A regular in his church choir, Fry was annoyed when he sometimes lost his place in the hymnbook. So he experimented with a releasable adhesive to create a bookmark that would not slip but could be easily removed. Thus began a whole new line of Post-it notepads that turn any surface into an instant bulletin board.

Years ago Philip Palmquist, technical director of special enterprises, found that microscopic glass beads were no good for sandpaper. But he was fascinated by their reflective properties. Working in his spare time, he helped create a coating that reflects a hundred times more light than a plain white surface: the now familiar Scotchlite of license plates and road signs.

"That was just the beginning," Phil said, as he showed me around his lab. "We discovered that by adding aluminum backing we could boost reflectivity 1,500 times—ideal for large, projection-type screens."

The movie industry used Palmquist's screens for dramatic special effects in *2001* and *Star Wars*. Back in his office, bedecked with many awards, he showed me a favorite: the Oscar that Hollywood bestowed on him for technical achievement.

Pioneers in Science Fields

Playing a major role in the Twin Cities trend toward science-oriented industry is the University of Minnesota's Institute of Technology. Its programs—control systems, cryogenics, heat transfer, biomedical engineering, microelectronics—are all pioneers in their fields. I met energetic Roger W. Staehle, dean of the institute, a Buckminster Fuller kind who fuels his fleet of ideas with high-test enthusiasm. As we talked, his red ball-point pen filled yellow foolscap with lists, graphs, and sketches.

"The institute, with its seminars, lab facilities, joint research projects, and consultant services, serves as a catalyst," said Dean Staehle. "To better reach area industry with our programs, we have developed the UNITE program—University Industry Television for Education. Through this closed-circuit TV classroom, a busy company scientist can keep up with the state of the art, even earn advanced degrees, without the time-consuming commute to the classroom. The only time he or she need show up is to collect the diploma."

I visited one interesting institute project, the Underground Space Center, run by the university's civil-engineering department.

"Earth-sheltered housing is not a new idea," explained Dr. Charles Fairhurst, the department chairman. "Leonardo da Vinci proposed a multilevel city back in the 16th century. Our prairie pioneers often built sod houses.

"In this harsh northern climate, below-ground architecture is especially appropriate," he emphasized. "Twin Cities' temperatures can easily range from 100°F in summer to minus 30° in winter—the widest spread of any large city complex in the United States. But just 20 feet down, the temperature is a constant 50° year round."

An impressive example of such architecture stands on (and in) the university's own campus: four-level, earth-sheltered Williamson Hall, which houses the bookstore

and admissions office. Using half the heating and cooling energy of a conventional surface facility, the building is lighted by a subterranean central courtyard. Windows and skylights are shaded by Engelmann ivy, which sheds its leaves in winter, admitting sunlight. Students stroll across the roof, a green mall of trees and shrubs.

I spent my own student days at Macalester in St. Paul, typical of the dozen smaller private colleges in the cities. Although I was something less than a distinguished scholar, Macalester College, with its international programs and its large roster of foreign students, opened wide my eyes onto the world.

Professor Ivan Burg taught me how a newspaper works; Ted Mitau made even political science fascinating; "Herr Doktor" Westermeier force-fed me German grammar. Dr. John Maxwell Adams gave me an appreciation of Old Testament history, and later officiated at my wedding in the college chapel. I had touched base recently with Dr. Adams's daughter Joan, an art major in my class of '52, now living in Washington, D. C.

"I owe a lot to Macalester," Joan said. We sat beneath a colorful oval-shaped weave by Bolotowsky, one of the splendid collection she has assembled on living American artists. "Solid midwestern values and an international perspective. Above Old Main the United Nations flag always flew alongside the Stars and Stripes.

"My home will always be in the Twin Cities," Joan said, "although I plan to stay in Washington for at least another four years."

I felt sure that her husband, Vice President Walter F. Mondale, had similar plans.

Many of my old classmates still cling to the Twin Cities. Ralph Reeve, who covers Vikings football for the *St. Paul Pioneer Press*, told me how the Macalester football team recently established a conference and NCAA record by losing its fiftieth game in a row (the last win was in 1974); Mike Armajani, president of a company that manufactures four-wheel-drive vehicles, took me for a wild ride in one of his products. William Bowell had retired from a profitable printing career in Chicago to return to his first love, the Mississippi. I rode the river with Cap'n Bill at the wheel of his 315-passenger stern-wheeler *Jonathan Padelford*. "You know," he said, "given the hazards of fire and treacherous sandbars, the average life of the old wooden steamers was only about three years. I built this one to last: Compressed air drives her pistons, and her hull is steel." From the pilothouse, Bill gave a running capsule of local history from Fort Snelling all the way to Pigs Eye Island.

A Haven for Mink and Herons

I reached Pigs Eye by canoe one day with St. Paul conservationist Steve Tanner. This unique wilderness is besieged by the city—a sewage plant, railroad marshaling yards, and fleets of barges. But only a few steps from the sandy beach we plunged into a jungle of tall silver maples and cottonwoods, tangled with wild grape. We crossed mink tracks and heard the splash of beavers.

"A group of us recently formed the Pigs Eye Coalition to try to keep it this way, to have it designated a regional wildlife park and scientific area," Steve said. His voice dropped to a whisper. "Look! There!" High on the limbs of a gnarled elm a great blue heron was feeding her young.

"Official counts list 226 great blues on the island," he said, "1,700 of the smaller black-crowned night herons, and 320 egrets. Pigs Eye is one of only two rookeries we know of located in the heart of a big city. Is it not worth preserving?"

By early October the herons and egrets have swarmed south to the Mississippi's warmer reaches. Only the Twin Cities' human population has learned to cope with—and even enjoy—five months of arctic cold.

One way they beat winter is to stay indoors. Knowing this, downtown merchants have already built a world to attract shoppers back from suburban shopping centers. When my brother, Bruce, an engineer recently retired from 3M, and his wife, Pat, leave their heated garage in suburban Lake Elmo on a blustery January day, they don't need to bundle up. From a downtown parking garage on, say, Marquette Avenue, they can stroll through the skyway, a 14-block system of overhead corridors and arcades that connect most of the downtown buildings. St. Paul's system is similar, and both are expanding.

After an open-air lunch at Crystal Court, a whole square block under glass, they can

PIED PIPER PRO, Vikings wide receiver Ahmad Rashad (above) leads a jog at his football camp at Macalaster College. Boys from 18 states attended last summer; one doses homesickness with a call

add to their wardrobe at Dayton's famous department store, have snapshots developed at the Big Picture, browse for etchings at Phoenix Galleries, get a trim at Skyway Barbers, pick up Gruyère and sourdough bread at the Big Cheese ("A day without cheese is like a kiss without a squeeze"), sell the family flatware at Northwest Territories Gold and Silver Exchange, Inc.—all without stepping outside.

Not that Twin Citians are allergic to winter; on the contrary. At the drop of a snowflake they pull on thermal underwear and down parkas, grab their hockey sticks, skis, or ice-fishing poles, and plunge smiling into the storm. As my brother puts it, "I don't mind the cold, as long as it's my idea."

While most Minnesotans merely thrive on cold weather, St. Paulites actually celebrate it with their annual ten-day Winter Carnival, started back in 1886. Now each January, King Boreas and his Queen of the Snows preside over a chilling protocol: the International 500 Snowmobile Race, an ice-carving contest, winter golf and softball, ski jumping. One group of masochists holds an ice-cream social; others go waterskiing—river ice permitting.

I was disappointed to hear that the spectacularly lighted ice palaces, the very symbol of these frostbite festivals when I was a lad, are rarely put up any more. Eugene Strommen, executive director of the carnival, explained: "The cost of ice construction has skyrocketed. We must import the 400-pound ice blocks, and equipment and labor

BOTH BY STEVE WOIT

home (left). "We didn't push them to become all-pros," says Rashad. "We wanted them to just feel good about themselves by participating in something good." And that's a feeling people in the Twin Cities know well.

costs bring the price up to that of a medium-size residence. For a two-week life span!"

Before I left the Twin Cities, winter was again whitening the days; perfect weather for a visit to the Minnesota Zoological Garden in nearby Apple Valley. At the zoo's new ski shop I strapped on a pair of cross-country skis with Nancy Gibson, director of the public-relations office. She led me up and down snowy hills and across frozen ponds along Northern Trek, an easy three-mile tour of the arctic species.

"We have 250 different animal species here altogether, on 480 acres," Nancy said as we paused on a high knoll to watch the Siberian tigers. Farther along we passed moose, Asiatic wild horses, Bactrian camels, and a herd of musk-oxen.

For après-ski atmosphere the zoo offers the ultimate warming house, the Tropics Building: rambling forest under glass, bamboo, palms, and a 30-foot waterfall, where gibbons cavort, snakes coil lazily, and leopards pace.

Together the Twin Cities, like their marvelous zoo, provide a world for all seasons. If sometimes they disagree on issues or lifestyles—if sometimes the Mississippi seems wider than it really is—no matter, the differences round out the richness. They have learned in building a model urban environment that two heads can be better than one. As Byron wrote:

All who joy would win
Must share it,—Happiness was
born a twin.

□

Baja's Murals of Mystery

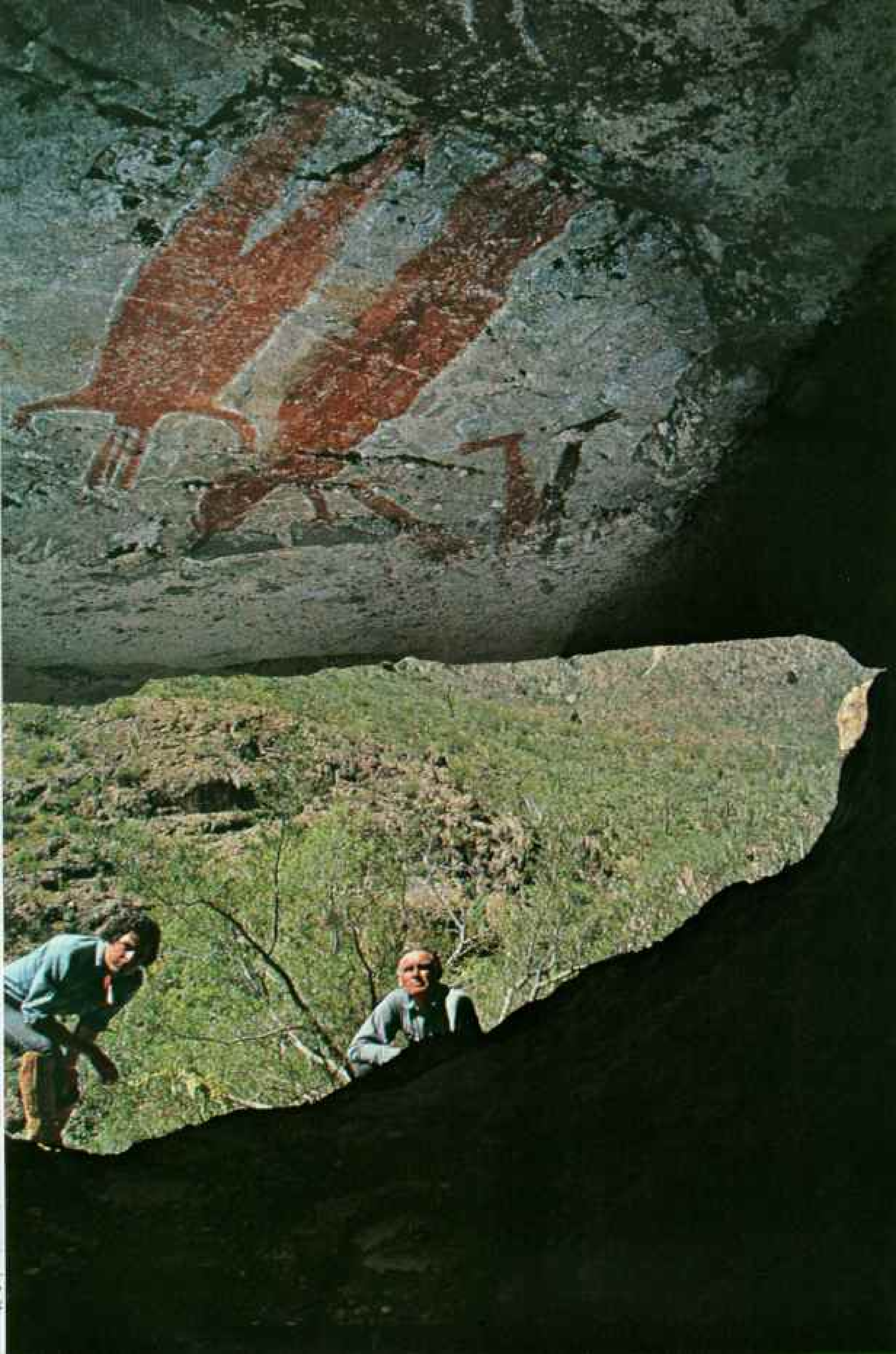
GRAND VISIONS of man and beast haunt the sierras of central Baja California. Guarded by canyons and caves, murals painted at an unknown time by unknown Indians celebrate their world on a giant scale unsurpassed in North American rock art.

I first saw the great murals more than a decade ago and was surprised to learn they had been little studied. I have since logged some 3,000 miles to document these expressions of a people I call the Painters.

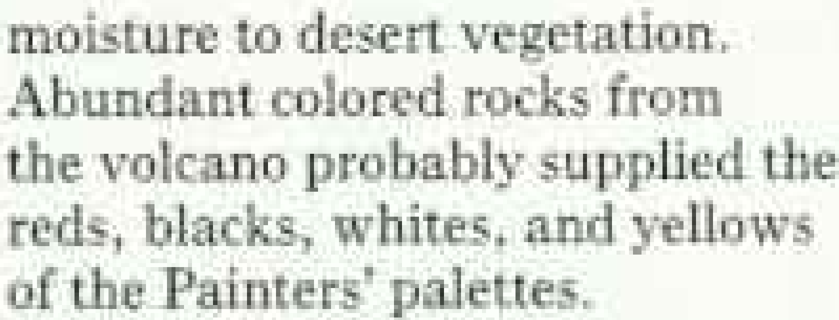
Men in headdresses came to light on the ceiling of a shallow cave, here visited by my associate Enrique Hambleton, left, and me. Heavy carbon deposits suggest it may have been a crematory.

By HARRY CROSBY

Photographs by CHARLES O'REAR



A GALLERY of rock art diverse in style and epoch spans the Baja peninsula. The Painters' heroic murals appear in only four sierras (***map, below***), most brilliantly in the Sierra de San Francisco, where the Arroyo de San Pablo (***right***) harbors many sites. Distant peaks of a dormant volcano, the Tres Vírgenes, rise like islands in a white sea when a rare Pacific fog rolls across the peninsula and yields precious

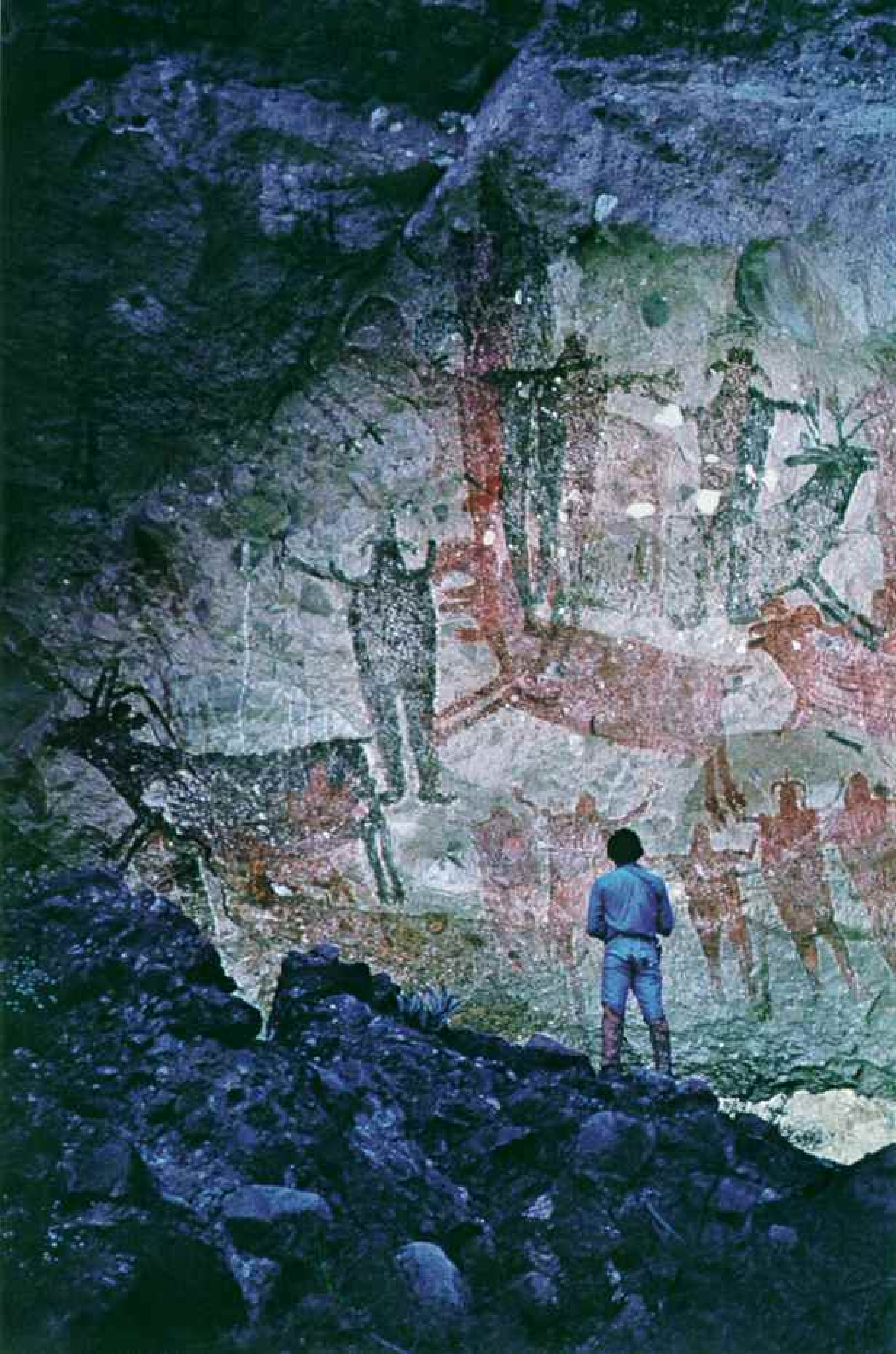


moisture to desert vegetation. Abundant colored rocks from the volcano probably supplied the reds, blacks, whites, and yellows of the Painters' palettes.

Elements of the Painters' ritual style merge in a dynamic mural almost 500 feet long and 30 feet high, stretching across a San Pablo rock-shelter long known to the people of the sierra as Cueva Pintada, or "painted cave" (***overleaf***). Life-size or larger is the usual scale of the Painters' figures. Men and women face front with arms raised. Deer, bighorn sheep, and rabbits—wildlife still found in the region—leap in silhouette, showing all appendages. Birds appear to be in flight, or may be spreading their wings to dry (***right,*** detail).

Layers of overpainting lend movement, but why was older work deliberately obscured? The cave may have been a holy place for the Painters, the act of painting this wall as important as the art itself.

ENRIQUE HAMBLETON



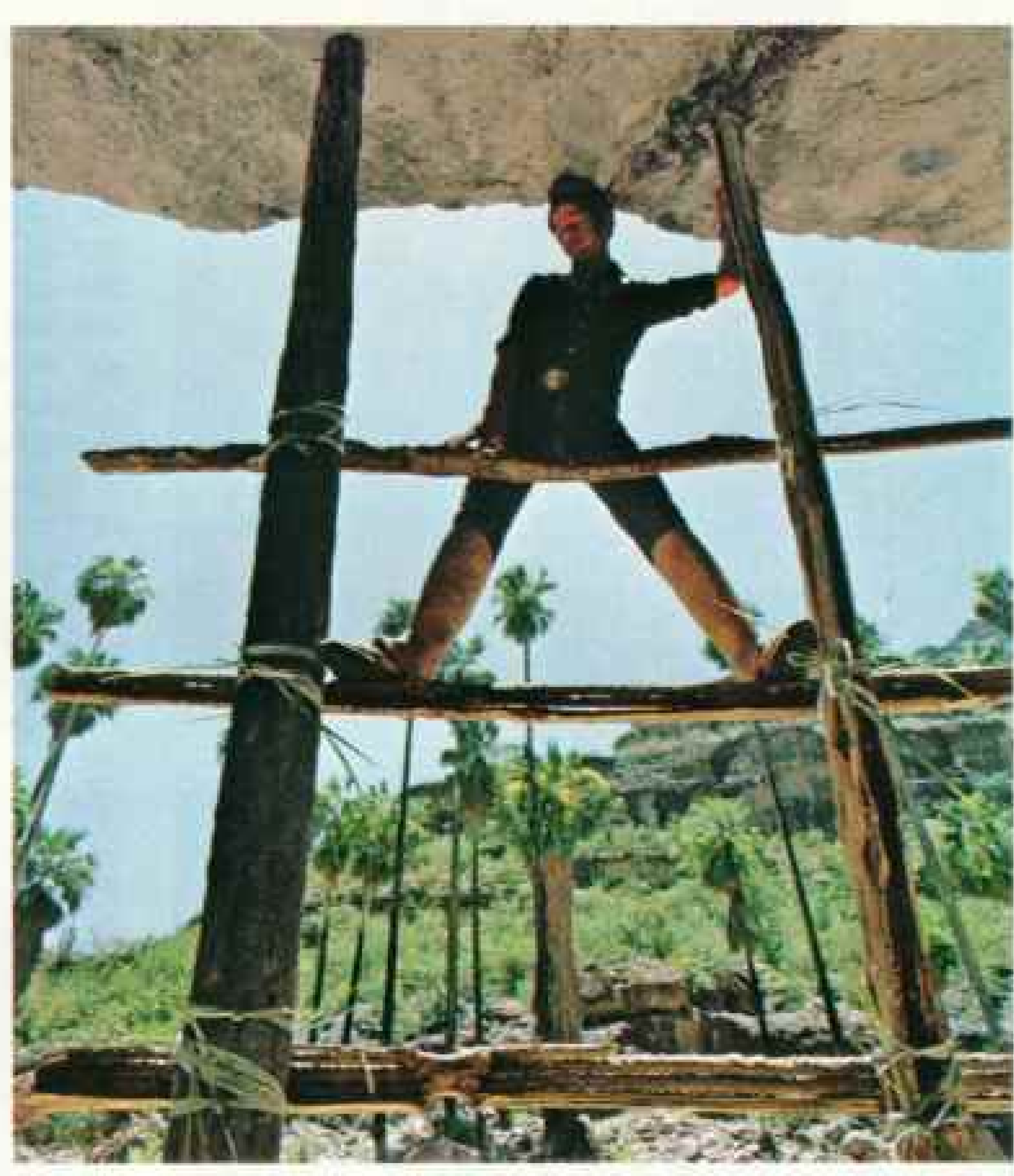
ONLY on mule and foot can we challenge this perpendicular world (***below***), more hospitable to scorpions (***right***) than man.

Exhaustion turns to awe under a montage of land and sea creatures on a cave brow (***lower right***). Guided by Tacho Arce, at left, whose family has ranched in the Sierra de San Francisco for generations, we have tapped the memories of sierra folk to locate rock-art sites. These sources and chance finds have increased the number of documented sites from less than three dozen to more than 200.

The murals intrigued Jesuit missionaries in the mid-18th century. They, too, queried local people—the now extinct

Cochimí tribe—who claimed no relation to the Painters. The artists probably led similar nomadic lives, however, entering the sierras during the fall rainy season. A wooden peg found in Cueva Pintada has been carbon-dated to about the time of Columbus. But it is difficult to connect site artifacts with the Painters without more extensive excavation.

SCORPION, CENTRUROIDES EXILICAUDA



GRAY WHALES wintering in Pacific lagoons found their way into the Painters' bestiary. A 12-foot, erosion-scarred leviathan breaches on an overhang in the Arroyo de San Gregorio (***left***). Light, scratchy painting is often seen on the top layer of an overpainted mural. Perhaps hard times brought the culture into decline and handicapped artistry.

How did the Painters reach the heights of their lofty canvases? Near Cueva Pintada we erected our theory: a scaffold strong enough to hold a man (***above***). Fallen palm logs made logical sidepieces; rungs of cactus skeletons were lashed with knotted palm frond fibers.

To simulate their medium, we ground bright volcanic rocks and watered the powder into a workable slurry (***below***).

HEAD REARED in exhausted flight, an eight-foot deer (***left,*** detail) powerfully conveys to me the Painters' respect for the hunted. Deer, the most painted animals, are often shown impaled by arrows, but their will seems undaunted.

Other artists, as mysterious as the Painters, carved petroglyphs—such as this anthropomorph in the Sierra de Guadalupe lowlands (***below left***)—throughout the peninsula.

More realistic is the Painters' three-foot fish (***below***).

ENRIQUE HAMBLETON (ABOVE AND LEFT)

Marine life was usually portrayed head up, tail down. No recent vandal chiseled its weathered stripes. The marks may express the artist's fancy, or an enemy's attempt to destroy the Painters' magic.

Though such details are left to our imagination, the art of these forgotten people reveals something of their spirit. □

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Before we told you all this, you could have innocently hurt your deck. Now that you know all about Super Avilyn, it would be a sin to use anything else.

TDK

The Vision of the Future

The Chairman of the Board tells "The Chairman of the Board" why it's time for Imperial.

Lee Iacocca talks to Frank Sinatra about the future of luxury cars in America.

On July 18, 1980 Frank Sinatra, the entertainment industry's "Chairman of the Board," joined Lee A. Iacocca, Chairman of the Board of The New Chrysler Corporation, at the first public exhibition of America's newest luxury car, the 1981 Imperial.

This new Imperial is an unusually timely automobile. In price and size it is comparable to Cadillac's Eldorado and the Continental Mark VI. But it is a newer automobile than its competitors and, in significant ways, it is substantially different from either of them; it is these differences that make the Imperial the unique automobile it is.

After opening the exhibition and viewing the new Imperial, Sinatra and Iacocca spent some time discussing what America needs in a luxury car today and how this new Imperial fills those needs.

Sinatra: When you build a luxury car, where do you start? How do you lay down the specs for a new luxury car?

Iacocca: You try to build a luxury car that's better than the competition. Say you take your leading potential competitor and you might say, 'I'm going to give a customer 105 percent of this guy's riding comfort. Or 100 percent of his cornering ability.' You can set your sights on what the people are already buying.

Sinatra: Is that what you did with the new Imperial?

Iacocca: Sure. But our standards for this one were based more on what the people need today than on what the competition is giving them. You know, times have changed in the automobile business.

Sinatra: You mean the energy crunch.

Iacocca: Partly. That's why today you have to try to build a car that's the right kind of car for now and, hopefully, for tomorrow as well. Now, you've owned a lot of cars.

Sinatra: You'd better believe it.

Iacocca: What do you think today's luxury car should be.

Sinatra: I don't know where to start.

Iacocca: Start with the way it should look.

Sinatra: Well, first of all, I'd want it to look simple. I like a clean look. Because I believe that a lot of chrome looks dated. I think things are getting cleaner and simpler looking and that's how it should be.

Iacocca: Agreed. That's why we tried to keep the Imperial as uncluttered as possible.

Sinatra: It looks rich, Lee.

"...the styling actually helps the car perform the way you need a car to perform."

And the shape—it's very clean.
Iacocca: It's what we call slippery.
Sinatra: Slippery?
Iacocca: Slips through the air. In the wind tunnel they give it a number they call a drag coefficient. Tells you how aerodynamic the car is. The lower the number, the better.
Sinatra: Well, you've come out of the wind tunnel with a very elegant looking automobile.
Iacocca: What pleases me more is that the styling actually helps the car perform the way you need a car to perform these days.
Sinatra: Fine, but what about the things I can't see? What about engineering? You guys had a big reputation for engineering.
Iacocca: I believe we're still ahead. But engineering a car has changed radically in the last ten years.
Sinatra: Come on, Lee, this country can put a man on the moon, but we can't build an automobile right. Where's our technology when it comes to things we use every day?
Iacocca: I hear you. But I've been in this business a lot of years and when I look at the new Imperial, I see an electronic marvel.
Sinatra: An electronic marvel? What does that mean?
Iacocca: Okay. You mention the space program. Our electronics division down in Huntsville, Alabama, was a prime contractor on the Redstone missile and the Saturn Apollo program. We're an industry leader in automotive electronics, going back to electronic ignition. There are several hundred electronics experts down there in Huntsville and after we switched them from space work to commercial work, the Imperial is one of the things they went to work on.
Sinatra: What did they do?
Iacocca: Built our system of Electronic Fuel Injection.
Sinatra: That's not new, Lee. Fuel injection's been around for years.
Iacocca: Not like this. The Imperial has the first continuous flow fully electronically controlled fuel injection for any production automobile built in the world.
Sinatra: Why is that good?
Iacocca: First of all, it controls both the fuel delivery and the spark advance, based on information it gets from about a dozen sensors that monitor everything from engine temperature to barometric pressure. They feed all this information into what we call the Combustion Computer. Then the computer figures the best possible spark advance for all these conditions and the best proportion of air to fuel, and meters out the exact amount you need.
Sinatra: What's in it for me?
Iacocca: Four things. First, it starts by just a turn of the key. Second, you get the smoothest idle, even on cold mornings. Number three, there are practically no balks. And number four, practically no stalls.
Sinatra: Sounds terrific.
Iacocca: And that's only the half of it. I tell you, we've never had electronics like this. Now, you've got to admit, this instrument panel is rather unusual.
Sinatra: I've never seen anything that looked like it. But why does a digital instrument panel make the Imperial a better car?
Iacocca: Because it makes you a smarter driver. Tell me, what do you need to know when you're driving a car?

"...when I look at the new Imperial, I see an electronic marvel."

Sinatra: I want to know how fast I'm going. How far I've gone. How much gas I've got left. What time it is. That's all.
Iacocca: Okay. This instrument panel shows you all of that in words and numbers.
Sinatra: No gauges?
Iacocca: No gauges. This is the only production built American car with a completely electronic

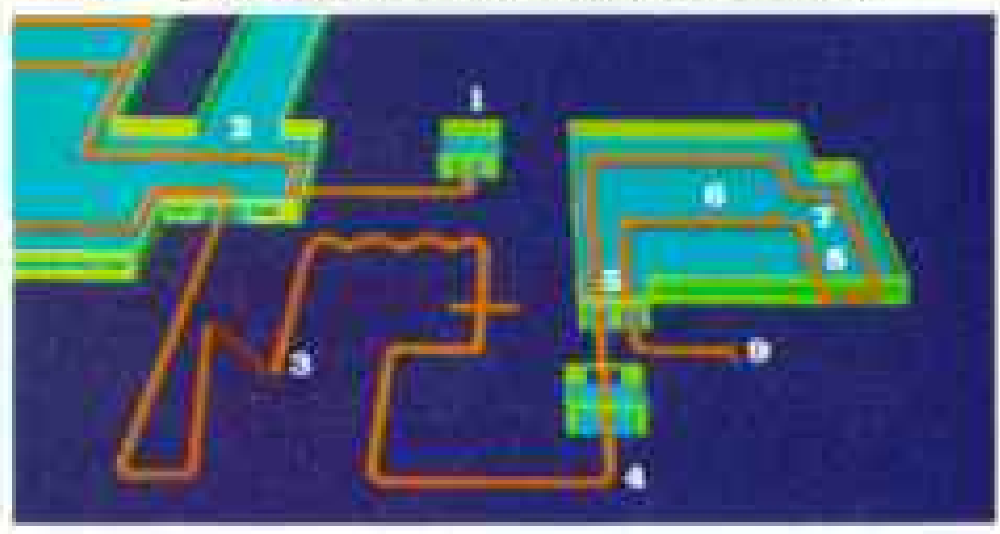
1981 Imperial. Size and price: comparable to Cadillac Eldorado and Continental Mark VI. 18 EPA est. mpg. 26 est. hwy. mpg. Use these estimates for comparison. Your mileage may vary depending on speed, weather and trip length. Actual highway mileage will probably be less. California ests. lower.

digital instrument cluster.
Sinatra: And what do the buttons do?
Iacocca: They turn your instrument panel into an Electronic Communications Center. Push button number one and your speedometer reading changes from miles to kilometers.
Sinatra: Not bad.
Iacocca: Push button number two and your electronic chronometer gives you the date instead of the time. Button number three turns the whole chronometer into an electronic timer that tells you how long you've been driving.
Sinatra: What about how far I've gone?
Iacocca: That's button number four. Push it and the electronic odometer shows you how far you've gone since you started. The next button tells your average speed.
Sinatra: And it's all in miles or kilometers?
Iacocca: That's right. Button six shows how far the gas in your tank will take you under present driving conditions. Number seven shows how many miles you're now getting to the gallon. Eight gives your mileage over your entire trip.
Sinatra: I've never had that on any car. That's fantastic.
Iacocca: There's more.
Sinatra: More buttons to push?
Iacocca: No. This part is all automatic. If either half of the dual hydraulic brake system is defective, a light goes on. If the emergency brake is on, this lights up. If your oil pressure or battery voltage are too low, or your engine temperature is too high, these lights come on.
Sinatra: That's a lot of lights.
Iacocca: We've got chimes, too. If you don't buckle up, your Imperial will chime at you. Leave the key in the ignition and it beeps. Leave the lights on and it makes a tone.

"There are more luxuries standard than any car in America."

Sinatra: Very musical.
Iacocca: I told you we built it for you, Frank.
Sinatra: What about your other customers? Is this stuff all standard equipment?
Iacocca: Frank, the only option on the Imperial is a power sliding roof. Every luxury is standard. And there are more luxuries standard than any car in America. I've got even more luxuries than *you* would ask for.
Sinatra: Try me.
Iacocca: You try me. What do you want your car to have?
Sinatra: Start with music.
Iacocca: Your choice of four sound systems, standard. All stereo. All with six speakers. What else do you want?
Sinatra: Power steering, power windows, power seats.
Iacocca: Of course.
Sinatra: Leather upholstery?

Imperial Quality Assurance Program starts with preselected parts (1) and special care assembly (2), goes on to a 3.5-mile test drive (3), hot engine checks (4), water checks (5), checks of suspension, steering (6), electrical systems (7) and metal finish (8) before final sign-off (9).



"I wanted to be able to give it a basic limited warranty twice as long as the competition's."

Iacocca: This is the only car in the world with an interior by Mark Cross. It's even got a built-in garage door opener and a hood ornament of Cartier crystal.
Sinatra: You're not fooling around with quality on this baby, are you?
Iacocca: I wanted a quality automobile to sell. I wanted to be able to give it a basic limited warranty twice as long as the competition's.
Sinatra: How long is that?
Iacocca: Two years or 30,000 miles, whichever comes first. It covers all parts except tires, all labor and all scheduled maintenance. Our rust warranty lasts a full *three* years.
Sinatra: I don't even pay for an oil change?
Iacocca: The Imperial warranty has the details.
Sinatra: That kind of confidence must have taken guts.
Iacocca: I know what went into it. Look, every one of these Imperials gets a test drive by an expert. We built a Quality Assurance Center where the whole vehicle gets a going-over to make sure that nothing gets out that's not first-rate. When an inspector there signs off on the car, the signed papers actually come to the buyer with the car.
Sinatra: I think there are a lot of people waiting for a car like this one, Lee.
Iacocca: I've got a whole bunch of Imperial dealers who are ready for them, Frank.

For the name of the nearest Imperial dealer call toll-free 1-800-521-7272. In Michigan 1-800-482-6838.

The New Chrysler Corporation

It's time for Imperial.

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A free offer to hear one today. So you'll own one tomorrow.

We're so confident of the sound and esthetic quality of Yamaha audio systems that we're making a special demonstration offer. We believe if you hear one today, you'll own one tomorrow. Because a system that recreates music accurately and beautifully is a joy forever. And beautiful music is what Yamaha is all about.

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Most of our receivers, for example, have the convenient Yamaha Optimum Tuning System feature. It automatically locks in the exact center of the FM station you've chosen for the clearest possible reception.

Our continuously variable loudness control lets you retain a totally balanced, natural sound. Even at the lowest volume setting.

And the same superb sound quality is yours whether you choose our most affordable, or our top-of-the-line receiver.

In addition to the receivers, Yamaha has a complete line of performance-matched audio components. Like finely crafted loudspeakers, a new series of precision turntables and more. Each a unique combination of performance and easy-to-use features. Each designed to complement the others. All for your enjoyment of music.

See and hear the Yamaha quality story for yourself at an Audio Specialty Dealer near you. And take advantage of our very limited, very special offer.

For more information, write: Yamaha International Corp., Audio Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, write: Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ontario M1S 3R1.

The Offer. A $15 value, FREE for the listening. The Yamaha Session II album.

Hear top musicians play the exciting sounds of contemporary pop-jazz on this lavishly produced, high technology record.

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Record quantities are limited so don't delay. Offer good through Dec. 15, 1980 at participating dealers. Offer limited to one per household. Record offer not available in Canada.

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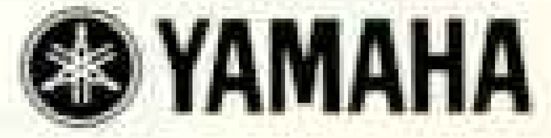

The Holidays belong to Hellmann's!

Easy recipes your family and guests will love.

Hors d'Oeuvre Pie

1 frozen (9") pastry shell, thawed
12 oz cream cheese
2 oz blue cheese (optional)
1/2 cup HELLMANN'S® Real Mayonnaise
1/2 tsp onion or garlic salt

Garnishes: Cherry tomato halves, sliced mushrooms, parsley sprigs, chopped hard-cooked egg, sliced ripe olives

On large baking sheet pat pastry into 11" circle. Pierce thoroughly with fork. Bake in 425°F oven 8 minutes or until lightly browned. Cool. Place on serving platter. Beat next 4 ingredients until fluffy; spread evenly on pastry. Cover; chill at least 4 hours. Garnish as shown just before serving. Makes 12 (2 1/2") wedges.

Parmesan Onion Canapes

1 cup HELLMANN'S® Real Mayonnaise
1 cup grated Parmesan cheese
1/2 cup finely chopped onion
1 Tbsp milk
1 loaf sliced cocktail bread, lightly toasted

Mix first 4 ingredients; spread on toast. Place on baking sheets. Broil 4" from source of heat 2 to 3 minutes or until golden and bubbly. Makes 36.

Sesame Chicken with Honey Dip

1/2 cup HELLMANN'S® Real Mayonnaise
1 tsp dry mustard
1 tsp instant minced onion
1/2 cup fine dry bread crumbs
1/4 cup sesame seeds
2 cups cubed cooked chicken or turkey

Mix first 3 ingredients; set aside. Mix crumbs and sesame seeds. Coat chicken with Real Mayonnaise mixture, then crumb mixture. Place on baking sheet. Bake in 425°F oven 12 minutes or until lightly browned. Serve hot with dip. Serves 6.

HONEY DIP: Mix 1 cup HELLMANN'S® Real Mayonnaise with 2 Tbsp honey.

Bring out the Hellmann's
Bring out the BEST!

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Mother Nature is lucky her products don't need labels.

All foods, even natural ones, are made up of chemicals.

But natural foods don't have to list their ingredients. So it's often assumed they're chemical-free. In fact, the ordinary orange is a miniature chemical factory. And the good old potato contains arsenic among its more than 150 ingredients.

This doesn't mean natural foods are dangerous. If they were, they wouldn't be on the market. The same is true of man-made foods.

All man-made foods are tested for safety. And they often provide more nutrition, at a lower cost, than natural foods. They even use many of the same chemical ingredients.

So you see, there really isn't much difference between foods made by Mother Nature and those made by man. What's artificial is the line drawn between them.

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Without chemicals, life itself would be impossible.

After 9 years, it's still built on the same simple philosophy.

The world has changed a lot over the past nine years.

So have our Honda Civics.

They're still built on the same simple philosophy of course: Simple to own. Simple to drive. And simple to maintain.

But the 1981 Honda Civic DX Hatchback gleaming in our picture is a very different car from the Civic we introduced back in 1973.

INSIDE. SIMPLE BUT CERTAINLY NOT PLAIN.

Some people thought our early Civics were a little plain inside.

Well, the 1981 Civic DX is just plain luxurious.

With velvet-like seat fabric, deep pile carpeting, remote hood and hatch release, glove box and tinted glass.

While on the Civic 1500 DX, a rear window wiper and washer help you see where you've been as well as where you're going.

SOME SIMPLE ENGINEERING FACTS.

The 1981 Civic DX features front-wheel drive and a transverse-mounted CVCC® engine. 1335cc or 1488cc.

Four-wheel independent suspension, rack and pinion steering, a 5-speed transmission and steel-belted radials come as standard.

New for this year, is the optional 3-speed automatic transmission.

DURABILITY IS ALSO PART OF OUR PHILOSOPHY.

We're not trying to say our cars are immortal. But they are built to last a long time.

We hope it won't be long before you test drive a Honda Civic DX.

Because if you buy our simple philosophy, you're sure to buy our car.

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Of all the ways to save energy, there's none as beautiful as a wall of glass.

You don't need elaborate equipment to use free solar energy to reduce your home's heating, cooling and lighting costs.

What you need is glass and windows, properly placed and designed.

For instance, a south-facing wall of PPG glass can collect the winter sun's heat and supplement a heating system.

And in the summer, when the sun is high in the sky, a roof overhang can shade south-facing glass and block out unwanted heat.

Of course, glass also provides a year-round source of free natural light, which not only brightens a room, but saves on electric lighting.

You can benefit even further by matching the right PPG glass to your climate.

If yours is a new home in a cold area, PPG *Twindow*® *Xi*® or other insulating glass can help control heating costs very effectively. In fact, heat loss through the glass is cut almost in half compared to single-pane glass. And storm windows can get similar results in existing homes.

In the summer, extended roof eaves shade the windows and block out much of the sun's heat.

In warmer climates, PPG *Solarcool*® Bronze reflective glass or any of our tinted glasses blocks out heat and helps control air conditioning costs, too.

To learn more about using glass to save energy, talk to your architect or builder. And write for our free idea book, "Home Styles for the Eighties."

PPG Industries, Inc., Dept. NG-4100, One Gateway Center, Pittsburgh, PA 15222.

PPG: a Concern for the Future

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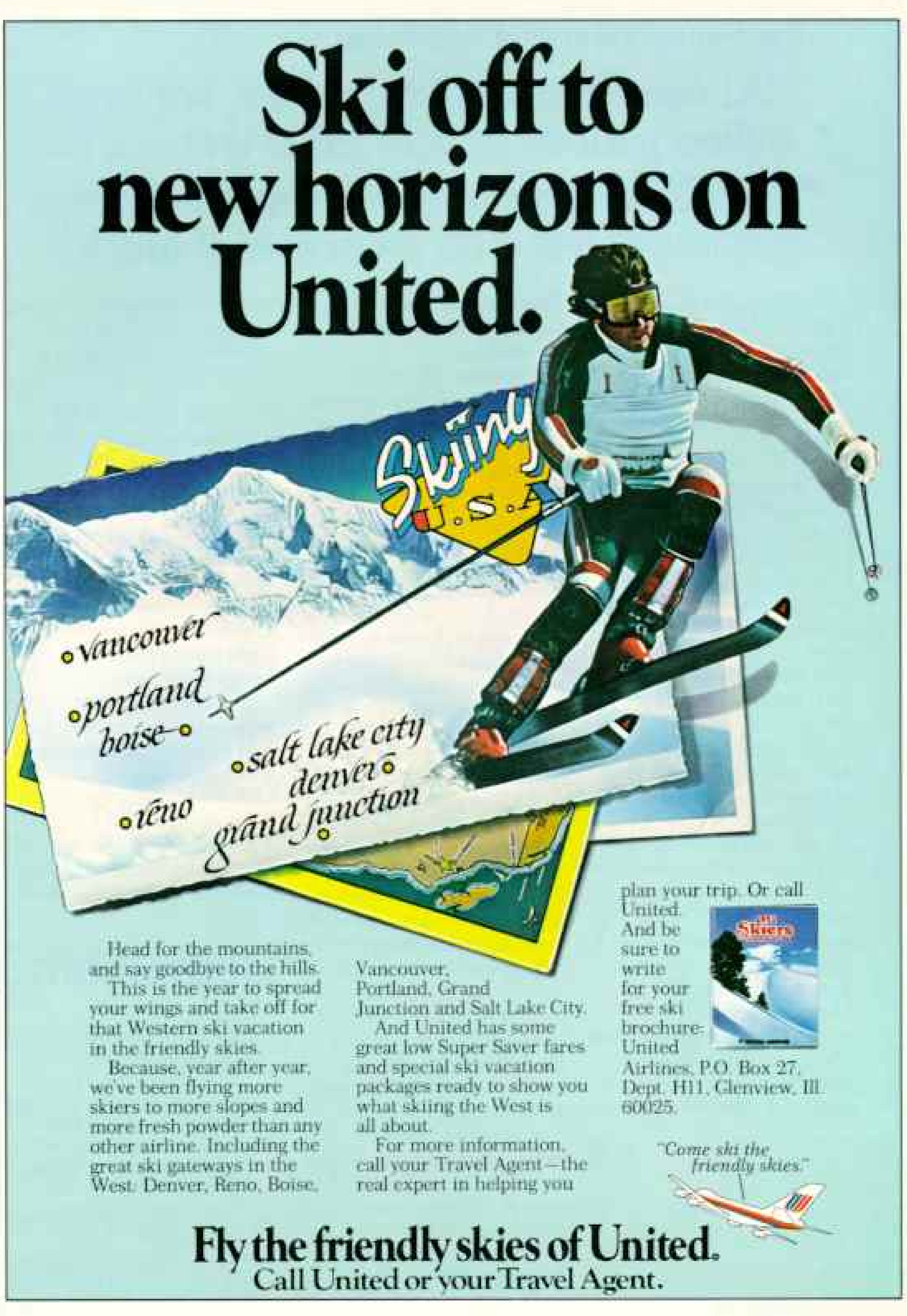

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Head for the mountains, and say goodbye to the hills.
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Environmental activist Ron Babik:

"At our Cambria coal mines, we treat 7 billion gallons of acid mine water a year.

"Thanks to a unique Bethlehem process, we're not left with an ocean of muck."

"Treating all of that water so it meets Federal and state guidelines is no small accomplishment," says Ron Babik. "And neither is disposing of the slurry generated during the process.

The "slurry" problem

"Mine water in this part of the country is acidic because it picks up sulfur and iron as it percolates down through the ground and the coal seams. In order to mine the coal, the water must be pumped out and then treated before it can be discharged into a nearby stream.

"In most mine water treatment methods, lime is added to the water to neutralize the acid and help precipitate out the dissolved metals as solids.

"But most of those methods generate a slurry that's 99% water and only 1% solids. The slurry has to be pumped to large man-made ponds. But these ponds quickly fill up. Then another one has to be started. That wastes land. And when your land runs out, you're up against a serious solid waste disposal problem.

New coal mine waste water process developed by Bethlehem

"Bethlehem's research scientists developed a process that produces a higher-density slurry—a sludge—in which the solids can be concentrated up to 40 times more than with the conventional lime-treatment method. This reduces the volume of the waste material, saves land and cuts costs. As a matter of fact, at Cambria we're able to dispose of most of the sludge by pumping it back into sections of our mines that have been worked out."

Pollution solutions don't come easy—or cheap

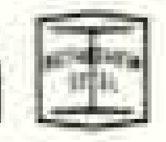
A major problem we face is that we usually can't buy pollution control facilities and equipment off the shelf. They've got to be researched, developed, designed, fabricated, installed, and de-bugged on a case-by-case basis—as was the high-density waste water process we've described here.

And, of course, money is another problem. Bethlehem has already spent more than $700 million for pollution control equipment at our various operations. And we're committed to continue with programs that will control approximately 95 percent of our pollutant emissions and discharges. These programs should achieve primary air and water standards, the level of control established for a healthy environment.

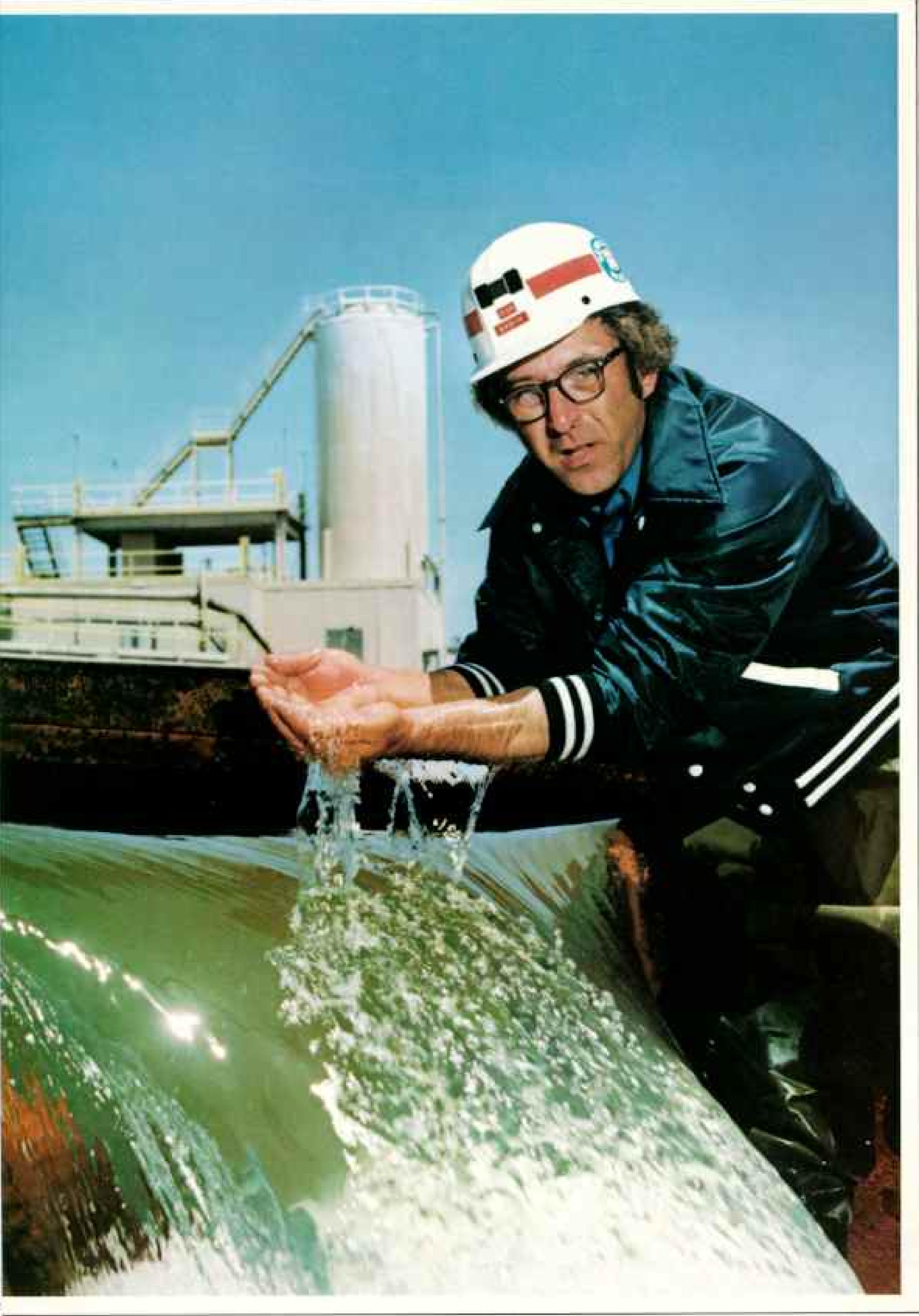
From here on: Let's make sure the benefits are worth the costs

Bethlehem intends to keep on with the clean-up. But before new and tighter regulations are proposed, we believe Federal and state environmental authorities should be required to show that the *benefits* of those regulations will clearly be worth the *costs*.

Our position is clearly explained in our booklet, *Steelmaking and the Environment*, which includes our *Statement on Environmental Quality Control*. If you'd like a copy, write: Public Affairs Dept., 476 Martin Tower, Bethlehem Steel Corporation, Bethlehem, PA 18016.

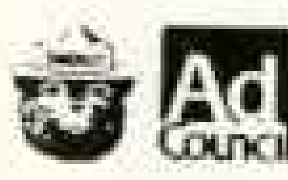
Bethlehem 

Ron Babik supervises the water treatment plants that service the mines at Bethlehem's Cambria Coal Mining Division near Johnstown, Pa. Ron is one of about a thousand Bethlehem Steel employees whose activities involve Bethlehem's environmental control program.



Remember, only you can prevent forest fires.

I can't



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Every car needs HELP!
The new GE emergency 2-way radio in a case.

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A family wagon even a bachelor could love.

GM

1981 Malibu Classic Wagon

It used to be you'd buy a station wagon not so much because you wanted to but because you had to. The family was getting bigger and you simply needed the room.

But times have changed.

People today are buying Chevy Malibu Wagons because they want to. Malibu's trim size makes it agile and easy to drive. When you get behind the wheel, if you don't look behind you, you're apt to think you're driving a coupe.

When you do turn around, you'll see there's over 71 cubic feet of load space with the rear seat down, easily accessible through Malibu's handy-dandy two-way hatchgate. There is also storage in both wheel wells and underneath the floor.

What we're saying is, while today's trim Malibu Wagon can still handle a load, it can also handle a road. You don't have to have a huge family to appreciate that. Heck, you don't even have to be married.

Buy or lease it at your Chevy dealer's now.

'81 Chevy Malibu Chevrolet

How to fit four states into one day.

There are two words for an executive who sets up his daily schedule in four states. One's aggressive. And the other is successful.

People who would add crazy, are probably ill-informed on the advantages of the company airplane.

That's why Beech Aircraft has put together a file of cold, hard facts, case histories, and simple logic on the business aircraft.

It shows how any company, large or small, can expand its territory and profitability, without depleting its treasury, with a Beechcraft company plane.

It shows how a Beechcraft company plane can stand up to the scrutiny of cost accounting by giving you more travel for less money.

And it shows how you can make a breakfast meeting in Denver, a plant inspection in Salt Lake City, a luncheon in Pocatello, a sales banquet in Cheyenne, and be home in Denver for the 10 o'clock news, if that's what it takes.

Because sometimes, that's what it takes.

Send for your free Management Guide to Business Aviation in the '80's and give new meaning to "a day's work."

Write us on your company letterhead, and we'll send you everything you need to decide whether your company can profitably use a Beechcraft. And which Beechcraft suits you best. Write to: Beech Aircraft Corporation, Dept. A4, Wichita, Kansas 67201, and please mention if you're a pilot. If you'd rather call, call collect and ask for Dick Schowalter, Jr. (316) 681-7072.

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You can visit the people you miss for $4.80 for a 3-minute call.

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Until your area has International Dialing, let the Operator do it for you fast. On station calls not requiring special operator assistance, you get the same low rate as dialing direct. Just tell the Operator the country, city name and local number you want.

P.S. Nearly everyone can dial direct to most telephones in Canada, the Caribbean, Alaska, Hawaii, parts of Mexico—just as you dial direct to cities inside the continental U.S.

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Coventry	203	Nottingham	602
Derby	332	Plymouth	752
Edinburgh	31	Portsmouth	705
Glasgow	41	Sheffield	742
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Announcing the ultimate American motor car.

New for 1981 . . . V8-6-4 Fuel Injection . . . or Diesel V8!
Of all the cars in the world, only Seville offers you the choice between a standard Diesel V8 engine—or V8-6-4 Fuel Injection, a remarkable new engine that automatically goes from 8 to 6 to 4 cylinders and back again.

V8-6-4 FUEL INJECTION

Sevilles are equipped with GM-built engines produced by various divisions. See your Cadillac dealer for details.

MPG Sentinel.
MPG Sentinel can help you become a more efficient driver. One push of the Active Cylinders Display button shows the number of cylinders in use—which can help you adjust your driving habits to increase 4-cylinder operation. Other features include instantaneous mpg, average mpg and estimated range. Standard with V8-6-4 Fuel Injection.

Front-Wheel Drive.
Seville's front-wheel drive gives impressive traction and added roominess.

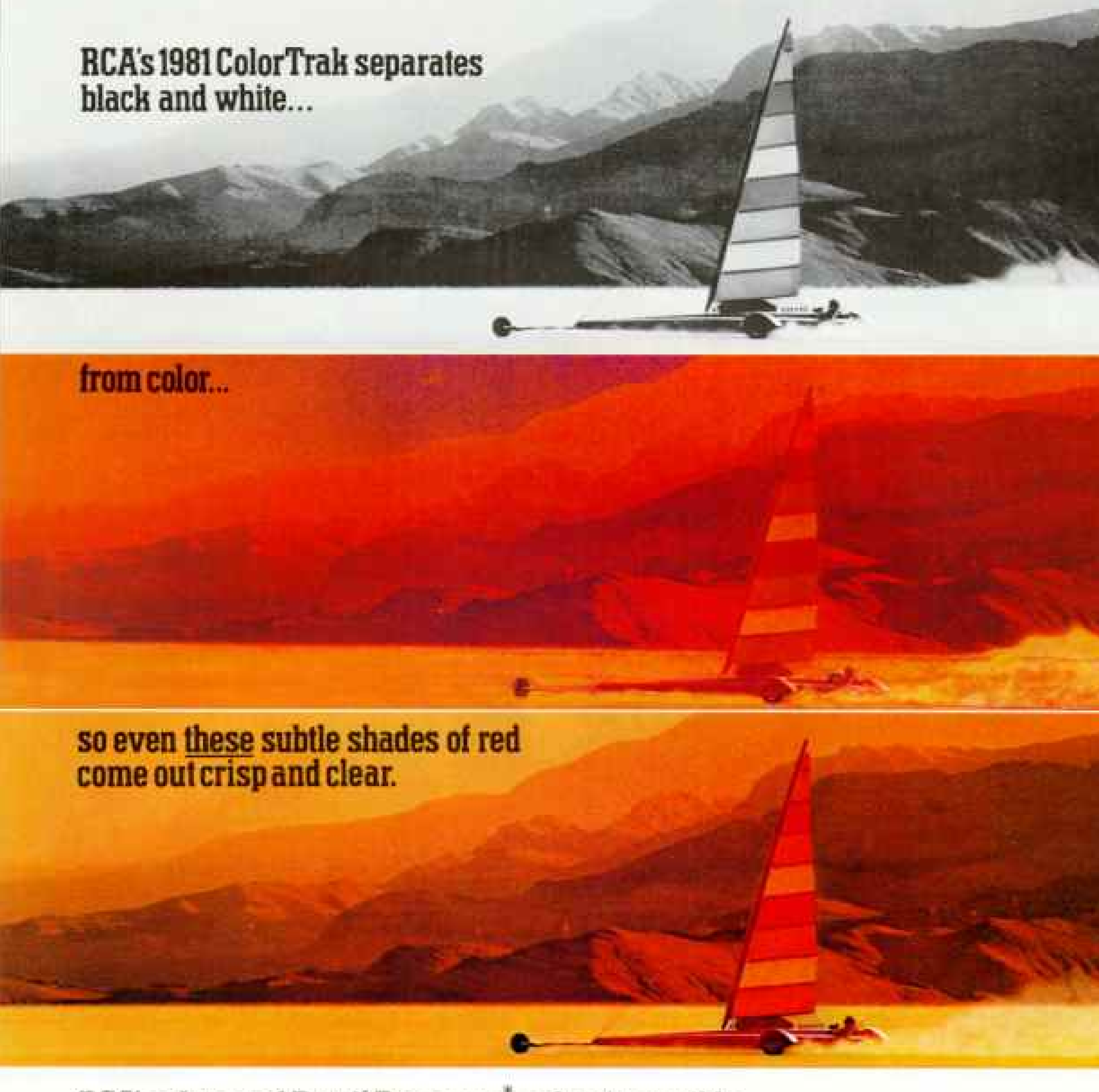
The Digital Seville.
Now available . . . a new Digital Instrument Cluster that translates vital driving information into bright, easy-to-read digital displays.

**Memory Seat—
with "His and Her" settings.**
This available Cadillac exclusive remembers two preset driver's positions. Just push a button and the seat automatically assumes the position of your choice.

An inviting invitation.
Your Cadillac dealer invites you to test-drive this remarkable automobile.

An American Standard for the World.

All you need when you need to straighten out your trip. In English.



RCA's advanced Detail Processor* makes it possible.

All color television pictures are made up of two kinds of picture information.

Color.

And black and white.

In order to create a color picture, every television has to keep each of these signals separate during processing. But if the separation of black and white from color isn't kept complete, the color picture you see won't be quite as *crisp and clear* as it could be. That's because one signal would "spill over" into the other.

To keep black and white separate from color and bring you every subtle shade of color... crisply, clearly... RCA has introduced the advanced Detail Processor to ColorTrak.

It separates color from black and white within the closest of tolerances. Then, with the help of RCA's eight automatic color systems, locks the right color on track. Even colors only subtle shades apart. For the very best color picture in RCA history.

Ask your RCA Dealer for a personal demonstration of ColorTrak 1981. He'll show you the wide range of screen sizes and stylings you have to choose from. Ranging from traditional... all the way to modern.

He'll also introduce you to the new ColorTrak remote control. You'll quickly discover why this is the most advanced remote to *ever* control a ColorTrak.

And while you're looking at ColorTrak, why not listen to ColorTrak? Some models even include Dual Dimension Sound. With sound closer to stereo than monaural.

But whichever model you choose, we're quite sure that you'll be just as proud of your 1981 ColorTrak as we are.

COLORTRAK

RCA

RCA IS MAKING TELEVISION BETTER AND BETTER.

*Available on most 1981 ColorTrak models.

Krementz®
A Tradition Since 1866

Handcrafted
14Kt. Gold
Overlay Jewelry

Write Krementz & Co., 41 Chestnut Street, Newark, N.J. 07101 for free
copy of "Unique - The Story of Krementz Gold Overlay Jewelry".

JEWELRY ENLARGED TO SHOW DETAIL.

THE PRO IN PROJECTORS.

35 mm camera owners would love a Kodak Carousel slide projector for Christmas. It's the projector that's as sophisticated as the camera they own—with the capabilities to get the most out of 35 mm photography.

Standard features include dependable gravity feed, Ektanar C curved-field lens, immediate replay, and whisper-quiet screening. Optional features include automatic focusing, automatic advance, and multivoltage —to allow Carousel projectors to be used anywhere in the world.

No wonder so many photographers go for the pro.

1880 Kodak 1980

America's Storyteller

Kodak Carousel slide projectors for the home.

© Eastman Kodak Company, 1980

THE K CARS PLYMOUTH THE AMERICAN WAY

FRONT-WHEEL-DRIVE PLYMOUTH RELIANT-K AMERICA'S HIGHEST GASOLINE MILEAGE SIX-PASSENGER CAR.

FRONT-WHEEL-DRIVE AND HIGH MILEAGE

25 41

Plymouth Reliant has the highest mileage rating of any six-passenger car in America. 25 EPA estimated MPG.* 41 est. highway. Plymouth's advanced front-wheel-drive technology provides more effective engine power, and reduces weight by eliminating heavy drive shaft parts.

*Reliant wagon 24 EPA est. MPG. 40 est. hwy MPG. Use EPA est. MPG for comparison. Your mileage may vary, depending on speed, weather, and trip length. Actual highway mileage will probably be less. Calif. estimates lower.

FRONT-WHEEL-DRIVE AND SIX-PASSENGER ROOM

The Reliant's power train unit has been placed in front of the passenger compartment, eliminating the giant transmission hump and the drive shaft tunnel. The engine itself is mounted sideways minimizing any intrusion into passenger space. As a result of these design changes the Plymouth Reliant can comfortably seat six people and carry their luggage.

FRONT-WHEEL-DRIVE AND SERVICE

Reliant's new Trans-4 engine was designed exclusively for front-wheel-drive. It was also specially designed for easy and inexpensive serviceability. Intervals between required maintenance have been extended significantly. Many vital functions such as sparkplugs, distributor, battery terminal and drive belt adjustments have been placed up front surrounded by lots of elbow room. You don't have to get under the car to change the oil filter. Many operations can be accomplished by a weekend mechanic.

FRONT-WHEEL-DRIVE AND TRACTION

Because the entire weight of its engine and drive train is directly over the front drive wheels, Reliant is far more resistant to wheel spin and even pulls through snow, where conventional cars may lose traction.

FRONT-WHEEL-DRIVE AND DIRECT POWER

Power from Reliant's transverse-mounted engine and transaxle goes directly to its front drive wheels without energy wasting detours. There is no more efficient way to get power to a car's wheels.

ARE HERE RELIANT-K TO BEAT THE PUMP

FRONT-WHEEL-DRIVE AND PRECISE CONTROL

Because Plymouth Reliant is pulled through turns, it corners with crisp precision. With the balance of its weight up front, Reliant has the stability of a much heavier car. It's nimble in traffic, and parks smartly.

FRONT-WHEEL-DRIVE AND THE ENGINE THAT THINKS FOR ITSELF

Chrysler Corporation's new 2.2 litre Trans-4 engine actually thinks for itself. Seven sensors send back data to an on-board computer, recording variations in outside temperature, engine load, throttle, engine coolant temperature, speed, exhaust oxygen. The engine automatically adjusts for maximum combustion efficiency.

FRONT-WHEEL-DRIVE AND 10 BILLION MILES EXPERIENCE

Chrysler Corporation has a total of nearly a million small front-wheel-drive cars in use today. Based on estimates of 15,000 miles per car per year, that's a minimum of 10.5 billion miles of owner-driven small front-wheel-drive experience. This background has been used to design and engineer the Reliant-K.

FRONT-WHEEL-DRIVE AND QUALITY

The Plymouth Reliant is built in America's newest, most-advanced assembly plants incorporating the latest production techniques and some of the most rigorous quality systems in the world.

Over 2,000 quality inspections and checks are performed before each car leaves the assembly line. Followed by one of the most rigorous "running in" programs in Chrysler history.

Reliant's Trans-4 engines are machined and assembled in an environment approaching the cleanliness of an operating room. Every engine is "hot" tested and rated by computer for 54 different operations. Unless it gets 54 straight A's, it doesn't get into a Reliant-K.

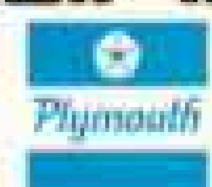
So confident are we of Reliant's quality that it comes with a 30 day/1,000 mile money-back guarantee.[†]

[†]Buy a new 1981 Plymouth Reliant from a participating dealer for personal use. Drive it up to 30 days or 1,000 miles whichever comes first.

If you're not happy with it, bring it back in good condition with no metal damage. When the dealer gets clear title, you get your money back, excluding finance and insurance charges.

Refund value of trade-in may differ from trade-in allowance on retail sales contract. Ask participating dealer for full details.

PLYMOUTH RELIANT K



The New Chrysler Corporation

"The more you learn about our DC-10, the more you know how great it really is."

Pete Conrad
Former Astronaut
Division Vice President, McDonnell Douglas

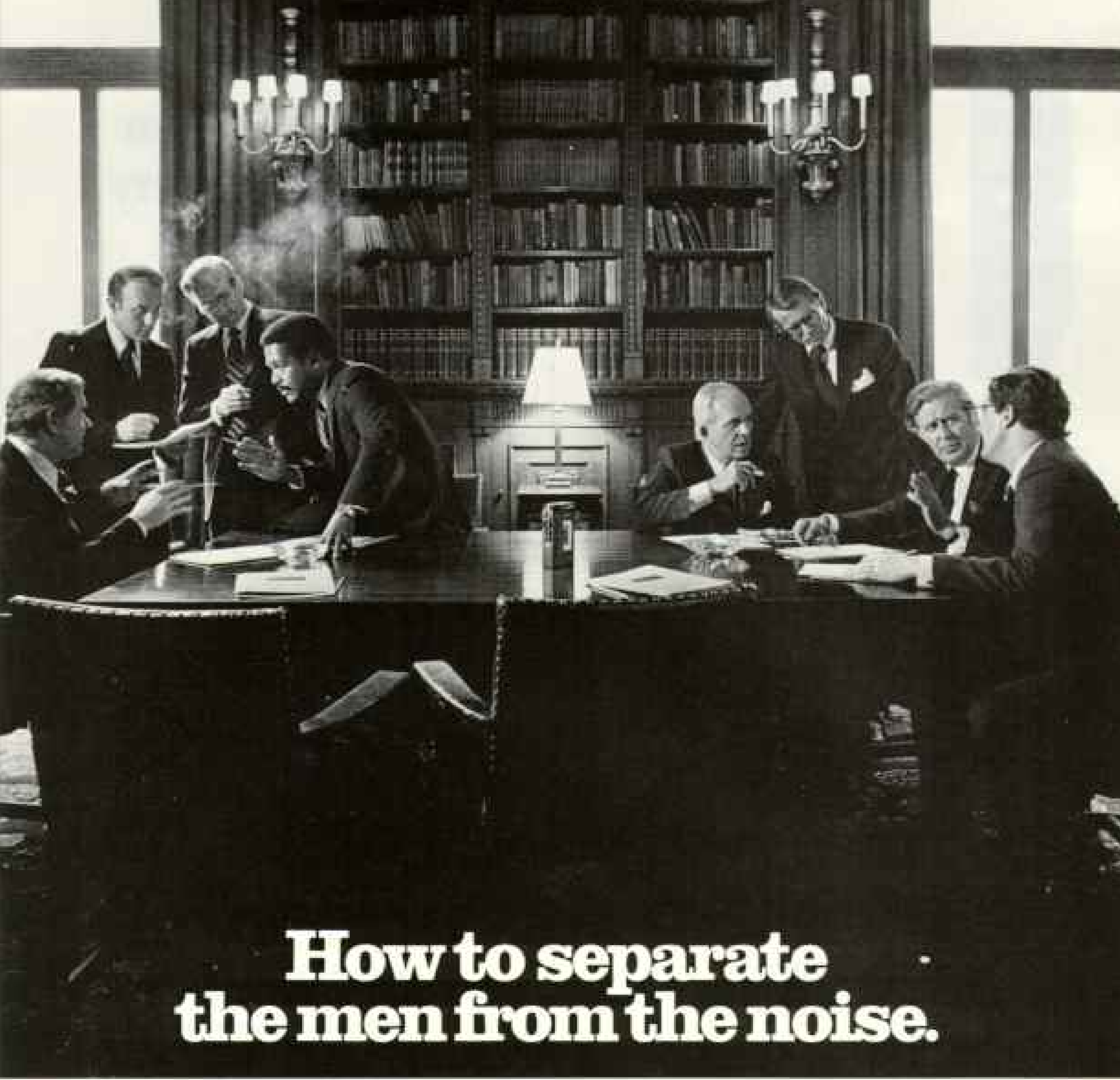
"I've watched airplanes and spacecraft take shape for much of my adult life. I'm certain that nothing made to fly has ever been built to more exacting standards than our DC-10.

"Eighteen million engineering man-hours were invested in this plane's development. That includes 14,000 hours of wind tunnel testing, as well as full-scale 'fatigue testing' for the equivalent of 40 years of airline service.

"I'm convinced that the DC-10 is the most thoroughly tested jetliner ever built. Along with U.S. Government certification, the DC-10 has passed structures tests just as demanding, in their own way, as those required of U.S. Air Force fighter planes.

"The DC-10 fleet demonstrates its dependability flying more than a million miles a day and serving 170 cities in 90 countries around the globe."

To learn more about the DC-10, write: "DC-10 Report," McDonnell Douglas, Box 14526, St. Louis, MO 63178.



During any high-powered group discussion, a lot of good ideas are frequently lost in the din. That's why Sony's TCS-300 stereo cassette-corder can be so invaluable.

It enables you to achieve true sound separation so you can hear *and* understand who said what, and when.

True sound separation

Like all Sony tape recorders, the TCS-300 has exceptional sensitivity and high-quality sound reproduction. But unlike most, this palm-size Notetaker records in stereo through two built-in, unidirectional microphones. And plays back in stereo through featherweight Sony headphones.

For added accuracy, the playback volume level is adjustable for each channel. And if you choose not to listen in stereo, the TCS-300 also has mono playback through the unit's built-in speaker.

A distinct advantage

Of course, should you want to record music, the stereo capabilities of the TCS-300 will add greater dimensions of depth and realism to your favorite sounds.

But getting back to business, when you are using the Sony TCS-300 in a meeting, you have a distinct advantage. And that's what separates the men from the boys.

SONY
THE ONE AND ONLY

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Collect Geographics in handsome files . . .

. . . that look like fine books on your library shelves. Only $1.76 each (in quantity). Have red leather-like fronts embossed in gold. One file holds six issues (12 are too heavy) or many maps. Offset gold numbers (not foil) supplied for neatly adding dates. Supplied only in cartons of six; specify your choice (A) carton of six magazine files, or (B) carton of five magazine and one map file. One carton $10.55 ($12.35 foreign), 4 or more cartons $9.95 each. Postpaid. Send check; Mastercard or VISA holders send number with expiration date and signature or place order by calling toll free 1-800-621-5199 (in Illinois: 1-800-972-5855) anytime. File catalog free with order. HIGHSMITH CO., Box 25NG, Fort Atkinson, Wisconsin 53538.

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Keep it circulating.

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All types of blood are needed . . . all the time.

A reminder from the
American Blood Commission

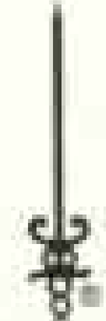
The American Cancer Society thanks you.

Your employees thank you.

Their families thank you.

You've become a life saver. Literally. For installing our Employee Education Program. For letting us supply free films, exhibits, speakers, pamphlets, posters, and articles for your company publications. For accepting our help in arranging "action" programs for your employees . . . for detection of colorectal cancer, instructions in breast cancer examination, for detection of cervical cancer via the Pap test. For simply understanding that if cancer is detected in its early stages, chances for cure are greatly increased. Thank you.

Hundreds of companies now have an American Cancer Society Employee Education Program. If yours isn't one of them, call us.



American Cancer Society
2,000,000 people fighting cancer.

THIS SPACE CONTRIBUTED AS A PUBLIC SERVICE

The Gold Coins of Mexico.

50 Peso "Centenario"
Fineweight:
1.2057 troy ozs.

20 Peso "Azteca"
Fineweight:
.4823 troy ozs.

Once you know the story behind them, you'll know why so many Americans are purchasing them.

The Gold Coins of Mexico are official restrikes of the government of Mexico, minted by the Casa de Moneda de Mexico, the oldest mint in the western hemisphere, established in 1535. Exclusively minted for the Mexican Federal Reserve Bank, Banco de Mexico, The Gold Coins of Mexico have enjoyed a fine reputation throughout the world for many years.

Now, Americans who have made the decision to purchase gold coins have the opportunity to acquire The Gold Coins of Mexico in the United States at the following banks: Citibank, Swiss Bank Corporation and Republic National Bank of New York.

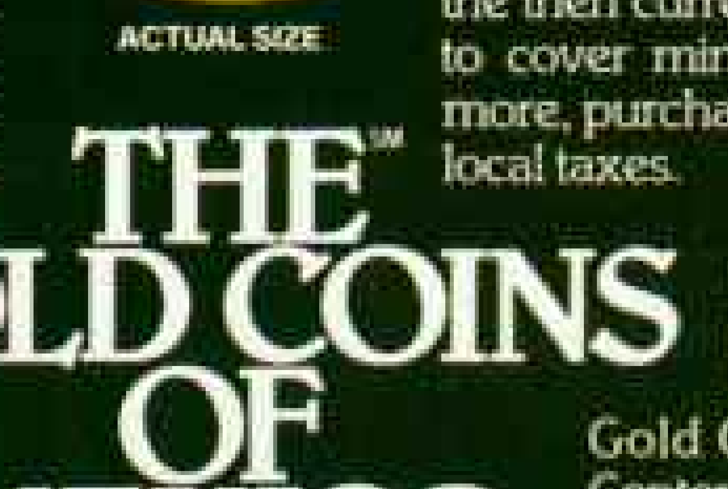
The Gold Coins of Mexico not only provide the convenience, portability and liquidity of owning gold in coin form, but they also offer more alternative choices for purchasers. Mexico's 50 peso gold piece, more commonly known as the "Centenario," is the heaviest of all high circulation gold bullion coins in the world--boasting a high gold content of 1.2057 troy ounces. The "Azteca," Mexico's 20 peso gold piece, features a .4823 troy ounce gold content for purchase on a small scale. A variety of Mexican gold coins of smaller denominations are also available.

ACTUAL SIZE

Many people consider the value and purchasing power of gold as an alternative hedge against inflation. Of course, the decision to own gold is a highly personal one in which risks and advantages should be carefully considered in light of ones specific financial and investment goals. Since gold is a commodity, its value is subject to continual market fluctuations.

Over the years, The Gold Coins of Mexico have become among the most popular gold bullion coins in the world. Due to the careful craftsmanship of Casa de Moneda de Mexico and the wide distribution of these coins, you can usually avoid the cost and delay of determining their authenticity upon resale. As with all gold coins, your pur chase price includes a premium above the then current market price of gold bullion to cover minting and distribution. Furthermore, purchases may be subject to state and local taxes.

Call any of the following toll-free numbers for up-to-the-minute prices. For additional literature, write: The Gold Coins of Mexico, Information Center, Grand Central Station, P.O. Box 1812, New York, N.Y. 10017.



The Gold Coins of Mexico are exclusively supplied to:

Citibank, N.A. 800-223-1080
N.Y. State call collect: 212-559-6041

Swiss Bank Corporation 800-221-9406
N.Y. State call collect: 212-938-3929

Republic National Bank of New York 800-223-0840.
N.Y. State call collect: 212-930-6338

The Gold Coins of Mexico are also available at coin dealers plus selected banks throughout the country.

The Gold Coins of Mexico is a Service Mark of Banco de Mexico, Mexico City.

Announcing the 1981 ~~Cutlass Supreme Brougham.~~

Hamilton!

GM

"This Cutlass is luxurious. I like that. So I call it the 1981 Hamilton!" "Luxury! This car's got it! Sharp, clean lines. Elegant interior, with seats as comfortable as sofas. ...Yet with all this luxury, the price is easy on my checkbook! ...Great gas mileage, too, with the standard V6. And the available diesel offers you even *better* estimated economy. ...You can call it the 1981 Cutlass Supreme Brougham. *I'll* call it the 1981 Hamilton!"

WE'VE HAD ONE BUILT FOR YOU.

STANDARD V6: 21 EPA Est. mpg, 30 Hwy. Est.

REMEMBER: *Compare* the "estimated mpg" to the "estimated mpg" of other cars. You may get different mileage, depending on how fast you drive, weather conditions and trip length. Actual highway mileage will probably be less than the estimated highway fuel economy. Estimates lower in California. Oldsmobiles are equipped with GM-built engines produced by various divisions. See your dealer for details.

IMPORTANT: Computer Command Control is on all standard 1981 gasoline engines. It helps reduce exhaust emissions while allowing good fuel efficiency.

DIESEL V8: 23 EPA Est. mpg, 34 Hwy. Est.

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In fact, the Atari Video Computer System™ is so much fun you'll want to play it all the time. And you can because Atari has more game cartridges to play than anybody else.

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